AnsaldoEnergia

Una Società Finmeccanica

Titolo Title	Identificativo document no.	Rev. rev.	Pagina page	Di of
OPERATING AND MAINTENANCE MANUAL MANUALI DI INSTALLAZIONE ,ESERCIZIO E MANUTENZIONE (INCLUSO PROCEDURE DI PULIZIA IMBALAGGIO E STOCCAGGIO)	**0432 FXLACM026**	**02**	1	647
		Classe di Riservatezza confidential class		2
	Volume N. volume no. 2	Prodotto/Struttura product/structure		

Tipo doc. doc. type	Codice EmittenteTeamcenter teamcenter issuer code	Ente Emittente issued by	Edizione in lingua language	Derivato da derived from	Rev. rev.
EQM	PRO	FLOWSERVE	ITAL/ENG		03

Commessa job no.	Progetto project	Cliente Client
0432	**APRILIA** **Centrale a ciclo combinato 2+1 da 800 MW**	SORGENIA

Rev. rev.	Descrizione kind of revision
00	**PRIMA EMISSIONE**
01	**SECONDA EMISSIONE**
02	**TERZA EMISSIONE**

FLOWSERVE

Rev rev.	Scopo scope	Preparato prepared	Controllato checked	Verificato verified	Verificato verified	Approvato Approved	Data Date
02	I	P. JARDON	R.BERNARDOS	B. CIFUENTES			17/05/2011
01	U	P. JARDON	R.BERNARDOS	B. CIFUENTES			20/12/2010
00	U	P. JARDON	R.BERNARDOS	B. CIFUENTES			30/09/2010
		SIGLA ENTE O FUNZIONE	SIGLA ENTE O FUNZIONE	SIGLA ENTE O FUNZIONE	SIGLA ENTE O FUNZIONE	SIGLA ENTE O FUNZIONE	

INDICE

9. DOCUMENTAZIONE RIGUARDANTE VELOCITÀ VARIABILE

DOCUMENTAZIONE TECNICA GIUNTO TURBO A VELOCITÀ VARIABILE

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Una Società Finmeccanica

Titolo Title	Identificativo document no.	Rev. rev.	Pagina page	Di of
VARIABLE SPEED TURBO COUPLING (DATA SHEET, DRAWING ETC) TECHNICAL DOCUMENTATION. **DOCUMENTAZIONE TECNICA GIUNTO VOITH (DIS. ASSIEME, DIS. SEZIONE, FOGLIO DATI, LISTE ECC.))**	**0432 FXLACM017**	**02**	1	644
		Classe di Riservatezza confidential class		2
	Volume N. volume no.	Prodotto/Struttura product/structure		

Tipo doc. doc. type	Codice EmittenteTeamcenter teamcenter issuer code	Ente Emittente issued by	Edizione in lingua language	Derivato da derived from	Rev. rev.
CCD	PRO	FLOWSERVE	ENGLISH		

Commessa job no.	Progetto project	Cliente Client
0432	**APRILIA** **Centrale a ciclo combinato 2+1 da 800 MW**	SORGENIA

Rev. rev.	Descrizione kind of revision
00	**PRIMA EMISSONE**
01	**SECONDA EMISSIONE**
02	**TERZA EMISSIONE**

FLOWSERVE

Rev rev.	Scopo scope	Preparato prepared	Controllato checked	Verificato verified	Verificato verified	Approvato Approved	Data Date
02		Voith	RB	BC			21/10/2010
01		Voith	RB	BC			10/03/2010
00		Voith	RB	BC			11/12/2009

Voith Turbo

VOITH

Documentazione tecnica
Manuale operativo

Riferimento
Flowserve Aprilia S1

Turbogiunto a velocità variabile
562 SVTL 12.1

Documentazione tecnica n. 91800110410_BA1_it

Revisione 0

Appendice_A_
Appendice_B_

In caso di domande sul Turbogiunto a velocità variabile, è possibile rivolgersi al servizio clienti (rep. aira) per la gamma di prodotti dei comandi regolabili della Voith Turbo GmbH & Co. KG Crailsheim, indicando il numero di fabbricazione.

Voith Turbo GmbH & Co. KG
Casella postale 15 55
D-74555 Crailsheim
Telefono sede centrale: +49 7951 32-0
Fax sede centrale: +49 7951 32-650
Email:service.regelbare.antriebe@voith.com

Servizio clienti - Comandi regolabili
www.voith-coupling-service.com
E-mail:
service.regelbare.antriebe@voith.com

Tel. +49 7951 32 1666
Fax +49 7951 32 903

Questo Manuale operativo descrive il livello tecnico del Turbogiunto a velocità variabile al momento della fornitura
Eventuali modifiche successive apportate al Turbogiunto a velocità variabile non sono considerate in questo Manuale operativo.

Data di pubblicazione: 2010-06-02
Documentazione tecnica n. 91800110410_BA1_it
Versione 1.00

Printed in Germany

Versioni - Protocollo

Versione 1.00

- Modifiche, sostituzione nei singoli capitoli/fogli del manuale operativo.
- Aggiunte all'interno di un manuale operativo

- Sostituzione completa dell'intero manuale operativo

Revisione	Versione	Modifica	Data
0	1.00	Prima edizione del manuale operativo	2010-06-02

Data	Creato da	Responsabile della Linea di Prodotti
2010-06-02	airpd / Kapp	airek / Hofmann

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N. serie da 8206786 a 8206789

Voith Turbo

Voith Turbo GmbH & Co. KG
Voithstraße 1
74564 Crailsheim, Germania

Dichiarazione di Incorporazione per quasi-macchine
(ai sensi della Direttiva Macchine CE 2006/42/CE, allegato II B)

Con la presente, noi

Voith Turbo GmbH & Co. KG
Voithstraße 1
74564 Crailsheim

dichiariamo che la quasi-macchina

Denominazione della macchina:	Giunto a velocità variabile per il controllo di turbomacchine Voith
Password:	"Flowserve Aprilia S 1"
Tipo:	562 SVTL 12.1
N° di serie:	8206786 - 8206789
N° d'ordine:	38002141

è conforme, fin dove consentito dal volume di fornitura, ai requisiti essenziali in materia di sicurezza e salute ai sensi dell'Allegato I della Direttiva 2006/42/CE (Direttiva Macchine).

Ulteriori direttive e norme armonizzate applicate, in particolare:
- 2006/95/Direttiva Bassa Tensione CE, 2004/108/CE - Direttiva CEM (compatibilità elettromagnetica)
- DIN EN ISO 12100-1, DIN EN ISO 13857, DIN EN 349, DIN EN 60204-1

Dichiariamo inoltre che la documentazione tecnica specifica per la suddetta quasi-macchina è stata redatta secondo quanto riportato nell'Allegato VII, parte B. Qualora richiesta ci impegnamo a trasmettere tale documentazione tecnica specifica alle autorità di vigilanza sul mercato.
La modalità di spedizione s'effettua come da accordi con l'autorità di vigilanza sul mercato.
La documentazione tecnica specifica può essere richiesta al mandatario della documentazione tecnica presso

Voith Turbo GmbH & Co. KG
sig. Hans Schirle, reparto aire
Voithstraße 1
74564 Crailsheim

La messa in funzione della quasi-macchina è vietata finché non è stato stabilito che (se applicabile) la macchina in cui la summenzionata quasi-macchina deve essere incorporata è conforme alle disposizioni della Direttiva Macchine 2006/42/CE.

Non è consentito apportare modifiche alla macchina senza espressa autorizzazione scritta di Voith Turbo.

Data/firma:	2010-06-08 i.A. Hofmann
Qualifica del firmatario:	Responsabile Linea Prodotto
Data/firma:	2010-06-08 i. V.
Qualifica del firmatario:	Responsabile Vendite

Informazioni generali relative al manuale operativo

Funzionamento comodo

Il manuale operativo contiene importanti indicazioni per far funzionare il Turbogiunto a velocità variabile in modo sicuro, regolare e comodo. L'osservanza di queste indicazioni consente di evitare pericoli, costi di riparazione e tempi di inattività e di aumentare l'affidabilità e la durata del Turbogiunto a velocità variabile.

Lettura del manuale operativo

Leggere attentamente il presente manuale operativo per acquisire dimestichezza con l'utilizzo e le corrette azioni da eseguire.

Luogo di impiego

Il manuale operativo deve essere sempre disponibile sul luogo di impiego del Turbogiunto a velocità variabile.

Copyright

Definizione dei gruppi di destinazione

I contenuti di questo manuale operativo sono definiti per diversi gruppi di destinazione. Qui viene definito il livello di conoscenza che il gruppo di destinazione specifico deve avere.

Tutti i gruppi di destinazione devono aver letto questo manuale operativo e averne compreso i contenuti.

L'operatore deve

- aver compiuto 18 anni,
- essere addestrato in relazione al Turbogiunto a velocità variabile,
- conoscere le disposizioni antinfortunistiche specifiche del paese.

Il personale addetto alla manutenzione deve

- aver compiuto 18 anni,
- conoscere i punti di manutenzione sul Turbogiunto a velocità variabile,
- conoscere le disposizioni per la tutela ambientale specifiche del paese per lo smaltimento di lubrificanti e detergenti.

Il personale di servizio deve

- aver compiuto 18 anni,
- possedere una formazione scolastica e professionale consolidata,
- essere addestrato da Voith Turbo GmbH & Co. KG nelle attività di servizio da eseguire sul Turbogiunto a velocità variabile,
- essere istruito sulle regole comportamentali in caso di anomalia.

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Modifiche tecniche

I nostri impianti vengono continuamente sviluppati e migliorati. I dati contenuti in questa edizione sono conformi allo stato della tecnica.

Le modifiche dei dettagli tecnici rispetto alle indicazioni e alle figure del manuale operativo sono riservate.

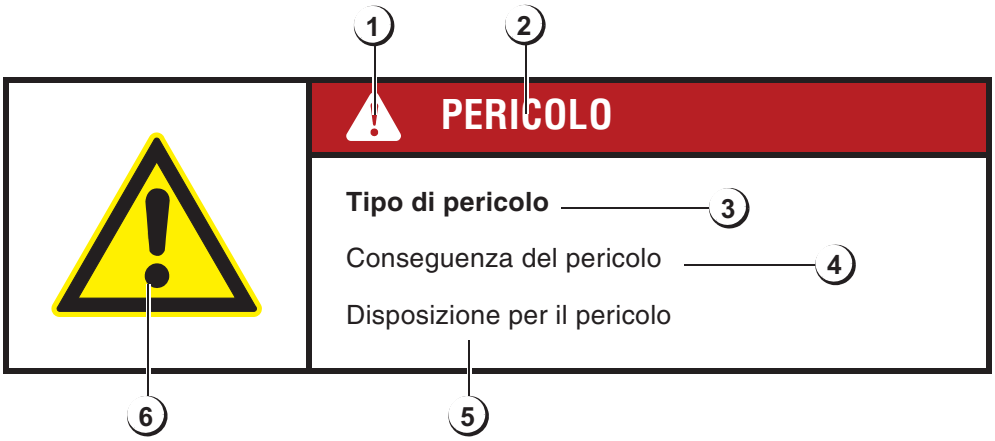
Regole per la prevenzione degli infortuni

Oltre al manuale operativo e alle regole vigenti nel paese dell'utente e nei luoghi di utilizzo per la prevenzione degli infortuni è necessario attenersi anche alle regole tecniche riconosciute per lavori eseguiti in sicurezza e a regola d'arte.

Indicazioni per l'utilizzo del manuale operativo

Struttura delle indicazioni di sicurezza

Segnalazione di anomalie relativa all'utilizzo:

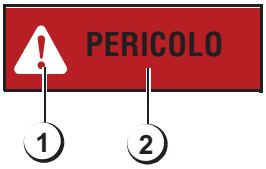


Riepilogo delle indicazioni di sicurezza e avvertenze aggiuntive prima del rispettivo capitolo:

Tipo di pericolo (3)

Conseguenza del pericolo (4)

Contromisura per il pericolo (5)



1. Simbolo di sicurezza
2. Dicitura del segnale livello di pericolo
3. Tipo e origine del pericolo
4. Eventuale conseguenza del pericolo
5. Disposizione per evitare il pericolo
6. Simbolo di sicurezza

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Avvertenze

AVVERTENZA

Presenta un'informazione che contiene importanti indicazioni relative all'utilizzo e/o al procedimento. La mancata osservanza delle indicazioni può causare anomalie.

Definizione dei tipi di testo

I testi vengono definiti in base alla loro funzione nel seguente modo:

Tipo di testo	Definizione	Funzione
Istruzioni per le azioni da eseguire	**1.**, **2.**, ecc.	invita ad eseguire un'azione
Elenco 1. livello	•	definisce singoli elementi dell'elenco
Elenco 2. livello	–	definisce punti secondari dell'elenco
Rimando	➔	rimanda ad altri capitoli o passi del testo

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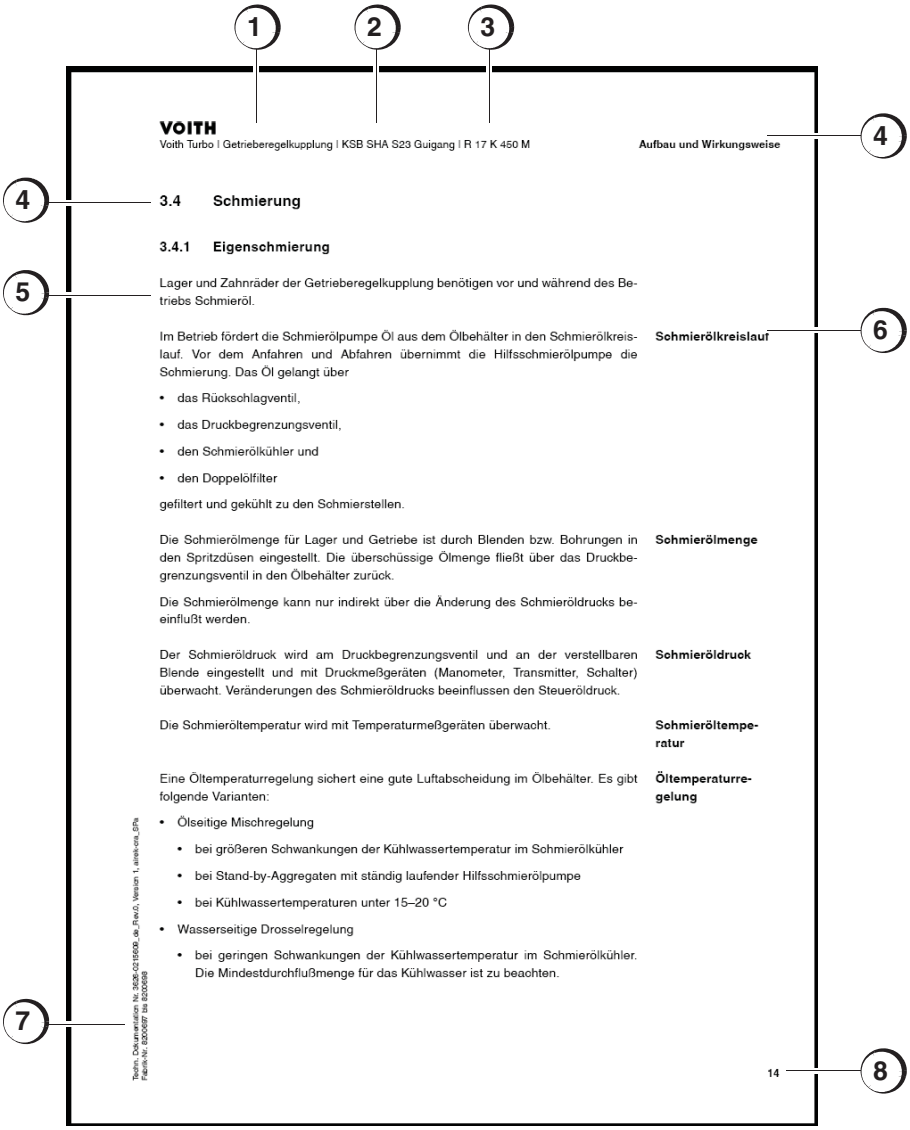
Struttura della pagina:



1. Tipo di impianto
2. Riferimento
3. Dimensione del giunto
4. Denominazione del capitolo
5. Paragrafi di testo
6. Titoli a margine
7. N. documentazione tecnica, lingua, versione e esecutore
8. Numero di pagina

Indice

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1 Dati tecnici

Turbogiunto a velocità variabile	562 SVTL 12.1
Riferimento	Flowserve Aprilia S1
Numero ordine	38002141
N. serie	da 8206786 a 8206789

1.1 Dati della macchina

Turbogiunto a velocità variabile

Turbogiunto a velocità variabile come comando pompa di alimentazione della caldaia		
Temperatura ambiente del **Turbogiunto a velocità variabile**	max. **+40 °C (104 °F)**	min. **18 °C (-0,4 °F)**
Senso di rotazione in direzione del flusso di forze:		**sinistrorso**
• Corsa del tubo di presa (H)		**145** mm
Assorbimento di potenza della macchina operatrice	P_a	**2014** kW
Numero di giri del motore	n_e	**2983** min^{-1}
Accelerazione a pieno carico	s	**3.1** %
Numero di giri in uscita max.	n_a	**2892** min^{-1}
Area di regolazione		4:1 verso il basso
Volumi di riempimento per il serbatoio dell'olio		**500** l
Viscosità dell'olio richiesta		ISO VG **32**
Peso:		
• Complessivamente (senza olio)		**1260** kg
Emissione di rumore:[1]		
• Livello pressione acustica della superficie di misurazione	L_{pA}	≤ **85** dB

1. Misurazione a norme EN ISO 3744
Valori dedotti da misure di impianti di uguale costruzione

Pezzi applicati

Pompa di riempimento

Pompa di riempimento	1 pompa di riempimento per il circuito olio di lavoro e olio di lubrificazione
Tipo pompa di riempimento	TZP **500C**
Avviamento	Meccanico tramite albero motore del Turbogiunto a velocità variabile

Pompa ausiliaria di lubrificazione

Tipo	"Tipo: R 25/20 FL-Z-W-G1-R"
Avviamento	Motore elettrico

Motore per la pompa ausiliaria di lubrificazione olio

Tipo	"Tipo: 5 AP 90S-2"
Assorbimento potenza	**1,5** kW
Tensione d'esercizio	**230** V / **50** Hz
Numero di giri	**2860** min^{-1}
Classe di protezione	IP **55**

Doppio filtro olio

Tipo	"Tipo: DSF 176.43837"
Finezza filtro	25 µm
Elemento filtrante	Inserto, lavabile
Classe di purezza olio raggiungibile di	18 / 15[1]

1. Classe di purezza olio a norme ISO 4406

Servomotore tubo di presa

Tipo	"Tipo: Contrac PME 120 AI"
Accessorio	**4-20 mA**

Giunti di collegamento

Lato avviamento	"Nessuna fornitura tramite Voith-Crailsheim"
Lato condotto	"Nessuna fornitura tramite Voith-Crailsheim"

Indicatore livello olio/Interruttore

Indicatore - Tipo	"Tipo: FSA 254.2.0/12"
Esecuzione	Indicatore livello fluido
Interruttore - Tipo	"Tipo: XT 20 (2xSPDT)"
Esecuzione	Livellostato

Scambiatore di calore

Tipo di raffreddamento olio	"Tipo: L1 N4 11 21 13K"

Strumenti

Vedi Capitolo 14 "Componenti esterni (descrizioni)" nel presente Manuale operativo

➔ Per una documentazione dettagliata dei componenti menzionati, vedi Capitolo 14 "Componenti esterni (descrizioni)" nel presente Manuale operativo.

1.2 Dati d'esercizio

1.2.1 Turbogiunto a velocità variabile

Temperature ( )[1]

Temperatura dell'olio di lavoro *dopo* il tubo di presa (18)	Campo operativo Allarme in caso di Disinserire a	< 100 °C (212 °F) > 100 °C (212 °F) > 110 °C (230 °F)
Temperatura dell'olio di lavoro *prima* dello scambiatore di calore (35)	Campo operativo	< 95 °C (203 °F)
Temperatura dell'olio di lavoro *dopo* lo scambiatore di calore (33 33.1; 31.10)	Campo operativo Allarme in caso di Disinserire a	< 55 °C (131 °F) > 60 °C (140 °F) > 65 °C (149 °F)
Temperatura olio *nel* serbatoio d'olio (60; 60.10)	Campo operativo Allarme in caso di Disinserire a	> 30 °C (86 °F) > 5 °C (41 °F) > 95 °C (203 °F)

1. I numeri tra parentesi indicano i punti di misurazione secondo "Schema circuito olio e punti di misurazione 91600384410".

Pressioni ( )[1]

Pressione dell'olio di lubrificazione sul manometro (16)		> 0,3 bar
Pressione dell'olio di lubrificazione sull trasmettitore di pressione (17;17.1; 17.2)	Campo operativo Consenso motore principale Consenso motore blocco Pompa ausiliaria olio di lubrificazione OFF Pompa ausiliaria olio di lubrificazione ON	> 1,2 bar > 1,3 bar < 1,0 bar > 1,8 bar < 1,5 bar
Pressione differenziale sull pressostato differenziale (41.1)	Campo operativo commutare l'allarme e il filtro doppio a Disinserire a	< 0,3 bar > 0,6 bar > 0,8 bar
Pressione dell'olio nel collegamento di controllo (55.1)	Campo operativo	conformemente ai valori di cui sopra nei punti di misurazione 16; 17; 17.1; 17.2

1. I numeri tra parentesi indicano i punti di misurazione secondo "Schema circuito olio e punti di misurazione 91600384410".

Livello olio ( )[1]

Livello stato olio/trasmettitore livello dell'olio (37)	Campo operativo	Livello dell'olio tra MIN - MAX
	Disinserimento / Allarme	**15 mm sopra MAX**
	Disinserimento / Allarme	**15 mm sotto MIN**

1. I numeri tra parentesi indicano i punti di misurazione secondo "Schema circuito olio e punti di misurazione 91600384410".

Riscaldamento coppa dell'olio ( )[1]

Riscaldatore / Regolatore di temperatura (36) Temperatura olio nel serbatoio (36)	Campo operativo Riscaldatore **ON** Riscaldatore **OFF**	**> 10 °C (50 °F)** **< 5 °C (41 °F)** **> 10 °C (50 °F)**
Riscaldatore / limitatore di temperatura (36)	Campo operativo Riscaldatore **OFF**	**< 95 °C (203 °F)** **> 130 °C (266 °F)**

1. I numeri tra parentesi indicano i punti di misurazione secondo "Schema circuito olio e punti di misurazione 91600384410".

Trasduttore di accelerazione ( )[1]

Trasduttore di accelerazione (53.1; 53.2)	Campo operativo	Vms **< 5,6 mm/s**
	Allarme in caso di Disinserire a	Vms **> 8mm/s** Vms **> 11mm/s**

1. I numeri tra parentesi indicano i punti di misurazione secondo "Schema circuito olio e punti di misurazione 91600384410".

Quantità d'olio

Quantità d'olio di lavoro nel circuito	**500** l/min
Quantità di olio di lubrificazione per Turbogiunto a velocità variabile > **0,3** bar	**10** l/min
Quantità di olio di lubrificazione per aggregati esterni:	
complessivamente (a **1,5** bar; **55** °C)	**30** l/min
Motore (a __bar)	l/min
Pompa (a __bar)	l/min

Servomotore

Tempo di regolazione	**60** sec./ **0-100** %

1.2.2 Scambiatore termico

Dati

Scambiatore di calore olio di lavoro[1] "Tipo: L1 N4 11 21 13K"	Vano rivestimento (olio)	Vano tubi (Acqua)
Mezzo	Olio	Acqua
Volumi	152 l	117 l
Portata nominale V_{nom}	30 m^3/h	50 m^3/h
Portata minima per corrosione V_{min}		35 m^3/h
Temperatura d'entrata	82 °C (180 °F)	50 °C (122 °F)
Temperatura d'uscita	55 °C (131 °F)	55 °C (131 °F)
Temperatura d'esercizio ammessa	120 °C (248°F)	70 °C (158 °F)
Sovrapressione d'esercizio ammessa	10 bar	10 bar
Sovrapressione di controllo	15 bar	15 bar

1. Dati esplicativi derivanti dallo scambiatore di calore - da completare da parte dei fornitori

2 Indicazioni di sicurezza

2.1 Presupposti per la costruzione dell'impianto

Principio fondamentale

Il Turbogiunto a velocità variabile è costruito secondo gli standard tecnici e le regole tecniche riconosciute per la sicurezza. Tuttavia, il suo utilizzo può causare lesioni e pericoli all'utente o a terzi oppure compromettere l'impianto e altri beni.

Utilizzo dell'impianto

Utilizzare Turbogiunto a velocità variabile solo in condizioni tecnicamente perfette rispettando le disposizioni sulla sicurezza e sui pericoli e attenendosi al manuale operativo. Eliminare immediatamente le anomalie che possono compromettere la sicurezza.

2.2 Utilizzo della macchina secondo le disposizioni

Impiego dell'impianto

Il Turbogiunto a velocità variabile serve a trasmettere potenza senza usura da una macchina d'avviamento a una macchina operatrice. Utilizzare la macchina solo in modo regolamentare.

Per un utilizzo conforme è necessario rispettare le condizioni di esercizio e di manutenzione prescritte dal costruttore.

Ogni altro utilizzo diverso da quello specificato è considerato non conforme.
Il costruttore non è responsabile di eventuali danni derivanti da un utilizzo non conforme; ogni rischio e pericolo sarà a carico dell'utente.

2.3 Utilizzo non conforme della macchina

La trasmissione della potenza consentita nel funzionamento permanente tramite il giunto con un determinato numero di giri dell'azionamento, potenza, senso di rotazione, quantità di olio per macchine esterne, contenuto di olio, è descritta in questo manuale operativo. Un utilizzo diverso da quello specificato, come ad es., per potenze più elevate, numeri di giri più elevati o numero di giri più bassi, liquidi di esercizio diversi, per condizioni di esercizio non stabilite o modifiche costruttive è considerato non conforme.

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2.4 Indicazioni di sicurezza generali

2.4.1 Simbolo di sicurezza

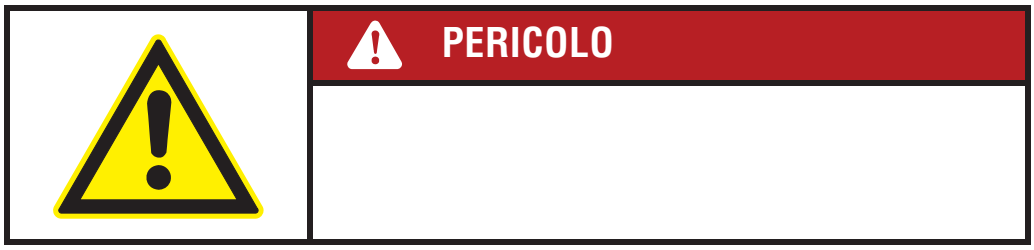
Il simbolo di sicurezza viene utilizzato per segnalare eventuali danni alle persone. Attenersi a tutte le indicazioni che presentano questo simbolo di sicurezza per evitare possibili lesioni o il decesso.

2.4.2 Classificazione dei pericoli

Classificazione dei pericoli valida per segnalazione di anomalie relative all'utilizzo (vedere gli esempi seguenti), riepilogo delle indicazioni di sicurezza e avvertenze aggiuntive prima del rispettivo capitolo.

Pericolo

Indica una situazione immediatamente pericolosa, che può provocare morte o lesioni gravi, se non vengono rispettate le disposizioni di sicurezza.



Avvertimento

Indica una possibile situazione pericolosa, che può provocare morte o lesioni gravi, se non vengono rispettate le disposizioni di sicurezza.

Attenzione

Indica una possibile situazione pericolosa, che può provocare danni materiali, lesioni lievi o medie, se non vengono rispettate le disposizioni di sicurezza.

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Attenzione - senza simbolo di sicurezza

Indica una possibile situazione pericolosa, che può provocare danni materiali, se non vengono rispettate le disposizioni di sicurezza.

2.4.3 Manutenzione e sostituzione dei simboli di sicurezza

La sicurezza dell'utente deve sempre essere al primo posto.

- Sostituire tutti i simboli di sicurezza danneggiati e persi.
- Utilizzare acqua e detergente delicato per pulire i simboli di sicurezza.

Non utilizzare detergenti che contengono solventi.

2.4.4 Sicurezza personale

Le persone che utilizzano o che lavorano con il Turbogiunto a velocità variabile devono leggere e comprendere il manuale operativo e i simboli descritti.

2.5 Indicazioni di sicurezza generali

- Il manuale operativo del costruttore è vincolante per l'utilizzo, la manutenzione, il montaggio e il trasporto.
- Laddove necessario, il cliente deve integrare le norme di sicurezza alle condizioni di utilizzo locali con particolari indicazioni adeguate.
- Conservare accuratamente il manuale operativo e le indicazioni relative alla sicurezza.
- Il manuale operativo e le indicazioni di sicurezza devono essere completi e in condizioni leggibili.

Prima dell'inizio del lavoro

- Prima dell'inizio dei lavori, informarsi sulle possibilità di primo soccorso e di salvataggio (medico di pronto intervento, vigili del fuoco, servizi di soccorso).
- Informarsi sull'ubicazione e sull'utilizzo degli estintori e sulle possibilità locali per la segnalazione degli incendi e la lotta antincendio.

Durante il lavoro

- I dispositivi di sicurezza non devono mai essere messi fuori servizio né rimossi.
- Durante il funzionamento, indossare indumenti protettivi da lavoro. Rimuovere anelli, sciarpe o giacche aperte. Per determinati lavori è necessario indossare occhiali, guanti e caschi protettivi, giubbotti riflettenti, cuffie per l'udito, ecc.
- Tralasciare qualsiasi modo di lavorare che limita la sicurezza.
- Azionare il Turbogiunto a velocità variabile solo in condizione sicura ed efficiente.
- Mai azionare la macchina con controllo difettoso.

Disposizioni per la tutela ambientale

- Per tutti i lavori eseguiti con il Turbogiunto a velocità variabile, rispettare le norme vigenti per la tutela ambientale.
- In particolare, durante i lavori di installazione, riparazione e manutenzione, fare attenzione che materiali dannosi per l'ambiente, quali grassi e oli lubrificanti, detergenti contenenti solventi e simili non penetrino nel terreno o nelle fognature.
  Questi materiali devono essere conservati, trasportati, raccolti e smaltiti in contenitori adeguati.
- Se i liquidi sopra indicati penetrano nei terreni, interromperne immediatamente la fuoriuscita e unire il liquido con un legante adeguato. Eventualmente sarà necessario scavare il terreno.
- Smaltire adeguatamente il legante e la terra scavata, rispettando le disposizioni vigenti per la tutela ambientale.

2.6 Misure organizzative

Manuale operativo

Il manuale operativo contiene indicazioni importanti per l'impiego corretto del Turbogiunto a velocità variabile. Prima del montaggio della macchina e soprattutto prima della messa in servizio dell'intero impianto, leggere attentamente il manuale operativo ed accertarsi di averlo capito bene.

Conservare il manuale operativo in modo tale che sia sempre a disposizione del personale di servizio.

Prevenzione incidenti/ tutela dell'ambiente

Integrazione al manuale operativo: Preparare e osservare delle regole per la prevenzione incidenti e per la tutela dell'ambiente.

Modifiche costruttive

Per quanto riguarda le modifiche di tipo costruttivo, osservare le seguenti indicazioni:

AVVERTIMENTO

Pericolo per modifiche costruttive

Modifiche costruttive eseguite sul Turbogiunto a velocità variabile possono causare danni a persone e a cose.

Eseguire modifiche, aggiunte o trasformazioni costruttive sul Turbogiunto a velocità variabile solo con il permesso della Voith Turbo GmbH & Co. KG, Crailsheim.

AVVERTENZA

Prima del montaggio e/o applicazione, controllare la presenza di eventuali danni interni ed esterni e di impurità nei componenti aggiuntivi (anche tramite mastici al silicone), che non fanno parte della fornitura della ditta Voith Turbo GmbH. Assicurare un funzionamento perfetto.

2.7 Scelta e qualifica del personale, doveri fondamentali

Personale qualificato

- Permettere soltanto a personale qualificato e addestrato di lavorare sul Turbogiunto a velocità variabile. Il personale deve disporre di formazione, istruzione e/o qualificazione
  - per poter lavorare ed eseguire la manutenzione degli impianti in modo adeguato e in base agli standard di sicurezza tecnica

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– per smaltire adeguatamente i mezzi e i loro componenti, per es. filtri, cartucce filtri olio e oli
– per curare e utilizzare l'equipaggiamento di sicurezza in base agli standard di sicurezza tecnica
– per prevenire gli incidenti e prestare il pronto soccorso.

Personale da istruire

- Il personale da addestrare, istruire, avviare o rientrante in una formazione generale, deve operare sull'impianto solo sotto lo stretto controllo di una persona esperta.

2.8 Doveri del cliente

Turbogiunto a velocità variabile in condizioni non perfette potrà causare danni a persone e macchine.

Il cliente ha l'obbligo di mettere in funzione il Turbogiunto a velocità variabile solo in condizioni perfette.

La protezione dei punti pericolosi che si creano tra Turbogiunto a velocità variabile e i dispositivi specifici del cliente deve essere eseguita dal cliente.

Il Turbogiunto a velocità variabile genera calore, che potrebbe aumentare la temperatura attorno all'area di lavoro e danneggiare le persone. Il cliente ha l'obbligo di fornire sempre una ventilazione adeguata.

Durante i lavori sulla macchina, il cliente deve provvedere a fornire un'illuminazione adeguata.

2.8.1 Dispositivi di protezione

Un esperto deve verificare lo stato di sicurezza dei dispositivi di protezione, bloccaggi e accoppiamenti presenti sull'impianto ad intervalli regolari.

Parti del corpo macchina, tubi dell'olio di lavoro e il radiatore raggiungono temperature superficiali > 60 °C. L'ambito della fornitura non comprende una protezione da contatto, dato che le condizioni di installazione non sono note e una protezione da contatto completa sarebbe troppo dispendiosa e limiterebbe notevolmente l'accessibilità per lavori di manutenzione.

Si consiglia di limitare l'accesso alle zone necessarie per il normale funzionamento adottando misure adeguate sul luogo di installazione, ad es., contrassegnando le zone di passaggio, applicando segnali di pericolo e istruendo il personale di servizio. Per zone necessarie si intende il quadro strumenti e il filtro dell'olio, quest'ultimo solo nel caso di sua sostituzione.

Qualora fossero tuttavia necessarie ulteriori misure di protezione dell'impianto, sarà opportuno definirle solo dopo un attento esame della situazione di installazione. In questo caso, Voith Turbo consiglia di limitare la protezione a misure inevitabili, ad es., alle parti che siano a portata di braccio dalle corsie. Voith Turbo può offrire a richiesta questa possibilità dopo un accordo sui dettagli.

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2.8.2 Definire e istruire persone responsabili

Impiegare solo personale addestrato o istruito, stabilire chiaramente le competenze del personale per l'utilizzo, l'installazione, la manutenzione e la riparazione.

Lavori in sicurezza

Controllare regolarmente il lavoro del personale dal punto di vista della sicurezza e dei pericoli, attenendosi al manuale operativo.

2.8.3 Dovere informativo

Lettura del manuale operativo

Prima dell'inizio dei lavori, il personale incaricato delle attività sull'impianto deve aver letto il manuale operativo e in particolare il capitolo **Indicazioni di sicurezza**. Durante il lavoro vero e proprio sarà troppo tardi.
Ciò si applica in particolare al personale che interviene solo occasionalmente sull'impianto, ad es., per la manutenzione.

Tenere sempre a portata di mano il manuale operativo nel luogo di utilizzo dell'impianto.

2.9 Utilizzo dell'impianto

Indicazione sull'impianto

Osservare tutte le indicazioni di sicurezza e di pericolo presenti sull'impianto.
Mantenere leggibili tutte le indicazioni di sicurezza e di pericolo presenti sull'impianto.

Particolarità aziendali

Integrare il manuale operativo con indicazioni, inclusi obblighi di sorveglianza e di denuncia che tengano conto di particolarità aziendali, ad es., per quanto riguarda l'organizzazione del lavoro, i cicli di lavorazione e il personale impiegato.

Pericolo di lesioni causato da indumenti e simili

Il personale non deve portare capelli lunghi sciolti, abiti lenti o gioielli, compresi gli anelli, poiché possono rimanere impigliati nell'impianto e causare lesioni.

Equipaggiamento di protezione

Se necessario o richiesto dalle disposizioni, indossare dispositivi di protezione personali.

2.10 Lavori sull'impianto

Riparazione

Rispettare gli interventi e gli intervalli di regolazione, manutenzione ed ispezione indicati nel manuale operativo, incluse le indicazioni per la sostituzione delle parti. Questi interventi devono essere eseguiti solo da personale specializzato.

Informare il personale prima dell'inizio dei lavori straordinari e di manutenzione. Designare gli addetti alla sorveglianza.

Accensione e spegnimento

Per tutti i lavori relativi al funzionamento o alla regolazione dell'impianto e rispettivi dispositivi di sicurezza, quale ispezione, manutenzione e riparazioni, attenersi alle procedure di accensione e spegnimento conformemente al manuale operativo e alle indicazioni per gli interventi di manutenzione.

Se necessario, garantire un ampio spazio per la zona di manutenzione.

Protezione da riaccensione

Se l'impianto viene completamente spento per interventi di manutenzione e riparazione, è necessario assicurarsi che non possa riaccendersi.

Ricambi

I ricambi devono essere conformi ai requisiti tecnici stabiliti dal costruttore. Ciò è sempre garantito per ricambi originali.

Mezzo di sollevamento

In caso di sostituzione, le singole parti e gli elementi costruttivi più grandi devono essere fissati con cautela a mezzi di sollevamento, in modo da evitare qualunque tipo di pericolo. Utilizzare solo mezzi di sollevamento adeguati e tecnicamente perfetti e dispositivi di sollevamento con portata sufficiente. Non sostare né lavorare sotto carichi sospesi.

Lavori al di sopra dell'altezza del corpo

In caso di lavori di montaggio al di sopra dell'altezza del corpo, utilizzare appositi dispositivi di salita o piattaforme di lavoro in condizioni di sicurezza. Non utilizzare parti dell'impianto come dispositivi di salita.

Collegamenti e fissaggi a vite

All'inizio della manutenzione/riparazione, rimuovere olio e sostanze preservanti dall'impianto e in particolare da collegamenti e fissaggi a vite. Non utilizzare sostanze aggressive. Utilizzare stracci privi di filamenti.

Collegamenti a vite

Durante gli interventi di manutenzione e riparazione serrare sempre a fondo i collegamenti a vite allentati.

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Conclusione degli interventi di manutenzione

Se durante la manutenzione e la riparazione è necessario smontare i dispositivi di sicurezza, al termine degli interventi di manutenzione e di riparazione eseguire immediatamente il rimontaggio e il controllo di tali dispositivi.

Garantire uno smaltimento sicuro e rispettoso dell'ambiente di ogni materiale di funzionamento e ausiliario nonché dei ricambi.

A completamento del manuale operativo, rispettare e segnalare tutte le normative generali e ogni altra norma vincolante per la prevenzione degli infortuni e dell'ambiente.

In caso di modifiche all'impianto significative per la sicurezza o per le procedure di funzionamento, arrestare immediatamente l'impianto e segnalare il guasto all'ufficio/persona di competenza.

Manutenzione/ riparazione

Rispettare le scadenze previste per la manutenzione/riparazione periodica. Rispettare in ogni caso le prescrizioni e gli intervalli di manutenzione indicati.

Lasciare liberi gli accessi alle zone di manutenzione/lavoro.

Per l'esecuzione delle operazioni di manutenzione è assolutamente necessaria una dotazione di officina adeguata al tipo di lavoro da svolgere.

Variazioni di sede

L'impianto potrà essere smontato solo da personale specializzato nel rispetto delle norme di sicurezza locali.

Imballare in modo adeguato le parti fragili e scaricare ogni liquido.

Smaltimento

Rispettare l'ambiente. Conformarsi alle normative territoriali e locali.

Prima di uno smontaggio per un riutilizzo e per lo smaltimento, rimuovere senza residui tutti gli oli e gli altri materiali che potrebbero essere dannosi per le acque.

2.11 Apparecchiature elettriche/elettroniche

PERICOLO

Pericolo di vita

Correnti e tensioni elettriche pericolose del Turbogiunto a velocità variabile possono causare lesioni personali o anche il decesso.

Gli impianti elettrici del Turbogiunto a velocità variabile potranno essere modificati solo da personale elettrico specializzato.

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Energia elettrica

Impiegare solo fusibili originali con la portata prescritta. In caso di guasti all'alimentazione elettrica, disinserire immediatamente l'impianto.

Ogni lavoro all'impianto elettrico o ai mezzi di funzionamento potrà essere effettuato solo da un elettricista specializzato, oppure da persone addestrate sotto la direzione e sorveglianza di un elettricista specializzato, nel rispetto delle regole elettroniche.

Togliere tensione e proteggere dal riavvio tutte le parti di impianti che necessitino di lavori di ispezione, manutenzione e riparazione. Per prima cosa verificare l'assenza di tensione dalle parti cui si è tolto tensione, quindi metterle a terra e cortocircuitarle, isolando le parti vicine che siano ancora sotto tensione.

Ispezionare e verificare regolarmente la dotazione elettrica dell'impianto. Eliminare immediatamente ogni difetto quale collegamenti lenti o cavi usurati.

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2.12 Segnalazioni di tipi particolari di pericolo

Oli, grassi e aerosol

Durante il lavoro con oli o grassi rispettare le prescrizioni di sicurezza valide per il prodotto in questione.
Prestare attenzione al lavoro con materiali di funzionamento e ausiliari a temperature elevate (pericolo di bruciatura o ustione).
Gli aerosol rilasciati possono essere assorbiti dalle persone tramite la pelle, gli occhi o la respirazione, e causare infiammazioni o lesioni. Il cliente ha l'obbligo di fornire sempre una ventilazione adeguata

2.13 Interfacce verso altre macchine

Il cliente dovrà mettere in sicurezza la zona pericolosa che viene creata da una interfaccia verso una macchina terza.

2.14 Divieto di modifiche indipendenti

Modifiche

Ogni modifica, aggiunta o trasformazione all'impianto che potrebbe mettere in pericolo la sicurezza non potrà essere apportata senza l'autorizzazione di Voith Turbo GmbH & Co.KG Crailsheim.

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2.15 Pulizia del Turbogiunto a velocità variabile

AVVERTIMENTO

Pericolo di lesioni

Le parti in movimento dell'impianto possono causare lesioni a persone.

Arrestare l'impianto per eseguire lavori di pulizia a tali parti.

2.15.1 Detergente

AVVERTIMENTO

Pericolo di lesioni

I detergenti infiammabili possono infiammarsi e causare lesioni a persone.

Impiegare solo detergenti permessi.

2.15.2 Per una sporcizia normale

- Impiegare solo detergenti comunemente in commercio e non infiammabili.
- Qualora i vapori dei detergenti possano essere inalati, è necessario indossare un dispositivo di protezione della respirazione.
- Non lasciare che i detergenti penetrino negli scarichi.
- Osservare la marcatura e le indicazioni presenti sui loro contenitori e imballi.

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2.16 Singole fasi d'esercizio

AVVERTIMENTO

Danni materiali

Il Turbogiunto a velocità variabile viene fornito senz'olio. Un esercizio senza olio causa danni alla macchina già dopo pochi secondi.

Prima di avviare il Turbogiunto a velocità variabile riempirlo con olio di servizio.

AVVERTENZA

Per ottenere un esercizio perfetto del Turbogiunto a velocità variabile è necessario garantire la capacità di funzionamento degli strumenti.

Messa in esercizio

- Il Turbogiunto a velocità variabile può essere danneggiato, se
  - la macchina viene avviata senza olio di servizio,
  - lo scambiatore di calore e le condutture dello scambiatore non vengono puliti prima della messa in esercizio,
  - viene utilizzato un olio di servizio non ammesso dalla Voith,
  - viene rabboccato olio di servizio contaminato,
  - la funzione di raffreddamento dello scambiatore di calore non è sufficiente.
- Il Turbogiunto a velocità variabile può essere danneggiato, se
  - il gruppo motore non ha il giusto senso di rotazione o il numero di giri prestabilito,
  - gli aggregati, che vengono alimentati di olio lubrificante dal Turbogiunto a velocità variabile, sono stati errmetizzati con mastici al silicone.

Manutenzione

- Eseguire gli interventi di manutenzione prescritti nei termini stabiliti!
- Riparare subito oppure sostituire i componenti in condizioni difettose. Utilizzare solo pezzi di ricambio originali della Voith!

L'olio di servizio nel Turbogiunto a velocità variabile può rimanere sotto pressione. Disattivare l'impianto prima degli interventi di manutenzione e riparazione (osservare le disposizioni locali).
L'involucro, le condutture dell'olio, nonché l'olio di servizio possono essere molto caldi – in casi estremi possono raggiungere la temperatura di 110 °C. Il contatto può causare ustioni alla pelle.

Lasciare raffreddare il Turbogiunto a velocità variabile prima di effettuare lavori di manutenzione e riparazione!

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Pulizia

Durante la pulizia con il getto di pressione o di vapore può penetrare sporcizia o acqua nella macchina.

Proteggere le impermeabilizzazioni degli alberi (labirinti) e i filtri di sfiato nel Turbogiunto a velocità variabile, in modo tale che il getto di pressione o vapore non vi agisca direttamente.

Smaltimento dell'olio usato

Osservare le seguenti indicazioni per lo smaltimento dell'olio usato:

ATTENZIONE

Danni ambientali

L'olio usato, che finisce nelle fognature o in terreni aperti, può causare gravi danni all'ambiente.

Smaltire l'olio usato in modo appropriato in base alle norme nazionali.

2.17 Garanzia

Sono da ritenersi valide le condizioni e le scadenze indicate nelle Condizioni di consegna generali della Voith Turbo GmbH & Co.KG Crailsheim. I diritti alla garanzia sono esclusi, se i danni sono riconducibili a una o più delle seguenti cause:

- trasporto, collocazione, installazione, messa in esercizio, esercizio del Turbogiunto a velocità variabile,
- se l'assistenza, i lavori di riparazione e le modifiche che influiscono sul funzionamento non vengono eseguiti da montatori Voith o da personale qualificato Voith,
- inosservanza delle indicazioni per la sicurezza del prodotto e del lavoro contenute nel manuale operativo,
- riempimento del Turbogiunto a velocità variabile con olio contaminato con un tipo di olio che non fa parte dell'elenco autorizzato dalla Voith e/o non approvato dalla Voith Turbo GmbH & Co. KG Crailsheim.

AVVERTENZA

Durante il periodo di garanzia possono essere eseguite riparazioni al Turbogiunto a velocità variabile solo previo accordo con la Voith Turbo GmbH & Co. KG, Crailsheim.

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3 Struttura e funzionamento

3.1 Struttura

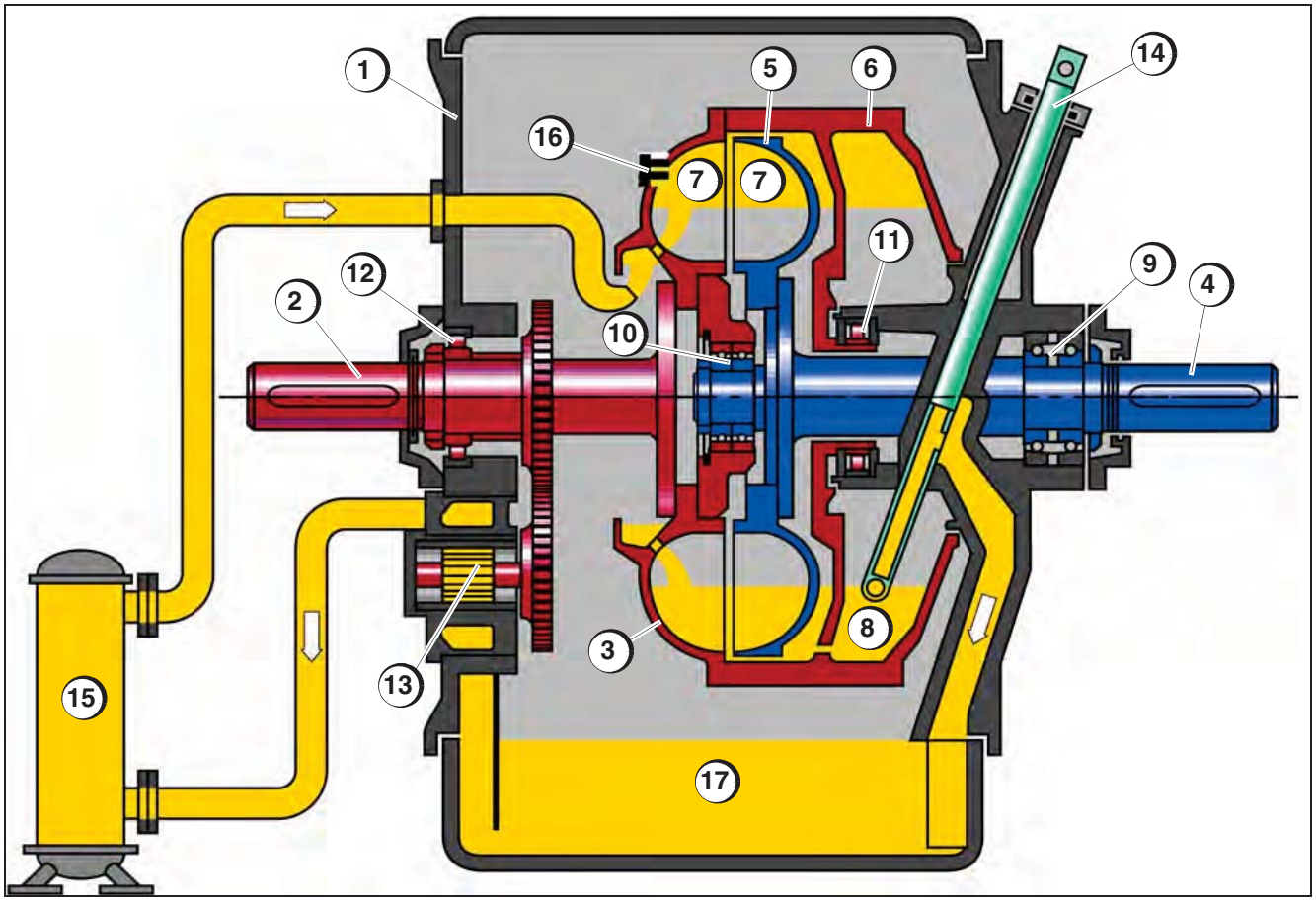

Figura 3-1: Struttura del Turbogiunto a velocità variabile

1 Corpo con serbatoio d'olio
2 Albero primario
3 Ruota primaria
4 Albero secondario
5 Ruota secondaria
6 Guscio
7 Camera di lavoro
8 Vano di sgrassamento
9 Cuscinetto assiale e cuscinetto radiale 3
10 Cuscinetto assiale e cuscinetto radiale (cuscinetto relativo)
11 Cuscinetto radiale 1
12 Cuscinetto radiale 2
13 Pompa di riempimento
14 Tubo di presa
15 Scambiatore di calore olio lavoro Scambiatore di calore
16 Vite di sicurezza
17 Serbatoio olio

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Corpo

Il Turbogiunto a velocità variabile è realizzato in una struttura a tunnel e sistemato in un corpo in lamiera monopezzo chiuso. Questo corpo costituisce contemporaneamente il serbatoio dell'olio.

Giunto

Il giunto è composto da

- albero primario e ruota primaria,
- albero secondario e ruota secondaria,
- guscio (flangiato alla ruota primaria, racchiude la ruota secondaria) e
- la scatola del tubo di presa con servomotore.

L'albero primario e la ruota primaria sono saldamente collegati l'un l'altro, come pure la ruota secondaria e l'albero secondario. L'albero primario è collegato al gruppo motore, l'albero secondario alla macchina operatrice.

La ruota primaria, la ruota secondaria e il guscio costituiscono la camera di lavoro. Nella camera di lavoro circola l'olio di lavoro.

Il tubo di presa con relativa scatola è integrato nel corpo del Turbogiunto a velocità variabile. Nella scatola del tubo di presa è sistemato l'albero secondario.

Cuscinetti

L'albero primario e secondario del Turbogiunto a velocità variabile sono dotati di cuscinetti volventi. L'albero primario viene inserito in direzione assiale sopra un cuscinetto (tra l'albero primario e secondario).

Pompe olio

Una pompa di riempimento nel serbatoio olio convoglia l'olio di servizio per il circuito olio lavoro e olio lubrificante. La pompa di riempimento viene azionata meccanicamente dall'albero primario del Turbogiunto a velocità variabile.

La pompa di avviamento lubrificazione olio azionata elettricamente serve per l'alimentazione dell'olio di lubrificazione dell'impianto al suo avviamento, al suo arresto e in caso di anomalie.

3.2 Trasmissione della potenza

Il Turbogiunto a velocità variabile trasmette la potenza priva di usura da un gruppo motore su una macchina operatrice. La potenza viene trasmessa nel seguente modo:

- tra gruppo motore e Turbogiunto a velocità variabile tramite un giunto di collegamento,
- tra la ruota primaria e la ruota secondaria in modo idrodinamico attraverso l'olio di lavoro,
- tra Turbogiunto a velocità variabile e macchina operatrice tramite un giunto di collegamento.

Il numero di giri della macchina operatrice può essere controllato in modo continuo tramite il tubo di presa

Energia meccanica – Energia idrodinamica

La potenza del gruppo motore viene trasmessa tramite la ruota primaria (funzione: pompa) sull'olio di lavoro; l'olio di lavoro viene accelerato nella ruota primaria e l'energia meccanica viene convertita in energia idrodinamica La ruota secondaria (funzione: turbina) riceve l'energia idrodinamica e la riconverte in energia meccanica. Questa energia viene trasmessa alla macchina operatrice.

Il momento torcente nella ruota primaria è uguale a quello della ruota secondaria.

Slittamento

Durante il trasferimento della potenza, il numero di giri della ruota secondaria è inferiore a quello della ruota primaria. Questa differenza del numero di giri viene definita slittamento. La potenza dissipata, che deriva dalla differenza del numero di giri, riscalda l'olio di lavoro. Per deviare questo calore è necessario raffreddare l'olio.

Circuito olio di lavoro

Tramite la **valvola di mantenimento pressione**, l'olio scorre nella camera di lavoro del giunto e forma nel vano di sgrassamento un anello di tenuta rotante in base alla forza centrifuga. La posizione del tubo di presa determina lo spessore dell'anello di tenuta nel vano di sgrassamento e quindi anche il riempimento nella camera di lavoro. Il tubo di presa raccoglie l'olio riscaldato nel vano di sgrassamento e lo rimanda nel serbatoio d'olio. La pompa di riempimento convoglia l'olio di lavoro proveniente dal serbatoio d'olio verso lo scambiatore di calore. L'olio di lavoro raffreddato ritorna successivamente tramite la **valvola di mantenimento pressione** nella camera di lavoro del giunto.

Se è necessario modificare il riempimento dell'olio di lavoro nel giunto, il tubo di presa viene spostato.

Temperatura dell'olio di lavoro

La temperatura dell'olio di lavoro dipende dalla potenza dissipata (slittamento) e dalla quantità d'olio di lavoro in circolazione. Essa viene controllata con misuratori di temperatura.

Viti a fusibile

Se, a causa di un'anomalia di funzionamento, la temperatura dell'olio nella camera di lavoro aumenta a 160 °C (320 °F), le viti a fusibile si fondono nel giunto e l'olio viene riversato nel corpo del Turbogiunto a velocità variabile. Il giunto si svuota parzialmente, pertanto il flusso della potenza si riduce e il numero di giri della macchina operatrice diminuisce.

3.3 Controllo del numero di giri

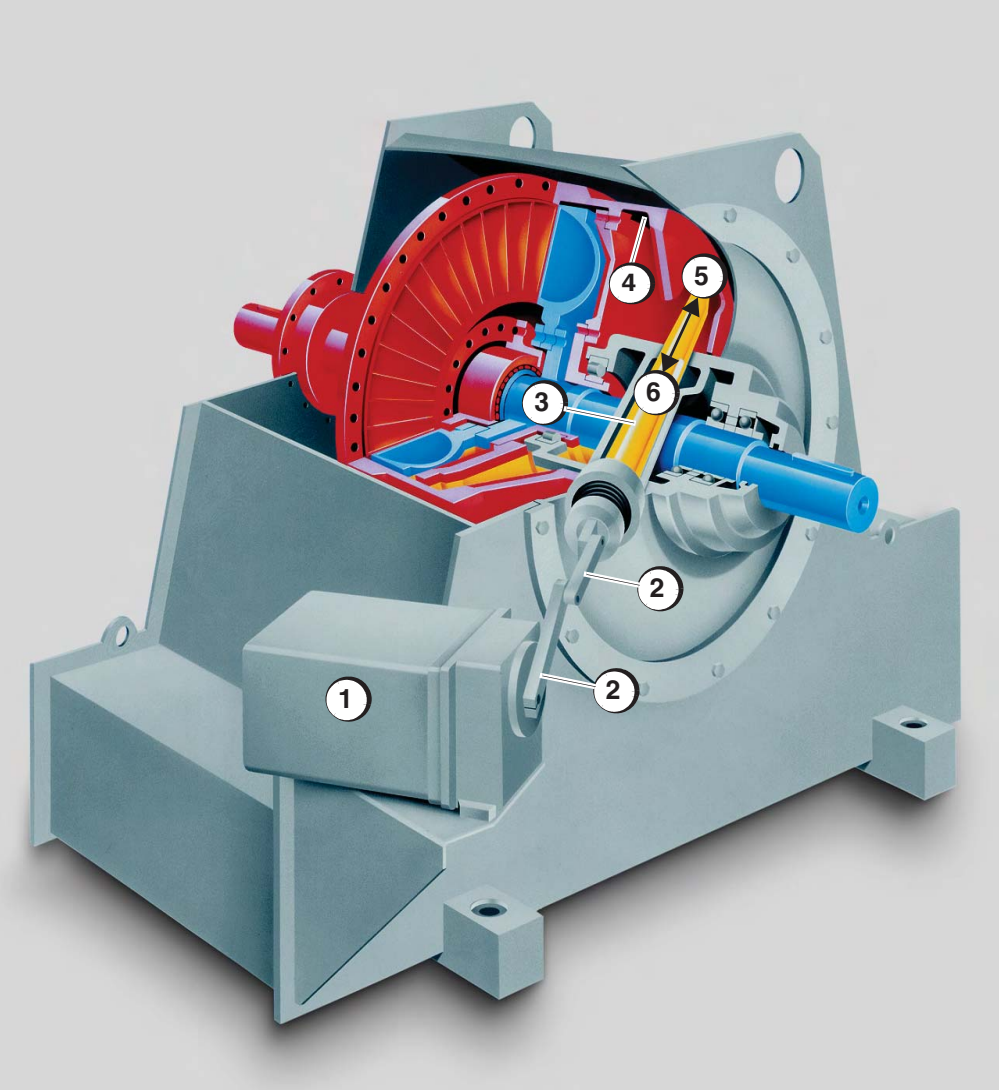

Figura 3-2: Controllo del numero di giri tramite il tubo di presa

1 Servomotore
2 Tiranteria tubo di presa
3 Tubo di presa
4 Anello di tenuta
5 Tubo pecante in posizione 0%
6 Tubo pescante in posizione 100%

Il numero di giri della macchina operativa può essere controllato in modo continuo. A tale scopo, il riempimento dell'olio del giunto durante il funzionamento viene modificato tramite il tubo di presa regolabile:

- Tubo di presa inserito il più lontano possibile *nel* vano di sgrassamento del giunto del giunto (posizione 0%): minimo anello di tenuto, minimo numero di giri di condotta
- Tubo di presa arretrato il più lontano possibile *dal* vano di sgrassamento del giunto (posizione 100%): massimo anello di tenuta, massimo numero di giri di condotta

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3.4 Lubrificazione

3.4.1 Autolubrificazione

I cuscinetti e gli ingranaggi del Turbogiunto a velocità variabile necessitano di olio lubrificante prima e durante il funzionamento.

Circuito olio di lubrificazione

Durante il funzionamento, la pompa di riempimento convoglia l'olio di servizio dal serbatoio d'olio. Da qui l'olio lubrificante viene deviato tramite il diaframma dell'olio lubrificante nel circuito dell'olio lubrificante.

L'olio arriva, tramite lo

- scambiatore di calore
- il filtro doppio dell'olio e il

diaframma dell'olio lubrificante,

filtrato e raffreddato nei punti di lubrificazione.

Quantità olio lubrificante

La quantità di olio lubrificante per i cuscinetti e gli ingranaggi viene regolata negli ugelli attraverso l'apposito diaframma e fori.

La quantità di olio lubrificante può essere condizionata solo indirettamente modificando la pressione dell'olio lubrificante.

Pressione dell'olio lubrificante

La pressione dell'olio lubrificante viene regolata nell'apposito diaframma e controllata con misuratori di pressione (manometro, pressostato).

Temperatura olio lubrificante

La temperatura dell'olio lubrificante viene controllata con misuratori di temperatura (ad es., termoresistenza).

3.5 Lubrificazione di gruppi esterni

L'olio per la lubrificazione del gruppo motore e della macchina operativa viene prelevato dal circuito olio di lubrificazione del Turbogiunto a velocità variabile tramite il diaframma olio esterno e ricondotto nel serbatoio d'olio del Turbogiunto a velocità variabile.

Pressione olio lubrificante, quantità olio lubrificante

La pressione olio lubrificante e la quantità olio lubrificante vengono regolate con il diaframma olio esterno situato dietro il filtro doppio dell'olio.

La pressione dell'olio lubrificante viene controllata con misuratori di pressione (manometro, pressostato).

AVVERTENZA

La quantità e la pressione dell'olio lubrificante per l'approvvigionamento di gruppi esterni vengono indicate nella conferma d'ordine.

Se solo successivamente fosse necessaria una fornitura di olio esterno per gruppi esterni, contattare il nostro centro di servizio:

➔ vedi Impressum.

4 Trasporto e collocazione

4.1 Indicazioni di sicurezza

Le seguenti indicazioni di sicurezza riguardano l'intero capitolo e devono essere osservate insieme alle varie indicazioni singole.

Messa in pericolo a causa di perdita di stabilità e rischi dovuti alle masse

Imballi e fissaggi insufficienti possono rendere la macchina instabile con conseguente movimento non intenzionale, cosa che potrebbe lesionare gravemente le persone.

AVVERTIMENTO

Rispettare la distanza di sicurezza. Consentire il trasporto solo a personale specializzato.

Messa in pericolo a causa di perdita di stabilità e rischi dovuti alle masse

Una persona potrebbe sottovalutare il peso della macchina. Ciò potrebbe causare (ad esempio avendo scelto un dispositivo di sollevamento insufficiente) una caduta del carico su una persona con conseguenti gravi lesioni o anche il decesso e/ o gravi danni alla macchina.

AVVERTIMENTO

➔ Indicazioni di peso (ved. Capitolo 1 "Dati tecnici" e "Schema di montaggio - Turbogiunto a velocità variabile 91500311610").

Consentire il trasporto solo a personale specializzato.

Pericolo di schiacciamento da parte dell'elemento superiore o inferiore

In caso di errata manipolazione della macchina, in particolare durante il trasporto con una gru, esiste il rischio di schiacciamento di persone con conseguenti gravi lesioni.

AVVERTIMENTO

Rispettare la distanza di sicurezza. Consentire il trasporto solo a personale specializzato.

Pericolo di collisione

Qualora il giunto si trovi sollevato e stia oscillando, esiste il rischio per una persona di essere colpita da esso, con conseguenti gravi lesioni.

AVVERTIMENTO

Rispettare la distanza di sicurezza. Consentire il trasporto solo a personale specializzato.

Pericolo di graffi ed escoriazioni

Una persona può entrare in contatto con la macchina sollevata ed oscillante e riportarne escoriazioni.

ATTENZIONE

Rispettare la distanza di sicurezza. Consentire il trasporto solo a personale specializzato.

Pericolo di urti durante il trasporto

Durante il trasporto la macchina può mettersi in movimento e causare o procurarsi gravi danni.

ATTENZIONE

Consentire il trasporto solo a personale specializzato.

4.2 Condizione di consegna

4.2.1 Condizione di montaggio e ciclo di prova

Il Turbogiunto a velocità variabile non è pronto all'uso quando viene fornito.

Condizione di montaggio

- Il Turbogiunto a velocità variabile viene fornito pronto per essere montato.
- Tutte le tubature interne per l'olio di lavoro e l'olio di lubrificazione sono posate.
- Tutti i collegamenti di tubi esterni sono dotati di flange di presaldatura e di guarnizioni e sono collegate per il trasporto.
- Se i giunti di raccordo fanno parte della consegna della Voith oppure sono stati ordinati dal cliente, i mozzi sull'albero primario e secondario del Turbogiunto a velocità variabile sono sollevati.
- Tutti gli strumenti (manometro, interruttori ecc.) sono montati e/o si trovano su una tavola strumenti. La tavola è fissata elasticamente all'involucro con elementi a cappello di metallo saldato.
- I dispositivi elettrici di intervento e indicazione sono cablati su una scatola dei morsetti.
- Gli strumenti montati sono indicati.
- Il servomotore del tubo di presa è montato.

Collaudo funzionale

Prima della consegna, il Turbogiunto a velocità variabile è stato collaudato in un banco di prova Voith oppure è stato sottoposto a un ampio controllo.

Sono stati verificati i seguenti componenti:

- Componenti aggiuntivi (doppio filtro olio, motore elettrico ecc.)
- Funzione del servomotore

Sono stati regolati:

- unità di regolazione del posizionamento
- quantità di olio in circolo
- pressioni olio
- punti di commutazione degli strumenti incorporati

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4.2.2 Conservazione e imballaggio

Il Turbogiunto a velocità variabile e tutti i suoi componenti aggiuntivi sono imballati e conservati per una durata di 12 mesi.

4.3 Immagazzinamento e conservazione (protezione)

Protezione dalla corrosione in Europa

I pezzi del Turbogiunto a velocità variabile sono bagnati d'olio per la consegna (cioè spruzzati con olio anticorrosivo privo di solventi) e imballati in carta oleata oppure fogli[1]. Questo bagno d'olio è sufficiente all'interno dell'Europa come protezione anticorrosione per 12 mesi. La premessa necessaria è che la macchina venga imagazzinata in un locale asciutto.

Protezione dalla corrosione oltreoceano

Per la spedizione oltreoceano il Turbogiunto a velocità variabile viene anche avvolto in fogli. Sacchetti di essiccazione nell'imballaggio legano una parte dell'umidità d'aria. I pezzi della macchina impacchettati in questo modo possono essere immagazzinati anche per 12 mesi in un ambiente chiuso e asciutto. A ciò la pellicola non deve essere tagliata o danneggiata.

➔ (ved. Sezione 4.5 "Normativa di conservazione" a pagina 33)

Conservazione dopo la fornitura

Per i Turbogiunto a velocità variabile, che devono essere immagazzinati per più di 12 mesi, la Voith Turbo GmbH Crailsheim offre speciali tipi di conservazione a lungo termine con indicazioni per l'immagazinamento.

➔ Appendice A (ved. "Procedura di conservazione e indicazioni per l'immagazzinaggio dopo la consegna 3625-006714")

1. Impiegato in fabbrica e consigliato (ved. Sezione 4.5.1 "Olio anticorrosivo interno" a pagina 35)

4.4 Disimballaggio, trasporto

Il Turbogiunto a velocità variabile viene fornito in posizione di montaggio. Se è necessario, è protetto anche da una cassa. Sia la macchina, che la cassa hanno dei punti di aggancio contrassegnati.

1. Rimuovere l'eventuale cassa.

AVVERTIMENTO

Pericolo di lesioni

Il sollevamento scorretto del Turbogiunto a velocità variabile può causare danni alle persone e alle cose.

Appendere il Turbogiunto a velocità variabile solo nei punti contrassegnati.

Utilizzare solo mezzi di sollevamento adatti, che corrispondano alle disposizioni di sicurezza!

ATTENZIONE

Danni materiali

Un trasporto e uno spostamento non conformi del Turbogiunto a velocità variabile possono causare danni a cose.

Trasportare il Turbogiunto a velocità variabile ancorato in modo corrispondente e nella struttura di trasporto.

Deporlo sempre su un fondo sufficientemente stabile e in piano.

Collocarlo solo sui piedini dell'involucro oppure su quelli del serbatoio olio!

AVVERTENZA

Nel Turbogiunto a velocità variabile i punti di sollevamento applicati bastano solo per il suo stesso peso.

Non sollevare anche altre macchine! Sollevare il Turbogiunto a velocità variabile soltanto senza riempimento d'olio!

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1. Prima dell'uso controllare i punti di aggancio (1) per verificare la presenza di crepe, deformazioni e corrosione.
2. Appendere il Turbogiunto a velocità variabile nei punti contrassegnati (1) (ved. Figura 4-3 "Punti di aggancio").

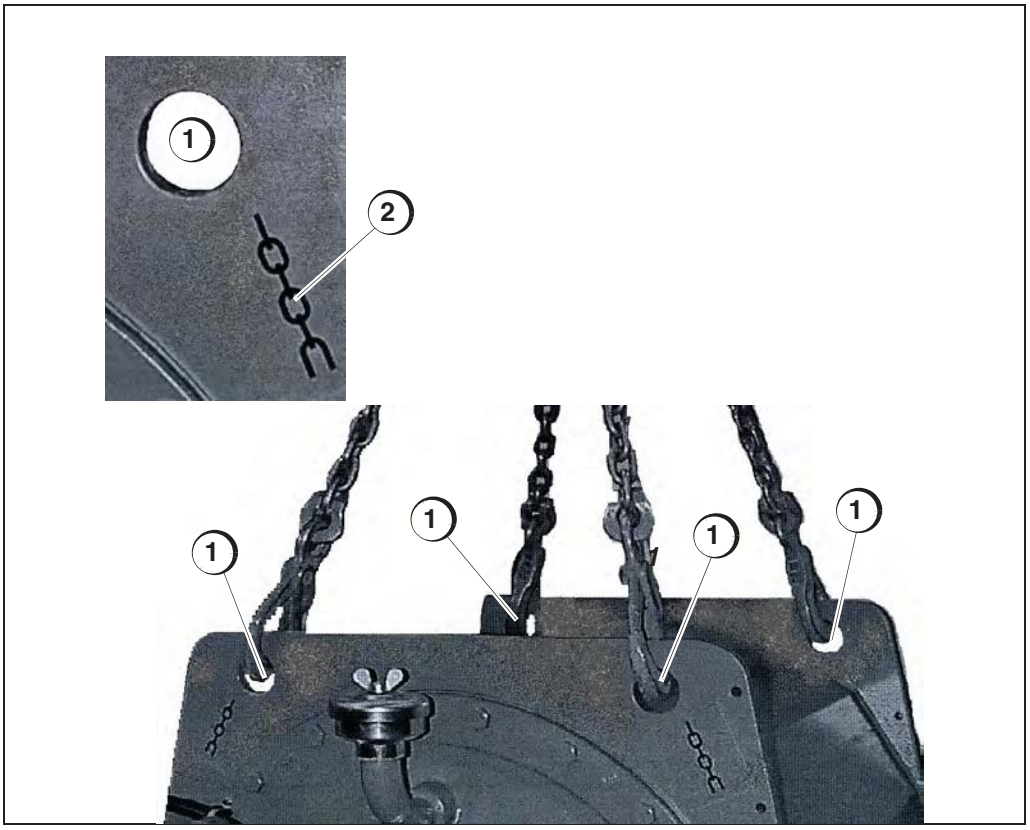

Figura 4-3:
Punti di aggancio

1) Punti di aggancio
2) Etichetta

3. Liberare la macchina dalla struttura di trasporto e togliere via la struttura sotto la macchina.
4. Turbogiunto a velocità variabile deporla sui piedini del serbatoio olio.

4.5 Normativa di conservazione

Fonte: foglio 3625-006212, edizione 2002- 11- 20

Queste indicazioni riguardano la protezione delle superfici esterne ed interne (premesso che tali superfici non siano stratificate e/o resistenti alla corrosione oppure che siano composte da materiale fuso in alluminio), così come l'imballaggio di consegna.

Prospetto

		Conservazione		
Trasporto, collocazione e durata d'immagazzinamento	**Imballaggio n.**	**Esterno**	**Interno con ciclo di prova**	**Interno senza ciclo di prova**
• Trasporto via terra/aerea per l'impiego immediato sul luogo di destinazione (e/o collocazione in capannone chiuso fino a 6 mesi)	Imballaggio n. 1	Conservazione esterna n. 1	Conservazione interna n. 1	Conservazione interna n. 2
• Trasporto marittimo e/o immagazzinamento fino a 12 mesi dalla data d'imballaggio	Imballaggio n. 2			
• Trasporto marittimo e/o immagazzinamento fino a 24 mesi dalla data d'imballaggio	Imballaggio n. 3			
• Prolungamento della durata di protezione (alla scadenza della durata)	Cambiare il foglio e saldarlo	Conservazione esterna n. 2	Conservazione interna n. 3	

Conservazione esterna n. 1

- Segno con vernice colorata in base alla documentazione dell'ordine.
- Pezzi di ferro lucidi spruzzati con "Shell Ensis Fluid S"[1]).
- Vedere nota.

Conservazione esterna n. 2

- Segno con vernice colorata in base alla documentazione dell'ordine.
- In caso di necessità, eseguire delle migliorie corrispondenti alla conservazione esterna n. 1.
- Sostituire il mezzo d'asciugamento.

AVVERTENZA

Se negli ordini, la catena d'imballaggio continua è assicurata da prodotti di conservazione in VCI, allora la protezione da corrosione è ammessa, in base all'accordo, anche con questo metodo di conservazione.

1. Pulire con solventi (benzina per prove oppure petrolio) le superfici spruzzate prima del montaggio delle macchine o dei pezzi.

Conservazione interna n. 1

- Conservazione interna con olio di controllo nel ciclo di prova.
- Se nella documentazione dell'ordine è prevista l'"Ispezione" dopo il ciclo di prova, spruzzare l'olio anticorrosivo privo di solventi (consigliato dall'azienda "Shell Ensis Motoröl 20"), fin dove è possibile. (per conoscere le alternative allo "Shell Ensis Motoröl 20" vedere 3625-006237).

Conservazione interna n. 2

- Tutte le superfici di parti metalliche (compresi fori, cavità e superfici interne di tubazioni) dovranno essere spruzzate, immerse o sciacquate in olio anticorrosione privo di solventi (in fabbrica con Shell Ensis Motoröl 20) al momento del montaggio, a seconda della fase di montaggio. Spruzzare per il montaggio tutti gli elementi costruttivi, fin dove sono accessibili. (per conoscere le alternative allo "Shell Ensis Motoröl 20" vedere 3625-006237).

Conservazione interna n. 3

- Controllare la conservazione.
- Spruzzare le parti in movimento e tutte le pareti con olio anticorrosivo privo di solventi (per es. "Shell Ensis Motoröl 20") e far girare nel frattempo le parti in movimento. (per conoscere le alternative allo "Shell Ensis Motoröl 20" vedere 3625-006237).
- Spruzzare le tubature internamente con olio anticorrosivo privo di solventi (vedere sopra). In alternativa riempire il vano interno della macchina con aria secca, umidità relativa massima 10%.

Imballaggio n. 1[1]

- Dispositivo per il trasporto (per es.struttura di trasporto, fissaggio, puntellamento)
- Protezione da agenti atmosferici tramite il mezzo di trasporto.

Imballaggio n. 2[1]

- Dispositivo per il trasporto (per es.struttura di trasporto, fissaggio, puntellamento)
- Eliminare gli spigoli vivi e le superfici che fuoriescono con materiale plastico.
- Saldato in fogli di PE.
- Mezzo di asciugamento conforme alla norma DIN 55 473 / 55 474.
- Cartone resistente all'acqua oppure cassa di legno.
- Coperchio della cassa rivestito internamente con una piastra rinforzata chiusa in PE (Akylux). In caso le piastre vengano urtate rinforzarle con fogli in PVC.

Imballaggio n. 3

Come l'imballaggio 2. Differenza: saldato in fogli di unione in alluminio, invece che in fogli in PE.

1. L'imballo ha luogo secondo le edizioni più nuove delle direttive sull'imballo dell'associazione federale Holzpackmittel -Paletten - Exportverpackung (HPE, imballi in lengo, pallet e imballi per l'esportazione).

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4.5.1 Olio anticorrosivo interno

AVVERTENZA

Il Turbogiunto a velocità variabile non è stato riempito con olio di servizio.

Fonte: foglio 3625-006237, Edizione giugno 1996

Come oli anticorrosione si consigliano oli motore HD con caratteristiche anticorrosive particolarmente marcate. Componenti speciali di tali oli anticorrosione privi di solventi garantiscono la formazione di pellicole di protezione adesive, tramite le quali è possibile conservare efficacemente anche superfici verticali.

(Olio impiegato in fabbrica: Shell Ensis Motoröl 20)

Proposta dei tipi

Ditta fornitrice	Indicazione
AGIP	AGIP RUSTICA 10W-20
ARAL	ARAL Oel KONIT SAE 20 W 20
DEA	DEA DEAMOT EKM 162 N (SAE 20 W-20)
ESSO	ESSO MZK Motorenoel HD 20W-20
FINA	FINA RUSAN MOTOR OIL SAE 20 W-20
MOBIL	MOBILARMA 524 (SAE 30)
SHELL	SHELL Ensis Motoröl 20
WINTERSHALL	WINTERSHALL Antikorrol 20 W-20

(La presente indicazione dei tipi non ha alcuna pretesa di completezza.)

4.5.2 Prestare attenzione nel cantiere

Unità montate o pronte per essere montati

Per quanto riguarda queste unità, c'è da tenere conto in particolare dell'efficacia della conservazione, in quanto spesso sono esclusi pericoli aggiuntivi come l'acqua, impurità grossolane, nonché danni meccanici.

Impianti completi, montati sulle fondamenta

Qui rientrano le misure, che permettono una protezione interna ampliata, quando si prevedono tempi di riposo fino a circa 12 mesi oppure se la conservazione originale non è più garantita a causa di aggressioni.

Riempire le unità con olio di servizio privo d'acqua. Ad intervalli di 1-2 mesi, a seconda delle condizioni di montaggio, è possibile eseguire i seguenti interventi:

- Impianto pronto per il funzionamento:
  - Avvio e breve funzionamento (ca. 5 minuti) per coprire d'olio le parti interne; non far funzionare fino al riscaldamento.
- Impianto non pronto per il funzionamento:
  - Unità con pompa elettrica dell'olio di lubrificazione di riserva pronta all'uso, oppure pompa dell'olio e serbatoio olio:
  - attivare la pompa, possibilmente far girare l'impianto. Muovere le parti di funzionamento (per es. gli snodi).
  - Unità senza pompa elettrica pronta all'uso dell'olio di lubrificazione oppure pompa dell'olio:
  - Prendere l'olio dal fondo, spruzzarlo attraverso le aperture dell'involucro nella zona interna e pomparlo con una pompa dell'olio separata attraverso le tubature, far girare l'impianto possibilmente per ca. 5 minuti. Muovere le parti di funzionamento (per es. gli snodi).

AVVERTENZA

Prima di riempire il liquido d'esercizio è necessario chiarire con il fornitore l'affidabilità del mezzo di conservazione interno.

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5 Installazione

5.1 Indicazioni di sicurezza

Le seguenti indicazioni di sicurezza riguardano l'intero capitolo e devono essere osservate insieme alle varie indicazioni singole.

Pericolo dovuto a montaggio difettoso

AVVERTI-MENTO

I componenti montati male possono distaccarsi, i collegamenti elettrici possono essere disposti o fissati in modo errato, i cavi posti in modo errato possono logorare i loro isolamenti e con ciò causare gravi lesioni a persone o danni a cose.

Gli impianti elettrici del Turbogiunto a velocità variabile potranno essere modificati solo da personale elettrico specializzato in conformità alle norme della nazione di installazione.
Impiegare condutture con isolamento che rispettino le condizioni ambientali.

Pericolo dovuto a zone non visibili

AVVERTI-MENTO

Durante la manipolazione della macchina una persona può ferirsi gravemente a causa dell'avvio della macchina stessa.

Fra il giunto e l'albero applicare adeguate protezioni, distaccabili solo con un utensile.
Lavorare alla macchina solo con impianto spento (non in tensione).
Mettere in funzione solo previo controllo visivo dell'assenza di persone nella zona di pericolo!

Pericolo dovuto a pressione massima, colpi di pressione, aumento della pressione o perdita di pressione

AVVERTI-MENTO

Uno scambiatore di calore non adeguato o non manutenzionato, tubazioni dell'olio dimensionate in modo errato, organi di chiusura non previsti, valvole di limitazione della pressione impostate in modo errato oppure una valvola di non ritorno montata in modo errato possono produrre pressioni troppo elevate e con ciò distruggere la macchina, ferendo gravemente le persone con parti volanti e danneggiando l'ambiente. Una forte perdita di pressione può causare danni ai cuscinetti.

- Far eseguire le operazioni di montaggio, manutenzione e riparazione nonché messa in funzione della macchina solo a personale addestrato.
- In presenza di valvole di non ritorno, controllarne il montaggio.
- Rispettare gli intervalli di manutenzione.
- Rispettare i valori limite.
- Non inserire alcun organo di chiusura nel circuito dell'olio, rispettare le indicazioni dello schema del circuito idraulico.

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Danni materiali

ATTEN-

Le correnti di dispersione e/o esterne possono finire nel Turbogiunto a velocità variabile tramite l'albero d'avviamento e danneggiare con l'erosione delle scintille i cuscinetti e le ruote dentate d'avviamento dell'azionamento pompa.

Mettere in atto misure adeguate di messa a terra/ isolamento del gruppo motore (per es. fra il giunto di collegamento) e garantire una interruzione del flusso di corrente!

Danni materiali

ATTEN-

Sporco, scintille, polvere di molatura ed acqua possono finire nel Turbogiunto a velocità variabile e causare danni di funzionamento.

Coprire completamente sul posto il Turbogiunto a velocità variabile con un foglio durante il periodo di costruzione.

Proteggere in particolare gli strumenti, le condutture elettriche e i canali dei cavi.

Impiegare solo mastice adeguato, con una resistenza all'olio fino a 130 °C e privo di silicone. La mancata osservanza farà modificare negativamente le qualità dell'olio con conseguenti danni per il Turbogiunto a velocità variabile.

Danni materiali

ATTEN-

Un montaggio difettoso può causare guasti d'esercizio e un logoramento prematuro degli aggregati.

Far effettuare l'installazione e la prima messa in funzione a un montatore Voith.

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5.2 Utensili e accessori

- Utensili metrici
- Chiave coppia motrice
- Mastice (senza silicone) (ved. "Mastice" a pagina 102)
- Mezzi di sollevamento
- Dispositivi per sollevare i mozzi del giunto
- Lamiere d'imbottitura
- Staffe e viti di fissaggio alle fondazione in cemento per disposizione orizzontale
- Viti di posizionamento per disposizione verticale
- Staffa di misurazione

5.2.1 Chiudere la cava per chiavetta di aggiustaggio

Chiusura della cava per chiavetta di aggiustaggio in caso di giunto di collegamento pieno di olio o di grasso.

- La boccola del giunto di collegamento è dotata o sarà dotata di un foro filettato sulla cava per chiavetta di aggiustaggio.
- Collocare il giunto sull'albero.
- Riempire il foro filettato fino a 2/3 con mastice[1].
- Inserire il perno filettato e serrare. Rimuovere il mastice che fuoriesce anteriormente.

1. LOCTITE 5910; Durante la lavorazione rispettare le istruzioni presenti sul tubetto. Fornitore Loctite Deutschland, Arabellastraße 17 D-81925 München

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5.3 Collocare i giunti di raccordo

AVVERTENZA

Sono adatti innesti a ruota dentata o giunti completamente metallici con minime forze di ritorno radiali. Possibilità di impiego di giunti di collegamento con elementi elastici di compensazione solo previ accordi specifici.

Montaggio franco stabilimento

Se i giunti di raccordo sono compresi nella fornitura della Voith, oppure sono stati ordinati dal cliente, le due metà lato avviamento e lato condotto dei giunti di raccordo sono già montate.

- Il coperchio di chiusura (2) e il mozzo del giunto (3) sono collocati sulle estremità dell'albero (1)
- Le boccole del giunto sono imballate separatamente.

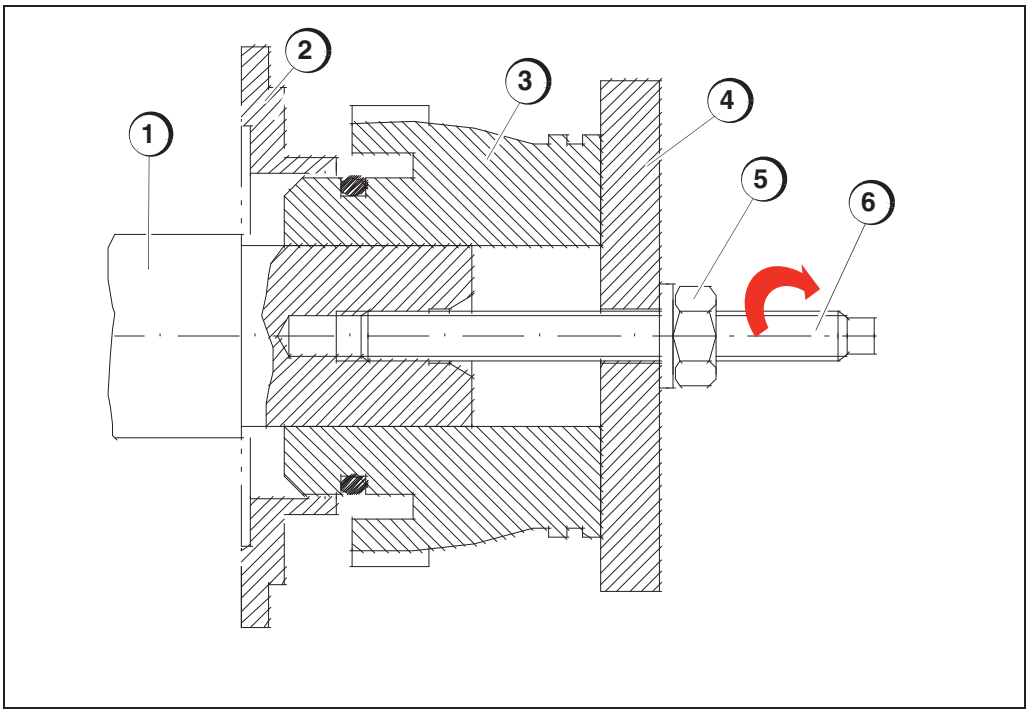

Figura 5-4: Mozzo del giunto sull'albero

1) Estremità albero
2) Coperchio
3) Giunto di collegamento

Dispositivo di collocazione:

4) Piastra
5) Vite
6) Alberino filettato

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Montaggio sul posto

Se i giunti di collegamento non sono ancora montati:

➔ Norma della casa produttrice per il giunto di collegamento.

AVVERTENZA

Sulla boccola del giunto di collegamento verificare la presenza di un filetto ad estrazione applicato anteriormente e sopra la filettatura situata sulla cava per chiavetta di aggiustaggio.

Giunti dentati con molle di regolazione

1. Pulire e sgrassare via dall'albero (1) e dal mozzo (3) i mezzi di conservazione con della benzina o una diluizione al nitro (non con petrolio).
2. Controllare la precisione di misura della foratura, dell'albero, della scanalatura e delle molle di regolazione.
3. Estrarre le molle di regolazione dalla scanalatura dell'albero e inserirle nella scanalatura del mozzo. Quindi, reinserire le molle di regolazione nella scanalatura dell'albero. Controllare l'altezza delle molle di regolazione: il gioco fra la scanalatura e la molla di regolazione deve essere di 0,2 – 0,3 mm.
4. Spalmare l'albero con Mykolyte D Paste[1] diluito oppure con un mezzo di scorrimento analogo.
5. Spingere il coperchio di chiusura (2) e le guarnizioni dell'anello ad O sopra l'estremità dell'albero.
6. Collocare il mozzo del giunto con un dispositivo (4, 5, 6).
7. Chiudere la cava per chiavetta di aggiustaggio della boccola del giunto di collegamento (ved. Sezione 5.2.1 "Chiudere la cava per chiavetta di aggiustaggio" a pagina 39).
8. Giunti di raccordo senza pezzo intermedio: spingere la boccola sopra il mozzo.
9. Giunti di raccordo con pezzo intermedio: Montare la boccola solo dopo l'orientamento.
10. Proteggere e coprire i giunti di raccordo dalla corrosione.

1. Molykote D Paste; Durante la lavorazione rispettare le istruzioni presenti sul tubetto/sulla confezione. Produttore Dow Corning Europe, Rue General de Gaulle 62 B-1310 La Hulpe

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5.4 Turbogiunto a velocità variabileCollocazione su fondamento di cemento

Prima della deposizione

Controlli:

- Le fondazioni di tutte le macchine dell'impianto sono della misura esatta? (Altezza, posizione intermedia, orizzontalità)
- L'altezza del fondamento è misurata in modo tale che rimanga uno spazio vuoto disponibile di 10 mm per l'imbottitura del Turbogiunto a velocità variabile con lamiere?
- E' garantito il vano di montaggio in base al piano per il Turbogiunto a velocità variabile?
- Le boccole dei giunti di raccordo sono montate e/o nei giunti di raccordo con pezzo intermedio c'è una distanza sufficiente tra gli alberi per montare successivamente la boccola?
- Dopo la collocazione del Turbogiunto a velocità variabile è possibile montare le condutture dell'olio?
- La macchina operatrice è fissata assialmente?
- Il gioco assiale del gruppo motore rientra nelle tolleranze? Il rotore del gruppo motore è nella posizione d'esercizio?
- Sono disponibili lamiere d'imbottitura?

5.4.1 Collocazione su fondamento di cemento

Condizioni

Per la collocazione del Turbogiunto a velocità variabile su un fondamento di cemento sono necessari

- 2 rotaie del fondamento oppure
- 4 piastre robuste del fondamento

con forature per le viti di ancoraggio.

AVVERTENZA

Pitturare il fondamento con un colore resistente all'olio, in modo che quando l'olio viene a contatto con il fondamento non possa penetrare nel cemento e causare danni.

Deposizione

1. Collocare il Turbogiunto a velocità variabile con le viti di ancoraggio appese, una lamiera d'imbottitura di 2-mm e rotaie di fondamento e/o piastre con il mezzo di sollevamento adatto sul fondamento di cemento. Prestare attenzione alla distanza assiale dei giunti di raccordo.
2. Rinforzare le rotaie del fondamento e/o le piastre del Turbogiunto a velocità variabile con lamiere di imbottitura e orientarle in modo approssimativo.
3. Versare il cemento sulle viti di ancoraggio e sulle rotaie e/o piastre del fondamento e lasciarlo indurire.

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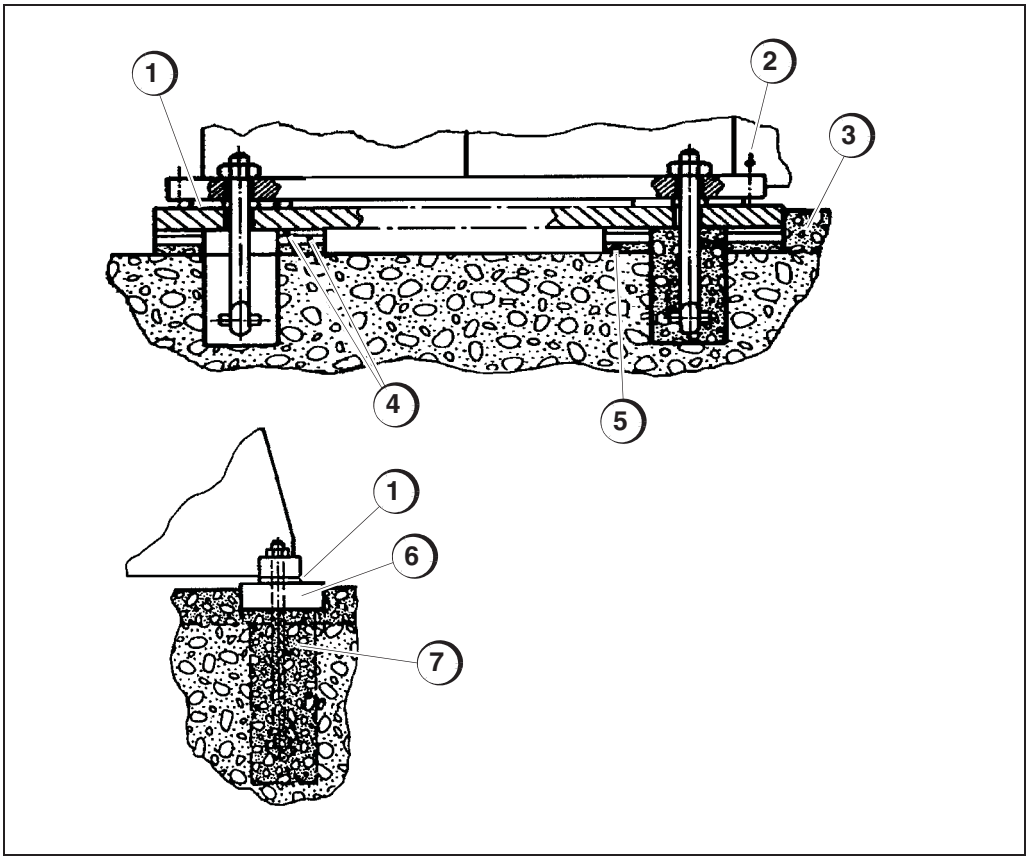

Figura 5-5:
Versare il cemento

1) Lamiera d'imbottitura (10 mm)
2) Vite di regolazione
3) Versamento
4) Lamiera d'imbottitura
5) Cemento battuto
6) Rotaie fondamento oppure piastra fondamento
7) Versamento cemento

4. Regolare l'altezza del giunto con le viti di regolazione comprese nella fornitura.

➔ Misurazioni: (vedere Sezione 5.5 "Orientamento della macchina" a pagina 44).

AVVERTENZA

Prima dell'orientamento, dovrebbero essere installate tutte le macchine interessate (gruppo motore Turbogiunto a velocità variabile, macchina operatrice).

5.4.2 Deposizione su fondamento di acciaio

Deposizione

1. Depositare il Turbogiunto a velocità variabile con un mezzo di sollevamento adatto sul fondamento d'acciaio. Prestare attenzione alla distanza assiale dei giunti di raccordo.
2. Regolare l'altezza del giunto con le viti di regolazione comprese nella fornitura.
3. Rinforzare il giunto con le lamiere d'imbottitura ingrassate, comprese nella fornitura. Impostare la posizione laterale del giunto, spostandolo sulle lamiere con l'ausilio delle viti di regolazione.

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5.5 Orientamento della macchina

I componenti dell'impianto devono essere orientati uno verso l'altro. Tutte le macchine devono quindi avere la temperatura di riposo. Con la temperatura d'esercizio gli alberi devono essere allineati con la massima precisione.

Sequenza di orientamento normale:

1. Turbogiunto a velocità variabile verso la macchina operatrice
2. Gruppo motore per Turbogiunto a velocità variabile

AVVERTENZA

L'orientamento della macchina viene descritto con un procedimento di misurazione con comparatori.

Come equivalenti è possibile impiegare anche "Procedimenti di misura elettronico/ottici" quali la misurazione elettronica CTC, i sistemi di misura Optalin o Indikon e simili.

Per ulteriori informazioni sull'orientamento vedere:

– la linea guida VDI, VDI 2726 "Orientamento di macchine"
– Manuale per la pratica "Orientamento degli alberi dell'inserimento macchina", casa editrice VDI

5.5.1 Spostamenti degli alberi e tolleranza di orientamento

Spostamenti degli alberi

Durante l'orientamento del Turbogiunto a velocità variabile è necessario prestare attenzione alle differenze di dimensioni, che derivano da

- riscaldamento e dilatazione dell'involucro durante il funzionamento

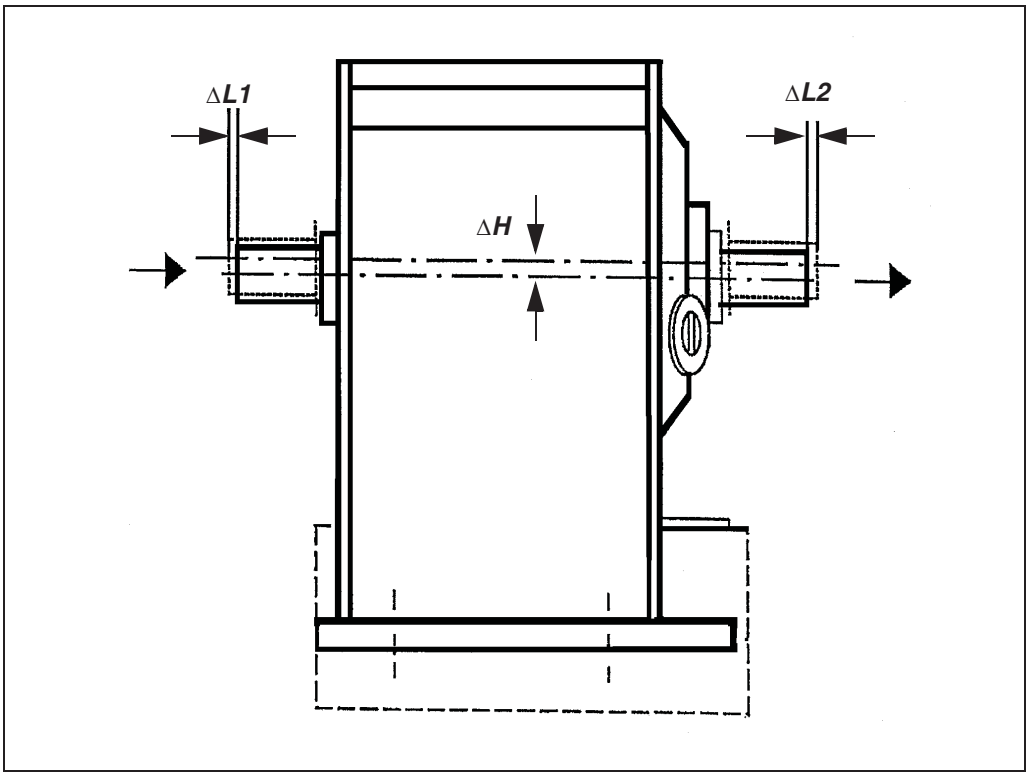

Figura 5-6: Spostamenti radiali e assiali

Spostamento radiale verticale Δ H

Spostamento assiale Δ L1
Spostamento assiale Δ L2

Spostamento radiale verticale[1]	Δ *H*	**0,50** mm
Spostamento assiale [1]		
• sul lato avviamento	Δ *L1*	**0,49** mm
• sul lato condotto	Δ *L2*	**0,45** mm

1. Temperatura dell'involucro ammessa: durante l'installazione 20 °C (68 °F), durante il funzionamento 80 °C (176 °F)
I valori corrispondono allo spostamento degli alberi massimo possibile, incluso il gioco dei cuscinetti.

Gli alberi collegati ai giunti di raccordo non devono quindi essere Allineati quando sono fermi, ma devono avere uno scostamento assiale/angolare/radiale. Questo scostamento compensa gli spostamenti che ci si deve aspettare all'avviamento e durante l'esercizio.

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con rotazione contemporanea degli alberi di 360°:

- Misurazione radiale A: spostamento radiale ± 0,03 mm
- Misurazioni angolari B e C.
  Scostamento angolare ± 0,03 mm/100 mm raggio R_m

Tolleranza di orientamento con la temperatura d'esercizio

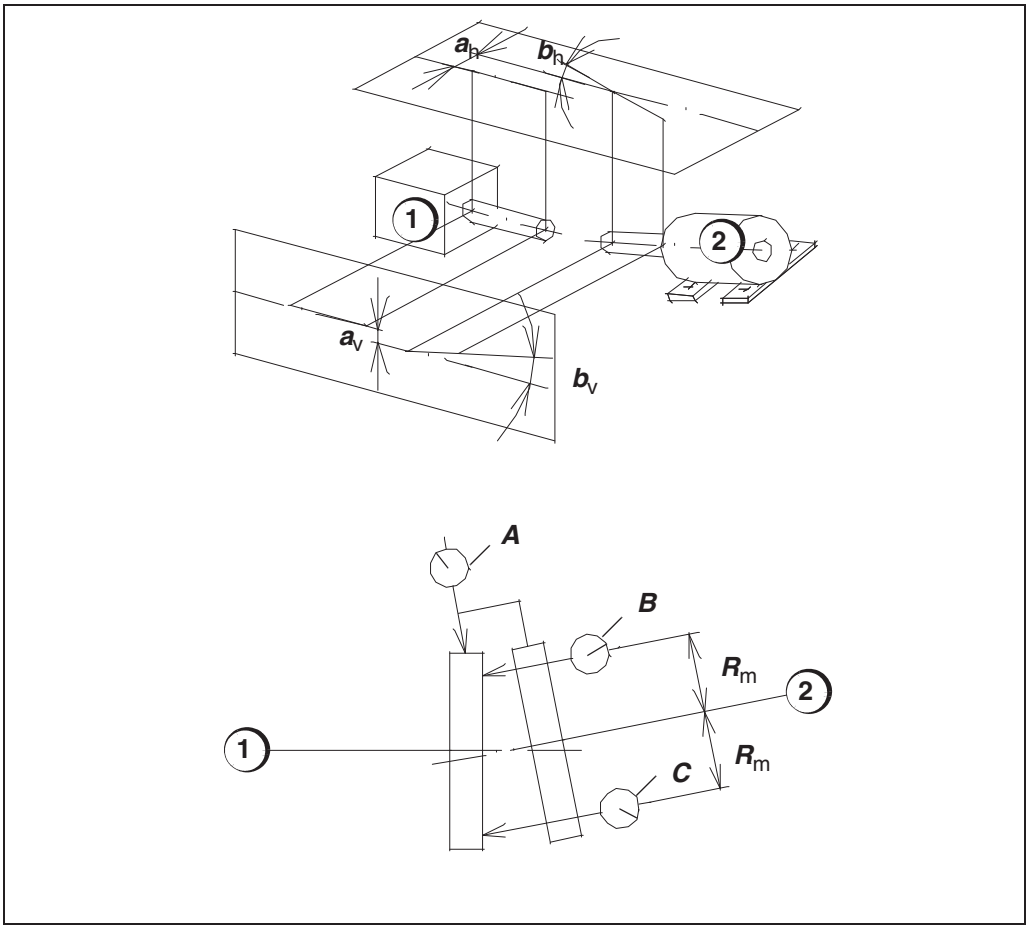

Figura 5-7: Scostamento angolare e spostamento radiale

1) macchina orientata
2) macchina ancora da orientare

scostamento radiale orizzontale a_h e verticale a_v

Scostamento angolare orizzontale b_h e verticale b_v

Raggio R_m

5.5.2 Giunti di raccordo con pezzo intermedio

Tra la macchina operatrice e il Turbogiunto a velocità variabile si trova in genere un giunto di raccordo con pezzo intermedio. Tra le estremità dell'albero c'è quindi uno spazio intermedio.

AVVERTENZA

Sono adatti innesti a denti o giunti completamente metallici con minime forze di ritorno radiali. Giunti di collegamento elastici solo con adattamento singolo.

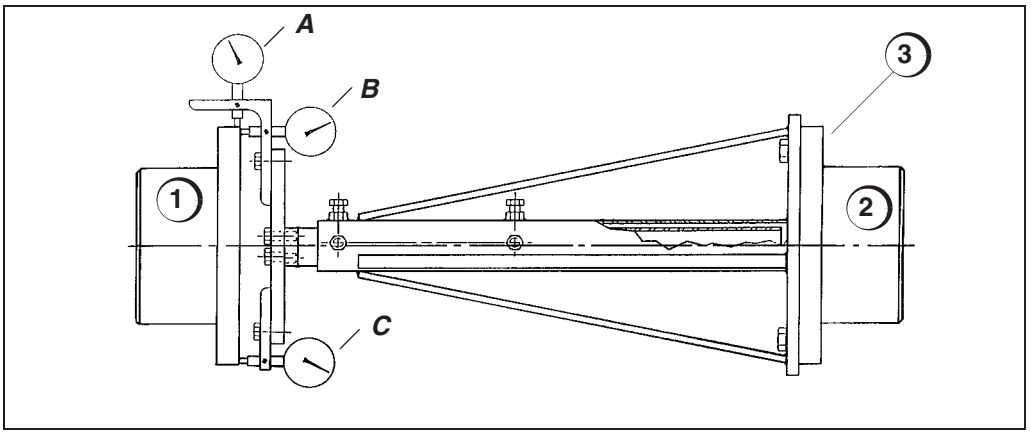

Figura 5-8: Orientamento con staffa di misurazione nel giunto di raccordo con pezzo intermedio

1) macchina orientata
2) macchina non ancora orientata
3) Staffa di misurazione con comparatore

1. Creare una staffa di misurazione stabile in acciaio piatto, tondo e profilato (3) e avvitarla alla estremità dell'albero della macchina da orientare (2).

AVVERTENZA

Il valore di partenza o visualizzazione del comparatore potrà essere di 5.00 come ipotizzato nell'esempio seguente.

2. Inserire e assicurare i comparatori senza gioco.

Controllo ciclo circolare

3. Controllo ciclo circolare della macchina già orientata (1): ruotare l'albero (1) di 360°.

   Valore da raggiungere: fine corsa comparatore ≤ **0,02** mm;
   Valore consentito: manuale operativo della macchina operatrice.

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Orientamento di precisione di paini verticali

4. Impostare nuovamente i comparatori sul valore di partenza.
5. Ruotare l'albero (2) di 180°.
6. Registrare l'oscillazione del comparatore all'incrocio delle coordinate della curva di controllo dell'installazione.

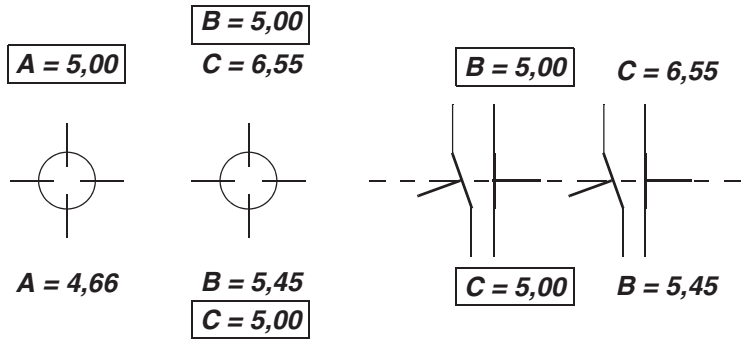

Figura 5-9: Esempio per misurazione radiale A e misurazione angolare B e C in piano verticale

Interpretazione:

scostamento radiale A
scostamento radiale verticale = (5,00 - 4,66) : 2 = 0,17 mm

misurazioni angolari B+C:
scostamento angolare verticale = (6,55 - 5,45) : 2 = 0,55 mm

Nelle misurazioni angolari: la metà della differenza delle due misurazioni angolari è la dimensione dello scostamento angolare.

7. Con le viti di regolazione, correggere lo scostamento radiale verticale e lo scostamento angolare verticale.

Orientamento di precisione del piano orizzontale

8. Portare la staffa di misurazione (3) in posizione orizzontale (ruotare di 90° verso la posizione d'uscita).
9. Ripetere la misurazione.

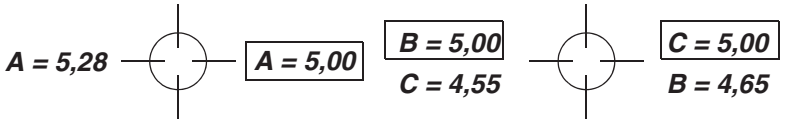

Figura 5-10: Esempio di misurazione radiale e di misurazione angolare nel piano orizzontale

Interpretazione:

scostamento radiale A
scostamento radiale orizzontale = (5,28 - 5,00) : 2 = 0,14 mm

misurazioni angolari B+C:
scostamento angolare orizzontale= (4,65 - 4,55) : 2 = 0,05 mm

10. Spostare orizzontalmente il Turbogiunto a velocità variabile sulle viti di regolazione e, così facendo, correggere lo scostamento radiale e angolare orizzontale.

5.5.3 Giunti di raccordo senza pezzo intermedio

Tra il gruppo motore e il Turbogiunto a velocità variabile si trova in genere un giunto di raccordo senza pezzo intermedio. Tra le estremità dell'albero non c'è quindi alcuno spazio intermedio.

Orientamento approssimativo

Prima di eseguire l'orientamento di precisione è meglio allineare le macchine in modo approssimativo, con l'ausilio di un calibro di spessore e di un regolo.

AVVERTENZA

Sono adatti innesti a denti o giunti completamente metallici con minime forze di ritorno radiali. Giunti di collegamento elastici solo con adattamento singolo.

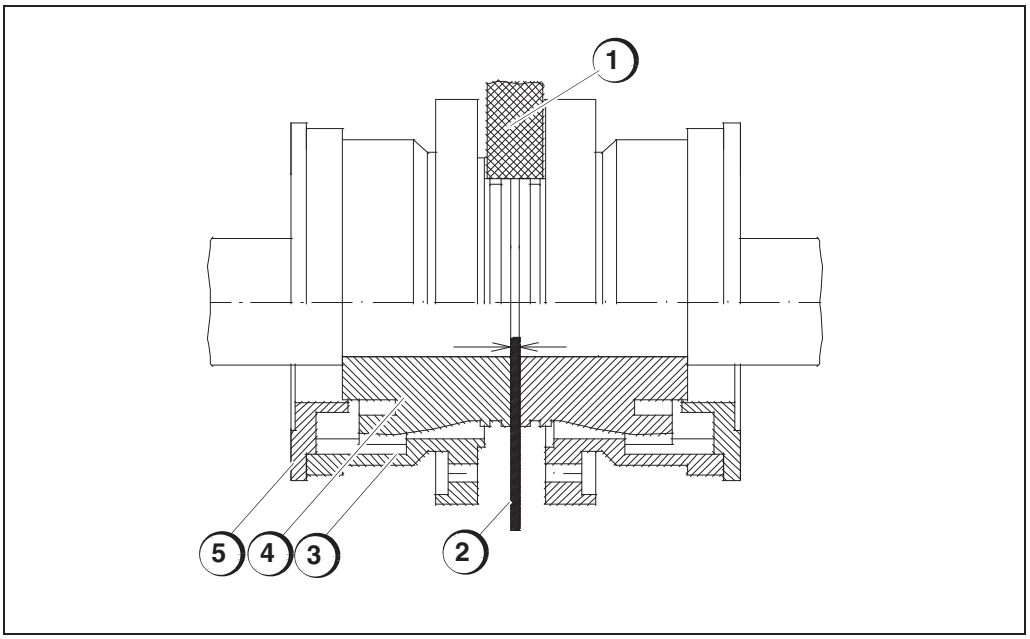

Figura 5-11: Orientamento approssimativo nei giunti di raccordo senza pezzo intermedio

1) Regolo
2) Calibro di spessore
3) Boccola del giunto
4) Boccola del giunto di collegamento
5) Coperchio

1. Controllare la distanza dell'albero con il calibro di spessore (2).
2. Controllare lo scostamento radiale ed assiale con un regolo corto (1).

Orientamento di precisione di paini verticali

In seguito, la macchina viene orientata in modo preciso con l'ausilio di una staffa di misurazione con misuratori a lancetta.

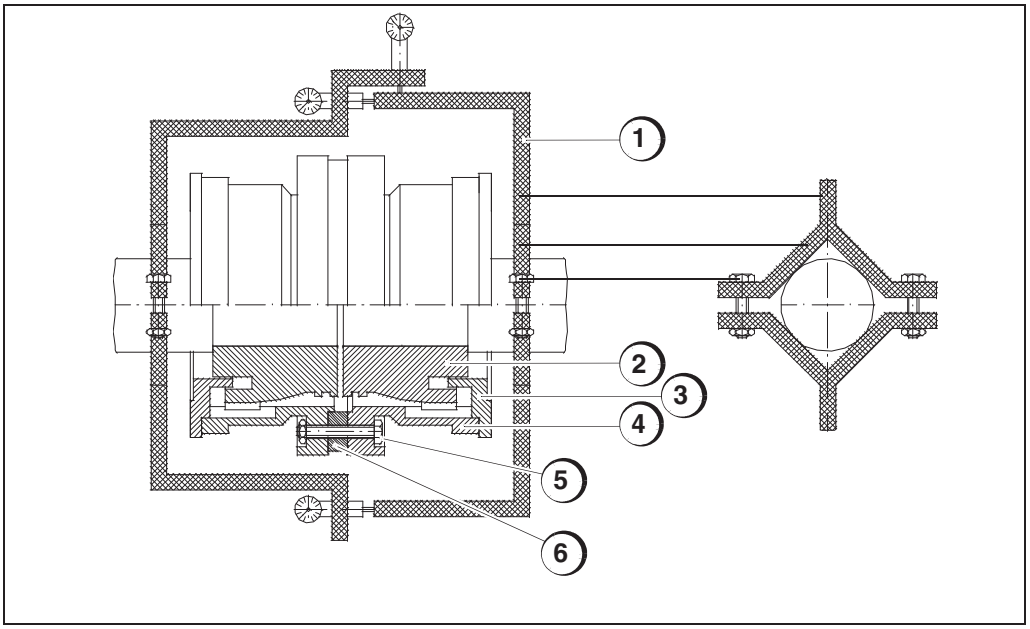

Figura 5-12: Orientamento di precisione nei giunti di raccordo senza pezzo intermedio

1) Staffa di misurazione con comparatore
2) Boccola del giunto di collegamento
3) Coperchio
4) Boccola del giunto
5) Vite
6) Distanziatore

3. Creare una staffa di misurazione d'acciaio piatto (1) e collocarla sugli alberi.

AVVERTENZA

Il valore di partenza o visualizzazione del comparatore potrà essere di 5.00 come ipotizzato nell'esempio seguente.

4. Inserire e assicurare i comparatori senza gioco.
5. Unire a vicenda di ca. 20 mm le boccole dei giunti di raccordo (4) tramite le 2 viti (5) e i 2 distanziatori (6).
6. Spingere il ferro piatto tra le due boccole e, contemporaneamente, ruotare anche gli alberi di 180°.
7. Continuare ad eseguire la misurazione nel piano verticale ed orizzontale, come descritto nel (ved. Sezione 5.5.2 "Giunti di raccordo con pezzo intermedio" a pagina 47).

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5.6 Fissare la macchina sulle fondazioni

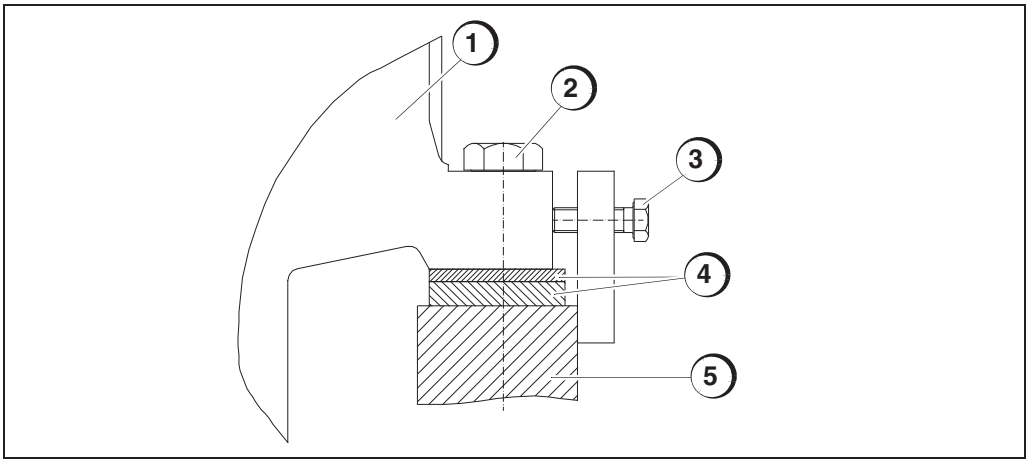

Figura 5-13: Fissaggio alle fondazioni

1) Turbogiunto a velocità variabile
2) Viti di fissaggio
3) Viti di regolazione
4) Lamiere d'imbottitura
5) Fondazioni

1. Rinforzare l'involucro del giunto su tutte le viti di fissaggio con lamiere d'imbottitura. Accertarsi che tutte le lamiere sostengano in modo uniforme (ved. Figura 5-13 "Fissaggio alle fondazioni" a pagina 51).
2. Ruotare le viti di regolazione in senso opposto.
   La macchina è collocata sulle lamiere d'imbottitura.
3. Serrare le viti di fissaggio.
4. Controllare l'orientamento.
5. Attenersi ai risultati di misurazione definitivi all'incrocio delle coordinate della curva di controllo dell'installazione.

5.6.1 Orientare in seguito l'intero impianto

Se dopo un lungo periodo di funzionamento la macchina viene riorientata, spostare il Turbogiunto a velocità variabile sulle lamiere d'imbottitura. In caso di viti di fissaggio applicate al centro, queste devono avere un gioco sufficiente nei fori (ved. Figura 5-13 "Fissaggio alle fondazioni" a pagina 51).

Dopo l'orientamento, serrare di nuovo le viti di fissaggio sulle lamiere di imbottitura affinché non ruotino.

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5.7 Collegare i tubi fra la macchina e lo scambiatore di calore

Per le dimensioni di montaggio dello scambiatore di calore:

➔ vedere il piano di montaggio dello scambiatore di calore in (ved. Capitolo 14 "Componenti esterni (descrizioni)") i questa documentazione.

5.7.1 Installazione dello scambiatore di calore

AVVERTENZA

Se lo scambiatore di calore viene installato in modo tale che i tubi partano dal Turbogiunto a velocità variabile svuotare il raffreddamento e le tubature ad impianto spento nel Turbogiunto a velocità variabile. Il Turbogiunto a velocità variabile si riempie eccessivamente e all'avvio non è più impermeabile. La temperatura aumenta oltre il valore ammesso e i tappi fusibili di sicurezza si fondono.

Installare lo scambiatore di calore possibilmente al di sotto del livello d'olio del Turbogiunto a velocità variabile. In caso di installazione al di sopra del livello d'olio, adottare le misure necessarie.

5.7.2 Scambiatore di calore orizzontale

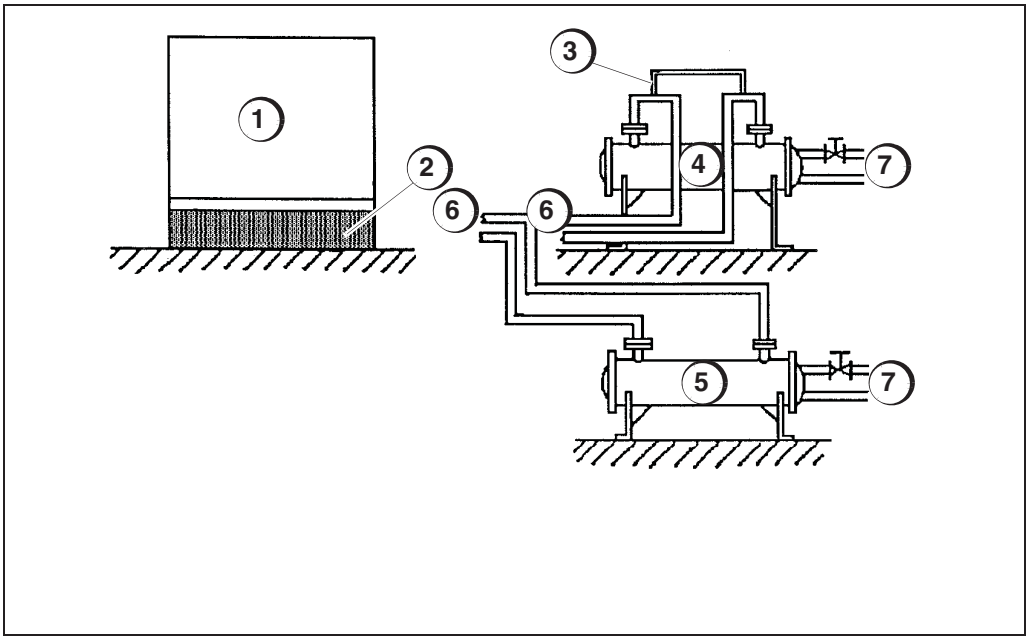

Figura 5-14: Scambiatore di calore orizzontale

1) Turbogiunto a velocità variabile
2) Livello dell'olio
3) Conduttura di strappo cieca di 3 mm
4) Raffreddamento olio sopra il livello dell'olio (H2)
5) Raffreddamento olio sotto il livello dell'olio (H1)
6) "Afflusso e deflusso" olio
7) "Afflusso e deflusso" acqua di raffreddamento

H1	H2
Scambiatore di calore **sotto** il Turbogiunto a velocità variabile	Scambiatore di calore **all'altezza** del Turbogiunto a velocità variabile
Le tubature e lo scambiatore di calore non devono funzionare vuote. Disporre le tubature per lo scambiatore di calore possibilmente in orizzontale, oppure rivolte verso il basso. **Favorevole**.	Le tubature e lo scambiatore di calore si svuotano. Misure: collocare verso l'alto la mandata e il ritorno d'olio nello scambiatore di calore con i sifoni e collegarli nel punto più alto con una conduttura di strappo DN 8 mm (4). Spostare le tubature al di sotto del livello dell'olio del Turbogiunto a velocità variabile.

5.7.3 Disposizione delle condutture dell'olio

AVVERTENZA

Collocare le condutture dell'olio preferibilmente al di sotto del livello dell'olio del Turbogiunto a velocità variabile.

Le tubature dell'olio devono essere il più corte possibile (< 8 m). Posare le condutture dell'olio possibilmente sotto il livello dell'olio, rispettando le istruzioni di installazione per lo scambiatore di calore (ved. Figura 5-14 "Scambiatore di calore orizzontale" a pagina 53).

Le condutture dell'olio prima e dopo lo scambiatore di calore devono essere dimensionate in modo che venga raggiunta una velocità dell'olio compresa fra 1,0 m/s e 4,0 m/s con olio lubrificante e di lavoro.

Il diametro delle condutture olio dovrebbe essere costante lungo tutta la lunghezza. In caso di ampiezze maggiori del collegamento del raffreddamento, l'allargamento delle condutture deve trovarsi direttamente presso lo scambiatore di calore.

➔ Piano di montaggio scambiatore di calore in (ved. Capitolo 14 "Componenti esterni (descrizioni)" di questo manuale operativo).

Premessa

La macchina deve essere orientata in modo preciso.

Disposizione delle condutture dell'olio

1. Togliere la flangia di presaldatura della macchina.
2. Collegare lo scambiatore di calore con il Turbogiunto a velocità variabile come mostrato in (ved. Figura 5-14 "Scambiatore di calore orizzontale" a pagina 53). Fare in modo di non eseguire un montaggio troppo rigido.
3. Puntellare le tubature.
4. Scambiatore di calore orizzontale H1–H2:
   – Se è disponibile uno sfiato del rivestimento presso lo scambiatore di calore, applicare la conduttura generale ai bocchettoni di sfiato dell'olio di lavoro dello scambiatore di calore.
   – Per lo svuotamento dell'olio applicare una tubazione di svuotamento con valvola di bloccaggio al bocchettone di svuotamento dell'olio di lavoro dello scambiatore di calore.
5. Posare delle condutture esterne per l'olio di lubrificazione (per es. per il gruppo motore e/o giunti di collegamento).

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Forare le cieche per l'alimentazione olio di lubrificazione degli aggregati esterni

6. Inserire la pompa ausiliaria di lubrificazione. Perforare i diaframmi alle uscite dell'olio di lubrificazione del Turbogiunto a velocità variabile verso il gruppo motore e la macchina operatrice oppure applicare dei diaframmi già perforati.

   La quantità di olio di lubrificazione e la pressione dell'olio degli aggregati esterni dipendono dal diametro di queste cieche ed eventualmente da altre cieche poste prima dei cuscinetti della macchina d'avviamento ed operatrice.
   ➔ Quantità di olio di lubrificazione necessaria: (vedere Sezione 1.2 "Dati d'esercizio" a pagina 4).

5.7.4 Brunitura delle condutture d'olio

AVVERTENZA

Prima della produzione e uso di questo o di un altro mordente, rispettare le specifiche applicabili, le informazioni di sicurezza (fogli dati) e le informazioni di impiego.

AVVERTIMENTO

Pericoli dovuti a sostanze pericolose

Le sostanze pericolose (mordente) possono causare lesioni o bruciature a persone.

Indossare i dispositivi specifici di protezione personale e in particolare occhiali di protezione durante la pulizia e la brunitura delle condutture dell'olio.

Brunitura di condutture di olio in acciaio (non resistente alla ruggine e agli acidi)

Le condutture d'olio disposte e saldate in cantiere, devono essere svitate e brunite in immersione, in modo che non presentino ruggine e scintille. Solo allora possono essere disposte e pulite definitivamente.

1. Svitare le condutture dell'olio.
2. Sgrassare, prima della brunitura, i pezzi molto oleosi o fortemente ingrassati, per es. con apparecchi a getto di vapore, oppure in un bagno di sgrassamento.
3. Mescolare il mordente[1] con acqua.
4. Per eliminare sporcizia, olio leggero, grafite oppure carboni d'olio:mescolare la soluzione di mordente con lo sgrassatore a mordente[2].

1. Si consiglia: prodotto BETONA, casa produttrice Fa. Karowa, Memmingerstr. 39A, Neu-Ulm, Deutschland, o un mordente analogo. Miscuglio: 1 parte di mordente su 10 parti d'acqua
2. Si consiglia: prodotto BETONA, casa produttrice Fa. Karowa, Memmingerstr. 39A, Neu-Ulm, Deutschland, o uno sgrassatore con mordente analogo. Miscuglio: 1–3 l su 100 l di soluzione di mordente.

5. Portare la temperatura della soluzione a 40 °C.
6. Mettere i pezzi nella soluzione di mordente.
7. Estrarre i pezzi. Dopo la brunitura dovrebbero essere lisci come metallo e privi di scintille e ruggine

	Durata di brunitura
ruggine mobile	ca. 5–10 min.
ruggine	ca. 15–30 min.
lamina	ca. 50 min.
Combustione di pezzi d'acciaio incandescenti	ca. 120 min.

8. Lasciar asciugare le parti in un luogo protetto da gocce d'acqua (24–48 ore a 20 °C). Non lavare! Se non è possibile attenersi ai tempi di asciugatura: risciacquare con acqua pura.
9. Spruzzare i pezzi asciugati internamente con olio di servizio ed esternamente con colore.

Brunitura di condutture dell'olio in acciaio antiruggine e resistente agli acidi (acciaio inox)

Le condutture d'olio disposte e saldate in cantiere, devono essere svitate e brunite in immersione, in modo che non presentino scintille, colori iniziali e ruggine estranea. Solo allora possono essere disposte e pulite definitivamente.

AVVERTENZA

Prima della produzione e uso di questo o di un altro mordente, rispettare le specifiche applicabili, le informazioni di sicurezza (fogli dati) e le informazioni di impiego.

1. Svitare le condutture dell'olio.
2. Sgrassare, prima della brunitura, i pezzi molto oleosi o fortemente ingrassati, per es. con apparecchi a getto di vapore, oppure in un bagno di sgrassamento[1].
3. Preparare[2] il mordente.
4. Mettere i pezzi nella soluzione di mordente.
5. Estrarre i pezzi. Dopo la brunitura dovrebbero essere lisci come metallo e privi di scintille e ruggine.

1. Consiglio: prodotto DERUSTIT 1622, produttore Deutsche Derustit GmbH • Emil von Behringstraße 4 • Dietzenbach/Germania • o uno sgrassatore con mordente equivalente.
2. Consiglio: prodotto DERUSTIT 1234, produttore Deutsche Derustit GmbH • Emil von Behringstraße 4 • Dietzenbach/Germania • o un mordente equivalente.

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Durante la brunitura, la
– temperatura e
– l'età del bagno

del liquido sono importanti.

Per il procedimento di brunitura usare
i materiali Nr. ad es. 1.4541, 1.4550, 1.4571

Età del bagno	Durata di brunitura
fresca fino a 1 settimana	da 20 a 30 min.
da 1 a 4 settimane	da 40 a 60 min.
4 settimane e oltre	fino a 120 min.

Per il procedimento di brunitura usare
i materiali Nr. ad es. 1.4301, 1.4306, 1.4401

Età del bagno	Durata di brunitura
fresca fino a 1 settimana	da 10 a 15 min.
da 1 a 4 settimane	da 20 a 30 min.
4 settimane e oltre	da 60 a 120 min.

ATTENZIONE

Danni ambientali

Il mordente rilasciato nelle tubature di scarico o direttamente nel terreno può causare danni all'ambiente.

Smaltire il mordente in modo appropriato in base alle norme nazionali.

6. Risciacquare con acqua le parti, rispettando le norme di protezione[1].
7. Spruzzare le parti umide con una soluzione passivizzante[2].
8. Per la pulitura finale delle parti, sciacquarle con acqua[3].
9. Lasciar asciugare le parti in luoghi asciutti. In caso di parti con cavità, procedere utilizzando azoto puro.
10. Spruzzare i pezzi asciugati internamente con olio di servizio ed esternamente con colore.

1. Alta pressione 160 bar
2. Soluzione passivizzante DERUSTIT 2016, tempo di contatto 5-10 minuti
3. Acqua completamente desalinizzata con una conduttività di 10 µm

5.8 Collegamento degli strumenti elettrici

AVVERTIMENTO

Pericolo di lesioni

Correnti e tensioni elettriche pericolose del Turbogiunto a velocità variabile possono causare lesioni personali o anche il decesso.

Gli impianti elettrici del Turbogiunto a velocità variabile potranno essere modificati solo da personale elettrico specializzato in conformità alle norme della nazione di installazione.

AVVERTIMENTO

Pericolo di lesioni

Pericolo dovuto a isolamento errato.

Un isolamento errato dei componenti elettrici può causare un contatto elettrico con una persona con conseguenti gravi lesioni.

Impiegare condutture con isolamento che rispettino le condizioni ambientali.

ATTENZIONE

Pericolo di lesioni/Danni materiali

Le correnti parassite che vagano per il Turbogiunto a velocità variabile possono ferire le persone o danneggiare gli ingranaggi e i cuscinetti.

Adottare adeguate misure di messa a terra su tutti i componenti del tratto d'avviamento.

1. Collegare tutti gli utilizzatori elettrici.
2. Collegare tutti gli apparecchi di comando e regolazione.
3. Controllare la direzione di rotazione, la ricezione di corrente e la protezione elettrica dei motori.

➔ Piano di collegamento per il cablaggio nella scatola dei morsetti.

➔ ved. Capitolo 14 "Componenti esterni (descrizioni)" in questo manuale operativo per una descrizione dettagliata degli strumenti incorporati.

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5.9 Montaggio dei dispositivi di protezione

Tipi di dispositivi di protezione

- Protezione da contatto nei pezzi rotanti e surriscaldati (giunti di raccordo, condutture d'olio) e altre fonti di pericoli riconoscibili
- Schermatura antiacustica
- Protezione da agenti atmosferici in caso di installazione esterna (tettoia e/o involucro)

5.9.1 Applicare protezioni da contatto

AVVERTIMENTO

Pericolo di lesioni

Pericolo dovuto a coinvolgimento, investimento, trascinamento o cattura nella zona degli alberi rotanti e nella zona dei giunti di collegamento rotanti.

Indumenti, capelli lunghi o parti sciolte (condutture, corde e funi) possono restare avvolti o venire trascinati nella zona di pericolo causando lesioni gravi/danni materiali

Sul giunto di collegamento applicare adeguate protezioni, distaccabili solo con un utensile.

ATTENZIONE

Pericolo di bruciature

L'involucro, le condutture dell'olio, nonché l'olio di servizio possono essere molto caldi – in casi estremi possono raggiungere la temperatura di 130 °C. Il contatto può causare ustioni alla pelle.

Lasciare raffreddare il Turbogiunto a velocità variabile prima di effettuare lavori di manutenzione e riparazione!

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Montare la protezione da contatto sulle parti rotanti e calde e su altre fonti di pericolo riconoscibili, in base alle norme di sicurezza vigenti del cliente e/o del paese di installazione.

Prevedere una protezione da contatto nei giunti di raccordo con 80 forature (Ø 8 mm) per il ricambio dell'aria.

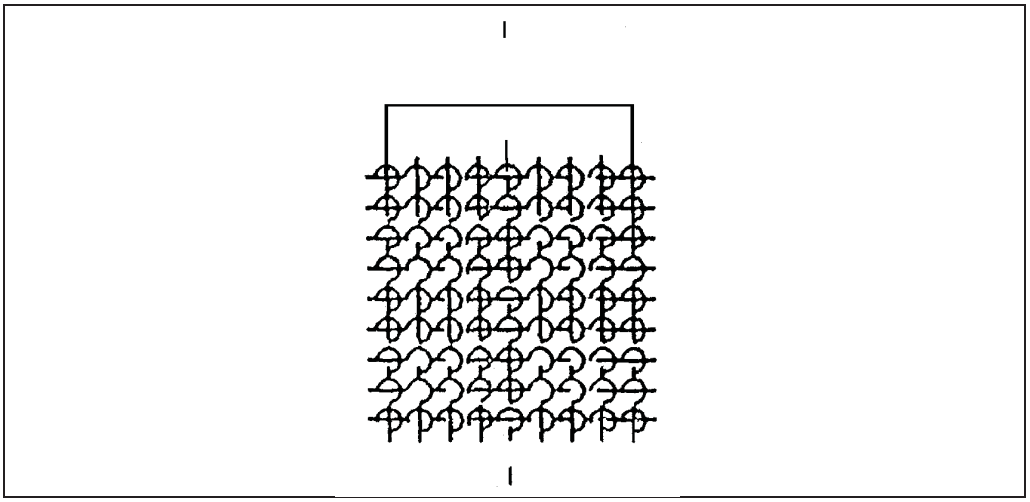

Figura 5-15: Applicare forature di aerazione nei dispositivi di protezione per i giunti di raccordo

5.9.2 Applicare la copertura antiacustica

Interventi senza impedimenti

Montare la copertura antiacustica in modo tale, che sia possibile eseguire le seguenti attività senza alcun impedimento:[1]

- lettura degli strumenti sulla tavola e nelle tubature
- lettura del livello dell'olio nell'indicatore del livello di olio della macchina
- pulizia del filtro doppio di olio
- attivazione degli organi di chiusura
- montaggio e smontaggio degli strumenti
- eseguire i lavori di manutenzione (rabbocco di lubrificante ad es. per i giunti di collegamento e simili)

1. Indicazioni conformi alla linea guida VDI 2711 "Protezione antiacustica tramite isolamento"

AVVERTIMENTO

Pericolo di intossicazione

L'impiego di coperture antiacustiche senza aperture può causare intossicazioni.

Quando si impiegano dei compressori, in caso di mancanza di tenuta dei gas potranno verificarsi intossicazioni ed avvelenamenti.

Per cambiare l'aria, dotare sempre le coperture antiacustiche di aperture di ventilazione e di sfiato dell'aria.

ATTENZIONE

Pericolo di esplosione

L'impiego di coperture antiacustiche, senza aperture può causare un ristagno del calore.

Per la fuoriuscita del calore e per il ricambio dell'aria prevedere sempre coperture antiacustiche con aperture di aerazione e sfiato.

Fuoriuscita del calore e sfiato

- Evitare temperature di esercizio non ammesse per gli strumenti, i dispositivi di regolazione e/o comando, l'isolamento e il dispositivo elettrico.
- Prevedere uno sfiato separato per i motori elettrici. L'aria di raffreddamento di un motore elettrico raffreddato ad aria, può essere eventualmente utilizzata per l'aerazione (prevedere la linea dell'aeratore del motore e il raffreddamento per il motore necessario).
- Regolare la guida dell'aria nella copertura in modo tale, che sia garantita la fuoriuscita del calore (tarare il passaggio per un aumento della temperatura dell'aria di raffreddamento di 10 °C).
- Guidare gli sfiati degli ingranaggi e dei rivestimenti (coperture chiuse dei giunti di raccordo) attraverso le tubature, sopra le coperture antiacustiche.
- Prevedere aperture e impermeabilizzazioni per i passaggi degli alberi, finestre per l'osservazione degli strumenti, per l'introduzione di tubi e cavi e per gli sfiati.

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5.10 Montare il tubo di presa-servomotore

Prima di montare un servomotore del tubo di presa, verificare la posizione del tubo di presa. Il lato del tubo di presa contrassegnato da "SOPRA", deve essere rivolto verso l'alto.

Montare il servomotore del tubo di presa in modo che il tubo di presa possa essere portato in qualunque posizione desiderata. Fissarlo perché non ruoti (non utilizzare alcuno snodo a cuscinetto, bensì snodi ad albero).

AVVERTENZA

E necessario prevedere misure per limitare la corsa del tubo di presa nel servomotore, non nel tubo di presa stesso!

Collegare a vicenda il tubo di presa e il suo servomotore in modo tale che non si crei alcun gioco o oscillazione. In questo modo i pochi rumori del tubo di presa (per es. a causa delle oscillazioni della pressione dell'olio) risulteranno impercettibili.

6 Messa in esercizio

6.1 Indicazioni di sicurezza

Le seguenti indicazioni di sicurezza riguardano l'intero capitolo e devono essere osservate insieme alle varie indicazioni singole.

Pericolo dovuto a coinvolgimento, investimento, trascinamento o cattura nella zona degli alberi rotanti e nella zona dei giunti di collegamento rotanti

AVVERTI-
MENTO

Indumenti, capelli lunghi o parti sciolte (condutture, corde e funi) possono restare avvolti o venire trascinati nella zona di pericolo causando lesioni gravi/danni materiali

Sul giunto di collegamento applicare adeguate protezioni, distaccabili solo con un utensile.

Pericolo causato dall'impianto idraulico

AVVERTI-
MENTO

Collegamenti o guarnizioni non stagne possono lasciar fuoriuscire olio, con conseguente pericolo di scivolate e di lesioni alle persone nonché di danni all'ambiente.

Eliminare immediatamente l'olio fuoriuscito.

Pericoli dovuti a sostanze pericolose

ATTEN-

I fluidi di lavoro fuoriusciti possono causare lesioni o ustioni alle persone nonché danni all'ambiente.

Indossare i dispositivi specifici di protezione personale e in particolare occhiali di protezione durante il rabbocco di olio, il controllo delle perdite e il cambio del filtro. Procedere conformemente al foglio dati di sicurezza del fluido impiegato.

Danni materiali

ATTEN-

Il Turbogiunto a velocità variabile viene fornito senz'olio. Un esercizio senza olio causa danni alla macchina già dopo pochi secondi.

Prima di avviare il Turbogiunto a velocità variabile riempirlo con olio di servizio.

Avvertenza

Prima di avviare i pezzi applicati del gruppo motore (strumenti, unità di regolazione della posizione, motore ecc.) verificare:
collegamento della tensione di alimentazione, inoltro/ elaborazione di segnali per comando, regolazione e sorveglianza.

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6.2 Riempimento dell'olio di servizio

Criteri per verificare l'idoneità dell'olio di servizio

Lista degli oli proposti dalla Voith: (vedere Sezione 6.5 "Liquidi di servizio" a pagina 70). I tipi di olio, contenuti in questa lista, sono stati testati in base ai seguenti criteri:

- viscosità più bassa possibile
  (viscosità iniziale ≤ 250 mm^2/s (cSt) ad una temperatura di 5 °C)
- capacità di lubrificazione contrassegnata
- migliore separazione dell'aria possibile
- elevata durata nel tempo
- neutralità chimica nei confronti dei metalli e delle guarnizioni
- sopportabilità da parte dell'organismo umano

AVVERTENZA

In caso di impiego di un tipo di olio non contenuto nella lista degli oli proposti, verificarne la compatibilità con l'olio di conservazione della Voith (olio per motori Shell Ensis 20). Verificare l'olio in base ai criteri di idoneità indicati nel (ved. Sezione 6.5 "Liquidi di servizio" a pagina 70). Pulire a fondo il Turbogiunto a velocità variabile internamente.

Quantità di olio necessaria: (ved. Sezione 1.1 "Dati della macchina" a pagina 1) e le istruzioni dello scambiatore di calore in (ved. Capitolo 14 "Componenti esterni (descrizioni)") di questo manuale operativo.

AVVERTENZA

Riempire l'olio di servizio possibilmente direttamente dopo il collegamento dei tubi dell'impianto.

Riempimento dell'olio

1. Riempire l'olio tramite il bocchettone, V2 (ved. "Schema di montaggio - Turbogiunto a velocità variabile 91500311610").
2. Filtrare l'olio durante il riempimento (unità filtro 25 µm[1] o inferiore).
3. Negli scambiatori di calore riempiti e/o sfiatati, il livello dell'olio deve raggiungere un valore medio compreso tra i segni min. e max. dell'indicatore di livello.

➔ (ved. Figura 7-17 "Controllo del livello dell'olio" a pagina 77)

1. Aumenta la durata degli elementi del filtro in particolare alla messa in funzione. Corrisponde a una classe di purezza dell'olio di 18/15 secondo le ISO 4406.

6.3 Lavaggio della macchina

Le nuove condotte dell'olio posate in opera devono essere sottoposte ad un accurato lavaggio prima della messa in esercizio reale per la durata di alcuni giorni (protezione contro la corrosione e filtrazione dell'olio).

Controlli prima dell'esercizio di lavaggio

1. Controllare il livello dell'olio (richiesto: valore medio tra la marcatura min. e max. dell'indicatore di livello dell'olio).
2. Controllare la quantità di lubrificante nei componenti supplementari, quali ad esempio giunti di collegamento, e rifornire ev. lubrificante secondo necessità.
3. Controllare il senso di rotazione della pompa d'olio ausiliare.
4. Verificare la tenuta ermetica nonché l'avvitatura delle condotte.

Avviare l'esercizio di lavaggio

5. Avviare la pompa d'olio ausiliare elettrica (bloccare la macchina d'azionamento, qualora potesse mettersi in funzione automaticamente).
6. A questo punto si riempiono il circuito operativo e dell'olio lubrificante.
7. Controllare la tenuta ermetica delle condotte dell'olio.
8. In caso di un aumento della pressione differenziale al massimo valore ammissibile (si veda Sezione 1.2 "Dati d'esercizio" a pagina 4), commutare il doppio filtro dell'olio al vassoio filtrante depurato e sottoporre ad una depurazione il vassoio filtrante (si veda Sezione 8.3 "Pulizia del doppio filtro dell'olio" a pagina 88).

Ulteriori controlli durante l'esercizio di lavaggio

9. Controllare la quantità di lubrificante per i gruppi esterni e correggerla eventualmente tramite un adattamento dei fori a diaframma.
10. Controllare la quantità iniettata nel giunto di collegamento per la lubrificazione a circolazione (prescrizione del costruttore) e correggerla eventualmente montando apposite blende (si veda Sezione 14 "Componenti esterni (descrizioni)".
11. Controllare il livello dell'olio e rifornire all'occorrenza olio d'esercizio (richiesto: valore medio tra la marcatura min. e max. dell'indicatore di livello dell'olio).
12. Verificare la pressione di lubrificazione e regolarla eventualmente nella **valvola di tenuta pressione**.
13. Controllare i punti di commutazione dei misuratori di pressione e correggerli secondo necessità.

Terminare l'esercizio di lavaggio

14. Sottoporre le condotte dell'olio ad una accurato lavaggio finché il doppio filtro dell'olio non presenta più a alcuna sporcizia (da uno a parecchi giorni).
15. Disinserire la pompa d'olio ausiliare.

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6.4 Prova a carico

6.4.1 Preparativi per la prova a carico

Controlli e regolazioni prima della prova a carico

1. Controllare l'allineamento della macchina ed eventualmente correggerlo.
2. Controllare il fissaggio delle fondamenta.
3. Allentare i giunti di collegamento e controllare il senso di rotazione del motore d'azionamento con il Turbogiunto a velocità variabile disinnestato.
4. Controllare ed eventualmente rabboccare la quantità di lubrificante di pezzi applicati quali i giunti di collegamento.
5. Controllare il montaggio dei giunti di collegamento e dei dispositivi di protezione.
6. Controllare se le prescrizioni del costruttore sono state rispettate alla regolazione dell'alimentazione olio di lubrificazione per gli aggregati esterni.
7. Controllare il livello olio (Richiesto: valore medio tra la marcatura MIN e MAX del tubo di livello olio).
8. Controllare l'installazione elettrica sull'allacciamento della tensione di alimentazione e la trasmissione e l'elaborazione dei segnali.
9. In caso di scambiatori di calore ad acqua, aprire le valvole applicate sul lato acqua, sfiatare il raffreddamento olio lato acqua e controllare la portata.
   Dati di funzionamento (ved. Sezione 1.2.2 "Scambiatore termico" a pagina 6) e il manuale operativo degli scambiatori di calore in Capitolo 14 "Componenti esterni (descrizioni)" di questo manuale operativo).
10. Nel servomotore del tubo di presa controllare la regolazione del servomotore oltre l'angolo di regolazione. Sul servomotore ambedue le posizioni finali devono essere meccanicamente limitate.
    - Con posizione del 100% del tubo di presa controllare ed eventualmente correggere il segnale massimo di posizionamento e di ritorno sul servomotore
    - Il segnale minimo di posizionamento e di ritorno corrisponde, dopo la traslazione dell'angolo di posizionamento, ad una posizione del tubo di presa di 0%.
11. Portare il tubo di presa nella posizione 0%.
12. Verificare la prontezza al servizio dell'intero impianto.

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6.4.2 Eseguire una prova di funzionamento

1. Avviare la pompa d'olio ausiliare.
2. Una volta raggiunta la pressione lubrificante richiesta, inserire la macchina d'azionamento ovvero monitorarne l'inserimento automatico.
3. Una volta che si è messa in funzione la macchia d'azionamento e al raggiungimento della pressione d'olio richiesta, monitorare il disinserimento automatico della pompa d'olio ausiliare ovvero disinserire manualmente la pompa.

Numero di giri minimo

4. Portare l'impianto al numero di giri minimo.
5. Monitorare la silenziosità di corsa, le temperature, la pressione dell'olio lubrificante e la condizione dei filtri.

Messa in funzione rallentata

6. Mettere lentamente in funzione la macchina operatrice.
7. Osservare le temperature e le pressioni fino al regime e protocollare i valori registrati.
8. Misurare le vibrazioni. Valutare la silenziosità di corsa e protocollare i valori dei punti misurati, i numeri di giri e la posizione del tubo di presa.

AVVERTENZA

Il Turbogiunto a velocità variabile è stato collaudato senza carico prima della consegna dalla VTCR. Pertanto, in condizioni di esercizio possono verificarsi delle vibrazioni e/o rumori nel tubo di presa.
Come rimedio si dovrebbe ottimizzare la posizione del tubo di presa, (si veda Sezione 6.4.3 "Regolare la posizione del tubo di presa ottimale" a pagina 68).

9. Qualora non dovessero essere presente i mozzi dei giunti di collegamento e nel caso in cui l'equilibratura completa fosse stata eseguita senza mozzo originale: in una silenziosità di corsa non perfetta riequilibrare l'albero di trazione e l'albero comandato secondario in loco.
10. Misurare le vibrazioni. Valutare la silenziosità di corsa e protocollare i valori dei punti misurati, i numeri di giri e la posizione del tubo di presa.

Funzionamento su tutto il regime

Qualora fosse necessario ottimizzare la caratteristica dell'impianto in corrispondenza delle condizioni d'esercizio:

11. Fare funzionare l'impianto su tutto il regime.

Regolazione

12. Regolare il regime dell'impianto al minimo.
13. Dopo il disinserimento della macchina d'azionamento, controllare l'inserimento automatico della pompa d'olio ausiliare.
14. Dopo l'arresto della macchina d'azionamento e della macchina operatrice, disinserire la pompa d'olio ausiliare.

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Dopo la prova di funzionamento

15. Depurare necessariamente il doppio filtro dell'olio e rifornirlo con olio d'esercizio (si veda Sezione 8.3 "Pulizia del doppio filtro dell'olio" a pagina 88).
16. Controllare il livello dell'olio e correggerlo all'occorrenza (richiesto: valore medio tra la marcatura min. e max. dell'indicatore di livello dell'olio).
17. Controllare la tenuta ermetica delle tubazioni.

6.4.3 Regolare la posizione del tubo di presa ottimale

AVVERTIMENTO

Danni materiali

I lavori di seguito descritti vengono eseguiti con Turbogiunto a velocità variabile in funzione. Durante il funzionamento sul tubo di presa vengono esercitate delle forze di corrente con effetto torsionale, di tiraggio o di pressione.
Manovre errate non a regola d'arte possono quindi causare danneggiamenti al Turbogiunto a velocità variabile.

Questi lavori sul Turbogiunto a velocità variabile devono essere eseguiti soltanto da personale qualificato (ved. Sezione 2.7 "Scelta e qualifica del personale, doveri fondamentali" a pagina 11).

AVVERTENZA

La posizione ottimale del tubo di presa deve essere regolata solo, quando il tubo di presa è stato sostituito oppure quando alla messa in funzione del Turbogiunto a velocità variabile si presentano delle oscillazioni e dei rumori.

Interventi

1. Messa in moto dell'intero impianto.
2. Spostamento del tubo di presa con l'ausilio del servomotore entro l'intera area di regolazione (posizioni del tubo da 0% a 100%).

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Montaggio del tubo di presa

In caso di oscillazioni assiali del tubo di presa oppure di un elevato livello di pressione acustica, il tubo di presa deve essere regolato:

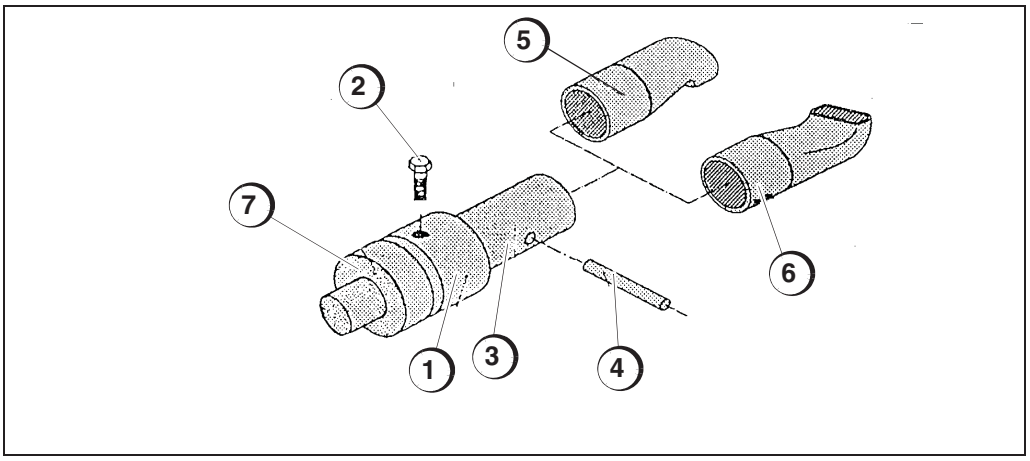

Figura 6-16: Montaggio del tubo di presa

1) Boccola
2) Vite di tenuta
3) Tubo di presa
4) Asta di rotazione
5) Tubo di presa "Senso di rotazione destro"
6) Tubo di presa "Senso di rotazione sinistro"
7) Identificazione "alto"

3. Portare il tubo di presa nella posizione, dove si sentono i rumori più forti.
4. Infilare l'asta di rotazione nella foratura per l'asta.

AVVERTIMENTO

Non girare il tubo di presa più di 40° su ciascun lato!

5. Allentare la vite di tenuta e girare il tubo di presa con l'ausilio dell'asta di rotazione fino a quando non si trova la posizione migliore.
6. Ripetere gli interventi dal 3 al 5 per altre posizioni del tubo di presa, fino a quando i rumori lungo tutta l'area di regolazione del tubo di presa si assestano al minimo.
7. Messa fuori servizio dell'impianto.
8. Smontare il tubo di presa, il soffietto e il servomotore del tubo.
9. Forare il tubo di presa smontato con la boccola e fissarlo con il mandrino.
10. Contrassegnare la direzione di rotazione del Turbogiunto a velocità variabile nella boccola (ved. Figura 6-16 "Montaggio del tubo di presa" a pagina 69).
11. Montare il tubo di presa, il soffietto e il servomotore del tubo.
12. Controllare l'accessibilità del tubo di presa lungo tutta l'area di regolazione girando lentamente il Turbogiunto a velocità variabile.

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6.5 Liquidi di servizio

Selezione della qualità d'olio da parte del cliente e della ditta di oli minerali

Rispettando i requisiti è possibile impiegare:

Oli idraulici HLP 32 DIN 51524, parte 2

Usare oli puri. L'autorizzazione a miscelare l'olio dovrà essere chiarita con il produttore dell'olio minerale.

Requisiti (parametri) dei fluidi di esercizio e proposta dei tipi:

➔ Allegato B (ved. "Fluidi di esercizio ISO VG 32 per circuiti idrodinamici 3625-006072")

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7 Esercizio

7.1 Indicazioni di sicurezza

Le seguenti indicazioni di sicurezza riguardano l'intero capitolo e devono essere osservate insieme alle varie indicazioni singole.

Pericolo dovuto a zone non visibili

Durante la manipolazione della macchina una persona può ferirsi gravemente a causa dell'avvio della macchina stessa.

AVVERTI-MENTO

Fra il giunto e l'albero applicare adeguate protezioni, distaccabili solo con un utensile.
Lavorare alla macchina solo con impianto spento (non in tensione).
Mettere in funzione solo previo controllo visivo dell'assenza di persone nella zona di pericolo!

Pericolo dovuto a coinvolgimento, investimento, trascinamento o cattura nella zona degli alberi rotanti e nella zona dei giunti di collegamento rotanti

Indumenti, capelli lunghi o parti sciolte (condutture, corde e funi) possono restare avvolti o venire trascinati nella zona di pericolo causando lesioni gravi/danni materiali

AVVERTI-MENTO

Sul giunto di collegamento applicare adeguate protezioni, distaccabili solo con un utensile.

Messa in pericolo a causa di perdita di stabilità e rischi dovuti alle masse

In caso di forte squilibrio, per via delle oscillazioni, un albero potrebbe rompersi e causare gravi lesioni personali o danni alla macchina.

AVVERTI-MENTO

In caso di squilibrio inammissibile o assenza di silenziosità, eseguire immediatamente un'ispezione!

Pericolo di scivolate per fuoriuscita olio

Eventuali fuoriuscite d'olio sulla macchina o in prossimità di essa potrebbero far scivolare o far cadere una persona con conseguenti gravi lesioni.

AVVERTI-MENTO

Controllare regolarmente eventuali fuoriuscite di olio o mancanza di tenuta.
Eseguire una pulizia regolare della macchina!

Pericolo causato dall'impianto idraulico

Collegamenti o guarnizioni non stagne possono lasciar fuoriuscire olio, con conseguente pericolo di scivolate e di lesioni alle persone.

AVVERTI-MENTO

Eliminare immediatamente l'olio fuoriuscito.

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Pericolo d'incendio

Un cortocircuito elettrico causato da un cavo usurato abbinato a temperature elevate e olio oppure un'infiltrazione di acqua nella scatola dei morsetti potrebbe innescare un incendio e mettere in pericolo le persone o l'ambiente.

AVVERTI-
MENTO

L'installazione dell'impianto deve essere eseguita solo da un elettricista specializzato. Rispettare gli intervalli di manutenzione.

Pericolo d'incendio

L'olio fuoriuscito (molto caldo) o la nebbia d'olio potrebbe innescare un incendio e causare gravi lesioni alle persone.

AVVERTI-
MENTO

Controllare regolarmente eventuali fuoriuscite di olio o mancanza di tenuta.

Pericolo dovuto a montaggio errato

La mancata osservanza del senso di rotazione stabilito potrebbe distruggere la macchina e causare gravi lesioni alle persone.
Il montaggio errato della macchina o delle sue singole parti potrebbe distruggere la macchina.

AVVERTI-
MENTO

Far eseguire le operazioni di montaggio, manutenzione e riparazione solo a personale addestrato.

Pericolo dovuto a colpi di pressione, aumento della pressione o perdita di pressione

I colpi di pressione potrebbero provocare oscillazioni e rotture delle tubazioni, inoltre l'olio fuoriuscito potrebbe causare lesioni alle persone.

ATTEN-

Rispettare l'utilizzo conforme tenendo conto dei dati di funzionamento e delle condizioni ambientali della macchina.

Pericolo dovuto a rumore

Un livello di pressione acustico prolungato a partire da 85 dBA potrebbe danneggiare l'udito delle persone.

ATTEN-

Indossare cuffie di protezione.

Contaminazione dell'ambiente

L'olio fuoriuscito potrebbe danneggiare l'ambiente.

ATTEN-

Controllare regolarmente eventuali fuoriuscite di olio o mancanza di tenuta.

7.2 Avviare e rallentare la macchina

ATTENZIONE

Danni materiali

Il Turbogiunto a velocità variabile viene fornito senz'olio. Un esercizio senza olio causa danni alla macchina già dopo pochi secondi.

Prima di avviare il Turbogiunto a velocità variabile riempirlo con olio di servizio.

Controlli prima dell'avviamento

1. Eseguire gli stessi controlli previsti prima dell'avvio del ciclo di prova (ved. Sezione "Controlli e regolazioni prima della prova a carico" a pagina 66).
2. Verificare la prontezza al servizio dell'intero impianto.
3. Portare il tubo di presa nella posizione 0 %.

   Il Turbogiunto a velocità variabile può essenzialmente essere avviato con qualsiasi posizione del tubo di presa. L'avviamento con una posizione del tubo allo 0 %, tuttavia, è il migliore, perché il gruppo motore può avviarsi praticamente senza carico.

Avviamento

➔ (ved. Sezione "Diagramma di flusso Foglio 1-26/91600388810" a pagina 105)

Condizioni di esercizio	Azione	Risultato
Temp. olio < 5 °C / 41 °F Temp. olio > 10 °C / 50 °F	Riscaldatore ON Riscaldatore OFF	L'olio nella coppa viene riscaldato.
	Tubo di presa in posizione 0 %	
	Pompa ausiliaria di lubrificazione olio ON	Giunto e macchina operatrice fermi. I cuscinetti vengono lubrificati.
Con pressione dell'olio di lubrificazione > 1.3 bar	Macchina motore ON	La macchina motore viene avviata. Il giunto si riempie e gira.
Pressione olio di lubrificazione di > 1.8 bar presente per 1 minuto	Pompa ausiliaria di lubrificazione olio OFF	Il giunto e la macchina operatrice girano.
	Tubo di presa nella posizione compresa tra 0 % e 100 %	La macchina operatrice procede con il numero di giri desiderato.

Rallentamento

➔ (ved. Sezione "Diagramma di flusso Foglio 1-26/91600388810" a pagina 105)

Condizioni di esercizio	Azione	Risultato
	Tubo di presa in posizione 0 %	Turbogiunto a velocità variabile si svuota. La macchina operatrice prosegue con il numero di giri minimo.

Rallentamento

➔ (ved. Sezione "Diagramma di flusso Foglio 1-26/91600388810" a pagina 105)

Condizioni di esercizio	Azione	Risultato
Con pressione dell'olio di lubrificazione < 1,0 bar	Macchina motore OFF	La macchina motore e la macchina operatrice si fermano.
Automaticamente con macchina motore OFF o pressione olio di lubrificazione < 1,5 bar	Pompa ausiliaria di lubrificazione olio ON	I cuscinetti vengono lubrificati ancora.
1 minuto do che l'impianto si è fermato	Pompa ausiliaria di lubrificazione olio OFF	I cuscinetti non vengono più lubrificati.

7.3 Azionare la macchina

7.3.1 Controllo della macchina

Durante l'esercizio è necessario controllare:

- Temperature
- Pressione dell'olio lubrificante
- Pressione differenziale (filtro olio)
- Livello dell'olio

AVVERTENZA

Se il funzionamento del Turbogiunto a velocità variabile cambia, è giunto il momento di eseguire una revisione.
(ved. Sezione 8.2.2 "Misure e intervalli di riparazione" a pagina 87)

Temperature

Olio di lavoro/di lubrificazione

Temperatura dell'olio dopo il tubo di presa (punto di misurazione 18)	Campo operativo Allarme in caso di Disinserire a	< 100 °C (212 °F) > 100 °C (212 °F) > 110 °C (230 °F)
Temperatura olio *prima* dello scambiatore di calore (punto di misurazione 35)	Campo operativo	< 95 °C (203 °F)
Temperatura olio *dopo* lo scambiatore di calore (punti di misurazione 33; 33.1; 33.10)	Campo operativo Allarme in caso di Disinserire a	< 55 °C (131 °F) > 60 °C (140 °F) > 65 °C (149 °F)
Temperatura olio *nel* serbatoio d'olio (punti di misurazione 60; 60.10)	Campo operativo Allarme in caso di Disinserire a	> 30 °C (86 °F) > 5 °C (41 °F) > 95 °C (203 °F)

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Temperatura olio *nel riscaldatore* (punto di misurazione 36)	Campo operativo Riscaldatore **ON** a Riscaldatore **OFF** a Campo operativo Spegnimento	> 10 °C (50 °F) < 5 °C (41 °F) > 10 °C (50 °F) < 95 °C (203 °F) > 130 °C (266 °F)

➔ Posizione dei punti di misurazione (ved. Schema circuito olio e punti di misurazione 91600384410) di questo manuale operativo.

Tappi fusibili di sicurezza

I tappi fusibili di sicurezza si fondono ad una temperatura dell'olio di lavoro nel vano di sgrassamento di 160 °C (320 °F) ed evitano, in questo modo, un surriscaldamento del giunto.

Ciò che fa scattare questa reazione di aumento termico a breve termine della temperatura dell'olio di lavoro potrebbe essere:

- mancato funzionamento dello scambiatore di calore
- sovraccarico del Turbogiunto a velocità variabile

La fusione dei tappi fusibili di sicurezza ha come conseguenza:

– cambiamento limitato del comportamento di regolazione del Turbogiunto a velocità variabile
– raggiungimento approssimativo della potenza d'uscita max.
– aumento minimo della temperatura dell'olio nel serbatoio
– tempi più lunghi per portarsi a regime di pieno carico della macchina operatrice

Pressioni

Olio di lavoro/olio lubrificante/olio di comando

Pressione della pompa di riempimento alla temperatura d'esercizio		da 2,0 a 4,0 bar
Pressione dell'olio di lubrificazione sul manometro (punto di misurazione 16)	Campo operativo	> 0,3 bar
Pressione dell'olio di lubrificazione sull trasmettitore di pressione (punto di misurazione 17; 17.1; 17.2)	Campo operativo Motore principale **ON** Motore principale **OFF** Pompa d'olio ausiliare**OFF** Pompa d'olio ausiliare **ON**	> 1,2 bar > 1,3 bar < 1,0 bar > 1,8 bar < 1,5 bar
Pressione dell'olio di lubrificazione sull pressostato differenziale (punto di misurazione 41.1)	Campo operativo Allarme in caso di commutazione del filtro doppio Disinserire a	< 0,3 bar > 0,6 bar > 0,8 bar
Pressione dell'olio nel collegamento di controllo (punto di misurazione 55.1)	Campo operativo	conformemente ai valori di cui sopra nei punti di misurazione 16; 17; 17.1; 17.2

➔ Posizione dei punti di misurazione (ved. Schema circuito olio e punti di misurazione 91600384410) di questo manuale operativo.

Livello dell'olio

Controllo del livello dell'olio

Far avanzare il Turbogiunto a velocità variabile con tubo di presa in posizione 0% e sfiatarlo in base alla disposizione dello scambiatore di calore. Accertarsi che il livello dell'olio in queste condizioni di esercizio si trovi a metà dell'area del livello di riempimento h1. In caso di necessità, rabboccare l'olio di servizio.

Interruttore di livello olio (punto di misurazione 37)	Campo operativo	Livello dell'olio tra MIN - MAX
	Disinserimento / Allarme Disinserimento / Allarme	15 mm sopra MAX 15 mm sotto MIN

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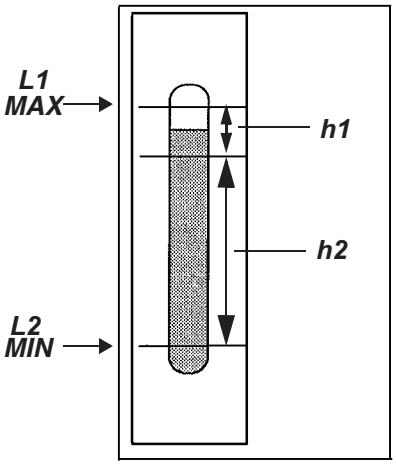

Figura 7-17: Controllo del livello dell'olio

h1 = area del livello di riempimento con posizione tubo di presa a 0%
h2 = area del livello di riempimento con posizione tubo di presa a 100%
L1 = segno MAX
L2 = segno MIN

L1/ L2 e h1 (area di riempimento) vedere l'indicazione del livello dell'olio in (ved. Schema di montaggio - Turbo-giunto a velocità variabile 91500311610)

Nelle condizioni d'esercizio con olio di servizio caldo e posizione del tubo di presa dello 0%, il livello dell'olio non può superare il segno max. L1, e/o con una posizione del tubo di presa del 100% non può scendere al di sotto del segno del livello dell'olio min. L2.

Nell'area della posizione del tubo di presa compresa tra 0% e 100%, il livello dell'olio si abbassa, poiché il rotore del giunto si riempie d'olio. Anche dopo la collocazione del Turbogiunto a velocità variabile con la posizione del tubo di presa dello 0%, nel rotore del giunto rimane una parte dell'olio di servizio.

Un controllo preciso del livello dell'olio è possibile solo con il Turbogiunto a velocità variabile in funzione e la posizione del tubo di presa dello 0%.

7.3.2 Regolare il numero di giri

Tramite il servomotore, il tubo di presa viene spostato tra la posizione 0% e 100%. La posizione del tubo di presa determina il numero di giri della macchina operatrice.

➔ ved. Capitolo 14 "Componenti esterni (descrizioni)" in questo manuale operativo per una descrizione dettagliata del servomotore.

7.3.3 Marcia indietro della pompa ausiliaria di lubrificazione

AVVERTENZA

Per sfiatare la pompa ausiliaria di lubrificazione nella valvola di non ritorno è presente un foro di **2 mm.** Perciò la pompa ausiliaria di lubrificazione nel funzionamento normale (pompa ausiliaria di lubrificazione disinserita) gira all'indietro con un numero minimo di giri di 50-100 1/min.

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7.3.4 Commutazione del filtro dell'olio doppio

Differenza di pressione nel filtro dell'olio doppio	Commutare e pulire il filtro a	> 0,6 bar

Il filtro dell'olio doppio pulisce l'olio di lubrificazione. Esso è composto da due vasi, dei quali, durante l'esercizio, sempre soltanto uno di essi viene attraversato dall'olio. Per il controllo della differenza di pressione del filtro viene montato un indicatore di differenza di pressione e/o un interruttore differenziale. L'indicatore e/o l'interruttore di pressione fanno scattare l'allarme, quando la differenza tra le pressioni dell'olio di lubrificazione prima e dopo il filtro risulta troppo elevata. In caso di allarme, il vaso del filtro che si trova in funzione non fa più passare olio a sufficienza e deve essere pulito (ved. Sezione 8.3 "Pulizia del doppio filtro dell'olio" a pagina 88).

AVVERTENZA

Con il trasporto, la collocazione e l'installazione del Turbogiunto a velocità variabile, nonché con la collocazione delle condutture dell'olio possono finire impurità nel Turbogiunto a velocità variabile.
Quindi, durante la messa in servizio controllare le condizioni del doppio filtro dell'olio e, in caso di necessità, pulirlo (anche più volte).

Allagare la tazza pulita del filtro

Prima che il doppio filtro dell'olio venga commutato sulla seconda tazza del filtro, quest'ultimo deve essere riempito.

AVVERTENZA

Se la tazza del filtro non viene allagata, commutando il filtro doppio dell'olio, la pressione dell'olio di lubrificazione si abbassa troppo e l'impianto viene disinserito attraverso gli strumenti di sorveglianza.

AVVERTENZA

Allagare la tazza pulita del filtro.
Manutenzione e pulizia.

➔ (ved. Sezione 14.10 "Doppio filtro" a pagina 118)

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7.4 Provvedimenti in caso di avvitamento e corsa inversa

Avvitamento

L'avvitamento è una rotazione rallentata del Turbogiunto a velocità variabile attraverso la macchina operatrice con l'impianto disinserito, ad esempio nei motori di ventilazione.

- Inserire la pompa d'olio ausiliare, per alimentare olio nei cuscinetti.

Corsa inversa dell'albero secondario

Se la macchina operatrice è in grado di eseguire una rotazione inversa, sarà necessario prevedere un dispositivo di monitoraggio del senso di rotazione. Nel caso in cui questo dispositivo di monitoraggio del senso di rotazione dovesse segnalare una rotazione inversa:

- inserire la pompa d'olio ausiliare senza ritardo di tempo.
- posizionare il tubo di presa al 100%.
- chiudere la valvola d'arresto della macchina operatrice.
- limitare assolutamente la corsa inversa una durata di 1–3 minuti.

AVVERTENZA

Controllare il Turbogiunto a velocità variabile in seguito ad una corsa inversa della macchina operatrice. Controllare se si sono surriscaldati i cuscinetti. Sottoporre i fusibili a vite ad una ispezione. Inserire la pompa d'olio ausiliare e controllare le pressioni dell'olio.

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7.5 Prelievo di campione dall'olio di servizio

AVVERTENZA

La capacità informative dell'analisi dell'olio di servizio dipendono da un corretto ed accurato prelievo di campione. È preferibile eseguire il prelievo del campione di olio durante il funzionamento o subito dopo lo spegnimento dell'impianto da un zona ben ricoperta di olio.

Con il Turbogiunto a velocità variabile, il campione di olio deve essere prelevato dal circuito dell'olio di lavoro. È possibile eseguire un prelievo di olio sicuro nella valvola di scarico olio dello scambiatore di calore.

ATTENZIONE

Pericolo di bruciature

Lo scambiatore di calore, le condutture dell'olio e l'olio di servizio possono surriscaldarsi. In casi estremi, la temperatura in questa zona dell'olio di lavoro raggiunge 100 °C.

Indossare guanti protettivi

AVVERTIMENTO

Pericolo di lesioni

L'olio molto caldo che rimane sotto pressione nello scambiatore di calore e nella conduttura di sfiato può causare lesioni gravi.

Indossare guanti, occhiali e indumenti di protezione.

ATTENZIONE

Danni ambientali

L'olio usato, che finisce nelle fognature o in terreni aperti, può causare gravi danni all'ambiente.

Smaltire l'olio usato in modo appropriato in base alle norme nazionali.

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Mezzi ausiliari

- Recipiente di raccolta per quantità di mandata
- Recipiente di prelievo campione

Eseguire il prelievo di campione dell'olio

1. Rimuovere il tappo di chiusura nella valvola di scarico.

AVVERTENZA

Se la valvola di scarico viene aperta eccessivamente, può verificarsi una caduta di pressione con conseguente disinserimento dell'impianto da parte degli strumenti di sorveglianza.

2. Mettere il recipiente di raccolta per la quantità di mandata in posizione e aprire leggermente la valvola di scarico.
3. Dopo aver prelevato la quantità dal tubo di mandata, riempire il recipiente per il prelievo di campione dell'olio con olio di servizio.
4. Chiudere la valvola di scarico e inserire il tappo di chiusura.

7.6 Provvedimenti nel modo di riserva (stand-by)

- Fare funzionare la pompa d'olio ausiliare nel modo continuo.

7.7 Misure nei tempi di riposo

In caso di tempi di riposo della durata di più di un giorno:

- Attivare tutti i giorno la pompa ausiliaria dell'olio di lubrificazione per almeno cinque minuti.
- Proteggere il Turbogiunto a velocità variabile dall'entrata di acqua e dall'umidità. Conservare i pezzi lisci in modo corrispondente.
- Avviare il Turbogiunto a velocità variabile ogni 1–2 mesi per breve tempo. Non arrivare fino al riscaldamento della macchina (pericolo di formazione di acqua di condensazione).

La macchina viene bagnata internamente con olio e, in questo modo, viene protetta dalla corrosione.
Tempi di arresto degli scambiatori di calore: vedere il manuale operativo dello scambiatore di calore in (ved. Capitolo 14.17 "Scambiatore termico/ Valvola di regolazione della temperatura") questo manuale operativo.

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7.8 Smontaggio del Turbogiunto a velocità variabile

AVVERTIMENTO

Pericolo di lesioni

Correnti e tensioni elettriche pericolose e le altre energie del Turbogiunto a velocità variabile possono causare lesioni personali o anche il decesso.

Prima dello smontaggio, staccare qualsiasi alimentazione esterna del Turbogiunto a velocità variabile. Far defluire i liquidi.

Il Turbogiunto a velocità variabile potrà essere smontato solo da personale specializzato nel rispetto delle norme di sicurezza locali.

ATTENZIONE

Danni ambientali

L'olio usato, che finisce nelle fognature o in terreni aperti, può causare gravi danni all'ambiente.

Smaltire l'olio usato in modo appropriato in base alle norme nazionali.

Prima di eseguire uno smontaggio per un riciclaggio o per la rottamazione, rimuovere completamente gli oli e gli altri materiali dannosi per l'acqua.

Il Turbogiunto a velocità variabile è costituito da acciaio, metalli leggeri e materie plastiche. Questi materiali possono essere riciclati.

Smaltire i materiali non più utilizzabili nelle apposite sedi.

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8 Manutenzione

8.1 Indicazioni di sicurezza

Le seguenti indicazioni di sicurezza riguardano l'intero capitolo e devono essere osservate insieme alle varie indicazioni singole.

Pericolo dovuto ad un distacco incontrollato delle parti

AVVERTI-MENTO

Senza il giunto di collegamento incorporato e le protezioni, le molle di regolazione o le viti del giunto di collegamento potrebbero essere catapultate all'esterno e causare gravi lesioni personali.

Far eseguire le operazioni di montaggio, manutenzione e riparazione solo a personale addestrato.
La macchina deve essere avviata solo con boccola del giunto di collegamento montata e/o secondo le indicazioni del costruttore con il giunto di collegamento completo e le protezioni.

Pericolo dovuto a un impianto non arrestato in modo sicuro

AVVERTI-MENTO

Un impianto non arrestato in modo sicuro potrebbe avviarsi e causare gravi lesioni alle persone che lavorano in prossimità della macchina.

Lavorare alla macchina solo con impianto spento (non in tensione).

Pericolo dovuto a zone non visibili

AVVERTI-MENTO

Durante la manipolazione della macchina una persona può ferirsi gravemente a causa dell'avvio della macchina stessa.

Fra il giunto e l'albero applicare adeguate protezioni, distaccabili solo con un utensile.
Lavorare alla macchina solo con impianto spento (non in tensione).
Mettere in funzione solo previo controllo visivo dell'assenza di persone nella zona di pericolo!

Pericolo di bruciature

AVVERTI-MENTO

Una persona può ustionarsi con la macchina o con i mezzi d'esercizio a temperature elevate.

Toccare la macchina solo dopo che si è raffreddata.

Pericolo di taglio

ATTEN-

Le persone possono tagliarsi se vengono a contatto con lamiere di protezione non sbavate e con spigoli appuntiti.

Far eseguire le operazioni di montaggio, manutenzione e riparazione solo a personale addestrato.

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Pericoli dovuti a sostanze pericolose

ATTEN-

I fluidi di lavoro fuoriusciti possono causare lesioni o ustioni alle persone nonché danni all'ambiente.

Indossare i dispositivi specifici di protezione personale e in particolare occhiali di protezione durante il rabbocco di olio, il controllo delle perdite e il cambio del filtro. Procedere conformemente al foglio dati di sicurezza del fluido impiegato.

Pericolo di lesioni

ATTEN-

Guarnizioni inadeguate o superfici metalliche non a tenuta, flange, collegamenti non sufficientemente serrati o valvole di limitazione della pressione regolate in modo errato possono far fuoriuscire l'olio e causare lesioni alle persone.

Far eseguire le operazioni di montaggio, manutenzione e riparazione solo a personale addestrato.

Avvertenza

Lasciare liberi gli accessi alle zone di manutenzione/lavoro.
Rispettare le dimensioni e la configurazione nel (ved. "Schema di montaggio - Turbogiunto a velocità variabile 91500311610").

Avvertenza

Permettere soltanto a personale qualificato di lavorare sul Turbogiunto a velocità variabile.

➔ (ved. Sezione 2.7 "Scelta e qualifica del personale, doveri fondamentali" a pagina 11).

8.2 Manutenzione e riparazione

- Manutenzione, disposizioni per il mantenimento delle condizioni standard.
- Riparazione, disposizioni per il ripristino delle condizioni standard.

8.2.1 Misure ed intervalli di manutenzione

Con impianto in funzione

In caso di un aumento della differenza di pressione nel filtro dell'olio doppio	• Commutare ed eseguire la manutenzione del filtro dell'olio doppio (ved. Sezione 8.3 "Pulizia del doppio filtro dell'olio").
In caso di oscillazioni dei numeri di giri della macchina operatrice	• Controllare il potenziale di separazione dell'olio di servizio (ved. Sezione 8.4 "Criteri di prova e indicazioni per la valutazione degli oli di servizio").
In caso di livello dell'olio elevato	• Analizzare il contenuto d'acqua nell'olio di servizio[1] (ved. Sezione 8.4 "Criteri di prova e indicazioni per la valutazione degli oli di servizio").
Tutti i giorni, se il controllo degli strumenti non è integrato nel sistema di controllo	• Controllare il livello dell'olio (ved. Sezione "Livello dell'olio").
Settimanalmente	• Verificare e protocollare tutte le indicazioni di temperatura e pressione (ved. Sezione 7.3.1 "Controllo della macchina").
Mensilmente	• Controllare ed eventualmente pulire il filtro di sfiato. • Misurare, protocollare e confrontare lo stato di riposo alle stesse condizioni di esercizio.[2] • Analizzare l'olio di servizio[1+3] per stabilire se è idoneo all'utilizzo.

1. Sezione 8.4 "Criteri di prova e indicazioni per la valutazione degli oli di servizio".
2. Determinare i punti di misurazione mediante il numero di giri in uscita.
3. Questo intervallo di manutenzione può essere temporaneamente esteso in base alla conoscenza di questo impianto. Tale periodo non dovrà essere superiore a 6 mesi.

In caso di impianto spento

In caso di contestazione della qualità dell'olio (idoneità all'utilizzo)	• Stabilire ed eliminare le cause. Separare e/o sostituire l'olio[1] (ved. Sezione 8.4 "Criteri di prova e indicazioni per la valutazione degli oli di servizio").
I valori dello stato di riposo sono aumentati	• Controllare e correggere l'allineamento del Turbogiunto a velocità variabile. Controllare il fissaggio alle fondazioni (ved. Sezione 5.6 "Fissare la macchina sulle fondazioni").

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In caso di impianto spento

Dopo le prime 100 ore di esercizio	• Pulire il filtro dell'olio doppio. (ved. Sezione 8.3 "Pulizia del doppio filtro dell'olio"). • Pulire il filtro di sfiato. • Verificare la mobilità del servomotore del tubo di presa, controllare la limitazione della corsa del tubo di presa, ingrassare gli snodi e i pezzi lisci. • Controllare il raffreddamento dell'olio, in caso di necessità pulirlo secondo le indicazioni della casa produttrice. • Controllare la tenuta delle tubature e dei giunti di raccordo ingrassati o lubrificati con olio. • Analizzare la presenza di impurità e il contenuto d'acqua dell'olio di servizio. Stabilire ed eliminare le cause. Separare e/o sostituire l'olio (ved. Sezione 8.4 "Criteri di prova e indicazioni per la valutazione degli oli di servizio").
Dopo le prime 500 ore di esercizio	• Pulire il filtro dell'olio doppio[2] (ved. Sezione 8.3 "Pulizia del doppio filtro dell'olio"). • Pulire il filtro di sfiato. • Controllare la tenuta delle tubature e dei giunti di raccordo[2].
Dopo le prime 1000 ore di esercizio	• Interventi di controllo e manutenzione uguali a quelli eseguiti dopo 100 ore di esercizio.
Dopo 1000 ore di esercizio, oppure in caso di inquinamento del filtro dell'olio doppio	• Controllare il filtro dell'olio doppio[3], se necessario, pulirlo (ved. Sezione 8.3 "Pulizia del doppio filtro dell'olio").
Dopo 6000 ore di esercizio o almeno una volta all'anno	• Analizzare l'invecchiamento dell'olio di servizio (ved. Sezione 8.4 "Criteri di prova e indicazioni per la valutazione degli oli di servizio"). • Controllare ed eseguire la manutenzione dei giunti di raccordo. • Controllare l'orientamento del Turbogiunto a velocità variabile e correggerlo in caso di necessità. Controllare il fissaggio alle fondazioni (ved. Sezione 5.6 "Fissare la macchina sulle fondazioni"). • Controllare lo stato generale del Turbogiunto a velocità variabile. • Aprire il coperchio del foro d'ispezione e controllare le condizioni dei tappi fusibili di sicurezza (riempimento stagno fusibile) (ved. Sezione 8.5 "Sostituzione dei tappi fusibili di sicurezza").

1. Attenersi alle indicazioni del fornitore di olio
2. Attenersi alle norme della casa produttrice e all'identificazione dell'equilibrio
3. Attenersi alle norme della casa produttrice.

AVVERTENZA

Prima di far ripartire un Turbogiunto a velocità variabile spento a causa di una disattivazione

– Controllare che i cuscinetti non siano surriscaldati
– Ispezionare i tappi fusibili di sicurezza
– Inserire la pompa d'olio ausiliare e controllare la pressione dell'olio

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8.2.2 Misure e intervalli di riparazione

Modifica del modo di funzionamento	• Determinare la causa. • Eseguire la riparazione del Turbogiunto a velocità variabile.
dopo una durata d'esercizio max. di 7 anni	• Eseguire una revisione generale.

AVVERTENZA

Per via del funzionamento permanente, gli impianti sono soggetti ad un'usura naturale e condizionata dall'ambiente. La revisione periodica dell'impianto riduce al minimo il rischio di sospensioni della produzione. Il nostro centro di servizio elabora una strategia specifica di riparazione su misura. La revisione regolare ed eseguita a regola d'arte dal nostro team di servizio, allunga la durata di utilizzo del prodotto Voith.

Affinché non si crei alcun tempo di attesa durante le revisioni, si consiglia di procurarsi per tempo i pezzi di ricambio a magazzino. A questo scopo siamo disponibili ad elaborare, su richiesta, un'offerta di pezzi di ricambio (servizio clienti - ved. Impressum).

Per facilitare un disbrigo rapido delle richieste, degli ordini di montatori e dei pezzi di ricambio per il turbogiunto, si prega di indicare sempre il numero di serie, il luogo esatto del turbogiunto e il nome della persona competente per l'impianto.

Gli interventi di montaggio sul turbogiunto possono essere eseguiti solo dai nostri montatori o da personale qualificato (ved. Sezione 2.4 "Indicazioni di sicurezza generali").

Per ulteriori informazioni, contattare il nostro Servizio clienti:

– vedi Impressum.

8.3 Pulizia del doppio filtro dell'olio

Mezzi ausiliari

- Recipiente per pulizia con benzina solvente pulita, escabon o olio diesel (ca. 5 l.)
- Recipiente per l'olio da scaricare (ca. 10 l.)
- Pennello angolato (non spazzola)
- Aria compressa

ATTENZIONE

Pericolo di bruciature

Il corpo del filtro, le condutture dell'olio e l'olio di servizio possono surriscaldarsi. In casi estremi, la temperatura in questa zona dell'olio di lavoro raggiunge 100 °C.

Indossare guanti protettivi

AVVERTIMENTO

Pericolo di lesioni

L'olio molto caldo che rimane sotto pressione nel filtro dell'olio doppio e nella conduttura di sfiato può causare lesioni gravi.

Indossare guanti, occhiali e indumenti di protezione.

ATTENZIONE

Danni ambientali

L'olio usato, che finisce nelle fognature o in terreni aperti, può causare gravi danni all'ambiente.

Smaltire l'olio usato in modo appropriato in base alle norme nazionali.

AVVERTENZA

Non commutare il filtro durante la procedura di pulizia.

AVVERTENZA

Allagare la tazza pulita del filtro
Manutenzione e pulizia.

➔ (ved. Sezione 14.10 "Doppio filtro" a pagina 118)

8.4 Criteri di prova e indicazioni per la valutazione degli oli di servizio

Informazioni generali

È necessario analizzare e valutare l'idoneità di utilizzo degli oli di servizio ad intervalli regolari.
La capacità informative dell'analisi dell'olio di servizio dipende da un corretto ed accurato prelievo di campione (ved. Sezione 7.5 "Prelievo di campione dall'olio di servizio" a pagina 80).

AVVERTENZA

Questo elenco contiene punti di vista e valori limite approssimativi per la valutazione dell'idoneità all'uso degli oli di servizio.
La decisione relativa all'idoneità all'uso dell'olio di servizio è a discrezione del costruttore o del fornitore dell'olio.

Queste indicazioni sono suggerimenti che dipendono da diverse condizioni di utilizzo, dalla composizione e dal tipo di olio di servizio.

Sostituire l'olio in caso di

Controllo visivo e sensoriale

- forte colorazione nera
- deposito di residui
- odore pungente, simile alla combustione

È necessario determinare la causa.

Viscosità (DIN 51562)

- Variazione di viscosità > ± 10%

È necessario determinare la causa.

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Numero di neutralizzazione NZ(s) (DIN 51558)

- Aumento del numero di neutralizzazione NZ(s) rispetto all'olio fresco (nuovo olio di servizio)
  - Olio per turbina -TD-0,5 -1 mg KOH / g
  - Olio idraulico -HLP-1 - 1,5 mg KOH / g
  - Olio lubrificante -CLP-1,5 -2 mg KOH / g
  - Contenuto d'acqua (DIN 51582)
- Contenuto d'acqua > 0,05 peso % (500 ppm).

  Se la quota di acqua contenuta nell'olio viene eliminata tramite uno dei metodi seguenti, non sarà necessario sostituire l'olio.
  - Centrifuga
  - Filtraggio tramite separatori superficiali a coalescenza
  - Trattamento sotto vuoto
  - Deposito (lasciando il tutto immobile per 1-2 giorni) e scarico o pompaggio[1]
  - Riscaldamento

La sostituzione dell'olio è necessaria in caso di

- Contenuto di acqua > 0,2% del peso

È necessario determinare la causa.

Capacità di demulgazione LVA (DIN 51381)

- Presenza di oscillazioni nella pressione e nel numero di giri, quando si è certi che il livello dell'olio non è troppo basso e il valore LAV > 5 minuti è allo 0,2% a 50 °C.

1. In caso di oli sintetici con una densità > 1,0 l'acqua di condensa galleggia.

8.5 Sostituzione dei tappi fusibili di sicurezza

1. Rimuovere il coperchio di ispezione (2) dal corpo.

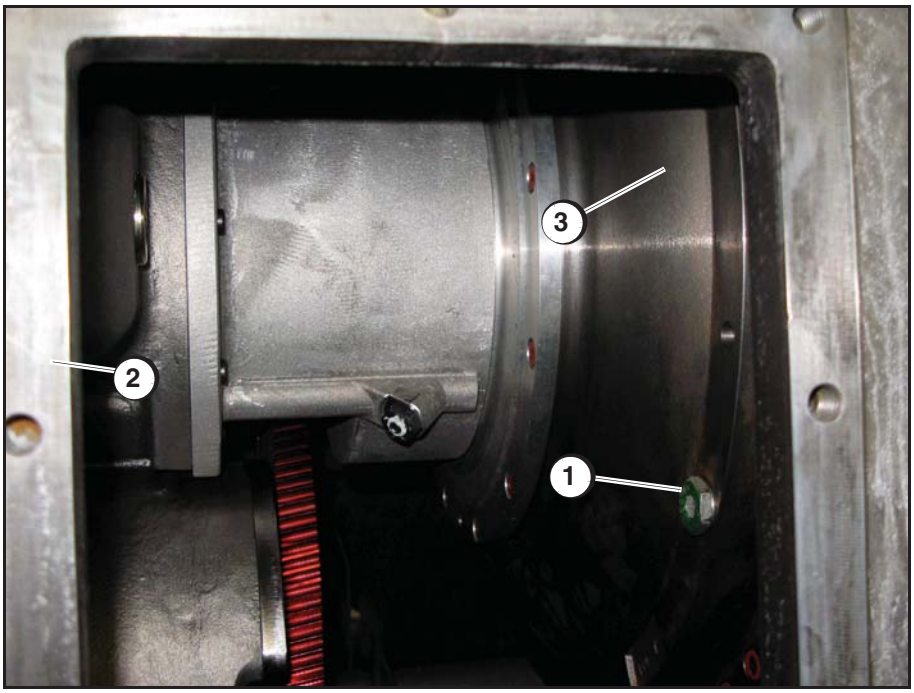

Figura 8-18: Coperchio del foro d'ispezione

1) Tappo fusibile di sicurezza
2) Superficie di appoggio per coperchio di ispezione
3) Ruota primaria

2. Ruotare l'albero d'avviamento, fino a quando i tappi fusibili di sicurezza (1) (e/o le forature per i tappi fusibili di sicurezza) sono visibili sulla ruota primaria (3).
3. Controllare il riempimento di stagno fusibile dei tappi, in caso di necessità inserire tappi nuovi e serrarli. Osservare le indicazioni della coppia motrice nel disegno sezionale.

8.6 Rimandi

Tematiche	Documentazione importante
Olio di servizio	Sezione 6.2 "Riempimento dell'olio di servizio" Sezione 6.5 "Liquidi di servizio" Sezione 8.4 "Criteri di prova e indicazioni per la valutazione degli oli di servizio" Indicazioni dei fornitori d'olio
Viti a fusibile	Sezione 8.5 "Sostituzione dei tappi fusibili di sicurezza"
Doppio filtro olio	Sezione 7.3.4 "Commutazione del filtro dell'olio doppio" e Sezione 8.3 "Pulizia del doppio filtro dell'olio"
Scambiatore di calore	Giunti di collegamento BA in Capitolo 14.17 "Scambiatore termico/ Valvola di regolazione della temperatura" di questo manuale operativo
Allineamento	Sezione 5.5 "Orientamento della macchina"
Temperature e pressioni	Sezione 7.3.1 "Controllo della macchina"
Giunti di collegamento	Norma della casa produttrice Capitolo 14.18 "Giunto di collegamento"
Motore per la pompa d'olio ausiliare	Prescrizione del costruttore Capitolo 14.12.2 "Motore"

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9 Eliminazione delle anomalie

9.1 Avviamento

Anomalia	Causa(e)	Provvedimento(i)
La macchina operatrice non si avvia, dopo che il gruppo motore ha raggiunto il numero di giri nominale	• Il tubo di presa si trova in posizione 0%	• Adottare i seguenti provvedimenti: • Regolare il tubo di presa in direzione 100%
	• Mancata erogazione della pompa di riempimento	• Adottare i seguenti provvedimenti:
	– Temperatura olio nel serbatoio d'olio < 0 °C (32 °F) e viscosità olio > 400 mm^2/s	– Riscaldare l'olio a > 0 °C (32 °F). Chiudere l'afflusso dell'acqua di raffreddamento nel refrigerante dell'olio.
	– Livello olio troppo basso	– Controllare il livello dell'olio e riempire fino al valore compreso tra il segno min. e max. Controllare le viti a fusibile.
	– Olio schiumoso (temp. olio troppo bassa; presenza di acqua nell'olio; pessima capacità di demulgazione; qualità olio inadeguata)	– Controllare l'eventuale presenza di impurità nell'olio. Centrifugare o separare l'olio. Eventualmente sostituire l'olio – Controllare la pressione pompa di riempimento nei punti di misura della pressione
	– Tubazione ostruita	– Controllare le tubazioni, rimuovere eventuali ostruzioni.
	– Senso di rotazione errato del motore principale	– Controllare il motore principale e collegarlo correttamente.
	• Momento di avviamento troppo elevato (elevato assorbimento di corrente del motore), macchina operatrice bloccata (vedere anche la temperatura olio di lavoro)	• Verificare il corretto funzionamento della macchina operatrice. Controllare le viti a fusibile.
Turbogiunto a velocità variabile si riscalda eccessivamente durante l'avviamento.	• La macchina operatrice si blocca, ulteriori rallentamenti	• Verificare il corretto funzionamento della macchina operatrice, rimuovere gli ostacoli. Controllare le viti a fusibile.
	• Quantità di circolazione dell'olio troppo scarsa	• Controllare la circolazione dell'olio.

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9.2 Numero di giri di condotta

Anomalia	Causa(e)	Provvedimento(i)
Il numero di giri di condotta varia con tubo di presa in posizione costante	• Olio schiumoso (temperatura olio troppo bassa dopo lo scambiatore di calore, quindi capacità di demulgazione troppo scarsa)	• Riscaldare l'olio nel serbatoio d'olio a > 45 °C (113 °F).
	• La pompa di riempimento aspira aria	• Controllare il livello dell'olio ed eventualmente la pompa di riempimento.
	• Variazioni di pressione o di quantità nel sistema	• Controllare il sistema, se necessario, sfiatare e stabilizzare il sistema.
Il numero di giri di condotta varia in caso di regolazione automatica (la leva di regolazione si muove periodicamente)	• Il regolatore non è nella giusta dipendenza di tempi in riferimento al tragitto di regolazione	• Adeguare il regolatore alla linea (evtl. spegnere il regolatore).
Non è possibile regolare il numero di giri di condotta	• Blocco del tubo di presa o del servomotore del tubo di presa	• Controllare lo scorrimento del tubo di presa, eliminare i bloccaggi.
	• Servomotore del tubo di presa difettoso	• Controllare il servomotore del tubo di presa.
Il max. numero di giri di condotta non viene raggiunto	• Il tubo di presa non si trova in posizione 100%	• Controllare la massima corsa del tubo di presa.
	• Le viti a fusibile si sono fuse	• Determinare la causa ed eliminare il problema. Inserire nuove viti a fusibile.
	• Potenza assorbita della macchina operatrice troppo elevata	• Confrontare i dati di rendimento con i dati presentati Verificare il corretto funzionamento della macchina operatrice.

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9.3 Pressioni

Anomalia	Causa(e)	Provvedimento(i)
Pressione olio di lubrificazione per consenso all'avvio troppo bassa	•	•
	• Erogazione di olio lubrificante troppo elevata nei gruppi esterni	• Inserire i diaframmi
	• Diaframma non installato nella linea di sfiato della pompa di riempimento	• Installare il diaframma (ved. Sezione 7.3.3 "Marcia indietro della pompa ausiliaria di lubrificazione")
	• Perdita nei circuiti d'olio	• Controllare il livello dell'olio. Controllare la tenuta della tubazione (adottare eventuali misure per prevenire danni ambientali).
	• Presenza di sporco nel doppio filtro dell'olio	• Sostituire il doppio filtro dell'olio e pulire il portafiltro. Verificare il controllo della pressione differenziale.
Pressione differenziale nel doppio filtro dell'olio troppo elevata	• Presenza di sporco nel doppio filtro dell'olio	• Sostituire il doppio filtro dell'olio e pulire il portafiltro.
Pressione olio di lubrificazione troppo bassa durante il funzionamento normale	• Presenza di sporco nel doppio filtro dell'olio	• Sostituire il doppio filtro dell'olio e pulire il portafiltro.
	• Erogazione di olio lubrificante troppo elevata nei gruppi esterni	• Inserire i diaframmi
	•	•
Pressione pompa di riempimento troppo bassa	• Temperatura olio nel serbatoio d'olio < 45 °C (113 °F), quindi capacità di demulgazione troppo scarsa	• Riscaldare l'olio nel serbatoio d'olio a > 45 °C (113 °F).
	• Livello olio troppo basso	• Controllare il livello dell'olio e riempire fino al valore compreso tra il segno min. e max. Controllare le viti a fusibile.
	• Olio schiumoso (temp. olio troppo bassa; presenza di acqua nell'olio; pessima capacità di demulgazione; qualità olio inadeguata)	• Controllare l'eventuale presenza di impurità nell'olio. Centrifugare o separare l'olio. Eventualmente sostituire l'olio

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9.4 Temperature

Anomalia	Causa(e)	Provvedimento(i)
Temperature dell'olio del Turbogiunto a velocità variabile troppo elevate durante il funzionamento	• Portata acqua di raffreddamento troppo scarsa • Acqua di raffreddamento troppo calda • Scambiatore di calore sporco	• Aumentare la portata dell'acqua di raffreddamento • Controllare la valvola termostatica • Controllare e pulire il sistema di raffreddamento
	• Funzionamento del Turbogiunto a velocità variabile fuori dalle curve caratteristiche consentite	• Far funzionare il Turbogiunto a velocità variabile all'interno della curva caratteristica (controllare le viti a fusibile).
	• Le viti a fusibile si sono fuse	• Determinare la causa ed eliminare il problema. Inserire nuove viti a fusibile.
Temperature cuscinetti troppo elevate	• Danni ai cuscinetti	• Controllare la silenziosità di funzionamento. • Controllare ed evtl. sostituire i cuscinetti.
	• Temperatura olio lubrificante troppo elevata	• Controllare il refrigerante dell'olio, sostituire il doppio filtro dell'olio e pulire il portafiltro.
	• Pressione olio lubrificante troppo bassa	• Controllare il sistema dell'olio lubrificante • Sostituire il doppio filtro dell'olio e pulire il portafiltro. Verificare il controllo della pressione differenziale. • Controllare il livello dell'olio. • Aumentare la pressione dell'olio lubrificante.

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9.5 Silenziosità di funzionamento

Anomalia	Causa(e)	Provvedimento(i)
Funzionamento instabile, oscillazioni e rumorosità	• Allineamento difettoso	• Controllare l'allineamento ed evtl. correggerlo
	• Rivestimento interno della macchina nella fondazione (guida di fondazione) insufficiente; nessun appoggio uniforme, macchina deformata	• Controllare l'allineamento e il rivestimento interno ed evtl. eseguire modifiche
	• Viti di fondazione allentate, fondazione danneggiata, telaio/guida di fondazione non colati	• Controllare la fondazione, evtl. serrare le viti di fondazione
	• Usura o mancanza di lubrificante nei giunti di collegamento; boccola nei giunti con denti a spirale non regolabile in direzione assiale (dentatura ridotta)	• Controllare i giunti di collegamento, l'afflusso di olio lubrificante e l'ugello
	• Squilibrio nelle parti rotanti • Danni ai cuscinetti	• Eseguire le misurazioni delle vibrazioni e l'analisi della frequenza nell'intero impianto. Registrare i valori misurati e i dati di funzionamento. • Controllare ed eventualmente sostituire i cuscinetti dei gruppi.

9.6 Rimandi

Tematiche	Documentazione importante
Scambiatore di calore	Scambiatore di calore BA nel Capitolo 14 "Componenti esterni (descrizioni)" di questo manuale operativo
Allineamento	Sezione 5.5 "Orientamento della macchina"
Dati di funzionamento (pressioni, temperatura, quantità d'olio)	Sezione 1.2 "Dati d'esercizio" Sezione 7.3.1 "Controllo della macchina"
Diaframmi per la lubrificazione di gruppi esterni	Sezione "Forare le cieche per l'alimentazione olio di lubrificazione degli aggregati esterni" a pagina 55
Fondazioni	Sezione 5.6 "Fissare la macchina sulle fondazioni"
Motore della pompa d'olio ausiliare	Manuale di istruzione del motore della pompa d'olio ausiliare in Capitolo 14 "Componenti esterni (descrizioni)" delle presenti istruzioni per l'uso
Olio	Sezione 8.4 "Criteri di prova e indicazioni per la valutazione degli oli di servizio"
Livello dell'olio	Sezione 6.2 "Riempimento dell'olio di servizio"
Viti a fusibile	Sezione 8.5 "Sostituzione dei tappi fusibili di sicurezza"
Filtro olio lubrificante	Sezione 8.3 "Pulizia del doppio filtro dell'olio"
Servomotore tubo di presa	Servomotore tubo di presa BA nel Capitolo 14 "Componenti esterni (descrizioni)" di questo manuale operativo
Giunti di collegamento	Giunti di collegamento BA nel Capitolo 14 "Componenti esterni (descrizioni)" di questo manuale operativo

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10 Istruzioni per una revisione generale

AVVERTENZA

Per via del funzionamento permanente, gli impianti sono soggetti ad un'usura naturale e condizionata dall'ambiente. La revisione periodica dell'impianto riduce al minimo il rischio di sospensioni della produzione. Il nostro centro di servizio elabora una strategia specifica di riparazione su misura. La revisione regolare ed eseguita a regola d'arte dal nostro team di servizio, allunga la durata di utilizzo del prodotto Voith.

Affinché non si crei alcun tempo di attesa durante le revisioni, si consiglia di procurarsi per tempo i pezzi di ricambio a magazzino. A questo scopo siamo disponibili ad elaborare, su richiesta, un'offerta di pezzi di ricambio (servizio clienti - ved. Impressum).

Per facilitare un disbrigo rapido delle richieste, degli ordini di montatori e dei pezzi di ricambio per il turbogiunto, si prega di indicare sempre il numero di serie, il luogo esatto del turbogiunto e il nome della persona competente per l'impianto.

Gli interventi di montaggio sul turbogiunto possono essere eseguiti solo dai nostri montatori o da personale qualificato (ved. Sezione 2.7 "Scelta e qualifica del personale, doveri fondamentali" a pagina 11).

Per ulteriori informazioni, contattare il nostro Servizio clienti:

➔ vedi Impressum.

10.1 Indicazioni di sicurezza

Le seguenti indicazioni di sicurezza riguardano l'intero capitolo e devono essere osservate insieme alle varie indicazioni singole.

Pericolo di schiacciamento o taglio da parte dell'elemento superiore o inferiore

AVVERTI-MENTO

Durante gli interventi di manutenzione e riparazione, in particolare quando si ruotano gli alberi manualmente per il montaggio e il posizionamento della macchina, una persona potrà schiacciarsi o tagliarsi le dita.

Far eseguire le operazioni di montaggio, manutenzione e riparazione solo a personale addestrato.

Pericolo di lesioni

AVVERTI-MENTO

Il sollevamento scorretto del Turbogiunto a velocità variabile può causare danni alle persone e alle cose.

Appendere il Turbogiunto a velocità variabile solo nei punti contrassegnati.

Utilizzare solo mezzi di sollevamento adatti, che corrispondano alle disposizioni di sicurezza!

Lesioni personali o danni materiali

ATTEN-

Uno smontaggio e un montaggio inadeguati del Turbogiunto a velocità variabile possono causare lesioni personali o danni materiali.

Far eseguire le operazioni di smontaggio e montaggio del Turbogiunto a velocità variabile solo a personale qualificato.

Rispettare la scelta e la qualifica del personale indicate nel manuale operativo.

Danni ambientali

ATTEN-

L'olio usato, che finisce nelle fognature o in terreni aperti, può causare gravi danni all'ambiente.

Smaltire l'olio usato in modo appropriato in base alle norme nazionali.
Controllare regolarmente eventuali fuoriuscite di olio o mancanza di tenuta.

Pericolo di scivolate per fuoriuscita olio

AVVERTI-MENTO

Eventuali fuoriuscite d'olio sulla macchina o in prossimità di essa potrebbero far scivolare o far cadere una persona con conseguenti gravi lesioni.

Controllare regolarmente eventuali fuoriuscite di olio o mancanza di tenuta.
Eseguire una pulizia regolare della macchina!

Pericolo dovuto a zone non visibili

AVVERTI-MENTO

Durante la manipolazione della macchina una persona può ferirsi gravemente a causa dell'avvio della macchina stessa.

Fra il giunto e l'albero applicare adeguate protezioni, distaccabili solo con un utensile.
Lavorare alla macchina solo con impianto spento (non in tensione).
Mettere in funzione solo previo controllo visivo dell'assenza di persone nella zona di pericolo!

Pericolo di lesioni

AVVERTI-MENTO

Una persona può ustionarsi con la macchina o con i mezzi d'esercizio a temperature elevate.

Toccare la macchina solo dopo che si è raffreddata.

Pericolo dovuto a montaggio errato

AVVERTI-MENTO

La mancata osservanza del senso di rotazione stabilito potrebbe distruggere la macchina e causare gravi lesioni alle persone.
Il montaggio errato della macchina o delle sue singole parti potrebbe distruggere la macchina.

Far eseguire le operazioni di montaggio, manutenzione e riparazione solo a personale addestrato.

Avvertenza

Porre sempre il Turbogiunto a velocità variabile e le parti smontate del Turbogiunto a velocità variabile su un supporto adeguato (per es. materassino in gomma).

Avvertenza

Lasciare liberi gli accessi alle zone di manutenzione/lavoro.
Rispettare le dimensioni e la configurazione nel (ved. "Schema di montaggio - Turbogiunto a velocità variabile 91500311610").

10.2 Utensili e accessori

Utensili

- Set di utensili standard
- Chiave coppia motrice (per la gamma delle coppie di serraggio, vedere i disegni)
- Strumento di misurazione
- Utensili metrici
- Mezzi di sollevamento
- Strumento di pretensionamento idraulico (HYDROCAM)
- Punto di attacco per estremità albero (dentatura frontale Hirth)

In caso di necessità è possibile acquistare dalla Voith gli attrezzi speciali.
Oltre a questi, per lo smontaggio/montaggio del Turbogiunto a velocità variabile non sono necessari altri strumenti speciali.

Mezzi ausiliari

- Supporti in gomma o materiale simile
- Mezzi di fissaggio / sicurezza
- Mastice

Mezzi di fissaggio/sicurezza

Impiegare mezzi di fissaggio/sicurezza conformemente alle indicazioni riportate sui disegni per "Materia plastica fluida".

Le parti che devono essere unite le une con le altre devono essere

- pulite
- e prive di olio e grasso.

Detergente: tricloroetano o altri liquidi che sciolgono il grasso.

Mastice

Il mastice da usare con il Turbogiunto a velocità variabile dovrà adempiere ai seguenti criteri:

- resistente all'olio fino a 130 °C
- privo di silicone

Voith Turbo consiglia HYLOMAR - L[1] come mastice. Applicare tale mastice in strato sottile e lasciar asciugare per circa 10 minuti. Rispettare altre istruzioni di lavorazione del fabbricante.

Detergente: tricloroetano o altri liquidi che sciolgono il grasso.

1. HYLOMAR-L; Durante la lavorazione rispettare le istruzioni presenti sul tubetto
Produttore: MARSTON-DOMSEL D-53909 Zülpich

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10.3 Preparativi

Prima dello smontaggio di gruppi dal Turbogiunto a velocità variabile eseguire i seguenti lavori di preparazione:

1. Disinserire il gruppo motore e lasciar raffreddare il Turbogiunto a velocità variabile.
2. Togliere tensione elettrica dal motore dell'impianto.
3. Procurarsi l'autorizzazione allo smontaggio dall'ufficio di competenza.
4. Distaccare i collegamenti elettrici se necessario.
5. A seconda della situazione, smontare ogni costruzione che possa creare ostacoli, quale canali per i cavi, tubazioni o coperture insonorizzanti.
6. Approntare un sollevatore (gru) per il Turbogiunto a velocità variabile e per i suoi componenti.
   Per le indicazioni di peso necessarie: (ved. Sezione 1.1 "Dati della macchina" a pagina 1).

AVVERTENZA

Rispettare ogni altra regola di sicurezza in vigore localmente.

10.4 Panoramica degli elementi costruttivi

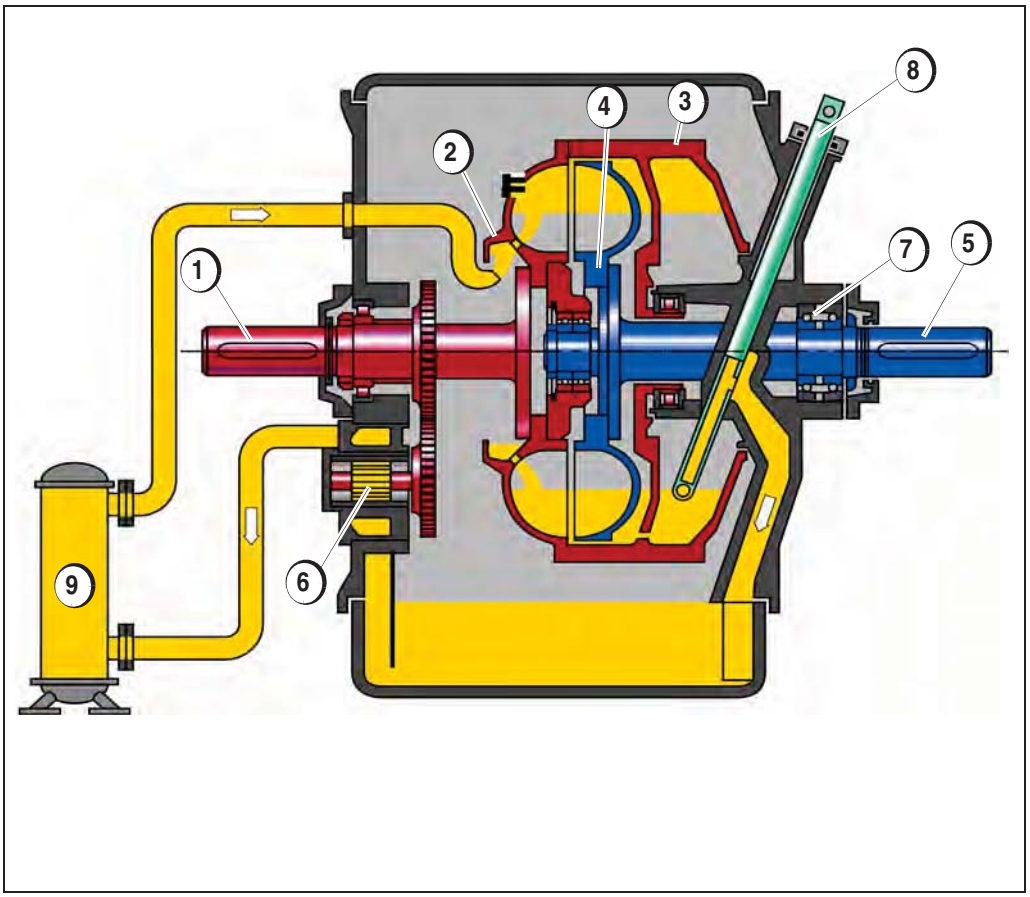

Figura 10-19: Elementi costruttivi del Turbogiunto a velocità variabile

1 Albero motore (albero primario)
2 Ruota primaria
3 Guscio
4 Ruota secondaria
5 Albero in uscita (albero secondario)
6 Pompa di riempimento
7 Scatola del tubo di presa
8 Tubo di presa
9 Scambiatore di calore

11 Disegni, schemi, diagrammi

Disegni in sezione	**Foglio 1 - 3/20400308810**
Montaggio/servomotore	**20400523710**
Montaggio anello V	**3623-013395**
Schema circuito olio e punti di misurazione	**91600384410**
Denominazioni e strumenti	**Foglio 1-8/91600384510**
Diagramma di flusso	**Foglio 1-26/91600388810**
Morsettiera	**Foglio 1-15/91600389310**
Schema di montaggio - Turbogiunto a velocità variabile	**91500311610**

Scambiatore di calore (ved. Capitolo 14 "Componenti esterni (descrizioni)")

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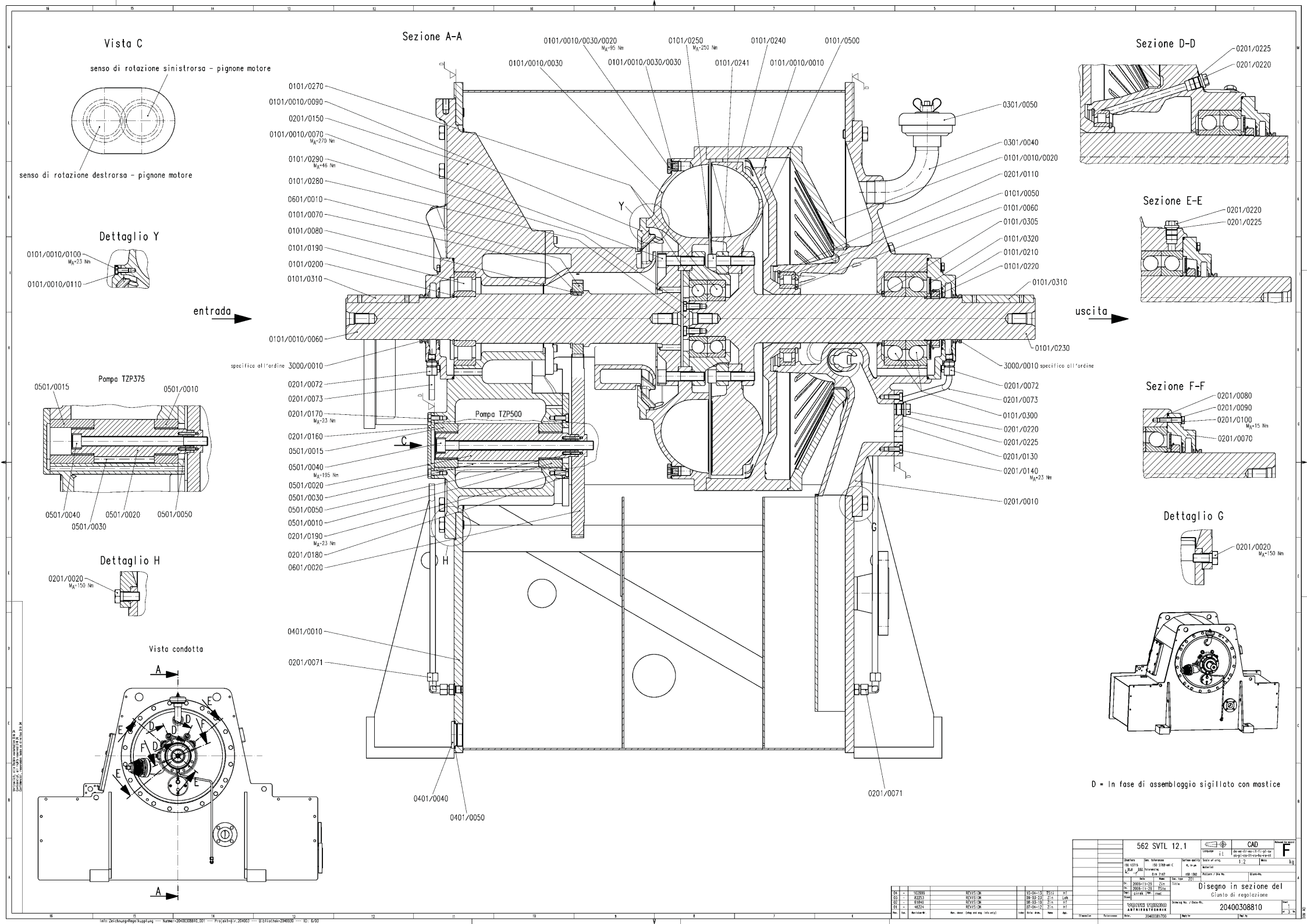
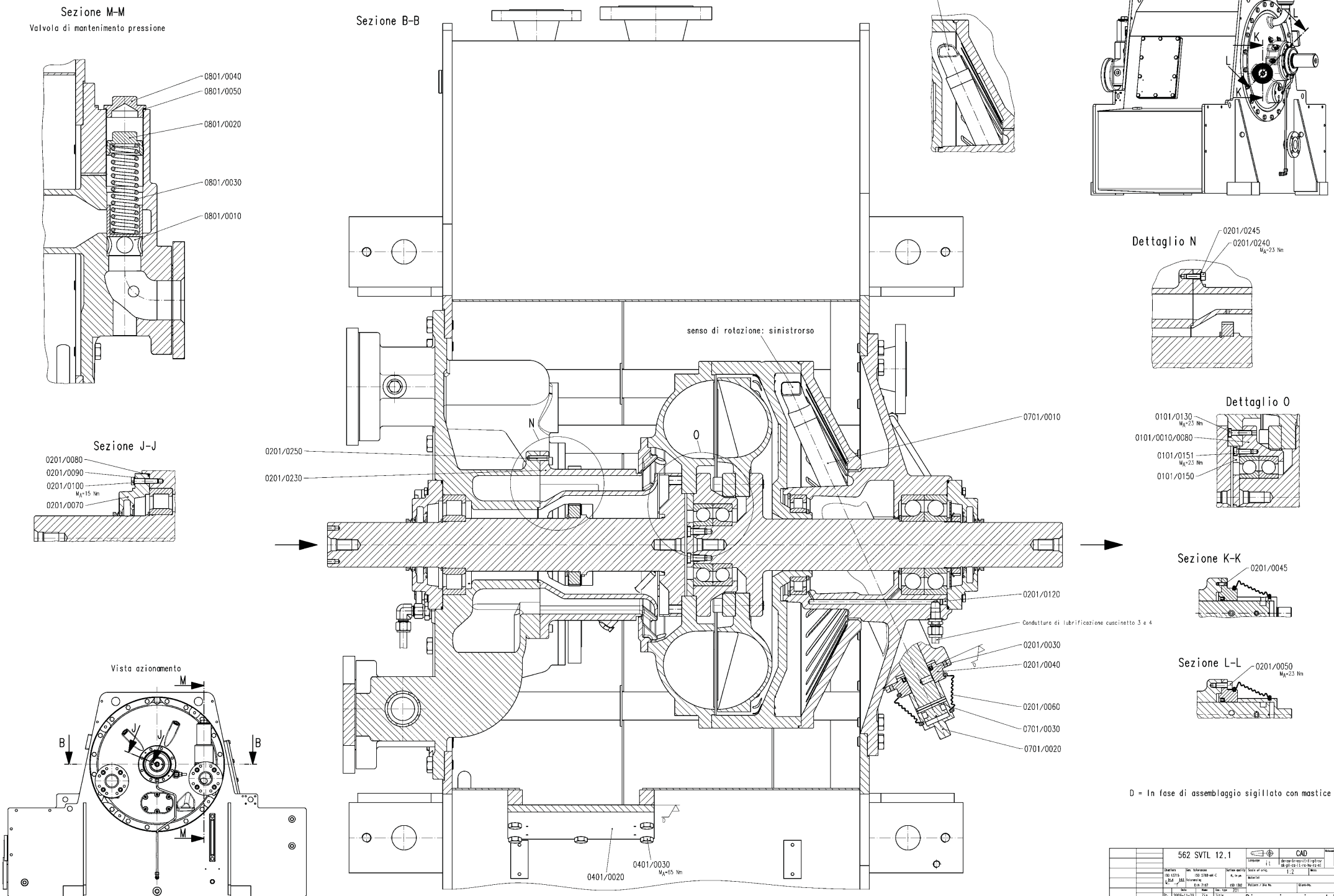
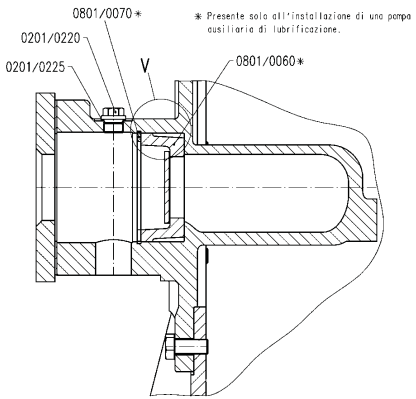
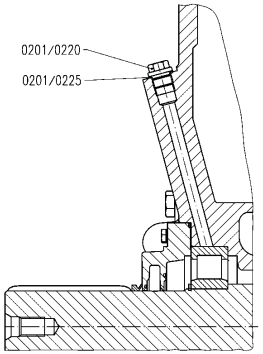

Vista C
senso di rotazione sinistrorsa - pignone motore
senso di rotazione destrorsa - pignone motore
Dettaglio Y
0101/0010/0100 MA=23 Nm
0101/0010/0110
Pompa TZP375
0501/0015
0501/0010
0501/0040
0501/0030
0501/0020
0501/0050
Dettaglio H
0201/0020 MA=150 Nm
Vista condotta
A
Sezione A-A
0101/0010/0030/0020 MA=95 Nm
0101/0250 MA=250 Nm
0101/0240
0101/0500
0101/0010/0030
0101/0010/0030/0030
0101/0241
0101/0010/0010
0101/0270
0101/0010/0090
0201/0150
0101/0010/0070 MA=270 Nm
0101/0290 MA=46 Nm
0101/0280
0601/0010
0101/0070
0101/0080
0101/0190
0101/0200
0101/0310
entrada
0101/0010/0060
specifico all'ordine 3000/0010
0201/0072
0201/0073
0201/0170 MA=23 Nm
0201/0160
0501/0015
0501/0040 MA=195 Nm
0501/0020
0501/0030
0501/0050
0501/0010
0201/0190 MA=23 Nm
0201/0180
0601/0020
0401/0010
0201/0071
0401/0040
0401/0050
Pompa TZP500
C
H
Y
G
0301/0050
0301/0040
0101/0010/0020
0201/0110
0101/0050
0101/0060
0101/0305
0101/0320
0101/0210
0101/0220
0101/0310
uscita
0101/0230
3000/0010 specifico all'ordine
0201/0072
0201/0073
0101/0300
0201/0220
0201/0225
0201/0130
0201/0140 MA=23 Nm
0201/0010
0201/0071
Sezione D-D
0201/0225
0201/0220
Sezione E-E
0201/0220
0201/0225
Sezione F-F
0201/0080
0201/0090
0201/0100 MA=15 Nm
0201/0070
Dettaglio G
0201/0020 MA=150 Nm
D = In fase di assemblaggio sigillato con mastice
562 SVTL 12.1
CAD
F
Disegno in sezione del
Giunto di regolazione
20400308810
20400308810_001 — Projekt-Nr. 204003 — Bibliothek-Z94035 — ID: 6/03


Sezione M-M
Valvola di mantenimento pressione
0801/0040
0801/0050
0801/0020
0801/0030
0801/0010
Sezione B-B
senso di rotazione: destrorso
senso di rotazione: sinistrorso
Dettaglio N
0201/0245
0201/0240
M_A=23 Nm
Dettaglio O
0101/0130
M_A=23 Nm
0101/0010/0080
0101/0151
M_A=23 Nm
0101/0150
Sezione J-J
0201/0080
0201/0090
0201/0100
M_A=15 Nm
0201/0070
N
O
0201/0250
0201/0230
0701/0010
0201/0120
Conduttura di lubrificazione cuscinetto 3 e 4
0201/0030
0201/0040
0201/0060
0701/0030
0701/0020
0401/0020
0401/0030
M_A=55 Nm
Sezione K-K
0201/0045
Sezione L-L
0201/0050
M_A=23 Nm
Vista azionamento
M
B
D = In fase di assemblaggio sigillato con mastice
562 SVTL 12.1
CAD
F
1:2
kg
Disegno in sezione del
Giunto di regolazione
20400308810
04 - 102899 REVISION 10-04-13 TS11 HF
03 - 82253 REVISION 09-03-23 Zin LeM
02 - 61845 REVISION 08-03-10 Zin HF
01 - 46324 REVISION 07-04-12 Zin HF
Info:Zeichnung-Kegelkupplung --- Nummer:20400308810_002 --- Projekt-Ktr.204003 --- Bibliothek=2040030 --- ID: 6/03

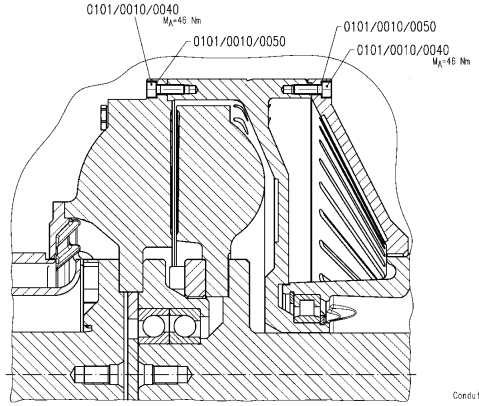
Sezione S-S



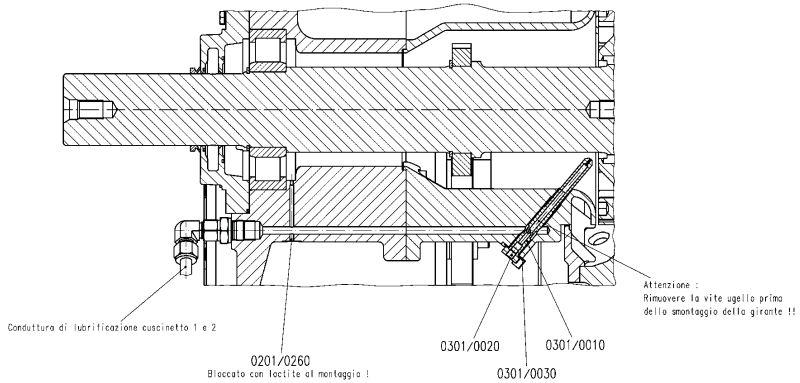
Sezione T-T



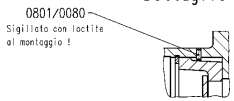
Sezione U-U



Sezione W-W

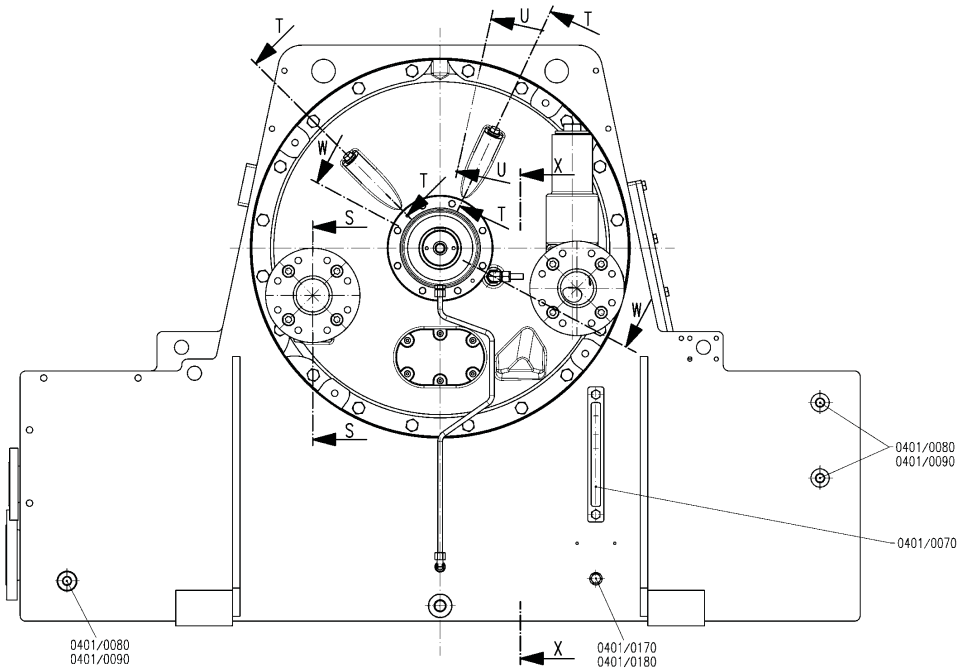


Dettaglio V

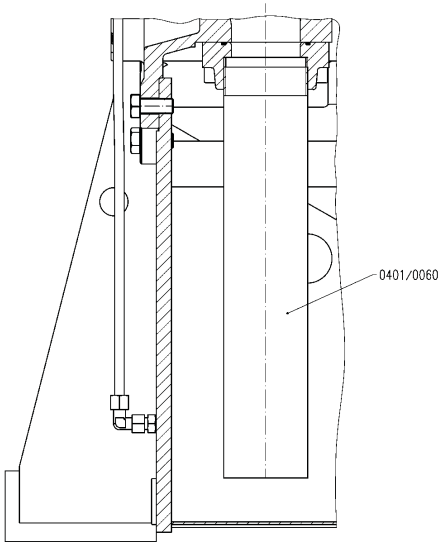


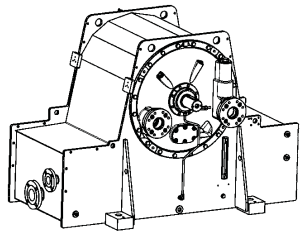
Vista azionamento

M 1:4



Sezione X-X





D = In fase di assemblaggio sigillato con mastice

04	-	102899	REVISION	10-04-13	TS11	HF	
03	-	82253	REVISION	09-03-23	Zin	LeM	
02	-	81846	REVISION	08-03-10	Zin	HF	
01	-	46374	REVISION	07-04-12	Zin	HF	
Rev.	Ind.	Revision-Nr.	Rev. descr. (dwg and eng. info only)	Index	Date dwg.	Name	App.

562 SVTL 12.1

CAD

Released for work: F

Language: de-en-fr-es-it-nl-pl-ru-pt-sk-gr-tr-cz-hu-ro-no-dk

Chamfers: DIN 2768-mK-C

Gen. tolerances: ISO 13715 E, F, G, H, J, K, M, N, P, R, S, T, U, V, W, X, Y, Z, A, B, C, D, E, F, G, H, J, K, L, M, N, P, R, S, T, U, V, W, X, Y, Z

Surface quality: DIN 7167 / ISO 1302

Scale of orig.: 1:2 (1:4)

Mass: kg

Material: Pattern / Dim No.: Block-No.

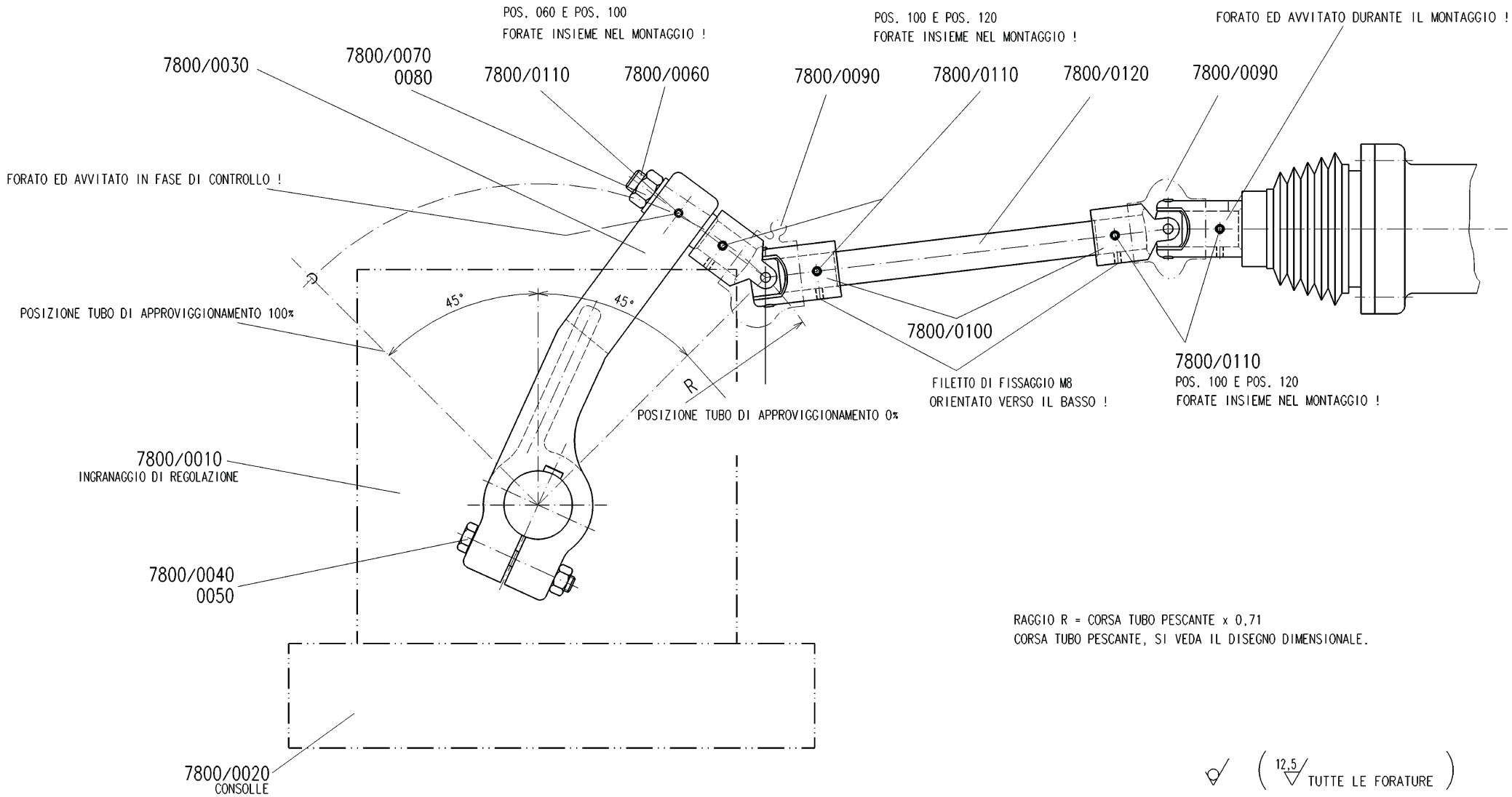
	Date	Name	Doc. type: 201
Dr.	2005-11-23	Zin	Title
Ch.	2005-11-23	TS1a	Disegno in sezione del
Gen.	direct.	Dim.	Giunto di regolazione
Stand			

VOITH TURBO ANTRIEBSTECHNIK

Drawing No. / Docu-No.: 20400308810

Sheet 3 of 3

Dimension: Tolerances: Mat.: 20400308700 Repl.by: Repl.by



RAGGIO R = CORSA TUBO PESCANTE x 0,71
CORSA TUBO PESCANTE, SI VEDA IL DISEGNO DIMENSIONALE.

12,5 TUTTE LE FORATURE

NOTA:
MONTARE I GIUNTI DELL ALBERO
(POS: 7800/100) COME RAPPRESENTATO!

Rev.	Iss.	Revision-Nr.	Rev. descr. (shop and eng. info only)	Index	Date: draw.	Name	App.
03	-	88988	REVISION		09-07-29	Trp	Wss
02	-	82842	REVISION		09-04-01	Zin	Leh
01	-	71646	REVISION		08-09-05	cra_SSte	Hf

SVNL / SVTL

CAD

Released for microf.

Language: it

de-en-fr-es-il-cs-pl-ru
fi-hu-lt-et-nl-ro-pt-sk

Chamfers: ISO 13715 L1.6 L4.2

Gen. tolerances: ISO 2768-mK-E

Tolerancing: DIN 7167

Surface quality: R_a in µm, ISO 1302

Scale of orig.

Mass

Material

Pattern / Die No.

Blank-No.

Doc. type: Z01

	Date	Name
Dr.	2008-02-29	Zin
Ch.	2008-02-29	Hf
Dept.	airek	App. Met
Stand.		

Title: MONTAGIO
INGRANAGGIO DI REGOLAZIONE

VOITH TURBO ANTRIEBSTECHNIK

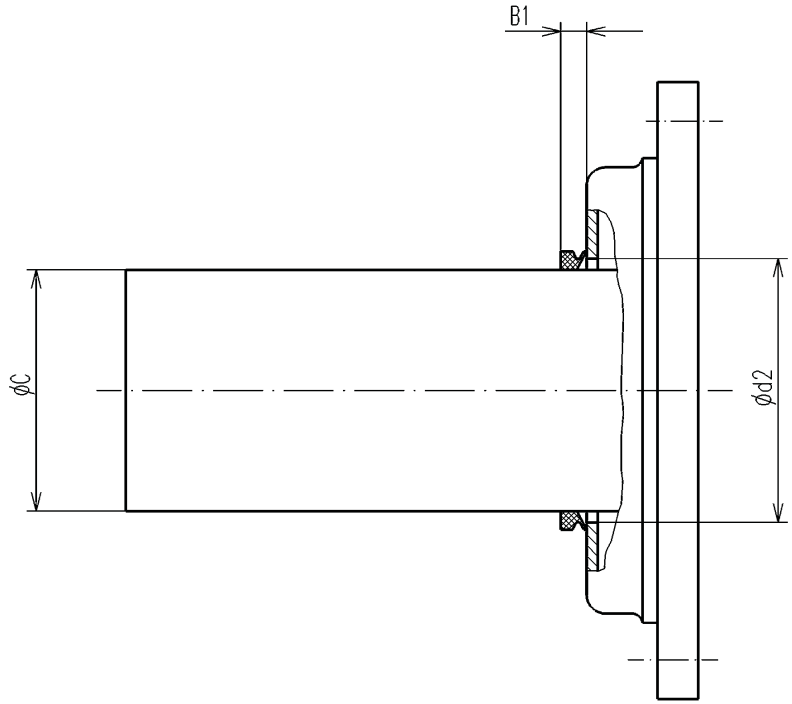
Drawing No. / Docu-No.: 20400523710

Sheet 1 of 1 Sh.

Dimension | Tolerances | Refer. 4 189357 0 | Reply for | Repl. by

DIN A2

TIPO ANELLO A V	DIAMETRO DELL' ALBERO C	LARGHEZZA DEL PROFILO (DOPO INSTALLAZIONE) B1	ød2 max.
VA-0060	58-63	7,0±1,0	C+3
VA-0065	63-68	7,0±1,0	C+3
VA-0070	68-73	9,0±1,2	C+4
VA-0075	73-78	9,0±1,2	C+4
VA-0080	78-83	9,0±1,2	C+4
VA-0085	83-88	9,0±1,2	C+4
VA-0090	88-93	9,0±1,2	C+4
VA-0095	93-98	9,0±1,2	C+4
VA-0100	98-105	9,0±1,2	C+4
VA-0110	105-115	10,5±1,5	C+4
VA-0120	115-125	10,5±1,5	C+4
VA-0130	125-135	10,5±1,5	C+4
VA-0140	135-145	10,5±1,5	C+4
VA-0150	145-155	10,5±1,5	C+4
VA-0160	155-165	12,0±1,8	C+5
VA-0170	165-175	12,0±1,8	C+5
VA-0180	175-185	12,0±1,8	C+5
VA-0190	185-195	12,0±1,8	C+5
VA-0199	195-210	12,0±1,8	C+5
VA-0200	190-210	20,0±4,0	C+10
VA-0220	210-235	20,0±4,0	C+10
VA-0250	235-265	20,0±4,0	C+10



Rev.	Iss.	Revision-Nr.	Rev. descr. (shop and eng. info only)	Index	Date: draw.	Name	App.
02	-	89032	Text in pt-ru-fr-it-cs zugef.		09-07-29	Trp	Wss
1		A2365/00	Text in spanisch zugefuegt		00-11-14	Ha	Os

Dimension | Tolerances

SVNL / SVTL

Chamfers: ISO 13715 (±1,6 / ±0,2)
Gen. tolerances: ISO 2768-mK-E
Tolerancing: DIN 7167
Surface quality: R_a in µm, ISO 1302

Language: it
CAD: de-en-es-pt-ru-fr-it-cs
Released for microf.: F
Scale of orig.: -
Mass
Material
Pattern / Die No.
Blank-No.

	Date	Name
Dr.	2000-11-13	Ha
Cn.	2000-11-14	Met
Dept.	airek	App. Met
Stand.		

Doc. type: Z01

Title: MONTAGGIO
ANELLO A V

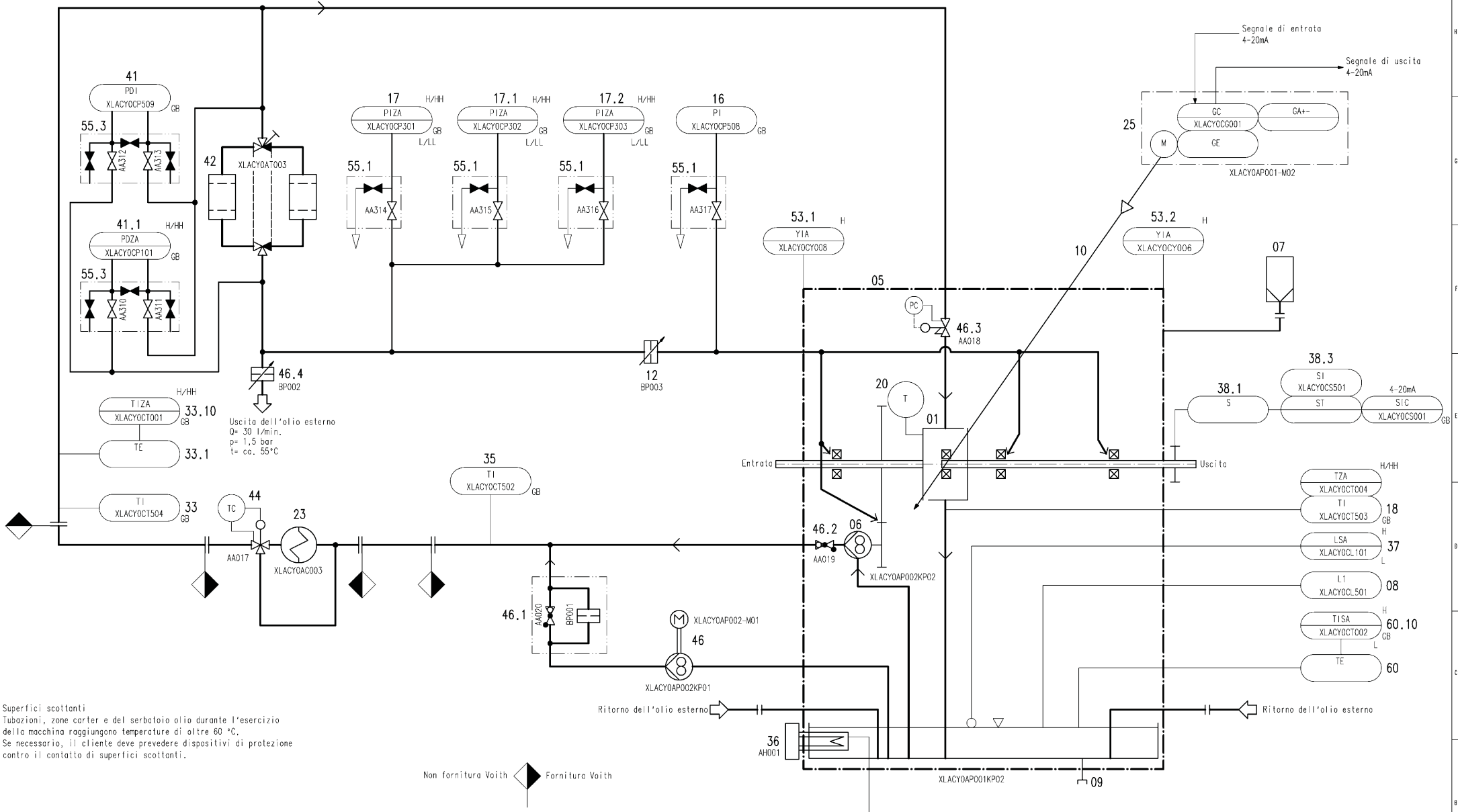
VOITH TURBO ANTRIEBSTECHNIK

Drawing No. / Docu-No.: 3623-013395

Sheet 1 of 1 Sh.

Refer. | Reply for | Repl. by

DIN A3



Superfici scottanti
Tubazioni, zone carter e del serbatoio olio durante l'esercizio della macchina raggiungono temperature di oltre 60 °C.
Se necessario, il cliente deve prevedere dispositivi di protezione contro il contatto di superfici scottanti.

Sito di emissione o d'uso/manovra

- Luogo di misurazione o luogo di regolazione
- GB Quadro strumentazione locale
- Sala di comando centrale
- GB Quadro strumentazione locale
  Elaborazione segnali nella sala di comando centrale

Per i componenti principali e gli strumenti vedi lista N° 91600384510

Flowserve Aprilia S1

01	–	96684	REVISION	09-12-11	trp	Teh	
Rev.	Iss.	Revision-Nr.	Rev. descr. (shop and eng. info only)	Date: draw.	Name	App.	

562 SVTL 12.1
Ordine N°.: 38002141

CAD
Language: it
de en it

Released for minof.
F

Chamfers: ISO 13715 H14 h14
Gen. tolerances: ISO 2768-mK-E
Tolerancing: DIN 7167
Surface quality: R_a in µm ISO 1302
Scale of orig.: –
Mass
Material
Pattern / Die No.
Blank-No.

	Date	Name
Dr.	2009-10-21	TSti
Ch.	2009-10-26	Leh
Dept.	cirek	App. met
Stand.		

Doc. type: ZQ1

Title: Giunto di regolazione
Schema del circuito dell'olio e dei punti di misurazione

VOITH TURBO ANTRIEBSTECHNIK

Drawing No. / Docu-No.: 91600384410

Sheet 1 of 1 Sh.

Dimension | Tolerances | Refer. 91600210410 | Apply for | Repl. by

DIN A1

Componenti principali ed elenco strumentazione

Revisione	Pos n. Voith	Pos n. Cliente 1)	Componente o strumentazione Tipo: Fornitore:	Range di misurazione --- Range modificato	Collegamento processo --- Collegamento elettrico	Protezione contro l'ingresso	Misura / Punto di misura, ubicazione	Valore impostato	Valore nominale di funzi-onamento	Osservazioni
	01		Parti rotanti							
	05		Carcassa giunto							
	06	XLACY0AP002 KP02	Pompa di riempimento							
	07		Filtro di sfiato Tipo: TLF I 2-32 G 25 Make: Eppensteiner							
	08	XLACY0CL501	Spia visiva in vetro livello olio Tipo: FSA 254.2.0/12 Fornitore: Flutec							
	09		Tappo di scarico olio		G 1 ¼					
	10		Tubo scoop							
	12	XLACY0BP003	Flangia tarata per olio di lubrificazione				Olio di lubrificazione dopo filtro olio di lubrificazione			
	16	XLACY0CP508	Manometro Tipo: 100-T5500-S-L-04-L-0/1 bar Fornitore: Ashcroft	0 - 1 bar	½ NPT	IP 65	Pressione olio di lubrificazione dopo diaframma olio di lubrificazione		> 0.3 bar	Diametro quadrante: 100 mm Materiale corpo in acciaio inox ASTM 304 riempito con glicerina

Componenti principali ed elenco strumentazione

Revisione	Pos n. Voith	Pos n. Cliente 1)	Componente o strumentazione Tipo: Fornitore:	Range di misurazione --- Range modificato	Collegamento processo --- Collegamento elettrico	Protezione contro l'ingresso	Misura / Punto di misura, ubicazione	Valore impostato	Valore nominale di funzi-onamento	Osservazioni
	17	XLACY0CP301	Trasmettitore di pressione Tipo: 3051 TG Fornitore: Rosemount	0 - 10 bar --- 0 - 4 bar = 4 - 20 mA	½" NPT --- ½" NPT	IP 65	Pressione olio di lubrificazione dopo filtro olio di lubrificazione	Consenso al motore principale: ↑ 1.3 bar Blocco: ↓ 1.0 bar Pompa aus. di lubrificazione OFF: ↑ 1.8 bar Pompa aus. di lubrificazione ON / Allarme: ↓ 1.5 bar	> 1.2 bar	Materiale corpo: Alluminio con verniciatura in poliuretano Elemento di misura in SS 316 Tensione alimentazione: 10.5 - 55 V CC
	17.1	XLACY0CP302	Trasmettitore di pressione Tipo: 3051 TG Fornitore: Rosemount	0 - 10 bar --- 0 - 4 bar = 4 - 20 mA	½" NPT --- ½" NPT	IP 65	Pressione olio di lubrificazione dopo filtro olio di lubrificazione	Consenso al motore principale: ↑ 1.3 bar Blocco: ↓ 1.0 bar Pompa aus. di lubrificazione OFF: ↑ 1.8 bar Pompa aus. di lubrificazione ON / Allarme: ↓ 1.5 bar	> 1.2 bar	Materiale corpo: Alluminio con verniciatura in poliuretano Elemento di misura in SS 316 Tensione alimentazione: 10.5 - 55 V CC

Componenti principali ed elenco strumentazione

Revisione	Pos n. Voith	Pos n. Cliente 1)	Componente o strumentazione Tipo: Fornitore:	Range di misurazione --- Range modificato	Collegamento processo --- Collegamento elettrico	Protezione contro l'ingresso	Misura / Punto di misura, ubicazione	Valore impostato	Valore nominale di funzi-onamento	Osservazioni
	17.2	XLACY0CP303	Trasmettitore di pressione Tipo: 3051 TG Fornitore: Rosemount	0 - 10 bar --- 0 - 4 bar = 4 - 20 mA	½" NPT --- ½" NPT	IP 65	Pressione olio di lubrificazione dopo filtro olio di lubrificazione	Consenso al motore principale: ↑ 1.3 bar Blocco: ↓ 1.0 bar Pompa aus. di lubrificazione OFF: ↑ 1.8 bar Pompa aus. di lubrificazione ON / Allarme: ↓ 1.5 bar	> 1,2 bar	Materiale corpo: Alluminio con verniciatura in poliuretano Elemento di misura in SS 316 Tensione alimentazione: 10,5 - 55 V CC
	18	XLACY0CT503 XLACY0CT004	Teletermometro a quadrante con contatti Tipo: 608523-22-10 Fornitore: Juchheim	0 - 160°C	G½" --- M20x1.5	IP 66	Temperatura olio di lavoro all'uscita del tubo scoop	Allarme: ↑ 100°C Blocco: ↑ 110°C	< 100 °C	Diametro quadrante: 100 mm Dati nominali contatti: 250 V CA / 5 A 2 x contatti SPDT Materiale corpo: acciaio inox
	20		Tappo fusibile					Punto di fusione: ↑ 160 °C		
	23	XLACY0AC003	Scambiatore di calore							Vedere offerta

Componenti principali ed elenco strumentazione

Revisione	Pos n. Voith	Pos n. Cliente 1)	Componente o strumentazione Tipo: Fornitore:	Range di misurazione --- Range modificato	Collegamento processo --- Collegamento elettrico	Protezione contro l'ingresso	Misura / Punto di misura, ubicazione	Valore impostato	Valore nominale di funzi-onamento	Osservazioni
	25	XLACY0AP001-M02 XLACY0CG001	Azionatore opzionale: Servomotore con elettronica integrata Tipo: PME 120 AI Fornitore: ABB		--- 2x M20x1.5 1x M25x1.5	IP 66	Posizione tubo scoop			Segnale in ingresso : 4 – 20 mA Segnale in uscita : 4 – 20 mA, 2 finecorsa integrati per posizione tubo captatore 0 e 100 % 2 x contatto normalmente aperto, Dati nominali contatti: max. 60 V / 150 mA Alimentazione: 90 V ... 360 V; 47,5 ... 63 Hz; 1 Ph. Temperatura ambiente: -25 - 55 °C
	33	XLACY0CT504	Teletermometro a quadrante senza contattos Tipo: S 5500 Fornitore: Ashcroft	0 - 120°C	½" NPT	IP 65	Temperatura olio di lavoro dopo lo scambiatore di calore		< 55 °C	Diametro quadrante: 100 mm Materiale corpo: acciaio inox
	33.1		Termometro a resistenza Tipo: 2x PT100; sistema a 3 fili DIN IEC 751 Classe B Documento n. 42035240 Fornitore: Voith/Juchheim	0 - +180°C	½ NPT --- M20x1.5	IP 65	Temperatura olio di lavoro dopo lo scambiatore di calore	Allarme: ↑ 60 °C Blocco: ↑ 65°C	< 55°C	Materiale corpo: Alluminio, trattato
	33.10	XLACY0CT001	Trasmettitore di temperatura Tipo: TF12 Make: ABB	-200 - 850 °C		IP 65				Montato nella morsettiera, ingresso 0 - 180 °C uscita Profibus PA dal min. al max. corrisponde da -200 a 850 °C
	35	XLACY0CT502	Teletermometro a quadrante senza contattos Tipo: S 5500 Fornitore: Ashcroft	0 - 120°C	½" NPT	IP 65	Temperatura olio di lavoro prima del scambiatore di calore		< 95 °C	Diametro quadrante: 100 mm Materiale corpo: acciaio inox

Componenti principali ed elenco strumentazione

Revisione	Pos n. Voith	Pos n. Cliente 1)	Componente o strumentazione Tipo: Fornitore:	Range di misurazione --- Range modificato	Collegamento processo --- Collegamento elettrico	Protezione contro l'ingresso	Misura / Punto di misura, ubicazione	Valore impostato	Valore nominale di funzi-onamento	Osservazioni
	36	XLACY0AH001 XLACY0CT106	Scaldiglia con regolatore e limitatore Tipo: NE-F-4-1,3-400D-75 Fornitore: Roni		3" ANSI B16,5 150 lbs. --- 2x ½" NPT	IP 65	Temperatura dell'olio nel carter del giunto	Scaldiglia ON: ↓ 5 °C Scaldiglia OFF: ↑10 °C Limitatore di temperatura: ↑ 130 °C	> 10 °C < 95 °C	Dati nominali contatti: 230 V CA / 16 A 2x contatti SPDT Alimentazione: 400 V / 50 Potenza nominale: 4 kW Materiale corpo: acciaio inox, trattato
	37	XLACY0CL101	Livellostato olio Tipo: XT20 Fornitore: Magnetrol		1" NPT --- ¾" NPT	IP 65	Livello serbatoio olio	Allarme: ↑15 mm sopra il livello massimo dell'olio Allarme: ↓15 mm sotto il livello minimo dell'olio 15 mm sopra il livello massimo dell'olio		Dati nominali contatti: 240 V CA / 15 A 2x contatti SPDT Materiale corpo: alluminio, trattato
	38.1		Sensore di velocità Tipo: A5S31B Fornitore: Braun		--- M14x1.5	IP 67	Velocità in uscita			
	38.3	XLACY0CS501 XLACY0CS001	Trasduttore di misura velocità con indicatore di velocità e rivelatore di rotazione invertita Tipo: D124.1 S2 U2M Fornitore: Braun	0 - 3000 Hz			Velocità in uscita			Collegato alla morsettiera IP 65 Temperatura: -20 °C / +65 °C Alimentazione: 85 – 265 V CA/CC Segnale in ingresso : 0 - 3000 Hz Segnale in uscita : 4 – 20 mA Display: 0 - 3000 rpm

Componenti principali ed elenco strumentazione

Revisione	Pos n. Voith	Pos n. Cliente 1)	Componente o strumentazione Tipo: Fornitore:	Range di misurazione --- Range modificato	Collegamento processo --- Collegamento elettrico	Protezione contro l'ingresso	Misura / Punto di misura, ubicazione	Valore impostato	Valore nominale di funzi-onamento	Osservazioni
	41	XLACY0CP509	Indicatore di pressione differenziale Tipo: 100-F 5509-S-L-25-L Fornitore: Ashcroft	0 – 1.6 bar	¼" NPT		Caduta di pres-sione al filtro dop-pio		< 0.6 bar	
	41.1	XLACY0CP101	Pressostato differenziale Tipo: DPD2T M80 SS Fornitore: Barksdale	0.14 - 5.5 bar	1/8" NPT --- M20x1.5	IP 65	Pressione differenziale al filtro doppio	Allarme: ↑ 0.6 bar commutare filtro doppio Blocco: ↑ 0.8 bar	< 0.3 bar	Dati nominali contatti: 250 V CA / 10 A 2 x contatti SPDT Materiale corpo: alluminio, copertura epossidica
	42	XLACY0AT003	Filtro doppio Tipo: DSF176 Fornitore: Internormen		Flangia per tubo 1 ½"		Tubazione olio			Elementi filtro: acciaio inox Grado di filtrazione: 25 µm
	44	XLACY0AA017	Valvola di regolazione della temperatura Fornitore: MVA o AMOT							
	46	XLACY0AP002 KP01 XLACY0AP002-M01	Pompa ausiliaria di lubrificazione Tipo: R25/20 Fornitore: Rickmeier con Motore		G1"					Portata: 56 l/min Pressione: 3.5 bar Motore: 1.5 kW, 400 V / 50 Hz Protezione motore: IP55 con scaldiglia anticondensa 230 V CA / 50 Hz
	46.1	XLACY0AA020 XLACY0BP001	Valvola di non ritorno con foro diaframma Tipo: RHZ 28 PLR-ED Fornitore: Ermeto				Pompa ausiliaria di lubrificazione Tubo di scarico			

Componenti principali ed elenco strumentazione

Revisione	Pos n. Voith	Pos n. Cliente 1)	Componente o strumentazione Tipo: Fornitore:	Range di misurazione --- Range modificato	Collegamento processo --- Collegamento elettrico	Protezione contro l'ingresso	Misura / Punto di misura, ubicazione	Valore impostato	Valore nominale di funzi-onamento	Osservazioni
	46.2	XLACY0AA019	Valvola di non ritorno Tipo: RK 44 Fornitore: Gestra				Pompa di riempimento Tubo di scarico			
	46.3	XLACY0AA018	Valvola di regolazione della pressione				Pressione dell'olio lubrificante			Materiale corpo: GGG-40
	46.4	XLACY0BP002	Diaframma olio esterno				Quantità olio esterno			
	53.1	XLACY0CY008	Trasduttore di accelerazione Tipo: 330400-01-05 kit di montaggio tipo: 37439-01 Corpo Tipo: 43217-01 Fornitore: Bently Nevada				Vibrazioni della carcassa - carcassa del giunto idr. lato di entrata	Allarme: Vms ↑ 8 mm/s Blocco:: Vms ↑ 11 mm/s	Vms < 5.6 mm/s	
	53.2	XLACY0CY006	Trasduttore di accelerazione Tipo: 330400-01-05 kit di montaggio tipo: 37439-01 Corpo tipo: 43217-01 Fornitore: Bently Nevada				Vibrazioni della carcassa - car-cassa del giunto idr. lato di uscita	Allarme: Vms ↑ 8 mm/s Blocco:: Vms ↑ 11 mm/s	Vms < 5.6 mm/s	
	55.1	XLACY0AA314 XLACY0AA315 XLACY0AA316 XLACY0AA317	Blocco valvole doppio Tipo: N342.44.483.21 Fornitore: Schneider		Strumentazione: ½ " NPT Processo: ½" NPT Prova: ¼" NPT					Materiale corpo: acciaio inox 316 L

Componenti principali ed elenco strumentazione

Revisione	Pos n. Voith	Pos n. Cliente 1)	Componente o strumentazione Tipo: Fornitore:	Range di misurazione --- Range modificato	Collegamento processo --- Collegamento elettrico	Protezione contro l'ingresso	Misura / Punto di misura, ubicazione	Valore impostato	Valore nominale di funzi-onamento	Osservazioni
	55.3	XLACY0AA310 XLACY0AA311 XLACY0AA312 XLACY0AA313	Blocco valvole quintuplo Tipo: N 342.42.482.01 Fornitore: Schneider		Strumentazione: ½ " NPT Processo: ½" NPT Prova: ¼" NPT					Materiale corpo: acciaio inox 316 L
	60		Termometro a resistenza Tipo: 2x PT100; sistema a 3 fili DIN IEC 751 Classe B Documento n. 42035240 Fornitore: Voith/Juchheim	0 - +180°C	½ NPT --- M20x1,5	IP 65	Temperatura olio di lavoro dopo lo scambiatore di calore	Consenso al motore principale: ↑ 5°C Allarme: ↑ 95°C	> 30 °C	Materiale corpo: Alluminio, trattato
	60.10	XLACY0CT002	Trasmettitore di temperatura Tipo: TF12 Make: ABB	-200 - 850 °C		IP 65				Montato nella morsettiera, ingresso 0 - 180 °C uscita Profibus PA dal min. al max. corrisponde da -200 a 850 °C

VOITH TURBO

T E C N I C A D'A Z I O N A M E N T O
Azionamenti variabili

Voithstrasse 1
D-74564 Crailsheim
Tel.: 07951 / 32 - 0
Fax : 07951 / 32 - 650

Password	:	Flowserve Aprilia S1
Prodotto VTCR	:	562 SVTL 12.1
AZ no.	:	38002141
Disegno no.	:	91600388810 it
Denominazione	:	Turbogiunto a velocità variabile - schema logico
File simbolico	:	
Percorso	:	J:\Turbo\ai-VTCR\air\BA-Doku\916\003500-004000\91600388810it.pfd
Reparto	:	airek

Creato il : 09-11-02 del : Leh Numero di pagine : 26

				Data	09-11-02	Flowserve Aprilia S1	VOITH TURBO	Frontespizio	AZ no.:	38002141
				Inc.	Leh					
				Data		562 SVTL 12.1	Rep.: airek		Disegno no.:	91600388810 it
Indice	Modifica no.	Data	Nome	Verif.						

Pag. 1
26 Pag.

Indice

Elenco delle modific

Pagina	Descrizione della modifica	Indice	Modifica no.	Data	Nome

SU QUESTA LATO SI TROVANO I SEGNALI D'ENTRATA

SPANZIO PER SIMBOLI E ANNOTAZIONI

SU QUESTA LATO SI TROVANO I SEGNALI D'USCITA

ANNOTAZIONI

Definizione dei simboli sulle ultimie 4 pagine di questo documento.

Pos. no si veda schema del circuito dell'olio e dei punti di misura 91600384410.

Prima della messa in servizio e dopo ogni revisione è necessario verificate e regolare
i valori limite, i gruppi di funzione e le connessioni.

Per i valori di collegamento si veda alla lista dei componenti principali e degli strumenti 91600384510.

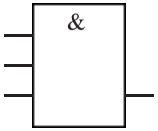
Per la misurazione delle vibrazioni si veda la scheda di lavoro VOITH C 081.5

I numeri TAG sono specificati per il giunto Voith fabbricazione no. 8206786

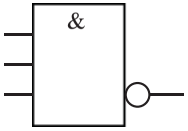
Nelle altre unità questi cambiano come illustrato nell'esempio seguente:

Tag No.	Giunto Voith fabbricazione no.
11LAC10…	8206786
11LAC20…	8206787
12LAC10…	8206788
12LAC20…	8206789

Questa è il lato d'ingresso



E
L'uscita viene settata su 1,
quando tutti gli ingressi sono settati su 1.



E-NON (NAND)
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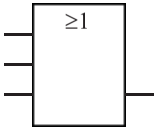
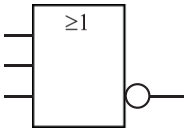
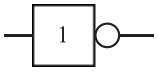
quando tutti gli ingressi sono settati su 1.



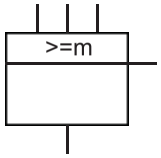
OR
L'uscita viene settata su 1,
quando almeno un'uscita è settata su 1.



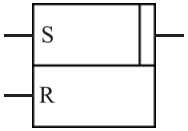
NOR
L'uscita viene settata su 0,
quando almeno un'uscita è settata su 1.



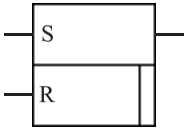
NOT (Negator/Inverter)
L'uscita viene settata su 0,
quando l'ingresso è settato su 1.



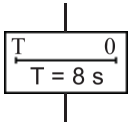
Elemento valore di soglia, in generale
L'uscita si trova nello stato OK soltanto
quando il numero degli ingressi
che si trovano nello stato OK, è uguale o
maggiore del numero nella marcatura
funzionale, qui descritta con m.



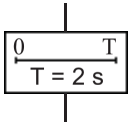
Simbolo di funzione bistabile con
l'ingresso S assegnato



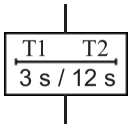
Simbolo di funzione bistabile con
l'ingresso R assegnato



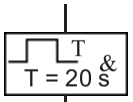
ON - ritardato (8 sec.)



OFF - ritardato (2 sec.)



ON - ritardato (3 sec.)
e
OFF - ritardato (12 sec.)



Il tempo dell'impulso in uscita
corrisponde sempre a 20 sec.
indipendentemente dalla
durata del segnale d'ingresso

Questa è il lato di partenza

La lettera descrive il
segnale, la cifra indica la
pagina in cui prosegue il
collegamento.

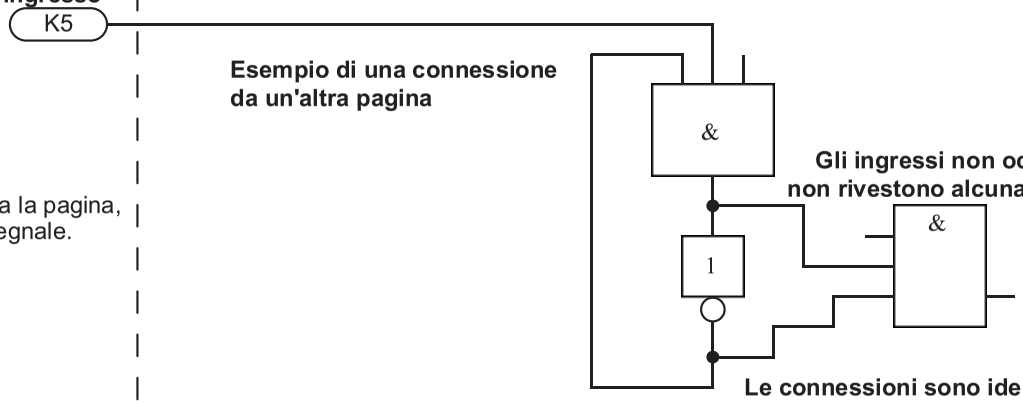
K6

**Esempio di una connessione
con un altro utente**

				Data	09-11-02	Flowserve Aprilia S1	VOITH TURBO	Descrizione dei simboli, parte 1	AZ no.: 38002141	
				Inc.	Leh					
				Data		562 SVTL 12.1	Rep.:airek		Disegno no.: 91600388810 it	Pag. 5
Indice	Modifica no.	Data	Nome	Verif.						26 Pag.

Questa è il lato d'ingresso

Questa è il lato di partenza

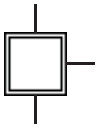


Esempio di una connessione da un'altra pagina

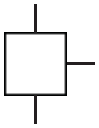
Gli ingressi non occupati non rivestono alcuna funzione

Le connessioni sono identificate con un punto

La lettera descrive il segnale, la cifra indica la pagina, da dove proviene il segnale.

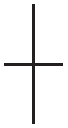


Questa è un'operazione iniziale in un processo e rappresenta le condizioni di partenza.

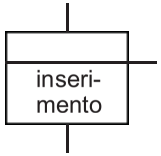


Questa è un'operazione in un processo.

Questa è un'operazione in un ciclo. Il punto indica che la sua condizione logica 1 è soddisfatta.



Questo è un passaggio. Esso si trova tra le operazioni e descrive le azioni richieste nel frattempo.

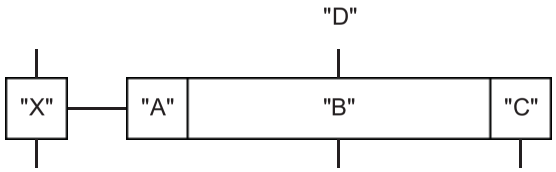


Questa è un'operazione con una descrizione

				Data	09-11-02	Flowserve Aprilia S1	VOITH TURBO	Descrizione dei simboli, parte 2	AZ no.:	38002141	
				Inc.	Leh						
				Data		562 SVTL 12.1	Rep.:airek		Disegno no.:	91600388810 it	Pag. 6
Indice	Modifica no.	Data	Nome	Verif.							26 Pag.

Questa è il lato d'ingresso

Questa è il lato di partenza



Il simbolo a destra del simbolo dell'operazione è un simbolo d'azione.
Il simbolo d'azione potrebbe essere composto dei tre campi "A", "B" e "C").

Il campo "A" o "C" è opzionale, se richiesto.

Il campo "B" descrive l'azione quando è soddisfatta l'operazione "X".

Il campo "A" descrive la correlazione tra l'operazione "X" e l'azione "B",
si possono utilizzare le denominazioni seguenti:

S	salvato
D	ritardato
L	limitato nel tempo
P	impulso
C	condizionato

Si possono utilizzare combinazioni di lettere, è determinante la successione.

Esempio: "A" = DSL — Il segnale di ingrosso "X" viene ritardato, salvato e il comando "B" limitato nel tempo.

Il campo "C" descrive la risegnalazione del comando "B".
Si possono utilizzare le denominazioni seguenti:

A	notificazione di un ordine
R	azione dell'ordine raggiunta (controllo di risposta)
X	segnale d'errore, azione dell'ordine non raggiunta
1,2...	no. della risegnalazione

Esempio:

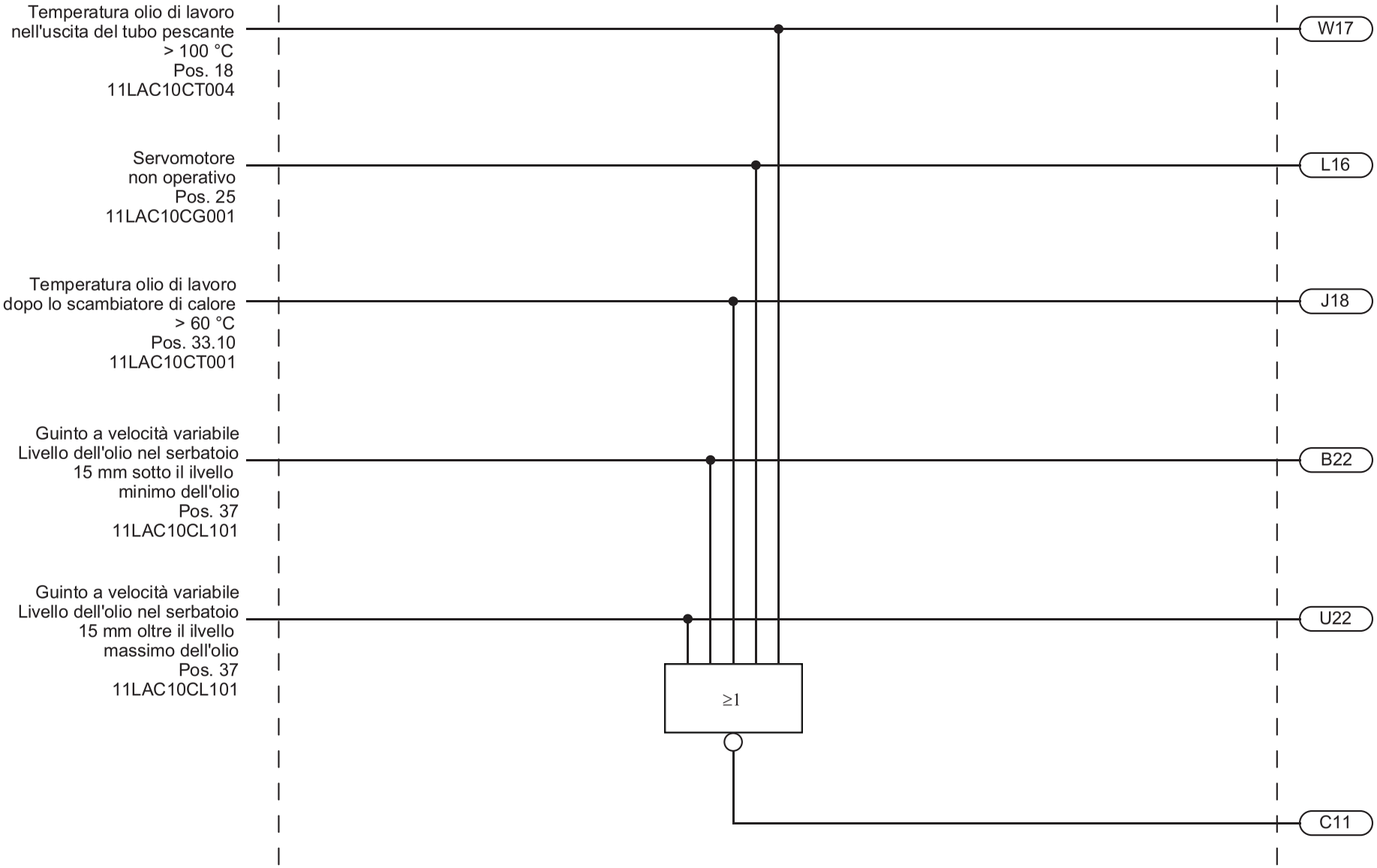
"A" = DSL Il segnale di ingresso "X" viene ritardato, salvatot
e il comando "B" limitato nel tempo.

Se si usa la lettera C (condizionato), il comando viene eseguito solamente se è soddisfatta la condizione "B".

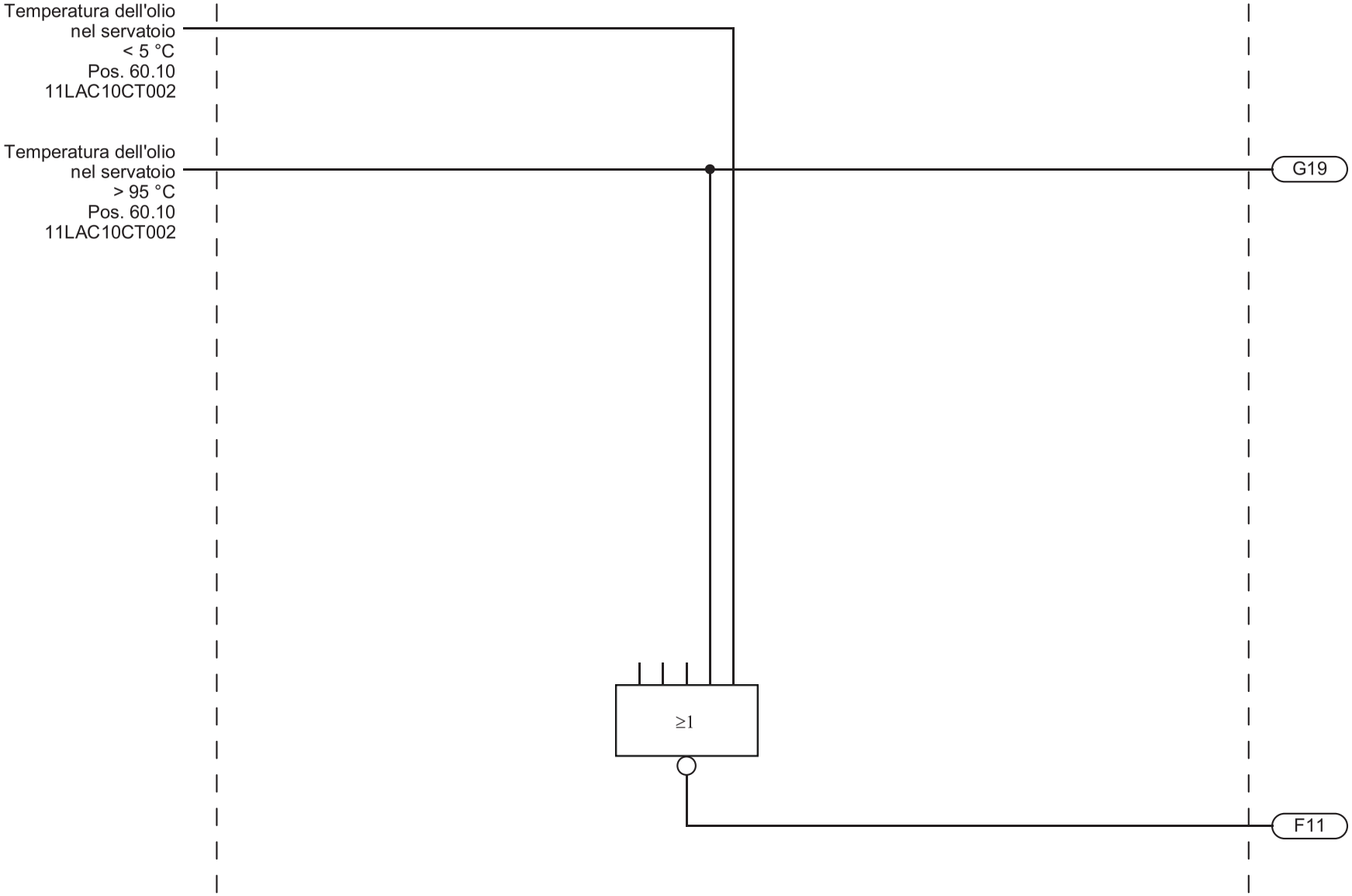
Esempio: "A" = SLC
"B" = pompa dell'olio lubrificante ON
"D" = livello dell'olio OK

Il segnale di ingresso "X" viene salvato e la pompa dell'olio lubrificante inserita con un determinato ritardo di tempo a condizione che il livello dell'olio sia ok.

Il campo "C" indica la risegnalazione del comando da eseguire.
Nell'esempio sopra indicato la "C" indicherebbe la logica 1, quando è inserita la pompa dell'olio lubrificante.



				Data	09-11-02	Flowserve Aprilia S1	VOITH TURBO	Procedura d'avviamento - condizioni di partenza	AZ no.:	38002141
				Inc.	Leh					
				Data		562 SVTL 12.1	Rep.:airek		Disegno no.:	91600388810 it
Indice	Modifica no.	Data	Nome	Verif.						



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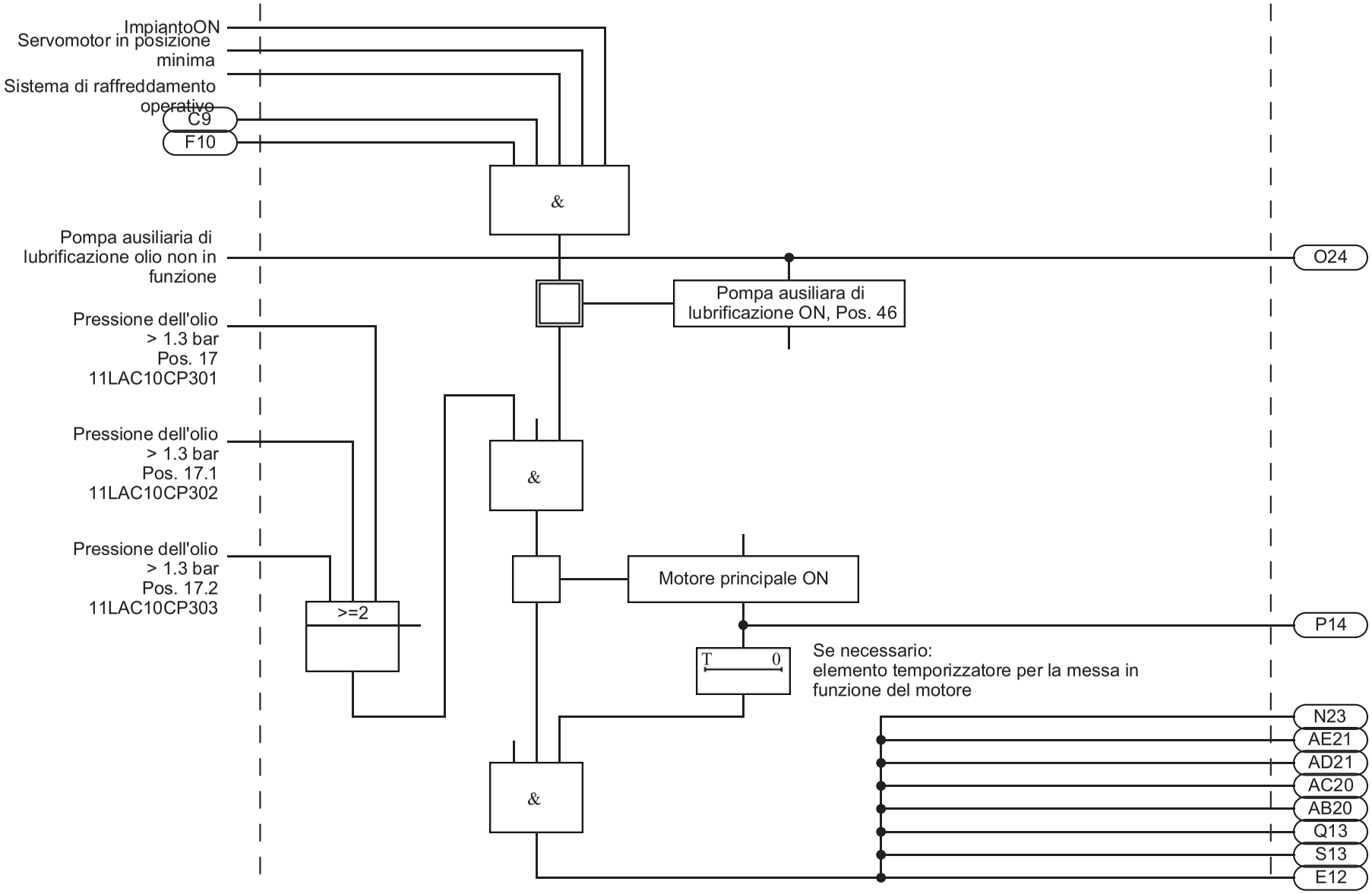
				Inc.	Leh					
				Data		562 SVTL 12.1	Rep.: airek		Disegno no.:	91600388810 it
Indice	Modifica no.	Data	Nome	Verif.						



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				Inc.	Leh						
				Data		562 SVTL 12.1	Rep.:airek		Disegno no.:	91600388810 it	Pag. 11
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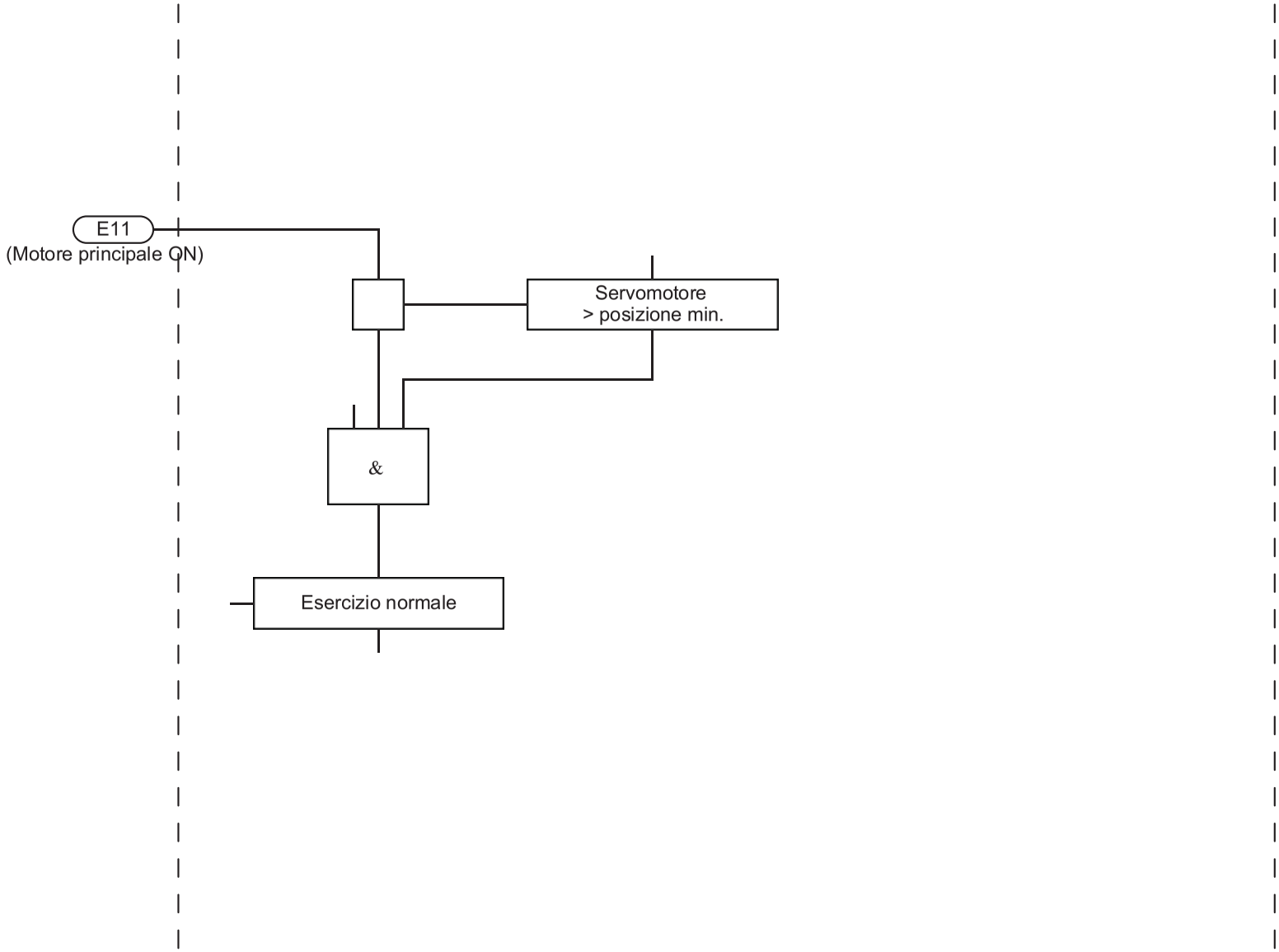

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				Inc.	Leh						
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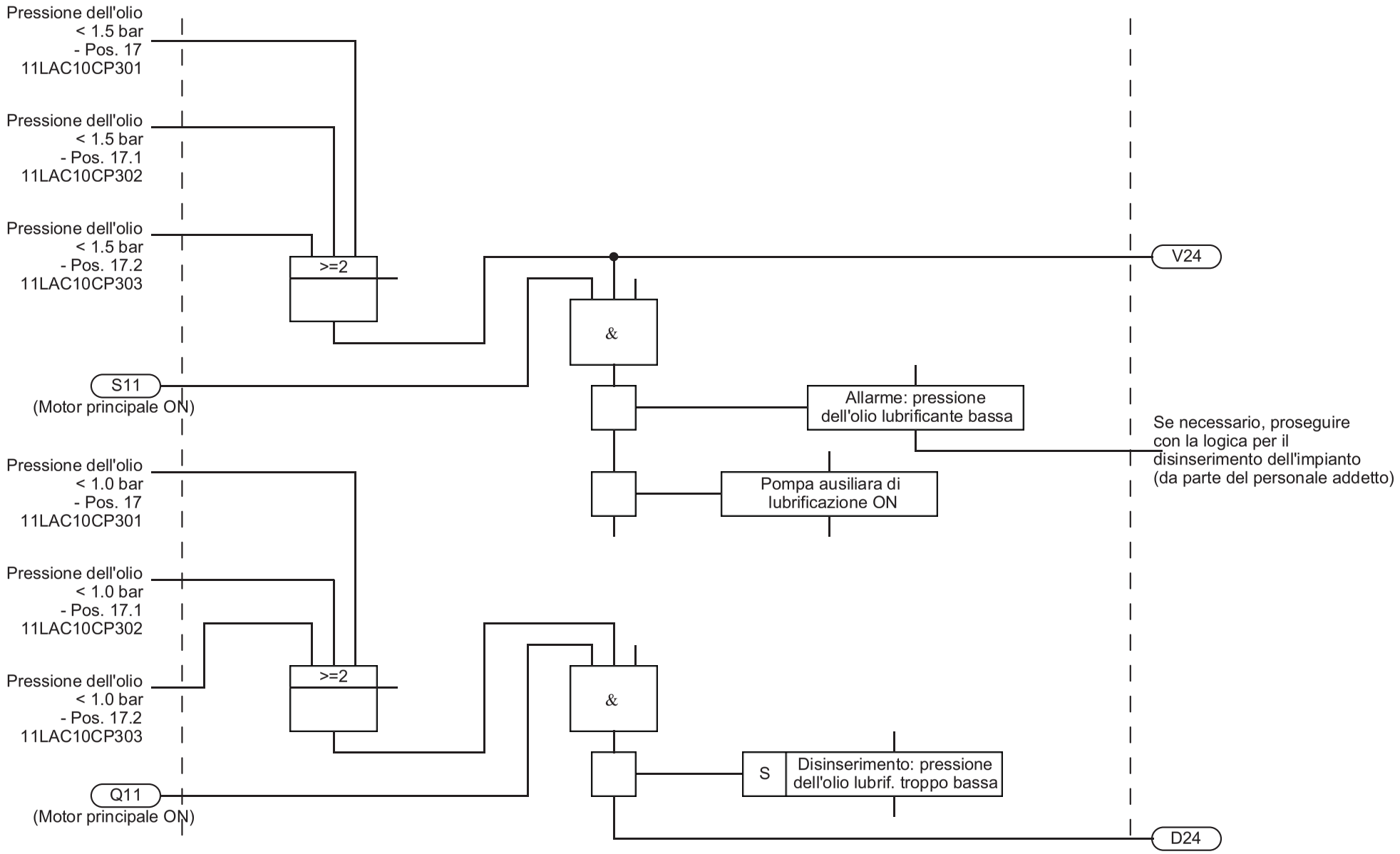
Indice	Modifica no.	Data	Nome	Verif.							26 Pag.



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				Inc.	Leh					
				Data		562 SVTL 12.1	Rep.: airek		Disegno no.:	91600388810 it
Indice	Modifica no.	Data	Nome	Verif.						

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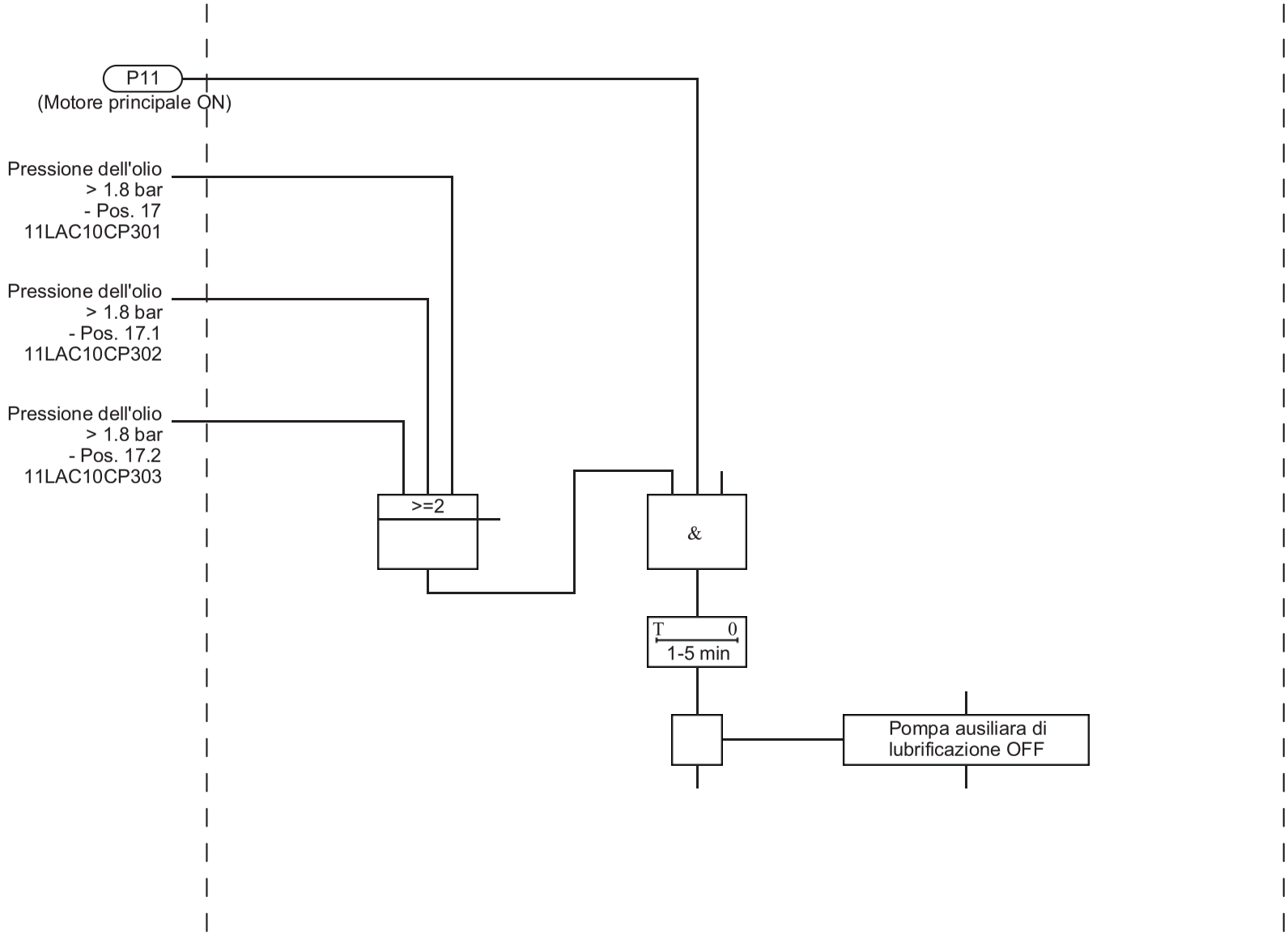

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				Inc.	Leh					
				Data		562 SVTL 12.1	Rep.:airek		Disegno no.:	91600388810 it
Indice	Modifica no.	Data	Nome	Verif.						

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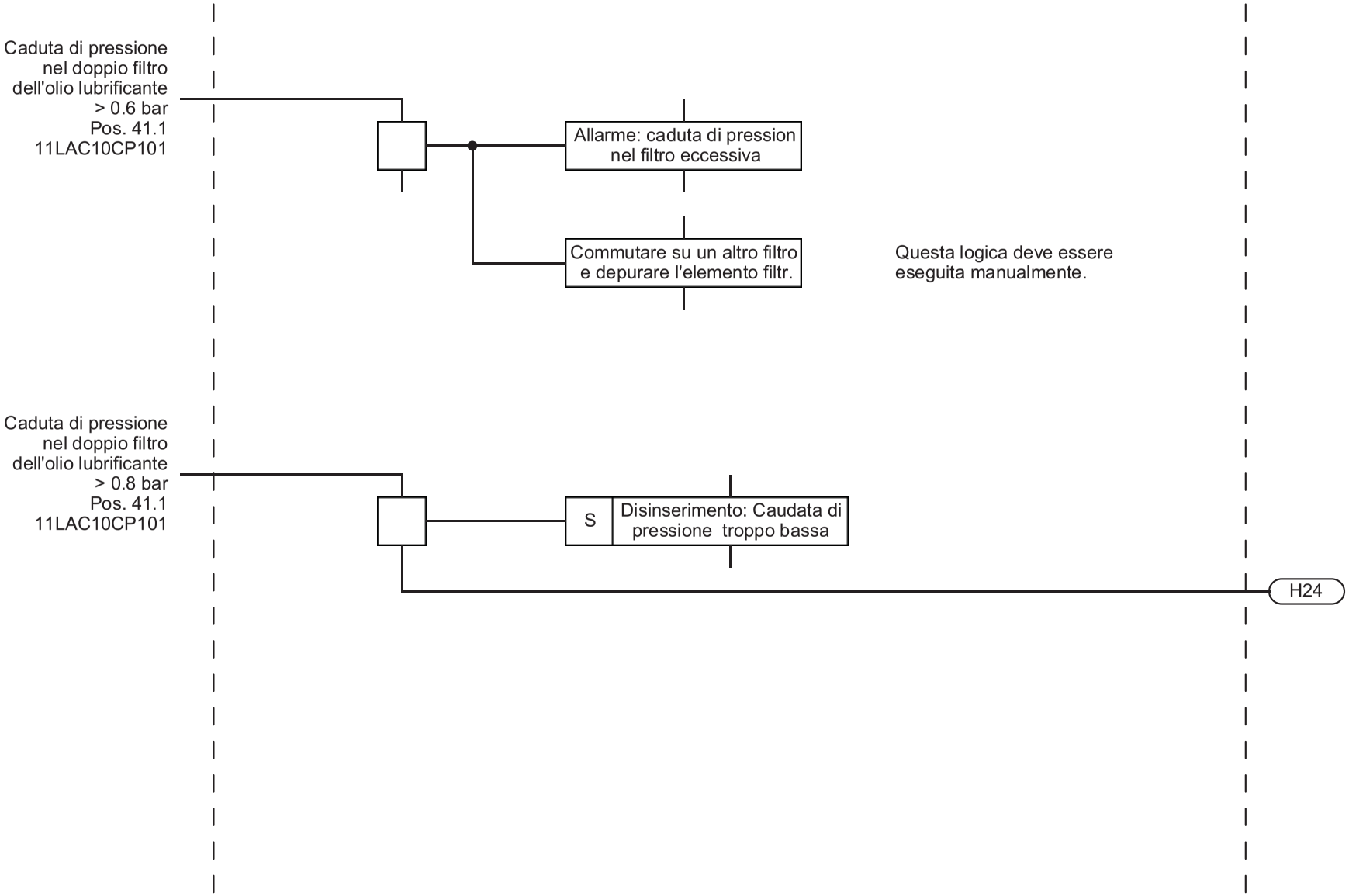

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				Inc.	Leh						
				Data		562 SVTL 12.1	Rep.:airek		Disegno no.:	91600388810 it	Pag. 15
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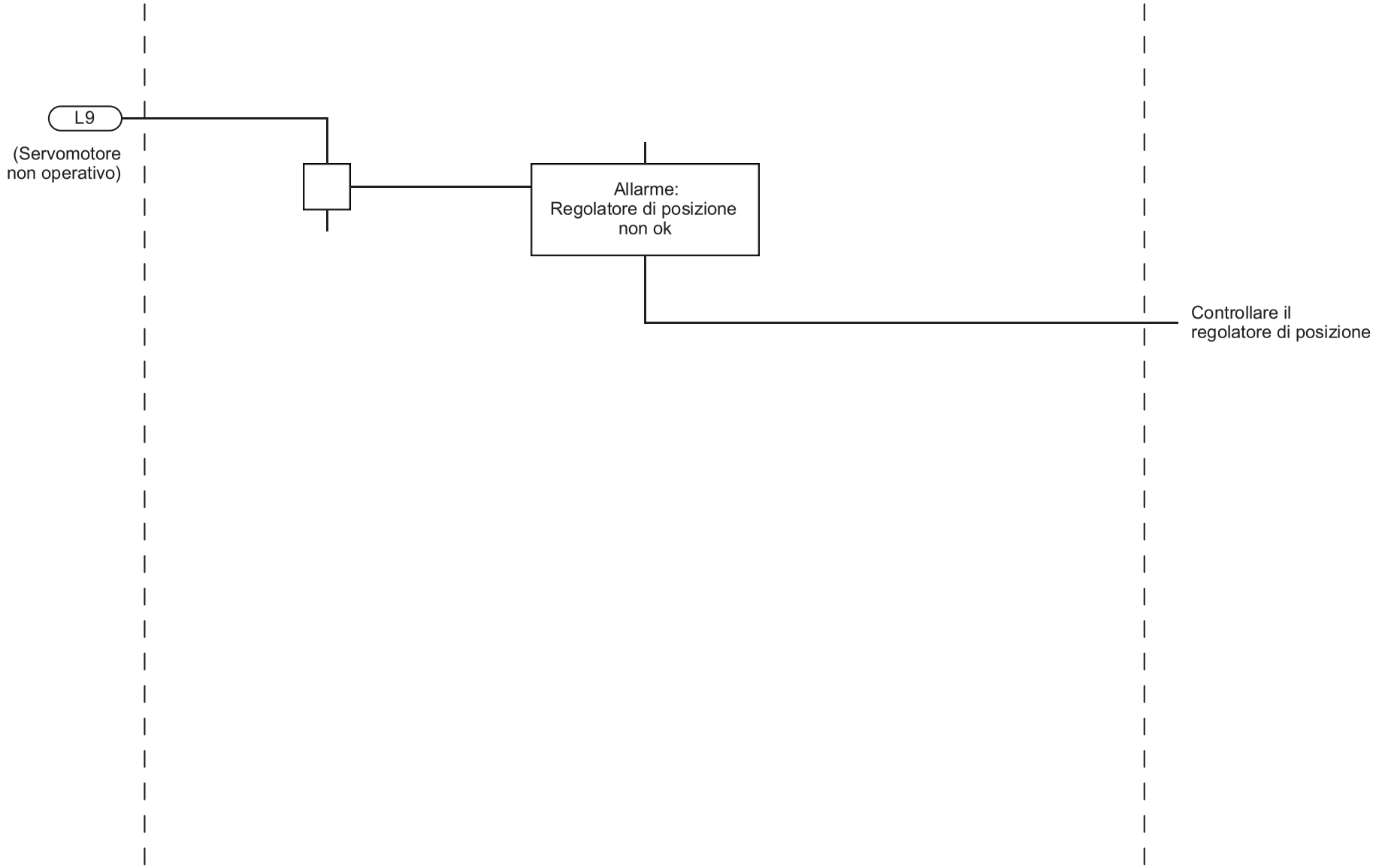

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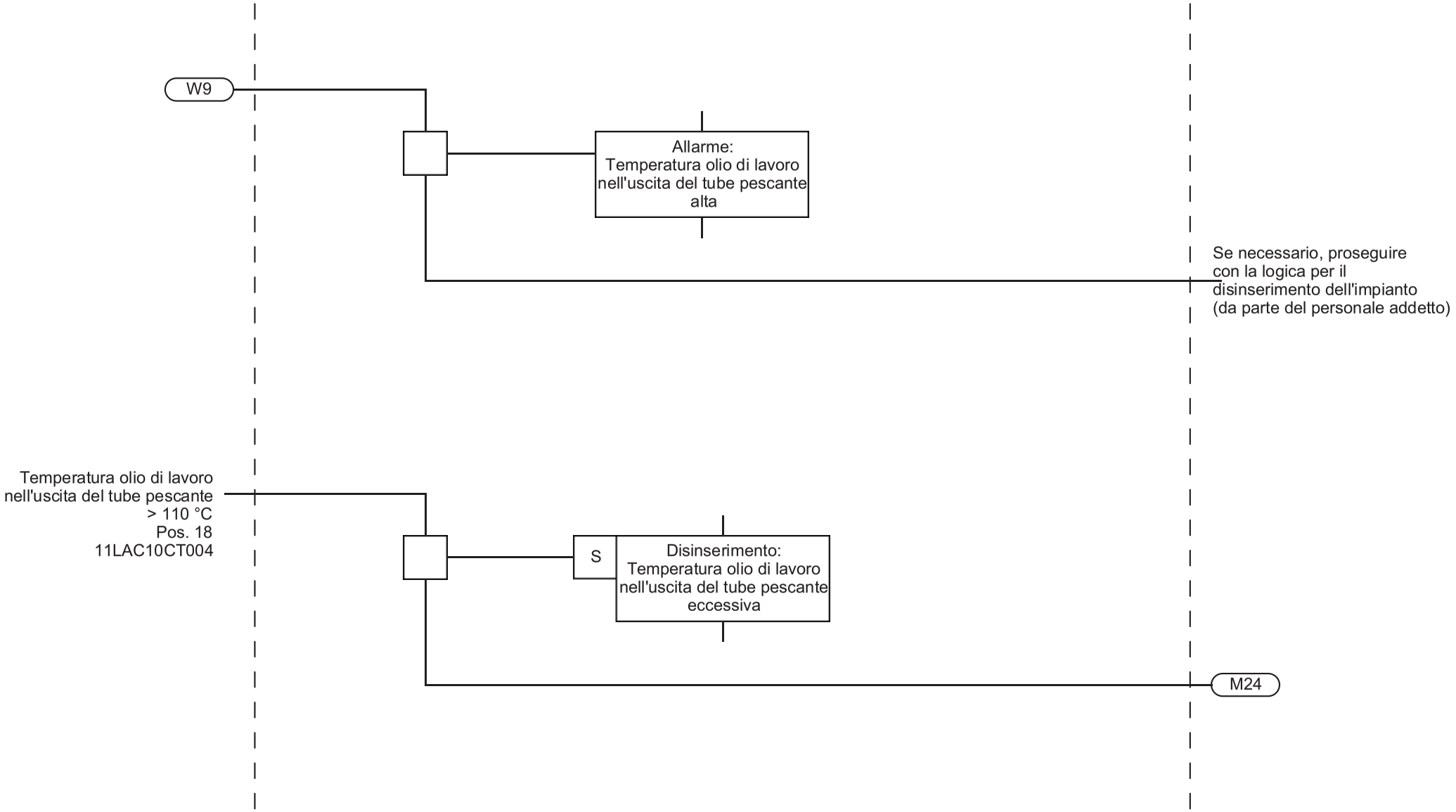
Indice	Modifica no.	Data	Nome	Verif.							26 Pag.



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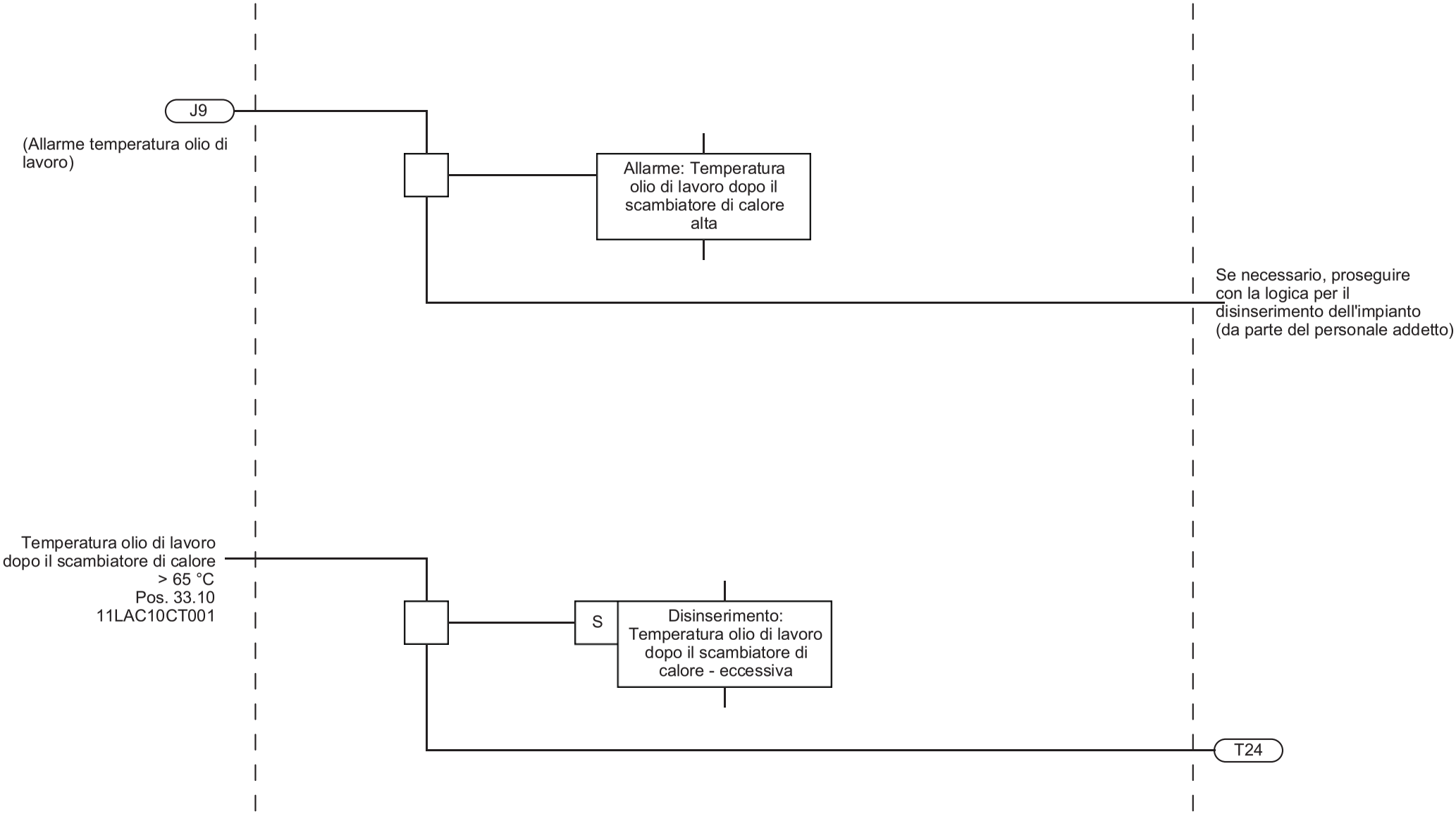
				Inc.	Leh						
				Data		562 SVTL 12.1	Rep.:airek		Disegno no.:	91600388810 it	Pag. 17
Indice	Modifica no.	Data	Nome	Verif.							26 Pag.



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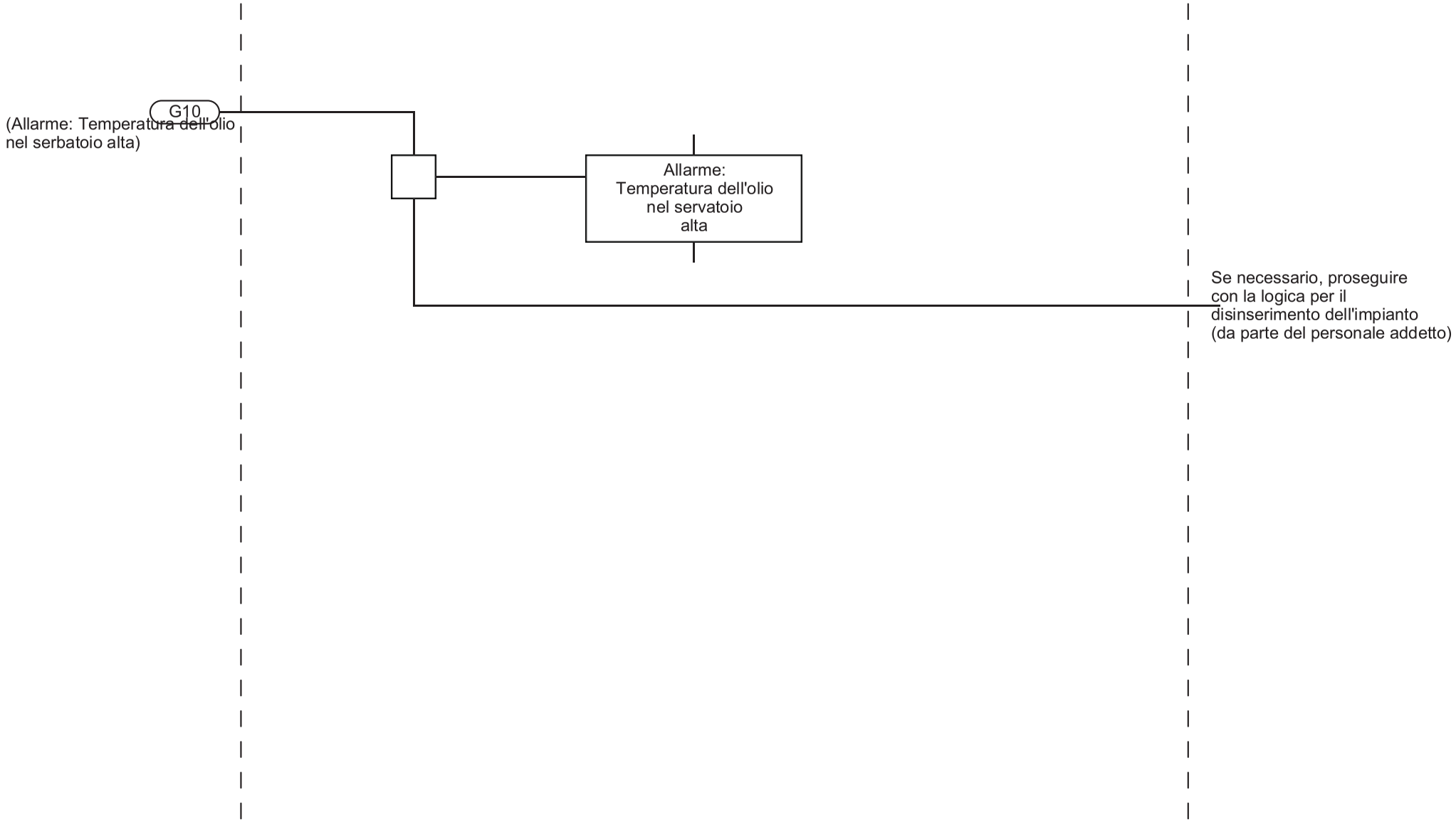
				Inc.	Leh						
				Data		562 SVTL 12.1	Rep.:airek		Disegno no.:	91600388810 it	Pag. 18
Indice	Modifica no.	Data	Nome	Verif.							26 Pag.



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				Inc.	Leh						
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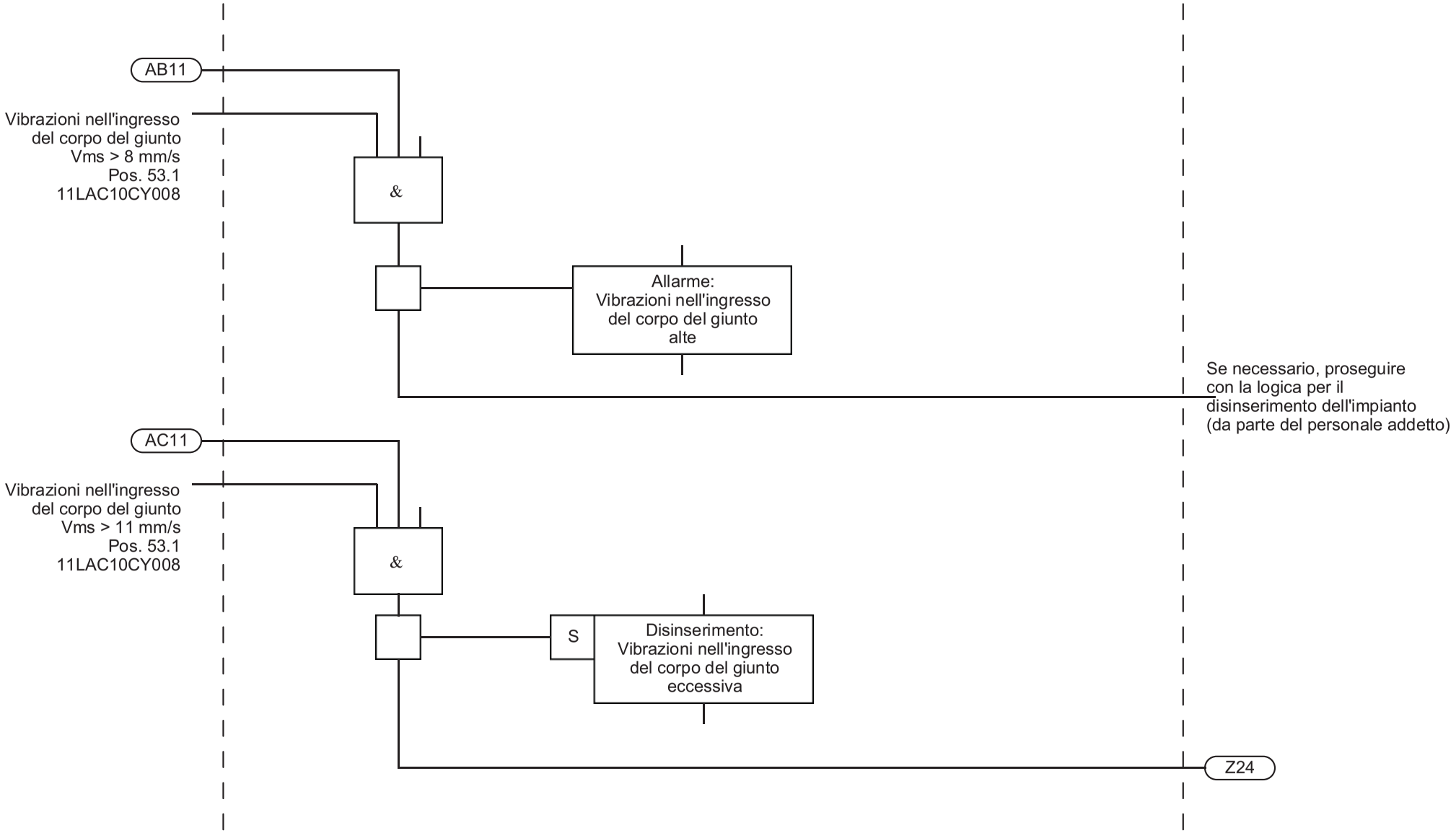
Indice	Modifica no.	Data	Nome	Verif.							26 Pag.



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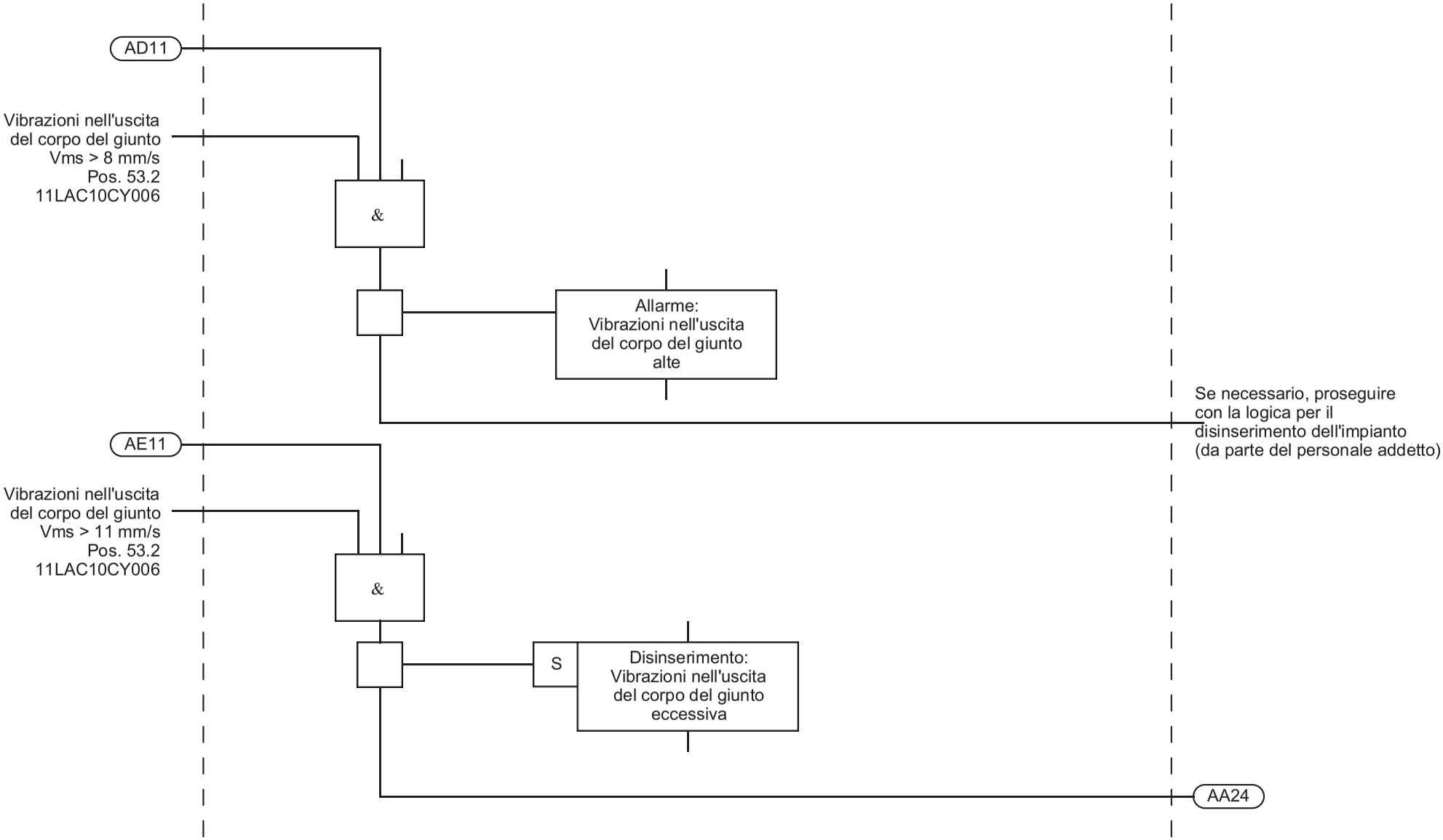

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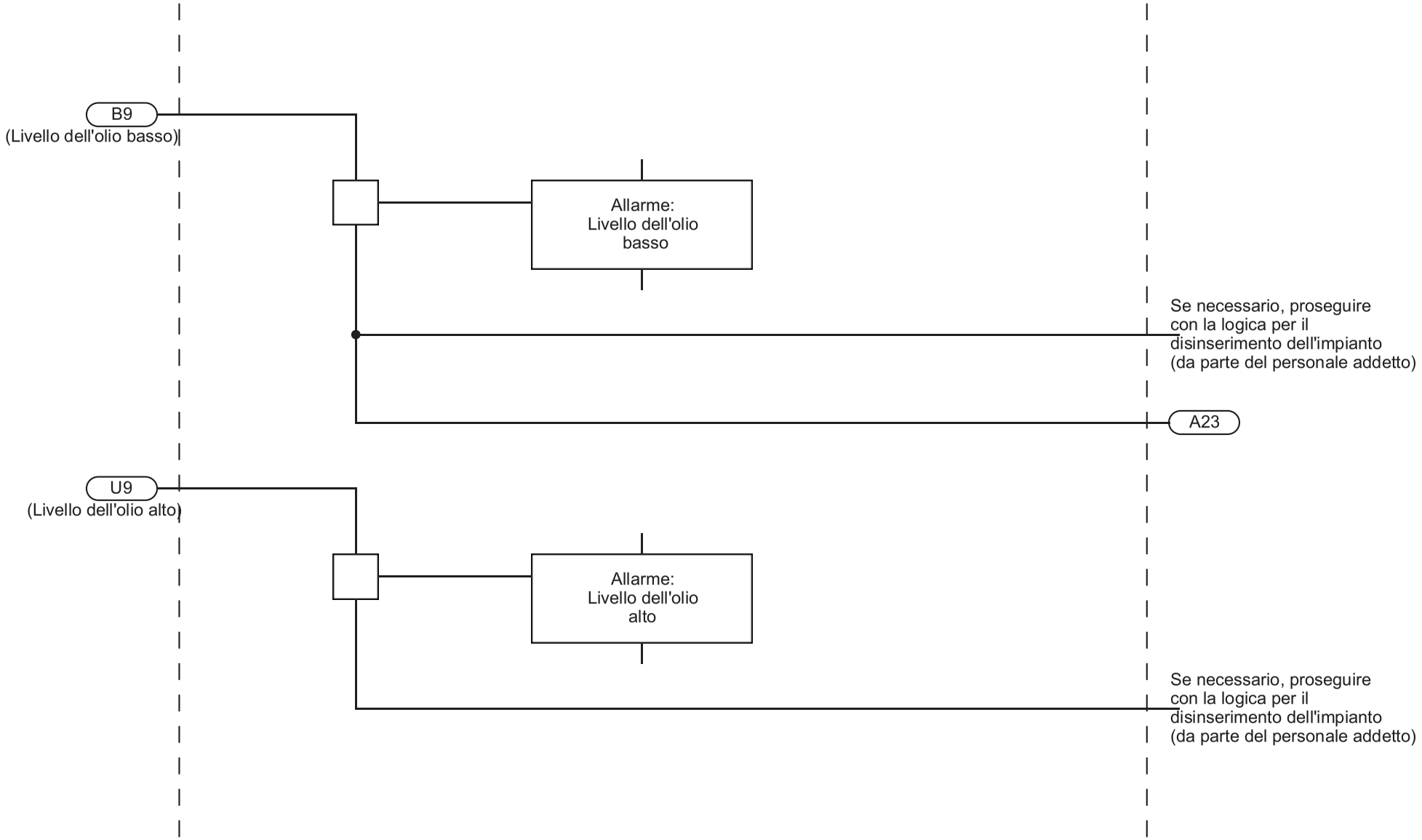
				Inc.	Leh						
				Data		562 SVTL 12.1	Rep.:airek		Disegno no.:	91600388810 it	Pag. 21
Indice	Modifica no.	Data	Nome	Verif.							26 Pag.



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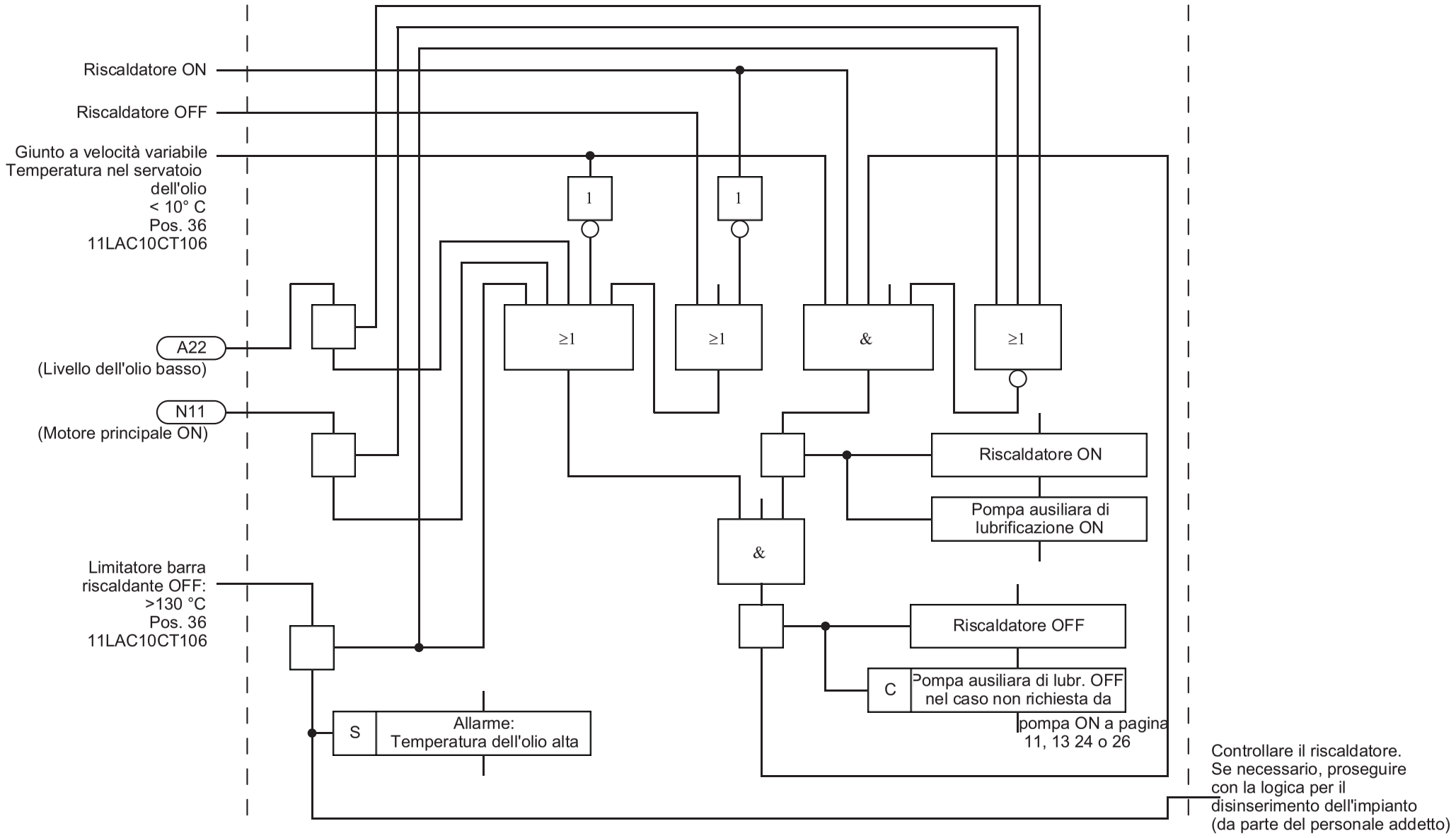
				Inc.	Leh						
				Data		562 SVTL 12.1	Rep.:airek		Disegno no.:	91600388810 it	Pag. 22
Indice	Modifica no.	Data	Nome	Verif.							26 Pag.



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				Inc.	Leh						
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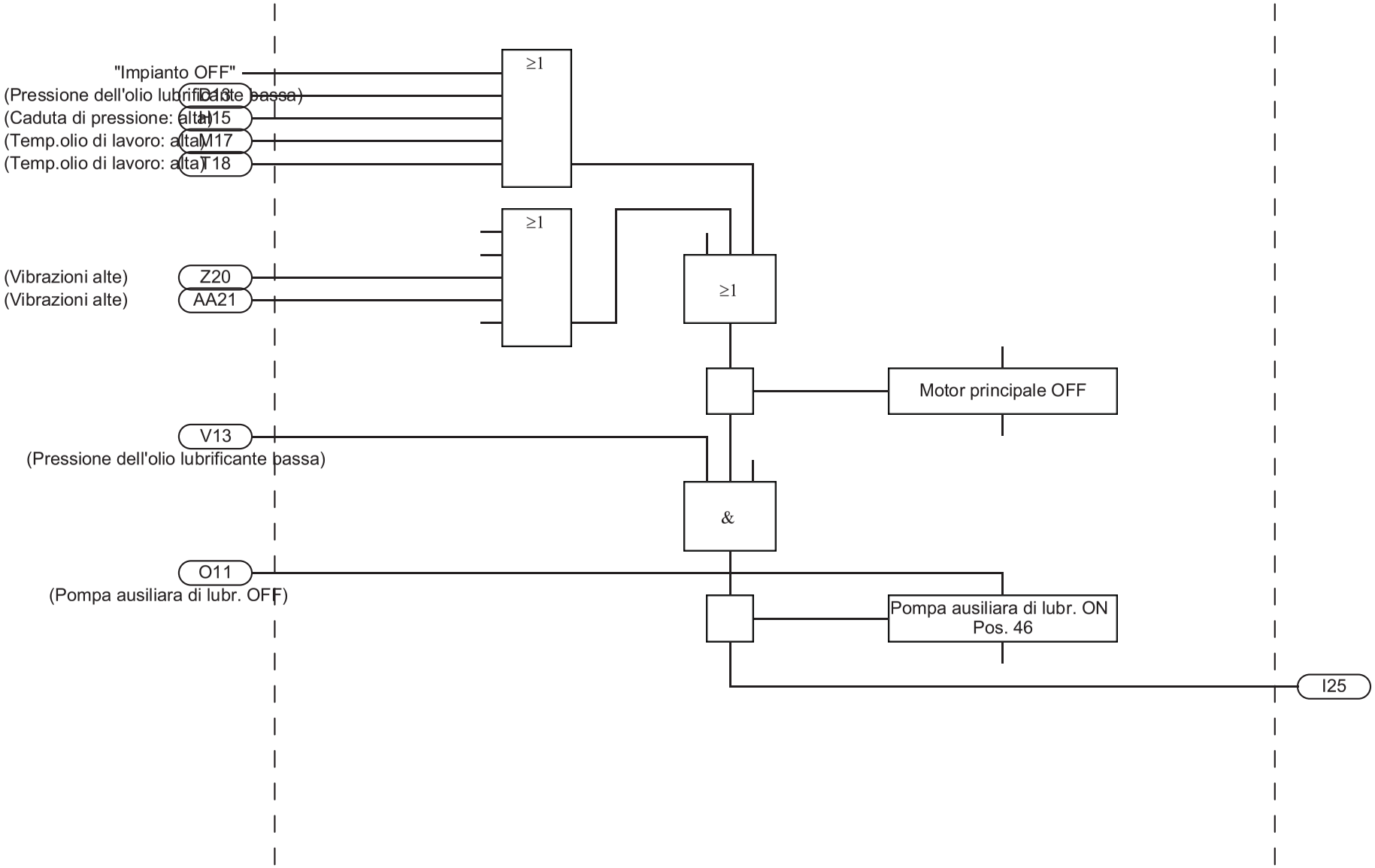
Indice	Modifica no.	Data	Nome	Verif.							26 Pag.



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				Inc.	Leh					
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Indice	Modifica no.	Data	Nome	Verif.						

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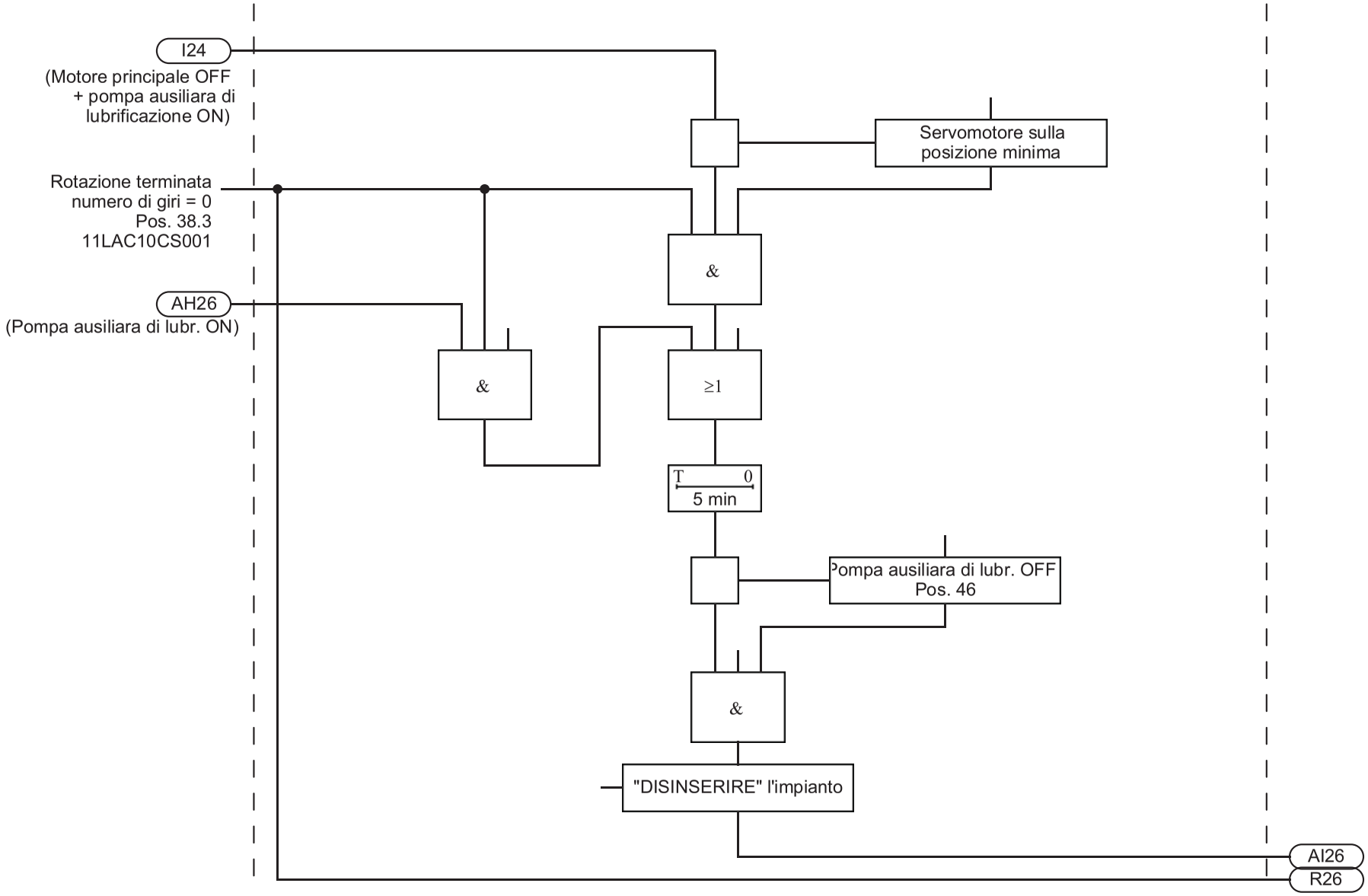

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				Inc.	Leh					
				Data		562 SVTL 12.1	Rep.:airek		Disegno no.:	91600388810 it
Indice	Modifica no.	Data	Nome	Verif.						

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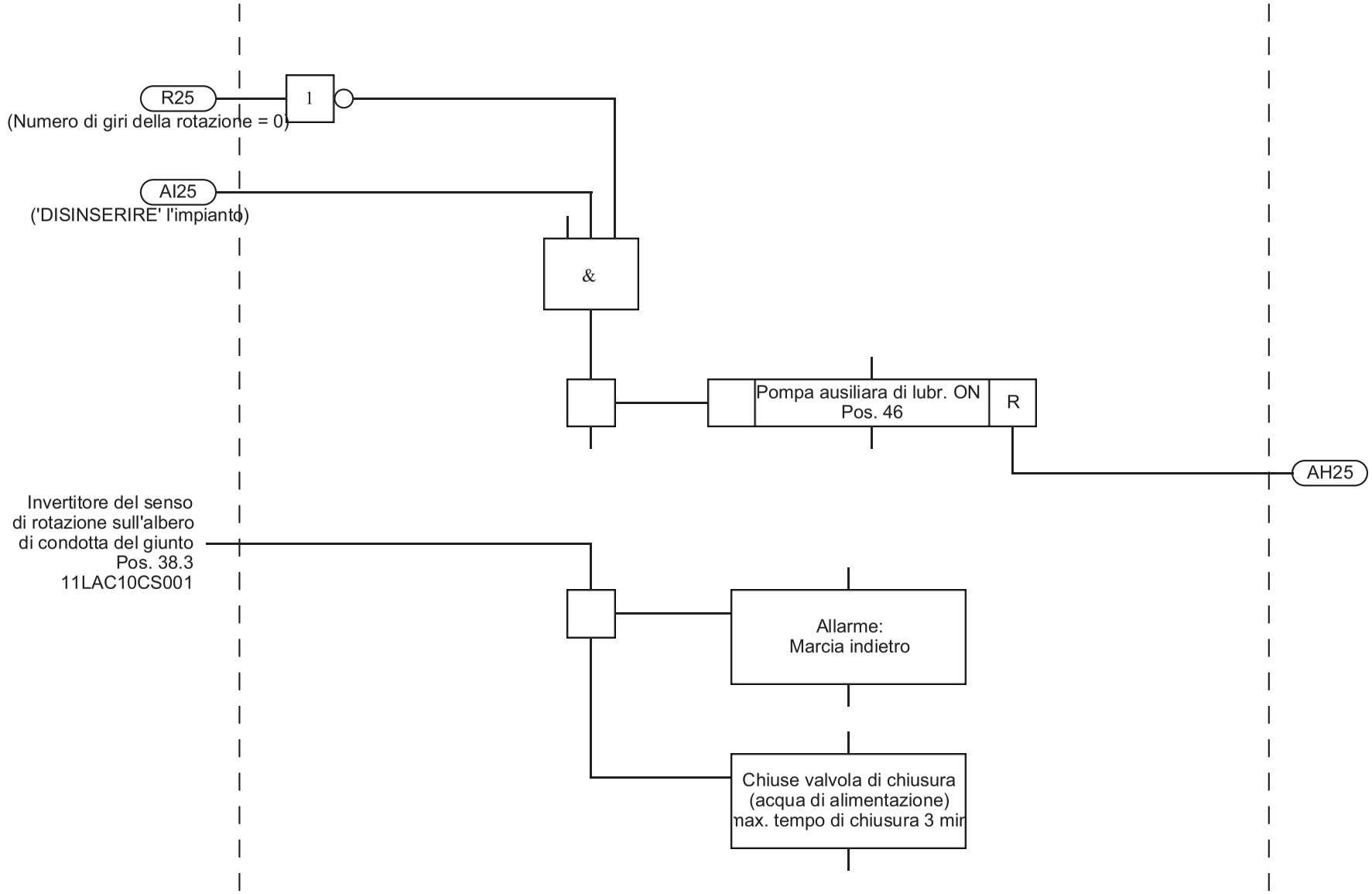

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				Inc.	Leh					
				Data		562 SVTL 12.1	Rep.:airek		Disegno no.:	91600388810 it
Indice	Modifica no.	Data	Nome	Verif.						

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VOI1203/23.Feb.2004

VOITH

VOITH TURBO GmbH & Co. KG

Voithstrasse 1 74564 Crailsheim
Tel: 07951 / 32-0
Fax: 07951 / 32-650

Client : Flowserve Spain S.L.
Unit designation : 562 SVTL 12.1
Order number : 38 002 141
Drawing number : 916 003 893 10 en
Code word : FLOWSERVE APRILIA S1

Regulating and Control : ABB
Equipment - Type : CONTRAC PME 120 AI

File name without \EPLAN\P: \VOI\GA_2009\916 003 893 10 EN

CAD - Symbolic files : DIN_WUP/VC_SYMBL

Designation : WIRING DIAGRAM

Department : airea-Ga

Created at : 03.11.2009
Revised edition : 01.06.2010 by : Gaugler

according design specification c131

2

1	105750	01.06.10	Ga	Date	03.11.2009	FLOWSERVE APRILIA S1	VOITH TURBO	cover sheet	Order no.: 38 002 141
				Editor	Gaugler	562 SVTL 12.1	Dep.: airea-Ga		= +
				Date	01.06.2010				Page 1
Revisions	Date	Name	Checked			Original / Replacing	Replaced by		Drawing number: 916 003 893 10 en / 15 P.

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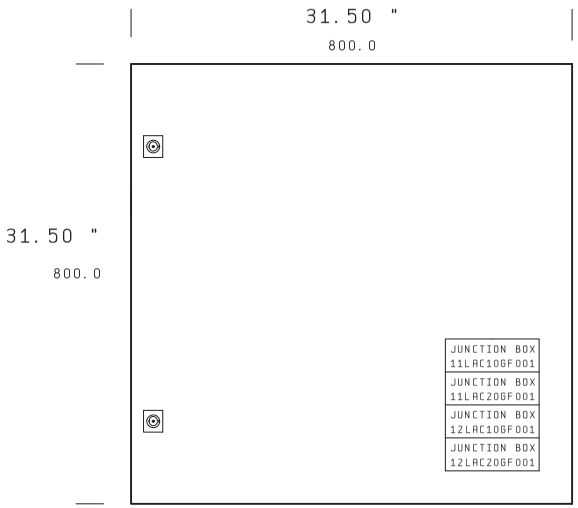
VOI_1201 / 22.März 2001

junction box
11/12 LAC 10/20 GF001

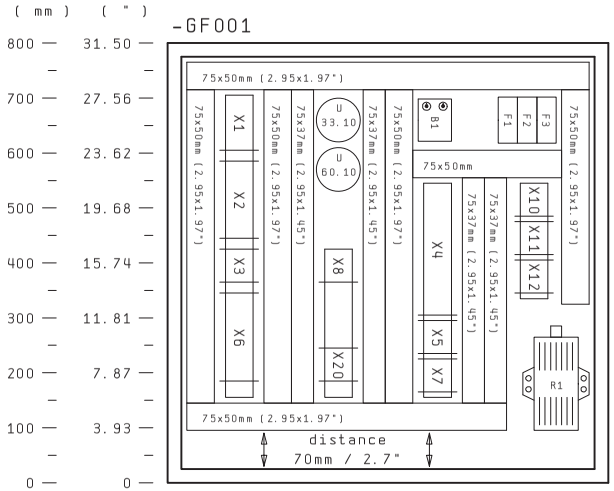
front view



Gland plate for customer

Flange
345x130 mm
13,58x5,12 "

layout
mounting plate



Note:

Terminal strip: X1/X2/X3/X4/X5/X6/X7/X8
X11/X12/X20
Supplier: PHOENIX
Type: UK 2,5 N / USLKG 2,5 N
(0,2-4 mm²)

Terminal strip: X10
Supplier: PHOENIX
Type: UK 5 N / USLKG 5
(0,2-6 mm²)

side view

Supplier: Eldon

Type: ASR 08082

junction box dimensions: 31.50x31.50x8.27 "
800x800x210 mm

degree of protection: NEMA 4
IP 65

material: stainless steel 304

weight: approx. 50kg

scale: 1:10

ITEM NO.	Symbol designation	Type designation	VTCR - Art. number
1	GF001	ASR 08082	4 179 898 0
2	GF001-U33.10	TF12	
3	GF001-U60.10	TF12	
4	GF001-B1	ETF300	204.008 984 10
5	GF001-F1	FAZ-S4/2	4 221 910 0
6	GF001-F2	FAZ-S4/2	4 221 910 0
7	GF001-F3	FAZ-S1/2	4 178 991 0
8	GF001-R1	SK 3107.000 / 130 W	4 253 472 0

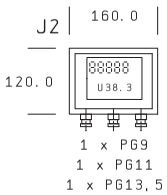
2 3.1

1	105750	01.06.10	Ga	Date	03.11.2009	FLOWSERVE APRILIA S1	VOITH TURBO	junction box 11/12 LAC 10/20 GF001 / view / layout	Order no.: 38 002 141
				Editor	Gaugler	562 SVTL 12.1	Dep.: airea-Ga		
				Date	01.06.2010				Drawing number: 916 003 893 10 en
Revisions	Date	Name	Checked			Original / Replacing	Replaced by		Page 3 / 15 P.

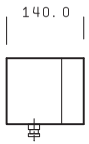
junction box
J2

speed measuring transducer &
rotation detector

front view



side view



Supplier: Braun

terminal box
dimensions: 160x120x140 mm
degree of
protection: IP 65
material: plastic / RAL 7035
weight: approx. 2 kg

scale: 1:10

3 4

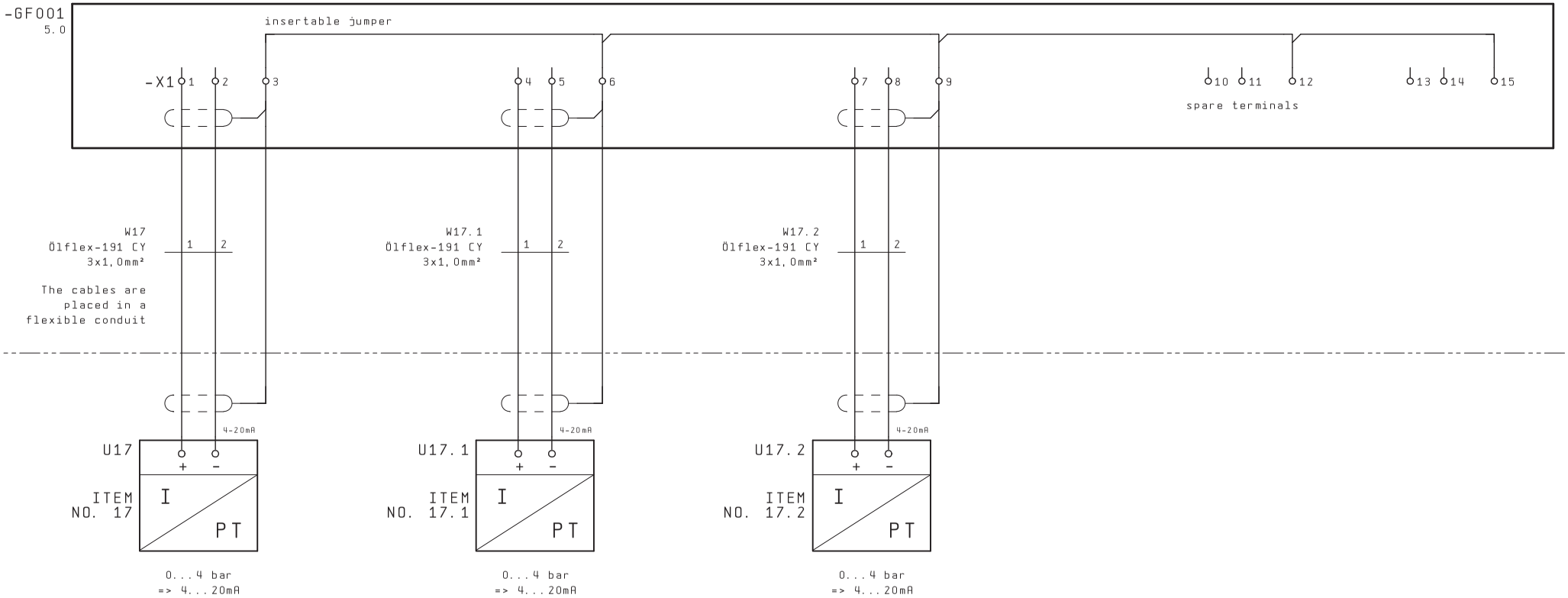
1	105750	01.06.10	Ga	Date	03.11.2009	FLOWSERVE APRILIA S1	VOITH TURBO	junction box J2 / view / layout
				Editor	Gaugler	562 SVTL 12.1	Dep.: airea-Ga	
				Date	01.06.2010			
Revisions	Date	Name	Checked			Original / Replacing	Replaced by	

Order no.: 38 002 141
Drawing number: 916 003 893 10 en
Page 3.1
15 P.

item no. see oil circuit and measuring point scheme 916 003 844 10

CLIENT

VOITH



pressure transmitter
lube oil

11/12 LAC 10/20
CP301 XQ01

pressure transmitter
lube oil

11/12 LAC 10/20
CP302 XQ01

pressure transmitter
lube oil

11/12 LAC 10/20
CP303 XQ01

3.1

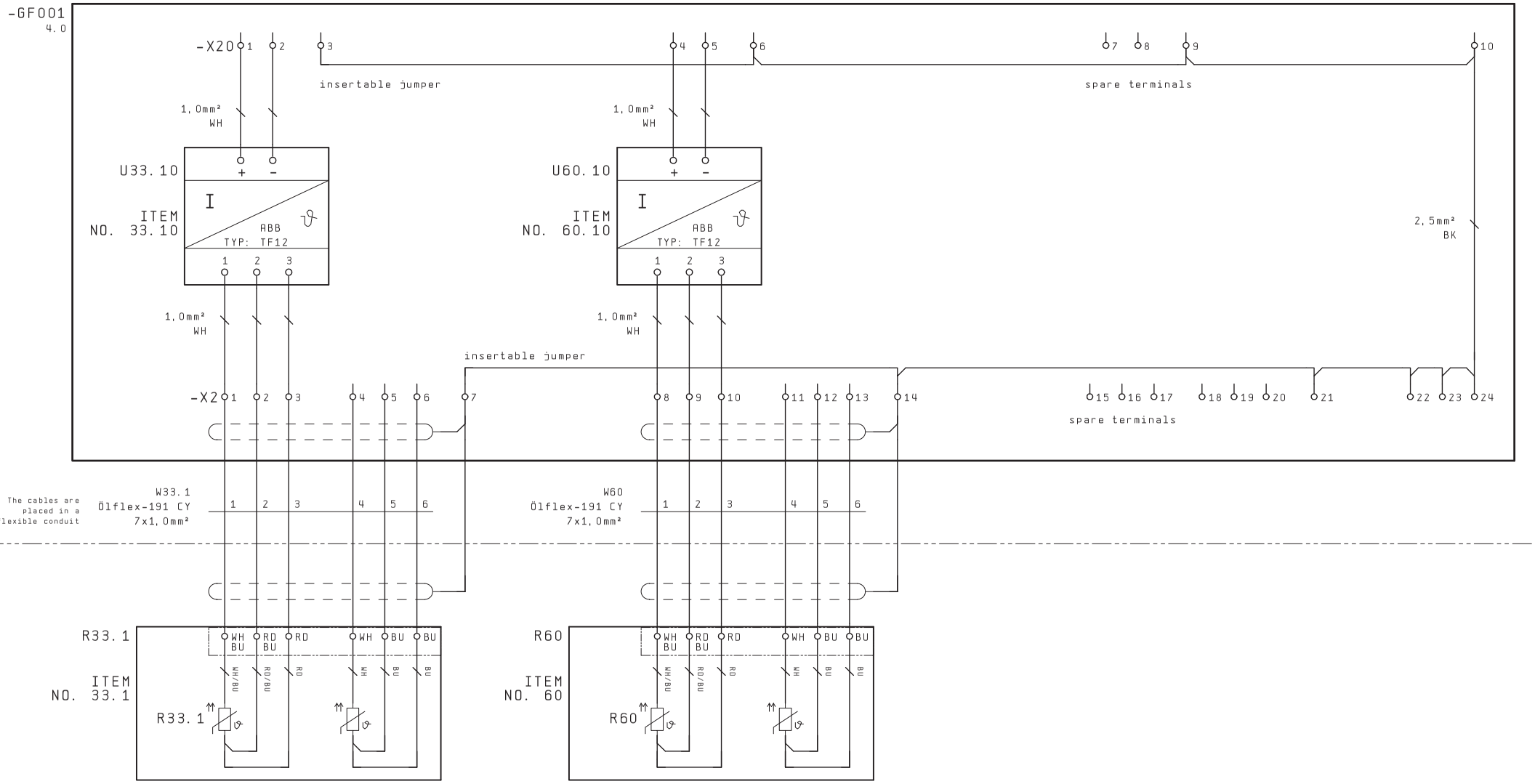
5

1	105750	01.06.10	Ga	Date	03.11.2009	FLOWSERVE APRILIA S1		VOITH TURBO	pressure transmitter	Order no.: 38 002 141
				Editor	Gaugler	562 SVTL 12.1		Dep.: airea-Ga		
				Date	01.06.2010					Page 4
Revisions	Date	Name	Checked			Original	Replacing	Replaced by		Drawing number: 916 003 893 10 en / 15 P.

item no. see oil circuit and measuring point scheme 916 003 844 10

CLIENT

VOITH



working oil temperature
downstream of heat exchanger

11/12 LAC 10/20
CT001 XE01

oil sump temperature

11/12 LAC 10/20
CT002 XE01

4

6

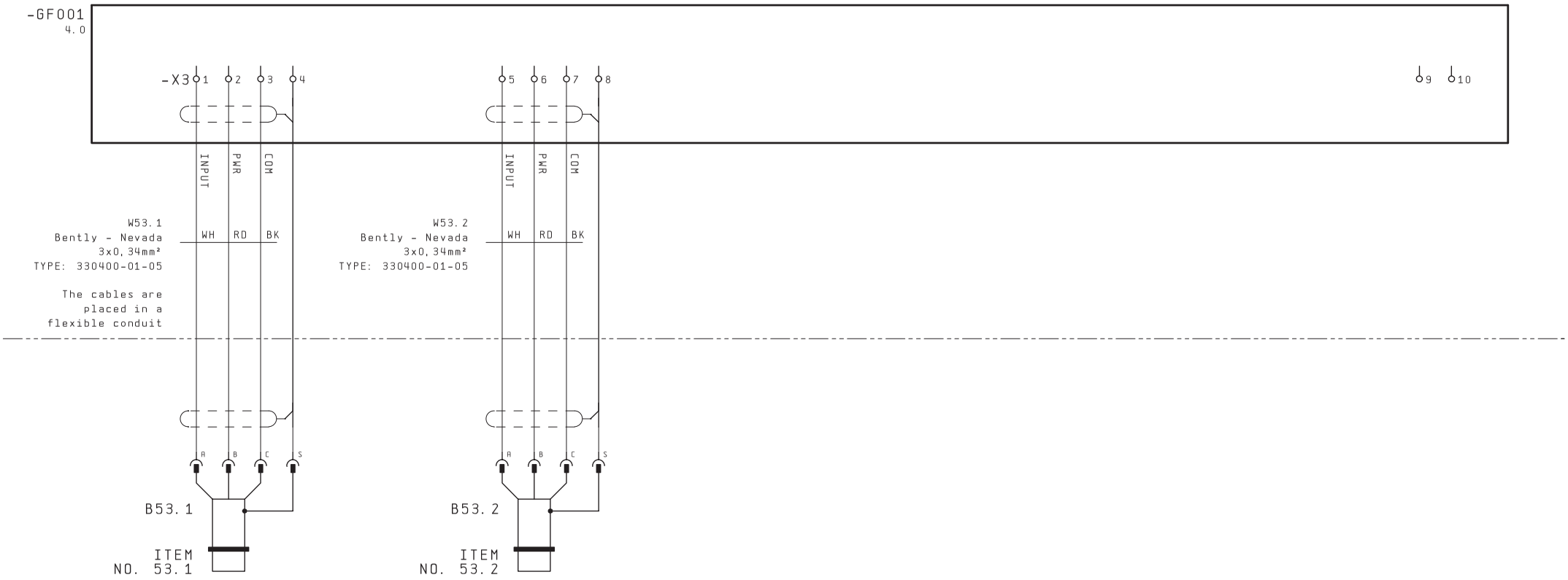
1	105750	01.06.10	Ga	Date	03.11.2009	FLOWSERVE APRILIA S1	VOITH TURBO	resistance thermometer PT100	Order no.: 38 002 141
				Editor	Gaugler	562 SVTL 12.1	Dep.: airea-Ga		
				Date	01.06.2010				Drawing number: 916 003 893 10 en
Revisions	Date	Name	Checked			Original	Replacing	Replaced by	

Page 5
15 P.

item no. see oil circuit and measuring point scheme 916 003 844 10

CLIENT

VOITH



housing vibration
input side

11/12 LAC 10/20
CY008

housing vibration
output side

11/12 LAC 10/20
CY006

5

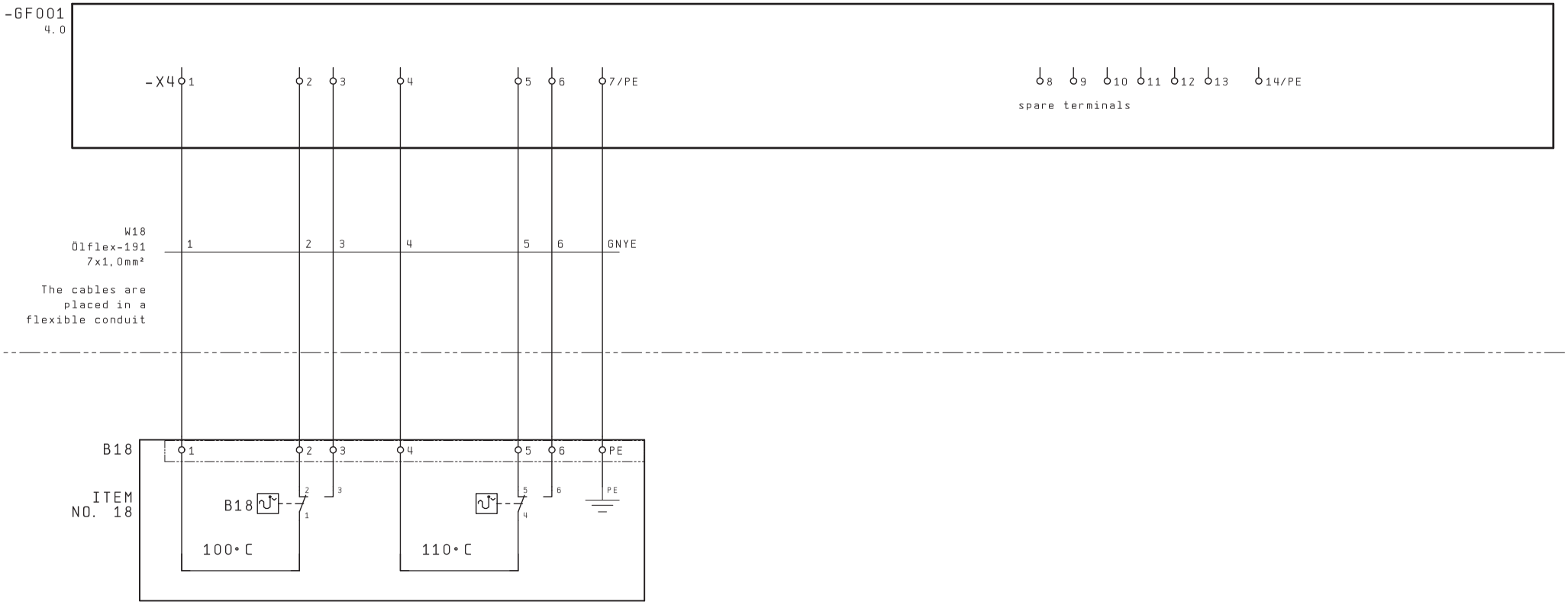
7

1	105750	01.06.10	Ga	Date	03.11.2009	FLOWSERVE APRILIA S1		VOITH TURBO	housing vibration	Order no.: 38 002 141
				Editor	Gaugler	562 SVTL 12.1		Dep.: airea-Ga		
				Date	01.06.2010					Page 6
Revisions	Date	Name	Checked			Original	Replacing	Replaced by		Drawing number: 916 003 893 10 en 15 P.

item no. see oil circuit and measuring point scheme 916 003 844 10

CLIENT

VOITH



working oil temperature
at scoop tube outlet

11/12 LAC 10/20 CT004 XG01

11/12 LAC 10/20 CT004 XG02

6 8

1	105750	01.06.10	Ga	Date	03.11.2009	FLOWSERVE APRILIA S1		VOITH TURBO	temperature switch	Order no.: 38 002 141
				Editor	Gaugler	562 SVTL 12.1		Dep.: airea-Ga		
				Date	01.06.2010					Drawing number: 916 003 893 10 en
Revisions	Date	Name	Checked			Original	Replacing	Replaced by		

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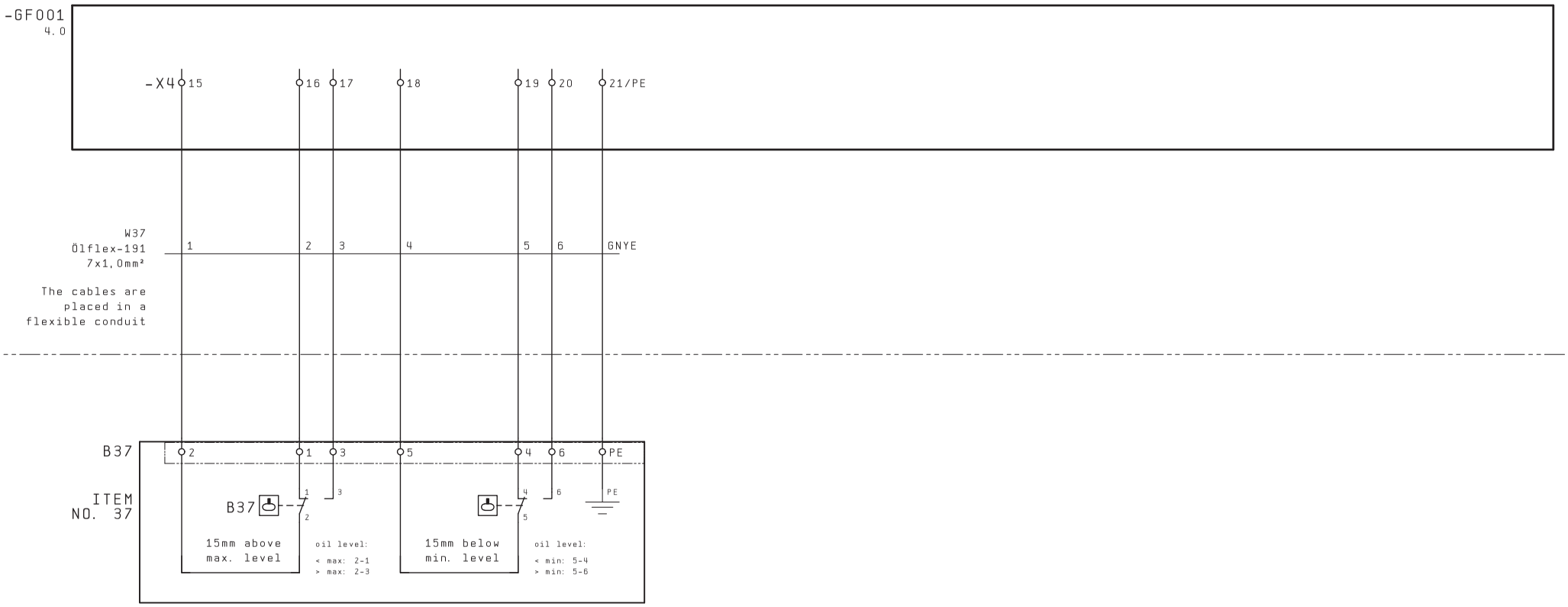
item no. see oil circuit and measuring point scheme 916 003 844 10

CLIENT

VOITH



oil level switch

11/12 LAC 10/20 CL101 XG01

11/12 LAC 10/20 CL101 XG02

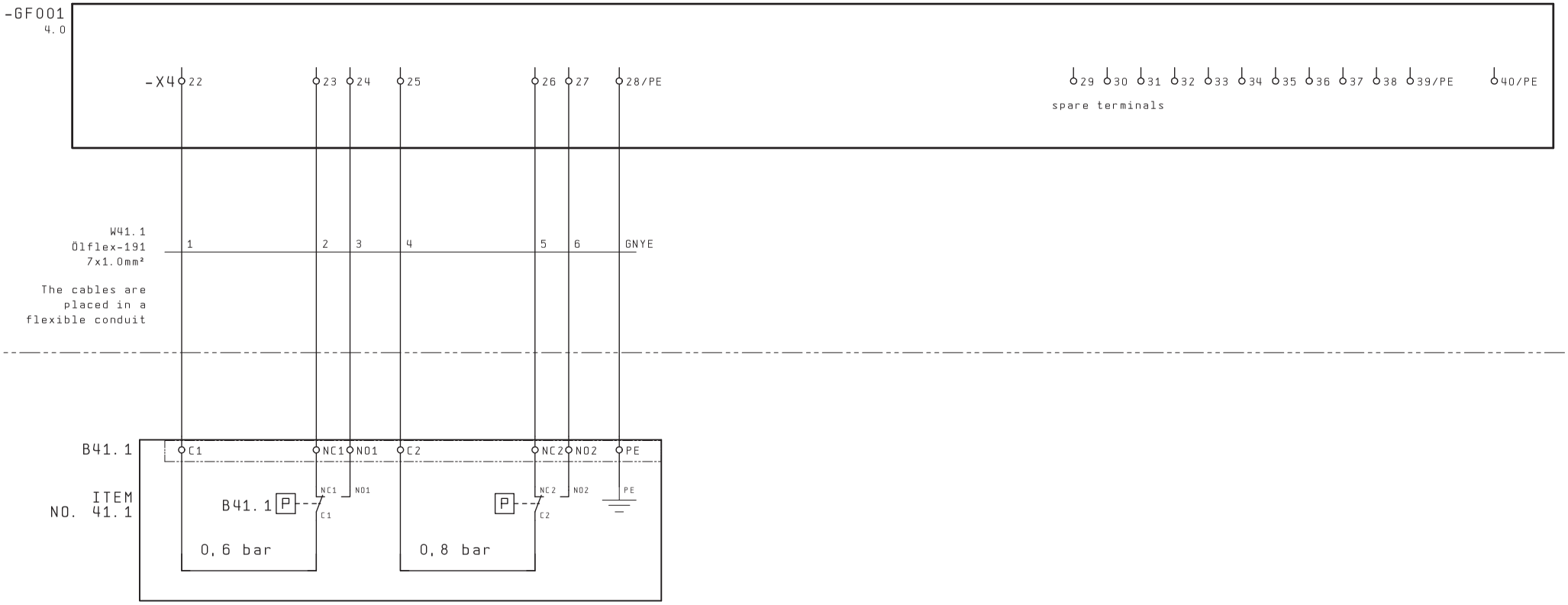
7 9

1	105750	01.06.10	Ga	Date	03.11.2009	FLOWSERVE APRILIA S1	VOITH TURBO	oil level switch	Order no.: 38 002 141
				Editor	Gaugler	562 SVTL 12.1	Dep.: airea-Ga		
				Date	01.06.2010				Page 8
Revisions	Date	Name	Checked			Original / Replacing	Replaced by		Drawing number: 916 003 893 10 en / 15 P.

item no. see oil circuit and measuring point scheme 916 003 844 10

CLIENT

VOITH



differential pressure switch

11/12 LAC 10/20 CP101 XG01

11/12 LAC 10/20 CP101 XG02

8

10

1	105750	01.06.10	Ga	Date	03.11.2009	FLOWSERVE APRILIA S1		VOITH TURBO	differential pressure switch	Order no.: 38 002 141
				Editor	Gaugler	562 SVTL 12.1		Dep.: airea-Ga		
				Date	01.06.2010					Drawing number: 916 003 893 10 en
Revisions	Date	Name	Checked			Original	Replacing	Replaced by		

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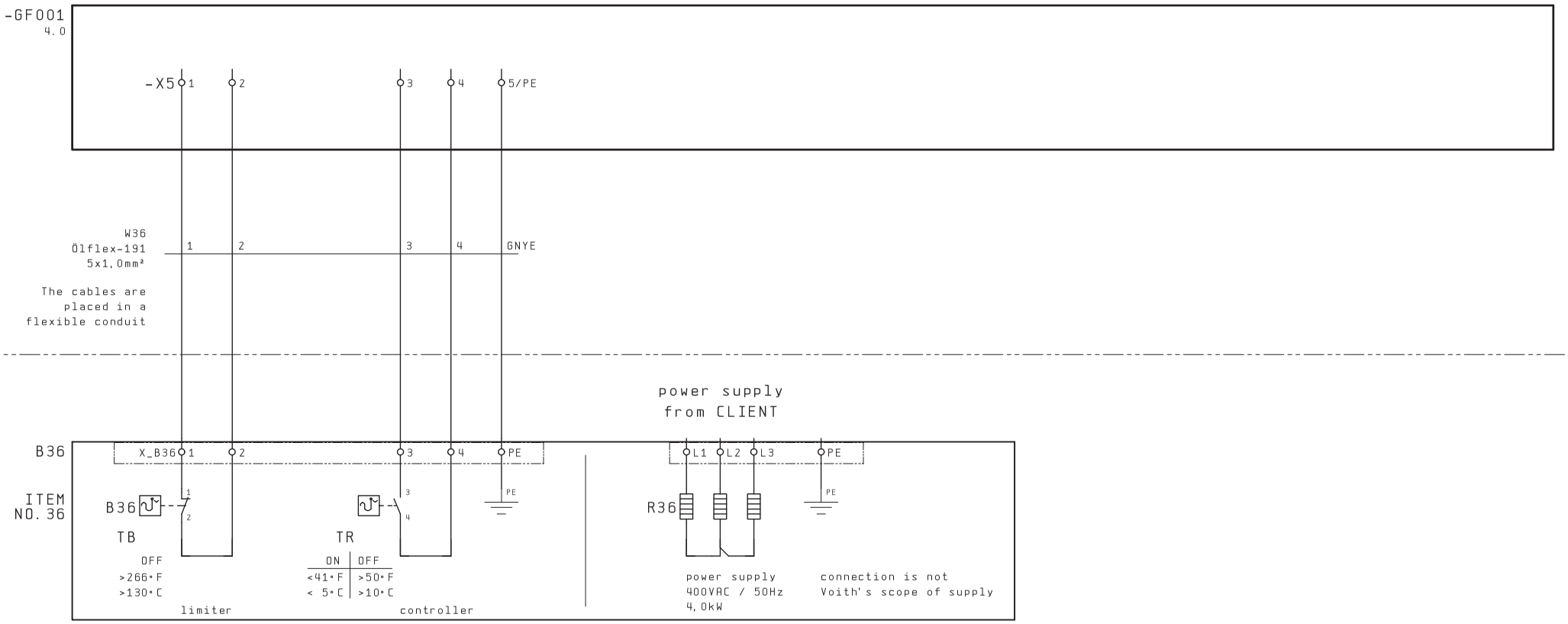
15 P.

item no. see oil circuit and measuring point scheme 916 003 844 10

CLIENT

VOITH



9

11

1	105750	01.06.10	Ga	Date	03.11.2009	FLOWSERVE APRILIA S1	VOITH TURBO	oil sump heating system	Order no.: 38 002 141	=
				Editor	Gaugler	562 SVTL 12.1	Dep.: airea-Ga			+
				Date	01.06.2010					Page 10
Revisions	Date	Name	Checked			Original	Replacing	Replaced by	Drawing number: 916 003 893 10 en	15 P.

item no. see oil circuit and measuring point scheme 916 003 844 10

-GF001
4.0

power supply
230VAC
actuator

12.0/ 1L1.1

12.1/ 1N1.1

insertable jumper

-X11 3 4

-R1
130W

-X11 1 7/PE 2 8/PE

PE

PE-bar

PE PE

1,0mm²
BK

-B1

1

ELDON
ETF300
HEATER ON
<10°C
<50°F
>70 %rH
230VAC
50/60Hz

3 4

1 5 2
L L N

-X11 6 5

1,0mm²
BK

-F1
S4A

-F2
S4A

power supply
230VAC
- speed measuring transducer &
rotation detector -

1,0mm²
BK

-F3
S1A

enclosure heating

1,5mm²
BK

PE PE PE PE-bar

-X10 1 2 3/PE 4/PE 5/PE

PE

E1
MOUNTING PLATE

LINE

NEUTRAL

ATTENTION
VOLTAGE

Note:

Terminal strip: -X10
Supplier: PHOENIX
Type: UK 5 N /
USLKG 5

PE PE-bar

-X12 1 2 3/PE

LINE

NEUTRAL

ATTENTION
VOLTAGE

VOITH

CLIENT W1

delivery, installation,
and connection are not
in Voith's scope of supply

VOITH

VOITH

CLIENT

12.0

F
max.
16A

L N PE

delivery, installation,
and connection are not
in voith's scope of supply

power supply
230VAC/50Hz

1L1.2 /13.1

1N1.2 /13.1

PE /13.2

power supply
230VAC
to junction box
J2

10

12

1	105750 1x	01.06.10	Ga	Date	03.11.2009	FLOWSERVE APRILIA S1	VOITH TURBO	power supply 230VAC /	Order no.: 38 002 141
				Editor	Gaugler	562 SVTL 12.1	Dep.: airea-Ga	cubicle heater	
				Date	01.06.2010				Drawing number: 916 003 893 10 en
Revisions	Date	Name	Checked			Original	Replacing	Replaced by	

Page 11
15 P.

item no. see oil circuit and measuring point scheme 916 003 844 10

CLIENT

11.0

option manual / automatic

delivery, installation, and connection are not in Voith's scope of supply

S+E y+ | S-E y- | S1 manual automatic

X 1 2 3 4 5 6 7 8

control system (DCS)
setvalue 4...20mA | actual value 4...20mA

11/12 LAC 10/20
CG001
YQ01 XQ01

+ - + - PE

W2
delivery, installation, and connection are not in Voith's scope of supply

CLIENT

VOITH
-GF001
4.0

11.1/1L1.1 | 11.2/1N1.1

PE | PE-BAR

1,0mm² BU

connection must be removed at option manual/automatic function

11/12 LAC 10/20
CG101 XB01

-X12 4 5 6/PE

-X6 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18/PE 19/PE

+ - + - 20 21 22 23 24/PE 25/PE

W25/A
Ölflex-191
3x1,0mm²

1 2 GNYE

W25/B
Ölflex-191 CY
18x1,0mm²

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 GNYE

W25/C
Ölflex-191 CY
5x1,0mm²

1 2 3 4 GNYE

Y25

ITEM
NO. 25

HAN 24 E insert

X25 1 13 PE | 3 4 | 5 6 | 7 8 | 15 16 17 | 18 19 | 20 21 | 22 23 | SPARE | SPARE | PE | PE | 9 10 | 11 12 | PE | PE

L N

BE1 BE2 BE3

Uv 24V

RB

I U

POWER SUPPLY
190 ... 260VAC
47,5 ... 63 Hz

potential-free contact max.
60V/150mA

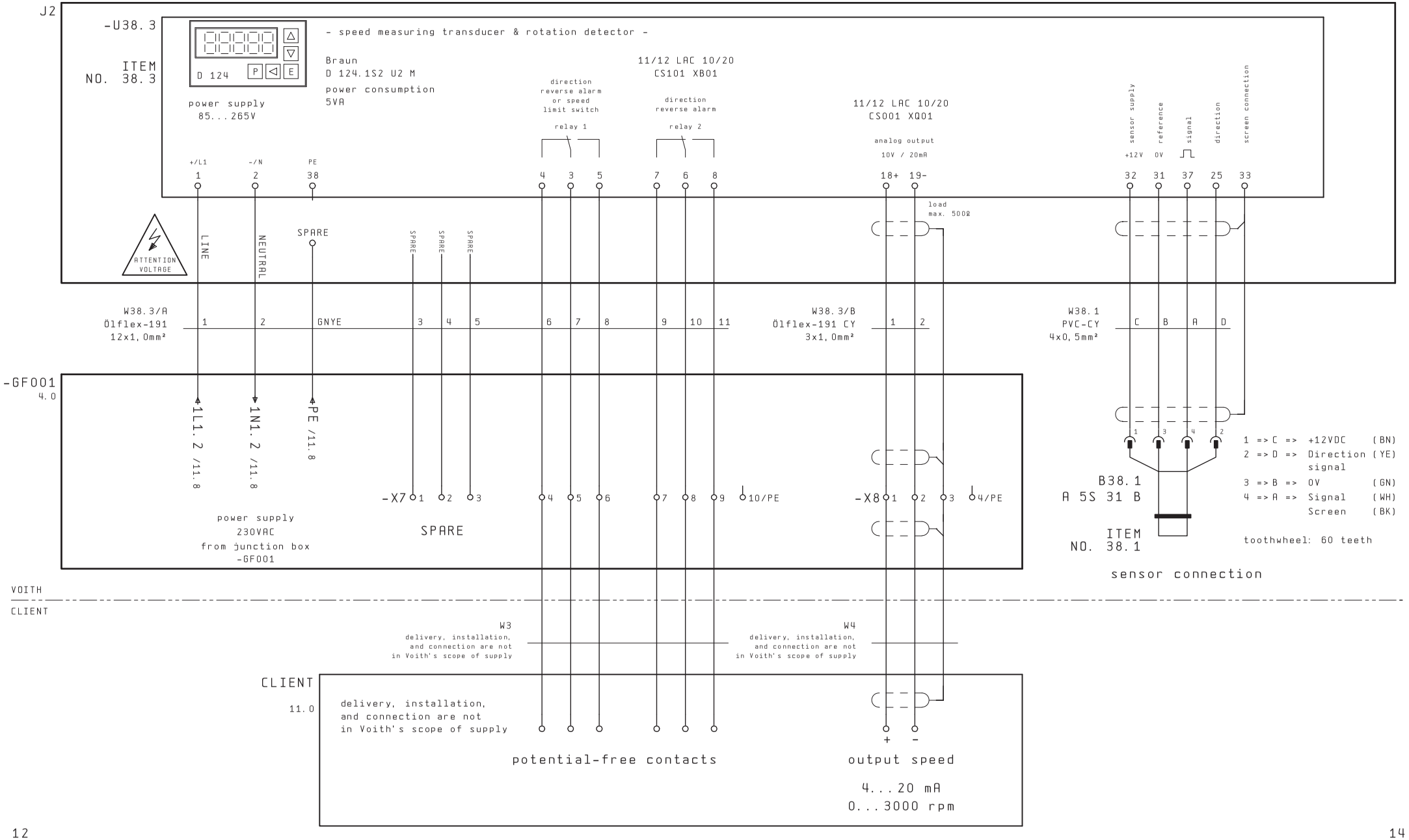
manual automatic | scoop tube position increase | scoop tube position decrease | ready for operation 17-16: ok 17-15: fault | end position 0% | end position 100% | 24VDC | setvalue 4...20mA | actual value 4...20mA

Contrac
Actuator
Type: PME 120 AI

11 actuator 13

1	105750	01.06.10	Ga	Date	03.11.2009	FLOWSERVE APRILIA S1		VOITH TURBO	actuator /	Order no.: 38 002 141	=
				Editor	Gaugler	562 SVTL 12.1		Dep.: airea-Ga	CONTRAC PME 120 AI		+
				Date	01.06.2010					Drawing number: 916 003 893 10 en	Page 12 / 15 P.
Revisions		Date	Name	Checked		Original	Replacing	Replaced by			

item no. see oil circuit and measuring point scheme 916 003 844 10

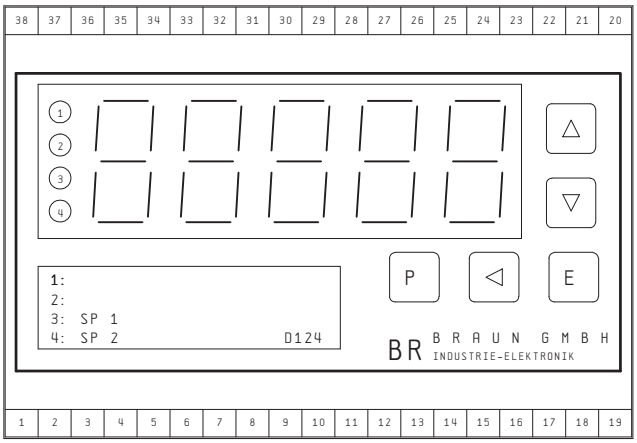


1	105750	01.06.10	Ga	Date	03.11.2009	FLOWSERVE APRILIA S1	VOITH TURBO	power supply 230VAC / speed measuring transducer & rotation detector	Order no.: 38 002 141
				Editor	Gaugler	562 SVTL 12.1	Dep.: airea-Ga		
				Date	01.06.2010				Drawing number: 916 003 893 10 en
Revisions	Date	Name	Checked			Original / Replacing	Replaced by		Page 13 / 15 P.

Short Form Programming Instructions

Procedure

- To enter the programming phase, press both E and P keys simultaneously.
- Select program group or step No. by keys △ (for next), ▽ (for previous).
- Switch between group and step select by key ◁.
- Enter parameter by key E.
- Select digit by key ◁ .
- Adjust figure by key △ (to increase), or ▽ (to decrease).
- Acknowledge by key E.
- Return to operation by key P.



Summary of parameters, and detailed information in selection "Programming" - instruction manual.

Step No.	program-comments on page	parameter function	data set on delivery (initial data)	actual parameter
P00.00	6	access code request	0000	0000
.01	6	new code figure	0000	0000
.02	6	lock status (1 = unlocked, 0 = locked)	1=unlocked	1
.03	6	minimum measuring time (see table)	3=0,4s	4
P01.00	7	scaling: decimals of input signal frequency	0 = none	0
.01	7	value of nominal input frequency (Hz)	00100	03000
.02	7	decimals of corresponding speed	0 = none	0
.03	7	corresponding speed (unit as desired)	00100	03000
.04	7	low end of speed range	00001	00000
P02.00	8	LSDs on zero (least significant digit)	0 = none	0
.01	8	Display updating sequence	0,3 (sec)	0.3
.02	8	Direction output assigned to no-power condition (0=forw,1=rev)	1=reverse	0
.03	8	minimum no of reverse pulses to release reverse alarm	05	05
.04	8	time periode for reset of reverse pulse counter (XXX seconds)	010 sec	010
.05	8	forced direction at zero speed (0=no, 1=forw, 2=rev)	0 = no	0
.06	8	reverse alarm latched unit resetted (0=no, 1=yes)	0 = no	0
P03.00	9	analog output: high end speed value	10000	03000
.01	9	low end speed value	00000	00000
.02	9	zero level (0=dead zero, 1=live zero)	0	1
.03	9	signal voltage (0), current (1) (do not fail to set DIP switch accordingly)	1 (current)	1
P04.00	9	setpoint (SP1) in unit as programmed for display	01000	03100
.01	9	hysteresis bandwidth (XX % of SP1)	05 (%)	0,5
.02	9	hysteresis location (0=above, 1=below, 2=symm.)	1=below SP	1
.03	10	alarm output assigned to "no-power" (see table)	0 <SP	0
.04	10	alarm output assigned to starter phase	0 <SP	0
.05	10	time elapse of starter phase (XXX sec)	000 (sec)	000
.06	10	function of output SP1 (0= setpoint SP1, 1=rev. alarm SP2)	0=setpoint	1
P05.00	10	Data Interface baud rate (see table)	1 = 9600	0
.01	10	"my name" in communication	001	001

Note: Program group P05 ... is irrelevant without the data interface option.

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Order no.: 38 002 141

Drawing number: 916 003 893 10 en

parameterlist Braun D 124

VOITH TURBO Dep.: airea-Ga

FLOWSERVE APRILIA S1 562 SVTL 12.1

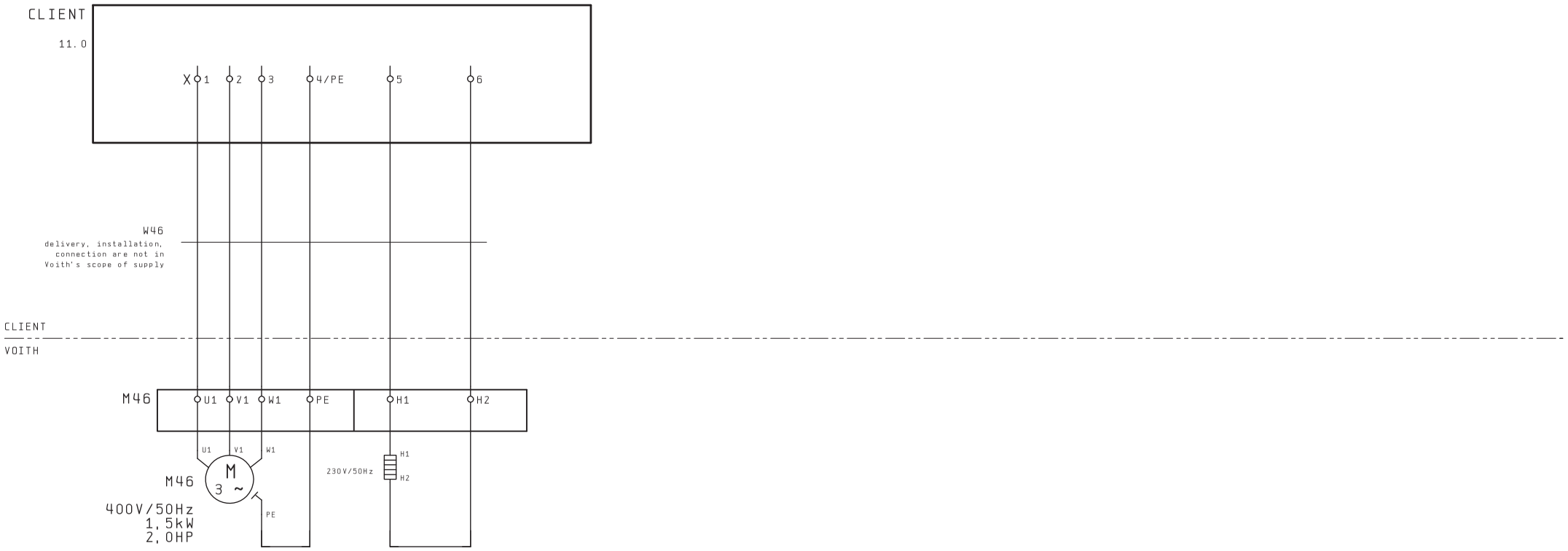
Replaced by | Replacing | Original

Revisions	Date	Name	Checked	Date	Editor	Date	Ga
1 105750	01.06.10			01.06.2010	Gaugler	03.11.2009	

item no. see oil circuit and measuring point scheme 916 003 844 10

CLIENT

- PROPOSAL FOR WIRING -



ITEM NO. 46

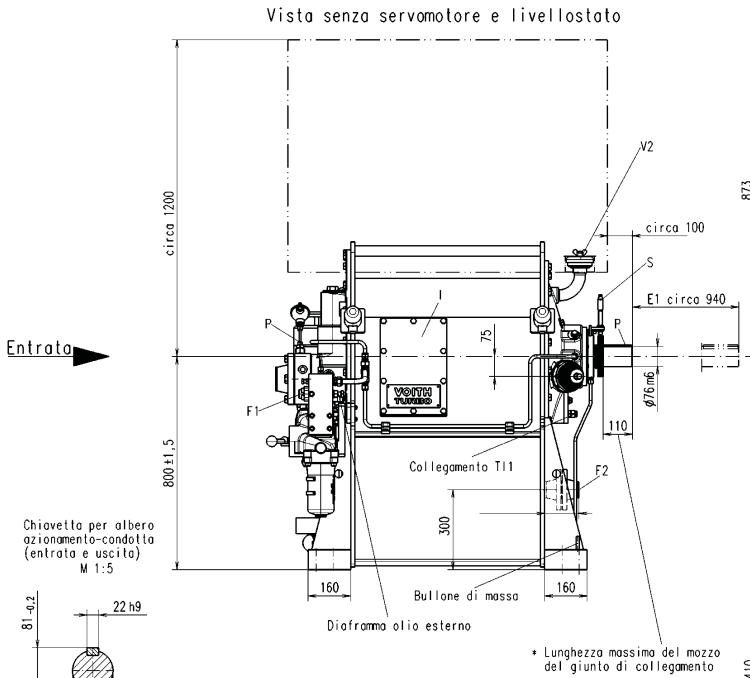
auxiliary lube oil pump

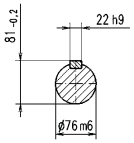
space heater

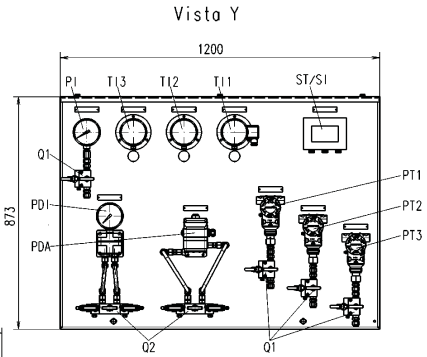
11/12 LAC 10/20
AP002-M01

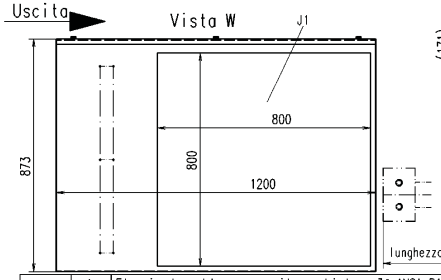
14

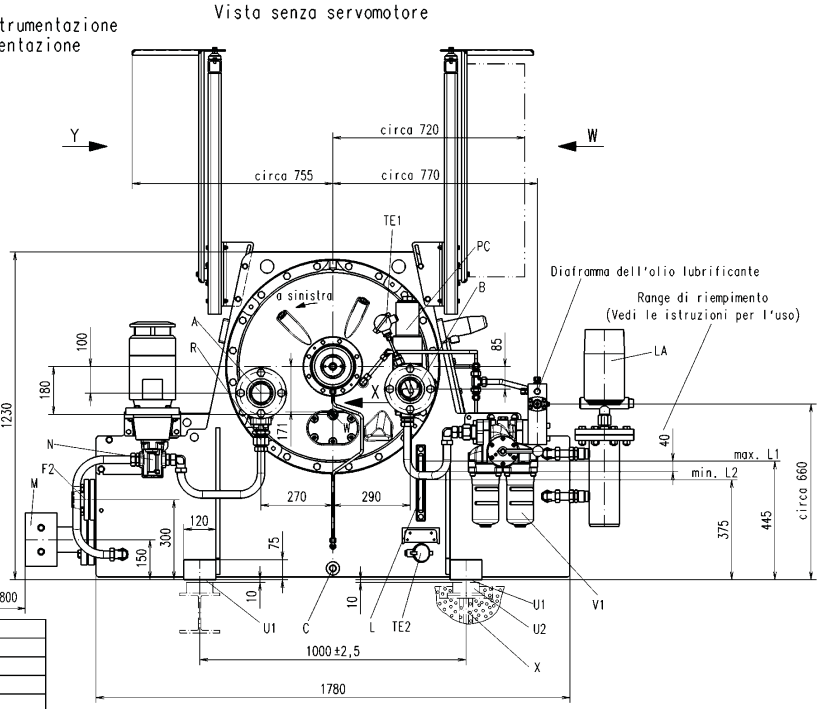
1	105750	01.06.10	Ga	Date	03.11.2009	FLOWSERVE APRILIA S1		VOITH TURBO	auxiliary lube oil pump	Order no.: 38 002 141
				Editor	Gaugler	562 SVTL 12.1		Dep.: airea-Ga		
				Date	01.06.2010					Page 15
Revisions	Date	Name	Checked			Original	Replacing	Replaced by		Drawing number: 916 003 893 10 en 15 P.

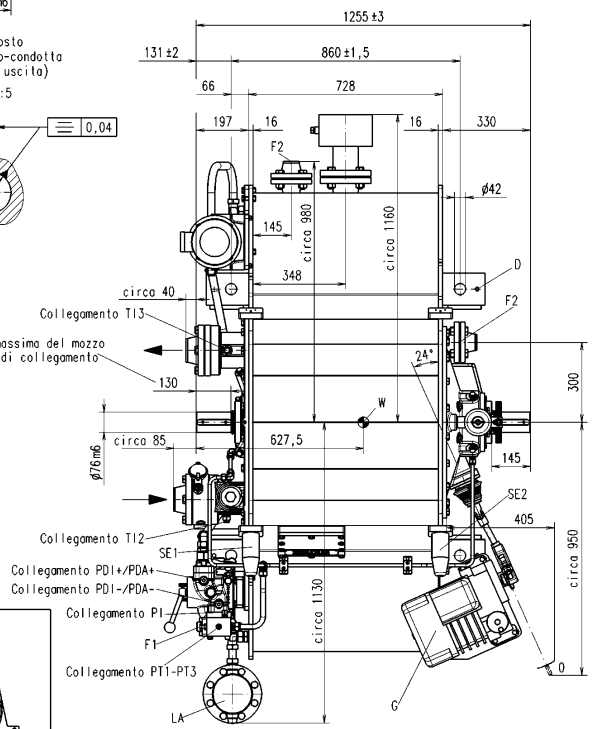


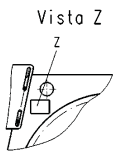


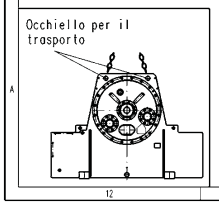


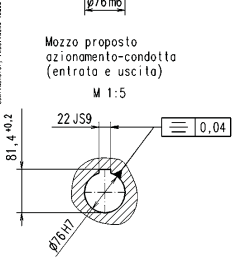












N° dello schema del circuito dell'olio e dei punti di misurazione 916003844 10

	A	Flangia da saldare verso il scambiatore 3" ANSI B16.5 150LBS
	B	Flangia da saldare dal scambiatore 3" ANSI B16.5 150LBS
09	C	Tappo di scarico olio G 1 1/4
	D	Filetto per vite di regolazione M16
	E1	Lunghezza di smontaggio (parti girante)
46.4	F1	Uscita dell'olio esterno flangia da saldare 1" SAE
46.6/46.7	F2	Ritorno dell'olio esterno flangia da saldare 2" ANSI B16.5 150LBS
25	G	Servomotore Contrac PME 120 AI
	I	Coperchio per ispezioni
	J1	Morsettiera
08	L	Tubo di livello olio
	L1	Livello dell'olio a posizione 0% del tubo captatore in esercizio
	L2	Livello dell'olio a posizione 100% del tubo captatore in esercizio
37	LA	Livellostato olio
36	M	Aerotermo con regolatore e limitatore
46	N	Pompa ausiliaria di lubrificazione
	O	Spazio per lo smontaggio del tubo captatore
	P	Chiavetta AS22x14x130 DIN 6885/1
46.3	PC	Valvola sequenziale
41.1	PDA	Pressostato differenziale
41	PDI	Manometro differenziale
16	PI	Manometro
17	PT1	Trasmettitore di pressione
17.1	PT2	Trasmettitore di pressione
17.2	PT3	Trasmettitore di pressione
55.1	Q1	Blocco valvole doppio
55.3	Q2	Blocco valvole quintuplo
46.1	R	Valvola di non ritorno
38.1	S	Rilevatore di giri
38.3	ST/SI	Trasduttore di giri con indicatore e rilevatore di rotaz. inversa
53.1	SE1	Trasduttore di accellerazione
53.2	SE2	Trasduttore di accellerazione
33.1	TE1	Termometro a resistenza (olio dopo il radiatore)
60	TE2	Termometro a resistenza (Temperatura coppa dell'olio)
18	TI1	Teletermometro a quadrante (uscita olio tubo captatore)
33	TI2	Termometro a quadrante (temperatura di lavoro dell'olio dopo lo scambiatore di calore)
35	TI3	Termometro a quadrante (temperatura di lavoro dell'olio prima dello scambiatore di calore)
	U1	Lamierino di spessore di 10 mm per le fondazioni
	U2	Guida fondazioni/piastra fondazioni (non fornitura Voith)
42	V1	Filtro doppio
07	V2	Filtro di sfiato e possibilità di riempimento
	W	Baricentro senza olio
	X	Bullone da fondazione M36x630 DIN 529
	Z	Targhetta tipo

Il volume d'olio del radiatore e quello delle tubazioni non fa parte della quantità di riempimento

Tolleranza collegamento tubo secondo EN ISO 13920-D

Applicare delle coperture per parti in rotazione che siano conformi alle prescrizioni legali!

Il turbogiunto è una macchina con tubazioni scambiatori e serbatoio olio a semplice parete per l'olio minerale. Eventuali prescrizioni ambientali supplementari vanno definite sull'impianto!

*)
Per potenze d'uscita oltre 2000 kW il materiale del mozzo dei giunti di collegamento deve avere un limite di snervamento di almeno 500 N/mm.
La lunghezza mozzo deve essere di 120 mm.

Superfici scottanti
Tubazioni, zone carter e del serbatoio olio durante l'esercizio della macchina raggiungono temperature di oltre 60 °C.
Se necessario, il cliente deve prevedere dispositivi di protezione contro il contatto di superfici scottanti.

Grandezza		562
Carico dovuto al peso		
Olio nel serbatoio	(l)	500
Olio nelle parti in rotazione	(l)	36
Peso complessivo senza olio	(kg)	1260
Parti in rotazione con olio	(kg)	296

Momento d'inerzia di massaJ (kgm^2)		
Primario con olio	(kgm^2)	11,59
Secondario con olio	(kgm^2)	1,46

Carico dinamico delle fondazioni F dyn (N)		
f dyn ≤ ne/60	(Hz)	
F dyn = y $(ne/1500)^2$	(N)	y=445

Vibrazioni secondo foglio C81

Corsa tubo captatore		
senso di rotazione sinistrorso	(mm)	145

Flowserve Aprilia S1

562 SVTL 12.1
Ordine N°.: 38002141

76 m6	+0,030 / +0,011	
76 H7	+0,030 / 0	
22 h9	0 / -0,052	
22 JS9	+0,026 / -0,026	

Dimension / Tolerances

	Date	Name
Dr.	2009-10-21	TSti
Ch.	2009-10-26	Leh
Appl.	airek	Met
Standard		

Doc. type: Z01

Title: Giunto di regolazione
Disegno dimensionale

Drawing No. / Dwg.-No.: 91500311610

Refer.: 91500189410

Scale of orig.: 1:10(1:5)

Language: it — de en it

CAD

Released for micro: F

Material

Pattern / Die No.

Blank-No.

Mass

Sheet 1 of 1 Sh.

DIN A1

Rev.	Iss.	Revision-Nr.	Rev. descr. (shop and eng. info only)	Index	Date: draw.	Name	App.

12 Distinta pezzi

12.1 Elenco delle distinte pezzi

Denominazione disegno / Nr. disegno	Raggrup-pamento disegno	Nr. SAP
"Disegni in sezione Foglio 1 - 3/20400308810"	04	215.000607 / Foglio 1-4
"Montaggio/servomotore 20400523710"	06	215.000607 / Foglio 5

VOITH	Teileliste zur Betriebsanleitung Intitolazione delle istruzioni per l'uso		Betriebsanl.-Nr.: Num. manuale istruzi	Datum: 28.05.2010 Data
	Kennwort: Codice: Flowserve Aprilia S 1	Typ: Tipo:	Mat.-Nummer: Material No. 215.000607	Rev.: 0 Rev.:
	Auftrags-Nr.: Numero d'ordine 38002141	562 SVTL 12.1	Zeichnungs-Nr.: N° disegno 20400308810 Blatt: Foglio 1 - 3	Gruppe Gruppo 04 / Seite Pagina 1/ 5

Zeichnungs-Pos.-Nr. Codice parte di rica	Menge Quantità	ME UM	Materialnummer Numero materiale	Benennung Denominazione	Fremdbenennung italiano	Zeichnungsgrp. Gruppo disegni	Ersatzteilkz. Codice parte
0101/0010/0010	1	ST	TCR.42012360	Schale	GUSCIO	04	
0101/0010/0020	1	ST	TCR.42012370	Schalendeckel	Coperchio del carter	04	
0101/0010/0030	1	ST	TCR.42012340	Primaer-Rad	Ruota primaria complet	04	
0101/0010/0030/0020	2	ST	TCR.41347470	Schmelzsichergs.Schrau	VITE.VALV.FUSIBILE	04	C1
0101/0010/0030/0030	2	ST	TCR.03658018	Dichtring	ANELLO DI TENUTA	04	C1
0101/0010/0040	96	ST	TCR.40798620	Schraube Gewichtst.	Vite calibrata	04	C3
0101/0010/0050	96	ST	TCR.03111105	Federscheibe	ROSETTA ELASTICA	04	C3
0101/0010/0060	1	ST	204.00043000	Primaerwelle	ALBERO	04	
0101/0010/0070	18	ST	TCR.03014855	Zylinderschraube	VITE A TESTA CIL.	04	C3
0101/0010/0080	1	ST	TCR.41918880	Lagerhaltering	ANELLO FERMO CUSCI	04	
0101/0010/0090	1	ST	TCR.42012350	Fangrinne	canaletta lubrificazio	04	
0101/0010/0100	12	ST	TCR.40747300	Zylinderschraube	VITE A TESTA CIL.	04	
0101/0010/0110	12	ST	TCR.03110008	Federscheibe	ROSETTA ELASTICA	04	C3
0101/0050	1	ST	TCR.49836122	Zylinderrollenlager	CUSC. A RULLI CIL.	04	B1
0101/0060	1	ST	TCR.03170110	Sicherungsring	ANELLO DI SICUREZZA	04	C3
0101/0070	1	ST	TCR.03160070	Passfeder	LINGUETTA	04	L5
0101/0080	1	ST	TCR.03170092	Sicherungsring	ANELLO DI SICUREZZA	04	C3
0101/0130	2	ST	TCR.03015081	Zylinderschraube	VITE A TESTA CIL.	04	
0101/0150	1	ST	TCR.41920430	Haltescheibe	DISCO DI FERMO	04	L5
0101/0151	6	ST	TCR.03016030	Zylinderschraube	VITE A TESTA CIL.	04	C3
0101/0190	1	ST	TCR.03309575	Zylinderrollenlager	CUSC. A RULLI CIL.	04	B1
0101/0200	1	ST	TCR.03170080	Sicherungsring	ANELLO DI SICUREZZA	04	C3
0101/0210	1	ST	TCR.03374016	Sicherungsblech	ROSETTA DI SICUREZ.	04	C3
0101/0220	1	ST	TCR.03372016	Nutmutter	GHIERA CON INTAGLI	04	C3
0101/0230	1	ST	TCR.41918700	Sekundaerwelle	ALBERO SECONDARIO	04	L6
0101/0240	1	ST	TCR.41918690	Sekundaerrad	RUOTA SECONDARIA	04	L6
0101/0241	1	ST	204.00202500	Haltescheibe	DISCO DI FERMO	04	L6
0101/0250	18	ST	TCR.03014855	Zylinderschraube	VITE A TESTA CIL.	04	C3

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	Kennwort: Codice: Flowserve Aprilia S 1 / Typ: Tipo:	Mat.-Nummer: Material No. 215.000607	Rev.: 0 Rev.:
	Auftrags-Nr.: Numero d'ordine 38002141 / 562 SVTL 12.1	Zeichnungs-Nr.: N° disegno 20400308810 / Blatt: Foglio 1 - 3	Gruppe Gruppo 04 / Seite Pagina 2/ 5

Zeichnungs-Pos.-Nr. Codice parte di rica	Menge Quantità	ME UM	Materialnummer Numero materiale	Benennung Denominazione	Fremdbenennung italiano	Zeichnungsgrp. Gruppo disegni	Ersatzteilkz. Codice parte
0101/0270	2	ST	TCR.49906043	Schraegkugellager	CUSC. OBL. A SFERE	04	B1
0101/0280	1	ST	TCR.41920440	Haltescheibe	DISCO DI FERMO	04	L6
0101/0290	4	ST	TCR.03016049	Zylinderschraube	VITE A TESTA CIL.	04	C3
0101/0300	2	ST	TCR.03310066	Schraegkugellager	CUSC. OBL. A SFERE	04	B1
0101/0305	1	ST	TCR.03166080	Stuetzscheibe	ROSETTA DI APPOGGIO	04	C3
0101/0310	2	ST	TCR.03160241	Passfeder	LINGUETTA	04	L6
0101/0320	1	ST	TCR.40595990	Deckel	COPERCHIO	04	
0101/0500	1	ST	TCR.4192278004	Isolierscheibe	DISCO ISOLANTE	04	C3
0201/0010	1	ST	TCR.41921690	Schoepfrohrgehaeuse	SCATOLA DELLO SCOOP	04	
0201/0020	40	ST	TCR.03002290	Sechskantschraube	VITE A T.E.	04	
0201/0030	1	ST	TCR.03682033	Wellendichtring	ANELLO TENUTA ALB.	04	C3
0201/0040	1	ST	TCR.40140340	Deckel	COPERCHIO	04	
0201/0045	1	ST	TCR.03130014	Spannstift	SPINA ELASTICA	04	C3
0201/0050	4	ST	TCR.03014065	Zylinderschraube	VITE A TESTA CIL.	04	
0201/0060	1	ST	TCR.40140360	Faltenbalg	SOFFIETTO	04	C3
0201/0070	2	ST	TCR.41918910	Labyrinthdeckel	COPERCHIO A LABIR.	04	
0201/0071	2	ST	TCR.03032931	W-Verschraub.Einst.	Raccordo a W	04	
0201/0072	2	ST	TCR.03032162	Verschraubung	RACCORDO FILETTATO	04	
0201/0073	1	ST	204.00442310	Rohrleitungssatz	Set di tubazioni	04	
0201/0080	2	ST	TCR.03645203	Runddichtring	ANELLO DI TENUTA	04	C3
0201/0090	16	ST	TCR.03658008	Dichtring	ANELLO DI TENUTA	04	C3
0201/0100	16	ST	TCR.03002065	Sechskantschraube	VITE A T.E.	04	
0201/0110	1	ST	TCR.03171170	Sicherungsring	ANELLO DI SICUREZZA	04	C3
0201/0120	1	ST	H01.028688	Verschlussschraube	TAPPO A VITE	04	
0201/0130	1	ST	TCR.40564670	Flansch	FLANGIA	04	
0201/0140	4	ST	TCR.03015029	Zylinderschraube	VITE A TESTA CIL.	04	
0201/0150	1	ST	TCR.42052210	Pumpengehaeuse	CORPO DELLA POMPA	04	
0201/0160	1	ST	TCR.40436530	Pumpendeckel	COPERCHIO POMPA	04	

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	Auftrags-Nr.: Numero d'ordine 38002141	562 SVTL 12.1	Zeichnungs-Nr.: N° disegno 20400308810 Blatt: Foglio 1 - 3	Gruppe Gruppo 04 / Seite Pagina 3/ 5

Zeichnungs-Pos.-Nr. Codice parte di rica	Menge Quantità	ME UM	Materialnummer Numero materiale	Benennung Denominazione	Fremdbenennung italiano	Zeichnungsgrp. Gruppo disegni	Ersatzteilkz. Codice parte
0201/0170	6	ST	TCR.03015032	Zylinderschraube	VITE A TESTA CIL.	04	
0201/0180	1	ST	204.00058900	Deckscheibe	DISCO DI COPERTURA	04	
0201/0190	13	ST	TCR.03015029	Zylinderschraube	VITE A TESTA CIL.	04	
0201/0220	8	ST	TCR.03040260	Verschlussschraube	TAPPO A VITE	04	
0201/0225	8	ST	TCR.03658021	Dichtring	ANELLO DI TENUTA	04	C3
0201/0230	1	ST	TCR.42052600	Befuellleitung	Tubo di riempimento	04	
0201/0240	12	ST	TCR.03015034	Zylinderschraube	VITE A TESTA CIL.	04	
0201/0245	12	ST	TCR.03110008	Federscheibe	ROSETTA ELASTICA	04	C3
0201/0250	1	ST	TCR.03130060	Spann-Stift	Spina elastica	04	C3
0201/0260	3	ST	TCR.03048500	Gewindestift	VITE SENZA TESTA	04	
0301/0010	1	ST	TCR.42030800	Duesenschraube	VITE CON FORELLINO	04	
0301/0020	1	ST	TCR.03040283	Verschlussschraube	TAPPO A VITE	04	
0301/0030	1	ST	TCR.03114213	Sicherungsblech	ROSETTA DI SICUREZ.	04	C3
0301/0040	1	ST	TCR.41895820	Winkel	RACC. FIL. AD ANGOL	04	
0301/0050	1	ST	TCR.4188931001	Entlueftungs-Filter	Filtro di sfiato	04	
0401/0010	1	ST	TCR.42589770	Gehaeuse	CARTER	04	
0401/0020	1	ST	TCR.10381520	Deckel	COPERCHIO	04	
0401/0030	10	ST	TCR.03002208	Sechskantschraube	VITE A T.E.	04	
0401/0040	1	ST	TCR.03040253	Verschlussschraube	TAPPO A VITE	04	
0401/0050	1	ST	TCR.03658042	Dichtring	ANELLO DI TENUTA	04	C3
0401/0060	1	ST	TCR.41922700	Saugrohr	TUBO ASPIRANTE	04	
0401/0070	1	ST	TCR.21241230	Fluess.Standanzeige	indicat. livello fluid	04	L12
0401/0080	3	ST	TCR.03040237	Verschlussschraube	TAPPO A VITE	04	
0401/0090	3	ST	TCR.03658033	Dichtring	ANELLO DI TENUTA	04	C3
0401/0170	1	ST	TCR.03040260	Verschlussschraube	TAPPO A VITE	04	
0401/0180	1	ST	TCR.03658021	Dichtring	ANELLO DI TENUTA	04	C3
0501/0010	2	ST	TCR.40701280	Gleitlager	CUSC.A STRISCIAM.	04	B2
0501/0015	2	ST	TCR.40701280	Gleitlager	CUSC.A STRISCIAM.	04	B2

VOITH	Teileliste zur Betriebsanleitung Intitolazione delle istruzioni per l'uso		Betriebsanl.-Nr.: Num. manuale istruzi	Datum: 28.05.2010 Data
	Kennwort: Codice: Flowserve Aprilia S 1	Typ: Tipo:	Mat.-Nummer: Material No. 215.000607	Rev.: 0 Rev.:
	Auftrags-Nr.: Numero d'ordine 38002141	562 SVTL 12.1	Zeichnungs-Nr.: N° disegno 20400308810 Blatt: Foglio 1 - 3	Gruppe Gruppo 04 / Seite Pagina 4/ 5

Zeichnungs-Pos.-Nr. Codice parte di rica	Menge Quantità	ME UM	Materialnummer Numero materiale	Benennung Denominazione	Fremdbenennung italiano	Zeichnungsgrp. Gruppo disegni	Ersatzteilkz. Codice parte
0501/0020	1	ST	TCR.42205120	Antriebsritzel	PIGNONE D'ENTRATA	04	
0501/0030	1	ST	TCR.41917680	Ritzel	PIGNONE	04	
0501/0040	1	ST	TCR.03014844	Zylinderschraube	VITE A TESTA CIL.	04	
0501/0050	2	ST	TCR.03130039	Spann-Stift	Spina elastica	04	C3
0601/0010	1	ST	204.00046300	Stirnrad	RUOTA CILINDRICA	04	
0601/0020	1	ST	TCR.42205100	Stirnrad	RUOTA CILINDRICA	04	
0701/0010	1	ST	TCR.41326540	Schoepfrohr	Tubo pescante	04	L13
0701/0020	1	ST	TCR.41718020	Huelse	BUSSOLA	04	L13
0701/0030	1	ST	TCR.03130055	Spann-Stift	Spina elastica	04	L13
0801/0010	1	ST	TCR.41753100	Ventilkolben	PISTONE D.VALVOLA	04	B6
0801/0020	1	ST	TCR.41768860	Einstellschraube	VITE DI REGOLAZIONE	04	
0801/0030	1	ST	TCR.03210108	Druckfeder	MOLLA	04	C3
0801/0040	1	ST	TCR.40378300	Verschlussschraube	TAPPO A VITE	04	
0801/0050	1	ST	TCR.03658065	Dichtring	ANELLO DI TENUTA	04	C3
0801/0060	1	ST	204.00305410	Rueckschlagventil	VALVOLA NON RITORNO	04	
0801/0070	1	ST	TCR.03171115	Sicherungsring	ANELLO DI SICUREZZA	04	C3
0801/0080	1	ST	TCR.03048030	Gewindestift	VITE SENZA TESTA	04	
3000/0010	2	ST	TCR.41405740	V-Ring	ANELLO A SEZ. A V	04	C3

VOITH	Teileliste zur Betriebsanleitung Intitolazione delle istruzioni per l'uso		Betriebsanl.-Nr.: Num. manuale istruzi	Datum: 28.05.2010 Data
	Kennwort: Codice: Flowserve Aprilia S 1	Typ: Tipo:	Mat.-Nummer: Material No. 215.000607	Rev.: 0 Rev.:
	Auftrags-Nr.: Numero d'ordine 38002141	562 SVTL 12.1	Zeichnungs-Nr.: N° disegno 20400523710 Blatt: Foglio 1	Gruppe Gruppo 06 / Seite Pagina 5/ 5

Zeichnungs-Pos.-Nr. Codice parte di rica	Menge Quantità	ME UM	Materialnummer Numero materiale	Benennung Denominazione	Fremdbenennung italiano	Zeichnungsgrp. Gruppo disegni	Ersatzteilkz. Codice parte
7800/0010	1	ST	TCR.4255861003	Stellgetriebe	Ingranaggio di regol.	06	L14
7800/0020	1	ST	TCR.42452210	Konsole	MENSOLA	06	
7800/0030	1	ST	TCR.41707820	Hebel	LEVA	06	
7800/0040	1	ST	TCR.03002228	Sechskantschraube	VITE A T.E.	06	
7800/0050	1	ST	TCR.03072012	Sechskantmutter	DADO ESAGONALE	06	
7800/0060	1	ST	TCR.41718470	Bolzen	PERNO	06	
7800/0070	1	ST	TCR.03072016	Sechskantmutter	DADO ESAGONALE	06	
7800/0080	1	ST	TCR.03103132	Scheibe	ROSETTA	06	
7800/0090	2	ST	TCR.41717950	Schutzabdeckung	Copertura di protezion	06	C3
7800/0100	2	ST	TCR.41717940	Wellengelenk	SNODO PER ALBERI	06	B6
7800/0110	4	ST	TCR.03130052	Spann-Stift	Spina elastica	06	C3
7800/0120	0,500	M	TCR.02119200	Rund	TONDO	06	

13 Distinta dei ricambi consigliati

13.1 Impiego/montaggio di ricambi originali

Ricambi originali sono costruiti specificamente per i Turbogiunto a velocità variabile. Richiamiamo l'attenzione che i ricambi originali non forniti dalla "VOITH" non vengono controllati e deliberati dalla stessa.
Il montaggio e/o l'utilizzo di ricambi NON originali in alcune circostanze può modificare in modo negativo le caratteristiche costruttive prescritte del Turbogiunto a velocità variabile e con ciò quindi pregiudicarne la sicurezza.
È esclusa qualsiasi responsabilità da parte della "VOITH" per danni che vengono a crearsi attraverso l'utilizzo di ricambi NON originali.

13.2 Identificazione ricambi

L'identificazione ricambi classifica i ricambi in gruppi.

Identificazione ricambi:

- **C** Parti per la messa in esercizio
- **B** Pezzi di ricambio di base
- **L** Pezzi di ricambio a lunga durata

AVVERTENZA

I numeri di posizione disegno (*p.es. 0210/0010/0040*) nella distinta dei ricambi senza gruppo disegno appartenente (*p.es. 04*) non sono posizionati nei disegni e distinte pezzi (vedi Sezione 11 "Disegni, schemi, diagrammi" e Sezione 12 "Distinta pezzi").

13.3 Elenco dei ricambi

Denominazione disegno/Nr. disegno	Nr. SAP
Distinta ricambi	215.000607 / Foglio 1-8

Documentazione tecnica n. 91800110410_BA1_it, Versione 1.00, airpd / Kapp
N. serie da 8206786 a 8206789

VOITH	**Ersatzteilliste Übersicht** **Panoramica elenchi pezzi di ricambio**	Kennwort: Codice: **Flowserve Aprilia S 1**	**Voith Turbo GmbH & Co.KG** Voithstraße 1 74564 Crailsheim, Germany Tel. +49 7951 32-1666 Fax +49 7951 32-903 coupling-service@voith.com www.voith-coupling-service.com Datum/Date: **2010-04-07** Rev.No: **0**
		Typ: Tipo: **562 SVTL 12.1**	
	SAP Angebots-Nr.: Num. offerta SAP: **20128532**	Serien Nr.: Num. seriale: **8206786, 8206787, 8206788, 8206789**	
	Lieferumfang: Standard di fornitura: **215.000607**	Betriebsanl.-Nr.: Num. manuale istruzioni:	

C = Teile für Inbetriebnahme / Parti per la messa in esercizio

C1	1 Satz / kit	Schmelzsicherungsschrauben / Tappo fusibile di sicurezza
C2	1 Satz / kit	Filterelemente / Elementi filtro
C3	1 Satz / kit	Dichtungs- und Revisionsteile allgemein / Parti a tenuta e e revisione in generale
C4	1 Satz / kit	Dichtungs- und Revisionsteile für Wärmetauscher / Parti a tenuta e revisione per scambiatori di calore

B = Ersatzteilgrundausstattung / Pezzi di ricambio di base

B1	1 Satz / kit	Hauptwellenlager oder Nadellager für Wandler / Cuscinetti albero principale o cusinetto ad aghi per convert
B2	1 Satz / kit	Lager zur Hauptfüllpumpe / Cuscinetti per pompa di riempimento principale
B4	1 Satz / kit	Lager zur Anfahrschmierpumpe ASP / Cuscinetti per pompa ASP
B6	1 Satz / kit	Teile für VEHS und Steuerungsteile / Pezzi per VEHS e unità di comando

L = Ersatzteile für Langzeitbetrieb / Pezzi di ricambio a lunga durata

L2	1 Stück / pezzo	Anfahrschmierpumpe (ASP) plus 1 Motor / Pompa (ASP) più 1 motore
L5	1 Satz / kit	Primärläuferteile / Pezzi pignore primario
L6	1 Satz / kit	Sekundärläuferteile / Pezzi pignore secondario
L12	1 Satz / kit	Anbauteile für Druck-, Schwingungs-, Drehzahl- und Temperatu / Elementi di montaggio per il controllo della pressione,
L13	1 Stück / pezzo	Schöpfrohr / Tubo di sfiato
L14	1 Stück / pezzo	Stellantrieb komplett (voreingestellt) / Attuatore completo (preimpostato)

Kurzanleitung für Ersatzteilanfragen oder -bestellungen / Brevi istruzioni per richieste o ordini di pezzi di ricambio

Zeichnungs-Pos. Nr. /
num. di posizione disegno

Die Zeichnungs-Positionsnummer wird im Ersatzteilangebot oder Ersatzteilauftrag auf Positionsebene angegeben. Dadurch können die Teile den Positionen in der Ersatzteilstückliste und den Zeichnungen der Betriebsanleitung eindeutig zugeordnet werden. /
Il numero di posizione disegno è indicato nell'offerta di pezzi di ricambio o nell'ordine di pezzi di ricambio nella posizione. In tal modo è possibile assegnare chiaramente i pezzi alle posizioni nell'elenco pezzi di ricambio e nei disegni delle istruzioni per l'uso.

Menge / Quantità

Bestimmt die Stückzahl der in der Anlage eingebauten Teile. /
Definisce il numero dei pezzi installati nell'impianto.

ME / UM

Physikalische Einheit des eingesetzten Materials pro Artikel-Nr. /
Unità fisica del materiale utilizzato per num. articolo.

Materialnummer / Numero materiale

Voith Material-Nr. / Num. materiale Voith.

Benennung / Denominazione

Bezeichnung des Materials in SAP. / Denominazione del materiale in SAP.

Zeichnungsgruppe / Gruppo disegni

Gibt die Nummerierung der Zeichnung an, in der das Teil mit der zugehörigen Zeichnungs-Positionsnummer enthalten ist. /
Indica il numero dei disegni in cui è contenuto il pezzo con il corrispondente numero di posizione disegno.

Ersatzteilkennzeichen /
Codice parte di ricambio

Das Ersatzteilkennzeichen klassifiziert die Ersatzteile in Gruppen, für die von **Voith Coupling Service** entsprechende Empfehlungen für die Ersatzteilvorhaltung gemacht werden können. **Voith Coupling Service** arbeitet auf Anfrage individuelle Ersatzteilvorschläge für jedes Projekt mit einer oder mehreren Anlagen aus. /
Il codice parte di ricambio classifica i pezzi di ricambio in gruppi per i quali **Voith Coupling Service** può fornire corrispondenti suggerimenti per l'immagazzinaggio dei pezzi di ricambio.
Voith Coupling Service elabora, su richiesta, proposte individuali di pezzi di ricambio per ogni progetto con uno o più impianti.

Auswahl / Selezione ☐

Durch Ankreuzen wird auf Positionsebene ein oder mehrere Artikel ausgewählt, für die ein Angebot oder eine Auftragsbestätigung für Ersatzteile erstellt werden soll. Entfällt, wenn das Feld "alle Positionen" angekreuzt und ausgewählt wird. /
Selezionando con una croce nelle posizioni si scelgono uno o più articoli per i quali deve essere preparata un'offerta a una conferma d'ordine. Non si applica quando è contrassegnato con croce e selezionato il campo "tutte le posizioni".

Anfrage / Richiesta ☐

Auswahl für Anfrage, dadurch wird ein Ersatzteilangebot erstellt. /
Selezione per richiesta; si richiede il rilasscio di un'offerta di pezzi di ricambio.

Bestellung / Ordine ☐

Auswahl für Bestellung, dadurch wird eine Auftragsbestätigung für erstellt. /
Selezione per ordine; si provvedere alla preparazione di una conferma d'ordine.

Alle Positionen / Tutte le posizioni ☐

Durch Ankreuzen werden alle Positionen mit dem entsprechenden Kennzeichen ausgewählt, für die ein Angebot oder eine Auftragsbestätigung erstellt werden soll. Das Feld muss leer bleiben, wenn einzelne Positionen ausgewählt werden. /
Contrassegnando con la croce si selezionano tutte le posizioni con codice corrispondente per le quali deve essere preparata un'offerta op una conferma d'ordine. Il campo deve restare vuote se sono selezionate singole posizioni.

VOITH	Ersatzteilliste Übersicht Panoramica elenchi pezzi di ricambio	Kennwort: Codice: **Flowserve Aprilia S 1**	**Voith Turbo GmbH & Co.KG** Voithstraße 1 74564 Crailsheim, Germany Tel. +49 7951 32-1666 Fax +49 7951 32-903 coupling-service@voith.com www.voith-coupling-service.com Datum/Date: **2010-04-07** Rev.No: **0**
		Typ: Tipo: **562 SVTL 12.1**	
	SAP Angebots-Nr.: Num. offerta SAP: **20128532**	Serien Nr.: Num. seriale: **8206786, 8206787, 8206788, 8206789**	
	Lieferumfang: Standard di fornitura: **215.000607**	Betriebsanl.-Nr.: Num. manuale istruzioni:	

C = Parti per la messa in esercizio

Anfrage/Richiesta ☐ **Bestellung/Ordine** ☐ **Alle Positionen/Tutte le posizioni** ☐

Zeichnungs-Pos.Nr. Codice parte di ricambio	Menge Quantità	ME UM	Materialnummer Numero materiale	Benennung Denominazione	Zeichnungsgrp. Gruppo disegni	Ersatzteilkz. Posizione sul disegno	Auswahl Selezione
0101/0010/0030/0020	2	ST	TCR.41347470	VITE.VALV.FUSIBILE	04	C1	☐
0101/0010/0030/0030	2	ST	TCR.03658018	ANELLO DI TENUTA	04	C1	☐
0301/0050/	1	ST	TCR.4188931009	ELEMENTO FILTRANTE		C2	☐
0301/0150/	2	ST	TCR.4247147001	ELEMENTO FILTRANTE		C2	☐
0101/0010/0040	96	ST	TCR.40798620	Vite calibrata	04	C3	☐
0101/0010/0050	96	ST	TCR.03111105	ROSETTA ELASTICA	04	C3	☐
0101/0010/0070	18	ST	TCR.03014855	VITE A TESTA CIL.	04	C3	☐
0101/0010/0100	12	ST	TCR.40747300	VITE A TESTA CIL.	04	C3	☐
0101/0010/0110	12	ST	TCR.03110008	ROSETTA ELASTICA	04	C3	☐
0101/0060	1	ST	TCR.03170110	ANELLO DI SICUREZZA	04	C3	☐
0101/0080	1	ST	TCR.03170092	ANELLO DI SICUREZZA	04	C3	☐
0101/0130	2	ST	TCR.03015081	VITE A TESTA CIL.	04	C3	☐
0101/0151	6	ST	TCR.03016030	VITE A TESTA CIL.	04	C3	☐
0101/0200	1	ST	TCR.03170080	ANELLO DI SICUREZZA	04	C3	☐
0101/0210	1	ST	TCR.03374016	ROSETTA DI SICUREZ.	04	C3	☐
0101/0220	1	ST	TCR.03372016	GHIERA CON INTAGLI	04	C3	☐
0101/0250	18	ST	TCR.03014855	VITE A TESTA CIL.	04	C3	☐
0101/0290	4	ST	TCR.03016049	VITE A TESTA CIL.	04	C3	☐
0101/0305	1	ST	TCR.03166080	ROSETTA DI APPOGGIO	04	C3	☐
0101/0500	1	ST	TCR.4192278004	DISCO ISOLANTE	04	C3	☐
0201/0030	1	ST	TCR.03682033	ANELLO TENUTA ALB.	04	C3	☐
0201/0045	1	ST	TCR.03130014	SPINA ELASTICA	04	C3	☐
0201/0060	1	ST	TCR.40140360	SOFFIETTO	04	C3	☐
0201/0080	2	ST	TCR.03645203	ANELLO DI TENUTA	04	C3	☐

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		Typ: Tipo: **562 SVTL 12.1**	
	SAP Angebots-Nr.: Num. offerta SAP: **20128532**	Serien Nr.: Num. seriale: **8206786, 8206787, 8206788, 8206789**	
	Lieferumfang: Standard di fornitura: **215.000607**	Betriebsanl.-Nr.: Num. manuale istruzioni:	

C = Parti per la messa in esercizio

Anfrage/Richiesta ☐ **Bestellung/Ordine** ☐ **Alle Positionen/Tutte le posizioni** ☐

Zeichnungs-Pos.Nr. Codice parte di ricambio	Menge Quantità	ME UM	Materialnummer Numero materiale	Benennung Denominazione	Zeichnungsgrp. Gruppo disegni	Ersatzteilkz. Posizione sul disegno	Auswahl Selezione
0201/0090	16	ST	TCR.03658008	ANELLO DI TENUTA	04	C3	☐
0201/0110	1	ST	TCR.03171170	ANELLO DI SICUREZZA	04	C3	☐
0201/0225	8	ST	TCR.03658021	ANELLO DI TENUTA	04	C3	☐
0201/0245	12	ST	TCR.03110008	ROSETTA ELASTICA	04	C3	☐
0201/0250	1	ST	TCR.03130060	Spina elastica	04	C3	☐
0301/	1	ST	TCR.03645191	ANELLO DI TENUTA		C3	☐
0301/0030	1	ST	TCR.03114213	ROSETTA DI SICUREZ.	04	C3	☐
0301/0150/	2	ST	204.00518510	ANELLO DI TENUTA		C3	☐
0301/0300	1	ST	TCR.03658014	ANELLO DI TENUTA		C3	☐
0401/	1	ST	TCR.03660513	GUARNIZIONE PIATTA		C3	☐
0401/	2	ST	TCR.03660509	GUARNIZIONE PIATTA		C3	☐
0401/0050	1	ST	TCR.03658042	ANELLO DI TENUTA	04	C3	☐
0401/0090	3	ST	TCR.03658033	ANELLO DI TENUTA	04	C3	☐
0401/0180	1	ST	TCR.03658021	ANELLO DI TENUTA	04	C3	☐
0501/0050	2	ST	TCR.03130039	Spina elastica	04	C3	☐
0801/0030	1	ST	TCR.03210108	MOLLA	04	C3	☐
0801/0050	1	ST	TCR.03658065	ANELLO DI TENUTA	04	C3	☐
0801/0070	1	ST	TCR.03171115	ANELLO DI SICUREZZA	04	C3	☐
2000/	1	ST	TCR.03658021	ANELLO DI TENUTA		C3	☐
2000/0020	2	ST	TCR.03660509	GUARNIZIONE PIATTA		C3	☐
2000/0020	1	ST	TCR.03661082	GUARNIZIONE PIATTA		C3	☐
2000/0030	1	ST	204.00081300	GUARNIZIONE PIATTA		C3	☐
2000/0060	2	ST	TCR.03660513	GUARNIZIONE PIATTA		C3	☐
3000/0010	2	ST	TCR.41405740	ANELLO A SEZ. A V	04	C3	☐

VOITH	Ersatzteilliste Übersicht Panoramica elenchi pezzi di ricambio	Kennwort: Codice: **Flowserve Aprilia S 1**	**Voith Turbo GmbH & Co.KG** Voithstraße 1 74564 Crailsheim, Germany Tel. +49 7951 32-1666 Fax +49 7951 32-903 coupling-service@voith.com www.voith-coupling-service.com Datum/Date: **2010-04-07** Rev.No: **0**
		Typ: Tipo: **562 SVTL 12.1**	
	SAP Angebots-Nr.: Num. offerta SAP: **20128532**	Serien Nr.: Num. seriale: **8206786, 8206787, 8206788, 8206789**	
	Lieferumfang: Standard di fornitura: **215.000607**	Betriebsanl.-Nr.: Num. manuale istruzioni:	

C = Parti per la messa in esercizio

Anfrage/Richiesta ☐ **Bestellung/Ordine** ☐ **Alle Positionen/Tutte le posizioni** ☐

Zeichnungs-Pos.Nr. Codice parte di ricambio	Menge Quantità	ME UM	Materialnummer Numero materiale	Benennung Denominazione	Zeichnungsgrp. Gruppo disegni	Ersatzteilkz. Posizione sul disegno	Auswahl Selezione
5800/0010/	2	ST	TCR.4177563003	ANELLO DI TENUTA		C3	☐
5800/0010/	1	ST	TCR.4177563002	ANELLO TENUTA ALB.		C3	☐
5800/0140	1	ST	TCR.03645191	ANELLO DI TENUTA		C3	☐
7000/0130	10	ST	TCR.42561520	Elemento a cappello		C3	☐
7800/0090	2	ST	TCR.41717950	Copertura di protezione	06	C3	☐
7800/0110	4	ST	TCR.03130052	Spina elastica	06	C3	☐
8000/0050	1	ST	TCR.03660080	GUARNIZIONE PIATTA		C3	☐
8100/	1	ST	TCR.03660513	GUARNIZIONE PIATTA		C3	☐
5600//	2	ST	TCR.03660517	GUARNIZIONE PIATTA		C4	☐
5600//	2	ST	TCR.03660511	GUARNIZIONE PIATTA		C4	☐
5600///	3	ST	TCR.03660511	GUARNIZIONE PIATTA		C4	☐
5600///0020	2	ST	TCR.03636409	ANELLO DI TENUTA		C4	☐
5600///0020	1	ST	TCR.80705580	GUGARNIZIONE PIATTA		C4	☐
5600///0030	1	ST	TCR.03660088	GUARNIZIONE PIATTA		C4	☐
5600///0050	2	ST	TCR.03040262	TAPPO A VITE		C4	☐
5600///0050	1	ST	TCR.03656507	ANELLO DI TENUTA		C4	☐
5600///0060	1	ST	TCR.03040246	TAPPO A VITE		C4	☐
5600///0060	2	ST	TCR.03656506	ANELLO DI TENUTA		C4	☐
5600///0070	1	ST	TCR.03040246	TAPPO A VITE		C4	☐
5600///0080	1	ST	TCR.03656507	ANELLO DI TENUTA		C4	☐

VOITH	Ersatzteilliste Übersicht Panoramica elenchi pezzi di ricambio	Kennwort: Codice: **Flowserve Aprilia S 1**	**Voith Turbo GmbH & Co.KG** Voithstraße 1 74564 Crailsheim, Germany Tel. +49 7951 32-1666 Fax +49 7951 32-903 coupling-service@voith.com www.voith-coupling-service.com Datum/Date: **2010-04-07** Rev.No: **0**
		Typ: Tipo: **562 SVTL 12.1**	
	SAP Angebots-Nr.: Num. offerta SAP: **20128532**	Serien Nr.: **8206786, 8206787, 8206788,** Num. seriale: **8206789**	
	Lieferumfang: Standard di fornitura: **215.000607**	Betriebsanl.-Nr.: Num. manuale istruzioni:	

B = Pezzi di ricambio di base

Anfrage/Richiesta ☐ **Bestellung/Ordine** ☐ **Alle Positionen/Tutte le posizioni** ☐

Zeichnungs-Pos.Nr. Codice parte di ricambio	Menge Quantità	ME UM	Materialnummer Numero materiale	Benennung Denominazione	Zeichnungsgrp. Gruppo disegni	Ersatzteilkz. Posizione sul disegno	Auswahl Selezione
0101/0050	1	ST	TCR.49836122	CUSC. A RULLI CIL.	04	B1	☐
0101/0190	1	ST	TCR.03309575	CUSC. A RULLI CIL.	04	B1	☐
0101/0270	2	ST	TCR.49906043	CUSC. OBL. A SFERE	04	B1	☐
0101/0300	2	ST	TCR.03310066	CUSC. OBL. A SFERE	04	B1	☐
0501/0010	2	ST	TCR.40701280	CUSC.A STRISCIAM.	04	B2	☐
0501/0015	2	ST	TCR.40701280	CUSC.A STRISCIAM.	04	B2	☐
5800/0010/	1	STZ	TCR.41775630	CUSC.A STRISCIAM.		B4	☐
0801/0010	1	ST	TCR.41753100	PISTONE D.VALVOLA	04	B6	☐
5600///	1	ST	221.00228410	REGOLATORE TEMPERAT		B6	☐
7000/1010	3	ST	TCR.4190372024	TRASMETTIT. PRESS.		B6	☐
7000/2020/0010	1	ST	205.00438510	INTERRU.PRESS.DIFF.		B6	☐
7200/	2	ST	TCR.42215150	TERMORESISTENZA		B6	☐
7200/	2	ST	204.00313310	TRASDUTTORE TEMPER.		B6	☐
7400/0010	1	ST	TCR.41921540			B6	☐
7400/0070	1	ST	TCR.41789790	RIVELATORE VELOCITA		B6	☐
7400/0071	1	ST	TCR.4178979002	CAVO DI ALLACCIAM.		B6	☐
7400/0080	1	ST	TCR.4179305001	TRASFORM.CONTAGIRI		B6	☐
7800/0100	2	ST	TCR.41717940	SNODO PER ALBERI	06	B6	☐
8000/0030	1	ST	TCR.4191840015	LIVELLOSTATO		B6	☐
8200/	2	ST	TCR.4222916003	CAVO DI ALLACCIAM.		B6	☐
8200/	2	ST	TCR.4242808001	RILEVATORE VIBRAZ.		B6	☐

VOITH	Ersatzteilliste Übersicht Panoramica elenchi pezzi di ricambio	Kennwort: Codice: **Flowserve Aprilia S 1**	**Voith Turbo GmbH & Co.KG** Voithstraße 1 74564 Crailsheim, Germany Tel. +49 7951 32-1666 Fax +49 7951 32-903 coupling-service@voith.com www.voith-coupling-service.com Datum/Date: **2010-04-07** Rev.No: **0**
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	SAP Angebots-Nr.: Num. offerta SAP: **20128532**	Serien Nr.: Num. seriale: **8206786, 8206787, 8206788, 8206789**	
	Lieferumfang: Standard di fornitura: **215.000607**	Betriebsanl.-Nr.: Num. manuale istruzioni:	

L = Pezzi di ricambio a lunga durata

Anfrage/Richiesta ☐ **Bestellung/Ordine** ☐ **Alle Positionen/Tutte le posizioni** ☐

Zeichnungs-Pos.Nr. Codice parte di ricambio	Menge Quantità	ME UM	Materialnummer Numero materiale	Benennung Denominazione	Zeichnungsgrp. Gruppo disegni	Ersatzteilkz. Posizione sul disegno	Auswahl Selezione
5800/0010	1	ST	TCR.4191803012	POMPA AD INGRANAGGI		L2	☐
5800/0010/	1	ST	204.00153700	giunto di collegamento		L2	☐
5800/0010/	1	ST	204.00505110	MOTORE		L2	☐
0101/0010	1	ST	204.00204500	Rotore primario		L5	☐
0101/0070	1	ST	TCR.03160070	LINGUETTA	04	L5	☐
0101/0150	1	ST	TCR.41920430	DISCO DI FERMO	04	L5	☐
0101/0230	1	ST	TCR.41918700	ALBERO SECONDARIO	04	L6	☐
0101/0240	1	ST	TCR.41918690	RUOTA SECONDARIA	04	L6	☐
0101/0241	1	ST	204.00202500	DISCO DI FERMO	04	L6	☐
0101/0280	1	ST	TCR.41920440	DISCO DI FERMO	04	L6	☐
0101/0310	2	ST	TCR.03160241	LINGUETTA	04	L6	☐
0401/0070	1	ST	TCR.21241230	indicat. livello fluido	04	L12	☐
7000/3010	1	ST	TCR.4201477018	MANOMETRO		L12	☐
7000/4010	1	ST	TCR.4201595002	MANOM.PRESS.DIFF.		L12	☐
7000/5005	1	ST	TCR.41894160	teletermom. a quadrante		L12	☐
7000/5010	2	ST	204.00497110	TERMOM.A QUADRANTE		L12	☐
8100/	1	ST	TCR.4226146024	ELEMENTO RISCALD.		L12	☐
0701/0010	1	ST	TCR.41326540	Tubo pescante	04	L13	☐
0701/0020	1	ST	TCR.41718020	BUSSOLA	04	L13	☐
0701/0030	1	ST	TCR.03130055	Spina elastica	04	L13	☐
7800/0010	1	ST	TCR.4255861003	Ingranaggio di regol.	06	L14	☐

Ordinazione di ricambi

Ricambi originali vengono forniti secondo lo stato tecnico attuale.

Pertanto consigliamo di approvvigionarsi di ricambi conformemente alla distinta consigliata.

AVVERTENZA

Per alcuni Turbogiunto a velocità variabile la ruota primaria e quella secondaria vengono equilibrate con gli alberi e il guscio secondo uno speciale procedimento di equilibratura. A tale scopo, i ricambi corrispondenti sono identificati l'uno rispetto all'altro. Una sostituzione di questi singoli componenti è perciò eseguibile solo presso la Voith Crailsheim oppure in casi eccezionali sul posto, mediante speciali mezzi d'aiuto, sotto la sorveglianza di un montatore Voith.

13.4 Ordinazione di ricambi

All'ordinazione dei ricambi bisogna indicare:

1. Numero di serie del Turbogiunto a velocità variabile (ved. targhetta) Turbogiunto idrodinamico a velocità variabile con ingranaggi
2. Denominazione completa, come
   – N° di posizione disegno
   – N° di materiale
   – Denominazione pezzi
   – Quantità

Documentazione tecnica n. 91800110410_BA1_it, Versione 1.00, airpd / Kapp
N. serie da 8206786 a 8206789

14 Componenti esterni (descrizioni)

14.1 Teletermometro a quadrante

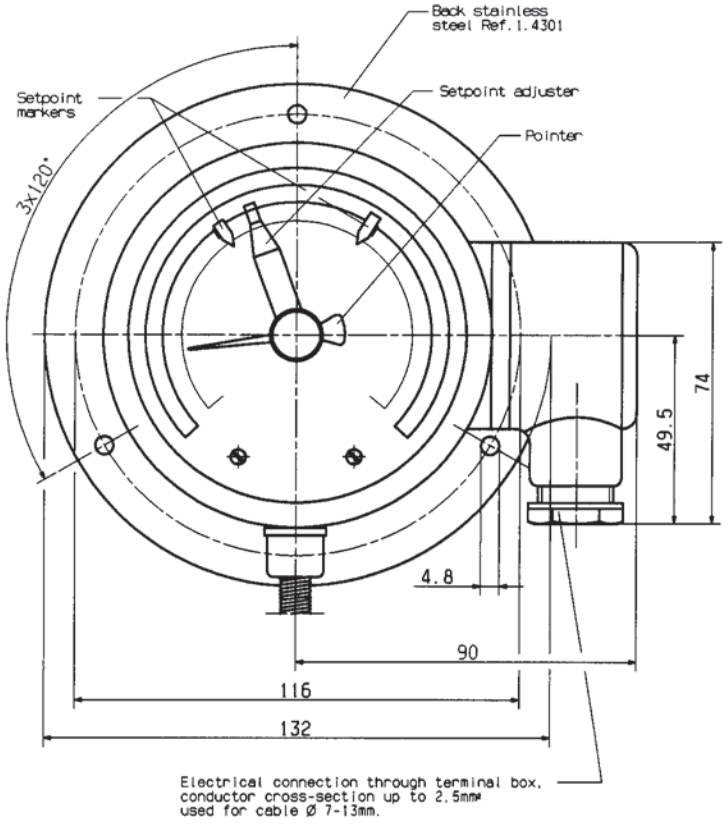
Numero di disegno Voith: 4 189416 0
Numero di disegno Voith: 204.00497110

Tipo: 608523-22-10 (2xSPDT)
Tipo: S 5500

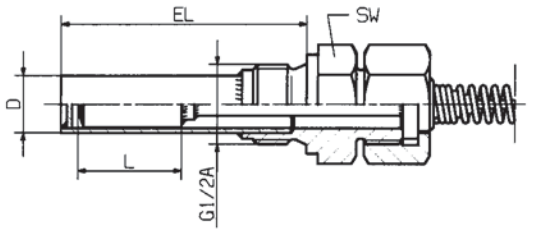
Descrizione. . . . . .JUMO

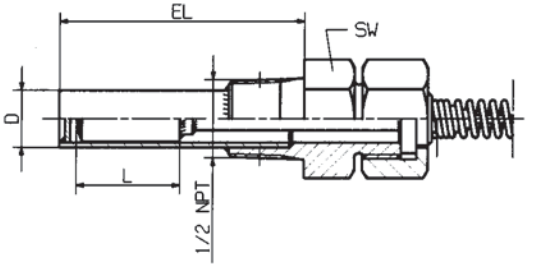
Descrizione. . . . . ASHCROFT

Manufacturing Drawing: —

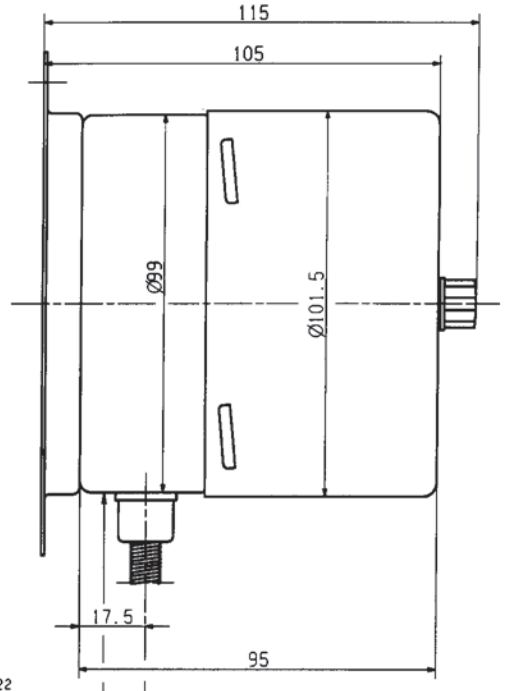


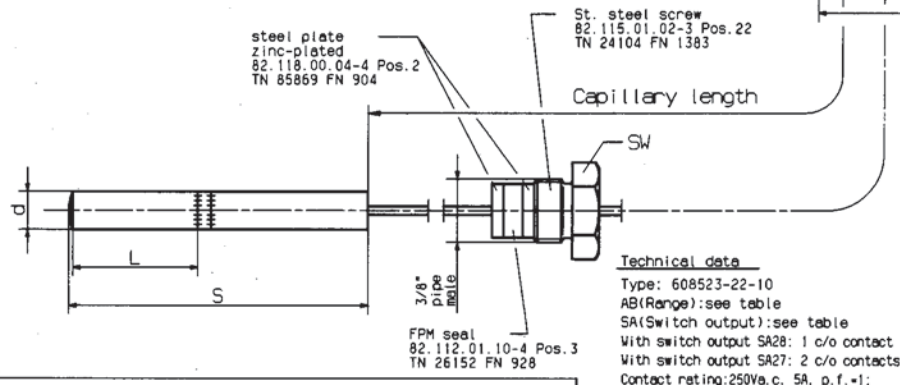
Probe form TA03 with pocket SH05





Probe form TA25 without screw fitting, suitable for TA25 with protection tube Drg.No. 82.118-F01-4M





Technical data

Type: 608523-22-10
AB(Range):see table
SA(Switch output):see table
With switch output SA28: 1 c/o contact
With switch output SA27: 2 c/o contacts
Contact rating:250Va.c. 5A, p.f.=1;
48Vd.c. 0.5A; 24Vd.c. 1A; 12Vd.c. 3A
FL(Capillary):see table
TF(Probe):see table
TA(Mounting):see table
SH(Pocket):see table

Special notes

Final inspection to test specification EP8-022 Kl. 1.5
Label to be marked as follows:
-Type
-Order number
-Manufacturing date
-Ident-No. Voith acc.order specification
-Protection IP66

Temperature limit for storage and transport -20 to +80°C

Model	AB (Range)	L (Active probe length)	SA (Switch output)	FL (Capillary)	TF (Temperature probe)	TA (Probe mounting)	SH (Pocket)	SW a/f	System change	on housing per°C ambient temperature change ambient temperature(in % from Rangelerror based on deviation from 23°C calibration temperature	on capillary per°C ambient temperature change	Fa. Voith Ident-No.	Fa. Jumo Ref. No.
9	Technische Daten nach Kundenangaben												
8	0 +160°C	ca. 27.5mm	SA27	FL04-5500mm-St. steel (1.4571)-Ø2.2mm	TF01-St. steel (1.4571)-d=12mm	TA03-St. steel (1.4571)	SH05-1/2 NPT-St. steel (1.4571)-D=15mm-EL=65mm	27	Paraffin oil	0.15 %	0.023 %/m	41894160	00310948
7	0 +120°C	ca. 35mm										41894150	00310947
6							SH05-1/2"pipe-St. steel (1.4571)-D=15mm-EL=65mm	27				41722720	85002580
5				FL04-3000mm-St. steel (1.4571)-Ø2.2mm								41722710	85002579
4				FL04-5500mm-St. steel (1.4571)-Ø2.2mm	TF05-St. steel (1.4571)-d=10mm-S=80mm	TA25	—	17				41722700	85002578
3				FL04-3000mm-St. steel (1.4571)-Ø2.2mm								41722690	85002577
2	0 +160°C	ca. 27.5mm		FL04-5500mm-St. steel (1.4571)-Ø2.2mm	TF01-St. steel (1.4571)-d=12mm	TA03-St. steel (1.4571)	SH05-1/2"pipe-St. steel (1.4571)-D=15mm-EL=65mm	27				41722680	85002576
1				FL04-3000mm-St. steel (1.4571)-Ø2.2mm								41722670	85002575

Voith Drg.-No.: 41713830 en
Änd. Ind.: 3 | Abt./Name: crk/Mer | Datum: 16.12.94

Pos	Hilfszeug			Werkstoff-Nr.		DIN-Kurzbezeichnung	Oberfläche
f	auf Typ 608523 umgestellt	12.06.03	Schaile/Venzel			Dial contact thermometer	Maße ohne Toleranzangabe DIN ISO 2768-v
e	SA angeglichen A01/03/46	04.03.02	Rippert	Datum	Name	Benennung Type 608523-22-10	Teile-Nr.
d	Auftrag-Nr. A85/367	16.12.94	Weber	Bearb. 08.07.92	Schlaiegel	85.543-F01-2M f Bl.2	
c	Auftrag-Nr. A85/227	28.06.93	Weber	Gepr. 08.07.92	Weber	Zeichnungs-Nr.	
b	Auftrag-Nr. 14286	20.01.93	Weber	Norm.	Belz	Ersetzt für Nr.	
a	Auftrag-Nr. A85/184	05.08.92	Pietron	Ges.	Junk		
	Änderung	Datum	Name				

JUMO MESS- UND REGELTECHNIK M.K. JUCHHEIM GMBH&CO FULDA

Maßstab 1:1

Verteiler: LEIV-80 (37) | LEFP-80 (45) | LENM (67)
KZ.-Rest.-Stück: LEFE-80 (26) | GRVT-80 (26) 5 | LEDI-80 (45) | Gesamt: 8
LEIV-I (38) | LEFE-80P (45) 1 | LEDI-80 (45)

Fa. Voith Crailsheim

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e-mail: info@jumo.us
Internet: www.jumo.us

Contact Dial Thermometer

- ❑ Temperature controller with indication, panel mounting or self-supporting
- ❑ Class 1.5
- ❑ Protection IP65
- ❑ Housing size 100mm dia.

Type 608523/2210

Brief description

Contact dial thermometers are universal instruments with indication for temperature measurement, control and monitoring.
The volume change with temperature of a liquid-filled measuring system, or the change of pressure with temperature inside a gas-filled system, is converted by a Bourdon tube into a rotation of the pointer without transmission gearing. The movement of the pointer spindle operates a microswitch through a lever system.

Technical data

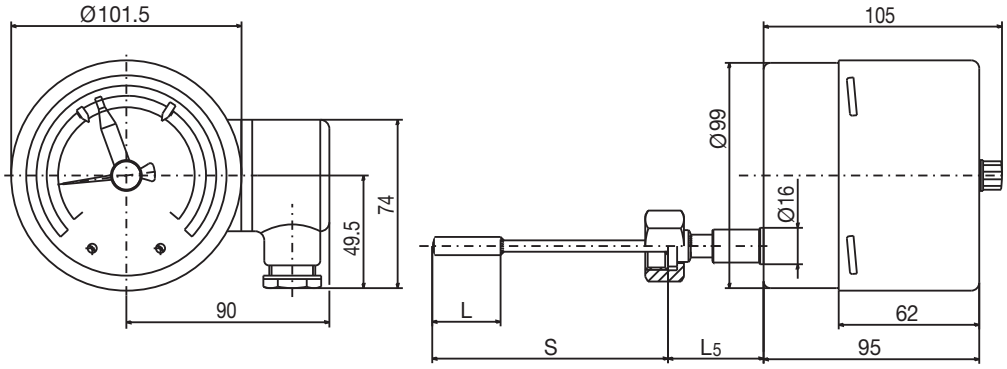
Housing	housing with bayonet lock in stainless steel (1.4301)
Enclosure protection	IP65 to EN 60 529
Window	polycarbonate
Scale	white, black lettering
Indication	linear, Class 1.5 similar to EN 13 190
Capillary reinforcement	for instruments with capillary: on housing and temperature probe
Setpoint adjustment	by setting knob on window using a screwdriver, protected by screw cap
Indication correction	at the rear, no indication correction on style 20
Limit temperatures	for transport and storage -20°C to +70°C (for indication range: 0 to +60°C up to 65°C; -40 to +40°C up to 50°C; -30 to +50°C up to 60°C)
Nominal position (NL)	unrestricted

	liquid-filled	**gas-filled**
Measuring system	indication range (AB) ≤ 350°C	indication range (AB) ≥ 400°C
Time constant t (to DIN 3440; at 63.2%)	approx. 8 sec, measured in water bath, with a 6 mm dia. copper probe	approx. 2 sec, measured in oil bath, with a 10 mm dia. stainless steel probe
Ambient temperature effect	in % of indication range (referred to the deviation from the reference value +23°C)	
on housing	0.15% of indication range per °C change in ambient temperature	0.05% of indication range per °C change in ambient temperature
on capillary (per m)	0.015% of indication range per °C change in ambient temperature	no effect
	higher ambient temperature – higher temperature indication – lower switching point	

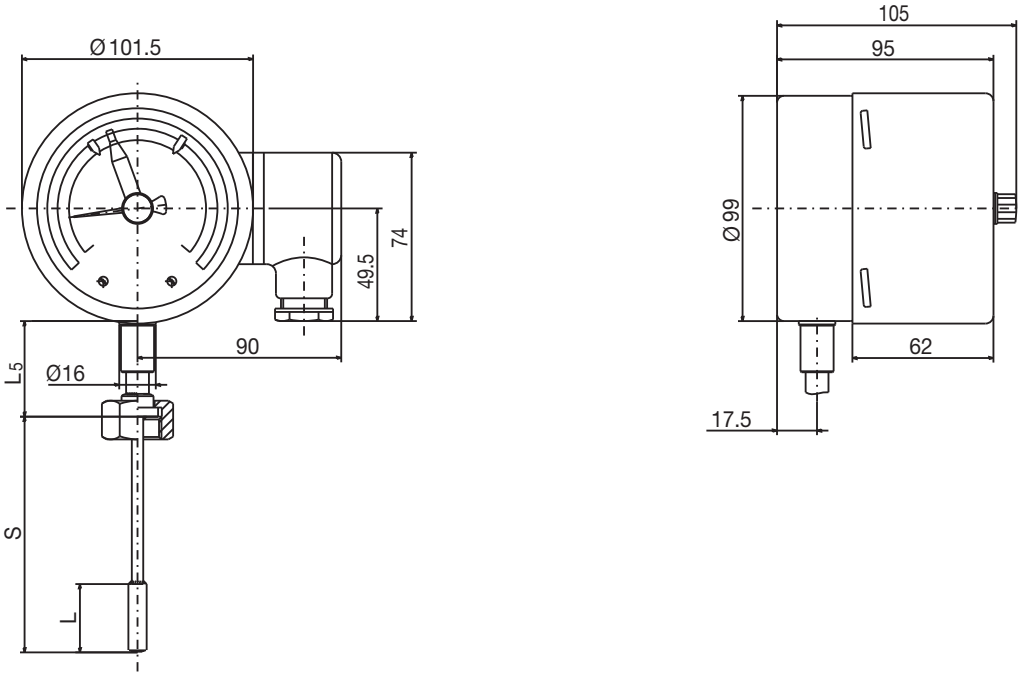
	standard	extra code (TZ) 650
Electrical contact **contact type**	single-pole microswitch with mechanically operated changeover contact	
contact rating	230V AC/DC +10/-15%, 48 — 63Hz, p.f. = 1 (0.6) 5 (1.5) A	10 (3) A
switching differential	approx. 1.5% of indication range	1.5 to 3% of indication range
switching point accuracy	± 0.5% of indication range span referred to the switch-off point with rising temperature	
switching reliability	To ensure maximum switching reliability, we recommend a minimum voltage of 24 V and a minimum current of 20 mA.	
Electrical connection	terminal box: conductor cross-section up to 2.5 mm^2 suitable for cable diameters from 6.5 to 13 mm	

Dimensions

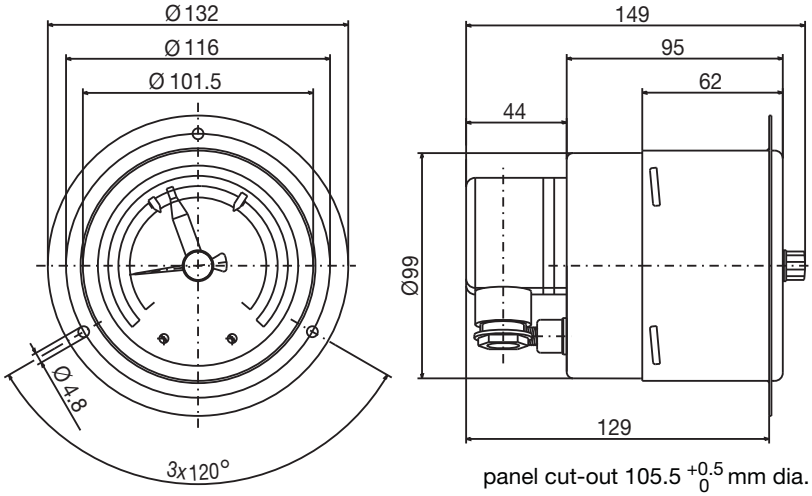
Type: 608523/0210



Type: 608523/1010



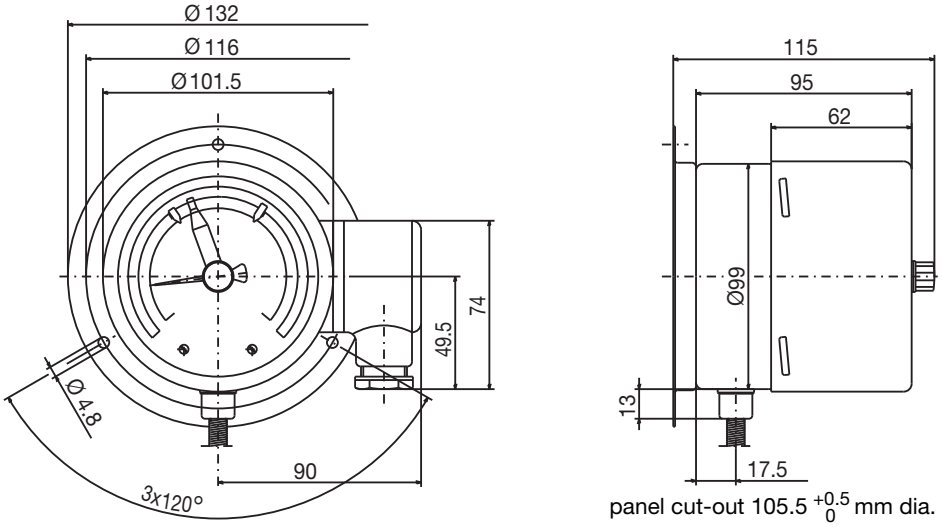
Type: 608523/2010



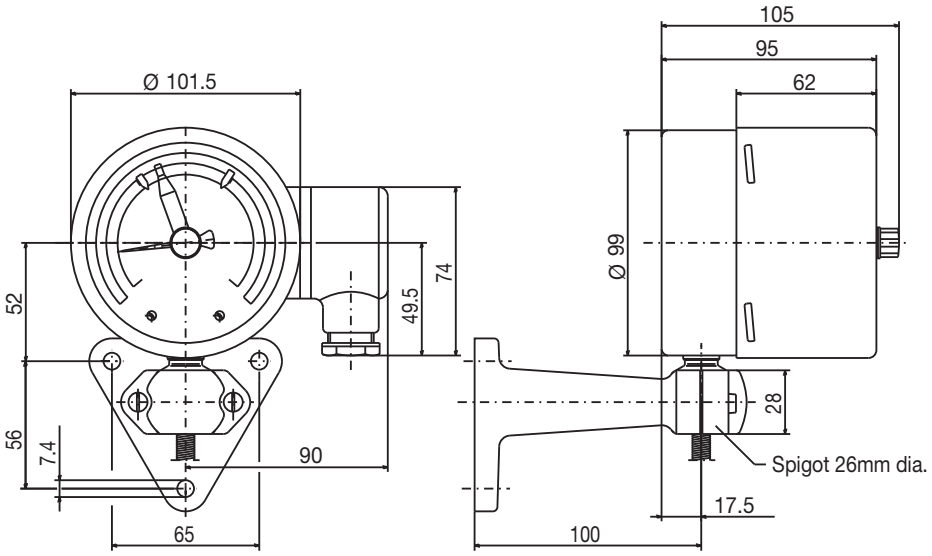
panel cut-out 105.5 $^{+0.5}_{0}$ mm dia.

Dimensions

Type: 608523/2210



Type: 608523/2310



Instrument mounting to DIN 16281

L_5	Probe mounting
40 mm	TA 03, TA 30
≤ 69 mm	TA 02
42.5 mm	TA 21
51.5 mm	TA 22, TA 31

Order details

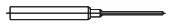
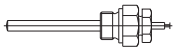
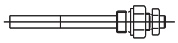
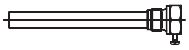
Contact dial thermometer Class 1.5, Type 608523

Order code	(1)	Basic type
608523		Mechanical contact dial thermometer Class 1.5
	(2)	**Basic type extension**
0210		Style: 02; housing size: 100 mm dia.
1010		Style: 10; housing size: 100 mm dia.
2010		Style: 20; housing size: 100 mm dia.
2210		Style: 22; housing size: 100 mm dia.
2310		Style: 23; housing size: 100 mm dia.
	(3)	**Indication range (AB)**
469		-40 to + 40°C; measuring range –30 to + 30°C, accuracy 1.5°C
566		-30 to + 50°C; measuring range –20 to + 40°C, accuracy 1.5°C
643		-20 to +120°C; measuring range 0 to +100°C, accuracy 3.0°C
807		0 to + 60°C; measuring range +10 to + 50°C, accuracy 1.5°C
810		0 to + 80°C; measuring range +10 to + 70°C, accuracy 1.5°C
814		0 to +100°C; measuring range +10 to + 90°C, accuracy 1.5°C
818		0 to +120°C; measuring range +20 to +100°C, accuracy 3.0°C
826		0 to +160°C; measuring range +20 to +140°C, accuracy 3.0°C
832		0 to +200°C; measuring range +20 to +180°C, accuracy 3.0°C
834		0 to +250°C; measuring range +30 to +220°C, accuracy 4.0°C
926		+50 to +250°C; measuring range +70 to +230°C, accuracy 3.0°C
840		0 to +300°C; measuring range +30 to +270°C, accuracy 6.0°C
927		+50 to +300°C; measuring range +80 to +270°C, accuracy 4.0°C
843		0 to +350°C; measuring range +50 to +300°C, accuracy 6.0°C
932		+50 to +350°C; measuring range +80 to +320°C, accuracy 6.0°C
848		0 to +400°C; measuring range +50 to +350°C, accuracy 6.0°C
851		0 to +450°C; measuring range +50 to +400°C, accuracy 6.0°C
854		0 to +500°C; measuring range +50 to +450°C, accuracy 8.0°C
858		0 to +600°C; measuring range +100 to +500°C, accuracy 10.0°C
	(4)	**Capillary type (FL)[1]**
00		none (with rigid connection)
02		FL02 copper capillary with copper braiding, approx. 2.5 mm dia. (up to +300°C top of range)
11		FL11 copper capillary with PE sleeve, approx. 3.5 mm dia. (up to +120°C top of range)
17		FL17 stainless steel capillary, 1.5 mm dia.
21		FL21 copper capillary, 1.0 mm dia. (up to +300°C top of range)
	(5)	**Capillary length[1]**
0		none (with rigid connection)
1000		1000 mm
2000		2000 mm
3000		3000 mm
4000		4000 mm
5000		5000 mm
. . . .		special length (details in plain text: in 1000 mm steps, up to 15000 mm length)

[1] see Data Sheet 60.8730 for description and features
[2] screw-in spigot to DIN 3852 Form A
[3] List extra codes in sequence, separated by commas.

Order details

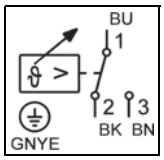
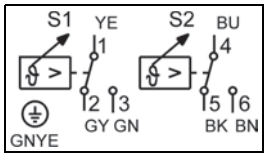
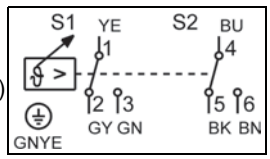
Contact dial thermometer Class 1.5, Type 608523

Order code			
	(6)	**Process connection (PA)[1]**	
750		TF 01; temperature probe with stepped support tube	
752		TF 11; temperature probe without support tube	
843		TA 02; immersion tube with union nut and loose nipple[2]	
161		TA 03; immersion tube with loose union nut	
311		TA 20; immersion tube with loose nipple and shoulder[2]	
403		TA 21; immersion tube with loose plug and conical seal	
351		TA 22; immersion tube with loose plug, conical seal and loose nipple[2]	
401		TA 23; immersion tube with plug and spring clip	
251		TA 25; sliding clamp fitting on support tube[2]	
913		SH 07; screw-in pocket, assembled, with clamping clip and fixing screw[2]	
820		SH 09; weld-in pocket, assembled, with clamping clip and fixing screw (not with FL21 - welding shoulder with steel 1.4515)	
876		SH10; screw-in pocket, assembled[2]	
871		SH11; screw-in pocket, assembled[2]	
	(7)	**Diameter of process connection (PA)[1]**	
6		Ø 6 mm	
8		Ø 8 mm	
10		Ø 10 mm	
11		Ø 11 mm	
12		Ø 12 mm	
	(8)	**Type of thread for process connection (PA)[1]**	
000		no thread (with TF 01 and TF 11)	
103		thread $G^3/_8$	
104		thread $G^1/_2$	
105		thread $G^3/_4$	
114		thread M 10 x 1 (TA 23 and SH 11 only)	
	(9)	**Material of probe / support tube[1]**	
26		stainless steel (CrNi, 1.4571)	
96		copper (Cu) / brass (CuZn) (up to 200°C)	
95		stainless steel (CrNi, 1.4571) — probe / brass (CuZn) — support tube (above 250°C)	
	(10)	**Material of process connection (PA)[1]**	
00		none (TF01 and TF11 only)	
01		steel (St)	
26		stainless steel (CrNi, 1.4571)	
46		brass (CuZn)	

[1] see Data Sheet 60.8730 for description and features
[2] screw-in spigot to DIN 3852 Form A
[3] List extra codes in sequence, separated by commas.

Order details

Contact dial thermometer Class 1.5, Type 608523

Order code		
	(11)	**Fitting length of process connection (PA)[1] (dimension EL or S)**
0		minimum fitting length TF 11 (active probe dimension)
50		50 mm
100		100 mm
150		150 mm
200		200 mm
. . .		special length (details in plain text — in 50 mm steps)
	(12)	**Switch output (SA)**
28	SA 28	one contact 
27	SA 27	two contacts 
19	SA 19	two contacts (sequential contacts) 
	(13)	**Extra codes (TZ)**
000		no extra code
430		peak-reading pointer
650		microswitch 10 (3) A (230 V AC/DC +10/-15%, 48 — 63 Hz, p.f. = 1 (0.6))
518		stop for min. or max. setpoint limit, factory-set
522		customized scale

special versions on request!

Order code

(1)		(2)		(3)		(4)		(5)		(6)		(7)		(8)		(9)		(10)		(11)		(12)		(13)		
608523	/	. . . .	-	. . .	-	. .	-	. . . .	-	. . .	-	. .	-	. . .	-	. .	-	. .	-	. . .	-	. .	/	. . .	,	. . .

Order example

608523	/	2010	-	818	-	21	-	2000	-	750	-	8	-	000	-	26	-	00	-	100	-	28	/	000[3]

[1] see Data Sheet 60.8730 for description and features
[2] screw-in spigot to DIN 3852 Form A
[3] List extra codes in sequence, separated by commas.

All stainless steel gas actuated thermometer
Model S5500

According EN 13190
Nominal size 100 mm or 160 mm
With or without capillary/contacts
Accuracy: Class 1 dry
Class 2 liquid filled

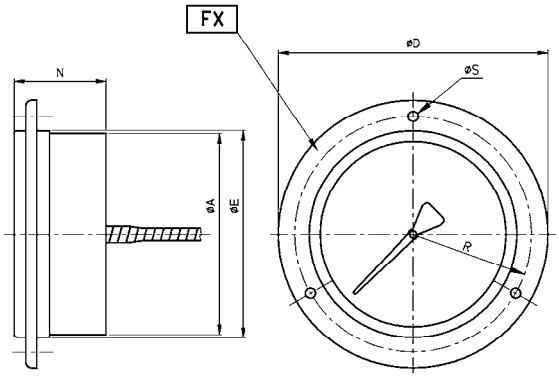
Features
- Rugged stainless steel construction
- Fast response
- Protection IP65
- High repeatability and small hysteresis
- Dry or liquid filled
- Rigid stem or bulb with capillary

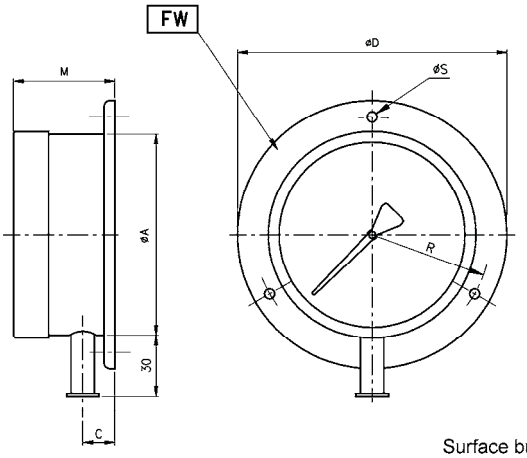
Ranges
-200 ... 50 °C up to 0 ... 800 °C
-330 ... 120 °F up to 50 ... 1450 °F

Applications
Chemical and petrochemical industry
Machine and apparatus construction
Food and beverage industry
Pulp and paper industry

Technical specification	Rigid stem		With capillary	
Dial size in mm	100	160	100	160
Construction	Cylindrical case with bayonet ring			
Measuring principle Range in °C Overtemperature limit	Inert gas actuated 0/60 0/80 0/100 0/120 0/160 0/200 0/250 0/300 0/400 0/500 0/700 0/800 -10/50 -10/110 -20/40 -20/100 -20/120 -20/180 -30/50 -30/70 -30/170 -40/40 -40/60 -40/160 -50/50 -60/40 -80/40 -100/50 -120/40 -200/50 Ranges in °F and dual scales on request Max. 130 % F.S. but max. 800 °C, optional 210 % F.S. but max. 800 °C			
Stem or bulb diameter	6 mm, 8 mm, 9 mm, 10 mm, others on request			
Lengths	55 ... 4000 mm, other length on request, min. length depends on bulb and range			
Capillary length	N.A.		Max. 100 m	
Process connection	Plain G ½ B male, G ¾ B male, G 1 B male according ISO 228-1, ½ NPT male, ¾ NPT male, 1 NPT male according ANSI/ASME B1.20.1, M20x1,5 male, M24x1,5 male, M27x2 male according ISO 68-1, Others on request Fixed, adjustable union or with swivel nut			
Connection location	Back, lower, knee joint bendable (180°), knee joint bendable (360°)			
Material				
Connection	Stainless steel 304 (1.4301)			
Stem	Stainless steel 321 (1.4541)			
Case/ring	Stainless steel 304 (1.4301), optional 316 (1.4401)			
Capillary			Stainless steel 321 (1.4541)	
Armor			Flexible, 304 (1.4301), or 316 (1.4401) optional PVC covered	
Window	Instrument glass, optional laminated safety glass or acrylic glass			
Dial	Aluminum, black markings on white background			
Pointer	Aluminum, black, optional micrometer pointer or maximum pointer			
Movement	Stainless steel 304/303 (1.4301/1.4305)			
Accuracy	Class 1 (dry) , Class 2 (liquid filled) according to EN 13190			
Zero adjustment	±6 % externally			
Protection according EN 60 529/IEC 529	IP65			
Filling liquids	Glycerin, silicone			
Weight dry/filled in kg	0,8/1,0 (stem length 100 mm)	1,2/3,0 (stem length 100 mm)	1,0/1,2 (stem length 100 mm, capillary 1,5 m)	1,4/3,2 (stem length 100 mm, capillary 1,5 m)
Accessories, options	Thermowells, dual scales, magnet spring- or inductive contacts, built in microswitch 1 or 2 SPDT, calibration certification			

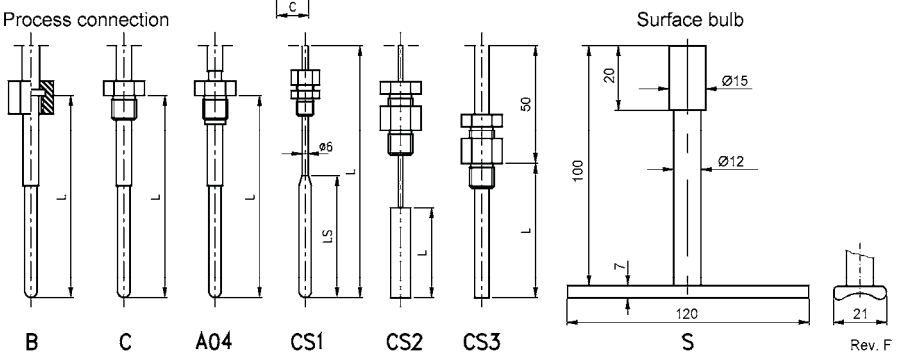
General dimensions in mm





	A	C	D	E	M	N	R	S
NG 100	99	13	132	103	50	45	58	5
NG 160	159	13	196	164	50	45	89	6

minimum bulb length				
bulb diamter	6	8	9	10
direct mount or capillary up to 5 m	190	90	68	55
capillary over 5 m	on request	170	130	100



Order information

Size	Bulb diameter	Length of bulb/stem	Length of capillary	Process connection	Connection size	Connection orientation	Range	Engineering units	Options
(100) 100 mm **(160)** >160 mm	**(6)** 6 mm **(7)** 7 mm **(8)** 8 mm **(9)** 9 mm **(10)** 10 mm others on request	**55 to 4000 mm**	**length in mm** [1] [1] for fixed bulb „0“ max. length: 100 m	**(B)** Turning nut **(C)** Single nipple **(A04)** Turning nipple **(CS1)** Adjustable union connection sliding on tube [1] **(CS2)** Adjustable union connection sliding on capillary **(CS3)** Adjustable union connection sliding on stem **(S)** Surface bulb [2] [1] length of bulb (LS) must be specified. [2] only for bulb diameter (7) others on request	**(50)** G ½ B **(75)** G ¾ B **(10)** G 1 B **(50N)** ½ NPT **(75N)** ¾ NPT **(10N)** 1 NPT **(M20)** M20x1,5 **(M24)** M24x1,5 **(M27)** M27x2 others on request	**(L)** Lower **(R)** Back **(E1)** Knee joint bendable (180°) **(E2)** Knee joint bendable (360°)	0/ 60 0/ 80 0/ 100 0/ 120 0/ 160 0/ 200 0/ 250 0/ 300 0/ 400 0/ 500 0/ 700 0/ 800 -10/ 50 -10/ 110 -20/ 40 -20/ 100 -20/ 120 -20/ 180 -30/ 50 -30/ 70 -30/ 170 -40/ 40 -40/ 60 -40/ 160 -50/ 50 -60/ 40 -80/ 40 -100/ 50 -120/ 40 -200/ 50	**°C** °F and dual scale on request	**(NH)** Tagging wired **(DA)** Dial marking **(CS)** Dual scale **(PD)** Acrylic glass **(SG)** Safety glass **(MP)** Micro pointer **(A4)** Capillary st. st. armored **(A5)** Capillary st. st. armored with PVC covering **(FX)** Front flange **(FW)** Back flange **(FH)** Surface mounting bracket L = 100 mm **(UC)** U-clamp **(EP)** Maximum pointer **(TM)** 2" pipe mounting bracket **(Q3)** 1 microswitch **(Q33)** 2 microswitches other options on request for contacts see data sheet K55

Order example

Size	Type	Bulb diameter	Length of bulb/stem	Length of capillary	Process connection	Connection size	Connection orientation	Range	Engineering unit	Options
100	S5500	8	100	1500	CS2	50N	L	0/100	C	FW

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United Kingdom
Unit 5 William James House
Cowley Road, Cambridge CB4 0WX
Tel.: +44 (0) 12 23 39 55 00, **Fax:** +44 (0) 12 23 39 55 01

Ausrichten des Gelenkanschluss

Thermometer MIT GELENKANSCHLUSS sollten im Gelenk nur dann verstellt werden, wenn es während der Montage oder des Abbaus notwendig ist (Gewährleistung der Lebensdauer).
Der Fühler sollte mittels Gelenk möglichst vor dem Einbau in die richtige Position gebracht werden, wobei wie folgt vorgegangen werden soll:

- Thermometer Anzeigenteil gerade stellen (Lage "C")
- Die mit "A" gekennzeichneten Schrauben lösen bis das Gelenk frei am Gehäuseunterteil und Fühler um 180° drehbar ist.
- Das Thermometergehäuse mit einer Hand festhalten, und mit der anderen Hand das Gelenkstück soweit verdrehen, bis die innere Seite des Gelenks in die gewünschte Biegerichtung zeigt.
- Die vorgenannten Schrauben "A" wieder fest anziehen.
- Die mit "B" gekennzeichneten Schrauben lösen und das Gelenk in die gewünschte Biegerichtung bringen.
- Die vorgenannten Schrauben "B" wieder fest anziehen.

Positioning of stem, Every-Angle execution

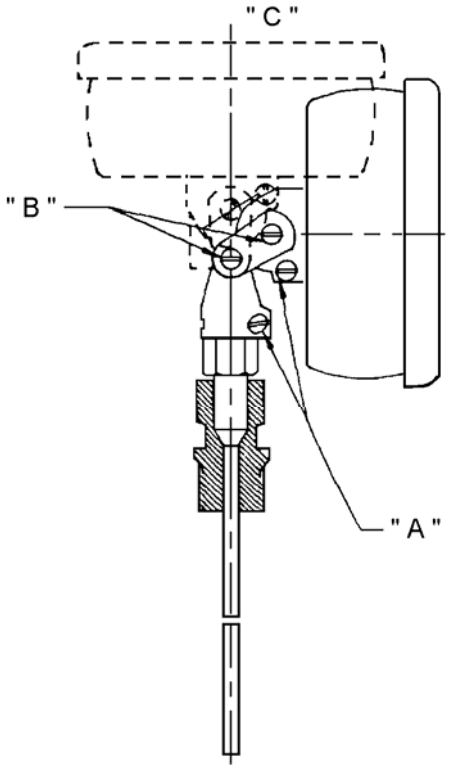
"Every-Angle style thermometers should be operated only when necessary during installation or removal to assure longest life time.
Positioning of the stem should be performed before installation, the stem and case should be set to the desired angle as follows:

- Thermometer head shall be putt in position "C".
- Loosen the screws labeled "A", until the harness and stem revolves freely through an angle of 180° with reference to the case.
- While holding the case revolve the harness and stem to place the harness in a position that will permit flexing the stem into the desired position.
- Lock screws labeled "A" again.
- Loosen the screws labeled "B" then flex the stem to the desired angle.
- Lock the screws labeled "B" again.

Positionnement de la tige, type Tous Angles

Pour obtenir la meilleure longévité du thermomètre "tous angles", l'articulation ne devra être actionnée que lorsque cela est indispensable; au montage et à la dépose par exemple. Avant l'installation, la tige devra être positionnée de la manière suivante:

- Placer la tête du thermomètre dans la position "C".
- Desserrer les vis repérées "A" jusqu'à ce que l'articulation tourne librement sans forcer, autour du soufflet.
- Tout en maintenant le boîtier, faire tourner l'articulation jusqu'à la position désirée.
- Resserrer les vis repérées "A".
- Desserrer les vis repérées "B" et plier la tête du thermomètre jusqu'à l'angle désiré.
- Resserrer les vis repérées "B".



ASHCROFT®

Betriebsanleitung
Thermometer

Operating Instruction
Thermometer

Instruction de Service
Thermomètre

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1. Montagebedingungen

- Die Thermometer müssen nach den in Betracht kommenden Anforderungen ausgewählt und montiert werden.
- Die max. Umgebungstemperaturen des Gehäuses für flüssigkeitsgefüllte Thermometer betragen - 40 °C (- 40 °F) oder + 60 °C (140 °F). Andere Temperaturgrenzen sind optional mit speziellen Serien möglich.

2. Montage

- Die Thermometer am Gehäuse oder am Prozessanschluss aus der Verpackung herausnehmen.
- Das Thermometer so montieren, dass das Fühlerende bei Bimetallen 50 mm und bei gasgefüllten Thermometern 75 mm im Messmedium eintaucht. Wird ein Thermometer in einer Schutzhülse montiert, so ist diese zuerst einzubauen. Der Fühler des Thermometers sollte dann mit einem wärmeübertragenden Stoff (z.B. Wärmeleitpaste) umgeben sein.
- Mit einem Gabelschlüssel am Sechskant des Gewindeanschlusses bis zur Dichtposition einschrauben und dann durch weiteres Anziehen die exakte Ableseposition einstellen. Bei Thermometern mit Kapillarleitung muss die Kapillarleitung so verlegt werden, dass diese nicht extremen Temperaturen ausgesetzt ist. Das Thermometersystem (Rohrfeder, Kapillarleitung und Fühler) darf in keinem Fall demontiert werden.

Achtung !

- Es darf keine Kraft (Moment) auf das Gehäuse ausgeübt werden.
- Die Gehäusetemperatur darf bei Bimetall - Thermometern +90 °C und bei gasgefüllten Thermometern +70 °C nicht überschreiten.
- Das Instrument grundsätzlich nicht am Fühler festhalten.
- Messbereich und zulässige Über- bzw. Untertemperatur nicht über- bzw. unterschreiten.
- Der minimale Kapillarradius beträgt 40 mm (1 1/2“). Wenn die Kapillarleitung zu lang ist, die Überlänge in einem Kreis von 20 - 25 cm Durchmesser aufwickeln, **jedoch nicht abschneiden**

3. Justierungen

- Falls die Anzeige verändert werden muss, wie folgt vorgehen:
  1. Bei Thermometern mit externer Verstellmöglichkeit diese mit einem Schraubendreher so lange verdrehen, bis der Zeiger die gewünschte Temperatur auf der Skala anzeigt.
  2. Bei Thermometern mit Bajonettring diesen abnehmen, mit zwei Fingern den Zeiger am breiteren Teil in der Nähe der Zeigerbuchse festhalten und mit einem kleinen Schraubendreher die Buchse um einen geschätzten Winkel verdrehen. Dann den Zeiger loslassen und den angezeigten Wert ablesen. Diesen Vorgang wiederholen, bis der gewünschte Wert angezeigt wird. Anschließend ist das Gehäuse mit Bajonettring, Glas und Dichtring dicht zu verschließen.

4. Wartung

- Die Geräte brauchen kaum oder keine Wartung. Das Gehäuse muss absolut dicht sein, damit keine Feuchtigkeit oder Schmutz eindringt.
- Falls der Fühler mit einem Messstoff in Berührung kommt, der eventuell aushärten kann, sollte das Thermometer des öfteren vom Messort entnommen und der Tauchschaft gereinigt werden.

5. Anmerkung

- Thermometer, die bei Umgebungstemperaturen unter 0 °C zum Einsatz kommen, müssen besonders gut abgedichtet sein, damit keine Feuchtigkeit eindringen kann. "Hermetisch dichte" Thermometer werden in trockener Atmosphäre verschlossen und bedürfen deshalb keiner Wartung. Thermometer mit Bajonettring sollten bei Umgebungstemperaturen < 0 °C nicht geöffnet werden. Falls sie geöffnet wurden, an einen trokkenen und warmen Ort 24 bis 48 Stunden trocknen lassen. Danach sorgfältig verschließen.

Technische Änderungen vorbehalten

1. Installation requirements

- The Thermometer must be selected and installed this wise, that the possibility of failure resulting in injury or misapplication is minimized.
- The maximum ambient temperature for liquid filled thermometers shall not exceed -40 °C (-40 °F) or +60 °C (140 °F). Other temperature limits are available optionally in special series.

2. Mounting

- Remove the thermometer by the case or outlet out of the packing box.
- Mount thermometer at any convenient location (Thermowell) where the sensing portion of the stem will be at least 50 mm (2") for the bimetal or 75 mm (3") for gas-filled thermometer in the temperature to be measured. When a thermometer has to be inserted into a thermowell, install the thermowell first. The stem or bulb of the thermometer shall than be coated with a heat conducting medium, suitable for the required temperature (e.g. mixture of glycerine and graphite).
- To tighten always use a wrench applied to the hexagon head of the connection. Turn until the thermometer is reasonable tight, then tighten further until scale is in the desired position.
- For remote gas-filled thermometer the capillary should be laid so that it will not be exposed to extreme temperatures. The thermometer system (Bourdon tube, line and bulb) must not, under any circumstances be taken apart, or the capillary cut.

Attention !

- Do not tighten by turning the thermometer case.
- Install the thermometer so that the maximum case temperature does not exceed 90°C.
- (200 °F) for bimetals and 70 °C (16 °F) gas - filled thermometer.
- During all operations do not handle the thermometer by the stem.
- Do not exceed range or admissible overtemperature.
- The minimum capillary radius is 40 mm (1 1/2"), Should it be too long, coil the surplus neatly in a loop of 20 - 25 cm diameter at a convenient point but **do not cut it**

3. Adjustment

- If it is necessary to adjust the thermometer, proceed as follows:
  1. On the thermometers fitted with an "External Adjustment" use a screw driver to turn the slotted hexagon head in the back of the case until the pointer indicates the proper temperature on the dial.
  2. On the "Bayonet ring thermometers" after removal of the bayonet ring, hold the tail of the pointer close to the center with one hand and by using a small screw driver, turn the slotted center bushing. Release the pointer and check its reading. Repeat if necessary above operation until the pointer is brought to the proper reading on the scale. Replace the gasket, glass and ring and assure that the case is absolutely tight, after the adjustment has been made.

4. Maintenance

- The instruments need little or no maintenance. But be sure that the case is close at all times, so that no moisture or dirt can enter the case.
- If the thermometer is used in to a medium that may harden and built up, the thermometer should be removed occasionally to clean the stem.

5. Caution

- Thermometers operating below 0 °C (32 °F) must have a perfectly tight case to prevent entrance of moisture. "Hermetically sealed" thermometers are close in a dry, warm atmosphere and need no maintenance. "Bayonet ring type thermometers" may show for any reason sign of stickiness when indicating a low temperature they should be brought to a dry, warm location and allow them to dry out within 24 or 48 hours with an open case. Afterward close the cases carefully and reinstall them.

Modification reserved

1. Conditions de montage

- Le thermomètre doit être installé avec précaution afin d'éviter tout défaut provenant d'un mauvais montage.
- La température ambiante maximum pour les thermomètres à bain ne devra pas dépasser -40 °C (-40 °F) ou +60 °C (140 °F). D'autres limites de température sont possibles sur demande.

2. Montage

- Enlever le thermomètre de son emballage en le prenant par le boîtier ou au niveau du raccord.
- Monter le thermomètre (doigt de gant) de telle manière que l'extrémité de la tige soit au contact de la température à mesurer sur une longueur minimum de 50 mm (2") pour les bimétalliques et de 75 mm (3") pour ceux à gaz. Installer d'abord le doigt de gant. Il est conseillé d'enduire la tige ou le bulbe d'un produit conducteur adapté à la température (p. e. un mélange de glycérine et de graphite).
- Pour serrer, utiliser toujours une clé adaptée au raccord 6 pans. Serrer raisonnablement puis ajuster jusqu'à la position désirée.
- Pour les thermomètres à gaz, le capillaire doit être monté de manière à n'être pas exposé à des températures extrêmes. Le système du thermomètre (Tube Bourdon, bulbe, capillaire) ne doit dans aucun cas être démonté ou coupé.

Attention !

- Ne jamais serrer le thermomètre en le tournant par le boîtier.
- Installer le thermomètre de telle manière que la température au niveau du boîtier ne dépasse pas 90 °C pour les thermomètres bimétalliques et 70 °C pour les thermomètres à gaz.
- Ne jamais prendre le thermomètre par la tige.
- Ne pas dépasser l'échelle ou la température maximum admissible.
- Le radius minimum pour le capillaire est de 40 mm (1 1/2"). Si celui-ci est trop long, enrouler le surplus en formant une boucle de 20 - 25 cm de diamètre mais ne jamais couper le capillaire.

3. Réglage

- Si un réglage du thermomètre s'avère nécessaire, procéder comme suit:
  1. Sur le thermomètre "hermétique" à lunette sertie, utiliser un petit tournevis pour tourner la vis de réglage placée au dos de l'appareil jusqu'à ce que l'aiguille indique la bonne température.
  2. Sur le thermomètre à "baïonnette", enlever la lunette et en maintenant l'aiguille par son extrémité, tourner la bague centrale à l'aide d'un petit tournevis. Relâcher l'aiguille pour vérifier la position et répéter l'opération si nécessaire jusqu'à ce que la lecture soit correcte. Replacer la lunette, sa vitre et son joint et resserrer la lunette fermement.

4. Entretien

- Il n'y a pas d'entretien particulier. Cependant, s'assurer que la lunette est toujours parfaitement serrée afin qu'aucune humidité ou poussière n'entre à l'intérieur du boîtier.
- Si le thermomètre est utilisé sans doigt de gant et que des produits risquent de se déposer sur la tige, la tige du thermomètre devra être nettoyée régulièrement.

5. Information

- Les thermomètres soumis à des températures inférieures à 0 °C doivent être parfaitement étanches pour éviter l'introduction d'humidité. Les thermomètres "hermétiques" sont sertis en usine en atmosphère sèche et chaude et ne nécessitent aucun entretien. Les thermomètres à "baïonnette" peuvent présenter des signes d'adhérence à basse température. Déposer alors l'appareil, enlever la lunette et le laisser sécher de 24 à 48 heures. Puis le remonter au sec en s'assurant de la parfaite condition du joint avant de le réinstaller sur le site.

Sous réserve de modifications

14.2 Termometro a resistenza / Trasmettitore di temperatura

14.2.1 Termoresistenza con testa di collegamento BUZ

Numero di disegno Voith: 4 221515 0
Numero di disegno Voith: 4 203470 001

Tipo: Jumo (2xPt100, 3 fili)
Tipo: BUZ

Scheda dati tecnici 4 203524 0

Descrizione. . . . . Pagina 1-16 90.2000

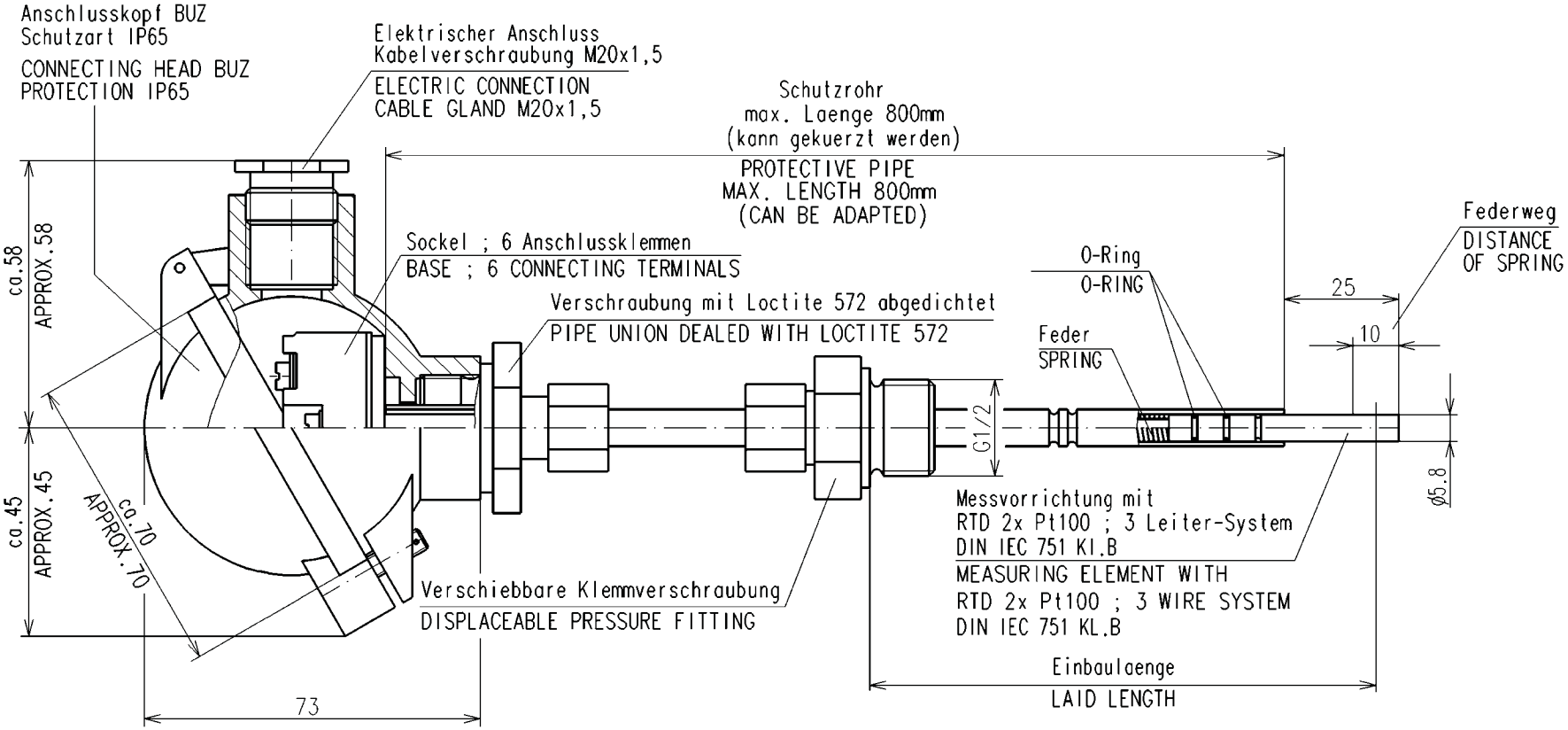
14.2.2 Trasmettitore di temperatura

Numero di disegno Voith: 204.00313310

Tipo: TF 12 V11 (4-20 mA)

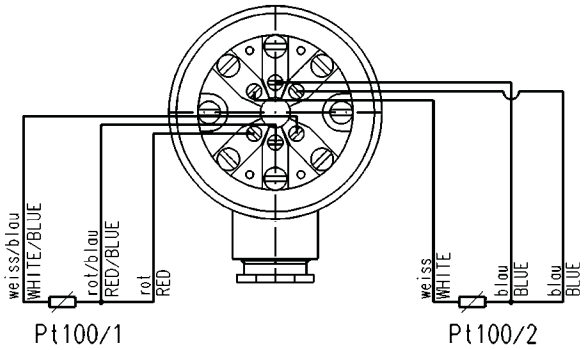
Descrizione. . . . . ABB

Documentazione tecnica n. 91800110410_BA1_it, Versione 1.00, airpd / Kapp
N. serie da 8206786 a 8206789



① Class I, Div.2, Group C & D;
Temperature Code T5

Anschlussbild
WIRING DIAGRAM



Vorhandene Sprachen / Available languages
de / en / fr / pl

✳ Federbelastetes oeldichtes Widerstandsthermometer
2xPt100 ; 3 Leiter-System
SPRING-LOADED OILTIGHT RESISTANCE THERMOMETER
2xPt100 ; 3 WIRE SYSTEM

Aend. Rev. Index	kommt vor Iss.	Aenderungs-Nr. Rev. No.	Aenderung Rev. descr. (shop and eng. info only)	Index Index	Datum: Gez. Date: Dr.	Name Name	Ges. App.
1	1x	A6046/02	Text zugefuegt		02-01-29	Putz	Roeth

Passmass Dimension | Abmasse Toleranzen

Kanten Chamfers DIN 6784 Innenkanten Inside ±1.6 Aussenkanten Outside -0.2
Allg.Toleranzen Gen.Tolerances ISO 2768 mK
Tolerierung Tolerancing DIN 7167
Surface Quality acc. to R_a in µm ISO 1302

Freigabevermerk Released for microf.

F

CAD

	Datum Date	Name Name
Gez. Dr.	2001-12-19	Putz
Gepr. Ch.	2001-12-19	vB
Abt. Dept.	crpe	Ges. App. Met
Norm Stand.		

VOITH TURBO ANTRIEBSTECHNIK

Urspr. 4 221772 0
Relgr.

Prueffordernungen in Zeichnungen nach VN 1631
VN
Bestell- und Liefervorschrift
Datum
Ges.
Massstab im Orig. Scale of Orig. 1 : 1
Masse (Gewicht) Weight Kg
Werkstoff / Werkstoff-Nr. Material/Material No.
Modell-, Gesenk-Nr. Pattern No. etc. (for internal use only)
Rohteil-Nr. mit Rohtz. Premachine Prt. No. with Drg. No
Benennung Title ✳ Widerstandsthermom.
RESISTANCE THERMOM.
Zeichnungs-Nr. / Sach-Nr. Drawing No. / Art. No. 4 203524 0 deen
Blatt Sheet 1
1 Bl.
Ers. f. Reply for
Ers. d. Repl. by
DIN A3

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Construction and application of resistance thermometers

Temperature-dependent resistance

The variation of the electrical resistance of metals with temperature is very often employed for the electrical measurement of temperature. Since the electrical resistance increases with increasing temperature, we speak of a **positive temperature coefficient** or **PTC** (in platinum temperature sensors, for example).
In order to employ this effect for temperature measurement, the electrical resistance of the metal must vary in a reproducible manner depending on temperature. The characteristics of the metal must not change during operation, as this would introduce measurement errors. The temperature coefficient should be as independent as possible of temperature, pressure and chemical effects.

Standardized platinum temperature sensors

Platinum has established itself as the resistance material of choice in industrial instrumentation. Its advantages include high chemical stability, relatively easy workability (especially in wire manufacture), its availability in highly pure form, and the good reproducibility of its electrical properties. In order to ensure universal interchangeability, these properties are defined in the standard EN 60751.
This standard lays down the electrical resistance and the permitted tolerances at different temperatures.
Additional definitions cover the nominal value of the temperature sensor and the temperature range. The calculation makes a distinction between the two temperature ranges -200 to 0°C and 0 to 850°C.
The range from -200 to 0°C is covered by the third-order polynomial:

$$R(t) = R_0(1 + A \times t + B \times t^2 + C \times (t - 100°C) \times t^3)$$

A second-order polynomial applies to the range 0 to 850°C …

$$R(t) = R_0(1 + A \times t + B \times t^2)$$

…with the coefficients:

$$A = 3{,}9083 \times 10^{-3}\,°C^{-1}$$
$$B = -5.775 \times 10^{-7}\,°C^{-2}$$
$$C = -4{,}183 \times 10^{-12}\,°C^{-4}$$

The term R_0 is referred to as the **nominal value,** and represents the resistance at 0°C.

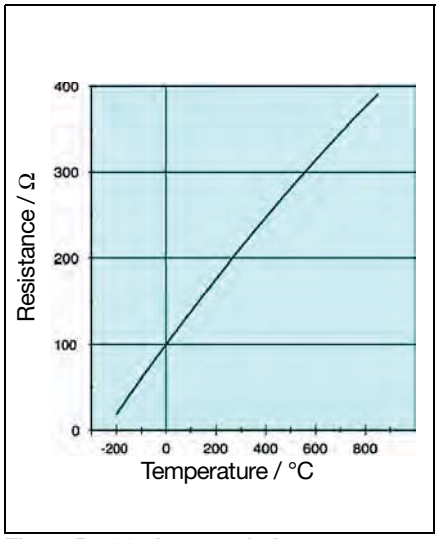

Fig. 1: Pt100 characteristic

According to EN 60751, the nominal value is 100.000 Ω at 0°C. We therefore speak of a Pt100 temperature sensor.
Temperature sensors with nominal values of 500 and 1000Ω are also available. Their advantage is a higher sensitivity, i.e. a larger variation of their resistance with temperature.

The resistance change in the temperature range up to 100°C is approximately:
0.4Ω/°C for Pt100 temperature sensors
2.0Ω/°C for Pt500 temperature sensors
4.0Ω/°C for Pt1000 temperature sensors
As an additional parameter, the standard defines a mean temperature coefficient between 0°C and 100°C. This represents the average change in resistance, referred to the nominal value at 0°C:

$$\alpha = \frac{R_{100} - R_0}{R_0 \times 100°C} = 3{,}850 \times 10^{-3}\,°C^{-1}$$

R_0 and R_{100} are the resistances at the temperatures 0°C and 100°C respectively.

Calculating the temperature from the resistance

In its application as a thermometer, the resistance of the temperature sensor is used to calculate the corresponding temperature. The formulae above represent the variation of electrical resistance with temperature.
For temperatures above 0°C it is possible to derive an explicit expression from the characteristic according to EN 60751:

$$t = \frac{-R_0 \times A + [(R_0 \times A)^2 - 4 \times R_0 \times B \times (R_0 - R)]^{1/2}}{2 \times R_0 \times B}$$

R = measured resistance in Ω
t = calculated temperature in °C
R_0, A, B = parameter as per IEC 751

Tolerance limits

EN 60 751 distinguishes between two tolerance classes:

Class A: $\Delta t = \pm (0.15 + 0.002 \times |t|)$
Class B: $\Delta t = \pm (0.30 + 0.005 \times |t|)$

t = temperature in °C (without sign)

The formula for calculating the tolerance ΔR in Ω at a temperature of t > 0°C is:

$$\Delta R = R_0(A + 2 \times B \times t) \times \Delta t$$

For t < 0°C it is:

$$\Delta R = R_0(A + 2 \times B \times t - 300°C \times C \times t^2 + 4 \times C \times t^3) \times \Delta t$$

Tolerance Class A applies for temperatures between -200 and +600°C.
Tolerance Class B covers the entire definition range of -200 to +850°C.

Extended tolerance classes

It is frequently found that the two tolerance classes specified in the standard are not adequate to meet particular requirements. On the basis of the standard tolerances, **JUMO** have defined additional classes in order to meet the different requirements of the market.

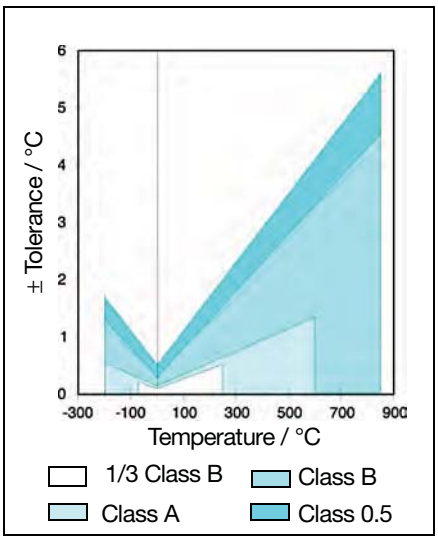

Fig. 2: Tolerance variation, depending on measurement temperature

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Internet: www.JumoUSA.com

Tolerance class	Temperature range	Tolerance in °C	Tolerance at	
			t = 0°C	t = 100°C
1/3Class B	- 70 to +250°C	± (0.10 °C + 0.0017 x ltl)	± 0.10°C	± 0.27°C
Class A	-200 to +600°C	± (0.15°C + 0.020 x ltl)	± 0.15°C	± 0.35°C
Class B	-200 to +850°C	± (0.30°C + 0.0050 x ltl)	± 0.30°C	± 0.80°C
Class 0.5	-200 to +850°C	± (0.50°C + 0.0060 x ltl)	± 0.50°C	± 1.10°C

Table 1: Tolerance classes

ltl = measured temperature in °C, without sign

Construction of resistance thermometer probes

Apart from the virtually unlimited number of special models, there is also a series of probes whose components are completely defined by standard specifications.

Resistance thermometers with terminal head

These **resistance thermometers** are of modular construction, consisting of the measurement insert, protection tube, the terminal head and the terminal plate inside the head. A flange or a screw fitting can also be provided.

The **temperature sensor** is that part of the resistance thermometer which is directly affected by the measured temperature.

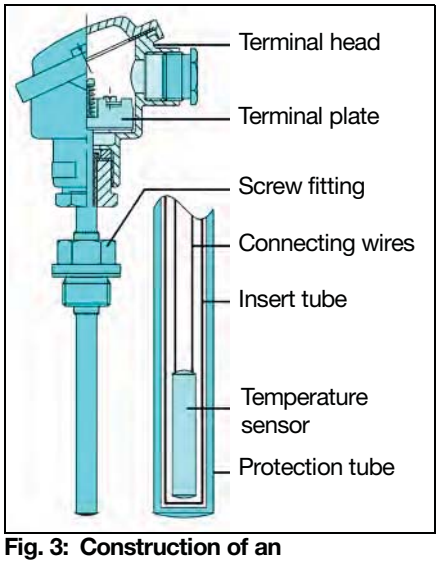

Fig. 3: Construction of an electrical thermometer

Measuring inserts are completely fabricated units, consisting of a temperature sensor and a terminal plate, with the sensor contained in an **insert tube** of 6 or 8mm diameter, made from bronze SnBz6 as per DIN 17 681 (up to 300°C) or nickel.

It is inserted into the actual **protection tube**, which is often made from stainless steel.

The tip of the insert tube is in full contact with the inside of the protection tube end plate, in order to ensure good heat transfer. The insert fixing screws are backed by springs so that bottom contact is maintained even with differential expansion between the insert tube and protection tube lengths. This arrangement makes it easy to replace the insert at a later date. The thermometers are available in single and twin versions. Their dimensions are specified in the standard DIN 43 762. Inserts with an integral 2-wire transmitter are also available.

If no insert is used, the temperature sensor is positioned directly inside the protection tube, embedded in aluminium oxide or a thermally conducting medium. After assembly, the terminal plate is mounted inside the terminal head and the connecting wires are soldered up.

In this arrangement, the sensor cannot be changed later; the complete resistance thermometer has to be replaced.

If a **pocket** is used, the thermometer can be removed without having to drain or depressurize the system.

The pocket is a type of protection tube which is mounted permanently at the measurement site, and in which the thermometer can be inserted and fixed in position. Other forms of pocket have an internal thread, so that a thermometer can be screwed in. The thermometer can then be made simply as an insert, or have its own protection tube. This, however, results in a much poorer response. The pocket itself is welded in position (which is not possible with a protection tube, because of the thin wall of the tube) or has an external thread, usually a pipe thread.

Since pockets are in direct contact with the fluid, they have to meet the same requirements for chemical resistance and mechanical robustness as protection tubes.

For the **terminal heads**, the DIN 43 729 standard defines two forms, A and B, which differ in size and also slightly in shape.

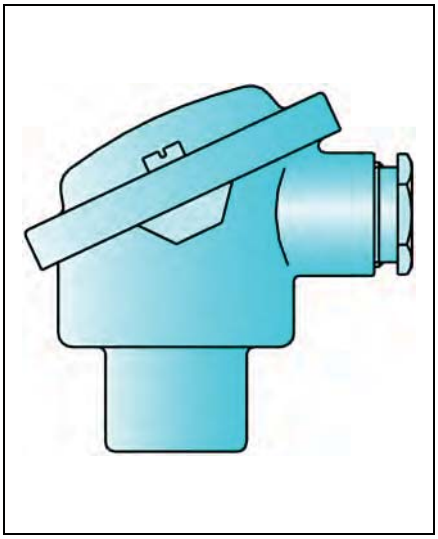

Fig. 4: Terminal head to DIN 43 729, Form B

The material used is cast iron, aluminium or plastic.

In addition, there are various other forms which are adapted to meet special requirements. The enclosure protection is not convered by the standard, it is usually a splashproof form (IP 54).

The nominal diameter of the bore in the terminal head, to take the protection tube, is:
for Form A: 22, 24 or 32mm.
for Form B: 15mm or
thread M 24 x 1.5.

The smaller terminal head (Form B) is the most widely used one, and the 2-wire transmitters are designed for this form.

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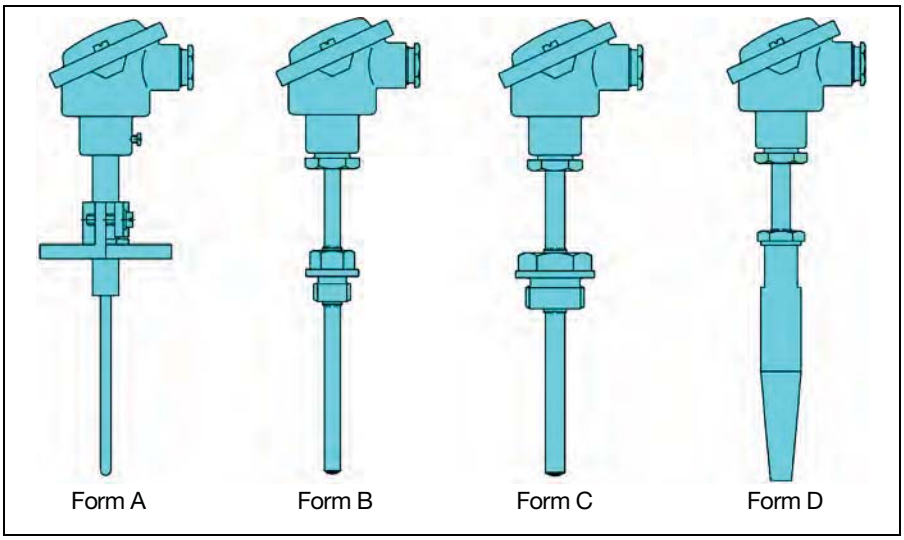

The standards DIN 43 764 to 43 769 define various protection tube designs for different resistance thermometers **and** thermocouples in different applications. They are all fitted with an insert and a terminal head Form B. The diameters and lengths of the protection tubes are also fixed.
The design of the protection tubes of these thermometers (with flange, taper, etc.) are identified by code letters A to G, which themselves are laid down in DIN 43 763.
Form A: enamelled tube for mounting by sliding stop flange, for flue gas measurement

Form B: tube with fixed external ½" pipe thread

Form C: tube with fixed external 1" pipe thread

Form D: pressure-resistant thick-walled tube, for welding into position

Form E: tube tapering at the tip, for rapid response and mounting by sliding stop flange

Form F: tube as Code E, but with fixed flange

Form G: tube as Code E, but with fixed external 1" pipe thread

The above-mentioned standard DIN 43 763 also lays down the materials and their abbreviations in the form of special codes. For instance: the designation "Protection tube DIN 43 763-B1-H" identifies a tube to Form B, i.e. with a welded-on external ½" pipe thread, length 305mm (code number 1), in steel St 35.8 (code letter H). The standard also indicates the maximum pressure in air, water or steam as well as the maximum flow velocity. This makes it easy to select the protection tubes during the design phase of system construction.
There are also numerous special versions available, partly with standardized terminal heads and partly in highly specialized non-standard forms with plug connectors or attached cable.

Resistance thermometers to DIN 3440

Resistance thermometers for use with temperature controllers or limiters for heating systems must meet the requirements of the standard DIN 3440. These are resistance thermometers, as described in the previous section, but with an additional TUV type approval.
The resistance thermometer must withstand temperatures which are 15% above the upper temperature limit for at least one hour, and must meet specific response times, depending on the fluid
(e.g. in air: $t_{0.63}$ = 120 sec).
Furthermore, the thermometer must be designed to withstand mechanical loading caused by the external pressure and the flow rate of the medium, at the operating temperatures.
Alterations to such thermometers are not permitted without obtaining a fresh TUV approval!

Explosion-protected resistance thermometers

In all areas where flammable materials are stored, processed or manufactured, there is a possibility that, in combination with air, an explosive atmosphere may be formed which represents a hazard to the environment. The necessary conditions and requirements which electrical equipment has to meet in order that it can be used in an area exposed to an explosion hazard are summarized in the European Standards EN 50 014 … EN 50 020. Equipment that conforms to these standards can therefore be used throughout Europe.

Pressure-tight enclosure EEx "d"

Transducers in pressure-tight enclosures are designed so that all components which could ignite an explosive atmosphere are safely enclosed in the protective fitting or in the terminal head. Any explosion produced inside can therefore not be propagated to the outside. This is achieved by close tolerances, special cable glands and a particularly robust construction of the terminal head. Advantages of this version:

- an intrinsically safe power supply is not required
- connection in 2-wire, 3-wire or 4-wire circuit is possible
- also available with 2-wire transmitter

Fig. 6: Resistance thermometer in pressure-tight enclosure EEx "d"

Intrinsic safety EEx "i"

By contrast with protection "d", which refers generally to the actual device, protection "i" always considers the complete circuit.

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In this form of resistance thermometer, the intrinsically safe 2-wire transmitter with a 4 — 20 mA output signal is located directly inside the enlarged terminal head of the thermometer, and is included in an intrinsically safe circuit.
This arrangement offers decisive advantages:
- interference-free output signal, directly from the thermometer
- low installation cost
- no lead compensation required
- signal can be transmitted over long distances
- installation and repair while the system is in operation

Fig. 7: Resistance thermometer with intrinsic safety EEx "i"

Resistance thermometers with 2-wire transmitters
Resistance thermometers with transmitter are used for measuring temperatures in liquids and gases when measurement signals have to be transmitted over considerable distances, free from interference. The transmitter converts the sensor signal into a standard 4 — 20mA current signal which is linear with temperature.
The supply for the transmitter is fed through the same connections, utilizing the quiescent current level of 4 mA. Because of the zero offset, this method is also referred to as "live zero". The 2-wire transmitter amplifies the signal and achieves a considerable reduction in its sensitivity to interference. In these styles, the 2-wire transmitter is encapsulated in epoxy resin and mounted directly inside the terminal head of the resistance thermometer.

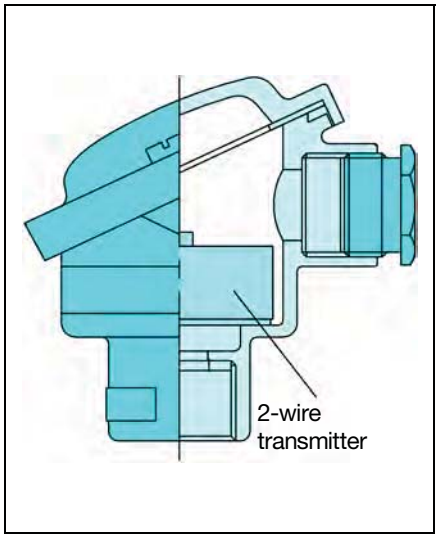

Fig. 8: Terminal head with a 2-wire transmitter

The transmitter is suitable for operating temperatures up to 90°C. Terminal heads are available in Forms BUZ, BBK and BUZH, as well as the standard Form B.

Resistance thermometers with connecting cable
On resistance thermometers with a connecting cable, the insert and terminal head are omitted. The temperature sensor is joined directly to the connecting cable, and placed in the protection tube. Strain relief is provided, for instance by grooving or compressing the end of the protection tube several times (enclosure IP65). The internal space between the protection tube and the temperature sensor is normally filled with thermally conductive material to improve the thermal contact to the fluid being measured. The maximum operating temperature is determined mainly by the temperature limit for the sheathing and insulating material of the connecting cable. The table shows some typical materials and their temperature limits.

Material	t_{max}/°C
PVC	80
PVC 105	105
Silicone	180
PTFE	260

The thermometers are available in many different styles, which are frequently designed to suit particular user requirements.

Some typical data values are:
- diameter: 2 — 8 mm
- protection tube length: 35 — 150 mm
- protection tube material: stainless steel, brass, coated steel
- circuit connection: 2, 3, or 4-wire
- mounting: flange with union connector, fixed nipple and clamping nipple

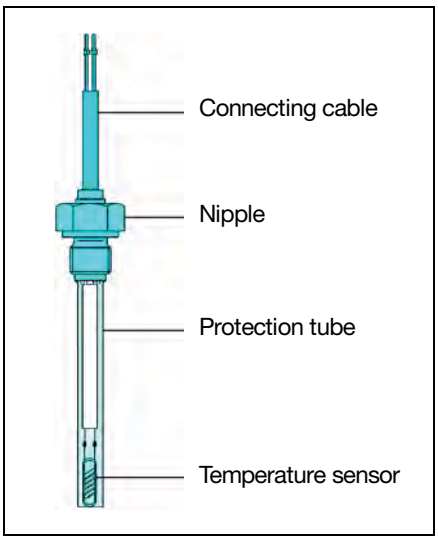

Fig. 9: Construction of a resistance thermometer with attached cable

Another type is **resistance thermometers for sterilizers.**
The temperature probes must have an especially high reliability, since these installations usually operate 24 hours a day.
The transition from the protection tube to the connecting cable is sealed steam-tight and can withstand absolute pressures of 0.1 to 4 bar at temperatures up to 150°C.
The basic versions are fitted with high-temperature PTFE-Teflon connecting cables and smooth protection tubes. Up to three Pt100 temperature sensors to EN 60 751 can be fitted in these temperature probes (see Data Sheet 90.2830).

Mineral-insulated resistance thermometers
Mineral-insulated resistance thermometers are constructed using a mineral-insulated cable. The thin stainless-steel cable sheath contains the copper conductors embedded in compressed, fire-resistant magnesium oxide. The temperature sensor (in 2-, 3- or 4-wire circuit) is connected to the internal conductors and fitted into the stainless steel protection tube, which is welded to the cable sheath. Diameters as small as 1.9 mm are available.

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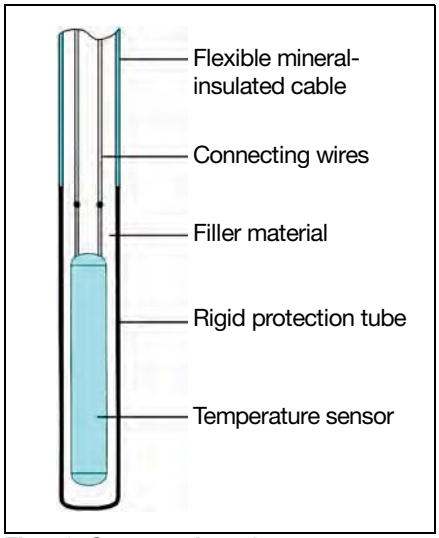

Fig. 10: Construction of a mineral-insulated resistance thermometer

The excellent heat transfer between the **protection tube** and the temperature sensor leads to a fast response ($t_{0.5}$ from 1.2 sec) and high accuracy. The shockproof construction ensures a long life. The flexible **mineral-insulated cable**, with a minimum bending radius of 5 x outside diameter (1.9/3/6mm), permits temperature measurement at relatively inaccessible locations. Because of their special properties, mineral-insulated resistance thermometers are used in chemical plant, power stations, pipelines, in engines, on test beds and in all locations where flexibility and problem-free installation are required.

Heat meter resistance thermometers

Resistance thermometers for heat meters have a federal type approval from the German Physikalisch-Technische-Bundesanstalt (PTB). The various styles meet the requirements of the Draft European Standard EN 1434 and are recommended by the German District Heating Association (AGFW = Arbeitsgemeinschaft für Fernwärme). **Thermometers with a terminal head** are available for direct temperature measurement as well as for use in suitable close-fitting pockets. The fitting length varies from 85 to 400mm. A variant is the **resistance thermometer with attached cable,** as a screw-in or push-in version. Screw-in resistance thermometers with an M 10x1 thread measure temperature directly inside the liquid, with the advantages of fast response and low heat conduction error. Using push-in thermometers in close-fitting pockets makes it unnecessary to drain the system when replacing the thermometer at the end of the certification period. The ideal locations for screw-in resistance thermometers with an attached cable are ball valves for 1/2", 3/4" and 1" pipes. The special design of the ball valves makes it unnecessary to drain the system when fitting or replacing the temperature probe. The small pipe diameters lead to a fitting length no greater than 30mm. This gives rise to a heat conduction error which affects the measurement. The optimized internal construction of **JUMO** resistance thermometers results in a negligible heat conduction error of less than 0.03°C, and is thus even lower than the PTB specification of 0.1°C.

Insertion resistance thermometers

The design is essentially a resistance thermometer with attached cable, which is fitted with a handle. Special features of this thermometer style are: it is unaffected by alternating temperatures, sealed against water (vapor), resistant to mechanical shock and vibration. The temperature sensor in 2-wire or 3-wire circuit is inserted into the protection tube which is then sealed. The stainless steel protection tube is 100 mm long and has a concentric point or angled tip. The handles in Teflon, PPS plastics or HTV silicone are resistant to a large number of aggressive media. The connecting cable has Teflon insulation for good heat resistance.

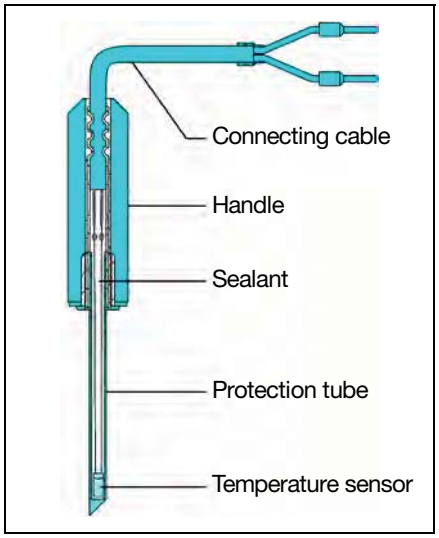

Fig. 11: Construction of an insertion resistance thermometer

A special feature of the internal construction is the sealing, which withstands high temperatures and prevents entry of water (vapor).

Surface resistance thermometers

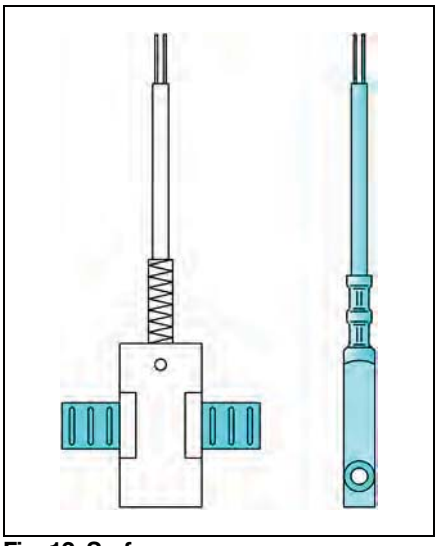

Fig. 12: Surface resistance thermometers

Surface resistance thermometers are used preferably for measuring temperatures on closed pipe systems and other round or flat surfaces. Simple installation by tension bands or hose clips avoids any mechanical preparation of the measurement location. Other versions have a mounting hole, for securing to any form of surface by a screw. Indirect temperature measurement avoids disturbing the flow of the liquid or gas. In addition, pressure and chemical effects do not influence the life of the resistance thermometer.

The object being measured is hardly affected by the small thermal mass. Heat-conductive paste can be used to improve the heat transfer. Large temperature differences between the gas/liquid and the surroundings have a direct effect on the measurement. In such cases, it is advisable to provide the thermometer with thermal insulation.

Indoor and outdoor resistance thermometers

Different versions are available for temperature measurement indoors and in the open. In the **domestic version,** the temperature sensor is enclosed in an elegant plastic housing with IP20 protection. On **outdoor thermometers for industrial use,** with IP65 protection, the temperature sensor is mounted outside the housing and enclosed by a protective cap.

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A further version is provided with a stainless steel protection tube, into which the temperature sensor is inserted.
Electrical connection is made through a Pg9 cable gland. The measuring range covers -30 to +80°C. Various versions can be fitted with a 2-wire transmitter having a 4 — 20mA output signal.

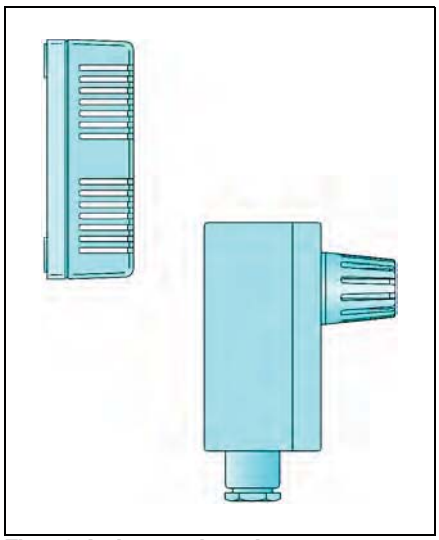

Fig. 13: Indoor and outdoor resistance thermometers

Precision resistance thermometers
For maximum stability, it is usual to arrange the resistance coil freely suspended inside the protection tube.

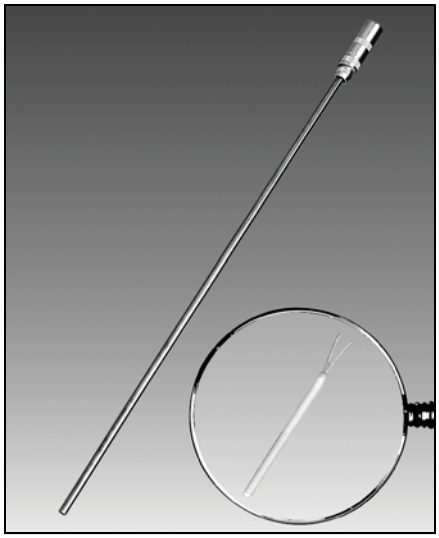

Fig. 14: Certifiable thermometer

This prevents mechanical loading under temperature, caused by differential expansion. But vibration can very easily result in a break in the coil. So, while these thermometers have excellent long-term stability, of the order of 0.001°C or less, the low mechanical strength means that they are unsuited for industrial use. For such applications **JUMO** employs a temperature sensor with a platinum coil that is secured in a ceramic sleeve. The leads to the connector are made as a 4-wire circuit. A stainless steel tube protects the sensor from mechanical influences. The temperature range covers -200 to +450°C, depending on the version. The measurement accuracy can be up to ±0.025°C.

Measurement

Connection of resistance thermometers
In a resistance thermometer, the electrical resistance varies with temperature. For evaluating the output signal, a constant current is passed through the thermometer and the voltage drop across it is measured. For this voltage drop, Ohm's Law states that:

$$V = R \times I$$

The measuring current should be as small as possible, in order to avoid heating of the sensor. It can be assumed that a measuring current of 1 mA does not introduce any appreciable errors. This current produces a voltage drop of 0.1 V in a Pt100 at 0°C. This signal voltage must now be transmitted through the connecting cables to the indicating or evaluation point, with a minimum of alteration.

Three different types of connecting circuit are used for this purpose:

2-wire circuit
The connection between the thermometer and the evaluation electronics is provided by a 2-core cable. Like any other electrical conductor, this cable has an electrical resistance which is in series with the temperature sensor. So the two resistances are added, and the result is a systematically higher temperature indication. For longer distances, the lead resistance may amount to a few ohms and produce an appreciable shift in the measured value. In order to avoid this error, the resistance is compensated electrically.
The instrument is designed to allow always for a lead resistance of, for instance, 10Ω. When the resistance thermometer is connected up, a compensating resistance is connected in one of the measurement lines and the sensor is replaced initially by a 100.00Ω resistor. The compensating resistance is then altered until a reading of 0°C appears on the instrument.
Because of the relative large amount of work involved and the fact that effects of temperature on the measurement cable are not covered, the use of the 2-wire circuit is becoming increasingly rare.

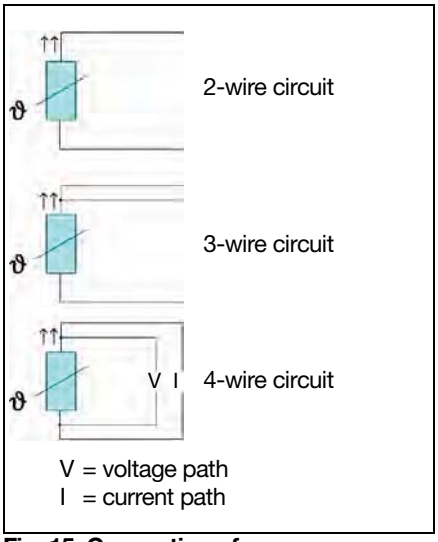

Fig. 15: Connection of resistance thermometers

3-wire circuit
The effects of the lead resistances and their fluctuation with temperature are reduced to a minimum in the 3-wire circuit. In this circuit, an additional lead is brought out to a contact on the resistance thermometer. This results in two measuring circuits, one of which is used as a reference.
The 3-wire circuit makes it possible to compensate for both the value and the temperature dependency of the lead resistance. But it is a requirement that all three cores have identical properties and are at the same temperature. In most cases, this is true to a sufficient degree of accuracy, so that the 3-wire circuit is the one most frequently used these days. No lead compensation is required.

4-wire circuit
The optimum form of connection for resistance thermometers is the 4-wire circuit. The measurement depends neither on the lead resistances nor on their variation due to temperature. No lead compensation is required. The thermometer receives the measuring current I through the supply connections. The voltage drop V across the temperature sensor is picked off by the measuring leads.

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If the input resistance of the electronics is many times greater than the lead resistance, then the latter can be neglected. The voltage drop determined in this way is independent of the properties of the connecting wires.

With both 3-wire and 4-wire circuits it must be remembered that the circuit is not always taken right up to the actual sensing element. The connection from the sensor to the terminal head of the fitting, the so-called internal connection, is frequently made in a 2-wire circuit. This results in similar problems to those discussed for the 2-wire circuit, although to a much smaller extent. The total resistance, consisting of the sum of internal connection and sensor, is defined by DIN 16160 as the **thermometer resistance**.

Insufficient insulation resistance

Because of the finite resistance between the connections and within the insulation material in which the sensor is embedded, there is a possibility of a further error due to poor insulation resistance which reduces the indicated temperature. Based on a Pt100 thermometer, an insulation resistance of 100 kΩ results in an error of 0.25°C, and 25 kΩ one of 1°C. Because of the variation of insulation resistance with temperature, it is possible for this error to vary with the measuring conditions.
For ceramic insulating materials in particular, the resistance decreases with increasing temperature.

In view of the relatively low maximum temperature of about 600°C, this effect is hardly noticeable for platinum temperature sensors. Much more important is any moisture which may penetrate the insulation, as this can cause a substantial measurement error. Sensors are therefore usually covered by a glaze or some other form of hermetic sealing. The measuring insert itself is also sealed, in order to prevent entry of moisture into the probe tube. Inserts are readily interchangeable, since they are completely enclosed units. For resistance thermometers without inserts, on the other hand, it is vital to ensure a reliable seal if they have to be repaired.

Self-heating

The output signal of a resistance thermometer can only be measured by passing a current through the sensor. This measurement current produces a power loss and therefore heats up the sensor, with the result that the temperature indication is increased. Self-heating depends on a number of factors, including the extent to which the heat generated can be removed by the fluid (or gas) being measured. Because the relationship for electrical power is $P = R \times I^2$, the effect depends also on the basic resistance of the temperature sensor. For the same measurement current, a Pt1000 temperature sensor is heated ten times as much as a Pt100. In addition, design features (thermometer size) and thermal conduction and capacity also determine the error. The thermal capacity of the fluid and its flow velocity also have a large influence on this effect.
Thermometer manufacturers often specify a self-heating coefficient, which represents a measure for the temperature increase through a defined power loss in the sensor. Such calorimetric measurements are carried out under standard conditions (in water at 0.5m/sec, or air at 2m/sec), but the information is somewhat theoretical and serves only for comparison between different designs.
In most cases, the measurement current is set at 1mA by the instrument manufacturer, since this value has been found appropriate in practice and produces no appreciable self-heating.
For example, a Pt100 temperature sensor is placed in a closed and fully insulated container with $10cm^3$ of air, and this measurement current of 1 milliampere increases the air temperature by 39°C after one hour. With flowing gases and liquids the effect is very much less pronounced, because of the much greater heat dissipation.
Because of differences in measurement conditions it is necessary to measure the actual self-heating effect on site. The current is varied and the corresponding temperature is measured. The self-heating coefficient E is derived as:

$$E = \Delta t / (R \times I^2)$$

where
Δt = (indicated temperature) – (fluid temperature),
R = thermometer resistance
I = measurement current

The self-heating coefficient can be used to determine the maximum measurement current if an error Δt is permitted.

$$I = (\Delta t / E \times R)^{1/2}$$

Parasitic thermal voltages

The effect of thermo-electric voltages can also be seen during temperature measurement with resistance thermometers, in this case as a highly undesirable side effect. Thermal voltages can be generated at the junction of two different metals.
Such metal junctions occur at the lead connections in the resistance thermometer. The connecting wires of the sensor frequently consist of silver, with extensions of copper or nickel as internal conductors, for example.

Under normal conditions, it can be assumed that both junctions are at the same temperature and that the resulting thermal voltages cancel each other. Differences in heat conduction to the outside may however lead to the establishment of different temperatures; the resulting thermal voltage is interpreted by the electronics as a voltage drop, thus producing a measurement error.
This can take the form of an increase or a decrease, depending on the polarity of the thermal voltage which is produced.

The magnitude of the resulting error depends very much on the characteristics of the electronics, in particular on how the voltage is evaluated as a temperature.

A simple method for diagnosing such errors consists of performing two measurements with the measurement current in opposite directions. The larger the difference between the two measurements, the greater is the thermal voltage generated.

Transfer function

A sensor will never respond instantaneously, but always with a certain delay, because of the ever-present thermal resistances within the probe. The resulting measurement error, caused by the measurement or output signal lagging behind a change in the substance being measured, is known as the **dynamic error**.
As a simplification, it is possible to think of the probe as consisting of a combination of resistances and energy stores. The material masses and the corresponding thermal capacities form the energy stores. The materials have different thermal conductivities which cause the resistances. The components of the thermometer often have both characteristics simultaneously.

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The speed with which the thermometer responds depends in the first instance on the ratio of the thermal resistance to the thermal capacity of the probe. The larger this thermal resistance, the slower the probe heats up. So in order to achieve a fast response it is desirable to use small sensors and thin materials which conduct heat readily. A particularly unfavourable feature is the air gap between the measurement insert and its protection tube, since all gases are poor heat conductors. The remedy consists of embedding the insert in thermally conductive pastes or metal oxides. Thermocouples have essentially shorter reponse times than resistance thermometers, because of their lower thermal mass. This applies in particular to thin mineral-insulated thermocouples. However, in most cases the difference is largely outweighed by the comparatively high thermal capacity of the protective fitting. The response time generally increases with increasing protection tube diameter. It is therefore advisable to use thin-walled fittings of small diameter, as far as the mechanical circumstances allow.

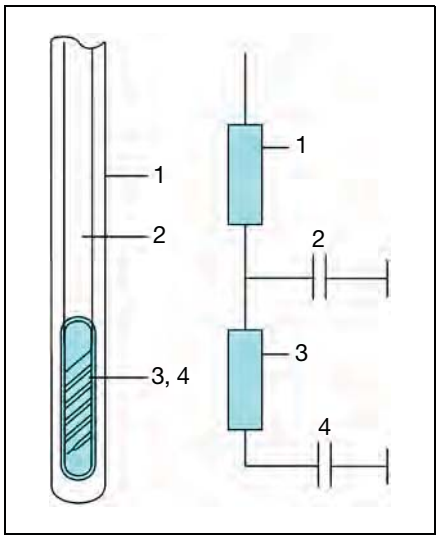

Fig. 16: Thermal resistances in a thermometer

The thermal conductivity of the protection tube material is also very important. Copper and iron are comparatively good heat conductors, but stainless steel and ceramics are not so good.

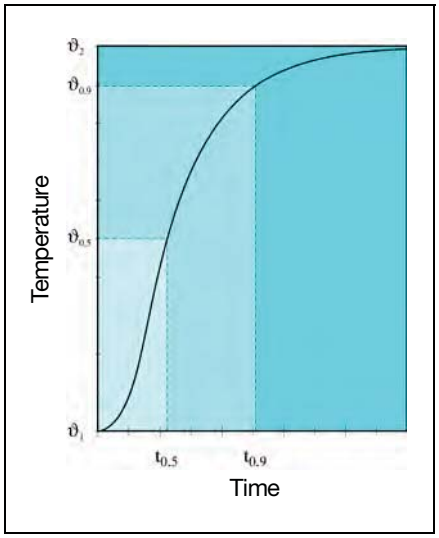

Fig. 17: The transfer function

The **transfer function**, i.e. the variation of the measured value following a sudden change in temperature, provides information on this effect. Tests to determine the transfer function of the thermometer are carried out in a flow of warm water or air, using special test set-ups, as specified for example in EN 60751. Two times (response periods) characterize the transfer function:

- **Half-value time $t_{0.5}$**
  The half-value time indicates the period during which the measured value reaches 50% of its final value.
- **90%-time $t_{0.9}$**
  The 90%-time indicates the period during which the measured value reaches 90% of its final value.

A time τ taken to reach 63.2% of the final value is not generally specified, because of possible confusion with the time constant of an exponential function. The heat transfer function of virtually all thermometers deviates clearly from such a function.

Errors in resistance thermometers

Effect of the cable

In measurements using resistance thermometers, the results may be falsified by design features or measurement effects. The following section explains the most important effects which may cause erroneous measurements.
As described elsewhere, the lead resistance enters into the measurement as a resistor in series with the sensor.

Particularly in large installations, with the resulting longer transmission distances, the lead resistance can reach the same order of magnitude as the sensor resistance itself. Compensation of the lead resistance is therefore absolutely essential, and usually consists of shifting the zero of the instrument connected to the sensor. However, such compensation does not take account of the changes in the lead resistance with temperature. If the connecting cable is subjected to fluctuating temperatures, this will lead to varying degrees of measurement error. The effect only becomes apparent with larger lead resistances, i.e. with longer cable lengths and small conductor cross-sections.

Heat conduction error

A thermometer is rarely used in the range of ambient temperatures. If the measured temperature is above or below the ambient temperature, a temperature gradient will result at the thermometer, between the measurement point and the surroundings.
This leads to an error in the temperature indication: heat flows through the protection tube and the internal components from the hotter to the cooler location. In addition, the sensor is connected to the cable, forming a direct metallic contact between the sensor and the surroundings – a thermal bridge which also causes an error. Good electrical conductors always have a low thermal resistance, so the requirement for a lower lead resistance is counteracted by a higher heat conduction error.
Furthermore, the design of the thermometer influences the heat conduction error. The sensor must have a good thermal connection to the protection tube, but at the same time be thermally decoupled from the connecting cable. The installation length of the thermometer must not be made too short, otherwise too much heat will be dissipated. The **immersion depth** (the length of the portion of the thermometer which is exposed to the medium being measured) depends on the type of medium and the rate at which it transports heat. For example, a fast-flowing liquid will transfer more heat than still air, and will therefore provide better compensation for the heat conduction of the thermometer.
Measurements in liquids only require about half of the installation length compared with that used with gases.

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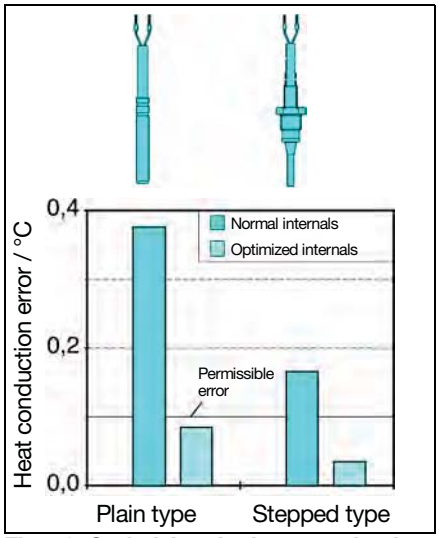

Fig. 18: Optimizing the heat conduction error, through protection tube geometry and internal layout

An example will demonstrate the effect of design on the heat conduction error. When used with heat meters, thermometers must have a heat conduction error not exceeding 0.1°C under the following conditions:

- Measured temperature: 80°C,
- Ambient temperature: 20°C,
- Measured medium: water, at a flow velocity of 0.1 to 0.2 m/sec

Particularly in short temperature probes with a fitting length less than 50mm, the achievement of the accuracy specified above raises problems which have to be solved through the design. The connecting cable is taken right up to the sensor and consists of copper. The thermal interface between sensor and protection tube is usually provided by heat conductive paste.

In the absence of any special precautions for thermal decoupling, there is a heat conduction error of about 0.3°C.

A 50% improvement is achieved by reducing the protection tube diameter in the region of the sensor. The error of 0.15°C for this probe version is still not adequate to meet the test criteria. Finally, a thermal decoupling of the connecting cable from the sensor reduces the heat conduction error to 0.03°C, which is now a factor of 10 better than the original version.

Measures for reducing the heat conduction error

It is not always possible to optimize the probe design for a particular measurement application so that the result is not affected by heat conduction errors. The publication "Electrical Temperature Measurement", described on the last page, summarizes the most important selection criteria for a probe with regard to heat conduction errors.

Calibration

During its operational life, a thermometer experiences changes in its characteristic compared with its original ex-factory condition, because of chemical and mechanical effects, as well as through ageing phenomena such as recrystallization and diffusion. In order to allow for drift and to compensate for it, it is necessary to recalibrate the thermometer at regular intervals.


DEUTSCHER KALIBRIERDIENST (DKD)

Kalibrierlaboratorium für die Meßgröße Temperatur
Calibration laboratory for the measured Temperature

AKKREDITIERT DURCH DIE PHYSIKALISCH-TECHNISCHE BUNDESANSTALT (PTB)

JUMO
MESS- UND REGELTECHNIK

0066
DKD-K
09501
94-10

Kalibrierschein
Calibration Certificate

Kalibrierzeichen
Calibration mark

Gegenstand *Object*	Platinwiderstandsthermometer
Hersteller *Manufacturer*	M.K. Juchheim GmbH D-36039 Fulda
Typ *Type*	90.286 - F11 P2
Fabrikat/Serien-Nr. *Serial number*	C 28
Auftraggeber *Customer*	Fa. Mustermann D-00000 Musterstadt
Auftragsnummer *Order No.*	723796
Anzahl der Seiten des Kalibrierscheines *Number of pages of the certificate*	5
Datum der Kalibrierung *Date of calibration*	13.10.1994

Der Deutsche Kalibrierdienst ist Unterzeichner des multilateralen Übereinkommens der Western European Calibration Cooperation (WECC) zur gegenseitigen Anerkennung der Kalibrierscheine.
Dieser Kalibrierschein dokumentiert die Rückführbarkeit auf nationale Normale zur Darstellung der physikalischen Einheiten in Übereinstimmung mit dem internationalen Einheitensystem (SI).
Für die Einhaltung einer angemessenen Frist zur Wiederholung der Kalibrierung ist der Benutzer verantwortlich.
The Deutscher Kalibrierdienst is signatory to the multilateral agreement of the Western European Calibration Cooperation (WECC) for the mutual recognition of calibration certificates.
The calibration is performed according to the stipulations of the contract between the Physikalisch-Technische Bundesanstalt and the holder of the calibration laboratory.
This calibration certificate documents the traceability to national standards, which realize the physical units of measurement according to the International System of Units (SI).
The user is obliged to have the object recalibrated at appropriate intervals.

Dieser Kalibrierschein darf nur vollständig und unverändert weiterverbreitet werden. Auszüge oder Änderungen bedürfen der Genehmigung sowohl der Physikalisch-Technischen Bundesanstalt als auch des ausstellenden Kalibrierlaboratoriums.
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This calibration certificate may not be reproduced other than in full except with the permission of both the Physikalisch-Technische Bundesanstalt and the issuing calibration laboratory.
Calibration certificates without signature and seal are not valid.

Siegel *Seal* — stellv. Leiter des Kalibrierlaboratoriums *Head of the calibration laboratory* — Bearbeiter *Person responsible*

Gerd Scheller — Ralf Ziar

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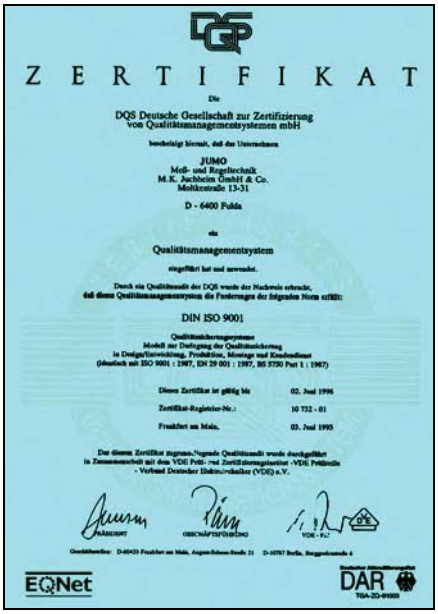
· D-36039 Fulda · Moltkestraße 13 – 31
Telefon (06 61) 60 03-6 31 · Telefax (06 61) 60 03-6 01 · Teletex 6619726

Fig. 19: Calibration certificate

Recalibration consists of checking the indicated temperature values and, where appropriate, recording the amounts by which they deviate from the true temperatures. By contrast, the concept of **adjustment**, which is often used in this connection, means altering the instrument to render the deviation small, at least to within the tolerance limits.
Calibration is identical with testing and measuring the accuracy for each individual thermometer. The manufacturer is, however, unable to provide any guarantee for the long-term stability of these values, since he cannot predict the future application and frequency of use, and the resulting stresses on the thermometer. It is advisable to recalibrate a thermometer initially every year and to compare the results with the previous calibration data. In the course of time, this produces a life history of the thermometer, from which its stability can be seen.
Depending on whether the reproducibility is adequate or not for the particular application, the recalibration period can then be extended or shortened.
The question concerning the actual details and the accuracy of a calibration cannot be answered in general terms. It is always subject to agreement between the user and the calibration laboratory, including temperature ranges and test points. The accuracy is determined by the type of measurement that is applied.

The German Calibration Service (Deutscher Kalibrierdienst, DKD)

The opening of the internal European trade boundaries after 1992, the new quality standards such as ISO 9001, and the more stringent product liability regulations make increasing demands on the documentation of processes and on the monitoring of measuring devices. In addition, there is an increasing demand from users for higher product quality standards. A particularly stringent requirement arises from the ISO 9001 standard, which describes the global concept of a quality assurance system.


DQS

Z E R T I F I K A T

Die
DQS Deutsche Gesellschaft zur Zertifizierung von Qualitätsmanagementsystemen mbH

bescheinigt hiermit, daß das Unternehmen

JUMO
Meß- und Regeltechnik
M.K. Juchheim GmbH & Co.
Moltkestraße 13-31

D - 6400 Fulda

ein

Qualitätsmanagementsystem

eingeführt hat und anwendet.

Durch ein Qualitätsmanagement der DQS wurde der Nachweis erbracht, daß dieses Qualitätsmanagementsystem die Forderungen der folgenden Norm erfüllt:

DIN ISO 9001

Qualitätssicherungssystem
Modell zur Darlegung der Qualitätssicherung
in Design/Entwicklung, Produktion, Montage und Kundendienst
(identisch mit ISO 9001 : 1987, EN 29 001 : 1987, BS 5750 Part 1 : 1987)

Dieses Zertifikat ist gültig bis	02. Juni 1996
Zertifikat-Registrier-Nr.:	10 732 - 01
Frankfurt am Main,	03. Juni 1993

Das diesem Zertifikat zugrunde liegende Qualitätsaudit wurde durchgeführt in Zusammenarbeit mit dem VDE Prüf- und Zertifizierungsinstitut - VDE Prüfstelle - Verband Deutscher Elektrotechniker (VDE) e.V.

PRÄSIDENT — GESCHÄFTSFÜHRUNG — VDE - Pr.

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Fig. 20: Certificate to ISO 9001

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If a manufacturer wishes to issue certificates based on this standard, it is necessary that the testing devices involved in production can be traced back to recognized national standards.

Traceability to a national standard means that in the checking of a testing device, the actual measurements are documented so that they can be traced back to legal instrument standards. In Germany, the PTB (Physikalisch-Technische-Bundesanstalt) lays down the national standards and compares them with the results from other organizations so that the representation of important parameters such as temperature can be ensured uniformly by physical means throughout the world.

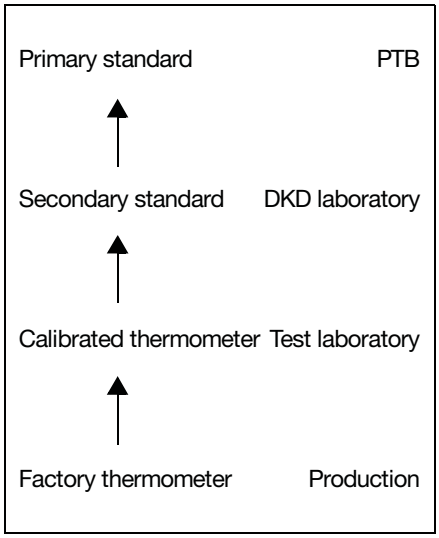

Fig. 21: Traceability

Because of the large demand for such calibrated devices, the government laboratories are found to have insufficient capacity and industry has therefore established and supports special calibration laboratories. These laboratories, including the **JUMO DKD Laboratory for Temperature 9501**, are linked to the German Calibration Service (DKD) and are subordinate to the national PTB laboratory for instrumental aspects. This ensures that the measuring devices used in a DKD laboratory can be traced back unequivocally to the national standards, and therefore also to the thermometers used there.

Safety note

All welded joints on thermometers and pockets are monitored through a fundamental quality assurance system according to DIN 8563, Part 113. Special safety regulations apply to the "Mandatory monitored area" (e.g. pressure vessels) according to Section 24 of the German Trade Regulations. In cases where the customer specifies such an application, the welding is monitored according to EN 287 and EN 288.

Pressure loading for temperature probes

The pressure resistance of protection fittings, such as are used for electric thermometers, depends largely on the different process parameters.
These include:
- temperature
- pressure
- flow velocity
- vibration

In addition, physical properties, such as material, fitting length, diameter and type of process connection have to be taken into account.

The diagrams below are taken from DIN 43 763 and show the load limit for the different basic types in relation to the temperature and the fitting length, as well as the flow velocity, temperature and medium.

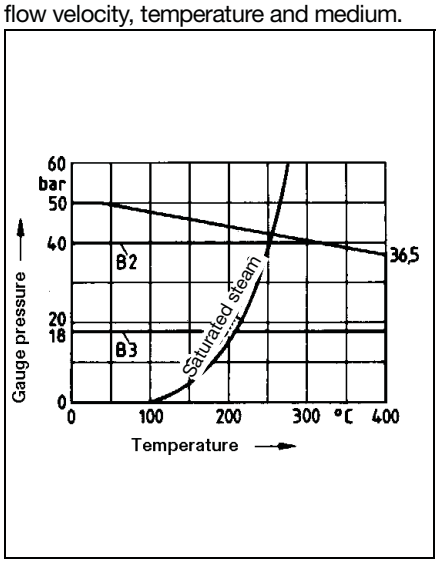

Fig. 22: Pressure loading for Form B protection tubes

stainless steel 1.4571
velocity up to 25m/sec in air
velocity up to 3m/sec in water

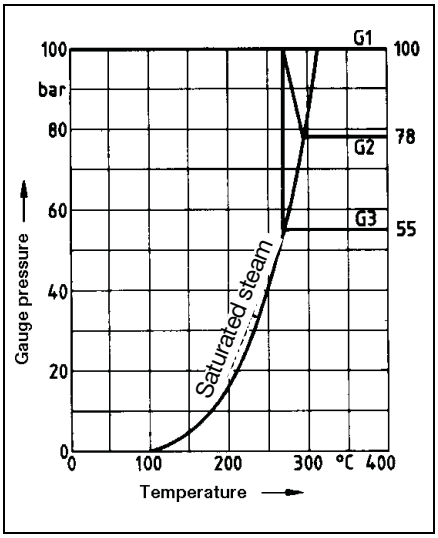

Fig. 23: Pressure loading for Form G protection tubes

stainless steel 1.4571
velocity up to 40m/sec in air
velocity up to 4m/sec in water

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As explained in the standard, the values indicated are guide values, which have to be individually examined for the specific application. Slight differences in the measurement conditions may suffice to destroy the protection tube.
If, when ordering an electric thermometer, it is required that the protection fitting be checked, the load type and the limit values have to be specified.

Fig. 24 shows the load limits (guide values) for different tube dimensions on a variety of additional thermometer designs. The maximum pressure loading of cylindrical protection tubes is shown in relation to the wall thickness with different tube diameters.
The data refer to protection tubes in stainless steel 1.4571, 100mm fitting length, 10m/sec flow velocity in air, or 4m/sec in water, and a temperature range from -20 to +100°C. A safety factor of 1.8 has been taken into account. For higher temperatures or different materials, the maximum pressure loading has to be reduced by the percentage values given in the table.

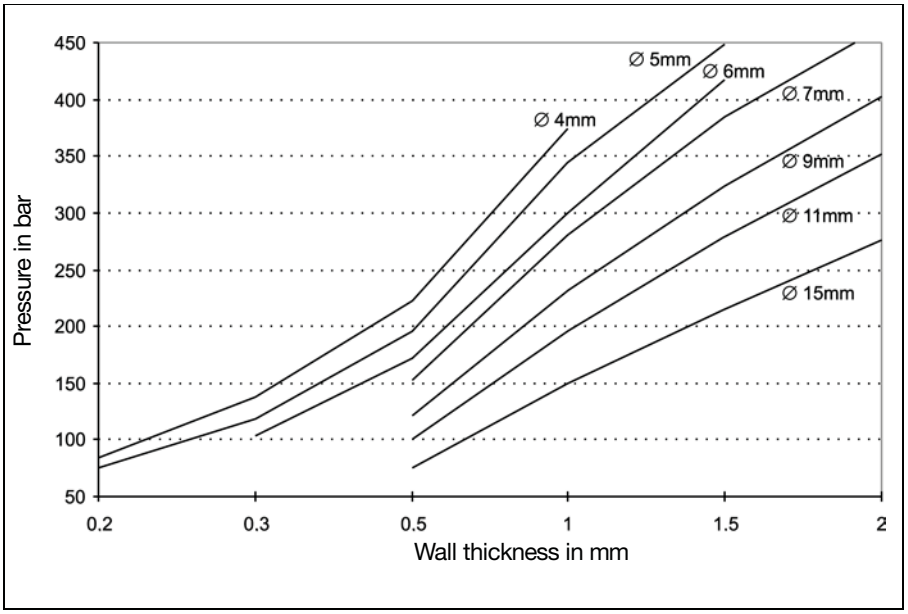

Fig. 24: Load limits on protection tubes, for various tube dimensions

Material	Temperature	Reduction
CrNi 1.4571	up to +200°C	-10%
CrNi 1.4571	up to +300°C	-20%
CrNi 1.4571	up to +400°C	-25%
CrNi 1.4571	up to +500°C	-30%
CuZn 2.0401	up to +100°C	-15%
CuZn 2.0401	up to +175°C	-60%

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Pressure test for thermometer protection fittings

The welded protection fittings of JUMO thermometers are subjected to a leakage test or a pressure test, depending on the construction of the protection fitting.

Thermometers which are manufactured to DIN or to application-specific guidelines (chemical or petrochemical plant, pressure vessel regulation, steam boilers) require different pressure tests according to the specific application.

If the thermometers are to be manufactured to such standards or guidelines, then the required tests or standards and/or guidelines have to be specified when ordering.

Scope of test
Tests can be carried out on each individual protection fitting and documented with a test report or acceptance certificate to EN 10204 (at extra cost).

Type of test
Tests can be performed on protection fittings up to a fitting length of 1050mm with flange connection DN25 or screw connection up to 1" thread size.

The following tests can be carried out:

Test type	Test medium	Pressure range	Test duration
Leakage test	helium	vacuum	10sec
Pressure test I	nitrogen	1 — 50bar	10sec
Pressure test II	water	50 — 300bar	10sec

Leakage test
A vacuum is produced inside the protection tube. From the outside, helium is applied to the protection fitting. If there is a leak in the protection tube, helium will penetrate and will be recognized through analysis. A leakage rate is determined by the rise in pressure (leakage rate > 1 x 10^{-6} l/bar).

Pressure test I
A positive pressure of nitrogen is applied to the protection tube from the outside. If there is a leak in the fitting, a volume flow will be produced inside the protection tube, which will be recognized.

Pressure test II
Water pressure is applied to the protection tube from the outside. The pressure must remain constant for a certain length of time. If this is not the case, the protection fitting has a leak.

Qualified welding processes for the production of protection tubes for thermometers

In addition to using perfect materials, it is the joining technique which, in the end, determines the mechanical stability and quality of the protection fittings. This is why the welding techniques at JUMO comply with the European Standards EN 287 and EN 288. Manual welding is carried out by qualified welders according to EN 287. Automatic welding processes are qualified by a WPS (welding instruction) to EN 288.

The following table provides an overview of the qualified welding processes:

	WIG welding	
Material	**manual**	**automatic**
W11, W11 with W01-W04 to EN 287	Tube diameter 2 — 30mm Wall thickness 0.75 — 5.6mm	Tube diameter 5 — 10mm Wall thickness 0.5 — 1.0mm

Table. 2: Qualified welding processes

Based on this experience, our welders can also join different materials and dimensions.

Laser beam welding is employed for wall thicknesses of less than 0.6mm, which is monitored by a laser beam specialist according to guideline DSV 1187.

On customers' request, material test certificates can be issued at extra cost. Likewise, special tests and treatments can be carried out, which are calculated according to the extent of the work, as set out in various application guidelines. This includes X-ray examinations, crack test (dye penetration test), thermal treatment, special cleaning processes and markings.

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Reference values according to EN 60 751 (ITS 90)

in ohms, for Pt100 temperature sensors, in 1°C steps

°C	-0	-1	-2	-3	-4	-5	-6	-7	-8	-9
-200	18.520	-	-	-	-	-	-	-	-	-
-190	22.825	22.397	21.967	21.538	21.108	20.677	20.247	19.815	19.384	18.952
-180	27.096	26.671	26.245	25.819	25.392	24.965	24.538	24.110	23.682	23.254
-170	31.335	30.913	30.490	30.067	29.643	29.220	28.796	28.371	27.947	27.552
-160	35.543	35.124	34.704	34.284	33.864	33.443	33.022	32.601	32.179	31.757
-150	39.723	39.306	38.889	38.472	38.055	37.637	37.219	36.800	36.382	35.963
-140	43.876	43.462	43.048	42.633	42.218	41.803	41.388	40.972	40.556	40.140
-130	48.005	47.593	47.181	46.769	46.356	45.944	45.531	45.117	44.704	44.290
-120	52.110	51.700	51.291	50.881	50.470	50.060	49.649	49.239	48.828	48.416
-110	56.193	55.786	55.378	54.970	54.562	54.154	53.746	53.337	52.928	52.519
-100	60.256	59.850	59.445	59.039	58.633	58.227	57.821	57.414	57.007	56.600
- 90	64.300	63.896	63.492	63.088	62.684	62.280	61.876	61.471	61.066	60.661
- 80	68.325	67.924	67.552	67.120	66.717	66.315	65.912	65.509	65.106	64.703
- 70	72.335	71.934	71.534	71.134	70.733	70.332	69.931	69.530	69.129	68.727
- 60	76.328	75.929	75.530	75.131	74.732	74.333	73.934	73.534	73.134	72.735
- 50	80.306	79.909	79.512	79.114	78.717	78.319	77.921	77.523	77.125	76.726
- 40	84.271	83.875	83.479	82.083	82.687	82.290	81.894	81.497	81.100	80.703
- 30	88.222	87.827	87.432	87.038	86.643	86.248	85.853	85.457	85.062	84.666
- 20	92.160	91.767	91.373	90.980	90.586	90.192	89.798	89.404	89.010	88.616
- 10	96.086	95.694	95.302	94.909	94.517	94.124	93.732	93.339	92.946	92.553
0	100.000	99.609	99.218	98.827	98.436	98.044	97.653	97.261	96.870	96.478

°C	0	1	2	3	4	5	6	7	8	9
0	100.000	100.391	100.781	101.172	101.562	101.953	102.343	102.733	103.123	103.513
10	103.903	104.292	104.682	105.071	105.460	105.849	106.238	106.627	107.016	107.405
20	107.794	108.182	108.570	108.959	109.347	109.735	110.123	110.510	110.898	111.286
30	111.673	112.060	112.447	112.835	113.221	113.608	113.995	114.382	114.768	115.155
40	115.541	115.927	116.313	116.699	117.085	117.470	117.856	118.241	118.627	119.012
50	119.397	119.782	120.167	120.552	120.936	121.321	121.705	122.090	122.474	122.858
60	123.242	123.626	124.009	124.393	124.777	125.160	125.543	125.926	126.309	126.692
70	127.075	127.458	127.840	128.223	128.605	128.987	129.370	129.752	130.133	130.515
80	130.897	131.278	131.660	132.041	132.422	132.803	133.184	133.565	133.946	134.326
90	134.707	135.087	135.468	135.848	136.228	136.608	136.987	137.367	137.747	138.126
100	138.506	138.885	139.264	139.643	140.022	140.400	140.779	141.158	141.536	141.914
110	142.293	142.671	143.049	143.426	143.804	144.182	144.559	144.937	145.314	145.691
120	146.068	146.445	146.822	147.198	147.575	147.951	148.328	148.704	149.080	149.456
130	149.832	150.208	150.583	150.959	151.334	151.710	152.085	152.460	152.865	153.210
140	153.584	153.959	154.333	154.708	155.082	155.456	155.830	156.204	156.578	156.952
150	157.325	157.699	158.072	158.445	158.818	159.191	159.564	159.937	160.309	160.682
160	161.054	161.427	161.799	162.171	162.543	162.915	163.286	163.658	164.030	164.401
170	164.772	165.143	165.514	165.885	166.256	166.627	166.997	167.368	167.738	168.108
180	168.478	168.848	169.218	169.588	169.958	170.327	170.696	171.066	171.435	171.804
190	172.173	172.542	172.910	173.279	173.648	174.016	174.384	174.752	175.120	175.488
200	175.856	176.224	176.591	176.959	177.326	177.693	178.060	178.427	178.794	179.161
210	179.528	179.894	180.260	180.627	180.993	181.359	181.725	182.091	182.456	182.822
220	183.188	183.553	183.918	184.283	184.648	185.013	185.378	185.743	186.107	186.472
230	186.836	187.200	187.564	187.928	188.292	188.656	189.019	189.383	189.746	190.110
240	190.473	190.836	191.199	191.562	191.924	192.287	192.649	193.012	193.374	193.736
250	194.098	194.460	194.822	195.183	195.545	195.906	196.268	196.629	196.990	197.351
260	197.712	198.073	198.433	198.794	199.154	199.514	199.875	200.235	200.595	200.954
270	201.314	201.674	202.033	202.393	202.752	203.111	203.470	203.829	204.188	204.546
280	204.905	205.263	205.622	205.980	206.338	206.696	207.054	207.411	207.769	208.127
290	208.484	208.841	209.198	209.555	209.912	210.269	210.626	210.982	211.339	211.695
300	212.052	212.408	212.764	213.120	213.475	213.831	214.187	214.542	214.897	215.252

The reference values have been calculated according to the International Temperature Scale ITS 90.
(The reference values must be multiplied by the factor 5 or 10 for Pt500 or Pt1000 temperature sensors).

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Internet: www.JumoUSA.com

Reference values according to EN 60 751 (ITS 90)

in ohms, for Pt100 temperature sensors, in 1°C steps

°C	0	1	2	3	4	5	6	7	8	9
310	215.608	215.962	216.317	216.672	217.027	217.381	217.736	218.090	218.444	218.798
320	219.152	219.506	219.860	220.213	220.567	220.920	221.273	221.626	221.979	222.332
330	222.685	223.038	223.390	223.743	224.095	224.447	224.799	225.151	225.503	225.855
340	226.206	226.558	226.909	227.260	227.612	227.963	228.314	228.664	229.015	229.366
350	229.716	230.066	230.417	230.767	231.117	231.467	231.816	232.166	232.516	232.865
360	233.214	233.564	233.913	234.262	234.610	234.959	235.308	235.656	236.005	236.353
370	236.701	237.049	237.397	237.745	238.093	238.440	238.788	239.135	239.482	239.829
380	240.176	240.523	240.870	241.217	241.563	241.910	242.256	242.602	242.948	243.294
390	243.640	243.986	244.331	244.677	245.022	245.367	245.713	246.058	246.403	246.747
400	247.092	247.437	247.781	248.125	248.470	248.814	249.158	249.502	249.845	250.189
410	250.533	250.876	251.219	251.562	251.906	252.248	252.591	252.934	253.277	253.619
420	253.962	254.304	254.646	254.988	255.330	255.672	256.013	256.355	256.696	257.038
430	257.379	257.720	258.061	258.402	258.743	259.083	259.424	259.764	260.105	260.445
440	260.785	261.125	261.465	261.804	262.144	262.483	262.823	263.162	263.501	263.840
450	264.179	264.518	264.857	265.195	265.534	265.872	266.210	266.548	266.886	267.224
460	267.562	267.900	268.237	268.574	268.912	269.249	269.586	269.923	270.260	270.597
470	270.933	271.270	271.606	271.942	272.278	272.614	272.950	273.286	273.622	273.957
480	274.293	274.628	274.963	275.298	275.633	275.968	276.303	276.638	276.972	277.307
490	277.641	277.975	278.309	278.643	278.977	279.311	279.644	279.978	280.311	280.644
500	280.978	281.311	281.643	281.976	282.309	282.641	282.974	283.306	283.638	283.971
510	284.303	284.634	284.966	285.298	285.629	285.961	286.292	286.623	286.954	287.285
520	287.616	287.947	288.277	288.608	288.938	289.268	289.599	289.929	290.258	290.588
530	290.918	291.247	291.577	291.906	292.235	292.565	292.894	293.222	293.551	293.880
540	294.208	294.537	294.865	295.193	295.521	295.849	296.177	296.505	296.832	297.160
550	297.487	297.814	298.142	298.469	298.795	299.122	299.449	299.775	300.102	300.428
560	300.754	301.080	301.406	301.732	302.058	302.384	302.709	303.035	303.360	303.685
570	304.010	304.335	304.660	304.985	305.309	305.634	305.958	306.282	306.606	306.930
580	307.254	307.578	307.902	308.225	308.549	308.872	309.195	309.518	309.841	310.164
590	310.487	310.810	311.132	311.454	311.777	312.099	312.421	312.743	313.065	313.386
600	313.708	314.029	314.351	314.672	314.993	315.314	315.635	315.956	316.277	316.597
610	316.918	317.238	317.558	317.878	318.198	318.518	318.838	319.157	319.477	319.796
620	320.116	320.435	320.754	321.073	321.391	321.710	322.029	322.347	322.666	322.984
630	323.302	323.620	323.938	324.256	324.573	324.891	325.208	325.526	325.843	326.160
640	326.477	326.794	327.110	327.427	327.744	328.060	328.376	328.692	329.008	329.324
650	329.640	329.956	330.271	330.587	330.902	331.217	331.533	331.848	332.162	332.477
660	332.792	333.106	333.421	333.735	334.049	334.363	334.677	334.991	335.305	335.619
670	335.932	336.246	336.559	336.872	337.185	337.498	337.811	338.123	338.436	338.748
680	339.061	339.373	339.685	339.997	340.309	340.621	340.932	341.244	341.555	341.867
690	342.178	342.489	342.800	343.111	343.422	343.732	344.043	344.353	344.663	344.973
700	345.284	345.593	345.903	346.213	346.522	346.832	347.141	347.451	347.760	348.069
710	348.378	348.686	348.995	349.303	349.612	349.920	350.228	350.536	350.844	351.152
720	351.460	351.768	352.075	352.382	352.690	352.997	353.304	353.611	353.918	354.224
730	354.531	354.837	355.144	355.450	355.756	256.062	356.368	356.674	356.979	357.285
740	357.590	357.896	358.201	358.506	358.811	359.116	359.420	359.725	360.029	360.334
750	360.638	360.942	361.246	361.550	361.854	362.158	362.461	362.765	363.068	363.371
760	363.674	363.977	364.280	364.583	364.886	365.188	365.491	365.793	366.095	366.397
770	366.699	367.001	367.303	367.604	367.906	368.207	368.508	368.810	369.111	369.412
780	369.712	370.013	370.314	370.614	370.914	371.215	371.515	371.815	372.115	372.414
790	372.714	373.013	373.313	373.612	373.911	374.210	374.509	374.808	375.107	375.406
800	375.704	376.002	376.301	376.599	376.897	377.195	377.493	377.790	378.088	378.385
810	378.683	378.980	379.277	379.574	379.871	380.167	380.464	380.761	381.057	381.353
820	381.650	381.946	382.242	382.537	382.833	383.129	383.424	383.720	384.015	384.310
830	384.605	384.900	385.195	385.489	385.784	386.078	386.373	386.667	386.961	387.255
840	387.549	387.843	388.136	388.430	388.723	389.016	389.310	389.603	389.896	390.188
850	390.481	-	-	-	-	-	-	-	-	-

The reference values have been calculated according to the International Temperature Scale ITS 90.
(The reference values must be multiplied by the factor 5 or 10 for Pt500 or Pt1000 temperature sensors).

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Electrical Temperature Measurement

with Thermocouples and Resistance Thermometers

D. Weber and M. Nau

Electrical temperature sensors have become indispensable components in modern automation, domestic engineering and production technology. As a result of the rapid expansion of automation during recent years, they have become firmly established in industrial engineering.

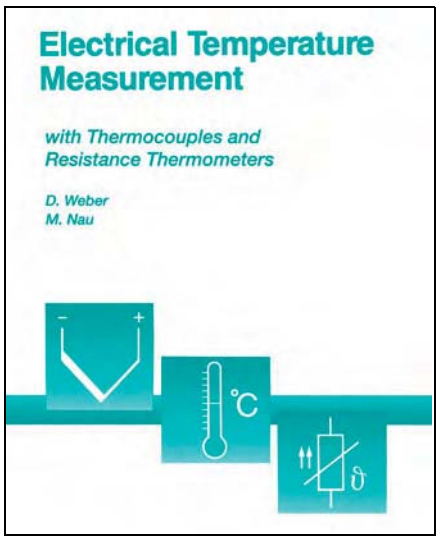

Fig. 25: Publication Electrical Temperature Measurement with Thermocouples and Resistance Thermometers

In view of this large spectrum of available products for temperature measurement it is becoming ever more important for the user to select the one suitable for his application.

On 128 pages this publication deals with the theoretical fundamentals of electrical temperature measurement, the practical construction of temperature sensors, their standardization, electrical connection, tolerances and types of construction.

In addition, it describes in detail the different fittings for electrical thermometers, their classification according to DIN standards, and the great variety of applications. An extensive series of tables for voltage and resistance series according to DIN and EN makes the book a valuable guide, both for the experienced practical engineer and also for the novice in the field of electrical temperature measurement.

To be ordered under Sales No. 90/00085081, price 15 DM net.
Schools, institutes and universities are asked to order in bulk, in view of the high handling costs.

Control Engineering

A guide for beginners

F. Blasinger

On 137 pages this publication covers the essential principles of measurement and control engineering. It offers the reader an opportunity to become familiar with the different types and applications of electronic controllers, assists in selecting the one most suitable for a particular application from the large number of different models, and ensures that it is adjusted correctly.

Mathematics has been avoided where possible, and the emphasis has been placed on practical control principles.

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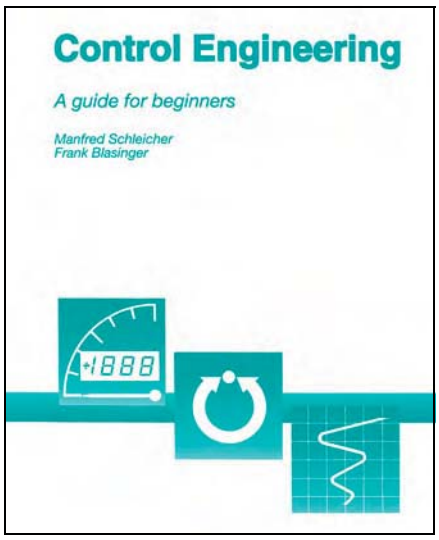

Fig. 26: Publication Control Engineering A guide for beginners

To be ordered under Sales No. 70/00323761, price 25 DM. net
Schools, institutes and universities are asked to order in bulk, in view of the high handling costs.

German Calibration Service (DKD) at JUCHHEIM

Certification laboratory for temperature

Raised quality expectations, improved measurement technology and, of course, quality assurance systems, such as DIN ISO 9000, make increasing demands on the documentation of processes and the monitoring of measuring devices.
In addition, there are increasing calls from customers for high product quality standards. Particularly stringent demands arise from the ISO 9001/9004 standard “Test devices monitoring”. This provides the legal basis for obliging suppliers and manufacturers (of products that are subject to processes where temperature is relevant) to check testing devices which can affect the product quality before use, or at certain intervals. Generally, this is done by calibrating or adjusting with certified devices. Because of the high demand for calibrated instruments and the large number of instruments to be calibrated, the state laboratories have insufficient capacity.
The industry has therefore established and supports special calibration laboratories which are linked to the German Calibration Service (DKD) and subordinate to the PTB (Physikalisch-Technische-Bundesanstalt) for all aspects of instrumentation.

The certification laboratory of the German Calibration Service at JUMO has carried out calibration certification for temperature since 1992. This service provides fast and economical certification for everyone.
DKD calibration certificates can be issued for resistance thermometers, thermocouples, measurement sets, data loggers and temperature block calibrators within the range -80 to +1100°C. The traceability of the reference standard is the central issue here. All DKD calibration certificates are recognized as documents of traceability, without any further specifications. In addition, calibrated precision platinum resistance thermometers or complete measurement sets with indicator in a service case can be obtained.

TF 12, TF 12-Ex
TF 212, TF 212-Ex

PROFIBUS PA
Temperatur-Meßumformer
Temperature Transmitter

Kurzgebrauchsanweisung / Short Manual

41/11-50-1 XA

ABB Instrumentation

Hartmann & Braun

ABB

Zu ergänzende Dokumentation!

Bei der vorliegenden Gebrauchsanweisung handelt es sich um eine Kurzform. Bei explosionsgeschützten Geräten ist zusätzlich die angefügte Baumusterprüfbescheinigung zu beachten. Weiterführende Dukumentation kann bei Bedarf beim Hersteller (Adresse auf der Rückseite) bestellt oder von der Homepage des Herstellers (www.abb.de/automation/) geladen werden:

TF12 / TF12-Ex	Listenblatt 11/10-8.26, Konformitätsbescheinigung ZELM 99 ATEX 0021
TF212 / TF212-Ex	Listenblatt 11/10-8.70, Konformitätsbescheinigung ZELM 99 ATEX 0021
alle Typen	Gebrauchsanweisung 42/11-50 Einführung in Feldbustechnologie 30/00-G980

Allgemeine Sicherheitshinweise!

Das Gerät
- ist gemäß IEC 1010-1 (entspricht EN 61010-1 entspricht DIN VDE 0411 Teil 1 „Sicherheitsbestimmungen für elektrische Meß-, Steuer-, Regel- und Laborgeräte“) gebaut und geprüft,
- ist CE-zertifiziert und
- hat das Werk in sicherheitstechnisch einwandfreiem Zustand verlassen.

Um diesen Zustand zu erhalten, müssen beim Umgang mit dem Gerät (Transport, Lagerung, Installation, Inbetriebnahme, Bedienung, Instandhaltung, Außerbetriebsetzung)
- der Inhalt dieser Gebrauchsanweisung sowie
- auf dem Gerät angebrachte Typschilder, Beschriftungen und Sicherheitshinweise

beachtet werden, andernfalls können
- Personen gefährdet und
- das Gerät selbst sowie andere Geräte und Einrichtungen beschädigt werden.

Die in dieser Gebrauchsanweisung genannten Verordnungen, Normen und Richtlinien gelten in der Bundesrepublik Deutschland. Bei der Verwendung des Gerätes in anderen Ländern sind die einschlägigen nationalen Regeln zu beachten.

Sollten die Informationen in dieser Gebrauchsanweisung nicht ausreichen, so kann jederzeit unter der auf der Rückseite dieser Gebrauchsanweisung angegebenen Adresse mit dem Hersteller Kontakt aufgenommen werden.

Sicherheitshinweise für alle Geräte-Ausführungen!

Die sichere Trennung von berührungsgefährlichen Stromkreisen ist nur gewährleistet, wenn die angeschlossenen Geräte die Anforderungen der VDE 0106 T.101 (Grundanforderungen für sichere Trennung) erfüllen. Für die sichere Trennung die Zuleitungen getrennt von berührungsgefährlichen Stromkreisen verlegen oder zusätzlich isolieren.

Vor dem Einschalten sicherstellen, daß die im Listenblatt genannten Umgebungsbedingungen eingehalten werden sowie daß die Spannung der Energieversorgung mit der Spannung des Transmitters übereinstimmt.

Wenn anzunehmen ist, daß ein gefahrloser Betrieb nicht mehr möglich ist, das Gerät außer Betrieb setzen und gegen unabsichtlichen Betrieb sichern.

Zusätzliche Sicherheitshinweise für TF 12-Ex und TF 212-Ex!

Bei allen Arbeiten am TF 12-Ex oder TH 212-Ex die EG-Baumusterprüfbescheinigung ZELM 99 ATEX 0021 beachten.

TF 12-Ex und TF 212-Ex dürfen direkt in Zone 1 montiert werden. Der Meßstromkreis als auch der Feldbusanschluß entsprechend EEx ia. Den benötigten Segmentkoppler zur Versorgung des Messumformers (IEC 1158) entsprechend der Ex-Klassifizierung selektieren.

Den TF 12-Ex so montieren, daß auch für die Anschlußteile ein Gehäuseschutzgrad von mindestens IP 20 gemäß IEC-Publikation 529 (144) erreicht wird.

Bei Erdungsmaßnahmen an der Busleitung (insbesondere des Schirmes) unbedingt die Angaben in der IEC 60079-14 bzw. EN 60 079-14 beachten (siehe auch Bedienungsanleitung 42/11-50).

Wird ein Gerät mit einem eigensicheren Stromkreis an die Transmitter angeschlossen, so ist gemäß DIN VDE 0165 / 08.98 (= EN 60079-14 / 1997 sowie IEC 60 079-14 / 1996) ein Nachweis über die Eigensicherheit der Zusammenschaltung zu führen.

Arbeiten an einem explosionsgeschützten Gerät dürfen von jeder fachkundigen Elektrofachkraft bzw. in jeder Werkstatt durchgeführt werden. Vor Beginn der Arbeiten sind die Sicherheitsvorkehrungen des Explosionsschutzes beachten!

Konformitätserklärung

Die Schutzanforderungen der europäischen Richtlinie 94/9/EG werden erfüllt.

Die Schutzanforderungen der europäischen Richtlinie 89/336/EWG mit ihren Änderungen werden aufgrund der Einhaltung folgender Normen erfüllt:
- Störaussendung: EN 50 081-1:1992
- Störfestigkeit: EN 50 082-2:1995
- Prüfstandards: EN 61 000-4 Teil 2, 3, 4, 5 und 6.

Ausführliche EMV-Prüfergebnisse siehe Listenblätter.

Supplementary documentation!

This manual for the TF12 / TF212 temperature tarnsmitters is a compressed version of the overall description. For Ex-certified devices, the Certificate of Conformity must be read prior to the installation. In case you need supplementary information, please feel free to contact us (see address on last page of this documentation) or download the information from our web page (www.abb.com/automation). A list of supplementary information is given below:

TF12 / TF12-Ex	Data Sheet 11/10-8.26, Certificate of Conformity (Ex) ZELM 99 ATEX 0021
TF212 / TF212-Ex	Data Sheet 11/10-8.70, Certificate of Conformity (Ex) ZELM 99 ATEX 0021
all versions	Manual 42/11-50 Introduction to the Fieldbus technology 30/00-G980

General Safety Regulations!

The unit
- has been constructed and tested in accordance with IEC 1010-1 (corresponds to EN 61 010-1 corresponds to DIN VDE 0411 part 1 “Safety requirements for electrical process, instrumentation and laboratory units”),
- possesses CE certification and
- has left the factory in a perfect technical and safe condition.

In order to retain this condition when dealing with the unit (transportation, storage, maintenance, commissioning, operation, servicing, switch-off)
- the contents of this Manual and
- the rating plates attached to the unit, inscriptions and safety instructions

must be observed. Otherwise
- persons could be endangered and
- the unit itself, as well as other equipment could be damaged.

The directives, norms and guidelines mentioned in this Manual are applicable in the Federal Republic of Germany. When using the unit in other countries, please observe the national regulations prevailing in the respective country.

Should the information provided in this Operating Manual prove to be insufficient, please do not hesitate to use the address list provided on the back sheet of this manual to contact the manufacturer.

Safety instructions for all versions!

The safe separation of live currents can only be guaranteed, if the connected apparatus meets the requirements of VDE 0106 T.101 (basic standards for electrical safety). To achieve this safety, the conduits should be laid separately from the hazardous circuits, or should receive extra insulation.

Before switching on the apparatus make sure that the ambient conditions stated in the Data Sheet are met and also that the voltage of the power supply unit is identical with the voltage of the transmitter.

Whenever it can be assumed that harmless operation is no longer possible, the apparatus shouldbe be made inoperative and secured against any unintended operation.

Additional safety instructions for TF 12-Ex and TF 212-Ex!

During all work on TF 12-Ex or TH 212-Ex the EEC Certificate of Conformity ZELM 99 ATEX 0021 must be observed.

TF12 and TF212 are certified for the installation in Zone 1 (according to ATEX) of hazardeous locations. The measuring circuits as well as the fieldbus connection are in accordance to EEx ia. The required segment coupler for the supply of the transmitter (IEC 1158) must be selected according to the Ex classification.

The TF 12-Ex should be mounted in such way that the connected parts also achieve a degree of housing protection of at least IP 20, as stipulated in the IEC publication 529 (144).

For grounding measures on the bus cable (e.g shield) the guidelines given in IEC 60 079-14 or EN 60 079-14 must be followed (see Manual 42/11-50).

If an apparatus with an intrinsically safe circuit is connected to the transmitter, proof of the intrinsic safety of the connection must be provided in accordance with DIN VDE 0165 / 08.98 (= EN 60 079-14 / 1997 as well as IEC 60 079-14 / 1996).

Work on an explosion-proof apparatus may be carried out in any workshop by all persons trained as electricians. Before commencing work, please ensure that safety measures regarding explosion protection have been taken!

Declaration of Conformity

The protection regulations of the European Guidelines 94/9/EG are fulfilled.

The safety regulations of the European Guidelines 89/336/EWG together with its amendments are fulfilled because of adherence to the following norms:
- Emitted interference: EN 50 081-1: 1992
- Interference immunity: EN 50 082-2: 1995
- Test standards: EN 61 000-4 part 2, 3, 4, 5 and 6.

For details of the EMC test report see the Data Sheets.

TF 12 / -Ex montieren

Mounting TF 12 / -Ex

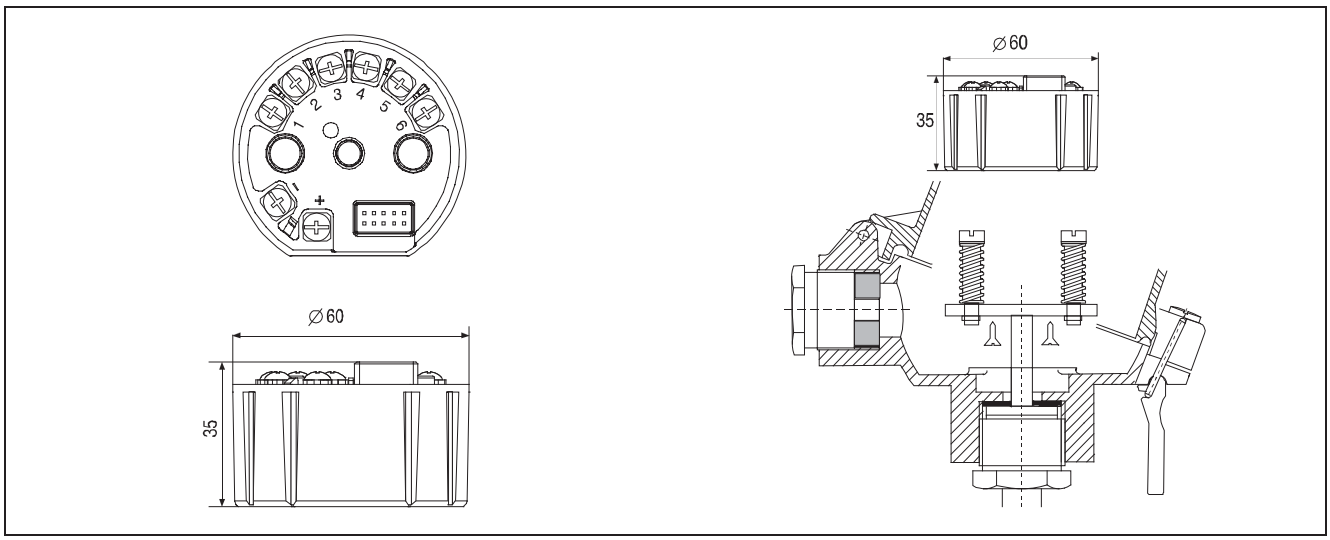

Bild 1 TF 12 / -Ex montieren
Z-20159 links Maßbild (Maße in mm)
Z-20218 rechts Montage auf Meßeinsatz mit angenieteten Hülsen und Federn (z.B. Anschlußkopf BUSH)
Meßeinsatz und Transmitter um 90° gedreht dargestellt

Fig. 1 Mounting TF 12 / -Ex
left Dimensinal drawing (dimensions in mm)
right Mounting on measuring module with riveted sleeves and springs (e.g. connecting head BUSH)
Measuring module and transmitter illustrated at a 90° angle

⚠ Achtung

Nur die mitgelieferten gewindefurchenden Schrauben M3 × 6 mm verwenden. Bei der Verwendung von anderen, längeren Schrauben kann der Transmitter beschädigt werden. Beim explosionsgeschützten Transmitter ist dann der Explosionsschutz nicht mehr gewährleistet.

⚠ Attention

Use only the supplied threaded screws M3 × 6 mm. The use of other, longer screws can lead to transmitter damage. In the case of ex-proof transmitters, this would nullify the explosion protection.

TF 212 / -Ex montieren

Mounting TF 212 / -Ex

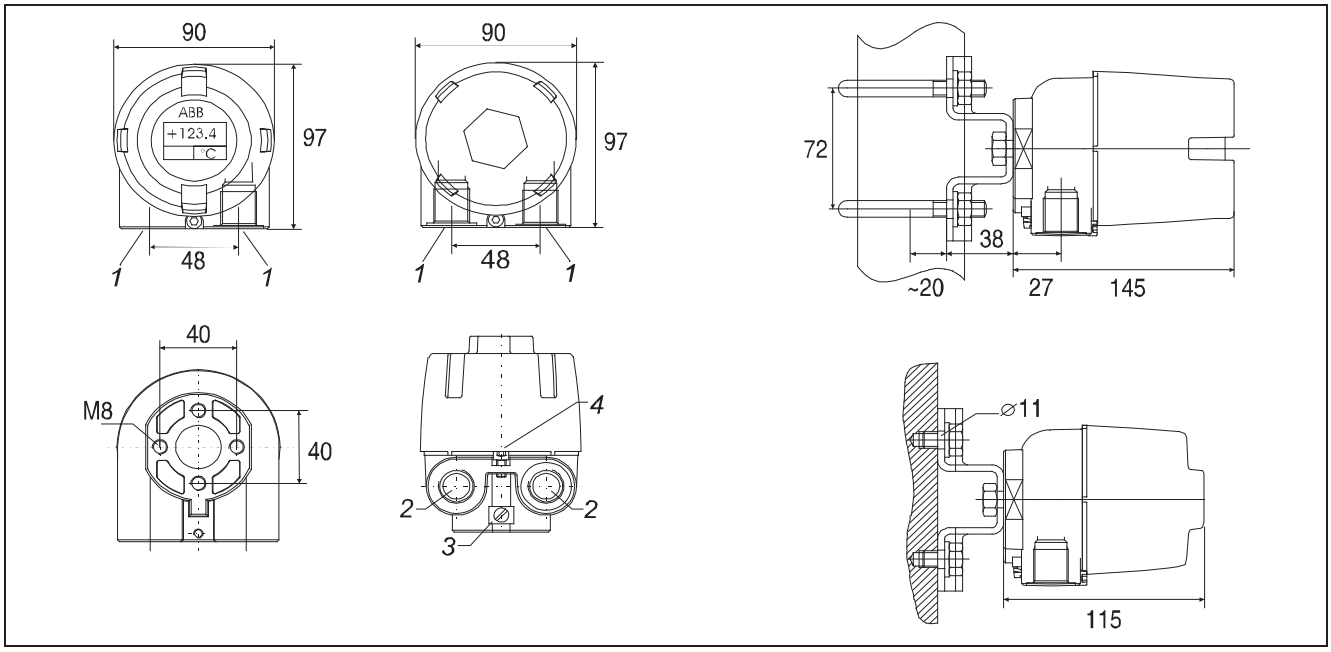

Bild 3 TF 212 / -Ex montieren
Z-20161 *1* elektrische Anschlüsse
2 Gewinde
3 Potentialausgleichsschraube M5
4 Sicherungsschraube

Fig. 3 Mounting TF 212 / -Ex
1 electrical connections
2 thread
3 eqiupotential bonding (connection point)
4 lock screw

TF 12 / TF 212 anschließen

Wiring TF 12 / TF 212

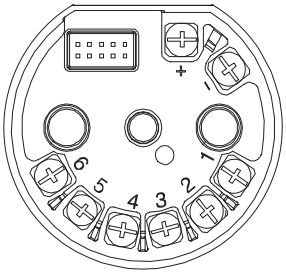

Bild 4 anschließen
Z-20211 + / − Energieversorgung (und Ausgang):
TF 12 9...32 V DC
TF 12-Ex9...17,5 V DC
1..6 siehe Bild 5

Fig. 4 wiring
+ / − Power supply (and output):
TF 12 9...32 V DC
TF 12-Ex9...17,5 V DC
1..6 see figure 5

Bild 5 Anschlußbild

A Widerstandsthermometer 2-Leiter

B Widerstandsthermometer 3-Leiter

C Widerstandsthermometer 4-Leiter

D Doppelwiderstandsmessung 2-Leiter

E Doppelwiderstandsmessung 3-Leiter

F Thermoelement

G Doppelthermoelement

H Kombination Widerstandsthermometer - Thermoelement

I Kombination Thermoelement - Widerstandsthermometer

- Widerstandsmessung analog zu Widerstandsthermometern (A...F)

- Spannungsmessung analog zu Thermoelementen (F...I)

Z-20212

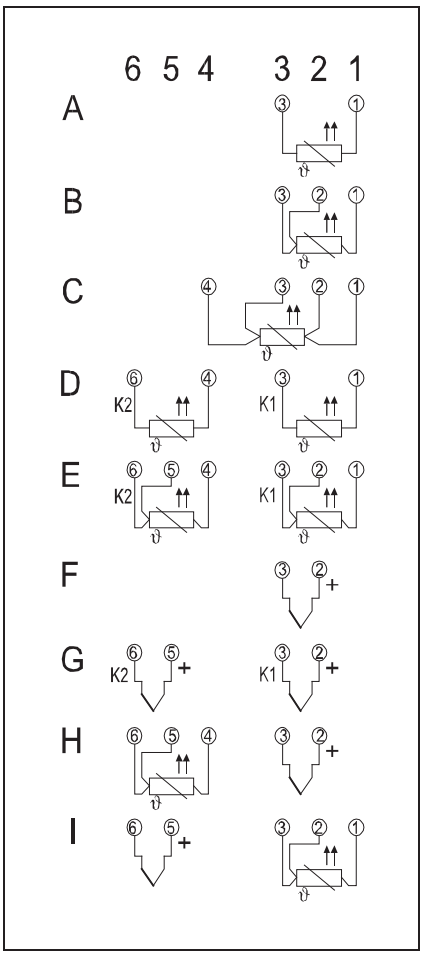

Fig. 5 Connection diagram

A Resistance thermometer 2-wire

B Resistance thermometer 3-wire

C Resistance thermometer 4-wire

D Double resistance measurement 2-wire

E Double resistance measurement 3-wire

F Thermocouple

G Double thermocouple

H Combination resistance thermometer - thermocouple

I Combination thermocouple - resistance thermometer

- Resistance measurement corresponding to resistance thermometers (A...F)

- Voltage measurement corresponding to thermocouples (F...I)

- Sensor- und Versorgungsleitungen werden an den Schraubklemmen für Leitungsquerschnitte bis max. 1,5 mm² (mit Adernendhülsen) angeschlossen.
- In Applikationen, in denen der Sensor getrennt vom Meßumformer installiert wird, müssen geschirmte Leitungen zum Sensor verwendet werden (siehe Gebrauchsanweisung 42/11-50)
- Der Einsatz von geschirmten und verdrillten Buskabeln wird von der PROFIBUS-Norm EN 60 079-14 vorgeschrieben, um den störungsfreien Betrieb von Profibusgeräten zu gewährleisten (siehe Gebrauchsanweisung 42/11-50).

- The sensor - and supply wiring (fieldbus) are connected to the screw terminals. The wire gauge is limited to 1.5 mm². The use of ferrules is mandatory.
- For applications in which the sensor is located remotely from the actual transmitter, shielded wires are to be used (see manual 42/11-50 for details).
- The use of shielded and twisted-pair bus cables is required by the Profibus standard EN 60 079-14 to ensure an error-free operation of Profibus devices (see manual 42/11-50 for details).

Konfiguration des Meßumformers Configuration of the transmitter

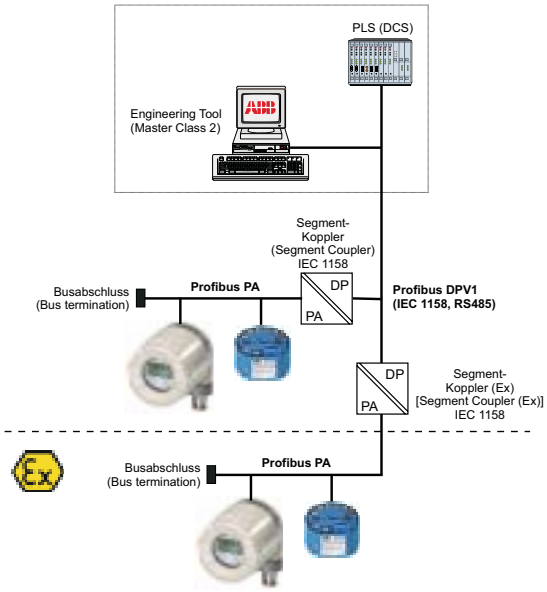

Bild 6 Konfiguration des Meßumformers

Fig. 6 *Configuration of the transmitter*

Das minimale System zur Konfiguration der Meßumformer der TF 12-Serie umfaßt ein Engineering Tool (Smart Vision 4.0, Klasse 2 Master) mit PROFIBUS DP V1-Karte, einen Segmentkoppler (entsprechend IEC 1158) sowie die entsprechenden Abschlußwiderstände.

Die Anzahl der Slaves, die an einem PROFIBUS PA Strang betrieben werden können, wird durch den verwendeten Segmentkoppler und die Applikation bestimmt:

Anwendung im Ex-Bereich

Verwendung eines Ex-Segmentkopplers:
max. 8 Slaves (z.B. TF 12, TF 212)

Verwendung eines nicht-Ex Segmentkopplers mit der Multibarriere MB 204-Ex:
max. 31 Slaves (z.B. TF 12, TF 212)

Anwendung im sicheren Bereich (nicht-Ex)

Verwendung eines nicht-Ex Segmentkopplers:
max. 31 Slaves (z.B. TF 12, TF 212)

Die ABB Leitsysteme Freelance 2000 und Symphony - Melody sind kombinierte Klasse 1 und 2 Master und beinhalten somit das Engineering Tool. So steht für Applikationen mit Freelance 2000 ein gerätespezifisches Template bereit, die Symphony - Melody-Applikation wird mit der DTM Technologie unterstützt.

Für alle anderen Applikationen besteht die Möglichkeit, das Engineering Tool Smart Vision 4.0 als Master Klasse 2 zur Konfiguration des Meßumformers einzusetzen.

For the configuration process of the transmitter type TF12 requires an Engineering Tool (e.g. Smart Vision 4.0; Master Class 2) with Profibus DPV1 card, a segment coupler (acc. IEC1158) as well as the bus termination.

The maximum number of slaves connected to a Profibus PA line is limited by the type of segment coupler and the application itself

Applications in hazardous zones

Use of Ex-Segment Coupler:
max. 8 Slaves (e.g. TF12, TF212)

Use of a non-Ex Segment Coupler in combination with the multi barrier MB204-Ex:
max. 31 Slaves (e.g. TF12, TF212).

Applications in safe areas (non-Ex)

Use of a non-Ex Segment Coupler:
max. 31 Slaves (e.g. TF12, TF212)

The ABB DCS systems Freelance 2000 and Symphony-Melody represent combined Class 1 and 2 masters and therefore contain the engineering tool. Applications with Freelance 2000 are supported via a device specific template, applications with Symhony – Melody are supported via the DTM technology.

For all other applications the engineering tool Smart Vision 4.0 – acting as a Class 2 master - may be used for the configuration of the transmitter.

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Documentation of the Temperature Transmitter

PROFIBUS - PA

(ABB Type: TF12 / TF212)

Profile definition

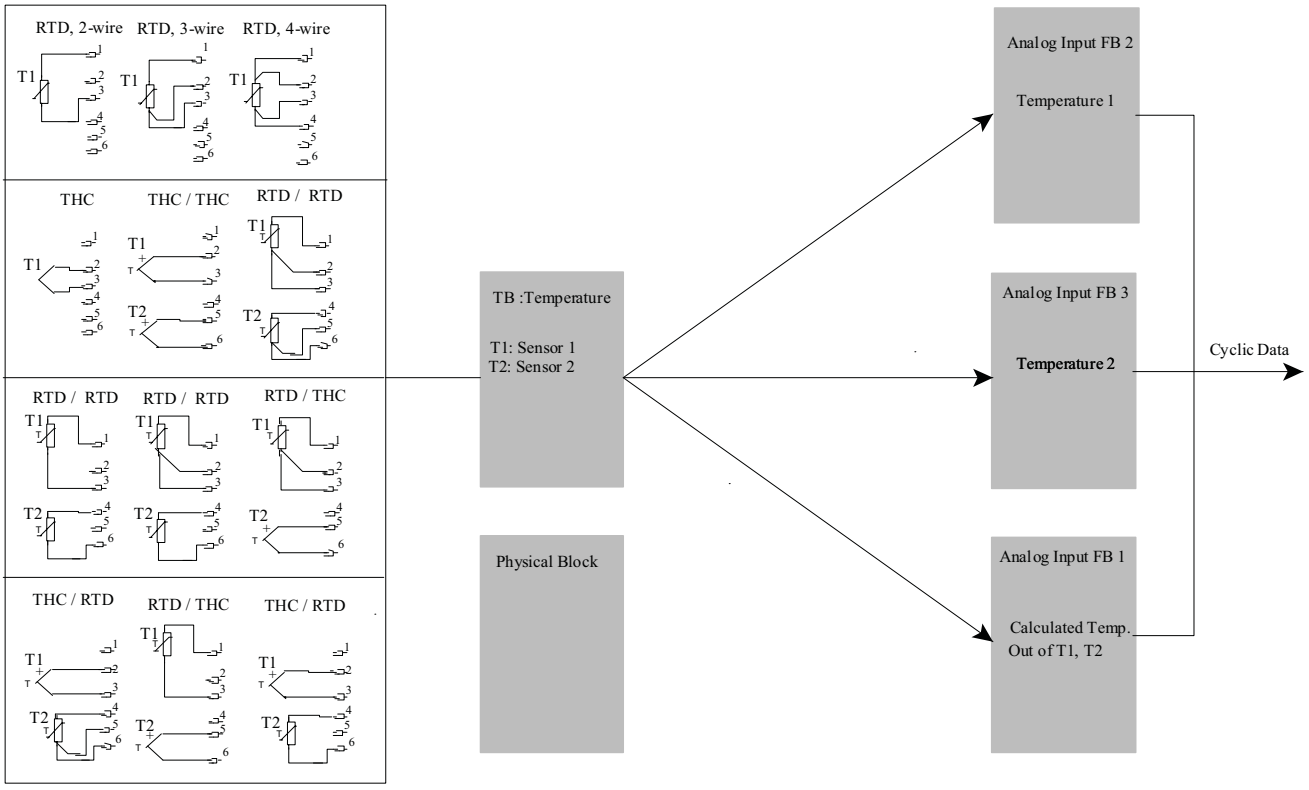
Index	Changes	Date	Draw.	Proof
0	----------	11. Januar 1999	Heil/Huber	
5	Changes in Description of Transducer Block Parameters	27. September 1999	Huber	
6	Integrating Profile 3.0 (Dated 3.10.99)	27. Januar 2000	Heil / Huber	
7	Page 48: Definition of Statusbits	11. Aug. 00	Huber	
8	Sensor Limits Depend From Linmode_x	12. Sep. 00	Heil	
9	Diagnosis Table extended	28. Mai 2001	Huber/Heil	

Datei: ABB_PROF30.WPD

Contents

1 Block Structure, Overview

Block Structure of Profibus PA Temperaturetransmitter TF12



1.1 Introduction

The profile definition within this document is based on the „Profile For Process Control Devices“ 3.0 dated 3.10.99 published by the PNO.

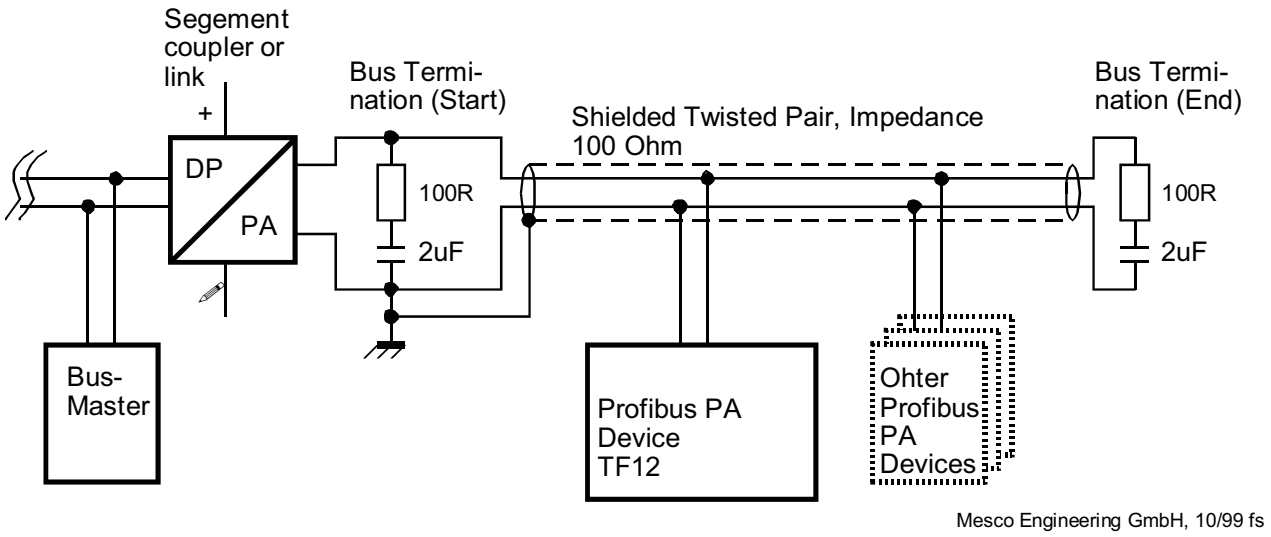
The transmitter TF12, 212 is build as a Profibus DPE (DPV1) device wich provides the following Profibus services:

- max. 3 acyclic (MSAC2) connections with the following services:
  - initiate
  - abort
  - read
  - write
  - rw-data transport
- cyclic communication (MSCYC)
- the device supports the service „Change station address“.
  The default station address is 126.

According to the Profibus PA Profiles TF12 is a class B device

Identnumber of the device:	0x04C4
Device Man. Id (ABB):	0x1A
Device Id.:	„TF12/TF212“

Installation of a Profibus PA bus segment:



1.2 Legend of the Abbreviations and key words used

Variable: Name of a parameter

Object Type: Variable class

Data Type: Type and structure of a variable (see Profibus standards for additional information). In some cases also the allowed selctions are listet in that column.

Store: storage class
- C = Constant (Value is stored in ROM),
- N = Nonvolatile (Value is stored in EEPROM, no influence to static revision counter),
- D = Dynamic (Value will be calculated on runtime by the Slave, the storage will be in the RAM)
- S = Static (Value is stored in EEPROM, static revision counter will be incremented, wenn write access is done to this parameter)

Size: Number or bytes

ACC: Access, allowed acces Read and / or Write

Parameterusage:
- C = will be used internal within the block
- O = Output to functionblock
- I = Inputparameter (from another block)

Type of transport:
- a = acyclic (this parameter is only in acyclic communication available)
- cyc = cyclic (this parameter is available through cyclic communication, possible only in the function block)

Default Values: The parameter will be set to this value wenn Factory Reset is executet.

Man/Opt.
- m = mandatory (according to the Profil definition of the PNO),
- o = optional (according to the Profil definition of the PNO),
- s = manufacturer specific

Indication type

Type of clearing the status information
- R = Indication remains active as long as the reason for the message exists
- **A** = Indication will be automatically reset after reading

2 Physical Block

2.1 Standard Parameter description

PARAMETER	Standard Parameter Description
ALARM_SUM	It contains the current states of the block alarms. See Datatypes at the end of this document
ALERT_KEY	It contains the identification number of the plant unit. It helps to identify the location of an event.
BLOCK OBJECT	This object contains the characteristics of the blocks.
MODE_BLK	It contains the current mode and the permitted and normal mode of the block.
ST_REV	Static Revision counter: Each block has static parameters (see parameter attributes table column "Store"), that are not changed by the process. Values to this parameters are assigned during the configuration or optimization procedure. The value of ST_REV will be automatically increased by 1 after every change of a static parameter. This provides a check of the parameter revision.
STRATEGY	Grouping of Function Block. This can be used to group blocks (this parameter has no effect to the transmitter).
TAG_DESC	Every block can be assigned a textual TAG description. The TAG_DESC is the address of the block. It must be unambiguous and unique in the fieldbus system.
TARGET_MODE	This parameter contains desired mode normally set by a control application or an operator.

2.1.1 Standard Parameter attributes

Relative Index	Variable	Object type	Data type	Store	Size	Access	Parameter usage/ Type of transport	Default Values	Man/ opt.	Slot	Absolute Index
0	BLOCK OBJECT	Record	DS-32	C	20	r	C/a		m	1	114
1	ST_REV	Simple	unsigned16	N	2	r	C/a	0	m	1	115
2	TAG_DESC	Simple	Octetstring	S	32	r,w	C/a	‘ ’	m	1	116
3	STRATEGY	Simple	unsigned16	S	2	r,w	C/a	0	m	1	117
4	ALERT_KEY	Simple	unsigned8	S	1	r,w	C/a	0	m	1	118
5	TARGET MODE	Simple	unsigned8	S	1	r,w	C/a	8	m	1	119
6	MODE_BLK actual permitted normal	Record	DS-37	D Cst Cst	3	r	C/a	888	m	1	120
7	ALARM_SUM	Record	DS_42	D	8	r	C/a	0;0;0...	m	1	121

2.2 Block Object of Physical Block

E	Element Name	Data Type (Index)	Size	Value
1	Reserved	Unsigned 8 - (5)	1	250
2	Block Object	Unsigned 8 - (5)	1	1
3	Parent Class	Unsigned 8 - (5)	1	1
4	Class	Unsigned 8 - (5)	1	250
5	DD Reference	Unsigned 32 - (7)	4	-
6	DD Revision	Unsigned 16 - (6)	2	-
7	Profile	OctetString (10)	2	64; 2
8	Profile Revision	Unsigned 16 - (6)	2	3; 0
9	Execution Time	Unsigned 8 - (5)	1	-
10	Number_of_parameters	Unsigned 16 - (6)	2	33
11	Address of VIEW_1	Unsigned 16 - (6)	2	1;147
12	Number of View List	Unsigned 8 - (5)	1	1

2.3 Physical Block Parameter Descriptions

Parameter	Physical Block Parameter Descriptions
DEVICE_CERTIFICATION	Certifications of the device
DEVICE_ID	Identification
DEVICE_MAN_ID	Id-code of the manufacturer of the device (defined by PNO)
DEVICE_SER_NUM	Serial number of the device
DIAGNOSIS	Detailed information of the device, bitwise coded. If MSB of byte 4 is set to 1, than more diagnose information is available in the DIAGNOSIS_EXTENSION parameter.
DIAGNOSIS_EXTENSION	Additional manufacturer specifications of the device, bitwise coded.
DIAGNOSIS_MASK	Definition of supported DIAGNOSIS bits. 0 = not supp. 1 = supp.
DIAGNOSIS_MASK_EXT.	Definition of supported DIAGNOSIS_EXTENSION bits. 0 = not supp. 1 = supp.
FACTORY_RESET	Value = 1 is the command for resetting device for default values, if the device has bus address setting the bus address remains the same. Value = 2506 is the command for warmstart of the device. All parametrisation remains unchanged. Value = 2712 reset the bus address only. The Ident_Number parameter isn't effected by the Factory_Reset.
HARDWARE_REVISION	Revision number of the hardware of the device.
WRITE_LOCKING	Storage location for a password. This password may be read and written by a tool to perform a write protection strategy. 0 – acyclic write service of all parameter, except this WRITE_LOCKING one, are refused, i.e. access is denied 1- 2456 reserved by PNO 2457 is the default value and means all writeable parameters of a device are writeable. 2458 - 65535 manufacturer specific
SOFTWARE_REVISION	Revision number of the software of the device.
IDENT_NUMBER_ SELECTOR	Each PROFIBUS-DP /EN50170/ device shall have an Ident_Number provided by the PNO. There are profile specific Ident_Numbers. A device may have a profile specific one and the manufacturer specific one. The user is able to chose one of both using this parameters. O - profile specific Ident_Number (0x9702 = device with 3 AI - FB´s) 1 – manufacturer specific Ident_Number (0x04C4 for TF12/TF212) If a device is switched to the profile Ident_Number, the device shall interact with the profile features of the GSD file. The Ident_Number parameter isn't effected by the Factory_Reset.
DESCRIPTOR	User definable text to describe the device within the application
DEVICE INSTALL DATE	Date of installation
DEVICE MESSAGE	User definable text to describe the device within the application or in the plant

2.3.1 Parameter Attribute Table

Relative Index	Variable	Object type	Data type	Store	Size	Access	Parameter usage/ Type of transport	Default Values	Man/ opt.	Slot	Absolute Index
8	SOFTWARE REVISION	Simple	Visiblestring	Cst	16	r	C/a	-	m	1	122
9	HARDWARE REVISION	Simple	Visiblestring	Cst	16	r	C/a	-	m	1	123
10	DEVICE MAN ID	Simple	Unsigned16	Cst	2	r	C/a	-0x001A	m	1	124
11	DEVICE ID	Simple	Visiblestring	Cst	16	r	C/a	-„TF12/ TF212“	m	1	125
12	DEVICE SER NUM	Simple	Visiblestring	Cst	16	r	C/a	-	m	1	126
13	DIAGNOSIS	Simple	Octetstring	D	4	r	C/a	0	m	1	127
14	DIAGNOSIS EXTENSION	Simple	Octetstring	D	6	r	C/a	0	o	1	128
15	DIAGNOSIS MASK	Simple	Octetstring	Cst	4	r	C/a	-	m	1	129
16	DIAGNOSIS MASK EXTENSION	Simple	Octetstring	Cst	6	r	C/a	-	o	1	130
17	DEVICE CERTIFICATION	Simple	Visiblestring	Cst	32	r	C/a	-	o	1	131
18	WRITE LOCKING	Record	Unsigned16 0 = write lock. 2457 = all write-able	N	2	r,w	C/a	2457	o	1	132
19	FACTORY RESET	Record	Unsigned16 1 = set all defaults 2506 = warmstart 2712 = reset bus address	S	2	r,w	C/a	-	o	1	133
20	DESCRIPTOR	Simple	Octetstring	s	32	r,w	C/a	32 blanks	m	1	134
21	DEVICE MESSAGE	Simple	Octetstring	s	32	r,w	C/a	32 blanks	m	1	135
22	DEVICE INSTALL DATE	Simple	Octetstring	s	16	r,w	C/a	8 blanks	m	1	136
24	IDENT_NUMBER_ SELECTOR	Simple	Unsigned8	s	1	r,w	C/a	1	m	1	138
26-32	Reserved by PNO									1	140 - 146

2.3.1.1 Standard Diagnosis Parameter (Rel. Index 13)

Bit	Mnemonic	Description	Diagnosis Mask Rel. Index 15	Indication Remain/ Automatic	Effect to Target Mode
0	DIA_HW_ELECTR	Hardware failure of electroni caused by: - Analog/Digital Converter Error - Any Bit of Input_fault_gen (Transducer Block)	1	R	Out of service
1	DIA_HW_MECH	Hardware failure of mechanic	0	R	--
2	DIA_TEMP_MOTOR	Motor- temperature too high	0	R	--
3	DIA_TEMP_ELECTR	Electronic temperature too high	0	R	--
4	DIA_MEM_CHECKSUM	Memory checksum error EEPROM Error,	1	R	Out of service
5	DIA_MEASUREMENT	Failure in measurement caused by short / open circuit of the Sensors (see also Input_fault in Transducer Block)	1	R	--
6	DIA_NOT_INIT	Device not initialized Parameter in EEPROM are not available because of EEPROM Error	11	R	--
7	DIA_INIT_ERROR	SELFCALIBRATION FAILED	0	R	--
8	DIA_ZERO_ERROR	ZERO POINT ERROR	0	R	--
9	DIA_SUPPLY	POWER SUPPLY FAILED (ELECTRICAL, PNEUM.)	0	R	--
10	DIA_CONF_INVALID	Different Dimensions of Sensor 1 and Sensor 2 selected, so the mathematical function of Sensor 1 and 2 is not possible	1	R	--
11	DIA_WARMSTART	RE-START-UP CARRIED OUT (set after factory reset with 2506)	1	A	--
12	DIA_COLDSTART	NEW-START-UP CARRIED OUT (set after factory reset with 1)	1	A	--
13	DIA_MAINTAINANCE	SERVICE REQUIRED	0	R	--
14	DIA_CHARACT	Charactarisation invalid	0	R	--
15	IDENT_NUMBER_Violation	Set to 1 (one), if the Ident_Number of the running cyclic data transfer and the value of Physical Block IDENT_NUMBER parameter are different. Because of different data types a comparison is impossible.	1	R	--
16... 30	reserved	Reserved for use within PNO	0		--
31	EXTENSION_AVAILABLE	If set, more diagnosis information is available	1		--

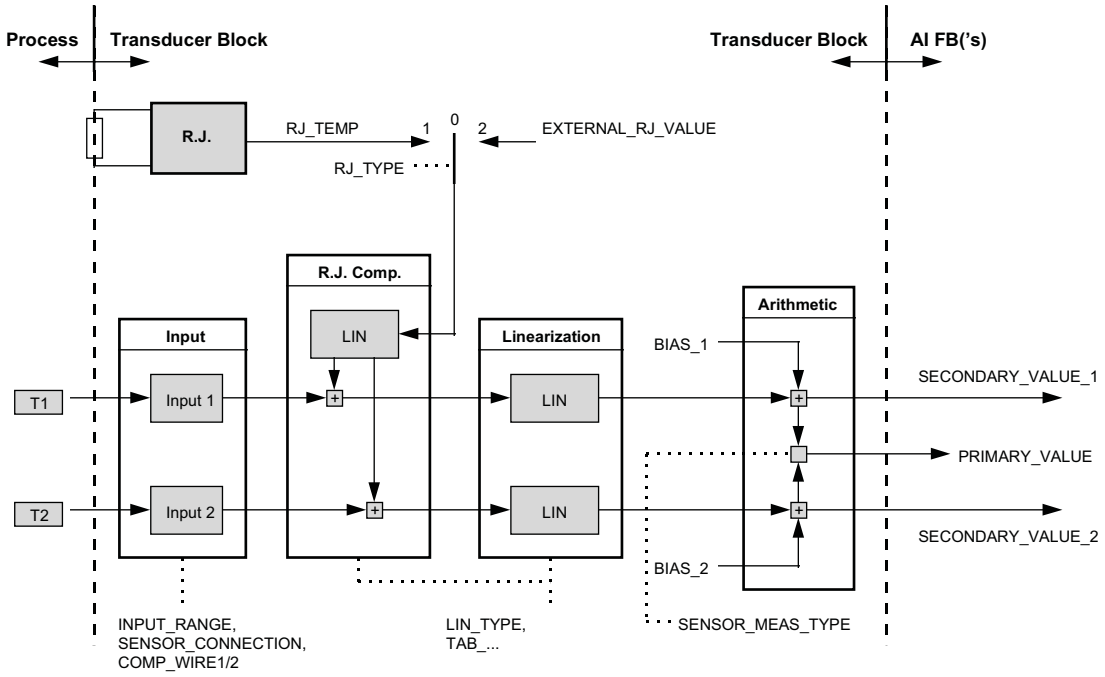
2.3.1.2 Extended Diagnosis Parameter (Rel. Index 14/16)

Bit	Mnemonic	Description	Diagnosis Mask Rel. Index 15	Indication Remain/ Automatic	Effect to Target Mode
0	ADC_CALIBRATED	Device not calibrated, therfore the measurement will be not accurate	1	R	--
1..47 not used			0		--

2.4 View Object Table

Relative Index	Parameter Mnemonic	Operation Dynamic VIEW_1	Operation Static VIEW_2	All Dynamic VIEW_3	Other static VIEW_4
0	BLOCK_OBJECT				
1	ST_REV	2			
2	TAG_DESCRIPTION				
3	STRATEGY				
4	ALERT_KEY				
5	TARGET_MODE				
6	MODE_BLK	3			
7	ALARM_SUM	8			
8	SOFTWARE REVISION				
9	HARDWARE REVISION				
10	DEVICE MAN ID				
11	DEVICE ID				
12	DEVICE SER NUM				
13	DIAGNOSIS	4			
14	DIAGNOSIS EXTENSION				
15	DIAGNOSIS MASK				
16	DIAGNOSIS MASK EXTENSION				
17	DEVICE CERTIFICATION				
18	SECURITY LOCKING				
19	FACTORY RESET				
20	DESCRIPTOR				
21	DEVICE_MESSAGE				
22	DEVICE_INSTALL_DAT				
24	IDENT_NUMBER				

3 Transducer Block Temperature



3.1 Standard Parameter description

See 1.1 Standard Parameter description of Physical Block.

3.1.1 Standard Parameter attributes

See 1.1.1 Standard Parameter attributes of Physical Block.

3.2 Block Object of Transducer Block

E	Element Name	Data Type (Index)	Size	Value
1	Reserved	Unsigned 8 - (5)	1	-
2	Block Object	Unsigned 8 - (5)	1	3
3	Parent Class	Unsigned 8 - (5)	1	2
4	Class	Unsigned 8 - (5)	1	240
5	DD Reference	Unsigned 32 - (7)	4	-
6	DD Revision	Unsigned 16 - (6)	2	-
7	Profile	OctetString (10)	2	64; 2
8	Profile Revision	Unsigned 16 - (6)	2	3; 0
9	Execution Time	Unsigned 8 - (5)	1	-
10	Number_of_parameters	Unsigned 16 - (6)	2	81
11	Address of VIEW_1	Unsigned 16 - (6)	2	4;81
12	Number of View List	Unsigned 8 - (5)	1	1

3.3 Transducer Block Temperature: Parameter Description

3.3.1 Process Parameter

Parameter	Description
BIAS_1	Bias of sensor 1: Value that will be algebraically added to process temperature 1 (like an offset value). Unit is primary value unit.
BIAS_2	Bias of sensor 2: Value that will be algebraically added to process temperature 2 (like an offset value). Unit is primary value unit.
COMP_WIRE1	Value in Ohm to compensate line when the sensor 1 (RTD) connection is 2 wires. For 3 or 4-wire connection the parameter is don´t care. The value must be the resistance of the complete wire loop. Note: - If the COMP_Wire value is bigger than the measuring value the result will be negative.
COMP_WIRE2	Value in Ohm to compensate line when the sensor 2 (RTD) connection is 2 wires. For 3 or 4-wire connection the parameter is don´t care. The value must be the resistance of the complete wire loop. Note: - If the COMP_Wire value is bigger than the measuring value the result will be negative
INPUT_FAULT_ GEN	Input malfunction: Diagnosis object for errors that concerns all values 0 = device OK Bit: 0 = Rj error (Set if 150°C < RJ_Temp or < -50°C) 1 = Hardware error 2 – 4 = reserved 5 – 7 = manufacturer specific
INPUT_FAULT_1	Input malfunction: Diagnosis object for errors that concern SV_1 0 = Input OK Bit: 0 = underrange 1 = overrange 2 = lead breakage 3 = short circuit 4 – 5 = reserved 6 – 7 = manufacturer specific
INPUT_FAULT_2	Input malfunction: Diagnosis object for errors that concern SV_2 0 = Input OK Bit definition see INPUT_FAULT_1
INPUT_ RANGE	Electrical input range and mode of sensor 1, only active if Lin_Type is linear otherwise don´t care.
LOWER_SENSOR _LIMIT	Physical lower limit function of sensor 1 (e.g. Pt 100 = -200°C) and input range.The unit of LOWER_SENSOR_LIMIT is the PRIMARY_VALUE_UNIT. In case of custom specific linearization(linmode_1 > 0), this value is -1e9.
LIN_TYPE	Select the type of sensor1 (Code) for Thermocouples, Rtd or linear.

PRIMARY_VALUE	Process value, function of SECONDARY_VALUE_1/2. The unit of PRIMARY_VALUE is the PRIMARY_VALUE_UNIT. If the dimensions of temperature 1 and 2 are not the same type (e.g. °C and mV), and measuring type is other than 0..3, this parameter will allways contain NAN (not a number). In this case the flag "DIA_CONF_INVALID" in the standard diagnoses will be set.
PRIMARY_VALUE_UNIT	Select the unit code of the PRIMARY_VALUE and other values. Set of unit codes: 1000: K (Kelvin) 1001: °C (degree Celsius) 1002: °F (degree Fahrenheit) 1003: Rk (Rankine) 1243: mV 1281: 1997: None The following table shows the possible unit selections at the different configurations:.

Sensor 1	Sensor 2	PV_Unit: available units
THC or RTD	THC or RTD or not available	None, °C, F, K, Rk
linear mV or linear	THC or RTD	None
THC or RTD	linear mV or linear	None
linear mV	linear mV or not available	None, mV
linear	linear or not available	None,
linear mV	linear	None
linear	linear mV	None

EXTERNAL_RJ_VALUE	Fixed temperature value of an external reference junction. The unit of EXTERNAL_RJ_VALUE is the PRIMARY_VALUE_UNIT. If PRIMARY_VALUE_UNIT is no temperature unit (e.g. mV) EXTERNAL_RJ_VALUE is stated in °C. The allowed range is -50....+150°C other values will not be accepted.
RJ_TEMP	Reference junction temperature. The unit of RJ_TEMP is the PRIMARY_VALUE_UNIT. If PRIMARY_VALUE_UNIT is no temperature unit (e.g. mV) RJ_TEMP is stated in °C.
RJ_TYPE	Select reference junction from internal to fixed value. Defined codes: 0 = No reference: Compensation is not used (e.g. for TC Type B). 1 = Internal: Reference junction temperature is measured by the device itself via an internal sensor. 2 = External: The fixed value EXTERNAL_RJ_VALUE is used for compensation. Note: -For type B thermocouple Rj_type is always „No reference“. So if one changes the Lin_Type to type B the RJ-type is automatically changed to „No reference“ - For Lin_Type = linear and Input_range = mV and LINMODE_1 = linear the Rj_Type is fixed to „No reference“. Also for Lin_Type = linear and Input_range = Ω the Rj_Type is fixed to „No reference“. On the other hand if the linear input range = mV is selected with LINMODE_1 = polynome_n the RJ compensation can still be set to Internal or external or no reference.

SECONDARY_ VALUE1 (SV1)	Process value connected to the channel 1 corrected by BIAS_1. The unit of SECONDARY_VALUE1 is the PRIMARY_VALUE_UNIT.
SECONDARY_ VALUE2 (SV2)	Process value connected to the Sensor 2 corrected by BIAS_2. The unit of SECONDARY_VALUE2 is the PRIMARY_VALUE_UNIT.
SENSOR_ CONNECTION	Connection of the sensor 1, either 2, 3 or 4 wires connection. Defined codes: 0 = 2 wires 1 = 3 wires 2 = 4 wires This parameter is valid only if sensor1 is thermoresistance or linear resistance.
SENSOR_ MEAS_TYPE	Mathematical function to calculate PRIMARY_VALUE (PV). Defined codes: 0: PV = SV_1 1: PV = SV_2 128: PV = SV_1 - SV_2 Difference.. 129: PV = SV_2 - SV_1 Difference 192: PV = ½ * (SV_1 + SV_2) Average 193: PV = ½ * (SV_1 + SV_2) Average but SV_1 or SV_2 if the other is wrong 194: = reserved : 219: = reserved 220: = manufacturer specific : 239: = manufacturer specific
UPPER_SENSOR _LIMIT	Physical upper limit function of sensor 1 (e.g. Pt 100 = 850°C) and input range.The unit of UPPER_SENSOR_LIMIT is the PRIMARY_VALUE_UNIT. In case of custom specific linearization(linmode_1 > 0), this value is 1e9.

3.3.2 Process Parameter, Manufacturer Specific Extensions

Parameter		Description
DIFFERENCE		T2-T1.If only one sensor is available, this value is NAN.
INPUT_ RANGE2		Electrical input range and mode of sensor 2, only active if Lin_Type2 is linear otherwise don´t care.
LINMODE_1		This activates the linearization for sensor 1. It selects one of four 4th order polynoms for the input. For using this feature, LIN_TYPE of sensor 1 has to be LINEAR. In this case the related sensor limits are set to –1e9 and +1e9.
LINMODE_2		This activates the linearization for sensor 2. It selects one of four 4th order polynoms for the input. For using this feature, LIN_TYPE_2 has to be LINEAR. In this case the related sensor limits are set to –1e9 and +1e9.
LOWER_SENS OR_LIMIT2		Minimum sensor temperature: physical lower limit of sensor 2. e.g.: Pt100 = -200 °C. In case of custom specific linearization(linmode_2 > 0), this value is -1e9.
LIN_TYPE2		Select the type of sensor 2 (Code) for Thermocouples, Rtd or linear.
POLYNOM_C		Their are 4 sets of coefficents availabe to be used with a 4th order polynom Any of the the 4 sets could be used to linearize Sensor 1 or Sensor 2 (Linmode_1 and Linmode_2 must be set). For Linmode_1 and Linmode_2 all combinations are allowed e.g: both set to polynom 1, or Linmode_1 = polynom 1 and Linmode_2 = 4 The polynom is: $y = A+Bx+Cx^2+Dx^3+Ex^4$. So a set of coefficients are defined by 5 coefficients (P_C1_A....P_C1_E). An additional index (1...4) seperates the 4 sets of coefficients. So every coefficient parameter (P_C1_n) consists of a float value and an index. There could be also a descriptor string set for each polynom so the operator can easily identify the polynom. The coefficients P_C1_n describe the polynom where x is a mV value and y is the corresponding temperature value in °C.
	P_C1_A	Coefficient A including the coefficient and the index.
	P_C1_B	Coefficient B including the coefficient and the index
	P_C1_C	Coefficient C including the coefficient and the index
	P_C1_D	Coefficient D including the coefficient and the index
	P_C1_E	Coefficient E including the coefficient and the index
	P_DESC	Descriptor String for the set of polynom coefficients
POLYNOM_ INDEX		Index of coefficient set, that should be read by a following read access via parameter P_Cn_m; m = [A...E] (same for P_C1_m , P_C2_m and P_DESC. Only effective for read access)
PT0DEG_ VALUE1		Value in Ohm at zero degrees for sensor 1, when SENSOR_TYPE of sensor 1 is PTxxx. In this case the standard table for PT100 is used as base and it's values are spreaded.
PT0DEG_ VALUE2		Value in Ohm at zero degrees for sensor 2, when SENSOR_TYPE_2 is PTxxx. In this case the standard table for PT100 is used as base and it's values are spreaded.
SENSOR_CON NECTION2		Connection of the sensor 2, could be either 2, 3 wires connection. This parameter is valid only if sensor 2 type is thermoresistance or linear resistance.

UPPER_SENSOR_LIMIT2	Maximum sensor temperature: physical upper limit function of sensor2. EG: Pt100=850 C. In case of custom specific linearization(linmode_2 > 0), this value is 1e9.
RJ_TYPE2	Select reference junction from internal to fixed value. Defined codes: 0 = No reference: Compensation is not used (e.g. for TC Type B). 1 = Internal: Reference junction temperature is measured by the device itself via an internal sensor. 2 = External: The fixed value EXTERNAL_RJ_VALUE2 is used for compensation. Note: -For type B thermocouple Rj_type2 is always „No reference“. So if one changes the Lin_Type_2 to type B the RJ_type2 is automatically changed to „No reference“ - For Lin_Type_2 = linear and Input_range_2 = mV and LINMODE_2 = linear the Rj_Type is fixed to „No reference“. Also for Lin_Type_2 = linear and Input_range_2 = Ω the Rj_Type is fixed to „No reference“. On the other hand if the linear Input_Range = mV is selected with LINMODE_2 = polynome_n the RJ compensation can still be set to Internal or external or no reference.
EXTERNAL_RJ_VALUE2	Fixed temperature value of an external reference junction. The unit of EXTERNAL_RJ_VALUE2 is the PRIMARY_VALUE_UNIT. If PRIMARY_VALUE_UNIT is no temperature unit (e.g. mV) EXTERNAL_RJ_VALUE2 is stated in °C. The allowed range is -50....+150°C other values will not be accepted.

3.4 Transducer Block Temperature Parameter Attributes

Rel. Index	Variable	Object type	Data type	Store	Size	Access	Parameter usage / Type of transport	Default Values	Man/ opt.	Slot	Absolute Index
0-7	Standard Parameters								M	4	0-7
8	Primary_value	record	DS-33	D	5	r	O/a	-	M	4	8
9	Primary_value_unit	simple	unsigned16	S	2	r,w	C/a	deg C	m	4	9
10	Secondary_value_1	record	DS-33	D	5	r	O/a	-	m	4	10
11	Secondary_value_2	record	DS-33	D	5	r	O/a	-	o	4	11
12	Sensor_meas_ type	simple	unsigned8 0 = Temp.1 1 = Temp.2 128 = T1-T2 129 = T2-T1 192 = Average 193 = Average but T1 or T2 if other is wrong	S	1	r,w	C/a	0	m	4	12
13	Input_range (sensor 1)	simple	unsigned8 0 = -15...115mV 128=0...400 129=0...4000	S	1	r,w	C/a	0	m	4	13
14	Lin_type (sensor 1)	simple	unsigned8 0=linear 128 = TC type B 129 = TC type C 130 = TC type D 131 = TC type E 133 = TC type J 134 = TC type K 139 = TC type L 135 = TC type N 136 = TC type R 137 = TC type S 138 = TC type T 140 = TC type U 102 = Pt100 105 = Pt1000 123 = Ni100 253 = Ptxxx xxx is Value in at 0 C	S	1	r,w	C/a	Pt100	m	4	14
19	Bias_1	simple	float	S	4	r,w	C/a	0	m	4	19
20	Bias_2	simple	float	S	4	r,w	C/a	0	o	4	20
21	Upper_sensor_ limit (sensor 1)	simple	float	N	4	r	C/a	-	m	4	21
22	Lower_sensor_ limit (sensor 1)	simple	float	N	4	r	C/a	-	m	4	22
24	Input_fault_gen	simple	unsigned8 Bit 0=RJ error 1=HW error	D	1	r	a	-	m	4	24
25	Input_fault_1	simple	unsigned8 Bit 0 =underrange 1 =overrange. 2 = lead reakage 3 = short circuit	D	1	r	a	-	m	4	25
26	Input_fault_2	simple	unsigned8 see input_fault1	D	1	r	a	-	o	4	26

Rel. Index	Variable	Object type	Data type	Store	Size	Access	Parameter usage / Type of transport	Default Values	Man/ opt.	Slot	Absolute Index
33	Rj_temp	simple	float	D	4	r	C/a	-	o	4	33
34	Rj_type	simple	unsigned8 0=no reference 1=internal 2=external	S	1	r,w	C/a	0	m	4	34
35	External_rj_value	simple	float	S	4	r,w	C/a	0	o	4	35
36	Sensor_connection (sensor 1)	simple	unsigned8 0 = 2 wires 1 = 3 wires 2 = 4 wires 4 wires only for single input	S	1	r,w	C/a	1	m	4	36
37	Comp_wire_1	simple	float	S	4	r,w	C/a	0	m	4	37
38	Comp_wire_2	simple	float	S	4	r,w	C/a	0	o	4	38
62	Lin_type2	simple	unsigned8 0=linear 251 = sensor 2 not available 128 = TC type B 129 = TC type C 130 = TC type D 131 = TC type E 133 = TC type J 134 = TC type K 139 = TC type L 135 = TC type N 136 = TC type R 137 = TC type S 138 = TC type T 140 = TC type U 102 = Pt100 105 = Pt1000 123 = Ni100 253 = Ptxxx xxx is Value in at 0 C	S	1	r,w	a	Pt100	s	4	62
63	Sensor_connection2	simple	unsigned8 0 = 2 wires 1 = 3 wires	S	1	r,w	a	1	s	4	63
64	Linmode_1	simple	unsigned8 0=linear 1=polynom1 2=polynom2 3=polynom3 4=polynom4	s	1	r,w	a	0	s	4	64
65	Linmode_2	simple	unsigned8 0=linear 1=polynom1 2=polynom2 3=polynom3 4=polynom4	s	1	r,w	a	0	s	4	65
66	Pt0deg_value1	simple	float Range=50...1000	S	4	r,w	a	100	s	4	66
67	Pt0deg_value2	simple	float Range=50...1000	S	4	r,w	a	100	s	4	67
68	P_C1_A	record	DS-33	N	5	r,w	a	0, 1	s	4	68
69	P_C1_B	record	DS-33	N	5	r,w	a	0, 1	s	4	69
70	P_C1_C	record	DS-33	N	5	r,w	a	0, 1	s	4	70
71	P_C1_D	record	DS-33	N	5	r,w	a	0, 1	s	4	71
72	P_C1_E	record	DS-33	N	5	r,w	a	0, 1	s	4	72

Rel. Index	Variable	Object type	Data type	Store	Size	Access	Parameter usage / Type of transport	Default Values	Man/ opt.	Slot	Absolute Index
73	P_ DESC	record	Visiblestring (16 Octects), unsigned8 (Range: 1...4)	N	17	r,w	a	‘ ‘, 1	s	4	73
74	Polynom_Index	simple	unsigned8 Range: 1...4	N	1	r,w	a	1	s	4	74
75	Input_range2 (sensor 2)	simple	unsigned8 0 = -15...115mV 128=0...400 129=0...4000	S	1	r,w	a	0	s	4	75
76	Upper_sensor_ limit2 (sensor 2)	simple	float	N	4	r	a	-	s	4	76
77	Lower_sensor_ limit2 (sensor 2)	simple	float	N	4	r	a	-	s	4	77
78	Difference	record	DS-33	D	5	r	O/a	-	s	4	78
79	Rj_type2	simple	unsigned8 0=no reference 1=internal 2=external	S	1	r,w	C/a	0	s	4	79
80	External_rj_value2	simple	float	S	4	r,w	C/a	0	so	4	80

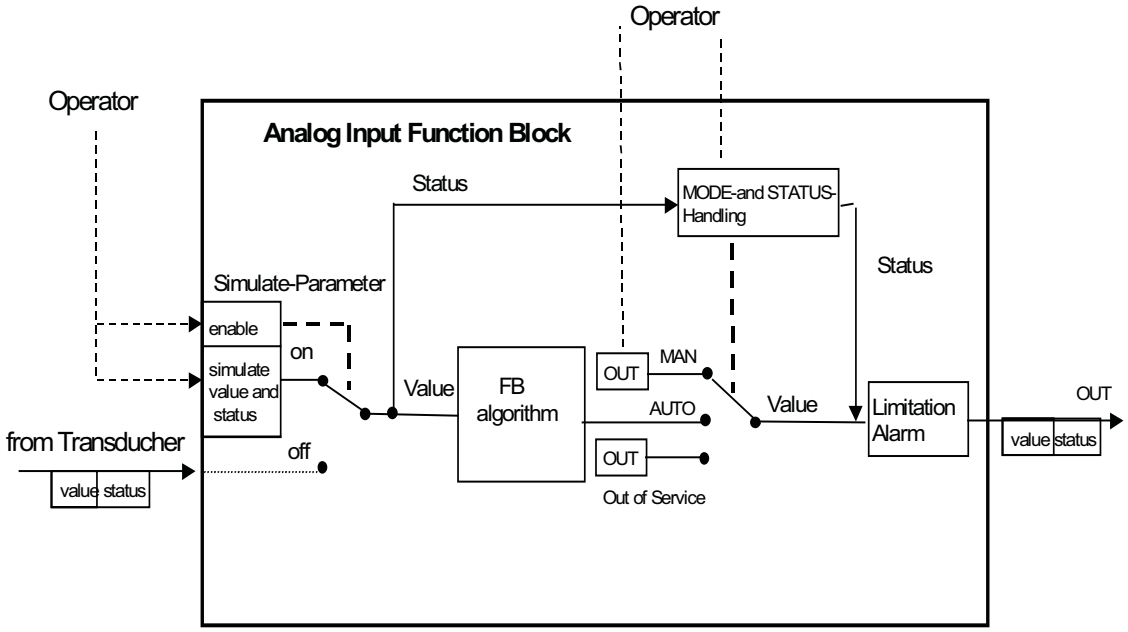
3.5 View Object Table

Relative Index	Parameter Mnemonic	Operation Dynamic VIEW_1	Operation Static VIEW_2	All Dynamic VIEW_3	Other static VIEW_4
0	BLOCK_OBJECT				
1	ST_REV	2			
2	TAG_DESCRIPTION				
3	STRATEGY				
4	ALERT_KEY				
5	TARGET_MODE				
6	MODE_BLK	3			
7	ALARM_SUM	8			
8	PRIMARY_VALUE	5			
24	INPUT_FAULT_GEN	1			
25	INPUT_FAULT_1	1			

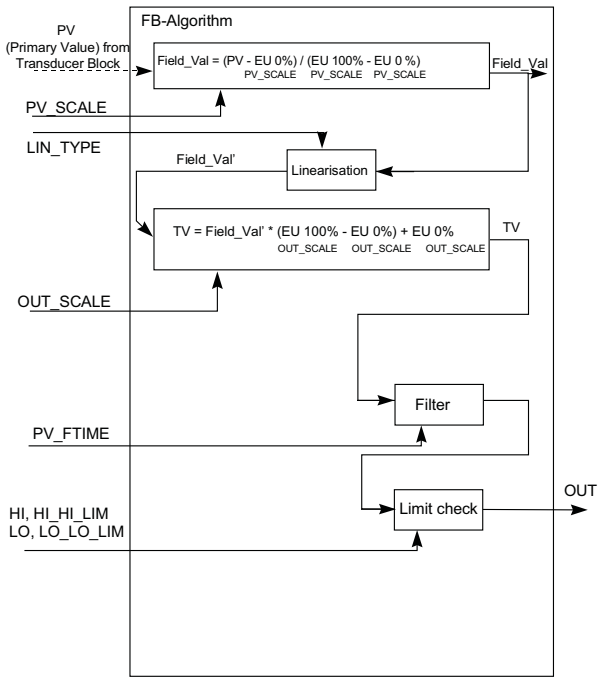
4 Function Block 1: Calculated Temperature

The Input for this function block is the parameter PRIMARY_VALUE, rel. Index 8, of the transducer block.

Simulation, Mode and Status diagram of Analog Input Function Block:



Parameter relationship of AI FB



4.1 Standard Parameter Description

See 1.1 Standard parameter description of physical block.

4.1.1 Standard Parameter Attributes

See 1.1.1 Standard parameter attributes of physical block.

4.2 Block Object of Function Block

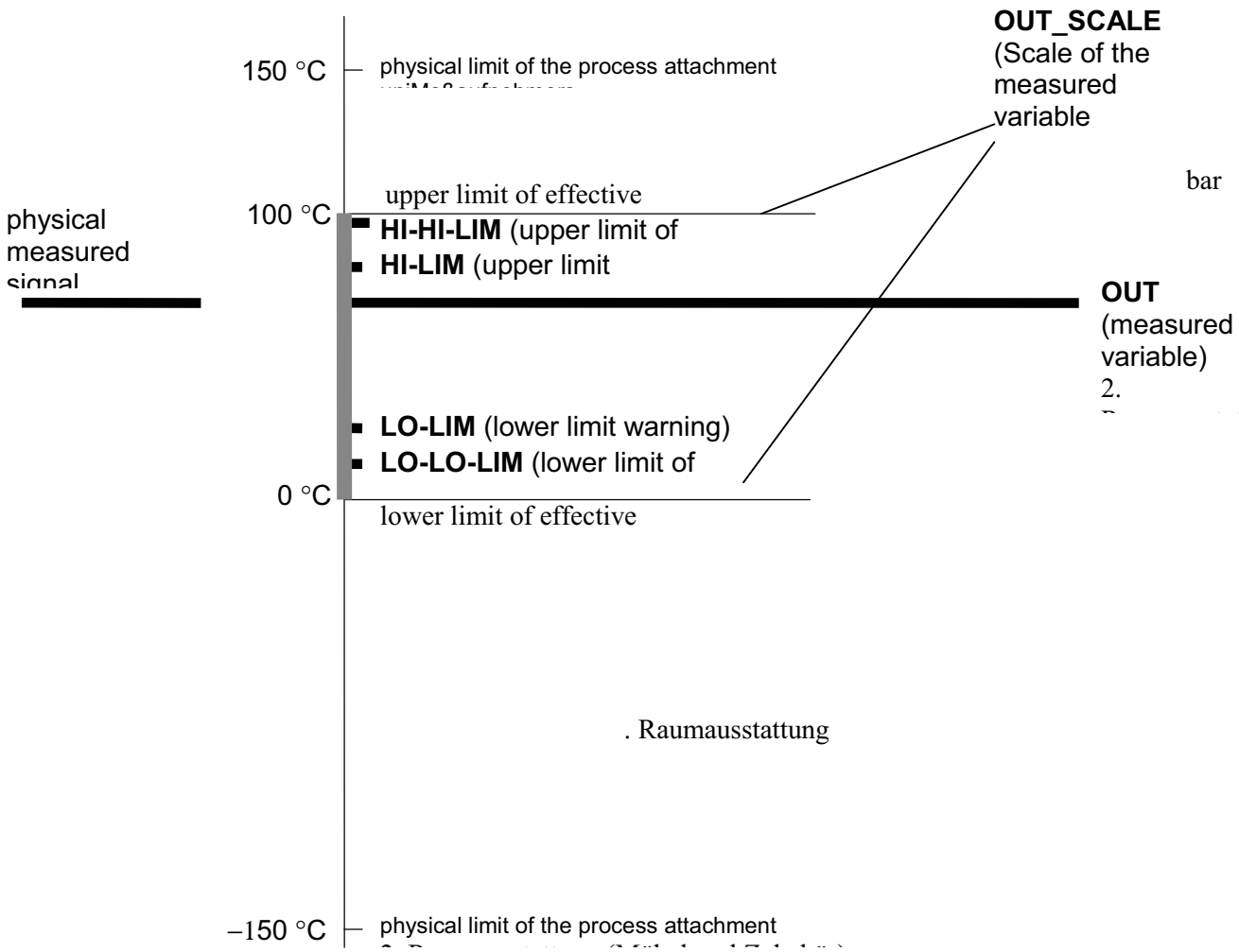
E	Element Name	Data Type (Index)	Size	Value
1	Reserved	Unsigned 8 - (5)	1	-
2	Block Object	Unsigned 8 - (5)	1	2
3	Parent Class	Unsigned 8 - (5)	1	1
4	Class	Unsigned 8 - (5)	1	1
5	DD Reference	Unsigned 32 - (7)	4	-
6	DD Revision	Unsigned 16 - (6)	2	-
7	Profile	OctetString (10)	2	64; 2
8	Profile Revision	Unsigned 16 - (6)	2	3; 0
9	Execution Time	Unsigned 8 - (5)	1	-
10	Number_of_parameters	Unsigned 16 - (6)	2	45
11	Address of VIEW_1	Unsigned 16 - (6)	2	1;61
12	Number of View List	Unsigned 8 - (5)	1	1

4.3 Analog Input Function Block 1: Parameter Description

4.3.1 Process Parameter

Parameter	Description
BATCH	This parameter is intended to be used in Batch applications in line with IEC 61512 Part1. Only Function blocks carry this parameter. There is no algorithm necessary within a function block. The Batch parameter is necessary in a distributed fieldbus system to identify used and available channels, in addition to identify the current batch in case of alerts.
CHANNEL	Reference to the active transducer block which provides the measurement value to the function block. In this application this value is constant.
LIN_TYPE	Type of linearisation. details see General Requirement. Here always zero.
OUT	Process Variable
PV_SCALE	Conversion of the Process Variable into percent using the high and low scale values. The engineering unit of PV_SCALE high and low scale values are direct related to the PV_UNIT of the configured Transducer Block (configured via Channel parameter). The PV_SCALE high and low scale values follow the changes of the PV_UNIT of the related Transducer Block automatically, i.e. a change of the Transducer Block PV_Unit causes no bump at OUT from AI.
OUT_SCALE	Scale of the process variable. It contains the values of the lower limit and upper limit effective range, engineering units code, and number of digits to the right of the decimal point.
PV_FTIME	Filter time of the Process Variable The function block parameter PV_FTIME contains the time constant for the rise time of the FB output up to a value of 63,21 % resulted from a jump on the input (PT1 filter). The engineering unit of the parameter is second.

Alarm Parameter and Simulation



Parameter	Description
ALARM_HYS	Hysteresis (effective to all limits).
HI_ALM	State of the upper limit of warnings. It contains the state of the upper limit of an alarm and the relating time stamp. Time stamp is not supported and therefore fixed to 0
HI_HI_ALM	State of the upper limit of alarms. It contains the state of the upper limit of an alarm and the relating time stamp. Time stamp is not supported and therefore fixed to 0
HI_HI_LIM	Value for upper limit of alarms Upper limit value for alarms with engineering unit of the OUT parameter. If the measured variable is equal or higher than the upper limit value the State Bits in the State Byte of OUT and in the FB parameter ALARM_SUM have to change to 1. The unit of this parameter is the same like the OUT one.
HI_LIM	Value for upper limit of warnings Upper limit value for warnings with engineering unit of the OUT parameter. If the measured variable is equal or higher than the upper limit value, the State Bits in the State Byte of OUT and in the FB parameter ALARM_SUM have to change to 1. The unit of this parameter is the same like the OUT one .
LO_ALM	State of the lower limit of warnings. It contains the state of the lower limit of an alarm and the relating time stamp. Time stamp is not supported and therefore fixed to 0
LO_LIM	Value for lower limit of warnings Lower limit value for warnings with engineering unit of the OUT parameter. If the measured variable is equal to or lower than the lower limit value, the State Bits in the State Byte of OUT and in the FB parameter ALARM_SUM have to change to 1. The unit of this parameter is the same like the OUT one.
LO_LO_ALM	State of the lower limit of alarms. It contains the state of the lower limit of an alarm and the relating time stamp. Time stamp is not supported and therefore fixed to 0
LO_LO_LIM	Value for the lower limit of alarms Lower limit value for alarms with engineering unit of the OUT parameter. If the measured variable is equal to or lower than the lower limit value, the State Bits in the State Byte of OUT and in the FB parameter ALARM_SUM have to change to 1. The unit of this parameter is the same like the OUT one.
Simulate	For comissioning and test purposes the input from the transducer block can be disconnected, and the input value and status can be set by the parameter Simulate.

4.4 Analog Input Function Block 1: Parameter Attributes

Rel. Index	Variable	Object type	Data type	Store	Size	Access	Parameterusage/ Type of transport	Default Values	Man/ opt.	Slot	Absolute Index
0-7	Standard Parameters								m	1	16-23
8	BATCH	record	DS-67	S	10	r,w	C/a	0,0,0,0	m	1	24
10	OUT	record	DS-33	D	5	r	O/Cyc		m	1	26
11	PV_SCALE	array	float	S	8	r,w	C/a	100,0	m	1	27
12	OUT_SCALE	record	DS-36	S	11	r,w	C/a	100,0,-,-	m	1	28
13	LIN_TYPE	simple	unsigned8	S	1	r,w	C/a	0	m	1	29
14	CHANNEL	simple	unsigned16 0x0108	S	2	r,w	C/a	to TB, rel.Idx.8	m	1	30
16	PV_FTIME	simple	float Range = 0...60	S	4	r,w	C/a	0	m	1	32
19	ALARM_HYS	simple	float	S	4	r,w	C/a	0,5% of range	m	1	35
21	HI_HI_LIM	simple	float	S	4	r,w	C/a	*1	m	1	37
23	HI_LIM	simple	float	S	4	r,w	C/a	*1	m	1	39
25	LO_LIM	simple	float	S	4	r,w	C/a	*1	m	1	41
27	LO_LO_LIM	simple	float	S	4	r,w	C/a	*1	m	1	43
30	HI_HI_ALM	record	DS-39	D	16	r	C/a	0	o	1	46
31	HI_ALM	record	DS-39	D	16	r	C/a	0	o	1	47
32	LO_ALM	record	DS-39	D	16	r	C/a	0	o	1	48
33	LO_LO_ALM	record	DS-39	D	16	r	C/a	0	o	1	49
34	SIMULATE	record	DS-50	S	6	r,w	C/a	disable	m	1	50
36-44	Reserved by PNO										52-60

*1 The default values are lower sensor limit and upper sensor limit of the default sensor type1.

4.5 View Object Table

Relative Index	Parameter Mnemonic	Operation Dynamic VIEW_1	Operation Static VIEW_2	All Dynamic VIEW_3	Other static VIEW_4
0	BLOCK_OBJECT				
1	ST_REV	2			
2	TAG_DESCRIPTION				
3	STRATEGY				
4	ALERT_KEY				
5	TARGET_MODE				
6	MODE_BLK	3			
7	ALARM_SUM	8			
10	OUT	5			
11	PV_SCALE				
12	OUT_SCALE				
14	CHANNEL				
16	PV_FTIME				
19	ALARM_HYS				
21	HI_HI_LIM				
23	HI_LIM				
25	LO_LIM				
27	LO_LO_LIM				
30	HI_HI_ALM				
31	HI_ALM				
32	LO_ALM				
33	LO_LO_ALM				
34	SIMULATE				

5 Function Block 2: Process Temperatur 1

The Input for this function block is the parameter SECONDARY_VALUE1, rel. Index 10, of the transducer block.

5.1 Standard Parameter Description

See 1.1 Standard parameter description of physical block.

5.1.1 Standard Parameter Attributes

See 1.1.1 Standard parameter attributes of physical block.

5.2 Block Object of Function Block

E	Element Name	Data Type (Index)	Size	Value
1	Reserved	Unsigned 8 - (5)	1	-
2	Block Object	Unsigned 8 - (5)	1	2
3	Parent Class	Unsigned 8 - (5)	1	1
4	Class	Unsigned 8 - (5)	1	1
5	DD Reference	Unsigned 32 - (7)	4	-
6	DD Revision	Unsigned 16 - (6)	2	-
7	Profile	OctetString (10)	2	64; 2
8	Profile Revision	Unsigned 16 - (6)	2	3; 0
9	Execution Time	Unsigned 8 - (5)	1	-
10	Number_of_parameters	Unsigned 16 - (6)	2	45
11	Address of VIEW_1	Unsigned 16 - (6)	2	2;61
12	Number of View List	Unsigned 8 - (5)	1	1

5.3 Analog Input Function Block 2: Parameter Description

5.3.1 Process Parameter

Parameter	Description
BATCH	This parameter is intended to be used in Batch applications in line with IEC 61512 Part1. Only Function blocks carry this parameter. There is no algorithm necessary within a function block. The Batch parameter is necessary in a distributed fieldbus system to identify used and available channels, in addition to identify the current batch in case of alerts.
CHANNEL	Reference to the active transducer block which provides the measurement value to the function block. In this application this value is constant.
LIN_TYPE	Type of linearisation. details see General Requirement. Here always zero.
OUT	Process Variable
PV_SCALE	Conversion of the Process Variable into percent using the high and low scale values. The engineering unit of PV_SCALE high and low scale values are direct related to the PV_UNIT of the configured Transducer Block (configured via Channel parameter). The PV_SCALE high and low scale values follow the changes of the PV_UNIT of the related Transducer Block automatically, i.e. a change of the Transducer Block PV_Unit causes no bump at OUT from AI.
OUT_SCALE	Scale of the process variable. It contains the values of the lower limit and upper limit effective range, engineering units code, and number of digits to the right of the decimal point.
PV_FTIME	Filter time of the Process Variable The function block parameter PV_FTIME contains the time constant for the rise time of the FB output up to a value of 63,21 % resulted from a jump on the input (PT1 filter). The engineering unit of the parameter is second.

5.3.2 Alarm Parameter and Simulation

Parameter	Description
ALARM_HYS	Hysteresis (effective to all limits).
HI_ALM	State of the upper limit of warnings. It contains the state of the upper limit of an alarm and the relating time stamp. Time stamp is not supported and therefore fixed to 0
HI_HI_ALM	State of the upper limit of alarms. It contains the state of the upper limit of an alarm and the relating time stamp. Time stamp is not supported and therefore fixed to 0
HI_HI_LIM	Value for upper limit of alarms Upper limit value for alarms with engineering unit of the OUT parameter. If the measured variable is equal or higher than the upper limit value the State Bits in the State Byte of OUT and in the FB parameter ALARM_SUM have to change to 1. The unit of this parameter is the same like the OUT one.
HI_LIM	Value for upper limit of warnings Upper limit value for warnings with engineering unit of the OUT parameter. If the measured variable is equal or higher than the upper limit value, the State Bits in the State Byte of OUT and in the FB parameter ALARM_SUM have to change to 1. The unit of this parameter is the same like the OUT one .
LO_ALM	State of the lower limit of warnings. It contains the state of the lower limit of an alarm and the relating time stamp. Time stamp is not supported and therefore fixed to 0.
LO_LIM	Value for lower limit of warnings Lower limit value for warnings with engineering unit of the OUT parameter. If the measured variable is equal to or lower than the lower limit value, the State Bits in the State Byte of OUT and in the FB parameter ALARM_SUM have to change to 1. The unit of this parameter is the same like the OUT one.
LO_LO_ALM	State of the lower limit of alarms. It contains the state of the lower limit of an alarm and the relating time stamp. Time stamp is not supported and therefore fixed to 0
LO_LO_LIM	Value for the lower limit of alarms Lower limit value for alarms with engineering unit of the OUT parameter. If the measured variable is equal to or lower than the lower limit value, the State Bits in the State Byte of OUT and in the FB parameter ALARM_SUM have to change to 1. The unit of this parameter is the same like the OUT one.
Simulate	For comissioning and test purposes the input from the transducer block can be disconnected, and the input value and status can be set by the parameter Simulate.

5.4 Analog Input Function Block 2: Parameter Attributes

Rel. Index	Variable	Object type	Data type	Store	Size	Access	Parameterusage/ Type of transport	Default Values	Man/ opt.	Slot	Absolute Index
0-7	Standard Parameters								m	2	16-23
8	BATCH	record	DS-67	S	10	r,w	C/a	0,0,0,0	m	2	24
10	OUT	record	DS-33	D	5	r	O/Cyc		m	2	26
11	PV_SCALE	array	float	S	8	r,w	C/a	100,0	m	2	27
12	OUT_SCALE	record	DS-36	S	11	r,w	C/a	100,0,-,-	m	2	28
13	LIN_TYPE	simple	unsigned8	S	1	r,w	C/a	0	m	2	29
14	CHANNEL	simple	unsigned16 0x010a	S	2	r,w	C/a	toTB,rel. Idx. 10	m	2	30
16	PV_FTIME	simple	float Range = 0...60	S	4	r,w	C/a	0	m	2	32
19	ALARM_HYS	simple	float	S	4	r,w	C/a	0,5% of range	m	2	35
21	HI_HI_LIM	simple	float	S	4	r,w	C/a	*1	m	2	37
23	HI_LIM	simple	float	S	4	r,w	C/a	*1	m	2	39
25	LO_LIM	simple	float	S	4	r,w	C/a	*1	m	2	41
27	LO_LO_LIM	simple	float	S	4	r,w	C/a	*1	m	2	43
30	HI_HI_ALM	record	DS-39	D	16	r	C/a	0	o	2	46
31	HI_ALM	record	DS-39	D	16	r	C/a	0	o	2	47
32	LO_ALM	record	DS-39	D	16	r	C/a	0	o	2	48
33	LO_LO_ALM	record	DS-39	D	16	r	C/a	0	o	2	49
34	SIMULATE	record	DS-50	S	6	r,w	C/a	disable	m	2	50
36-44	Reserved by PNO										52-60

*1 The default values are lower sensor limit and upper sensor limit of the default sensor 1 type.

5.5 View Object Table

Relative Index	Parameter Mnemonic	Operation Dynamic VIEW_1	Operation Static VIEW_2	All Dynamic VIEW_3	Other static VIEW_4
0	BLOCK_OBJECT				
1	ST_REV	2			
2	TAG_DESCRIPTION				
3	STRATEGY				
4	ALERT_KEY				
5	TARGET_MODE				
6	MODE_BLK	3			
7	ALARM_SUM	8			
10	OUT	5			
11	PV_SCALE				
12	OUT_SCALE				
14	CHANNEL				
16	PV_FTIME				
19	ALARM_HYS				
21	HI_HI_LIM				
23	HI_LIM				
25	LO_LIM				
27	LO_LO_LIM				
30	HI_HI_ALM				
31	HI_ALM				
32	LO_ALM				
33	LO_LO_ALM				
34	SIMULATE				

6 Function Block 3: Process Temperature 2

The Input for this function bloc is the parameter SECONDARY_VALUE2, rel. Index 11, of the transducer bloc.

6.1 Standard Parameter Description

See 1.1 Standard parameter description of physical block.

6.1.1 Standard Parameter Attributes

See 1.1.1 Standard parameter attributes of physical block.

6.2 Block Object of Function Block

E	Element Name	Data Type (Index)	Size	Value
1	Reserved	Unsigned 8 - (5)	1	-
2	Block Object	Unsigned 8 - (5)	1	2
3	Parent Class	Unsigned 8 - (5)	1	1
4	Class	Unsigned 8 - (5)	1	1
5	DD Reference	Unsigned 32 - (7)	4	-
6	DD Revision	Unsigned 16 - (6)	2	-
7	Profile	OctetString (10)	2	64; 2
8	Profile Revision	Unsigned 16 - (6)	2	3; 0
9	Execution Time	Unsigned 8 - (5)	1	-
10	Number_of_parameters	Unsigned 16 - (6)	2	45
11	Address of VIEW_1	Unsigned 16 - (6)	2	3;61
12	Number of View List	Unsigned 8 - (5)	1	1

6.3 Analog Input Function Block 3: Parameter Description

6.3.1 Process Parameter

Parameter	Description
BATCH	This parameter is intended to be used in Batch applications in line with IEC 61512 Part1. Only Function blocks carry this parameter. There is no algorithm necessary within a function block. The Batch parameter is necessary in a distributed fieldbus system to identify used and available channels, in addition to identify the current batch in case of alerts.
CHANNEL	Reference to the active transducer block which provides the measurement value to the function block. In this application this value is constant.
LIN_TYPE	Type of linearisation. details see General Requirement. Here always zero.
OUT	Process Variable
PV_SCALE	Conversion of the Process Variable into percent using the high and low scale values. The engineering unit of PV_SCALE high and low scale values are direct related to the PV_UNIT of the configured Transducer Block (configured via Channel parameter). The PV_SCALE high and low scale values follow the changes of the PV_UNIT of the related Transducer Block automatically, i.e. a change of the Transducer Block PV_Unit causes no bump at OUT from AI.
OUT_SCALE	Scale of the process variable. It contains the values of the lower limit and upper limit effective range, engineering units code, and number of digits to the right of the decimal point.
PV_FTIME	Filter time of the Process Variable The function block parameter PV_FTIME contains the time constant for the rise time of the FB output up to a value of 63,21 % resulted from a jump on the input (PT1 filter). The engineering unit of the parameter is second.

6.3.2 Alarm Parameter and Simulation

Parameter	Description
ALARM_HYS	Hysteresis (effective to all limits).
HI_ALM	State of the upper limit of warnings. It contains the state of the upper limit of an alarm and the relating time stamp. Time stamp is not supported and therefore fixed to 0
HI_HI_ALM	State of the upper limit of alarms. It contains the state of the upper limit of an alarm and the relating time stamp. Time stamp is not supported and therefore fixed to 0
HI_HI_LIM	Value for upper limit of alarms Upper limit value for alarms with engineering unit of the OUT parameter. If the measured variable is equal or higher than the upper limit value the State Bits in the State Byte of OUT and in the FB parameter ALARM_SUM have to change to 1. The unit of this parameter is the same like the OUT one.
HI_LIM	Value for upper limit of warnings Upper limit value for warnings with engineering unit of the OUT parameter. If the measured variable is equal or higher than the upper limit value, the State Bits in the State Byte of OUT and in the FB parameter ALARM_SUM have to change to 1. The unit of this parameter is the same like the OUT one .
LO_ALM	State of the lower limit of warnings. It contains the state of the lower limit of an alarm and the relating time stamp. Time stamp is not supported and therefore fixed to 0
LO_LIM	Value for lower limit of warnings Lower limit value for warnings with engineering unit of the OUT parameter. If the measured variable is equal to or lower than the lower limit value, the State Bits in the State Byte of OUT and in the FB parameter ALARM_SUM have to change to 1. The unit of this parameter is the same like the OUT one.
LO_LO_ALM	State of the lower limit of alarms. It contains the state of the lower limit of an alarm and the relating time stamp. Time stamp is not supported and therefore fixed to 0
LO_LO_LIM	Value for the lower limit of alarms Lower limit value for alarms with engineering unit of the OUT parameter. If the measured variable is equal to or lower than the lower limit value, the State Bits in the State Byte of OUT and in the FB parameter ALARM_SUM have to change to 1. The unit of this parameter is the same like the OUT one.
Simulate	For comissioning and test purposes the input from the transducer block can be disconnected, and the input value and status can be set by the parameter Simulate.

6.4 Analog Input Function Block 3: Parameter Attributes

Rel. Index	Variable	Object type	Data type	Store	Size	Access	Parameterusage/ Type of transport	Default Values	Man/ opt.	Slot	Absolute Index
0-7	Standard Parameters								m	3	16-23
8	BATCH	record	DS-67	S	10	r,w	C/a	0	m	3	24
10	OUT	record	DS-33	D	5	r	O/Cyc		m	3	26
11	PV_SCALE	array	float	S	8	r,w	C/a	100,0	m	3	27
12	OUT_SCALE	record	DS-36	S	11	r,w	C/a	100,0,-,-	m	3	28
13	LIN_TYPE	simple	unsigned8	S	1	r,w	C/a	0	m	3	29
14	CHANNEL	simple	unsigned16 0x010b	S	2	r,w	C/a	toTB,rel. Idx. 11	m	3	30
16	PV_FTIME	simple	float Range = 0...60	S	4	r,w	C/a	0	m	3	32
19	ALARM_HYS	simple	float	S	4	r,w	C/a	0,5% of range	m	3	35
21	HI_HI_LIM	simple	float	S	4	r,w	C/a	*1	m	3	37
23	HI_LIM	simple	float	S	4	r,w	C/a	*1	m	3	39
25	LO_LIM	simple	float	S	4	r,w	C/a	*1	m	3	41
27	LO_LO_LIM	simple	float	S	4	r,w	C/a	*1	o	3	43
30	HI_HI_ALM	record	DS-39	D	16	r	C/a	0	o	3	46
31	HI_ALM	record	DS-39	D	16	r	C/a	0	o	3	47
32	LO_ALM	record	DS-39	D	16	r	C/a	0	o	3	48
33	LO_LO_ALM	record	DS-39	D	16	r	C/a	0	o	3	49
34	SIMULATE	record	DS-50	S	6	r,w	C/a	disable	m	3	50
36-44	Reserved by PNO										52-60

*1 The default values are lower sensor limit and upper sensor limit of the default sensor 2 type.

6.5 View Object Table

Relative Index	Parameter Mnemonic	Operation Dynamic VIEW_1	Operation Static VIEW_2	All Dynamic VIEW_3	Other static VIEW_4
0	BLOCK_OBJECT				
1	ST_REV	2			
2	TAG_DESCRIPTION				
3	STRATEGY				
4	ALERT_KEY				
5	TARGET_MODE				
6	MODE_BLK	3			
7	ALARM_SUM	8			
10	OUT	5			
11	PV_SCALE				
12	OUT_SCALE				
14	CHANNEL				
16	PV_FTIME				
19	ALARM_HYS				
21	HI_HI_LIM				
23	HI_LIM				
25	LO_LIM				
27	LO_LO_LIM				
30	HI_HI_ALM				
31	HI_ALM				
32	LO_ALM				
33	LO_LO_ALM				
34	SIMULATE				

7 Test Bloc

This bloc includes some test features.

7.1 Test Bloc: Parameter Description

Parameter	Description
RD_MEM	This parameter allowes a directly memory read access. It is realized like DATA TRANSPORT.
WR_MEM	This parameter allowes a directly memory write access. It is realized like a WRITE command.
CALIBRATE	This parameter allowes the calibrating of the voltage inputs of the ADC. For more informations please see the related document.
TEST CALIBRATE	This parameter tests the calibration. For more informations please see the related document.
CALIB CURRENT	This parameter calibrates the current. For more informations please see the related document.
READ VALUES	This parameter allowes a directly reading of digits and voltage of the actual channel.

7.2 Test Bloc: Parameter Attributes

Abs. Index	Parameter	Object type	Data type	Meaning	Size	Access	Type of transport	Slot
0	RD_MEM (data transport)	record	(write command) unsigned32 unsigned8 (answer) unsigned32 unsigned8 bytestream	memory address byte count memory address byte count data < 27	5 5+x	r,w	a	5
1	WR_MEM	record	unsigned32 unsigned8 bytestream	memory address byte count data < 27	5+x	w	a	5
2	CALIBRATE	record	unsigned8 unsigned8 unsigned8 float	1 = Zero cal 2 = Span cal gain channel value	7	w	a	5
3	TEST CALIBRATE	record	unsigned8 unsigned8 unsigned8	0 = stop test 1 = start test gain channel	3	w	a	5
4	CURRENT CALIBRATION	record	unsigned8 float	0 = 400 1 = 4000 resistance	5	w	a	5
5	READ VALUES	record	unsigned16 float	digits from ADC calculated voltage		r,w	a	5

8 Mapping to PROFIBUS

SLOT	INDEX decimal	Description
1	2	DEVICE MANAGEMENT
1	3...13	not used / Reserved by PNO
1	16...60	Analog Input Function Block (Calc. Temp.)
1	61	View Object Function Block (Calc. Temp.)
1	114... 146	PHYSICAL BLOCK
1	147	View Object Physical Block
2	16...60	Analog Input Function Block (Proc. Temp. 1)
2	61	View Object Function Block (Proc. Temp. 1)
3	16...60	Analog Input Function Block (Proc. Temp. 2)
3	61	View Object Function Block (Proc. Temp. 2)
4	0...80	TRANSDUCER BLOCK TEMPERATURE
5	81	View Object Transducer Block TEMPERATURE
5	0..5	Test Block

9 Cyclic Data Communication

The cyclic data telegram has the following structure:

Byte	Data	Access	Data Format
0 - 4	Function Block 1 rel. Index 10 (OUT)	r	Meas.val.t (32-Bit floating point (IEEE-754)) State Byte (80h = 0k)
5 - 9	Function Block 2 rel. Index 10 (OUT)	r	Meas.val. (32-Bit floating point (IEEE-754)) State Byte (80h = 0k)
10 - 14	Function Block 3 rel. Index 10 (OUT)	r	Meas.val. (32-Bit floating point (IEEE-754)) State Byte (80h = 0k)

The status byte is coded according to "PROFIBUS-PA Profile for Process Control Devices"

The above table shows the maximum length of a cyclic data telegram. The telegram could be fit to the needs of the application. So if not all of the output data of the transmitter is necessary to transmit, the master class I has the possibility to configure the number of output data he needs to have on cyclic communication. This configuration could only be done when the master starts the communication with the slave.

According to the PROFIBUS spec´s the master has to send for each of the 3 output values (or block) either a "42h 84h 08h 05h" to make this block active or a FREE PLACE "00h" to make this block inactive, as configuration data (CHK_CFG). The "42h 84h 08h 05h" may also be replaced by „94h“as defined by the Profile spec. The table below shows all possibilties of configuration and the effect to the output data or cyclic data of the transmitter.

Configuration data (CHK_CFG) Special Format	Configuration data (CHK_CFG) Identifier Bytes	Function block 1	Function block 2	Function block 3	Number of Output bytes
42h 84h 08h 05h 00h 00h	94h 00h 00h	active	inactive	inactive	5
00h 42h 84h 08h 05h 00h	00h 94h 00h	inactive	active	inactive	5
00h 00h 42h 84h 08h 05h	00h 00h 94h	inactive	inactive	active	5
42h 84h 08h 05h 42h 84h 08h 05h 00h	94h 94h 00h	active	active	inactive	10
00h 42h 84h 08h 05h 42h 84h 08h 05h	00h 94h 94h	inactive	active	active	10
42h 84h 08h 05h 00h 42h 84h 08h 05h	94h 00h 94h	active	inactive	active	10
42h 84 08h 05h 42h 84h 08h 05h 42h 84h 08h 05h	94h 94h 94h	active	active	active	15

9.1 Manufacturer Specific Cyclic Data Communication

The following configuration telegram allowes to select secondary values of the transducer bloc.

Byte	Data	Access	Data Format
0 - 4	Analog Input Function Block 1, rel. index 10	r	32-Bit floating point (IEEE-754)) State Byte (80h = 0k)
5 - 9	Transducer Block, rel. Index 82 Difference (T2-T1)	r	32-Bit floating point (IEEE-754) State Byte (80h = 0k)

It is assumed that these parameters belongs to a virtual fourth function bloc. So the configuration telegram is as follows:

0x42h 0x84h 0x08h 0x05h 0x00h 0x00h 0x42h 0x84 0x08h 0x05h

10 Listing of not supported optional Parameters

All optional parameters that are mentioned within the Profile 3.0 of the PNO but not supported by the device are listed here.

10.1 Physical Block

rel. Index	Variable Name
23	LOCAL_OP_ENA
25	HW_WRITE_PROTECTION

10.2 Transducer Block

rel. Index	Variable Name
27	SENSOR_WIRE_CHECK1
28	SENSOR_WIRE_CHECK2
29	MAX_SENSOR_VALUE1
30	MIN_SENSOR_VALUE1
31	MAX_SENSOR_VALUE2
32	MIN_SENSOR_VALUE2
45	TAB_INDEX
46	TAB_X_Y_VALUE
47	TAB_MIN_NUMBER
48	TAB_MAX_NUMBER
49	TAB_OP_CODE
50	TAB_STATUS
51	TAB_ACTUAL_NUMBER

10.3 Analog Input Function Blocks

This table is valid for all the analog input function blocks.

rel. Index	Variable Name
17	FSAFE_TYPE
18	FSAVE_VALUE
35	OUT_UNIT_TEXT

11 Datatypes

The datatypes are defined by the Profibus PA Profile document and are listed here as reference only.

11.1 Block structure (DS 32)

Index	E	Element name	Data type (index)	Size
32	1	Reserved	UNSIGNED8 - (5)	1
	2	Block object	UNSIGNED8 - (5)	1
	3	Parent class	UNSIGNED8 - (5)	1
	4	Class	UNSIGNED8 - (5)	1
	5	DD reference	UNSIGNED32 - (7)	4
	6	DD revision	UNSIGNED16 - (6)	2
	7	Profile	UNSIGNED16 - (6)	2
	8	Profile revision	UNSIGNED16 - (6)	2
	9	Execution time	UNSIGNED8 - (5)	1
	10	Number of parameters	UNSIGNED16 - (6)	2
	11	Index of VIEW_1	UNSIGNED16 - (6)	2
	12	Number of view lists	UNSIGNED8 - (5)	1

11.2 Value and Status (DS 33)

This data structure consists of the values and the state of the Floating Point parameters. These parameters can be inputs or outputs.
DataType Value & Status - Floating Point
Key Attribute Index = 33
Attribute: Number of Elements = 2

Attribute: Lists of Elements (shown below)

E	Element Name	Data Type (Index)	Size
1	Value	Float (8)	4
2	Status	Unsigned 8 (5)	1

11.2.1 Coding of Status for Transducer Block:

Note: Bit 0,1 are assumed to be 0 for the following table

Code (hexadecimal)	Meaning	caused by
4	Bad, configuration error	DIA_CONF_INVALID is active or Extended Diagnoses: ADC_CALIBRATED active
0C	Bad, device failure	DIA_HW_ELECTR or DIA_MEM_CHECKSUM is active
10	Bad, Sensor failure	DIA_MEASUREMENT active (Open / Short circuit of sensor)
20	Configuration Error	Variable not supported
50	Uncertain, Sensor conversion not accurate	Measuring value out of sensor limits
80	Good	---

11.2.2 Coding of Status for Function Block:

Note: Bit 0,1 are assumed to be 0 for the following table

Code (hexadecimal)	Meaning	caused by
1C	Bad, Out of service	Mode_Blk = out of service
44	Uncertain, last usable value	Fail safe active, after normal operation
60	Uncertain, simulated value	Mode_Blk = manual, Out value is set by operator
4C	Uncertain, initial value	Fail safe active, after power on without normal operation
54	Uncertain, engineering unit violation	Primary_value out of PV_Scale settings.
80	Good	---
88	Good, active advisory alarm	High_Lim or Low_Lim active
8C	Good, active critical alarm	High_High_Lim or Low_Low_Lim active

For all Status messages of class bad or uncertain bit 0,1 give the information of the limit status:

bit 0	bit 1	Meaning
0	0	Ok
1	0	Low Limit
0	1	High Limit
1	1	Constant output

11.3 Scaling structure (DS 36)

Index	E	Element name	Data type (index)	Size
36	1	EU at 100%	FLOAT - (8)	4
	2	EU at 0%	FLOAT - (8)	4
	3	Unit index	UNSIGNED16 - (6)	2
	4	Decimal point	INTEGER - (2)	1

Decimal point is a memo how many digit after the point are valid.

11.4 Mode structure (DS37)

Index	E	Element name	Data type (index)	Size
37	1	Actuel	UNSIGNED8 - (5)	1
	2	Permitted	UNSIGNED8 - (5)	1
	3	Normal	UNSIGNED8 - (5)	1

11.5 Alarm Float structure (DS39)

Index	E	Element name	Data type (index)	Size
39	1	Unacknowledged	UNSIGNED8 - (5)	1
	2	Alarm state	UNSIGNED8 - (5)	1
	3	Time stamp	TIME_VALUE - (21)	8
	4	Subcode	UNSIGNED16 - (6)	2
	5	Value	Float- (8)	4

11.6 Alarm Summary Structure (DS 42)

This data structure consists of data that summarize 16 alarms.
DataType Alarm Summary
Key Attribute Index = 42
Attribute Number of Elements = 4

Attribute Lists of Elements (shown below)

E	Element Name	Data Type (Index)	Size
1	Current	Octet String - (10)	2
2	Unacknowledged	Octet String - (10)	2
3	Unreported	Octet String - (10)	2
4	Disabled	Octet String - (10)	2

Table 28.List of elements of the Alarm Summery Structure

Bits of the Octet String are associated with the following alarms:
Octet 0

0 = Discrete alarm (LSB) (only Function Blocks with discrete limit parameters)
1 = HI_HI_Alarm (only Function Blocks with analog limit parameters)
2 = HI_Alarm (only Function Blocks with analog limit parameters)
3 = LO_LO_Alarm (only Function Blocks with analog limit parameters)
4 = LO_Alarm (only Function Blocks with analog limit parameters)
5 = reserved
6 = reserved
7 = Update Event (e.g. increment of ST_REV)

Octet 1

0 -7 = reserved

Current	Limit alarm bits will be set to 1 or 0 if the alarm reason occurs (1) or is gone (0). The update event bit will be set to 1 after ST_REV increment or other problems (see block specification) and will be set to 0 after 10 s.
Unreported	for future use
Unacknowledged	for future use
Disabled	for future use

11.7 Simulation parameter for floating point (DS 50)

Index	E	Element name	Data type (index)	Size
50	1	Simulate status	UNSIGNED8 - (5)	1
	2	Simulate value	FLOAT - (8)	4
	3	Simulate emabled	UNSIGNED8 - (5)	1

14.3 Manometro

Numero di disegno Voith: 4 201477 018

Tipo: 100-T5500 (0-1 bar)

Descrizione. . . . . ASHCROFT

ASHCROFT®

All stainless steel process gauge open or solid front
Model T5500 and T6500

According EN 837-1
Nominal size 100 mm or 160 mm
Accuracy: Class 1 (DIN)

Features
- Rugged stainless steel construction
- Socket and case welded
- Protection IP54 and IP65
- Usable to full scale
- Overload protection 130%
- Dry, liquid filled or liquid less (*PLUS!* gauge)
- Measuring system stainless steel or Monel
- Optional contacts

Ranges
-1 ... 0 bar up to 0 ... 2.500 bar
-30 in.Hg ... 0 psi up to 0 ... 36.000 psi

Applications
Chemical and petrochemical industry
Machine and apparatus construction
Food and beverage industry
Pulp and paper industry

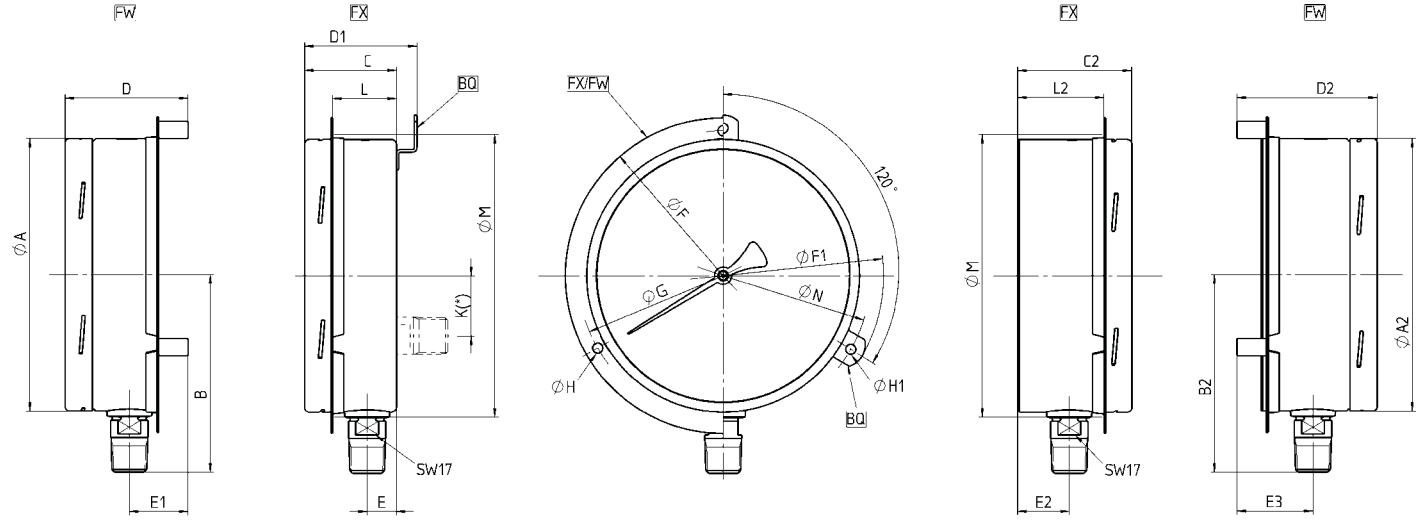
Technical specification	T5500		T6500	
Dial size [mm]	100	160	100	160
Construction	Open front cylindrical case with blow out disc at the back		Solid front safety pattern cylindrical case with blow out at the back	
Measuring principle Range [bar] Overpressure limit Pressure type	Bourdon tube 0,6 1 1,6 2,5 4 6 10 16 25 40 60 100 160 250 400 600 1000 1600 2500 -1/0 -1/0,6 -1/1,5 -1/3 -1/5 -1/9 130% F.S., short time Gauge, vacuum and compound			
Process connection	G ¼ B male, G ½ B male , G 3/8 B male according EN 837, M20x1,5 male, R ½ male tapered (DIN 2999), ½" male straight (JIS, BSP), 3/8" male straight (JIS, BSP) ¼ NPT male, ½ NPT male according ANSI/ASME B1.20.1 9/16-18 UNF-2B Aminco (high pressure), Others on request (for pressure limitations see order information)			
Connection location	Lower, back		Lower only	
Material Pressure connection Tube Case/bayonet ring Window Dial Pointer Movement	Stainless steel 316L (1.4404), optional Monel Stainless steel 316L (1.4404), optional Monel, > 1000 bar Ni Span Stainless steel 304 (1.4301), optional 316L (1.4404) Instrument glass, optional laminated safety glass or acrylic glass Aluminum, black markings on white background Aluminum, black, optional micrometer adjustment, red set hand or maximum pointer Stainless steel 304/303 (1.4301/1.4305)		Laminated safety glass, optional acrylic glass	
Accuracy	Class 1 (1% F.S.), optional 0,5% F.S.			
Permissible Ambient temperature Medium temperature Storage temperature Effect	 -25 ... 60°C max. 100°C -40 ... 60°C max. 0,3% / 10 K			
Protection according EN 60 529/IEC 529	IP54 (dry), IP65 (liquid filled), optional IP65 for dry gauges			
Filling liquids	Glycerin, silicone, halocarbon, others on request Optional dampened movement (liquid less gauge), functions as liquid filled gauge (*PLUS!* gauge)			
Mounting	Standard stem, optional flush or surface, others on request			
Weight dry/filled [kg]	0,8/1,0	1,2/2,0	0,8/1,0	1,2/2,0
Accessories, options	Diaphragm seals, valves, gauges with contacts (see G1.K55/E), gauges with electrical output, NACE			

All specifications are subject to change without notice.

DRESSER Measurement & Control

ASHCROFT®

General dimensions [mm]



T5500

Ø	A	B	C	D	D1	E	E1	F	F1	G	H	H1	K	K*	L	M	N
100	101	89	51	69	62	18,5	36,5	132	134	116	4,5	6	35	31	33	103	119
160	162	118	49	70	59	17	38	196	194	178	5	6	35	54	31	164	179

K*= Bereich / range / échelle >1000 bar oder / or / ou Material System / system material / matière élément D, M, P

T6500

Ø	A2	B2	C2	D2	E2	E3	F	G	H	H1	L2	M	N
100	101	89	61	76	26	41	132	116	4,5	6	42	103	119
160	158	118	66	80	30	44	183	168	6	6	50	161	179

Rev. I

Order information

Size	Type	System material	Execution	Process connection	Connection orientation	Range	Engineering units	Filling/Case material	Options
(100) 100 mm **(160)** 160 mm	**T5500** **T6500**	**(S)** 316L (1.4404) ≤ 1000 bar **(P)** Monel 400 ≤ 1000 bar **(M)** Monel 400 tube, 316L (1.4404) socket ≤ 1000 bar **(D)** Ni span tube, 316L (1.4404) socket > 1000 bar	**(D)** IP54 **(L)** Liquid filled IP65	**(04)** ½ NPT male [1] **(02)** ¼ NPT male [1] **(09)** 9/16-18 UNF-2B Aminco **(13)** G ¼ B male [1] **(14)** G 3/8 B male [1] **(15)** G ½ B male [1] **(16)** M20x1,5 male [1] **(KQ)** R½ male tapered DIN 2999 [1] **(KN)** ½" male straight (JIS,BSP)[1] **(KP)** 3/8" male straight (JIS,BSP)[1] [1] max. 1000 bar	**(L)** Lower **(B)** Back [1] [1] not for type T6500	**-1/ 0** **-1/ 1,5** **-1/ 3** **-1/ 5** **-1/ 9** **0/ 0,6** [1] **0/ 1** **0/ 1,6** **0/ 2,5** **0/ 4** **0/ 6** **0/ 10** **0/ 16** **0/ 25** **0/ 40** **0/ 60** **0/ 100** **0/ 160** **0/ 250** **0/ 400** **0/ 600** **0 1000** **0/1600** **0/2500** [1] not allowed with execution L	**(BAR)** psi and others on request	**(=)** Standard no filling **(GV)** Silicone **(GV3)** Silicone 3 cst **(GR)** Glycerin [1] **(GX)** Halocarbon [2] **(YW)** Case material 316L (1.4404) **( )** Contact type and function (see G1.K55/E) [1] not for ranges ≤ 2,5 bar [2] Not allowed in combination with Liquid less (LL) option	**(NH)** Tagging wired **(DA)** Dial Marking **(TU)** Throttle plug stainless steel **(6B)** Oxygen cleaned (not for open front acc. EN 837-1) **(MP)** Micrometer pointer **(EP)** Maximum pointer, adjustable **(PD)** Acrylic glass **(SG)** Safety glass **(FX)** Front flange **(FW)** Back flange **(BQ)** Wall mounting bracket (not for T6500) **(UF)** U-clamp (not for solid front) **(SH)** Red set hand stationary **(LJ)** Field fillable (only for execution "D", IP65) **(AJ)** Calibration 0,5% F.S. (not for range 0/0,6 bar filled) **(LL)** Liquid less gauges (Halocarbon filling not allowed) **(PR)** Receiver gauge **(OS)** Overload stop **(VS)** Underload stop

How to order

Size	Type	System material	Execution	Process connection	Connection orientation	Range	Engineering unit	Filling/Case material	Option
100	T5500	S	D	15	L	0/16	BAR	YW	NH

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6. Nullpunktkorrektur

- Bei Meßgeräten mit abnehmbaren Frontring oder externer Verstellmöglichkeit kann der Nullpunkt eingestellt werden.
- Bei Meßgeräten mit interner Nullpunktverstellung muß der Bajonett - Ring bzw. der klappbare Ring vorsichtig entfernt werden. Meßgeräte mit geschraubtem Ring werden wie in Bild 1 dargestellt geöffnet.
  1. Gerät (3) mit einer Schutzhülse (2) im Schraubstock einspannen.
  2. Schraubring vorsichtig mit einem Hammer und einem großen Schraubendreher (1) gegen den Uhrzeigersinn lösen.
  3. Nach der Nullpunktkorrektur Schraubring von Hand fest andrehen. Bei wetterfester Ausführung eine 1/8 Umdrehung, bei hermetisch dichter und gefüllter Ausführung eine 1/3 Umdrehung nachziehen.
- Differenzdruckmeßgeräte haben eine externe Verstellmöglichkeit an der Gehäuseseite.
- Feinmeßgeräte mit klappbarem Ring haben eine frontseitige Nullpunktkorrektur (siehe Bild 2).
  1. Feststellschraube A lösen.
  2. Mit der Justierschraube B den Nullpunkt einstellen.
  3. Feststellschraube A in Justierschraube B eindrehen.
- Vor der Nullpunktkorrektur ist ein Druckausgleich erforderlich.

6. Zero adjustment

For instruments with a removable ring, bezel or external zero adjust feature the zero can be adjusted. For the instruments with internal zero adjustments the bayonetring or hinged ring bezel must be removed, for gauges with screwed ring see sketch 1 to remove the ring.

1. Hold gauge in vise with threaded nut. it is important to hold the gauge rigidly otherwise ring lugs may be damaged.
2. To remove ring - tap counterwise as shown using hammer and large screw driver with flat tip
3. To install ring tighten snugly by hand. Turn as per sketch 1/8 turn for weatherproof and 1/3 turn for liquid filled and hermetically sealed.

The differential pressure gauges have an external adjustment on the side of the case.

- Testgauges with hinged ring are equipped with a front mounted zero adjustment (see sketch 2).
  1. Loosen ring locking screw A.
  2 Rotated knob B until required adjustment.
  3 Tighten screw A down on knob B.

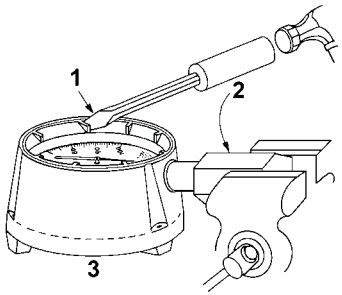
The pointer can be adjusted to zero after releasing the pressure element against atmosphere.

6. Réglage du zéro

- Pour les instrument à lunette amovible ou munis d'une système de remise à zéro externe, le zéro peut être. Pour les instruments munis d'un système de réglage interne du zéro, la lunette à baïonnette ou articulée peut être aisément enlevée, pour les manomètres lunette visée, voir le schéma pour retirer la lunette.
  1. Tenir la manomètre solidement fixé. il est important de le tenir étroitement sinon les ergots de la lunette pourraient être endommagés.
  2. Pour retirer la lunette, tapoter dans le sens inverse des aiguilles d'une montre comme indiqué en utilisant un marteau et un tournevis à bout plat.
  3. Pour installer la lunette, la serrer à fond à la main. Tourner comme indiqué sur le schéma d'1/8 de tour pour l'étanchéité et d'1/3 de tour pour les boîtiers à bain ou hermétique.
- Les manomètres différentiels ont un ajustement externe sur le côte du boîtier.
- Les manomètres étalons à lunette amovible sont équipés d'une vis de remise à zéro sur la façade (voir schéma 2).
  1. Desserrer la bague de verrouillage „A"
  2. Faire tourner le bouton „B" pour ajuster le zéro.
  3. Serrer la vis „A" sur le bouton „B".
- L'aiguille ne peut être remise à zéro qu'après avoir libéré l'élément sensible de tout pression.

Bild / sketch / schéma

1



2

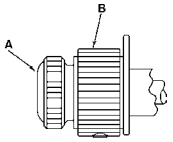


Tabelle / table / tableau 3

max. Umgebungstemperatur / ambient temperature limits / température ambiante maximum

Ausführung execution type de boîtier		°C	°F
hermetisch dicht hermetically sealed hermetique	Luft / air / air	- 25 ... 50	- 10 ... 125
Flüssigkeitsgefüllt liquid filled à bain	Glycerin / glycerin / glycérine Silikon / silicon / silicone	- 18 ... 65 - 45 ... 65	0 ... 150 - 50 ... 150

- Füllflüssigkeit und Meßstoff müssen kompatibel sein.
- Be sure filling liquid is compatible with process fluid
- S'assurer que le liquide de remplissage est compatible avec le fluide de service.

ASHCROFT®

Betriebsanleitung
Druck- und Differenzdruckmanometer

Operating Instruction
Pressure- and DP gauge

Instruction de Service
Manomètre et Manomètre différentiel

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DRESSER Measurement

1. Montagebedingungen

- Die Manometer müssen nach den in Betracht kommenden Anforderungen ausgewählt und montiert werden.
- Zul. Umgebungstemperatur siehe Tabelle 3. Andere Temperaturgrenzen sind optional mit speziellen Serien möglich.

2. Montage

- Der Einbau des Meßgerätes sollte in der Nähe des Meßpunktes erfolgen. Der Einbauort sollte zugänglich und frei von Erschütterungen sein.
- Die Betriebsstellung muß mit der auf dem Zifferblatt angegebenen Gebrauchsstellung übereinstimmen. Ohne Angabe auf dem Zifferblatt ist die Gebrauchslage 90° ± 5° (Zifferblatt in vertikaler Lage).
- Bei extremen Bedingungen (Druckspitzen, Vibrationen) Schutzelemente verwenden (Dämpfungselemente, Füllflüssigkeiten).
- Das Meßgerät ist vor schädlichen Umwelteinflüssen, Beschädigungen, großen Temperaturschwankungen und, bei Differenzdruckmeßgeräten, vor einseitiger Wärmestrahlung zu schützen.
- Differenzdruckmeßgeräte müssen frostsicher eingebaut werden.
- Überschreitet die Temperatur des Meßstoffes die zulässige Betriebstemperatur, so muß eine ausreichend lange Meßleitung, ein Wassersackrohr oder ein Druckmittler mit Kapillarrohr vorgeschaltet werden.
- Beim Montieren ist ein entsprechender Maulschlüssel zu verwenden. Es darf keine Kraft (Moment) auf das Gehäuse ausgeübt werden.

3. Inbetriebnahme

- Ist auf dem Zifferblatt keine Begrenzungsmarke ▼ aufgedruckt, so ist der Verwendungsbereich gleich dem Anzeigebereich. Bei Differenzdruckmeßgeräten ist der maximale statische Druck zu berücksichtigen.
- Beim Abdrücken von Rohrleitungen und Kesseln darf das Meßgerät nicht höher als die vorgenannten Begrenzungen belastet werden.
- Die Bezugstemperatur beträgt + 20°C (Normaltemperatur bei betrieblicher Eichung). Abweichend von der Bezugstemperatur ergibt sich je ± 30°C Betriebstemperaturzunahme bzw. Abnahme ein zusätzlicher Anzeigefehler von ± 1 % bezogen auf den M. E..
- Die Anschlußleitung sollte, in Abhängigkeit von Druck und Länge, einen Innendurchmesser von 4 ... 9 mm haben.
- Nach Montage eines Differenzdruckmeßgerätes sind die Anschlußleitungen auszublasen, bzw. bei flüssigen Medien zu entlüften. Bis zum Einsatz bleibt das Anschlußventil geschlossen und das Ausgleichsventil geöffnet. Einseitige Druckbelastungen sind zu vermeiden.
- Absperrventile immer langsam öffnen.
- Bei Inbetriebnahme von Differenzdruckmeßgeräten wie folgt vorgehen:
  1. Ausgleichsventil öffnen
  2. Anschlußventil öffnen.
  3. Ausgleichsventil schließen. Der Differenzdruck wird angezeigt.
- Bei Außerbetriebnahme wie folgt vorgehen:
  1. Ausgleichsventil öffnen. 2. Anschlußventil schließen.

4. Nullpunktprüfung / Funktionstest

- Nach dem Schließen der Absperrventile und erfolgtem Druckausgleich muß der Zeiger im als Nullpunkt gekennzeichneten Bereich stehen.
- Bei Differenzdruckmeßgeräten steht der Zeiger bei gleichzeitigem Schließen der Ventile innerhalb des Anzeigebereiches. Fällt der Zeiger, ist die Plusleitung undicht oder das Ausgleichsventil nicht geschlossen. Steigt der Zeiger, ist die Minusleitung undicht. Zeigt das Differenzdruckmeßgerät nichts an, Minusleitung schließen und Plusleitung öffnen. Bewegt sich der Zeiger nicht, so ist das Gerät defekt.

5. Wartung

- Das Gerät ist wartungsfrei.
- Lassen sich Störungen nicht beheben, wenden Sie sich bitte an unsere Niederlassungen und Vertretungen, die Ihnen mit Beratung und Service zur Verfügung stehen.

Technische Änderungen vorbehalten !

1. Installation requirements

- The pressure gauges must be selected and installed this wise, that the possibility of failure, resulting in injury or misapplication, is minimized.
- For the maximum ambient temperature see table 3. Other limits are possible at special series.

2. Mounting

- The mounting of measuring instruments shall be in proximity of measuring point, easily accessible and safe from vibrations and always coincide with the position as indicated on the dial. If no such statement is printed on the dial, the gauges must be mounted in a 90° ± 5° position with the vertical dial. If the instrument can not protected against shock or vibration, use an additional movement damping feature (liquid filled or pulsation dampener). The measuring instrument must be protect against damages, great pollution, high fluctuation of temperature and one-sided heat radiation for the dp gauge. Please note the freezing point of media and choose a frost - protected place for the dp gauges.
- If the process temperature at the gauge is in excess of the max. allowable operation temperature, than depending of the application a syphon, diaphragm seal or sufficient length of pipe / capillary has to be mounted between the pressure tap and the instrument.
- When installing always use a wrench suitable for the flats on the instrument. Do never apply mechanical torque's to the case.

3. Operation

- The operating range corresponds to the scale range or see static pressure limit mark ▼ printed on the dial. For dp gauges look for the max. allowable static pressure. When carrying out pressure test of process pipes and vessels, the instrument may not exposed to the above limits as mentioned before. The calibration temperature is + 20°, each ± 30°C deviation of this temperature adds ± one class of full scale value to the accuracy. The instruments piping shall be between 4 and 9 mm ID, depending on the pressure and the lengths.
- After installation of the dp gauges the measuring lines must be blowed through. When using liquid media, the measuring lines must be bled.
- Until definitive operation the connection valve remains closed and the compensation valve remains open. Please avoid one-sided charge.
- On start up for pressure gauges open the shut off valve slowly.
- For dp gauges follow the following sequence for:
- Operation:
  1. Open balancing valve.
  2. Open connection valves.
  3. Close balancing valve. Differential pressure is indicated on dial
- Out of operation:
  1. Open balancing valve.
  2. Close connection valves.

4. Zero or functional test

- The shut off valve(s) at the pressure tap(s) for the instrument has to be closed and the pressure has to be released to atmosphere. The pointer tip must stay within the zero mark.
- Check for dp gauges: Close both valves at the pressure taps at the same time. The pointer must rest within the scale range. If pointer drops the plus line leaks or the balancing valve is still open. In case of rising pointer the minus line leaks. If the dp gauge shows no indication, close the minus line and open the plus line. In case the pointer doesn't move the instrument is damaged.

5. Maintenance

- The instrument require no special maintenance.
- In case of any default apply for assistance from ourselves or our agents. We will assist you with advice and service.

Modification reserved !

1. Conditions de montage

- Les manomètres doivent être choisis et montés de manière à minimiser les possibilités d'erreurs, résultant d'un mauvais montage d'une mauvaise application.
- Pour la température ambiante maximum, se référer au tableau 3. D'autres limites sont possibles dans des modèles particuliers.

2. Montage

- Le montage de mano's doit être fait à proximité du point de mesure, facilement accessible, exempt de vibrations et toujours coïncider avec la position indiquée sur cadran. En standard, les manomètres doivant être montés à 90° ± 5° par rapport au cadran à la verticale. Protéger les mano's contre les chocs ou les vibrations ou utiliser un système d'amortissement supplémentaire (remplissage ou amortisseur). Le mano doit être protégé contre avaries, pollution, hautes fluctuations de température et chaleur d'un côté de l'appareil pour le mano différentiel. Noter la point de gel du fluide et choisir une place protégée du gel pour les mano's différentiels.
- Si la température du process au niveau du mano est supérieure à la température maximum admissible, alors il sera nécessaire de monter un siphon, un séparateur ou un capillaire suffisamment long. Utilisez toujours clefs adaptées au plats du mano. Ne jamais appliquer de forces sur le boîtier.

3. Mise en service

- L'échelle d'opération correspond à la pleine échelle sinon se référer à la marque ▼ indiquant la limite de pression. Pour les mano's différentiels, vérifier la pression statique maxi. Pendant les essais d'étanchéité des tuyaux, les mano's ne doivent pas être exposés hors limites indiquées. La température d'étalonnage est de + 20°, chaque déviation de ± 30° ajoute ± une classe de la valeur pleine échelle à la précision. Les tuyaux vers les mano's doivent avoir un diamètre interne entre 4 et 9 mm, en fonction de la pression et de la longueur.
- Après l'installation de mano's différentiels, les lignes de mesure doivent être ventilées (purgées pour liquides).
- Jusqu'à la mise en service définitive, la vanne d'isolement doit rester fermée et la vanne d'équilibrage ouverte. Faire attention aux charges unidirectionnels.
- Au démarrage pour les mano's ouvrir la vanne d'isolement lentement.
- Pour les mano's différentiels, suivre les instructions suivantes pour:
- Mise en service:
  1. Ouvrir la vanne d'équilibrage
  2. Ouvrir les vannes d'isolement
  3. Fermer la vanne d'équilibrage. La pression différentielle est indiquées sur le cadran
- Mise hors service:
  1. Ouvrir la vanne d'équilibrage.
  2. Fermer les vannes d'isolement.

4. Zéro ou test de fonctionnement

- La vanne d'isolement du mano fermée, la pression doit être amenée à la pression atmosphérique. L'aiguille doit rester à zéro.
- Vérification pour les mano's différentiels. Fermer l'ensemble des vannes à la prise de pression en même temps. L'aiguille doit reste dans l'échelle. Si l'aiguille descend, la partie haute pression a des fuites ou la vanne d'équilibrage est restée ouverte. En cas montée de l'aiguille, la partie basse pression a des fuites. Si le mano ne montre aucune indication, fermer la coté basse pression et ouvrir la haute pression. Si l'aiguille ne bouge pas, l'instrument est défectueux.

5. Maintenance

- L'instrument ne demande pas une maintenance particulière.
- En cas de défaut, demander l'assistance de nos agents ou la nôtre. Nous vous apporterons conseil et service.

Sous réserve de modifications !

DRESSER INSTRUMENT
EUROPEAN OPERATIONS
A Haliburton Company

Konformitätserklärung
EG - Richtlinien

Declaration of Conformity
EC - direction

DRESSSER EUROPE S.A.
Max-Planck-Straße 1
D-52499 Baesweiler

Wir erklären hiermit in alleiniger Verantwortung, daß die folgenden Produkte in Übereinstimmung mit den Bestimmungen der benannten EG-Richtlinien sind und die aufgeführten Normen und technischen Spezifikationen zur Anwendung gelangt sind	We hereby declare under sole responsibility that following products are in conformity with the provisions of the following EC-directives and the listed standards and technical specifications have been applied

Bezeichnung : Specification :	Schalter (Temperatur-, (Differenz-)Druck--) Switch (temperature-, (differntial-) pressure-)	
Typ / Artikel-Nr. / Baureihe : Type / Part-No. / Series :	B-.., D-.., L-.., G-.., P-.., T-..	
Serien-Nr. : Serial No. :	Ab Lieferdatum 01.01.1997 Supplied from 01.01.1997	
Spezifikation : Specification :		
EG-Richtlinie : EC-directive :	73 / 23 / EWG	Niederspannungsrichtlinie Low-Voltage Directive
Angewandte Normen : Applied standards :	EN 60 010-1 EN 60 947-7 EN 60 947-7	Sicherheitsbestimmungen MSR Niederspannungs-Schaltgeräte Niederspannung-Schaltgeräte-kombinationen

Hersteller-Unterschrift : Signature of manufacturer :	Tom Fiedler	Tom Fiedler
Funktion des Unterzeichners : Function of signer :	Engineering	
Datum : Date :	16.01.1997	
Stempel Stamp		DRESSER EUROPE S.A. INSTRUMENT DIVISION Max-Planck-Straße 1 D-52499 Baesweiler Postfach/P.O. Box 11 20 D-52490 Baesweiler Tel. 0 24 01 / 80 80 - Fax 0 24 01 - 70 27

14.4 Indicatore di pressione differenziale

Numero di disegno Voith: 4 201595 002

Tipo: 100-F 5509 (0-1,6 bar)

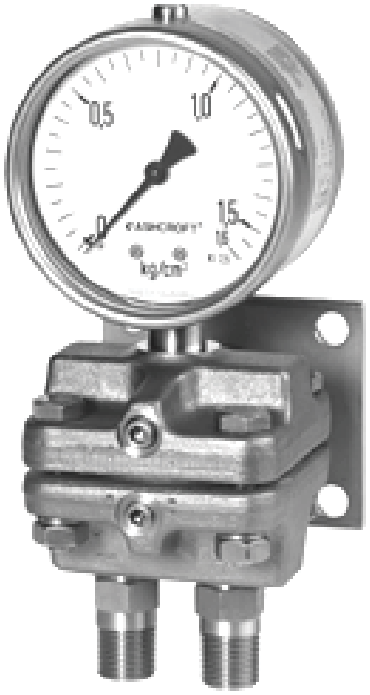
Descrizione. . . . . ASHCROFT

ASHCROFT®

Stainless steel differential pressure gauge
Model F5509 and F6509

Max. static pressure 25 bar

Nominal size 100 mm or 160 mm
Accuracy: Class 2,5 (DIN), optional 1,6%



Features

- Stainless steel case and wetted parts
- Static pressure 10 bar or 25 bar one side load permitted
- Protection IP54 or IP65
- Chamber purge and bleed connection available
- High corrosive resistance
- Dry or liquid filled
- Optional solid front

Ranges

0 ... 25 mbar up to 0 ... 250 mbar (max. static pressure 10 bar)
0 ... 400 mbar up to 0 ... 25 bar (max. static pressure 25 bar)

Applications

Chemical and petrochemical industry
Machine and apparatus construction
Food and beverage industry
Pulp and paper industry

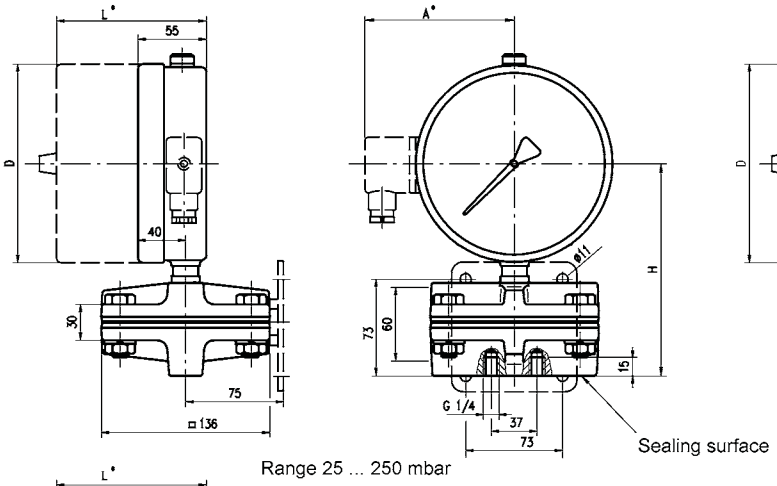
Technical specification	F5509		F6509	
Dial size [mm]	100	160	100	160
Construction	Open front cylindrical case with blow out disc at the back		Solid front safety pattern cylindrical case with blow out at the back	
Zero adjustment	Externally, at the top of the case			
Measuring principle	Diaphragm (see back side)			
Range [mbar]	25 40 60 100 160 250 400			
[bar]	0,6 1 1,6 2,5 4 6 10 16 25			
max. static pressure	Range < 400 mbar static pressure = 10 bar (10 times F.S. load at one side) Range ≥ 400 mbar static pressure = 25 bar (10 times F.S. load at one side)			
Pressure type	Differential			
Process connection	G ¼ B male, G ¼ female, G ½ B male, G ½ female ¼" NPT male, ¼" NPT female, ½" NPT male, ½" NPT female, others on request			
Connection location	Lower			
Material				
Pressure connection	Stainless steel AISI 316Ti (1.4571)			
Pressure chamber	Stainless steel AISI 316Ti (1.4571), Viton O-ring, Teflon on request			
Measuring diaphragm	> 1 bar stainless steel AISI 316Ti (1.4571) ≤ 1 bar Duratherm (NiCrCo alloy)			
Bellows	Stainless steel AISI 316Ti (1.4571)			
Case/bayonet ring	Stainless steel AISI 304 (1.4301)			
Window	Laminated safety glass			
Dial	Aluminum, black markings on white background			
Pointer	Aluminum, black, optional red set hand or maximum pointer			
Movement	Stainless steel AISI 304/AISI 303 (1.4301/1.4305)			
Accuracy	Class 2,5 (2,5% F.S.), optional class 1,6 (1,6% F.S.)			
Permissible				
Ambient temperature	-25 ... 85°C			
Medium temperature	max. 100°C			
Storage temperature	-40 ... 60°C			
Effect	max. 0,3% / 10 K			
Protection according EN 60 529/IEC 529	IP54 (dry), IP65 (liquid filled), optional IP65 for dry gauges			
Filling liquids	Glycerin, silicone, others on request			
Mounting	Direct, optional wall or 2" pipe mounting, others on request			
Weight dry/filled [kg] range	≤ 400 mbar 9/9,5 ≥ 600 mbar 4/4,5	≤ 400 mbar 9,4/10 ≥ 600 mbar 4,4/5	≤ 400 mbar 9/9,5 ≥ 600 mbar 4/4,5	≤ 400 mbar 9,4/10 ≥ 600 mbar 4,4/5
Accessories, options	3 or 5 way manifolds, valves, gauges with contacts (see data sheet G1.K55/D)			

All specifications are subject to change without notice.

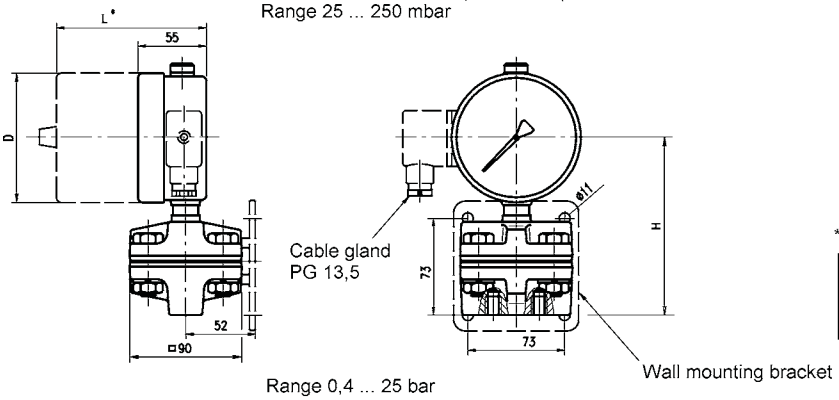
DRESSER INSTRUMENT
EUROPEAN OPERATIONS

General dimensions [mm]

F5509

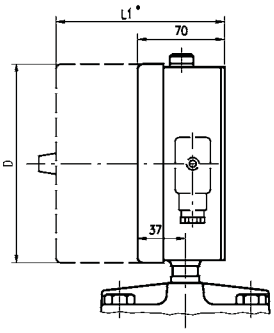


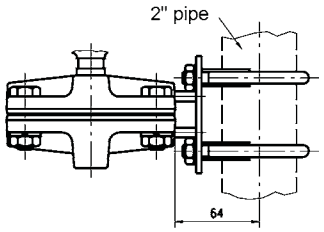
Range 25 ... 250 mbar



Range 0,4 ... 25 bar

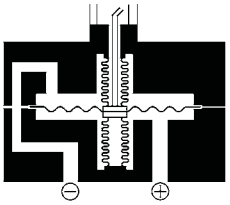
F6509





Pipe mounting

Measuring principle



* with integrated contacts

Dial Size	D	H	A	L	L1
100	Ø 101	140	86	100	116
160	Ø 161	170	120	102	118

Rev.B

Order information

Size	Type	System material	Execution	Process connection	Connection orientation	Range	Engineer-in units	Filling/contacts	Options
(100) 100 mm **(160)** 160 mm	**F5509** **F6509**	**(S) Pressure compartment** AISI 316Ti (1.4571) **Diaphragm** > 1 bar AISI 316Ti (1.4571), ≤ 1 bar Duratherm **Bellows** AISI 316Ti (1.4571)	**(=)** IP54 standard case **(L)** Liquid filled IP65	**(27)** G ¼ female **(02)** ¼" NPT male **(04)** ½ " NPT male **(13)** G ¼ B male **(15)** G ½ B male **(25)** ¼" NPT female **(50)** ½ " NPT female **(51)** G ½ female	**(L)** Lower	**0/ 25** **0/ 40** **0/ 60** **0/ 100** **0/ 160** **0/ 250** **0/ 400** **0/ 0,6** **0/ 1** **0 1,6** **0/ 2,5** **0/ 4** **0/ 6** **0/ 10** **0/ 16** **0/ 25** max. static pressure for < 400 mbar 10 bar for ≥ 400 mbar 25 bar	**(MBAR)** **(BAR)** psi and others on request compound ranges on request	**(=)** Standard no filling **(GV)** Silicone **(GR)** Glycerin **( )** Contact type and function (see data sheet G1.K55/E)	**(NH)** Tagging wired **(DA)** Dial marking **(FW)** Wall mounted bracket **(TB)** Purge and vent connection G 1/8 **(EP)** Maximum pointer adjustable **(TM)** 2" pipe mounting bracket **(LJ)** Field fillable IP65 (only for execution =)

How to order

Size	Type	System material	Execution	Process connection	Connection orientation	Range	Engineering unit	Filling/contacts	Option
100	F5509	S	S	27	L	0/16	BAR	=	TM

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United Kingdom
East Gillibrands
Skelmersdale, Lancashire WN8 9TU
Tel.: +44 (0) 16 95 52 600, **Fax:** +44 (0) 16 95 52 693

- Si la température du process au niveau du mano est supérieure à la température maximum admissible, alors il sera nécessaire de monter un siphon, un séparateur ou un capillaire suffisamment long. Utilisez toujours clefs adaptées au plats du mano. Ne jamais appliquer de forces sur le boîtier.

3. Mise en service

- L'échelle d'opération correspond à la pleine échelle sinon se référer à la marque ▼ indiquant la limite de pression. Pour les mano's différentiels, vérifier la pression statique maxi. Pendant les essais d'étanchéité des tuyaux, les mano's ne doivent pas être exposés hors limites indiquées. La température d'étalonnage est de +20 °C, chaque déviation de ±30 °C ajoute ± une classe de la valeur pleine échelle à la précision. Les tuyaux vers les mano's doivent avoir un diamètre interne entre 4 et 9 mm, en fonction de la pression et de la longueur.
- Après l'installation de mano's différentiels, les lignes de mesure doivent être ventilées (purgées pour liquides).
- Jusqu'à la mise en service définitive, la vanne d'isolement doit rester fermée et la vanne d'équilibrage ouverte. Faire attention aux charges unidirectionnels.
- Au démarrage pour les mano's ouvrir la vanne d'isolement lentement.
- Pour les mano's différentiels, suivre les instructions suivantes pour:
- Mise en service: 1. Ouvrir la vanne d'équilibrage
  2. Ouvrir les vannes d'isolement
  3. Fermer la vanne d'équilibrage.
  La pression différentielle est indiquées sur le cadran
- Mise hors service: 1. Ouvrir la vanne d'équilibrage
  . 2. Fermer les vannes d'isolement.
- Service en zone dangereuse (model T5500/T6500):
  Ambiance: -20 … 60 °C
  Le "Process": Les températures maxi des fluides, gaz et vapeurs en contact avec l'instrument dépendent de la construction de l'appareil ainsi que la température d'inflammation des gaz, vapeurs ou poussières dans l'ambiance (voir tableau 1):
  Attention: Pour les gaz, la température peut augmenter à cause de la compression; ceci limite la fréquence maxi admissible (pas les pulsations) jusqu'à 0,1 Hz. Ce n'est pas applicable pour les manomètres remplis d'un bain d'huile amortisseur.
  Tableau 1: Température du "process" maxi.

Classe de température	Température du "process" maxi
T6	+55 °C
T5	+70 °C
T4	+100 °C
T3	+100 °C
T2	+100 °C
T1	+100 °C

Pendant les essais de chocs le degré de risque mécanique à été classifié comme léger.

4. Zéro ou test de fonctionnement

- La vanne d'isolement du mano fermée, la pression doit être amenée à la pression atmosphérique. L'aiguille doit rester à zéro.
- Vérification pour les mano's différentiels. Fermer l'ensemble des vannes à la prise de pression en même temps. L'aiguille doit reste dans l'échelle. Si l'aiguille descend, la partie haute pression a des fuites ou la vanne d'équilibrage est restée ouverte. En cas montée de l'aiguille, la partie basse pression a des fuites. Si le mano ne montre aucune indication, fermer la coté basse pression et ouvrir la haute pression. Si l'aiguille ne bouge pas, l'instrument est défectueux.

5. Maintenance

- L'instrument ne demande pas une maintenance particulière.
- En cas de défaut, demander l'assistance de nos agents ou la nôtre. Nous vous apporterons conseil et service.

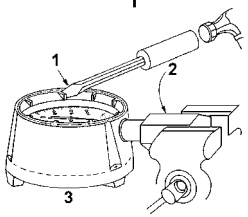
6. Réglage du zéro

- Pour les instrument à lunette amovible ou munis d'une système de remise à zéro externe, le zéro peut être. Pour les instruments munis d'un système de réglage interne du zéro, la lunette à baïonnette ou articulée peut être aisément enlevée, pour les manomètres lunette visée, voir le schéma pour retirer la lunette.
  1. Tenir la manomètre solidement fixé. il est important de le tenir étroitement sinon les ergots de la lunette pourraient être endommagés.
  2. Pour retirer la lunette, tapoter dans le sens inverse des aiguilles d'une montre comme indiqué en utilisant un marteau et un tournevis à bout plat.
  3. Pour installer la lunette, la serrer à fond à la main. Tourner comme indiqué sur le schéma d'1/8 de tour pour l'étanchéité et d'1/3 de tour pour les boîtiers à bain ou hermétique.
- Les manomètres différentiels ont un ajustement externe sur le côte du boîtier.
- Les manomètres étalons à lunette amovible sont équipés d'une vis de remise à zéro sur la façade (voir schéma 2).
  1. Desserrer la bague de verrouillage „A"
  2. Faire tourner le bouton „B" pour ajuster le zéro.
  3. Serrer la vis „A" sur le bouton „B".
- L'aiguille ne peut être remise à zéro qu'après avoir libéré l'élément sensible de tout pression.

Sous réserve de modifications !

Bild / sketch / schéma

1



2

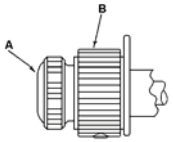


Tabelle / table / tableau 2

max. Umgebungstemperatur / ambient temperature limits / température ambiante maximum

Ausführung execution type de boîtier		°C	°F
hermetisch dicht hermetically sealed hermétique	Luft / air / air	- 25 ... 50	- 10 ... 125
Flüssigkeitsgefüllt liquid filled à bain	Glycerin / glycerin / glycérine	- 18 ... 65	0 ... 150
	Silikon / silicon / silicone	- 45 ... 65	- 50 ... 150

- Füllflüssigkeit und Messstoff müssen kompatibel sein.
- Be sure filling liquid is compatible with process fluid
- S'assurer que le liquide de remplissage est compatible avec le fluide de service.

GAUGE - BA Rev. K 09/04/2004

ASHCROFT®

Betriebsanleitung
Druck- und Differenzdruckmanometer

Operating Instruction
Pressure- and DP gauge

Instruction de Service
Manomètre et Manomètre différentiel

Dresser Europe GmbH

Niederlassung Baesweiler

Germany/Deutschland/Allemagne
Max - Planck - Straße 1
D - 52499 Baesweiler
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„206" ZA Le Mandinet Rue des Campanules
F-77185 Lognes
✆ +33 (0) 1 60 37 25 30
Fax: +33 (0) 1 60 37 25 39

DRESSER Instruments

1. Montagebedingungen
- Die Manometer müssen nach den in Betracht kommenden Anforderungen ausgewählt und montiert werden.
- Zulässige Umgebungstemperatur siehe Tabelle 2. Andere Temperaturgrenzen sind optional mit speziellen Serien möglich.

2. Montage
- Der Einbau des Messgerätes sollte in der Nähe des Messpunktes erfolgen. Der Einbauort sollte zugänglich und frei von Erschütterungen sein.
- Die Betriebsstellung muss mit der auf dem Zifferblatt angegebenen Gebrauchsstellung übereinstimmen. Ohne Angabe auf dem Zifferblatt ist die Gebrauchslage 90° ±5° (Zifferblatt in vertikaler Lage).
- Bei extremen Bedingungen (Druckspitzen, Vibrationen) Schutzelemente verwenden (Dämpfungselemente, Füllflüssigkeiten).
- Das Messgerät ist vor schädlichen Umwelteinflüssen, Beschädigungen, großen Temperaturschwankungen und, bei Differenzdruckmessgeräten, vor einseitiger Wärmestrahlung zu schützen.
- Differenzdruckmessgeräte müssen frostsicher eingebaut werden.
- Überschreitet die Temperatur des Messstoffes die zulässige Betriebstemperatur, so muss eine ausreichend lange Messleitung, ein Wassersackrohr oder ein Druckmittler mit Kapillarrohr vorgeschaltet werden.
- Beim Montieren ist ein entsprechender Maulschlüssel zu verwenden. Es darf keine Kraft (Moment) auf das Gehäuse ausgeübt werden.

3. Inbetriebnahme
- Ist auf dem Zifferblatt keine Begrenzungsmarke ▼ aufgedruckt, so ist der Verwendungsbereich gleich dem Anzeigebereich. Bei Differenzdruckmessgeräten ist der maximale statische Druck zu berücksichtigen.
- Beim Abdrücken von Rohrleitungen und Kesseln darf das Messgerät nicht höher als die vorgenannten Begrenzungen belastet werden.
- Die Bezugstemperatur beträgt +20 °C (Normaltemperatur bei betrieblicher Eichung). Abweichend von der Bezugstemperatur ergibt sich je ±30 °C Betriebstemperaturzunahme bzw. Abnahme ein zusätzlicher Anzeigefehler von ±1 % bezogen auf den M. E..
- Die Anschlussleitung sollte, in Abhängigkeit von Druck und Länge, einen Innendurchmesser von 4 ... 9 mm haben.
- Nach der Montage eines Differenzdruckmessgerätes sind die Anschlussleitungen auszublasen, bzw. bei flüssigen Medien zu entlüften. Bis zum Einsatz bleibt das Anschlussventil geschlossen und das Ausgleichsventil geöffnet. Einseitige Druckbelastungen sind zu vermeiden.
- Absperrventile immer langsam öffnen.
- Bei Inbetriebnahme von Differenzdruckmessgeräten wie folgt vorgehen:
  1. Ausgleichsventil öffnen 2. Anschlussventil öffnen.
  3. Ausgleichsventil schließen. Der Differenzdruck wird angezeigt.
- Bei Außerbetriebnahme wie folgt vorgehen:
  1. Ausgleichsventil öffnen. 2. Anschlussventil schließen.
- Einsatz in explosionsfähiger Atmosphäre (Modell T5500/T6500):
  Umgebung: -20 … 60 °C
  Messstoff: Die zulässige Messstofftemperatur hängt außer von der Gerätebauart auch von der Zündtemperatur der umgebenden Gas, Dämpfe bzw. Stäube ab (siehe Tabelle 1):
  Achtung: Bei gasförmigen Stoffen kann sich die Temperatur durch Kompressionswärme erhöhen. Auf Grund dessen darf die Frequenz von 0,1 Hz (nicht Pulsation) nicht überschritten werden. Dies trifft nicht bei gefüllten Geräten zu.
  Tabelle 1: Zulässige Messstofftemperaturen

Temperaturklasse	Max. Messstofftemperatur
T6	+55 °C
T5	+70 °C
T4	+100 °C
T3	+100 °C
T2	+100 °C
T1	+100 °C

Bei der Stoßprüfung wurde der Grad der mechanischen Gefahr als niedrig angesehen.

4. Nullpunktprüfung/Funktionstest
- Nach dem Schließen der Absperrventile und erfolgtem Druckausgleich muss der Zeiger im, als Nullpunkt, gekennzeichneten Bereich stehen.
- Bei Differenzdruckmessgeräten steht der Zeiger bei gleichzeitigem Schließen der Ventile innerhalb des Anzeigebereiches. Fällt der Zeiger, ist die Plusleitung undicht oder das Ausgleichsventil nicht geschlossen. Steigt der Zeiger, ist die Minusleitung undicht. Zeigt das Differenzdruckmessgerät nichts an, Minusleitung schließen und Plusleitung öffnen. Bewegt sich der Zeiger nicht, so ist das Gerät defekt.

5. Wartung
- Das Gerät ist wartungsfrei.
- Lassen sich Störungen nicht beheben, wenden Sie sich bitte an unsere Niederlassungen und Vertretungen, die Ihnen mit Beratung und Service zur Verfügung stehen.

6. Nullpunktkorrektur
- Bei Messgeräten mit abnehmbaren Frontring oder externer Verstellmöglichkeit kann der Nullpunkt eingestellt werden.
- Bei Messgeräten mit interner Nullpunktverstellung muss der Bajonett-Ring bzw. der klappbare Ring vorsichtig entfernt werden. Messgeräte mit geschraubtem Ring werden wie in Bild 1 dargestellt geöffnet.
  1. Gerät (3) mit einer Schutzhülse (2) im Schraubstock einspannen.
  2. Schraubring vorsichtig mit einem Hammer und einem großen Schraubendreher (1) gegen den Uhrzeigersinn lösen.
  3. Nach der Nullpunktkorrektur Schraubring von Hand fest andrehen. Bei wetterfester Ausführung eine 1/8 Umdrehung, bei hermetisch dichter und gefüllter Ausführung eine 1/3 Umdrehung nachziehen.
- Differenzdruckmessgeräte haben eine externe Verstellmöglichkeit an der Gehäuseseite.
- Feinmessgeräte mit klappbarem Ring haben eine frontseitige Nullpunktkorrektur (siehe Bild 2).
  1. Feststellschraube A lösen.
  2. Mit der Justierschraube B den Nullpunkt einstellen.
  3. Feststellschraube A in Justierschraube B eindrehen.
- Vor der Nullpunktkorrektur ist ein Druckausgleich erforderlich.

Technische Änderungen vorbehalten !

1. Installation requirements
- The pressure gauges must be selected and installed this wise, that the possibility of failure, resulting in injury or misapplication, is minimized.
- For the maximum ambient temperature see table 2. Other limits are possible at special series.

2. Mounting
- The mounting of measuring instruments shall be in proximity of measuring point, easily accessible and safe from vibrations and always coincide with the position as indicated on the dial. If no such statement is printed on the dial, the gauges must be mounted in a 90° ±5° position with the vertical dial. If the instrument can not protected against shock or vibration, use an additional movement damping feature (liquid filled or pulsation dampener). The measuring instrument must be protect against damages, great pollution, high fluctuation of temperature and one-sided heat radiation for the dp gauge. Please note the freezing point of media and choose a frost-protected place for the dp gauges.
- If the process temperature at the gauge is in excess of the max. allowable operation temperature, than depending of the application a syphon, diaphragm seal or sufficient length of pipe/capillary has to be mounted between the pressure tap and the instrument.
- When installing always use a wrench suitable for the flats on the instrument. Do never apply mechanical torque's to the case.

3. Operation
- The operating range corresponds to the scale range or see static pressure limit mark ▼ printed on the dial. For dp gauges look for the max. allowable static pressure. When carrying out pressure test of process pipes and vessels, the instrument may not exposed to the above limits as mentioned before. The calibration temperature is +20 °C, each ±30 °C deviation of this temperature adds ± one class of full scale value to the accuracy.
  The instruments piping shall be between 4 and 9 mm ID, depending on the pressure and the lengths.
- After installation of the dp gauges the measuring lines must be blowed through. When using liquid media, the measuring lines must be bled.
- Until definitive operation the connection valve remains closed and the compensation valve remains open. Please avoid one-sided charge.
- On start up for pressure gauges open the shut off valve slowly.
- For dp gauges follow the following sequence for:
- Operation: 1. Open balancing valve. 2. Open connection valves.
  3. Close balancing valve.
  Differential pressure is indicated on dial
- Out of operation: 1. Open balancing valve. 2. Close connection valves.
- Service in hazardous area (model T5500/T6500):
  Ambiance: -20 … 60 °C
  Process media: The admissible temperature of the process media depends on the instrument construction as well as the ignition temperature of the surrounding gases, vapors or dusts (see table 1):
  Attention: For gaseous media the temperature can rise as result of compression. Therefore the maximum admissible frequency (not pulsation) is 0,1 Hz. This does not apply to liquid filled gauges.
  Table 1: Maximum admissible process media temperature

Temperature class	Max. process media temperature
T6	+55 °C
T5	+70 °C
T4	+100 °C
T3	+100 °C
T2	+100 °C
T1	+100 °C

During choc tests the degree of mechanical hazard was classified as low.

4. Zero or functional test
- The shut off valve(s) at the pressure tap(s) for the instrument has to be closed and the pressure has to be released to atmosphere. The pointer tip must stay within the zero mark.
- Check for dp gauges: Close both valves at the pressure taps at the same time. The pointer must rest within the scale range. If pointer drops the plus line leaks or the balancing valve is still open. In case of rising pointer the minus line leaks. If the dp gauge shows no indication, close the minus line and open the plus line. In case the pointer doesn't move the instrument is damaged.

5. Maintenance
- The instrument require no special maintenance.
- In case of any default apply for assistance from ourselves or our agents. We will assist you with advice and service.

6. Zero adjustment
For instruments with a removable ring, bezel or external zero adjust feature the zero can be adjusted. For the instruments with internal zero adjustments the bayonet ring or hinged ring bezel must be removed, for gauges with screwed ring see sketch 1 to remove the ring.
  1. Hold gauge in vise with threaded nut. it is important to hold the gauge rigidly otherwise ring lugs may be damaged.
  2. To remove ring-tap counter wise as shown using hammer and large screw driver with flat tip
  3. To install ring tighten snugly by hand. Turn as per sketch 1/8 turn for weatherproof and 1/3 turn for liquid filled and hermetically sealed.
The differential pressure gauges have an external adjustment on the side of the case.
- Testgauges with hinged ring are equipped with a front mounted zero adjustment (see sketch 2).
  1. Loosen ring locking screw A.
  2 Rotated knob B until required adjustment.
  3 Tighten screw A down on knob B.
The pointer can be adjusted to zero after releasing the pressure element against atmosphere.

Modification reserved !

1. Conditions de montage
- Les manomètres doivent être choisis et montés de manière à minimiser les possibilités d'erreurs, résultant d'un mauvais montage d'une mauvaise application.
- Pour la température ambiante maximum, se référer au tableau 2. D'autres limites sont possibles dans des modèles particuliers.

2. Montage
- Le montage de mano's doit être fait à proximité du point de mesure, facilement accessible, exempt de vibrations et toujours coïncider avec la position indiquée sur cadran. En standard, les manomètres doivant être montés à 90° ±5° par rapport au cadran à la verticale. Protéger les mano's contre les chocs ou les vibrations ou utiliser un système d'amortissement supplémentaire (remplissage ou amortisseur). Le mano doit être protégé contre avaries, pollution, hautes fluctuations de température et chaleur d'un côté de l'appareil pour le mano différentiel. Noter la point de gel du fluide et choisir une place protégée du gel pour les mano's différentiels.

14.5 Trasmettitore di pressione

Numero di disegno Voith: 4 190372 024

Tipo: 3051 TG (0-4 bar/ 4-20 mA)

Descrizione. . . . . Rosemount

Rosemount 3051 Pressure Transmitter

THE PROVEN INDUSTRY LEADER IN PRESSURE MEASUREMENT

- *Best-in-Class performance with 0.04% High Accuracy option*
- *Industry first installed five-year stability*
- *Unmatched Dynamic Performance*
- *Coplanar™ platform enables integrated pressure, flow, and level solutions*
- *Advanced PlantWeb® Functionality to increase plant productivity*

Contents

Setting the Standard for Pressure Measurement

Industry's best total performance, a flexible *Coplanar* platform, and installed five-year stability, has made the Rosemount 3051 the standard in pressure measurement.

Industry's best-in-class total performance of ±0.15%
Total performance is the true measure of "real-world" transmitter performance. Using superior sensor technology and engineered for optimal performance, the 3051 delivers unprecedented ±0.04% reference accuracy, resulting in total operating performance of ±0.15%. Superior total performance equates to reduced variability and improved plant safety.

Installed five-year stability of ±0.125%
Transmitter stability is a critical measure of transmitter performance over time. Through aggressive simulation testing beyond standard IEC 770 testing, the 3051 has proven its ability to maintain performance over a five year period under the most demanding process conditions. Superior transmitter stability reduces calibration frequency to save operation and maintenance costs.

Unmatched dynamic performance
In dynamic applications, speed of measurement is as important as repeatability. The 3051 responds up to eight times faster than the typical pressure transmitter to detect and control variations quickly and efficiently. Superior dynamic response yields more accurate measurements to reduce variability and increase profitability.

***Coplanar* platform enables complete point solutions**
The versatile *Coplanar* platform design enables the best process connection for pressure, flow and level applications. Right out of the box, the solution arrives factory calibrated, pressure-tested, and ready to install. Only the 3051 has a flexible design to reduce engineering and inventory costs.

Advanced *PlantWeb* Functionality
The 3051 powers the PlantWeb architecture by delivering the best sensor and transmitter, best installation practices, and best in class field intelligence. One component is the enhanced diagnostic capabilities in *FOUNDATION* fieldbus that provide an increase in process visibility, enabling proactive maintenance, improving process availability and plant productivity.

Rosemount Pressure Solutions

Rosemount 3051S Series of Instrumentation
Scalable pressure, flow and level measurement solutions improve installation and maintenance practices.

Rosemount 3095MV Mass Flow Transmitter
Accurately measures differential pressure, static pressure and process temperature to dynamically calculate fully compensated mass flow.

Rosemount 305 and 306 Integral Manifolds
Factory-assembled, calibrated and seal-tested manifolds reduce on-site installation costs.

Rosemount 1199 Diaphragm Seals
Provides reliable, remote measurements of process pressure and protects the transmitter from hot, corrosive, or viscous fluids.

Orifice Plate Primary Element Systems: Rosemount 1495 and 1595 Orifice Plates, 1496 Flange Unions and 1497 Meter Sections
A comprehensive offering of orifice plates, flange unions and meter sections that is easy to specify and order. The 1595 Conditioning Orifice provides superior performance in tight fit applications.

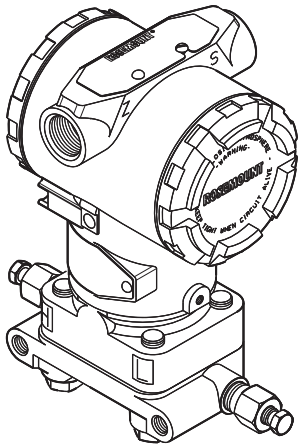
***Annubar*® Flowmeter Series: Rosemount 3051SFA, 3095MFA, and 485**
The state-of-the-art, fifth generation Rosemount 485 *Annubar* combined with the 3051S or 3095MV MultiVariable transmitter creates an accurate, repeatable and dependable insertion-type flowmeter.

Compact Orifice Flowmeter Series: Rosemount 3051SFC, 3095MFC, and 405
Compact Orifice Flowmeters can be installed between existing flanges, up to a Class 600 (PN100) rating. In tight fit applications, a conditioning orifice plate version is available, requiring only two diameters of straight run upstream.

***ProPlate*® Flowmeter Series: Rosemount *ProPlate*, Mass *ProPlate*, and 1195**
These integral orifice flowmeters eliminate the inaccuracies that become more pronounced in small orifice line installations. The completely assembled, ready to install flowmeters reduce cost and simplify installation.

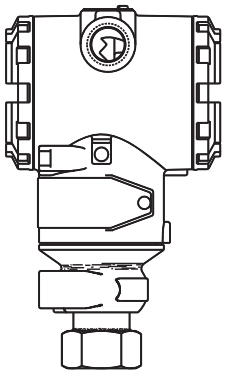
Product Offering

Rosemount 3051C Differential, Gage, and Absolute



See ordering information on page 25.

- Performance up to 0.04% accuracy
- Installed five-year stability of 0.125%
- *Coplanar* platform enables integrated manifold, primary element and diaphragm seal solutions
- Calibrated spans/ranges from 0.1 inH_2O to 4000 psi (0,25 mbar to 276 bar)
- 316L SST, *Hastelloy*® C276, *Monel*®, Tantalum, Gold-plated *Monel*, or Gold-plated 316L SST process isolators



Rosemount 3051T Gage and Absolute

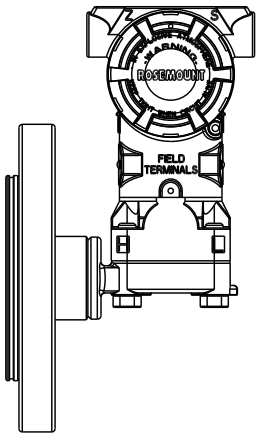
See ordering information on page 29.

- Performance up to 0.04% accuracy
- Installed five-year stability of 0.125%
- Calibrated spans from 0.3 to 10000 psi (10,3 mbar to 689 bar)
- Multiple process connections available
- 316L SST and *Hastelloy* C276 process isolators

Rosemount 3051L Liquid Level

See ordering information on page 31.

- Performance up to 0.075% accuracy
- Welded fill fluid system provides best-in-class system reliability
- Flush and extended diaphragms
- Multiple fill fluids and wetted materials available



Specifications

PERFORMANCE SPECIFICATIONS

Total Performance is based on combined errors of reference accuracy, ambient temperature effect, and static pressure effect.
This product data sheet covers both HART and fieldbus protocols unless specified.

Conformance To Specification (±3σ (Sigma))

Technology leadership, advanced manufacturing techniques and statistical process control ensure specification conformance to at least ±3σ.

Reference Accuracy(1)

Models		Standard	High Accuracy Option
3051CD, 3051CG			
	Range 0 (CD)	±0.10% of span For spans less than 2:1, accuracy = ±0.05% of URL	
	Range 1	±0.10% of span For spans less than 15:1, accuracy = $\pm\left[0.025 + 0.005\left(\frac{URL}{Span}\right)\right]$% of Span	
	Ranges 2-5	±0.065% of span For spans less than 10:1, accuracy = $\pm\left[0.015 + 0.005\left(\frac{URL}{Span}\right)\right]$% of Span	Ranges 2-4 High Accuracy Option, P8 ±0.04% of span For spans less than 5:1, accuracy = $\pm\left[0.015 + 0.005\left(\frac{URL}{Span}\right)\right]$% of Span
3051T			
	Ranges 1-4	±0.065% of span For spans less than 10:1, accuracy = $\pm\left[0.0075\left(\frac{URL}{Span}\right)\right]$% of Span	Ranges 2-4 High Accuracy Option, P8 ±0.04% of span For spans less than 5:1, accuracy = $\pm\left[0.0075\left(\frac{URL}{Span}\right)\right]$% of Span
	Range 5	±0.075% of span For spans less than 10:1, accuracy = $\pm\left[0.0075\left(\frac{URL}{Span}\right)\right]$% of Span	
3051CA			
	Ranges 1-4	±0.065% of span For spans less than 10:1, accuracy = $\pm\left[0.0075\left(\frac{URL}{Span}\right)\right]$% of Span	Ranges 2-4 High Accuracy Option, P8 ±0.04% of span For spans less than 5:1, accuracy = $\pm\left[0.0075\left(\frac{URL}{Span}\right)\right]$% of Span
3051H/3051L			
	All Ranges	±0.075% of span For spans less than 10:1, accuracy = $\pm\left[0.025 + 0.005\left(\frac{URL}{Span}\right)\right]$% of Span	

(1) For FOUNDATION fieldbus transmitters, use calibrated range in place of span. For zero based spans, reference conditions, silicone oil fill, SST materials, Coplanar flange (3051C) or 1/2 in. - 18 NPT (3051T) process connections, digital trim values set to equal range points.

Total Performance

For ±50 °F (28 °C) temperature changes, up to 1000 psi (6,9 MPa) line pressure (CD only), from 1:1 to 5:1 rangedown.

Models		Total Performance
3051C		
	Ranges 2-5	±0.15% of span
3051T		
	Ranges 1-4	±0.15% of span

Long Term Stability

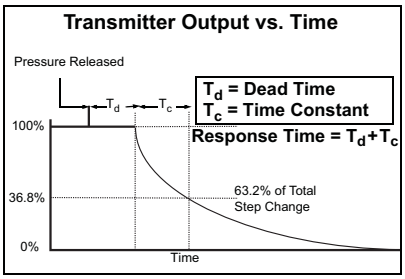
Models		Long Term Stability
3051C		
	Ranges 2-5	±0.125% of URL for 5 years ±50 °F (28 °C) temperature changes, and up to 1000 psi (6,9 MPa) line pressure.
3051CD Low/Draft Range		
	Ranges 0-1	±0.2% of URL for 1 year
3051T		
	Ranges 1-4	±0.125% of URL for 5 years ±50 °F (28 °C) temperature changes, and up to 1000 psi (6,9 MPa) line pressure.
Rosemount 3051H		
	Ranges 2-3	±0.1% of URL for 1 year
	Ranges 4-5	±0.2% of URL for 1 year

Dynamic Performance

		4 - 20 mA (*HART* protocol)(1)	Fieldbus protocol(3)
Total Response Time (T_d + T_c)(2):			
	3051C, Ranges 2-5:	100 ms	152 ms
	Range 1:	255 ms	307 ms
	Range 0:	700 ms	752 ms
	3051T:	100 ms	152 ms
	3051H/L:	Consult factory	Consult factory
Dead Time (Td)		45 ms (nominal)	97 ms
Update Rate		22 times per second	22 times per second

(1) Dead time and update rate apply to all models and ranges; analog output only
(2) Nominal total response time at 75 °F (24 °C) reference conditions.
(3) Transmitter fieldbus output only, segment macro-cycle not included.

Typical HART Transmitter Response Time



Line Pressure Effect per 1000 psi (6,9 MPa)

For line pressures above 2000 psi (13,7 MPa) and Ranges 4-5, see user manual (Rosemount publication number 00809-0100-4001).

Models		Line Pressure Effect
3051CD		Zero Error(1)
	Range 0	±0.125% of URL/100 psi (6,89 bar)
	Range 1	±0.25% of URL/1000 psi (68,9 bar)
	Ranges 2-3	±0.05% of URL/1000 psi (68,9 bar) for line pressures from 0 to 2000 psi (0 to 13,7 MPa)
		Span Error
	Range 0	±0.15% of reading/100 psi (6,89 bar)
	Range 1	±0.4% of reading/1000 psi (68,9 bar)
	Ranges 2-3	±0.1% of reading/1000 psi (68,9 bar)
3051HD		Zero Error(1)
	All Ranges	±0.1% of URL/1000 psi (68,9 bar) for line pressures from 0 to 2000 psi (0 to 13,7 MPa)
		Span Error
	All Ranges	±0.1% of reading/1000 psi (68,9 bar)

(1) Can be calibrated out at line pressure.

Ambient Temperature Effect per 50°F (28°C)

Models		Ambient Temperature Effect
3051CD/CG		
	Range 0	±(0.25% URL + 0.05% span)
	Range 1	±(0.1% URL + 0.25% span)
	Ranges 2-5	±(0.0125% URL + 0.0625% span) from 1:1 to 5:1 ±(0.025% URL + 0.125% span) from 5:1 to 100:1
3051T		
	Range 1	±(0.025% URL + 0.125% span) from 1:1 to 10:1 ±(0.05% URL + 0.125% span) from 10:1 to 100:1
	Range 2-4	±(0.025% URL + 0.125% span) from 1:1 to 30:1 ±(0.035% URL + 0.125% span) from 30:1 to 100:1
	Range 5	±(0.1% URL + 0.15% span)
3051CA		
	All Ranges	±(0.025% URL + 0.125% span) from 1:1 to 30:1 ±(0.035% URL + 0.125% span) from 30:1 to 100:1
3051H		
	All Ranges	±(0.025% URL + 0.125% span + 0.35 inH_2O) from 1:1 to 30:1 ±(0.035% URL + 0.125% span + 0.35 inH_2O) from 1:1 to 30:1
3051L		See Rosemount Inc. Instrument Toolkit® software.

Mounting Position Effects

Models	Mounting Position Effects
3051C	Zero shifts up to ±1.25 inH_2O (3,11 mbar), which can be calibrated out. No span effect.
3051H	Zero shifts up to ±5 inH_2O (12,43 mbar), which can be calibrated out. No span effect.
3051L	With liquid level diaphragm in vertical plane, zero shift of up to 1 inH_2O (2,49 mbar). With diaphragm in horizontal plane, zero shift of up to 5 inH_2O (12,43 mbar) plus extension length on extended units. All zero shifts can be calibrated out. No span effect.
3051T/CA	Zero shifts up to 2.5 inH_2O (6,22 mbar), which can be calibrated out. No span effect.

Vibration Effect

All Models

Measurement effect due to vibrations is negligible except at resonance frequencies. When at resonance frequencies, vibration effect is less than ±0.1% of URL per g when tested between 15 and 2000 Hz in any axis relative to pipe-mounted process conditions.

Power Supply Effect

All Models

Less than ±0.005% of calibrated span per volt.

RFI Effects

All Models

±0.1% of span from 20 to 1000 MHz and for field strength up to 30 V/m.

Transient Protection (Option Code T1)

All Models:

Meets IEEE C62.41, Category B

- 6 kV crest (0.5 µs - 100 kHz)
- 3 kV crest (8 × 20 microseconds)
- 6 kV crest (1.2 × 50 microseconds)

Meets IEEE C37.90.1, Surge Withstand Capability

- SWC 2.5 kV crest, 1.25 MHz wave form

General Specifications:

- Response Time: < 1 nanosecond
- Peak Surge Current: 5000 amps to housing
- Peak Transient Voltage: 100 V dc
- Loop Impedance: < 25 ohms
- Applicable Standards: IEC61000-4-4, IEC61000-4-5

NOTE:
Calibrations at 68 °F (20 °C) per ASME Z210.1 (ANSI)

FUNCTIONAL SPECIFICATIONS

Range and Sensor Limits

TABLE 1. 3051CD, 3051CG, 3051L, and 3051H Range and Sensor Limits

Range	Minimum Span	Range and Sensor Limits						
			Lower (LRL)					
	3051CD(1), CG, L, H	Upper (URL)	3051C Differential	3051C/ Gage	3051L Differential	3051L Gage	3051H Differential	3051H Gage
0	0.1 inH_2O (0,25 mbar)	3.0 inH_2O (7,47 mbar)	–3.0 inH_2O (-7,47 mbar)	NA	NA	NA	NA	NA
1	0.5 inH_2O (1,2 mbar)	25 inH_2O (62,3 mbar)	–25 inH_2O (–62,1 mbar)	–25 inH_2O (–62,1 mbar)	NA	NA	NA	NA
2	2.5 inH_2O (6,2 mbar)	250 inH_2O (0,62 bar)	–250 inH_2O (–0,62 bar)	–250 inH_2O (–0,62 bar)	–250 inH_2O (–0,62 bar)	–250 inH_2O (–0,62 bar)	–250 inH_2O (–0,62 bar)	–250 inH_2O (–0,62 bar)
3	10 inH_2O (24,9 mbar)	1000 inH_2O (2,49 bar)	–1000 inH_2O (–2,49 bar)	0.5 psia (34,5 mbar abs)	–1000 inH_2O (–2,49 bar)	0.5 psia (34,5 mbar abs)	–1000 inH_2O (–2,49 bar)	0.5 psia (34,5 mbar abs)
4	3 psi (0,20 bar)	300 psi (20,6 bar)	–300 psi (–20,6 bar)	0.5 psia (34,5 mbar abs)	–300 psi (–20,6 bar)	0.5 psia (34,5 mbar abs)	–300 psi (–20,6 bar)	0.5 psia (34,5 mbar abs)
5	20 psi (1,38 bar)	2000 psi (137,9 bar)	– 2000 psi (–137,9 bar)	0.5 psia (34,5 mbar abs)	NA	NA	– 2000 psi (–137,9 bar)	0.5 psia (34,5 mbar abs)

(1) Range 0 only available with 3051CD. Range 1 only available with 3051CD or 3051CG.

TABLE 2. Range and Sensor Limits

3051CA			
Range	Minimum Span	Range and Sensor Limits	
		Upper (URL)	Lower (LRL)
1	0.3 psia (20,6 mbar)	30 psia (2,07 bar)	0 psia (0 bar)
2	1.5 psia (0,103 bar)	150 psia (10,3 bar)	0 psia (0 bar)
3	8 psia (0,55 bar)	800 psia (55,2 bar)	0 psia (0 bar)
4	40 psia (2,76 bar)	4000 psia (275,8 bar)	0 psia (0 bar)

3051T				
Range	Minimum Span	Range and Sensor Limits		
		Upper (URL)	Lower (LRL)	Lower(1) (LRL) (Gage)
1	0.3 psi (20,6 mbar)	30 psi (2,07 bar)	0 psia (0 bar)	–14.7 psig (–1,01 bar)
2	1.5 psi (0,103 bar)	150 psi (10,3 bar)	0 psia (0 bar)	–14.7 psig (–1,01 bar)
3	8 psi (0,55 bar)	800 psi (55,2 bar)	0 psia (0 bar)	–14.7 psig (–1,01 bar)
4	40 psi (2,76 bar)	4000 psi (275,8 bar)	0 psia (0 bar)	–14.7 psig (–1,01 bar)
5	2000 psi (137,9 bar)	10000 psi (689,4 bar)	0 psia (0 bar)	–14.7 psig (–1,01 bar)

(1) Assumes atmospheric pressure of 14.7 psig.

Zero and Span Adjustment Requirements (*HART* and Low Power)

Zero and span values can be set anywhere within the range limits stated in Table 1 and Table 2.

Span must be greater than or equal to the minimum span stated in Table 1 and Table 2.

Service

Liquid, gas, and vapor applications

4–20 mA (Output Code A)

Output

Two-wire 4–20 mA, user-selectable for linear or square root output. Digital process variable superimposed on 4–20 mA signal, available to any host that conforms to the *HART* protocol.

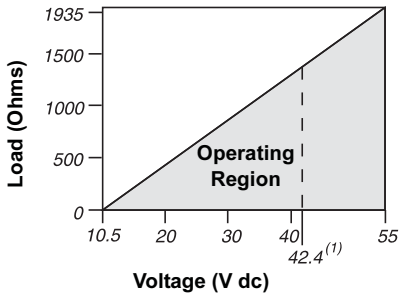
Power Supply

External power supply required. Standard transmitter (4–20 mA) operates on 10.5 to 55 V dc with no load.

Load Limitations

Maximum loop resistance is determined by the voltage level of the external power supply, as described by:

Max. Loop Resistance = 43.5 (Power Supply Voltage – 10.5)



Communication requires a minimum loop resistance of 250 ohms.

(1) For CSA approval, power supply must not exceed 42.4 V.

FOUNDATION fieldbus (output code F) and Profibus (output code W)

Power Supply

External power supply required; transmitters operate on 9.0 to 32.0 V dc transmitter terminal voltage.

Current Draw

17.5 mA for all configurations (including LCD display option)

FOUNDATION fieldbus Function Block Execution Times

Block	Execution Time
Resource	-
Transducer	-
LCD Block	-
Analog Input 1, 2	30 milliseconds
PID	45 milliseconds
Input Selector	30 milliseconds
Arithmetic	35 milliseconds
Signal Characterizer	40 milliseconds
Integrator	35 milliseconds

FOUNDATION fieldbus Parameters

Schedule Entries	7 (max.)
Links	20 (max.)
Virtual Communications Relationships (VCR)	12 (max.)

Standard Function Blocks

Resource Block

Contains hardware, electronics, and diagnostic information.

Transducer Block

Contains actual sensor measurement data including the sensor diagnostics and the ability to trim the pressure sensor or recall factory defaults.

LCD Block

Configures the local display.

2 Analog Input Blocks

Processes the measurements for input into other function blocks. The output value is in engineering units or custom and contains a status indicating measurement quality.

PID Block

Contains all logic to perform PID control in the field including cascade and feedforward.

Backup Link Active Scheduler (LAS)

The transmitter can function as a Link Active Scheduler if the current link master device fails or is removed from the segment.

Advanced Control Function Block Suite (Option Code A01)

Input Selector Block

Selects between inputs and generates an output using specific selection strategies such as minimum, maximum, midpoint, average or first “good.”

Arithmetic Block

Provides pre-defined application-based equations including flow with partial density compensation, electronic remote seals, hydrostatic tank gauging, ratio control and others.

Signal Characterizer Block

Characterizes or approximates any function that defines an input/output relationship by configuring up to twenty X, Y coordinates. The block interpolates an output value for a given input value using the curve defined by the configured coordinates.

Integrator Block

Compares the integrated or accumulated value from one or two variables to pre-trip and trip limits and generates discrete output signals when the limits are reached. This block is useful for calculating total flow, total mass, or volume over time.

FOUNDATION fieldbus Diagnostics Suite (Option Code D01)

The 3051C *FOUNDATION* fieldbus Diagnostics provide Abnormal Situation Prevention (ASP) indictation. The integral statistical process monitoring (SPM) technology calculates the mean and standard deviation of the process variable 22 times per second. The 3051C ASP algorithm uses these values and highly flexible configuration options for customization to many user-defined or application specific abnormal situations. The detection of plugged impulse lines is the first available predefined application.

Low Power (Output Code M)

Output

Three wire 1–5 V dc or 0.8–3.2 V dc (Option Code C2) user-selectable output. Also user selectable for linear or square root output configuration. Digital process variable superimposed on voltage signal, available to any host conforming to the *HART* protocol. Low-power transmitter operates on 6–12 V dc with no load.

Power Consumption

3.0 mA, 18–36 mW

Minimum Load Impedance

100 kΩ (V_{out} wiring)

Indication

Optional 5-digit LCD display

Overpressure Limits

Rosemount 3051CD/CG

- Range 0: 750 psi (51,7 bar)
- Range 1: 2000 psig (137,9 bar)
- Ranges 2–5: 3626 psig (250 bar)
  4500 psig (310,3 bar) for option code P9

Rosemount 3051CA

- Range 1: 750 psia (51,7 bar)
- Range 2: 1500 psia (103,4 bar)
- Range 3: 1600 psia (110,3 bar)
- Range 4: 6000 psia (413,7 bar)

Rosemount 3051H

- All Ranges: 3626 psig (25 MPa)

Rosemount 3051TG/TA

- Range 1: 750 psi (51,7 bar)
- Range 2: 1500 psi (103,4 bar)
- Range 3: 1600 psi (110,3 bar)
- Range 4: 6000 psi (413,7 bar)
- Range 5: 15000 psi (1034,2 bar)

For 3051L or Level Flange Option Codes FA, FB, FC, FD, FP, and FQ, limit is 0 psia to the flange rating or sensor rating, whichever is lower.

TABLE 3. 3051L and Level Flange Rating Limits

Standard	Type	CS Rating	SST Rating
ANSI/ASME	Class 150	285 psig	275 psig
ANSI/ASME	Class 300	740 psig	720 psig
ANSI/ASME	Class 600	1480 psig	1440 psig
At 100 °F (38 °C), the rating decreases with increasing temperature.			
DIN	PN 10–40	40 bar	40 bar
DIN	PN 10/16	16 bar	16 bar
DIN	PN 25/40	40 bar	40 bar
At 248 °F (120 °C), the rating decreases with increasing temperature.			

Static Pressure Limit

Rosemount 3051CD Only

Operates within specifications between static line pressures of 0.5 psia and 3626 psig (4500 psig (310, 3 bar) for Option Code P9).

Range 0: 0.5 psia and 750 psig (3, 4 bar and 51, 7 bar)

Range 1: 0.5 psia and 2000 psig (3, 4 bar and 137, 9 bar)

Burst Pressure Limits

Burst pressure on *Coplanar*, traditional, or 3051H process flange is 10000 psig (69 MPa).

Burst pressure for the 3051T is

Ranges 1–4: 11000 psi (75,8 MPa)

Range 5: 26000 psig (179 MPa)

Failure Mode Alarm

Output Code A

If self-diagnostics detect a gross transmitter failure, the analog signal will be driven either below 3.75 mA or to 21.75 mA to alert the user. NAMUR-compliant values are available, option code C4. High or low alarm signal is user-selectable by internal jumper.

Output Code M

If self-diagnostics detect a gross transmitter failure, the analog signal will be driven either below 0.94 V or above 5.4 V to alert the user (below 0.75 V or above 4.4 V for Option C2). High or low alarm signal is user-selectable by internal jumper.

Output Code F and W

If self-diagnostics detect a gross transmitter failure, that information gets passed as a status along with the process variable.

Temperature Limits

Ambient

–40 to 185 °F (–40 to 85 °C)

With LCD display[1]: –4 to 175 °F (–20 to 80 °C)

Storage

–50 to 230 °F (–46 to 110 °C)

With LCD display: –40 to 185 °F (–40 to 85 °C)

Process

At atmospheric pressures and above. See Table 4

(1) LCD display may not be readable and LCD updates will be slower at temperatures below -4 °F (-20 °C).

TABLE 4. 3051 Process Temperature Limits

3051CD, 3051CG, 3051CA	
Silicone Fill Sensor(1)	
with *Coplanar* Flange	–40 to 250 °F (–40 to 121 °C)(2)
with Traditional Flange	–40 to 300 °F (–40 to 149 °C)(2)(3)
with Level Flange	–40 to 300 °F (–40 to 149 °C)(2)
with 305 Integral Manifold	–40 to 300 °F (–40 to 149 °C)(2)
Inert Fill Sensor(1)	0 to 185 °F (–18 to 85 °C)(4)(5)
3051H (Process Fill Fluid)	
D.C.® Silicone 200(1)	–40 to 375 °F (–40 to 191 °C)
Inert(1)	–50 to 350 °F (–45 to 177 °C)
Neobee M-20®(1)	0 to 375 °F (–18 to 191 °C)
3051T (Process Fill Fluid)	
Silicone Fill Sensor(1)	–40 to 250 °F (–40 to 121 °C)(2)
Inert Fill Sensor(1)	–22 to 250 °F (–30 to 121 °C)(2)
3051L Low-Side Temperature Limits	
Silicone Fill Sensor(1)	–40 to 250 °F (–40 to 121 °C)(2)
Inert Fill Sensor(1)	0 to 185 °F (–18 to 85 °C)(2)
3051L High-Side Temperature Limits (Process Fill Fluid)	
Syltherm® XLT	–100 to 300 °F (–73 to 149 °C)
D.C. Silicone 704®	32 to 400 °F (0 to 205 °C)
D.C. Silicone 200	–40 to 400 °F (–40 to 205 °C)
Inert	–50 to 350 °F (–45 to 177 °C)
Glycerin and Water	0 to 200 °F (–18 to 93 °C)
Neobee M-20	0 to 400 °F (–18 to 205 °C)
Propylene Glycol and Water	0 to 200 °F (–18 to 93 °C)

(1) Process temperatures above 185 °F (85 °C) require derating the ambient limits by a 1.5:1 ratio (0.6:1 ratio for the 3051H).

(2) 220 °F (104 °C) limit in vacuum service; 130 °F (54 °C) for pressures below 0.5 psia.

(3) 3051CD0 process temperature limits are –40 to 212 °F (–45 to 100 °C)

(4) 160 °F (71 °C) limit in vacuum service.

(5) Not available for 3051CA.

Humidity Limits

0–100% relative humidity

Turn-On Time

Performance within specifications less than 2.0 seconds (10.0 s for Profibus protocol) after power is applied to the transmitter

Volumetric Displacement

Less than 0.005 in^3 (0,08 cm^3)

Damping

Analog output response to a step input change is user-selectable from 0 to 36 seconds for one time constant. This software damping is in addition to sensor module response time.

PHYSICAL SPECIFICATIONS

Electrical Connections

$^1/_2$–14 NPT, PG 13.5, G$^1/_2$, and M20 × 1.5 (CM20) conduit. *HART* interface connections fixed to terminal block.

Process Connections

All Models except 3051L and 3051T

$^1/_4$–18 NPT on 2$^1/_8$-in. centers

$^1/_2$–14 NPT on 2-, 2$^1/_8$-, or 2$^1/_4$-in. centers

Rosemount 3051L

High pressure side: 2-, 3-, or 4-in., ASME B 16.5 (ANSI) Class 150, 300 or 600 flange; 50, 80 or 100 mm, PN 40 or 10/16 flange

Low pressure side: $^1/_4$–18 NPT on flange $^1/_2$–14 NPT on adapter

Rosemount 3051T

$^1/_2$–14 NPT female. A DIN 16288 Male (available in SST for Range 1–4 transmitters only), or Autoclave type F-250-C (Pressure relieved $^9/_{16}$–18 gland thread; $^1/_4$ OD high pressure tube 60° cone; available in SST for Range 5 transmitters only).

Process-Wetted Parts

Drain/Vent Valves

316 SST, *Hastelloy* C276, or *Monel* material (*Monel* not available with 3051L or 3051H)

Process Flanges and Adapters

Plated carbon steel, SST cast CF-8M (cast version of 316 SST, material per ASTM-A743), C-Type cast alloy CW12MW, or *Monel* cast alloy M30C

Wetted O-rings

Glass-filled PTFE or Graphite-filled PTFE

Process Isolating Diaphragms

Isolating Diaphragm Material	3051CD/CG	3051T	3051CA	3051H
316L SST	•	•	•	•
Hastelloy C276	•	•	•	•
Monel	•		•	
Tantalum	•			•
Gold-plated *Monel*	•		•	
Gold-plated SST	•		•	

Rosemount 3051L Process Wetted Parts

Flanged Process Connection (Transmitter High Side)

Process Diaphragms, Including Process Gasket Surface

- 316L SST, *Hastelloy* C276, or Tantalum

Extension

- CF-3M (Cast version of 316L SST, material per ASTM-A743), or *Hastelloy* C276. Fits schedule 40 and 80 pipe.

Mounting Flange

- Zinc-cobalt plated CS or SST

Reference Process Connection (Transmitter Low Side)

Isolating Diaphragms

- 316L SST or *Hastelloy* C276

Reference Flange and Adapter

- CF-8M (Cast version of 316 SST, material per ASTM-A743)

Non-Wetted Parts

Electronics Housing

Low-copper aluminum or CF-3M (Cast version of 316L SST, material per ASTM-A743). NEMA 4X, IP 65, IP 66

Coplanar Sensor Module Housing

CF-3M (Cast version of 316L SST, material per ASTM-A743)

Bolts

ASTM A449, Type 1 (zinc-cobalt plated carbon steel)
ASTM F593G, Condition CW1 (Austenitic 316 SST)
ASTM A193, Grade B7M (zinc plated alloy steel)
Monel K-500

Sensor Module Fill Fluid

Silicone oil (D.C. 200) or Fluorocarbon oil (Halocarbon or Fluorinert® FC-43 for 3051T)

Process Fill Fluid (3051L and 3051H only)

3051L: Syltherm XLT, D.C. Silicone 704, D.C. Silicone 200, inert, glycerin and water, Neobee M-20 or propylene glycol and water

3051H: inert, Neobee M-20, or D.C. Silicone 200

Paint

Polyurethane

Cover O-rings

Buna-N

Shipping Weights

Refer to “Shipping Weights” on page 38

Product Certifications

Approved Manufacturing Locations

Rosemount Inc. — Chanhassen, Minnesota USA
Emerson Process Management GmbH & Co. — Wessling, Germany
Emerson Process Management Asia Pacific Private Limited — Singapore
Beijing Rosemount Far East Instrument Co., LTD — Beijing, China

European Directive Information

The EC declaration of conformity for all applicable European directives for this product can be found on the Rosemount website at www.rosemount.com. A hard copy may be obtained by contacting an Emerson Process Management representative.

ATEX Directive (94/9/EC)
All 3051 transmitters comply with the ATEX Directive.

European Pressure Equipment Directive (PED) (97/23/EC)
3051CA4; 3051CG2, 3, 4, 5; 3051CD2, 3, 4, 5 *(also with P9 option)*; 3051HD2, 3, 4, 5; 3051HG2, 3, 4, 5; 3051PD2, 3; and 3051PG2, 3, 4, 5 Pressure Transmitters
— QS Certificate of Assessment - EC No. PED-H-100 Module H Conformity Assessment

All other 3051/3001 Pressure Transmitters
— Sound Engineering Practice

Transmitter Attachments: Diaphragm Seal - Process Flange - Manifold
— Sound Engineering Practice

Electro Magnetic Compatibility (EMC) (2004/108/EC)
All 3051 Pressure Transmitters meet all of the requirements of EN61326: 1997 - A1, A2, and A3 and NAMUR NE-21

Ordinary Location Certification for Factory Mutual
As standard, the transmitter has been examined and tested to determine that the design meets basic electrical, mechanical, and fire protection requirements by FM, a nationally recognized testing laboratory (NRTL) as accredited by the Federal Occupational Safety and Health Administration (OSHA).

HART PROTOCOL

Hazardous Locations Certifications

North American Certifications

FM Approvals

E5 Explosion-Proof for Class I, Division 1, Groups B, C, and D. Dust-Ignition-Proof for Class II, Division 1, Groups E, F, and G. Dust-Ignition-Proof for Class III, Division 1.
Factory Sealed, Enclosure Type 4X

I5 Intrinsically Safe for use in Class I, Division 1, Groups A, B, C, and D; Class II, Division 1, Groups E, F, and G; Class III, Division 1 when connected per Rosemount drawing 03031-1019; Non-incendive for Class I, Division 2, Groups A, B, C, and D.
Temperature Code:T4 (Ta = 40 °C), T3 (Ta = 85 °C), Enclosure Type 4X
For input parameters see control drawing 03031-1019.

Canadian Standards Association (CSA)

E6 Explosion-Proof for Class I, Division 1, Groups B, C, and D. Dust-Ignition-Proof for Class II and Class III, Division 1, Groups E, F, and G. Suitable for Class I, Division 2 Groups A, B, C, and D for indoor and outdoor hazardous locations. Enclosure type 4X, factory sealed

C6 Explosion-Proof and intrinsically safe approval. Intrinsically safe for Class I, Division 1, Groups A, B, C, and D when connected in accordance with Rosemount drawings 03031-1024. Temperature Code T3C.
Explosion-Proof for Class I, Division 1, Groups B, C, and D. Dust-Ignition-Proof for Class II and Class III, Division 1, Groups E, F, and G. Suitable for Class I, Division 2 Groups A, B, C, and D hazardous locations. Enclosure type 4X, factory sealed
For input parameters see control drawing 03031-1024.

European Certifications

I1 ATEX Intrinsic Safety and Dust
Certification No.: BAS 97ATEX1089X Ⓔx II 1 GD
EEx ia IIC T4 (–60 ≤ T_a ≤ +70 °C)
Dust Rating: T80 °C (–20 ≤ T_a ≤ 40 °C) IP66
CE 1180

TABLE 5. Input Parameters

U_i = 30V
I_i = 200 mA
P_i = 0.9W
C_i = 0.012 µF

Special Conditions for Safe Use (X):
When the optional transient protection terminal block is installed, the apparatus is not capable of withstanding the 500V insulation test required by Clause 6.4.12 of EN50020:1994. This must be taken into account when installing the apparatus.

N1 ATEX Type n and Dust
Certification No.: BAS 00ATEX3105X Ⓔx II 3 GD
U_i = 55 Vdc max
EEx nL T5 (–40°C ≤ T_{amb} ≤ 70 °C)
Dust rating: T80 °C (–20 ≤ T_a ≤ 40 °C) IP66
CE

Special Conditions for Safe Use (X):
When the optional transient protection terminal block is installed, the apparatus is not capable of withstanding a 500V r.m.s. test to case. This must be taken into account on any installation in which it is used, for example by assuring that the supply to the apparatus is galvanically isolated.

E8 ATEX Flame-Proof and Dust
Certification No.: KEMA 00ATEX2013X Ⓔx II 1/2 GD
EEx d IIC T6 (–50 ≤ T_a ≤ 65 °C)
Dust rating T90 °C, IP66
CE 1180
Vmax = 55 V dc

Special Conditions for Safe Use (X):
This device contains a thin wall diaphragm. Installation, maintenance, and use shall take into account the environmental conditions to which the diaphragm will be subjected. The manufacturer's instructions for installation and maintenance shall be followed in detail to assure safety during its expected lifetime.

Japanese Certifications

E4 TIIS Flame-Proof
Ex d IIC T6

Certificate	Description
C15850	3051C/D/1 4–20 mA *HART* — no display
C15851	3051C/D/1 4–20 mA *HART* — with display
C15854	3051T/G/1 4–20 mA *HART*, SST, Silicon — no display
C15855	3051T/G/1 4–20 mA *HART*, *Hastelloy* C276, Silicon — no display
C15856	3051T/G/1 4–20 mA *HART*, SST, Silicon — with display
C15857	3051T/G/1 4–20 mA *HART*, *Hastelloy* C276, Silicon — with display

I4 TIIS Intrinsic Safety
Ex ia IIC T4

Certificate	Description
C16406	3051CD/CG

Australian Certifications

I7 SAA Intrinsic Safety
Certification No.: AUS Ex 1249X
Ex ia IIC T4 (T_{amb} = 70 °C)
IP66
When connected per Rosemount drawing 03031-1026

TABLE 6. Input Parameters

U_i = 30V
I_i = 200 mA
I_i = 160 mA (output code A with T1)
P_i = 0.9W
C_i = 0.01 µF
C_i = 0.042 µF (output code M)
L_i = 10 µH
L_i = 1.05 mH (output code A with T1)
L_i = 0.75 mH (output code M with T1)

Special Conditions for Safe Use (X):
The apparatus may only be used with a passive current limited power source Intrinsic Safety application. The power source must be such that Po ≤ (Uo * Io) / 4. Modules using transient protection in the terminal assembly (T1 transient protection models) the apparatus enclosure is to be electrically bonded to the protective earth. The conductor used for the connection shall be equivalent to a copper conductor of 4 mm^2 minimum cross-sectional area.

E7 SAA Explosion-Proof (Flame-Proof)
Certification No.: AUS Ex 03.1347X
Ex d IIC T6 (T_{amb} = 40 °C)
DIP A21 T6 (T_{amb} = 40 °C)
IP66

Special Conditions for Safe Use (X):
It is a condition of safe use for transmitter enclosures having cable entry thread other than metric conduit thread that the equipment be utilized with an appropriate certified thread adaptor.

N7 SAA Type n (Non-sparking)
Certification No.: AUS Ex 1249X
Ex n IIC T4 (T_{amb} = 70 °C)
IP66

Special Conditions for Safe Use (X):
Where the equipment is installed such that there is an unused conduit entry, it must be sealed with a suitable blanking plug to maintain the IP66 degree of protection. Any blanking plug used with the equipment shall be of a type which requires the use of a tool to effect its removal. Voltage source shall not exceed 55V dc.

Combinations of Certifications

Stainless steel certification tag is provided when optional approval is specified. Once a device labeled with multiple approval types is installed, it should not be reinstalled using any other approval types. Permanently mark the approval label to distinguish it from unused approval types.

K5 **E5** and **I5** combination
KB **K5** and **C6** combination
KD **K5**, **C6**, **I1**, and **E8** combination
K6 **C6**, **I1**, and **E8** combination
K8 **E8** and **I1** combination
K7 **E7**, **I7**, and **N7** combination

FIELDBUS PROTOCOL

Hazardous Locations Certifications

North American Certifications

FM Approvals

E5 Explosion-Proof for Class I, Division 1, Groups B, C, and D. Dust-Ignition-Proof for Class II, Division 1, Groups E, F, and G. Dust-Ignition-Proof for Class III, Division 1.

I5 Intrinsically Safe for use in Class I, Division 1, Groups A, B, C, and D; Class II, Division 1, Groups E, F, and G; Class III, Division 1 when connected per Rosemount drawing 03031-1019; Non-incendive for Class I, Division 2, Groups A, B, C, and D.

Temperature Code:T4 (Ta = 60 °C), T3 (Ta = 85 °C), Enclosure Type 4X
For input parameters see control drawing 03031-1019.

Canadian Standards Association (CSA)

E6 Explosion-Proof for Class I, Division 1, Groups B, C, and D. Dust-Ignition-Proof for Class II and Class III, Division 1, Groups E, F, and G. Suitable for Class I, Division 2 Groups A, B, C, and D for indoor and outdoor hazardous locations. Enclosure type 4X, factory sealed

C6 Explosion-Proof and intrinsically safe approval. Intrinsically safe for Class I, Division 1, Groups A, B, C, and D when connected in accordance with Rosemount drawings 03031-1024. Temperature Code T3C.
Explosion-Proof for Class I, Division 1, Groups B, C, and D. Dust-Ignition-Proof for Class II and Class III, Division 1, Groups E, F, and G. Suitable for Class I, Division 2 Groups A, B, C, and D hazardous locations. Enclosure type 4X, factory sealed
For input parameters see control drawing 03031-1024.

European Certifications

I1 ATEX Intrinsic Safety and Dust
Certification No.: BAS 98ATEX1355X Ⓔx II 1 GD
EEx ia IIC T4 (T_{amb} = –60 to +60 °C)
Dust Rating: T70 °C (T_{amb} –20 to 40 °C) IP66
CE 1180

TABLE 7. Input Parameters

U_i = 30V
I_i = 300 mA
P_i = 1.3 W
C_i = 0 µF

Special Conditions for Safe Use (X):
The device is not capable of withstanding the 500V insulation test required by Clause 6.4.12 of EN50020:1994. This must be taken into account when installing the apparatus.

IA ATEX FISCO Intrinsic Safety
Certification No.: BAS 98ATEX1355X Ⓔx II 1 G
EEx ia IIC T4 (T_{amb} = –60 to +60 °C)
IP66
CE 1180

TABLE 8. Input Parameters

U_i = 17.5 V
I_i = 380 mA
P_i = 5.32 W
C_i = ≤ 5 µF
L_i = ≤ 10 µH

Special Conditions for Safe Use (X):
The device is not capable of withstanding the 500V insulation test required by Clause 6.4.12 of EN50020:1994. This must be taken into account when installing the apparatus.

N1 ATEX Type n and Dust
Certification No.: BAS 98ATEX3356X Ⓔx II 3 GD
U_i = 40 Vdc max
EEx nL IIC T5 (T_a = –40°C to 70 °C)
Dust rating: T80 °C (T_{amb} = –20 to 40 °C) IP66

Special Conditions for Safe Use (X):
The device is not capable of withstanding the 500V insulation test required by Clause 6.4.12 of EN50020:1994. This must be taken into account when installing the apparatus.

E8 ATEX Flame-Proof and Dust
Certification No.: KEMA 00ATEX2013X Ⓔx II 1/2 GD
EEx d IIC T6 (T_{amb} = –50 to 65 °C)
Dust rating T90 °C, IP66
CE 1180
Vmax = 55 V dc

Special Conditions for Safe Use (X):
This device contains a thin wall diaphragm. Installation, maintenance, and use shall take into account the environmental conditions to which the diaphragm will be subjected. The manufacturer's instructions for installation and maintenance shall be followed in detail to assure safety during its expected lifetime.

Japanese Certifications

E4 TIIS Flame-Proof
Ex d IIC T6

Certificate	Description
C15852	3051C/D/1 *FOUNDATION* Fieldbus — no display
C15853	3051C/D/1 *FOUNDATION* Fieldbus — with display
C15858	3051T/G/1 *FOUNDATION* Fieldbus, SST, Silicon — no display
C15859	3051T/G/1 *FOUNDATION* Fieldbus, *Hastelloy* C276, Silicon — no display
C15860	3051T/G/1 *FOUNDATION* Fieldbus, SST, Silicon — with display
C15861	3051T/G/1 *FOUNDATION* Fieldbus, *Hastelloy* C276, Silicon — with display

Australian Certifications

I7 SAA Intrinsic Safety
Certification No.: AUS Ex 1249X
Ex ia IIC T4 (T_{amb} = 60 °C)
IP66
When connected per Rosemount drawing 03031-1026.

TABLE 9. Input Parameters

U_i = 30 V
I_i = 300 mA
P_i = 1.3 W
C_i = 0 µF
L_i = 0 µH

Special Conditions for Safe Use (X):
The apparatus may only be used with a passive current limited power source Intrinsic Safety application. The power source must be such that Po ≤ (Uo * Io) / 4. Modules using transient protection in the terminal assembly (T1 transient protection models) the apparatus enclosure is to be electrically bonded to the protective earth. The conductor used for the connection shall be equivalent to a copper conductor of 4 mm2 minimum cross-sectional area.

E7 SAA Explosion-Proof (Flame-Proof)
Certification No.: AUS Ex 1347X
Ex d IIC T6 (T_{amb} = 40 °C)
DIP A21 T6 (T_{amb} = 40 °C)
IP66

Special Conditions for Safe Use (X):
It is a condition of safe use for transmitter enclosures having cable entry thread other than metric conduit thread that the equipment be utilized with an appropriate certified thread adaptor.

N7 SAA Type n (Non-sparking)
Certification No.: AUS Ex 1249X
Ex n IIC T4 (T_{amb} = 70 °C)
IP66

Special Conditions for Safe Use (X):
Where the equipment is installed such that there is an unused conduit entry, it must be sealed with a suitable blanking plug to maintain the IP40 degree of protection. Any blanking plug used with the equipment shall be of a type which requires the use of a tool to effect its removal. Voltage source shall not exceed 35V dc.

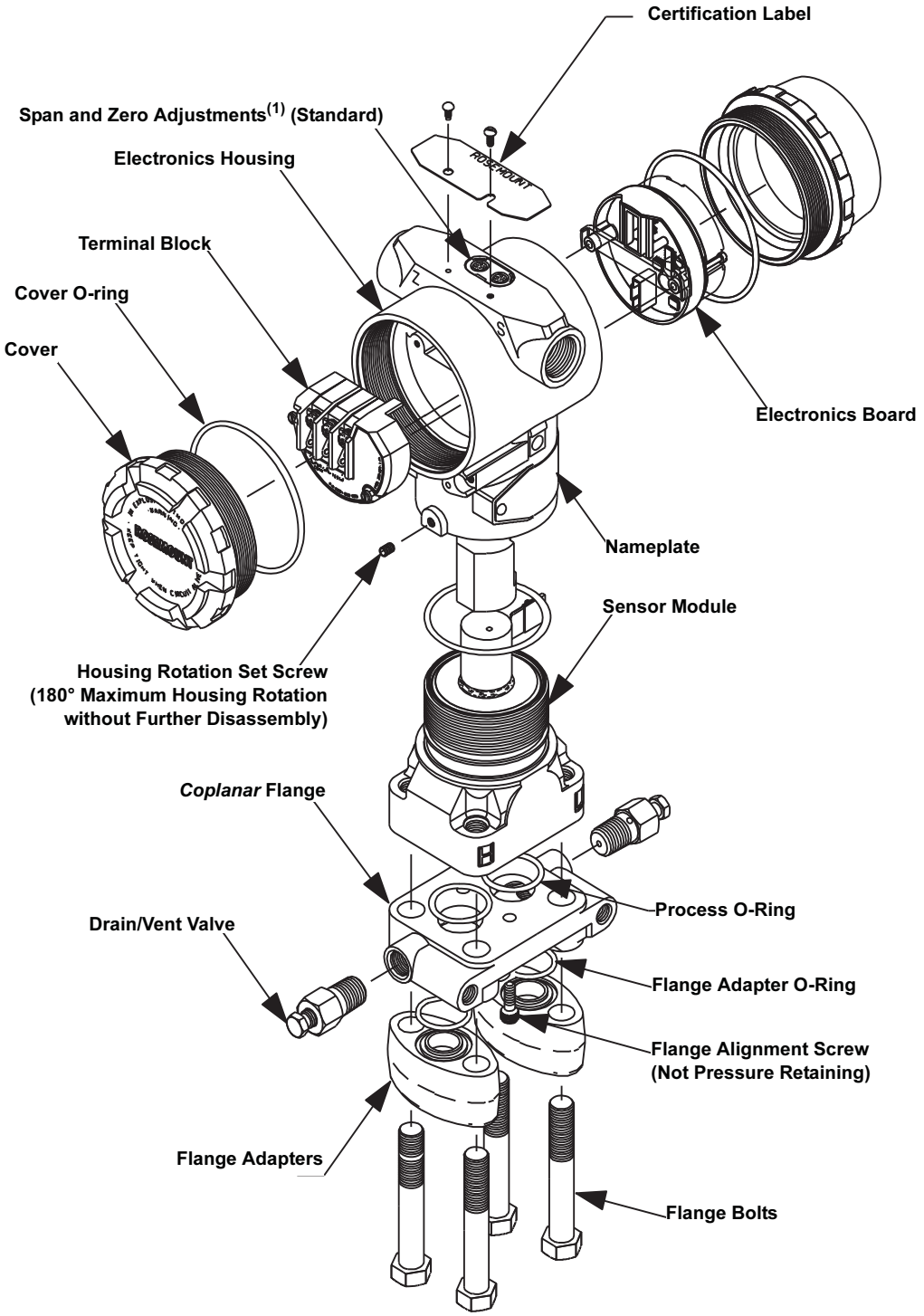
Combinations of Certifications

Stainless steel certification tag is provided when optional approval is specified. Once a device labeled with multiple approval types is installed, it should not be reinstalled using any other approval types. Permanently mark the approval label to distinguish it from unused approval types.

K5 **E5** and **I5** combination
KB **K5** and **C6** combination
KD **K5**, **C6**, **I1**, and **E8** combination
K6 **C6**, **I1**, and **E8** combination
K8 **E8** and **I1** combination
K7 **E7**, **I7**, and **N7** combination

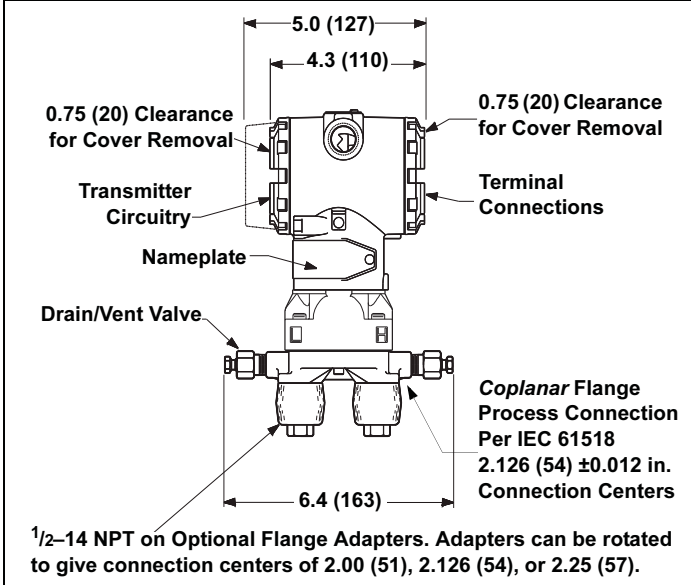
Dimensional Drawings

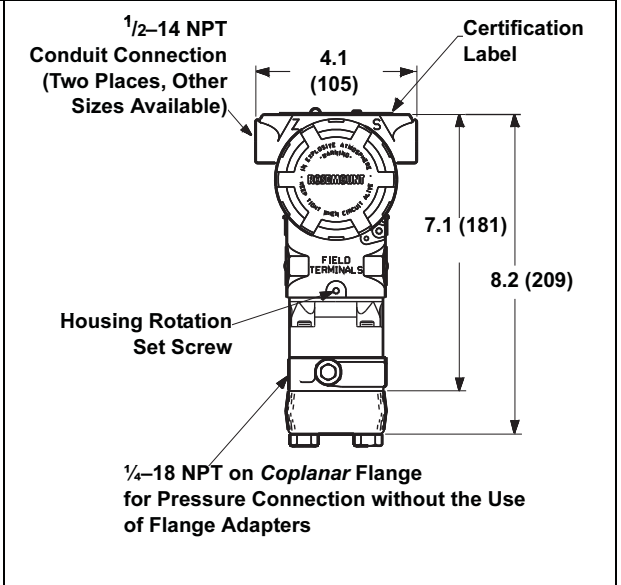
3051 Exploded View



1) Span and Zero Adjustments are not available with fieldbus or profibus protocols.

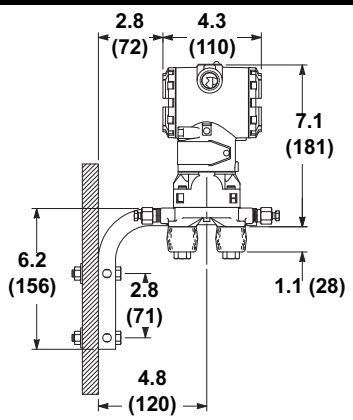
3051C *Coplanar* Flange Dimensional Drawing (Differential Pressure Transmitter Shown)

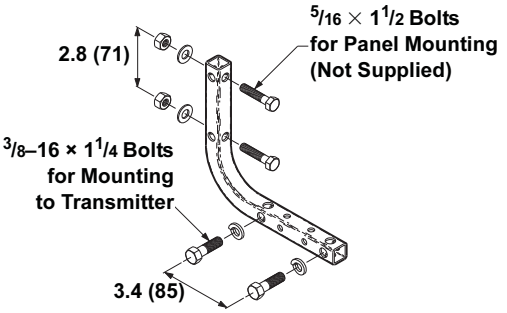




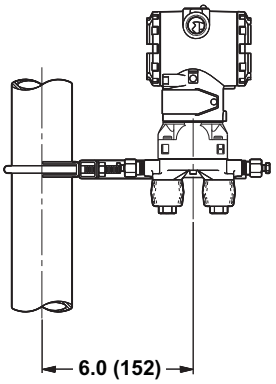
Coplanar Flange Mounting Configurations with Optional Bracket (B4) for 2-in. Pipe or Panel Mounting

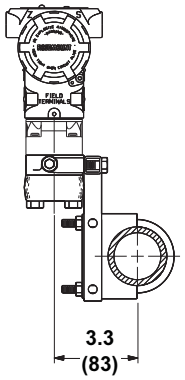
PANEL MOUNTING

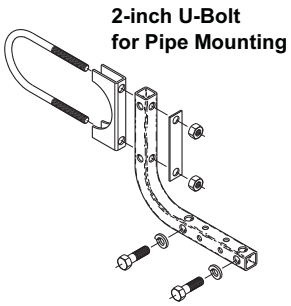




PIPE MOUNTING



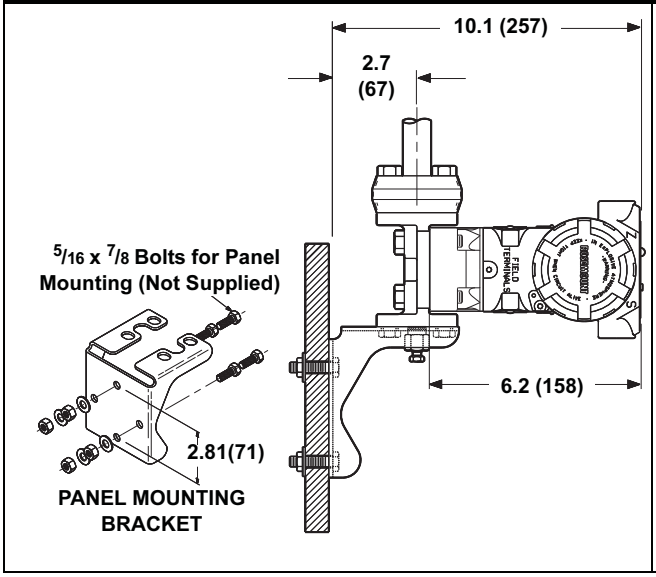




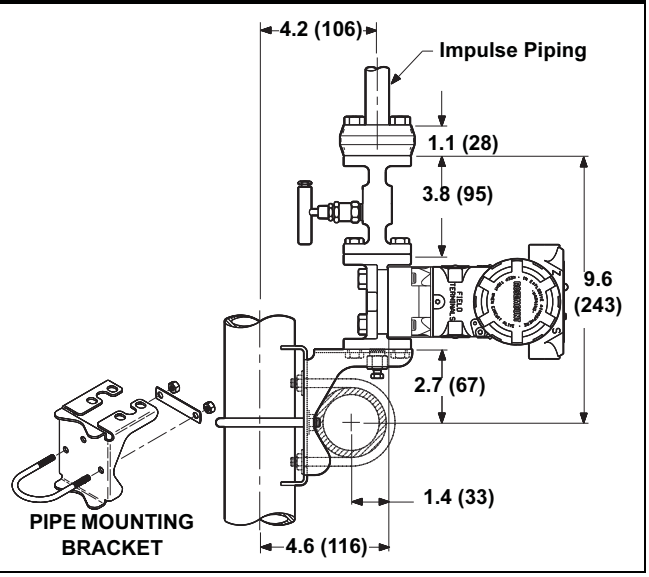
Dimensions are in inches (millimeters)

Traditional Flange Mounting Configurations with Optional Brackets for 2-in. Pipe or Panel Mounting

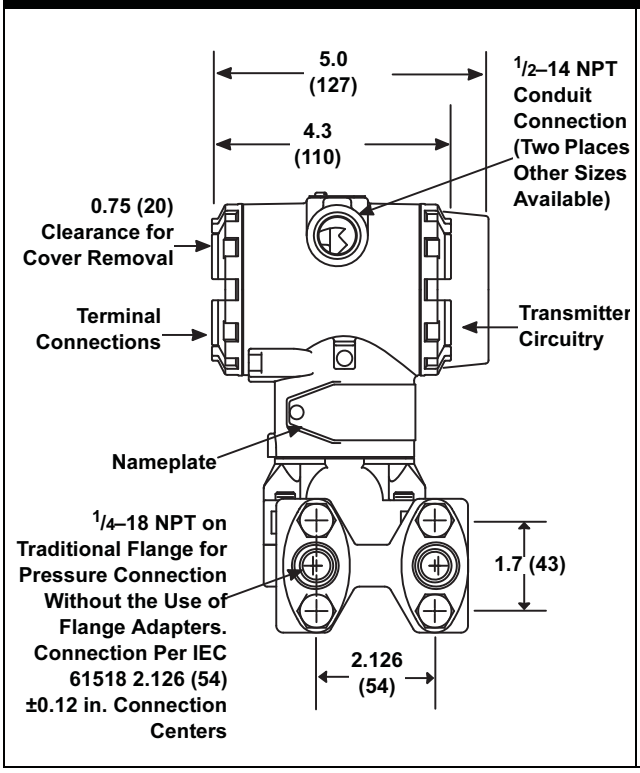
Traditional Flange Panel Mounting Bracket (option B2/B8)

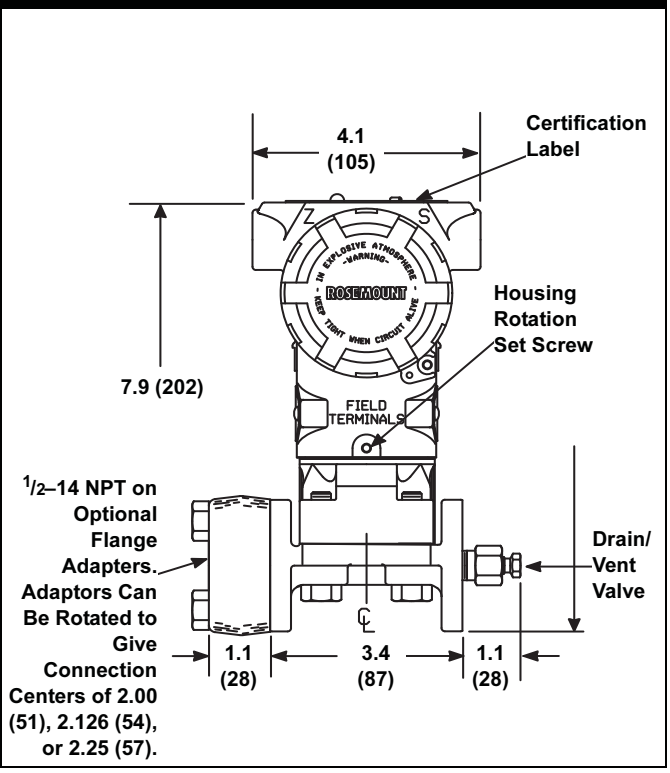


Traditional Flange 2-in. Pipe Mounting Bracket (option B1/B7/BA)



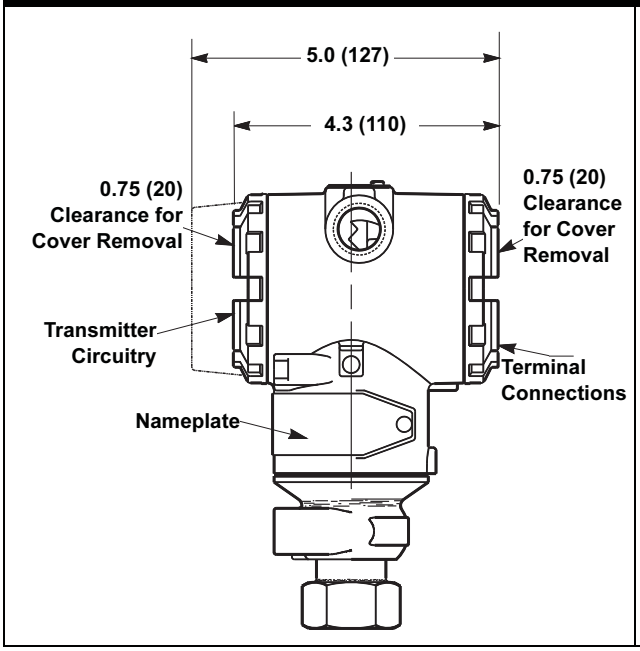
Traditional Flange (Options H2–H7) Dimensional Drawing

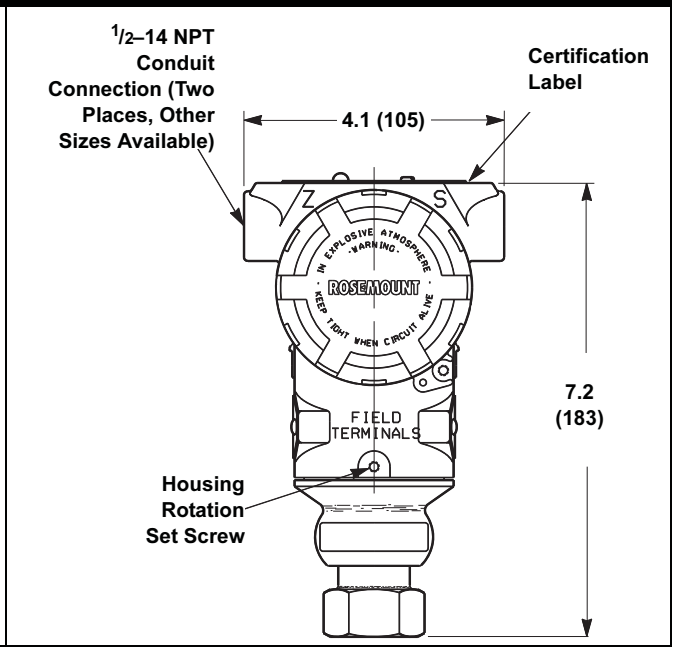




Dimensions are in inches (millimeters)

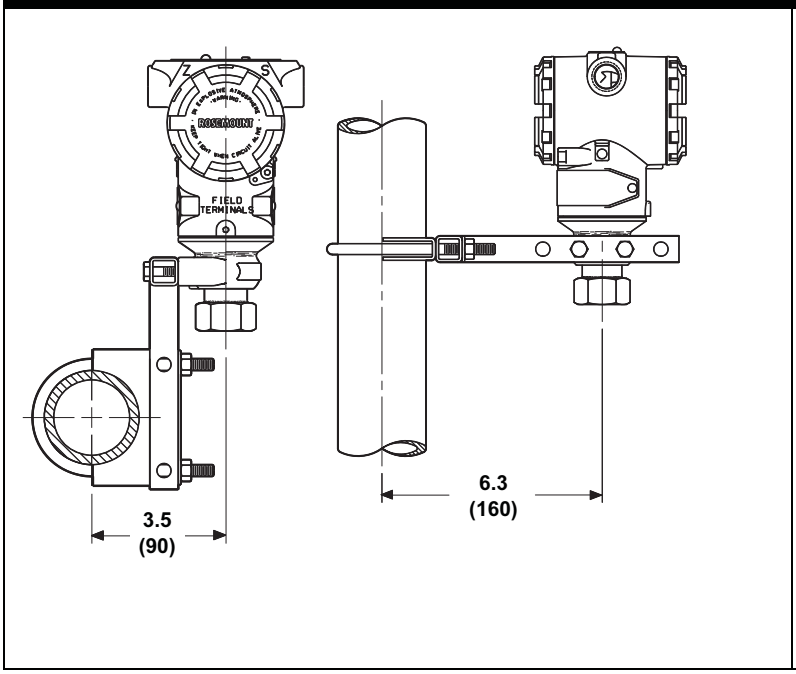
3051T Dimensional Drawings



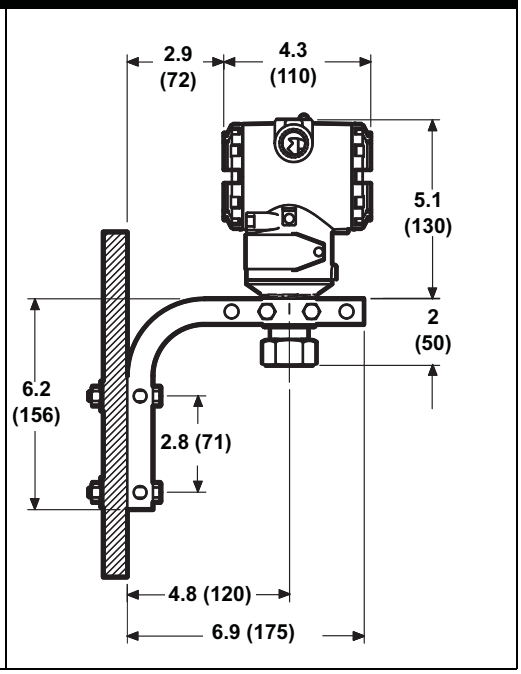


3051T Typical Mounting Configurations with Optional Mounting Bracket

Pipe Mounting

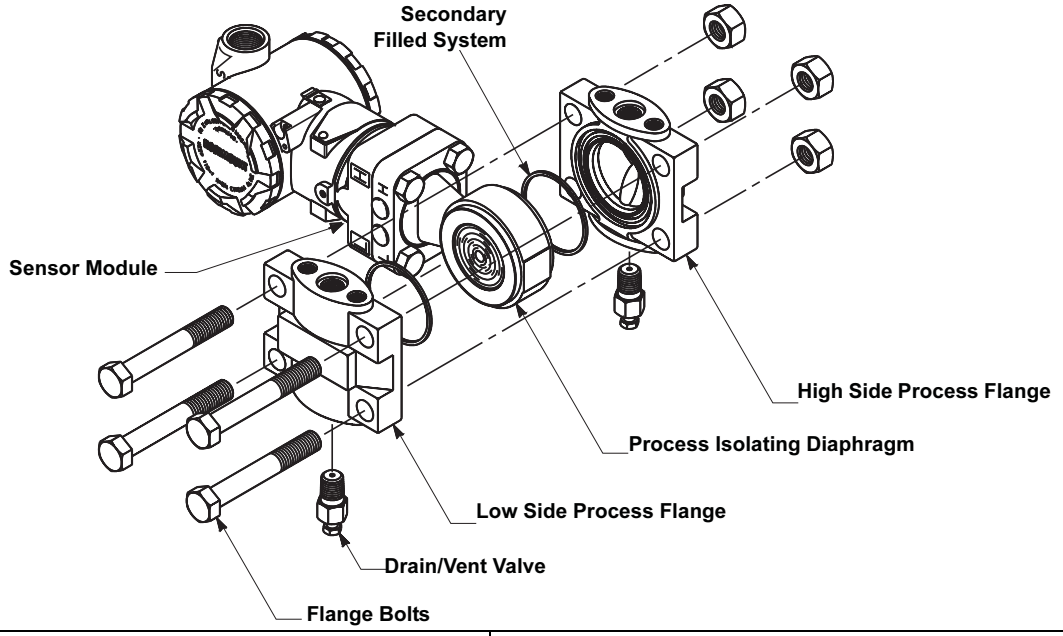


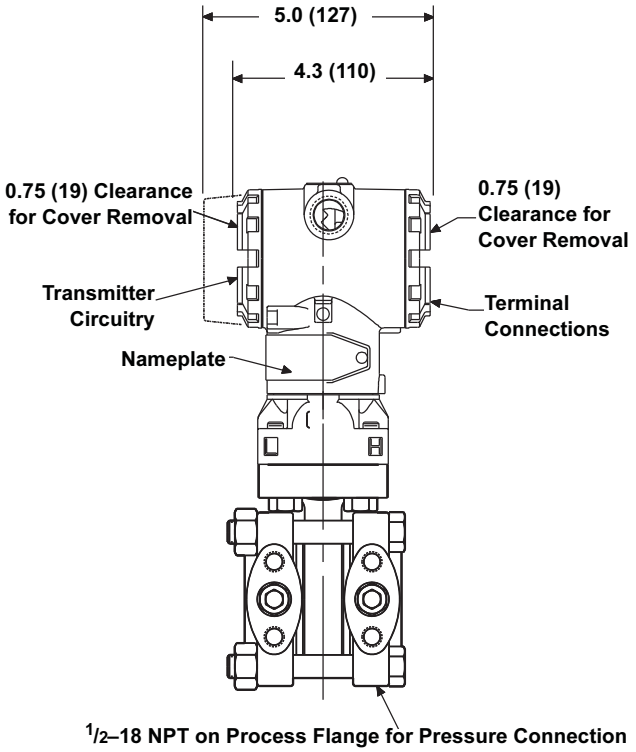
Panel Mounting

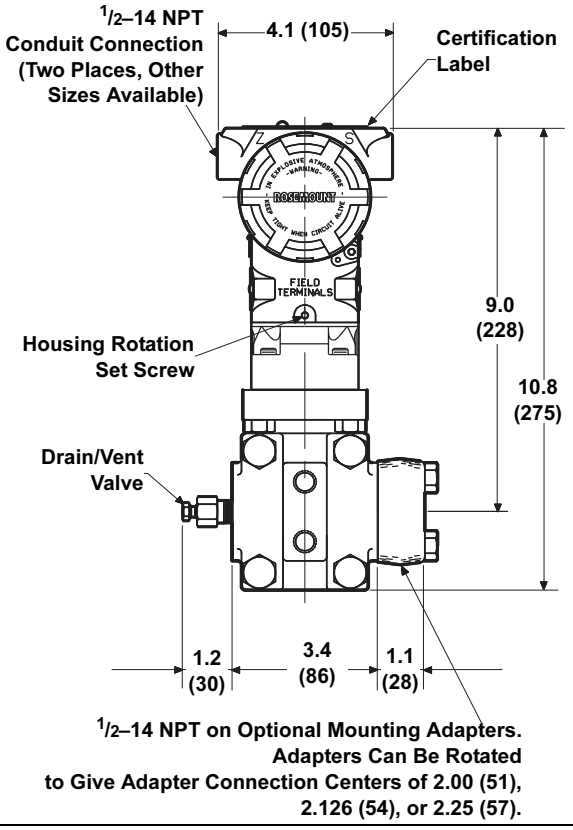


Dimensions are in inches (millimeters)

3051H Pressure Transmitter Exploded View and Dimensional Drawings



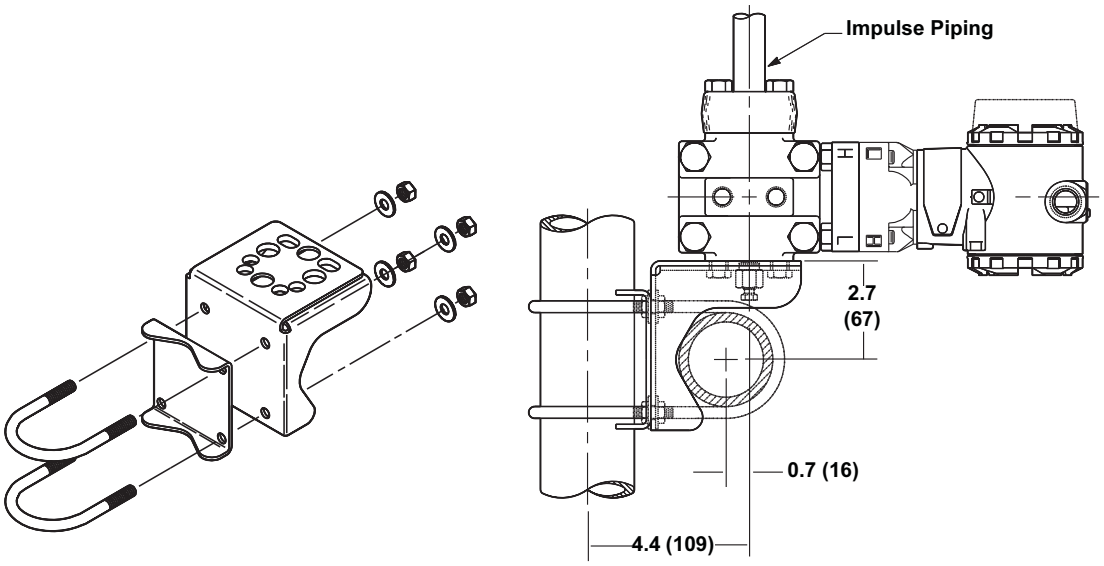




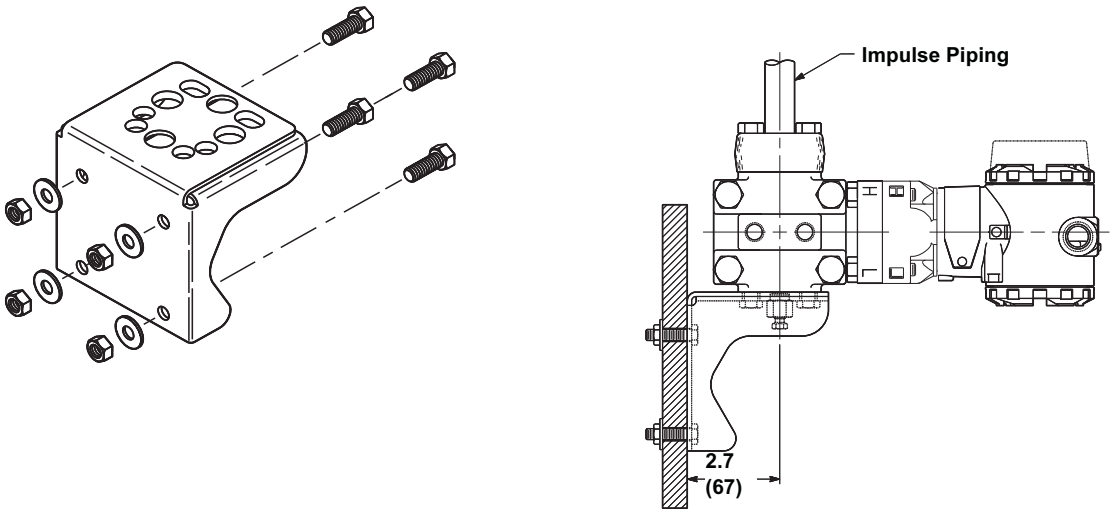
Dimensions are in inches (millimeters)

3051H Mounting Brackets for 2-in. Pipe and Panel Mount (Option Code B5/B6)

PIPE MOUNTING CONFIGURATION



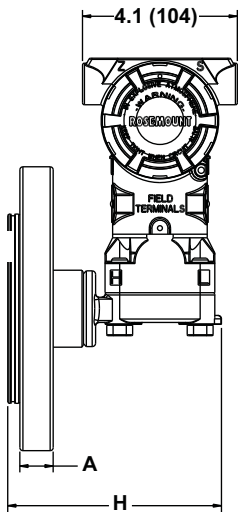
PANEL MOUNTING CONFIGURATION
7/16–20 × 3/4 Bolts Supplied for Attaching Bracket to Transmitter



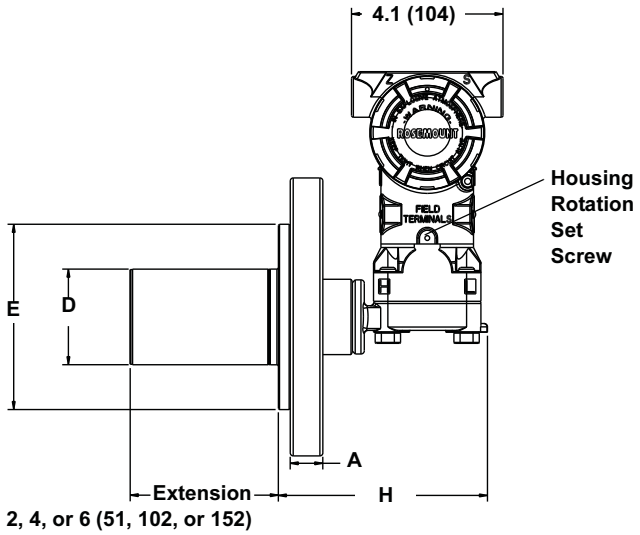
Dimensions are in inches (millimeters)

3051L Dimensional Drawings

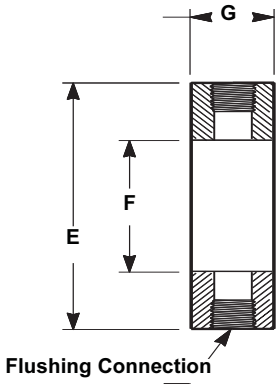
2-in. Flange Configuring (Flush Mount Only)



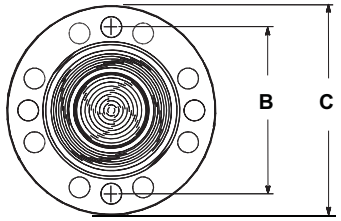
3- and 4-in. Flange Configuration

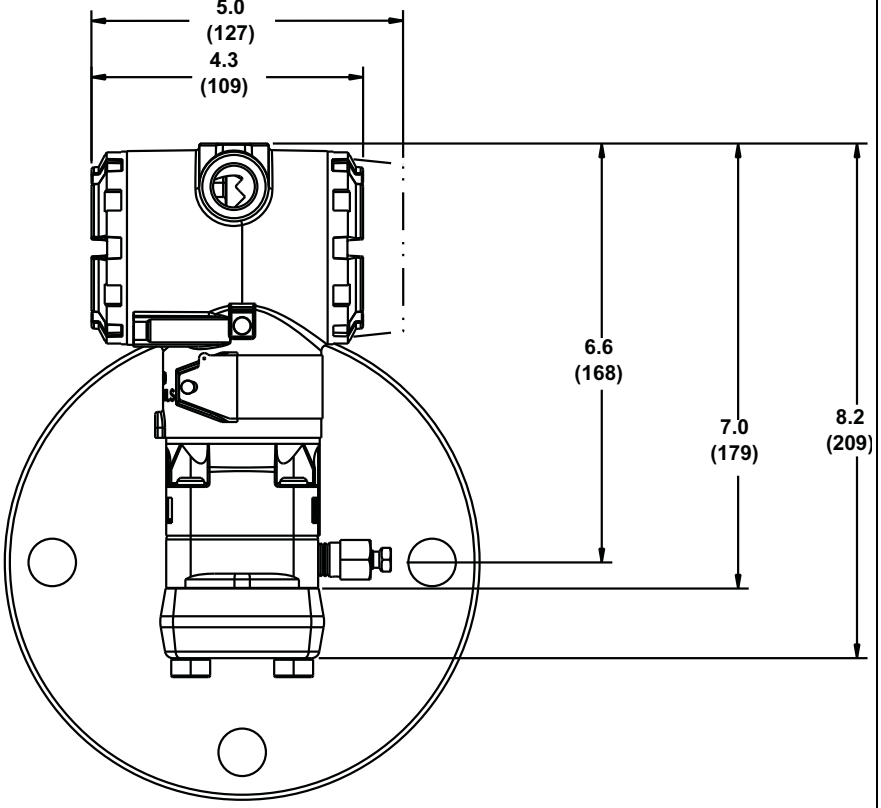


Optional Flushing Connection Ring (Lower Housing)



Diaphragm Assembly and Mounting Flange





Dimensions are in inches (millimeters)

TABLE 10. 3051L Dimensional Specifications

Except where indicated, dimensions are in inches (millimeters).

Class	Pipe Size	Flange Thickness A	Bolt Circle Diameter B	Outside Diameter C	No. of Bolts	Bolt Hole Diameter	Extension Diameter(1) D	O.D. Gasket Surface E
ASME B16.5 (ANSI) 150	2 (51)	0.69 (18)	4.75 (121)	6.0 (152)	4	0.75 (19)	NA	3.6 (92)
	3 (76)	0.88 (22)	6.0 (152)	7.5 (191)	4	0.75 (19)	2.58 (66)	5.0 (127)
	4 (102)	0.88 (22)	7.5 (191)	9.0 (229)	8	0.75 (19)	3.5 (89)	6.2 (158)
ASME B16.5 (ANSI) 300	2 (51)	0.82 (21)	5.0 (127)	6.5 (165)	8	0.75 (19)	NA	3.6 (92)
	3 (76)	1.06 (27)	6.62 (168)	8.25 (210)	8	0.88 (22)	2.58 (66)	5.0 (127)
	4 (102)	1.19 (30)	7.88 (200)	10.0 (254)	8	0.88 (22)	3.5 (89)	6.2 (158)
ASME B16.5 (ANSI) 600	2 (51)	1.00 (25)	5.0 (127)	6.5 (165)	8	0.75 (19)	NA	3.6 (92)
	3 (76)	1.25 (32)	6.62 (168)	8.25 (210)	8	0.88 (22)	2.58 (66)	5.0 (127)
DIN 2501 PN 10–40	DN 50	20 mm	125 mm	165 mm	4	18 mm	NA	4.0 (102)
DIN 2501 PN 25/40	DN 80	24 mm	160 mm	200 mm	8	18 mm	65 mm	5.4 (138)
	DN 100	24 mm	190 mm	235 mm	8	22 mm	89 mm	6.2 (158)
DIN 2501 PN 10/16	DN 100	20 mm	180 mm	220 mm	8	18 mm	89 mm	6.2 (158)

Class	Pipe Size	Process Side F	Lower Housing G		H
			1/4 NPT	1/2 NPT	
ASME B16.5 (ANSI) 150	2 (51)	2.12 (54)	0.97 (25)	1.31 (33)	5.65 (143)
	3 (76)	3.6 (91)	0.97 (25)	1.31 (33)	5.65 (143)
	4 (102)	3.6 (91)	0.97 (25)	1.31 (33)	5.65 (143)
ASME B16.5 (ANSI) 300	2 (51)	2.12 (54)	0.97 (25)	1.31 (33)	5.65 (143)
	3 (76)	3.6 (91)	0.97 (25)	1.31 (33)	5.65 (143)
	4 (102)	3.6 (91)	0.97 (25)	1.31 (33)	5.65 (143)
ASME B16.5 (ANSI) 600	2 (51)	2.12 (54)	0.97 (25)	1.31 (33)	7.65 (194)
	3 (76)	3.6 (91)	0.97 (25)	1.31 (33)	7.65 (194)
DIN 2501 PN 10–40	DN 50	2.4 (61)	0.97 (25)	1.31 (33)	5.65 (143)
DIN 2501 PN 25/40	DN 80	3.6 (91)	0.97 (25)	1.31 (33)	5.65 (143)
	DN 100	3.6 (91)	0.97 (25)	1.31 (33)	5.65 (143)
DIN 2501 PN 10/16	DN 100	3.6 (91)	0.97 (25)	1.31 (33)	5.65 (143)

(1) Tolerances are 0.040 (1,02), –0.020 (0,51).

Ordering Information

TABLE 11. 3051C Differential, Gage, and Absolute Pressure Transmitters — = Not Applicable • = Applicable

Model	Transmitter Type (Select One)			CD	CG	CA
3051CD	Differential Pressure Transmitter			•	—	—
3051CG	Gage Pressure Transmitter			—	•	—
3051CA	Absolute Pressure Transmitter			—	—	•
Code	**Pressure Ranges (Range/Min. Span)**			**CD**	**CG**	**CA**
	3051CD	**3051CG(1)**	**3051CA**			
0(2)	–3 to 3 inH_2O/0.1 inH_2O (–7,5 to 7,5 mbar/0,25 mbar)	Not Applicable	Not Applicable	•	—	—
1	–25 to 25 inH_2O/0.5 inH_2O (–62,2 to 62,2 mbar/1,2 mbar)	–25 to 25 inH_2O/0.5 inH_2O (–62,1 to 62,2 mbar/1,2 mbar)	0 to 30 psia/0.3 psia (0 to 2,1 bar/20,7 mbar)	•	•	•
2	–250 to 250 inH2O/2.5 inH_2O (–623 to 623 mbar/6,2 mbar)	–250 to 250 inH_2O/2.5 inH_2O (–621 to 623 mbar/6,2 mbar)	0 to 150 psia/1.5 psia (0 to 10,3 bar/0,1 bar)	•	•	•
3	–1000 to 1000 inH_2O/10 inH_2O (–2,5 to 2,5 bar/25 mbar)	–393 to 1000 inH_2O/10in H_2O (–0,98 to 2,5 bar/25 mbar)	0 to 800 psia/8 psia (0 to 55,2 bar/0,55 bar)	•	•	•
4	–300 to 300 psi/3 psi (–20,7 to 20,7 bar/0,2 bar)	–14.2 to 300 psi/3 psi (–0,98 to 20,7 bar/0,2 bar)	0 to 4000 psia/40 psia (0 to 275,8 bar/2,8 bar)	•	•	•
5	–2000 to 2000 psi/20 psi (–137,9 to137,9 bar/1,4 bar)	–14.2 to 2000 psig/20 psi (–0,98 to 137,9 bar/1,4 bar)	Not Applicable	•	•	—
Code	**Output**			**CD**	**CG**	**CA**
A	4–20 mA with Digital Signal Based on *HART* Protocol			•	•	•
M(3)	Low-Power, 1–5 V dc with Digital Signal Based on *HART* Protocol *(See Option C2 for 0.8–3.2 V dc)*			•	•	•
F	*FOUNDATION* fieldbus Protocol			•	•	•
W	Profibus — PA			•	•	•
Code	**Materials of Construction**			**CD**	**CG**	**CA**
	Process Flange Type	**Flange Material**	**Drain/Vent**			
2	*Coplanar*	SST	SST	•	•	•
3(4)	*Coplanar*	*Alloy C*	*Hastelloy* C276	•	•	•
4	*Coplanar*	*Monel*	*Monel*	•	•	•
5	*Coplanar*	Plated CS	SST	•	•	•
7(4)	*Coplanar*	SST	*Hastelloy* C276	•	•	•
8(4)	*Coplanar*	Plated CS	*Hastelloy* C276	•	•	•
0	Alternate Flange—See Options on page 26			•	•	•
Code	**Isolating Diaphragm**			**CD**	**CG**	**CA**
2(4)	316L SST			•	•	•
3(4)	*Hastelloy* C276			•	•	•
4	*Monel*			•	•	•
5	Tantalum *(Available on 3051CD and CG, Ranges 2–5 only. Not available on 3051CA)*			•	•	—
6	Gold-plated *Monel (Use in combination with O-ring Option Code B.)*			•	•	•
7	Gold-plated SST			•	•	•
Code	**O-ring**					
A	Glass-filled PTFE			•	•	•
B	Graphite-filled PTFE			•	•	•
Code	**Fill Fluid**			**CD**	**CG**	**CA**
1	Silicone			•	•	•
2	Inert fill (Halocarbon)			•	•	—

TABLE 11. 3051C Differential, Gage, and Absolute Pressure Transmitters — = Not Applicable • = Applicable

Code	Housing Material	Conduit Entry Size	CD	CG	CA
A	Polyurethane-covered Aluminum	½–14 NPT	•	•	•
B	Polyurethane-covered Aluminum	M20 × 1.5 (CM20)	•	•	•
C	Polyurethane-covered Aluminum	PG 13.5	•	•	•
D	Polyurethane-covered Aluminum	G½	•	•	•
J	SST	½–14 NPT	•	•	•
K	SST	M20 × 1.5 (CM20)	•	•	•
L	SST	PG 13.5	•	•	•
M	SST	G½	•	•	•
Code	***PlantWeb* Functionality (Optional)**		**CD**	**CG**	**CA**
A01	Advanced Control Function Block Suite		•	•	•
D01	*FOUNDATION* fieldbus Diagnostics Suite		•	•	•
Code	**Alternate Flange Options (Requires Materials of Construction Code 0)**		**CD**	**CG**	**CA**
H2	Traditional Flange, 316 SST, SST Drain/Vent		•	•	•
H3(4)	Traditional Flange, *Alloy C*, *Hastelloy* C276 Drain/Vent		•	•	•
H4	Traditional Flange, *Monel*, *Monel* Drain/Vent		•	•	•
H7(4)	Traditional Flange, 316 SST, *Hastelloy* C276 Drain/Vent		•	•	•
HJ	DIN Compliant Traditional Flange, SST, 1/16 in. Adapter/Manifold Bolting		•	•	•
HK	DIN Compliant Traditional Flange, SST, 10 mm Adapter/Manifold Bolting		•	•	•
HL	DIN Compliant Traditional Flange, SST, 12mm Adapter/Manifold Bolting *(Not available on 3051CD0)*		•	•	•
FA	Level Flange, SST, 2 in., ANSI Class 150, Vertical Mount		•	•	•
FB	Level Flange, SST, 2 in., ANSI Class 300, Vertical Mount		•	•	•
FC	Level Flange, SST, 3 in., ANSI Class 150, Vertical Mount		•	•	•
FD	Level Flange, SST, 3 in., ANSI Class 300, Vertical Mount		•	•	•
FP	DIN Level Flange, SST, DN 50, PN 40, Vertical Mount		•	•	•
FQ	DIN Level Flange, SST, DN 80, PN 40, Vertical Mount		•	•	•
Code	**Integral Mount Manifold Options (Requires Materials of Construction Code 0)**		**CD**	**CG**	**CA**
S5(5)	Assemble to Rosemount 305 Integral Manifold (specified separately, see the Rosemount 305 and 306 Integral Manifolds PDS (document number 00813-0100-4733))		•	•	•
S6(5)	Assemble to Rosemount 304 Manifold or connection system		•	•	•
Code	**Integral Mount Primary Elements (Optional)**		**CD**	**CG**	**CA**
S4(5)	Factory Assembly to Rosemount Primary Element (Rosemount *Annubar* or Rosemount 1195 Integral Orifice) *(With the primary element installed, the maximum operating pressure will equal the lesser of either the transmitter or the primary element. Option is available for factory assembly to range 1–4 transmitters only)*		•	—	—
S3(5)	Factory Assembly to Rosemount 405 Primary Element		•	—	—
Code	**Diaphragm Seal Assemblies (Optional)** ***NOTE: Standard flange and adapter bolts are austenitic 316 SST.***		**CD**	**CG**	**CA**
S1(5)	One Diaphragm Seal (Direct Mount or Capillary Connection Type)		•	•	•
S2(5)	Two Diaphragm Seals (Direct Mount or Capillary Connection Type)		•	—	—
Code	**Optional All Welded Diaphragm Seal Systems (for high vacuum applications)** ***NOTE: Standard flange and adapter bolts are austenitic 316 SST.***		**CD**	**CG**	**CA**
S7(5)	One Diaphragm Seal, All-Welded System (Capillary Connection Type)		•	•	•
S8(5)	Two Diaphragm Seals, All-Welded System (Capillary Connection Type)		•	—	—
S0(5)	One Diaphragm Seal, All-Welded System (Direct Mount Connection Type)		•	•	•
S9(5)	Two Diaphragm Seals, All-Welded System (One Direct Mount and One Capillary Connection Type)		•	—	—

TABLE 11. 3051C Differential, Gage, and Absolute Pressure Transmitters — = Not Applicable • = Applicable

Code	Mounting Bracket Options	CD	CG	CA
B4	*Coplanar* Flange Bracket for 2-in. Pipe or Panel Mounting, all SST	•	•	•
B1	Traditional Flange Bracket for 2-in. Pipe Mounting, CS Bolts	•	•	•
B2	Traditional Flange Bracket for Panel Mounting, CS Bolts	•	•	•
B3	Traditional Flange Flat Bracket for 2-in. Pipe Mounting, CS Bolts	•	•	•
B7	B1 Bracket with Series 300 SST Bolts	•	•	•
B8	B2 Bracket with Series 300 SST Bolts	•	•	•
B9	B3 Bracket with Series 300 SST Bolts	•	•	•
BA	SST B1 Bracket with Series 300 SST Bolts	•	•	•
BC	SST B3 Bracket with Series 300 SST Bolts	•	•	•
Code	**Hazardous Locations Certification Options**	**CD**	**CG**	**CA**
E5	FM Explosionproof Approval	•	•	•
I5	FM Non-incendive and Intrinsic Safety Approval	•	•	•
IE	FM FISCO Intrinsically Safe; for FOUNDATION fieldbus protocol only	•	•	•
K5	FM Explosionproof and Intrinsic Safety Approval	•	•	•
I1(6)	ATEX Intrinsic Safety	•	•	•
N1(6)	ATEX Type N and Dust Certification	•	•	•
E8	ATEX Flame-proof and Dust Certification	•	•	•
E4(6)	TIIS Flame-proof Certification	•	•	•
I4	TIIS Intrinsic Safety Certification *(Only available with HART Option Code A)*	•	•	—
C5(7)	Measurement Canada Accuracy Approval *(Limited availability depending on transmitter type and range. Contact an Emerson Process Management representative)*	•	•	•
C6	CSA Explosion-proof and Intrinsic Safety Approval	•	•	•
K6(6)	CSA and ATEX Explosion-proof and Intrinsic Safety Approval (combination of C6 and K8)	•	•	•
KB	FM and CSA Explosion-proof and Intrinsic Safety Approvals (combination of K5 and C6)	•	•	•
K7	SAA Flame-proof and Intrinsic Safety Approvals (combination of I7, N7, and E7)	•	•	•
K8(6)	ATEX Flame-proof and Intrinsic Safety Approvals (combination of I1 and E8)	•	•	•
KD(6)	FM, CSA, and ATEX Explosion-proof and Intrinsically Safe combination of K5, C6, I1, and E8	•	•	•
I7	SAA Intrinsic Safety Certification	•	•	•
E7	SAA Flame-proof Certification	•	•	•
N7	SAA Type N Certification	•	•	•
IA	ATEX Intrinsic Safety for FISCO; for *FOUNDATION* fieldbus protocol only	•	•	•
Code	**Bolting Options**	**CD**	**CG**	**CA**
L4	Austenitic 316 SST Bolts	•	•	•
L5	ASTM A 193, Grade B7M Bolts	•	•	•
L6	*Monel* Bolts	•	•	•
Code	**Display Options**	**CD**	**CG**	**CA**
M5	LCD display for Aluminum Housing (Housing Codes A, B, C, and D only)	•	•	•
M6	LCD display for SST Housing (Housing Codes J, K, L, and M only)	•	•	•

TABLE 11. 3051C Differential, Gage, and Absolute Pressure Transmitters — = Not Applicable • = Applicable

Code	Other Options	CD	CG	CA
Q4	Calibration Data Sheet	•	•	•
Q8	Material Traceability Certification per EN 10204 3.1.B *(Only available for the sensor module housing and Coplanar or traditional flanges and adapters (3051C), and for the sensor module housing and low-volume Coplanar flange and adapter (3051C with Option Code S1))*	•	•	•
Q16	Surface finish certification for sanitary remote seals	•	•	•
QZ	Remote Seal System Performance Calculation Report	•	•	•
QP	Calibration certification and tamper evident seal	•	•	•
QS	Certificate of FMEDA Data	•	•	•
J1(7)(8)	Local Zero Adjustment Only	•	•	•
J3(7)(8)	No Local Zero or Span Adjustment	•	•	•
T1	Transient Protection Terminal Block	•	•	•
C1(7)	Custom Software Configuration (Completed CDS 00806-0100-4001 required with order)	•	•	•
C2(7)	0.8–3.2 V dc Output with Digital Signal Based on *HART* Protocol (Output Code M only)	•	•	•
C3	Gage Calibration (3051CA4 only)	—	—	•
C4(7)(9)	Analog Output Levels Compliant with NAMUR Recommendation NE 43	•	•	•
CN(7)(9)	Analog Output Levels Compliant with NAMUR Recommendation NE 43 Alarm Configuration–Low	•	•	•
P1	Hydrostatic Testing with Certificate	•	•	•
P2	Cleaning for Special Service	•	•	•
P3	Cleaning for <1 PPM Chlorine/Fluorine	•	•	•
P4	Calibrate at line pressure *(Specify Q48 on order for corresponding certificate)*	•	•	•
DF	1/2 -14 NPT flange adapter(s)— Material determined by flange material	•	•	•
D7	*Coplanar* Flange Without Drain/Vent Ports	•	•	•
D8	Ceramic Ball Drain/Vents	•	•	•
D9	JIS Process Connection—RC ¼ Flange with RC ½ Flange Adapter	•	•	•
P8	0.04% accuracy to 5:1 turndown (Range 2-4)	•	•	•
P9	4500 psig Static Pressure Limit (3051CD Ranges 2–5 only)	•	—	—
V5(10)	External Ground Screw Assembly	•	•	•
Typical Model Number:	**3051CD 2 A 2 2 A 1 A B4**			

(1) 3051CG lower range limit varies with atmospheric pressure.

(2) 3051CD0 is available only with Output Code A, Process Flange Code 0 (Alternate Flange H2, H7, HJ, or HK), Isolating Diaphragm Code 2, O-ring Code A, and Bolting Option L4.

(3) Not available with hazardous locations certification Options Codes I1, N1, E4, K6 and K8.

(4) Materials of Construction comply with recommendations per NACE MR0175/ISO 15156 for sour oil field production environments. Environmental limits apply to certain materials. Consult latest standard for details. Selected materials also conform to NACE MR0103 for sour refining environments.

(5) "Assemble-to" items are specified separately and require a completed model number.

(6) Not available with Low Power code M.

(7) Not available with Fieldbus (output code F) or Profibus (output code W).

(8) Local zero and span adjustments are standard unless Option Code J1 or J3 is specified

(9) NAMUR-Compliant operation is pre-set at the factory and cannot be changed to standard operation in the field.

(10) The V5 option is not needed with the T1 option; external ground screw assembly is included with the T1 option.

TABLE 12. 3051T Gage and Absolute Pressure Transmitter

Model	Transmitter Type	
3051T	Pressure Transmitter	
Code	**Pressure Type**	
G	Gage	
A	Absolute	
Code	**Pressure Ranges (Range/Min. Span)** **3051TG(1)**	**3051TA**
1	–14.7 to 30 psi/0.3 psi (–1,01 to 2,1 bar/20,7 mbar)	0 to 30 psia/0.3 psia (0 to 2,1 bar/20,7 mbar)
2	–14.7 to 150 psi/1.5 psi (–1,01 to 10,3 bar/103,4 mbar)	0 to 150 psia/1.5 psia (0 to 10,3 bar/103,4 mbar)
3	–14.7 to 800 psi/8 psi (–1,01 to 55,2 bar/0,55 bar)	0 to 800 psia/8 psia (0 to 55,2 bar/0,55 bar)
4	–14.7 to 4000 psi/40 psi (–1,01 to 275,8 bar/2,8 bar)	0 to 4000 psia/40 psia (0 to 275,8 bar/2,8 bar)
5	–14.7 to 10000 psi/2000 psi (–1,01 to 689,5 bar/138 bar)	0 to 10000 psia/2000 psia (0 to 689,5 bar/138 bar)
Code	**Output**	
A	4–20 mA with Digital Signal Based on *HART* Protocol	
M	Low-Power 1–5 V dc with Digital Signal Based on *HART* Protocol (See Option Code C2 for 0.8–3.2 V dc Output) (*Not available with hazardous certification Option Codes I1, N1, E4, K6 or K8)*	
F	*FOUNDATION* fieldbus Protocol	
W	Profibus — PA	
Code	**Process Connection Style**	
2B	1/2–14 NPT Female	
2C	G½ A DIN 16288 Male (Available in SST for Range 1–4 only)	
2F	Coned and Threaded, Compatible with Autoclave Type F-250-C *(Only available in SST for Range 5)*	
Code	**Isolating Diaphragm**	**Process Connection Wetted Parts Material**
2(2)	316L SST	316L SST
3(2)	*Hastelloy* C276	*Hastelloy* C276
Code	**Fill Fluid**	
1	Silicone	
2	Inert (Fluorinert® FC-43)	
Code	**Housing Material**	**Conduit Entry Size**
A	Polyurethane-covered Aluminum	½–14 NPT
B	Polyurethane-covered Aluminum	M20 × 1.5 (CM20)
C	Polyurethane-covered Aluminum	PG 13.5
D	Polyurethane-covered Aluminum	G½
J	SST	½–14 NPT
K	SST	M20 × 1.5 (CM20)
L	SST	PG 13.5
M	SST	G½
Code	***PlantWeb* Functionality (Optional)**	
A01	Advanced Control Function Block Suite	
D01	*FOUNDATION* fieldbus Diagnostics Suite	
Code	**Integral Mount Manifold (Optional)**	
S5(3)	Assemble to Rosemount 306 Integral Manifold (specified separately, see the Rosemount 305 and 306 Integral Manifolds PDS (document number 00813-0100-4733)) (*Requires 1/2-in. process connection code 2B)*	
Code	**Remote Diaphragm Seals Assemblies (Optional)**	
S1(3)	One remote diaphragm seal (Direct Mount or Capillary Connection Type) (Requires Process Connection Style code 2B)	
Code	**Mounting Brackets (Optional)**	
B4	Bracket for 2-in. Pipe or Panel Mounting, All SST	

TABLE 12. 3051T Gage and Absolute Pressure Transmitter

Code	Hazardous Locations Certifications (Optional)
E5	FM Explosion-proof Approval
I5	FM Non-incendive and Intrinsic Safety Approval
IE	FM FISCO Intrinsically Safe; for FOUNDATION fieldbus protocol only
K5	FM Explosion-proof and Intrinsic Safety Approval
C5	Measurement Canada accuracy approval *(Limited availability depending on transmitter type and range. Contact an Emerson Process Management representative)*
C6	CSA Explosion-proof and Intrinsic Safety Approval
K6(4)	CSA and ATEX Explosion-proof and Intrinsic Safety Approval (combination of C6 and K8)
KB	FM and CSA Explosion-proof and Intrinsic Safety Approvals (combination of K5 and C6)
K7	SAA Flame-proof and Intrinsic Safety Approvals (combination of I7, N7, and E7)
K8(4)	ATEX Flame-proof and Intrinsic Safety Approvals (combination of I1 and E8)
KD(4)	CSA, FM, and ATEX Explosion-proof and Intrinsic Safety Approval (combination of K5, C6, I1, and E8)
I7	SAA Intrinsic Safety Certification
E4(4)	TIIS Flame-proof Certification
E7	SAA Flame-proof Certification
N7	SAA Type N Certification
I1(4)	ATEX Intrinsic Safety and Dust Certification
N1(4)	ATEX Type N and Dust Certification
E8	ATEX Flame-proof and Dust Certification
DW	NSF drinking water approval
IA	ATEX Intrinsic Safety for FISCO; for *FOUNDATION* fieldbus protocol only
Code	**Other Options**
Q4	Calibration Data Sheet
Q8	Material Traceability Certification per EN 10204 3.1.B *NOTE: This option applies to the process connection only.*
Q16	Surface finish certification for sanitary remote seals
QZ	Remote Seal System Performance Calculation Report
QP	Calibration certification and tamper evident seal
QS	Certificate of FMEDA Data
J1(5)(6)	Local Zero Adjustment Only
J3(5)(6)	No Local Zero or Span Adjustment
M5	LCD display for Aluminum Housing (Housing Codes A, B, C, and D only)
M6	LCD display for SST Housing (Housing Codes J, K, L and M only)
T1	Transient Protection Terminal Block
C1(5)	Custom Software Configuration (Completed CDS 00806-0100-4001 required with order)
C2(5)	0.8–3.2 V dc Output with Digital Signal Based on *HART* Protocol (Output Code M only)
C4(5)(7)	Analog Output Levels Compliant with NAMUR Recommendation NE 43, 27-June-1996.
CN(5)(7)	Analog Output Levels Compliant with NAMUR Recommendation NE 43: Low Alarm Configuration
P1	Hydrostatic Testing with Certificate
P2	Cleaning for Special Service
P3	Cleaning for <1 PPM Chlorine/Fluorine
P8	0.04% accuracy to 5:1 turndown (Range 1-4)
V5(8)	External Ground Screw Assembly

Typical Model Number: 3051T G 5 F 2A 2 1 A B4

(1) 3051TG lower range limit varies with atmospheric pressure.

(2) Materials of Construction comply with recommendations per NACE MR0175/ISO 15156 for sour oil field production environments. Environmental limits apply to certain materials. Consult latest standard for details. Selected materials also conform to NACE MR0103 for sour refining environments.

(3) "Assemble-to" items are specified separately and require a completed model number.

(4) Not available with low-power Option Code M.

(5) Not available with fieldbus (output code F) or Profibus protocols (output code W).

(6) Local zero and span adjustments are standard unless Option Code J1 or J3 is specified.

(7) NAMUR-Compliant operation is pre-set at the factory and cannot be changed to standard operation in the field.

(8) The V5 option is not needed with T1 option; external ground screw assembly is included with the T1 option.

TABLE 13. 3051L Flange-Mounted Liquid Level Transmitter

Model	Transmitter Type
3051L	Flange-Mounted Liquid Level Transmitter
Code	**Pressure Ranges (Range/Min. Span)**
2	–250 to 250 inH_2O/2.5 inH_2O (–0,6 to 0,6 bar/6,2 mbar)
3	–1000 to 1000 inH_2O/10 inH_2O (–2,5 to 2,5 bar/25 mbar)
4	–300 to 300 psi/3 psi (–20,7 to 20,7 bar/0,2 bar)
Code	**Output**
A	4–20 mA with Digital Signal Based on *HART* Protocol
M	Low-Power 1–5 V dc with Digital Signal Based on *HART* Protocol (See Option Code C2 for 0.8–3.2 V dc Output) *(Not available with hazardous certification Option Codes I1, N1, E4, K6, and K8)*
F	*FOUNDATION* fieldbus Protocol
W	Profibus – PA

High Pressure Side

Code	Diaphragm Size	Material	Extension Length
G0	2 in./DN 50	316L SST	Flush Mount Only
H0	2 in./DN 50	*Hastelloy* C276	Flush Mount Only
J0	2 in./DN 50	Tantalum	Flush Mount Only
A0	3 in./DN 80	316L SST	Flush Mount
A2	3 in./DN 80	316L SST	2 in./50 mm
A4	3 in./DN 80	316L SST	4 in./100 mm
A6	3 in./DN 80	316L SST	6 in./150 mm
B0	4 in./DN 100	316L SST	Flush Mount
B2	4 in./DN 100	316L SST	2 in./50 mm
B4	4 in./DN 100	316L SST	4 in./100 mm
B6	4 in./DN 100	316L SST	6 in./150 mm
C0	3 in./DN 80	*Hastelloy* C276	Flush Mount
C2	3 in./DN 80	*Hastelloy* C276	2 in./50 mm
C4	3 in./DN 80	*Hastelloy* C276	4 in./100 mm
C6	3 in./DN 80	*Hastelloy* C276	6 in./150 mm
D0	4 in./DN 100	*Hastelloy* C276	Flush Mount
D2	4 in./DN 100	*Hastelloy* C276	2 in./50 mm
D4	4 in./DN 100	*Hastelloy* C276	4 in./100 mm
D6	4 in./DN 100	*Hastelloy* C276	6 in./150 mm
E0	3 in./DN 80	Tantalum	Flush Mount Only
F0	4 in./DN 100	Tantalum	Flush Mount Only

TABLE 13. 3051L Flange-Mounted Liquid Level Transmitter

Code	Mounting Flange		
	Size	**ASME B 16.5 (ANSI) or DIN Flange Rating**	**Material**
M	2 in.	Class 150	CS
A	3 in.	Class 150	CS
B	4 in.	Class 150	CS
N	2 in.	Class 300	CS
C	3 in.	Class 300	CS
D	4 in.	Class 300	CS
P	2 in.	Class 600	CS
E	3 in.	Class 600	CS
X	2 in.	Class 150	SST
F	3 in.	Class 150	SST
G	4 in.	Class 150	SST
Y	2 in.	Class 300	SST
H	3 in.	Class 300	SST
J	4 in.	Class 300	SST
Z	2 in.	Class 600	SST
L	3 in.	Class 600	SST
Q	DN 50	PN 10-40	CS
R	DN 80	PN 40	CS
S	DN 100	PN 40	CS
V	DN 100	PN 10/16	CS
K	DN 50	PN 10-40	SST
T	DN 80	PN 40	SST
U	DN 100	PN 40	SST
W	DN 100	PN 10/16	SST

Code	Process Fill-High Pressure Side	Temperature Limits
A	*Syltherm* XLT	–100 to 300 °F (–73 to 135 °C)
C	*D. C. Silicone 704*	60 to 400 °F (15 to 205 °C)
D	*D. C. Silicone 200*	–40 to 400 °F (–40 to 205 °C)
H	Inert (Halocarbon)	–50 to 350 °F (–45 to 177 °C)
G	Glycerine and Water	0 to 200 °F (–17 to 93 °C)
N	*Neobee M-20*	0 to 400 °F (–17 to 205 °C)
P	Propylene Glycol and Water	0 to 200 °F (–17 to 93 °C)

Low Pressure Side

Code	Configuration	Flange Adapter	Diaphragm Material	Sensor Fill Fluid
11	Gage	SST	316L SST	Silicone
21	Differential	SST	316L SST	Silicone
22	Differential	SST	*Hastelloy* C276	Silicone
2A	Differential	SST	316L SST	Inert (Halocarbon)
2B	Differential	SST	*Hastelloy* C276	Inert (Halocarbon)
31	Remote Seal	SST	316L SST	Silicone *(Requires Option Code S1)*

Code	O-ring Material
A	Glass-filled PTFE

TABLE 13. 3051L Flange-Mounted Liquid Level Transmitter

Code	Housing Material	Conduit Entry Size
A	Polyurethane-covered Aluminum	½–14 NPT
B	Polyurethane-covered Aluminum	M20 × 1.5 (CM20)
C	Polyurethane-covered Aluminum	PG 13.5
D	Polyurethane-covered Aluminum	G½
J	SST	½–14 NPT
K	SST	M20 × 1.5 (CM20)
L	SST	PG 13.5
M	SST	G½
Code	***PlantWeb* Functionality (Optional)**	
A01	Advanced Control Function Block Suite	
D01	*FOUNDATION* fieldbus Diagnostics Suite	
Code	**Diaphragm Seal Assemblies (Optional)**	
S1[1]	One Diaphragm Seal *(requires low pressure side Option Code 31 capillary connection type)*	
Code	**Hazardous Locations Certification Options**	
E5	FM Explosion-proof Approval	
I5	FM Non-incendive and Intrinsic Safety Approval	
IE	FM FISCO Intrinsically Safe; for FOUNDATION fieldbus protocol only	
K5	FM Explosion-proof and Intrinsic Safety Approval	
I1[2]	ATEX Intrinsic Safety and Dust Certification	
N1[2]	ATEX Type N and Dust Certification	
E8	ATEX Flame-proof and Dust Certification	
E4[2]	TIIS Flame-proof Certification	
C6	CSA Explosion-proof and Intrinsic Safety Approval	
K6[2]	CSA and ATEX Explosion-proof and Intrinsic Safety Approval (combination of C6 and K8)	
KB	FM and CSA Explosion-proof and Intrinsic Safety Approvals (combination of K5 and C6)	
K7	SAA Flame-proof and Intrinsic Safety Approvals (combination of I7, N7, and E7)	
K8[2]	ATEX Flame-proof and Intrinsic Safety Approvals (combination of I1 and E8)	
KD[2]	CSA, FM, and ATEX Explosion-proof and Intrinsic Safety Approval (combination of K5, C6, I1, and E8)	
I7	SAA Intrinsic Safety Certification	
E7	SAA Flame-proof Certification	
N7	SAA Type N Certification	
IA	ATEX Intrinsic Safety for FISCO; for *FOUNDATION* fieldbus protocol only	
Code	**Bolt for Flange and Adapters (Optional)**	
L5	ASTM A 193, Grade B7M Bolts	
Code	**Display Options**	
M5	LCD display for Aluminum Housing *(Available with Housing codes A, B, C, and D only)*	
M6	LCD display for SST Housing *(Available with Housing codes J, K, L, and M only)*	

TABLE 13. 3051L Flange-Mounted Liquid Level Transmitter

Code	Other Options
Q4	Calibration Data Sheet
Q8	Material Traceability Certification per EN 10204 3.1.B (*Available with the diaphragm, upper housing, Coplanar flange, adapter, sensor module housing, lower housing/flushing connection, and extension)*
QZ	Remote Seal System Performance Calculation Report
QP	Calibration certification and tamper evident seal
J1(3)(4)	Local Zero Adjustment Only
J3(3)(4)	No Local Zero or Span Adjustment
T1	Transient Protection Terminal Block
C1(3)	Custom Software Configuration (*Completed CDS 00806-0100-4001 required with order)*
C2(3)	0.8–3.2 V dc Output with Digital Signal Based on *HART* Protocol *(Available with Output code M only)*
C4(3)(5)	Analog Output Levels Compliant with NAMUR Recommendation NE 43
CN(3)(5)	Analog Output Levels Compliant with NAMUR Recommendation NE 43: Alarm Configuration–Low
D8	Ceramic Ball Drain/Vents
V5(6)	External Ground Screw Assembly

Code	Lower Housing Flushing Connections Options					
	Ring Material	**Number**	**Size**	**2 in.**	**3 in.**	**4 in.**
F1	SST	1	1/4	•	•	•
F2	SST	2	1/4	•	•	•
F3(7)	*Hastelloy* C276	1	1/4	•	•	•
F4(7)	*Hastelloy* C276	2	1/4	•	•	•
F7	SST	1	1/2	•	•	•
F8	SST	2	1/2	•	•	•
F9	*Hastelloy* C276	1	1/2	•	•	•
F0	*Hastelloy* C276	2	1/2	•	•	•

Typical Model Number: 3051L 2 A A0 D 21 A A F1

(1) "Assemble-to" items are specified separately and require a completed model number.

(2) Not available with low-power Option Code M

(3) Not available with fieldbus (output code F) or profibus protocols (output code W).

(4) Local zero and span adjustments are standard unless Option Code J1 or J3 is specified.

(5) NAMUR-Compliant operation is pre-set at the factory and cannot be changed to standard operation in the field.

(6) The V5 option is not needed with the T1 option; external ground screw assembly is included with the T1 option.

(7) Not available with Option Codes A0, B0, and G0.

TABLE 14. 3051H Pressure Transmitter for High-Temperature Processes — = Not Applicable • = Applicable

Model	Transmitter Type (Select One)	HD	HG
3051HD	Differential Pressure Transmitter for High-Temperature Processes	•	—
3051HG	Gage Pressure Transmitter for High-Temperature Processes	—	•

Code	Pressure Ranges (Range/ Min. Span)	
	3051HD	**3051HG**
2	–250 to 250 inH_2O/2.5 inH_2O (–0,62 to 0,62 bar/6,2 mbar)	–250 to 250 inH_2O/2.5 inH_2O (–0,62 to 0,62 bar/6,2 mbar)
3	–1000 to 1000 inH_2O/10 inH_2O (–2,5 to 2,5 bar/25 mbar)	–407 to 1000 inH_2O/10in H_2O (–1,01 to 2,5 bar/25 mbar)
4	–300 to 300 inH_2O/3 psi (–747 to 747 mbar/0,2 bar)	–14.7 to 300 psi/3 psi (–1,01 to 20,7 bar/0,2 bar)
5	–2000 to 2000 psi/20 psi (–138 to 138 bar/1,4 bar)	–14.7 to 2000 psig/20 psi (–1,01 to 138 bar/1,4 bar)

NOTE: 3051HG lower range limit varies with atmospheric pressure.

Code	Output	HD	HG
A	4–20 mA with Digital Signal Based on *HART* Protocol	•	•
M	Low-Power 1–5 V dc with Digital Signal Based on *HART* Protocol (See Option Code C2 for 0.8–3.2 V dc Output) *(Not available with hazardous certification Option Codes I1, N1, E4, K6, and K8)*	•	•
F	*FOUNDATION* fieldbus Protocol	•	•
W	Profibus – PA	•	•

Code	Process Connection		HD	HG
	Process Flange Material	**Drain/Vent**		
2	SST	SST	•	•
7(1)	SST	*Hastelloy* C276	•	•

Code	Process Isolating Diaphragm	HD	HG
2	316L SST	•	•
3(1)	*Hastelloy* C276	•	•
5	Tantalum	•	•

Code	O-ring Material	HD	HG
A	Glass-Filled PTFE	•	•

Code	Process Fill Fluid	HD	HG
D	*D.C. 200* Silicone	•	•
H	Inert	•	•
N	*Neobee M-20*	•	•

Code	Sensor Module Isolator Material	HD	HG
2	SST	•	•

Code	Sensor Module Fill Fluid	HD	HG
1	Silicone	•	•
2	Inert (Halocarbon)	•	•

Code	Housing Material	Conduit Entry Size	HD	HG
A	Polyurethane-covered Aluminum	½–14 NPT	•	•
B	Polyurethane-covered Aluminum	M20 × 1.5 (CM20)	•	•
C	Polyurethane-covered Aluminum	PG 13.5	•	•
D	Polyurethane-covered Aluminum	G½	•	•
J	SST	½–14 NPT	•	•
K	SST	M20 × 1.5 (CM20)	•	•
L	SST	PG 13.5	•	•
M	SST	G½	•	•

Code	*PlantWeb* Functionality (Optional)
A01	Advanced Control Function Block Suite
D01	*FOUNDATION* fieldbus Diagnostics Suite

Code	Integral Mount Primary Elements (Optional)	HD	HG
S4(2)	Factory Assembly to Rosemount Primary Element (Rosemount *Annubar* or Rosemount 1195 Integral Orifice) *(With the primary element installed, the maximum operating pressure will equal the lesser of either the transmitter or the primary element. Option is available for factory assembly to range 1–4 transmitters only)*	•	—

TABLE 14. 3051H Pressure Transmitter for High-Temperature Processes — = Not Applicable • = Applicable

Code	Mounting Bracket Options	HD	HG
B5	Universal Mounting Bracket for 2-in. Pipe or Panel Mount, CS Bolts	•	•
B6	Universal Mounting Bracket for 2-in. Pipe or Panel Mount, SST Bolts	•	•
Code	**Hazardous Locations Certification Options**	**HD**	**HG**
E5	FM Explosion-proof Approval	•	•
I5	FM Non-incendive and Intrinsic Safety Approval	•	•
K5	FM Explosion-proof and Intrinsic Safety Approval	•	•
I1(3)	ATEX Intrinsic Safety and Dust Certification	•	•
N1(3)	ATEX Type N and Dust Certification	•	•
E8	ATEX Flame-proof and Dust Certification	•	•
E4(3)	TIIS Flame-proof Certification	•	•
C6	CSA Explosion-proof and Intrinsic Safety Approval	•	•
K6(3)	CSA and ATEX Explosion-proof and Intrinsic Safety Approval (combination of C6 and K8)	•	•
KB	FM and CSA Explosion-proof and Intrinsic Safety Approvals (combination of K5 and C6)	•	•
K7	SAA Flame-proof and Intrinsic Safety Approvals (combination of I7, N7, and E7)	•	•
KB(3)	ATEX Flame-proof and Intrinsic Safety Approvals (combination of I1 and E8)	•	•
KD(3)	CSA, FM, and ATEX Explosion-proof and Intrinsic Safety Approval (combination of K5, C6, I1, and E8)	•	•
I7	SAA Intrinsic Safety Certification	•	•
E7	SAA Flame-proof Certification	•	•
N7	SAA Type N Certification	•	•
IA	ATEX Intrinsic Safety for FISCO; for *FOUNDATION* fieldbus protocol only	•	•
IE	FM FISCO Intrinsic Safety; for *FOUNDATION* fieldbus protocol only	•	•
Code	**Bolt for Flange and Adapter Options**	**HD**	**HG**
L4	Austenitic 316 SST Bolts	•	•
Code	**Display Options**	**HD**	**HG**
M5	LCD display for Aluminum Housing *(Available with Housing codes A, B, C, and D only)*	•	•
M6	LCD display for SST Housing *(Available with Housing codes J, K, L, and M only)*	•	•
Code	**Other Options**	**HD**	**HG**
Q4	Calibration Data Sheet	•	•
Q8	Material traceability certification per EN 10204 3.1.B	•	•
QP	Calibration certification and tamper evident seal	•	•
J1(4)	Local Zero Adjustment Only *(Local zero and span adjustments are standard unless Option Code J1 or J3 is specified.)*	•	•
J3(4)	No Local Zero or Span Adjustment *(Local zero and span adjustments are standard unless Option Code J1 or J3 is specified)*	•	•
T1	Transient Protection Terminal Block	•	•
C1(4)	Custom Software Configuration (Completed CDS 00806-0100-4001 required with order)	•	•
C2(4)	0.8–3.2 V dc Output with Digital Signal Based on *HART* Protocol *(Output Code M only)*	•	•
C4(4)(5)	Analog Output Levels Compliant with NAMUR Recommendation NE 43	•	•
CN(4)(5)	Analog Output Levels Compliant with NAMUR Recommendation NE 43: Alarm Configuration–Low	•	•
P1	Hydrostatic Testing with Certificate	•	•
P2	Cleaning for Special Service	•	•
P3	Cleaning for <1 PPM Chlorine/Fluorine	•	•
DF	1/2–14 NPT flange adapters—SST	•	•
D8	Ceramic Ball Drain/Vents	•	•
V5(6)	External Ground Screw Assembly	•	•
Typical Model Number: 3051HG 2 A 2 2 A H 2 1 A B5			

(1) Materials of Construction comply with recommendations per NACE MR0175/ISO 15156 for sour oil field production environments. Environmental limits apply to certain materials. Consult latest standard for details. Selected materials also conform to NACE MR0103 for sour refining environments.

(2) "Assemble-to" items are specified separately and require a completed model number.

(3) Not available with low-power Option Code M.

(4) Not available with fieldbus (output code F) or profibus protocols (output code W).

(5) NAMUR-Compliant operation is pre-set at the factory and cannot be changed to standard operation in the field.

(6) The V5 option is not needed with the T1 option; external ground screw assembly is included with the T1 option.

OPTIONS

Standard Configuration

Unless otherwise specified, transmitter is shipped as follows:

ENGINEERING UNITS	
***Differential/Gage*:**	inH_2O (Range 0, 1, 2, and 3) psi (Range 4 and 5)
***Absolute/3051T*:**	psi (all ranges)
4 mA (1 V dc)[1]:	0 (engineering units above)
20 mA (5 V dc):	Upper range limit
Output:	Linear
Flange type:	Specified model code option
Flange material:	Specified model code option
O-ring material:	Specified model code option
Drain/vent:	Specified model code option
Integral meter:	Installed or none
Alarm[1]:	Upscale
Software tag:	(Blank)

(1) Not applicable to fieldbus.

Custom Configuration *HART* protocol only[1]

If Option Code C1 is ordered, the customer may specify the following data in addition to the standard configuration parameters.

- Output Information
- Transmitter Information
- LCD display Configuration
- Hardware Selectable Information
- Signal Selection

Refer to the “HART Protocol C1 Option Configuration Data Sheet” document number 00806-0100-4001.

Tagging (3 options available)

- Standard SST hardware tag is wired to the transmitter. Tag character height is 0.125 in. (3,18 mm), 56 characters maximum.
- Tag may be permanently stamped on transmitter nameplate upon request, 56 characters maximum.
- Tag may be stored in transmitter memory (30 characters maximum). Software tag is left blank unless specified.

Commissioning tag (fieldbus only)

A temporary commissioning tag is attached to all transmitters. The tag indicates the device ID and allows an area for writing the location.

Optional Rosemount 304, 305 or 306 Integral Manifolds

Factory assembled to 3051C and 3051T transmitters. Refer to the following Product Data Sheet (document number 00813-0100-4839 for Rosemount 304 and 00813-0100-4733 for Rosemount 305 and 306) for additional information.

(1) Not applicable to fieldbus.

Optional Diaphragm and Sanitary Seals

Refer to Product Data Sheet 00813-0100-4016 or 00813-0201-4016. for additional information.

Output Information[1]

Output range points must be the same unit of measure. Available units of measure include:

inH2O	inH2O@4 °C[1]	psi	Pa
inHg	ftH2O	bar	kPa
mmH2O	mmH2O@4 °C[1]	mbar	torr
mmHg	g/cm2	kg/cm2	atm

(1) Not available on low power or previous versions.

LCD display

M5 Digital Display, 5-Digit, 2-Line LCD

- Direct reading of digital data for higher accuracy
- Displays user-defined flow, level, volume, or pressure units
- Displays diagnostic messages for local troubleshooting
- 90-degree rotation capability for easy viewing

M6 Digital Display with 316 Stainless Steel Cover

- For use with stainless steel housing option (housing codes J, K, and L)

Local Span and Zero Adjustment[2]

Transmitters ship with local span and zero adjustments standard unless otherwise specified.

- Non-interactive external zero and span adjustments ease calibration
- Magnetic switches replace standard potentiometer adjustments to optimize performance

J1 Local Zero Adjustment Only[1]

J3 No Local Zero or Span Adjustment[1]

Transient Protection

T1 Integral Transient Protection Terminal Block

- Integral transient protection terminal block
- Meets IEEE Standard 587, Category B
  1 kV crest (10 × 1 000 microseconds)
  3 kV crest (8 × 20 microseconds)
  6 kV crest (1.2 × 50 microseconds)
- Meets IEEE Standard 472,
  Surge Withstand Capability
  SWC 2,5 kV crest, 1 MHz wave form
- Applicable standards: IEC 801-4, 801-5

Bolts for Flanges and Adapters

- Options permit bolts for flanges and adapters to be obtained in various materials
- Standard material is plated carbon steel per ASTM A449, Type 1

L4 Austenitic 316 Stainless Steel Bolts

L5 ASTM A 193, Grade B7M Bolts

L6 *Monel* Bolts

(2) Not applicable to fieldbus.

Rosemount 3051C *Coplanar* Flange and 3051T Bracket Option

B4 Bracket for 2-in. Pipe or Panel Mounting

- For use with the standard *Coplanar* flange configuration
- Bracket for mounting of transmitter on 2-in. pipe or panel
- Stainless steel construction with stainless steel bolts

Rosemount 3051H Bracket Options

B5 Bracket for 2-in. Pipe or Panel Mounting

- For use with the 3051H Pressure Transmitter for high process temperatures
- Carbon steel construction with carbon steel bolts

B6 B5 Bracket with SST Bolts

- Same bracket as the B5 option with Series 300 stainless steel bolts.

Traditional Flange Bracket Options

B1 Bracket for 2-in. Pipe Mounting

- For use with the traditional flange option
- Bracket for mounting on 2-in. pipe
- Carbon steel construction with carbon steel bolts
- Coated with polyurethane paint

B2 Bracket for Panel Mounting

- For use with the traditional flange option
- Bracket for mounting transmitter on wall or panel
- Carbon steel construction with carbon steel bolts
- Coated with polyurethane paint

B3 Flat Bracket for 2-in. Pipe Mounting

- For use with the traditional flange option
- Bracket for vertical mounting of transmitter on 2-in. pipe
- Carbon steel construction with carbon steel bolts
- Coated with polyurethane paint

B7 B1 Bracket with SST Bolts

- Same bracket as the B1 option with Series 300 stainless steel bolts

B8 B2 Bracket with SST Bolts

- Same bracket as the B2 option with Series 300 stainless steel bolts

B9 B3 Bracket with SST Bolts

- Same bracket as the B3 option with Series 300 stainless steel bolts

BA Stainless Steel B1 Bracket with SST Bolts

- B1 bracket in stainless steel with Series 300 stainless steel bolts

BC Stainless Steel B3 Bracket with SST Bolts

- B3 bracket in stainless steel with Series 300 stainless steel bolts

Shipping Weights

TABLE 15. Transmitter Weights without Options

Transmitter	Add Weight In lb (kg)
3051C	6.0 (2,7)
3051L	Table 16 on page 38
3051H	13.6 (6,2)
3051T	3.0 (1,4)

TABLE 16. 3051L Weights without Options

Flange	Flush lb. (kg)	2-in. Ext. lb (kg)	4-in. Ext. lb (kg)	6-in. Ext. lb (kg)
2-in., 150	12.5 (5,7)	—	—	—
3-in., 150	17.5 (7,9)	19.5 (8,8)	20.5 (9,3)	21.5 (9,7)
4-in., 150	23.5 (10,7)	26.5 (12,0)	28.5 (12,9)	30.5 (13,8)
2-in., 300	17.5 (7,9)	—	—	—
3-in., 300	22.5 (10,2)	24.5 (11,1)	25.5 (11,6)	26.5 (12,0)
4-in., 300	32.5 (14,7)	35.5 (16,1)	37.5 (17,0)	39.5 (17,9)
2-in., 600	15.3 (6,9)	—	—	—
3-in., 600	25.2 (11,4)	27.2 (12,3)	28.2 (12,8)	29.2 (13,2)
DN 50/PN 40	13.8 (6,2)	—	—	—
DN 80/PN 40	19.5 (8,8)	21.5 (9,7)	22.5 (10,2)	23.5 (10,6)
DN 100/ PN 10/16	17.8 (8,1)	19.8 (9,0)	20.8 (9,5)	21.8 (9,9)
DN 100/ PN 40	23.2 (10,5)	25.2 (11,5)	26.2 (11,9)	27.2 (12,3)

TABLE 17. Transmitter Options Weights

Code	Option	Add lb (kg)
J, K, L, M	Stainless Steel Housing(T)	3.9 (1,8)
J, K, L, M	Stainless Steel Housing (C, L, H, P)	3.1 (1,4)
M5	LCD display for Aluminum Housing	0.5 (0,2)
M6	LCD display for SST Housing	1.25 (0,6)
B4	SST Mounting Bracket for *Coplanar* Flange	1.0 (0,5)
B1 B2 B3	Mounting Bracket for Traditional Flange	2.3 (1,0)
B7 B8 B9	Mounting Bracket for Traditional Flange	2.3 (1,0)
BA, BC	SST Bracket for Traditional Flange	2.3 (1,0)
B5 B6	Mounting Bracket for 3051H	2.9 (1,3)
H2	Traditional Flange	2.4 (1,1)
H3	Traditional Flange	2.7 (1,2)
H4	Traditional Flange	2.6 (1,2)
H7	Traditional Flange	2.5 (1,1)
FC	Level Flange—3 in., 150	10.8 (4,9)
FD	Level Flange—3 in., 300	14.3 (6,5)
FA	Level Flange—2 in., 150	10.7 (4,8)
FB	Level Flange—2 in., 300	14.0 (6,3)
FP	DIN Level Flange, SST, DN 50, PN 40	8.3 (3,8)
FQ	DIN Level Flange, SST, DN 80, PN 40	13.7 (6,2)

3051C Differential/Gage Pressure Transmitter Range Limits										
	Range 1 Span		Range 2 Span		Range 3 Span		Range 4 Span		Range 5 Span	
Units	min	max	min	max	min	max	min	max	min	max
inH_2O	0.5	25	2.5	250	10	1000	83.040	8304	553.60	55360
inHg	0.03678	1.8389	0.18389	18.389	0.73559	73.559	6.1081	610.81	40.720	4072.04
ftH_2O	0.04167	2.08333	0.20833	20.8333	0.83333	83.3333	6.9198	691.997	46.13	4613.31
mmH_2O	12.7	635.5	63.553	6355	254	25421	2110.95	211095	14073	1407301
mmHg	0.93416	46.7082	4.67082	467.082	18.6833	1868.33	155.145	15514.5	1034.3	103430
psi	0.01806	0.903	0.0902	9.03183	0.36127	36.127	3	300	20	2000
bar	0.00125	0.06227	0.00623	0.62272	0.02491	2.491	0.20684	20.6843	1.37895	137.895
mbar	1.2454	62.2723	6.22723	622.723	24.9089	2490.89	206.843	20684.3	1378.95	137895
g/cm^2	1.26775	63.3875	6.33875	633.875	25.355	2535.45	210.547	21054.7	1406.14	140614
kg/cm^2	0.00127	0.0635	0.00635	0.635	0.0254	2.54	0.21092	21.0921	1.40614	140.614
Pa	124.545	6227.23	622.723	62160.6	2490.89	249089	20684.3	2068430	137895	13789500
kPa	0.12545	6.2272	0.62272	62.2723	2.49089	249.089	20.6843	2068.43	137.895	13789.5
torr	0.93416	46.7082	4.67082	467.082	18.6833	1868.33	155.145	15514.5	1034.3	103430
atm	0.00123	0.06146	0.00615	0.61460	0.02458	2.458	0.20414	20.4138	1.36092	136.092

When using a HART communicator, ±5% adjustment is allowed on the sensor limit to allow for unit conversions.

3051L/3051H Pressure Transmitter Range Limits								
	Range 2 Span		Range 3 Span		Range 4 Span		Range 5 Span	
Units	min	max	min	max	min	max	min	max
inH_2O	2.5	250	10	1000	83.040	8304	553.60	55360
inHg	0.18389	18.389	0.73559	73.559	6.1081	610.81	40.720	4072.04
ftH_2O	0.20833	20.8333	0.83333	83.3333	6.9198	691.997	46.13	4613.31
mmH_2O	63.553	6355	254	25421	2110.95	211095	14073	1407301
mmHg	4.67082	467.082	18.6833	1868.33	155.145	15514.5	1034.3	103430
psi	0.0902	9.03183	0.36127	36.127	3	300	20	2000
bar	0.00623	0.62272	0.02491	2.491	0.20684	20.6843	1.37895	137.895
mbar	6.22723	622.723	24.9089	2490.89	206.843	20684.3	1378.95	137895
g/cm^2	6.33875	633.875	25.355	2535.45	210.547	21054.7	1406.14	140614
kg/cm^2	0.00635	0.635	0.0254	2.54	0.21092	21.0921	1.40614	140.614
Pa	622.723	62160.6	2490.89	249089	20684.3	2068430	137895	13789500
kPa	0.62272	62.2723	2.49089	249.089	20.6843	2068.43	137.895	13789.5
torr	4.67082	467.082	18.6833	1868.33	155.145	15514.5	1034.3	103430
atm	0.00615	0.61460	0.02458	2.458	0.20414	20.4138	1.36092	136.092

When using a HART communicator, ±5% adjustment is allowed on the sensor limit to allow for unit conversions.

3051T Gage and Absolute Pressure Transmitter Range Limits										
	Range 1 Span		Range 2 Span		Range 3 Span		Range 4 Span		Range 5 Span	
Units	min	max	min	max	min	max	min	max	min	max
inH_2O	8.30397	831.889	41.5198	4159.45	221.439	22143.9	1107.2	110720	55360	276799
inHg	0.61081	61.0807	3.05403	305.403	16.2882	1628.82	81.441	8144.098	4072.04	20360.2
ftH_2O	0.69199	69.3241	3.45998	345.998	18.4533	1845.33	92.2663	9226.63	4613.31	23066.6
mmH_2O	211.10	21130	1054.60	105460.3	5634.66	563466	28146.1	2814613	1407301	7036507
mmHg	15.5145	1551.45	77.5723	7757.23	413.72	41372	2068.6	206860.0	103430	517151
psi	0.3	30	1.5	150	8	800	40	4000	2000	10000
bar	0.02068	3.06843	0.10342	10.3421	0.55158	55.1581	2.75791	275.7905	137.895	689.476
mbar	20.6843	2068.43	103.421	10342.11	551.581	55158.1	2757.91	275790.5	137895	689476
g/cm^2	21.0921	2109.21	105.461	10546.1	561.459	56145.9	2807.31	280730.6	140614	703067
kg/cm^2	0.02109	2.10921	0.10546	10.5461	0.56246	56.2456	2.81228	281.228	140.614	701.82
Pa	2068.43	206843	10342.1	1034212	55158.1	5515811	275791	27579054	13789500	68947600
kPa	2.06843	206.843	10.3421	1034.21	55.1581	5515.81	275.791	27579.05	13789.5	68947.6
torr	15.5145	1551.45	77.5726	7757.26	413.721	413721	2068.6	206859.7	103430	517151
atm	0.02041	2.04138	0.10207	10.2069	0.54437	54.4368	2.72184	272.1841	136.092	680.46

When using a HART communicator, ±5% adjustment is allowed on the sensor limit to allow for unit conversions.

3051C Absolute Pressure Transmitter Range Limits								
	Range 1 Span		Range 2 Span		Range 3 Span		Range 4 Span	
Units	min	max	min	max	min	max	min	max
inH_2O	8.30397	831.889	41.5198	4151.98	221.439	22143.9	1107.2	110720
inHg	0.61081	61.0807	3.05403	305.403	16.2882	1628.82	81.441	8144.098
ftH_2O	0.69199	69.3241	3.45998	345.998	18.4533	1845.33	92.2663	9226.63
mmH_2O	211.10	21130	6.35308	635.308	5634.66	563466	28146.1	2814613
mmHg	15.5145	1551.45	1055.47	105547	413.72	41372	2068.6	206860.0
psi	0.3	30	1.5	150	8	800	40	4000
bar	0.02068	2.06843	0.10342	10.342	0.55158	55.1581	2.75791	275.7905
mbar	20.6843	2068.43	103.421	10342.1	551.581	55158.1	2757.91	275790.5
g/cm^2	21.0921	2109.21	105.27	105.27	561.459	56145.9	2807.31	280730.6
kg/cm^2	0.02109	2.10921	0.10546	10.546	0.56246	56.2456	2.81228	281.228
Pa	2068.43	206843	10342.1	1034210	55158.1	5515811	275791	27579054
kPa	2.06843	206.843	10.3421	1034.21	55.1581	5515.81	275.791	27579.05
torr	15.5145	1551.45	77.5726	7757.26	413.721	413721	2068.6	206859.7
atm	0.02041	2.04138	0.10207	10.207	0.54437	54.4368	2.72184	272.1841

When using a HART communicator, ±5% adjustment is allowed on the sensor limit to allow for unit conversions.

HART Protocol C1 Option Configuration Data Sheet

★ = Default Value(1)

CONFIGURATION DATA SHEET

Customer: _____ P.O. No.: _____

Model No.: _____ Line Item: _____

SST Tag No.: _____

Software Tag: |__|__|__|__|__|__|__|__|

OUTPUT INFORMATION: (Software Selectable)

4 mA (1, 0.8 Volts) = _____ 0 ★

20 mA (5, 3.2 Volts) = _____ Upper Range Limit ★

Pressure Units =	☐ inH_2O(2)★	☐ psi (3) ★	☐ Pa	☐ ftH_2O
	☐ inHg	☐ bar	☐ kPa	☐ g/cm^2
	☐ mbar	☐ Torr	☐ mmH_2O	☐ inH_2O at 4 °C(5)
	☐ Atm	☐ kg/cm^2	☐ mmHg	☐ mmH_2O at 4 °C (5)

Output = ☐ Linear ★ ☐ Square Root (For DP transmitters only)

Damping(4)=	☐ 0.00 sec.	☐ 0.05 sec.	☐ 0.10 sec.	☐ 0.20 sec.	☐ 0.40 sec.★
	☐ 0.80 sec.	☐ 1.60 sec.	☐ 3.20 sec.	☐ 12.8 sec.	☐ 25.6 sec.

TRANSMITTER INFORMATION: (Software Selectable)

Descriptor(4): |__|__|__|__|__|__|__|__|__|__|__|__|__|__|__|__|(16 characters)

Message(4): |__|__|__|__|__|__|__|__|__|__|__|__|__|__|__|__|__|__|__|__|__|__|__|__|__|__|__|__|__|__|__|__|__|__|__|__|__|__|
(32 characters)

Date(4): ☐ ☐/☐ ☐ ☐/☐ ☐
Day Month Year

Local Span and Zero: ☐ Enabled ★ ☐ Disabled

(1) Default values may be different outside the U.S. A. Consult an Emerson Process Management Representative for details.

(2) inH20 for CD/CG ranges 1-3

(3) psi for CD/CG range 4 and 5, all CA ranges

(4) C1 option required for configuration of this parameter.

(5) Not available with low power output.

LCD display CONFIGURATION (Software Adjustable – M5 or M6 option must be specified in model number)

Meter Display Type[4]:

- ☐ Eng. Units only
- ☐ % of Range only
- ☐ Custom Display only
- ☐ Alternate Eng. Units &% of Range ★
- ☐ Alternate Eng. Units & Custom Display[5]
- ☐ Alternate % of Range & Custom Display[5]

Custom Display Configuration: (must be filled out if Custom Display is selected as meter type)

Decimal Point Position (fixed)— indicate decimal point location: X□ X□ X★□ X□ X□

Enter Lower Range Value (Decimal point must be in the same position as specified above.)

(circle sign) + – □□□□□□□□ +000.00 ★

Enter Upper Range Value (Decimal point must be in the same position as specified above.)

(circle sign) + – □□□□□□□□ +100.00 ★

Custom Units—spaces consume A-Z, 0-9, /, ★, %, blank

□□□□□ %RNGE ★

Custom Display Transfer Function (Independent of Analog Output)

☐ Linear ★ ☐ Square Root

HARDWARE SELECTABLE INFORMATION

Alarm Option: ☐ High ☐ Low

Transmitter Security: ☐ Off ☐ On

Note: Specify C4 Option in model structure when ordering NAMUR-compliant alarm and saturation limits.[5]

SIGNAL SELECTION: (Software Selectable)

☐ 4–20 mA with simultaneous digital signal based on *HART* protocol★

☐ Burst mode of *HART* digital process variable [4]

Burst mode output options:

- ☐ Primary variable in engineering units
- ☐ Primary variable in percent of range
- ☐ All dynamic variables in engineering units and the primary variable mA value

☐ Multidrop Communication[4][6] Choose transmitter address[7] (1-15): _____

(4) C1 option required for configuration of this parameter.
(5) Not available with low power output.
(6) This option fixes the transmitter analog output at 4mA.
(7) Default address is 1 if multidrop communication is selected.

Rosemount Model 3051 Smart Pressure Transmitters may be protected by one or more of the following U.S. Patent Nos. 4,370,890; 4,466,290; 4,612,812; 4,791,352; 4,798,089; 4,818,994; 4,833,922; 4,866,435; 4,926,340; 4,988,990; and 5,028,746. Mexico Patentado No. 154,961. May depend on model. Other foreign patents issued and pending.

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EMERSON
Process Management

Quick Installation Guide
00825-0100-4001, Rev DB
March 2005

Rosemount 3051 Smart Pressure Transmitter

Start

End

HART FIELD COMMUNICATIONS PROTOCOL

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⚠ IMPORTANT NOTICE

This installation guide provides basic guidelines for Rosemount 3051 transmitters. It does not provide instructions for configuration, diagnostics, maintenance, service, troubleshooting, Explosion-Proof, Flame-Proof, or intrinsically safe (I.S.) installations. Refer to the 3051 reference manual (document number 00809-0100-4001) for more instruction. This manual is also available electronically on www.rosemount.com.

⚠ WARNING

Explosions could result in death or serious injury:

Installation of this transmitter in an explosive environment must be in accordance with the appropriate local, national, and international standards, codes, and practices. Please review the approvals section of the 3051 reference manual for any restrictions associated with a safe installation.

- Before connecting a HART-based communicator in an explosive atmosphere, make sure the instruments in the loop are installed in accordance with intrinsically safe or non-incendive field wiring practices.
- In an Explosion-Proof/Flame-Proof installation, do not remove the transmitter covers when power is applied to the unit.

Process leaks may cause harm or result in death.

- To avoid process leaks, only use the o-ring designed to seal with the corresponding flange adapter.

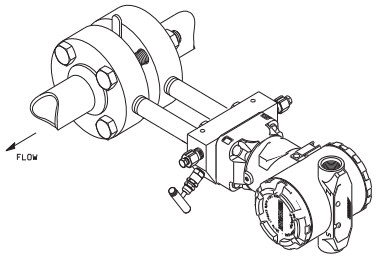
Electrical shock can result in death or serious injury.

- Avoid contact with the leads and the terminals. High voltage that may be present on leads can cause electrical shock.

STEP 1: MOUNT THE TRANSMITTER

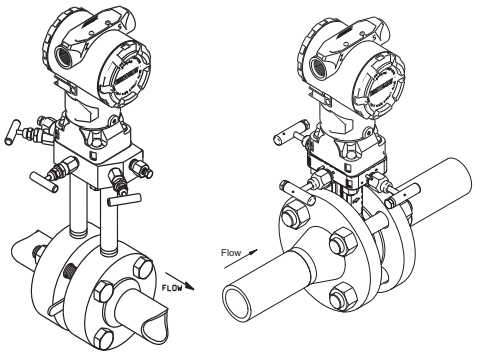
Liquid Flow Applications

1. Place taps to the side of the line.
2. Mount beside or below the taps.
3. Mount the transmitter so that the drain/vent valves are oriented upward.



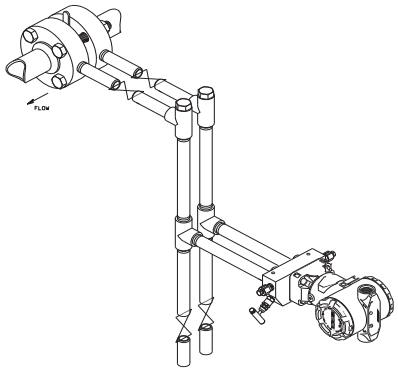
Gas Flow Applications

1. Place taps in the top or side of the line.
2. Mount beside or above the taps.



Steam Flow Applications

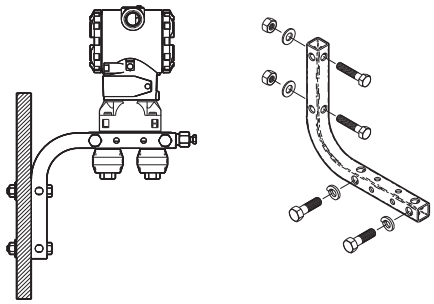
1. Place taps to the side of the line.
2. Mount beside or below the taps.
3. Fill impulse lines with water.

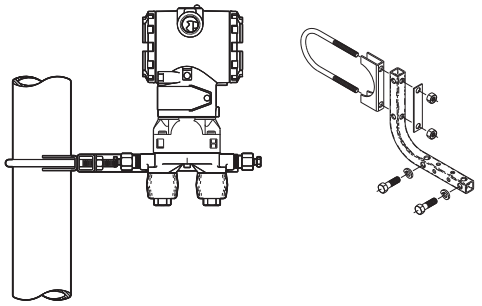


STEP 1 CONTINUED...

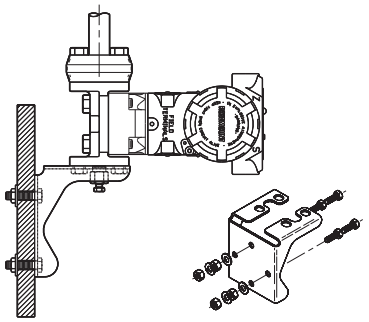
Panel Mount[1]	Pipe Mount

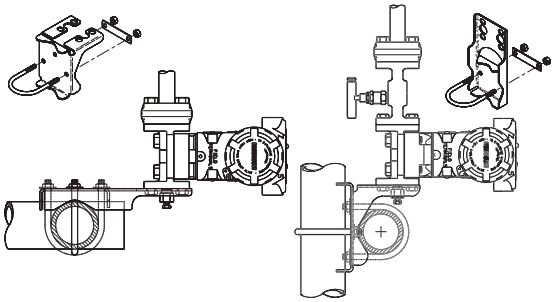
Coplanar Flange



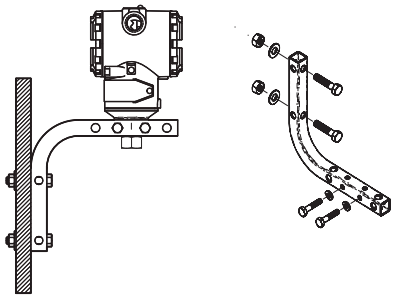


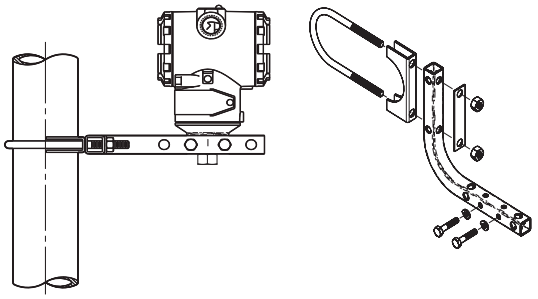
Traditional Flange



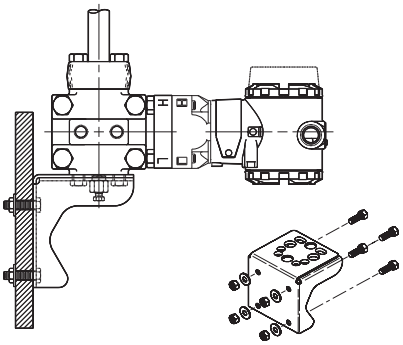


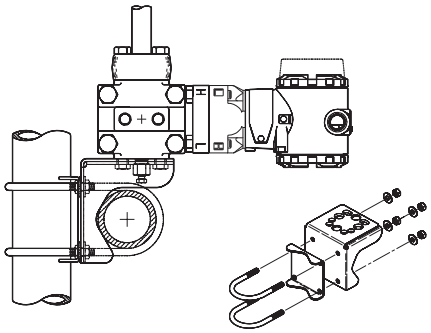
Rosemount 3051T





Rosemount 3051H



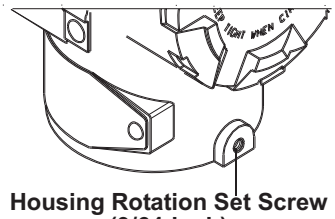


(1) Panel bolts are customer supplied.

STEP 2: CONSIDER HOUSING ROTATION

To improve field access to wiring or to better view the optional LCD display:

1. Loosen the housing rotation set screw.
2. First rotate the housing clockwise to the desired location. If the desired location cannot be achieved due to thread limit, rotate the housing counter clockwise to the desired location (up to 360° from thread limit).
3. Retighten the housing rotation set screw.

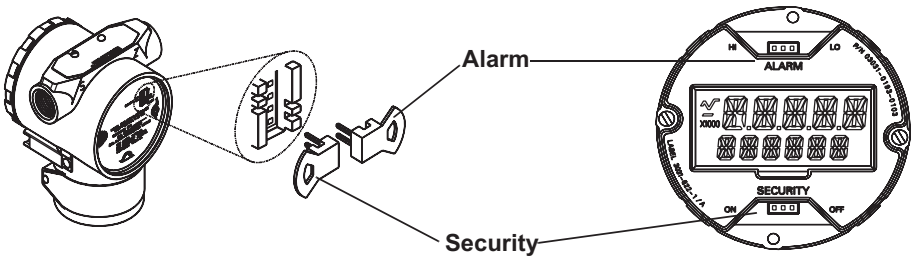


STEP 3: SET THE JUMPERS

If alarm and security jumpers are not installed, the transmitter will operate normally with the default alarm condition alarm *high* and the security *off*.

Figure 1. Transmitter Electronics Board

Without LCD Display	With LCD Display



STEP 4: CONNECT THE WIRING AND POWER UP

Use the following steps to wire the transmitter:

1. Remove the housing cover on the FIELD TERMINALS side.
2. Connect the positive lead to the “+” terminal (PWR/COMM) and the negative lead to the “–” terminal.

NOTE

Do not connect the powered signal wiring to the test terminals. Power could damage the test diode in the test connection. Shielded twisted pair cable should be used for best results. Use 24 AWG or larger wire and do not exceed 5,000 feet (1500 meters).

3. Plug and seal unused conduit connections.
4. If applicable, install wiring with a drip loop. Arrange the drip loop so the bottom is lower than the conduit connections and the transmitter housing.
5. Replace the housing cover.

Figure 2 shows wiring connections necessary to power a 3051 and enable communications with a hand-held HART communicator. For low-power transmitters, refer to the reference manual.

STEP 4 CONTINUED...

Figure 2. Transmitter Wiring Diagrams (4–20 mA)

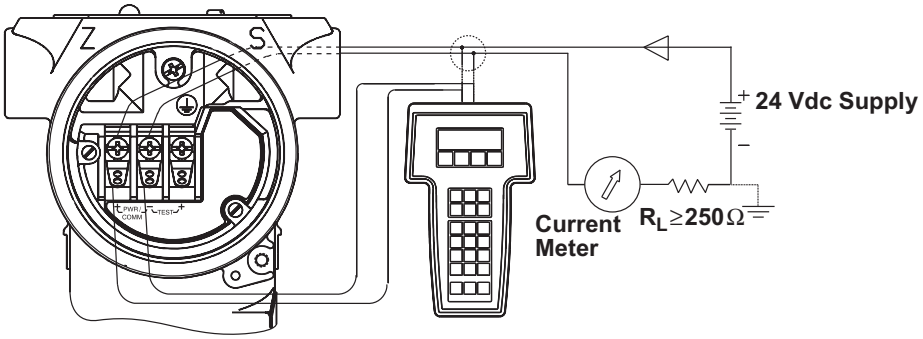
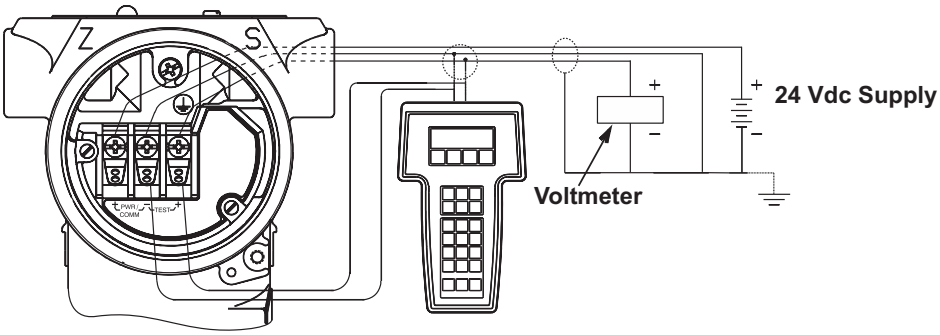


Figure 3. Low Power Transmitter Wiring



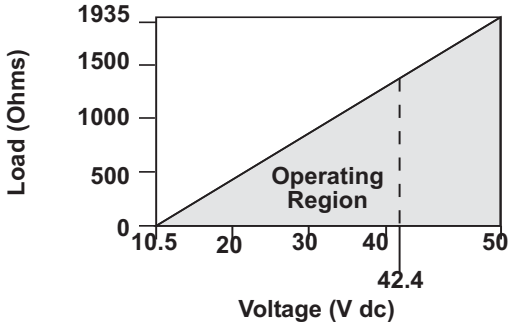
Installation of the transient protection terminal block does not provide transient protection unless the 3051 case is properly grounded.

Power Supply

The dc power supply should provide power with less than two percent ripple. The total resistance load is the sum of the resistance of the signal leads and the load resistance of the controller, indicator, and related pieces. Note that the resistance of intrinsic safety barriers, if used, must be included. Low power transmitters require a 6–12 Vdc external power supply.

Figure 4. Load Limitation

Maximum Loop Resistance = 43.5 (Power Supply Voltage – 10.5)



The HART communicator requires a minimum loop resistance of 250Ω for communication.

STEP 5: VERIFY CONFIGURATION

NOTE:
A check (✓) indicates the basic configuration parameters. At minimum, these parameters should be verified as part of the configuration and startup procedure.

Table 1. HART Communicator Fast Key Sequence

	Function	Fast Key Sequence
✓	Alarm and Saturation Levels	1, 4, 2, 7
	Analog Output Alarm Type	1, 4, 3, 2, 4
	Burst Mode Control	1, 4, 3, 3, 3
	Burst Operation	1, 4, 3, 3, 3
	Custom Meter Configuration	1, 3, 7, 2
	Custom Meter Value	1, 4, 3, 4, 3
✓	Damping	1, 3, 6
	Date	1, 3, 4, 1
	Descriptor	1, 3, 4, 2
	Digital To Analog Trim (4-20 mA Output)	1, 2, 3, 2, 1
	Disable Local Span/Zero Adjustment	1, 4, 4, 1, 7
	Field Device Information	1, 4, 4, 1
	Full Trim	1, 2, 3, 3
	Keypad Input – Rerange	1, 2, 3, 1, 1
	Local Zero and Span Control	1, 4, 4, 1, 7
	Loop Test	1, 2, 2
	Lower Sensor Trim	1, 2, 3, 3, 2
	Message	1, 3, 4, 3
	Meter Options	1, 4, 3, 4
	Number of Requested Preambles	1, 4, 3, 3, 2
	Poll Address	1, 4, 3, 3, 1
	Poll a Multidropped Transmitter	Left Arrow, 4, 1, 1
✓	Range Values	1, 3, 3
	Rerange	1, 2, 3, 1
	Scaled D/A Trim (4–20 mA Output)	1, 2, 3, 2, 2
	Self Test (Transmitter)	1, 2, 1, 1
	Sensor Info	1, 4, 4, 2
	Sensor Temperature	1, 1, 4
	Sensor Trim Points	1, 2, 3, 3, 5
	Status	1, 2, 1, 1
✓	Tag	1, 3, 1
✓	Transfer Function (Setting Output Type)	1, 3, 5
	Transmitter Security (Write Protect)	1, 3, 4, 4
	Trim Analog Output	1, 2, 3, 2
✓	Units (Process Variable)	1, 3, 2
	Upper Sensor Trim	1, 2, 3, 3, 3
	Zero Trim	1, 2, 3, 3, 1

STEP 6: TRIM THE TRANSMITTER

NOTE
Transmitters are shipped fully calibrated per request or by the factory default of full scale (span = upper range limit).

Zero Trim

A zero trim is a single-point adjustment used for compensating mounting position effects. When performing a zero trim, ensure that the equalizing valve is open and all wet legs are filled to the correct level.

If zero offset is less than 3% of true zero, follow the “Using the HART Communicator” instructions below. If zero offset is greater than 3% of true zero, follow the “Using the Transmitter Zero Adjustment Buttons” instructions below.

Using the HART Communicator

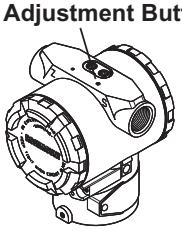
HART Fast Keys	Steps
1, 2, 3, 3, 1	1. Equalize or vent the transmitter and connect HART communicator. 2. At the menu, input the HART Fast Key sequence. 3. Follow the commands to perform a zero trim.

Using the Transmitter Zero Adjustment Buttons

Perform the following steps to perform a rerange using the zero adjustment buttons.

1. Loosen the certifications label screw and rotate the label to expose the zero adjustment buttons.
2. Set the 4 mA point by pressing the zero button for 2 seconds. Verify that the output is 4 mA. A meter will display ZERO PASS.

Zero Adjustment Buttons



SAFETY INSTRUMENTED SYSTEMS

The following section applies to 3051C transmitters used in SIS applications.

Installation

No special installation is required in addition to the standard installation practices outlined in this document. Always ensure a proper seal by installing the electronics housing cover(s) so that metal contacts metal.

The loop must be designed so the terminal voltage does not drop below 10.5 Vdc when the transmitter output is 22.5 mA.

Position the security switch to the “ON” position to prevent accidental or deliberate change of configuration data during normal operation.

Configuration

Use any HART-compliant master to communicate with and verify configuration of the 3051.

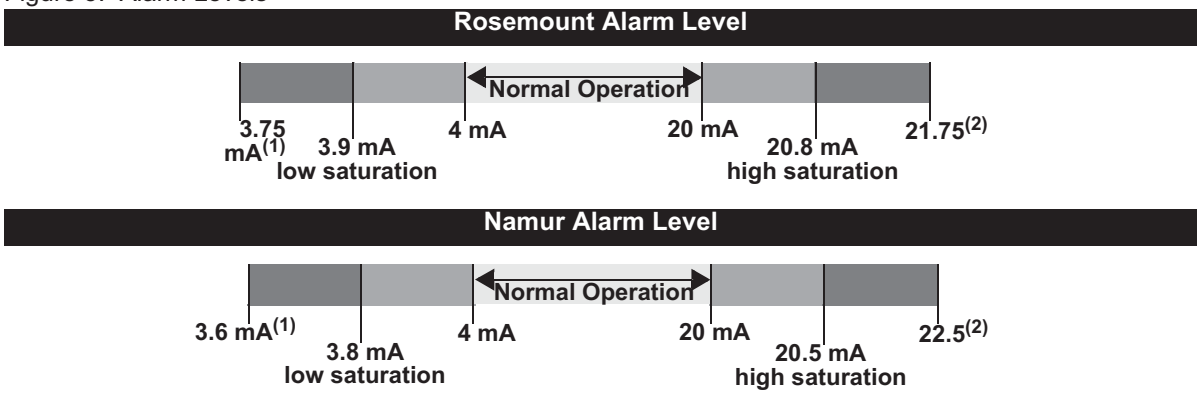
User-selected damping will affect the transmitters ability to respond to changes in the applied process. The *damping value + response time* must not exceed the loop requirements.

NOTES

1. Transmitter output is not safety-rated during the following: configuration changes, multidrop, loop test. Alternative means should be used to ensure process safety during transmitter configuration and maintenance activities.

2. DCS or safety logic solver must be configured to match transmitter configuration. Figure 5 identifies the two alarm level available and their operation values. Position the alarm switch to the required HI or LO alarm position.

Figure 5. Alarm Levels



(1) Transmitter Failure, hardware alarm in LO position.
(2) Transmitter Failure, hardware alarm in HI position.

NOTE

Some detected faults are indicated on the analog output at a level above high alarm regardless of the alarm switch selection.

Operation and Maintenance

Proof Test and Inspection

The following proof tests are recommended. Proof test results and corrective actions taken must be documented at *www.rosemount.com/safety* in the event that an error is found in the safety functionality.

Use "Table 1: HART Communicator Fast Key Sequence" to perform a Loop Test, Analog Output Trim, or Sensor Trim. See the 3051 reference manual (00809-0100-4001) for additional information.

Proof Test 1 (1)

This proof test will detect 59.6% of DU failures not detected by the 3051 automatic diagnostics.

1. Execute the Master Reset command to initiate start-up diagnostics.
2. Enter the milliampere value representing a high alarm state
3. Check the reference meter to verify the mA output corresponds to the entered value.
4. Enter the milliampere value representing a low alarm state
5. Check the reference meter to verify the mA output corresponds to the entered value.

Proof-Test 2 (2)

This proof test, when combined with the Five-year Proof-Test, will detect 94.6% of DU failures not detected by the 3051 automatic diagnostics.

1. Execute the Master Reset command to initiate start-up diagnostics.
2. Perform a minimum two point sensor calibration check using the 4-20mA range points as the calibration points.
3. Check the reference mA meter to verify the mA output corresponds to the pressure input value.
4. If necessary, use one of the “Trim” procedures available in the 3051 reference manual to calibrate.

NOTE

The user determines the proof-test requirements for impulse piping.

Visual Inspection

Not required.

Special Tools

Not required

Product Repair

All failures detected by the transmitter diagnostics or by the proof-test must be reported. Feedback can be submitted electronically at *www.rosemount.com/safety*.

The 3051 is repairable by major component replacement. Follow the instructions in the 3051 reference manual (document number 00809-0100-4001) for additional information.

Reference

Specifications

The 3051 must be operated in accordance to the functional and performance specifications provided in the 3051 reference manual.

(1) This test will detect approximately 59.6% of possible DU failures in the transmitter.
(2) This test will detect approximately 94.6% of possible DU failures in the transmitter.

Failure Rate Data

The FMEDA report includes failure rates and common cause Beta factor estimates. This report is available at www.rosemount.com.

3051 Safety Failure Values

Safety accuracy: 0.065%
Safety response time- 100 msec

Product Life

50 years – based on worst case component wear-out mechanisms – not based on wear-out process wetted materials

PRODUCT CERTIFICATIONS

Approved Manufacturing Locations

Rosemount Inc. — Chanhassen, Minnesota, USA

Fisher-Rosemount GmbH & Co. — Wessling, Germany

Emerson Process Management Asia Pacific Private Limited — Singapore

Beijing Rosemount Far East Instrument Co., Limited – Beijing, China

European Directive Information

The EC declaration of conformity for all applicable European directives for this product can be found on the Rosemount website at www.rosemount.com. A hard copy may be obtained by contacting our local sales office.

ATEX Directive (94/9/EC)

Emerson Process Management complies with the ATEX Directive.

European Pressure Equipment Directive (PED) (97/23/EC)

3051CA4; 3051CG2, 3, 4, 5; 3051CD2, 3, 4, 5 *(also with P9 option)*; 3051HD2, 3, 4, 5; 3051HG2, 3, 4, 5; 3051PD2, 3; and 3051PG2, 3, 4, 5 Pressure Transmitters

— QS Certificate of Assessment - EC No. PED-H-20
Module H Conformity Assessment

All other 3051/3001 Pressure Transmitters

— Sound Engineering Practice

Transmitter Attachments: Diaphragm Seal - Process Flange - Manifold

— Sound Engineering Practice

Electro Magnetic Compatibility (EMC) (89/336/EEC)

All 3051 Pressure Transmitters meet all of the requirements of:

— IECEN61326 and NAMUR NE-21

Ordinary Location Certification for Factory Mutual

As standard, the transmitter has been examined and tested to determine that the design meets basic electrical, mechanical, and fire protection requirements by FM, a nationally recognized testing laboratory (NRTL) as accredited by the Federal Occupational Safety and Health Administration (OSHA).

Hazardous Locations Certifications

North American Certifications

FM Approvals

E5 Explosion-Proof for Class I, Division 1, Groups B, C, and D. Dust-Ignition-Proof for Class II, Division 1, Groups E, F, and G. Dust-Ignition-Proof for Class III, Division 1. T5 (Ta = 85 °C), Factory Sealed, Enclosure Type 4x

I5 Intrinsically Safe for use in Class I, Division 1, Groups A, B, C, and D; Class II, Division 1, Groups E, F, and G; Class III, Division 1 when connected per Rosemount drawing 03031-1019 and 00268-0031 (When used with a HART communicator); Non-incendive for Class I, Division 2, Groups A, B, C, and D.

Temperature Code:T4 (Ta = 40 °C), T3 (Ta = 85 °C), Enclosure Type 4x
For input parameters see control drawing 03031-1019.

Canadian Standards Association (CSA)

E6 Explosion-Proof for Class I, Division 1, Groups B, C, and D. Dust-Ignition-Proof for Class II and Class III, Division 1, Groups E, F, and G. Suitable for Class I, Division 2 Groups A, B, C, and D for indoor and outdoor hazardous locations. Enclosure type 4X, factory sealed

C6 Explosion-Proof and intrinsically safe approval. Intrinsically safe for Class I, Division 1, Groups A, B, C, and D when connected in accordance with Rosemount drawings 03031-1024. Temperature Code T3C.

Explosion-Proof for Class I, Division 1, Groups B, C, and D. Dust-Ignition-Proof for Class II and Class III, Division 1, Groups E, F, and G. Suitable for Class I, Division 2 Groups A, B, C, and D hazardous locations. Enclosure type 4X, factory sealed.

For input parameters see control drawing 03031-1024.

European Certifications

I1 ATEX Intrinsic Safety and Dust
Certification No.: BAS 97ATEX1089X Ⓔx II 1 GD
EEx ia IIC T5 (–60 $\leq T_a \leq$ +40 °C)
EEx ia IIC T4 (–60 $\leq T_a \leq$ +70 °C)
Dust Rating: T80 °C (–20 $\leq T_a \leq$ 40 °C) IP66
CE 1180

Table 2. Input Parameters

U_i = 30V
I_i = 200 mA
P_i = 0.9W
C_i = 0.012 µF

Special Conditions for Safe Use (X):

When the optional transient protection terminal block is installed, the apparatus is not capable of withstanding the 500V insulation test required by Clause 6.4.12 of EN50020:1994. This must be taken into account when installing the apparatus.

N1 ATEX Non-incendive/Type n and Dust
Certification No.: BAS 00ATEX3105X Ⓔx II 3 GD
EEx nL IIC T5 (–40 $\leq T_a \leq$ +70 °C)
U_i = 55 Vdc max
Dust rating: T80 °C (–20 $\leq T_a \leq$ 40 °C) IP66

Special Conditions for Safe Use (X):
When the optional transient protection terminal block is installed, the apparatus is not capable of withstanding a 500V r.m.s. test to case. This must be taken into account on any installation in which it is used, for example by assuring that the supply to the apparatus is galvanically isolated.

E8 ATEX Flame-Proof and Dust
Certification No.: KEMA 00ATEX2013X Ⓔx II 1/2 GD
EEx d IIC T6 (–50 $\leq T_a \leq$ 65 °C)
EEx d IIC T5 (–50 $\leq T_a \leq$ 80 °C)
Dust rating T90 °C, IP66
CE 1180
Vmax = 55 V dc

Special Conditions for Safe Use (X):
This device contains a thin wall diaphragm. Installation, maintenance, and use shall take into account the environmental conditions to which the diaphragm will be subjected. The manufacturer's instructions for installation and maintenance shall be followed in detail to assure safety during its expected lifetime.

Japanese Certifications

E4 JIS Flame-Proof
Ex d IIC T6

Certificate	Description
C15850	3051C/D/1 4–20 mA HART — no meter
C15851	3051C/D/1 4–20 mA HART — with meter
C15852	3051C/D/1 FOUNDATION Fieldbus — no meter
C15853	3051C/D/1 FOUNDATION Fieldbus — with meter
C15854	3051T/G/1 4–20 mA HART, SST, Silicon — no meter
C15855	3051T/G/1 4–20 mA HART, Hast, Silicon — no meter
C15856	3051T/G/1 4–20 mA HART, SST, Silicon — with meter
C15857	3051T/G/1 4–20 mA HART, Hast, Silicon — with meter
C15858	3051T/G/1 FOUNDATION Fieldbus, SST, Silicon — no meter
C15859	3051T/G/1 FOUNDATION Fieldbus, Hast, Silicon — no meter
C15860	3051T/G/1 FOUNDATION Fieldbus, SST, Silicon — with meter
C15861	3051T/G/1 FOUNDATION Fieldbus, Hast, Silicon — with meter

I4 JIS Intrinsic Safety
Ex ia IIC T4

Certificate	Description
C16406	3051CD/CG

Australian Certifications

I7 SAA Intrinsic Safety
Certification No.: AUS EX 1249X
Ex ia IIC T4 (T_{amb} = 70 °C)
Ex ia IIC T5 (T_{amb} = 40 °C)
IP66
When connected per Rosemount drawing 03031-1026

The apparatus may only be used with a passive current limited power source Intrinsic Safety application. The power source must be such that Po ≤(Uo * Io) / 4. Modules using transient protection in the terminal assembly (T1 transient protection models) the apparatus enclosure is to be electrically bonded to the protective earth. The conductor used for the connection shall be equivalent to a copper conductor of 4 mm2 minimum cross-sectional area.

Table 3. Input Parameters

U_i = 30V
I_i = 200 mA
I_i = 160 mA (output code A with T1)
P_i = 0.9W
C_i = 0.01 µF
C_i = 0.042 µF (output code M)
L_i = 10 µH
L_i = 1.05 mH (output code A with T1)
L_i = 0.75 mH (output code M with T1)

E7 SAA Explosion-Proof (Flame-Proof)
Certification No.: AUS EX 03.1347X
Ex d IIC T6 (T_{amb} = 40 °C)
Ex d IIC T5 (T_{amb} = 80 °C)
DIP T6 (T_{amb} = 40 °C)
DIP T5 (T_{amb} = 80 °C)
IP66

Special Conditions for Safe Use (X):
It is a condition of safe use for transmitter enclosures having cable entry thread other than metric conduit thread that the equipment be utilized with an appropriate certified thread adaptor.

N7 SAA Type n (Non-sparking)
Certification No.: AUS EX 1249X
Ex n IIC T4 (T_{amb} = 70 °C)
Ex n IIC T5 (T_{amb} = 40 °C)
IP66

Special Conditions for Safe Use (X):
Where the equipment is installed such that there is an unused conduit entry, it must be sealed with a suitable blanking plug to maintain the IP40 degree of protection. Any blanking plug used with the equipment shall be of a type which requires the use of a tool to effect its removal. Voltage source shall not exceed 60V ac or 75V dc.

Combinations of Certifications

Stainless steel certification tag is provided when optional approval is specified. Once a device labeled with multiple approval types is installed, it should not be reinstalled using any other approval types. Permanently mark the approval label to distinguish it from unused approval types.

K5 **E5** and **I5** combination

KB **K5** and **C6** combination

KD **KS**, **C6**, **I1**, and **E8** combination

K6 **C6**, **I1**, and **E8** combination

K8 **E8** and **I1** combination

K7 **E7**, **I7**, and **N7** combination

14.6 Pressostato differenziale

Numero di disegno Voith: 205.00438510

Tipo: DPD2T-M80SS (2xSPDT)

Descrizione. . . . . .Barksdale

DPD1T-.../DPD2T-...

Metal-Diaphragm
Differential Pressure Switches

▶ Pressure

- Proved technology in new design
- Very precise and complete sealed switching system
- Adjustment range from 0.002 ... 10.3 bar

Barksdale
CONTROL PRODUCTS
CRANE
Barksdale, Inc./Barksdale GmbH
A Subsidiary of Crane Co.

Mechanical single/dual pressure switch
Repeatability ±1.0 % at constant temperature

Features

Metal diaphragm pressure switches
Switching point can be adjusted with corresponding reference unit during operation

Measuring ranges

0.025 ... 10 bar

Applications

machine and tool engineering,
autoclaves,
pump control,
refrigerant monitoring
ship building applications

Technical Data

medium-contacting parts:	Stainless steel 17-7PH Aluminium, nickel-plated O-rings: FKM
Repeatability:	±1 % at constant temperature
Switching rate:	max. 20/min
Temperature range:	-40 °C... +75 °C
System of protection	IP65
Housing:	Aluminium, anodized
Process connection:	1/8“ NPT female thread
Electrical connection:	internal terminal strip (0.5-2.5 mm²) Standard: WAGO terminal and cable gland M20 x 1.5; clamping range ø5 ... 11 mm

Electrical ratings and hysteresis:	A large variety of microswitches offers different electrical ratings and hysteresis for many applications.
Weight:	DPD1T-...: approx. 1.6 kg DPD2T-...: approx. 1.7 kg
Set point adjustment:	Turn the adjustment screw clockwise to decrease the set point.
Intrinsically safe:	The switches are designed for intrinsically safe applications. Please add "Exi" to your ordering details when placing an order. To comply with the intrinsically safe approval following max. ratings must not be exceeded: Umax = 28 V Imax = 50 mA
Approval:	---

Adjustable ranges

* Static operating pressures up to 28 bar possible. Differential pressure of the adjustable range must not be exceeded.
Values shown in red (max. pressure rising) = max. operating pressure

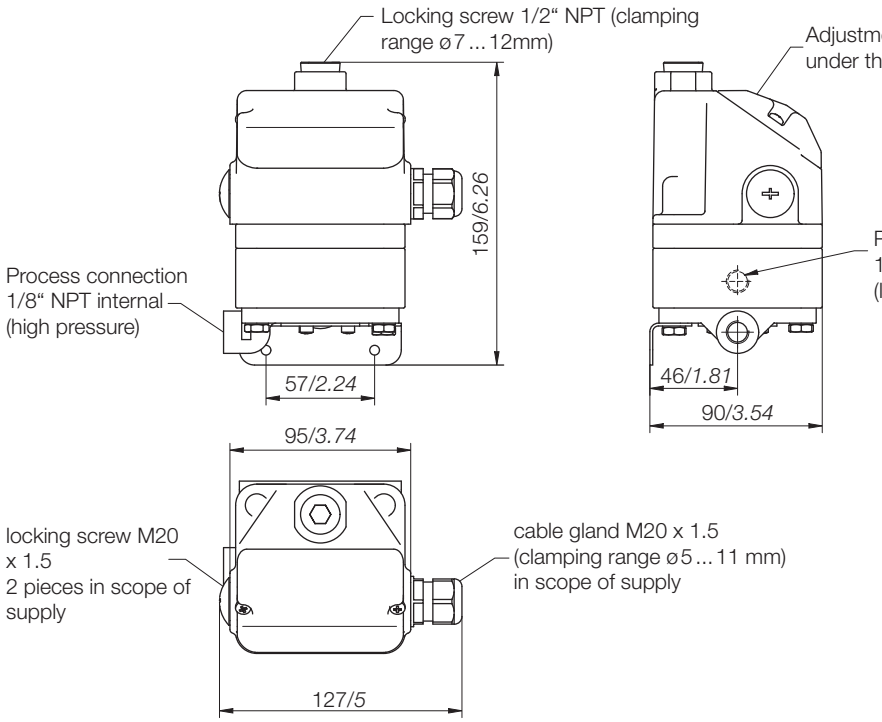
Pressure range code	Adjustable range [bar] * Diff. Pressure		Proof pressure [bar]	Max. hysteresis of switch types in bar (end of range)	
	Increasing press.	Decreasing press.	(short term)	H, GH [bar]	M, GM [bar]
Overpressure					
3SS	0.025 ... 0.2	0.02 ... 0.20	0.7	0.004	0.01
18SS	0.040 ... 1.2	0.03 ... 1.19	4.0	0.010	0.04
80SS	0.130 ... 5.3	0.03 ... 5.20	10.7	0.100	0.22
150SS	0.280 ... 10.0	0.10 ... 9.80	20.0	0.180	0.40

Index: B

Specifications are subject to changes without notice.

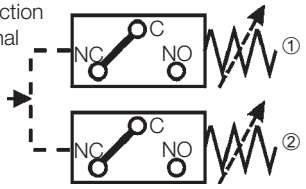
Metal Diaphragm Diff. Press. Switches — *Type DPD1T-.../DPD2T-...*

Dimensions (in mm / *inch*)



Wiring code for all types (contact status at atmospheric pressure)

Process connection 1/8“ NPT internal (low pressure)



Power circuit ①	Power circuit ②
C=purple	C=brown
NC=blue	NC=orange
NO=red	NO=black

Electrical ratings

Micro-switch	special features	Volt AC 50/60 Hz	Ind. load A	Res. load A	Volt DC	Ind. load A	Res. load A	Comments
H	Microswitch with silver contacts	125 250	10 10	10 10	6 to 28	0.50	0.5	low change-back values; high AC-/ low DC-load
M	Microswitch with silver contacts	125 250	10 10	10 10	12 24 250	5.00 1.00 0.25	15.0 2.0 0.4	intermediate change-back values; high AC- and DC-loads
GH	Microswitch with gold contacts for low voltage and low current	125	1	1	24	1.00	1.0	low change-back values
gm		30	0.1	0.1	30	0.10	0.1	intermediate change-back values

480 V AC and 15 A only upon request

Options

	DPD1T-...		DPD2T-...
ST1	Plug, 3-pin + E, DIN EN 175 301-801-A (prev. DIN 43650)	**ST3**	Plug, 6-pin + E, DIN EN 43651
ST2	Amphenol plug 4-pin + E	**EXI**	for intrinsically safe application
EXI	for intrinsically safe application		

Ordering

Example for order number

Type			Microswitch		Pressure range		Options
DPD1T or	**DPD2T**	–	**H**	–	**3SS**	–	**ST2**

Your order number

Type			Microswitch		Pressure range		Options
	or		–		–		–

Experts
Specialists for monitoring and control of:

- Pressure
- Temperature
- Level
- Flow

Almost sixty years of experience in the area of mechanical and electronic control of liquid media and responding to customers needs have resulted in an extensive range of products to meet a wide range of applications. Barksdale's priority is clear. It is our commitment to quality instrumentation and exceptional customer service that has remained the cornerstone of our success. Based on our innovative and market-focused technologies in the areas of pressure, level, flow and temperature measuring processes we provide solutions that fit.

Global Presence
Global Presence

Barksdale Inc.
3211 Fruitland Avenue
Los Angeles, CA-90058-0843
U.S.A.
Phone: (323) 5 89 61-81
Fax: (323) 5 89 34-63
www.barksdale.com

Barksdale GmbH
Dorn-Assenheimer Strasse 27
D-61203 Reichelsheim
Phone: (+49)-6035-949(0)
Fax: (+49)-6035-949-111/113
E-mail: info@barksdale.de
www.barksdale.de

Barksdale
CONTROL PRODUCTS
CRANE Barksdale, Inc./Barksdale GmbH
A Subsidiary of Crane Co.

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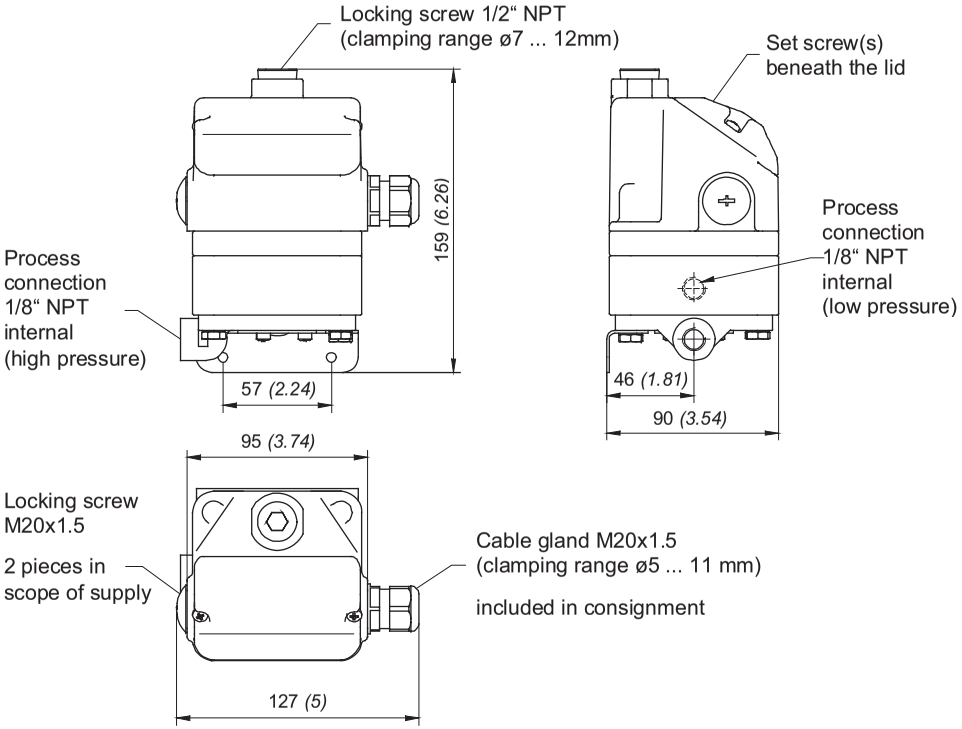


Figure 8: Metal-diaphragm differential pressure switch type DPD1T .../DPD2T ...

Operating life time

Normal expected service life (expressed in the number of cycles over the full measuring range) is appr. 1 million for the pressure switch. This may be extended up to 2.5 million cycles if system pressure change is very slight (within 20%, or less, of adjustable range).

Switch sensor life may also be effected negatively by:

- Media not compatible with the wetted materials.
- Too high switch cycling speed or more than 20 cycles per minute.
- System cycling pressure exceeding the top of the adjustable range.

The proof pressure must never be exceeded to avoid permanent sensor damage. Matching the working range of the switch to the application is also a key for optimal switch performance. For greatest accuracy the set point should fall in the upper 70% of the adjustable range. For most favourable life the set point should be in the lower 30% of the adjustable range. Therefore, the most favourable combination of accuracy and life factor lies between 30% and 70% of the adjustable range.

Operating Instructions

Single-/Dual-Metal Diaphragm Pressure Switches D1T/D2T
Single-/Dual-Metal-diaphragm differential pressure switch DPD1T/ DPD2T

Barksdale
CONTROL PRODUCTS

Barksdale GmbH
Dorn-Assenheimer Strasse 27
D-61203 Reichelsheim

Phone: +49 (6035) 949-0
Fax: +49 (6035) 949-111 and 949-113
email: info@barksdale.de
Internet: www.barksdale.de

Art.-No.: 923-1545
Index A, 25.04.2007

Specifications are subject to changes without notice!

1 Intended Applications

The pressure switches are specifically applied for monitoring and controlling of operations using maximum and minimum pressures. A micro switch triggers an electrical signal when minimum or maximum pressure are reached.

DANGER

The switch may only be used in the specified fields of application (see type label).

The temperature has to be within the specified ranges, the pressure values and the electrical rating must not exceed the values specified.

Observe also the applicable national safety instructions for assembly, commissioning and operation of the switch.

The switch is not designed to be used as the only safety relevant element in pressurized systems according to DGR 97/23/EC.

Without special provisions/actions, pressure switches must not be used for combustable gas or pure hydrogen applications.

2 Safety Instructions

The safety instructions are intended to protect the user from dangerous situations and/or material damage.

In the operating instructions the seriousness of the potential risk is designated by the following signal words:

DANGER

Refers to imminent danger to men.

Nonobservance may result in fatal injuries.

WARNING

Refers to a recognizable danger.

Nonobservance may result in fatal injuries, and destroy the equipment or plant parts.

CAUTION

Refers to a danger.

Nonobservance may result in light injuries and material damage to the sensor and/or to the plant.

IMPORTANT

Refers to important information essential to the user.

Disposal

The sensor must be disposed of correctly in accordance with the local regulations for electric/electronic equipment.

The switch must not be disposed of with the household garbage!

3 Standards

The standards applied during development, manufacture and configuration are listed in the CE conformity and manufacturer's declaration.

4 Warranty/Guaranty

Warranty

Our scope of delivery and services is governed by the legal warranties and warranty periods.

Terms of guaranty

We guaranty for function and material of the single- / dual- pressure switch under normal operating and maintenance conditions in accordance with the statutory provisions.

Loss of guaranty

The agreed guaranty period will expire in case of:

- incorrect use,
- incorrect installation or
- incorrect handling or operation contrary to the provisions of these operating instructions.

No liability is assumed for any damage resulting therefrom, or any consequential damage.

5 Installation/Commissioning

DANGER

Only install or uninstall the switch when deenergized (electrically and hydraulically/pneumatically).

Pressure connection and electrical connection must be carried out by trained or instructed personnel according to state-of-the-art standards.

The switch must only be installed in systems where the maximum pressure P_{max} is not exceeded (see type label).

CAUTION

Alternating pressure - vacuum applications are not authorized in switch types which are suitable for both vacuum and pressure applications.

WARNING

Pressure peaks and pressure shocks exceeding the maximum operating pressure are inadmissible.

The maximum operating pressure is the upper final value of the adjustable range or, if specified, the pressure indicated as maximum operating pressure. Exceeding the max. operating pressure affects the performance and the life span of the product and may damage it.

Pressure switches must be mounted vibrationless.

WARNING

Check the switch regularly for functioning.

If the switch does not work properly, stop operation immediately!

Contact Protection

The micro switches used are normally suitable for both direct and alternating current operation. Inductive, capacitive and lamp loads may, however, considerably reduce the life expectancy of a micro switch and, under extreme circumstances, even damage the contacts.

Depending on the application spark supression and current limiting is recommended (see succeeding figures).

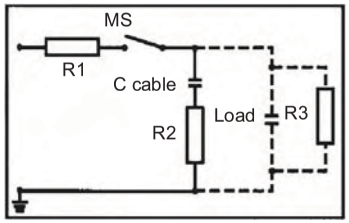


Fig. 1: Protection in case of capacitive loads
R1: Protection against starting current rushs
R2,R3: Protection against high discharge currents

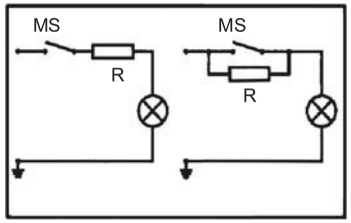


Fig. 2: Lamp load provided with resistance in parallel or series connection to switch of condensators

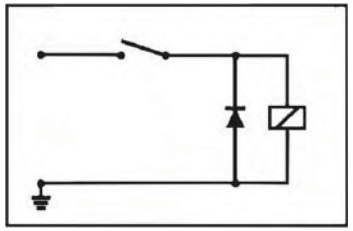


Fig. 3: Protection in case of continuous current and inductive load by recovery diode

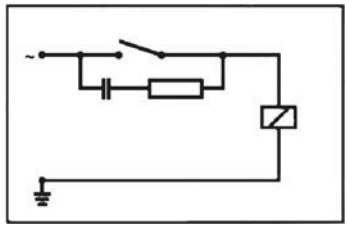


Fig. 4: Protection in case of alternating current and inductive load by RC-link

Set point adjustment

In pressure switches, a displacement of the pressure sensing element occurs with a change in pressure. Following the displacement of the pressure sensing element operates a microswitch.

Upon delivery of the product, the set points are likely to be found in the middle of the adjustable range. On request, fix set points may be adjusted by our factory. In this event, the point will be indicated on the type plate or any separate plate, i = increasing, d = decreasing.

The set point is adjusted by turning the adjustment screw.

IMPORTANT

To reach the adjustment screw for pressure switches with housing, remove the cover.

- Allow pressure switch to reach the desired switch pressure.
- Turn adjustment screw clockwise or counterclockwise to actuate the micro switch.

IMPORTANT

Please consult the wiring diagram for the contact status at atmospheric pressure (see Figure 5).

Precise adjustment of set point to actuate on increasing pressure

- Lower system pressure to 0 bar.
- Increase pressure slowly and check if micro switch is actuated at desired switch pressure.
- If necessary, readjust by turning the adjustment screw
- Repeat preceding steps until microswitch operates at desired switch pressure.

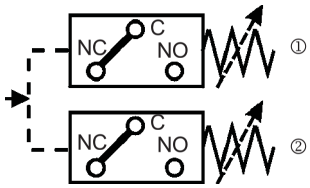
Precise adjustment of set point to actuate on decreasing pressure

- Increase pressure up to a point clearly above the desired switch pressure (at least, switch pressure plus max. hysteresis; not above max. operating pressure).
- Lower pressure slowly and check if micro switch is actuated at desired switch pressure.
- If necessary, readjust by turning the adjustment screw
- Repeat preceding steps until microswitch operates at desired switch pressure.
- Following the adjustment of all set points, each set point must be checked and, if necessary, be readjusted.

IMPORTANT

The adjustment of several set points occurs for each set point as specified above.

Wiring Code for all Types (Contact status at atm. pressure)



Power circuit ①	Power circuit ②
C=lila	C=brown
NC=blue	NC=orange
NO=red	NO=black

at vacuum NC/NO vice versa

Figure 5: Wiring Code

Use in Hazardous Locations

Pressure switches with T-housing are marked as **EExi** intrinsically safe. This switch must be operated with a certified switch amplifier .

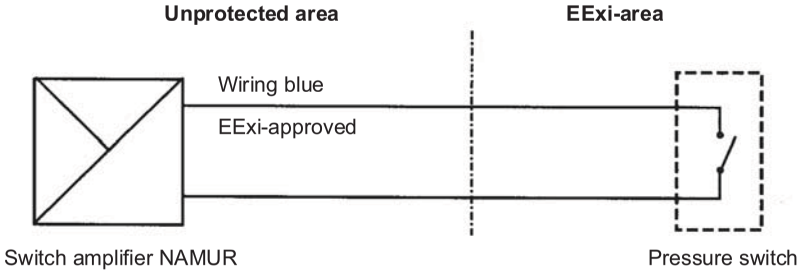


Fig. 6: Operation of pressure switches in intrinsically safe areas

6 Maintenance/Cleaning

Maintenance

The pressure switch is maintenance free, however, the country specific test intervals for preventive maintenance in plants, the PED guideline are to be carried out at all times. Checking the set points lies within the discretion of the user.

Small setpoint drifts may occur during the initial use of the switch (run-in period). To minimize the setpoint drift we can perform a run-in (ageing) process in our works on request. Larger or continuing setpoints drifts during the normal use of the switch may indicate that the measuring system is not used correctly within the specified limits, exceeding the design criteria or is worn-out. This might lead to metal fatigue of the measuring system and it therefore should be replaced before an ultimate rupture of the metal diaphragm might take place. Please consult your supplier or Barksdale directly for guidelines.

7 Technical Data

See data sheet

Dimensions in mm *(inch)*

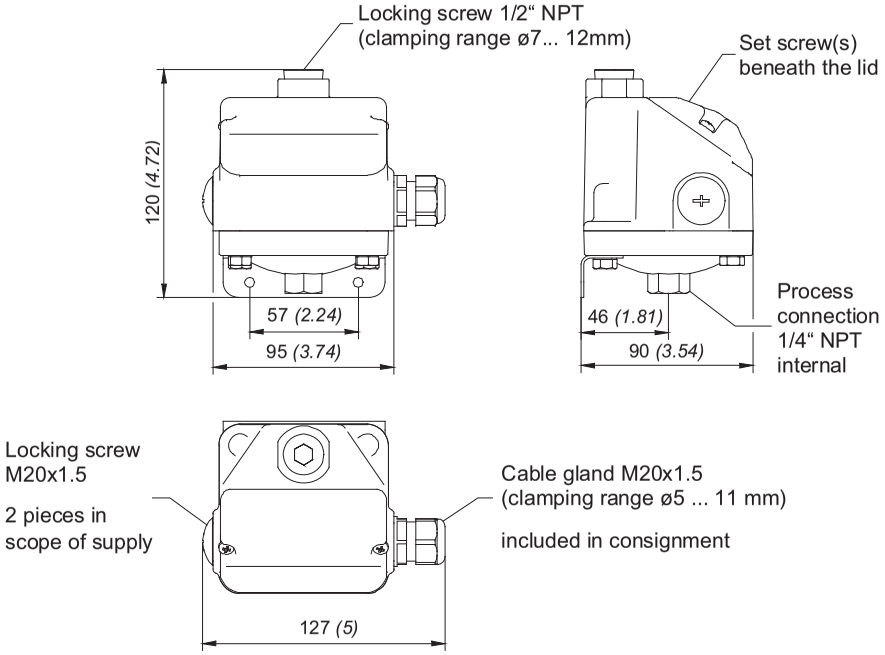


Figure 7: Metal-diaphragm pressure switch type D1T .../D2T ...

14.7 Indicatore livello fluido

Numero di disegno Voith: 2 124123 0

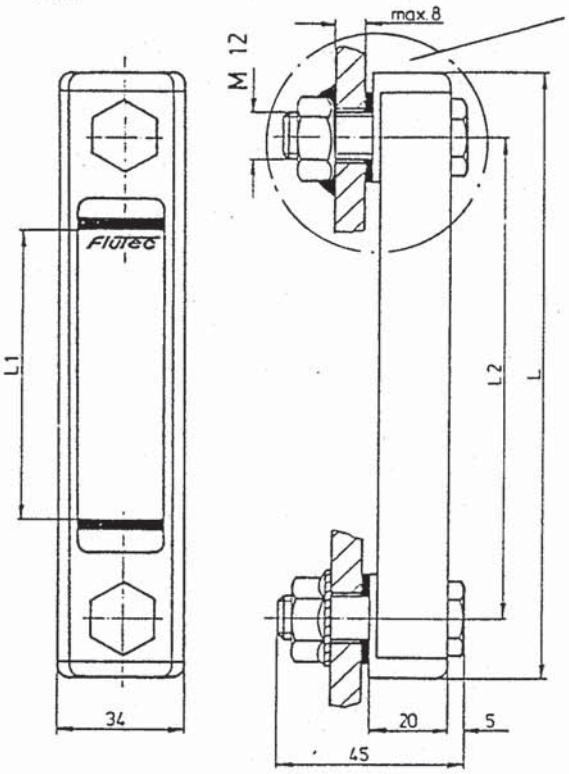
Tipo: FSA 254.2.0/12

Descrizione. 3626-9710

VOITH

FLUID LEVEL GAUGE FSA

FSA



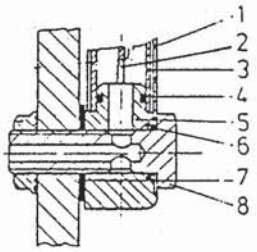
Voith design

Screw tightening torque
10 Nm max.

NG	L	L1	L2	Type	Voith part no.
76	108	37	76	FSA 76.2.0/12	521241210
127	159	76	127	FSA 127.2.0/12	521241220
254	286	203	254	FSA 254.2.0/12	521241230

SPARE PARTS

FSA



Item	Description
1	Housing
2	Name plate
3	Tube
4	O-ring 13 x 2.5
5	End cap
6	O-ring, 12.3 x 2.4
7	Washer
8	Banjo bolt

14.8 Filtro di sfiato

Numero di disegno Voith: 4 188931 001

Tipo: TLF I 2-32 G 25

Descrizione. . . . . EPE

Industrial Filters · Accumulators

Breather Filters

TLF I..., TLF II...,TLF III..., BF...,BE...,EF...,EFK...

Filters for tank mounting

Efficient filtration of air

Air breather filters with changeable spin-on filters (BF and BE)

Combined air breather and filler filters (TLF, EF, EFK, FEF, FES, BE)

Flange mounted filters

Low pressure drop

Special high efficient filter media, also for water absorbing

Air flow up to 3500 m³/h
Connection up to DN 250

Quality assured!

Breather Filters

TLFO..., TLF..., BF..., BFS..., BFV...
EF..., EFK..., FEF...
BS 7SL..., BE 7 SL..., B 7 SL...
Operating temperature
-20°C to +100°C

Application

Filtration and dehumidifying of intake air for industrial systems.

Design

TLF...: *filter housing for breathing and ventilation with changeable filter element inside. Filter elements H...SL up to 1µm filtration grade with glass-fibre filter media, water absorbing filter media AS optional. Types: I with female thread or DIN flange (for size TLF I 8-20), II with male thread, III with male thread (with flange for size TLF III 7-125) and filler filter(130 µm strainer). Type TLF 0 with 500 µm synthetic strainer.*

BF, BFS, BFV...: *compact housing for breathing and ventilation with integrated filter media (BF) or pleated filter element made out of paper (BFS, BFV). Design with a dip stick possible. Bypass valves 0,1 bar for in and outflowing air for type BFV.*

EF...: *130 µm filler strainer with screwed on breather cap and interior sintered bronze plate.*

EFK...: *130 µm filler strainer with screwed cap, without breather.*

FEF..: *combination out of a flangeable filler filter (500 µm strainer) and a breather cap including a 40µm foamed material. The breather cap can be removed through a bayonet joint and is secured with a chain.*

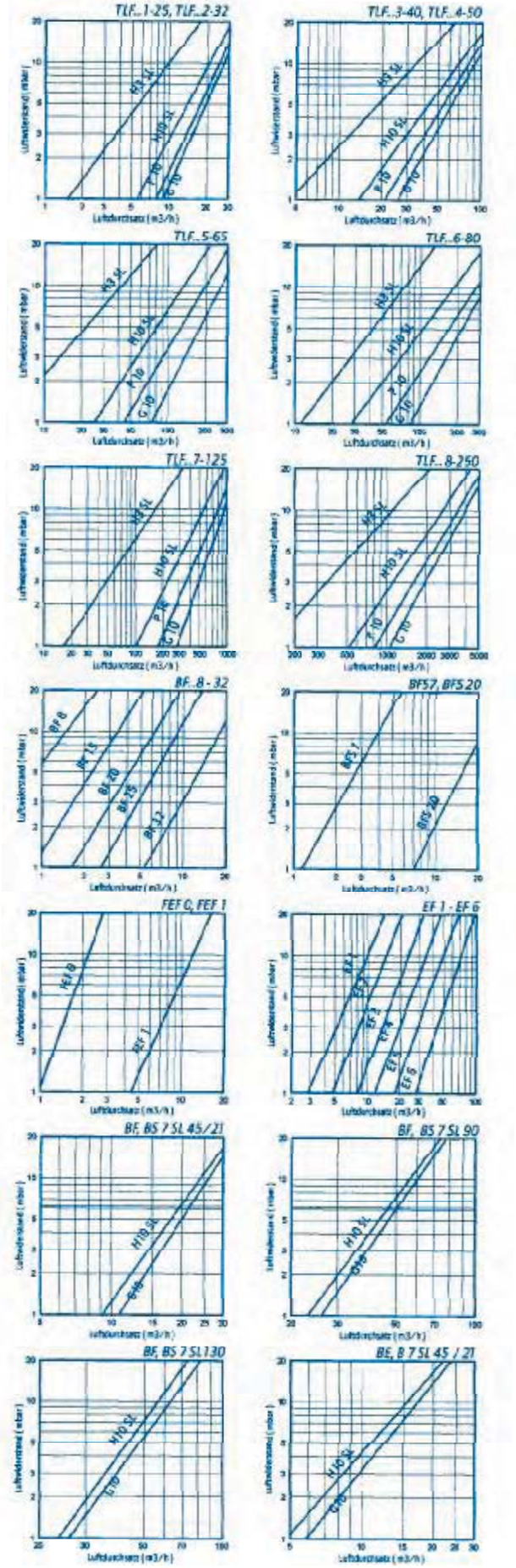
BF 7 SL...; BS 7 SL...: *breather filter with a spin on filter and pleated filter element with filter paper P. Design with flange connection (BF 7 SL...) or female thread (BS 7 SL ...).*

B 7 SL..., BE 7 SL...: *design as BF... and BS 7 SL, however with connection for maintenance indicator (B 7 SL...) and / or extension with a filler filter (500 µm strainer).*

Materials: as per spare parts list in this brochure.

Performance Characteristics

Air flow characteristics
Test temperature: 20°C



Ordering Information

Selection of filter size:
using the computer program "EPE - FILTERSELECT" or performance characteristics in this brochure.

Special designs available on request.

Filter Type	Magnet	Maintenance Indicator	Connection	Material
TLF... = reservoir breather filter, flange mountable TLF 0... = reservoir breather filter, flange mountable with filler strainer TLF I... = reservoir breather filter with female thread, abbr. DIN connection TLF II... = reservoir breather filter with male thread connection TLF III... = reservoir breather filter wit male thread connection, abbr. DIN flange and filler strainer	0 = without	0 = without	00 = standard	0 = standard

Filter Assembly → TLF III 7 - 125 P 10 – S 00 – 0 0 0 – 00 P 0 0

Seal Kit* → D TLF III 7 - 125 – 0 – 00 P 0

Nominal Size			
TLF I, II, III	1-25	TLF	2-32
	2-32	TLF 0	
	3-40	TLF I, III	7-125
	4-50		
	5-65	TLF I	8-250
	6-80		

Filter-Element	Filter Element Size			
	Nominal Size	Element Size	Nominal Size	Element Size
Type:	1-25 2-32	002	6-80	006
7.	3-40 4-50 5-65	004	7-125	007
			8-250	008

Filtration Grade

nominal filtration grade in µm
G = stainless steel wire mesh, cleanable
G10 G25 G40 G60 G80 G100
VS = nonwoven media, not cleanable
VS 25 VS 40 VS 60
P = paper, not cleanable
P5 P10 P25

absolute filtration grade(ISO4572)in µm
H...SL = micro glass-fibre, not cleanable
H1SL H3SL H6SL H10SL H20SL
AS = micro glass-fibre, water absorbing, not cleanable
AS1 AS3 AS6 AS10 AS20

Differential Pressure

Maximum allowable pressure drop across the filter element

S = standard

Filter Element Design

0... = standard adhesive T = 80°C

...0 = standard material
...Z = zinc free

Bypass Valve

0 = without

Seal

0 = without
P = Buna N

Additional Information

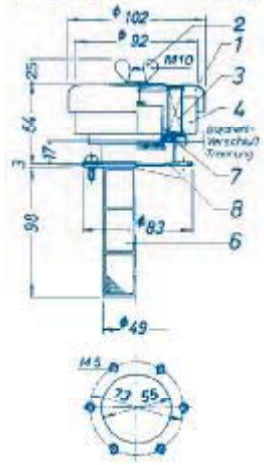
0 = without
5 = silicon free
E = vent valve
Z = inspection certificate

5 = silicon free
C = silicagel
Z = inspection certificate

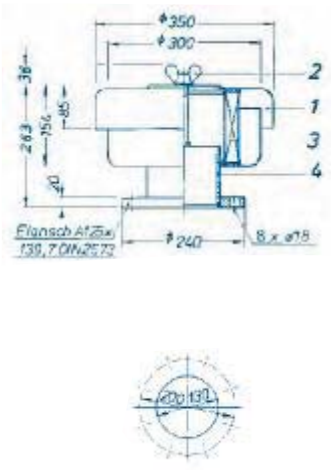
Filter Element → 7. 007 P 10 – S 00 – 0 – P _

Dimensions

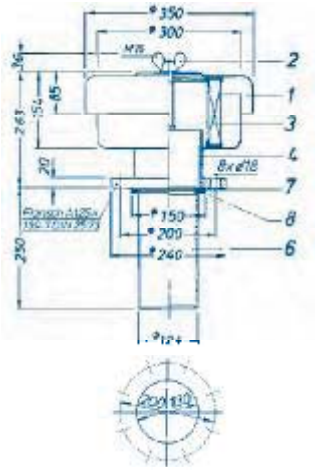
TLF 02-32 TLF 2-32



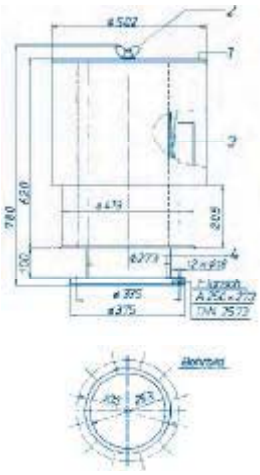
TLF I 7-125



TLF III 7-125



TLF I 8-250



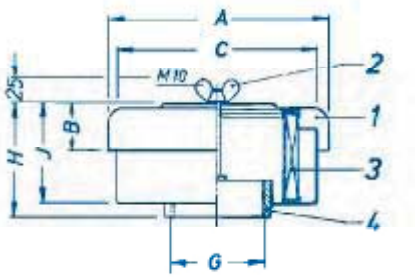
Spare Parts

			Size	TLF 2-32	TLF 2-32	TLF 2-32	TLF 2-32
			Weight in kg	0,5	0,6	8,0	33,0
Part	Qty.	Designation	Material				
1	1	Cover	Steel	please indicate ordering information "Filter Assembly"			
2	1	Wing nut	Steel	Part No. 4349		Part No. 5233	
3	1	Filter Element	Various	please indicate ordering information "Filter Element"			
4	1	Filter housing	Various	please indicate ordering information "Filter Assembly"			
6	1	Filler strainer	Various	–	Part No. 5767	Part No. 5784	–
7	1	Seal	Buna N	please indicate ordering information "Seal Kit"			
8	1	Seal	Buna N	please indicate ordering information "Seal Kit"			

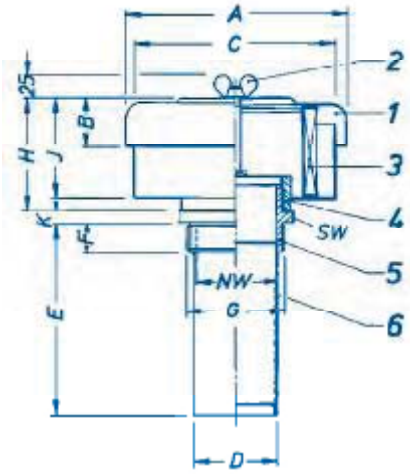
* Seal Kit only for TLF/TLF 0 2-32, TLF I/III 7-125 and TLF I 8-250

Dimensions

TLF I...

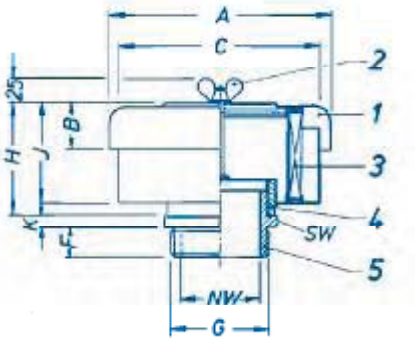


TLF II...



Design with filler nozzle and filler strainer

TLF III...



Design with filler nozzle

Size	Weight in kg	A	B	C	D	E	F	G	H	J	K	SW
TLF I 1-25	0,5	ø 102	24	ø 92	—	—	—	G 1	53	43	—	—
TLFI 2-32	0,6							G 1 1/4	63			
TLF I 3-40	2,1	ø 177	46	ø 162				G 1 1/2	98	88		
TLFI 4-50	2,1							G 2				
TLFI 5-65	1,6							G 2 1/2				
TLFI 6-80	1,9	ø 210	45	ø 190				G 3	88	78		
TLFII 1-25	0,6	ø 102	24	ø 92	—	—	17	G 1	53	43	6	46
TLFII 2-32	0,7							G 1 1/4	63			55
TLFII 3-40	2,3	ø 177	46	ø 162				G 1 1/2	98	88	7	60
TLFII 4-50	2,3						18	G 2				75
TLFII 5-65	2,0						20	G 2 1/2			8	90
TLFII 6-80	2,3	ø 210	45	ø 190			22	G 3	78	78	9	105
TLFIII 1-25	0,7	ø 102	24	ø 92	ø 27	101	17	G 1	53	43	6	46
TLFIII 2-32	0,8				ø 36	123		G 1 1/4	63			55
TLFIII 3-40	2,5	ø 177	46	ø 162	ø 42	147	18	G 1 1/2	98	88	7	60
TLFIII 4-50	2,5				ø 52,5	177		G 2				75
TLFIII 5-65	2,3				ø 67	209	20	G 2 1/2			8	90
TLFIII 6-80	2,7	ø 210	45	ø 190	ø 82	246	22	G 3	78	78	9	105

Spare parts

Size				TLF I, TLF II, TLF III					
Part	Qty.	Designation	Material	1 - 25	2 - 32	3 - 40	4 - 50	5 - 65	6 - 80
1	1	Cover	Steel	please indicate ordering information "Filter Assembly"					
2	1	Wing nut	Steel	Part No. 4349					
3	1	Filter element	Various	please indicate ordering information "Filter Element"					
4	1	Filter housing	Various	please indicate ordering information "Filter Assembly"					
5	1	Filler nozzle	Aluminium	Part No. 3650	Part No. 3658	Part No. 3659	Part No. 3660	Part No. 3661	Part No. 3662
6	1	Filler strainer	Various	Part No. 3651	Part No. 3663	Part No. 3664	Part No. 3665	Part No. 3666	Part No. 3667

Filler nozzle and filler strainer only available as unit
Seal kit is not possible

Ordering Information

Selection of filter size:
using the computer program "EPE - FILTERSELECT" or performance characteristics in this brochure.
Special designs available on request.

Filter Type	Magnet	Maintenance Indicator	Connection	Material
BF 7 SL = Breather Filter with flange BS 7 SL = Breather with welded hexagon nipple BE 7 SL = Breather with Filler Filter B 7 SL = Breather without Filler Filter	0 = without	0 = without A = pressure gauge M 010 only for B 7 SL and BE 7 SL For technical data see our brochure "Maintenance Indicator"	00= standard Connection for B 7 SL and BE 7 SL = with welded nipple	0 = standard

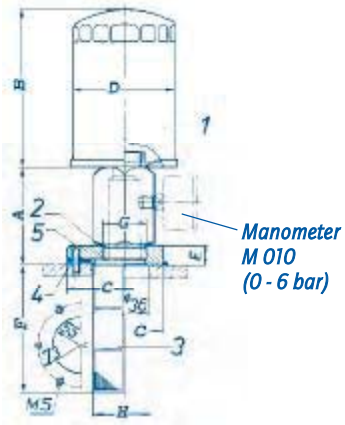
Filter Assembly → BF 7 SL 90 P 10 – S 00 – 0 0 A – 00 P 0 0

Seal Kit → D BF 7 SL 90 – A – 00 P 0

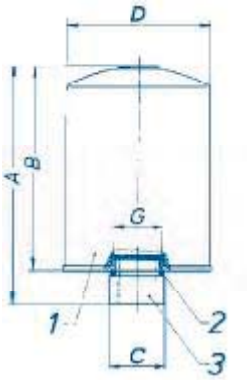
Filter Element Type: 80.	Nominal Size	Filtration Grade	Differential Pressure	Filter Element Design	Bypass Valve	Seal	Additional Information
	Type: BF 7 SL 45/21, 90, 130 BS 7 SL 45/21, 90, 130 BE 7 SL 45/21 B 7 SL 45/21	nominal filtration grade in µm VS = nonwoven media, not cleanable VS 25 VS 40 VS 60 P = paper, not cleanable P5 P10 P25 absolute filtration grade (ISO4572) in µm H...SL = micro glass-fibre, not cleanable H1SL H3SL H6SL H10SL H20SL AS = micro glass-fibre, water absorbing, not cleanable AS1 AS3 AS6 AS10 AS20	Maximum allowable pressure drop across the filter element S = standard	0... = standard adhesive T = 100°C E... = special adhesive T = 160°C ...0 = standard material	0 = without	P = Buna N	0 = without 5 = silicon free E = vent valve Z = inspection certificate 5 = silicon free Z = inspection certificate

Filter Element → 80. 90 P 10 – S 00 – 0 – P _

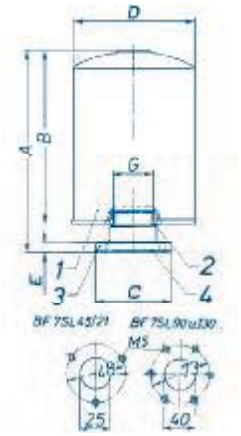
BE 7 SL 45/21, B 7 SL 45/21



BS 7 SL 45/21, BS 7 SL 90 and 130



BF 7 SL 45/21, BF 7 SL 90 and 130



Dimensions

Size	Weight in kg	A	B	C	D	E	F	G	H
BF 7 SL 45/21	0,8	191	146	ø 60	ø 92	7	-	G ¾	-
BF 7 SL 90	1,4	229	183	ø 85	ø 128	10	-	G 1¼	-
BF 7 SL 130	1,5	277	231	ø 85	ø 127	10	-	G 1¼	-
BS 7 SL 45/21	0,7	191	146	ø 35	ø 92	-	-	G ¾	-
BS 7 SL 90	1,3	229	183	ø 50	ø 128	-	-	G 1¼	-
BS 7 SL 130	1,4	277	231	ø 50	ø 127	-	-	G 1¼	-
BE 7 SL 45/21	1,3	68	146	ø 85	ø 92	10	98	G 1	ø 49
B 7 SL 45/21	1,2	73	146	ø 60	ø 92	16	-	G 1	ø 36

Spare Parts

Size				BF 7 SL 45/21, BF 7 SL 90 and 130 BS 7 SL45/21, BS 7 SL 90 and 130 Bs 7 SL 45/21	BE 7 SL 45/21
Part	Qty.	Designation	Material		
1	1	Spin-on filter	Various	please indicate ordering information "Spin On Filter"	
2	1	Seal	Buna N	-	Part No. 5767
3	1	Strainer	PA 6	please indicate ordering information "Seal Kit"	
4	1	Seal	Buna N	please indicate ordering information "Seal Kit"	
5	1	Flat Head Screw	4.8	-	Part No. 4285

Ordering Information

Selection of filter size: using the computer program "EPE - FILTERSELECT" or performance characteristics in this brochure. Special designs available on request.

Filter Assembly →	BF	15	S 130	–	F	0	0
Seal Kit →	D BF	15	S 130	–	F	0	

Filter Type	Nominal Size	Filtration Grade	Seal	Material	Add. Info.
BF = Breather filter	8; 15; 20; 25; 32	S 130	F = Fibre (standard)	0 = standard	0 = without 5 = silicon free Q = dip stick BF, EF and EFK only Z = inspection certificate
BFV = Breather with Bypass Valve	20	S 130			
BFS = Breather with Filter Element	7 20	P5 P10 P25			
FEF = Breather and Filler Filter	0 1	S10 S20 S40			
EF = Breather and Filler Filter	1-25 2-32 3-40 4-50 5-65 6-80	G 130	0 = without		
EFK = Filler Filter			P = Buna N		

Dimensions

Size	Weight in kg	A	B	C	D	E	F	G	SW	NW
BF 8	0,05	55	10	20	ø 30	9	55	G 1/4	19	9
BF 15	0,1	105	12	25	ø 50	12	105	G 1/2	27	13
BF 20	0,15	140		26	ø 60	13	140	G 3/4	35	18
BF 25	0,2	175	16	27		15	175	G 1	41	23
BF 32	0,3	225		35	ø 80	17	225	G 1 1/4	55	32
BFS 7	0,03	—	11	41	ø 46	6	—	G 1/4	19	7
BFS 20	0,3		12	57	ø 81	15		G 3/4	32	18
BFV 20				54	ø 77	14				
EF 1	0,4	107	36	17	ø 60	ø 28	—	G 1	46	25
EFK 1			37		ø 38					
EF 2	0,5	131	39	17	ø 67	ø 34		G 1 1/4	55	32
EFK 2			40	19	ø 47					
EF 3	0,7	155	44	18	ø 75	ø 42		G 1 1/2	60	40
EFK 3			41	19	ø 54					
EF 4	0,8	187	48	18	ø 93	ø 53		G 2	75	50
EFK 4			46	22	ø 66					
EF 5	1,4	218	58	20	ø 120	ø 67		G 2 1/2	90	65
EFK 5			51	24	ø 83					
EF 6	1,6	256	69	22	ø 140	ø 82		G 3	105	80
EFK 6			55	26	ø 96					
FEF 0	0,17	62	48	ø 50	ø 45	ø 28	—	—		
FEF 1	0,23	98	54	ø 83	ø 76	ø 49				

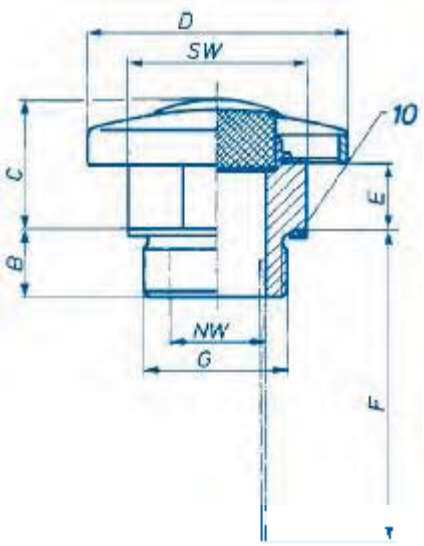
Spare Parts

			Size	BF 8-32 BFS 7, BFS 20 BFV 20	EF 1	EFK 1	EF 2	EFK 2	EF 3	EFK 3	EF 4	EFK 4	EF 5	EFK 5	EF 6	EFK 6	FEF 0	FEF 1
Part	Qty.	Designation	Material	Part No.														
1	1	Cover	Various	—	please indicate ordering information "Filter Assembly"													
2	1	Flange	Steel		please indicate ordering information "Filter Assembly"													
3	1	Filler nozzle	Aluminium		3650		3658		3659		3660		3661		3662		—	
4	1	Filler strainer	Various		3651		3663		3664		3665		3666		3667		5779	5767
5	1	Filter plate	Sika-B 200		5635	—	5636	—	5637	—	5638	—	5639	—	5640	—		
6	1	Locking ring	Spring steel		5641		5642		5643		5644		5645		5646			
7	3	Oval head screw	4.8		—												5783	—
8	6	Socket head cap screw	4.8														—	5770
9	1	Seal	Buna N	please indicate ordering information "Seal Kit"														
10	1	Seal	Fibre															
11	1	Seal	Fibre															

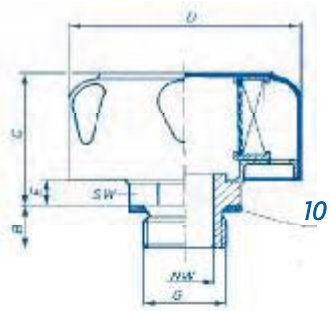
Filler nozzle and filler strainer only available as unit

Dimensions

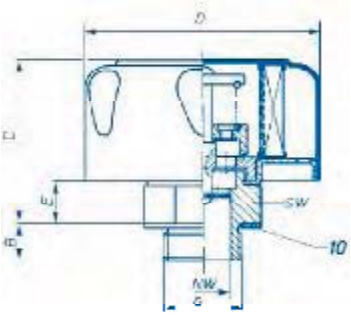
BF 8-32



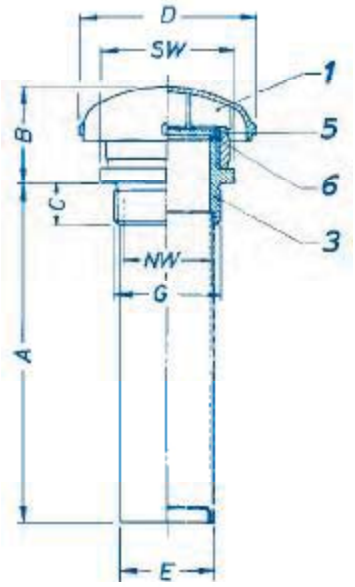
BFS 7… /BFS 20…



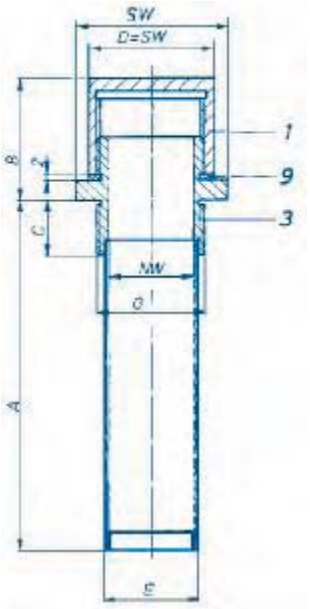
BFV 20



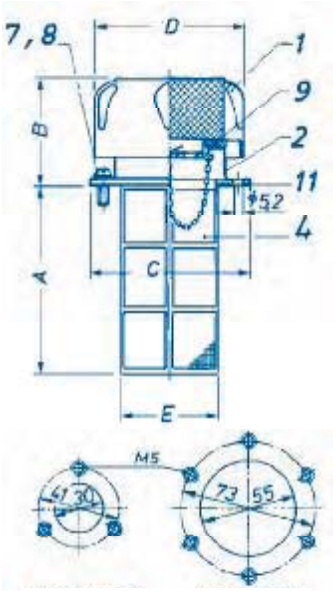
EF 1-6



EFK 1-6



FEF 0 and FEF 1



hole pattern FEF 0 *hole pattern FEF 1*

lockable design on request

Quality and Standardisation

The development, manufacturing and assembly of EPE Industrial filters and filter elements is performed within the guidelines of a certified quality management system according to DIN EN ISO 9001.
The calculation of strength and the filter tests are done in compliance to actual pressure vessel regulations and national & international standards.
A filter inspection by accredited certification bodies
(e.g. TÜV, GL, LRS, LRIS, ABS, BV, DNV, DRIRE, UDT etc.) is possible on request.

Industrial Filters · Accumulators

Installation, Starting and Maintenance

Filter Installation
Flange filter assembly at mounting device or in reservoir opening.

Starting
Switch on system pump and start system. Pay attention to flow noise at breather filter. If flow noise can be heard, check size selection in accordance to air flow rate (Initial flow resistance < 20 mbar).

Maintenance
BE, B7SL45/21... : If a vacuum or overpressure of 0,02 bar is displayed, the spin on filter 80.45/21 needs to be replaced.
All other breather filters do not have any maintenance indicators.
We therefore recommend to check or to replace breather filters in regularly periods according to following table:

filter application	environmental conditions average dust concentration	service interval
general mechanical engineering	9 - 25 mg/m³	4000 h
heavy industry	50 - 80 mg/m³	3000 h
mobile hydraulics	30 - 100 mg/m³	3000 h

Filter Element Service
TLF:
open cover (Part 1) by unscrewing wing nut (Part 2).
Replace (H..SL, P and VS...) or clean (G...material) filter element in the case of visual contamination.
Insert filter element (Part 4) in filter housing and refit cover while tighten wing nut hand screwed.

BF, BS, BE, B 7SL... :
unscrew spin-on filter (Part 1) and refit new one with seal (Part 2) hand screwed.

BF 8-32, BFS, BFV... :
unscrew filter, replace completely and screw on again using a new fibre seal (Part 10).

EF... :
unscrew cover (Part 1)and replace filter disc (Part 5).

EFK... :
unscrew cover (Part 1) and check strainer (Part 4) for contamination, clean if necessary, check seal (Part 9) for damage and refit cover.

FEF... :
open cover (Part 1) , release from security chain and replace, close security chain.

Check filler filters during maintenance for contamination and clean if necessary.

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E-Mail: Eppensteiner@compuserve.com
Internet: www.Eppensteiner.de

10/01/10.99/6000

14.9 Valvole

14.9.1 Blocco valvole

Numero di disegno Voith: 4 201528 001
Numero di disegno Voith: 4 223859 0

Tipo: N 342.44.483.21
Tipo: N 342.42.482.01

Descrizione. . . . . .Schneider

14.9.2 Valvola di non ritorno

Numero di disegno Voith: 4 990401 7
Numero di disegno Voith: 204.00423310

Tipo: RK 44 NW 65
Tipo: RHZ 28 PLR-ED (2mm)

Descrizione. . . . . Gestra

Descrizione. F5

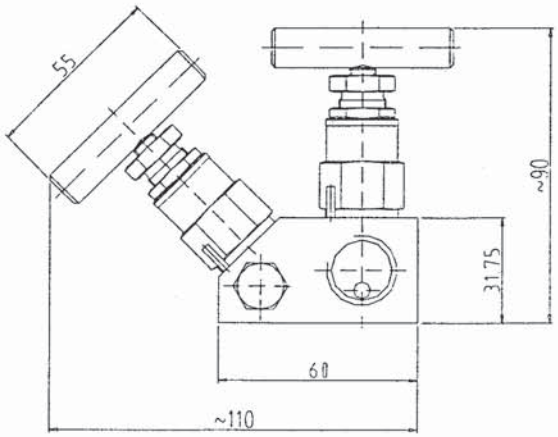
14.9.3 Valvola

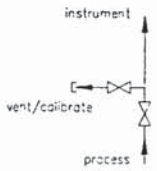
Numero di disegno Voith: 8 089514 001

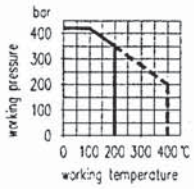
Tipo: 406-4

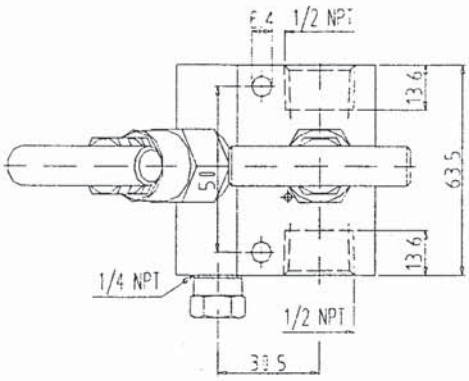
Descrizione. 070897

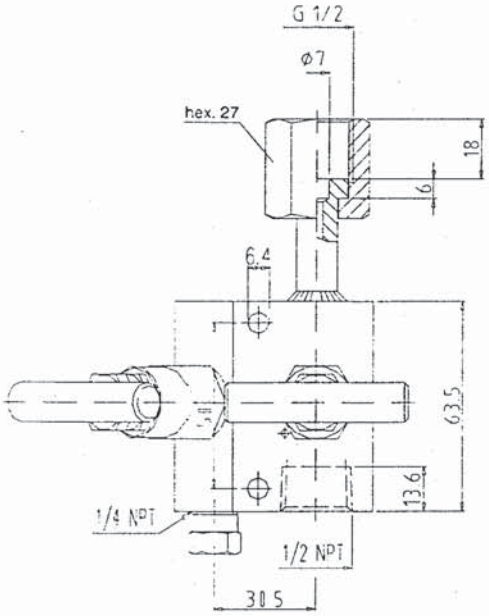
SCHNEIDER Armaturen	2 valve manifold PN 420 DN 5 for pressure instruments with 1/2 NPT and G 1/2 male	4.06 07/97











MOUNTING ACCESSORIES see section 8 and 10

Material	Connections: Inlet	Connections: Outlet	Connections: Vent / Calibrate connection	Part no.
steel st. st.	1/2 NPT female		1/4 NPT female with screw plug	N 342.44.183.21 N 342.44.483.21
steel st. st.	1/2 NPT female	swivel nut G 1/2		N 342.44.183.22 N 342.44.483.22

Components	Steel	Stainless steel [1]
	DIN - Material Number	
Body [2]	1.0460	1.4404
Bonnet	1.0501	1.4571
Valve stem	1.4104	1.4571
Needle tip [3]	1.4122 [4]	1.4571
Packing	PTFE up to 200°C special packing up to 400°C	
Gland nut	1.0501	1.4301
T-handle	stainless steel	
Screw plug	1.0501	1.4404

- Surface: steel phosphatized
- External stem thread
- Stem with cold rolled surface, back seat and non-rotating needle tip
- Special types are available
- The manifolds can be supplied according to NACE-standard

1) Can also be supplied for oxygen service. Please notice order instruction B 3!
2) Available with inspection certificate 3.1.B acc. to EN 10 204
3) Also available with soft tip in KEL-F (PCTFE) or Delrin (POM)
4) 1.4122 quenched and tempered

Proper use

Shut-off valves assembled with „E-series" valve head units are used to connect instruments to the impulse lines or to shut off the impulse lines in chemical plants, power stations or similar facilities.

The max. permissible operating pressure depends on the temperature of the medium and on the used materials of the parts and gaskets. Please pay attention to the pressure-temperature-diagram of the valve or manifold.

Any other use or any modification are not allowed and exclude the manufacturer from any liability.

General warning

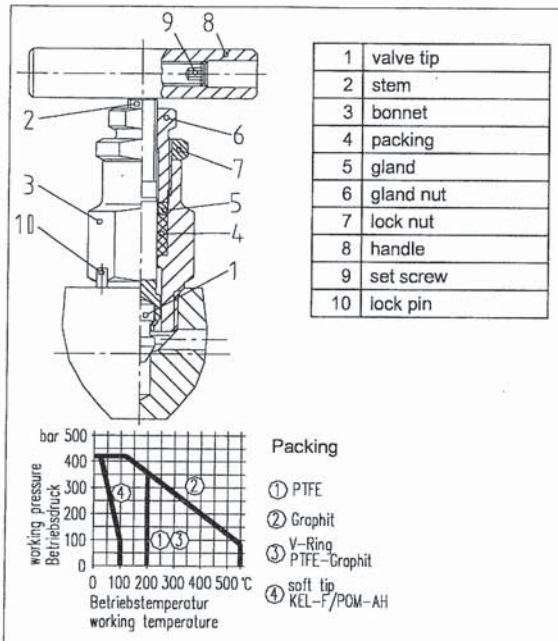
Shut-off valves with „E-series" valve head units are used to shut off various media. These can be **poisonous, explosive, irritating, very hot or very cold**. Mounting, disassembling, operation and maintenance may only be done by experienced staff, which is familiar with the secure handling of the used medium.

In addition to these instructions also the common safety regulations and the instructions of the complete installation and of the measuring device have to be considered.

Suitability of material:

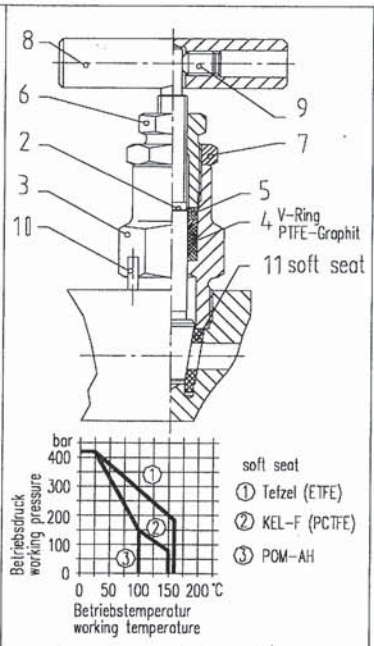
Protection against improper use of the shut-off valve:
In particular, it has to be ensured that the chosen materials of the wetted parts of the valve are suitable for the used media.
The manufacturer is not responsible for damages at the shut-off valve caused by corrosive media.
The disregard of these precautions can mean danger for the user and it can also cause damages in the piping system.

Types

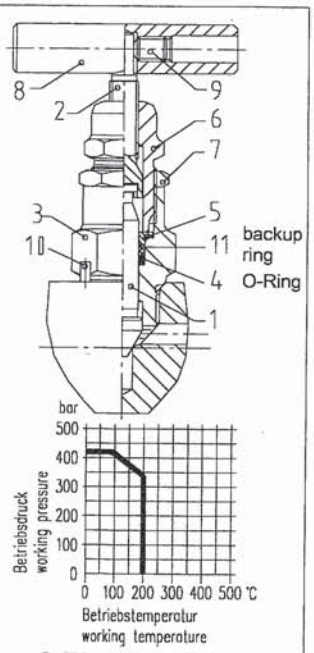


1	valve tip
2	stem
3	bonnet
4	packing
5	gland
6	gland nut
7	lock nut
8	handle
9	set screw
10	lock pin

E-series standard



E-series soft seat
S011.42_20.__(__)



O-Ring-Type

Installation / Disassembling

Mounting and disassembling may only be done at depressurized systems!

Even at depressurized systems the parts can be very hot or very cold for a reasonable period of time!
Small volumes of the medium can penetrate during disassembling.
Wear protective gloves and safety glasses!

Operating

The valves are operated by T-handles or socket wrench.

Close clockwise.

1. Adjustment of packing

The packing (4; stem sealing against atmosphere) is pre-set at 1.5 times the nominal pressure. In case of long storage, the packing may lose it's tightness as it isn't under pressure. In this case it should be adjusted as follows:

Open the stem (2) and release the lock nut (7). Tighten the gland nut (6) ¼ turn until the valve feels not too slack or difficult to operate. Then tighten down the lock nut.

Required tools: engineer's wrench A/F 19 and A/F 14

2. Relieving of packing

Open the valve by turning the T-handle or socket wrench in an anti clockwise direction until it stops (back seat).

3. Replacing the head unit

Required tools: hexagon socket wrench A/F 3mm, flat-nose pliers, torque ring spanner A/F 22mm, hammer, drift punch

a) Depressurize the impulse line.

b) Open the stem up to the stop. Then dismount the T-handle.

c) Remove the lock pin (10).

d) Unscrew the valve head unit (3) counter-clockwise.

e) Lubricate the threads of the new head unit (valves for oxygen service require special approved lubricants). Open the stem completely up to the stop (back seat).

f) Screw in the new valve head unit and tighten it with a torque of 100 Nm (70 Nm for soft seat type).

g) Drive in the lock pin (10).

h) Mount the T-handle.

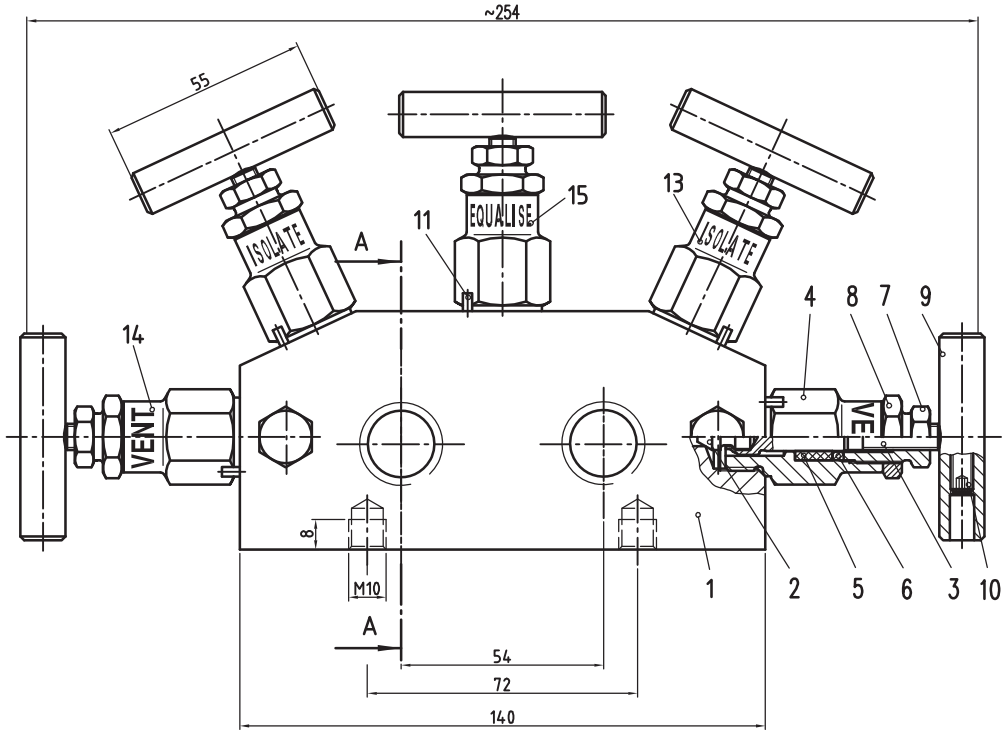
i) Pressurize the impulse line.

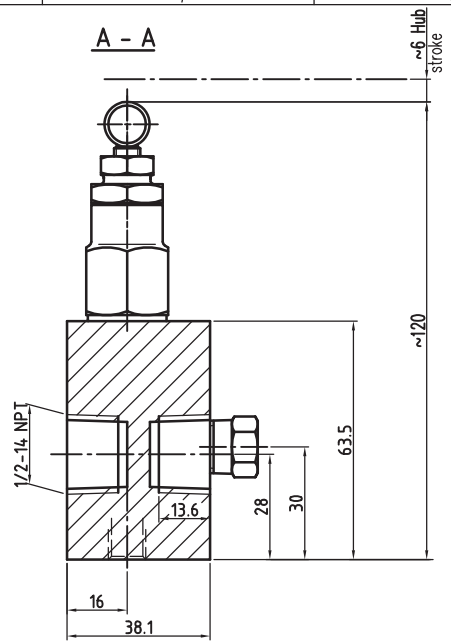
j) Check the packing for tightness and whether the valve feels not too slack or difficult to operate.

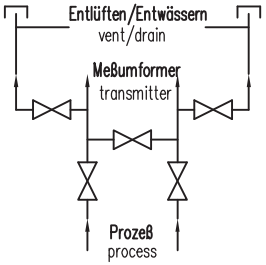
4. Oxygen service

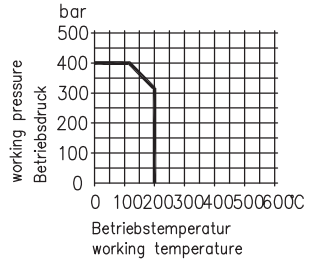
For degreased valves for oxygen service please consider the applicable accident prevention regulations.

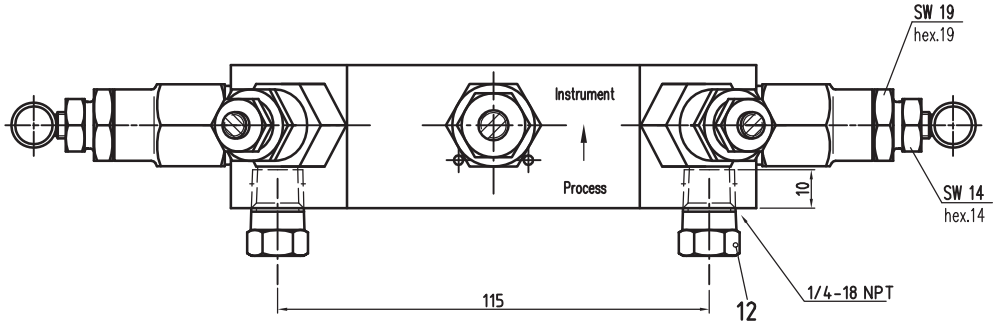
Armaturenfabrik Franz Schneider GmbH & Co.KG • D-74226 Nordheim • Germany • Tel. 07133/101-0 • Fax 07133/101-180











Pos.	Benennung		Werkstoff	Stck.	Artikel-Nr.	Bemerkungen
15	Schild "EQUALISE"	name plate	Nr.1.4301	1		
14	Schild "VENT"	name plate	Nr.1.4301	2		
13	Schild "ISOLATE"	name plate	Nr.1.4301	2		
12	Verschlußschraube	screw plug	Nr.1.4404	2		
11	Spannstift DIN 1481-3,0x10	pin	A2	5		
10	Gewindestift DIN 916 M6x8	set screw	A2	5		
9	Knebelgriff	T-handle	Edelstahl stainless steel	5		
8	Sechskantmutter	hexagon nut	Edelstahl stainless steel	5		
7	Spindelmutter	gland nut	1.4301	5		
6	Stopfbuchse	gland	Sint C40	5		
5	Packung	packing	PTFE	5		
4	Spindelführung	bonnet	1.4401	5		
3	Ventilspindel	stem	1.4404	5		
2	Ventilkegel	valve tip	1.4571	5		
1	Ventilgehäuse	valve body	Nr.1.4404	1		

Zust.	Änderung	Datum	Name
1	Spindelgewinde neue Form	00-05-16	Niederer

	Datum	Name
Bearb.	15.10.96	Rüter
Gepr.		

Maßstab 1:1 | Position - | Menge -

Ventilblock PN420 DN5

MANIFOLD

N342.42.482.01

Blatt -

SCHNEIDER Armaturen
D-74224 Nordheim
Tel. 07133/101-0

EDV Nr. N342 4X6 CAD

Proper use

Shut-off valves assembled with „E-series“ valve head units are used to connect instruments to the impulse lines or to shut off the impulse lines in chemical plants, power stations or similar facilities.

The max. permissible operating pressure depends on the temperature of the medium and on the used materials of the parts and gaskets. Please pay attention to the pressure-temperature-diagram of the valve or manifold.

Any other use or any modification are not allowed and exclude the manufacturer from any liability.

General warning

Shut-off valves with „E-series“ valve head units are used to shut off various media. These can be **poisonous, explosive, irritating, very hot or very cold**. Mounting, disassembling, operation and maintenance may only be done by experienced staff, which is familiar with the secure handling of the used medium.

In addition to these instructions also the common safety regulations and the instructions of the complete installation and of the measuring device have to be considered.

Suitability of material:

Protection against improper use of the shut-off valve:
In particular, it has to be ensured that the chosen materials of the wetted parts of the valve are suitable for the used media.
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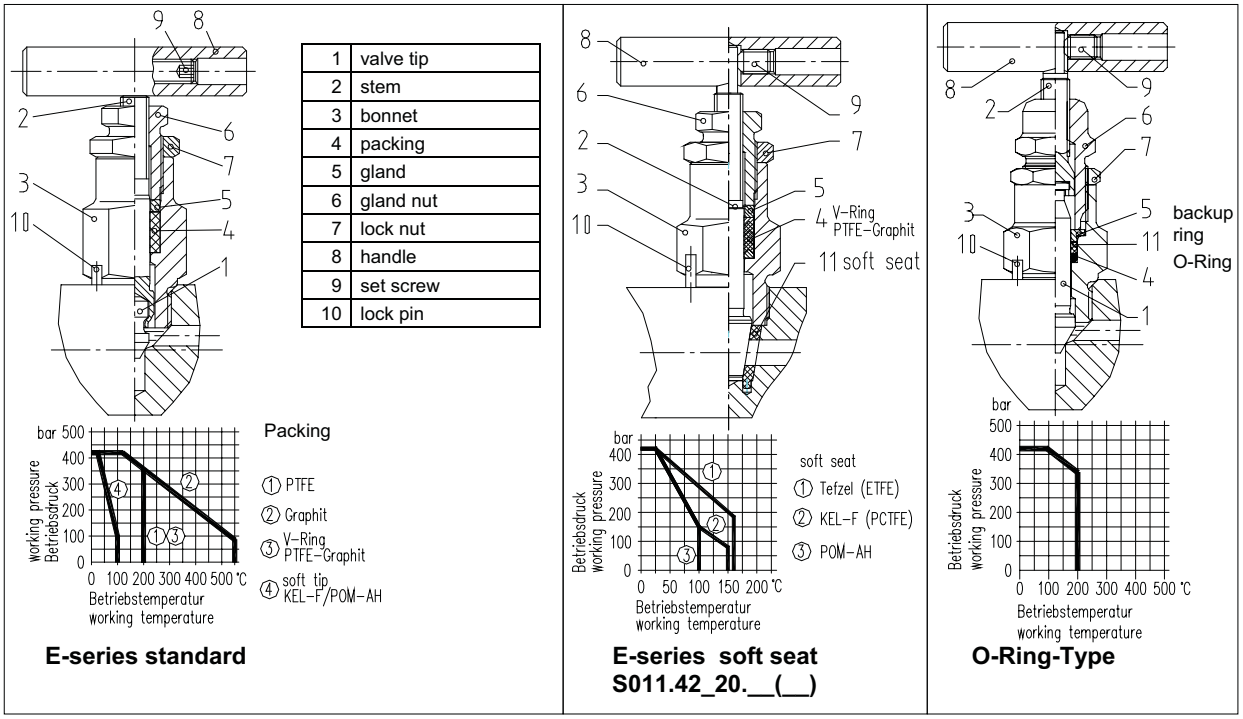
Types



1	valve tip
2	stem
3	bonnet
4	packing
5	gland
6	gland nut
7	lock nut
8	handle
9	set screw
10	lock pin

E-series standard | **E-series soft seat S011.42_20.__(__)** | **O-Ring-Type**

Installation / Disassembling

Mounting and disassembling may only be done at depressurized systems!

Even at depressurized systems the parts can be very hot or very cold for a reasonable period of time!
Small volumes of the medium can penetrate during disassembling.
Wear protective gloves and safety glasses!

Operating

The valves are operated by T-handles or socket wrench.

Close clockwise.

1. Adjustment of packing

The packing (4; stem sealing against atmosphere) is pre-set at 1.5 times the nominal pressure. In case of long storage, the packing may lose it's tightness as it isn't under pressure. In this case it should be adjusted as follows:

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Required tools: engineer's wrench A/F 19 and A/F 14

2. Relieving of packing

Open the valve by turning the T-handle or socket wrench in an anti clockwise direction until it stops (back seat).

3. Replacing the head unit

Required tools: hexagon socket wrench A/F 3mm, flat-nose pliers, torque ring spanner A/F 22mm, hammer, drift punch

a) Depressurize the impulse line.

b) Open the stem up to the stop. Then dismount the T-handle.

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d) Unscrew the valve head unit (3) counter-clockwise.

e) Lubricate the threads of the new head unit (valves for oxygen service require special approved lubricants). Open the stem completely up to the stop (back seat).

f) Screw in the new valve head unit and tighten it with a torque of 100 Nm (70 Nm for soft seat type).

g) Drive in the lock pin (10).

h) Mount the T-handle.

i) Pressurize the impulse line.

j) Check the packing for tightness and whether the valve feels not too slack or difficult to operate.

4. Oxygen service

For degreased valves for oxygen service please consider the applicable accident prevention regulations.

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GESTRA Steam Systems

Product Range A2

Non-Return Valve
RK 44
For flanges PN 6 / 10 / 16

RK 44

CE

Description

Wafer-type non-return (check) valve for sandwiching between flanges. Valve with spring for installation in any position. Without spring only for vertical lines with upward flow. Self-centering valve body. Application for liquids, gases and vapours (observe classification according to PED).

Pressure / Temperature Rating for valves with metal-to-metal seat

Nominal sizes DN	[mm] [in]	15 – 100 ½ – 4			125 – 200 5 – 8		
Nominal pressure	PN	16 [1])					
Max. service pressure	[barg] [psig]	16 230	14 200	13 185	16 230	14 200	13 185
Related temperature	[°C] [°F]	120 248	200 392	250 482	120 248	200 392	250 482
Minimum temperature		–200 °C (–328 °F) [1])			–10 °C (14 °F) [1])		

[1]) Minimum temperature at nominal pressure rating.

Soft seats

EPDM (ethylene propylene): – 40 to +150 °C (–58 to +302 °F) for water, condensate and steam.
FPM (fluoro rubber): – 25 to +200 °C (–13 to +392 °F) for oils, gases and air.

But also note valve pressure/temperature rating in the above table.

Tightness with soft seats of EPDM and FPM in accordance with DIN 3230, part 3, leakage rates BN 1, BO 1.
Permissible leakage rates with metal-to-metal seat in accordance with DIN 3230, part 3, leakage rates BN 2, BO 3.

Chemical resistance see GESTRA data base "Chemical Resistance".

Connections of wafer-type valves [2])

Standard valves for fitting between flanges to		
DIN	BS	ASME
DIN EN 1092 PN 6/10/16	BS 10 tables D, E, F	B 16.1 class 125 FF B 16.5 class 150 RF[3])

[2]) DN 15 – 100 mm (½ – 4") with universal centering ring.
[3]) ASME class 150 RF only suitable for DN 125 – 200 mm (5 – 8").

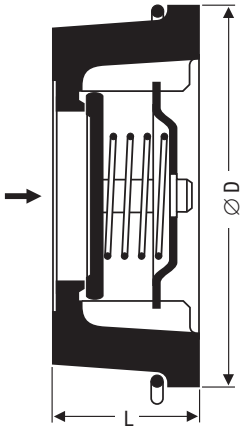
Dimensions

DN	[mm] [in]	15 ½	20 ¾	25 1	32 1¼	40 1½	50 2	65 2½	80 3	100 4	125 5	150 6	200 8
Dimensions [mm]	L[4])	16	19	22	28	31.5	40	46	50	60	90	106	140
	D	42	49	58	74	84	97	117	132	152	184	209	264
Weight	[kg]	0.1	0.2	0.25	0.5	0.7	1.1	1.4	2	3.2	7.7	11	22

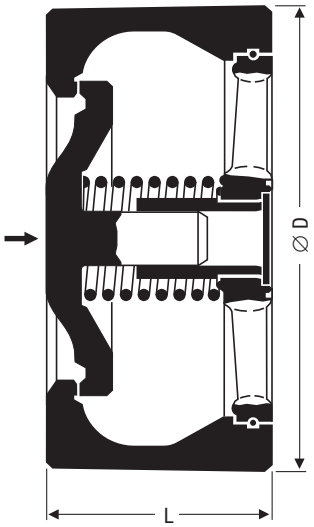
[4]) Overall length according to DIN EN 558-1, table 11, series 49 (≙ DIN 3202, part 3, series K 4).

Materials

DN 15 – 100 (½ – 4")	DIN reference		ASTM equivalent
Body, seat and guide ribs	CuSn 10 – Cu	CC480K-GS	B 584 C90 500
Valve disc, spring retainer	X6CrNiMoTi17-12-2	1.4571	A 182 F 316
Spring			A 313 Type 316
Centring ring	X10CrNi18-8	1.4310	A 313 Type 302
DN 125 – 200 (5 – 8")			
Body	EN-GJL-250	EN-JL 1040	A 126 Class A
Seat, valve cone and spindle	CuSn10 – Cu	CC480K-GS	B 584 C90 500
Guide support			
Spindle guide			
Spring	X6CrNiMoTi17-12-2	1.4571	A 313 Type 316



DN 15 – 100
(½ – 4")



DN 125 – 200
(5 – 8")

Non-Return Valve
RK 44
For flanges PN 6 / 10 / 16

Opening pressures

Differential pressures at zero volume flow.

DN		Opening pressures [mbar]			
		Direction of flow			
mm	in	without springs	with springs		
		↑	↑	→	↓
15	½	2.5	25	22.5	20
20	¾	2.5	25	22.5	20
25	1	2.5	25	22.5	20
32	1¼	3.5	27	23.5	20
40	1½	4.0	28	24.0	20
50	2	4.5	29	24.5	20
65	2½	5.0	30	25.0	20
80	3	5.5	31	25.5	20
100	4	6.5	33	26.5	20
125	5	12.5	35	22.5	10
150	6	14.0	38	24.0	10
200	8	13.5	37	23.5	10

1 mbar = 0.0145 psi = 10 mm w.g. = 0.4 in w.g.

On request at extra charge, special springs for opening pressures:

- between 5 and 1000 mbar for DN 15–50 mm (½–2"),
- between 5 and 700 mbar for DN 65 and 80 mm (2½–3"),
- between 5 and 500 mbar for DN 100–200 mm (4–8").

Enquiry Specification

GESTRA DISCO non-return valve RK 44, PN 6 / 10 / 16. Wafer design with extremely short overall length to DIN EN 558-1, table 11, series 49.
Suitable for fitting between flanges to DIN, BS or ASME. Indications on pressure, nominal size (DN), body material. Metal-to-metal seat or soft seat (EPDM or FPM).

Order Specifications

Type RK 44, DN…
Metal-to-metal or soft seat (EPDM or FPM).
Fluid, flowrate, pressure and temperature.
Type of pipe flanges.

Note
The valves should not be used on compressors or where pulsating flow exists.
For these applications please consult us.

These products comply with the requirements of the EC Pressure Equipment Directive (PED) 97/23/eec. DN 65–200 with CE marking. DN 15–50 are excluded from the scope of this Directive and **not entitled** to bear the CE marking.

Supply in accordance with our general terms of business.

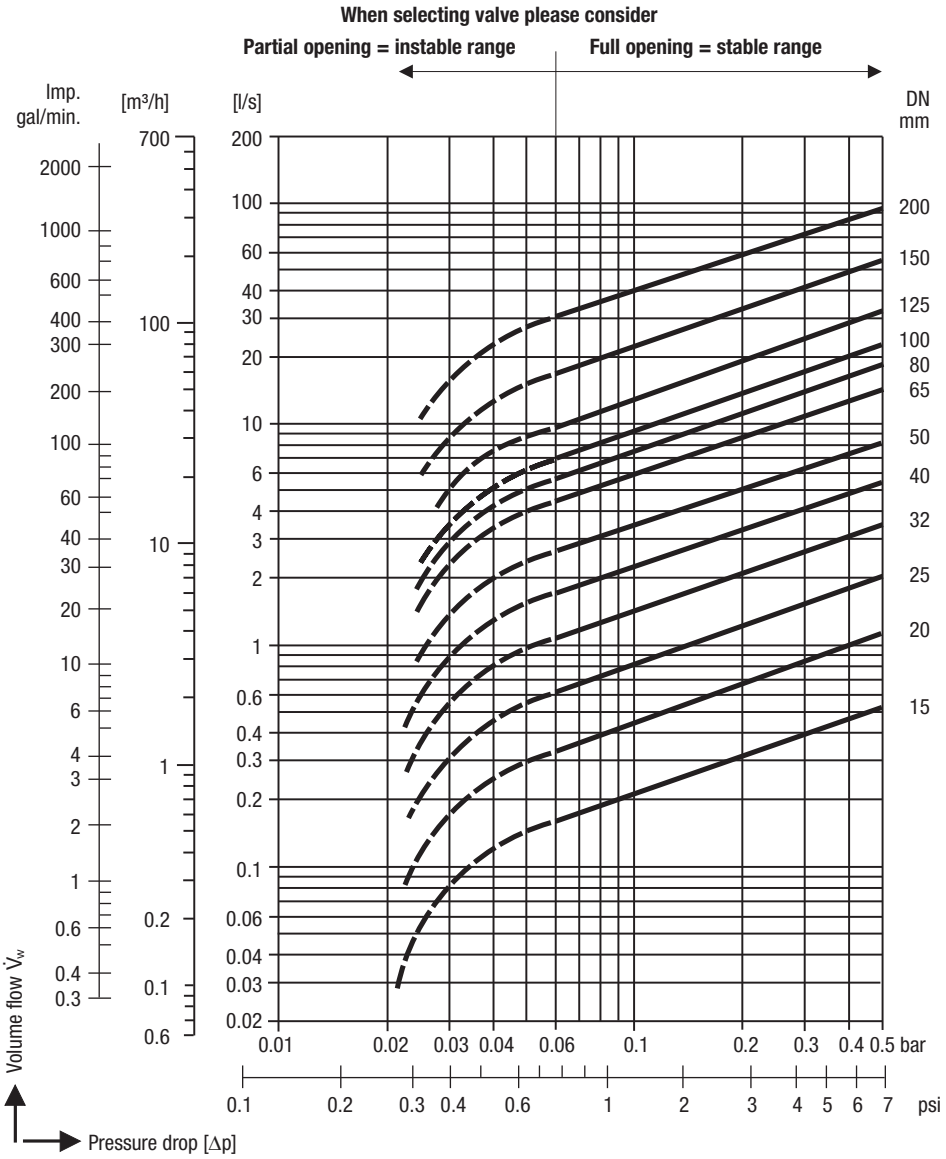
Pressure Drop Chart

The curves given in the chart are valid for water at 20 °C. To read the pressure drop for other fluids the equivalent water volume flowrate must be calculated and used in the graph.

The values indicated in the chart are applicable to spring-loaded valves with horizontal flow. With vertical flow insignificant deviations occur only within the range of partial opening.

$$\dot{V}_w = \dot{V} \cdot \sqrt{\frac{\rho}{1000}}$$

$\dot{V}_w$ = Equivalent water volume flow in [l/s] etc.
ρ = Density of fluid (operating condition) in [kg/m³] etc.
$\dot{V}$ = Volume of fluid (operating condition) in [l/s] etc.



GESTRA AG
P. O. Box 10 54 60, D-28054 Bremen
Münchener Str. 77, D-28215 Bremen
Telephone +49 (0) 421 35 03 - 0, Fax +49 (0) 421 35 03 - 393
E-Mail gestra.ag@flowserve.com, Internet www.gestra.de

FLOWSERVE GESTRA

FLOWSERVE® GESTRA

RK 70/71
RK 41
RK 44/44s
RK 76
RK 86/86A
RK 16A/16B/16C
RK 49
RK 29A

(D) **Betriebsanleitung 808519-05**
Rückschlagventile RK

(GB) **Installation Instructions 808519-05**
Non-Return Valves RK

(F) **Instructions de montage et de mise en service 808519-05**
Clapets de retenue RK

(E) **Instrucciones de montaje y servicio 808519-05**
Válvulas de retención RK

(I) **Manuale di Istruzioni 808519-05**
Valvole di non ritorno RK

Lloyd's Register
PRESSURE EQUIPMENT DIRECTIVE

Safety Note

GB

The equipment must only be installed and commissioned by qualified and adequately trained personnel.

Maintenance and retrofitting must only be performed by entrusted personnel who – through adequate training – have achieved a recognized level of competence.

Usage for the intended purpose

The non-return valves RK are automatic-stop check valves and designed for use in pipes in order to prevent the backflow of fluid. The admissible pressure and temperature ratings as well as the chemical and corrosive influences of the fluid on the pressure equipment must be taken into account.

Check the chemical resistance and suitability of the valve for the operating conditions in question.

⚠ Danger

GB

The valve is under pressure during operation.

When loosening flanged connections or sealing plugs, hot water, steam, corrosive fluids or toxic gases may escape. This presents the risk of severe burns and scalds to the whole body or severe cases or poisoning.

Installation and maintenance work should only be carried out when the system is depressurized.

The valve becomes hot or extremely cold during operation. This presents the risk of severe burns to hands and arms. Installation and maintenance work should only be carried out at room temperatures.

Sharp edges on internals present a danger of cuts to hands. Always wear industrial gloves for installation and maintenance work.

ATEX Directive 94/9/EC, 1999/92/EC

GB

The equipment can be used in the following explosive zones: 0, 1, 2, 20, 21 and 22.

The equipment does not have its own potential source of ignition and is therefore not subject to the Directive 94/9/EC.

The equipment does not require an Ex marking.

The equipment does not produce excessively high surface temperatures. The user must make sure that the process fluid does not generate an inadmissibly high surface temperature.

Description

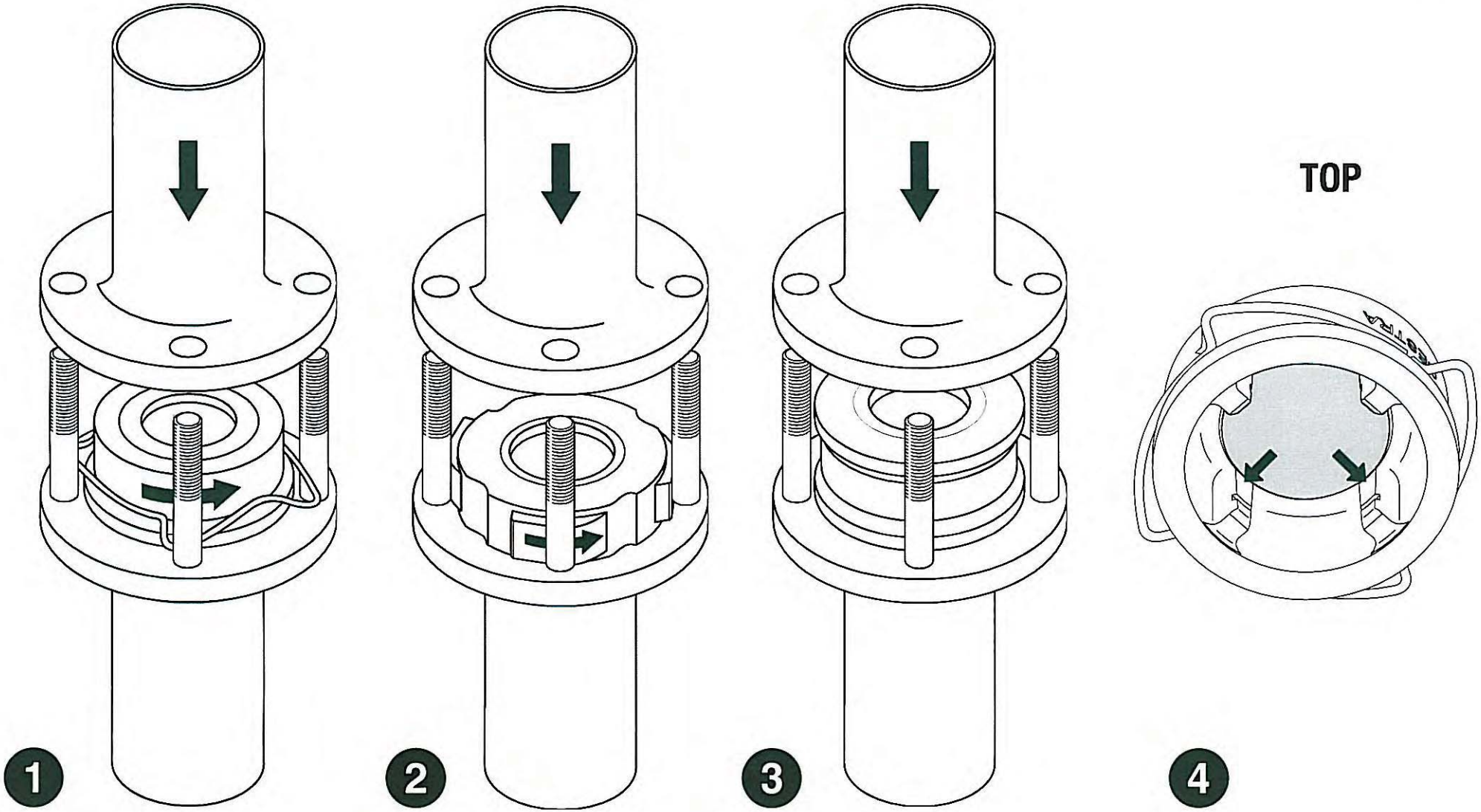
GB

Non-return valve RK with spiral centering ring or self-centering body. Installation in any position. Exception: Valves without spring can only be installed in vertical lines with upward flow.

1. Non-return valve with spiral centering ring
2. Non-return valve with body centering cams
3. Non-return valve with self-centering body
4. Position of guide ribs (horizontal installation)

Installation

GB



Technical Data

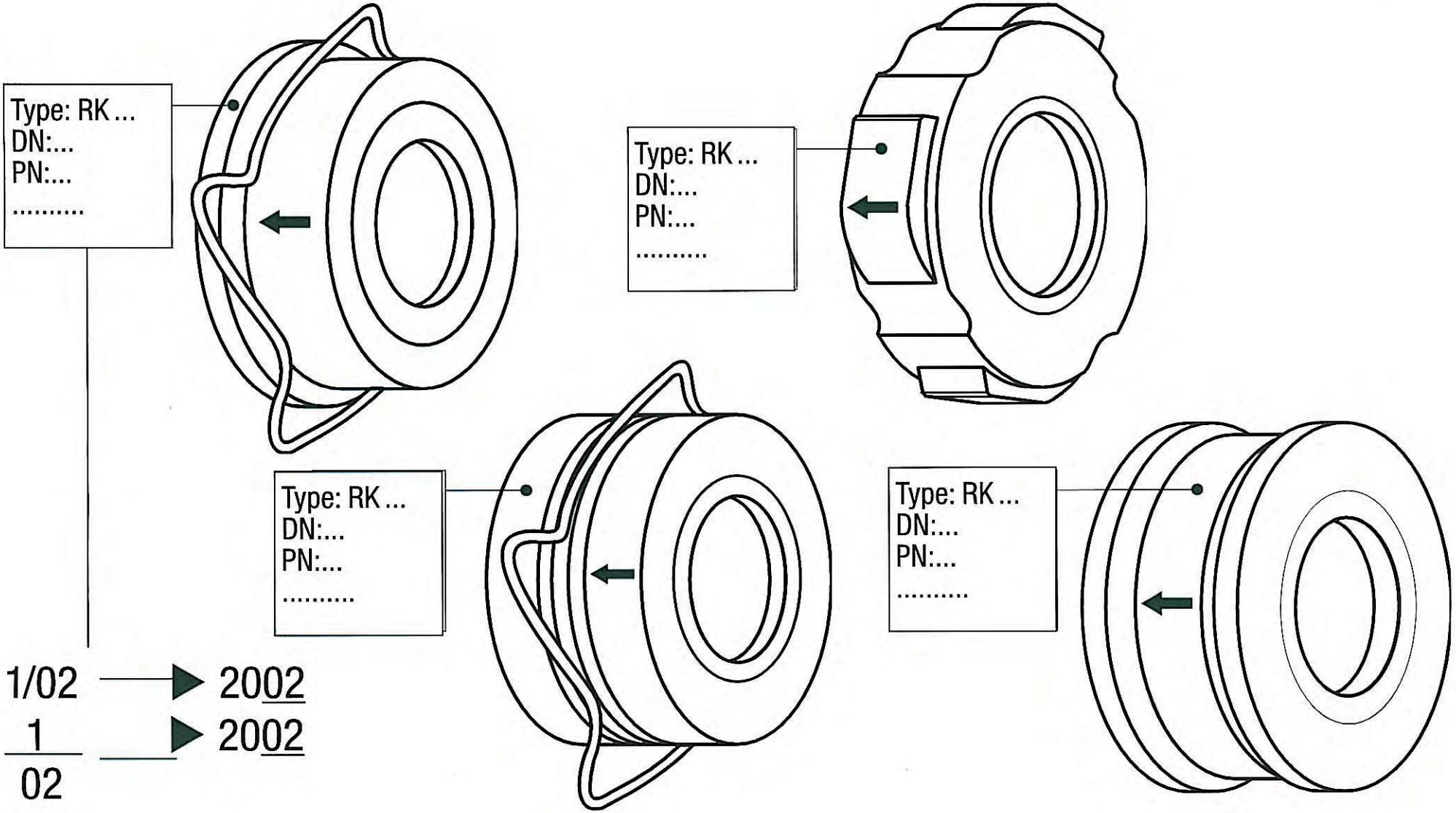
GB

For pressure/temperature ratings see marking or name plate (pressure class PN/Class, material number, sticker for soft seal, spring material)

Observe lower temperature ratings for equipment with elastic seals and certain spring types (see data sheet).

Name Plate / Marking

GB



Declaration of Conformity CE GB

We hereby declare that the pressure equipment **RK** – except for equipment excluded from the scope of the PED according to section 3.3 – conforms to the European Pressure Equipment Directive (PED) 97/23/EC of 29 May 1997.

Equipment in conformity with the PED bears the marking CE 0525.

Applied conformity assessment procedure: Annex III; Module H, verified by the Notified Body 0525.

This declaration is no longer valid if modifications are made to the equipment without consultation with us.

Bremen, 1st August 2004
GESTRA AG

i. V. U. Bledschun

Head of the Design Dept.
Uwe Bledschun
(Academically qualified engineer)

i. V.

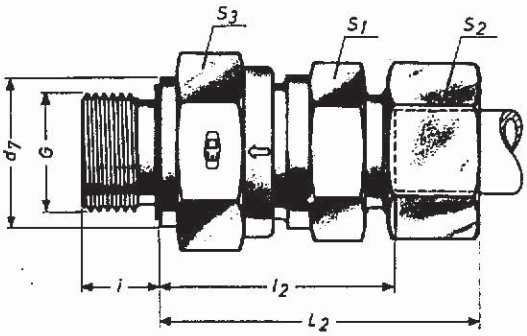
Quality Assurance Manager
Lars Bohl
(Academically qualified engineer)

EO non-return valves

RHZ-R-ED

BSP male stud thread seal by EOLASTIC sealing*

Inlet = **EO** tube connection
Outlet = BSP thread



Series	Tube o.d.	S_1	S_2	S_3	L_2	l_2	i	Male stud BSP thread G	d_7	DN	LW inside diameter mm		Part no.	kg per 100 pcs. steel	1.4571
L	06	17	14	17	41	26,5	8	G 1/8 A	14	4	—**	3,5	**RHZ 6-PLR-ED**	5,1	5,6
light	8	19	17	19	43	28,5	12	G 1/4 A	19	6	1/8	5,5	**RHZ 8-PLR-ED**	6,5	7,7
PB 100	10	22	19	24	53	38,5	12	G 1/4 A	19	8	1/4	7,5	**RHZ 10-PLR-ED**	8,5	12,4
	12	27	22	30	55	40,5	12	G 3/8 A	22	10	3/8	9,5	**RHZ 12-PLR-ED**	18,0	19,0
	15	27	27	32	57,5	42,5	14	G 1/2 A	27	12	1/2	11,5	**RHZ 15-PLR-ED**	21,0	23,0
	18	36	32	36	64	48	14	G 1/2 A	27	16	1/2	14	**RHZ 18-PLR-ED**	32,0	34,3
	22	41	36	46	72	56	16	G 3/4 A	32	20	3/4	18	**RHZ 22-PLR-ED**	49,0	52,4
	28	50	41	55	80,5	64	18	G 1 A	40	25	1	23	**RHZ 28-PLR-ED**	77,0	77,5
	35	60	50	60	91,5	70	20	G 1 1/4 A	50	32	1 1/4	29	**RHZ 35-PLR-ED**	114,0	117,4
	42	65	60	70	93	70,5	22	G 1 1/2 A	55	32	1 1/4	29	**RHZ 42-PLR-ED**	180,0	—
S	6	19	17	19	46	31,5	12	G 1/4 A	19	3	—	3,5	**RHZ 6-PSR-ED**	7,5	9,0
heavy	8	19	19	19	46	31,5	12	G 1/4 A	19	4	—	3,5	**RHZ 8-PSR-ED**	8,5	9,6
PB 400	10	22	22	24	54	38	12	G 3/8 A	22	6	1/8	5,5	**RHZ 10-PSR-ED**	15,0	15,9
	12	24	24	27	57	41	12	G 3/8 A	22	8	1/4	7,5	**RHZ 12-PSR-ED**	18,0	19,0
	14	27	27	32	61	43,5	14	G 1/2 A	27	10	3/8	9,5	**RHZ 14-PSR-ED**	25,2	26,9
	16	32	30	36	64	46	14	G 1/2 A	27	12	1/2	11,5	**RHZ 16-PSR-ED**	32,5	34,5
	20	41	36	46	71,5	50	16	G 3/4 A	32	16	1/2	15	**RHZ 20-PSR-ED**	59,0	60,7
PB 250	25	46	46	50	78,5	54,5	18	G 1 A	40	20	3/4	19	**RHZ 25-PSR-ED**	82,5	85,6
	30	60	50	60	90,5	64	20	G 1 1/4 A	50	25	1	24	**RHZ 30-PSR-ED**	133,2	139,9
	38	65	60	70	102	71,5	22	G 1 1/2 A	55	32	1 1/4	29	**RHZ 38-PSR-ED**	197,5	196,8

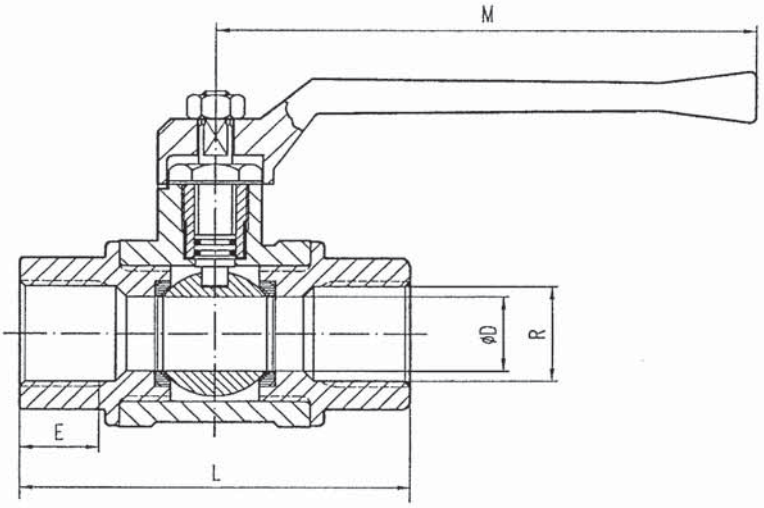
Dimensions given are approx. figures with tightened nut.
If non-return valves with other than 1 bar opening pressure are ordered, we charge additional price.
*EOLASTIC sealing of buna N (standard) −20°C up to +90°C, of viton (on request) −20°C up to +200°C
**Inch sizes

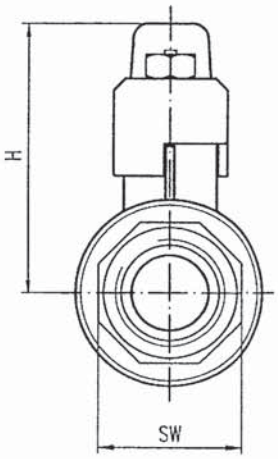
DIETRICH SCHWABE
GESELLSCHAFT FÜR STEUER–REGEL–ARMATURENTECHNIK M.B.H.
63322 RÖDERMARK
ODENWALDSTR.61
TEL. 06074/89590
FAX 06074/90008

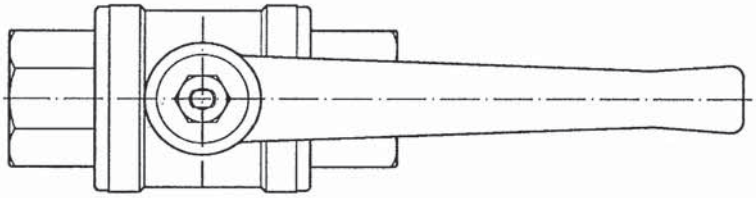
BALL–VALVE TYPE 406–4

DIN-DVGW

FACE–TO–FACE DIMENSIONS TO DIN 3357 PART 4
BRASS
FEMALE THREAD TO DIN 2999
FULL BORE
R 1/4" – R 2"







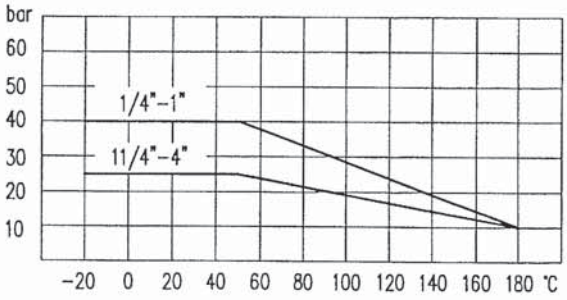
item	material
body	Ms58, nickel–plated
ball	Ms58, chromium–plated
stem	Ms58
seats	P.T.F.E.
stem–O–rings	NBR
lever	die cast aluminium

Specifications for DIN–DVGW–test
Testnumber:
DIN–DVGW–Reg.–Nr. 92.01 e 443 (for Gas PN 1)

Dimensions in mm

DN	R	PN	øD	L	H	M	E	SW	weight (kg)
06	1/4"	40	10	60	55	80	11.5	19	0.304
10	3/8"	40	10	60	55	80	17	22	0.307
15	1/2"	40	15	75	59	100	21	27	0.388
20	3/4"	40	20	80	72	120	20	32	0.613
25	1"	40	25	90	77	120	21	41	0.852
32	11/4"	25	32	110	95	160	27	50	1.404
40	11/2"	25	40	120	100	180	28.5	55	1.846
50	2"	25	50	140	110	180	31.8	70	3.074

Pressure–Temperature–Rating



14.10 Doppio filtro

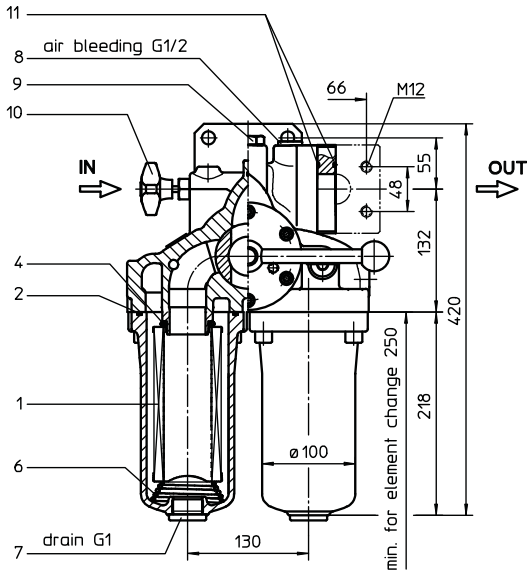
Numero di disegno Voith: 204.00207600

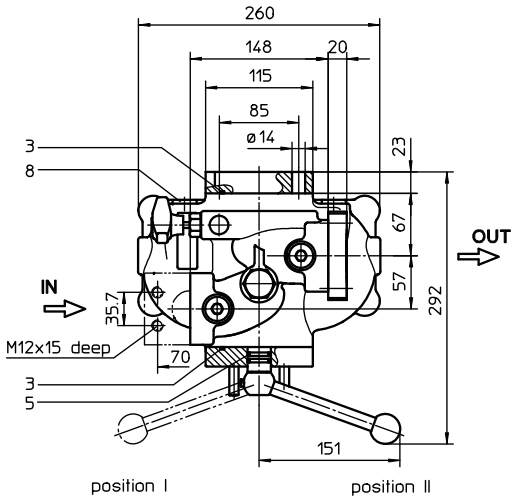
Tipo: DSF 176.43837

Descrizione. . . . . Internormen

PRESSURE FILTER, change-over
Series DSF 176.43837 DN 40/32 PN 25

Sheet No.
43837-4





Pos. I: left filter side in operation
Pos. II: right filter side in operation

1. Type index:

1.1. Complete filter: (ordering example)

DSF. 176. 43837. 25G. 16. E. P. -. FS. 7. FW. 02. -

1	2	3	4	5	6	7	8	9	10	11	12	13

1 **series:**
DSF = duplex filter

2 **nominal size:** 176

3 **execution** according to sheet-no. 43837

4 **filter-material and filter-fineness:**
25 G = 25 µm stainless steel wire mesh
10VG = 10 $\mu m_{(c)}$ Interpor fleece (glass fibre)

5 **resistance of pressure difference for filter element:**
16 = Δp 16 bar

6 **filter element design:**
E = without by-pass valve

7 **sealing material:**
P = Nitrile (NBR)

8 **filter element specification:**
- = standard

9 **connection „IN“:**
FS = SAE-flange 3000 PSI

10 **connection size „IN“:**
7 = 1 ½“

11 **connection „OUT“:**
FW = flange according to INTERNORMEN factory specification

12 **connection size „OUT“:**
02 = DN32

13 **filter housing specification:**
- = standard

1.2. Filter element: (ordering example)

01E. 175. 25G. 16. E. P. -

1	2	4	5	6	7	8

1 **series:**
01E = filter element according to INTERNORMEN factory specification

2 **nominal size:** 175

4 - 8 see type index-complete filter

2. Accessories:

- counter flange FS.7.G.6.ST.P.3000

weight: approx. 36 kg

Changes of measures and design are subject to alteration!

internormen technology

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phone +49 - (0)6205 - 2094-0 e-mail sales@internormen.com
fax +49 - (0)6205 - 2094-40 url www.internormen.com

3. Spare parts:

item	qty.	designation	dimension	article-no.
1	2	filter element	01E.175.10VG.16.E.P.-	300156
	2	filter element	01E.175.25G.16.E.P.-	300161
2	2	O-ring	98 x 4	301914 (NBR)
3	2	O-ring	75 x 3	302215 (NBR)
4	2	O-ring	44 x 6	302222 (NBR)
5	2	O-ring	18 x 3	304359 (NBR)
6	2	pressure spring	d=4,0 Da=80/60 Lo=50,0 if=2,5	304989
7	2	screw plug	G 1	305303
8	4	screw plug	G ½	304678
9	1	screw plug	20913-4	309817
10	1	pressure balance valve		
11	2	O-ring	50 x 3	307398 (NBR)

4. Description:

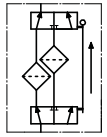
Duplex filters change-over of the series DSF 176.43837 are suitable for a working pressure up to 25 bar
Pressure peaks can be absorbed with a sufficient margin of safety.
A three-way-change-over valve which is integrated in the middle of the housing makes it possible to switch from the dirty filter-side to the clean filter-side without interruting operation.
The filters can be installed as suction filter, pressure filter or return-line filter.
The filter element consist of star-shaped, pleated filter material which is supported on the inside by a perforated core tube and is bonded to the end caps with a high-quality adhesive. The flow direction is from outside to the inside. Filter finer than 40 µm should use throw-away elements made of paper or Interpor fleece (glass fibre). Filter elements as fine as 5 $\mu m_{(c)}$ are available; finer filter elements on request.
INTERNORMEN-Filter elements are known as elements with a high intrinsic stability and an excellent filtration capability, a high dirt-retaining capacity and a long service life.
INTERNORMEN-Filter are suitable for all petroleum based fluids, HW-emulsions, most synthetic hydraulic fluids and lubrication oils.
Approvals according to TÜV, and the major „Shipyard Classification Societies" D.N.V.; B.V.; G.L.; L.R.S.; R.I.N.A.; A.B.S.; P.R.S.;USS.R.S. and others are possible.

5. Technical data:

temperature range:	- 10°C to + 80°C (for a short time + 100°C)
operating medium:	mineral oil, other media on request
max. operating pressure:	25 bar
test pressure:	50 bar
connection:	SAE-flange 3000 PSI, flange INTERNORMEN factory specification DN32
housing material:	EN-GJS-400-18-LT
sealing material:	Nitrile (NBR)
installation position:	vertical
bleeder connections:	G ½
evacuation connections:	G 1
volume tank:	2x 1,2 l

Classified under the Pressure Vessel Directive 97/23/EC for mineral oil (fluid group 2), Article 3, Para. 3.
Classified under ATEX Directive 94/9/EC according to specific application (see questionnaire sheet-no. 34279-4).

6. Symbol:



7. Pressure drop flow curves:

Precise flow rates see 'INT-Expert-System Filter', respectively Δp-curves; depending on filter fineness and viscosity.

8. Test methods:

Filter elements are tested according to the following ISO standards:

ISO 2941	Verification of collapse/burst resistance
ISO 2942	Verification of fabrication integrity
ISO 2943	Verification of material compatibility with fluids
ISO 3723	Method for end load test
ISO 3724	Verification of flow fatigue characteristics
ISO 3968	Evaluation of pressure drop versus flow characteristics
ISO 16889	Multi-pass method for evaluating filtration performance

Manual and maintenance instructions

for INTERNORMEN pressure filters, change-over
DSF 175, 176, 330, 331, related specifications

This manual is effective for all filters of the type DSF 175, 176, 330, 331 and related specifications. It contains certain requirements and instructions which ensure unobjectionable operation of the filter. It can be completed with specific additional instructions by the operator himself if necessary.

1. Safety instructions

- Prior to operating the filter, manual and maintenance instructions have to be read carefully.
- Follow the instructions of this manual under any circumstances!
- The manufacturer does not assume liability for any damage, which occurs due to disregarding these instructions.
- If operations are carried out differently, the safety of the pressurized device can not be assured!
- Operating conditions given in the data sheet, especially excess pressure, temperature range and operating fluid, have to be followed unconditionally. Variation of these parameters can cause damage to important pressure holding parts and sealing. Also take in consideration the compatibility of filter components with the operating fluid.
- Under working conditions the filter housing is pressurized. Do not try to loosen or remove any part of the filter or the filter housing during operation. The operating fluid could escape at high pressure and high temperatures.
  This does not apply for parts of the decompressed or the turned off side of the filter.
- Leaking operating fluid always bears the danger of injuries and burns!
- Do not open the filter housing until you made sure it is not pressurized any more!
- Touching parts of the filter may cause burning, depending on the operating temperature.
- When exchanging the filter keep in mind that it might have operating temperature. Danger of burning!
- Always wear safety goggles and gloves when working on the filter!
- If you come into contact with the operating fluid please follow the instructions of the fluid manufacturer!!
- Only use original spare parts.

For filters being used in hazardous locations the INTERNORMEN documentation N° 41269 "Supplementation of the Operating Manual for the use of filters in potential explosive areas.

2. Installation

Note safety instructions!

When removing a new filter from its box it is ready for installation. The filter is fixed with 2 screws M12 at a vertical mounting surface.

When installing the filter please make sure, that:
- sufficient fixation of the filter is assured
- the clogging indicator is accessible and can be checked easily.
- the connections for draining, air-bleeding and pressure measurements can be accessed easily.
- there is enough room above the filter to remove and replace elements.
- no dirt, particles, other contamination or fluids enter the filter.
- both inlet and outlet of the filter are connected to the pipe work correctly.
- counterflanges or screw joints of the pipe system and the filter have to be angled precisely and connected that same way (if counterflanges or pipe joints are canted or under tension switching filters can be aggravated and it might harm pressure tightness)

3. Commissioning

Prior to the commissioning of the filter the completeness (filter elements, seals) has to be controlled.
Then the filter has to be bleeded as follows :

- Set the shift lever of the reversing valve into middle position
- Open the screw plugs G ½" at the air-bleed bore holes and connect suitable air bleeding tubes with collecting pan for the operating fluid flowing out
- Connection of the volume flow until bubble-free operating fluid flow out of the air-bleeding tubes
- Disconnection of the volume flow
- Remove the air-bleeding tubes and close the air-bleed bore holes
- Connection to the required filter side at the positioning pin of the selector shaft

The shift lever of the selector shaft always points at the operating filter side.

internormen technology

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4. Change of Elements

The change of filter elements is necessary when reaching the unit specific pressure difference, respectively the maximum pressure difference shown on the clogging indicator. If there is no unit specific definition, the change of elements should be done at a maximum pressure of Δp 6 bar.

The elements can be changed as follows:

- Open the pressure balance valve
- Set the positioning pin from the operating side to the other side
- Closing the pressure balance valve
- Open the screw plug for the bleeding at the filter side to be serviced (G ½" at operating filter side), respectively close the bleeding according to data sheet 1650 and open the drain screw G 1" at the filter bowl
- Unscrew the filter bowl
- Remove the filter elements
- Clean the filter bowl (pressure spring Item 8 (DSF175-330) and item 6 (DSF176-331) must be there)
- Install the new or cleaned filter element
- Screw the filter bowl to the filter housing
- Closing of the drain bore (G 1") at the filter bowl
- Air-bleeding of the serviced filter side (see Item 5)

In general take care of the absolute cleanness during the change of elements in order to prevent from any penetration of dirt, respectively of impurities. The new elements should be taken out of their package shortly before they are replaced, and they should be protected against mechanical damages.
When changing the filter elements the availability and quality of the sealing elements should be controlled. Worn-out sealing elements should be replaced by new ones.

5. Air-bleeding of the Filter

The air-bleeding of the filter during the change of elements is different to the air-bleeding of commissioning. For the change of elements there is an air-bleeding required only at the filter side to be serviced. The air-bleeding is done during the operation of the unit.

- Open the bleeding screw plug G ½" at the operating side of the filter head, respectively connect the bleeding device according to data sheet 1650
- Open the bleeding screw plug G ½" at the operating side of the filter head, respectively connect the bleeding device according to data sheet 1650
- Close the pressure balance valve and the bleeding bore hole. From filters equipped with a bleeding device according to data sheet 1650 this is to be removed.

6. Cleaning of the Filter Element

Filter elements with filter materials of glass fibre (VG) or paper (P) are not cleanable. They have to be replaced when having reached the dirt retention capacity . Filter elements with filter materials of wire mesh (G) are cleanable and can be used again.
The cleaning ost ehese filter elements has to be carried out according to the cleaning specification for INTERNORMEN-filter elements (metal), sheet-no. 21070-4 and 39448-4.

7. Pressure Difference Measuring

In case of filters installed with clogging indicators a permanent measuring of the pressure difference takes place. The indication corresponds to the kind of clogging indicators; either visual or visual and electrical respectively electronic.
In addition the air-bleeding connections III and IV can be used for the connection of external pressure gauges.
Recommended are the measuring connections according to data sheet 1650.

8. Service

The service will be performed by

INTERNORMEN Technology GmbH
Friedensstr. 41
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Germany

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url: www.internormen.com

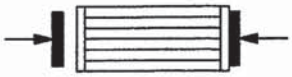
Special questions about the operation of the filter will also be answered within this area.
Spare parts respectively wearing parts have to be ordered according to the spare part list of the filter-data-sheet.

Cleaning instructions

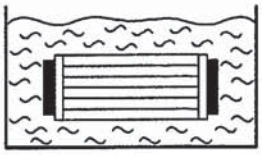
for INTERNORMEN filter elements of wire mesh

Sheet No.
21070-4 B

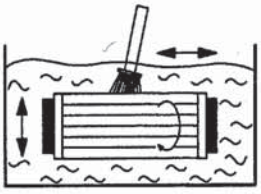
1. Before starting the cleaning process, close the clean side of the filter element.



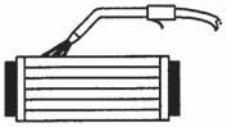
2. Lay the filter element into a vessel. According tothe contamination level soak the coarse contamination for about 30 minutes. As cleansing liquor we recommed petrol, trichlorethylene, escabon or hot water.



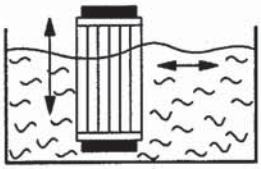
3. Remove the soaked contamination with a soft brush, while spinning the filter element. (For filter elements with a micron size rating of < 25 µm, we recommed the cleaning in an ultrasonic bath).



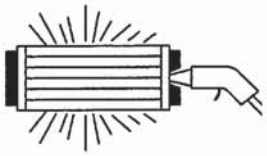
A steam jet can also be used →



4. After precleaning wash the filter element up in a **clean** liquid.

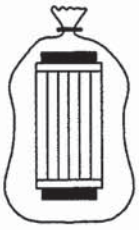


5. After cleaning blow out the filter element from inside to outside with compressed air or steam jet.



6. Check the filter element optical (back light), whether the pores are open.

7. a) Reinstall the cleaned filter element (check the seal)
or
b) restore it carefully in a dustfree bag.



8. Service life:
In course of time the efficiency of cleaning will become worse due to the contamination level and the cleaning intervals become shorter. This results in a limited life also for the cleanable filter elements. After several cleanings more and more fiber particles and debris stick to the wire mesh, which hardly can be removed. This is perceptible in shorter standing times.

EDV 07/00

INTERNORMEN-Filter

D-68804 ALTLUSSHEIM Phone 0 62 05 / 20 94 - 0 Fax 0 62 05 / 20 94 - 40

14.11 Servomotore tubo di presa

14.11.1 Servomotore

Numero di disegno Voith: 4 255861 003

Tipo: Contrac PME 120 AI

Istruzioni per l'uso. . . . . ABB

Cablaggio completo . . . . . "Morsettiera Foglio 1-15/91600389310"

Instructions
42-68-151 EN

Electrical Part-Turn Actuator PME120-AI/-AN (Contrac)

For continous control; rated torque 100 Nm; with integrated or for separate electronic unit

Content

Legend

Danger
Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury

Warning
Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury or serious property damage.

Caution
Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury or property damage.

Important
Indicates useful hints or other special information which, if not observed, could lead to a decline in operating convenience or affect the functionality.

1. Device Identification

1.1 Actuator ID label

1	**Antrieb / Actuator: CONTRAC ....**		
2	F-Nr./No	NL	
3	M =	Jahr/Year	CE
4	t =	IP 66	
5	min.....max.	max.	
6	Öl / Oil:		
7	Elektronik/Electronics		
8			
9			
10			
	ABB Automation D-32425 Minden Made in Germany		ABB

1. Actuator type
2. Device number / No. of non-standard version (if applicable)
3. Rated torque / Year of manufacture
4. Permissible ambient temperature / protection class
5. Min./max. positioning travel / max. speed
6. Filled-in oil type
7. Associated electronics
8. Permissible voltage range / Mains frequency (only with PME120AI)
9. Power consumption / Fuse (only with PME120AI)
10. Available for customer-specific information

1.2 ID Label of electronic unit

The ID labels of the power electronic unit are located on the cover of the local control panel.

1.2.1 ID Label for hardware description

1	**Elektronik / Electronics Type: ....**		
2	B-Nr./No.	NL	
3		Jahr/Year	
4			
5	t = ...°C	IP 66	CE
6			
	ABB Automation Made in Germany		ABB

1. Electronic unit type
2. Device no. / No. of non-standard version (if applicable)
3. / Year of manufacture
4. Not used
5. Permissible ambient temperature / Protection class
6. Not used

1.2.2 ID Label for software description

1	Für / For Antrieb / Actuator Typ / Type. . . . .
2	Nennwerte / Rated values M=..... .....°/s
3	F-Nr. / No.: . . . . .
4	NL. . . . .
5	SW Version . . . . .

1 Associated actuator type
2 Rated values for torque / force / speed
3 Fabrication No.
4 No. of non-standard version
5 Actuator firmware release

2. General

2.1 Proper use

Control actuators are intended to be used exclusively for actuating final control elements (valves, vanes, etc.). Do not use these actuators for any other purpose. Otherwise, a hazard of personal injury or of damage to or impairment of the operational reliability of the device may arise.

2.2 Safety and precautions

When mounting the actuator in areas which may be accessed by unauthorized persons, take the required protective measures.

- Control actuators perform movements for positioning vanes and valves. Handle properly and with care. Otherwise, a hazard of bruise injuries may arise.
- When changing the oil of the actuator, thoroughly remove any oil that may have run down on the floor during the procedure to avoid accidents.
- Dispose of the waste oil in compliance with the respective local regulations. Make sure that no waste oil reaches the water cycle.
- Only qualified specialists who have been trained for these tasks are authorized to mount and adjust the control actuator, and to make the electrical connection.
- When working on the actuator itself or its electronics always observe the locally valid accident prevention regulations and the regulations concerning the construction of technical installations.

3. Storage

Contrac actuators may be stored under moist and aggressive condition for a short time. The equipment is protected against external corrosive influences. However, direct exposure to rain, snow, etc. must be avoided.
Actuators, equipped with an anti condensation heater, are additionally protected by desiccant placed in the connector (and in the terminal box of the separate electronics, if present). The desiccant guarantees sufficient protection for approximately 150 days. It can be regenerated at a temperature of 90° C within 4 h.
The desiccant must be removed prior to commissioning the actuator or the electronics.

3.1 Long-time storage

If you intend to store or transport the device for a longer time, we recommend to wrap it in plastic foil and add desiccant. Regularly check if the desiccant is still active.

4. Delivery State

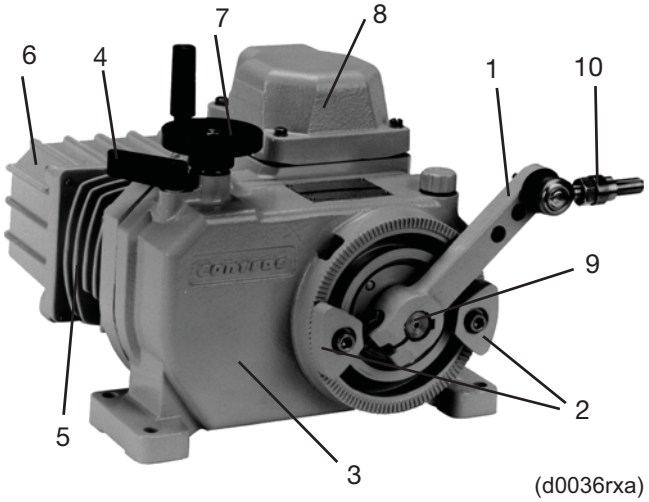
If not otherwise specified by the customer, Contrac actuators are delivered with the following standard configuration:

Behavior in 0/100% position:	Shut-off with rated torque / force
Setpoint function:	Linear; setpoint = positioning value
Input (setpoint):	4 ... 20 mA [1)]
Function:	Positioner, parameter: setpoint
Output (actual value):	4 ... 20 mA [1)]
Digital inputs : [1)]	DI 1 switch-over manual/automatic and v.v. DI 2 / DI 3 manual control +/-
Digital outputs: [1)]	DO 1 ready to operate, DO 2/3 end position signalling
Range:	Not adjusted

The configuration of your actuator may differ from the standard configuration specified above. It can be called up for display using the configuration program.

[1)] Not available for bus communication

5. Assemblies



1: Lever
2: Mechanical stops
3: Gearbox
4: Lock lever
5. Motor
6. Cover
(incl. electronics
for PME 120 AI)
7. Handwheel
8. Connector
9. Ouput shaft
10.Ball-and-socket joint

Table 1: PME 120

5.1 Operating mode

5.1.1 Normal mode

The motor triggered by the power electronics drives the output shaft (9) via oil-lubricated spur gears. The drive lever mounted on the shaft transmits rotary motion to the valve.
The brake built in the motor (5) acts as a retainer when the power is off.

5.1.2 Handwheel mode

- Allows you to move the actuator manually when the electrical power is off.
- Turn the lock lever (4) clockwise
- Turn the handwheel (7) to move the lever to the wanted position.
- Release the lock lever.

The friction clutch is designed such that a handwheel force of around 11 N suffices to create the rated torque on the actuator. If you should feel a considerable counter-force when moving the actuator by hand, do not increase the force you apply to the handwheel. Otherwise, you might damage the actuator or valve.

6. Technical Data

	PME 120 AI	**PME 120 AN**
Rated torque [Nm]	40 ... 100	
Starting torque [Nm]	appr. 1.2 x rated torque (break-away torque in end positions 2 x rated torque for short time)	
Rated speed [°/s]	1.5 ... 4.5	
Weight	approx. 45 kg	approx. 32 kg
Ambient temperature	(-25) 1) -10 ... +55°C	(-25) 1) -10 ... +65°C
Associated electronic unit	integrated in actuator	for field mounting: EAN 820 for rack mounting: EAS 822
Power supply (on electronic unit)	115 V AC (94 V ... 130 V) or 230 V AC (190 V ... 260 V); 47.5 ... 63 Hz	
Max. power consumption with 115 / 230 V AC [A]	1.0 / 0.5	
Current consumption in positioning mode:	approx. 40 ... 50% of I_{max}., each	

Table 2:
1) actuator is equipped with additional electrical heater

7. Lubrication

Prior to delivery the actuator is filled with 2.5 l oil in factory.

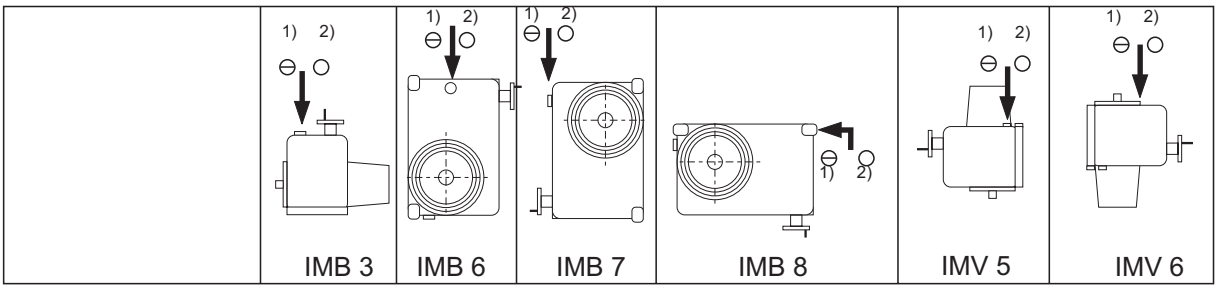


Fig. 1:

Min. oil quantity; approx. [l]	2.2	2.5	2.2	2.2	2.5	2.5
Min. oil level [mm] under inspection screw	45	2	42	20	23	17

Table 3: The arrow indicates the position of the inspection screw 1) and the vent screw 2). After having mounted the actuator, replace the highest inspection screw with the separately delivered vent screw.

7.1 Lubricants

Actuator type	Ambient temperature	Oil type	Motorbearing (grease)
PME 120AI (with integrated electronic unit)	(-25) 1) - 10°C ... + 55°C	Mobil SHC 629	ESSO Beacon 325
PME 120AN (for separate electronic unit)	(-25) 1) - 10°C ... + 65°C		

Table 4:

8. Mounting

8.1 Actuator check

- Is the actuator filled with the appropriate oil type?
- Is enough oil in the actuator?
- Did you fasten the separately delivered vent screw in the highest bore (depending on the mounting orientation)?
- Has the actuator integrated or separate electronic unit?

8.2 Mounting orientation

All mounting orientations seen in Figure 2 are permissible. To facilitate mounting and maintenance, however, it is recommended to use orientation IMB 3.

8.3 Mounting instructions

- Make sure that the actuator is accessible from all sides to ensure convenient handwheel operation, electrical connection, and replacement of assemblies.
- Avoid direct exposure to rain, snow and other environmental influences. Select the mounting site accordingly.
- Exclusively mount the actuator on a rigid, non-vibrating support to avoid relative motion between the actuator and the valve.
- When mounting the actuator close to heat sources use an insulating layer or shielding.

8.4 Mounting the Actuator to the Valve

8.4.1 Preparing the Equipment

- Make sure that the shaft and lever bore surface are clean and free of grease.
- Determine the length of the stay tube (not included in the scope of delivery).
- Move the valve to the “CLOSED“ position.
- Move the actuator to the corresponding end position using the handwheel. Observe the permissible angle.
- Spacing “L“ minus 140 mm yields the required length of the link tube.
- Drill a cone bore into the valve lever for mounting the second ball-and-socket joint, as shown in Figure 4.
- Insert the ball-and-socket joint, secure with crown nut and split-pin.
- Remove the welding bushings and weld them to the stay tube (C 15 to DIN 17210)
- Insert the link rod between the two ball-and-socket joints and screw it in.
- If required adjust “L” by turning the link rod.
- When all adjustment steps are finished, fasten the counter nuts.

8.4.2 Adjusting the Stops in Dependence of the Travel

- Move the output lever / valve to the position requiring fine adjustment.
- Put the stop onto the toothing as close to the output lever as possible and fasten with screws.
- Move the output lever towards the stop using the handwheel; turn the coupling rod for fine adjustment.
- Fasten the counter nuts.
- Fasten the stop in the other mounting position close to the end position, depending on the toothing.

8.4.3 Adjusting the Stops in Dependence of the Torque

- First proceed as described above for travel-dependent adjustment.
- Prior to re-fastening the counter-nut lock the handwheel and then turn the coupling rod in such a way that an initial tension occurs in the valve’s closing position.
- Fasten the counter-nuts.

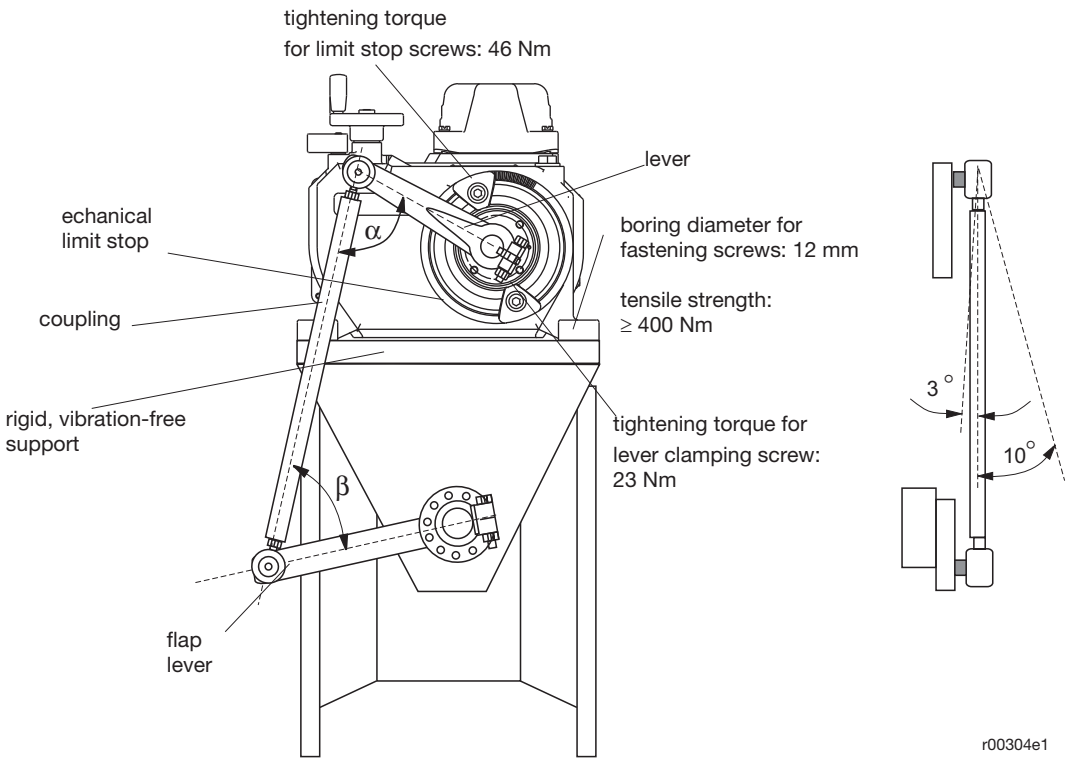


Fig. 2: Mounting PME 120, example

$\alpha \geq 15$ °
β according to dimensions specified by the valve manufacturer

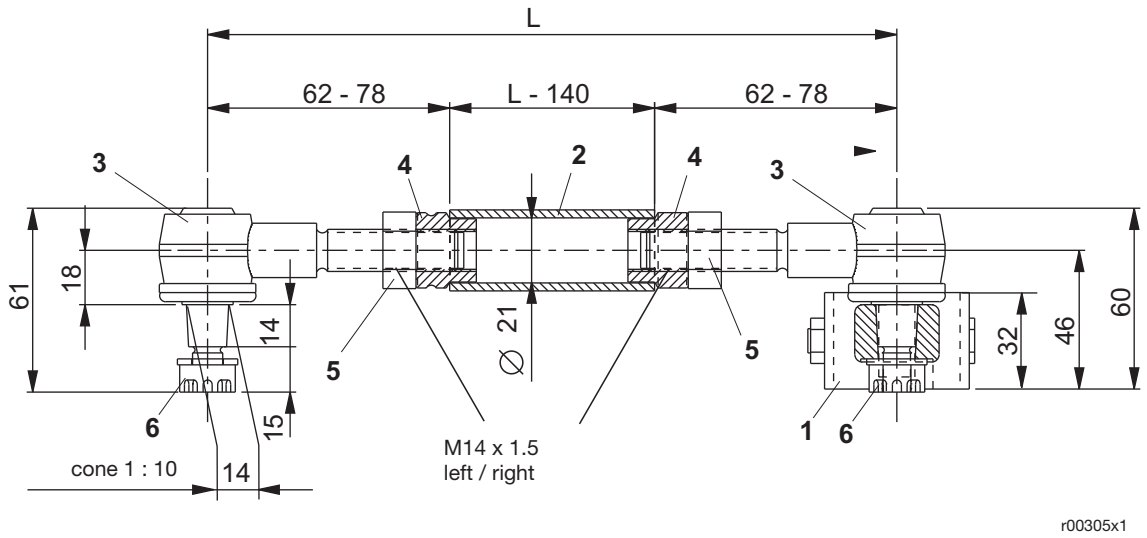


Fig. 3: Dimensional drawing

1. Output lever
2. Link tube
3. Ball-and-socket joint
4. Welding bushings (C15 to DIN 17210)
5. Counter nuts
6. Crown nuts

9. Electrical Connection

Each actuator requires a Contrac electronic unit. Proper actuator operation requires an actuator specific software loaded in this associated electronic unit. See electronic unit instructions for details. Compare the data labels on both, electronic unit and actuator, in order to ensure a correct hardware and software assignment.

9.1 Integrated electronic unit (standard)

Power and signal cables are connected to the integrated electronic unit via a plug.

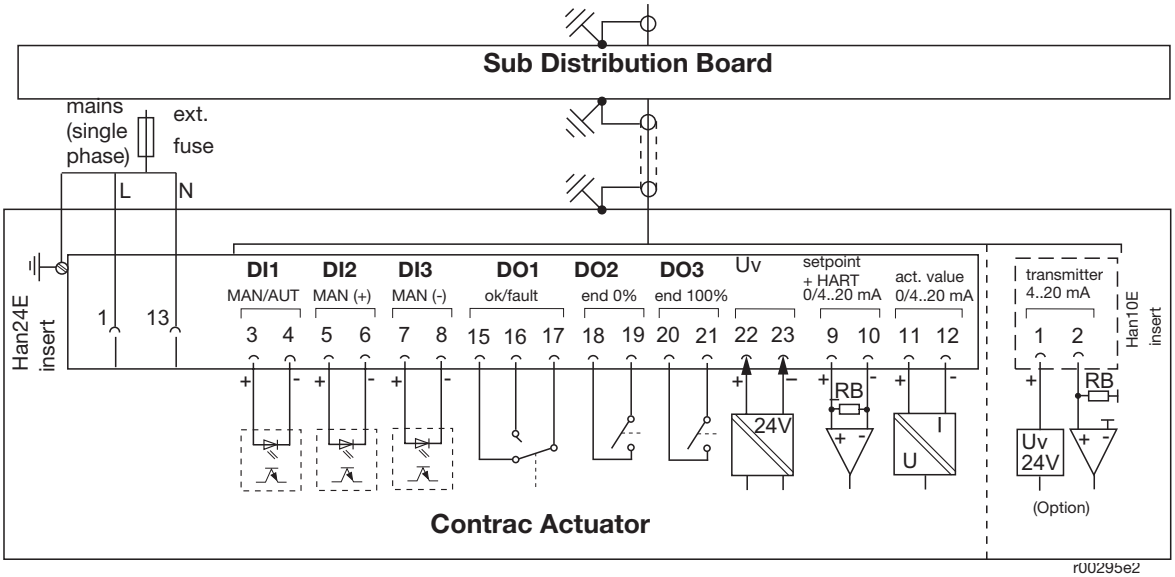


Fig. 4: Electrical connection, standard

The following steps must be performed to switch the actuator to automatic mode (AUT):

- Activate digital inputs DI 1, DI 2 and DI 3 via the configuration program.
- Make sure that the supply voltage is present on digital input 1 (DI 1).
- Activate AUT mode via the configuration program.

9.2 Integrated electronic unit (bus comunication)

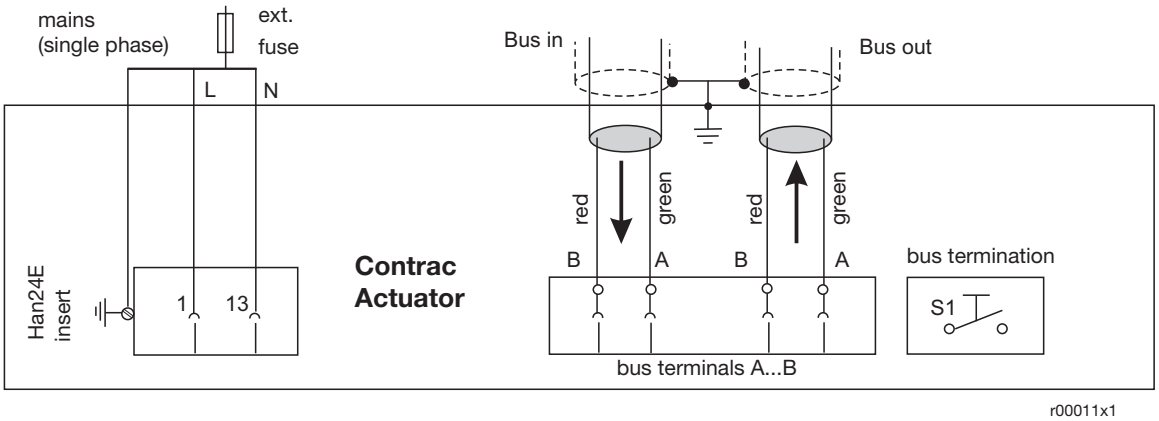


Fig. 5: Electrical connection, PROFIBUS DP

9.3 Separate electronic unit EAN823 (standard)

The electrical connection is done with a combined plug on the actuator and with screw terminals on the electronics.

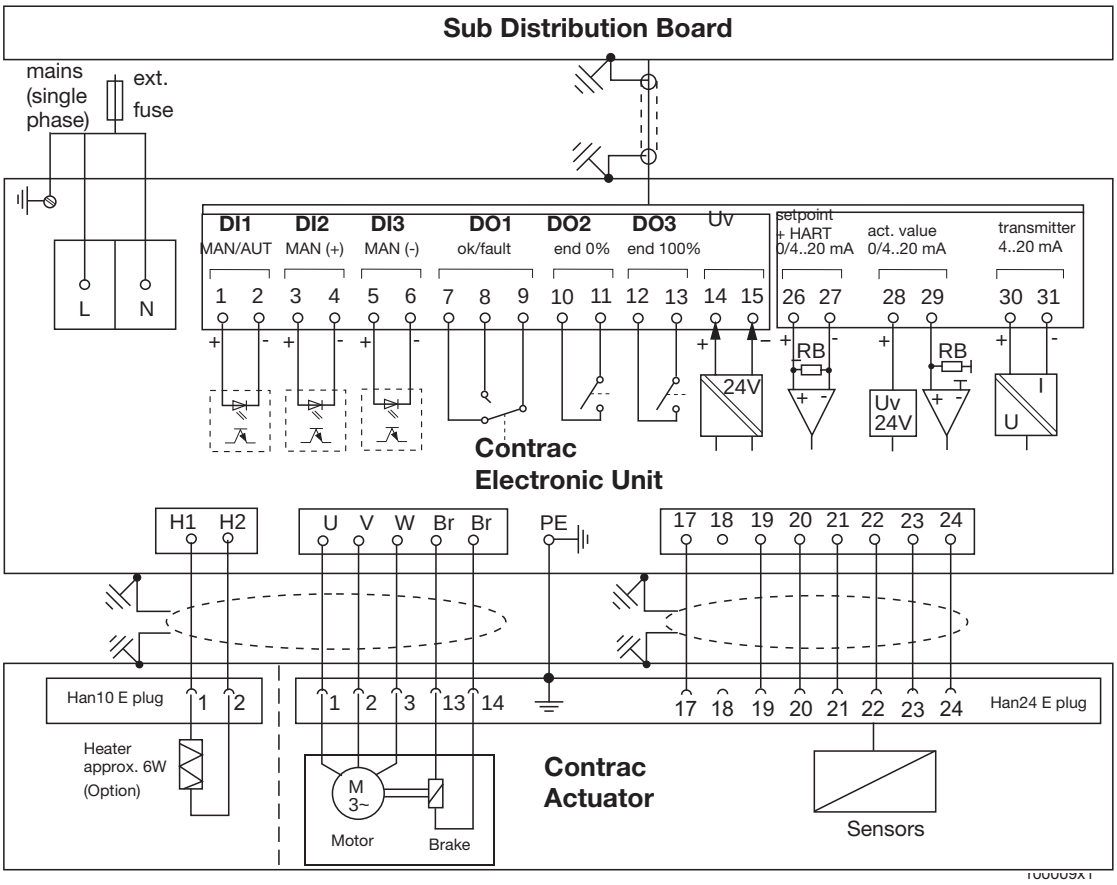


Fig. 6: Electrical connection EAN 823, standard

- The following steps must be performed to switch the actuator to automatic mode (AUT):
- Activate digital inputs DI 1, DI 2 and DI 3 via the configuration program.
- Make sure that the supply voltage is available on digital input 1 (DI 1).
- Activate AUT mode via the configuration program.

9.4 Separate electronic unit EAN823 (bus communication)

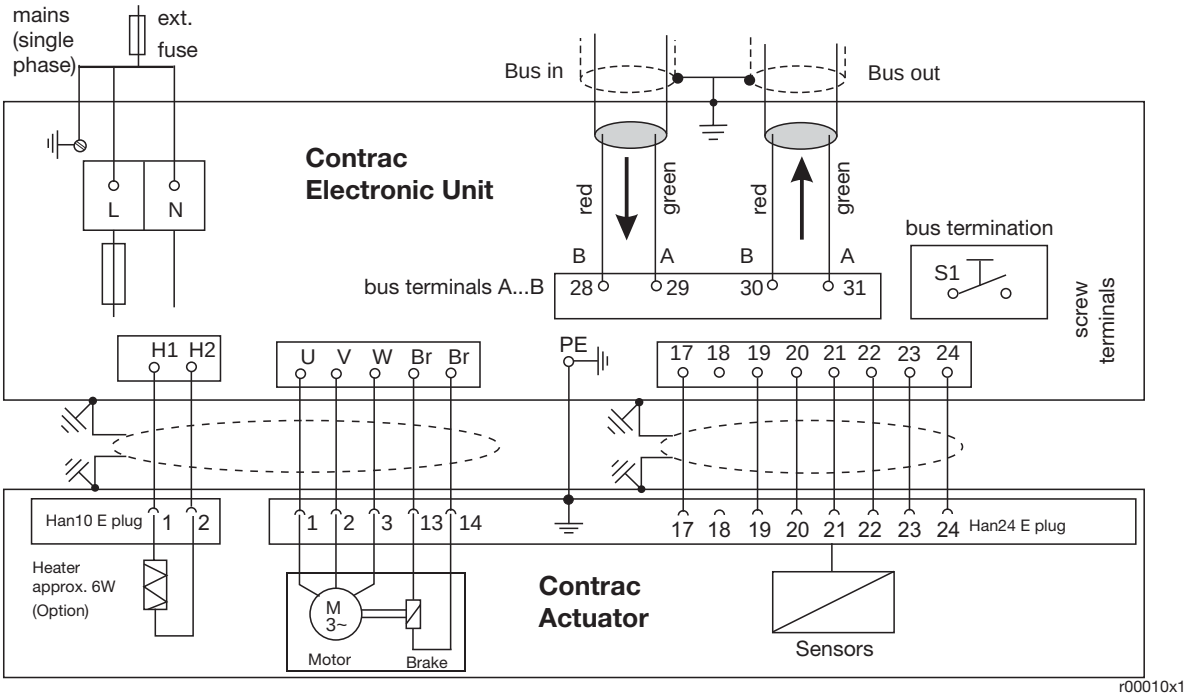


Fig. 7: Electrical connection: EAN 823, PROFIBUS DP

9.5 Signal input and output (conventional triggering)

9.5.1 Standard

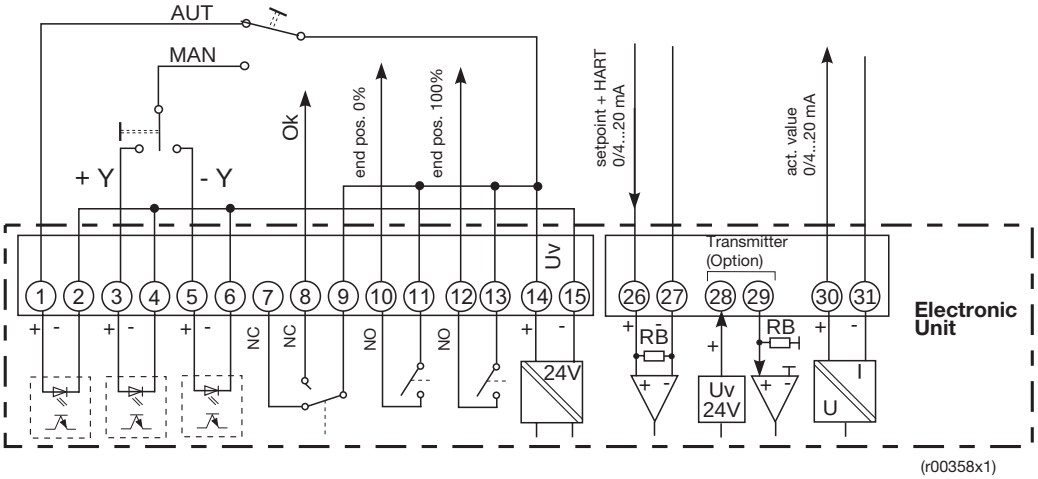


Fig. 8:

** Write-protected when applying +24 V DC to DI 1.

9.5.2 Behind a step controller

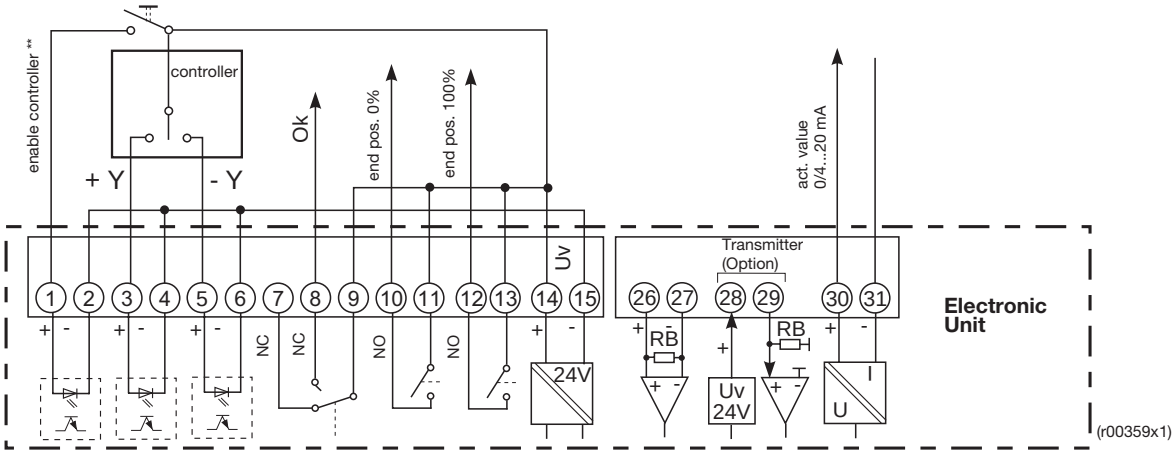


Fig. 9:

** Write-protected when applying +24 V DC to DI 1.

9.6 Wiring for ectronic units in a mounting rack

Refer to operating instructions 42/68-821 for installation details.

9.7 Fuses at actuator with integrated electronic unit

Fuse type	U = 115 V	U = 230 V
External fuse(extern)	16 A, slow	
Mains fuse	6.3 A slow	3.15 A slow
Low temperature heater (only for low temperature version)	2 A	2 A
Fuse for protection against active 20 mA current feed at set-point input	0.04 A (fast)	0.04 A (fast)
Relay fuse for DO 1, DO 2, DO3 (not changeable)	3 x 0.5 A; medium	

Table 5:

9.7.1 Fuse arrangement

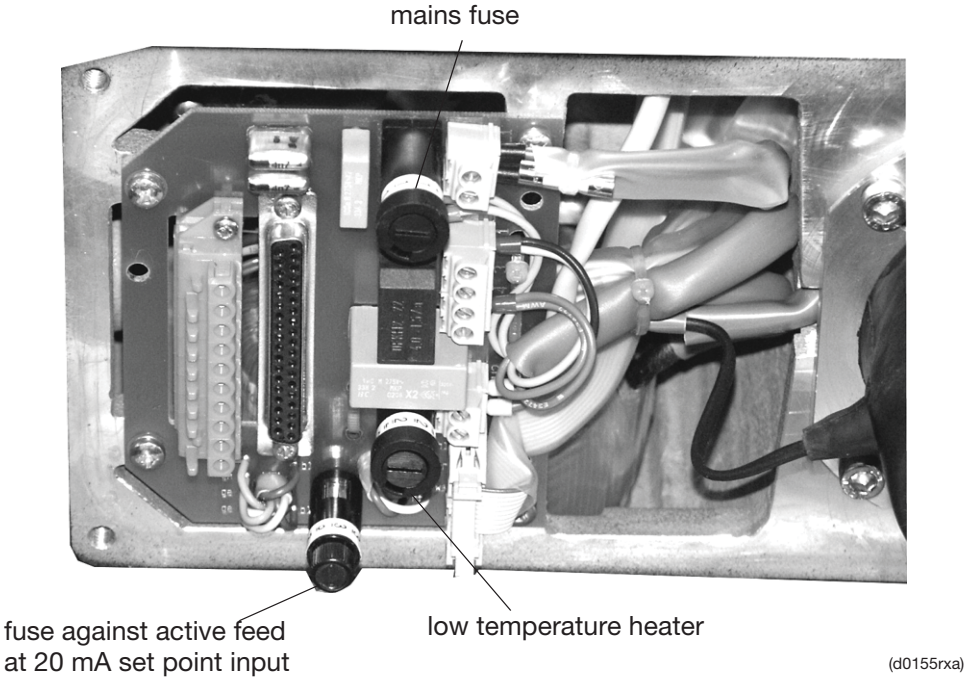


Fig. 10:Fuse arrangement

10.Setup

The actuator only requires the basic settings (adaptation to the operating range) in order to be operated with the standard or custumer specific configuration. Use the **L**ocal **C**ontrol **P**anel (LCP) for these settings. Use the appropriate configuration software for more detailed parameter changes or diagnosis functions.

10.1Set-up via local control panel (LCP)

10.1.1Operating elements

1.	Write-protect switch	(Default setting: OFF)
2.	LED for 100% position	Indication if adjustment procedure, saved position, or fault by different flash frequencies.
3.	Drive buttons	Press to cause drive motion
4.	Reset button	Press to restart processor
5.	Power LED	Indicates available mains supply
6.	RS 232 socket	Connection socket to PC
7.	Potential toggle switch	Connection of reference potential to the system or protective earth (by default set to system) of electronic unit
8.	LED for 0% position	Indication if adjustment procedure, saved position, or fault by different flash frequencies..
9.	Accept button (0%)	Press to define current position as 0%; simultaneously press push button 9 + 10 to complete the adjustment procedure.
10.	Accept button (100%)	Press to define current position as 100%; simultaneously press push button 9 + 10 to complete the adjustment procedure

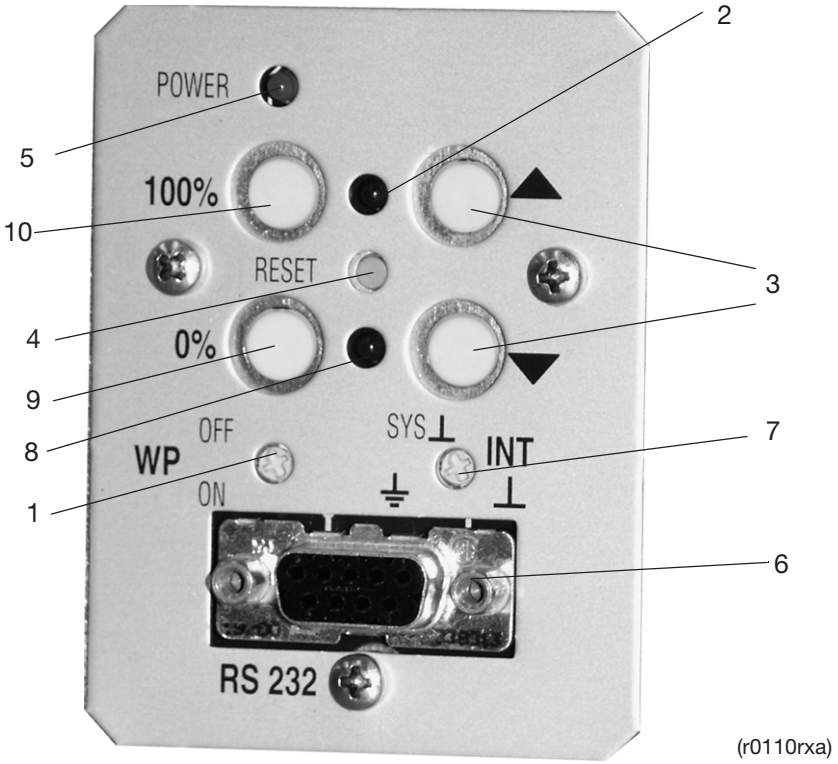


Figure 11: **L**ocal **C**ontrol **P**anel (LCP)

The actuator range is not preset in factory!

10.1.2Setup procedure

- Undo the screws of the LCP cover
- Swing the cover to the side

10.1.3Initial situation

- Electronics connected to power supply and actuator
- Write-protect switch (1) set to “OFF” position
- Electronics in operating mode “MAN” (no signal on DI 1)
- No fault (if a fault occurs, both LEDs flash alternately at 4 Hz)

10.1.4 Setting

10.1.4.1 "Setting" mode

- Set electronics to "setting" mode by pressing both push buttons (3) simultaneously for approx. 5 seconds, until both LEDs (2 + 8) are flashing synchronously at approx. 4 Hz. („setting mode" is the standard electronic unit status after passing the final factory test)

10.1.4.2 Defining first position (0% or 100%)

(Higher precision in 2nd position)

- Move to desired position by pressing one of the push buttons (3).
- To accept the position for 0% or 100%, press push button (10) or (9); the associated LED flashes at approx. 2 Hz when value is correctly accepted, the other one continues to flash at approx. 4 Hz

10.1.4.3 Defining second position (0% or 100%)

- Move to second position by pressing tho other of the push buttons (3).
- To accept the position, press push button (10) or (9); both LEDs (2) and (8) are flashing at approx. 2 Hz when values are accepted correctly.

10.1.4.4 Saving the settings

- Save the settings by simultaneously and shortly pressing the push buttons (10 + 9); the LEDs (2 + 8) are „ON" (without flashing) for approx. 5 sec before they extinguish and the setting procedure is completed.
- If the selected range is too small for the actuator, both LEDs will flash again at 4 Hz. Repeat the adjustment procedure with a wider range (min. positioning travel).
  (See positioning travel specification on actuator ID label)

10.1.4.5 Correction after setup

- If the setting is to be corrected after accepting the first value, first press the Reset button (4) and then repeat the setting.
- If the correction is to be re-done after saving the settings, the entire adjustment procedure must be repeated.

10.2 Adjustment using the configuration program

Context-sensitive help information is available in the configuration program at all times. For basic handling and installation instructions refer to the associated manual, number 41/68-001.

A conductive ground connection is established between the PC and the CONTRAC electronics with the RS 232 communication cable. If the PC is grounded, this may cause a ground loop in the installation.

10.3 Functions and signals at the LCP

Function	Indication
Adjustment	
Change-over to adjustment mode: Press and hold both drive buttons for approx. 5 seconds	Both LEDs flash synchronously at approx 4 Hz after time has expired.
Moving to an end position Use associated drive button on LCP	Both LEDs continue to flash at 4 Hz while driving.
Saving the first end position Press button 0% or 100%	The associated LED flashes at approx. 2 Hz, the other continues at 4 Hz.
Saving the second end position Press button 0% or 100%	The associated LED flashes at approx. 2 Hz synchronously to the first one.
Confirm settings Press 0% and 100% buttons simultaneously	Both LEDs are briefly „ON" together and then extinguish.
Operation	
Normal operation: MAN / AUT	LED off
Driving with button on CSF Priority over control system	LED off
Bootstrap mode	
Electronic is in bootstrap mode during the data transfer of e. g. firmware, objects or motor charcteristics; use ECOM688 software for this procedure.	Both LED are „ON"; actuator is not available
Fault (both LEDs flash alternately at 4 Hz)	
Reset: Resets fault indications	If no „Failure" conditions exist, both LEDs extinguish (if the actuator had been moved out of its operating range, drive it back prior to the reset).

Table 6:

11. Maintenance

Contrac actuators have a robust construction. As a result, they are highly reliable and require only little maintenance. The maintenance intervals depend upon the effective load and are therefore not specified here.
The built-in microprocessor evaluates the actual load factors (e.g. torques, temperatures, etc.) and derives the remaining operating time until the next routine maintenance is required. Use the configuration program for viewing this information.

11.1 Motor and gears

All maintenance work must be carried out by qualified specialists who have been trained for this task. As a rule, perform the following routine maintenance works:
- Check the shafts and gears.
- Check the motor pinion gear and the respective mating gear.
- Replace the motor's rotary shaft seal and ball bearings.
- Check the position sensor.
- Change the oil; then make a visual check and check for proper operation.

11.2 Adjusting the brake

The actuator setting may be changed accidentally by the repelling power of the valve when the brake is released!

In automatic mode the brake is permanently released. Therefore, it is not exposed to wear and does not require any re-adjustment.

11.3 Replacing the position sensor

11.3.1 Dismounting

- drive actuator into 50% position
- delete the current position setting by pressing the drive buttons on the LCP for at least 5 sec.
- switch-off the voltage supply
- disconnect the connector plug from pcb
- undo the two fastening screws (1) of the position sensor and pull the sensor out of the gears.

11.3.2 Mounting

The toothed gear pair of the position sensor is held in place by a tension spring (3), to ensure sufficient free motion when the direction of rotation is reversed
- set the stop pin to the center position, as seen in Figure 12
- connect the plug (5) to the PCB
- align the sensor and its gears with the actuator; set the first toothed gear in 11:00 o'clock position (see Figure 13) onto the drive shaft gear (4)
- slightly move the sensor back and forth to pre-tension the toothed gears with the difference "z" until the second toothed gear snaps in
- fasten the screws (1) tightly.

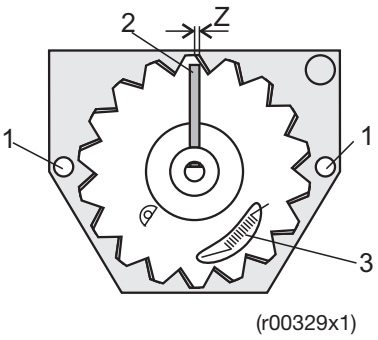


Figure 12: Position sensor

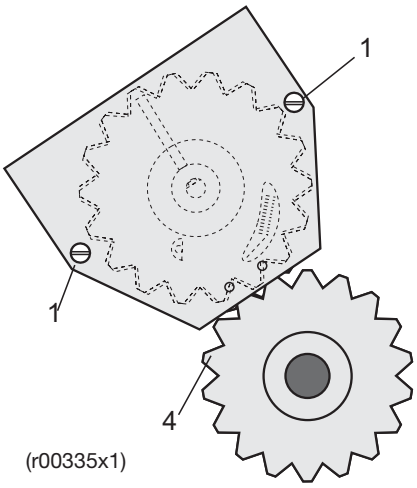


Figure 13: Mounting position

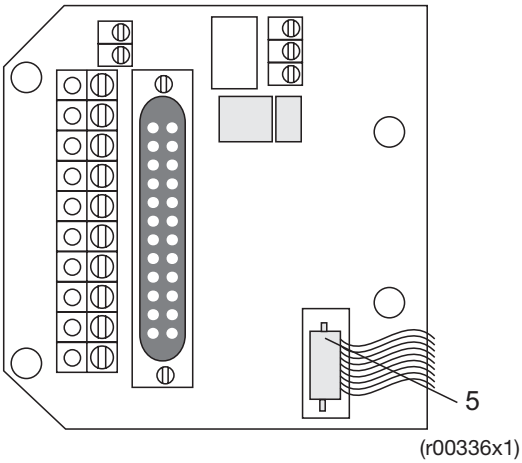


Figure 14: Connecting the ribbon cable plug to the PCB

After mounting is completed readjust the actuator range as described in section 10 of this manual.

12. Troubleshooting

This section only describes how to handle hardware errors. Refer to the configuration program's online help for errors related to the software.

Error	Possible reason	Measures to be taken
Valve cannot be moved by actuator	Malfunction of actuator or valve (e.g. cable gland fastened too tightly)	Disconnect the actuator from the valve. If the actuator is working properly then, the valve is likely to be defective. Otherwise, the actuator seems to be the error source.
Actuator does not react	No communication	Set up communication using the configuration program
	Motor / brake is defective	Check the winding resistances of the motor and brake.
	Digital inputs of electronics are not connected	Connect
	Brake does not release (no audible "click" noise)	Check the air gap (should be around 0.25 mm) and the electrical connection of the brake. Check the winding resistance of the brake coil.
Actuator does not work in automatic mode, although "AUT" has been selected in the configuration program	Digital input 1 (DI 1) has not been connected.	Connect DI 1.
LEDs on the commissioning and service field are flashing simultaneously	Actuator has not been adjusted properly	Adjust the actuator.

Table 7:

12.1 Electrical test values

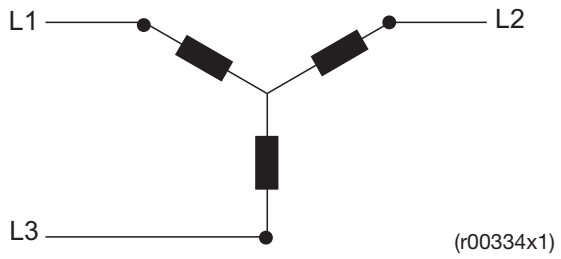


Figure 15: Motor block diagram

Winding resistance ± 5% at 20° C (motor)	L1 (blue) - L2 (black):3,4 Ω L1 (blue) - L3 (violet):3,4 Ω
Winding resistance ± 5% at 20° C (brake)	50 Ω

Table 8:

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ABB Automation Products GmbH
Schillerstr. 72
32425 Minden
Germany
Tel: +49 551 905-534
Fax: +49 551 905-555

14.12 Pompa ausiliaria di lubrificazione con Motore

14.12.1 Pompa ausiliaria di lubrificazione

Numero Voith: 4 191803 012

Tipo: R 25/20 FL-Z-W-G1-R

Descrizione. . . . . .Rickmeier

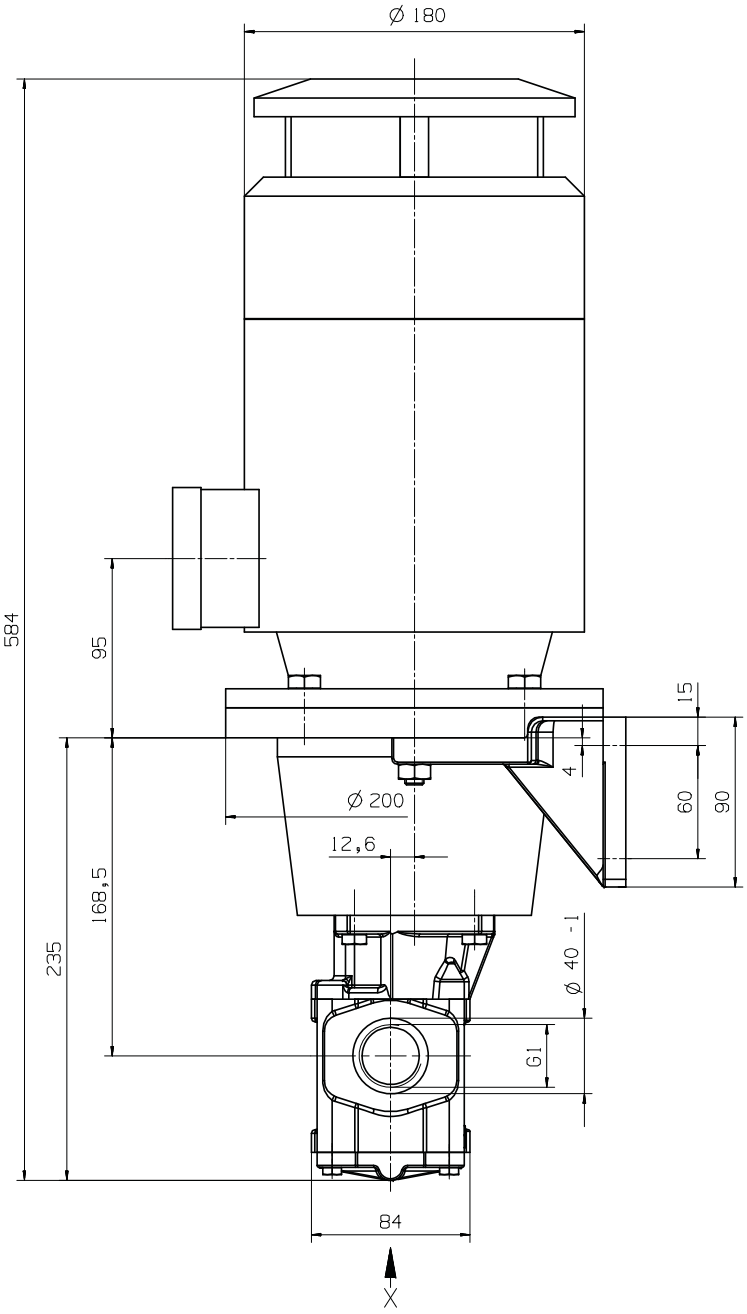
14.12.2 Motore

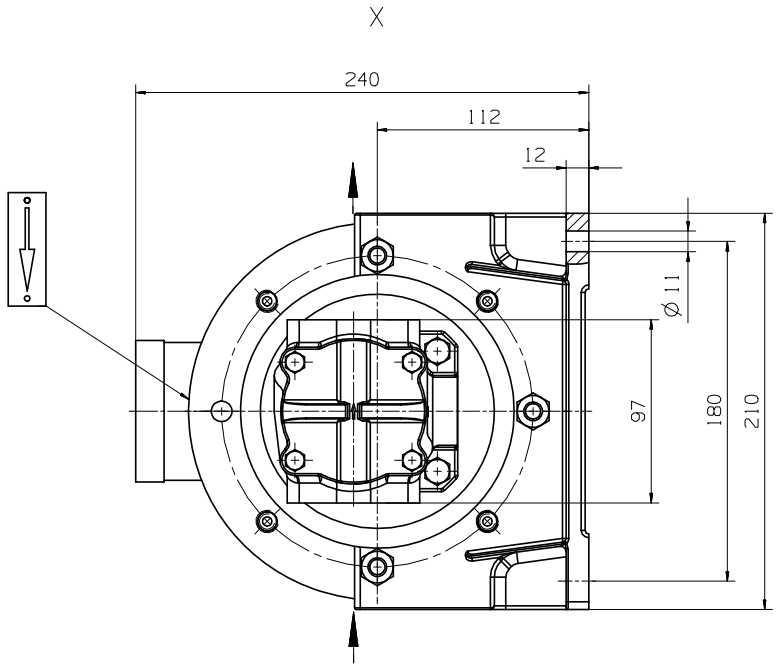
Numero di disegno Voith: 204.00505110

Tipo: 5 AP 90S-2

(1,5 kW, 2860 1/min, 400 V, 50 Hz, IP 55)

Descrizione. . . . . Birkenbeul





R25/12,5...,20

(1) pump unit
groupe moto-pompe
grupo moto-bomba
grupo de bombas
gruppo di pompaggio
pomp aggregaat
pumpaggregat
pompa agregasi
agregat pompy

			TOLERIERUNG DIN 7167 Ohr. Ø-4108				
			Allgemeintoleranzen fuer Gussrohteile nach DIN 1680 T1 Ohr. Ø-4126/01 und DIN ISO 8062 Ohr. Ø-412. GT...				
			Zulaessige Abweichungen fuer thermisches Schneiden nach DIN EN ISO 9013 Ohr. Ø-4116/93				
			Guete: ☐ I ☐ II Toleranzklasse: ☐ A ☐ B	01	06/004	24.08.2006	hul/web
			Werkstueckkanten nach DIN ISO 13715 Ohr. Ø-5231	AN-ZU	Aend.-Mitttlg.-Nr.	Datum	Name
			Zeichnungs-Zusatzangaben nach Ohr. Ø-5291	Maestab: Scale: 1:2	Gez.	04.12.2002	hul
			Schutzvermerk nach DIN ISO 16016 beachten! Reprint with our permission only!		Gepr.	04.12.2002	sche
Passmaass	Oberes Abmass	Unteres Abmass			Norm.		

Bemerkung:

Gewicht:

Werkstoff:

Ursprungs-Zeichnung:

Ersetzt durch:

Ersatz fuer:

DIN ISO 5456

Benennung:
Denomination:
PUMPENAGGREGAT (1)
R25/20 FL-Z

PUMPENTECHNOLOGIE
RICKMEIER
☐ Zahnradpumpen ☐ Ventile ☐ Sonderprodukte ☐ Systeme

Sach-Nr.: Object number: MZ2-0211-416464//2

Format-Kennz.

Zeichnung besteht aus 1 Blatt Blatt-Nr. 1

Rickmeier GmbH – Postfach 1340 – D-58797 Balve

Hauptadresse: Garbeck – Langenbeltkauser Strasse 29-22 – D-58802 Balve – Germany

© Zutreffendes bitte ankreuzen

PUMPENTECHNOLOGIE
RICKMEIER
Zahnradpumpen ■ Ventile ■ Sonderprodukte ■ Systeme

RICKMEIER WP

P A R T S L I S T
PUMP UNIT
R25/20 FL-Z

Date 01.02.07
Rev.0/17.06.04

Object-no.	: 421557	Order-no.	: 563072
Flow diagr.	:	Subj.-no.	:
Documentation	: MZ2-0211-416464	Codeword	: TCR.4191803012
Customer	: Voith Turbo GmbH & Co. KG		

Pos	Qty	Description	Object-no.	Rev.
1	1	GEAR PUMP R25/20 FL-Z-W-G1-R	330009-2	
2	1	THREE-PHASE MOTOR 5AP90S-2*S-V1S-FF165-IP55-F	421556	
3	1	CLAW COUPLING WP-N 8-2360-KB040A15B24-13 AL/PUR98 ROTEX 19	262749-5	
4	1	UNIT FOOT WP-N 8-2114-PTFL200 AL	407778	
5	1	BRACKET WP-N 8-2101-PT200A063-110 ALUMINIUM	407565	
7	4	HEXAGON HEAD SCREW DIN 933-M8X22-8.8 STAHL	250064-3	
8	4	HEXAGON HEAD SCREW DIN 933-M10X25-8.8 STAHL	250088-2	
9	3	CHEESE-HEAD-SCREW DIN 912-M10X25-8.8 STAHL	250548-5	
10	3	HEXAGON NUT DIN 934-M10-8 STAHL	252187-0	

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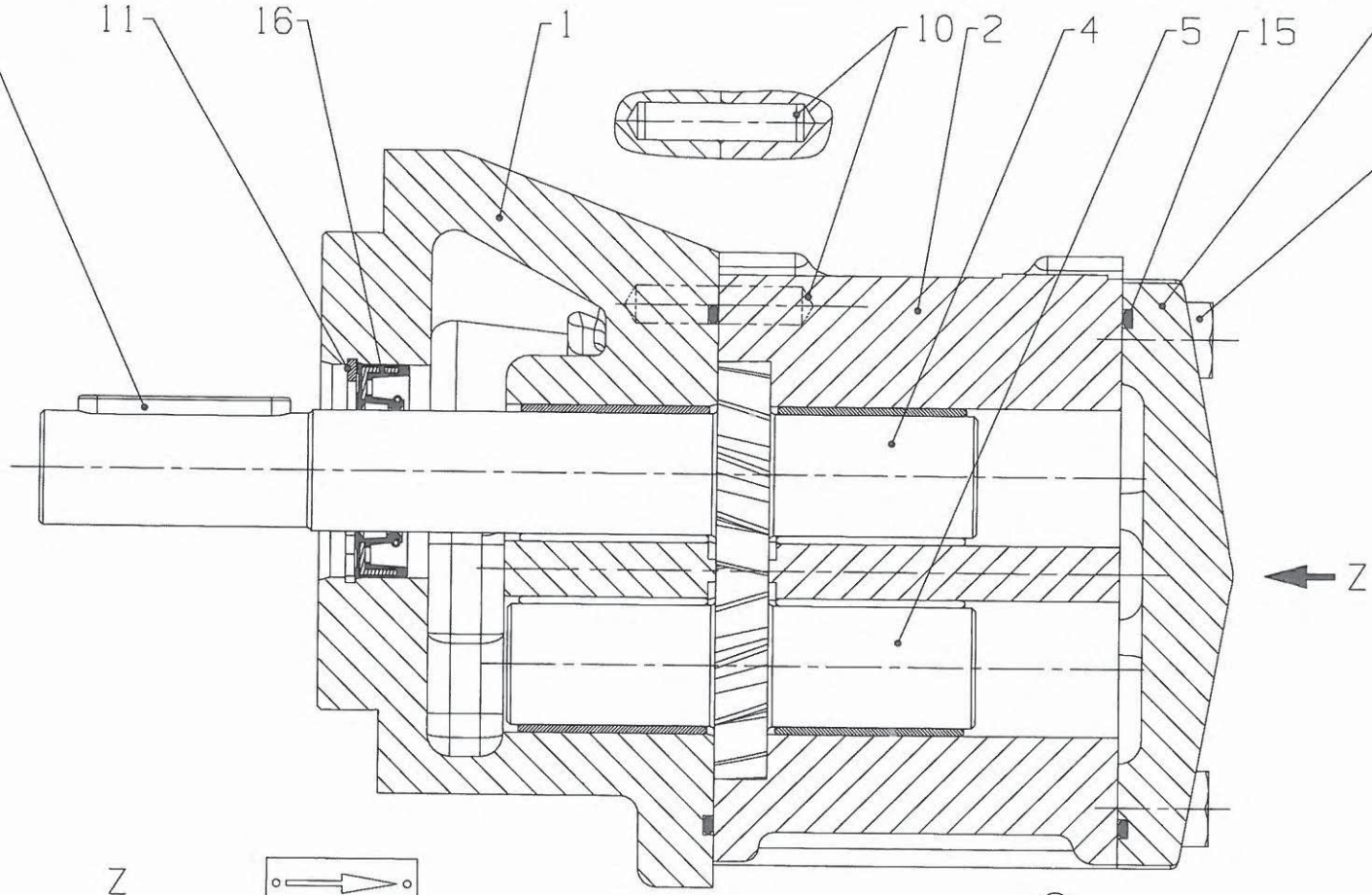
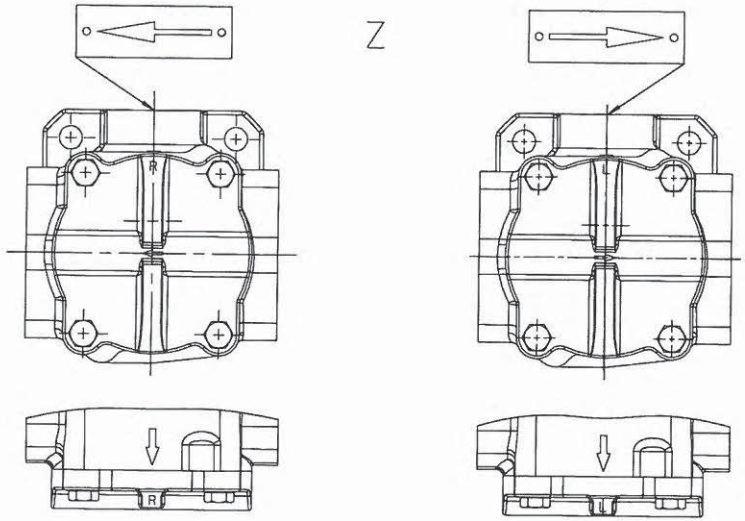
SWIFT-Code GENODEM1NRD
IBAN DE93 4476 1534 0013 5052 00
Vereinigte Sparkasse im MK
BLZ 458 510 20 Kto.: 91 017 079

Sitz der Gesellschaft: Balve
Handelsregister Arnsberg HRB 4702
Geschäftsführer:
Christiane Schulz · Karl-Heinz Rietdorf
Mitglied im VDMA
Ust-IdNr.: DE 125583846





(2) Anziehdrehmoment Pos.9 : R25 = 14 Nm
R35 = 50 Nm
R45 = 86 Nm
R65 = 150 Nm

Passmass	Oberes Abmass	Unteres Abmass

TOLERIERUNG DIN 7167 ONr. B-4106

Allgemeintoleranzen fuer Gussrohteile nach DIN 1680 T1 ONr. B-4120/01 und DIN 168 . ONr. B-412. GT...

Zulaessige Abweichungen fuer thermisches Schneiden nach DIN EN ISO 9013 ONr. B-4116/03

Guete: ☐ I ☐ II Toleranzklasse: ☐ A ☐ B

Werkstueckkanten nach DIN 6784 ONr. B-5231

Zeichnungs-Zusatzangaben nach ONr. B-5291

Schutzvermerk nach DIN 34 beachten!
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AN-ZU	Aend.-Mittlg.-Nr.	Datum	Name
Masstab: *Scale:* —	Gez.	28.06.04	Hul
	Gepr.		Web
	Normg.		

Bemerkung: ORIGINALERNEUERUNG

DIN 5

Benennung: *Denomination:* Zahnradpumpe (1)
R.5/... FL-Z

Gewicht:
Werkstoff:
Ursprungs-Zeichnung:
Ersetzt durch:
Ersatz fuer: Zchg.gl.Nr.

PUMPENTECHNOLOGIE RICKMEIER
☐ Zahnradpumpen ☐ Ventile ☐ Sonderprodukte ☐ Systeme

Sach-Nr.: *Object number:* FZ3-1000-330000-1//3
Format-Kennz.
Zeichnung besteht aus 2 Blatt Blatt-Nr. 1

Zutreffendes bitte ankreuzen

Rickmeier GmbH – Postfach 1340 – D-58797 Balve

Oberflächensymbole nach DIN ISO 1302 ONr. B-5227

Spanende Bearbeitung erforderlich: Fertigungsverfahren, Oberflächenbehandlung, sonstige Wertangabe
Spanlose Bearbeitung nicht zulässig: Bezugsstrecke, Grenzwellenlänge, (andere Rauheitsmessgrössen)
Bearbeitung (andere Rauheitsmessgrössen): Bearbeitungszugabe, sonstige Wertangabe

e – Bearbeitungszugabe in mm, sämtliche Rauheitsgrössen in µm

Nennmassbereich in mm	0,5 ..3	>3 ..6	>6 ..30	>30 ..120	>120 ..400	> 400 ..1000	>1000 ..2000
Allgemeintoleranzen nach DIN ISO 2768 T1 ONr. B-4117/01 fuer Laengen- und Winkelmasse: Mittel	± 0,1	± 0,1	± 0,2	± 0,3	± 0,5	± 0,8	± 1,2
Grob	± 0,2	± 0,3	± 0,5	± 0,8	± 1,2	± 2	± 3
			Form und Lage nach DIN ISO 2768 T2 ONr. B-4117/02			H	K L

Diese Tabelle ist nur durch Ankreuzen von Feld "Mittel" oder "Grob" bzw. "H", "K" oder "L" gueltig!

Nennmassbereich in mm	≤30	>30 ..120	>120 ..315	>315 ..1000	>1000 ..2000	>2000 ..4000	>4000 ..8000
Freimasstoleranzen aus DIN EN ISO 13920 ONr. B-4117/01 fuer Schweisskonstruktionen: B	± 1	± 2	± 2	± 3	± 4	± 6	± 8
C	± 1	± 3	± 4	± 6	± 8	± 11	± 14

Diese Tabelle ist nur durch Ankreuzen von Feld "B" oder "C" gueltig!

① gear pump
pompe à engrenages
bomba de engrenages
pompa ad ingranaggi
tandwielpompe
bomba de engrenagens
hammaspyoeraepumppu
зубчатый насос

② tightening torque
couple de serrage
apretado
coppia di serragio
aandraai moment
momento de aperto
kiristysmomentti
пусковой момент

TOLERIERUNG DIN 7167 Ohr. Ø-4106			
Allgemeintoleranzen fuer Gusserichteile nach DIN 1680 T1 Ohr. Ø-4120/01 und DIN 168 . Ohr. Ø-412. GT...			
Zulaessige Abweichungen fuer thermisches Schneiden nach DIN EN ISO 9013 Ohr. Ø-4116/03			
Gueto: ☐ I ☐ II Toleranzklasse: ☐ A ☐ B			
Werkstueckkanten nach DIN 6784 Ohr. Ø-5231	AN-ZU	Aend.-Mittlg.-Nr.	Datum	Name
Zeichnungs-Zusatzangaben nach Ohr. Ø-5291	Masstab: Scale: –	Gez.	28.06.04	Hul
Schutzvermerk nach DIN 34 beachten! Reprint with our permission only!		Gepr.		Web
		Normg.		

Passmass	Oberes Abmass	Unteres Abmass

Bemerkung:

Gewicht:

Werkstoff:

Ursprungs-Zeichnung:

Ersetzt durch:

Ersatz fuer:

DIN 6

Benennung:
Denomination:
Zahnradpumpe ①
R.5/...FL-Z

PUMPENTECHNOLOGIE RICKMEIER
☐ Zahnradpumpen ☐ Ventile ☐ Grundgeruestteile ☐ Systeme

Sach-Nr.: Object number: FZ3-1000-330000-1//4
Format-Kennz.
Zeichnung besteht aus 2 Blatt
Blatt-Nr. 2

Rickmeier GmbH – Postfach 1340 – D-58797 Balve

Hausadresse: Garbeck – Langenkuthauser Strasse 20-22 – D-58802 Balve – Germany

☒ Zutreffendes bitte ankreuzen

Diese Tabelle ist nur durch Aenderungen von Feld "B" oder "C" gueltig

Diese Tabelle ist nur durch Aenderungen von Feld "Mittel" oder "Grob" bzw. "D", "E" oder "L" gueltig

Oberflaechenrauheiten nach DIN ISO 1302 Ohr. Ø-5227
Dynamisch Beanspruchte Oberflaeche: Ra Fertigungsverfahren, Oberflaechenbehandlung, sonstige Vorgaben (Kennzeichnung, Verwendung, Lagerung, Transportsicherung)
Dynamisch Beanspruchte Oberflaeche nicht zulaessig: Bearbeitungsverfahren, sonstige Vorgaben (Kennzeichnung, Verwendung, Lagerung, Transportsicherung)
0 = Bearbeitungszugabe in mm, sonstige Bearbeitungsmasse in µm

RICKMEIER WP

PARTS LIST
GEAR PUMP
R25/20 FL-Z-W-G1-R

Page 1
Date 01.02.07
Rev.0/11.10.06

Object-no. : 330009-2
Flow diagr. :
Documentation : FZ3-1000 330000-1

Pos	Qty	Description	Object-no.	Rev.
1	1	DRIVING COVER R25 FL-W EN-GJL-250	185800-0	
2	1	GEAR CASING R25/20 G1 EN-GJL-250	185194-8	
3	1	END COVER R25 EN-GJL-250	169115-3	
4	1	DRIVING GEAR SHAFT R25/20 Z-W 16MNCRS5+FP	166933-2	
5	1	GEAR SHAFT R25/20 16MNCRS5+FP	166806-0	
9	4	HEXAGON HEAD SCREW DIN 931-M6X100-8.8 STAHL	250252-4	
10	2	PARALLEL PIN DIN 7-5M6X20-ST STAHL	253076-4	
11	1	CIRCLIP DIN 472-28X1,2 FEDERSTAHL	251965-0	
12	1	KEY DIN 6885-A5X5X28 C45+C	253821-3	

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IBAN DE93 4476 1534 0013 5052 00
Vereinigte Sparkasse im MK
BLZ 458 510 20 Kto.: 91 017 079

Sitz der Gesellschaft: Balve
Handelsregister Arnsberg HRB 4702
Geschäftsführer:
Christiane Schulz · Karl-Heinz Rietdorf
Mitglied im VDMA
Ust-IdNr.: DE 125583846

Form 229581-4 (02/04)

RICKMEIER WP

P A R T S L I S T
GEAR PUMP
R25/20 FL-Z-W-G1-R

Date 01.02.07
Rev.0/11.10.06

Object-no. : 330009-2
Flow diagr. :
Documentation : FZ3-1000 330000-1

Pos	Qty	Description	Object-no.	Rev.
15	2	O-RING DIN 3771A-66,4X1,78-NBR70 (2-038) NBR70	258030-6	
16	1	ROTARY SHAFT SEAL WP-N 8-1585/01-SV16X28X7-NBR NBR	259166-7	

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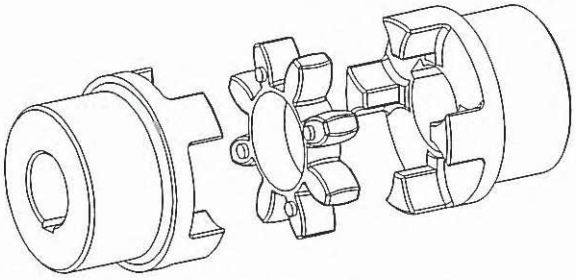
Handelsregister Arnsberg HRB 4702
Geschäftsführer:
Christiane Schulz · Karl-Heinz Rietdorf
Mitglied im VDMA
Ust-IdNr.: DE 125583846

ROTEX®

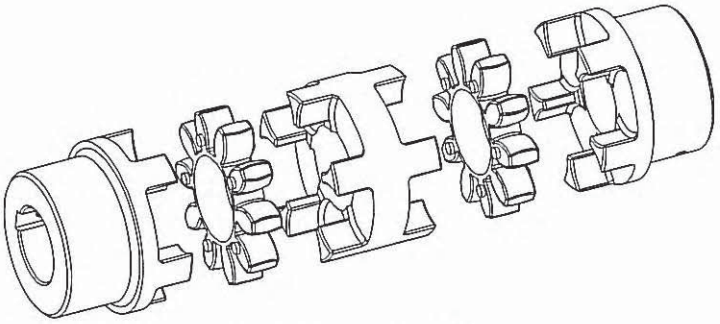
Torsionally flexible jaw-type couplings types

No. 001 – shaft coupling,
No. 018 – DKM,
with taper clamping sleeve
and their combinations

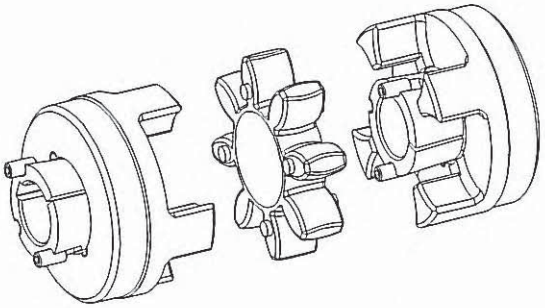
according to Standard 94/9/EC (ATEX 95) for finish bored, pilot bored and unbored couplings



design No. 001 – shaft coupling



design No. 018 – DKM
double-cardanic coupling

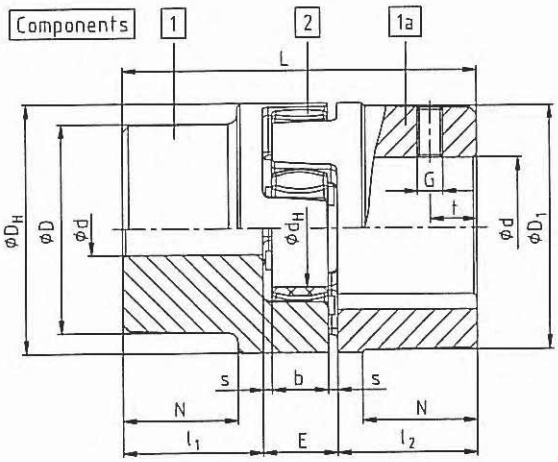


design with taper clamping sleeve

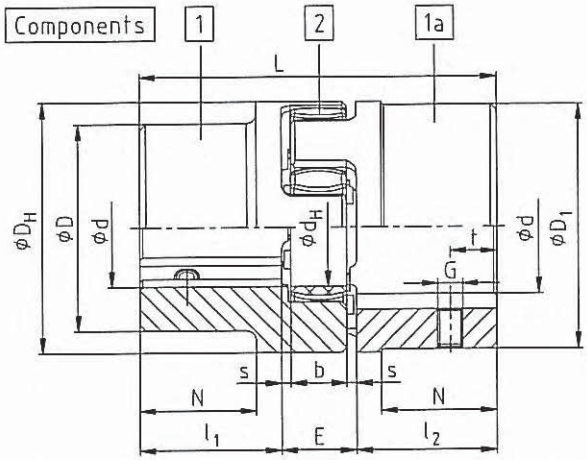
ROTEX® is a torsionally flexible jaw coupling. It is able to compensate for shaft displacement caused by, as an example, inaccuracies in production, heat expansion, etc.

Table of Contents

1 Technical Data



picture 1: ROTEX® (material: Al-D)



picture 2: ROTEX® (material: EN-GJL-250/EN-GJS-400-15)

Table 1: material Al-D

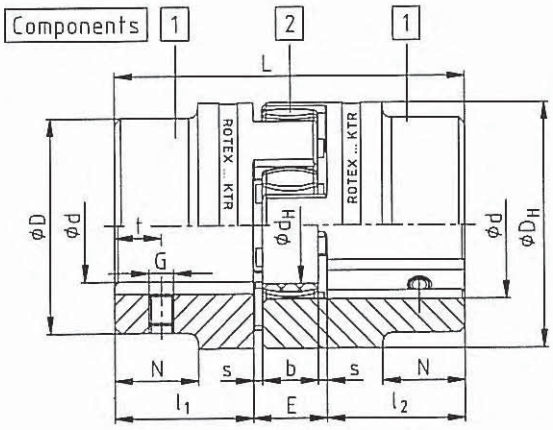
ROTEX® size	component	spider [1] (component 2) rated torque [Nm]			dimensions [mm]											
					finish bore [2] d (min-max)	general									thread for [3] setscrews	
		92 Sh A (yellow)	98 Sh A (red)	64 Sh D (green)		L	l_1; l_2	E	b	s	D_H	d_H	D;D_1	N	G	t
14	1a	7,5	12,5	-	6 - 16	35	11	13	10	1,5	30	10	30	-	M4	5
19	1	10	17	-	6 - 19	66	25	16	12	2	41	18	32	20	M5	10
	1a				19 - 24								41			
24	1	35	60	-	9 - 24	78	30	18	14	2	56	27	40	24	M5	10
	1a				22 - 28								56			
28	1	95	160	-	10 - 28	90	35	20	15	2,5	67	30	48	28	M8	15
	1a				28 - 38								67			

Table 2: material EN-GJL-250 (GG 25)/EN-GJS-400-15 (GGG 40)

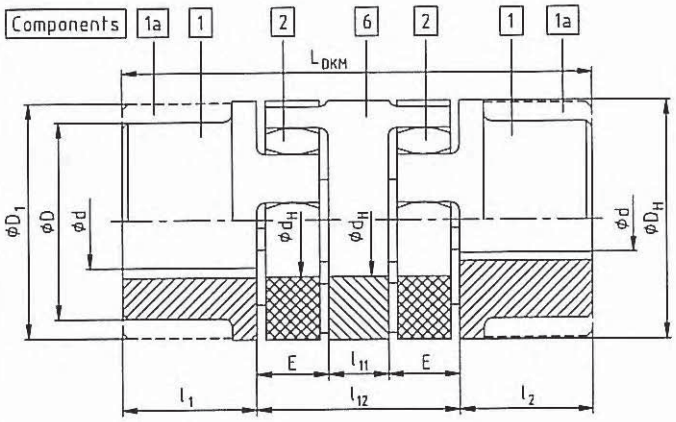
ROTEX® size	component	spider [1] (component 2) rated torque [Nm]			dimensions [mm]											
					finish bore [2] d (min-max)	general									thread for [3][4] setscrews	
		92 Sh A (yellow)	98 Sh A (red)	64 Sh D (green)		L	l_1; l_2	E	b	s	D_H	d_H	D;D_1	N	G [4]	t
cast iron EN-GJL-250																
38	1	190	325	405	12 - 38	114	45	24	18	3	80	38	66	37	M8	15
	1a				38 - 45								78			
	1b					164	70							62		
42	1	265	450	560	14 - 42	126	50	26	20	3	95	46	75	40	M8	20
	1a				42 - 55								94			
	1b					176	75							65		
48	1	310	525	655	15 - 48	140	56	28	21	3,5	105	51	85	45	M8	20
	1a				48 - 60								104			
	1b					188	80							69		
55	1	410	685	825	20 - 55	160	65	30	22	4	120	60	98	52	M10	20
	1b				55 - 70								118			
65	1	625	940	1175	22 - 65	185	75	35	26	4,5	135	68	115	61	M10	20
75	1	1280	1920	2400	30 - 75	210	85	40	30	5	160	80	135	69	M10	25
90	1	2400	3600	4500	40 - 90	245	100	45	34	5,5	200	100	160	81	M12	30
nodular iron EN-GJS-400-15																
100	1	3300	4950	6185	50 - 115	270	110	50	38	6	225	113	180	89	M12	30
110	1	4800	7200	9000	60 - 125	295	120	55	42	6,5	255	127	200	96	M16	35
125	1	6650	10000	12500	60 - 145	340	140	60	46	7	290	147	230	112	M16	40
140	1	8550	12800	16000	60 - 160	375	155	65	50	7,5	320	165	255	124	M20	45
160	1	12800	19200	24000	80 - 185	425	175	75	57	9	370	190	290	140	M20	50
180	1	18650	28000	35000	85 - 200	475	185	85	64	10,5	420	220	325	156	M20	50

1) maximum torque of the coupling $T_{Kmax.}$ = rated torque of the coupling $T_{K\ Nenn.}$ x 2
2) bore H7 keyway to DIN 6885 sheet 1 [JS9] with thread for setscrew
3) threads for set screws are opposite the keyway in case of material Al-D and on the keyway in case of material EN-GJL-250/ EN-GJS-400-15
4) from size 125 thread for setscrews on request

1 Technical Data



picture 3: ROTEX® (material: steel)



picture 4: ROTEX®, design DKM

Table 3: material steel

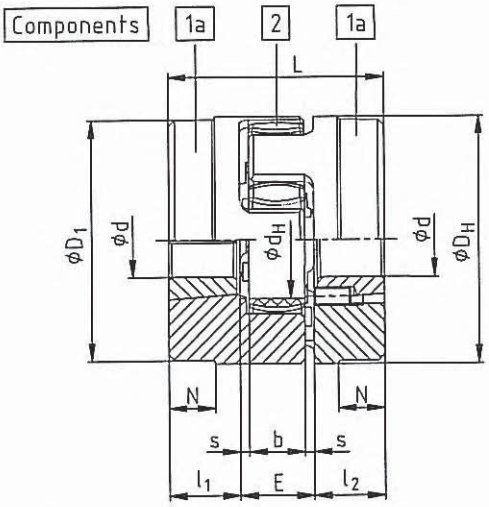
ROTEX® size	component	spider [1] (component 2) rated torque [Nm] 92 Sh A (yellow)	98 Sh A (red)	64 Sh D (green)	dimensions [mm] finish bore [2] d (min-max)	general L	l_1; l_2	E	b	s	D_H	d_H	D	N	thread for setscrews G	t
19	1a	10	17	21	0 - 25	66	25	16	12	2	40	18	40	-	M5	10
	1b					90	37									
24	1a	35	60	75	0 - 35	78	30	18	14	2	55	27	55	-	M5	10
	1b					118	50									
28	1a	95	160	200	0 - 40	90	35	20	15	2,5	65	30	65	-	M8	15
	1b					140	60									
38	1	190	325	405	0 - 48	114	45	24	18	3	80	38	70	27	M8	15
	1b					164	70						80	-		
42	1	265	450	560	0 - 55	126	50	26	20	3	95	46	85	28	M8	20
	1b					176	75						95	-		
48	1	310	525	655	0 - 62	140	56	28	21	3,5	105	51	95	32	M8	20
	1b					188	80						105	-		
55	1	410	685	825	0 - 74	160	65	30	22	4	120	60	110	37	M10	20
	1b					210	90						120	-		
65	1	625	940	1175	0 - 80	185	75	35	26	4,5	135	68	115	47	M10	20
	1b					235	100						135	-		
75	1	1280	1920	2400	0 - 95	210	85	40	30	5	160	80	135	53	M10	25
	1b					260	110						160	-		
90	1	2400	3600	4500	0 - 110	245	100	45	34	5,5	200	100	160	62	M12	30
	1b					295	125						200	-		

Table 4: design DKM

ROTEX® size	spider [1] (component 2) rated torque [Nm] 92 Sh A (yellow)	98 Sh A (red)	64 Sh D (green)	dimensions [mm] measure d, D, D_1	general L_{DKM}	l_1; l_2	E	b	s	D_H	d_H	l_{11}	l_{12}	thread for setscrews [3] G	t
19	10	17	-	see table 1 to 3	92	25	16	12	2	40	18	10	42	M5	10
24	35	60	-		112	30	18	14	2	55	27	16	52	M5	10
28	95	160	-		128	35	20	15	2,5	65	30	18	58	M8	15
38	190	325	-		158	45	24	18	3	80	38	20	68	M8	15
42	265	450	-		174	50	26	20	3	95	46	22	74	M8	20
48	310	525	-		192	56	28	21	3,5	105	51	24	80	M8	20
55	410	685	-		218	65	30	22	4	120	60	28	88	M10	20
65	625	940	-		252	75	35	26	4,5	135	68	32	102	M10	20
75	1280	1920	-		286	85	40	30	5	160	80	36	116	M10	25
90	2400	3600	-		330	100	45	34	5,5	200	100	40	130	M12	30

1) maximum torque of the coupling $T_{Kmax.}$ = rated torque of the coupling $T_{K\ Nenn.}$ x 2
2) bore H7 keyway to DIN 6885 sheet 1 [JS9] with thread for setscrew
3) threads for set screws are opposite the keyway in case of material Al-D and on the keyway in case of material EN-GJL-250/ EN-GJS-400-15

1 Technical Data



picture 5: ROTEX®, design with taper clamping sleeve

Coupling design:

TB1 Cam-sided screwing
TB2 Collar-sided screwing

Different combinations of types TB1 and TB2 are possible.

Table 5: design with taper clamping sleeve

ROTEX® size	compo-nent	spider [1] (component 2) rated torque [Nm]			dimensions [mm]										taper clamping sleeve
		92 Sh A (yellow)	98 Sh A (red)	64 Sh D (green)	finish bore [2] d (min-max)	general									
						L	l_1; l_2	E	b	s	D_H	d_H	D_1	N	
24	1a	35	60	-	10 - 22	64	23	18	14	2	55	27	-	-	1008
28	1a	95	160	-	10 - 25	66	23	20	15	2,5	65	30	-	-	1108
38	1a	190	325	-	10 - 25	70	23	24	18	3	80	38	78	15	1108
42	1a	265	450	-	14 - 40	78	26	26	20	3	95	46	94	16	1610
48	1a	310	525	-	14 - 40	106	39	28	21	3,5	105	51	104	28	1615
55	1a	410	685	-	14 - 50	96	33	30	22	4	120	60	118	20	2012
65	1	625	940	-	14 - 50	101	33	35	26	4,5	135	68	115	5	2012
75	1	1280	1920	-	16 - 60	130	52	40	30	5	160	80	158	36	2517
90	1	2400	3600	-	25 - 75	149	52	45	34	5,5	200	100	160	14	3020

1) maximum torque of the coupling $T_{Kmax.}$ = rated torque of the coupling $T_{K\ Nenn.}$ x 2

ROTEX® couplings with attached parts that can generate heat, sparks and static charging (e. g. combinations with brake drums, brake disks, overload systems like torque limiters, impellers etc.) are <u>not</u> allowed for the use in hazardous areas.
A separate checking must be made.

2 Hints

2.1 Coupling selection

CAUTION!
For a continuous and troublefree operation of the coupling it must be designed according to the selection instructions (according to DIN 740 part 2) for the particular application (see ROTEX® catalogue).
If the operating conditions (performance, speed, changes at engine and machine) change, the coupling selection must be checked again.
Please make sure that the technical data regarding torque only refers to the spider. The transmissible torque of the shaft/hub connection must be checked by the orderer, and he is responsible for the same.

For drives with endangered torsional vibration (drives with periodical load on torsional vibration) it is necessary to make a torsional vibration calculation to ensure a perfect selection. Typical drives with endangered torsional vibration are e. g. drives with diesel engines, piston pumps, piston compressors etc. On request KTR makes the coupling selection and the torsional vibration calculation.

2.2 General Hints

Please read through these mounting instructions carefully before you set the coupling into operation.
Please pay special attention to the safety instructions!

The **ROTEX®** coupling is suitable and approved for the use in hazardous areas. When using the coupling in hazardous areas please observe the special hints and instructions regarding safety in enclosure A.

The mounting instructions are part of your product. Please keep them carefully and close to the coupling.

2.3 Safety and Advice Hints

STOP	DANGER!	**Danger of injury to persons.**
!	CAUTION!	**Damages on the machine possible.**
☞	ATTENTION!	**Pointing to important items.**
Ex	PRECAUTION!	**Hints concerning explosion protection.**

2 Hints

2.4 General Hints of Danger

DANGER!
With assembly, operation and maintenance of the coupling it has to be made sure that the entire drive train is protected against unintentional engagement. You can be seriously hurt by rotating parts. Please make absolutely sure to read through and observe the following safety instructions.

- All operations on and with the coupling have to be performed taking into account "safety first".
- Please make sure to disengage the power pack before you perform your work.
- Protect the power pack against unintentional engagement, e. g. by providing hints at the place of engagement or removing the fuse for current supply.
- Do not touch the operation area of the coupling as long as it is in operation.
- Please protect the coupling against unintentional touch. Please provide for the necessary protection devices and caps.

2.5 Proper Use

may only assemble, operate and maintain the coupling if you

- carefully read through the mounting instructions and understood them
- had technical training
- are authorized to do so by your company

The coupling may only be used in accordance with the technical data (see table 1 to 5 in chapter 1). Unauthorized modifications on the coupling design are not admissible. We do not take any warranty for resulting damages. To further develop the product we reserve the right for technical modifications.
The **ROTEX®** described in here corresponds to the technical status at the time of printing of these mounting instructions.

3 Storage

The coupling hubs are supplied in preserved condition and can be stored at a dry and roofed place for 6 - 9 months.
The features of the coupling spiders (elastomers) remain unchanged for up to 5 years in case of favourable stock conditions.

CAUTION!
The storage rooms may not include any ozone-generating devices, like e. g. fluorescent light sources, mercury-vapour lamps or electrical high-voltage appliances.
Humid storage rooms are not suitable.
Please make sure that there is no condensation. The best relative air humidity is under 65%.

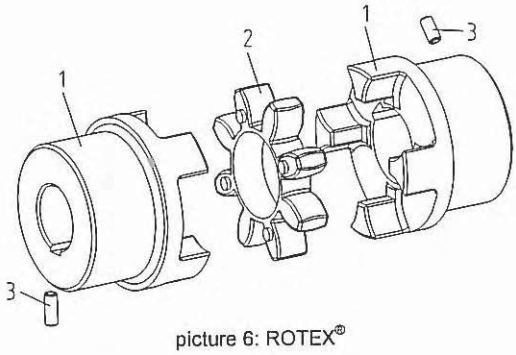
4 Assembly

Basically the coupling is supplied in individual parts. Before assembly the coupling has to be controlled for completeness.

4.1 Components of Couplings

Components of ROTEX®, shaft coupling design No. 001

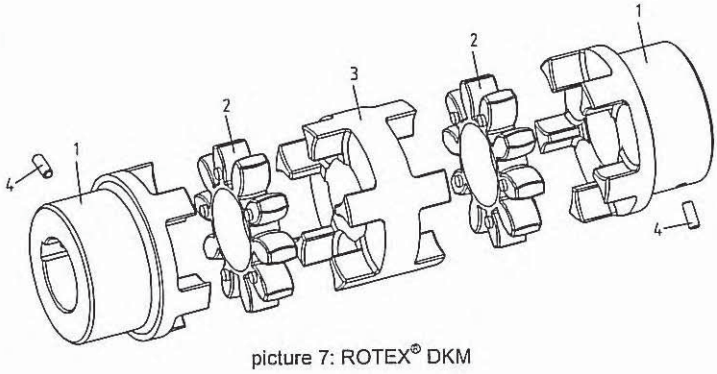
component	quantity	designation
1	2	hub
2	1	spider
3	2	setscrew



picture 6: ROTEX®

Components of ROTEX®, DKM

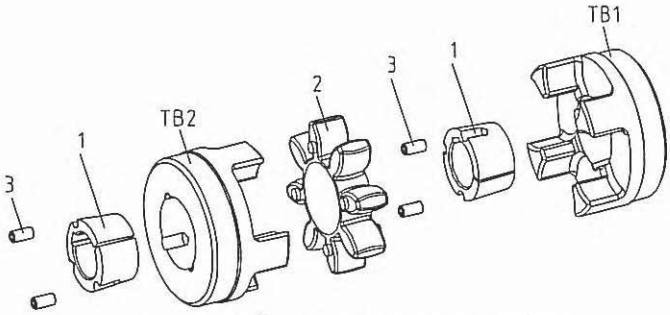
component	quantity	designation
1	2	hub
2	2	spider
3	1	DKM - spacer
4	2	setscrew



picture 7: ROTEX® DKM

Components of ROTEX®, design with taper clamping sleeve

component	quantity	designation
TB1/TB2	2	hub for taper clamping sleeve
1	2	taper clamping sleeve
2	1	spider
3	4	setscrew



picture 8: ROTEX® design with taper clamping sleeve

Features of the standard spiders

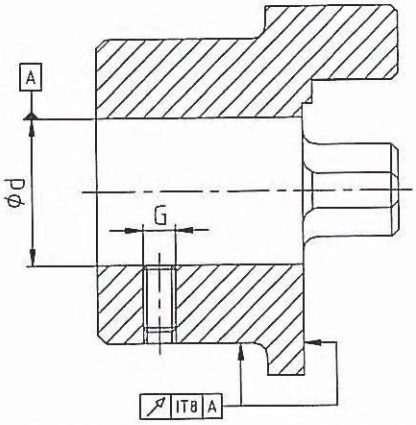
spider hardness (Shore)	marking (colour)
92 Sh A	yellow
95/98 Sh A	red
64 Sh D-F	natural white with green marking of teeth

4 Assembly

4.2 Hint regarding the finish bore

DANGER!
The maximum permissible bore diameters d (see table 1 to 5 in chapter 1 - Technical Data) must not be exceeded. If these figures are disregarded, the coupling may tear. Rotating particles may cause serious danger.

- Hub bores machined by the customer have to observe concentric running or axial running, respectively (see picture 9).
- Please make absolutely sure to observe the figures for d_{max}.
- Carefully align the hubs when the finish bores are brought in.
- Please use a setscrew according to DIN 916 with a cup point or an end plate to fasten the hubs axially.



picture 9: concentric running and axial running

CAUTION!
The orderer is responsible for all subsequently made machinings to unbored or pilot bored and to finish machined coupling parts and spare parts. KTR does not assume any warranty claims resulting from insufficient refinish.

PRECAUTION!
Any mechanical rework to couplings that are used in hazardous areas require an explicit release by KTR.
The orderer must send a drawing to KTR acc. to which the manufacture must be made. KTR checks this drawing and returns it to the orderer with approval.
KTR supplies unbored or pilot bored coupling parts and spare parts on explicit customer´s request. These parts are additionally labelled with the symbol Ⓤ.

Table 6: setscrews

ROTEX® size	14	19	24	28	38	42	48	55	65
dimension G	M4	M5	M5	M8	M8	M8	M8	M10	M10
tightening torque T_A	1,5	2	2	10	10	10	10	17	17

ROTEX® size	75	90	100	110	125	140	160	180	
dimension G	M10	M12	M12	M16	M16	M20	M20	M20	
tightening torque T_A	17	40	40	80	80	140	140	140	

4 Assembly

4.3 Assembly of the Hubs

ATTENTION!
We recommend to check bores, shaft, keyway and feather key for dimensional accuracy before assembly.

Heating the hubs slightly (approx. 80 °C) allows for an easier installation onto the shaft.

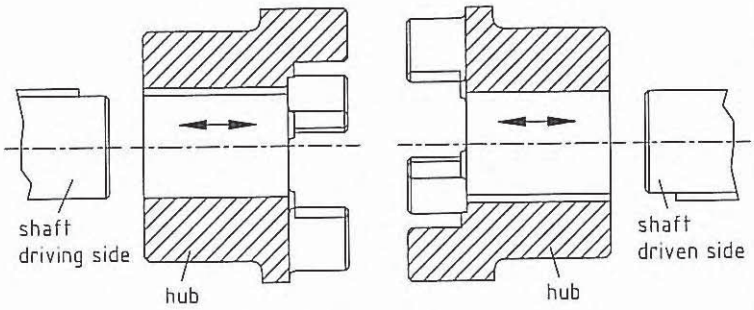
PRECAUTION!
Please pay attention to the danger of ignition in hazardous areas.

DANGER!
Touching the heated hubs causes burns.
We would recommend to wear safety gloves.

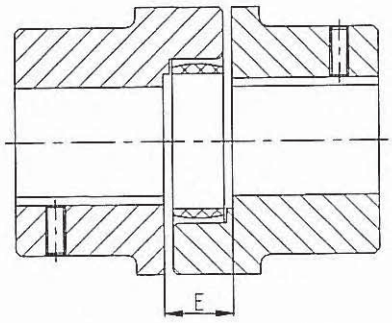
CAUTION!
For the assembly please make sure that the distance dimension E (see table 1 to 5) is kept to ensure that the spider can be moved axially.
Disregarding this hint may cause damage on the coupling.

- Assemble the hubs onto the shaft of driving and driven side (see picture 10).
- Insert the spider into the cam section of the drive- or driven sided hub.
- Move the power packs in axial direction until the dimension E is achieved (see picture 11).
- If the power packs are already firmly assembled, axial movement of the hubs on the shafts allows for adjusting the dimension E.
- Fasten the hubs by tightening the setscrews DIN 916 with cup point (tightening torque see table 6).

ATTENTION!
If the shaft diameters with inserted feather key are smaller than the dimension d_H (see table 1 to 5) of the spider, one or two shaft ends may protude into the spider.



picture 10: assemby of the hubs



picture 11: coupling assembly

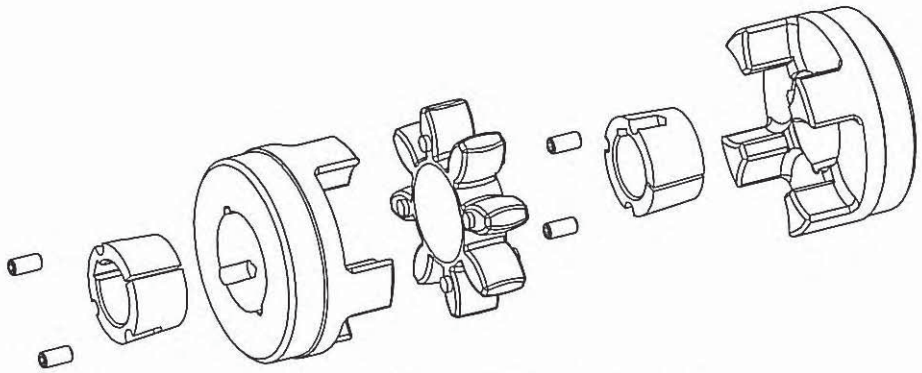
4 Assembly

4.4 Assembly of the Taper Clamping Sleeve

Assembly of the taper clamping sleeve:

The taper clamping sleeve has cylindrical and even pocket holes parallel to the axis. Only half to these holes are in the material of the sleeve. The other half located at the hub has convolutions.
Push the coupling part and the taper clamping sleeve into each other, make holes onto the cover and tighten the grub screws slightly. Push the coupling part with taper clamping sleeve onto the shaft and tighten the grub screws until reaching the tightening torque indicated in table 7.
During the screwing process the hub is pushed onto the conical sleeve and thus the sleeve is pressed onto the shaft. With light hammer strokes the taper clamping sleeve must be further pushed into the taper bore with a suitable sleeve. Afterwards please tighten the grub screws again with the tightening torque indicated in table 7. This must be made once at least.
After the drive has operated under load for a short time please check if the grub screws have untightened.
An axial fixing of the taper lock hub (coupling hub with taper clamping sleeve) is only possible by a correct assembly.

CAUTION!
If used in hazardous areas the grub screws must be additionally secured against self-loosening to fix the taper clamping sleeves, e. g. glue with Loctite (medium strength).
The use of taper clamping sleeves without a feather key is not permitted in hazardous areas.



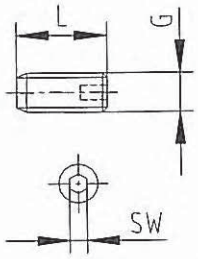
picture 12: ROTEX® design with taper clamping sleeve

Disassembly of the taper clamping sleeve:

By removing the grub screws you can detach the taper clamping sleeve. Afterwards, one of the grub screws is screwed into the thread of the sleeve as forcing screw and tightened.
The detached coupling hub can be manually taken off the shaft with the taper clamping sleeve.

Table 7:

taper clamping sleeve	screw dimension				quantity	spanner
	G [inch]	L [inch]	SW [mm]	T_A [Nm]		
1008	1/4	1/2	3	5,7	2	SW 3
1108	1/4	1/2	3	5,7	2	SW 3
1610	3/8	5/8	5	20	2	SW 5
1615	3/8	5/8	5	20	2	SW 5
2012	7/16	7/8	6	31	2	SW 6
2517	1/2	7/8	6	49	2	SW 6
3020	5/8	1 1/4	8	92	2	SW 8



picture 13: withworth grub screw (BSW)

4 Assembly

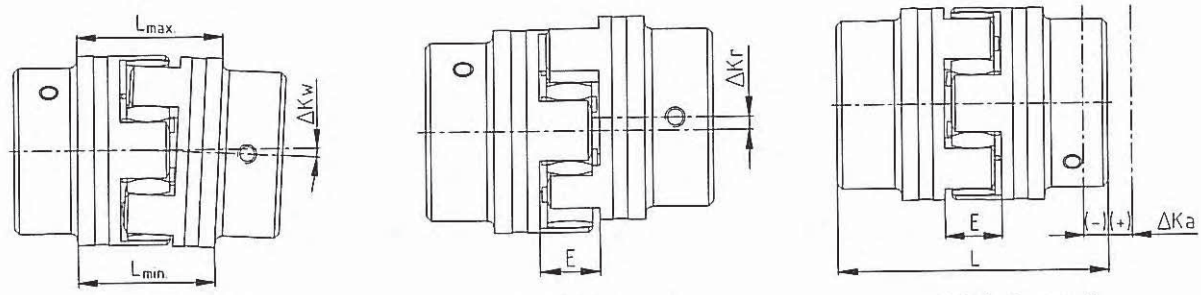
4.5 Displacements - Alignment of the Couplings

The displacement figures shown in tables 8 and 9 offer sufficient safety to compensate for environmental influences like, for example, heat expansion or lowering of foundation.

CAUTION!
In order to ensure a long lifetime of the coupling and to avoid dangers regarding the use in hazardous areas, the shaft ends must be accurately aligned.
Please absolutely observe the displacement figures indicated (see tables 8 and 9). If the figures are exceeded, the coupling is damaged.
The exacter the alignment of the coupling, the higher is its lifetime.
In case of a use in hazardous areas for the explosion group IIC (marking II 2GD c IIC T X), only the half displacement figures (see tables 8 and 9) are permissible.

Please note:

- The displacement figures mentioned in tables 8 and 9 are maximum figures which must not arise in parallel. If radial and angular displacement arises at the same time, the permissible displacement values may only be used in part (see picture 15).
- Please check with a dial gauge, ruler or feeler whether the permissible displacement figures of tables 8 and 9 can be observed.



angular displacements

$\Delta K_W = L_{1max.} - L_{1min.}$ [mm]

radial displacements

axial displacements

$L_{max} = L + \Delta K_A$ [mm]

picture 14: displacements

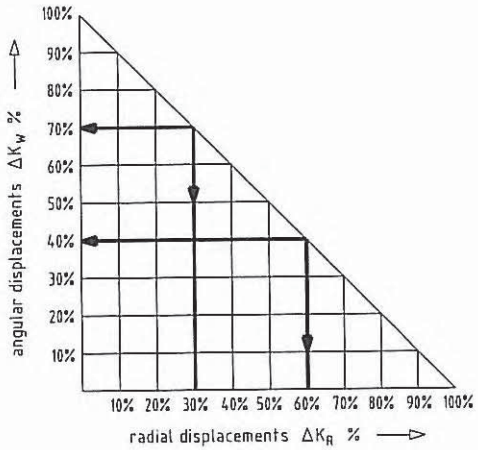
Example for the misalignment combinations given in picture 15:

Example 1:
$\Delta K_R = 30\ \%$
$\Delta K_W = 70\ \%$

Example 2:
$\Delta K_R = 60\ \%$
$\Delta K_W = 40\ \%$

$\Delta K_{total} = \Delta K_R + \Delta K_W \leq 100\ \%$

picture 15: combinations of displacement



4 Assembly

4.5 Displacements - Alignment of the Couplings

Table 8: displacement figures

ROTEX® size		14	19	24	28	38	42	48	55	65	75	90	100	110	125	140	160	180
max. axial displacement ΔKa [mm]		-0,5	-0,5	-0,5	-0,7	-0,7	-1,0	-1,0	-1,0	-1,0	-1,5	-1,5	-1,5	-2,0	-2,0	-2,0	-2,5	-3,0
		+1,0	+1,2	+1,4	+1,5	+1,8	+2,0	+2,1	+2,2	+2,6	+3,0	+3,4	+3,8	+4,2	+4,6	+5,0	+5,7	+6,4
max. radial displacement ΔKr [mm] with	1500 1/min	0,17	0,20	0,22	0,25	0,28	0,32	0,36	0,38	0,42	0,48	0,50	0,52	0,55	0,60	0,62	0,64	0,68
	3000 1/min	0,11	0,13	0,15	0,17	0,19	0,21	0,25	0,26	0,28	0,32	0,34	0,36	0,38	-	-	-	-
ΔKw [degree] max. angular displacement with n = 1500 1/min		1,2	1,2	0,9	0,9	1,0	1,0	1,1	1,1	1,2	1,2	1,2	1,2	1,3	1,3	1,2	1,2	1,2
ΔKw [mm]		0,67	0,82	0,85	1,05	1,35	1,70	2,00	2,30	2,70	3,30	4,30	4,80	5,60	6,50	6,60	7,60	9,00
ΔKw [degree] max. angular displacement with n = 3000 1/min		1,1	1,1	0,8	0,8	0,8	0,8	0,9	1,0	1,0	1,0	1,1	1,1	1,1	-	-	-	-
ΔKw [mm]		0,62	0,70	0,75	0,84	1,10	1,40	1,60	2,00	2,30	2,90	3,80	4,20	5,00	-	-	-	-

Table 9: displacement figures only for design DKM

ROTEX® size		19	24	28	38	42	48	55	65	75	90
max. axial displacement ΔKa [mm]		-0,5	-0,5	-0,7	-0,7	-1,0	-1,0	-1,0	-1,0	-1,5	-1,5
		+1,2	+1,4	+1,5	+1,8	+2,0	+2,1	+2,2	+2,6	+3,0	+3,4
max. radial displacement ΔKr [mm] with n =	1500 1/min	0,54	0,53	0,60	0,77	0,84	1,00	1,11	1,40	1,59	1,78
	3000 1/min	0,50	0,47	0,53	0,61	0,67	0,82	1,01	1,17	1,33	1,63
ΔKw [degree] max. angular displacement with n =	1500 1/min	1,20	0,90	0,90	1,00	1,00	1,10	1,10	1,20	1,20	1,20
	3000 1/min	1,10	0,80	0,80	0,80	0,80	0,90	1,00	1,00	1,00	1,10

4.6 Spares Inventory, Customer Service Addresses

A basic requirement to guarantee the operational readiness of the coupling is a stock of the most important spare parts on site.

Contact addresses of the KTR partners for spare parts and orders can be obtained from the KTR homepage under www.ktr.com.

5 Enclosure A

Hints and Instructions Regarding the Use in Ex Hazardous Areas

design 001:	hub / spider / hub
design 018:	hub / spider / DKM spacer / spider / hub
design with taper clamping sleeve:	hub / taper clamping sleeve / spider / taper clamping sleeve / hub **(Use of taper clamping sleeve <u>only</u> in connetion with a feather key!)**

ROTEX® DKM and ROTEX® ZS-DKM only with spacer from steel or aluminium semifinished-products with a yield point of $R_{p0,2} \geq 250$ N/mm^2.

5.1 Use in Ex Hazardous Areas According to the Regulations

Conditions of operation in Ex hazardous locations

ROTEX® couplings are suitable for the use according to EC standard 94/9/EC.

1. Industry (with the exception of mining)

- device class II of category 2 and 3 (*coupling is <u>not</u> approved for device class 1*)
- media class G (*gases, fogs, steams*), zone 1 and 2 (*coupling is <u>not</u> approved for zone 0*)
- media class D (*dusts*), zone 21 and 22 (*coupling is <u>not</u> approved for zone 20)*
- explosion class IIC (*explosion class IIA and IIB are included in IIC*)

Temperature class:

Temperature class	ambient temperature	max. surface temperature [1)]
T4, T3, T2, T1	- 30 °C to + 90 °C	110 °C [2)]
T5	- 30 °C to + 80 °C	100 °C
T6	- 30 °C to + 65 °C	85 °C

<u>Explanation:</u>
The maximum surface temperatures result from each the maximum permissible ambient or operating temperature T_a plus the maximum temperature increase ΔT of 20 K which has to be taken into account.

1) The ambient or operating temperature T_a is limited to + 90 °C due to the permissible permanent operating temperature of the elastomers used.
2) The maximum surface temperature of 110 °C applies for the use in locations which are potentially subject to dust explosion, too.

2. Mining

Device class I of category M2 (coupling is <u>not</u> approved for device category M1).
Permissible ambient temperature - 30 °C to + 90 °C.

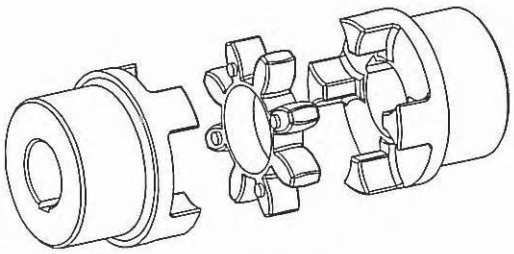
5 Enclosure A

Hints and Instructions Regarding the Use in Ex Hazardous Areas

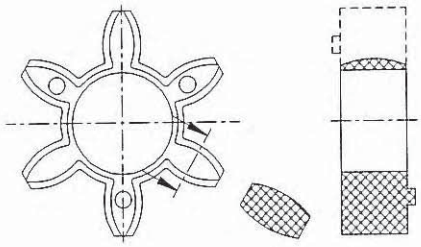
5.2 Control Intervals for Couplings in Ex Hazardous Areas

explosion group	control intervals
3G 3D	For couplings which are classified in category 3G or 3D the operating and assembly instructions that are usual for standard operation apply. During the standard operation which has to be subject to the analysis of danger of ignition the couplings are free from any ignition source. Merely the temperature increase produced by proper heating and depending on the coupling type has to be considered: for ROTEX®: $\Delta T = 20$ K
II 2GD c IIB T4, T5, T6	A checking of the circumferential backlash and a visual check of the flexible spider must be effected after 3,000 operating hours for the first time, after 6 months at the latest. Except for centered, stiff connecting flanges (e. g. bellhousings). If you note an unconsiderable or no wear at the spider after this first inspection, the further inspections can be effected, in case of the same operating parameters, respectively after 6,000 operating hours or after 18 months at the latest. If you note a considerable wear during the first inspection, so that a change of the spider would be recommended, please find out the cause according to the table „Breakdowns", as far as possible. The maintenance intervals must be adjusted according to the changed operating parameters.
II 2GD c IIC T4, T5, T6	A checking of the circumferential backlash and a visual check of the flexible spider must be effected after 2,000 operating hours for the first time, after 3 months at the latest. Except for centered, stiff connecting flanges (e. g. bellhousings). If you note an unconsiderable or no wear at the spider after this first inspection, the further inspections can be effected, in case of the same operating parameters, respectively after 4,000 operating hours or after 12 months at the latest. If you note a considerable wear during the first inspection, so that a change of the spider would be recommended, please find out the cause according to the table „Breakdowns", as far as possible. The maintenance intervals must be adjusted according to the changed operating parameters.

ROTEX® coupling



picture 16: ROTEX® coupling



picture 17: ROTEX® spider

Here the backlash between coupling cams and the flexible spider must be checked by a feeler gauge.
When reaching the limit of wear of max. friction, the spider must be exchanged immediately, independent of the inspection intervals.

5 Enclosure A

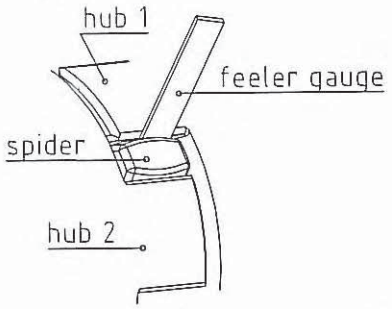
Hints and Instructions Regarding the Use in Ex Hazardous Areas

5.3 Approximate Values of Wear

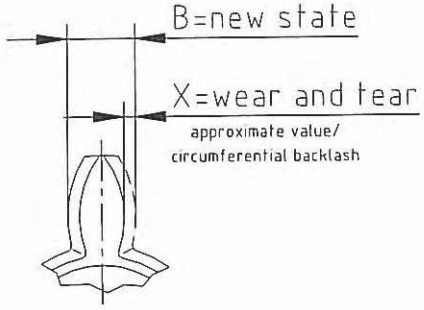
In case of a backlash of more than X mm, the flexible spider must be exchanged.

The reaching of the exchange values depends on the operating conditions and the existing operating parameters.

CAUTION!
In order to ensure a long lifetime of the coupling and to avoid dangers regarding the use in hazardous areas, the shaft ends must be accurately aligned.
Please absolutely observe the displacement figures indicated (see tables 8 and 9). If the figures are exceeded, the coupling is damaged.



picture 18: checking of the limit of wear



picture 19: wear of spider

Table 10:

ROTEX® size	limits of wear (friction) $X_{max.}$ [mm]	ROTEX® size	limits of wear (friction) $X_{max.}$ [mm]
9	2	65	5
14	2	75	6
19	3	90	8
24	3	100	9
28	3	110	9
38	3	125	10
42	4	140	12
48	4	160	14
55	5	180	14

5.4 Permissible Coupling Materials in the Ex Hazardous Area

In the Explosion Groups **IIA, IIB** and **IIC** the following materials may be combined:

EN-GJL-250 (GG 25)
EN-GJS-400-15 (GGG 40)
steel
stainless steel

Semifinished products from aluminium with a magnesium part of up to 7,5 % and a yield point of $R_{p0,2} \geq 250$ N/mm^2 are permitted for the use in hazardous areas.
Aluminium diecast is generally excluded for hazardous areas.

5 Enclosure A

Hints and Instructions Regarding the Use in Ex Hazardous Areas

5.5 Ex Marking of Coupling for the Hazardous Area

Couplings for the use in hazardous areas are marked on at least one component completely and on the remaining components at the outside diameter of the hub or on the front side with an Ex label for the respectively permitted conditions of use. The flexible spider is excluded.
For reason of the limited space only the symbol Ex is stamped up to size 19.

Complete labelling: Ex II 2G c IIC T6, T5 bzw. T4 - 30 °C ≤ T_a ≤ + 65°C, + 80 °C bzw. +90 °C
II 2D c T 110 °C/I M2 c - 30 °C ≤ T_a ≤ + 90 °C

Short labelling: Ex II 2GD c IIC T X/I M2 c X

The former marking remains valid: Ex II 2G c IIC T4/T5/T6 - 30 °C ≤ T_a ≤ + 80/60/45 °C
II 2D c T 110 °C/I M2 c - 30 °C ≤ T_a ≤ + 80 °C

The labelling with Explosion Group IIC includes the Explosion Groups IIA and IIB.

If the coupling part is labelled with U in addition to Ex, KTR supplied it unbored or pilot bored.

CAUTION!
Any mechanical rework to couplings that are used in hazardous areas require an explicit release by KTR.
The orderer must send a drawing to KTR acc. to which the manufacture must be made. KTR checks this drawing and returns it to the orderer with approval.

5.6 Starting

Before putting the coupling into operation, check the tightness of the setscrews in the hubs, the alignment and the distance dimension E and correct, if necessary, and also check all screw connections regarding the stipulated tightening torques dependent on the type of coupling.

Ex If used in hazardous areas the grub screws to fix the hub as well as all screw connections must be additionally secured against self-loosening, e. g. glue with Loctite (medium strength).

Last but not least, the coupling protection against unintended contact must be fixed.

The cover must be electrically conductive and be included in the equipotential bonding. Bellhousings (magnesium part below 7,5 %) made from aluminium and damping rings (NBR) can be used as connecting element between pump and electro motor. The cover may only be taken off after having stopped the unit.

During operation, please pay attention to

- strange running noises
- occurring vibrations.

If the couplings are used in dust explosive areas and in mining the user must make sure that there is no accumulation of dust in a critical quantity between the cover and the coupling. The coupling must no operate in an accumulation of dust.

5 Enclosure A

Hints and Instructions Regarding the Use in Ex Hazardous Areas

5.6 Starting

For covers with unlocked openings on the upper side no light metals may be used if the couplings are used as appliances of appliance group II (*if possible, from stainless steel*).
If the couplings are used in mining (appliance group I M2), the cover must not be made from light metal. In addition, it must be resistant to higher mechanical loads than if it is used as appliance of appliance group II.

The minimum distance of the protection device to the rotating parts must be at least 5mm.

If the protection device is used as cover, regular openings complying with the explosion protection demands can be made that must not exceed the following dimensions:

	form of the openings		
	circular openings diameter in mm	rectangular openings side length in mm	straight or bended slot distance of the side limit in mm
top surface of the covering	4	4	prohibited
side parts of the covering	8	8	8

CAUTION!
If you note any irregularities at the coupling during operation, the drive unit must be turned off immediately. The cause of the breakdown must be found out with the table „Breakdowns" and, if possible, be eliminated according to the proposals. The possible breakdowns mentioned can be hints only. To find out the cause all operating factors and machine components must be considered.

Coupling layer:

If coated (priming, painting etc.) couplings are used in hazardous areas, the requirements to conductability and layer thickness must be considered. In case of paintings up to 200 µm no electrostatic load can be expected. Multiple coatings that are thicker than 200 µm are prohibited for explosion group IIC.

5.7 Breakdowns, Causes and Elimination

The below-mentioned errors can lead to an incorrect use of the **ROTEX®** coupling. In addition to the stipulations in these operating and mounting instructions please make sure to avoid these errors.
The errors listed can only be clues to search for the errors. When searching for the error the adjacent components must be generally included.

Due to incorrect use the coupling can become a source of ignition.
EC Standard 94/9/EC requires a special care from the manufacturer and the user.

General errors incorrect use

- Important data for the coupling selection was not forwarded.
- The calculation of the shaft/hub connection was not considered.
- Coupling parts with damage occurred during transport are assembled.
- If the heated hubs are assembled, the permissible temperature is exceeded.
- The fits of the parts to be assembled are not coordinated with each other.
- Tightening torques are below/exceeded.
- Components are exchanged by mistake/put together incorrectly.
- A wrong or no spider is inserted into the coupling.

5 Enclosure A

Hints and Instructions Regarding the Use in Ex Hazardous Areas

5.7 Breakdowns, Causes and Elimination

Continuation:

- No original KTR parts (purchased parts) are used.
- Old spiders/already worn out spiders or superposed spiders are used.
- The coupling used/the coupling protection used is not suitable for the operation in hazardous areas and does not correspond to EC Standard 94/9/EC, respectively.
- Maintenance intervals are not observed.

breakdowns	causes	danger hints for hazardous areas	elimination
change of the running noises and/or occurring vibrations	misalignment	increased temperature the the spider surface; danger of ignition by hot surfaces	1) put the unit out of operation 2) eliminate the reason for the misalignment (e. g. loose foundation bolts, break of the engine fixing, heat expansion of unit components, change of the assembly dimension E of the coupling) 3) checking of wear see under point Control
	wear of spider, short-term torque transmission due to metal contact	danger of ignition due to sparking	1) put the unit out of operation 2) disassemble the coupling and remove rests of the spider 3) check coupling parts and exchange damaged coupling parts 4) insert spider, assemble coupling parts 5) check alignment, correct if necessary
	loose screws for axial securement of hubs	danger of ignition due to hot surfaces and sparking	1) put the unit out of operation 2) check alignment of coupling 3) tighten the screws to secure the hubs and secure against self-loosening 4) checking of wear see under point Control
break of cam	wear of spider, torque transmission due to metal contact	danger of ignition due to sparking	1) put the unit out of operation 2) change complete coupling 3) check alignment
	break of the cams due to high shock energy/overload	danger of ignition due to sparking	1) put the unit out of operation 2) change complete coupling 3) check alignment 4) find out the reason of overload
	operating parameters do not correspond to the performance of the coupling	danger of ignition due to sparking	1) put the unit out of operation 2) check the operating parameters and select a larger coupling (consider installation space) 3) assemble new coupling size 4) check alignment
	mistake in service of the unit	danger of ignition due to sparking	1) put the unit out of operation 2) change complete coupling 3) check alignment 4) instruct and train the service staff

5 Enclosure A

Hints and Instructions Regarding the Use in Ex Hazardous Areas

5.7 Breakdowns, Causes and Elimination

breakdowns	causes	danger hints for hazardous areas	elimination
premature wear of spider	misalignment	increased temperature the the spider surface; danger of ignition by hot surfaces	1) put the unit out of operation 2) eliminate the reason for the misalignment (e. g. loose foundation bolts, break of the engine fixing, heat expansion of unit components, change of the assembly dimension E of the coupling) 3) checking of wear see under point Control
	e. g. contact with aggressive liquids/ oils, ozone-influence, too high/low ambient temperatures etc. effecting a physical change of the spider	danger of ignition due to sparking in case of metallic contact of the cams	1) put the unit out of operation 2) disassemble the coupling and remove rests of the spider 3) check coupling parts and exchange damaged coupling parts 4) insert spider, assemble coupling parts 5) check alignment, correct if necessary 6) make sure that further physical changes of the spider are excluded
	ambient/contact temperatures which are too high for the spider, max. permissible e. g. T4 = - 30 °C/+ 90 °C	danger of ignition due to sparking in case of metallic contact of the cams	1) put the unit out of operation 2) disassemble the coupling and remove rests of the spider 3) check coupling parts and exchange damaged coupling parts 4) insert spider, assemble coupling parts 5) check alignment, correct if necessary 6) check and regulate ambient/contact temperature (eventually even elimination by using other spider materials)
premature wear of spider (liquefaction of material inside the spider cam)	drive vibrations	danger of ignition due to sparking in case of metallic contact of the cams	1) put the unit out of operation 2) disassemble the coupling and remove rests of the spider 3) check coupling parts and exchange damaged coupling parts 4) insert spider, assemble coupling parts 5) check alignment, correct if necessary 6) find out the reason for the vibrations (eventually elimination by spider with lower or higher shore hardness)

Ex If you operate with a worn spider (see item 5.2) and the subsequent contact of metal parts a due operation meeting the explosion protection requirements and acc. to Standard 94/9/EC is not ensured.

☞ **ATTENTION!**
KTR does not assume any liabilities or guarantees regarding the use of spare parts and accessories which are not provided by KTR and for the damages resulting herefrom.

5.8 EC Certificate of Conformity

EC Certificate of Conformity

corresponding to EC Standard 94/9/EC dated 23 March 1994
and to the legal regulations

The manufacturer - KTR Kupplungstechnik GmbH, D-48432 Rheine - states that the

flexible ROTEX® couplings

described in these mounting instructions and explosion-proof designed correspond to Article 1 (3) b) of Standard 94/9/EC and comply with the general Safety and Health Requirements according to enclosure II of Standard 94/9/EC.

The couplings are certified according to Type Examination Certificate IBExU02ATEXB001_05 X vor.

According to article 8 (1) of Standard 94/9/EC the technical documentation is deposited with the:

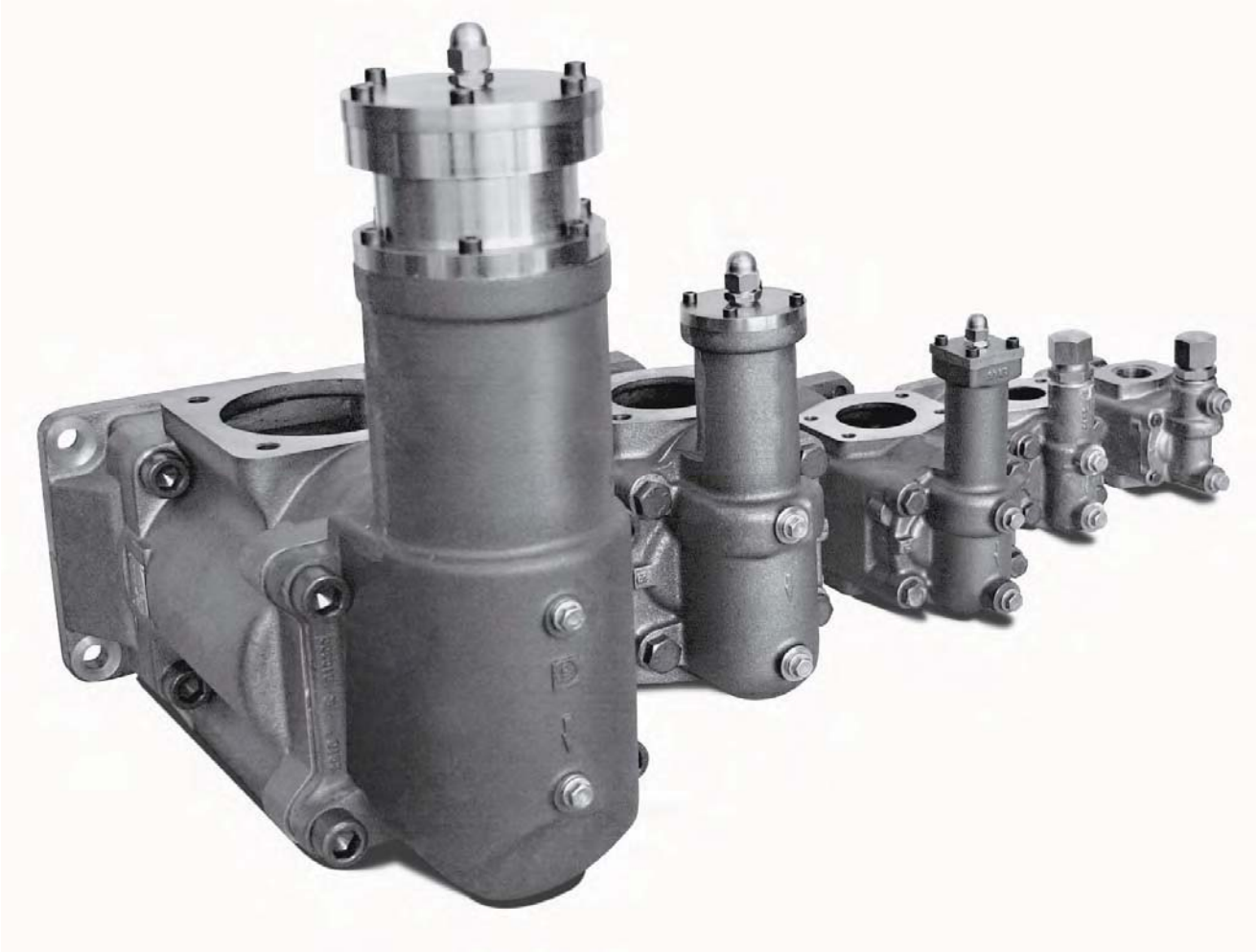
IBExU
Institut für Sicherheitstechnik GmbH
Fuchsmühlenweg 7

09599 Freiberg

Rheine, 14.03.02
Date

ppa.
Dr. Norbert Partmann
Engineering Manager

i. V.
Bernd Tenfelde
Product Manager



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Important General Information
In addition to the information provided in these operating instructions, the following documents must also always be observed:

1. The order data sheet from RICKMEIER GmbH shipped with the product.
2. In case of a planned deviation from the operating conditions in the order data sheet, please observe the operating instructions and limits for use in the applicable RICKMEIER GmbH pump catalog.
3. Other instructions (for pump units, e.g. the operating instructions of the drive motor).
4. <u>When using in a potentially explosive environment, the ATEX operating instructions BA2-0NNN-113 from RICKMEIER GmbH must also be observed. The information provided there on the use of the pump have **priority** over the corresponding information of these operating and maintenance instructions.</u>

This documentation must always be available at the operating location of the machine so that dangers or injuries and damage can be prevented to the greatest extent possible. For storage, transport, commissioning, operation, maintenance/service or decommissioning, the respectively applicable national, local and system-specific regulations must be observed.

Special designs and design variants may differ in their technical details! In case of unclear points, it is urgently recommended that RICKMEIER be consulted with specification of the rating plate data from the pump/pump unit.

Basic Safety Rules
Installation, commissioning, operation, maintenance and decommissioning may only be carried out by persons, who

1. have carefully read and understood the operating/installation instructions
2. have received special training for the planned work and are authorized by your company to perform such work
3. comply with the EC Directive 89/655/EEC **Minimum Safety and Health Requirements for the Use of Work Equipment by Workers at Work**.

Information attached directly to the pump, such as the **rotating direction arrow** or **markings of the fluid connections** must always be observed. These must always be kept in completely legible condition.
Following operating instructions apply additionally with pump units:

1. without motor : operating instruction clutch
2 with motor : operating instruction motor.

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1 Using gear pumps

RICKMEIER gear pumps may only be used to feed lubricating media.
The data relevant for operation will be specified in the RICKMEIER order data sheet, if necessary with separate data sheets, drawings or similar documents. Should the stipulated conditions be deviated from during later operation, then this must be coordinated with RICKMEIER, as otherwise the any and all warranty claims shall be voided. Use in a potentially explosive environment is only permissible when the pump/pump unit is marked accordingly!

2 Flow medium

As a condition for a longer service life and maximum operating safety, the flow medium is to have lubricating properties (kinematic viscosity of the flow medium under all occurring operating conditions always > 5 mm^2/s). The soiling of the flow medium should not be greater than the Purity Class 21/19/17 according to ISO 4406:1999. The flow medium must always be free of hard solid particles. The percentage of undissolved gases (bubbles) in the feed stream should not exceed 10 % by volume. Otherwise increased noise emissions can result.

3 Operating dangers

3.1 Safety-conscious working procedure

The safety precautions listed in these operating instructions, the existing national regulations for accident prevention and internal working, operating and safety regulations of the operator must be observed.

3.2 Dangers in case of failure to observe safety precautions

Failure to observe the safety precautions can result in hazards to persons, the environment and machines. Failure to observe the safety precautions can lead to the loss of any and all warranty claims and claims to damages.
In particular, failure to observe the precautions can, for example, result in the following hazards:

1. Endangering of persons, e.g. due to a danger of burns and poisoning
2. Leaks (e.g. of the shaft seal) of dangerous flow mediums (e.g. explosive, toxic, hot) must be discharged so that no hazard to persons and the environment results. Legal regulations must always be complied with.
3. If hot or cold machine parts lead to dangers, then these parts must be secured by the customer against touching.
4. Failure of important functions of the machine/system
5. Shortening of the expected service life of the machine/system
6. Failure of specified maintenance and service methods

Never remove safety equipment or deactivate it by making modifications to the machine!

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3.3 Using pressure relief valve R25, R35

The pressure relief valve is used to protect the pump against impermissible loads. It is set to the required opening pressure at the factory and should only react occasionally and briefly during operation.

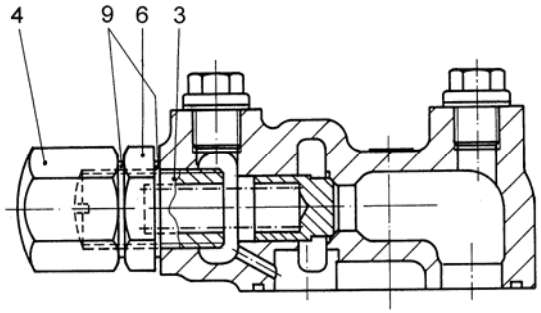

Fig. 1: Pressure relief valve R25, R35

	R25	R35
Tightening torque [Nm]	70	100

Table 1: Tightening torques

In the case of <u>later</u> pressure adjustment, the following must be observed:

1. Remove cap nut Item 4 (32 mm).
2. Loosen hexagon nut Item 6 (32 mm).
3. Make pressure setting by adjusting the spindle (slot). **Caution!** During the pressure adjustment the spindle (Item 3) may only be screwed in clockwise (pressure increase), as otherwise the dangers specified in 3.2 will occur.
   The spindle is not secured against unscrewing!
4. Replace Cu sealing ring (2 each) Item 9 (DIN 7603-A21x26-Cu).
5. Tighten hexagon nut Item 6 according to Fig. 1, hold spindle at slot with screwdriver.
6. Mount cap nut Item 4 according to Fig. 1.

4 Transport and storage

Dispose of the packing material after unpacking according to the applicable legal regulations.

4.1 Storage

Always protect the pump against impairments due to moisture, dust, water and/or other contami-nants. Store the pump in a clean, dry place (relative humidity ≤ 70%) at temperatures between – 25 °C and 40 °C; unpainted parts should stored with a relative humidity ≤ 40%. Pumps with a rotary shaft seal should be put into operation 24 months after shipping at the latest. Storage conditions which differ from this must be agreed upon separately.

The top coating provided by RICKMEIER is a base coating which is only intended to protect against corrosion during transport and storage. Do not damage the coating.

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4.2 Lifting pump/pump unit

The pump must be lifted with securely attached lifting belts. The center of gravity must lie between the belts to prevent the pump from tipping (see Fig. 2).

A suitable hoist must be used!

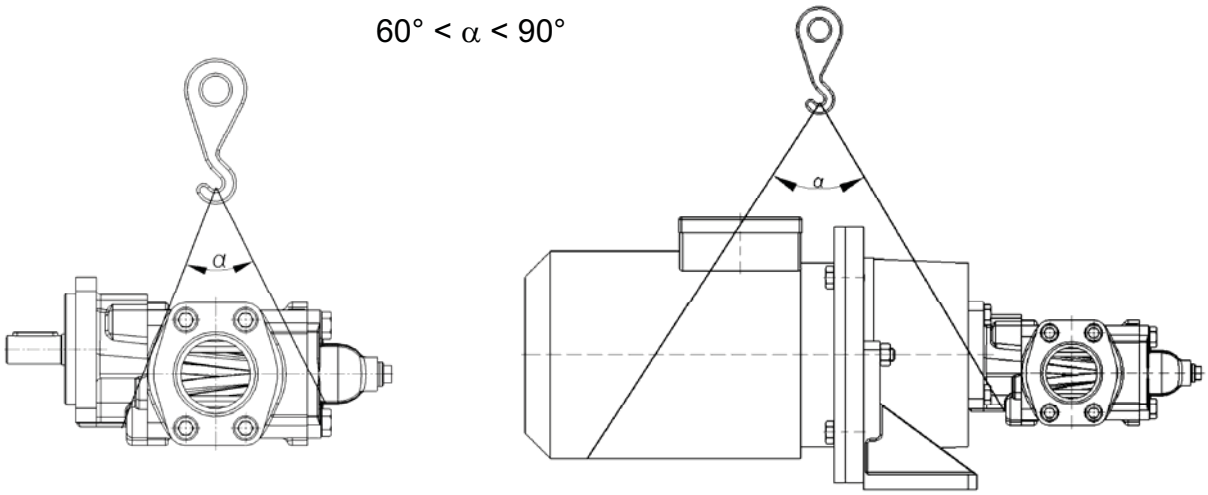

Fig. 2: Transport/lifting

5 Setup/Installation/Mounting

The pump must be set up as stipulated when ordering. The drive of the gear pumps must be adjusted to their power input.
The piping must be installed with as little tension as possible. For the suction and pressure connections of the series with an inside thread, only screw-in parts with an exactly matching, cylindrical thread may be used. When screwing in, make sure that the pump is not twisted. The connections must be sealed in accordance with the operating conditions (medium, pressure, temperature). The connection flange surfaces of the pump and the corresponding mating surfaces may not be damaged and must be free of paint residues and other soiling.
Drive elements such as clutches and gearwheels must be fit on the pump shaft with ISO fitting H7. These parts may not be driven on with hammer blows, as the pump can be damaged in the process.
When aligning the pump shaft to the drive machine, the permissible differences of the clutch may not be exceeded (see related clutch operating instructions).
Ensure even contact, good base or flange mounting and exact alignment!
For pump series without factory clutch protection, corresponding touch protection must be provided by the customer (for example, see the Machinery Directive 98/37/EC Paragraph 1.3.8).
Suitable precautions must be taken against the long-term effects of dust, water and exposure to the direct sunlight (e.g. large-area protection).
All parts which come into contact with the flow medium must be free of impurities. With hot-bent pipes or pipes belt by welding, it is particularly important to ensure that no residues are present in the pipes during commissioning.

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5.1 Suction pipe design, NPSHR value

For proper operation, it is necessary that the static pressure directly at the entrance into the pump is never less than **-0.4 bar** (equivalent to 0.6 bar absolute) under any operating conditions. Deviations from this must be expressly agreed upon with RICKMEIER when placing the order.

It is therefore advisable to calculate or measure the lowest possible static pressure at the pump entrance during operation. When doing so, all hydraulic resistances in the planned suction pipe must be taken into account. This is especially important when a filter is provided in the suction pipe which can become clogged in the course of time. In this case, it is recommended that the pump inlet pressure be monitored with a pressure measuring device as close to the pump as possible and that regular filter maintenance be conducted.

If no measuring connection is available in the suction pipe, the pressure gauge connection facing the suction side can also be used for this purpose for pumps with a pressure relief valve. Otherwise, the suction pipe must be absolutely leak-tight so that no air can be aspirated.

The NPSHR value of the pumps frequently used for comparison with the NPSHA value of a system is provided in Fig. 3.

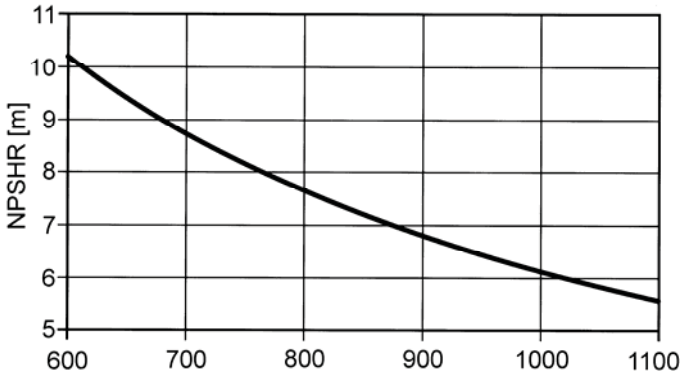

Fig. 3: NPSHR Density of flow medium [kg/m^3]

5.2 Sense of rotation and direction of flow

Before commissioning the pump, it must be ensured that the direction of drive rotation matches the direction of pump rotation. To check the rotating direction of the drive machine, it is practical to detach the clutch so that the pump is not driven. If this is not possible, then at least the pipe connections must be removed so that the pump cannot be damaged by an incorrect rotating direction.

When checking the direction of drive rotation, a pressure buildup in the suction pipe must be prevented (e.g. caused by an integrated non-return valve). Otherwise the shaft seal may be damaged in the case of an incorrect rotating direction.

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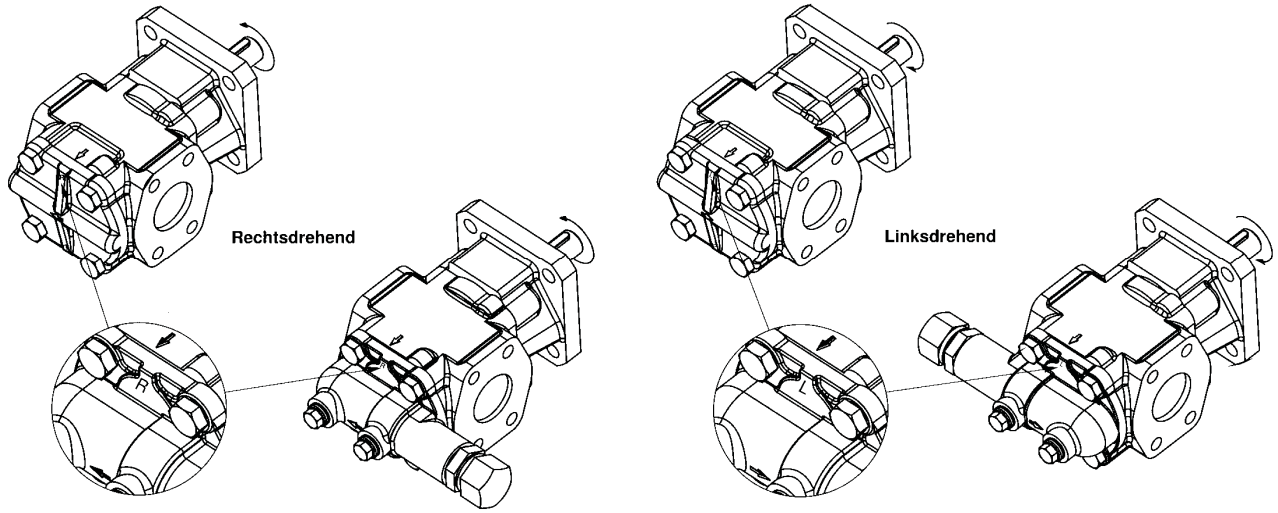
rechtsdrehend = clockwise

linksdrehend = counter-clockwise



Sense of rotation, identification arrow

Direction of delivery

L, R: Sense of rotation, view on shaft end: R = clockwise, L = counter-clockwise

Fig. 4: Sense of rotation and direction of flow

5.3 Reversing the sense of rotation

The pumps of the sizes R25 to R65 are designed so that the sense of rotation can be changed later. The direction of flow is then also reversed. Prior to conversion to another sense of rotation, and with it the reversal of the feed direction, the manufacturer must be consulted. The direction of rotation cannot be altered late at pumps with mechanical sealing. The rebuilding on another direction of rotation and so the reversion of the direction of flow must occur by RICKMEIER.

6 Commissioning

Before starting up, the pump and the suction or supply pipe must be filled with the flow medium. If the pump is installed so that the gear wheels lie above each other, a small quantity of flow medium remains in the pump even at a standstill. As a result, the pump retains its suction capacity for restarting even after longer standstills.
When operating two pumps in parallel which are secured against each other with non-return valves, both pumps should be bled on the pressure side. The same applies to a pump working against a closed system (loaded non-return valve etc.). Feeding against a closed pressure pipe is not permitted due to possible impermissible temperature increases in the pump.
With difficult suction conditions, the pump should be installed so that the driving gear shaft and the gear shaft are located above each other. This installation position ensures a better priming after longer standstills due to the residual oil quantity which remains in the pump. The gear pump is prevented from running dry when a non-return valve is present in the suction pipe. This can also be achieved by laying suction and pressure pipes on the pump in the form of a siphon.

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7 Operation/Function

Gear pumps are rotary displacement pumps. When the gear wheels turn, the medium enclosed in the space between the teeth is transported from the suction to the pressure side. Then the displacement toward the pressure side is carried out by the intermeshing teeth (see Fig. 5). The transport of the flow medium results in a pressure drop on the suction side of the pump. The flow medium compensates this pressure drop by flowing in, maintaining the feed process.

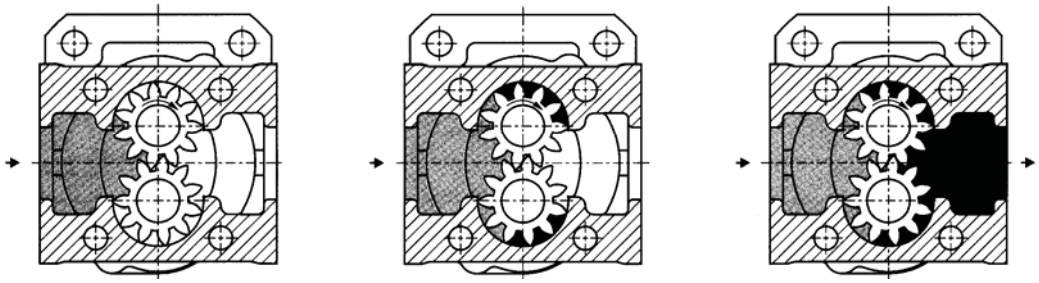

Fig. 5: Gear pump delivery principle

This process is the same for both gaseous and liquid media. As a result, the pump is capable of bleeding the suction pipe itself until it is completely filled with liquid flow medium.

7.1 Pressure relief valve

The pressure relief valve integrated in the end cover of the pump as an option is designed as a spring-loaded valve. It may only be used as an occasionally, briefly actuated valve for pressure limitation. If a larger partial quantity of the flow must be drained off over larger periods, a separate valve with a return pipe to the suction tank in the pipe (e.g. RICKMEIER valves of the type RSn, DBV40, DBV80, DB9) or another form of pressure relief must be provided. This also applies when the pressure pipe can become completely blocked during pump operation. Special designs and variants may differ in their technical details.

7.2 Dry running

Dry running is always to be avoided, i.e. the pump must be filled with the flow medium before being put into operation.
Exceptions: Dry running frequently occurs during start-up with unfilled suction pipe or during operation when the supply of flow medium has been interrupted. Pumps wetted with flow medium inside beforehand can be operated for up to 20 minutes under the following conditions:

1. Pump driven via clutch, i.e. free of radial forces
2. Pressure at pump inlet and outlet approximately equal

On pumps driven via a pinion, chain or belt, dry running is not permissible and must be avoided by the operator (fill pump with flow medium prior to start-up).

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7.3 Environmental protection

During installation work with the pump not completely drained, flow medium can get onto the floor under the pump. The shaft seals can also show signs of wear after longer operating periods. If the seals are not replaced in the course of maintenance work performed on schedule, drip leaks are also possible. To prevent any possible consequential damage by the flow medium, appropriate measure should be provided for safety's sake, e.g. a catch pan etc. under the pump.

8 Dismantling

Depending on the flow medium, the liquid escaping can present a hazard to people and the environment. Therefore, the required measures must be carried out in accordance with the safety data sheets of the flow liquids. In addition, the recommendations given in 7.3 must also be observed.

9 Maintenance/Service

9.1 Gear pump

RICKMEIER gear pumps usually require little maintenance when operated within the permissible operating limits. If a gear pump becomes unusable as the result of wear, it must be replaced. The installation of replacement parts generally does not restore the original performance.
The service life of the shaft seals is mainly dependent on the manner of operation of the pump and the purity and quality of the flow medium. As a result, in many cases no reliable prediction as to the time of failure can be made. For pumps with shaft seals, it is therefore recommended that they be subjected to an external visual inspection for drip leaks at regular intervals (recommendation: after 48 hrs, then every 4,000 operating hours). If a high danger potential exists due to the flow medium, a check should be made at shorter intervals.
When using in a potentially explosive environment, the maintenance intervals of the related **ATEX operating instructions BA2-0NNN-113** apply.

9.2 Pump unit

The maintenance of pump units also requires compliance with the maintenance intervals and work of the clutch and the motor (see table 2).

Product	Type of clutch	Information to the maintenance
Unit without motor	Clutch Rotex/Bowex	Pump: see 9.1 Clutch: maintenance-free
	Other clutches	Pump: see 9.1 Clutch: see separate operating instructions
Unit with motor	Clutch Rotex/Bowex	Pump: see 9.1 Clutch: maintenance-free Motor: see separate operating instructions
	Other clutches	Pump: see 9.1 Clutch: see separate operating instructions Motor: see separate operating instructions

Table 2: Maintenance of pump units

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E-mail: kontakt@rickmeier.de · www.rickmeier.de

10 Conversion/Changes to gear pump

Conversion of or changes to the gear pump are only permitted after consulting with RICKMEIER. Genuine spare parts and accessories authorized by RICKMEIER help ensure safety. The use of other parts can result in the voiding of any liability for the resulting consequences. When ordering spare parts, please always specify the data provided on the rating plate.

11 Decommissioning

When decommissioning the pump, it must be ensured that no pressure greater than atmospheric pressure exists in the pump, and that the pump drive cannot start up accidentally. In addition, the recommendations in section 7.3 must also be observed. For environmental protection reasons, pumps/pump units may only be disposed of by licensed specialized companies.

12 Malfunctions/Causes/Troubleshooting Measures

The following tabular overview is to be regarded as instruction to the removal for eventual occuring troubles and their possible causes. If faults occur which are not named here, we recommend consulting RICKMEIER. If it is necessary to remove the pump for troubleshooting, the recommendations given in the sections 7.3, 8 and 11 must be observed.

Fault							
Pump does not draw in	Pump does not bleed	Insufficient feed quantity or exit pressure too low	Pump is loud during operation	Outlet pressure too high	Pump does not start up, stops abruptly of jams up	Pressure relief valve causes noises	**Measure**
→							Compare sense of rotation with identification arrow on pump; reverse motor polarity if necessary.
→					→		Check whether pump is filled with flow medium.
→		→	→				Connections may be leaky. Check suction pipe and shaft seal for leaks. In case pressure relief valve existing: condition of the sealing rings checks, renews if necessary
→	→	→	→				Pressure drop in suction pipe too great; if possible, increase line cross-section, shorten suction pipe or raise liquid level on intake side – if filter is installed: clean and enlarge if necessary.
		→	→			→	Does the set opening pressure match the order data sheet? If necessary, increase opening pressure by approx. 10 %.

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Fault							Measure
Pump does not draw in	Pump does not bleed	Insufficient feed quantity or exit pressure too low	Pump is loud during operation	Outlet pressure too high	Pump does not start up, stops abruptly of jams up	Pressure relief valve causes noises	
→		→					Check whether the pressure relief valve is soiled or damaged; does valve piston move smoothly?
→	→						Bleed pump pressure side.
		→					Check switching type, speed and current consumption of drive motor. Compare voltage and frequency with motor rating plate.
			→				In case of pressureless feeding of thin media, charge pump with 1-2 bar.
			→	→			Has maximum permissible speed according to order data sheet been exceeded?
		→	→				When feeding media with a high vapor pressure (gasoline, solvent, paints etc.), the medium is to flow to pump.
		→	→			→	Avoid gas bubbles in flow media (e.g. have return pipes end below oil level of tank).
					→		Is motor output at least in accordance with order data sheet?
					→		Check whether flow medium has lost lubricity due to excessively high temperature.
					→		Check whether relief hole from sealing chamber to suction chamber is clogged.
		→	→	→	→		Check whether viscosity of flow medium matches information on order data sheet.
		→					Too small a pump was chosen.
					→		Pump piping may not be tension-free. Remove pump and check piping.

Table 3: Troubleshooting

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Manufacturer's statement

in conformity with the EU Machinery Directive 98/37/EG, Annex IIB
English

HE3-NNNN-111
An-Zu 05
30.06.05

We hereby declare that the **gear pumps:**

- **D**
- **HH**
- **R2/..., R3/... (HDa, HDFa, HDFb, FMa,)**
- **R4/..., R9/...**
- **R4,0; R4,5; R6,0**
- **R25/..., R35/..., R45/..., R65/..., R95/...**
- **R31/..., R41/..., R61/..., R91/...**
- **R29/..., R49/..., R59/..., R69/..., R89/..., R99/..., R109/...**
- **R93C/...**
- **4HD**

of the type delivered are intended for installation into a machine and that their commissioning is prohibited until it has been verified that the machine into which these gear pumps shall be installed complies with the provisions laid down in the EU Machinery Directive 98/37/EG.

Harmonized standard applied

DIN EN 809

Balve, 30.06.05

K.-H. Rietdorf
Company Management

The safety instructions included in the product documentation must be observed.

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PUMPENTECHNOLOGIE
RICKMEIER
Zahnradpumpen ■ Ventile ■ Sonderprodukte ■ Systeme

Elektromaschinenbau
Antriebstechnik
R.Birkenbeul GmbH & Co.KG
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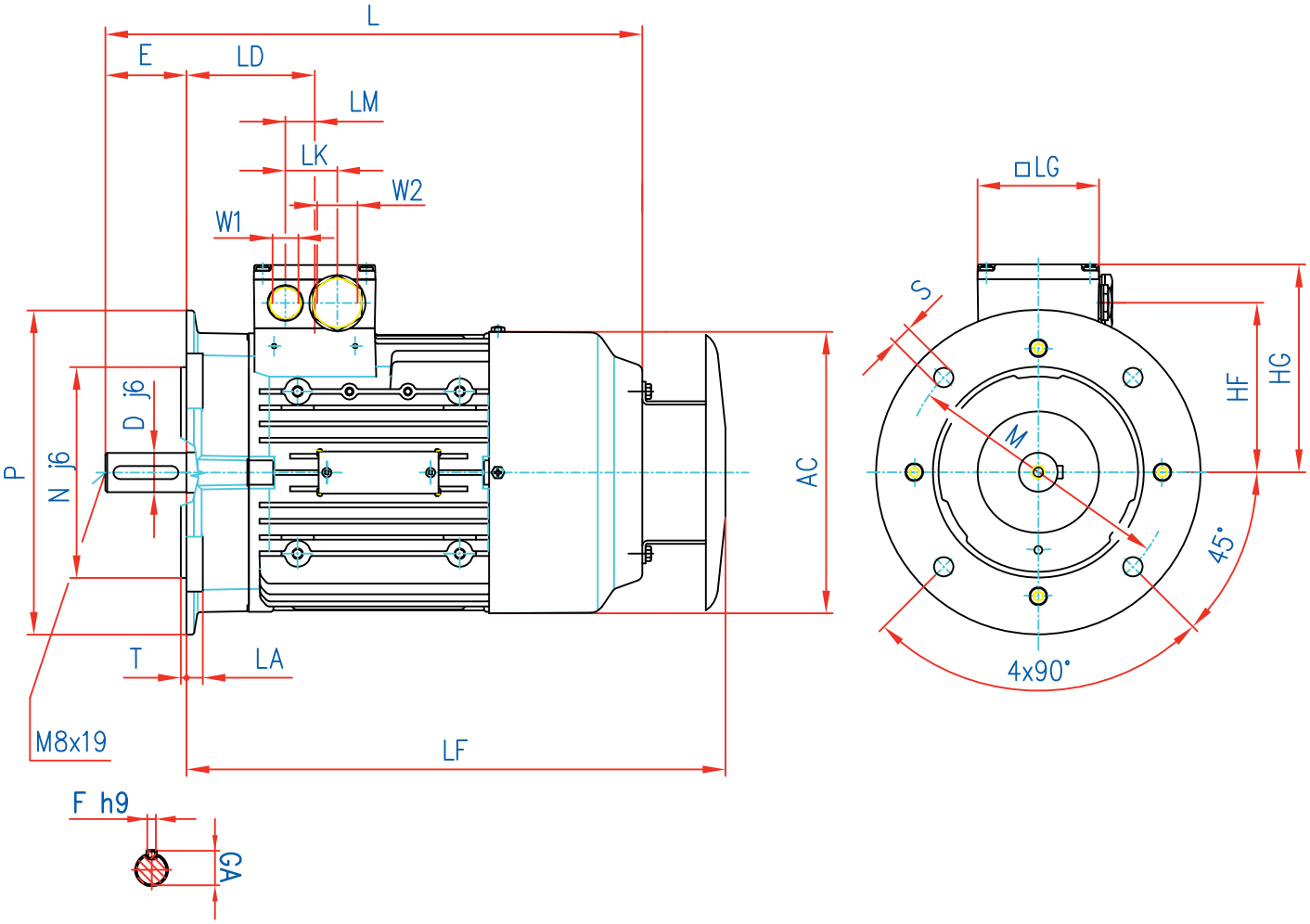
Tel.:02682/709-0
Fax:02682/709-10
E-mail:info@birkenbeul.de
http://www.birkenbeul.de



TYP	AC	HF	HG	L	LA	LD	LF	LG	LK	LM	M	N	P
5AP90 IMV1	180	105	128	331	10	79	333	75	32	18	165	130	200

TYP	S	T	W1	W2	D	E	F	GA
5AP90 IMV1	12	3.5	M16x1.5	M25x1.5	24	50	8	27

Elektromaschinenbau
Antriebstechnik
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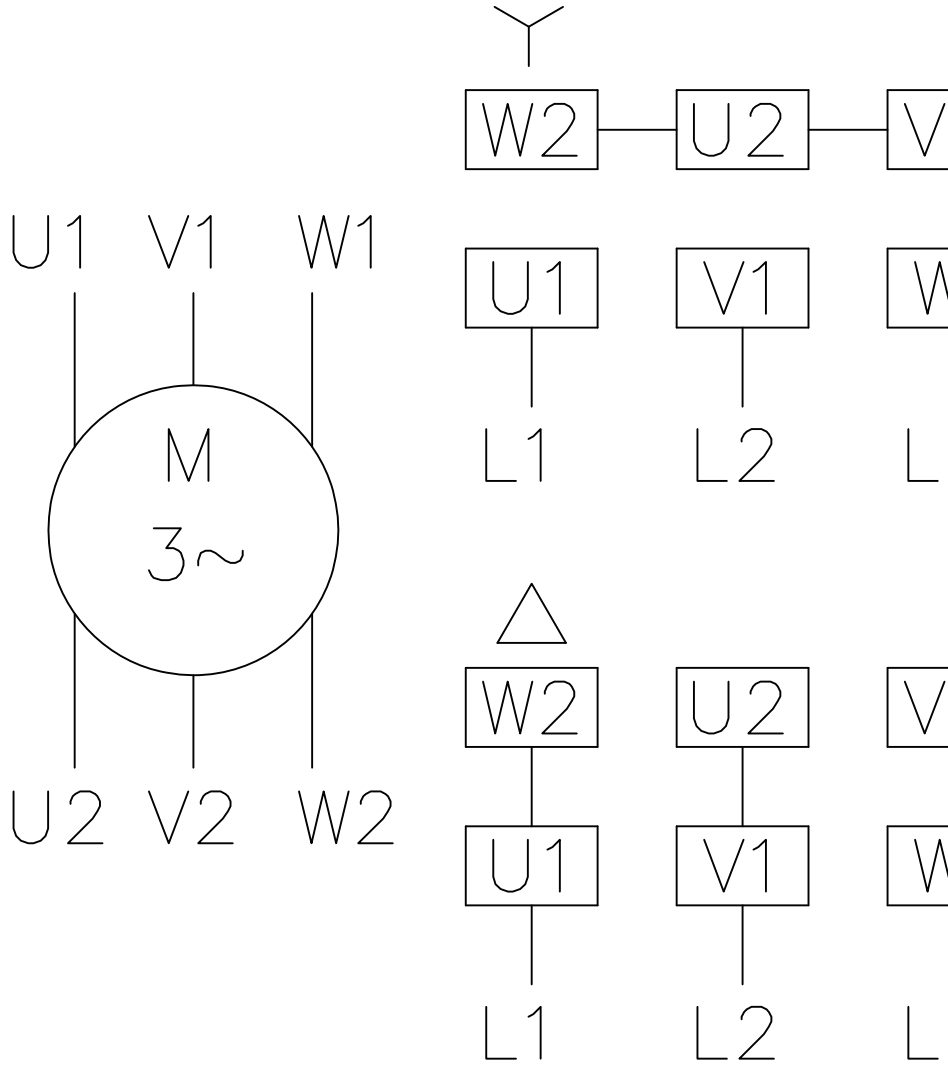
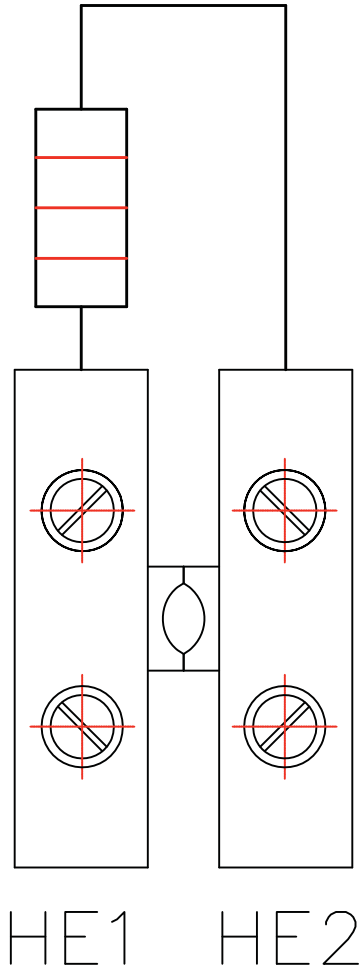
E-mail:info@birkenbeul.de
http://www.birkenbeul.de

Stillstandsheizung

25W 220-240V



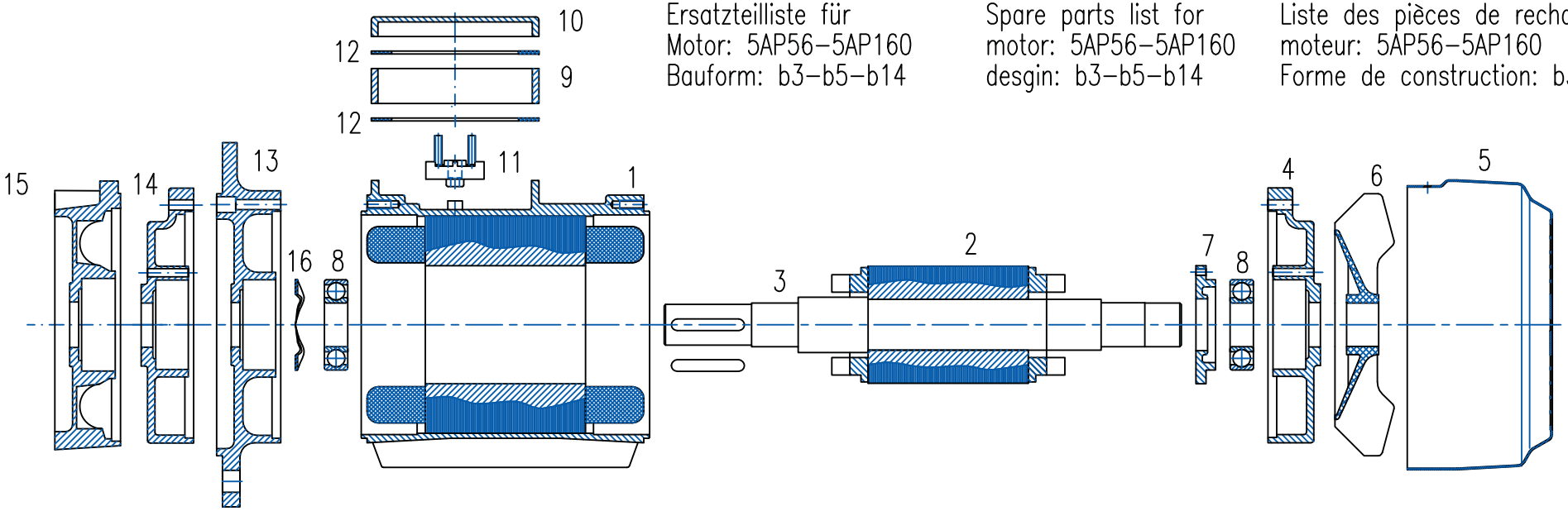


0312-B

Ersatzteilliste für
Motor: 5AP56–5AP160
Bauform: b3–b5–b14

Spare parts list for
motor: 5AP56–5AP160
desgin: b3–b5–b14

Liste des pièces de rechange pour
moteur: 5AP56–5AP160
Forme de construction: b3–b5–b14



Teil
parts
Pièce

1 — Statorgehäuse mit Wicklung
stator housing with winding
Caisse de stator avec bobinage

2–3 — Rotor mit Welle u. Paßfeder
rotor with shaft and adjusting spring
Rotor avec arbre et ressort d'ajusting

4 — Lagerschild B/Seite
bearing plate NDE
Flasque côté B

5 — Lüfterhaube
fan shell
Capot de ventilateur

6 — Ventilator
ventilator
Ventilateur

7 — Lagerdeckel
bearing cover
Chapeau de palier

Teil
parts
Pièce

8 — Kugellager
ball bearing
Roulement à billes

9 — Klemmenkasten
terminal box
Bôite des bornes

10 — Klemmenkasten Deckel
terminal box cover
Couvercle de la bôite des bornes

11 — Klemmenbrett
terminal panel
Planche à bornes

12 — Dichtungen
sealings
Joints

13 — Flanschlagerschild b5
flange bearing plate b5
Flasque–bride b5

Teil
parts
Pièce

14 — Lagerschild A/Seite
bearing plate DE
Flasque côté A

15 — Flanschlagerschild b14 nur von 5AP56 bis 5AP132
flange bearing plate b14 alone sizes from 5AP56 – 5AP132
Flasque–bride b14 seulement de 5AP56 jusqu'a 5AP132

16 — Kugellagerausgleichscheibe (1x)
ball bearing compensating
washer (1x)
disque de compensation de
roulement a billes (1x)

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BIRKENBEUL

ENGLISH

Information on safety and commissioning for low voltage asynchronous motors

(in accordance with L. V. directive 73/23/EEC)

Types: 5AP, 6AP,C,F,16BA,7BA,7AA

Shaft height: 56 to 315 mm

1 General information

Electric motors have dangerous voltage-carrying and rotating components as well as surfaces that may become hot. All work involved in the transport, connection, commissioning and regular maintenance must be carried out by **qualified, responsible specialists** (note VDE 0105; IEC 364). Improper behaviour may result in serious **injury** and **damage to property**. The applicable **national, local** and **works regulations** and **requirements** must be complied with.

2 Intended use

These motors are intended for commercial installations. They comply with the harmonized standards of the **EN60034 (VDE 0530)** series. Utilization in areas subject to **explosion hazard is not permitted**, unless **expressly intended** for this purpose (see additional notes). In certain special cases, for example, on use in non-commercial installations, if requirements are more strict (e.g. protection against contact with children's fingers), it is the responsibility of the customer to ensure compliance on installing the equipment.
The motors are rated for ambient temperatures of **-20°C to +40°C** and site altitudes **≤ 1000 m** above sea level. Any contradictory information on the rating plate **must** be observed. The conditions on site **must** correspond to all rating plate specifications.

> Low voltage motors are **components** for installation in machinery in terms of the Machine directive 89/392/EEC. **Commissioning** must not take place until it has been proved that the end product conforms with this guideline (please note EN 60204-1).

3 Transport and storage

Any **damage** detected after dispatch should be reported immediately to the transport company and **commissioning** must be postponed. Tighten the eyebolts. They are designed for the weight of the motor only therefore do not attach any additional loads. If necessary. use suitable, adequately dimensioned transporting equipment (e.g. rope guides).
Remove existing **shipping braces** before commissioning; and reuse for subsequent transport. If motors are stored, a **dry, dust-free** and **low vibration** ($v_{rms} \leq 0.2$ mm/s) environment is important (to avoid bearing standstill damage). On long-term storage, the regrease interval of the bearings is reduced.
Before commissioning. measure the impedance of the insulation. If values ≤1kΩ per volt of rated voltage are measured, the windings must be dried out.
When motors with roller bearings for increased cantilever force are operated the value of cantilever force must be minimal 30% of permissible cantilever force (see catalogue). Operating with smaller cantilever force is the cause of bearing faults.

4 Installation

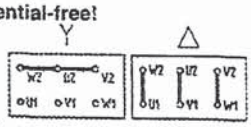
Ensure an even underlying surface, good foot or flange fixing and precise alignment for direct coupling. It is important to ensure that the mounting conditions do not cause resonance with the rotational frequency and the doubled supply frequency. Turn the rotor **by hand** and listen for any unusual grinding noises. **Check** the **direction of rotation** in the decoupled state (note section 5).
Only mount or remove drive components (belt pulley, coupling, etc.) using suitable tools (heat up), and cover to shield against contact. Avoid unpermissible belt tensions (see catalogue and technical data). The **balancing type** is specified on the shaft end face or rating plate (**H** = half- and **F** = full-key balancing). On mounting the drive, note the balancing type! In the case of half key balancing, the **protruding, visible part** of the half-featherkey must be removed.
A canopy is recommended for designs with the shaft end pointing downwards, and with the shaft end pointing upwards a cover must be **provided by the customer** to prevent foreign bodies from falling into the fan.

Do not obstruct ventilation! Discharged air, also from neighbouring equipment, must not be sucked in again immediately.
Checking of bearing grease must be carry out when motors are longer than 12 months storaged. When storage conditions are the cause of grease depreciation (presence of condensate, consistency change) the grease must be exchanged. Grease exchangr must be carry out no later than in three year interval.

5 Electrical connection

Work is only permitted to be carried out by **qualified specialists** on the **stationary motor**, while **disconnected** and **prevented from being switched on again**. This also applies for the auxiliary power circuits (e.g. Anti-condensation heaters).

Check that the equipment is potential-free!



If the **tolerance limits** are exceeded that are specified in **EN 60034, part 1 / IEC 34-1** (voltage ± 5%, frequency ± 2%, shape of curve, symmetry) the heating effect is increased and the electromagnetic compatibility is affected. Please note the specifications on the rating plate and the connection diagram in the terminal box.
Connections must be made in such a way as to ensure that a **permanently** safe electrical connection is maintained (no protruding wire ends); use the corresponding cable end pieces. Create a **safe earth continuity connection.**

Tightening torques for terminal board connections

Thread Ø	M4	M5	M6	M8	M10	M12	M16
Tightening torque [Nm]	0,8.. ..1,2	1,8.. ..2,5	2,7.. ..4	5,5.. ..8	9.. ..13	16.. ..20	36.. ..40

Clearences in air between bare live parts themselves and between bare live parts and earth must be ≥5,5 mm ($U_{rated} \leq 690$ V) .

It must be ensured that the terminal box does not contain **foreign** bodies, dirt or humidity. Seal any unused cable entry openings against **dust** and **water.**
Secure the **featherkey** on test operation without drive components. For motors with brakes, check that the brakes are operating perfectly before commissioning.

6 Operation

Vibration levels of $v_{rms} \leq 3.5$ mm/s ($P_N \leq 15$ kW) or $v_{rms} \leq 4.5$ mm/s ($P_N > 15$ kW) are quite acceptable in the coupled state.
If deviations from normal operation occur - e.g. **increased temperatures, noises, vibration** - the motor should be **switched off** in the event of doubt. Determine the causes and contact the manufacturer if necessary. Do not disconnect protective equipment, even under test operation.
Under dirty operating conditions, clean the air channels regularly. Open any closed **condensate water** holes from time to time!

For motors **without regreasing facilities**, bearing or grease replacement must be carried out in accordance with the manufacturer's instructions, or after 3 years, whichever is sooner.
Bearings **with regreasing facilities** must be regreased when the motor is running.
In the case of **motors with separate ventilation**, the separately-driven fan must be switched on throughout motor operation.

7 Further information

Information provided about any additional equipment must be noted!

These notes on safety and commissioning must be retained for future reference!

14.13 Misuratore numero di giri

14.13.1 Rilevatore

Numero Voith: 4 178979 0

Tipo: A5 S31 B90

Manuale operativo . . . . . Braun

14.13.2 Convertitore di misura

Numero di disegno Voith: 4 179305 0

Tipo: D124. 1S2 U2M)

(85-265 V AC/DC; 4-20 mA)

Descrizione. . . . . Braun

Cablaggio completo . . . . . "Morsettiera Foglio 1-15/91600389310"

BRAUN GMBH
INDUSTRIE-ELEKTRONIK

Postfach 11 06, D-71301 Waiblingen
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Tel. (0 71 51) 95 62 30
Fax (0 71 51) 95 62 50

Sensor Series A5S31B for speed and sense of rotation
Instructions

Application Characteristics

By non-contact sensing of a rotating (or linear moving) steel profile, the sensor provides a pulse train with its frequency proportional to the speed, and a dc-voltage signal indicating the sense of rotation.

Profile Requirements

Material must be (standard) steel. Non-ferrous material, stainless steel, or plastics does not work. Minimum size = module 2 (pitch No.12) of a gear wheel, or slot and pole width > 3mm each, with depth > 4mm.
This information refers to scanning in radial direction. Axial sensor positioning (i.e. parallel to the shaft) requires a profile of a much larger size, and a side shift or oscillation may cause problems.

How the profile is to look like

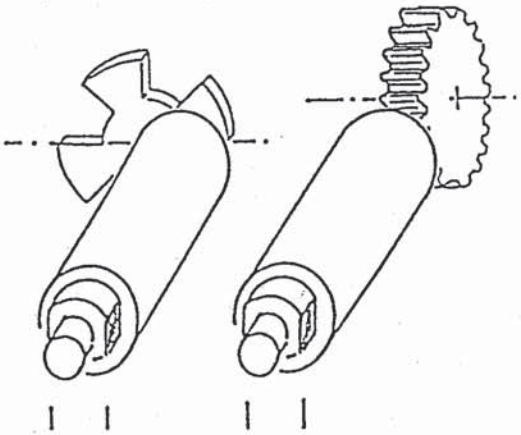
Positioning of the sensor

One positioning requirement refers to the profile edge, with the wrench planes at the sensor end serving as definition: they must be vertical in respect to the profile edge – see drawings in the margin. A deviation of max. ± 20 ° is acceptable. A 90 ° dislocation disables the function entirely. A turn by 180 ° reverses the direction output in its respect to the sense of rotation. See also instructions on next page.

A further requirement concerns the scanning gap between sensor and profile disk. The allowable gap depends on the profile size, according to the diagrams below. For the definitions of the size see General Instructions KA0-017E.

The sensor may be flush mounted within any material, and without distance to a neighbor sensor.

Adjustment to the profile edges



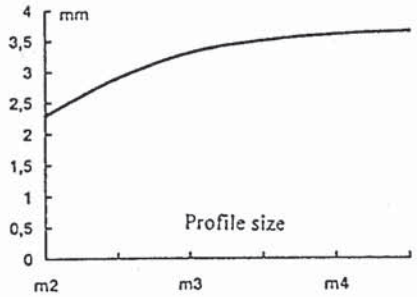
Wrench planes aiding to proper positioning

Mounting

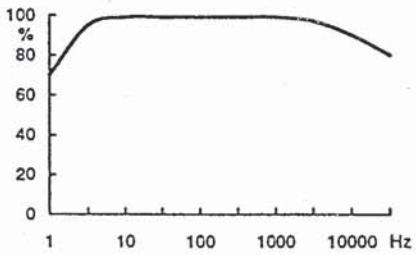
For a convenient mounting, a threaded bore M14x1,5 should be provided in the sensor support. Screw the sensor to the required position, and fix by the nut supplied with.

Allowable sensing gap

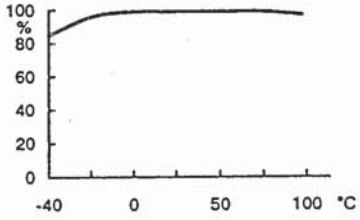
Gap width



derating of the allowable gap with the operating frequency



derating of the allowable gap with the ambient temperature



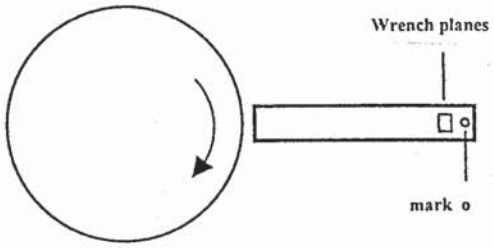
Direction Output

The sensor signalizes the direction by a DC-voltage. It switches between high and low with the sense of rotation, immediately after one pole has passed in reversed sense of rotation (definition of high and low see below). When the motion comes to stop, the existing signal will be maintained. A hysteresis between forward/reverse, or the conjunction to forward/reverse *run* must be achieved by a subsequent evaluation.

Positioning of the probe defines whether high or low level is assigned to clockwise or counter-clockwise motion. For a repeatable positioning, the probe carries a o mark on its type label. If this mark is visible on top, the probe output will be high, if the object turns clockwise; otherwise it is low.

Note: The Speed and Direction Monitor units CDE124.1S2 allow a further assignment between direction signal and the actual sense of rotation.

Relation between sensor position and sense of rotation



Output Level

The diagrams on the margin show the output voltage level versus the output load, valid for both direction and frequency output.

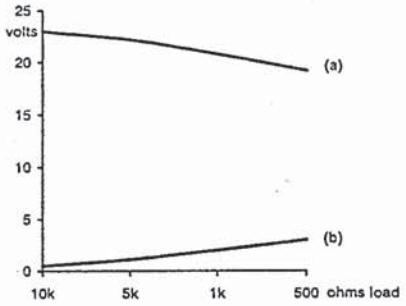
Diagram (a) indicates the high level of the output, if the load is inserted between output and common zero. The low level stays < 0.2 volts under this condition, with any load.

Diagram (b) indicates the low level of the output, if the load is inserted between output and + supply. Under this condition, the high level is always at supply voltage.

The evaluation module series CDE124.1S2 is recommended, when the direction signal is required as a relay contact, also in conjunction with a low speed limit to result in a signal switching at reverse *run* only.

The output power of the frequency signal allows its transmission up to 1000 meters, if adequately powered, as by the modules CDE124.1S2, or E15, or the C724 totalizers, available as panel meter, in snap-on-track enclosure or as 19-inch rack module. Observe the cable recommendations given below.

Sensor output under load at 24 volts supply



Connection

Straight (Bi4F/01) and angular (Bi4F/02) connectors are available, also cables in any required length, ready to plug-in. Pin connections are shown on the margin.

Wiring must use a shielded cable, leads with min 0.5mm² (AWG20), typ. 36 ohms/km, 150 pF/m. Do not run the cable in bundles with cables to any interference sources, specifically to motors, inverters, power switches, magnets.

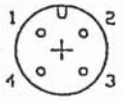
The cable screen shall not be connected to the sensor.

The circuit within the sensor is isolated from the sensor body.

The outputs are protected against short-circuiting.

Protection against supply polarity error is incorporated.

Pin No.	Function
1	+ supply
2	direction output
3	common zero
4	frequency output



view on soldering side of connector

Supply

DC 8....28 volts, approx. 20 ma plus load consumption. Transmission of high frequency signals over a wide distance may require more current in supply, up to 60 ma.

The supply source must not carry any interfering voltages.

Sensor supply

CE

The sensor complies with the requirements for the **CE** sign, as given by Standards EN50081/50082, provided that these instructions are carefully observed. For space reasons, the sensor is marked by its model No. but does not carry the CE-mark.

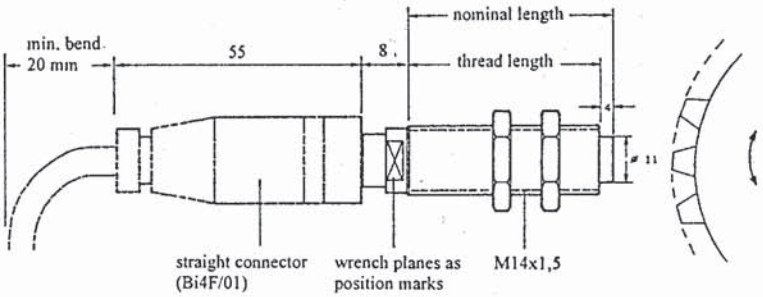
Dimensions (mm)
shown with straight connector

Allowable ambient temperature

- 40 °C ....+ 85 °C (sensor tip max. 125°C).

Protection grade

IP 67, with firmly tightened connector.



Subject to change without further notice

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Werksbescheinigung / Certificate of Compliance
DIN 50 049-2.1
Nr. / No. 99071503 Datum / Date 15.07.1999

zu Lieferschein / to Delivery Note:
Nr. / No: 602965
vom / of: 15.07.1999

Besteller / Purchaser:
Voith Turbo GmbH & Co. KG
74555 Crailsheim

Bestellung Nr. / Order No.:
0810503158

Datum / Date:
13.07.1999

Unsere Auftrags-Nr.
Our Order No: 57795

Unsere Abteilung: QS
Our Department:

Pos. Item	Anzahl und Einheit Quantity and Unit	Erzeugnis Product	Bemerkungen Remarks
1	7 Stück	Sonden **A5S31B94**	

tie oben genannten Teile wurden gemäß unseren Normen und den einschlägigen sonst geltenden Vorschriften geprüft. Die Teile haben diese Prüfung bestanden.
The items as listed above have been inspected according to our standard and the applicable public standards, and have been found satisfactory.

Es wird bestätigt, daß die Lieferung den Vereinbarungen bei der Bestellannahme entspricht.
We hereby certify, that the material described above complies with the terms of the order contract.

BRAUN GMBH
INDUSTRIE-ELEKTRONIK
D-71301 WAIBLINGEN-HEGNACH

(Firma)

(Unterschrift)

Anhang: Herstellererklärung mit Erläuterung des Prüfverfahrens

BRAUN GMBH
INDUSTRIE-ELEKTRONIK

Postfach 11 06, D-71301 Waiblingen
WN-Hegnach, Esslinger Straße 26
Tel. (0 71 51) 95 62 30
Fax (0 71 51) 95 62 50

CERTIFICATE OF COMPLIANCE
with CE - Standards

We, BRAUN GMBH Industrie-Elektronik, located at Waiblingen BRD, hereby declare that our product

Magnetic Field Probe
A5S31B

complies with all relevant regulations, as determined by the Policy of the European Committee for Electrotechnical Standardization (CENELEC), for the Electromagnetic Compatiblity (89/336/EWG). Testing and inspection has been performed according to Standards

DIN-EN 50081-2
DIN-EN 50082-2 with status November 1994.

Thus, this our product meets all requirements for the **CE** sign. Because of its small dimensions, it is marked with its model No. for identification, but does not carry this CE mark.

This certification applies to all products of the abovenamed series. Correct connection and wiring under strict observance of the operation instructions is an indispensable precondition, hereto.

BRAUN GMBH Industrie-Elektronik
Waiblingen

Signature:

Date: March 09, 1998

(Bruno Braun, Mgr.)

BRAUN GMBH
INDUSTRIE-ELEKTRONIK

Postfach 11 06, D-71301 Waiblingen
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Hersteller-Erklärung

Jedes unserer Erzeugnisse unterliegt vor seiner Auslieferung einer Stückprüfung.
Die **Prüfungen**, die an jedem einzelnen Stück vorzunehmen sind, sind im Gerätekennblatt aufgeführt. Die Prüfvorschrift benennt die vorzunehmenden Prüfschritte, dazu die einzusetzenden Prüfmittel, den Prüfvorgang, den Sollwert und die mögliche Toleranz für jeden Prüfschritt. Nur dann, wenn alle Prüfpunkte innerhalb der Toleranz erfüllt sind, ist die Stückprüfung bestanden.

Die **Prüfmittel** werden von der Zentralprüfung in unserem Hause überwacht. Dabei werden sie regelmäßig direkt mit Normalien verglichen oder zur bescheinigten Kalibrierung an geeignete Stellen außerhalb des Hauses gesandt. Für die regelmäßige Durchführung ist die Zentralprüfung verantwortlich, die hierüber Aufzeichnungen führt.
Der Frequenzstandard (mit der Zeit als Reziprokgröße) liegt im Hause selbst vor, durch Vergleich mit der von der PTB ausgestrahlten Normalfrequenz. Referenz-Meßgeräte für andere Meßgrößen werden ausserhalb des Hauses überprüft.

Damit ist die Rückführung aller Messungen auf die Standard-Maßeinheiten gegeben, die bei unseren Erzeugnissen relevant sind (elektrischer Strom/Spannung, Frequenz, Zeit).

Nach gleichem Verfahren werden ggf. **Kalibrierungen und Nachkalibrierungen** unserer Erzeugnisse bei uns durchgeführt, mit entsprechenden Einzel-Aufzeichnungen der Prüfergebnisse. Der danach ausgestellte Kalibrierschein dokumentiert damit die Rückführbarkeit auf nationale Normale, Normal-Messeinrichtungen und -Verfahren zur Darstellung der physikalischen Einheiten in Übereinstimmung mit dem Internationalen Einheitensystem (SI).

Quality Certificate

Design, production and inspection of all our products are permanently supervised by the Quality Management System, which we maintain, and which is certified according to ISO 9001.
Prior to its delivery, every product passes a specific quality inspection.

The tests to be performed in this inspection are listed in the product sheet of the specific product. The test procedure is defined therein by the inspection steps to be passed, the means of measurement to be applied, and the test results reuired with their tolerances. Not before all steps have been passed successfully, the product will be released to shipment.

All measuring instruments used for quality tests are monitored by the Quality Department of this company. They are compared to Approved Standards, or externally calibrated by authorized firms. Records are maintained for this calibration procedures.
Thus, all inspection measurements refer to the National and International Standards (SI), as relevant to our products (voltage, current, time, and frequency).

Later re-calibrations of our products are performed following the same procedures, with their results recorded. This is certified by the Certificate, as issued subsequently to a re-calibration, with reference to National and International Standards (SI).

BRAUN GMBH
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BRAUN INSTRUMENT
SPEED AND FREQUENCY

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Speed and Direction Monitor Series C124.1S2/D124.1S2/E124.1S2

with analog output and setpoint alarm

Instructions and Operation Manual

Contents page

Specifications

Design

series C... panel mount enclosure DIN 43700, front size 96 x 48 mm, enclosure depth length 125 mm. Panel cut-out 92x45 mm, flaps mounting for panel thickness 1.5 up to 10 mm.
weight ..... approx. 400 g
enclosure material .....plastics
terminals size ..... 2.5 mm^2

series D.... snap-on track enclosure for DIN 50022 rail 35 mm, Dimensions: length 100 mm, width 75 mm, height 111 mm.

series E... 19-inch module (3 HE x 8 TE).
Connector matching socket DIN 41612, series F, 32 poles b+z.

Installation Conditions

Ambient temperature in operation
Standard model: .....0°C...+50°C
Model with suffix M (extended range): ..... -20°C...+65°C
Ambient temperature in storage..... -40°C....+85°C

Electrical insulation grade I
Voltage grade..... I
Protection grade.....series C...IP40 for front side
series D...IP20 for terminals

Power Supply

Supply voltage	version U1:	.....18....40Vac/dc
	version U1M :	.....20....40Vac/dc
	version U2:	.....85..265Vac/dc
	version U2M :	.....85..265Vac/dc
Consumption		5 W resp. 5 VA

Signal input

matching speed/direction sensors series A5S3..
to other sources: response level on/off >7 volts/<4 volts
input impedance 100 kohms
sensor supply approx. 12 volts/max. 60 ma
speed measurement sequence 30 msec..10 sec (programmable)

Accuracy

± 0.005 % of measurement ± 1 in LSD

Analog output

isolated and programmable.....10volts/20ma
resolution ..... 12 bit
max. load ..... 500 ohms(with ma), 3 ma (with volts)
linearity error..... 0.1 %

Relay outputs

2, each SPDT
Breaking capacity voltage min 10 mv, max 250 v AC/DC
current min. 10 ua, max 2 amp AC, 1 amp DC
power rating max 100 W, 250 VA into ohmic load only.
Inductive load must be equipped with spark extinguisher

Display

5 digits LED red, with adjustable decimal point, programmable

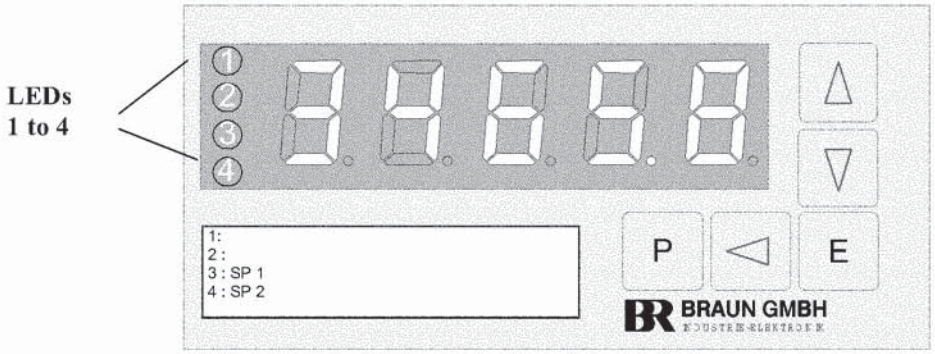
Data Interface

(optional only) RS 232 or RS 485

Application and Functions

In connection with the Speed/Direction Sensors series A5S3... the instrument provides:
Speed display, Direction signal output, Speed setpoint alarm output, Analog output proportional to the speed

Display and Operating Elements



Operating Instructions

Display

In normal operation the display reads the speed in programmed unit and decimals. LED 1 is permanently on, LED 2 is permanently off.
LED 3 indicates the excess of speed setpoint SP1(resp. reverse rotation)
LED 4 indicates reverse rotation sense of the object
In the programming phase the display indicates program step No., resp. the corresponding parameter.

Error signal:

-E1- : unauthorized access with incorrect code No.

Display readings in operation

Display Step-Down after Input Interrupt

In normal operation, the display closely tracks the input sequence, with the programmed performance. After a sudden interrupt of the input pulses, the instrument reduces the readings following an automatic step-down sequence. This starts as fast as the most recent measuring sequence before interrupt, but then decreases slower and slower (reciprocal) until it meets the programmed low end.

Display performance at input signal interrupt

Programming procedure

To enter the programming phase, press both E and P keys simultaneously.
Select program group or step No. by keys △ (for next), ▽ (for previous).
Switch between group and step select by key ◁.
Enter parameter by key E.
Select digit by key ◁.
Adjust figure by key △ (to increase), or ▽ (to decrease).
Acknowledge by key E.
Return to operation by key P.
Summary of parameters on next page, and detailed information in section "Programming".

Short form programming instructions

Summary of programming steps and their initial parameters as set on delivery

program-Step No.	comments on page	parameter function		data set on delivery *) (initial data)
P00 .00	6	access code request		0000
.01	6	new code figure		0000
.02	6	lock status (1= unlocked, 0=locked)		1 = unlocked
.03	6	minimum measuring time (see table)		3 = 0.4s
P01 .00	7	scaling	decimals of input signal frequency	0 = none
.01	7		value of nominal input frequency (Hz)	00100
.02	7		decimals of corresponding speed	0 = none
.03	7		corresponding speed (unit as desired)	00100
.04	7		low end of speed range	00001
P02 .00	8	LSDs on zero		0 = none
.01	8	Display updating sequence		0.3 (sec)
.02	8	Direction output assigned to no-power condition (0 = forw., 1 = rev.)		1 = reverse
.03	8	minimum no of reverse pulses to release reverse alarm		05
.04	8	time period for reset of reverse pulse counter (xxx seconds)		010 sec
.05	8	forced direction at zero speed (0 = no, 1 = forw, 2 = rev)		0 = no
.06	8	reverse alarm latched until resetted (0 = no, 1= yes)		0 = no
P03 .00	9	analog output	high end speed value	10000
.01	9		low end speed value	00000
.02	9		zero level (0 = dead zero, 1 = live zero)	0
.03	9		signal voltage (0), current (1) (do not fail to set DIP switch accordingly)	1 = current
P04 .00	9	setpoint (SP1) in unit as programmed for display		01000
.01	9	hysteresis bandwidth (XX % of SP1)		05 (%)
.02	9	hysteresis location (0=above, 1=below, 2=symm)		1 = below SP
.03	10	alarm output assigned to "no-power" (see table)		0 = < SP
.04	10	alarm output assigned to starter phase		0 = < SP
.05	10	time elapse of starter phase (XXX sec)		000 (sec)
.06	10	function of output SP1(0 = setpoint SP1, 1 = reverse alarm SP2		0 = setpoint
P05 .00	10	Data Interface	baud rate (see table)	0 = 9600
.01	10		"my name" in communication	001

Note: Program group P05...is irrelevant without the data interface option.

*) unless stated otherwise in extra sheet.

Installation

Safety Notes

This instrument has been designed and inspected according to standards DIN 57 411 / VDE 0411Sect 1, and IEC 348. Observe these instructions and wiring diagrams carefully, to ensure this protection. The installation must only be done by adequately qualified personnel.

General information and instructions to installation and wiring.

See last pages for specific wiring diagrams and dimension sheet.

General Instructions

Specifically, connect the ground terminal of the instrument to a safe ground potential.
Do not open the instrument. Connections and all programming are done from outside. When removing it from its enclosure however, from whatever reason, make sure that power is switched off.
The instrument may be installed in any position, but not in the immediate neighborhood of interfering sources.

Signal leads must be carefully shielded, and should not be run in bundles with power or relay control leads.

The ground terminal (PE) is internally separated from common zero, but tied by a 100 k resistor to it.

EMI

The unit complies with all relevant regulations, as determined by the Policy of the European Committee for Electrotechnical Standardization (CENELEC), for the Electromagnetic Compatibility (89/336/EWG). Testing and inspection has been performed according to Standards DIN-EN 50081-2 and DIN-EN 50082-2 with status November 1994. Thereby, the product meets all requirements to be marked by the CE sign.
Strict observance of these instruction during installation and use is an indispensable precondition hereto. Specifically to be observed:
Terminals must be kept off all undue access;
power supply and all input and output leads must be protected against voltage interference, higher than specified operation data, and they must be protected against electrostatic discharge.

Label pocket

Labelling facility

A pocket behind the transparent section of the front foil accepts a label to indicate ,for instance, the measured quantity and its unit, tag No and such. To insert a new label, remove the front frame. Remove the screws at the rear of the meter, and push the insert somewhat to the front. Insert the new label through the pocket opening at the low edge of the front. Return meter insert into original position, fasten rear screws and front frame.
Size of label sheet: max. 48,5 x 15 mm.
Visible section of label : 47 x 11.2 mm with upper end 0,5 mm below label rim.

Programming

Program Structure

A program step No. is assigned to each parameter.
The entire steps are divided into program groups, to facilitate the addressing. Therefore, the address appears as PXX.xx , where XX is the group No., and xx the No. of the specific step in this group.

Program steps grouping

PXX.xx
group step

Programming Procedure

To enter the programming phase, keep key [P] depressed when touching key [E]. The display switches to P00.00, indicating the first program step. The group No. blinks, indicating that it may be increased or decreased, using [△] or [▽] .
Once in the desired group, touch [◁] , to switch to step No selection. Increase or decrease the same way. Return to group selection by [◁] again. When in the desired step, touch [E]. The display now reads the actual parameter of this step. It may be varied, if data access is authorized, or access key unlocked. Programming a new parameter is done digit by digit. The digit ready to receive a new number blinks in display. Select a higher value by key [△] , or a lower one by key [▽] . Move to the next digit at left (if necessary) by key [◁] , and proceed accordingly. With the entire parameter ready prepared, touch [E] again. Not before then it will become valid.
[P] touched instead leaves the parameter at its previous value.
Leave the programming phase by again touching [P]. The display returns to process readings.

programming procedure

Programmable Parameters

Group P00.xx
Data Access and Minimum Measuring Period

Key figure to access

Programming access to all parameters can be locked by a password number. If not properly served, the parameters may be called to display but not varied. If not properly served, the display reads -E1-,and any programming in a later program step will be rejected.

Step P00.00
Code figure to access

Note:
If the knowledge of the password number went lost it may be recalled to display by a procedure, as described in a separate sheet K0-095 (not included into these instructions). The code figure than appears by 4 digits, headed by a _ sign.
In a subsequent program step, a new code may be established, substituting the one previously valid.

Step P00.01
new code figure

The key function may be disengaged by a next program step. With authorized access, set parameter to 1 in step No .02, to generally unlock the key. This may prove practical during the installation phase to facilitate the adjustments. Once installed, the key function should be reactivated, by programming parameter 0 in this step.

Step P00.02
unlock access key

Minimum Measuring Period

Step P00.03
minimum measuring time

All rate measurements are based on a time interval measurement over a (variable) number of input signal pulses. A programmable minimum measuring period thus will be maintained, automatically including more input pulses into every measurement with increasing input frequency. This establishes an averaging over the programmed period of time, which helps to stabilize the measurements, specifically with fluctuating variables. As a standard, a minimum time of 0.4 sec is recommended. A shorter period should only be selected to trace a fast variation (by the analog signal or alarm). A longer period however reduces the maximum allowable input frequency, as listed below.
The parameter of P00.03 defines the minimum measuring period:of time, with a number of steps available:

parameter	minimum time	max input frequency
0 =	0.03 s	100 kHz
1 =	0.07 s	100 kHz
2 =	0.1 s	100 kHz
3 =	0.4 s	100 kHz
4 =	0.8 s	75 kHz
5 =	2.0 s	30 kHz
6 =	5.0 s	12 kHz
7 =	10.0 s	6 kHz

Note:
The updating sequence for the display will be defined in a separate program step (P02.01).

Group P01.xx
Measurement Configuration

Input Scaling

Step P01.00
decimals for input frequency

Step P01.01
signal frequency at reference

Step P01.02
decimals for display

Step P01.03
speed value at reference

Scaling defines the relation between the input signal frequency (in terms of Hz), and the corresponding display (in the unit term and decimal position as required by the application). Both values are free programmable by their decimals and numerical amount. Of course, they must refer to the same operation level. This reference point is recommended at the high end of the intended operation range, but can be surpassed in the later operation without error.
Example:
A signal frequency of 13250 Hz corresponds to a speed of 5000 RPM.

Program as follows:	in step P01.00	parameter 0
	in step P01.01	parameter 13250
	in step P01.02	parameter 0
	in step P01.03	parameter 5000

General Note to the resolution:
Do not use too many decimals! If there are more decimals than justified by the operational fluctuation of the variable, and the transmitter resolution, the minor digits in display will fluctuate accordingly.
Note:
The parameters as set on delivery, apply to 60 pulses per revolution.

Low end level

The parameter of this step defines the low end of active measurement, by the same terms as selected for the speed display in the previous steps P01.02 and .03.

When the speed is below this level – and this is the most important function of this step – the direction output can be forced into a preselected sense, either forward or reverse or not changed (defined by step P02.03). The direction sensor by nature detects the sense of rotation and maintains its last state when the motion comes to stop (which might be an arbitrary condition). This function step however allows to assign, for instance, a forward signal to zero speed, thereby giving the "reverse" output a true *reverse run* meaning.

When the speed is below this level, the measurement will be set to zero, in display, analog output, and alarm condition.,

Step P01.04
Low end definiton

Group P02.xx
Display Performance and Direction Signal

Zeroing lesser significant digits

To eliminate a fluctuation in the last digit(s), as caused by fluctuations in the variable or signal source, these digits can be kept at zero reading. Set the number of those as the parameter of this step.

Note: If the paramter is set to 5, the display of the speed value will be totally blanked.

Step P02.00
number of LSDs to be kept at zero

Display updating sequence

Independent from the measuring period as programmed in step P00.03, the display may have its own up-dating, programmable in steps of 0.1 seconds, up to 9.9 sec. Set the parameter to the desired time sequence.

A recommended value is 0.3 sec.

Step P02.01
display up-date sequence

Direction Output assigned to "No-Power" condition

The wiring diagram shows the direction output relay in its deenergized position. To consider safety or other aspects of the application, this position may either be assigned to "forward" or to "reverse" signal by:

Parameter 0 = forward, parameter 1 = reverse

Step P02.02
"no power" direction output

Minimum number of reverse pulses to release reverse alarm

Reverse alarm is released, if during a given time period (refer to P02.04) a subsequent number reverse pulses have been counted. The amount of pulses is adjustable from 01 to 99 pulses.

Step P02.03
minimum number of reverse pulses

Time period for reset of reverse pulse counter

A slow reverse motion could trigger an inadvertent reverse alarm. To prevent this, the reverse pulse counter is periodically resetted after an adjustable time period (001 to 999 seconds).

Step P02.04
time period for reset of reverse pulse counter

Direction signal at low speed

When the speed is below the threshold set by program step P01.04, the direction output can be set to a signal position determined by the parameter: 0 = no change, 1 = forward, 2 = reverse.

Note: Settings 1 or 2 override the direction signal prevailing in the sensor output under this condition.

Step P02.05
direction signal at "low speed"

Reverse alarm latched/not latched

A reverse alarm can be latched. It must be then resetted by control input S2. Parameter 0 = alarm not latched, 1 = alarm is latched.

Step P02.06
reverse alarm latched/not latched

Program Group P03.xx
Analog output

High and low end of analog output span

High and low end of the analog output will be assigned to speed values by two program steps:
P03.00 defines the high end, P03.01 defines the low end of the analog output. Both limits are set by the same terms as already defined for the display.
Note:
This allows the low end to be set as high as 90 % of the high end, resulting in a 10 times spreading (enhancement) of the converted band. Further enhancement is not recommended.

Step P03.00
high end of analog output

Step P03.01
Low end of analog output

Analog output zero level

The parameter of step P03.02 defines:
0: without live zero
1: with live zero
This selection determines both ma or voltage output.

Step P03.02
analog output zero level

Output Signal Mode

The output is available as either dc-current (max. value = 20 ma) or voltage (max value = 10 volts). The selection requires a corresponding parameter in this program step, and also the positioning of the DIP-switches as shown in the wiring diagram.
Parameter 0 = voltage output
parameter 1 = ma-output
The DIP switches are accessible as shown in the diagrams.

Step P03.02
output mode

Program Range P04.xx
Defining the Speed Setpoint Alarm SP1

Alarm Setpoint

The setpoint SP1 is programmed by the same terms as selected for the display of the speed.

Step P04.00
setpoint SP1

Alarm Hysteresis

The hysteresis is the margin between condition "excess" (>) and "no excess" (<), defined by its bandwidth and its position in reference to the setpoint. The hysteresis bandwidth is set as a percentage of the setpoint.
The hysteresis band may be placed above setpoint, below setpoint, or symmetrically around the setpoint.
"Above" means, the alarm goes to excess state (>) when the speed exceeds the setpoint plus tolerance bandwidth, and it returns to no-excess (<), when the variable drops below setpoint.
Set parameter 0 for this performance.
"Below" means, the alarm goes to excess (>) when the variable exceeds the setpoint, and it cancels to no-excess (<), when the variable drops below setpoint minus tolerance.
Set parameter to 1 for this performance.
In "symmetrical" mode, the alarm goes to > when the variable exceeds the setpoint by half the tolerance band, and it cancels to < at half the tolerance below setpoint.
Set parameter to 2 for this performance.

Step P04.01
Alarm hysteresis bandwidth

Step P04.02
Alarm hysteresis position

0 = above setpoint
1 = below setpoint
2 = around setpoint

No-Power condition of the setpoint alarm

Step P04.03:
Alarm output at "no-power"

Without power supply to the unit, the alarm relay is de-energized. To consider safety aspects of the application, this No-Power condition can be assigned to either alarm > or < condition, by a corresponding parameter selection in this step:
0 = < setpoint
1 = > setpoint

Starter condition of alarms

Step P04.04
Alarm output during starter phase

A control signal to the Starter input (see diagram) throws the alarm output to a programmable condition for an adjustable period of time. This may be required for the starting period of a machine, specifically if monitored for low speed alarm.
Parameter 0 sets output to > setpoint during starter phase,
parameter 1 sets output to < setpoint during starter phase,

Starter time elapse

Step P04.05
starter time period

The starter time elapse is adjusted in program step P04.05 with range 000...999 sec.

Relay output SP1 assigned to setpoint SP1 or to reverse alarm SP2

Step P04.06
assignment of relay output SP2

The relay SP1 can be assigned either to the setpoint SP1 or to the reverse alarm SP2. If assigned to SP2, relay SP1 has identical function as relay SP2.
Assignment is adjusted in step P04.06:
Parameter 0 = relay SP1 assigned to setpoint SP1
Parameter 1 = relay SP1 assigned to reverse alarm SP2

Program Range P05

Defining Data Interface Parameters (option)

data interface definitions

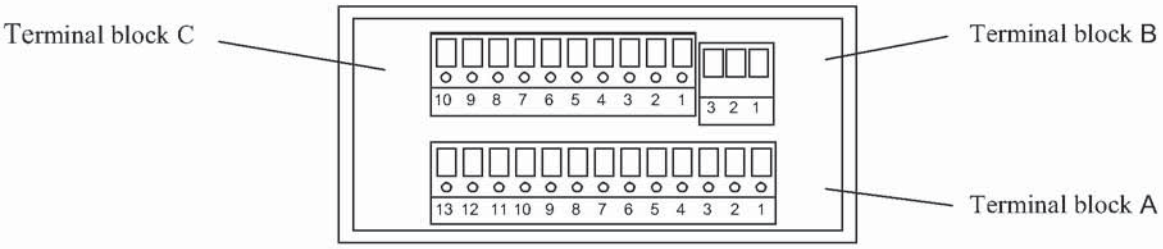
For the operation of the serial data interface (RS 485 or RS 232) these parameters are adjustable:
by program step P05.00: baud-rate.
by program step P05.01: "my device" No (address).
Further details see special instructions.

Initial parameters

initial parameters

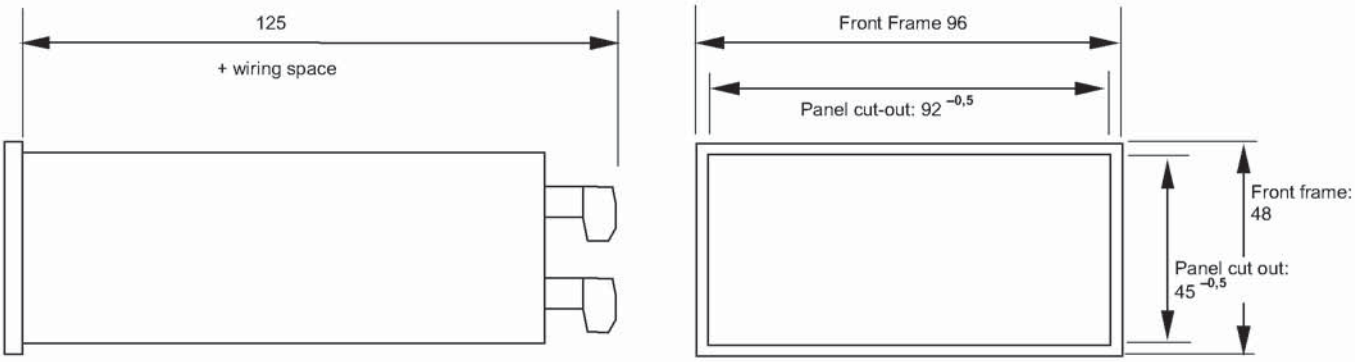
The unit comes programmed to initial parameters, as listed on page 4. In course of the installation however, the specific adjustment to the application conditions is indispensable.

Location of Terminals



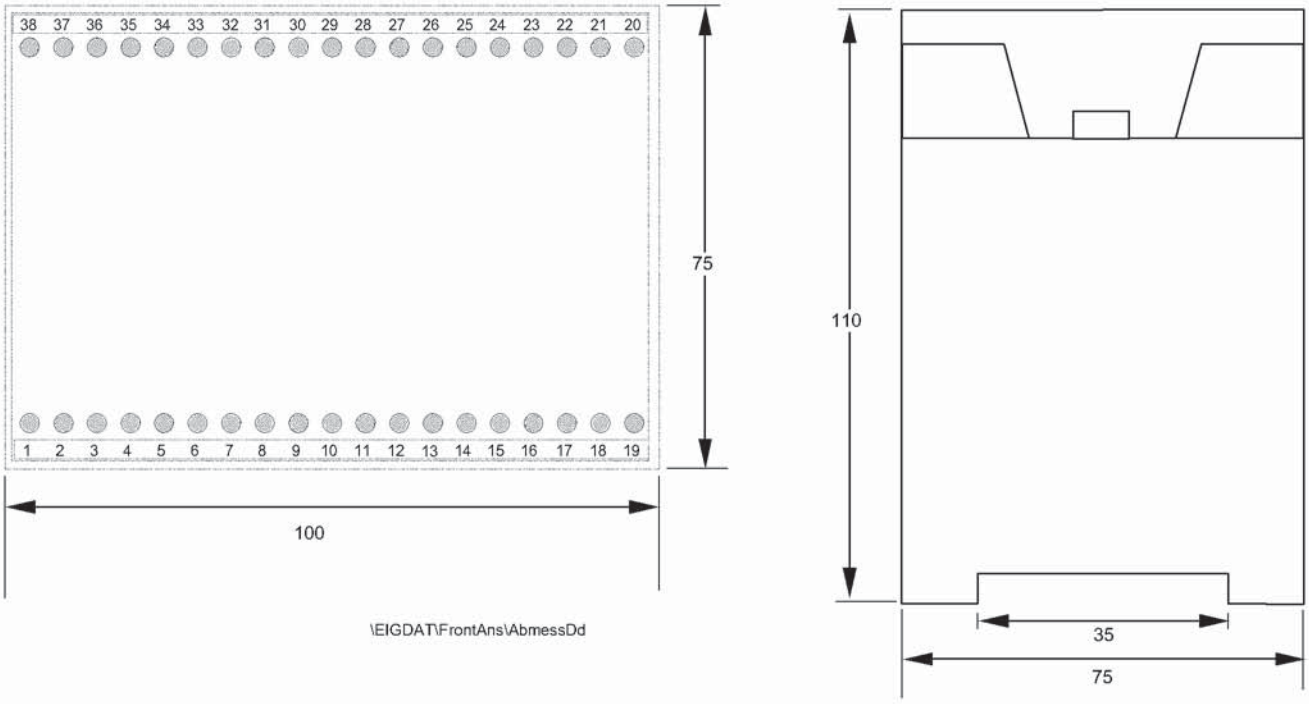
[Eigdat\FrontAns\RC124d]

Dimensions C124.1S2 (mm)



\EIGDAT\FrontAns\AbmessCd

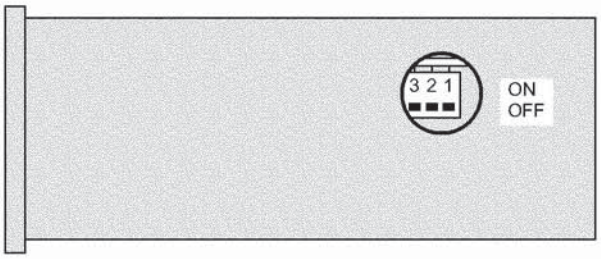
Dimensions D124.1S2 (mm)

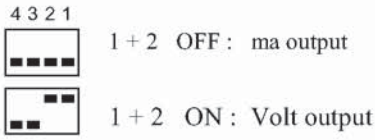


\EIGDAT\FrontAns\AbmessDd

Selection of the analog output mode

Adjustment of "C.." series





In Programming set parameter for the output mode accordingly

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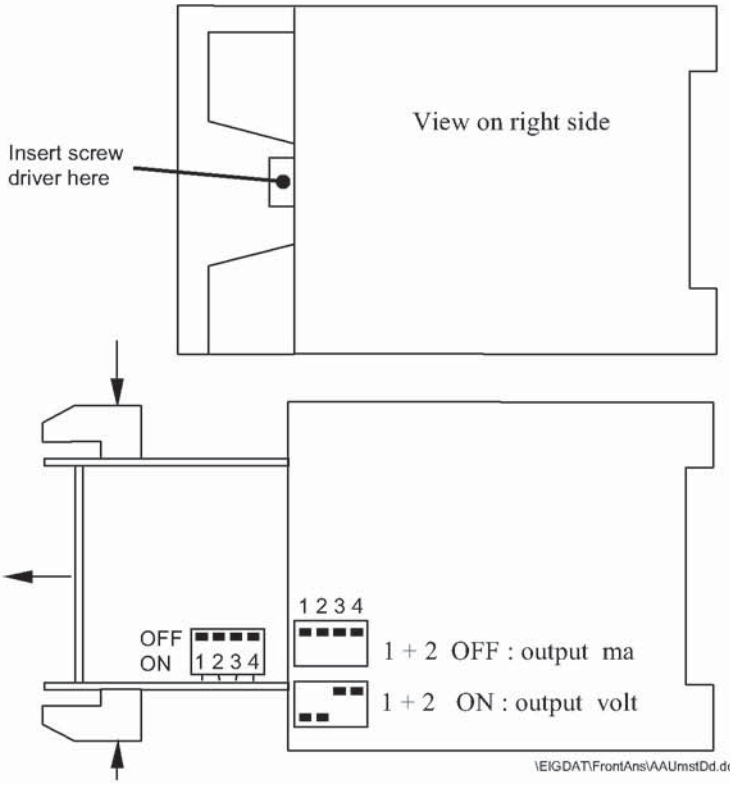
Adjustment of "D..." series

1. Prior to opening switch off power supply.
   Insert screwdriver blade at right side of cabinet, turn, and remove cover
2. Grip terminal blocks to pull unit out of enclosure for 3 cm, until DIP switches get accessible
3. SetDIP-switches to requested mode.
4. Re-assemble unit into enclosure.
5. Set parameter accordingly



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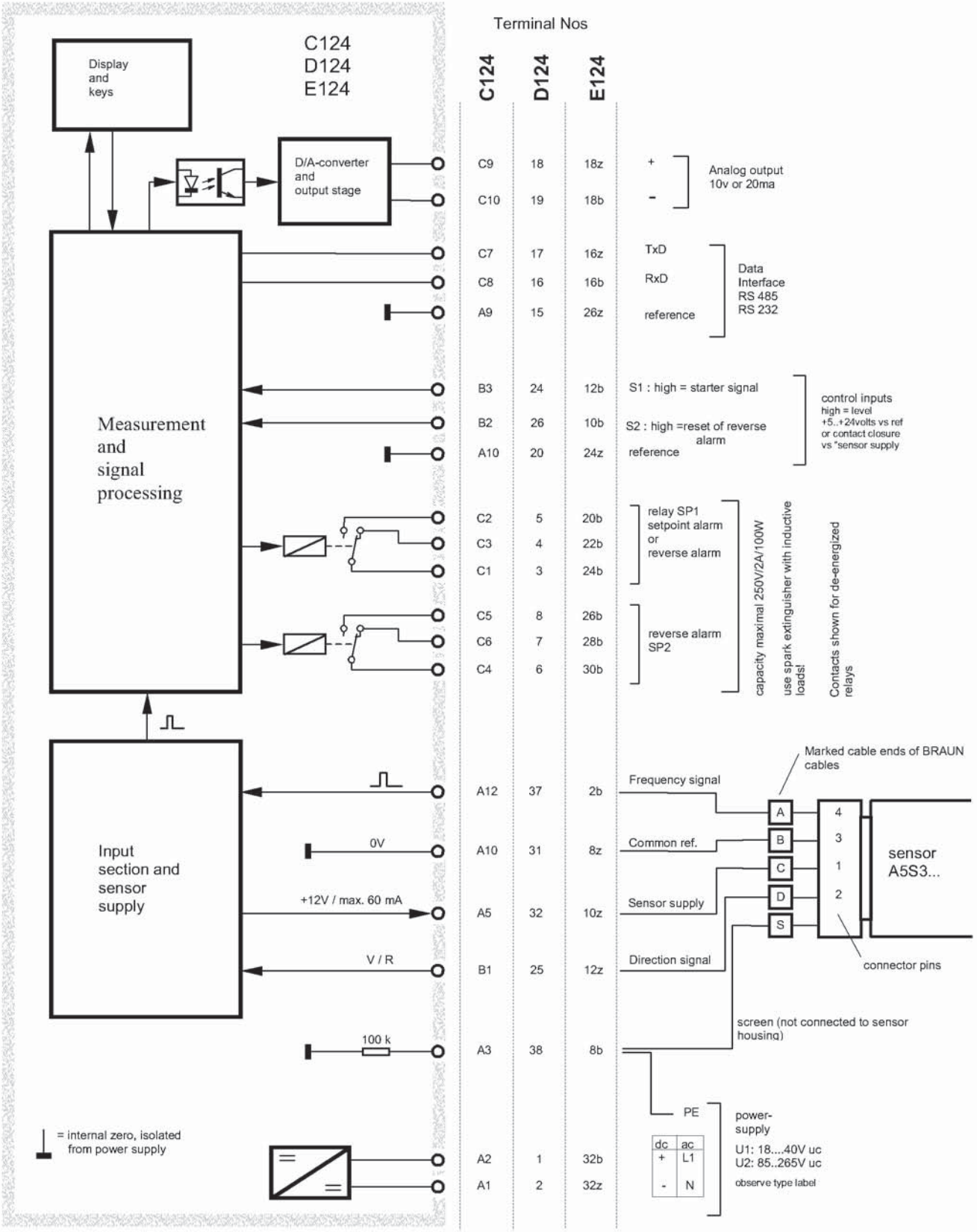
Function diagram and terminal nos.



Revision notes

11.2001
Changes versus edition of 4.1999
Opterating temperature range for version M extended to –20°C to +65°C.
Supply voltage for version U1M: 20...40Vac/dc

14.14 Trasmettitore di livello

Voith Sachnummer: 4 191840 015

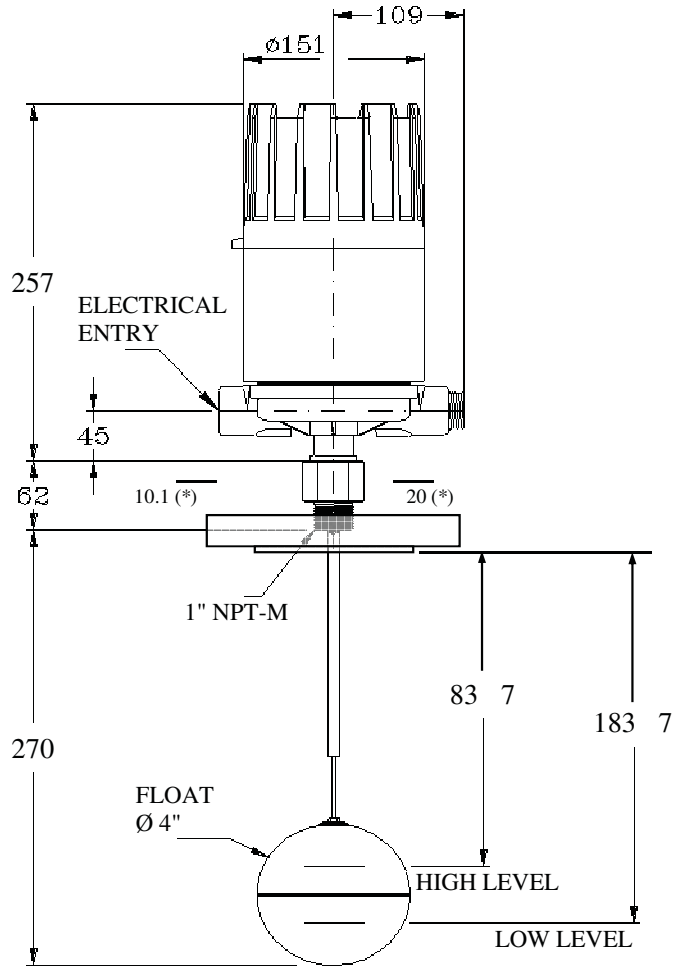
Tipo: XT 20 (2xSPDT)

Descrizione. . . . . .Magnetrol

DIMENSIONAL DRAWING - MECHANICAL LEVEL SWITCH

All dimensions are in mm unless otherwise specified - General tolerance ± 5 mm except as noted
Allow 200 mm overhead clearance for cover removal

CUSTOMER	: VOITH TURBO GMBH & CO.KG		
CUST. REF.	: 1000/4500599039/210 (Pos.0020/1)	**OUR REF.**	: DSM 8273B
ITEM	: 1	**QUANTITY**	: 2
MODEL	: XT20-AB2B-BBA		
TAG N°.	: 4191840015		



LOWEST POINT OF FLOAT IN FREE HANG POSITION

SWITCH/HOUSING INFORMATION

CERTIFICATION:	NEMA 4X
INGRESS PROTECTION:	IP 66
ELECTRICAL ENTRY:	3/4" NPT-F
SWITCH CONTACTS:	2 off SPDT MICRO SWITCH
CONTACT RATING:	240 VAC / 15 A ; 240 VDC / 0.25 A

BODY INFORMATION

PROCESS CONNECTION:	1" NPT-M

OPERATING INFORMATION

PRESSURE/TEMPERATURE RATING:	41,3 BAR @ 40 °C
MAXIMUM TEMPERATURE:	120 °C
MINIMUM S.G.:	0.79
ACTUATING LEVELS @ S.G.:	0.84

REMARKS

UNITS DELIVERED WITHOUT FLANGE

(*): DIMENSIONS GIVEN BY VOITH

0	04/05/2009	WARD VOET
REV.	**DATE**	**CERTIFIED BY**
DOC. REF.:	D83838-01-BE	

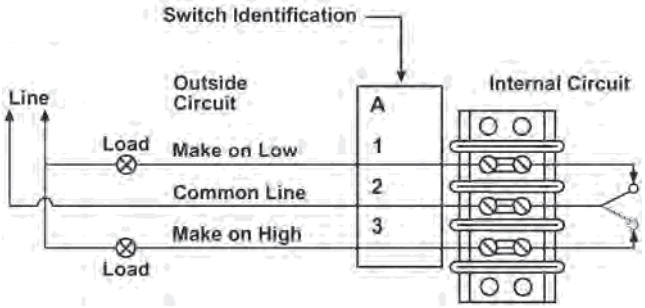
Magnetrol®

WIRING DIAGRAM

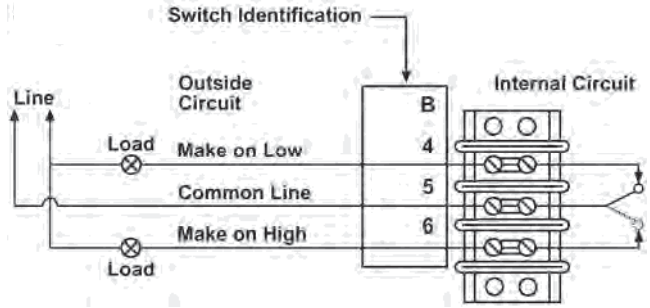
2 x SPDT
ELECTRICAL SWITCH

CUSTOMER : VOITH TURBO GMBH & CO.KG
CUST. REF. : 1000/4500599039/210 (Pos.0020/1) **OUR REF.** : DSM 8273B

UPPER SW. MECH.



LOWER SW. MECH.



NOTE:
DO NOT REMOVE THE INTERNAL CONNECTIONS

ITEM	MODEL	QTY	TAG NOS.
1	XT20-AB2B-BBA	2	4191840015

SWITCH TYPE:
2 off SPDT MICRO SWITCH

SWITCH RATING:
15 A @ 240 VAC
0.25 A @ 240 VDC

FUNCTION:

RISING LEVEL (CLOSES CONTACTS):

❑ 1 & 2	■ 2 & 3	❑ 4 & 5	■ 5 & 6

FALLING LEVEL (CLOSES CONTACTS):

■ 1 & 2	❑ 2 & 3	■ 4 & 5	❑ 5 & 6

UPPER LEVEL RANGE OPERATES: UPPER SWITCH MECHANISM
LOWER LEVEL RANGE OPERATES: LOWER SWITCH MECHANISM

0	04/05/5009	WARD VOET
REV.	**DATE**	**CERTIFIED BY**
DOC. REF.:	W83838-01BE	

Magnetrol®

T20 & T21

Top mounting Liquid level switches

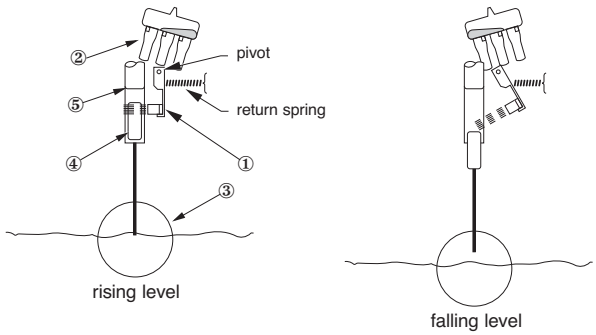
INSTRUCTION MANUAL AND REPLACEMENT PARTS

DESCRIPTION

T20 and T21 units are simple, reliable float switches designed for top mounting to tanks or vessels. T20 units utilize a single switch mechanism and float. T21 tandem units utilize two switch mechanisms and two separate floats when widely spaced actuating levels are required. T20 and T21 tandem models are available for any type of open or closed vessel with either threaded or flanged type mounting and actuating depths up to 1219 mm (48 inches)

OPERATING PRINCIPLE

A permanent magnet ① is attached to a pivoted switch actuator ②. As the float/ displacer ③ rises following the liquid level, it raises the attraction sleeve ④ into the field of the magnet, which then snaps against the non-magnetic enclosing tube ⑤, actuating the switch. The enclosing tube provides a static pressure boundary between the switch mechanism and the process. On a falling level, an inconel spring retracts the magnet, deactivating the switch.



UNPACKING

Unpack the instrument carefully. Inspect all units for damage. Report any concealed damage to carrier within 24 hours. Check the contents of the packing slip and purchase order. Check and record the serial number for future reference when ordering parts.

AGENCY APPROVALS

Agency	*Approval*
ATEX	II 2G EEx d II C T6, explosion proof II 1G EEx ia II C T6, intrinsically safe
CENELEC	EEx d II C T6, explosion proof
CCE ①	R1 (1) 136/MI/433, explosion proof
FM	Class I, Div. 1, Groups C & D Class II, Div. 1, Groups E, F & G, Type NEMA 7/9
FM/CSA ②	Non-Hazardous area
	Explosion proof area – Groups B, C, D, E, F & G Type NEMA 4X/7/9
SAA ②	Explosion proof area
LRS	Lloyds Register of Shipment (marine applications)
GOST/ GOSGORTECHNADZOR ②	Russian Authorisation Standards
Other approvals are available, consult factory for more details	

① For CCE approved units, use the ATEX explosion proof model numbers.
② Consult factory for proper model numbers.

MODEL IDENTIFICATION

A complete measuring system consists of:

1. Code for **top mounted** models (each unit can be factory calibrated when specific level differentials are specified separately – specify actuating level(s) for either rising or falling level and operating S.G.)
2. Code for **modified** models or adders: put an "X" in front of the closest matching order code and specify the modifications/ adders separately
   eg. XT20-AB2A-AAP X = with material certification EN 10204 / DIN 50049-3.1.B

1. Code for top mounting liquid float level switches

BASIC MODEL NUMBER

T 2 0	single float	- top mounted liquid float level switch
T 2 1	tandem float	- top mounted liquid float level switch

MATERIALS OF CONSTRUCTION

Code	*Cage & process connection material*	*Float and trim*	*Magnetic sleeve*
A	Carbon steel	316 SST (1.4401)	400 series SST
B			316 SST (1.4401)
D	316/316L (1.4401/1.4404)		

PROCESS CONNECTION

	Float sizes					
	ø 76 x 127 mm (3" x 5")		ø 102 mm (4")		ø 114 mm (4 1/2")	
	Threaded NPT connection - for T20 models only					
1"	B2A		B2B		B2C	
	ANSI Flanges - for all models					
	150 lbs RF	300 lbs RF	150 lbs RF	300 lbs RF	150 lbs RF	300 lbs RF
4"	H3A	H4A	-	-	-	-
5"	J3A	-	J3B	-	J3C	-
6"	K3A	K4A	K3B	K4B	K3C	K4C
	DIN flanges form to DIN 2526 - for all models					
	PN 16 Form C	PN 25/40 Form C	PN 16 Form C	PN 25/40 Form C	PN 16 Form C	PN 25/40 Form C
DN 100	8FA	8GA	-	-	-	-
DN 150	9FA	9GA	9FB	9GB	9FC	9GC

SWITCH MECHANISM & ENCLOSURE (see page 3)

complete code for top mounted models

MODEL IDENTIFICATION (cont.)

Select electric switch mechanism & enclosure for **models T20** (see page 3 for switch ratings)

qty and switch type		All models with material code A									All models with material codes B and D								
		Weather proof (IP 66)		ATEX (IP 66)						FM (IP 66)	Weather proof (IP 66)		ATEX (IP 66)						FM (IP 66)
				II 2G EEx d IIC T6		II 1G EEx ia II C T6		II 2G EEx d IIC T6		NEMA 7/9			II 2G EEx d IIC T6		II 1G EEx ia II C T6		II 2G EEx d IIC T6		NEMA 7/9
		cast Aluminium		cast Aluminium		cast Aluminium		cast Iron		cast Alu.	cast Aluminium		cast Aluminium		cast Aluminium		cast Iron		cast Alu.
		M20 x 1,5	1" NPT	M20 x 1,5	1" NPT	M20 x 1,5	1" NPT	M20 x 1,5	3/4" NPT	1" NPT	M20 x 1,5	1" NPT	M20 x 1,5	1" NPT	M20 x 1,5	1" NPT	M20 x 1,5	3/4" NPT	1" NPT
A	1 x SPDT	A2P	AAP	AHC	AAC	-	-	AK7	AU7	AKP	A2Q	AAQ	AH9	AA9	-	-	AK5	AU5	AKQ
	1 x DPDT	A8P	ADP	AJC	ABC	-	-	AD7	AW7	ANP	A8Q	ADQ	AJ9	AB9	-	-	AD5	AW5	ANQ
3	1 x SPDT	32P	3AP	3HC	3AC	-	-	3K7	3U7	3KP	32Q	3AQ	3H9	3A9	-	-	3K5	3U5	3KQ
	1 x DPDT	38P	3DP	3JC	3BC	-	-	3D7	3W7	3NP	38Q	3DQ	3J9	3B9	-	-	3D5	3W5	3NQ
B	1 x SPDT	B2P	BAP	BHC	BAC	-	-	BK7	BU7	BKP	B2Q	BAQ	BH9	BA9	-	-	BK5	BU5	BKQ
	1 x DPDT	B8P	BDP	BJC	BBC	-	-	BD7	BW7	BNP	B8Q	BDQ	BJ9	BB9	-	-	BD5	BW5	BNQ
C	1 x SPDT	C2P	CAP	CHC	CAC	C2L	CAL	CK7	CU7	CKP	C2Q	CAQ	CH9	CA9	C2S	CAS	CK5	CU5	CKQ
	1 x DPDT	C8P	CDP	CJC	CBC	C8L	CDL	CD7	CW7	CNP	C8Q	CDQ	CJ9	CB9	C8S	CDS	CD5	CW5	CNQ
D	1 x SPDT	-	-	-	-	-	-	-	-	-	D2Q	DAQ	DH9	DA9	-	-	DK5	DU5	DKQ
	1 x DPDT	-	-	-	-	-	-	-	-	-	D8Q	DDQ	DJ9	DB9	-	-	DD5	DW5	DNQ
F	1 x SPDT	F2P	FAP	FHC	FAC	-	-	FK7	FU7	FKP	F2Q	FAQ	FH9	FA9	-	-	FK5	FU5	FKQ
	1 x DPDT	F8P	FDP	FJC	FBC	-	-	FD7	FW7	FNP	F8Q	FDQ	FJ9	FB9	-	-	FD5	FW5	FNQ
HS	1 x SPDT	-	-	-	-	-	-	-	-	-	H7A	HM2	HFC	HA9	-	-	HB3	HB4	HM3
	1 x DPDT	-	-	-	-	-	-	-	-	-	H7C	HM6	HGC	HB9	-	-	HB7	HB8	HM7
U	1 x SPDT	U2P	UAP	UHC	UAC	U2L	UAL	UK7	UU7	UKP	U2Q	UAQ	UH9	UA9	U2S	UAS	UK5	UU5	UKQ
	1 x DPDT	U8P	UDP	UJC	UBC	U8L	UDL	UD7	UW7	UNP	U8Q	UDQ	UJ9	UB9	U8S	UDS	UD5	UW5	UNQ
V	-	-	-	-	-	VFS	VHS	-	-	-	-	-	-	-	V5S	VBS	-	-	-
W	1 x SPDT	W2P	WAP	WHC	WAC	W2L	WAL	WK7	WU7	WKP	W2Q	WAQ	WH9	WA9	W2S	WAS	WK5	WU5	WKQ
	1 x DPDT	-	-	-	-	-	-	-	-	-	W8Q	WDQ	WJ9	WB9	W8S	WDS	WD5	WW5	WNQ
X	1 x SPDT	X2P	XAP	XHC	XAC	X2L	XAL	XK7	XU7	XKP	X2Q	XAQ	XH9	XA9	X2S	XAS	XK5	XU5	XKQ
	1 x DPDT	-	-	-	-	-	-	-	-	-	X8Q	XDQ	XJ9	XB9	X8S	XDS	XD5	XW5	XNQ

Select pneumatic switch mechanism & enclosure - for **models T20** only

Pneumatic switch type	Max supply pressure bar (psi)	Max liquid temperature °C (°F)	Bleed orifice Ø mm (inches)	NEMA 3R (IP 53)	
				material code A	material codes B & D
Series J (open air)	6,9 (100)	200 (400)	1,60 (0.063)	JDG	JDE
	4,1 (60)	200 (400)	2,39 (0.094)	JEG	JEE
	4,1 (60)	370 (700)	1,40 (0.055)	JFG	JFE
Series K (closed circuit)	6,9 (100)	200 (400)	–	KOE	KOE
	2,8 (40)	200 (400)	–	KOG	–

Select electric switch mechanism & enclosure for **models T21**

qty and switch type		All models with material code A									All models with material codes B and D								
		Weather proof (IP 66)		ATEX (IP 66)						FM (IP 66)	Weather proof (IP 66)		ATEX (IP 66)						FM (IP 66)
				II 2G EEx d II C T6		II 1G EEx ia II C T6		II 2G EEx d II C T6		NEMA 7/9			II 2G EEx d II C T6		II 1G EEx ia II C T6		II 2G EEx d II C T6		NEMA 7/9
		cast Aluminium		cast Aluminium		cast Aluminium		cast Iron		cast Alu.	cast Aluminium		cast Aluminium		cast Aluminium		cast Iron		cast Alu.
		M20 x 1,5	1" NPT	M20 x 1,5	1" NPT	M20 x 1,5	1" NPT	M20 x 1,5	3/4" NPT	1" NPT	M20 x 1,5	1" NPT	M20 x 1,5	1" NPT	M20 x 1,5	1" NPT	M20 x 1,5	3/4" NPT	1" NPT
A	2 x SPDT	A4A	ABA	ALC	ADC	-	-	AL7	AV7	ALA	A4B	ABB	AL9	AD9	-	-	AL5	AV5	ALB
	2 x DPDT	A1A	AEA	APC	AGC	-	-	AO7	AY7	AOA	A1B	AEB	AP9	AG9	-	-	AO5	AY5	AOB
3	2 x SPDT	34E	3BE	39E	3DE	-	-	3L7	3V7	3LE	34B	3BB	3L9	3D9	-	-	3L5	3V5	3LB
	2 x DPDT	31A	3EA	3PC	3GC	-	-	3O7	3Y7	3OA	31B	3EB	3P9	3G9	-	-	3O5	3Y5	3OB
B	2 x SPDT	B4A	BBA	BLC	BDC	-	-	BL7	BV7	BLA	B4B	BBB	BL9	BD9	-	-	BL5	BV5	BLB
	2 x DPDT	B1A	BEA	BPC	BGC	-	-	BO7	BY7	BOA	B1B	BEB	BP9	BG9	-	-	BO5	BY5	BOB
C	2 x SPDT	C4A	CBA	CLC	CDC	C4X	CBX	CL7	CV7	CLA	C4B	CBB	CL9	CD9	C4T	CBT	CL5	CV5	CLB
	2 x DPDT	C1A	CEA	CPC	CGC	C1X	CEX	CO7	CY7	COA	C1B	CEB	CP9	CG9	C1T	CET	CO5	CY5	COB
D	2 x SPDT	D4B	DBB	DL9	DD9	-	-	DL5	DV5	DLB	D4B	DBB	DL9	DD9	-	-	DL5	DV5	DLB
	2 x DPDT	D1B	DEB	DP9	DG9	-	-	DO5	DY5	DOB	D1B	DEB	DP9	DG9	-	-	DO5	DY5	DOB
F	2 x SPDT	FFA	FBA	FLC	FDC	-	-	FL7	FV7	FLA	FFB	FBB	FL9	FD9	-	-	FL5	FV5	FLB
	2 x DPDT	FHA	FEA	FPC	FGC	-	-	FO7	FY7	FOA	FHB	FEB	FP9	FG9	-	-	FO5	FY5	FOB
U	2 x SPDT	U4A	UBA	ULC	UDC	U4X	UBX	UL7	UV7	ULA	U4B	UBB	UL9	UD9	U4T	UBT	UL5	UV5	ULB
	2 x DPDT	U1A	UEA	UPC	UGC	U1X	UEX	UO7	UY7	UOA	U1B	UEB	UP9	UG9	U1T	UET	UO5	UY5	UOB
W	2 x SPDT	W4A	WBA	WLC	WDC	W4X	WBX	WL7	WV7	WLA	W4B	WBB	WL9	WD9	W4T	WBT	WL5	WV5	WLB
	2 x DPDT	W1B	WEB	WP9	WG9	W1T	WET	WO5	WY5	WOB	W1B	WEB	WP9	WG9	W1T	WET	WO5	WY5	WOB
X	2 x SPDT	X4A	XBA	XLC	XDC	X4X	XBX	XL7	XV7	XLA	X4B	XBB	XL9	XD9	X4T	XBT	XL5	XV5	XLB
	2 x DPDT	X1B	XEB	XP9	XG9	X1T	XET	XO5	XY5	XOB	X1B	XEB	XP9	XG9	X1T	XET	XO5	XY5	XOB

INSTALLATION

MOUNTING

Before assembling control to tank or vessel, check threaded or flanged mounting nozzle for the following:

– Nozzle length and inside diameter must be sized correctly to allow for switch actuation at design levels within the maximum differential available (see table on page 4).

– Nozzle should be checked for horizontal alignment. Finished mounting must allow control switch housing to be within 3° degrees of vertical for proper operation. A three degree slant is noticeable by eye, but installation should be checked with a spirit level.

WIRING

Most mechanical control switch housings are designed to allow 360° positioning of the cable entries by loosening the set screw(s). See **figure 2**. On high temperature applications (above 120° C [250° F]), high temperature wire should be used between control and first junction box located in a cooler area.

1. To gain access to switch mechanism(s) remove switch housing cover.
2. Pull in supply wires (conductors), wrap them around enclosing tube under the baffle plate and connect to correct terminals. Be certain that excess wire does not interfere with "tilt" of switch and that adequate clearance exists for replacement of switch housing cover.

> *CAUTION:*
> *In hazardous area, do not power the unit until the cable gland is sealed and the enclosure cover is screwed down securely.*

NOTE: See bulletin on switch mechanism furnished with your control (as listed below) for proper connections.

3. Connect power supply to control and test switch action by varying liquid level in tank or vessel.

NOTE: If switch mechanism fails to function properly, check vertical alignment of control housing and consult installation instructions in switch mechanism bulletin.

4. Replace switch housing cover and place control into service.

NOTE: If control has been furnished with an explosion proof (cast) or moisture proof (gasketed) switch housing, check the following:

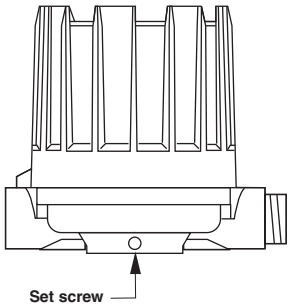
– After wiring connections have been completed, housings must be sealed via the correct cable gland to prevent entrance of air.

– Check cover to base fit, to be certain gasketed joint is tight. A positive seal is necessary to prevent infiltration of moisture laden air or corrosive gases into switch housing.

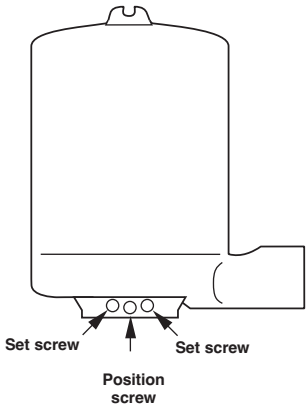
Switch mechanism	*Bulletin*	*Reference series*
Mercury switches	42-783	A
Dry contact switches	42-783	B, C, D, U, W, X
Anti-vibration mercury switches		E
Anti-vibration dry contact switches	42-684	G, H, I
Bleed type pneumatic valve	42-685	J
Non-bleed type pneumatic valve	42-686	K

OBSERVE ALL APPLICABLE ELECTRICAL CODES AND PROPER WIRING PROCEDURES

NEMA 4x



NEMA 7/9



> *CAUTION:*
> *- DO NOT attempt to reposition NEMA 4X / NEMA 7/9 housings without loosening the set screws.*

ATEX

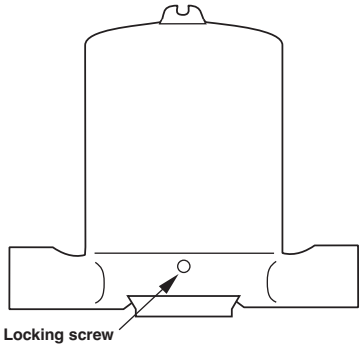


Figure 2

> *CAUTION:*
> *- DO NOT attempt to reposition NEMA 4 / NEMA 7/9 housings without loosening the set screws; ATEX housings MAY NOT BE REPOSITIONNED. ALWAYS retighten set screw(s) after repositionning.*
> *- DO NOT attempt to unscrew cover of ATEX housings before loosening locking screw in base of housing. ALWAYS retighten locking screw after replacing cover.*

SWITCH DIFFERENTIAL ADJUSTMENT

The standard differential of T20 and T21 Liquid Level Switches may be field adjusted. Adjustment may be necessary if a wider differential needs to be set to overcome switch chatter caused by the process.

The differential, or the amount of level travel between switch-on and switch-off, may be adjusted by repositioning the lower jam nuts on the float stem. The standard factory setting is for a minimum amount of play (gap) between the top jam nuts and the attraction sleeve as shown in **Figure 4**.

NOTE: For assistance in computing level differential change for a specific control, consult the factory giving the model and serial numbers of the control.

> ***CAUTION:*** *Maximum differential adjustment is 13 mm (0.5").*

NOTE: To widen the differential 13 mm (0.5"), the lower jam nuts must be set proportionately lower on the stem (i.e. in this example 13 mm (0.5")).

> ***CAUTION:*** *Before attempting any work on the control, pull disconnect switch, or otherwise assure that electrical circuit(s) through the control is deactivated. Close operating medium supply valve on controls equipped with pneumatic switch mechanisms.*

1. Determine what change in differential is necessary.
2. Make sure power source is turned off.
3. Unscrew and remove switch housing cover.
4. Disconnect power supply wires from switch mechanism. Pull wires out of conduit connection opening in housing base. Refer to **Figure 3**.

5a. Perform system shut-down procedures as required to relieve pressure from tank or vessel and drain off liquid head, if required. Allow unit to cool.

5b. The amount of level travel between switch-on and switch-off actuations (differential) may be field adjusted by repositioning the lower jam nuts on the float stem. The standard factory setting is for a minimum amount of play (gap) between the top jam nuts and the attraction sleeve, as shown in **Figure 4**. This setting may be increased to a maximum of 13 mm (0.50"), as shown in **Figure 5**.

6. Remove switch housing assembly by loosening hex nut, which is located immediately below housing base. Refer to **Figure 3**.

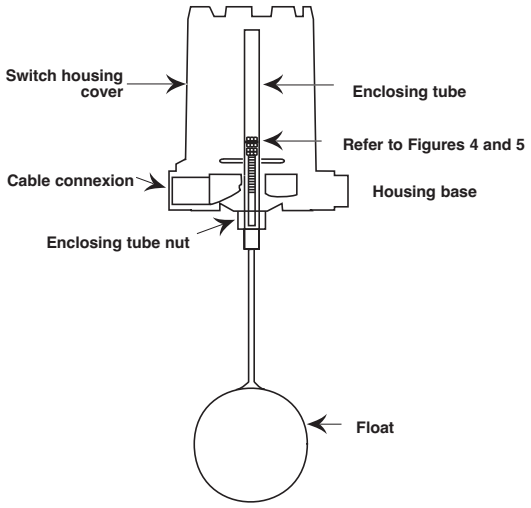
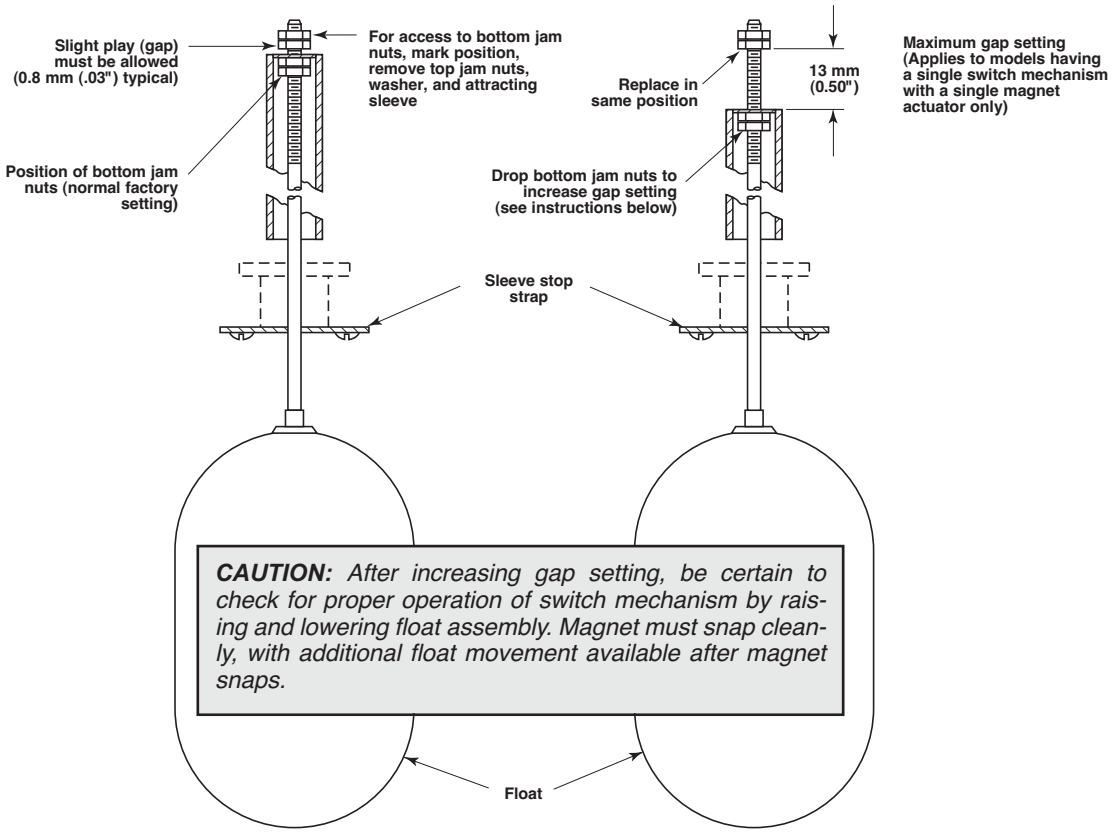


Figure 3



> ***CAUTION:*** *After increasing gap setting, be certain to check for proper operation of switch mechanism by raising and lowering float assembly. Magnet must snap cleanly, with additional float movement available after magnet snaps.*

Figure 4

Normal Factory Setting (minimum differential)

Figure 5

Differential adjustment

SWITCH DIFFERENTIAL ADJUSTMENT cont.

7. With switch housing removed, jam nuts and attraction sleeve are accessible. Measure position of upper jam nuts from stem end; then loosen and remove upper jam nuts, guide washer, and attraction sleeve.
8. Loosen and adjust lower jam nuts to desired position. Make certain jam nuts are retightened securely.

NOTE: Use new gasket in assembly of switch housing to chamber (Part No. 12-1301-002).

9. Test switch actuation by varying liquid level in tank or vessel.

CAUTION: *Instructions given are for standard base model units which use a single magnet switch mechanism only. No differential adjustment should be attempted on tandem float models in the field. Switch actuation levels have been set at the factory to meet specific customer specifications. Variations in actual conditions from design conditions usually requires special control modifications. Consult with the factory or local representative for assistance*

TROUBLE SHOOTING

Usually the first indication of improper operation is failure of the controlled equipment to function, i.e.: pump will not start (or stop), signal lamps fail to light, etc. When these symptoms occur, whether at time of installation or during routine service thereafter, check the following potential external causes first.

— Fuses may be blown.
— Reset button(s) may need resetting.
— Power switch may be open.
— Controlled equipment may be faulty.
— Wiring leading to control may be defective.

If a thorough inspection of these possible conditions fails to locate the trouble, proceed next to a check of the control's switch mechanism.

CHECK SWITCH MECHANISM

1. Pull disconnect switch or otherwise disconnect power to the control.
2. Remove switch housing cover.
3. Disconnect power wiring from switch assembly.
4. Swing magnet assembly in and out by hand to check carefully for any sign of binding. Assembly should require minimal force to move it through its full swing.
5. If binding exists, magnet may be rubbing enclosing tube. If magnet is rubbing, loosen magnet clamp screw and shift magnet position. Retighten magnet clamp screw.
6. If switch magnet assembly swings freely and mechanism still fails to actuate, check installation of control to be certain it is within the specified three (3°) degrees of vertical (Use spirit level on side of enclosing tube in two place, 90° apart.
7. If mechanism is equipped with a mercury switch, examine glass mercury tube closely as previously described in "Preventive Maintenance" section. If switch is damaged, replace it immediately.
8. If switch mechanism is operating satisfactorily, proceed to check sensing unit.

CHECK SENSING UNIT

1. Re-connect power supply and carefully actuate switch mechanism manually (using a non-conductive tool) to determine whether controlled equipment will operate.

CAUTION:
With electrical power "on", care should be taken to avoid contact with switch leads and connections at terminal block.

2. If controlled equipment responds to manual actuation test, trouble may be located in the level sensing portion of the control (float, stem and magnetic attraction sleeve[s]).

NOTE: Check first to be certain liquid is entering storage tank or vessel. A valve may be closed or pipe line plugged.

3. With liquid in tank or vessel, proceed to check level sensing action by removing switch housing assembly.

4. Inspect magnetic attraction sleeve(s) and inside of enclosing tube for excessive corrosion or solids build-up which could restrict movement, preventing sleeve(s) from reaching field of magnet(s).

5. If differential has been changed in the field, check tightness and position of the jam nuts.

NOTE: Differential adjustment affects a change in the amount of level travel between "switch on" and "switch off" actuations. Do **NOT** attempt adjustment without first consulting factory for assistance in computing level differential change for your control.

6. Check float to be certain it is buoyant in the liquid (tank or vessel must have adequate liquid level). If float is determined to be filled with liquid or collapsed, it must be replaced immediately. Do NOT attempt to repair a float.

If all the components in the control are in operating condition, the trouble must be (and should be) located external to the control. Repeat inspection of external conditions previously described.

NOTE: When in doubt about the condition or performance of a Magnetrol control, return it to the factory. See "Our Service Policy" on back page.

PREVENTIVE MAINTENANCE

Periodic inspections are a necessary means to keep your Magnetrol level control in good working order. This control is, in reality, a safety device to protect the valuable equipment it serves. Therefore, a systematic program of "preventive maintenance" should be implemented when control is placed into service. If the following sections on "what to do" and "what to avoid" are observed, your control will provide reliable protection of your capital equipment for many years.

WHAT TO DO

1. Keep control clean

NEVER leave switch housing cover off the control. This cover is designed to keep dust and dirt from interfering with switch mechanism operation. In addition, it protects against damaging moisture and acts as a safety feature by keeping bare wires and terminals from being exposed. Should the housing cover become damaged or misplaced, order a replacement immediately.

2. Inspect switch mechanisms, terminals and connections monthly.

– Mercury switches may be visually inspected for short circuit damage. Check for small cracks in the glass tube containing the mercury. Such cracks can allow entrance of air into the tube causing the mercury to "oxidize". This is noticeable as the mercury will appear dirty and have a tendency to "string out" like water, instead of breaking into round pools. If these conditions exist, replace the mercury switch immediately.

– Dry contact switches should be inspected for excessive wear on actuating lever or misalignment of adjusting screw at point of contact between screw and lever. Such wear can cause false switch actuating levels. Adjust switch mechanism to compensate (if possible) or replace switch.

Do **NOT** operate your control with defective or maladjusted switch mechanisms (refer to bulletin on switch mechanism furnished for service instructions).

– Magnetrol controls may sometimes be exposed to excessive heat or moisture. Under such conditions, insulation on electrical wires may become brittle, eventually breaking or peeling away. The resulting "bare" wires can cause short circuits.

Check wiring carefully and replace at first sign of brittle insulation.

– Vibration may sometimes cause terminal screws to work loose. Check all terminal connections to be certain that screws are tight. Air (or gas) operating medium lines subjected to vibration may eventually crack or become loose at connections causing leakage. Check lines and connections carefully and repair or replace, if necessary.

– On units with pneumatic switches, air (or gas) operating medium lines subjected to vibration, may eventually crack or become loose at connections carefully and repair or replace, if necessary.

NOTE: As a matter of good practice, spare switches should be kept on hand at all times.

3. Inspect entire unit periodically

Isolate control from vessel. Raise and lower liquid level to check for switch contact and reset.

WHAT TO AVOID

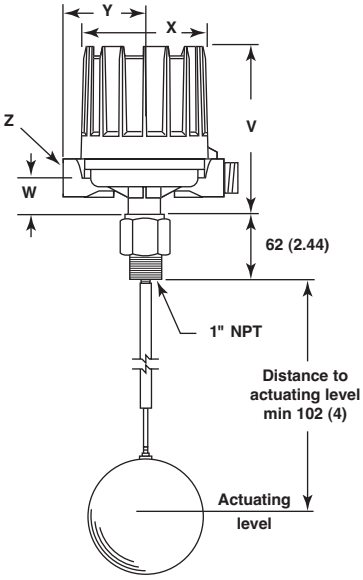
1. **NEVER** leave switch housing cover off the control longer than necessary to make routine inspections.

2. **NEVER** use lubricants on pivots of switch mechanisms. A sufficient amount of lubricant has been applied at the factory to insure a lifetime of service. Further oiling is unnecessary and will only tend to attract dust and dirt which can interfere with mechanism operation.

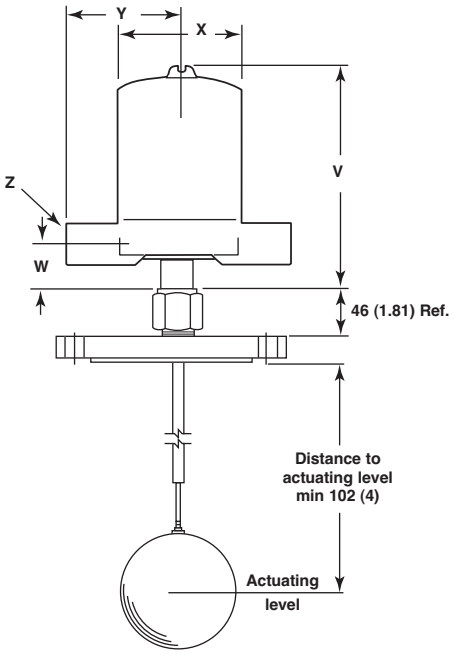
3. **NEVER** place a jumper wire across terminals to "cut-out" the control. If a "jumper" is necessary for test purposes, be certain it is removed before placing control into service.

4. **NEVER** attempt to make adjustments or replace switches without reading instructions carefully. Certain adjustments provided for in Magnetrol controls should not be attempted in the field. When in doubt, consult the factory or your local Magnetrol representative.

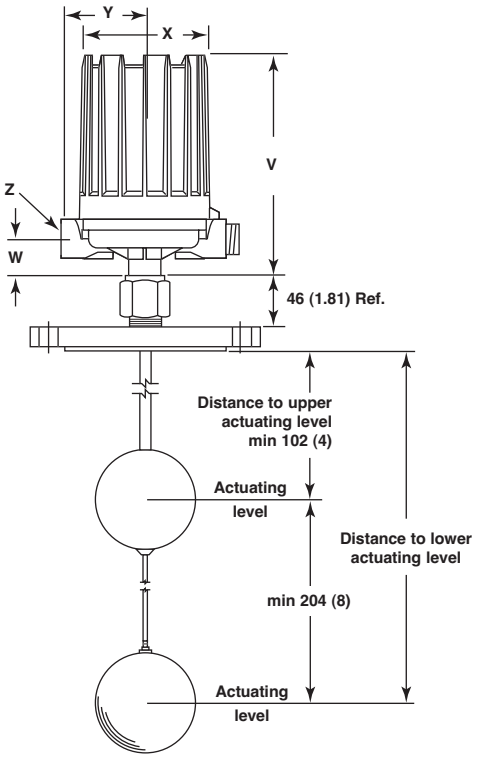
DIMENSIONAL SPECIFICATIONS mm (inches)



Model T20 with 1" NPT



Model T20 with flange



Model T21 with flange

Distance to	Maximum	Minimum
Upper level	1016 mm (40")	102 (4")
Lower level	1219 mm (48")	305 (12")

Note: On model T21, the lower float actuates the upper switch mechanism. The upper float actuates the lower switch mechanism.

Housing type	Models	V		W		ø X		Y		Z
		mm	inches	mm	inches	mm	inches	mm	inches	
Weatherproof- FM (NEMA 7/9) - ATEX (Cast Alu)	T21 and T20 with HS-switch	257	10.12	42	1.66	151	5.93	109	4.29	M20 x 1,5 (*) or 1" NPT (2 entries - 1 plugged) (*) **not for FM (NEMA 7/9)**
	T20 excl. HS-switch	202	7.94							
CENELEC (Cast Iron)	All	249	9.80	45	1.77	143	5.63	110	4.33	M20 x 1,5 or 3/4" NPT (single entry - 2 entries at request)
Pneumatics Switch Module J	All	165	6.50	39	1.54	118	4.65	110	4.33	1/4" NPT
Pneumatics Switch Module K								130	5.12	

Allow 200 mm (7.87") overhead clearance / All housings are 360 ° rotatable

FLOAT SELECTION AND INSERTION DEPTH

T20/T21 switches are fabricated to meet customer specific insertion depth, from mounting fitting to actuating level. The maximum available insertion depth is governed by the liquid specific gravity and selected float size as given in the table below. The minimum insertion depth is 102 mm (4").

	T20 models - float sizes		
Specific Gravity	ø 76 x 127 mm (3" x 5")	ø 102 mm (4")	ø 114 mm (4 1/2")
0.60	-	-	140 (5.5)
0.70	-	-	914 (36)
0.80	-	254 (10)	1219 (48)
0.90	432 (17)	813 (32)	1219 (48)
1.00	889 (35)	1219 (48)	1219 (48)

	T21 models - float sizes ①		
Specific Gravity	ø 76 x 127 mm (3" x 5")	ø 102 mm (4")	ø 114 mm (4 1/2")
0.70	-	-	711 (28)
0.80	-	305 (12)	1219 (48)
0.90	406 (16)	660 (26)	1219 (48)
1.00	711 (28)	1016 (40)	1219 (48)

① Max actuating levels as per lowest float

PRESSURE RATINGS

Float ratings are the maximum allowable pressure rating, even though the tank connections may have higher ratings.

	Pressure Rating Bar (PSIG)	
	@ 40° C (100° F)	*@ Maximum Temperature*
76 x 127 mm (3.00" x 5.00")	34,5 Bar (500 PSIG)	20,7 Bar @ 400° C (300 PSIG @ 750° F)
102 mm (4")	41,3 Bar (600 PSIG)	27,6 Bar @ 400° C (400 PSIG @ 750° F)
114 mm (4.50")	34,5 Bar (500 PSIG)	23,4 Bar @ 400° C (340 PSIG @ 750° F)

REPLACEMENT PARTS

ITEM	DESCRIPTION		SINGLE FLOAT MODELS		TANDEM FLOAT MODELS	
			T20-1	T20-4	T21-1	T21-4
1	Housing Cover	Housing Kits	Refer to bulletin on switch mechanism and housing furnished (listed on page 4).			
2	Housing Base					
3	Switch Mechanism(s)					
4	Attraction Sleeve	Float and Stem Kits ① ②	Consult Factory			
5	Jam Nuts					
6	Guide Washer(s)					
7	Float Stem					
8	Float	FLOAT SIZE 3 x 5	07-1202-003		07-1202-003	
		4	07-1102-008		07-1102-008	
		4.50	07-1102-009		07-1102-009	
9	Attraction Sleeve, Stop Tube, and Washers	Upper Float and Tube Assy. Kit ① ②	NOT REQUIRED		FLOAT SIZE	
					3 x 5	89-3230-001
10	Retaining Rings				4	Consult Factory
11	Float and Tube Assy.				4.50	
12	Adaptor Bushing		04-5734-126	04-5734-123	04-5734-126	04-5734-123
13	Stem Guide Tube ②		011-1418-194	011-1418-434	NOT REQUIRED	
14	E-Tube Gasket		12-1301-002			
15	Enclosing Tube	BASEEFA & CENELEC	032-6344-002	032-6344-001	032-6344-002	032-6344-001
		NEMA 4X, NEMA 7/9 Pneumatic housing (only for T20)	032-6302-031	032-6302-036	032-6302-033	032-6302-037
16	Mounting Flange ③		See Replacement Mounting Flange Chart			
17	Float Guide Cage (optional) ④	Guide Cage Kits	NOT REQUIRED		Guide Cages are special order items. See Gasket Chart Below	
18	Guide Cage Gasket					

REPLACEMENT MOUNTING FLANGES (Item 16) ③						CAGE GASKETS (Item 18)	
Size	125 Lb. Cast Iron	150 Lb. Forged Steel	300 Lb. Forged Steel	150 Lb. Forged T-304	150 Lb. Forged T316	125 Lb. & 150 Lb.	300 Lb.
4"	04-5840-001	04-5840-011	04-5840-016	04-5840-021	04-5840-026	12-1301-014	12-1301-012
5"	04-5840-002	04-5840-012	04-5840-017	04-5840-022	04-5840-027	12-1301-008	12-1204-008
6"	04-5840-003	04-5840-013	04-5840-018	04-5840-023	04-5840-028	12-1301-009	12-1301-013
8"	04-5840-004	04-5840-014	04-5840-019	04-5840-024	04-5840-029	12-1301-026	12-1301-027

IMPORTANT:

When ordering, please specify:

A. Model and serial number of control.

B. Name and number of replacement part or assembly (Kit).

NOTES:

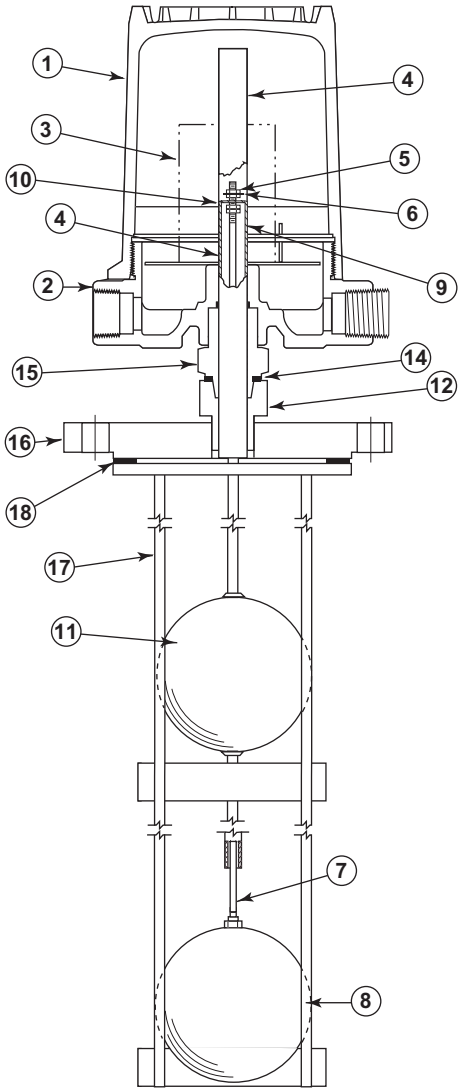
① All replacements furnished in kit form are for standard base models which use single magnet switch mechanisms only. Consult local representative for ordering assistance on all special model replacement parts not included in above listing.

② **Float stem and tube component lengths are cut to meet original customer specifications. When ordering these replacement kits, be certain to always give complete model and serial numbers of control.**

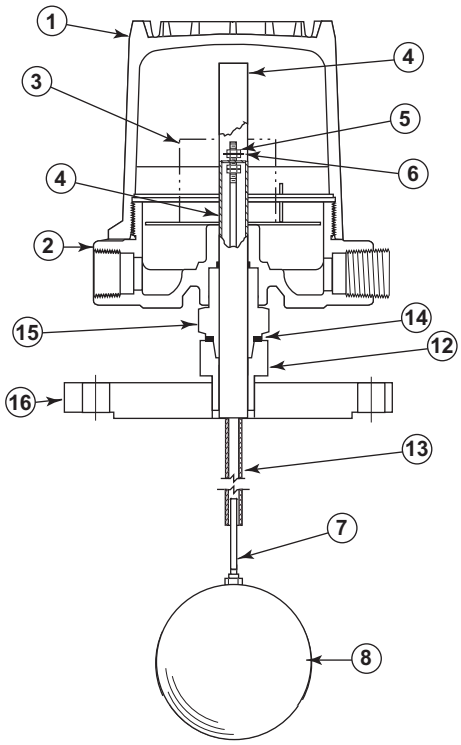
③ Flanges listed are standard ANSI raised face items. When ordering, please specify size, type, and part number.

④ Float cages are specially built to meet original customer specifications. When ordering, specify part numbers of float guide cage and gasket (as charted above relative to size of float and mounting flange respectively), as well as an overall cage length dimension from original assembly.

REPLACEMENT PARTS cont.



T21



T20

IMPORTANT

SERVICE POLICY

Owners of Magnetrol products may request the return of a control; or, any part of a control for complete rebuilding or replacement. They will be rebuilt or replaced promptly. Magnetrol International will repair or replace the control, at no cost to the purchaser, (or owner) ***other than transportation cost*** if:

a. Returned within the warranty period; and,
b. The factory inspection finds the cause of the malfunction to be defective material or workmanship.

If the trouble is the result of conditions beyond our control; or, is **NOT** covered by the warranty, there will be charges for labour and the parts required to rebuild or replace the equipment.

In some cases, it may be expedient to ship replacement parts; or, in extreme cases a complete new control, to replace the original equipment before it is returned. If this is desired, notify the factory of both the model and serial numbers of the control to be replaced. In such cases, credit for the materials returned, will be determined on the basis of the applicability of our warranty.

No claims for misapplication, labour, direct or consequential damage will be allowed.

RETURNED MATERIAL PROCEDURE

So that we may efficiently process any materials that are returned, it is essential that a “Return Material Authorisation” (RMA) form will be obtained from the factory. It is mandatory that this form will be attached to each material returned. This form is available through Magnetrol’s local representative or by contacting the factory. Please supply the following information:

1. Purchaser Name
2. Description of Material
3. Serial Number
4. Desired Action
5. Reason for Return
6. Process details

All shipments returned to the factory must be by prepaid transportation. Magnetrol **will *not* accept** collect shipments.

All replacements will be shipped FOB factory.

BULLETIN N°: BE 44-604.10
EFFECTIVE: JANUARY 2005
SUPERSEDES: February 1997

Magnetrol®

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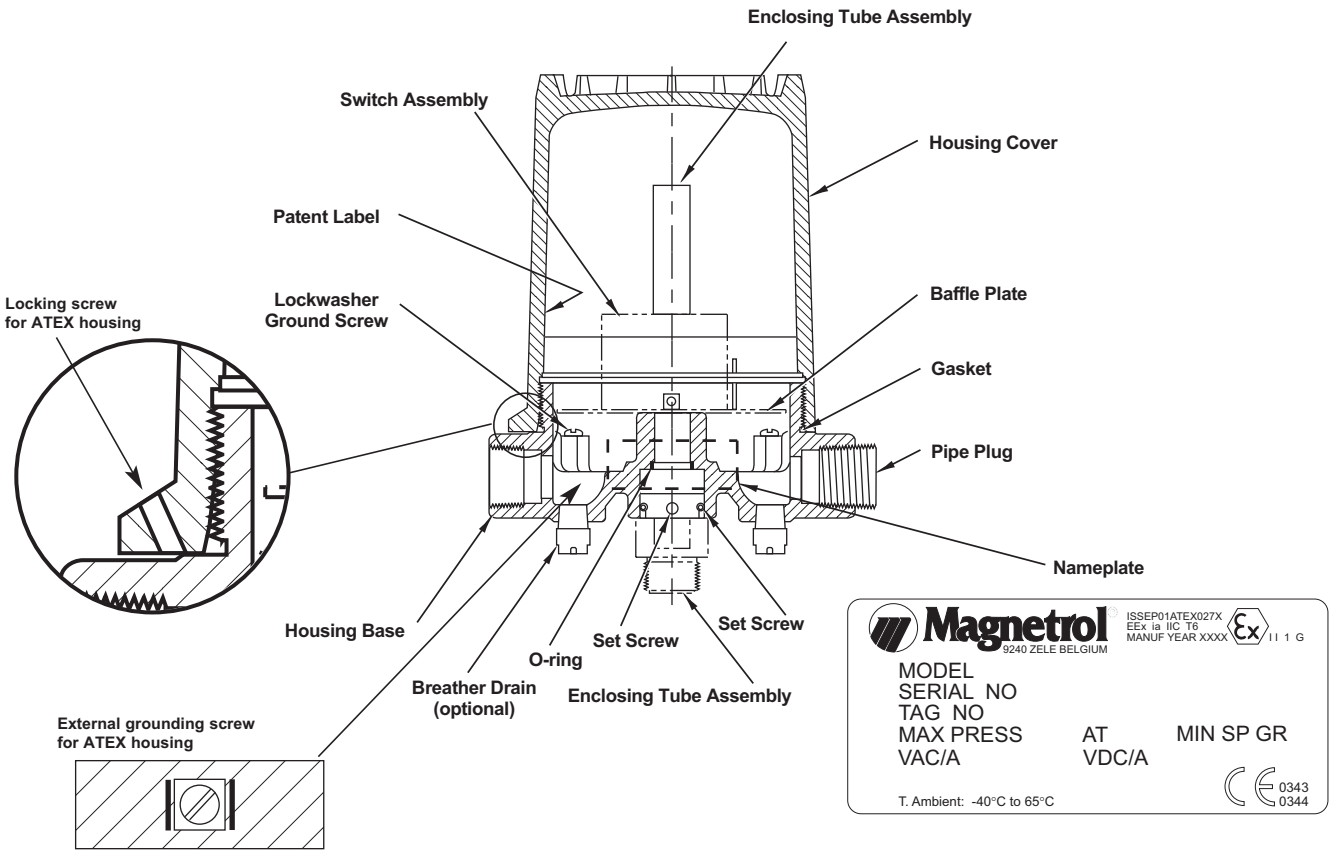
Magnetrol®

Mechanical switch housing

REPLACEMENT ASSEMBLIES
HOUSING ASSEMBLY – ATEX / WEATHER PROOF / FM NEMA 7/9



Description		*Replacement kit part no.*
ATEX housing (IP 66) cover 152 mm (6") and housing base, blue cover		Consult factory
IP 66 housing cover 152 mm (6") and housing base, blue cover (1" NPT entry)		89-6582-020
IP 66 housing cover 152 mm (6") and housing base with drain, blue cover		89-6582-026
ATEX housing cover (IP 66) 203 mm (8") and housing base, blue cover		Consult factory
IP 66 housing cover 203 mm (8") and housing base, blue cover (1" NPT entry)		89-6582-021
IP 66 housing cover 203 mm (8") and housing base with drain, blue cover		89-6582-027
Class I, Group B housing cover 203 mm (8") and housing base, blue cover		89-6582-032
IP 66 housing with extension 330 mm (13") and housing base, blue cover		89-6578-025
Gasket		12-2201-253
O-ring		12-2201-116
Baffle plate	series A, B, C, D, E, F, 2 & 3	05-6657-001
Washer	series HS, Group B	05-7101-001

DESCRIPTION

Standard housing replacement assemblies are designed for applications ranging from general purpose, indoor use, to non hazardous installations requiring a dust/water/lint, fiber/oil tight enclosure.
Explosion proof housing replacement assemblies are designed for applications in hazardous atmospheric locations, as classified under types ATEX II 1/2G and NEMA 7 and 9 of the National Electrical code.
Housings equipped with submersible base are suitable for submersion under water, as classified under NEMA types 6 of the code.

IMPORTANT

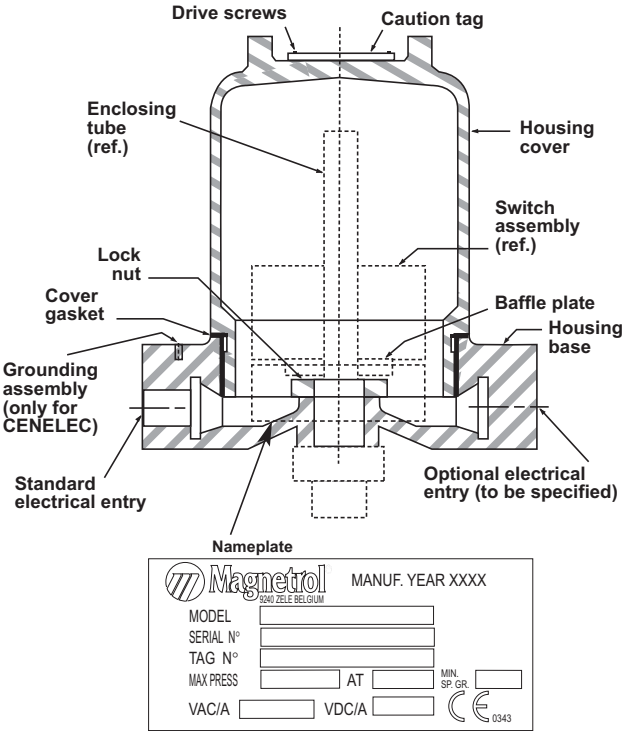
When ordering, please specify:

1. Model and serial number of control.
2. Name and part number of replacement kit.

Note: Consult your local representative on applications to meet NEMA and IP ratings not covered in this bulletin.

TYPICAL EXPLOSION PROOF (E.P.) HOUSING

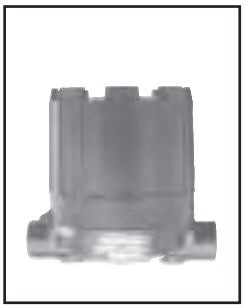
HOUSING ASSEMBLY - CENELEC (EEx d II C T6)



Description	*Replacement kit part no.*
Housing base kit housing base, nameplate, drive screws, lock nut, lock screw, grounding assembly (only for CENELEC)	189-9126-001 (3/4" NPT entry) 189-9126-002 (M20 x 1.5 entry)
Housing cover kit housing cover, caution tag, drive screws, cover gasket	189-9122-001
Cover gasket	12-1301-005
Baffle plate (switch series A, B, C, D, E, F, U, W, X, 2 and 3)	36-5303-003

AVAILABLE HOUSINGS

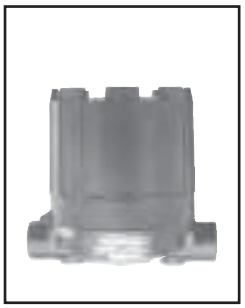
- For Non Ex use
- IP 66
- Die cast Aluminium
- 2 Entries (one plugged)
- Standard blue anti corrosive coating
- Housing heater/drain available, consult factory



- For Exd/Exi use
- IP 66
- Die cast Aluminium
- 2 Entries (one plugged)
- Standard blue anti corrosive coating
- ATEX II 2G EEx d II C T6
- ATEX II 1G EEx ia II C T6

- For Exd use
- IP 66
- Cast Iron
- One entry (2 entries at request)
- Standard blue anti corrosive coating
- CENELEC EEx d II C T6

- For pneumatic switches
- IP 53 (NEMA 3R)
- IP 55 optional at request
- Alu base / cold rolled steel cover
- Standard blue anti corrosive coating

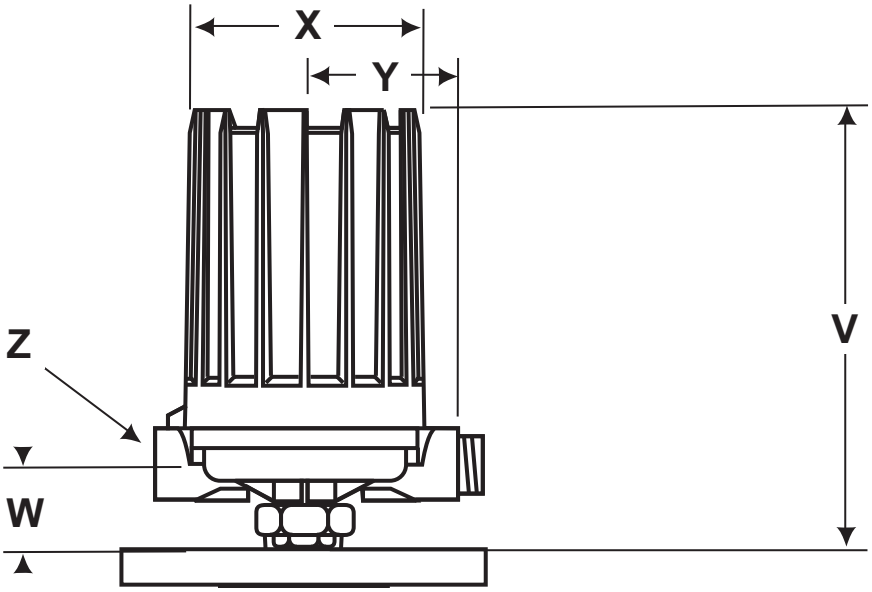


- For Exd use
- IP 66 (NEMA 7/9)
- Die cast Aluminium
- 2 Entries (one plugged)
- Standard blue anti corrosive coating
- FM, Class I, Div. 1, Groups C & D
- FM, Class II, Div. 1, Groups E, F & G

DIMENSIONS in mm (inches)

Housing type	Models	V		W		ø X		Y		Z
		mm	inches	mm	inches	mm	inches	mm	inches	
Weatherproof-FM (NEMA 7/9) - ATEX (Cast Alu)	With tall cover	257	10.12	42	1.66	151	5.93	109	4.29	M20 x 1,5 (*) or 1" NPT (2 entries - 1 plugged) (*) **not for FM (NEMA 7/9)**
	With short cover	202	7.94							
CENELEC (Cast Iron)	All	249	9.80	45	1.77	143	5.63	110	4.33	M20 x 1,5 or 3/4" NPT (single entry - 2 entries at request)
Pneumatics Switch Module J	With short cover	165	6.50	39	1.54	118	4.65	110	4.33	1/4" NPT
	With tall cover	216	8.50							
Pneumatics Switch Module K	With short cover	165	6.50					130	5.12	
	With tall cover	216	8.50							

Allow 200 mm (7.87") overhead clearance / All housings are 360 ° rotatable



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2. Description of Material
3. Serial Number
4. Desired Action
5. Reason for Return
6. Process details

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All replacements will be shipped FOB factory.

BULLETIN N°: BE 42-780.2
EFFECTIVE: JUNE 2002
SUPERSEDES: February 1999

Magnetrol®

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INDIA	B4/115 Safdurjung Enclave, New Delhi 110 029 Tel. 91 (11) 6186211	Fax 91 (11) 6186418

Magnetrol®

Series A, B, C, D, E, F, L, N, O, Q, S, T, U, W, X, 2 & 3

Electric switch mechanisms

INSTRUCTION MANUAL AND PARTS LIST

Magnetrol level controls are available with a range of different switch mechanisms - each designed for specific service conditions. A brief description of the individual switch mechanisms and their applications are given below.

MERCURY SWITCHES

Series A, E, L, N & T

Mercury switches offer the advantage of quick visual inspection of contact conditions.

A = switches are heavy duty units with high load carrying capability.
E = switches are specially designed to provide greater vibration resistance.
L = switches are used only in model B40 units.
N = switches are used only in model C10 and C15 units.
T = switches are used only in C15 units.

HIGH TEMPERATURE MERCURY SWITCHES

Series 2 & 3

These switches offer the advantage of quick visual inspection of contact conditions and feature nickel/copper bare wire and ceramic beaded insulation, allowing use in applications where the process temperature does not exceed 400°C (750°F).

2 = switches are specially designed to provide greater vibration resistance.
3 = switches are heavy duty units with high load carrying capability.

DRY CONTACT SWITCHES

Series B, C, D, O, U, Q & S

Dry contact switches are specified in applications where mercury must be avoided – such as in nuclear power plant installations.

B = switches are general purpose units with a maximum liquid temperature rating of 290°C (550°F).
C = switches are general purpose units with a maximum liquid temperature rating of 230°C (450°F).
D = switches are designed for DC current applications.
O = switches are used only in model C10 and C15 units.
Q = switches are used only in C15 units.
S = switches are used only in model B40 units.
U = switches are dry contact snap switches with gold alloy contacts and suitable for a maximum liquid temperature of 120°C (250°F).

HERMETICALLY SEALED SWITCHES

Series F, W & X

Hermetically sealed switches are for use in special applications where hermetically sealed contacts are required.

F = switches are well suited for use where the process temperature does not exceed 400°C (750°F).
W = switches have silver plated contacts with a maximum liquid temperature rating of 230°C (450°F).
X = switches have gold plated contacts and suitable for a maximum liquid temperature of 230°C (450°F).

Series A, E, N & T
Mercury switch

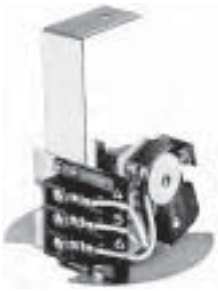
Series 2 & 3
High temperature mercury switch

Series B, C & D
Dry contact switches

Series F
Hermetically sealed switch

Series W & X
Hermetically sealed switch

Series L
Mercury switch

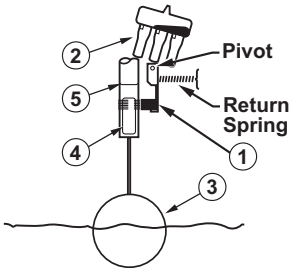


Series S
Snap switch

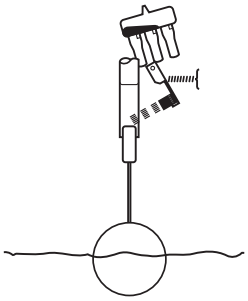
GENERAL INSTRUCTIONS

OPERATING PRINCIPLE

Diagrams A and **B** illustrate the simple and foolproof Magnetrol operating principle.
Switching action is obtained through the use of a magnetic sleeve ④ actuated by a float ③, displacer or flow sensing device and a switching mechanism ②.
These two basic component assemblies are separated by a non-magnetic, pressure tight enclosing tube ⑤.
A switch mechanism ② and magnet ① are assembled to a swinging arm which operates on precision stainless steel pivot sockets.



Rising level
Diagram A



Falling level
Diagram B

OPERATING CYCLE

At Normal Operating Level of a liquid in a storage vessel, **(diagram A)**, the float moves the magnetic sleeve upward in the enclosing tube and into the field of the switch mechanism magnet.
As a result, the magnet is drawn in tightly to the enclosing tube causing the switch to tilt, making or breaking the electrical circuit.
As the liquid level recedes, the float pulls the magnetic sleeve downward until, at a predetermined Low Level, **(diagram B)** the switch magnet releases and is drawn outward away from the enclosing tube by a tension spring. This in turn tilts the switch in an opposite direction, thus reversing switch action.
When the liquid level returns to normal, the float once again moves the magnetic sleeve up the enclosing tube, causing the switch to assume its original position.

Switch mechanisms may include a single switch or multiple switches depending on operational requirements and switching action desired.

INSTALLATION

REMOVING SWITCH MECHANISM

> ***CAUTION:*** *Before attempting to remove a switch mechanism, be certain to pull, disconnect switch or otherwise assure that electrical circuit through control is de-energized.*

1. Disconnect wiring from supply side of terminal block on switch mechanism. Note and record lead wire terminal locations.
2. Loosen screw in split mounting clamp until mechanism slides freely on enclosing tube, see **Figure 1**.
3. Remove small round head screw, securing lower switch mechanism to baffle plate, see **Figure 7** on page 6.
4. Carefully lift off switch mechanism and place on clean surface, free of metal particles which may be attracted to switch magnet.

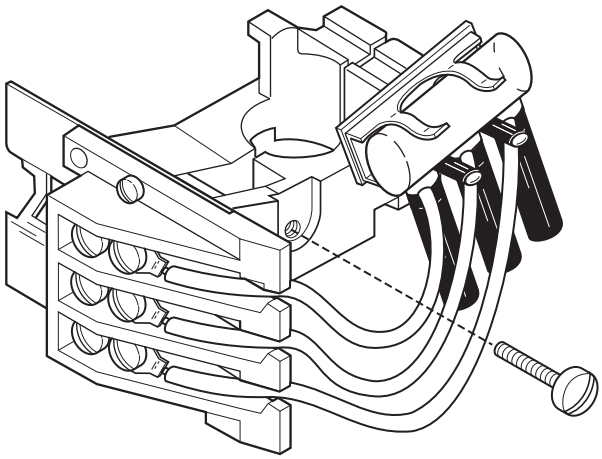


Figure 1

REPLACING MERCURY SWITCH

Series A, L, N & 3

1. Disconnect Magnetrol control from power supply.
2. Disconnect switch leads from terminal block ***A***, noting terminal post numbers marked on switch mechanism.

NOTE: Before removing existing mercury switch, loosen cement, holding switch, by gently prying between switch clips and glass tube.

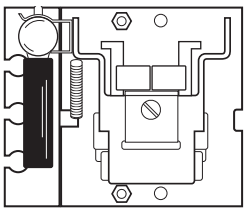


Figure 2

3. Remove mercury switch from clips ***B***, **Figure 3**.
4. Replace new mercury switch into clips ***B***, making certain that switch legs are positioned to help fouling of leads.
5. Glue switch to clips ***B*** using a cement such as DuPont Duco, Goodyear Pliobond, Shellac or equivalent, see **Figures 2 and 3**.
6. Connect switch leads to terminal block ***A*** on identical post positions as those in the original assembly. **Figure 3**.

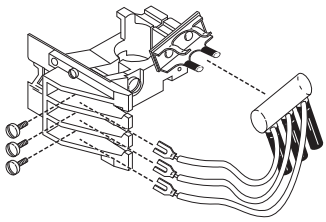


Figure 3

INSTALLATION cont.

REPLACING MERCURY SWITCH CONT.
Series A, L, N & 3 cont.

7. Check to be certain that switch leads do NOT cross over or under one another.

8. Swing magnet assembly in and out by hand, checking carefully for any sign of binding. Assembly should require minimum force to move through its full swing. Contact factory if binding is observed.

NOTE: DPDT mechanisms have left hand and right hand switches **(see Fig. 4)** (as viewed facing terminal block of mechanism). Follow all steps for switch replacement and adjustment described above. Re-connect power supply and test switch action by varying liquid level in the vessel or by blowing-down float chamber.

Figure 4

Series E, T & 2
Follow instructions for Series A except:

1. Replace new mercury switch into clips making certain that a space of 9.5 mm (3/8") exists from edge of clip to point where lead wires attach to glass tube. Lead wires should project downward at 90% angle from horizontal plane. **(See Fig. 5)**.

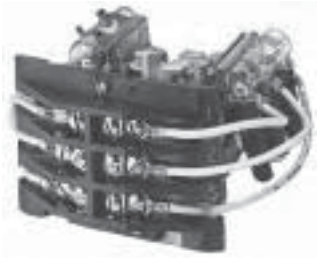


Figure 5

2. Glue switch to clips using a cement such as: DuPont Duco, Goodyear Pliobond, Shellac or equivalent. **(See Fig. 2)**.

3. Connect switch leads to terminal block on identical post positions as those in the original assembly.

NOTE: Check to be certain that switch glass tube is not resting on the upper switch lead and that switch leads "drape" loosely when switch magnet is in the "swing-out" position. Glass tube may be slid forward in clips toward terminal block to correct such conditions.

4. Check new mercury switch carefully to see that it makes and breaks circuit properly.

   A. Slowly swing switch magnet through its operating angle. Mercury must make and break contact between electrodes before magnet comes to its **"IN"** stop or **"OUT"** stop.

   B. If action is incorrect, contact factory for replacement.

REPLACING MERCURY SWITCH CONT.
Series E, T & 2 cont.

NOTE: A properly adjusted mercury switch will have equal overtravel tilt in both directions after switch actuation.

5. DPDT switch mechanisms have two mercury switches carried by the pivoted magnet **(See Figure 4)**. Follow all steps for switch replacement and adjustment described in steps 1 through 4.

   Re-connect power supply and test switch action by varying liquid level in the vessel or by blowing down float chamber.

REPLACING DRY CONTACT SWITCHES
Series B, C, D, F, O, Q, S, U, W & X

> ***CAUTION:*** *Before attempting to work on a switch mechanism, be certain to pull, disconnect switch or otherwise assure that electrical circuit through control is de-energized.*

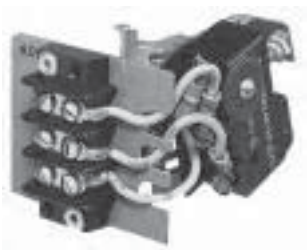
1. Disconnect switch leads from terminal block. Note and record terminal connections of switch to be replaced.

2. Remove two mounting screws holding existing switch. **(See Figure 6)**.

3. Remove existing switch and install replacement switch in the same position, tightening mounting screws securely.

NOTE: For proper operation of the replacement switch, it must actuate in the middle portion of the pivoted magnet's swing.

Figure 6



4. Check switch action and adjust as follows:

   A. Slowly rotate the pivoted magnet by hand, back and forth through its angle of swing, listening closely for the actuating click of the switch in each direction.

   B. Check to see if there is equal addition over-travel of magnet in its swing after the switch click in either direction.

   C. If switch actuation is not correct, change adjustment of actuating screw using a 1/16" hexagon key wrench. **(See Fig. 6)**.

NOTE: If a single switch is being replaced on a DPDT mechanism, lever of second switch must be depressed and held to allow for the audible adjustment of new switch, as described above.

   D. With new switch in adjustment, release lever of second switch and perform fine-tuning of both switches to provide simultaneous actuation (clicks).

5. Re-connect power supply and test switch action by varying liquid level in the vessel or by blowing-down float chamber.

MODEL NUMBER DESCRIPTION

Magnetrol mechanical level switches are identified by an alphnumeric part numbering system. The last three digits of the part number describe the type of switch mechanism, enclosure cover length and finish and magnet strength.

MAGNET STRENGTH

Magnetrol switch mechanisms are provided with different strength magnets as determined by the materials of construction. A red, white or yellow dot is visible on each magnet. When ordering replacement switch mechanisms, be certain to determine the colour dot on the magnet.

Example: B 7 5 – 1 B 2 0 – A A A

- Basic model number
- Materials of construction
- Tank connections
- Switch Mechanism, Enclosure & Magnet Strength

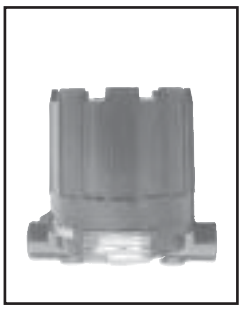
CAUTION: *NEVER replace a switch mechanism with a mechanism containing a dot of a different colour.*

AVAILABLE SWITCH MECHANISMS

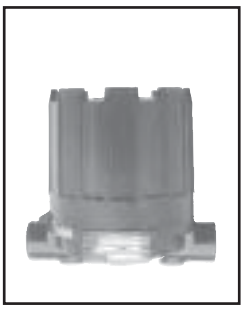
Type of switch module ①	Max. Process Temp. ②	Switch ratings – A res. ③			Code
		24 V DC	240 V AC	120 V AC	
Micro switch	max 120 °C (250 °F)	6	15	15	B
Micro switch	max 230 °C (450 °F)	10	15	15	C
Micro switch - DC current	max 120 °C (250 °F)	10	–	10	D
Micro switch with gold alloy contacts	max 120 °C (250 °F)	1	–	1	U
Hermetically sealed micro switch	max 290 °C (500 °F)	5	5	5	HS ④
Hermetically sealed micro switch with silver plated contacts	max 230 °C (450 °F)	3	1	1	W
Hermetically sealed micro switch with gold plated contacts	max 230 °C (450 °F)	0,5	0,5	0,5	X
Hermetically sealed micro switch	max 400 °C (750 °F)	4	–	2,5	F
Proximity switch - type SJ 3.5 SN	max 100 °C (210 °F)	NA	NA	NA	V
Mercury switch	max 290 °C (500 °F)	10	6,5	13	A
Mercury switch	max 400 °C (750 °F)	10	6,5	13	3
Pneumatic bleed type (open air)	max 200 °C (400 °F)	NA	NA	NA	J
Pneumatic non bleed type (closed circuit)	max 200 °C (400 °F)	NA	NA	NA	K

① For applications with heavy vibration, consult factory for suited switch modules.
② Max process temperature is specified at 40 °C (100 °F) ambient temperature and for non condensing applications.
③ For more details - see bulletin BE 42-120.
④ For condensing applications, max process temperature is down-rated to 200 °C (400 °F) @ 40 °C (100 °F) ambient.

AVAILABLE HOUSINGS



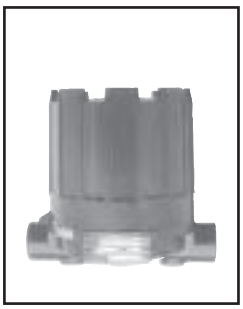
- For Non Ex use
- IP 66
- Die cast Aluminium
- 2 Entries (one plugged)
- Standard blue anti corrosive coating
- Housing heater/drain available, consult factory



- For Exd/Exi use
- IP 66
- Die cast Aluminium
- 2 Entries (one plugged)
- Standard blue anti corrosive coating
- ATEX II 2G EEx d II C T6
- ATEX II 1G EEx ia II C T6

- For Exd use
- IP 66
- Cast Iron
- One entry (2 entries at request)
- Standard blue anti corrosive coating
- CENELEC EEx d II C T6

- For pneumatic switches
- IP 53 (NEMA 3R)
- IP 55 optional at request
- Alu base / cold rolled steel cover
- Standard blue anti corrosive coating



- For Exd use
- IP 66 (NEMA 7/9)
- Die cast Aluminium
- 2 Entries (one plugged)
- Standard blue anti corrosive coating
- FM, Class I, Div. 1, Groups C & D
- FM, Class II, Div. 1, Groups E, F & G

Electric switch mechanism & enclosure for models with tall cover

qty and switch type		All models with red dot magnets									All models with yellow dot magnets								
		Weather proof (IP 66)		ATEX (IP 66)				CENELEC (IP 66)		FM (IP 66)	Weather proof (IP 66)		ATEX (IP 66)				CENELEC (IP 66)		FM (IP 66)
				II 2G EEx d II C T6		II 1G EEx ia II C T6		EEx d II C T6		NEMA 7/9			II 2G EEx d II C T6		II 1G EEx ia II C T6		EEx d II C T6		NEMA 7/9
		cast Aluminium		cast Aluminium		cast Aluminium		cast Iron		cast Alu.	cast Aluminium		cast Aluminium		cast Aluminium		cast Iron		cast Alu.
		M20 x 1,5	1" NPT	M20 x 1,5	1" NPT	M20 x 1,5	1" NPT	M20 x 1,5	3/4" NPT	1" NPT	M20 x 1,5	1" NPT	M20 x 1,5	1" NPT	M20 x 1,5	1" NPT	M20 x 1,5	3/4" NPT	1" NPT
A	1 x SPDT	A2A	AAA	AKC	ACC	-	-	AK7	AU7	AKA	A2B	AAB	AK9	AC9	-	-	AK5	AU5	AKB
	2 x SPDT	A4A	ABA	ALC	ADC	-	-	AL7	AV7	ALA	A4B	ABB	AL9	AD9	-	-	AL5	AV5	ALB
	3 x SPDT	36E	3CA	38E	3EE	-	-	367	377	3ME	A6B	ACB	AM9	AE9	-	-	A65	A75	AMB
	1 x DPDT	A8A	ADA	ANC	AFC	-	-	AD7	AW7	ANA	A8B	ADB	AN9	AF9	-	-	AD5	AW5	ANB
	2 x DPDT	A1A	AEA	APC	AGC	-	-	AO7	AY7	AOA	A1B	AEB	AP9	AG9	-	-	AO5	AY5	AOB
3	1 x SPDT	32A	3AA	3KC	3CC	-	-	3K7	3U7	3KA	32B	3AB	3K9	3C9	-	-	3K5	3U5	3KB
	2 x SPDT	34E	3BA	39E	3DE	-	-	3L7	3V7	3LE	34B	3BB	3L9	3D9	-	-	3L5	3V5	3LB
	3 x SPDT	36E	3CA	38E	3EE	-	-	367	377	3ME	36B	3CB	3M9	3E9	-	-	365	375	3MB
	1 x DPDT	38A	3DA	3NC	3FC	-	-	3D7	3W7	3NA	38B	3DB	3N9	3F9	-	-	3D5	3W5	3NB
	2 x DPDT	31A	3EA	3PC	3GC	-	-	3O7	3Y7	3OA	31B	3EB	3P9	3G9	-	-	3O5	3Y5	3OB
B	1 x SPDT	B2A	BAA	BKC	BCC	-	-	BK7	BU7	BKA	B2B	BAB	BK9	BC9	-	-	BK5	BU5	BKB
	2 x SPDT	B4A	BBA	BLC	BDC	-	-	BL7	BV7	BLA	B4B	BBB	BL9	BD9	-	-	BL5	BV5	BLB
	3 x SPDT	B6A	BCA	BMC	BEC	-	-	B67	B77	BMA	B6B	BCB	BM9	BE9	-	-	B65	B75	BMB
	1 x DPDT	B8A	BDA	BNC	BFC	-	-	BD7	BW7	BNA	B8B	BDB	BN9	BF9	-	-	BD5	BW5	BNB
	2 x DPDT	B1A	BEA	BPC	BGC	-	-	BO7	BY7	BOA	B1B	BEB	BP9	BG9	-	-	BO5	BY5	BOB
C	1 x SPDT	C2A	CAA	CKC	CCC	C2X	CAX	CK7	CU7	CKA	C2B	CAB	CK9	CC9	C2T	CAT	CK5	CU5	CKB
	2 x SPDT	C4A	CBA	CLC	CDC	C4X	CBX	CL7	CV7	CLA	C4B	CBB	CL9	CD9	C4T	CBT	CL5	CV5	CLB
	3 x SPDT	C6A	CCA	CMC	CEC	-	-	C67	C77	CMA	C6B	CCB	CM9	CE9	-	-	C65	C75	CMB
	1 x DPDT	C8A	CDA	CNC	CFC	C8X	CDX	CD7	CW7	CNA	C8B	CDB	CN9	CF9	C8T	CDT	CD5	CW5	CNB
	2 x DPDT	C1A	CEA	CPC	CGC	C1X	CEX	CO7	CY7	COA	C1B	CEB	CP9	CG9	C1T	CET	CO5	CY5	COB
D	1 x SPDT	D2B	DAB	DK9	DC9	-	-	DK5	DU5	DKB	D2B	DAB	DK9	DC9	-	-	DK5	DU5	DKB
	2 x SPDT	D4B	DBB	DL9	DD9	-	-	DL5	DV5	DLB	D4B	DBB	DL9	DD9	-	-	DL5	DV5	DLB
	3 x SPDT	-	-	-	-	-	-	-	-	-	D6B	DCB	DM9	DE9	-	-	D65	D75	DMB
	1 x DPDT	D8B	DDB	DN9	DF9	-	-	DD5	DW5	DNB	D8B	DDB	DN9	DF9	-	-	DD5	DW5	DNB
	2 x DPDT	D1B	DEB	DP9	DG9	-	-	DO5	DY5	DOB	D1B	DEB	DP9	DG9	-	-	DO5	DY5	DOB
F	1 x SPDT	FCA	FAA	FKC	FCC	-	-	FK7	FU7	FKA	FCB	FAB	FK9	FC9	-	-	FK5	FU5	FKB
	2 x SPDT	FFA	FBA	FLC	FDC	-	-	FL7	FV7	FLA	FFB	FBB	FL9	FD9	-	-	FL5	FV5	FLB
	1 x DPDT	FGA	FDA	FNC	FFC	-	-	FD7	FW7	FNA	FGB	FDB	FN9	FF9	-	-	FD5	FW5	FNB
	2 x DPDT	FHA	FEA	FPC	FGC	-	-	FO7	FY7	FOA	FHB	FEB	FP9	FG9	-	-	FO5	FY5	FOB
HS	1 x SPDT	H7A	HM2	HFC	HA9	-	-	HB3	HB4	HM3	H7A	HM2	HFC	HA9	-	-	HB3	HB4	HM3
	1 x DPDT	H7C	HM6	HGC	HB9	-	-	HB7	HB8	HM7	H7C	HM6	HGC	HB9	-	-	HB7	HB8	HM7
U	1 x SPDT	U2A	UAA	UKC	UCC	U2X	UAX	UK7	UU7	UKA	U2B	UAB	UK9	UC9	U2T	UAT	UK5	UU5	UKB
	2 x SPDT	U4A	UBA	ULC	UDC	U4X	UBX	UL7	UV7	ULA	U4B	UBB	UL9	UD9	U4T	UBT	UL5	UV5	ULB
	3 x SPDT	U6A	UCA	UMC	UEC	-	-	U67	U77	UMA	U6B	UCB	UM9	UE9	-	-	U65	U75	UMB
	1 x DPDT	U8A	UDA	UNC	UFC	U8X	UDX	UD7	UW7	UNA	U8B	UDB	UN9	UF9	U8T	UDT	UD5	UW5	UNB
	2 x DPDT	U1A	UEA	UPC	UGC	U1X	UEX	UO7	UY7	UOA	U1B	UEB	UP9	UG9	U1T	UET	UO5	UY5	UOB
V	-	-	-	-	-	VJS	VLS	-	-	-	-	-	-	-	VCS	VES	-	-	-
W	1 x SPDT	W2A	WAA	WKC	WCC	W2X	WAX	WK7	WU7	WKA	W2B	WAB	WK9	WC9	W2T	WAT	WK5	WU5	WKB
	2 x SPDT	W4A	WBA	WLC	WDC	W4X	WBX	WL7	WV7	WLA	W4B	WBB	WL9	WD9	W4T	WBT	WL5	WV5	WLB
	3 x SPDT	W6A	WCA	WMC	WEC	-	-	W67	W77	WMA	W6B	WCB	WM9	WE9	-	-	W65	W75	WMB
	1 x DPDT	W8A	WDB	WN9	WF9	W8T	WDT	WD5	WW5	WNB	W8B	WDB	WN9	WF9	W8T	WDT	WD5	WW5	WNB
	2 x DPDT	W1B	WEB	WP9	WG9	W1T	WET	WO5	WY5	WOB	W1B	WEB	WP9	WG9	W1T	WET	WO5	WY5	WOB
X	1 x SPDT	X2A	XAA	XKC	XCC	X2X	XAX	XK7	XU7	XKA	X2B	XAB	XK9	XC9	X2T	XAT	XK5	XU5	XKB
	2 x SPDT	X4A	XBA	XLC	XDC	X4X	XBX	XL7	XV7	XLA	X4B	XBB	XL9	XD9	X4T	XBT	XL5	XV5	XLB
	3 x SPDT	X6A	XCA	XMC	XEC	-	-	X67	X77	XMA	X6B	XCB	XM9	XE9	-	-	X65	X75	XMB
	1 x DPDT	X8B	XDB	XN9	XF9	X8T	XDT	XD5	XW5	XNB	X8B	XDB	XN9	XF9	X8T	XDT	XD5	XW5	XNB
	2 x DPDT	X1B	XEB	XP9	XG9	X1T	XET	XO5	XY5	XOB	X1B	XEB	XP9	XG9	X1T	XET	XO5	XY5	XOB

Select electric switch mechanism & enclosure for models with short cover

qty and switch type		All models with red dot magnets									All models with yellow dot magnets								
		Weather proof (IP 66)		ATEX (IP 66)				CENELEC (IP 66)		FM (IP 66)	Weather proof (IP 66)		ATEX (IP 66)				CENELEC (IP 66)		FM (IP 66)
				EEx d IIC T6		II 1G EEx ia II C T6		EEx d IIC T6		NEMA 7/9			EEx d IIC T6		II 1G EEx ia II C T6		EEx d IIC T6		NEMA 7/9
		cast Aluminium		cast Aluminium		cast Aluminium		cast Iron		cast Alu.	cast Aluminium		cast Aluminium		cast Aluminium		cast Iron		cast Alu.
		M20 x 1,5	1" NPT	M20 x 1,5	1" NPT	M20 x 1,5	1" NPT	M20 x 1,5	3/4" NPT	1" NPT	M20 x 1,5	1" NPT	M20 x 1,5	1" NPT	M20 x 1,5	1" NPT	M20 x 1,5	3/4" NPT	1" NPT
A	1 x SPDT	A2P	AAP	AHC	AAC	-	-	AK7	AU7	AKP	A2Q	AAQ	AH9	AA9	-	-	AK5	AU5	AKQ
	1 x DPDT	A8P	ADP	AJC	ABC	-	-	AD7	AW7	ANP	A8Q	ADQ	AJ9	AB9	-	-	AD5	AW5	ANQ
3	1 x SPDT	32P	3AP	3HC	3AC	-	-	3K7	3U7	3KP	32Q	3AQ	3H9	3A9	-	-	3K5	3U5	3KQ
	1 x DPDT	38P	3DP	3JC	3BC	-	-	3D7	3W7	3NP	38Q	3DQ	3J9	3B9	-	-	3D5	3W5	3NQ
B	1 x SPDT	B2P	BAP	BHC	BAC	-	-	BK7	BU7	BKP	B2Q	BAQ	BH9	BA9	-	-	BK5	BU5	BKQ
	1 x DPDT	B8P	BDP	BJC	BBC	-	-	BD7	BW7	BNP	B8Q	BDQ	BJ9	BB9	-	-	BD5	BW5	BNQ
C	1 x SPDT	C2P	CAP	CHC	CAC	C2L	CAL	CK7	CU7	CKP	C2Q	CAQ	CH9	CA9	C2S	CAS	CK5	CU5	CKQ
	1 x DPDT	C8P	CDP	CJC	CBC	C8L	CDL	CD7	CW7	CNP	C8Q	CDQ	CJ9	CB9	C8S	CDS	CD5	CW5	CNQ
D	1 x SPDT	-	-	-	-	-	-	-	-	-	D2Q	DAQ	DH9	DA9	-	-	DK5	DU5	DKQ
	1 x DPDT	-	-	-	-	-	-	-	-	-	D8Q	DDQ	DJ9	DB9	-	-	DD5	DW5	DNQ
F	1 x SPDT	F2P	FAP	FHC	FAC	-	-	FK7	FU7	FKP	F2Q	FAQ	FH9	FA9	-	-	FK5	FU5	FKQ
	1 x DPDT	F8P	FDP	FJC	FBC	-	-	FD7	FW7	FNP	F8Q	FDQ	FJ9	FB9	-	-	FD5	FW5	FNQ
HS	1 x SPDT	-	-	-	-	-	-	-	-	-	H7A	HM2	HFC	HA9	-	-	HB3	HB4	HM3
	1 x DPDT	-	-	-	-	-	-	-	-	-	H7C	HM6	HGC	HB9	-	-	HB7	HB8	HM7
U	1 x SPDT	U2P	UAP	UHC	UAC	U2L	UAL	UK7	UU7	UKP	U2Q	UAQ	UH9	UA9	U2S	UAS	UK5	UU5	UKQ
	1 x DPDT	U8P	UDP	UJC	UBC	U8L	UDL	UD7	UW7	UNP	U8Q	UDQ	UJ9	UB9	U8S	UDS	UD5	UW5	UNQ
V	-	-	-	-	-	VFS	VHS	-	-	-	-	-	-	-	V5S	VBS	-	-	-
W	1 x SPDT	W2P	WAP	WHC	WAC	W2L	WAL	WK7	WU7	WKP	W2Q	WAQ	WH9	WA9	W2S	WAS	WK5	WU5	WKQ
	1 x DPDT	-	-	-	-	-	-	-	-	-	W8Q	WDQ	WJ9	WB9	W8S	WDS	WD5	WW5	WNQ
X	1 x SPDT	X2P	XAP	XHC	XAC	X2L	XAL	XK7	XU7	XKP	X2Q	XAQ	XH9	XA9	X2S	XAS	XK5	XU5	XKQ
	1 x DPDT	-	-	-	-	-	-	-	-	-	X8Q	XDQ	XJ9	XB9	X8S	XDS	XD5	XW5	XNQ

Electric switch mechanism & enclosure for B40 models with tall cover and yellow dot magnets

qty and switch type		Weather proof (IP 66)		ATEX (IP 66)		FM (IP 66)
				II 2G EEx d II C T6		NEMA 7/9
		cast Aluminium		cast Aluminium		cast Alu.
		M20 x 1,5	1" NPT	M20 x 1,5	1" NPT	1" NPT
F	1 x SPDT	FCB	FAB	FK9	FC9	FKB
	1 x DPDT	FGB	FDB	FN9	FF9	FNB
S for AC current	1 x SPDT	S2B	SAB	SH9	SA9	SKB
	1 x DPDT	S8B	SDB	SJ9	SB9	SNB
S for DC current	1 x SPDT	S2R	SBB	SK9	SC9	SLB
	1 x DPDT	S8R	SEB	SN9	SF9	SOB

qty and switch type		Weather proof (IP 65)	NEMA 7/9 (IP 66)
		Alu base / cold rolled steel cover	cast Iron
		3/4" NPT	1" NPT
L	1 x SPDT	LAM	LKM
	1 x DPDT	LDM	LNM

INSTALLATION cont.

Series E, T & 2

Magnetrol controls are frequently used on applications where vibration is encountered, such as on scrubbers in oil field installations. Switch mechanisms may require repositioning to prevent sloshing of mercury in switches. This position is usually best at right angles to the direction of vibration. The direction of vibration may be determined by the arrangement of connections to the vessel or the vessel's mounting method. Accordingly, the vibration will tend to be in one direction only.

Upon determining the vibration direction, switch mechanism(s) may be rotated from an incorrect position (as shown in **Figure 7** at right which is looking at a control from above) to a correct position as follows:

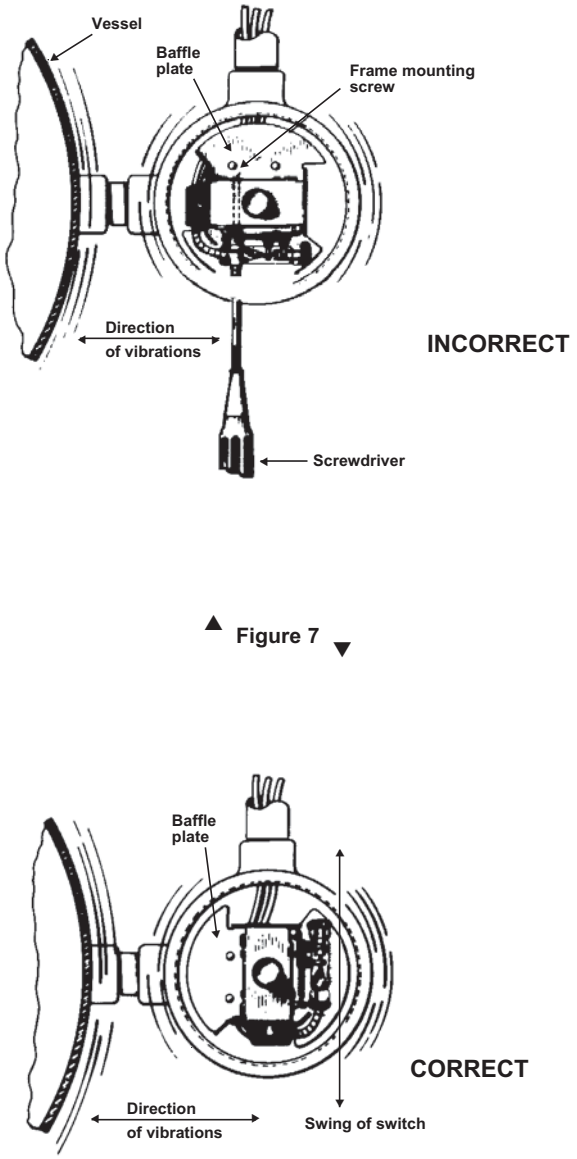
> ***CAUTION:*** *Before attempting to remove a switch mechanism, be certain to pull, disconnect switch or otherwise assure that electrical circuit through control is de-energized.*

1. Disconnect control from power supply.
2. Loosen screw in split mounting clamp until mechanism slides freely on enclosing tube, see **Figure 1** on page 2.
3. Rotate entire mechanism and bottom baffle plate, together to a correct position.

> ***CAUTION:*** *Be certain power supply wires retain some slack at new position. Do not pull wires taut.*

NOTE: Amount of rotation will vary with each installation and may not be as much, as shown in illustration.

4. Check action of mercury in switch at new position. When mercury sloshes from side to side in glass tube instead of end to end, correct position has been attained.
5. Tighten clamp screw on switch mechanism.
6. Re-connect power supply and test switch action under de-prating conditions.



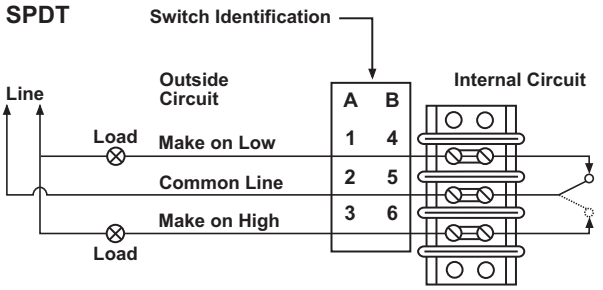
▲ Figure 7 ▼

REPLACEMENT MECHANISM

Switch series	*Contacts*	*Replacement mechanism with switch (ES)*		*Replacement switch only*	
		Yellow dot magnet	*Red dot magnet*	*Left hand*	*Right hand*
A & N	SPDT	A switch 89-7401-009	A switch 89-7401-003	NONE	37-4301-003
		B switch 89-7401-012	B switch 89-7401-006		
	DPDT	89-7401-055	89-7401-018	37-4303-003	
B & Q	SPDT	A switch 89-7401-103	A switch 89-7401-101	NONE	37-4604-001
		B switch 89-7401-104	B switch 89-7401-102		
	DPDT	89-7401-122	89-7401-121	37-4604-001	
C & O	SPDT	A switch 89-7401-109	A switch 89-7401-107	NONE	37-4621-002
		B switch 89-7401-110	B switch 89-7401-108		
	DPDT	89-7401-125	89-7401-124	37-4621-001	
D	SPDT	A switch 89-7401-105	A switch NONE	NONE	37-4606-001
		B switch 89-7401-106	B switch NONE		
	DPDT	89-7401-123	NONE	37-4606-001	
E	SPDT	A switch 89-7401-063	A switch 89-7401-073	NONE	37-4304-002
		B switch 89-7401-068	B switch 89-7401-078		
	DPDT	89-7401-052	89-7401-046	37-4304-002	
F	SPDT	A switch 89-7401-096	A switch 89-7401-094	NONE	37-4610-001
		B switch 89-7401-095	B switch 89-7401-093		
	DPDT	89-7401-098	89-7401-097	37-4610-001	
L	SPDT	89-7401-015	NONE	NONE	37-4326-001
	DPDT	89-7401-024		37-4325-001	
L Vibration resistant	SPDT	89-7401-155	NONE	NONE	37-4302-003
	DPDT	89-7401-156		37-4302-004	
S	SPDT	AC...89-7401-161 DC...89-7401-162	NONE	NONE	AC...37-4621-002 DC...37-4606-001
	DPDT	AC...89-7401-163 DC...89-7401-164		AC...37-4621-001 DC...37-4606-001	
2	SPDT	A switch 89-7401-149	A switch 89-7401-151	NONE	37-4302-003
		B switch 89-7401-150	B switch 89-7401-152		
	DPDT	89-7401-154	89-7401-153	37-4302-004	
3	SPDT	A switch 89-7401-146	A switch 89-7401-157	NONE	37-4326-001
		B switch 89-7401-147	B switch 89-7401-158		
	DPDT	89-7401-148	89-7401-159	37-4325-001	
U	SPDT	A switch 47-5535-001	A switch 47-5536-001	NONE	37-4630-001
		B switch 47-5534-001	B switch 47-5533-001		
	DPDT	47-6520-001	47-6519-001	37-4630-001	
W	SPDT	A switch 189-7410-003	A switch 189-7410-001	NONE	37-9101-001
		B switch 189-7410-004	B switch 189-7410-002		
	DPDT	189-7410-005	NONE	37-9101-001	
X	SPDT	A switch 189-7412-003	A switch 189-7412-001	NONE	37-9102-001
		B switch 189-7412-004	B switch 189-7412-002		
	DPDT	189-7412-005	NONE	37-9102-001	

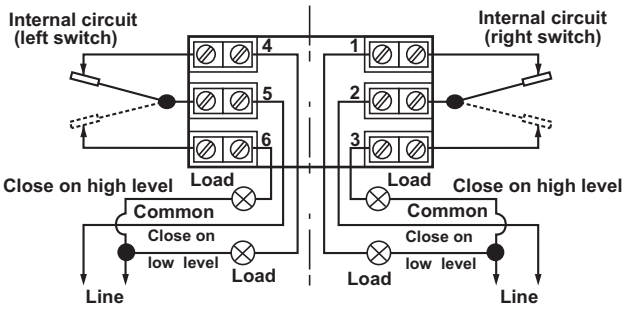
WIRING DIAGRAMS

SPDT



Circuits shown are for direct acting level switches and are reversed in side mounting float-in-tank models, which utilize reversing float pivot.

DPDT



IMPORTANT

SERVICE POLICY

Owners of Magnetrol products may request the return of a control; or, any part of a control for complete rebuilding or replacement. They will be rebuilt or replaced promptly. Magnetrol International will repair or replace the control, at no cost to the purchaser, (or owner) ***other than transportation cost*** if:

a. Returned within the warranty period; and,
b. The factory inspection finds the cause of the malfunction to be defective material or workmanship.

If the trouble is the result of conditions beyond our control; or, is **NOT** covered by the warranty, there will be charges for labour and the parts required to rebuild or replace the equipment.
In some cases, it may be expedient to ship replacement parts; or, in extreme cases a complete new control, to replace the original equipment before it is returned. If this is desired, notify the factory of both the model and serial numbers of the control to be replaced. In such cases, credit for the materials returned, will be determined on the basis of the applicability of our warranty.
No claims for misapplication, labour, direct or consequential damage will be allowed.

RETURNED MATERIAL PROCEDURE

So that we may efficiently process any materials that are returned, it is essential that a “Return Material Authorisation” (RMA) form will be obtained from the factory. It is mandatory that this form will be attached to each material returned. This form is available through Magnetrol’s local representative or by contacting the factory. Please supply the following information:

1. Purchaser Name
2. Description of Material
3. Serial Number
4. Desired Action
5. Reason for Return
6. Process details

All shipments returned to the factory must be by prepaid transportation. Magnetrol ***will not accept*** collect shipments.

All replacements will be shipped FOB factory.

BULLETIN N°: BE 42-783.2
EFFECTIVE: JUNE 2002
SUPERSEDES: December 1997

Magnetrol®

BENELUX	Heikensstraat 6, 9240 Zele, België Tel. (052) 45.11.11	Fax. (052) 45.09.93
DEUTSCHLAND	Schloßstraße 76, D-51429 Bergisch Gladbach-Bensberg Tel. (02204) 9536-0	Fax. (02204) 9536-53
FRANCE	Le Vinci 6 - Parc d’activités de Mitry Compans, 1, rue Becquerel, 77290 Mitry Mory Tél. 01.60.93.99.50	Fax. 01.60.93.99.51
ITALIA	Via Arese 12, I-20159 Milano Tel. (02) 607.22.98 (R.A.)	Fax. (02) 668.66.52
UNITED KINGDOM	Unit 1 Regent Business Centre Jubilee Road Burgess Hill West Sussex RH 15 9TL Tel. (01444) 871313	Fax (01444) 871317
INDIA	B4/115 Safdurjung Enclave, New Delhi 110 029 Tel. 91 (11) 6186211	Fax 91 (11) 6186418

Magnetrol®

ELECTRO-MECHANICAL LEVEL AND FLOW SWITCH

- **EC-declaration of conformity**
- **EG-verklaring van overeenstemming**
- **Déclaration de conformité CE**
- **EC Konformitätserklärung**
- **Dichiarazione di conformita' CE**
- **EU vaatimustenmukaisuusvakuus**

Serial number/Serienummer/Numéro de série/Seriennummer/Numero di serie/Mahdollinen sarjanumero/ Tillverkningsnummer/Serienummer/Número de série/Serial number/Número de serie/Serienummer:

85818-0100 1 to 85818-0100 3

GB Magnetrol® herewith declares that its electromechanical level and flow switches are in conformity with the provisions of:

1. The low voltage directive 2006/95/EC (applicable for voltages from 50 to 1000 V AC and from 75 to 1500 V DC) and declares furthermore that the following harmonized standards have been applied: EN 61010-1/2001
2. The PED directive 97/23/EC (pressure equipment directive). Safety accessories per category IV module H1. Notified body: Lloyd's Register of Shipping, 71, Fenchurch Street, London EC 3M-4BS, UK, notified body N° 0038. The following standard has been applied: ANSI/ASME B31.3

NL **B** Magnetrol® verklaart hiermede dat zijn electromechanische niveau- en debiet schakelaars voldoen aan de bepalingen van:

1. De laagspanningsrichtlijn: 2006/95/EC (van toepassing voor nominale spanningen tussen 50 en 1000 VAC en tussen 75 en 1500 V DC) en verklaart voorts dat de volgende geharmoniseerde norm is toegepast: EN 61010-1/2001
2. De PED richtlijn 97/23/EC (pressure equipment directive). Veiligheidsaccessoires per categorie IV module H1. Aangemelde instantie: Lloyd's Register of Shipping, 71, Fenchurch Street, London EC 3M-4BS, UK, aangemelde instantie nr. 0038. De volgende norm is toegepast: ANSI/ASME B31.3

F **B** **L** Magnetrol® déclare que ses alarmes électromécaniques de niveau et de débit sont conformes à:

1. Directive sur les basses tensions 2006/95/EC (applicable pour les tensions de 50 à 1000 V CA et de 75 à 1500 V CC) et déclare que les normes harmonisées suivantes ont été appliquées: EN 61010-1/2001
2. La directive PED 97/23/EC (pressure equipment directive). Accessoires de sécurité selon catégorie IV module H1. Certification: Lloyd's Register of Shipping, 71, Fenchurch Street, London EC 3M-4BS, UK, numéro d'agrément 0038. La norme suivante a été appliquée: ANSI/ASME B31.3

D **A** **B** Magnetrol® erklärt hiermit, daß die elektronische Füllstand- und Durchflußmessgeräte konform sind mit den einschlägigen Bestimmungen der:

1. Niederspannungsrichtlinie 2006/95/EG (Richtlinien für Spannungen zwischen 50 V und 1000 V Wechselspannung (AC) und 75 V und 1500 V Gleichspannung (DC)). Des weiteren erklären wir, daß folgende harmonisierten Normen zur Anwendung gelangten: EN 61010-1/2001
2. PED EU-Richtlinie 97/23/EG (pressure equipment directive). Sicherheitszubehör per Kategorie IV Modul H1. Zugelassen durch Lloyd's Register of Shipping, 71, Fenchurch Street, London EC 3M-4BS, UK, Zulassungsnr. 0038. Folgende Norm gelangte zur Anwendung ANSI/ASME B31.3

I Magnetrol® dichiara che la propia produzione di livellostati, flussostati elletromeccanici e' conforme a quanto previsto da:

1. Direttiva 2006/95/EC per basse tensioni (applicabili per tensioni da 50 a 1000 V CA e da 75 a 1500 CC) e dichiara inoltre che vengono applicate le seguenti standards armonizzati: EN 61010-1/2001
2. Direttiva PED 97/23/EC (pressure equipment directive). Accessori di sicurezza in categoria IV modulo H1. Notificato da: Lloyd's Register of Shipping, 71, Fenchurch Street, London EC 3M-4BS, UK, notifica 0038. Sono stati applicati i seguenti standards ANSI/ASME B31.3

SF Magnetrol® vakuuttaa, että sen Sähkömekaaniset pinta- ja virtauskytkimet täyttävät seuraavat direktiivit:

1. Pienjännitteen direktiivit 2006/95/EC (Jänniteille 50 – 1000 V AC ja 75 – 1500 V DC). Ja lisäksi vakuuttaa, että seuraavia yhdenmukaistettuja standardeja on sovellettu: EN 61010-1/2001
2. PED-direktiivi 97/23/EC (Paineastiadirektiivi). Turvavarusteet luokan IV modulin H1 mukaan Ilmoittava tarkastuslaitos (Notified Body): Lloyd's Register of Shipping, 71, Fenchurch Street, London EC 3M-4BS, UK, tarkastuslaitos 0038. Seuraavia standardeja on sovellettu: ANSI/ASME B31.3

- **EC deklarationer om överensstämmelse**
- **EC overensstemmelses erklæring**
- **Declaração de conformidade CE**
- Διακηρύξεις συμμορφώσεως της Ε.Ε.
- **Declaraciones de conformidad EC**
- **Erklæring om samsvar med EC**

S

Magnetrol® deklarerar härmed att dess elektromekaniska nivå- och flödestillverkade stämmer överens med villkoren för:

1. Lågspanningsdirektiv 2006/95/EC (tillämpliga för spänningar från 50 till 1000 V AC och från 50 till 1500 V DC) och deklarerar att följande tillämpliga standard har följts:
   EN 61010-1/2001
2. PED-direktiven 97/23/EC (direktiv för tryckutrustning). Säkerhetstillbehör enligt kategori IV avsnitt H1.
   Handlaggande organisation: Lloyd's Register of Shipping, 71, Fenchurch Street, London EC 3M-4BS, UK, org. nummer 0038.
   Följande standard har följts: ANSI/ASME B31.3

DK

Magnetrol® erklærer herved at dets elektromekaniske niveau-og flowkontakter er i overensstemmelse med bestemmelserne i:

1. Lavspændingsdirektiverne 2006/95/EC (anvendelig for spændinger fra 50 till 1000 V AC og fra 75 til 1500 V DC) og erklærer yderligere at følgende harmoniserede standarder er anvendt:
   EN 61010-1/2001
2. PED-direktivet 97/23/EC (Trykudstyrsdirektivet). Sikkerhedstilbehør i.h.t. kategori IV, modul H1. Informeret instans: Lloyd's Register of Shipping, 71, Fenchurch Street, London EC 3M-4BS, UK, informeret instans 0038. Samt at have anvendt følgende standarder: ANSI/ASME B31.3

P

Magnetrol® declara que os seus commutadores de nivel e fluxo electro-mecânicos estão em conformidade com:

1. Directiva de baixa tensão 2006/95/EC (apilcável para tensões de 50 a 1000 V AC e de 75 a 1500 V DC) e mais declara que foi aplicado o seguinte padrão homologado:
   EN 61010-1/2001
2. Directiva PED 97/23/EC (directiva para equipamentos sobre pressão). Accessórios de segurança, categoria IV modulo H1. Departamento emissor: Lloyd's Register of Shipping, 71, Fenchurch Street, London EC 3M-4BS, UK, departamento emissor 0038.
   Os seguintes standards tambem se aplicam:
   ANSI/ASME B31.3

GR

Η Magnetrol® δηλοί με το παρόν ότι οι ηλεκτρονικοί της διακόπτες στάθμης και ροής συμμοφούνται προς τις διατάξεις:

1. Επίσης δηλοί ότι συμμορφούνται προς τις διατάξεις των οδηγίων 2006/95/EC περί χαμηλών τάσεών (εφαρμοζομένών σε τάσεις απο 50 έώς 1000 V AC και απο 75 έως 1500 V DC). Επιπλέον δηλοί ότι η εξής εναρμονισμένη προδιαγραφή έχει εφαρμοσθη:
   EN 61010-1/2001
2. Οδηγία PED 97/23/EC (οδηγία για εξοπλισμό πίεσης) Ασφαλιστικά παρελκόμενα κατά κατηγορία IV μονάδα H1. Ειδοποιηθείς οργανιομός: Lloyd's Register of Shipping, 71, Fenchurch Street, London EC 3M-4BS, UK, ειδοποιηθείς οργανιομός 0038. Τα ακόλουθα εναρμονισμένα πρότυπα έχουν εφαρμοσθει:
   ANSI/ASME B31.3

E

Magnetrol® a continuación declara que sus interruptores de nivel y flujo electromécanicos estan en conformidad con las provisiones de:

1. Directiva de bajo voltaje 2006/95/EC (aplicables para voltajes de 50 a 1000 V CA y desde 75 a 1500 V CC) y así mismo declara que las siguientes normativas han sido aplicadas:
   EN 61010-1/2001 y Enmienda N° 1
2. Directiva 97/23/EC (directiva de equipos a presion). Accesorios de seguridad por categoria IV modulo H1. Cuerpo Notificador: Lloyd's Register of Shipping, 71, Fenchurch Street, London EC 3M-4BS, UK, cuerpo notificador 0038. La siguiente normativa ha sido aplicada: ANSI/ASME B31.3

N

Magnetrol® erklærer herved at elektromekanisk nivå og strømningsbrytere, er produsert i henhold til, og møter kravene i følgende direktiver og standarder relatert til disse:

1. Lavspenningsdirektiv 2006/95/EC (gjeldende for spenninger fra 50 til 1000 V AC og 75 til 1500 V DC) bekrefter videre at følgende harmoniserte standarder er benyttet:
   EN 61010-1/2001 og tillegg nr 1.
2. PED direktiv 97/23/EC (Direktiv for trykk utstyr). Sikkerhets tilleggsutstyr i henhold til kategori IV modul HI
   Sertifiseringsorgan: Lloyd's Register of Shipping, 71, Fenchurch Street, London EC 3M-4BS, UK, registreringsnummer 0038. Følgende standarder er relatert til sertifiseringen: ANSI/ASME B31.3

Magnetrol®
European Manufacturing
Heikensstraat 6, 9240 Zele
BELGIUM
Tel. (052) 45.11.11
Fax (052) 45.09.93

Operations Manager

P. D'Hoey

Bulletin N°: AP41-121.3
Effective: Jan 2007

14.15 Riscaldatore

Numero di disegno Voith: 4 226146 024

Tipo: NE-F-4000-1,3-400 D-75 (2xSPDT)

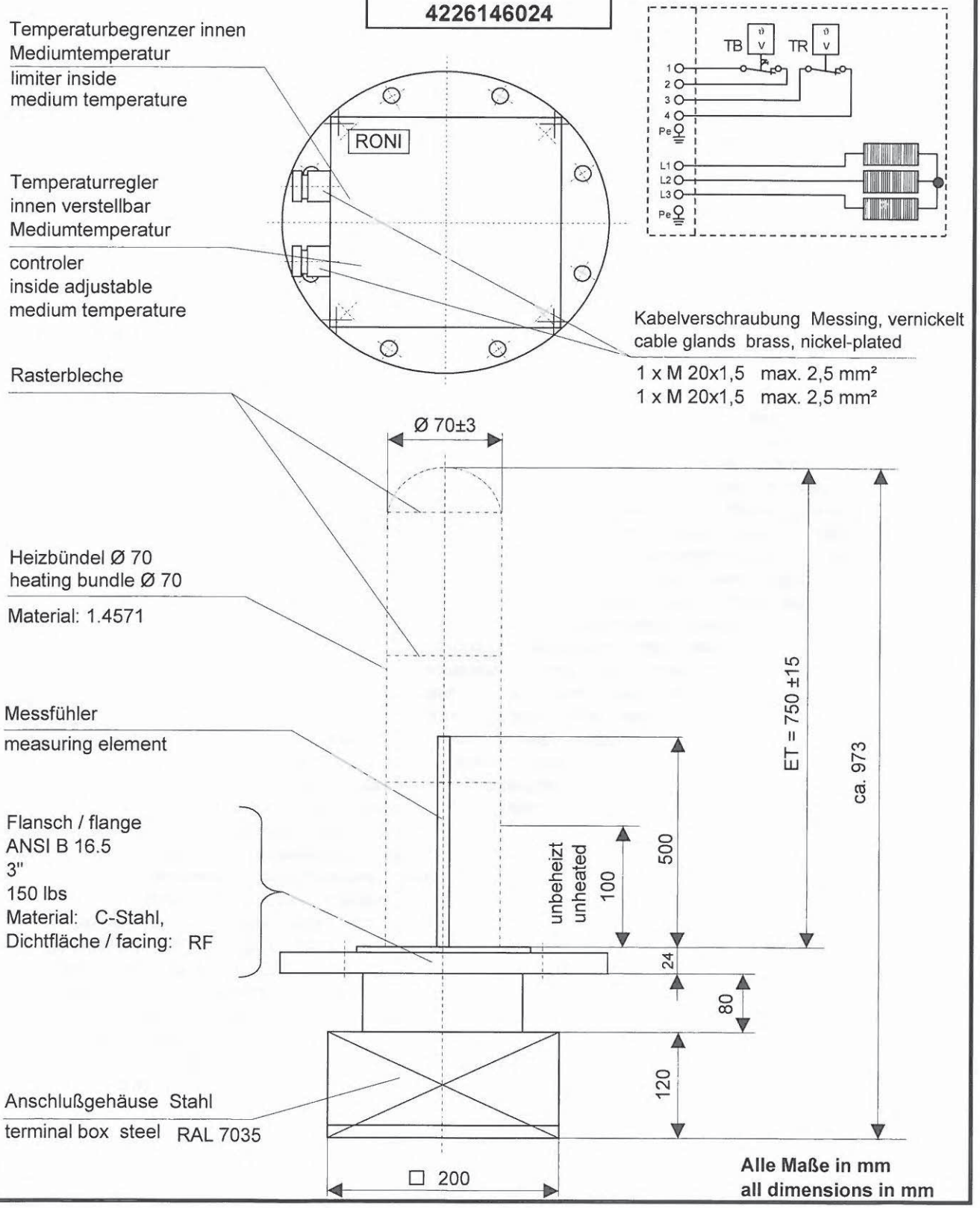
(4 kW; 400V; 50 Hz; IP65)

Descrizione. . . . . RONI

RONI-Elektrogerätebau GmbH Bokeler Weg 5 D-29596 Nienwohlde	Heizkörper zur Erwärmung von: **Schmieroel** Heater for warming of: **lube-oil** **K - 980283**	Artikel-Nr. **20539** 23.10.09

Typ:	**NE - F - 4 - 1,3 - 400D - 75**			S.-Nr.:	**19308 - 19310**
P: **4 kW**	U: **400 V 3~**	I: **5,8 A**	Oberflächenbel. / surface-load:		**1,3 W/cm²**
Temperatur-Regler / controller:	**0 - +70°C**			Begrenzer / limiter :	**+130°C**
Steuerspannung / control voltage:	**230 V AC**			eingestellt auf / fixed by :	**+15°C**
Schutzart / protection-typ:	**IP 65**		Schaltung / wiring diagram:		**4**
Einbaulage / mounting position:	**waagerecht / horizontal**			Gewicht / weight:	**ca. 15 kg**

Voith-Indent-Nr.:
4226146024

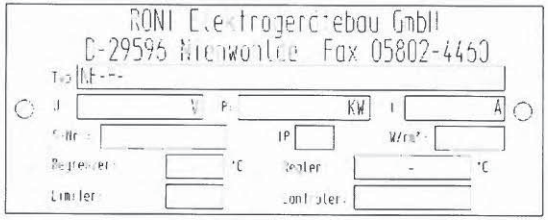


Alle Maße in mm
all dimensions in mm

Operating Instructions
Electric Heater for heating up fluid

Type : NE-F-...

Protection class : See Name Plate
Rated voltage : See Name Plate
Rated output : See Name Plate
Medium : See Data Sheet



Heating up fluid in:
- tanks which are open to the atmosphere
- tanks which are closed to the atmosphere but not under internal overpressure
- closed tanks under internal overpressure (pressure vessels)
- fitting as a heating insert in a pipe system which has fluid flowing through it (flow heater)

Construction:
Electrical heater consisting of a heating bundle with electrical heating elements, protection tubes with sensors, connection flange / threaded nipple and connection box with temperature-limiter and –controller or other measuring sensor, depending on version.

Storage instructions:
The devices must be stored in a dry warehouse with a regulated temperature acc. to storage directions for electrical appliances.

Mounting specifications:
Depending on the version, the heating insert must be fitted with a flange connection or screw-in thread (outside thread) in a tank or pipe system sealed against the atmosphere. The device must be provided with a roof as shelter against the rain or sun depending of the site of installation and the climatic conditions.
The heater is designed for an ambient temperature of –20°C to +40°C in acc. with EN 50014. Other heaters are marked with T_{amb} and the ambient temperature the heaters are designed for!

Flange connection:
The flange is connected into /onto a tank or pipe system by means of the heating insert flange, sealing between the heating insert and the tank flange and the bolts and the nuts suitable for the flange connection. The enterprise doing the assembly is responsible for choosing the right gasket, bolts and nuts to suit the medium to be heated, the pressure and the temperature. Before tightening the screwed connection (bolts with nuts), check that the gasket between the heating insert flange and the tank flange is positioned properly and if necessary correct the position of the gasket. Once the flange has been connected, check the gasket in accordance with the operating conditions for the tank or pipe system.
The bolts, nuts and gasket are not included in the scope of supply.

Screw-in connection:
By producing screw-in connections, suitable sealing material must be placed correctly at the outside threading of the heating insert's threaded nipple. Once the sealing material has been put on, the threaded nipple must be screwed into the threaded coupling in the tank or pipe system. As for the flange connection, select right materials and check the sealing.

Fitting position of the heating insert:
The correct position for fitting the heating insert is horizontal with the rating plate on "TOP". Respectively the vertical fitting position, with connection head on top or down. The precise mounting position is to be taken from the data sheet.

Temperature regulation:
The measuring sensors for the temperature limiter is accommodated in the top area of the heating bundle. Other sensors can be assembled (temperature controller, RTD, Thermocouple, capillary tube controller) too. The actual version of the heater can be seen in the data-sheet and the wiring diagram. The active parts of the sensors are in protection tubes (dip tube) and acquire the fluid temperature (see data sheet). The contact mechanisms, if any, of the temperature controller and limiter are inside the connecting box of the heating insert. It is not possible for the customer to adjust the temperature limiter. This may be done by the manufacturer only. It opens and interlocks a snap-action contact when the set temperature is exceeded. The temperature of the limiter has been fixed permanently in the factory and is secured against adjustment. All warranty and liability claims will be excluded if the seal is damaged. The temperature limiter can be unlocked only when the temperature has been reduced by about 10 K. If you "PRESS" the Reset-Button of the temperature limiter you unlock it. It does not occur automatically.

Temperature regulator:
This can be adjusted within its setting range. Turning the controller knob in a clockwise direction increases the temperature and turning in an anti-clockwise direction decreases the temperature. The scale indicates standard values only. Once the set temperature is reached, a snap-action contact opens. It closes again if the temperature drops by nearly 7K (Two-state controller). Output with potential free contact.

See type plate of the heater for set-up values of temperature-limiter and -controller.
The correct control voltage is shown in the data sheet.

	voltage	current	model
min.	24 V AC /DC	20 mA	Standard
max.	230 V AC	16 A	Standard
max.	230 V DC	0,25 A	Standard
min.	10 V AC / DC	10 mA	Au – contacts
max.	24 V AC / DC	0,1 A	Au – contacts

min. / max. control voltage with belonging contact rating

Level monitoring:
The top point of the heating bundle must be covered by at least 50 mm of fluid while the heating insert is being operated. The plant operator must take suitable measures to ensure this, for example by having an electrical interlock from the level monitor to the heating insert control.

WARNING!!
Depending on the medium, a fire and/or explosion may occur if the heating bundle is run in dry operation without being adequately covered by fluid. This can be expected to destroy the heating bundle. If the heating insert is integrated into a pipe system, the afore-said measures must also be taken or it must be ensured in terms of design and operation that fluid will flow through the heating bundle at all times and that the system unit will be subjected to forced ventilation always.

Electric connection:
The heating insert must be connected on site by authorised personnel in acc. with the local rules and regulations.
- Check the existing voltage against that specified on the rating plate.
- Open the connection compartment lid
- Lead in the power and control cable by cable glands and connect it the corresponding terminals in acc. with the wiring diagram.
- Close the connection compartment lid.
- It is important that the cables matches the screwed cable glands in terms of size and diameter because otherwise it will not be possible to conform to this type of protection.

Safety instruction:
Do not work on the device when it is energised!!!
Disconnect the voltage before opening the connection box and secure against restart.

Hot system parts, for example flange connection from the tank to the heating insert at surface temperatures above + 60°C must be provided with protection against accidental contact.

Electric actuation of the heating insert: see page 6

The temperature regulator and temperature limiter in the heating insert are designed as single-pole potential free control contacts. They are intended for integration into an electrical power control by means of power contactors. For safety reasons the regulator and limiter are each provided wit a separate power contactor and each actuated separately by means of the regulator- and limiter-contacts.
The level monitoring must also be integrated into the electric control so that the heater can be turned on if the heating is covered by minimum 50 mm of fluid only.

Hint:
We are not responsible for mounting the heating insert into the plant, connecting electric power to the heating insert or producing power control. This work must be done by the plant erector or operator on his own responsibility.

Maintenance:
The following service work should be done:
- check the sealing of the flanged joint
- check for deposits of settling sediment and suspended materials in the heating bundle (time intervals depending of the medium and deposit material).
- check for condensate in the electrical terminal box (check every 12 months)
- check the connection terminals for oxidation and tightness. (depending upon the climatic zone and ambient conditions)
- The device inspections interval is 3 years has to be done following the local laws and specifications

Exchangeable components:
- temperature limiter
- temperature regulator
- RTD/ Thermocouple

Exchange of parts at manufacturers site or by well trained and qualified personnel only. Switch off main voltage before start of repair!

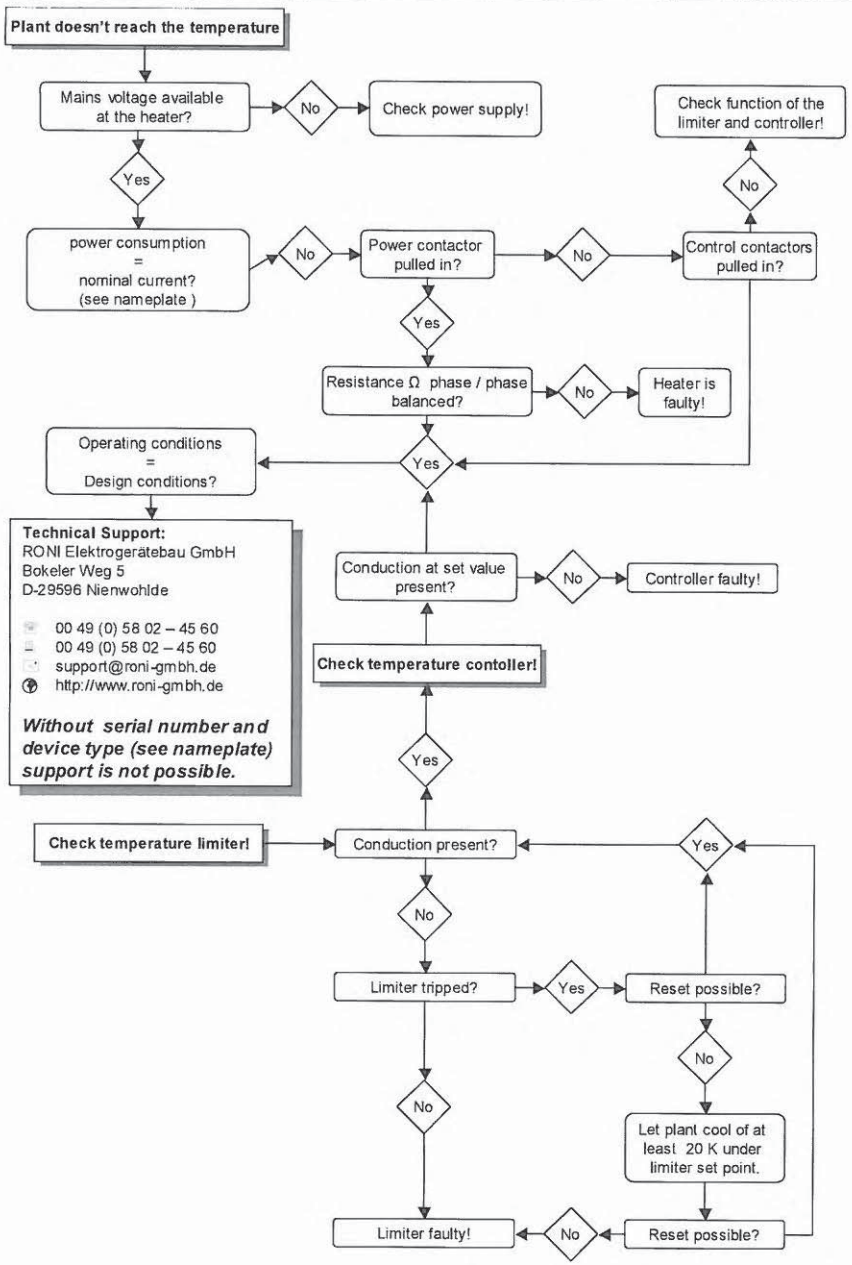
The electrical heating elements are soldered or welded tightly into the flange plate and cannot be replaced.

Changing components:
- Open the cover of the connection box
- Remove the regulator or limiter off it´s mounting plate
- Pull the capillary out of its protection tube.
- Insert new capillary into the protection tubes (be careful not to bend them)!!
- Reassembling in reverse sequence

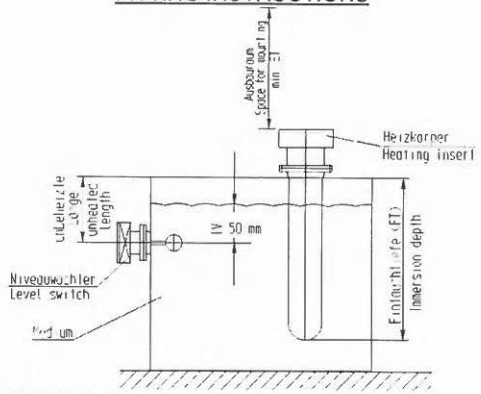
Troubleshooting
The plant does not reach the right temperature:
Check the following (page 5) in acc. with the local laws for an explosion-protected area!

Medium cannot be heated sufficiently although the heater is working.
Check the switch-on period of the heating unit. If the heating unit switches on and off constantly, this indicates there is poor heat transmission to the medium (for instance, if the liquid is resting without sufficient circulation from the switched on pumps).

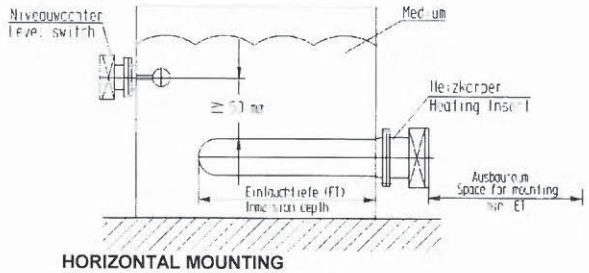
Interference in our appliances by unauthorised persons will release us from all liability or warranties!



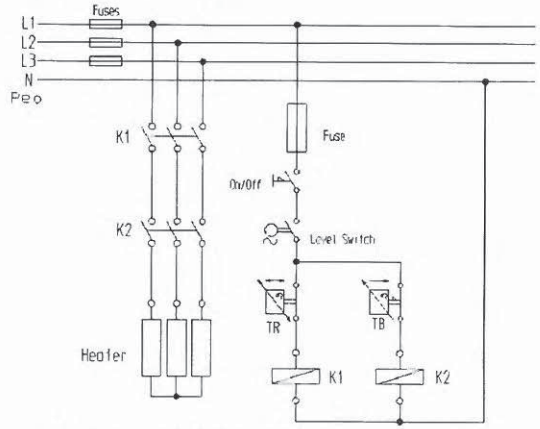
FITTING INSTRUCTIONS



VERTICAL MOUNTING



HORIZONTAL MOUNTING



Minimum requirements to power control (not part of delivery)

EG – Konformitätserklärung
EC – Declaration of Conformity

Name des Herstellers oder seines in der Gemeinschaft niedergelassenen Bevollmächtigten
Name of the manufacturer or his authorized representative established in the EEC

R O N I - Elektrogerätebau GmbH

Elektrische Industrieheizsysteme

Anschrift des Herstellers
Address of the manufacturer

Bokeler Weg 5

29596 Nienwohlde

Wir erklären, dass das von uns in Verkehr gebrachte Erzeugnis
We declare, that the equipment

Beschreibung der Maschine / Description of the machinery

Produktart / Kind of product:

Bezeichnung / Designation: **Industrieheizkörper, elektrisch**
Industrial Heater, electrical

Typ / Type : **NE-F-4-1,5-380D-75**

Serien-Nr. / Serial-No.: **19456** Komm-Nr. / Komm.-No.: **980332-3**

Hinsichtlich Konzipierung und Bau den grundlegenden Sicherheits- und Gesundheitsanforderungen der/ den nachstehend aufgeführten EG Richtlinie(n) entspricht.
Is designed and build in acc. with the following security- and health-requirements of the EEC:

Richtlinie / General Instruction: **2006/95/WE Niederspannungsrichtlinie**
2006/95/WE Low voltage instruction

Hierfür wurden nachstehende harmonisierte Normen angewandt:
The following technical standards and specifications were used:

VDE 0721 Teil 2 A3/ DIN 57 721

Es wurden folgende technische Normen und Spezifikationen angewandt :
The following technical standards and specifications were used:

VDE 0721 Teil 2 A3/ DIN 57 721

RONI Elektrogerätebau GmbH · Bokeler Weg 5 · D-29596 Nienwohlde · Tel. 0 5[illegible] · 45 60

Konstruktion / Qualitätsmanagement

Unterschrift / Sign

Funktionsbereich / Funktion

Ort / Town: **Nienwohlde**

Datum / Date : **23.12.2009**

Anmerkung :
Diese Erklärung entspricht einer Herstellererklärung im Sinne der EG- Maschinenrichtlinie 89/392/EWG, Anhang II A.
Etwaige Änderungen an dem oben beschriebenen Erzeugnis lassen die Gültigkeit dieser Erklärung erlöschen

Remark :
This declaration is made in the sence of the EEC-General Instruction for Machinery 89/392/EEC, Appendix II A.
After changings at the above described equipment this declaration will be expire

14.16 Trasduttore di accelerazione

Numero di disegno Voith: 4 242808 001
Numero di disegno Voith: 4 242810 0
Numero di disegno Voith: 4 242809 0
Numero di disegno Voith: 4 222916 003

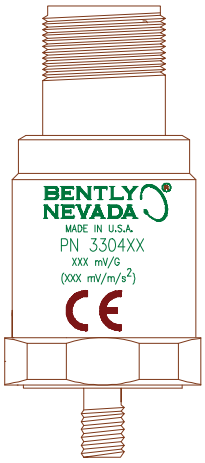
Tipo: 330400-01-00
Tipo: 37439-01
Tipo: 43217-01
Tipo: 16925-21

Descrizione. . . . . Bently Nevada

Part No. 127088-01
Revision D, December 1997

330400 AND 330425 ACCELEROMETER

OPERATION MANUAL



BENTLY NEVADA

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Foreword

The 330400 and 330425 Accelerometers are piezo-acceleration transducers designed mainly for high frequency applications. This manual describes how the transducers work, how to install and maintain the system.

This manual is intended for use by those experienced in the use of electronic instrumentation and machinery monitoring equipment.

Section 1 - Operating Information - describes the applications, the principle of operation and the monitoring compatibility of the Accelerometer systems.

Section 2 - Installation - provides instructions for receiving inspection, installing the sensor, connecting power and routing interconnect cable for the Accelerometers.

Section 3 - Maintenance - explains how to maintain the Accelerometers by describing the test procedures and equipment needed to verify that the transducer is operating properly.

Section 4 - Field Testing and Troubleshooting - contains instructions for field testing and troubleshooting problems with the Accelerometers and compatible Bently Nevada monitoring systems.

The Appendices provide detailed specifications, sensitivity curves representing typical 330400 and 330425 Accelerometer performance, lists of spare parts and accessories, European CE mark information, and hazardous area approvals installation information.

Related Documents

3300/25 Dual Accelerometer Input Monitor (Peak) Maintenance Manual, part number 80181-01
3300/26 Dual Accelerometer Input Monitor (RMS) Maintenance Manual, part number 86800-01
2201 Operation and Maintenance Manual, part number 100875-01
3500/42 Proximitor®/Seismic Monitor Module Operation and Maintenance Manual, part number 129773-01.

Safety Notices

Bently Nevada Corporation has attempted to identify areas of risk created by improper installation and operation of this product. These areas of information are noted as **WARNING** or **CAUTION** for your protection and as an aid for the safe and effective operation of this equipment. Read all instructions before installing or operating this product.

Contents

Section 1 — Operating Information

Section 2 — Installation

Section 3 — Maintenance

Section 4 — Field Testing and Troubleshooting

Appendix A — Specifications

Appendix B — Accessories

Appendix C — Electromagnetic Compatibility

Appendix D — Hazardous Area Approvals

Section 1
Operating Information

This section contains information that will help you prepare for the installation of the Accelerometer Systems. General information for typical applications, principles of operation, and monitoring compatibility of the Accelerometers are presented in this section.

Application

Accelerometers are very effective when used for the measurement of high frequency vibrations. Supplemental high frequency casing measurements are typically required for measuring gear mesh and blade pass frequencies. Section 2 explains the proper installation of the Accelerometers.

Application Advisory

If casing acceleration measurements are being made for the overall protection of a machine, thought should be given to the usefulness of the measurement for each application. Most common machine malfunctions, such as unbalance, misalignment, etc., occur on the rotor and originate as an increase or a change in rotor vibration. For any casing measurement alone to be effective for overall machine protection, a significant amount of rotor vibration must be faithfully transmitted to the machine casing or mounting location of the transducer. In addition, care should be exercised in the physical installation of the acceleration transducer on the bearing housing or machine casing. Improper installation may result in a decrease of the transducer amplitude and frequency response and the generation of false signals that do not represent vibration on that particular machine.

Principle of Operation

The Accelerometer is made up of a piezoelectric ceramic stack that is prestressed between the base of the transducer and a seismic mass. When subjected to machinery vibration, this mass/spring system exerts a force on the piezoelectric ceramic which generates a charge proportional to that force. The electronics converts the charge to a voltage that can be sent to a Bently Nevada monitoring system.

The 330400 and 330425 Accelerometers are designed to monitor vibration frequencies ranging from 10 Hz to 20 kHz. The calibrated scale factor and maximum acceleration for the Accelerometers are shown in Table 1.

Table 1

Transducer Model	Scale Factor (mV/g ± 5%)	Maximum Acceleration (g pk)
330400	100	50
330425	25	75

The 330400 and 330425 Accelerometers are three-wire transducers which require external power supplies. The power supply voltage is -24 ± 4 Vdc. A simplified schematic block diagram of the 330400 and 330425 Accelerometer appears in Figure 1-1.

The internal circuitry of the 330400 and 330425 Accelerometers automatically sets the output dc bias when power is supplied. The dc bias and ac signal appears across pin "A" and "C."

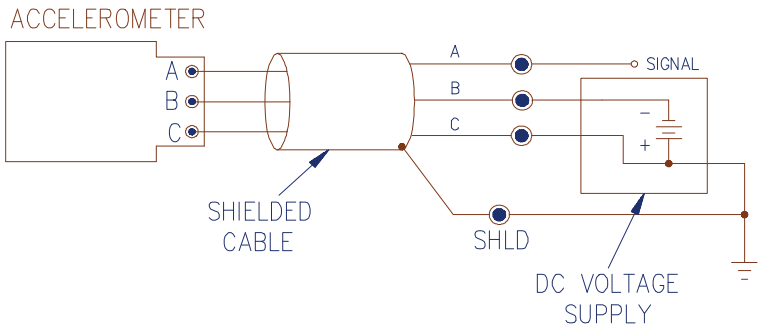


Figure 1-1 Schematic Block Diagram

Compatible Monitoring Systems

Compatible Bently Nevada monitoring systems can power the 330400 and 330425 Accelerometer without additional external circuitry.

The flexibility of the 3300 Dual Accelerometer Monitor, the 2201 Monitor and 3500/42 Monitor make them ideally suited for use with the 330400 and 330425 Accelerometers. The Alert and Danger setpoints and filtering can be adjusted to isolate, eliminate, or emphasize specific vibration frequencies. The monitor can also be configured to integrate each channel to provide output in terms of velocity. OK circuitry continuously monitors field wiring for open and short circuits and for Accelerometer malfunctions.

The Monitoring Systems and full-scale range options that are compatible with the 330400 and 330425 Accelerometers are shown in Table 1-1 and Table 1-2.

Table 1-1 Compatible Full-scale Range Options for the 330400 Accel

Monitoring System	Compatible Full-scale with No Integration		Full-scale with Integration	
	pk	**rms**	**pk**	**rms**
3300/25	Compatible with all full-scale range options		Compatible with all full-scale range options	
3300/26		0 to 2 g 0 to 5 g 0 to 10 g 0 to 20 m/s² 0 to 50 m/s² 0 to 100 m/s²		0 to 1 in/s 0 to 2 in/s 0 to 25 mm/s 0 to 50 mm/s
2201	0 to 2 g 0 to 5 g 0 to 10 g 0 to 20 m/s² 0 to 50 m/s² 0 to 100 m/s²	0 to 2 g 0 to 5 g 0 to 10 g 0 to 20 m/s² 0 to 50 m/s² 0 to 100 m/s²	0 to 1 in/s 0 to 2 in/s 0 to 25 mm/s 0 to 50 mm/s	0 to 1 in/s 0 to 2 in/s 0 to 25 mm/s 0 to 50 mm/s
3500/42	See manual part number 129773-01 for more details			

Table 1-2 Compatible Full-scale Range Options for the 330425 Accel

Monitoring System	Compatible Full-scale with No Integration		Full-scale with Integration	
	pk	rms	pk	rms
3300/26		0 to 20 g 0 to 25 g 0 to 40 g 0 to 50 g 0 to 200 m/s² 0 to 250 m/s² 0 to 400 m/s² 0 to 500 m/s²		0 to 100 mm/s
2201	0 to 20 g 0 to 25 g 0 to 40 g 0 to 50 g 0 to 200 m/s² 0 to 250 m/s² 0 to 400 m/s² 0 to 500 m/s²	0 to 20 g 0 to 25 g 0 to 40 g 0 to 50 g 0 to 200 m/s² 0 to 250 m/s² 0 to 400 m/s² 0 to 500 m/s²	0 to 100 mm/s	0 to 100 mm/s
3500/42	See manual part number 129773-01 for more details			

Section 2
Installation

Receiving Inspection

Inspect the components of the order when they are received to see if there was any damage during shipping. Keep all shipping forms and invoices. If any shipping damage is apparent, file a claim with the carrier and submit a copy to Bently Nevada Corporation. Include all model numbers and serial numbers with the claim. We will either repair or replace damaged parts according to the terms and conditions of the sale.

The Accelerometers are shipped in a protected box and the connector is protected with a screw-on plastic cap. The Accelerometers are sensitive instruments and these precautions help to prevent damage during shipping.

Installing the Accelerometer

Positioning

For optimum performance and accurate measurements, place the Accelerometer at a position on the machine casing that is most responsive to vibration. Proper placement often depends on the application. Bently Nevada offers Machinery Diagnostic Services that can help you find the optimum location for your application.

Mounting

Follow these steps to install the Accelerometer:

Step 1— Check that the ambient and surface temperatures of the installation location are within the temperature rating of the Accelerometer: -55° to 121°C (-67° to 250°F).

Step 2— Check that the mounting site is flat, clean and dry. The Accelerometer requires a flat area that is 21.6 mm dia. (0.85 in. dia.) for mounting. For best results the mounting surface should have a roughness of no more than 0.813 µm (32 µin) rms and a flatness of at least 25.4 µm (0.001 in) TIR.

Step 3— Drill and tap a hole in the mounting surface as required by the integral mounting stud. The 330400 and

330425 Accelerometers have two mounting stud options: 1/4-28 UNF-2B X 0.35 in and M8X1-6g X 8.89 mm thread. The hole should be perpendicular to the mounting surface within ± 6 minutes.

Step 4— Lightly grease the Accelerometer mating surface with Dow Corning 340 or equivalent grease and then screw the Accelerometer into the mounting surface. The grease is required to ensure good coupling between the Accelerometer and the mounting surface at high frequencies. A light oil may also be used.

Step 5— Use a torque wrench with a 15/16 hex socket. Tighten the Accelerometer to the mounting surface with a torque of 3.3 ± 0.56 N·m(30 ± 5 in·lb). To remove the Accelerometer, apply a counterclockwise torque to its hex base.

Routing Cable

When installing the interconnect cable, route it away from the moving components of the machine and avoid sharp corners. To minimize noise, avoid routing cables near or in the same conduit, raceway, or cable tray with power lines. Prevent the cable from bending sharply, twisting, knotting, or straining. Route the cable through the conduit to prevent physical damage. If the cable must be routed inside lubrication oil lines, be sure it will not be subjected to temperatures exceeding its specified operating range.

Routing Conduit

To route cable through the conduit, connect one end of the conduit to the protective enclosure or other structure in which the monitor is mounted. Connect the other end of the conduit rigidly to a structure near the Accelerometer. Before pulling cable through the conduit, protect the terminal lugs by wrapping the cable with tape or a similar covering. Be sure that the cable does not rub against rough or sharp surfaces.

Routing Armored Cable

Use armored cable if the cable is not routed inside conduit. Secure the cable to the supporting surfaces with clips or similar devices. Connect one end of the armor directly to the enclosure or other structure in which the monitor is mounted. Connect the other end of the armor rigidly to a structure near the 330400 and the 330425 Accelerometer. The recommended minimum bend radius for armored cable is 38.1 mm (1.5 in).

Sealing the Interconnect Cable

CAUTION

When the conduit is routed through hazardous areas, the ends of the conduit must be sealed to prevent hazardous gases from escaping into nonhazardous areas. Consult local authorities for approved sealing methods in hazardous areas.

If the differential pressure between the ends of the connector cable is less than one atmosphere, use one of the following cable sealing techniques:

1. ZY5 cable seal similar to Bently Nevada part number 10076-01 for unarmored cable and part number 100076-03 for armored cable.

2. Bently Nevada low pressure cable seal, part number 43501.

Power and Signal Connections

Bently Nevada Corporation supplies interconnect cables with terminal lugs and a 3-socket mating connector for the 330400 and the 330425 Accelerometer. Interconnect cables are sold separately (see Appendix B for the cable options).

At the Accelerometer end, tighten the 3-socket mating connector to the Accelerometer MIL-C-5015 connector. At the monitor end of the cable, use the wiring instructions for the appropriate monitoring system below.

Note: The wiring instructions assume that the interconnect cable is the standard Bently Nevada cable part number 16925 - XX.

3300 MONITORING SYSTEM

Connect the cable "A" lead to the "IN" terminal on the monitor, the "B" lead to the "PWR" terminal, and the "C" lead to the "COM" terminal. The terminal connections for the 3300 Dual Acceleration Monitor appear in Figure 2-1. Refer to the 3300/25 Peak and 3300/26 RMS Dual Acceleration Input Monitor Maintenance Manual (part number 80181-01 and 86801-01) for further information.

2201 MONITORING SYSTEM

Connect the cable "A" lead to "SIG/A" terminal on the monitor, the "B" lead to "PWR/B", and the "C" lead to "COM." The terminal connections for the 2201 Monitoring System appear in Figure 2-2. Refer to the 2201 Monitoring System Operation and Maintenance Manual (part number 100875-01) for further information.

3500 MONITORING SYSTEM

Connect the cable "A" lead to "SIG/A" terminal on the monitor, the"B" lead to "PWR/B", and the "C" lead to "COM." The terminal connections for the 3500/42 Monitoring System appear in Figure 2-3 and Figure 2-4. Refer to the 3500/42 Operation and Maintenance Manual (part number 129773-01) and 3500 Field Wiring Diagram Package (part number 130432-01) for further information.

Application Alert

Miswiring the Accelerometer to an external power supply without limiting the current to be less than 15 mA will permanently damage the Accelerometer**.**

EXTERNAL POWER SUPPLY

Using the16925 interconnect cable, connect the "B" lead to the " - " terminal of the power supply and the "C" lead to the " + " terminal of the power supply. The "A" lead of the cable is the output of the Accelerometer. Turn on the power supply. Adjust the voltage to -24 ± 0.5 Vdc. Set the current limit of the power supply to be less than 15 mA. Measure the dc voltage across the "A" and "C" lead. The voltage should be between -8 and -9 Vdc. If it is not, turn off the power supply immediately and check for proper connections. The terminal connection of the external power supply appear in figure 2-4.

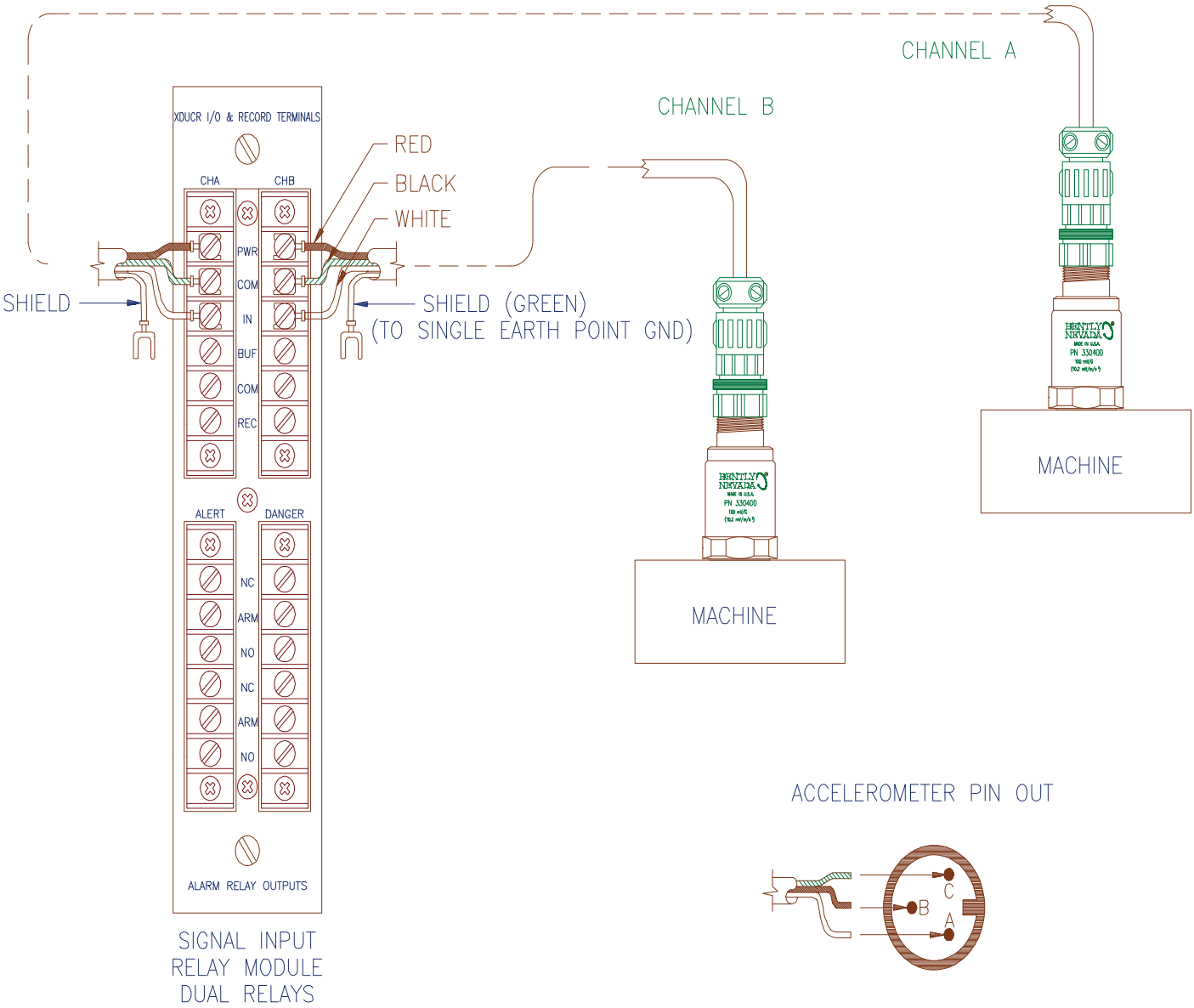


Figure 2-1 Accelerometer/3300 System Connections Using 16925 Interconnect Cable

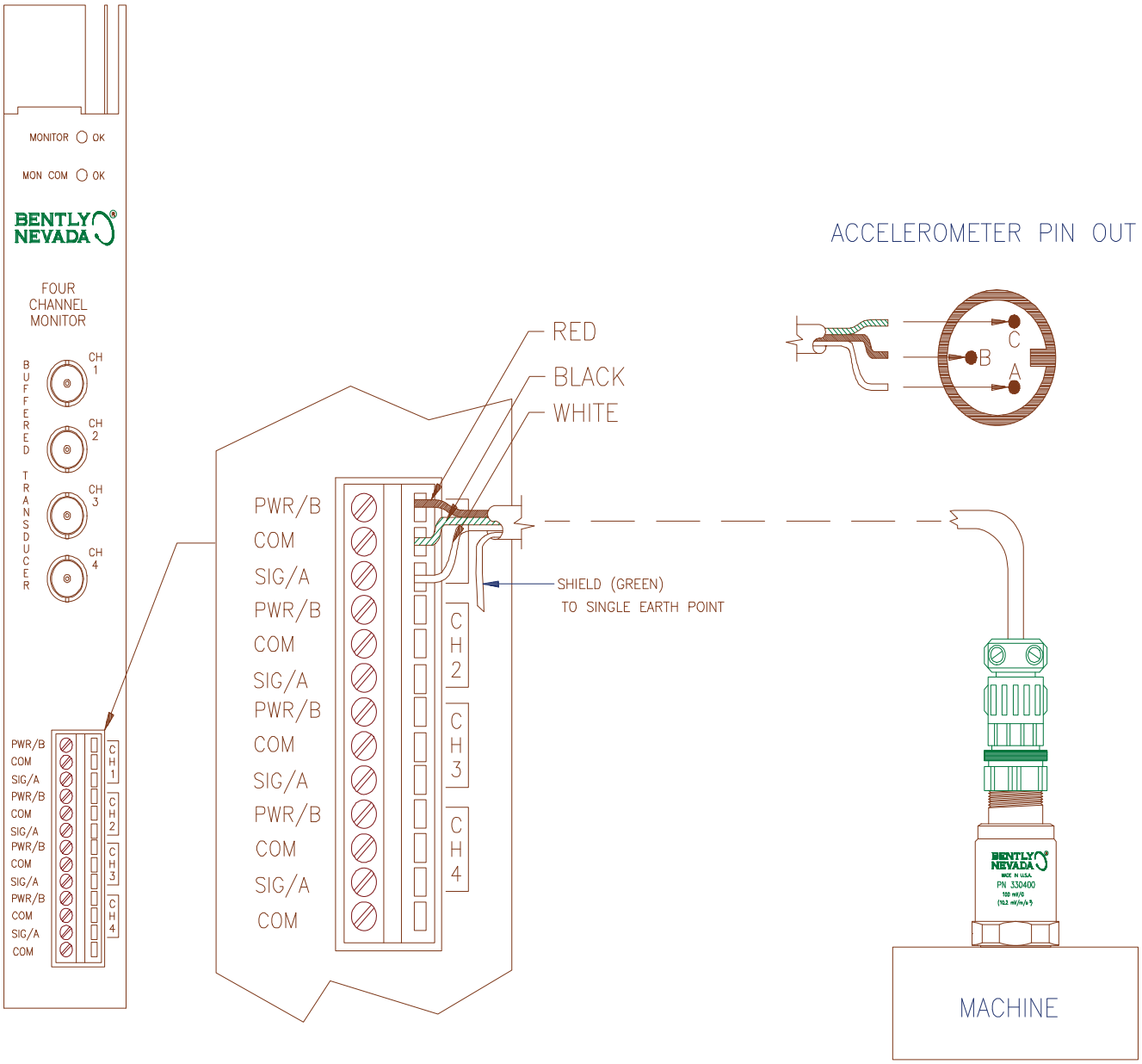


Figure 2-2 Accelerometer/2201 System Connections Using 16925 Interconnect Cable

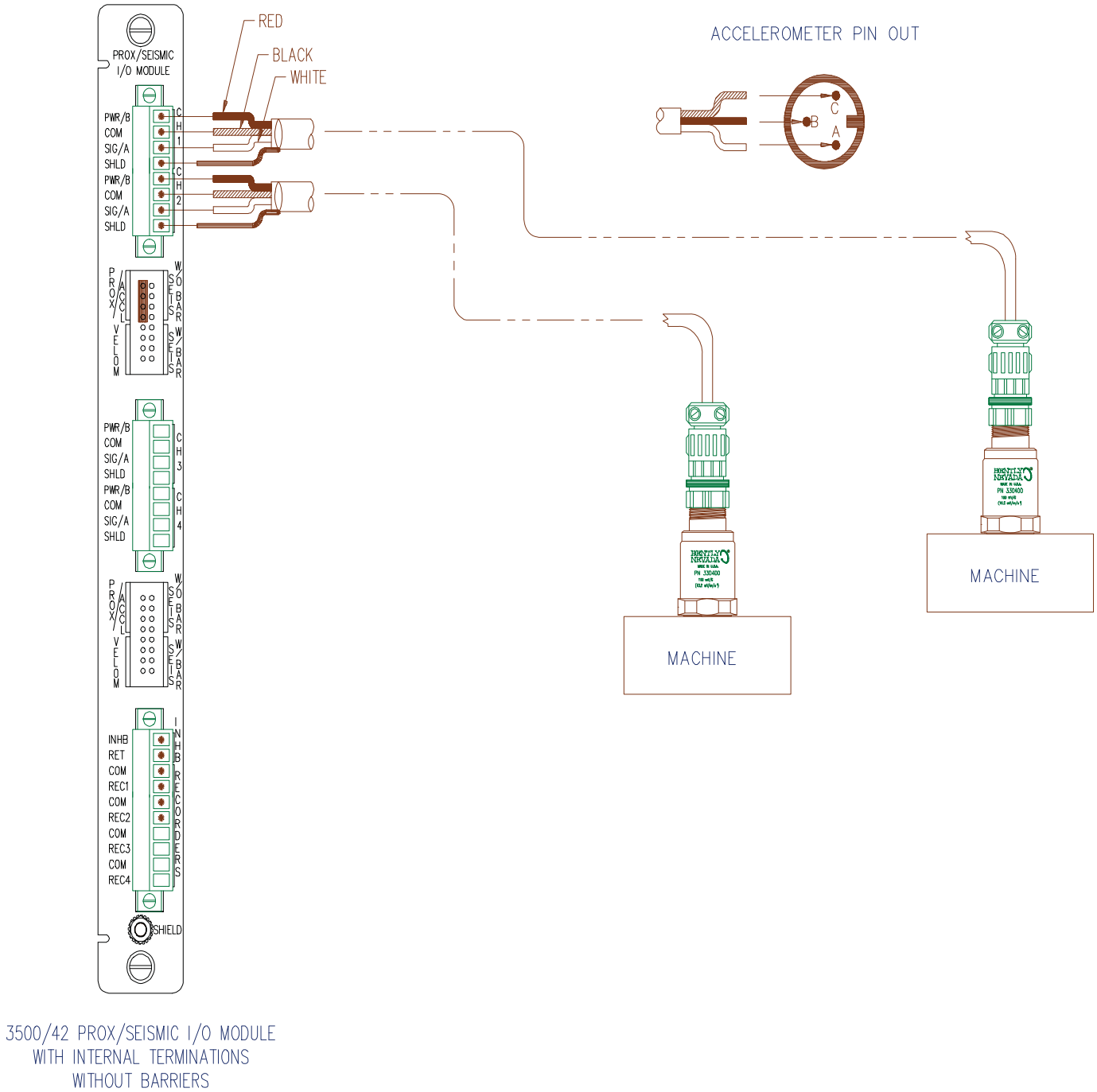


Figure 2-3 Accelerometer/3500 System Connections Using 16925 Interconnect Cable

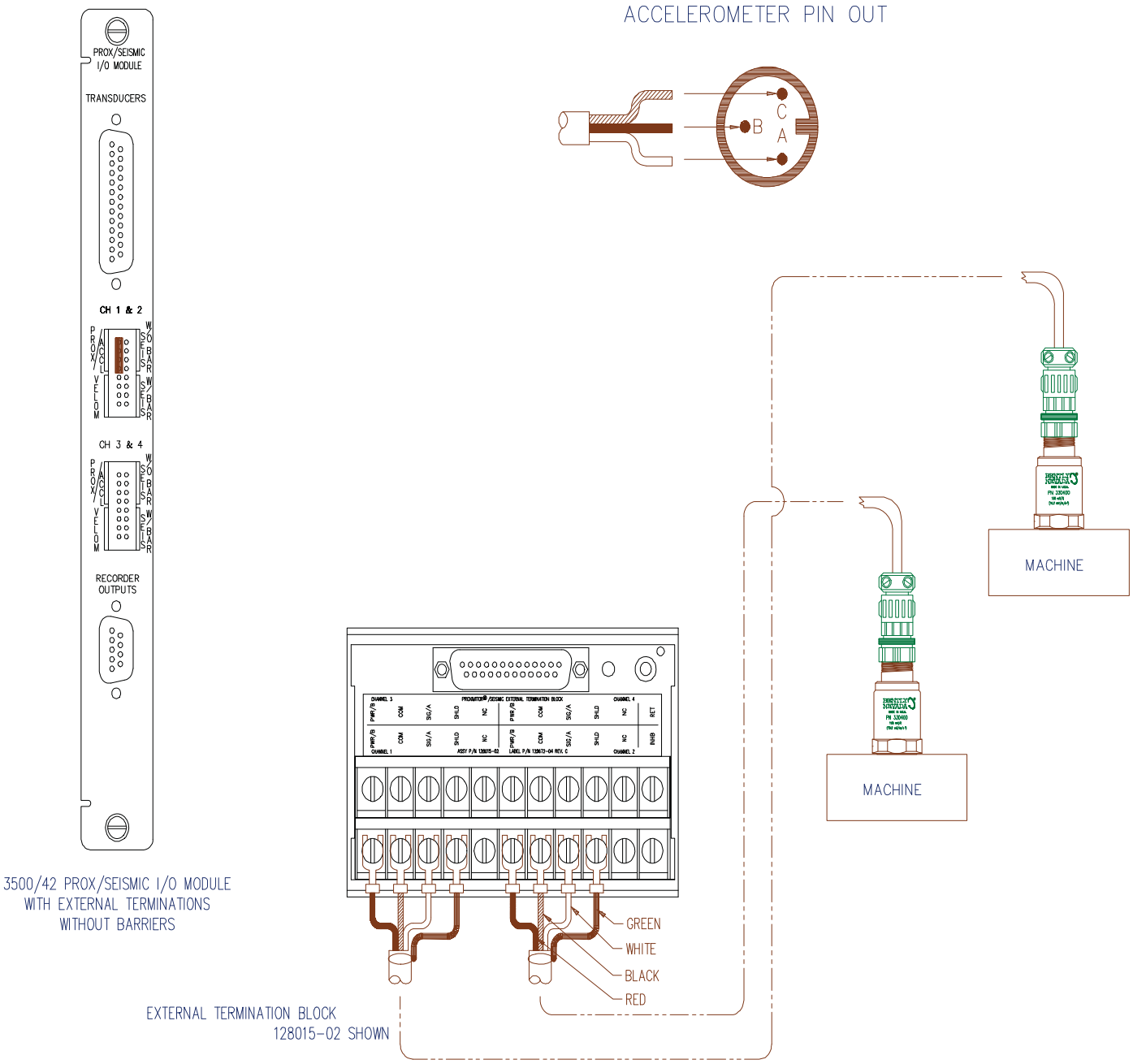


Figure 2-4 Accelerometer/3500 System Connections Using 16925 Interconnect Cable

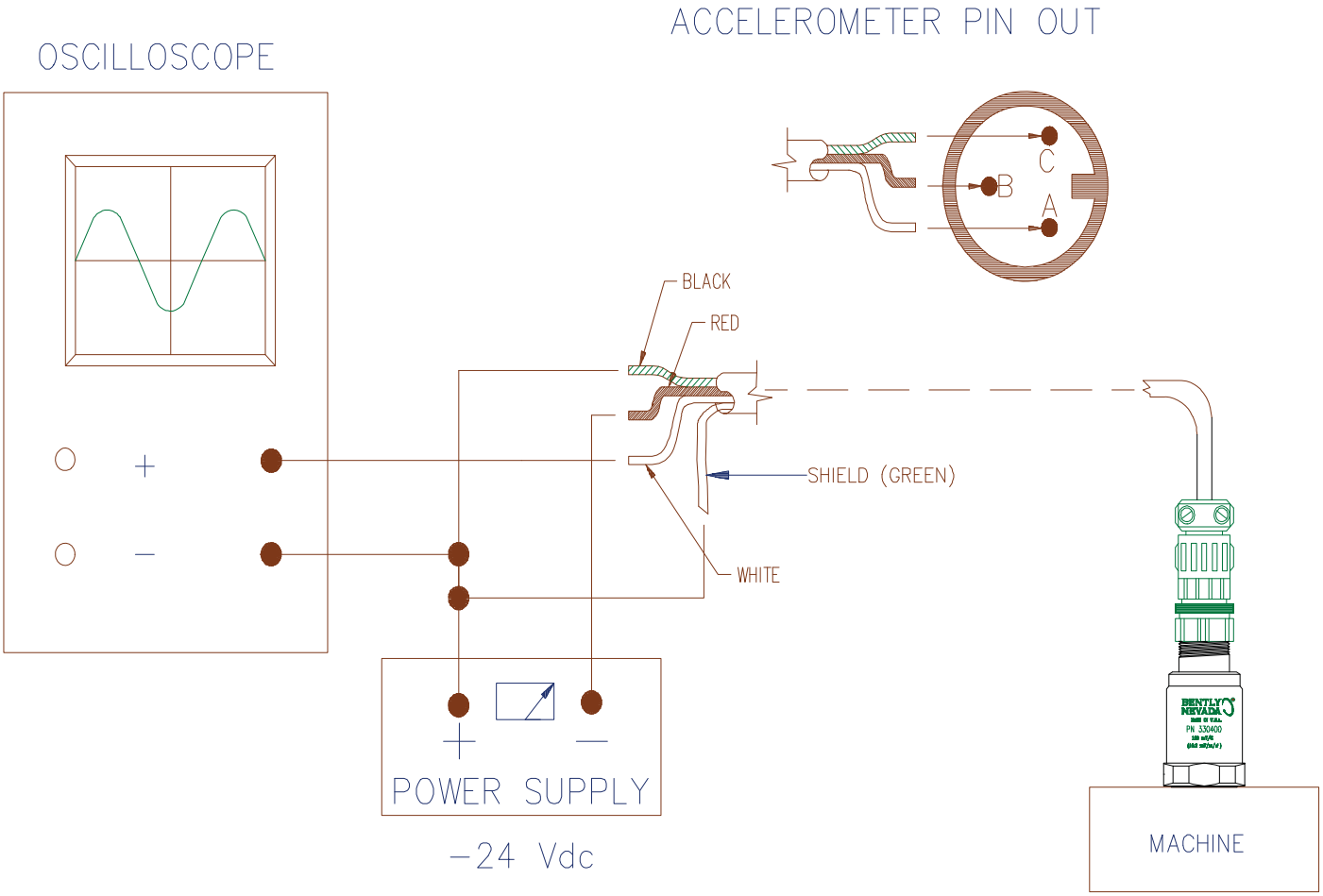


Figure 2-5 Accelerometer/External Power Supply Connections Using 16925 Interconnect Cable

Section 3
Maintenance

This section shows how to check the performance of the 330400 and 330425 Accelerometers. Table 3-1 lists the recommended maintenance equipment. If the equipment is not available, contact the nearest Bently Nevada Corporation field office, or return the transducer to the factory or a testing laboratory for testing.

Table 3-1 Recommended Maintenance Equipment

Recommended Equipment	Specification
A Shake Table Bently Nevada Monitoring Systems: 3300, 2201, or 3500 A Voltmeter	

Performance Test Procedure

Step 1— Mount the Accelerometer on a shake table.

Step 2— Connect the cable to the Accelerometer and the monitor as shown in section 2.

Step 3— Shake the Accelerometer at 100 Hz with a known acceleration level.

Step 4— Verify the Accelerometer output on the monitor or a Voltmeter.

Note

The accuracy of the system can be improved by calibrating the monitor and the shake table separately before performing the system loop check.

Polarity Test Procedure

Use this test to verify the proper phase response. An improper phase will adversely affect the use of the Accelerometer for machinery diagnostics.

Step 1— Power up the Accelerometer as shown in Figure 2-5.

Step 2— Set the time base on the oscilloscope to 20 milliseconds/division.

Step 3— Hold the transducer in hand and tap the bottom. Observe that the waveform on the oscilloscope first goes positive as shown in Figure 3-1. If the wave form goes negative first, contact the nearest Bently Nevada office for assistance.

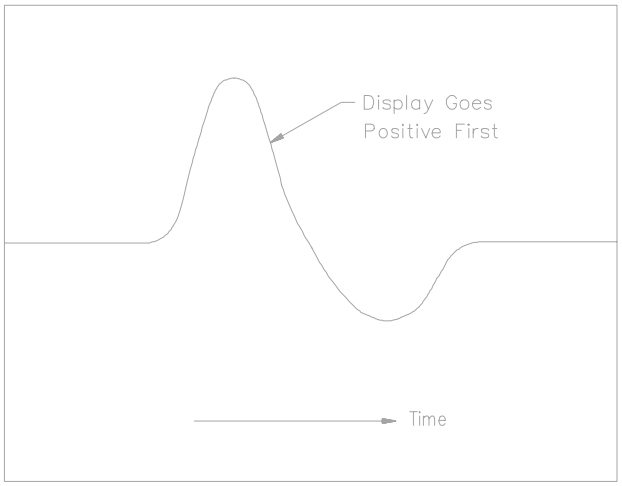


Figure 3-1 Polarity Check Oscilloscope Display

Section 4
Field Testing and Troubleshooting

Use the following procedures to test an installed 330400 and 330425 Accelerometer and isolate a suspected malfunction. The 330400 and 330425 Accelerometers are hermetically-sealed units with no adjustments or field repairable components. If you determine that the Accelerometer is not functioning properly, contact the nearest Bently Nevada office for assistance.

When the 330400 and 330425 Accelerometers are used with a Bently Nevada monitoring system, a fault may be due to an Accelerometer malfunction, a malfunction in the field wiring, a malfunction in the monitor itself, or a level of vibration that exceeds the OK limit. Before placing a call to our service group, use the steps below to troubleshoot the suspected problems.

Fault Indication #1	Cause/Solution
Bently Nevada Monitor OK LED is off	
	The vibration level has exceeded the OK limit Connect a voltmeter to the "IN" and "COM" on the SIRM terminals on the back of the monitor rack. Measure the dc voltage. The voltage should be between -8.0 and -9.0 Vdc.
	Monitor Power is off. Check that the monitor power supply is plugged in and that the power is on.
	Interconnect cable is disconnected, connected loosely, or connected to the wrong monitor. Verify that the Accelerometer is connected to the correct monitor and to the correct monitor terminals. Check that the screws on the Signal Input Relay Module are tight.
	Interconnect cable is not connected or connection is loose at the Accelerometer. Verify that the Accelerometer is connected to the cable.

The Accelerometer is open or shorted

Disconnect the interconnect cable from the instrumentation. Measure the resistance across Accelerometer terminals "A-C" and "B-C." The resistance should be between 4 Mohm and 6 Mohm and 19 Kohm and 19.5 Kohm, respectively.

Interconnect Cable is Damaged: Shorted

Visually inspect the interconnect cable for apparent damage. Disconnect the interconnect cable at both ends and measure the resistance among the three conductors of the interconnect cable. If intermittent or shorted, replace the cable.

Interconnect Cable is Damaged: Open

Disconnect the interconnect cable at both ends. Short two conductors together at one end at a time and measure the resistance of the cable at the other end. If open circuited, replace the cable.

Cable conductors are switched

With the Accelerometer and the interconnect cable connected to the monitor measure the DC voltage across terminals "IN" and "COM" for the 3300 Monitoring System and "SIG/A" and "COM" for the 2201 and 3500 Monitoring Systems. The voltage should be between -8.0 and -9.0 Vdc. If it is not, check for proper connections.

Fault Indication #2 Cause/Solution

Monitor showing vibration on the front panel when the machine is off line.

Noise is coupled to the Accelerometer signal.

Check that the shield wire is connected to earth or chassis ground.

Check that the Accelerometer and the machine case is properly grounded.

Appendix A
Specifications

330400 Accelerometer

Parameters are specified at 25°C (77°F) unless otherwise specified.

Note

Operation outside the specified limits will result in false readings or loss of machine monitoring.

Electrical

Scale factor	10.2 mV/(m/s²) (100 mV/g) ± 5% @ 100Hz
Frequency Response	±0.45 dB 30 Hz to 15 kHz ±3.0 dB 10 Hz to 20 kHz
Acceleration Range	490 m/s² pk (50 g pk) (see Figures A-2 and A-3)
Transverse Sensitivity	5% maximum of axial
Amplitude linearity	± 1% to 490 m/s² pk (50 g pk), above noise floor
Mounted Resonant Frequency	30 kHz minimum
Power Requirement	
DC Voltage	-24 ± 4 Vdc.
Bias Current	2 mA
Output Bias Voltage	-8.5 Vdc (nominal), Pin A referenced to Pin C
Dynamic Output Impedance	50 ohms, typical
Broadband Noise Floor	0.049 m/s² pk (0.005 g pk), maximum
Grounding	Internal electronics is isolated from case
Maximum Cable Length	305 m (1000 ft) with no degradation of signal

330425 Accelerometer

Parameters are specified at 25°C (77°F) unless otherwise specified.

Note

Operation outside the specified limits will result in false readings or loss of machine monitoring.

Electrical

Scale factor	2.55 mV/(m/s²) (25 mV/g) ± 5% @ 100Hz
Frequency Response	±0.45 dB 30 Hz to 15 kHz ±3.0 dB 10 Hz to 20 kHz
Acceleration Range	735 m/s² pk (75 g pk) (see Figures A-4 and A-5)
Transverse Sensitivity	5% maximum of axial
Amplitude linearity	± 1% to 735 m/s² pk (75 g pk), above noise floor
Mounted Resonant Frequency	30 kHz minimum
Power Requirement	
DC Voltage	-24 ± 4 Vdc
Bias Current	2 mA
Output Bias Voltage	-8.5 Vdc (nominal), Pin A referenced to Pin C
Dynamic Output Impedance	50 ohms, typical
Broadband Noise Floor	0.098 m/s² pk (0.01 g pk), maximum
Grounding	Internal electronics is isolated from case
Maximum Cable Length	305 m (1000 ft) with no degradation of signal

Environmental for the 330400 and the 330425 Accelerometer

Operating Temperature Range	-55° to 121°C (-67° to 250°F)
Shock Limit	49030 m/s² pk (5000 g pk) maximum
Humidity Limit	100% condensing, non-submerged. Case is hermetically-sealed

Mechanical for the 330400 and 330425 Accelerometer

Dimensions	See Figure A-1
Mounting Surface	21.6 mm (0.85 in) diameter
Mounting Torque	3.3 ± 0.6 N·m (30 ± 5 in·lb)
Case Material	300 Series stainless steel
Connector	3 pin, MIL-C-5015, hermetically-sealed
Polarity	Pin A goes positive with respect to pin C when acceleration is from base to connector of the transducer.
Weight	80 grams (2.8 oz) typical
Mounting angles	Any Orientation

Interconnect Cable for the 330400 and 330425 Accelerometer

Standard Interconnect Cable:

Size	0.5 mm² (22 AWG)
Materials	
Conductor	Silver Tinned Copper
Insulation	Teflon Jacket
Shield	Braided Silver Tinned Copper
Jacket	Teflon
Voltage Rating	600 V
Bend Radius	
Unarmored	25.4 mm (1.00 in)
Operating Temperature Range	-55° to 200°C (-67° to 392°F)
Maximum O.D	4.06 mm (0.0160 in)

Standard Armored Interconnect Cable:

Armored

Materials		
Hose Material		AISI 302 or 304 Stainless Steel
Joint Material		Silver Solder or Welded
Hose Diameter		
Outside Diameter		
	Max.	6.99 mm (0.275 in)
	Min.	6.68 mm (0.263 in)
Inside Diameter		
	Max.	5.16 mm (0.203 in)
	Min.	4.65 mm (0.183 in)
Bend Radius		38.1 mm (1.50 in)
Operating Temperature Range		-34° to 204°C (-29° to 400°F)

Cable - See the cable specifications for the standard interconnect cable.

Splash Resistance Cable/Connector

Cable

Size	1.00 mm² (18 AWG)
Materials	
Conductor	Silver Tinned Copper
Insulation	Teflon Jacket
Shield	Braided Silver Tinned Copper
Jacket	Teflon
Voltage Rating	600 V
Bend Radius	
Unarmored	25.4 mm (1.00 in)
Operating Temperature Range	-55° to 200°C (-67° to 392°F)

Boot

Material	Flourosilicone Elastomer
Operating Temperature	-57° to 177°C (-70° to 350°F)
Maximum I.D	21.34 mm (0.840 in)
Maximum O.D	28.19 mm (1.11 in)
Maximum Length	95.25 mm (3.75 in)

Mechanical Outline

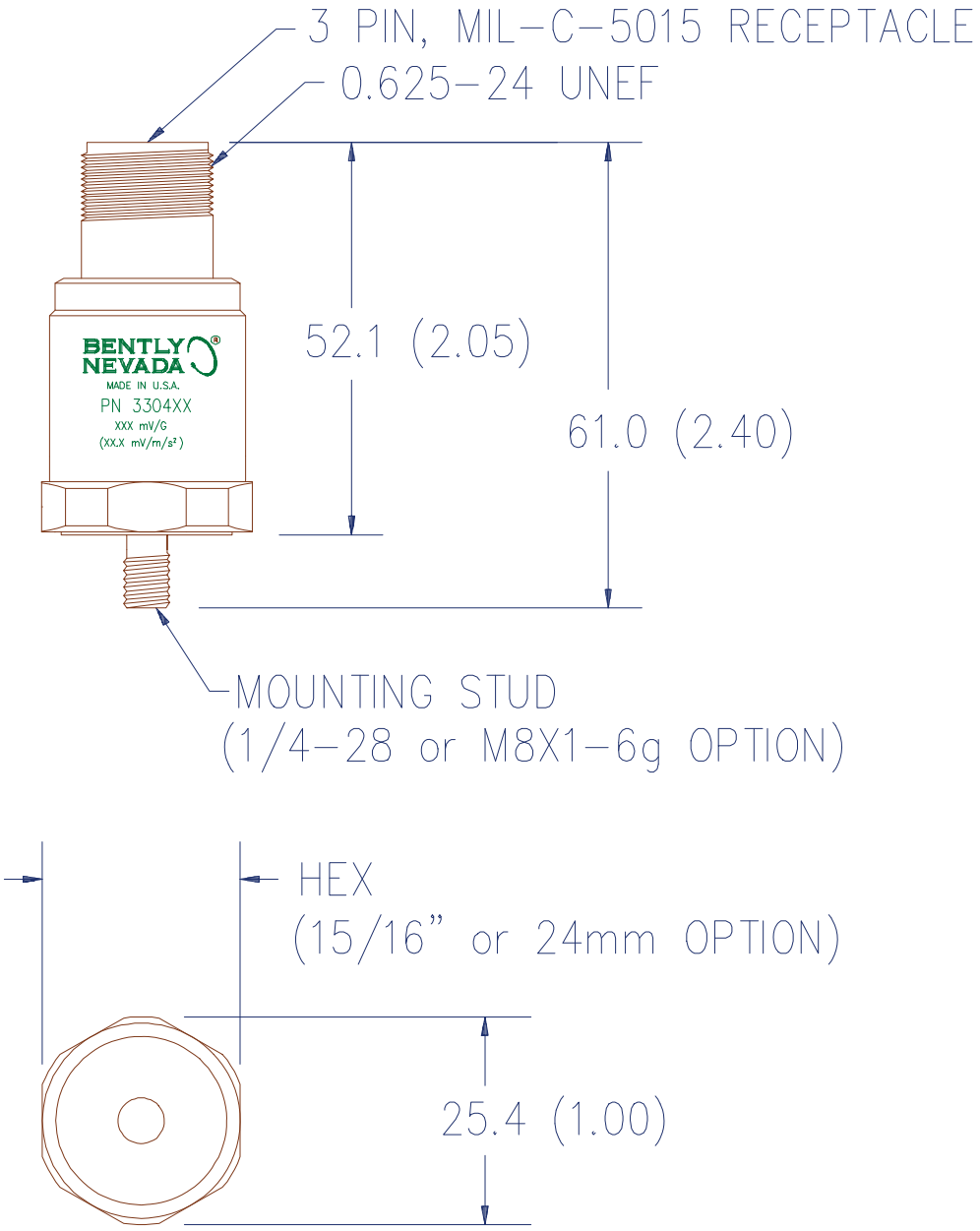
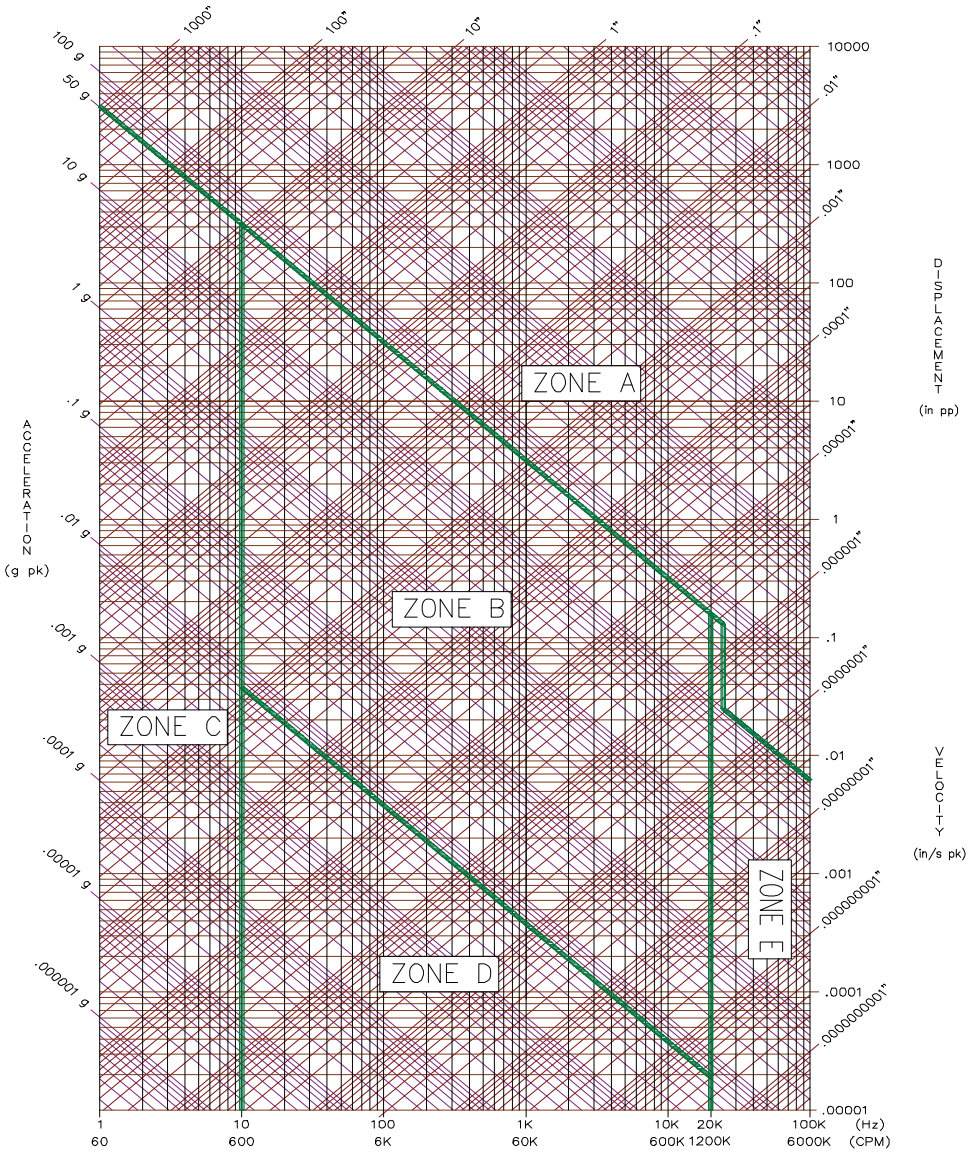


Figure A-1

Note
The units in this drawing are mm (in).

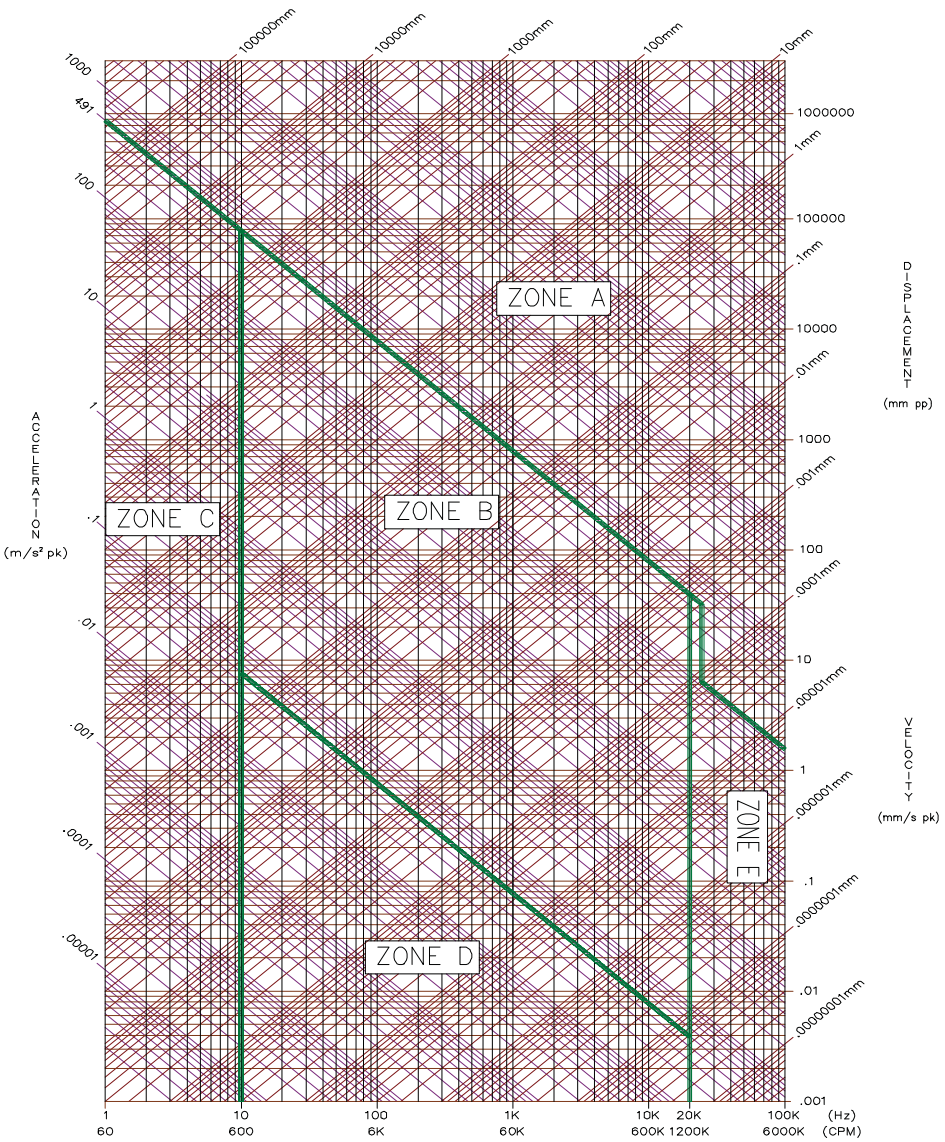
330400 Accelerometer Operating Range (English)



ZONE A: OPERATING IN THIS AREA WILL SATURATE THE TRANSDUCER.
ZONE B: OPERATING IN THIS AREA IS OK.
ZONE C: OPERATING IN THIS AREA IS OK, BUT IS BEYOND THE SPECIFIED FREQUENCY RESPONSE.
ZONE D: OPERATING IN THIS AREA IS OK, BUT THE ACCELEROMETER SIGNAL IS BELOW THE SPECIFIED NOISE FLOOR.
ZONE E: OPERATING IN THIS AREA IS OK BUT IS BEYOND THE SPECIFIED FREQUENCY RESPONSE.

Figure A-2

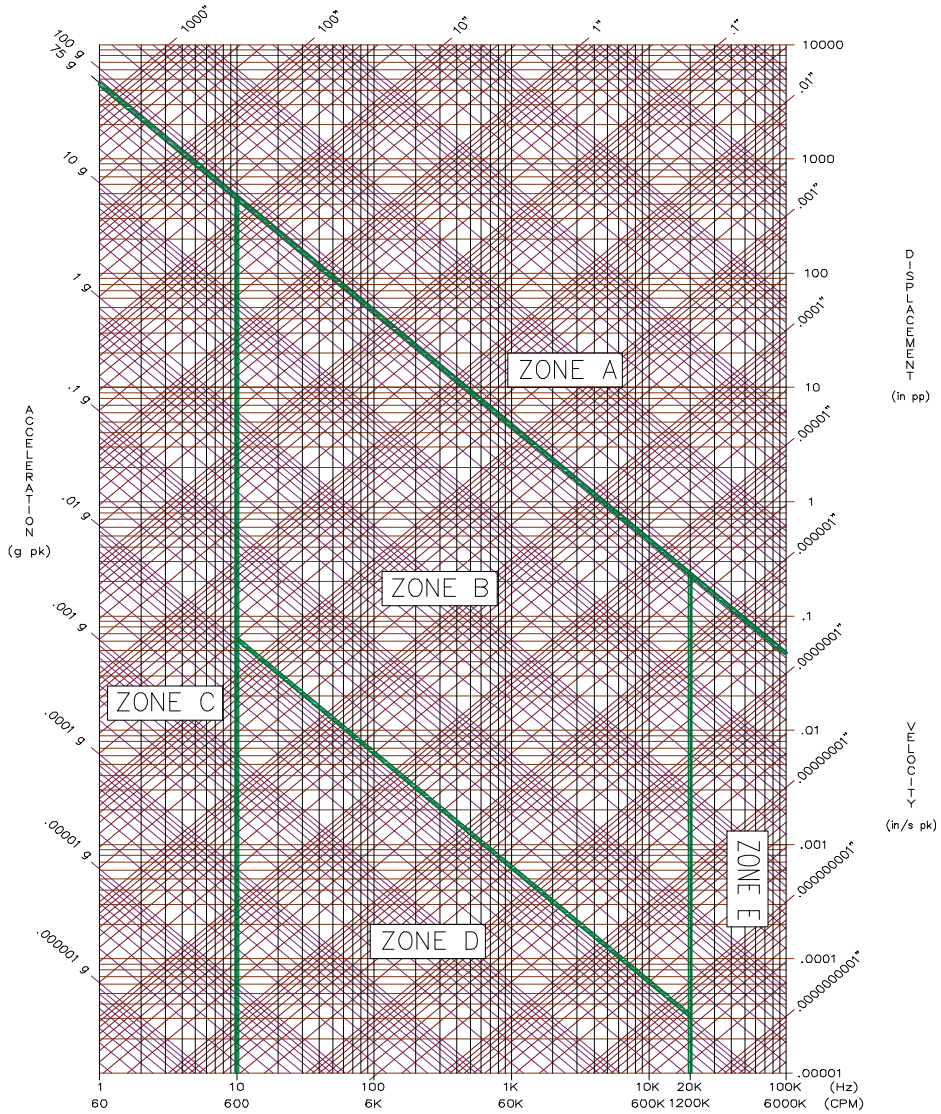
330400 Accelerometer Operating Range (Metric)



ZONE A: OPERATING IN THIS AREA WILL SATURATE THE TRANSDUCER.
ZONE B: OPERATING IN THIS AREA IS OK.
ZONE C: OPERATING IN THIS AREA IS OK, BUT IS BEYOND THE SPECIFIED FREQUENCY RESPONSE.
ZONE D: OPERATING IN THIS AREA IS OK, BUT THE ACCELEROMETER SIGNAL IS BELOW THE SPECIFIED NOISE FLOOR.
ZONE E: OPERATING IN THIS AREA IS OK BUT IS BEYOND THE SPECIFIED FREQUENCY RESPONSE.

Figure A-3

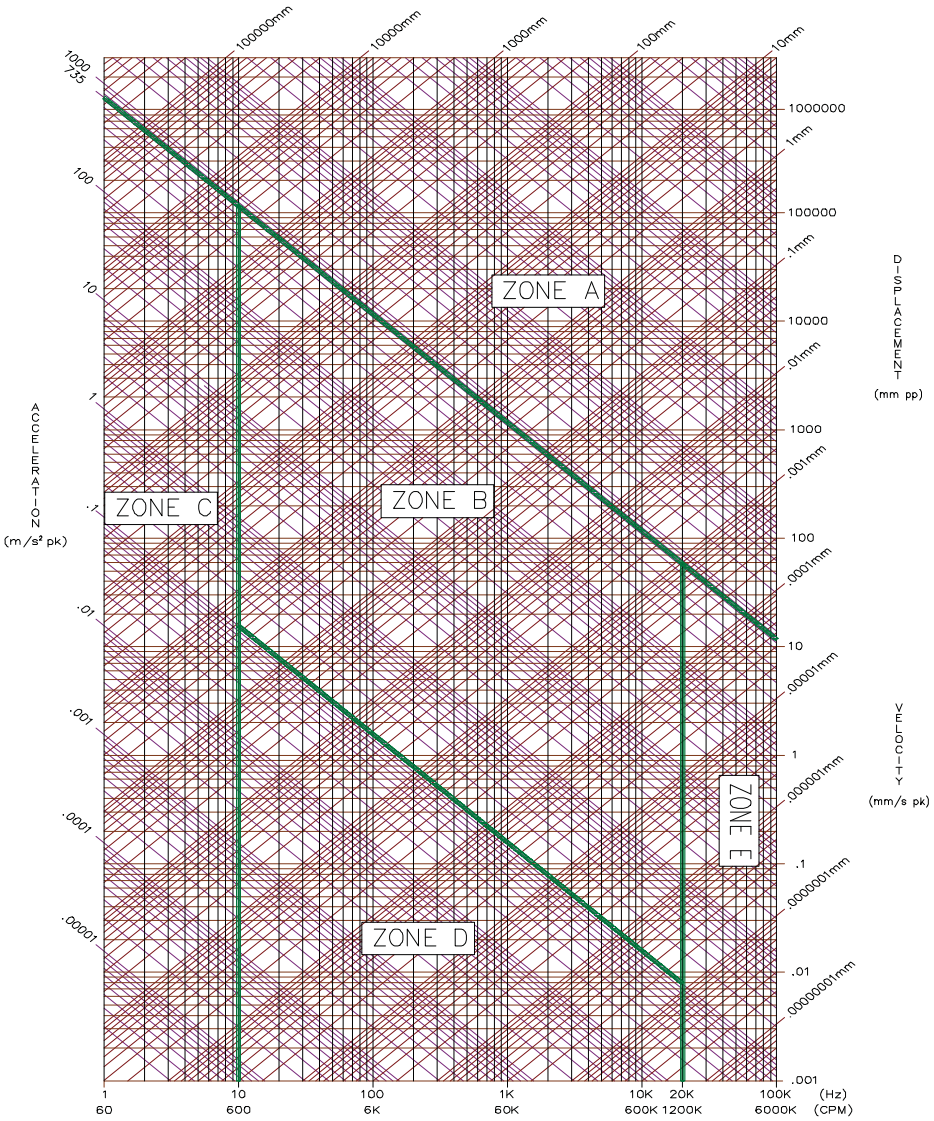
330425 Accelerometer Operating Range (English)



ZONE A: OPERATING IN THIS AREA WILL SATURATE THE TRANSDUCER.
ZONE B: OPERATING IN THIS AREA IS OK.
ZONE C: OPERATING IN THIS AREA IS OK, BUT IS BEYOND THE SPECIFIED FREQUENCY RESPONSE.
ZONE D: OPERATING IN THIS AREA IS OK, BUT THE ACCELEROMETER SIGNAL IS BELOW THE SPECIFIED NOISE FLOOR.
ZONE E: OPERATING IN THIS AREA IS OK BUT IS BEYOND THE SPECIFIED FREQUENCY RESPONSE.

Figure A-4

330425 Accelerometer Operating Range (Metric)



ZONE A: OPERATING IN THIS AREA WILL SATURATE THE TRANSDUCER.
ZONE B: OPERATING IN THIS AREA IS OK.
ZONE C: OPERATING IN THIS AREA IS OK, BUT IS BEYOND THE SPECIFIED FREQUENCY RESPONSE.
ZONE D: OPERATING IN THIS AREA IS OK, BUT THE ACCELEROMETER SIGNAL IS BELOW THE SPECIFIED NOISE FLOOR.
ZONE E: OPERATING IN THIS AREA IS OK BUT IS BEYOND THE SPECIFIED FREQUENCY RESPONSE.

Figure A-5

330400 Accelerometer Typical Amplitude Response

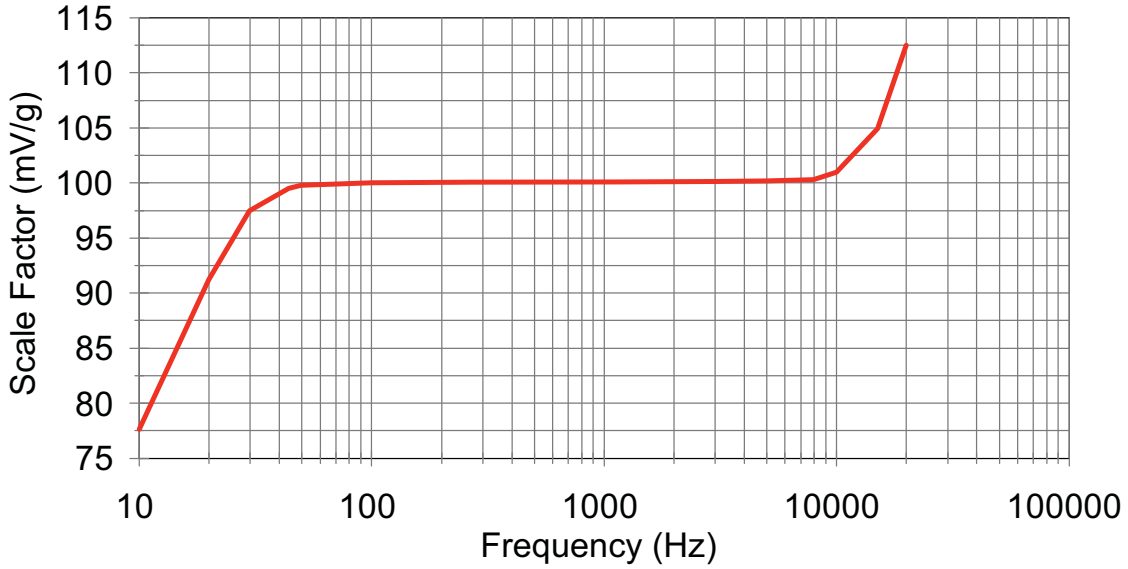


Figure A-6 Typical 330400 Accelerometer Frequency Response (English Units)

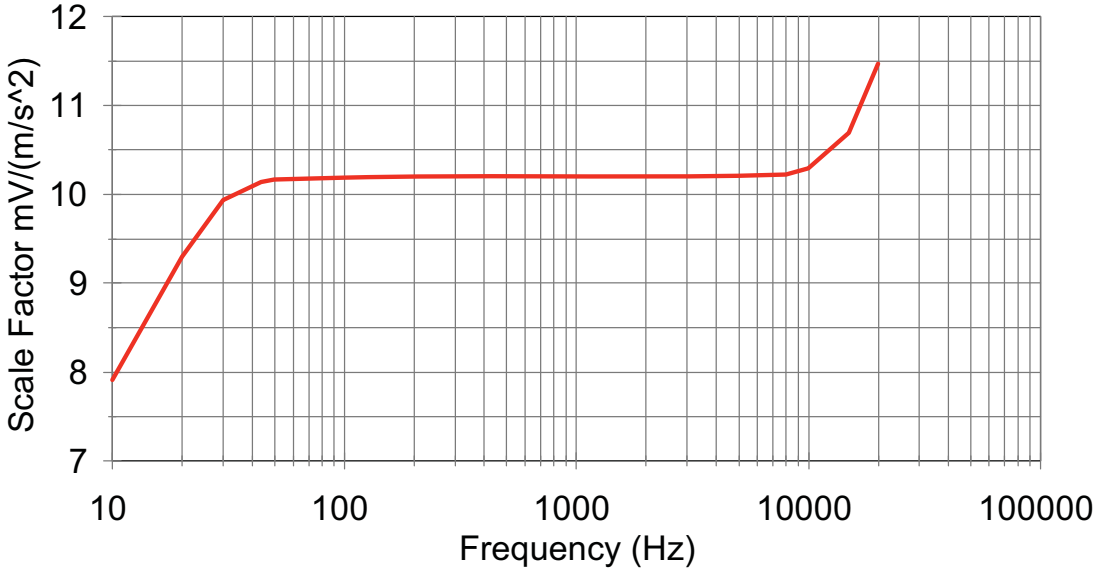


Figure A-7 Typical 330400 Accelerometer Frequency Response (Metric Units)

330425 Accelerometer Typical Amplitude Response

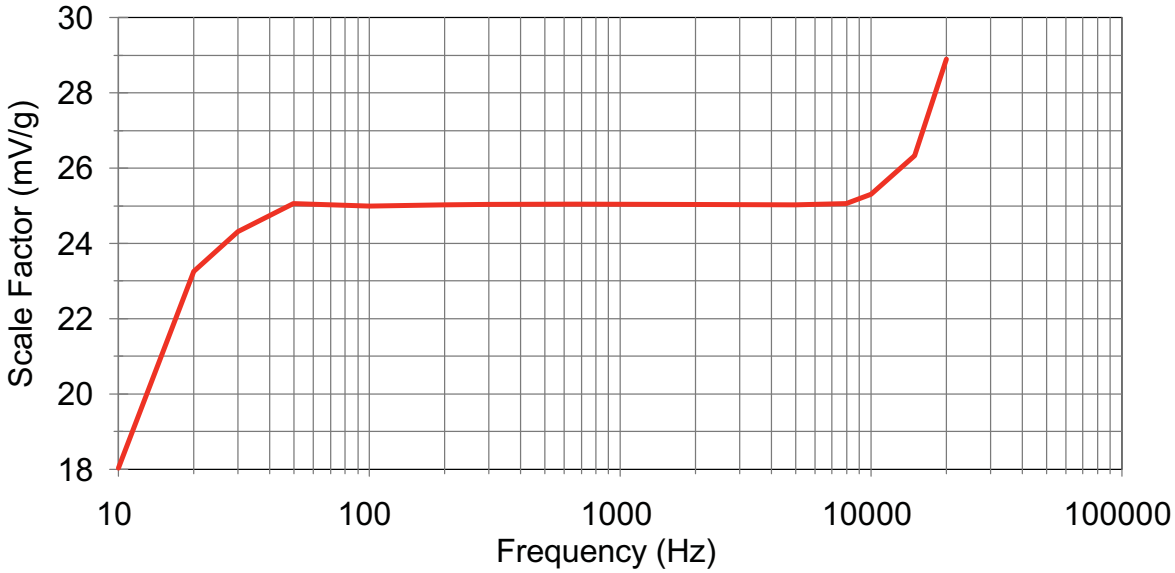


Figure A-8 Typical 330425 Accelerometer Frequency Response (English Units)

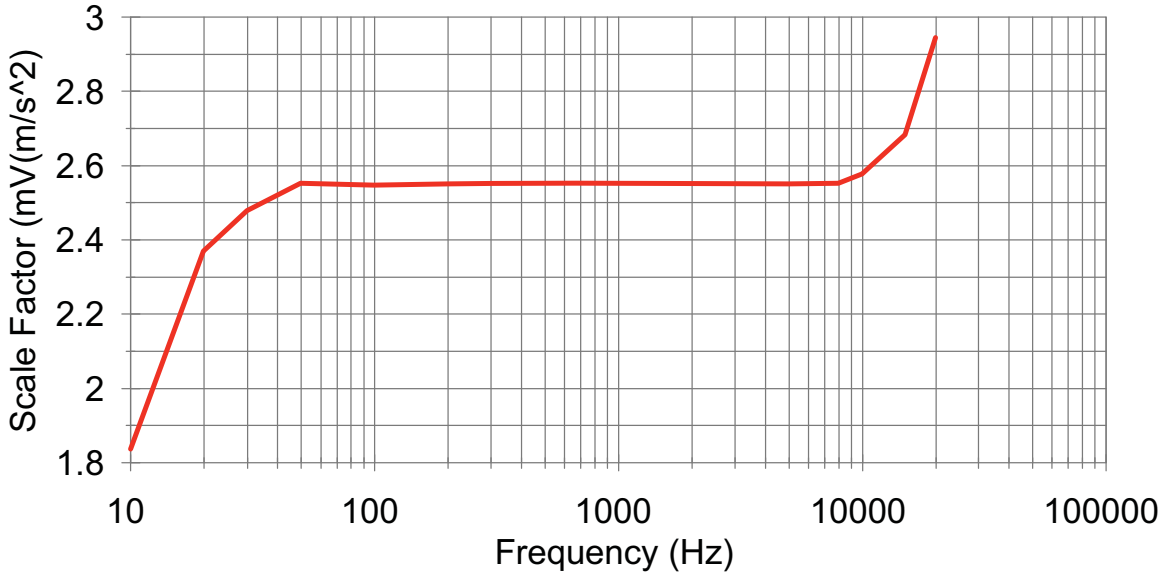


Figure A-9 Typical 330425 Accelerometer Frequency Response (Metric Units)

Appendix B
Accessories and Spare Parts

330400 Accelerometer Options

When ordering the 330400 Accelerometer, you may choose from the following list of options:

Part Number: 330400 - A B

A
Mounting Stud

01 1/4- 28 Integral Stud
02 M8X1-6g integral Stud

B
Agency Approvals

00 None Required
01 North American[1]
02 European[2]

Mounting Stud — Option A

The 330400 Accelerometer provides two mounting stud options, the English 1/4-28 and Metric M8X1-6g stud.

Agency Approvals — Option B

The 330400 Accelerometer is agency approved. Consult with your local Bently Nevada sales representative for information regarding approvals.

NOTES:
[1] North American Approvals (CSA/NRTL/C) are certified to USA and Canadian standards by Canadian Standards Association.

[2] European Approvals are certified to CENELEC standards.

330425 Accelerometer Options

When ordering the 330425 Accelerometer, you may choose from the following list of options:

Part Number: 330425 - **A** **B**

A
Mounting Stud

01 1/4- 28 Integral Stud
02 M8X1-6g integral Stud

B
Agency Approvals

00 None Required
01 North American[1]
02 European[2]

Mounting Stud — Option A

The 330425 Accelerometer provides two mounting stud options, the English 1/4-28 and Metric M8X1-6g stud.

Agency Approvals — Option B

The 330425 Accelerometer is agency approved. Consult with your local Bently Nevada sales representative for information regarding approvals.

NOTES:
[1] North American Approvals (CSA/NRTL/C) are certified to USA and Canadian standards by Canadian Standards Association.

[2] European Approvals are certified to CENELEC standards.

Transducer Housing

The 330400 and 330425 Accelerometers will be compatible with the 43217-01 Accelerometer housing only if a housing extension is used. The housing extension part number is 108576-01.

Interconnect Cable Options

The Accelerometers require a three-conductor cable. We recommend using shielded cable to minimize noise interference. You may use the Bently Nevada cable or another comparable cable. Table B-1 shows all of the Bently Nevada cables that are compatible with the Accelerometers.

Table B-1 Interconnect Cable

APPLICATION	PART NUMBER	DESCRIPTION
Standard Interconnect Cable (see Figure B-1)	16925 - XX	3-wire shielded 0.5 mm^2 (22 AWG) cable with a female connector at the 330400 Accelerometer end and terminal lugs at the monitor end.
Standard Armored Interconnect Cable (see Figure B-2)	16710 - XX	3-wire stainless steel armor over shielded 0.5 mm^2 (22 AWG) cable with a female connector at the 330400 Accelerometer end and terminal lugs at the monitor end.
Standard Interconnect with splash proof environmental boot (see Figure B-3)	130539-XX	3-wire shielded 1.00mm^2 (18 AWG) cable with a female connector and a splash proof environmental boot at the 330400 Accelerometer end and terminal lugs at the monitor end.
XX - Specifies the length of cable required in feet		

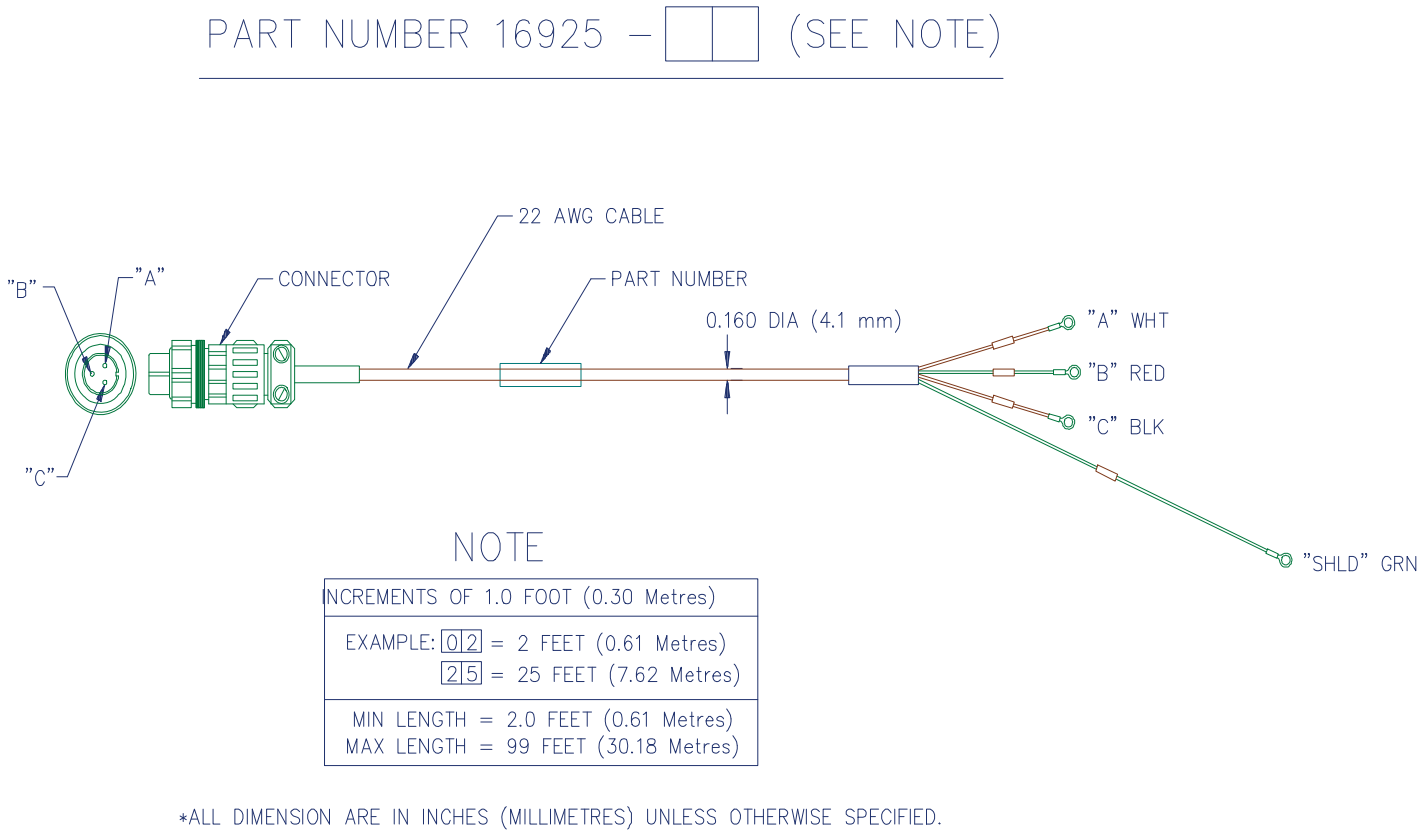
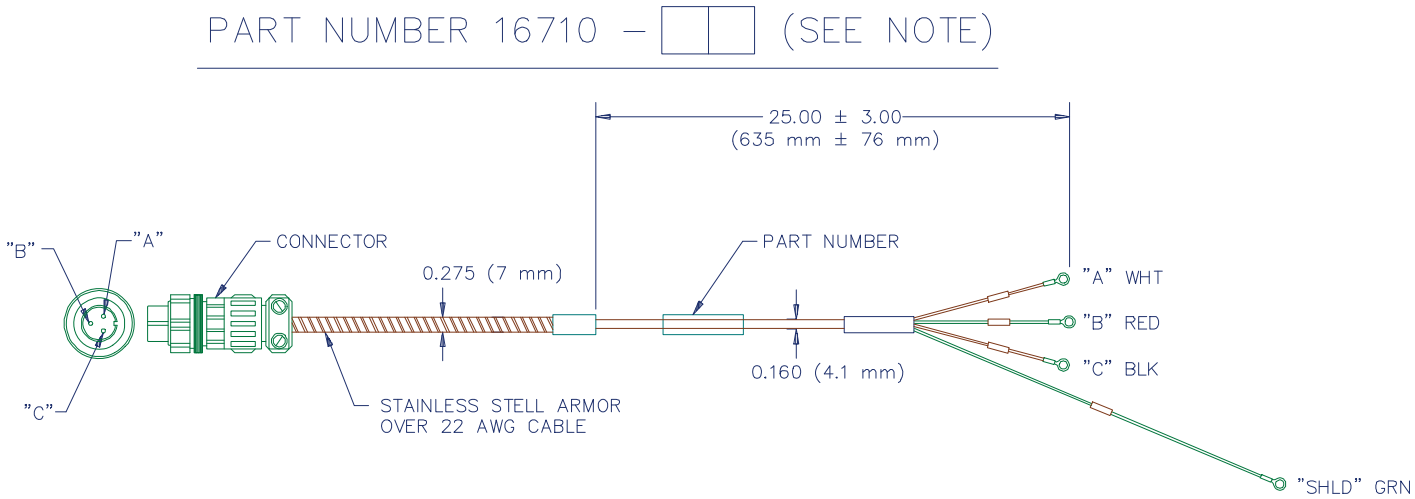


Figure B-1 Standard Interconnect Cable

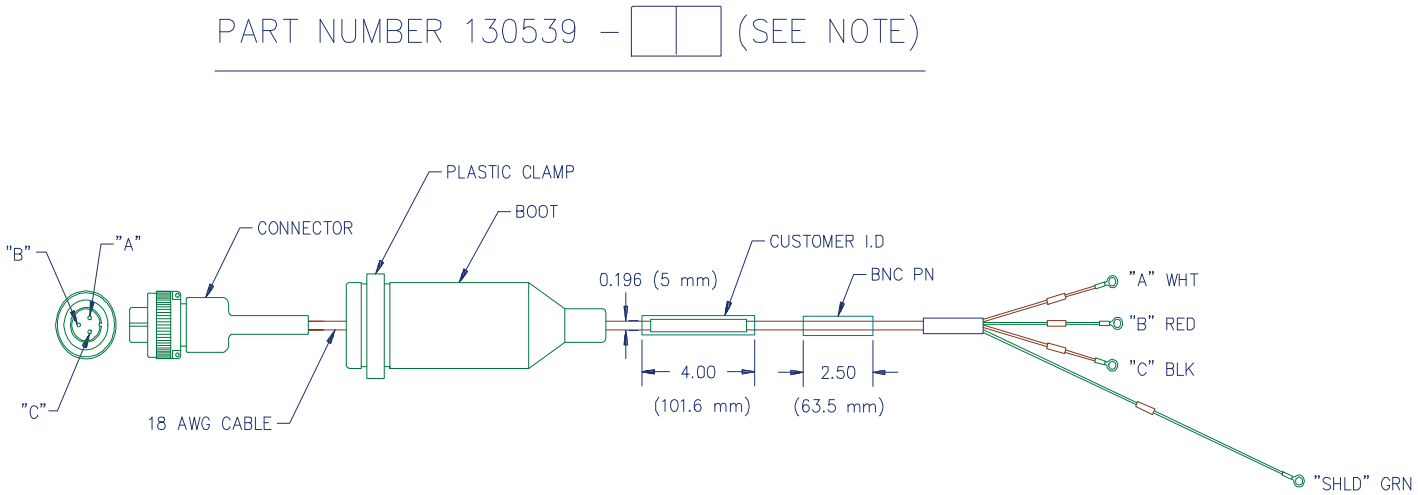


NOTE

INCREMENTS OF 1.0 FOOT (0.30 Metres)
EXAMPLE: 03 = 3 FEET (0.91 Metres) 25 = 25 FEET (7.62 Metres)
MIN LENGTH = 3.0 FEET (0.91 Metres) MAX LENGTH = 70 FEET (21.34 Metres)

*ALL DIMENSIONS ARE IN INCHES (MILLIMETRES) UNLESS OTHERWISE SPECIFIED.

Figure B-2 Standard Armored Interconnect Cable



NOTE

INCREMENTS OF 1.0 FOOT (0.30 Metres)
EXAMPLE: 12 = 12 FEET (3.66 Metres) 25 = 25 FEET (7.62 Metres)
MIN LENGTH = 2.0 FEET (0.61 Metres) MAX LENGTH = 99 FEET (30.18 Metres)

*ALL DIMENSIONS ARE IN INCHES (MILLIMETRES) UNLESS OTHERWISE SPECIFIED

Figure B-3 Splash Resistant Interconnect Cable

Appendix C
Electromagnetic Compatibility

The 330400 and 330425 Accelerometers met the European directives for Electromagnetic Compatibility including directives for meeting radio frequency emissions, susceptibility to conducted and radiated radio frequency interference (RFI), electrostatic discharges (ESD), and electrical fast transients (EFT).

This section presents technical information on Electromagnetic Compatibility terminology, lists of all the tests performed, and provides the 330400 and 330425 installation guidelines.

Terminology

Performance Criteria:

Criterion A:
When the apparatus is operated as intended, it will continue to operate during the test at a performance level specified by the manufacturer.

Criterion B:
When the apparatus is operated as intended, it will operate at a performance level specified by the manufacturer after the test is completed.

Electromagnetic Interference:

Radiated Interference occurs when energy propagates through space and couples into the equipment.

Conducted Interference occurs when energy propagates through a physical media other than space such as signal lines or ground paths.

Emission:
The equipment is emitting the energy that may interfere with other equipment.

Test Specifications and Performance Criteria

The Accelerometer was tested to the following generic standards:

EMI Testing (Emissions):
EN55022 Criteria A.

EMC Testing (Susceptibility):

EN 50082-2

The following is a list of the tests performed:

Test Description	Reference Specification	Test Specification	Performance Criteria
Radio Frequency Interference (Radiated) See note 1	ENV 50140	80 to 1000 MHZ sweep with 80% 1 kHz sine wave amplitude modulation at a field strength of 10 V/m (unmodulated, rms)	A
Radio Frequency Interference (Radiated)	ENV 50104	900 ± 5 MHZ sweep with 50% duty cycle, 200 Hz rep. frequency, and with the field strength of 10 V/m (unmodulated, rms)	A
Radio Frequency Interference (Conducted) See note 2	EN 50141	150 kHz to 80 MHZ sweep with 80% 1 kHz sine wave amplitude modulation at 10 V and source impedance of 150 ▫	A
Electrostatic Discharge (ESD)	EN 61000-4-2	8 kV contact discharges 15 kV air discharges	B
Electrical Fast Transients	EN 61000-4-4	2 kV on the power lines and 1 kV on the I/O lines	B

NOTE 1: Allowed deviation due to radiated RFI is less than 0.98 m/s² pk (0.1 g pk).
NOTE 2: Allowed deviation due to conducted RFI is less than 0.98 m/s² pk (0.1 g pk) between 150 kHz to 79 MHZ and less than 1.96 m/s² pk (0.2 g pk) between 79 MHZ to 80 MHZ.

Installation Requirements for EMC Compliance

For the 330400 and 330425 Accelerometer to meet the performance criteria listed, the transducer must be properly grounded and meet one of the following installation guidelines listed below:

1. The interconnect cable connecting the transducer to the monitor must be installed in a grounded metal conduit. A rigid metal conduit is recommended whenever possible with short lengths of a flexible metal conduit, such as a Sealite® flexible conduit, when needed.

2. Use the armored interconnect cable to connect the transducer to the monitor.

3. The transducer is installed in a housing. The interconnect cable leaving the housing must be installed in a grounded metal conduit.

Appendix D
Hazardous Area Approvals

330400 and 330425 Canadian Standards Association Approvals

The 330400 and 330425 Accelermeters are CSA approved for Division 2 non-hazardous aeas when installed per drawing 132524.

The 330400 and 330425 Accelermeters are CSA approved for Division 1 Zone 0 hazardous aeas when installed per drawing 132525.

The 330400 and 330425 Accelermeters are CENELEC approved for Division 1 Zone 0 hazardous aeas when installed per drawing 132525.

The table below lists the approval drawings in the order they appear in this section.

DRAWING TITLE	DRAWING NUMBER	NUMBER OF SHEETS
CSA Non-incedive installation drawing	132524	1
CSA Intrinsic safe installation drawing	132525	1

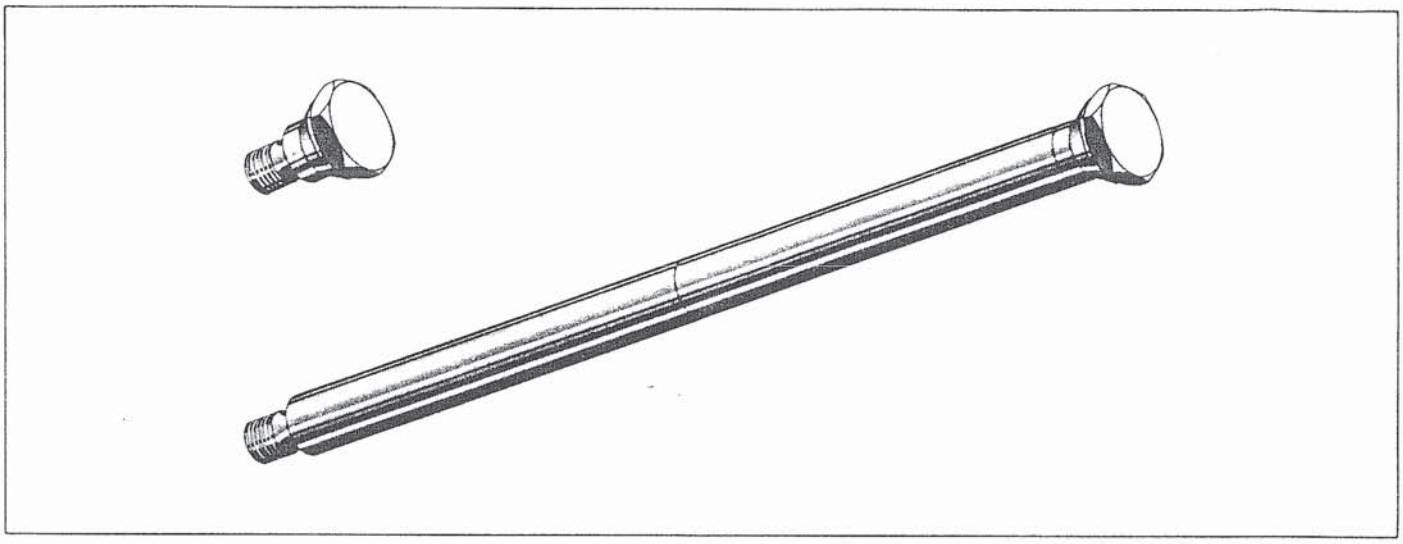
BENTLY NEVADA

Part number 127088-01

Montering av standard mätnipplar

Installation of standard adapters

Montieren der Standard Messnippel



Val av mätnippelplacering

Vid val av mätnippelplacering måste följande två huvudregler beaktas:

I Mätnippeln placeras så nära lagrets belastningszon som möjligt.

II Mätnippeln placeras så att materialförbindelsen mellan lagret och givaren blir obruten och så rätlinjig som möjligt.

Detta beroende på att tryckvågens front förlorar en stor del av sin energi när den reflekteras mot en yta eller passerar en materialövergång (delningsplan).

OBS!

Kontrollera att lagerhuset ej innehåller lätthål eller dylikt i gjutgodset bakom nippeln. Se fig.

Selection of pick-up points

When selecting pick-up points the following two main rules should be observed:

I The adapter should be located as close as possible to the load zone of the bearing.

II The signal path between bearing and adapter should be as straight as possible and must not contain mechanical interfaces.

This is because the pressure wavefront may lose a great amount of its energy when it is reflected against a surface or when it passes an interface.

NB!

Check that the bearing housing does not contain cavities or similar behind the pick-up point. See fig.

Wahl der Einschraubstellen für Messnippel

Bei der Auswahl der Einschraubstellen müssen folgende zwei Hauptregeln beachtet werden:

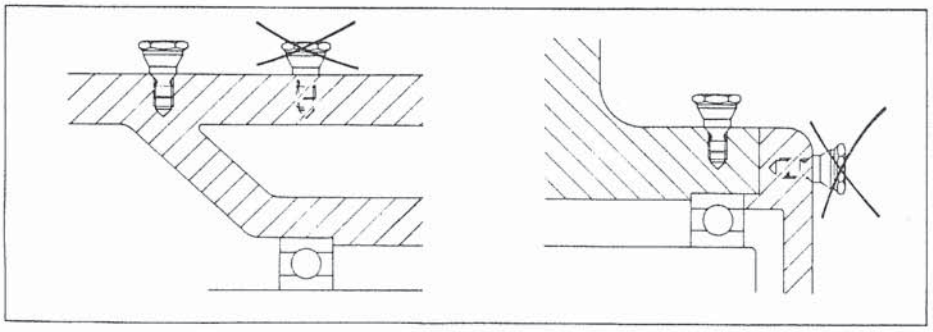
I Der Messnippel soll so nahe wie möglich an die Belastungszone des Lagers herangebracht werden.

II Zwischen Messnippel und Lager soll eine ununterbrochene und möglichst geradlinige Werkstoffbrücke vorhanden sein.

Die Druckwelle verliert nämlich einen grossen Teil ihrer Energie, wenn sie gegen eine Fläche reflektiert wird oder eine Materialfuge überbrücken muss.

ACHTUNG!

Bitte kontrollieren, dass das Lagergehäuse hinter dem Nippel im Guss von Hohlräumen u. dgl. frei ist. Siehe Fig.



Placeras mätnippeln enligt punkt I och II ovan kan lagertillståndet mätas direkt. Vid avvikande mätnippelplacering kan lagrets tillståndsutveckling följas genom jämförande mätningar.

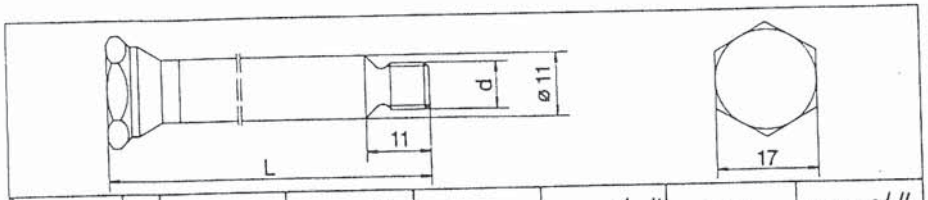
If the adapter is located as described above, the bearing condition can be measured and assessed directly. If this location is not possible, the assessment of the bearing condition must be based on comparative measurements.

Wird der Nippel lt. Punkt I und II oben montiert, kann der Lagerzustand direkt beurteilt werden. Bei abweichender Anbringung verfolgt man die Entwicklung des Lagerzustandes durch Vergleichsmessungen.

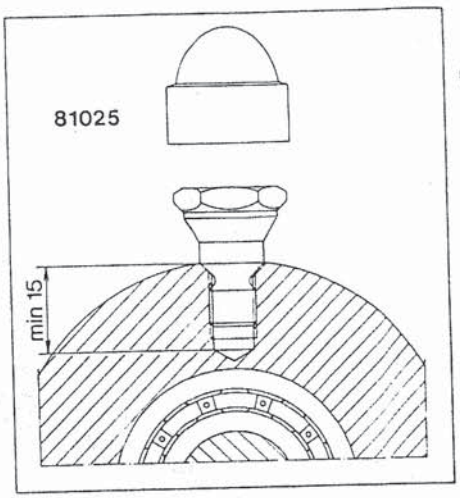
Standard mätnipplar

Standard adapters

Standard Messnippel



L \ d		M 6	UNC 1/4"	M 8	UNC 5/16"	M 10	UNC 3/8"
24 mm	1	30000	31000	32000	33000		
	2	30010	31010	32010	33010	34010	35010
113 mm	1			32200	33200	34200	35200
	2			32210	33210	34210	35210
202 mm	1			32300	33300	34300	35300
	2			32310	33310	34310	35310
291 mm	1			32400	33400	34400	35400
	2			32410	33410	34410	35410



Mätnipplar är massiva specialskruvar som tillsammans med snabbkopplingsgivaren bildar en "bajonettfattning". Mätnipplarna levereras i följande ytbehandlingsutföranden:

1. Zinkpläterad: 15µ Zn
2. Silverpläterad för starkt korrosiv miljö: 2µ Cu + 30µ Ag

Adapters are solid bolts of special design that form a bayonet connection together with the quick-connect transducer. The adapters are available with the following surface treatments:

1. Zinc-plated: 15µ Zn
2. Silver-plated for corrosive environments: 2µ Cu + 30µ Ag

Messnippel sind massive Spezialschrauben, die zusammen mit dem Schnellaufnehmer eine Bajonettfassung bilden. Messnippel können in folgenden Ausführungen geliefert werden:

1. Galvanisch verzinkt: 15µ Zn
2. Galvanisch versilbert für besonders korrosive Umgebung: 2µ Cu + 30µ Ag

81025

Skyddshatt för mätnipplar tillverkad i svart PVC

81025

Adapter cap in black PVC.

81025

Schutzkappe für Nippel aus schwarzem PVC-Plast

Mätnipplarna skall åtdragas enligt följande:

The adapters should be torqued as follows:

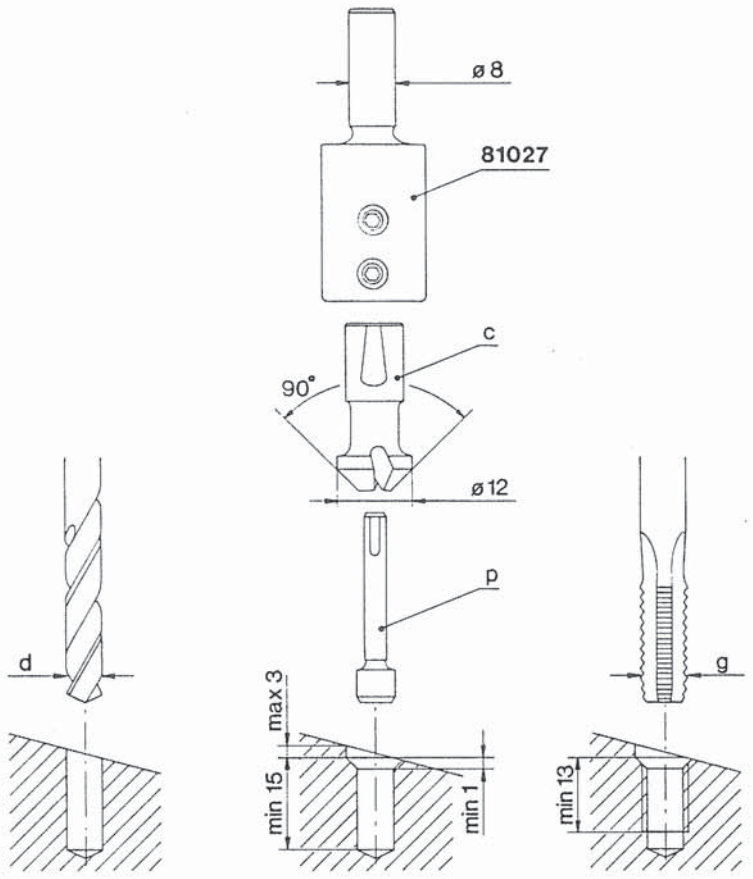
Die Messnippel werden wie folgt angezogen:

M 6	UNC 1/4"	M 8	UNC 5/16"	M 10	UNC 3/8"
5-7,5 Nm		10-20 Nm		20-30 Nm	

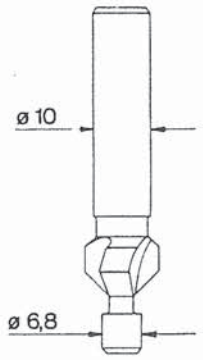
Monteringshål för mätnipplar

Mounting holes for adapters

Gewindelöcher für Messnippel



d	p	c	g
5,0 mm	**81030**	**81028**	M 6
5,1 mm	**81030**	**81028**	UNC 1/4"
6,8 mm	**81031**	**81028**	M 8
6,5 mm	**81032**	**81028**	UNC 5/16"
8,5 mm	**81033**	**81028**	M 10
8,0 mm	**81034**	**81028**	UNC 3/8"



82053

Verktyg för korrekt försänkning

För att uppnå bästa möjliga signalöverföring mellan lagerhus och mätnippel är det viktigt att nipplarna är korrekt monterade.

82053

Försänkare med fast styrtapp för M8 hål

Tools for correct countersinking

In order to achieve best possible signal transmission, it is important that the adapters are correctly mounted.

82053

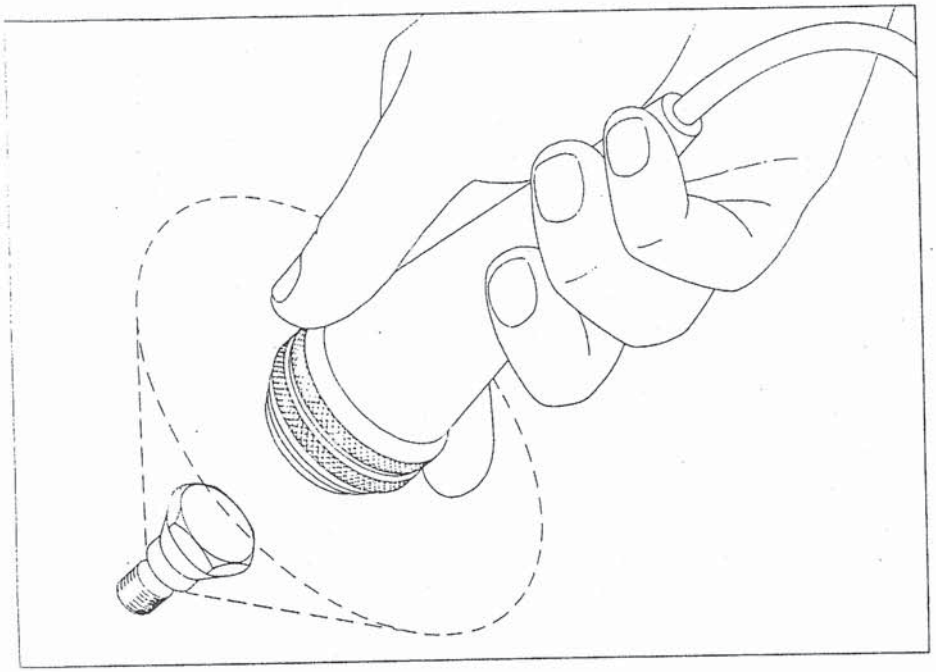
Countersink with fixed pilot for M8 holes.

Werkzeuge für fachgerechte Einsenkung

Um zwischen Lagergehäuse und Nippel die beste Signalübertragung zu erreichen, ist die korrekte Montage der Nippel sehr wichtig.

82053

Zapfensenker mit festem Zapfen für Gewinde M8.



OBS!

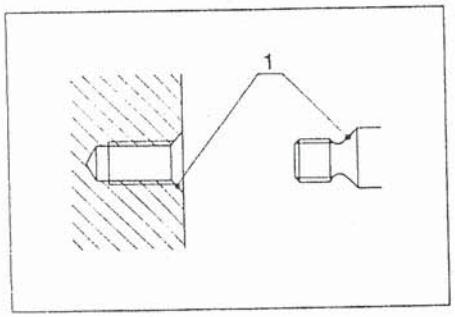
Vid placering av mätnipplar måste nödvändigt utrymme lämnas så att anslutning av givaren kan ske utan hinder. Min. 90° kona runt mätnippeln krävs.

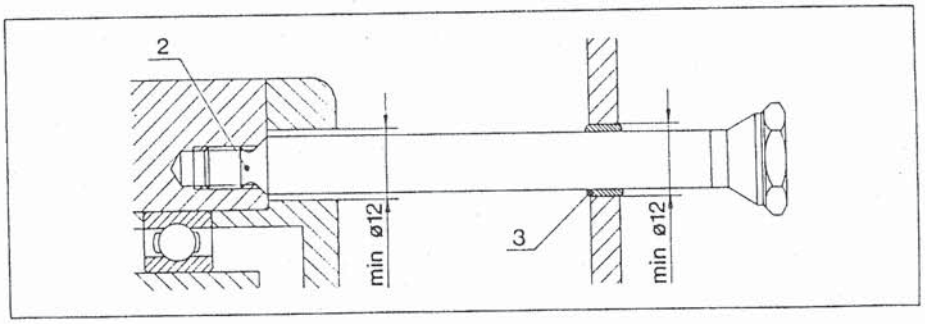
NB!

When installing adapters, make sure there is necessary space left for the attachment of the transducer. Min. 90° cone around the adapter required.

ACHTUNG!

Bei der Anbringung von Messnippeln muss für den unbehinderten Anschluss des Aufnehmers genügend Platz vorhanden sein. Min. 90° Konus um den Messnippel herum ist erforderlich.





Innan monteringen, kontrollera noga att inga föroreningar, spån eller andra partiklar förekommer i sätesytorna (1).

Vid montering av förlängda nipplar är det viktigt att dessa inte får annan metallisk kontakt med omgivningen än själva infästningen (2). Tätning vid genomföringar genom kåpor etc. måste utföras med elastiskt, dämpande material såsom gummi eller mjukplast (3).

Before the adapter is installed, make sure that the seat surfaces are clean (1).

When installing long adapters it is important that they have no other metallic contact with their surroundings than at the thread and seat surfaces (2). Sealing off must be carried out with elastic and dampening materials such as rubber or similar (3).

Vor Einschrauben der Messnippel muss genau kontrolliert werden, dass die Sitzflächen von Verunreinigungen, Spänen oder anderen Partikeln frei sind (1).

Bei der Montage von verlängerten Messnippeln ist darauf zu achten, dass diese keinen anderen metallischen Kontakt mit der Umgebung haben, als an der Einschraubstelle (2). An Durchgängen, z.B. bei Schutzhauben u.dgl. muss mit elastischen, dämpfenden Dichtungen wie Gummi oder Schaumplastik abgeschirmt werden (3).

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), Telex 17250

SPM Instrument

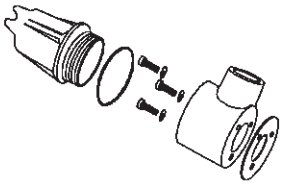
70241ABC 987

Printed in Sweden

Specifications and Ordering Information

Accelerometer Mounting Kit

BENTLY
Nevada



Description

The Accelerometer Mounting Kit protects an accelerometer from adverse physical and environmental conditions. Designed for rugged use, the mounting kit is water-tight and dust resistant.

The mounting kit consists of a flat cover with an optional dome cover, a housing base, a set of three 1/4-in 20 UNC x 0.62 mounting screws with lock washers, cable grip, O-ring, and a gasket. The optional dome cover is for use with accelerometers whose total height above the machine surface is 50 to 100 mm (2 to 4 in). The kits are designed for use with 12-mm (1/2-in) flexible or rigid conduit. Properly installed kits, using an accelerometer mounting base and rigid or flexible conduit, meet API 670 requirements. The mounting base and conduit are ordered as accessories. Prior to mounting, the machine surface where the housing will be installed must be spot faced.

An optional 303 stainless steel accelerometer mounting kit for corrosive environments is available for extra protection. It can be ordered under part number UK0159-00-01.

Specifications

Materials

Flat Cover:	"Copper free" aluminum
Dome Cover:	"Copper free" aluminum
Housing Base:	Feraloy®
Accelerometer Mounting Base:	Stainless steel (ordered separately)
Gasket and O-ring:	Neoprene®
Outlet Port Size:	1/2-in 14 NPT

Weight

With dome cover:	600 g (21 oz)
With flat cover:	320 g (11 oz)

Installation Instructions:	See Manual 43231-01 (included with kit.)

Ordering Information

43217-XX
Accelerometer Mounting Kit
Option description

0 0	Kit with flat cover for the 24147-01 Accelerometer
0 1	Kit with both flat and dome covers for the 23732-01 Accelerometer

Accessories

14847-XX
1/2-inch Sealtite® flexible conduit
Option Description

Assembly Length Option	Order in increments of 1 foot. **Minimum Length: 0 1** = 1 ft **Maximum Length: 9 9** = 99 ft **Example: 1 2** = 12-foot assembly.
37439-01	Accelerometer mounting base for the 23732-01

Dimensional Drawing

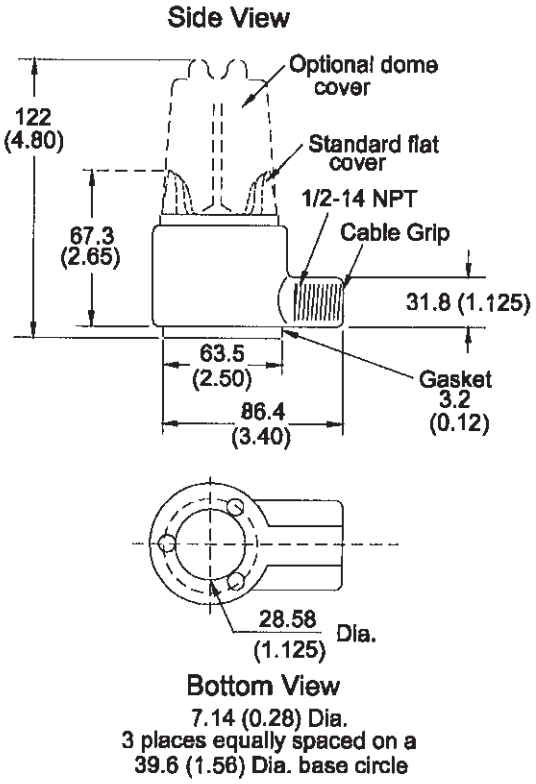
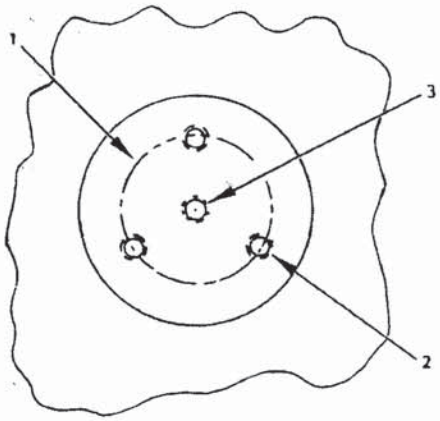


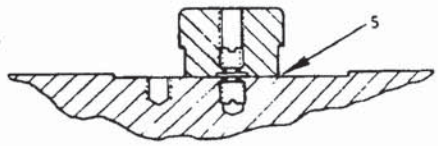
Figure 1: Accelerometer Mounting Kit Dimensions
Dimensions are in millimetres (inches)

INSTALLATION INSTRUCTIONS

ACCELEROMETER MOUNTING KIT
43217 AND 37442

The following instructions will aid in the installation of both the standard (PN 43217) and high temperature (PN 37442) accelerometer mounting kits. Both kits are designed to meet the API 678 Standard if properly installed using the API 678 accelerometer mounting base (37439-01, -02). Bently Nevada standard accelerometers can be installed in these housings for protection from harsh environmental conditions. Install the kit as follows:





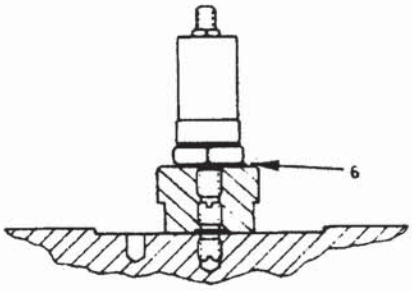
1. Spotface a 2-1/2 inch diameter minimum area no more than 0.030 inch deep.

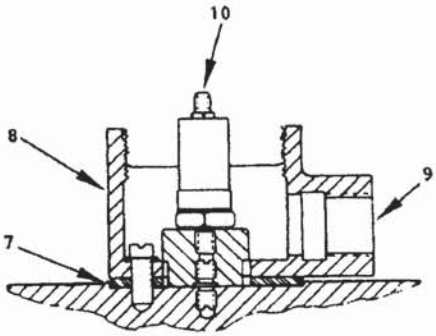
2. From the center of this spotface, drill and tap three equally spaced 1/4-20 UNC fully threaded holes on a 1-9/16 ± 1/64 inch diameter bolt circle. The direction that the conduit will exit will be opposite any one of these three holes.

3. Depending upon the transducer or mounting block to be installed, drill and tap a fully threaded hole at the center of the spotface. Use a 1/4-28 UNF with 0.40 inch minimum depth for either the API 678 mounting block (PN 37439-01) or the direct mounting of BNC accelerometer PN 23732-01. Use a M8 x 1.0 with 0.40 inch minimum depth for the BNC 37439-02 mounting block. Use a 6-32 UNC with 0.150 inch minimum depth for direct mounting of BNC High Frequency Accelerometer PN 24147-01.

4. Finish spotface surface to 63 microinches RMS with the exception of the central one-inch diameter region which should be finished to 32 microinches RMS.

5. If the API 678 mounting base is used, apply a small amount of adhesive (Cyanoacrylate, dental cement, or two part epoxy) to the bottom of the mounting block and install it into the center hole. Tighten to 60 ± 12 in-lbs maximum torque using a 1-inch diameter, 6 point socket.





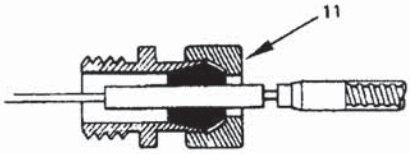
6. Apply a small amount of light oil or grease to the accelerometer base and stud. Install the accelerometer onto either the machine surface or the mounting block. Torque to 30 ± 5 in-lbs (BNC 23732-01) or 10 in-lbs (BNC 24147-01). The BNC 330400 and 330425 are supplied with a mounting block and both should be torqued to 30 ± 5 in-lbs after the mounting block is installed on the machine.

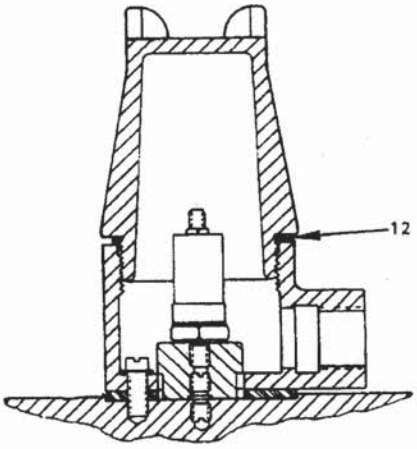
7. Install the gasket supplied with the kit over the accelerometer and the mounting block (if used) and align the gasket holes with the machine holes.

8. Place housing on top of gasket and secure to machine with the three screws and lock washers provided.

9. If 1/2 inch conduit assembly (BNC 14847-01) is not used, screw cable grip fitting into housing using teflon tape to seal threads. If conduit assembly is used, wrap teflon tape around threads of conduit fitting and install into housing.

10. Feed cable through fitting or conduit and connect to accelerometer electrical connector.





11. If conduit is used, connect and secure to fitting. If not, assemble cable seal as shown and secure back nut. Check that electrical cable is snug in the cable seal.

12. Place o-ring on dome and extension or flat cover as required and screw cover onto main body until finger tight. Be sure that cover does not crush cable.

BENTLY
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Minden, NV 89423 USA
Phone (775)782-3611
FAX (775)782-9203
Internet: www.bently.com

Certificate of Conformance

Customer Order no:
0810509614
Ship date:
07-Jan-2003
BNC Sales Order no:
54165

SHIPPING ADDRESS:
Voith Turbo GMBH
Brunnenstrasse 51
CRAILSHEIM 74564
Germany

ITEM #	QTY.	U/M	MODEL NO./DESCRIPTION
			CERTIFICATE OF CONFORMANCE The products included for shipment in the above customer order have been verified for conformance as follows: Products manufactured by Bently Nevada Corporation have been verified in accordance with the applicable Bently Nevada specifications, procedures, and the Integrated Manufacturing and Quality Plan. Products not manufactured by Bently Nevada Corporation have been verified for conformance to the specified order requirements. BENTLY NEVADA Dan Webb Quality Inspection Supervisor 03-Jan-2003 Date
1000	12	EA	43217-01 ACCELEROMETER MOUNTING KIT Customer Part #: 001 42428090
2000	12	EA	108576-01 ACCL HSG EXTENSION
3000	12	EA	04290422 O-RING NP 1.981X.14W
4000	6	EA	16925-21 EXTENSION CABLE Customer Part #: 002 4222916003
5000	40	EA	03818016 JUNCTION BOX Customer Part #: 003 41425270

14.17 Scambiatore termico/ Valvola di regolazione della temperatura

14.17.1 Scambiatore termico

Numero di disegno Voith: 221.00291310

Tipo: L1 N4 11 21 13K

Disegno dimensionale 91500288510

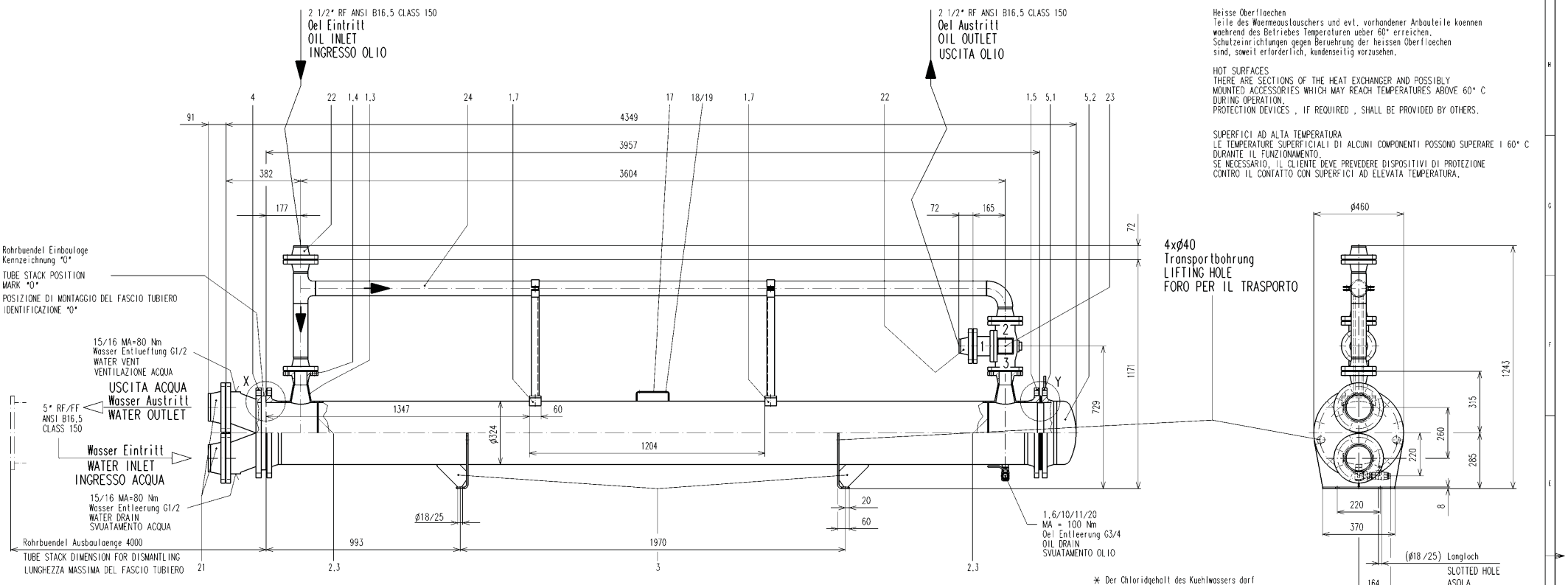
Descrizione di montaggio e manutenzione . . . . . 3626-007101_1it

14.17.2 Valvola di regolazione della temperatura

Numero di disegno Voith: 221.00228410

Tipo: M 65

Descrizione. . . . . MVA

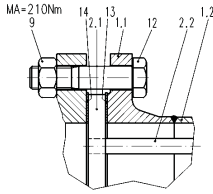


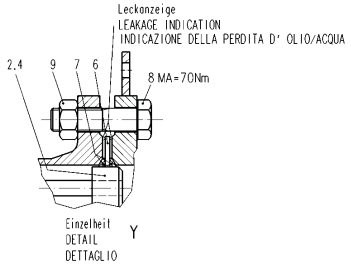
Heisse Oberflaechen
Teile des Waermeaustauschers und evt. vorhandener Anbauteile koennen waehrend des Betriebes Temperaturen ueber 60° erreichen.
Schutzeinrichtungen gegen Beruehrung der heissen Oberflaechen sind, soweit erforderlich, kundenseitig vorzusehen.

HOT SURFACES
THERE ARE SECTIONS OF THE HEAT EXCHANGER AND POSSIBLY MOUNTED ACCESSORIES WHICH MAY REACH TEMPERATURES ABOVE 60° C DURING OPERATION.
PROTECTION DEVICES , IF REQUIRED , SHALL BE PROVIDED BY OTHERS.

SUPERFICI AD ALTA TEMPERATURA
LE TEMPERATURE SUPERFICIALI DI ALCUNI COMPONENTI POSSONO SUPERARE I 60° C DURANTE IL FUNZIONAMENTO.
SE NECESSARIO, IL CLIENTE DEVE PREVEDERE DISPOSITIVI DI PROTEZIONE CONTRO IL CONTATTO CON SUPERFICI AD ELEVATA TEMPERATURA.

Pos	Benennung DESIGNATION DENOMINAZIONE	Groesse SIZE GRANDEZZA	DIN/EN/ISO	Werkst./DIN EN MATERIAL MATERIALE										
4	Anschlussflansch CHANNEL FLANGIA D' ATTACCO			EN-GJL-250 DIN EN 1561	19	Zylinderkopfniet SOCKET HEAD RIVED CHIODO			Edelstahl STAINLESS STEEL ACCIAIO INOX	24	Verrohrung PIPE WORK TUBAZIONE	2 1/2" RF CLASS 150	ANSI B 16.5	Stahl STEEL
3	Befestigung angeschweisst SUPPORT WELDED SUPPORTO			S235JR DIN EN10025	18	Leistungsschild NAME PLATE TARGA DI IDENTIFICAZIONE			X2CrNiMo17122 (1.4404)	23	Temperatur-Regler TEMPERATURE CONTROL VALVE REGOLATORE DI TEMPERATURA	2 1/2" RF CLASS 150	ANSI B 16.5	EN-GJL-250 DIN EN 1561
2.4	Rohrboden beweglich FLOATING TUBE SHEET FONDO TUBI MOBILE		DIN 17665	CuAl10Ni (2.0966)	17	Schildtraegerblech TRESTLE LAMIERCE		DIN 1542	S235JR DIN EN10025	22	Vorschweissflansch WELDING NECK FLANGE FLANGIA DA SALDARE	2 1/2" RF CLASS 150	ANSI B 16.5	C 21
2.3	Umlenkblech BAFFLE DEFLETTORE		DIN 1541	DC 01 DIN EN 10130	16	Dichtring JOINT GUARNIZIONE AD ANELLO	A21x26	DIN 7603	Cu	21	Vorschweissflansch WELDING NECK FLANGE FLANGIA DA SALDARE	5" RF CLASS 150	ANSI B 16.5	C 21
2.2	Rohr TUBE TUBO	⌀10	DIN EN 10217-7	X5CrNi1810 (1.4301)	15	Verschlussschraube PLUG VITE CHIUSURA	G 1/2	DIN 910	Ms	20	Kugelhahn BALL VALVE RUBINETTO A SFERA	G 3/4		Ms
2.1	Rohrboden starr STATIONARY TUBE SHEET FONDO TUBI FISSO		DIN 17665	CuAl10Ni (2.0966)	14	Flachdichtung mit Steg FLAT GASKET WITH WEB GUARNIZIONE PIANA CON COSTOLA	DN300PN16		Klinger - SIL C 4400					
	Rohrbuendel Baugruppe TUBE STACK FASCIO TUBIERO				13	Flachdichtung FLAT GASKET GUARNIZIONE PIANA	DN300PN16	DIN 2690	Klinger - SIL C 4400					
1.7	Befestigung angeschweisst SUPPORT WELDED SUPPORTO			S235JR DIN EN10025	12	Skt. Schraube HEX. BOLT BULLONE ESAGONALE	M24x110	ISO 4014	8.8-A					
1.6	Anschweissauge SOCKET OCCIO DA SALDARE	G 3/4	DIN EN 10220	P235GH EN 10216-2	11	Dichtring JOINT GUARNIZIONE AD ANELLO	A27x32	DIN 7603	Cu					
1.5	Vorschweissflansch WELDING NECK FLANGE FLANGIA DA SALDARE	DN300PN16	DIN 2633	C 22.3 DIN 17200	10	Verschlussschraube PLUG VITE CHIUSURA	G 3/4	DIN 910	Ms					
1.4	Vorschweissflansch WELDING NECK FLANGE FLANGIA DA SALDARE	2 1/2" RF CLASS 150	ANSI B 16.5	C 21	9	Skt. Mutter HEX. NUT DATO	M24	ISO 4032	8-A					
1.3	Reduzierstueck REDUCTION RIDUZIONE	⌀114.3x76.1	DIN 2616-2	P235TR2 EN10216-1	8	Skt. Schraube HEX. BOLT BULLONE ESAGONALE	M24x90	ISO 4014	8.8-A					
1.2	Mantelrohr SHELL PIPE GUSCIO	⌀324x7	DIN EN 10220	P235 DINEN10217	7	RDR O-RING ANELLO TORICO	⌀300 x 8		NBR 80					
1.1	Vorschweissflansch WELDING NECK FLANGE FLANGIA DA SALDARE	DN300PN16	DIN 2633	C 22.3 DIN 17200	6	Blockring PRESSURE RING FLANGIA		DIN 1543	S235JR DIN EN10025					
	Mantel Baugruppe SHELL RIVES TIMENTI				5.2	Kloepperboden TORISPHERICAL HEAD FONDO A CANESTRO	⌀324x8	DIN 28011	P265GH EN 10028-2					
	Waermeaustauscher HEAT EXCHANGER SCAMBIATORE DI CALORE				5.1	Vorschweissflansch WELDING NECK FLANGE FLANGIA DA SALDARE	DN300PN16	DIN 2633	C 22.3 DIN 17200					
					5	Umlenkkammer BONNET CAMERA DI RINVIO			Stahl STEEL					





* Der Chloridgehalt des Kuehlwassers darf 50 mg/l (ppm) nicht ueberschreiten.
* THE CHLORIDE CONTENT OF THE COOLING WATER SHALL NOT EXCEED 50 mg/l (ppm).
* IL CONTENUTO DI CLORURO DELL'ACQUA DI RAFFREDDAMENTO NON DEVE SUPERARE 50 mg/l (ppm).

Flowserve Aprilia S 1

Herstell-Nr.: SERIAL NO.: N. FABBRICAZIONE	Betriebsdaten OPERATING DATA DATI DI SERVIZIO	Mantelraum SHELL SIDE LATO MANTELLO	Rohrraum TUBE SIDE LATO TUBI
8206810 - 8206813	Medium FLUID FLUIDO	Oel OIL OLIO	* Wasser * WATER * ACQUA
	Betriebsvolumenstrom V OPERATING FLOW RATE V PORTA D' ESERCIZIO V	30 m^3/h	65 m^3/h
	Mindestvolumenstrom wegen Korrosion MIN. FLOW RATE BECAUSE OF CORROSION PORTATA MINIMA PER MOTIVI DI CORROSIONE		35 m^3/h
	Ein-/Austrittstemperatur INLET/OUTLET TEMPERATURE TEMPERATURA INGRESSO/USCITA	82 °C/55 °C	50 °C/ 55 °C
Stueckzahl: QUANTITY: QUANTITA PEZZI: 4	Zul. Betriebsueberdruck MAX. ADMISSIBLE WORKING PRESSURE PRESSIONE SERVIZIO AMMISS	10 bar	10 bar
	Pruefueberdruck TEST PRESSURE PRESSIONE DI PROVA	15 bar	15 bar
	Zul. Betriebstemperatur MAX. ADMISSIBLE WORKING TEMPERATURE TEMPERATURA SERVIZIO AMM.	120 °C	70 °C
Gewicht leer / gefuellt: WEIGHT EMPTY FILLED / PESO VUOTO RIEMPITO: 847 kg / 1116 kg	Inhalt CONTENTS VOLUME	152 L	117 L
	Einbau- und Betriebsanweisung INSTALLATION AND OPERATING INSTRUCTIONS INSTRUZIONE D' ASSEMBLAGGIO E SERVIZIO	3.626-7101	

* SCAMBIATORE DI CALORE

Aend. Rev. Index	Kurzel Rev. Ind.	Aenderungs-Nr. Revision-Nr.	Aenderung Rev. descr. (shop and eng. info only)	Indx Indx	Datum Ges. Date Draw.	Name Name	Gepr. App.

Typ: L1 N4 11 21 13K
ORDER-NO.: 38002141

CAD — Freigabevermerk Released for manuf.

Sprache Language: deenit

Kanten Chamfers ISO 13715 — Allg. Toleranzen Gen. Tolerances ISO 2768-mK-E — Oberflächen Surface Quality R_a in µm — Toleranzring Tolerancing DIN 7167 — ISO 1302

Massstab im Orig. Scale of Orig. 1:10 — Masse Mass kg — Werkstoff Material — Modell- / Gesenk-Nr. Pattern / Die No. — Rohrteil-Nr. Block-No.

	Datum Date	Name Name	Benennung Title
Erst. Gen.	2009-10-14	Hpfit	Waermeaustauscher
Gepr. Ch.	2009-10-14	JAr	* HEAT EXCHANGER
Abt. Dept.	circa	Ers. Rep.	
Norm Standard			

Doku-Art Doc. Type: ZCI

VOITH TURBO ANTRIEBSTECHNIK

Zeichnungs-Nr. / Doku-Nr. Drawing No. / Doc. No.: 91500288510

Blatt Sheet 1 v. 1 Bl.

Massstab Scale

Allgem. Toleranzen Gen. Tolerances

Bearb. Draftsman

Geprüft Checked

Freigegeben Released

Voith Turbo

VOITH

Documentazione tecnica
manuale operativo

Scambiatore di calore

Olio di lavoro:
Tipo L1 N4 11 21 13K
N. serie da 8206810 a 8206813

Documentazione tecnica n. 3626-007101it

In caso di domande sullo Scambiatore di calore, è possibile rivolgersi al servizio clienti (rep. aira) per la gamma di prodotti dei comandi regolabili della Voith Turbo GmbH & Co. KG Crailsheim, indicando il numero di fabbricazione.

Voith Turbo GmbH & Co. KG
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Questo Manuale operativo descrive il livello tecnico dello Scambiatore di calore al momento della fornitura. Eventuali modifiche successive apportate al Scambiatore di calore non sono considerate in questo Manuale operativo.

Data di pubblicazione: 2010-06-02
Documentazione tecnica n. 3626-007101it
Versione 1.00

Printed in Germany

Informazioni generali relative al manuale operativo

Funzionamento comodo

Il manuale operativo contiene importanti indicazioni per far funzionare lo Scambiatore di calore in modo sicuro, regolare e comodo. L'osservanza di queste indicazioni consente di evitare pericoli, costi di riparazione e tempi di inattività e di aumentare l'affidabilità e la durata dello Scambiatore di calore.

Lettura del manuale operativo

Leggere attentamente il presente manuale operativo per acquisire dimestichezza con l'utilizzo e le corrette azioni da eseguire.

Luogo di impiego

Il manuale operativo deve essere sempre disponibile sul luogo di impiego dello Scambiatore di calore.

Copyright

Definizione dei gruppi di destinazione

I contenuti di questo manuale operativo sono definiti per diversi gruppi di destinazione. Qui viene definito il livello di conoscenza che il gruppo di destinazione specifico deve avere.

Tutti i gruppi di destinazione devono aver letto questo manuale operativo e averne compreso i contenuti.

L'operatore deve

- aver compiuto 18 anni.
- essere addestrato in relazione allo Scambiatore di calore.
- conoscere le disposizioni antinfortunistiche specifiche del paese.

Il personale addetto alla manutenzione deve,

- aver compiuto 18 anni.
- conoscere i punti di manutenzione sullo Scambiatore di calore.
- conoscere le disposizioni per la tutela ambientale specifiche del paese per lo smaltimento di lubrificanti e detergenti.

Il personale di servizio deve,

- aver compiuto 18 anni.
- possedere una formazione scolastica e professionale consolidata.
- essere addestrati da Voith Turbo GmbH & Co. KG nelle attività di servizio da eseguire sullo Scambiatore di calore.
- essere istruito sulle regole comportamentali in caso di anomalia.

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Olio di lavoro: N. serie da 8206810 a 8206813

Modifiche tecniche

I nostri impianti vengono continuamente sviluppati e migliorati. I dati contenuti in questa edizione sono conformi allo stato della tecnica.

Le modifiche dei dettagli tecnici rispetto alle indicazioni e alle figure del manuale operativo sono riservate.

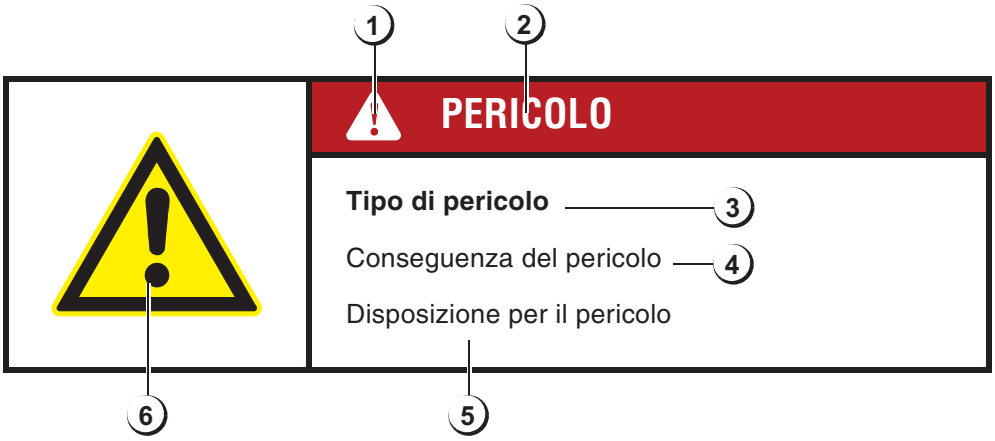
Regole per la prevenzione degli infortuni

Oltre al manuale operativo e alle regole vigenti nel paese dell'utente e nei luoghi di utilizzo per la prevenzione degli infortuni è necessario attenersi anche alle regole tecniche riconosciute per lavori eseguiti in sicurezza e a regola d'arte.

Indicazioni per l'utilizzo del manuale operativo

Struttura delle indicazioni di sicurezza

Segnalazione di anomalie relativa all'utilizzo:

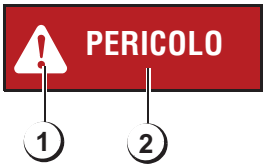


riepilogo delle indicazioni di sicurezza e avvertenze aggiuntive prima del rispettivo capitolo:

Tipo di pericolo (3)

Conseguenza del pericolo (4)

Contromisura per il pericolo (5)



1. Simbolo di sicurezza
2. Dicitura del segnale livello di pericolo
3. Tipo e origine del pericolo
4. Eventuale conseguenza del pericolo
5. Disposizione per evitare il pericolo
6. Simbolo di sicurezza

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Avvertenze

AVVERTENZA

Presenta un'informazione che contiene importanti indicazioni relative all'utilizzo e/o al procedimento. La mancata osservanza delle indicazioni può causare anomalie.

Definizione dei tipi di testo

I testi vengono definiti in base alla loro funzione nel seguente modo:

Tipo di testo	Definizione	Funzione
Istruzioni per le azioni da eseguire	**1.**, **2.**, ecc.	invita ad eseguire un'azione
Elenco 1. livello	•	definisce singoli elementi dell'elenco
Elenco 2. livello	–	definisce punti secondari dell'elenco
Rimando	➔	rimanda ad altri capitoli o passi del testo

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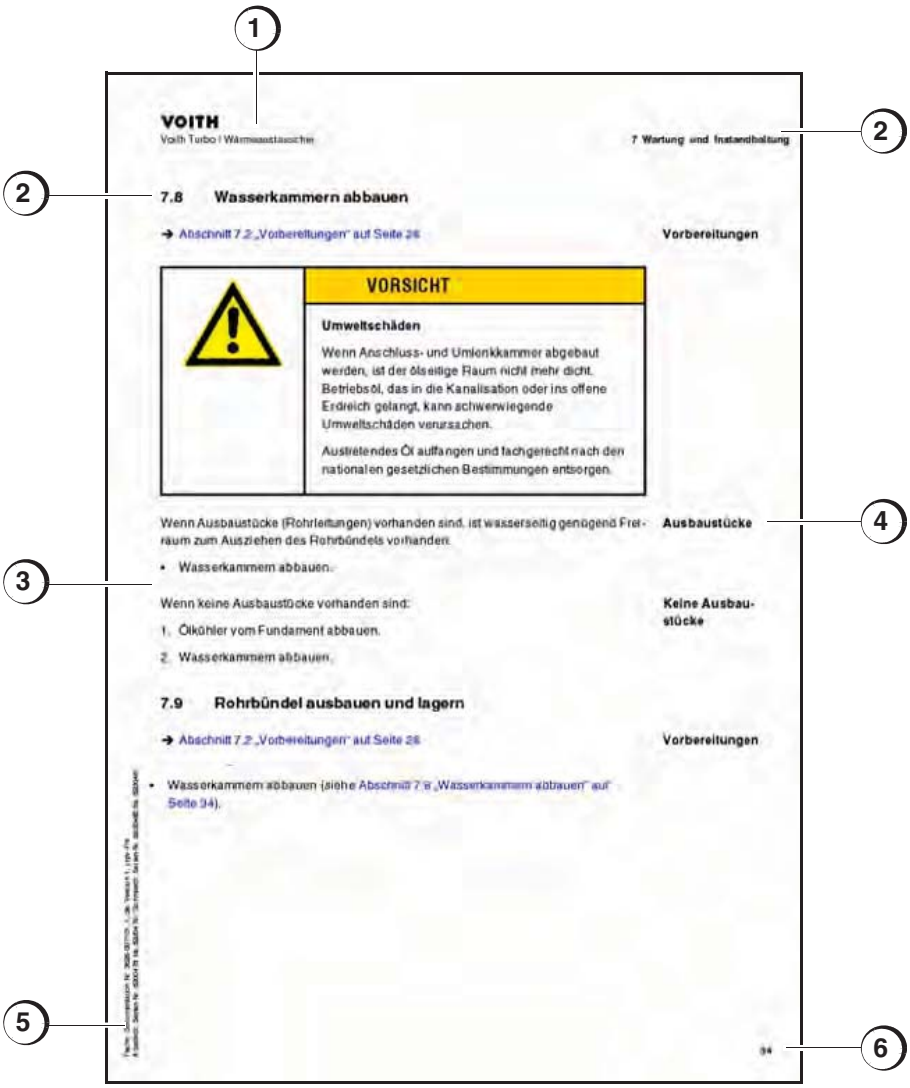
Struttura della pagina:



1. Tipo di impianto
2. Denominazione del capitolo
3. Paragrafi di testo
4. Titoli a margine
5. N. documentazione tecnica, lingua, versione e esecutore
6. Numero di pagina

Indice

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1 Dati tecnici

Scambiatore di calore

– Olio di servizio: Tipo L1 N4 11 21 13K, N. serie da 8206810 a 8206813

Dati sui componenti

Scambiatore di caloreOlio di servizio	Vano rivestimento	Vano tubi
Mezzo	Olio	Acqua
Volume	152 l	117 l
Peso: vuoto pieno	Totale 847 kg 1116 kg	

Dati di funzionamento

Scambiatore di calore Olio di lavoro	Vano rivestimento (olio)	Vano tubi (acqua)
Portata nominale V_{nom}	30 m^3/h	65 m^3/h
Portata minima a causa della corrosione V_{min}		35 m^3/h
Temperatura ingresso	82 °C (180 °F)	50 °C (122 °F)
Temperatura uscita	55 °C (131 °F)	55 °C (131 °F)
Temperatura di esercizio consentita	120 °C (248°F)	70 °C (158 °F)
Sovrapressione funzionamento ammissibile	10 bar	10 bar
Sovrapressione controllo	15 bar	15 bar

2 Indicazioni di sicurezza

2.1 Presupposti per la costruzione dell'impianto

Principio fondamentale

Lo Scambiatore di calore è costruito secondo gli standard tecnici e le regole tecniche riconosciute per la sicurezza. Tuttavia, il suo utilizzo può causare lesioni e pericoli all'utente o a terzi oppure compromettere l'impianto e altri beni.

Utilizzo dell'impianto

Utilizzare lo Scambiatore di calore solo in condizioni tecnicamente perfette rispettando le disposizioni sulla sicurezza e sui pericoli e attenendosi al manuale operativo. Eliminare (far eliminare) immediatamente le anomalie che possono compromettere la sicurezza.

2.2 Utilizzo della macchina secondo le disposizioni

Lo Scambiatore di calore serve per raffreddare l'olio di servizio. Utilizzare solo componenti appropriati.

Per un utilizzo conforme è necessario rispettare le condizioni di esercizio e di manutenzione prescritte dal costruttore.

Ogni altro utilizzo diverso da quello specificato è considerato non conforme.
Il costruttore non è responsabile di eventuali danni derivanti da un utilizzo non conforme; ogni rischio e pericolo sarà a carico dell'utente.

2.3 Indicazioni di sicurezza generali

2.3.1 Simbolo di sicurezza

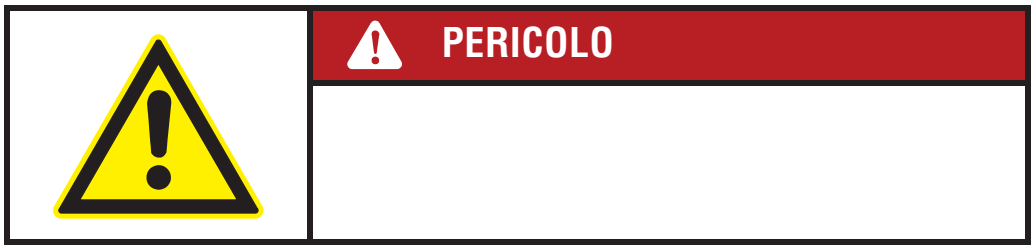
Il simbolo di sicurezza viene utilizzato per segnalare eventuali danni alle persone. Attenersi a tutte le indicazioni che presentano questo simbolo di sicurezza per evitare possibili lesioni o il decesso.

2.3.2 Classificazione dei pericoli

Classificazione dei pericoli valida per segnalazione di anomalie relative all'utilizzo (vedere gli esempi seguenti), riepilogo delle indicazioni di sicurezza e avvertenze aggiuntive prima del rispettivo capitolo.

Pericolo

Indica una situazione immediatamente pericolosa, che può provocare morte o lesioni gravi, se non vengono rispettate le disposizioni di sicurezza.



Avvertimento

Indica una possibile situazione pericolosa, che può provocare morte o lesioni gravi, se non vengono rispettate le disposizioni di sicurezza.

Attenzione

Indica una possibile situazione pericolosa, che può provocare danni materiali, lesioni lievi o medie, se non vengono rispettate le disposizioni di sicurezza.

Attenzione - senza simbolo di sicurezza

Indica una possibile situazione pericolosa, che può provocare danni materiali, se non vengono rispettate le disposizioni di sicurezza.

2.3.3 Manutenzione e sostituzione dei simboli di sicurezza

La sicurezza dell'utente deve sempre essere al primo posto.

- Sostituire tutti i simboli di sicurezza danneggiati e persi.
- Utilizzare acqua e detergente delicato per pulire i simboli di sicurezza.

Non utilizzare detergenti che contengono solventi.

2.3.4 Sicurezza personale

Le persone che utilizzano o che lavorano con lo Scambiatore di calore devono leggere e comprendere il manuale operativo e i simboli descritti.

2.4 Indicazioni di sicurezza generali

- Il manuale operativo del costruttore è vincolante per l'utilizzo, la manutenzione, il montaggio e il trasporto.
- Laddove necessario, il cliente deve integrare le norme di sicurezza alle condizioni di utilizzo locali con particolari indicazioni adeguate.
- Conservare accuratamente il manuale operativo e le indicazioni relative alla sicurezza.
- Il manuale operativo e le indicazioni di sicurezza devono essere completi e in condizioni leggibili.

Prima dell'inizio del lavoro

- Prima dell'inizio dei lavori, informarsi sulle possibilità di primo soccorso e di salvataggio (medico di pronto intervento, vigili del fuoco, servizi di soccorso).
- Informarsi sull'ubicazione e sull'utilizzo degli estintori e sulle possibilità locali per la segnalazione degli incendi e la lotta antincendio.

Durante il lavoro

- I dispositivi di sicurezza non devono mai essere messi fuori servizio né rimossi.
- Durante il funzionamento, indossare indumenti protettivi da lavoro. Rimuovere anelli, sciarpe o giacche aperte. Per determinati lavori è necessario indossare occhiali, guanti e caschi protettivi, giubbotti riflettenti, cuffie per l'udito, ecc.
- Tralasciare qualsiasi modo di lavorare che limita la sicurezza.
- Azionare lo Scambiatore di calore solo in condizione sicura ed efficiente.
- Mai azionare la macchina con controllo difettoso.

Disposizioni per la tutela ambientale

- Per tutti i lavori eseguiti con lo Scambiatore di calore, rispettare le norme vigenti per la tutela ambientale.
- In particolare, durante i lavori di installazione, riparazione e manutenzione, fare attenzione che materiali dannosi per l'ambiente, quali grassi e oli lubrificanti, detergenti contenenti solventi e simili non penetrino nel terreno o nelle fognature. Questi materiali devono essere conservati, trasportati, raccolti e smaltiti in contenitori adeguati.
- Se i liquidi sopra indicati penetrano nei terreni, interromperne immediatamente la fuoriuscita e unire il liquido con un legante adeguato. Eventualmente sarà necessario scavare il terreno.
- Smaltire adeguatamente il legante e la terra scavata, rispettando le disposizioni vigenti per la tutela ambientale.

2.5 Misure organizzative

Manuale operativo

Il manuale operativo contiene indicazioni importanti per l'impiego corretto dello Scambiatore di calore. Prima del collegamento dello Scambiatore di calore e soprattutto prima della messa in servizio dell'intero impianto, leggere attentamente il manuale operativo ed accertarsi di averlo capito bene.

Conservare il manuale operativo in modo tale che sia sempre a disposizione del personale di servizio.

Prevenzione incidenti/tutela dell'ambiente

Integrazione al manuale operativo: Preparare e osservare delle regole per la prevenzione incidenti e per la tutela dell'ambiente.

Modifiche costruttive

Per quanto riguarda le modifiche di tipo costruttivo, osservare le seguenti indicazioni:

AVVERTIMENTO

Pericolo per modifiche costruttive

Modifiche costruttive eseguite sullo Scambiatore di calore possono causare danni a persone e a cose.

Eseguire modifiche, aggiunte o trasformazioni costruttive sullo Scambiatore di calore solo con il permesso della Voith Turbo GmbH & Co. KG, Crailsheim.

2.6 Scelta e qualifica del personale, doveri fondamentali

Personale qualificato

- Permettere soltanto al personale qualificato e addestrato di lavorare sullo Scambiatore di calore. Il personale deve disporre di formazione, istruzione e/o qualificazione
  - per poter lavorare ed eseguire la manutenzione degli impianti in modo adeguato e in base agli standard di sicurezza tecnica
  - per smaltire adeguatamente i mezzi e i loro componenti, per es. filtri, cartucce filtri olio e oli
  - per curare e utilizzare l'equipaggiamento di sicurezza in base agli standard di sicurezza tecnica
  - per prevenire gli incidenti e prestare il pronto soccorso.

Personale da istruire

- Il personale da addestrare, istruire, avviare o rientrante in una formazione generale, deve operare sull'impianto solo sotto lo stretto controllo di una persona esperta.

2.7 Doveri del cliente

Scambiatore di calore in condizioni non perfette potrà causare danni a persone e macchine.

Il cliente ha l'obbligo di mettere in funzione lo Scambiatore di calore solo in condizioni perfette.

La protezione dei punti pericolosi che si creano tra Scambiatore di calore e i dispositivi specifici del cliente deve essere eseguita dal cliente.

Lo Scambiatore di calore genera calore, che potrebbe aumentare la temperatura attorno all'area di lavoro e danneggiare le persone. Il cliente ha l'obbligo di fornire sempre una ventilazione adeguata.

Durante i lavori sullo Scambiatore di calore, il cliente deve provvedere a fornire un'illuminazione adeguata.

2.8 Definire e istruire persone responsabili

Impiegare solo personale addestrato o istruito, stabilire chiaramente le competenze del personale per l'utilizzo, l'installazione, la manutenzione e la riparazione.

Lavori in sicurezza

Controllare regolarmente il lavoro del personale dal punto di vista della sicurezza e dei pericoli, attenendosi al manuale operativo.

2.8.1 Dovere informativo

Lettura del manuale operativo

Prima dell'inizio dei lavori, il personale incaricato delle attività sull'impianto deve aver letto il manuale operativo e in particolare il capitolo **Indicazioni di sicurezza**. Durante il lavoro vero e proprio sarà troppo tardi. Ciò si applica in particolare al personale che interviene solo occasionalmente sull'impianto, ad es., per la manutenzione.

Tenere sempre a portata di mano il manuale operativo nel luogo di utilizzo dell'impianto.

2.9 Segnalazioni di tipi particolari di pericolo

Oli, grassi e aerosol

Durante il lavoro con oli o grassi rispettare le prescrizioni di sicurezza valide per il prodotto in questione.

Prestare attenzione al lavoro con materiali di funzionamento e ausiliari a temperature elevate (pericolo di bruciatura o ustione).

Gli aerosol rilasciati possono essere assorbiti dalle persone tramite la pelle, gli occhi o la respirazione, e causare infiammazioni o lesioni. Il cliente ha l'obbligo di fornire sempre una ventilazione adeguata

2.10 Divieto di modifiche indipendenti

Modifiche

Ogni modifica, aggiunta o trasformazione all'impianto che potrebbe mettere in pericolo la sicurezza non potrà essere apportata senza l'autorizzazione di Voith Turbo GmbH & Co. KG Crailsheim.

2.11 Pulizia dello Scambiatore di calore

2.11.1 Detergente

AVVERTIMENTO

Pericolo di lesioni

I detergenti infiammabili possono infiammarsi e causare lesioni a persone.

Impiegare solo detergenti permessi.

2.11.2 Per una sporcizia normale

- Impiegare solo detergenti comunemente in commercio e non infiammabili.
- Qualora i vapori dei detergenti possano essere inalati, è necessario indossare un dispositivo di protezione della respirazione.
- Non lasciare che i detergenti penetrino negli scarichi.
- Osservare la marcatura e le indicazioni presenti sui loro contenitori e imballi.

2.12 Singole fasi d'esercizio

Messa in esercizio

- Lo Scambiatore di calore può essere danneggiato se:
  - esso (e/o le sue condutture) non vengono lavate prima della messa in servizio,
  - viene utilizzato un mezzo di raffreddamento diverso da quello stabilito per il rivestimento.

Manutenzione

- Eseguire gli interventi di manutenzione prescritti nei termini stabiliti!
- Riparare subito oppure sostituire i componenti in condizioni difettose. Utilizzare solo pezzi di ricambio originali della Voith!

L'olio di servizio dello Scambiatore di calore può rimanere sotto pressione. Disattivare l'impianto prima degli interventi di manutenzione e riparazione (osservare le disposizioni locali).

L'involucro, le condutture dell'olio, nonché l'olio di servizio possono essere molto caldi – in casi estremi possono raggiungere la temperatura di 130 °C. Il contatto può causare ustioni alla pelle.

Scambiatore di calore deve essere lasciato raffreddare lo prima di qualsiasi intervento di manutenzione e riparazione.

Pulizia

Durante la pulizia con il getto di pressione o di vapore può penetrare sporcizia o acqua nello Scambiatore di calore.

Se lo Scambiatore di calore è smontato, chiudere le aperture in modo tale che durante la pulizia dall'esterno, il getto di pressione o di vapore non agisca direttamente sull'impianto.

Smaltimento dell'olio usato

Osservare le seguenti indicazioni per lo smaltimento dell'olio usato:

ATTENZIONE

Danni ambientali

L'olio usato, che finisce nelle fognature o in terreni aperti, può causare gravi danni all'ambiente.

Smaltire l'olio usato in modo appropriato in base alle norme nazionali.

2.13 Garanzia

Sono da ritenersi valide le condizioni e le scadenze indicate nelle Condizioni di consegna generali della Voith Turbo GmbH & Co. KG Crailsheim. I diritti alla garanzia sono esclusi, se i danni sono riconducibili a una o più delle seguenti cause:

- trasporto, collocazione, installazione, messa in esercizio, esercizio dello Scambiatore di calore,
- se l'assistenza, i lavori di riparazione e le modifiche che influiscono sul funzionamento non vengono eseguiti da montatori Voith o da personale qualificato Voith.
- inosservanza delle indicazioni per la sicurezza del prodotto e del lavoro contenute nel manuale operativo,
- modifica delle condizioni e dei mezzi d'esercizio.

AVVERTENZA

Durante il periodo di garanzia possono essere eseguite riparazioni allo Scambiatore di calore solo previo accordo con la Voith Turbo GmbH & Co. KG, Crailsheim.

3 Struttura e funzionamento

Produzione

Lo Scambiatore di calore è prodotto

- in base alle disposizioni della legislazione tedesca riguardanti i serbatoi a pressione, i serbatoi di gas sotto pressione e gli impianti di riempimento
- in base a particolari richieste del cliente
- in base alle esigenze, derivanti dalle condizioni e dai mezzi di esercizio.

Struttura

Lo Scambiatore di calore è composto da rivestimento (7), fascio di tubi e camere d'acqua (5, 8).

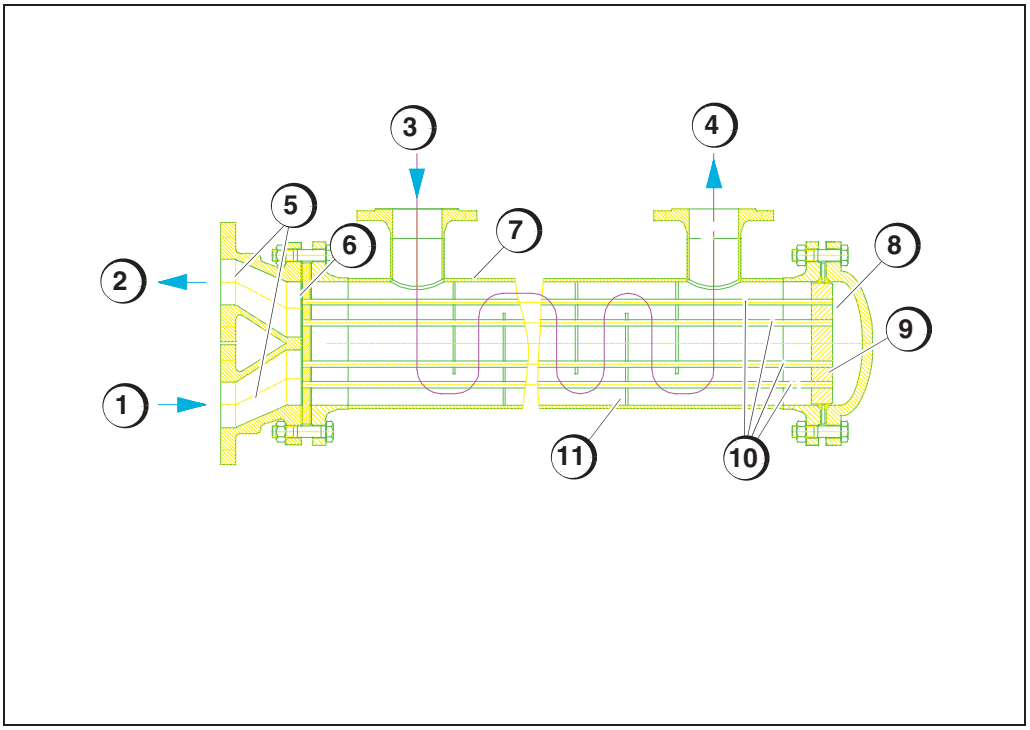


Figura 3-1: Composizione dello Scambiatore di calore

1 Afflusso acqua di raffreddamento
2 Riflusso acqua di raffreddamento
3 Afflusso olio
4 Riflusso olio
5 Camera d'acqua (camera di collegamento)
6 Corpo del tubo fisso
7 Rivestimento
8 Camera d'acqua (corpo di rinvio)
9 Corpo del tubo mobile
10 Tubi
11 Lamiera di rinvio

Il fascio di tubi è composto dai tubi (10), dai due corpi di tubi (6, 9) e dalle lamiere di rinvio disposte in posizione verticale (11). I tubi sono laminati nei corpi dei tubi. Il fascio di tubi completo è quindi installato nel rivestimento (7), in modo tale che si trovi sul lato dell'afflusso acqua di raffreddamento (1) del corpo del tubo fisso (6), sul lato posto di fronte al corpo del tubo mobile (9) con elementi di tenuta. Con la dilatazione termica il corpo del tubo mobile si sposta in questi elementi di tenuta.

Modo d'azione

L'acqua di raffreddamento defluisce attraverso la camera di collegamento (5) nella metà inferiore dei tubi nello Scambiatore di calore, viene deviata sul lato frontale attraverso il corpo di rinvio (8) e rifluisce attraverso la metà superiore dei tubi. L'olio da raffreddare viene quindi condotto con l'ausilio delle lamiere di rinvio (11), in modo tale che compia il percorso più lungo possibile.

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4 Trasporto e collocazione

Condizione di consegna

- Lo Scambiatore di calore viene fornito pronto per essere montato.
- Viene conservato per un periodo massimo di un anno, premesso che sia depositato in un luogo asciutto, controllato e con un imballaggio intatto:
  - Il vano del rivestimento è conservato in serie con olio.
  - Il vano dei tubi è conservato in serie con acqua e mezzi di conservazione.
- Tutte le aperture sono chiuse tramite tappi o flange cieche e valvole di scarico.
- In caso lo si ordini, si possono utilizzare valvole di sfiato al posto dei tappi di chiusura.

Attaccamento e trasporto

Per il trasporto legare un cavo attorno al rivestimento e fissarlo al gancio di una gru.

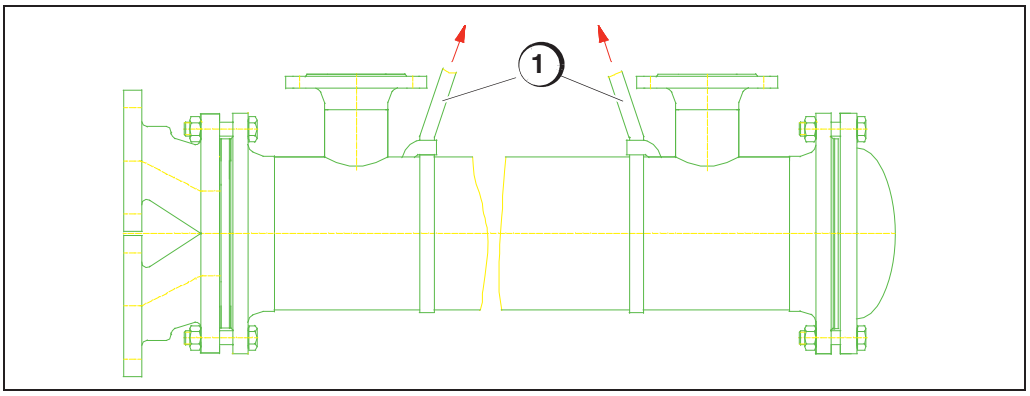

Figura 4-2: Fissaggio del cavo

1 Cavo (per il gancio alla gru)

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5 Installazione

1. Controllare che le fondamenta siano stabili e mantengano le loro dimensioni.
2. Installare lo Scambiatore di calore in modo tale
   – che anche in caso d'arresto non giri a vuoto né dal lato dell'acqua né da quello dell'olio;
   – che vengano osservate la posizione di montaggio e la disposizione dei supporti (vedere il piano di montaggio);
   – che sia disponibile spazio sufficiente per smontare e pulire il fascio di tubi.
3. Montare il filtro nell'afflusso dell'acqua di raffreddamento dello Scambiatore di calore oppure del sistema per l'acqua di raffreddamento, in modo da evitare l'intasamento dei tubi dovuto a sabbia, sporcizia o alla presenza di corpi estranei.
4. Controllare i collegamenti allo Scambiatore di calore durante il montaggio sui corpi estranei.
5. Produrre, spostare, pulire/lavare, collegare e puntellare le tubature. Durante l'esercizio, sullo Scambiatore di calore. non deve influire alcuna forza delle tubature né tensioni dovute al calore.

AVVERTIMENTO

Lesioni personali o danni materiali

Le vibrazioni che si trasmettono sullo Scambiatore di calore, così come le dilatazioni termiche, possono causare difetti di ermeticità. La fuoriuscita di liquidi può causare lesioni alle persone.

Durante il collegamento delle tubature inserire compensatori a più pareti oppure tubi flessibili di metallo.

6. Per il controllo della temperatura montare tubi a immersione con termometro e per il controllo della pressione, collegamenti di controllo con manometri nelle tubature di ingresso e di uscita.
7. Per il controllo della portata montare apparecchi di misurazione della portata.
8. Garantire l'accessibilità delle valvole di svuotamento.
9. Per evitare tensioni di temperatura, fissaare definitivamente lo Scambiatore di calore solo al raggiungimento della temperatura d'esercizio.

6 Messa in esercizio, esercizio

Preparativi prima della messa in servizio

- Per pulire, lavare lo Scambiatore di calore e il sistema di tubi con un mezzo di esercizio o di lavaggio.
- Riempire il lato rivestimento e tubi dello Scambiatore di calore con acqua di raffreddamento e/o olio.
- Sfiatare lo Scambiatore di calore.

Messa in esercizio

- Aprire l'alimentazione dell'acqua di raffreddamento.
- Osservare le portate, le temperature e le pressioni fino alla stabilizzazione. I valori devono rientrare nelle tolleranze ammesse (ved. Sezione 1 "Dati tecnici" a pagina 9).

Esercizio

- Controllare regolarmente i valori misurati.

AVVERTENZA

Evitare il più possibile rapidi cambiamenti di temperatura.
Nel caso in cui le camere d'acqua siano plastificate, evitare durante l'esercizio un carico termico eccessivo.

Valori massimi:
- Esercizio continuo 50 °C
- a breve durata 80 °C

- Prevenire possibili danni causati dalla corrosione. A tale scopo controllare regolarmente la portata minima e quella nominale dell'acqua di raffreddamento (ved. Sezione 1 "Dati tecnici" a pagina 9).

  La maggior parte dei materiali dei tubi comuni crea nella fase di rodaggio (nei primi 3 – 6 mesi dopo la messa in esercizio) uno strato protettivo passivante dovuto a una reazione chimica.

ATTENZIONE

Danni materiali

Se si scende al di sotto della portata minima dell'acqua di raffreddamento, la formazione dello strato protettivo dei tubi non è supportata

Se si supera la portata nominale dell'acqua di raffreddamento si causa la cavitazione/erosione, se si scende al di sotto della portata nominale si creano depositi. Le conseguenze sono danni causati dalla corrosione.

Attenersi ai dati d'esercizio indicati nel Sezione 1 "Dati tecnici" a pagina 9.

- Provvedere allo sfiato periodico o continuo. I vani rivestimento e tubi devono essere riempiti completamente.

Tempi di riposo

- Durante la fase di rodaggio (da 3 – 6 mesi):
  - In caso di tempo di riposo più breve: mantenere la portata minima dell'acqua di raffreddamento, in modo che venga sostenuta la formazione dello stato protettivo dei tubi.
  - In caso di tempo di riposo prolungato: svuotare lo Scambiatore di calore e asciugare il lato tubi con aria compressa (max. 0,5 bar).
- Dopo la fase di rodaggio (nei tubi di raffreddamento deve essersi formato lo strato protettivo):
  - In caso di tempo di riposo dell'impianto fino a un massimo di 4 settimane con acqua di raffreddamento pulita: ridurre la portata dell'acqua di raffreddamento a min. 50% della portata minima.
  - In caso di tempo di riposo superiore a 4 settimane e/o se c'è una quantità elevata di particelle in sospensione nell'acqua: mantenere la portata nominale dell'acqua di raffreddamento oppure svuotare lo Scambiatore di calore e asciugare il lato tubi con aria compressa (max. 0,5 bar).
- In caso vengano utilizzate valvole per regolare la temperatura lato acqua: procedere come indicato sopra. Garantire la portata minima dell'acqua di raffreddamento tramite la deviazione a una valvola di regolazione.

Rimessa in esercizio

- Riempire e sfiatare nuovamente lo Scambiatore di calore, che è stato svuotato nel tempo di riposo, prima di riutilizzarlo.

Messa fuori servizio

- Chiudere l'alimentazione dell'acqua di raffreddamento solo dopo l'arresto dell'impianto. In questo modo si evita il surriscaldamento dello Scambiatore di calore.

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7 Manutenzione e riparazioni

➔ Per quanto riguarda i pezzi di ricambio e il posizionamento delle singole parti vedere lo schema di montaggio allegato a queste istruzioni per l'uso.

7.1 Utensili

Gli speciali utensili necessari per la pulizia e la sostituzione dei tubi (spazzole, apparecchio di laminazione ecc.) possono essere ricevute come corredo di attrezzi dalla Voith Crailsheim.

7.2 Preparativi

- Far raffreddare e scaricare la pressione del sistema.
- Disattivare l'impianto e assicurarsi che non possa riaccendersi.
- Scaricare l'acqua di raffreddamento.
- Scaricare l'olio e riempirlo in contenitori.

ATTENZIONE

Danni ambientali

L'olio di servizio che finisce nelle fognature o in terreni aperti, può causare gravi danni all'ambiente.

Smaltire l'olio di servizio in modo appropriato in base alle norme nazionali.

7.3 Interventi di manutenzione regolari

Per la prima volta dopo circa tre mesi: **Dopo tre mesi**

- Controllare la funzione di tenuta dell'anello di bloccaggio nel corpo di rinvio.
- Controllare eventuali danni e pulire le camere d'acqua stratificate.
  (ved. Sezione 7.4 "Controllo e pulizia delle camere d'acqua stratificate" a pagina 26).
- Verificare la presenza di corrosione e pulire il lato tubi.
  (ved. Sezione 7.5 "Pulizia lato tubi e rivestimento" a pagina 27).

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AVVERTENZA

Eliminare per tempo i depositi dopo la formazione di uno strato visibile.

Intervalli di manutenzione aggiuntivi

A seconda dei risultati di questi controlli è possibile determinare altri intervalli di manutenzione.

7.4 Controllo e pulizia delle camere d'acqua stratificate

Preparativi

➔ Sezione 7.2 "Preparativi" a pagina 25

Controllare la plastificazione

Se le camere d'acqua sono plastificate come protezione contro la corrosione:

1. Eseguire l'estrazione delle camere d'acqua (ved. Sezione 7.8 "Estrazione delle camere ad acqua" a pagina 33).
2. Controllare visivamente la presenza di eventuali danni sulla stratificazione.
3. Eliminare provvisoriamente i danni minori con Primer, vernice a due componenti o altro.
4. Definire le misure per eliminare definitivamente i danni della stratificazione con il produttore, oppure con la Voith Crailsheim.

Pulire le camere d'acqua

5. Eliminare i depositi con spazzole di plastica. In caso di depositi ostinati utilizzare con cautela un mezzo di pulizia ad alta pressione (fino a 50 °C) e detergenti chimici delicati.

ATTENZIONE

Danni materiali

Temperature troppo elevate, l'effetto di colpi e urti nonché l'utilizzo di utensili duri e a spigoli vivi possono distruggere la plastificazione.

Utilizzare solo speciali spazzole adatte per lo scopo.
Mantenere i valori di temperatura massimi:
- Esercizio continuo 50 °C
- a breve durata 80 °C

7.5 Pulizia lato tubi e rivestimento

Preparativi

➔ Sezione 7.2 "Preparativi" a pagina 25

Lato tubi

1. Eseguire l'estrazione delle camere d'acqua (ved. Sezione 7.8 "Estrazione delle camere ad acqua" a pagina 33).
2. Eliminare i depositi leggeri (fango, alghe) con spazzole di plastica oppure con un getto d'acqua calda al max. a 50 °C. Eventualmente utilizzare detergenti delicati.
3. Eliminare i depositi resistenti (incrostazioni) solo con spazzole di rame morbide. Non premere o spingere la spazzola, ma farla scorrere solo delicatamente lungo i tubi.

   Per decalcificare, utilizzare eventualmente anche il 15% di acido muriatico. Durata dell'immersione con 1 mm di incrostazioni ca. 30 min. Per neutralizzarle lavare quindi a fondo con una soluzione di soda al 5% (Na_2 CO_3) oppure con acqua.

ATTENZIONE

Danni materiali

I singoli tubi non puliti possono essere danneggiati durante l'esercizio a causa di dilatazioni dovute alla temperatura più bassa. Pulire sempre tutti i tubi!

Lo sfiato di singoli tubi con vapore bollente può causare danni a causa delle diverse dilatazioni della temperatura. Lavorare solo con getti d'acqua oppure con spazzole morbide!

Non eliminare gli strati protettivi risultanti durante l'esercizio! Non utilizzare alcuna asta di metallo, trapano o fresa; non intervenire con forza eccessiva! Verificare l'idoneità dei detergenti chimici (in particolare nei tubi di titanio); non utilizzare alcun principio attivo riduttivo.

Pulire con particolare attenzione i tubi di titanio a causa del limitato spessore delle pareti.

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Lato rivestimento

Se l'olio di servizio viene sostituito regolarmente, il lato rivestimento deve essere pulito solo se è insolitamente sporco a causa di influssi esterni (per es. cokefazione dell'olio).

1. Eseguire l'estrazione delle camere d'acqua (ved. Sezione 7.8 "Estrazione delle camere ad acqua" a pagina 33).
2. Smontare il fascio di tubi (vedere il Sezione 7.9 "Smontare il fascio di tubi e immagazzinarlo" a pagina 33).
3. Immergere il fascio di tubi nell'acetone e/o mezzo di pulizia freddo oppure nell'acqua riscaldata (non nel vapore bollente), utilizzando detergenti delicati e togliere i depositi.
4. Lavare a fondo il fascio di tubi con l'acqua e asciugare.
5. Rimontare il fascio di tubi.

7.6 Chiudere le falle

Falle nel corpo del tubo mobile

Serrare di ½ giro tutte le viti in modo uniforme nel corpo di rinvio sulla circonferenza. Ripetere il procedimento, fino a quando lo Scambiatore di calore non è ermetico.

AVVERTENZA

Non serrare gli anelli di tenuta più del necessario.

Se non è possibile ottenere l'ermeticità serrando le viti, sostituire gli anelli di tenuta nel seguente modo:

Preparativi

➔ Sezione 7.2 "Preparativi" a pagina 25

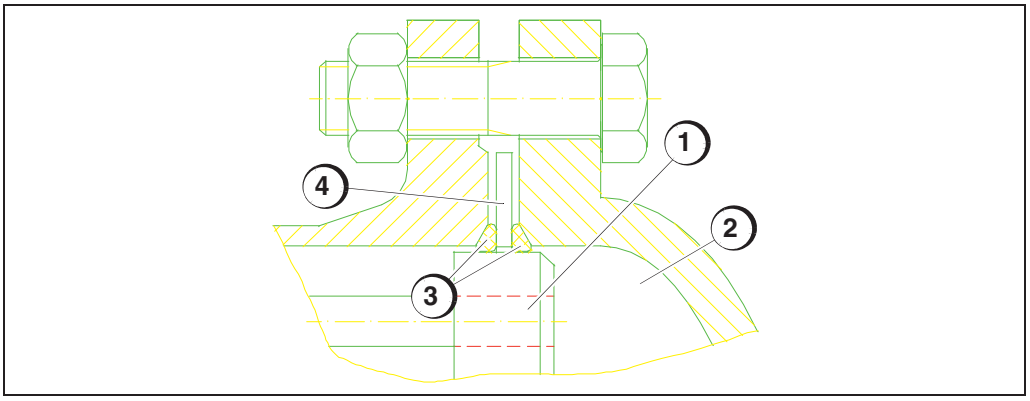

Figura 7-3:
Anelli di tenuta nel corpo del tubo mobile

1 Corpo del tubo mobile
2 Corpo di rinvio
3 Anelli di tenuta
4 Anello di bloccaggio

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Misure

1. Estrazione del corpo di rinvio (2) (ved. Sezione 7.8 "Estrazione delle camere ad acqua" a pagina 33). Rimuovere l'anello di bloccaggio (4) e i due anelli di tenuta (3).
2. Pulire e lubrificare le superfici di appoggio.
3. Rimontare gli anelli di tenuta, l'anello di bloccaggio e il corpo di rinvio. Gli anelli di tenuta non devono essere girati e devono essere posizionati correttamente nella sede.
4. Inserire in modo allentato tutte le viti con le dita. Così facendo, assicurarsi che i pezzi siano centrati correttamente sul corpo del tubo.
5. Serrare tutte le viti in modo uniforme di 1-2 giri nel corpo di rinvio sulla circonferenza.

Falle nel corpo del tubo fisso

Serrare tutte le viti in modo uniforme di ½ giro sulla circonferenza nella camera di collegamento. Ripetere il procedimento, fino a quando lo Scambiatore di calore non è ermetico.

Se non è possibile ottenere l'ermeticità serrando le viti, sostituire la guarnizione piatta nel seguente modo:

Preparativi

➔ Sezione 7.2 "Preparativi" a pagina 25

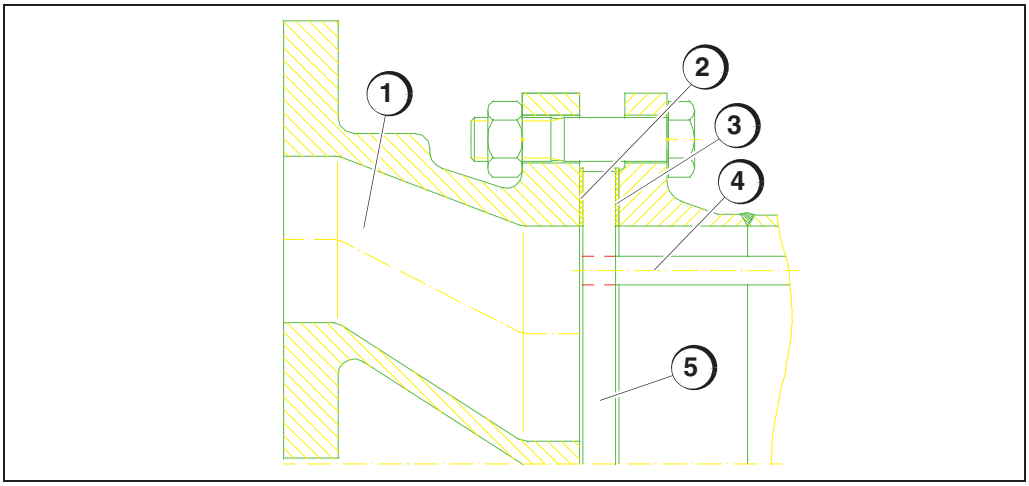

Figura 7-4: Guarnizioni nel corpo del tubo fisso

1 Camera di collegamento
2 Guarnizione piatta esterna con platinetta
3 Guarnizione piatta tra il corpo del tubo e il rivestimento
4 Tubo
5 Corpo del tubo fisso

Misure Guarnizione (2)

1. Estrazione della camera di collegamento (1) (ved. Sezione 7.8 "Estrazione delle camere ad acqua" a pagina 33).
2. Sostituire la guarnizione piatta esterna con platinetta (2).

Misure Guarnizione (3)

1. Estrazione della camera di collegamento (1) (ved. Sezione 7.8 "Estrazione delle camere ad acqua" a pagina 33).
2. Smontare il fascio di tubi (vedere il Sezione 7.9 "Smontare il fascio di tubi e immagazzinarlo" a pagina 33).
3. Sostituire la guarnizione piatta tra il corpo del tubo fisso e il rivestimento (3).

Falle nel fascio di tubi

Se viene rilevata acqua nell'olio oppure olio nell'acqua di raffreddamento, è presente una falla nel fascio di tubi.

➔ Sezione 7.2 "Preparativi" a pagina 25

Preparativi

Misure

1. Eseguire l'estrazione delle camere d'acqua (ved. Sezione 7.8 "Estrazione delle camere ad acqua" a pagina 33).
2. Controllare le guarnizioni nella flangia e nella platinetta.
3. Controllare l'eventuale presenza di intasamento, erosione e corrosione nella parte interna dei tubi.
4. Eventualmente pulire il lato tubi.

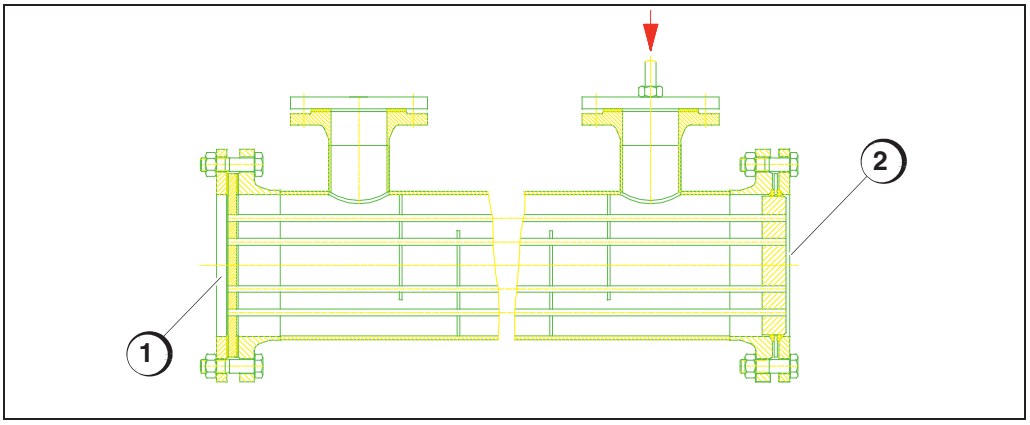

Figura 7-5: Flangia di prova

1 Flangia di prova del corpo del tubo fisso

2 Flangia di prova del corpo del tubo mobile

5. Montare la flangia di prova (1, 2) tenendo conto del fascio di tubi su entrambi i lati.
6. Spruzzare il lato rivestimento con olio o acqua, per localizzare le falle. Osservare la sovrapressione max.
7. Eliminazione delle falle:
   – Falle tra il tubo e il corpo del tubo: renderle ermetiche con l'apparecchio di laminazione tubi della Voith.
   – Falle in un singolo tubo: chiudere le due estremità del tubo con tappi adatti oppure sostituire il tubo
   – Falle in diversi tubi, conseguenza dell'erosione o della corrosione: sostituire l'intero fascio di tubi oppure lo Scambiatore di calore.

AVVERTENZA

Non rilaminare i punti laminati ermetici, perché le pareti dei tubi diventano inutilmente più sottili.

7.7 Sostituzione dei tubi danneggiati

Preparativi

➔ Sezione 7.2 "Preparativi" a pagina 25

Misure

1. Eseguire l'estrazione delle camere d'acqua (ved. Sezione 7.8 "Estrazione delle camere ad acqua" a pagina 33).
2. *Corpo del tubo mobile:* Trapanare il punto laminato del tubo con una fresa alesatrice (1) (diametro del foro ca. 0,4 mm in meno rispetto al diametro esterno del tubo e alla guida nel diametro interno del tubo). Trapanare abbastanza in profondità, da liberare il tubo. Eliminare tutte le scheggie.

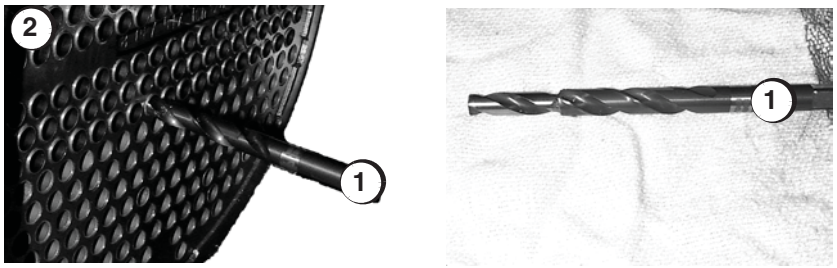

Figura 7-6: Fresa alesatrice

1 Fresa alesatrice
2 Corpo del tubo con punti laminati del tubo

3. Inserire il perno di centraggio (3) nell'estremità del tubo trapanata (2) e centrare in questo modo l'estremità del tubo nel corpo. Non inserire il perno di centraggio dandogli dei colpi.

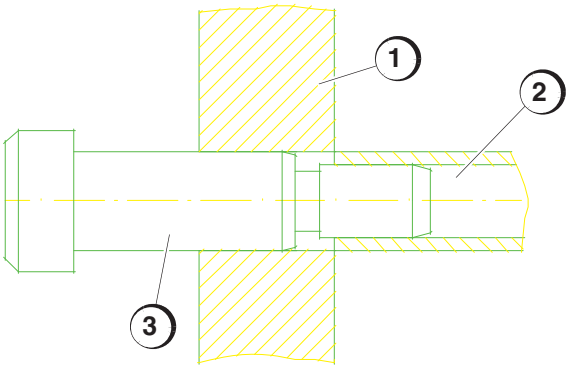

Figura 7-7: Perno di centraggio

1 Corpo del tubo mobile
2 Estremità del tubo
3 Perno di centraggio

4. *Corpo del tubo fisso:* trapanare il punto laminato del tubo e centrare il tubo inserendo la fresa alesatrice nel corpo del tubo.
5. *Corpo del tubo mobile:* inserire con cautela il perno di centraggio e quindi spingere il tubo allentato, in modo che si autocentri nel corpo del tubo fisso.

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AVVERTENZA

Il tubo si è accorciato a causa della trapanatura. Se non viene centrato nei corpi dei tubi, finisce nel fascio di tubi e non è più accessibile dall'esterno.

6. *Corpo del tubo fisso:* spingere una spazzola dotata di prolunga (1) attraverso il tubo difettoso (2) e spingere dentro il perno di centraggio.

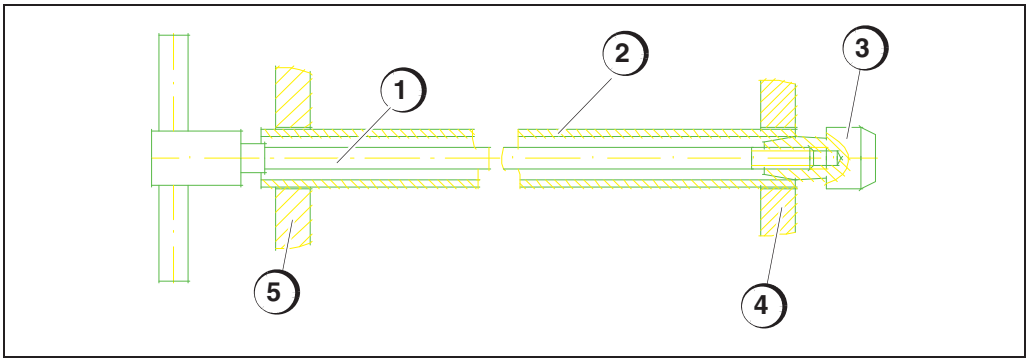

Figura 7-8: Estrazione del tubo difettoso

1 Prolunga
2 Tubo
3 Tappi
4 Corpo del tubo mobile
5 Corpo del tubo fisso

7. *Corpo del tubo mobile:* avvitare dei tappi adatti (3) sulla spazzola dotata di prolunga.
8. *Corpo del tubo fisso:* estrarre il tubo con cautela.
9. Pulire a fondo i punti laminati nei corpi dei tubi.
10. *Corpo del tubo mobile:* inserire un nuovo tubo con l'ausilio della spazzola dotata di prolunga e dei tappi.
11. Premere le estremità del tubo con il mandrino di spinta conico nei corpi dei tubi, in modo che il tubo non fuoriesca.
12. Laminare con cautela le estremità del tubo con l'apparecchio di laminazione tubi della Voith nei corpi dei tubi.

AVVERTENZA

Girare l'apparecchio di laminazione solo con una leggera pressione delle dita in senso orario; allo stesso tempo cercare di non influire sulla dilatazione e sulla spinta dell'apparecchio di laminazione, impiegando troppa forza. Eseguire il processo di laminazione solo una volta su ogni corpo del tubo.

13. Sostituire tutti i tubi difettosi.
14. Spruzzare il lato rivestimento dello Scambiatore di calore con la sovrapressione massima di controllo ammessa.
15. In caso si rilevi la presenza di falle rilaminare il punto laminato con l'apparecchio di laminazione tubi della Voith.

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7.8 Estrazione delle camere ad acqua

➔ Sezione 7.2 "Preparativi" a pagina 25

Preparativi

ATTENZIONE

Danni ambientali

Se non si esegue l'estrazione delle camere di collegamento e di rinvio, il vano lato olio non sarà più ermetico. L'olio di servizio che finisce nelle fognature o in terreni aperti, può causare gravi danni all'ambiente.

Raccogliere l'olio che fuoriesce e smaltirlo in modo appropriato in base alle norme nazionali.

Pezzi smontati

Se sono disponibili pezzi smontati (tubature), sul lato acqua c'è sufficiente spazio libero per estrarre il fascio di tubi.

- Eseguire l'estrazione delle camere d'acqua.

Nessun pezzo smontato

Se non è disponibile alcun pezzo smontato:

1. Smontare il raffreddatore olio dalle fondamenta.
2. Eseguire l'estrazione delle camere d'acqua.

7.9 Smontare il fascio di tubi e immagazzinarlo

➔ Sezione 7.2 "Preparativi" a pagina 25

Preparativi

- Eseguire l'estrazione delle tubature.
- Eseguire l'estrazione delle camere d'acqua (ved. Sezione 7.8 "Estrazione delle camere ad acqua" a pagina 33).

Primo metodo

1. Far passare vari cavi d'acciaio plastificati (1) dal corpo del tubo fisso attraverso i tubi e riportarli indietro.

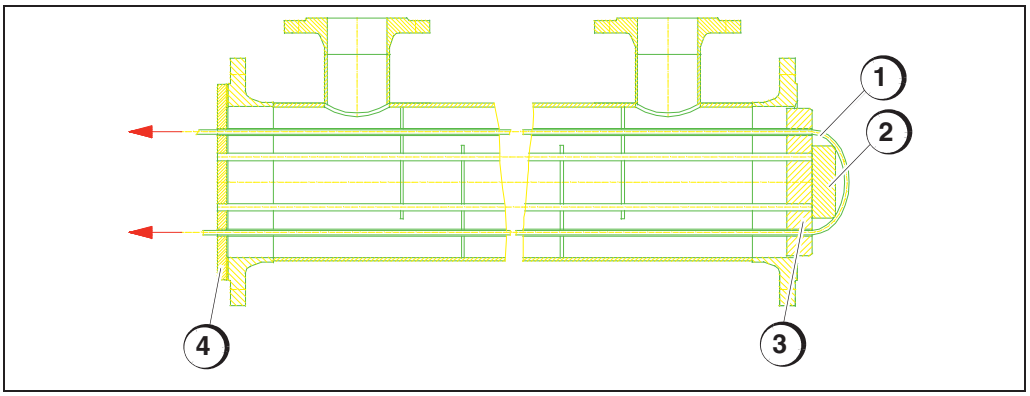

Figura 7-9: Smontare il fascio di tubi con i cavi

1 Cavo d'acciaio
2 Base
3 Corpo del tubo mobile
4 Corpo del tubo fisso

2. Inserire tra il rinvio del cavo (1) e il corpo tubo mobile (3) tubi o pezzi di legno come base (2), per evitare danni alle estremità del tubo.
3. *Corpo del tubo fisso:* estrarre il fascio di tubi sui cavi dal tubo di rivestimento.

Secondo metodo

1. *Corpo del tubo mobile:* produrre un dispositivo di pressione d'acciaio piatto (1) e avvitarlo al tubo di rivestimento.

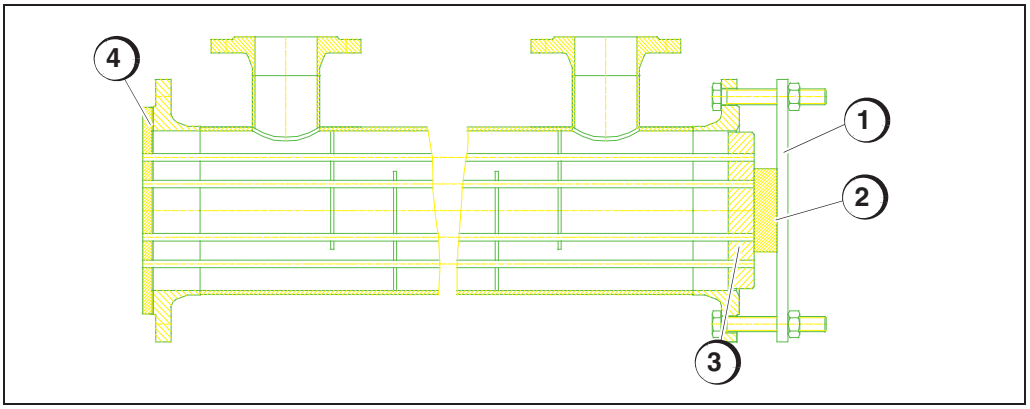

Figura 7-10: Premere il fascio di tubi con il dispositivo

1 Dispositivo di acciaio piatto
2 Base
3 Corpo del tubo mobile
4 Corpo del tubo fisso

2. Inserire tra il dispositivo di pressione (1) e il corpo del tubo mobile (3) assi di legno come basi (2), per evitare danni alle estremità del tubo.
3. Premere il fascio di tubi con il dispositivo (1) nel tubo di rivestimento.
4. Estrarre il fascio di tubi dal tubo di rivestimento.

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Olio di lavoro: N, serie da 8206810 a 8206813

Magazzinaggio

Deporre il fascio di tubi smontato in direzione orizzontale sulle lamiere di rinvio lungo l'intera lunghezza e fissarlo con cunei per evitare che rotoli.

ATTENZIONE

Danni materiali

Se singoli tubi vengono caricati con il peso dell'intero fascio, oppure se il fascio viene depositato in posizione verticale sui corpi dei tubi, può essere danneggiato.

Depositare il fascio di tubi solo in senso orizzontale.

8 Eliminazione delle anomalie

Anomalia	Causa(e)	Provvedimento(i)
Prestazioni ridotte con portata normale sul lato rivestimento (lato olio)	• Impurità e/o depositi sul lato tubi (lato acqua)	• Pulire i tubi internamente. (ved. Sezione 7.5 "Pulizia lato tubi e rivestimento" a pagina 27).
	• Quantità eccessiva di acqua di raffreddamento • Valvola di bloccaggio non aperta completamente	• Controllare il sistema di raffreddamento
Prestazioni ridotte con portata normale sul lato tubi	• Impurità e/o depositi sul lato rivestimento	• Pulire il lato rivestimento (ved. Sezione 7.5 "Pulizia lato tubi e rivestimento" a pagina 27).
	• Temperatura dell'acqua di raffreddamento troppo elevata	• Controllare il sistema di raffreddamento
Presenza di acqua nell'olio	• Mancanza di ermeticità in singoli tubi	• Spruzzare il fascio di tubi, rilaminare il punto di laminazione tubi, chiudere i tubi, sostituire i tubi difettosi. (ved. Sezione 7.7 "Sostituzione dei tubi danneggiati" a pagina 31).
	• Erosione o corrosione nei tubi o nei corpi dei tubi	• Spruzzare il fascio dei tubi, sostituire i tubi. Controllare la portata d'acqua. • In caso di corrosione causata dai depositi non scendere al di sotto della portata minima dell'acqua di raffreddamento.
	• Ingresso dell'acqua per effetto esterno	• Controllare il sistema dell'olio per trovare eventuali punti d'ingresso dell'acqua (falle). • Controllare le guarnizioni ad anelli di scorrimento nelle pompe. • Controllare, se nel funzionamento con forti cambi di temperatura si forma della condensa.
Prestazioni ridotte con portata ridotta	• Mancanza di olio o di acqua	• Rabboccare il sistema.
	• Lato acqua: impurità/depositi nel lato interno del tubo; filtri dell'acqua otturati, aria nel sistema. • Lato olio: inquinamento lato olio; basse quantità di estrazione dalle pompe, aria nel sistema	• Eliminare le impurità e i guasti nel sistema
Difetto di ermeticità esterna	• Guasti, per es. alle guarnizioni	• Eliminare i guasti (ved. Sezione 7.6 "Chiudere le falle" a pagina 28)
Depositi o aggressioni da parte del materiale del tubo o del materiale del corpo del tubo	• Corrosione, erosione	• Controllare ed eventualmente modificare le condizioni di esercizio, la qualità dell'acqua, la velocità dell'acqua e le condizioni delle tubature e delle armature di controllo.

Documentazione tecnica n. 3626-007101it, Versione 1.00, airpd-Kapp
Olio di lavoro: N. serie da 8206810 a 8206813

AVVERTENZA

La regolazione a strozzamento lato acqua per regolare la temperatura dell'olio può causare depositi e corrosione nei tubi in caso di cattivo rivestimento.

Self Actuated Thermostatic Valves

MVA Mess- und Verfahrenstechnik GmbH
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Fon: +49/89-85 83 69-0 • Fax: +49/89-85 83 69-70
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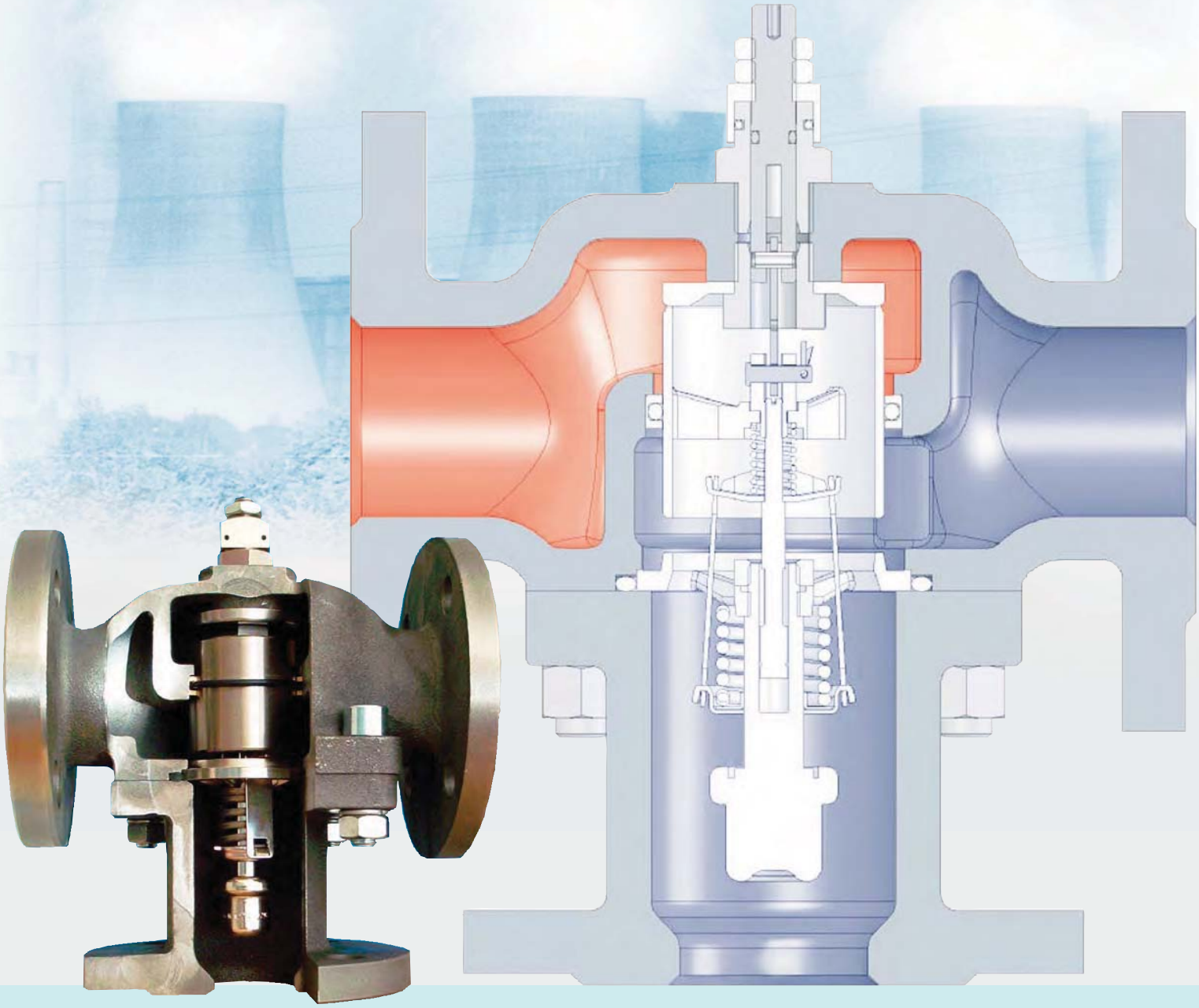
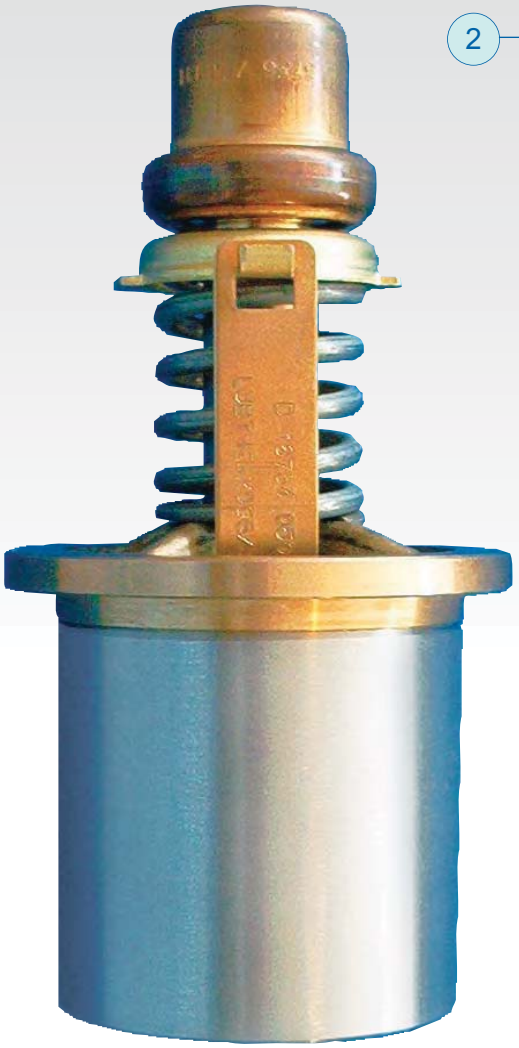


Automatically operated without external power for process control applications

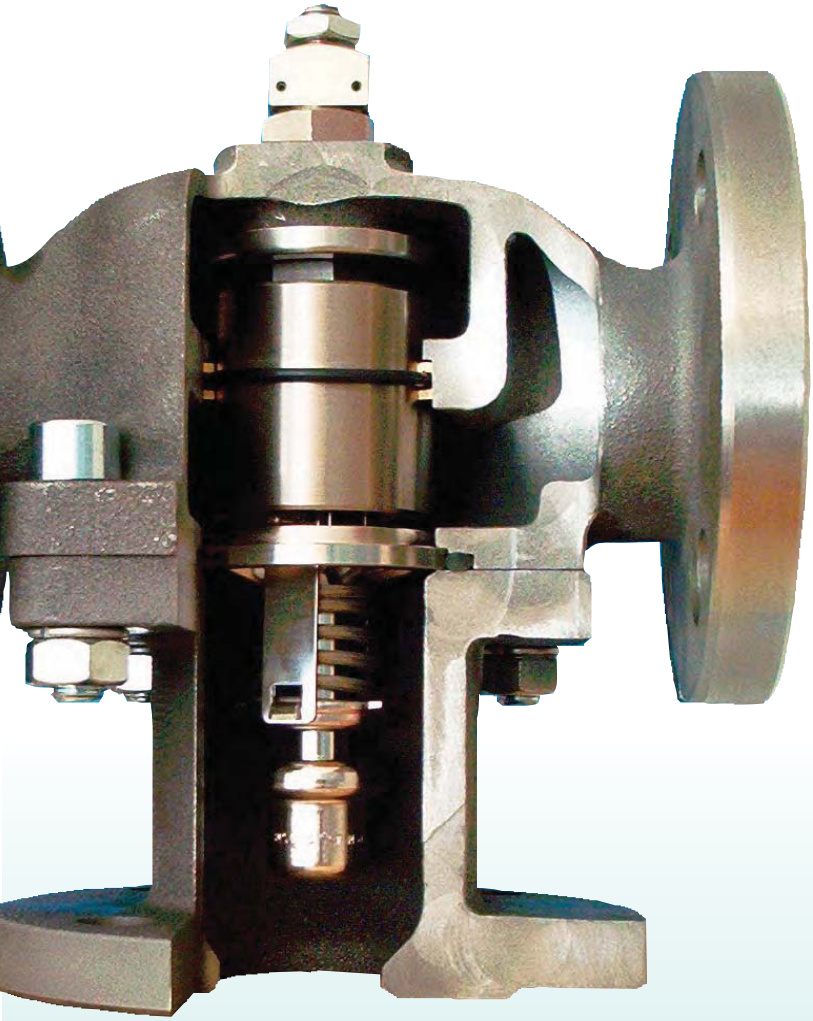
The Expertise for Components

SELF ACTUATED THERMOSTATIC VALVES



Temperature regulation of lubrication and cooling loops with oil or water and solar systems for the following applications

MVA offers a wide range of automatically operated thermostatic control valves for mixing and bypass loops. All valves are equipped with fully automatic working elements based on the wax expansion principle and provide most reliable and approved components for process control applications since decades.



Applications:

- Compressors
- Diesel engines
- Gearboxes
- Steam turbines
- Gas turbines
- Refrigeration systems
- Solar systems

Sizes:

DN 20 - 40
Threaded Connections
3/4" - 1 1/2"
DN 20 - 150
Flanges according to DIN or ANSI

Flowrates:

2 to 320 m^3/h

Body Material:

Cast Iron, Graphite Iron, Cast Steel, Aluminium, Bronce, Stainless Steel

Nominal Temperatures:

+13 °C bis +116 °C

Special Features:

Kanigen Plated Elements, PTFE Sealings, Manual Override

MVA • Am Kirchenhölzl 7 • D-82166 Gräfelfing • Fon: +49/89-85 83 69-0 • Fax: +49/89-85 83 69-70 • info@mva-messvt.de • www.mva-messvt.de

GENERAL INFORMATION - THERMOSTATIC VALVES ...

MVA Thermostatic Valves are used to provide reliable, automatic control of fluid temperatures in turbines, compressors and engine water jacket and lubricating oil cooling systems. They are also suitable for process control and industrial applications where fluids must be mixed or diverted depending on their temperatures. They may also be applied to co-generation systems to control temperatures in the heat recovery loop assuring proper engine cooling and maximising heat recovery.

All MVA Thermostatic Valves are equipped with positive 3-way valve action in which the water or lubricating oil is positively made to flow in the direction required. On jacket water applications when the engine is started up and is cold, the MVA Thermostatic Valve causes all of the water to be positively by-passed back into the engine, thus providing the quickest warm-up period possible. After warm up, the correct amount of water is by-passed and automatically mixed with the cold water returning from the heat exchanger or other cooling device to produce the desired jacket water outlet temperature. If ever required, the MVA Thermostatic Valve will shut off positively on the by-pass line for maximum cooling. The 3-way action of the MVA Thermostatic Valve allows a constant volume of water through the pump and engine at all times with no pump restriction when the engine is cold.

ADJUSTMENTS & MAINTENANCE

No adjustments are ever required on MVA Thermostatic Valves. Once installed a MVA Thermostatic Valve will provide years of trouble-free service.

TEMPERATURE SETTINGS

Because MVA Thermostatic Valves are set to a predetermined temperature at the factory, costly errors due to mistakes of operating personnel are eliminated. After a MVA Thermostatic Valve has been installed, it is impossible for the operator to arbitrarily change the operating temperature and run the engine too cold or too hot unless the temperature element assemblies themselves are changed.

MVA Thermostatic Valves are temperature rated for the expected nominal operating temperature in jakket water service. On lubricating oil applications the system operating temperature may be slightly above the nominal rating, depending on the type of oil flow rate, oil cooler capacity and other conditions of the system.

For long life, MVA Thermostatic Valves should not be operated continuously at temperatures more than about 54° F (12°C) above their nominal ratings. If higher continuous over-temperatures are expected, contact the factory for recommendations.

OPERATION

The power creating medium utilises the expansion of a special thermostatic wax material which remains in a semi-solid form and which is highly sensitive to temperature changes.

INSTRUCTIONS FOR MVA TEMPERATURE VALVE MODEL "M" WITH AND WITHOUT MANUAL OVERRIDE

1) Maintenance

Properly applied and installed, MVA Thermostatic Valves require minimal maintenance. An inspection at 2 or 3 year intervals is adequate to detect and make provision for manual wear.

Excessive temperatures, chemical, electrolytic attack or cavitation will shorten the life of the element assemblies, seals and seats. These items are replaceable. Water additives may cause swelling of the O-ring seals around the stem and the sliding valve to a point where they may affect valve action and require replacement. Synthetic base lubricants will definitely attack the O-ring seals which may be replaced by O-rings of alternate materials. Contact the MVA factory for recommendations.

Carbonates, scale and other solids must not be permitted to build up on sliding valve or sensing cup surfaces. The valve and element assemblies may be cleaned with mild acid or Oakite solutions. Hard scale may require wire brush buffing.

2) Manual override

If for any reason "M"-Thermostatic valves with manual override should not work properly, each element assembly is fitted with an infinitaly variable override which allows on accurate manual temperature regulation.

Before the manual override is used we recommend, however, to check whether the cause of trouble is not somewhere in the system, according to paragraph 3) "Trouble shooting". Manual override should only be used in emergency case.

If a thermostatic valve with several element assemblies is installed (DN 65 - DN 125) it is recommended to open one element assembly after the other against cooler by turning screw until desired temperature is nearly reached. Final regulation is done with next element assembly.

3) Trouble-Shooting

In the event that your cooling system does not operate close to the desired temperature, the following check list may point to one or more causes for the problem.

3.1 System Temperature too cold

a) Insufficient heat rejected to coolant to maintain the temperature

b) Wrong nominal temperature selected

c) Thermostatic valve is greatly oversized for the system flow rate or cooling capacity of the system is much greater than is required

d) Thermostatic valve ist installed backwards, forces water to cooler and causes engine to run cold under all conditions

e) Worn O-ring seal around the element assembly

f) Too great a pressure difference (in excess 1,7 bar) between ports 2 and 3

g) Foreign material is stuck between sliding valve and seat

h) Element assembly may have been over-temperated sufficiently to affect calibration or rupture wax seal and does therefore not close "2"-port completely anymore. Requires complete new element assembly.

3.2 System Temperature too hot

a) Cooling capacity of system not adequate

b) Thermostatic valve too small for flow rate (also causes high pressure drop and possibly cavitation)

c) Valve installed backwards; as temperature increases, Port 2 closes, reducing flow to cooler

d) Bypass will not close due to worn or pitted seats, sliding valve, O-ring seal, etc.

e) Worn O-ring seal around the element assembly

f) Element assembly may have been over temperated sufficiently to affect calibration or rupture wax seal and does therefore not fully open "3"-port anymore. Requires complete new element assembly.

g) Solids build up on sliding valve prevents proper action of element assembly

h) Foreign material stuck between sliding valve and seat

i) Excessive pressure differential between port (very low pressure through bypass leg, very high pressure in cooler)

3.3 Additional Considerations

a) Thermometers: A thermometer that reads the same whether system is cold or hot needs replacing

b) Location of thermometers: on horizontal pipe runs, these should be in the side of the pipe when possible, particularly on oil systems. Also, pipes do not always run full so the thermometer may not be immersed in the fluid

c) Thermometers should be as far as possible downstream from the confluence of two streams of different temperature to allow complete mixing

d) Look for bypasses or "sneak circuits" which prevent thermostatic valve control of the complete system

Fig. 1 COOLING WATER-HEAT EXCHANGER

This scheme shows the cooling water circuit of a fix installed or a ship engine with cooling by a heat exchanger. The MVA Thermostatic Valve is in such a way installed, that the temperature of the cooling water at the outlet of the engine will be maintained constant. Should exist any problem cause by enclosed air, a narrow ventilation pipe (x) leading from the highest point of the system to the compensation tank will help.

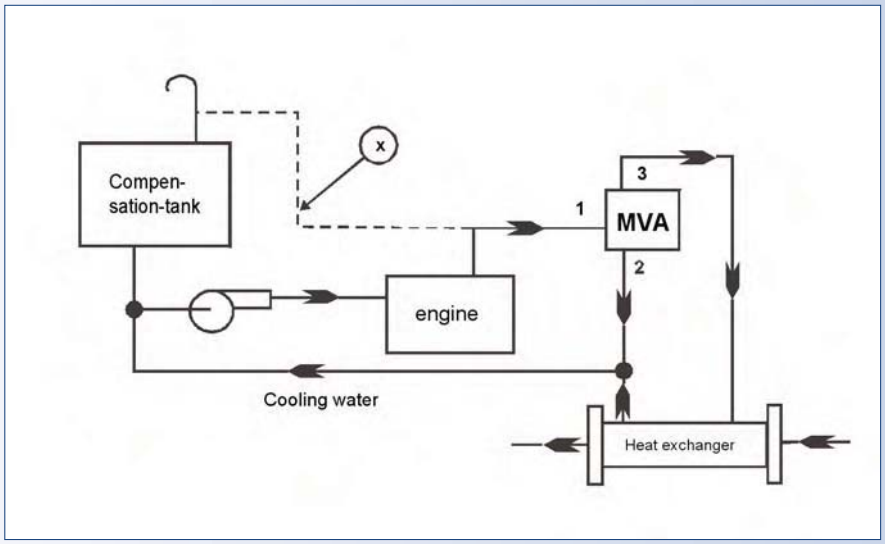


Fig. 2 COOLING WATER–AIR COOLING DEVICE

This arrangement is used practically always in vehicles and fixed installed engines with air cooling device. Here, the temperature of the cooling water also will be maintained constant at the outlet of the engine.

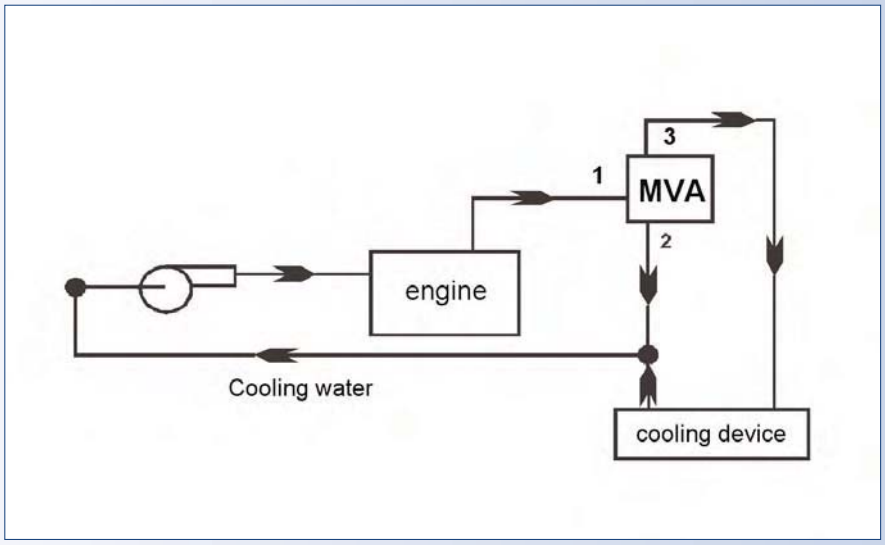


Fig. 3 COOLING WATER – DIRECT COOLING

Today, small and medium size engines are partially still cooled directly by sea water, although the disadvantages of such systems are well known.

In Fig. 3 the temperature of the cooling water is maintained constant at the engine's outlet. If the point T is above the water line, a non-return-valve (W) must be installed, in order to avoid that the cooling system looses all its fluid if the engine is stopped.

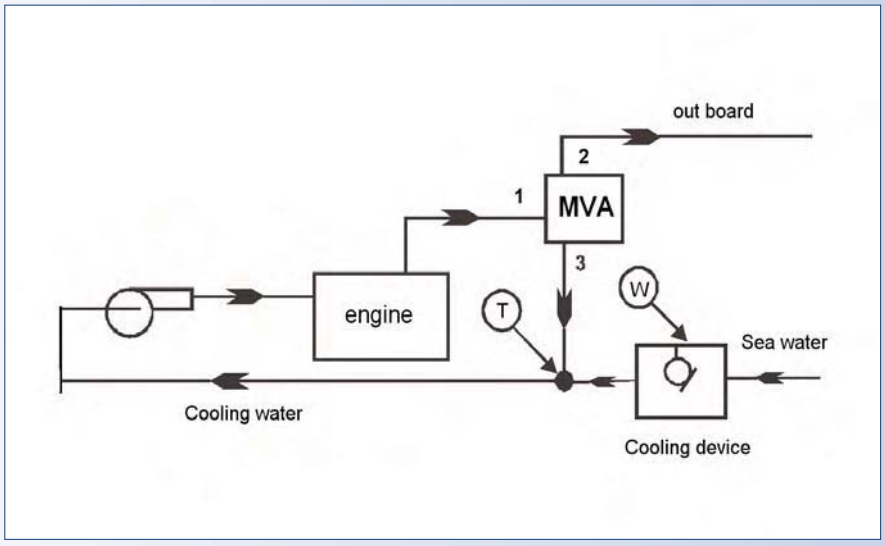


Fig 4 COOLING WATER CONTROL BY MIXING

Contrary to the system shown in Fig. 1 cold and warm water are mixed and the temperature will be maintained constant at the inlet of the engine. X serves, if necessary, for ventilation of the system. Another possibility for this kind of control is shown in Fig. 6

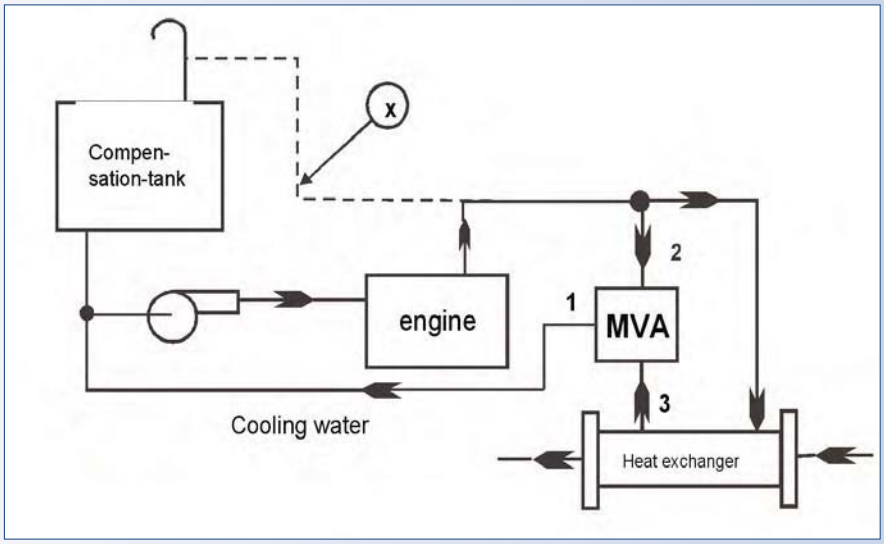


Fig. 5 LUBRICATION OIL CONTROL BY SHORT- CIRCUIT (DIVERTING)

In this scheme the MVA Thermostatic Valve is located in the lubrication oil circuit as a short- circuit controller. Similar as in Fig. 1 the temperature of the cooling water, in this scheme the temperature of the oil, that means the temperature of the oil at the outlet of the engine is maintained constant.

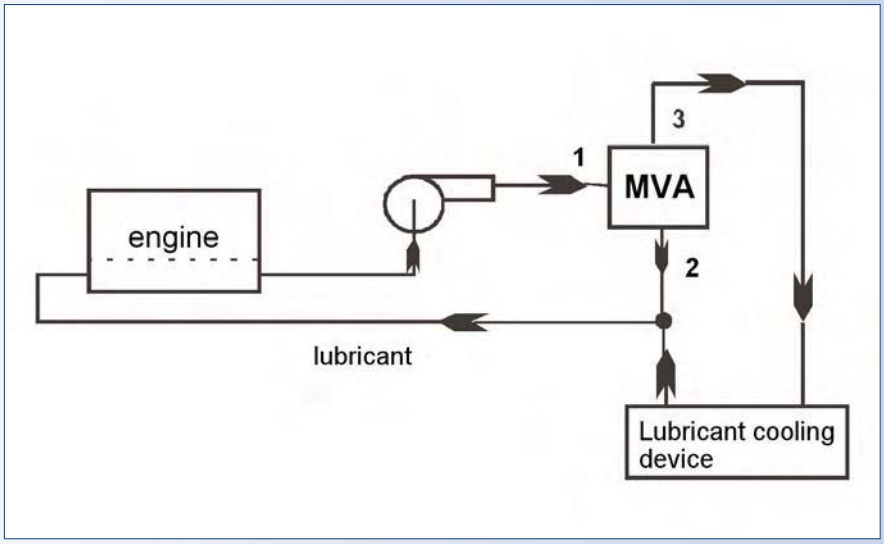
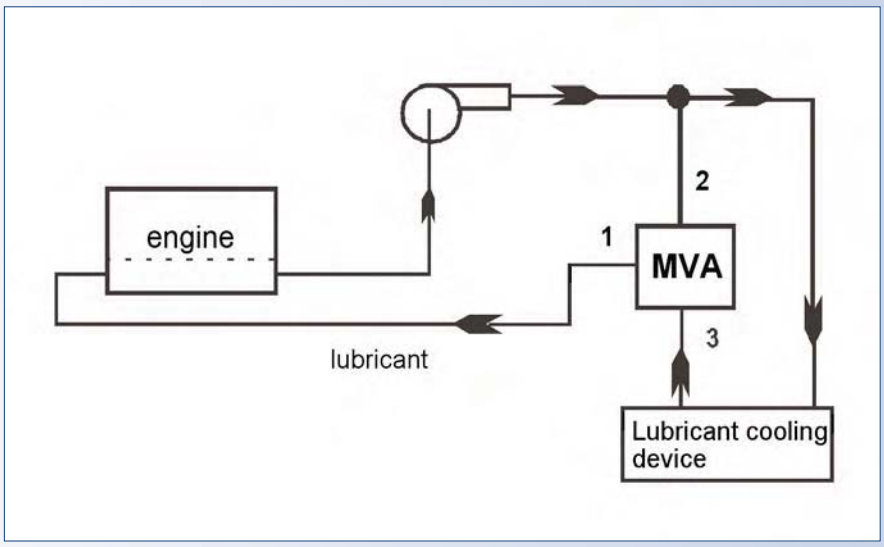


Fig. 6 LUBRICATION OIL CONTROL BY MIXING

In this system the MVA Thermostatic Valve mixes the warm oil coming from the engine with the cold one coming from the cooling device. This assures, that the temperature of the oil flow to the bearings, that means the temperature of the oil at the inlet of the engine will be maintained constant.



CODE FOR THE MODELS M20 ... M40

CODE FOR THERMOSTATIC VALVES MODEL M20 ... M40

M 25 C 1 A 120 C A

type of thermostatic valve

M20, M20T, M25, M25T, M32J, M32T, M40J, M40T

size of valve

M20, M20T : 3/4“ /DN 20
M25, M25T : 1“ /DN 25
M32J, M32T : 1 1/4“ /DN 32
M40J, M40T : 1 1/2“ /DN 40

valve housing material

A = aluminium
B = bronze
C = cast iron
D = spheroidal graphite cast iron
E = stainless steel ASTM A351 CF- 8M
S = cast steel ASTM A216 WCB

port connections

1 = BSP parallel
2 = BSP taper
3 = NPT
4 = flanges DIN 2501-1 PN 10
5 = flanges ANSI B16.5 (Class 150) RF
6 = flanges DIN 2501-1 PN 40
7 = flanges ANSI B16.5 (Class 300) RF
8 = flanges DIN 2501-1 PN 16

type of element

A = 2040A standard, seal mat. Nitrile Rubber (BUNA N)
B = 2040 A standard, seal material Viton

valve size DN 40 there is a reduction possible
for example: M40TS5B175-30

leak hole

A = no leak hole
B = 1 mm leak hole
C = 2 mm leak hole
D = 3 mm leak hole
E = 4 mm leak hole
X = without O-ring element

special requirements

C = seat cast in body (standard)
D = bronze seat (special)
E = cast seat & leak hole in body
H = seat cast in body with kanigen plated element
23 = PTFE seals + kanigen plated element
30 = flow-reduction
38 = manual override

nominal temperature of the elements no.

°F / °C	“cold”	“warm”
065/18	15 -	25°C
075/24	20 -	30
085/30	26 -	34
095/34	30 -	40
100/38	33 -	42
110/43	38 -	47
120/49	44 -	55
130/55	49 -	60
140/60	55 -	66
150/66	60 -	71
160/71	66 -	77
170/77	73 -	82
175/79	77 -	85
180/82	79 -	88
190/88	85 -	93
205/96	93 -	103
237/114	107 -	123

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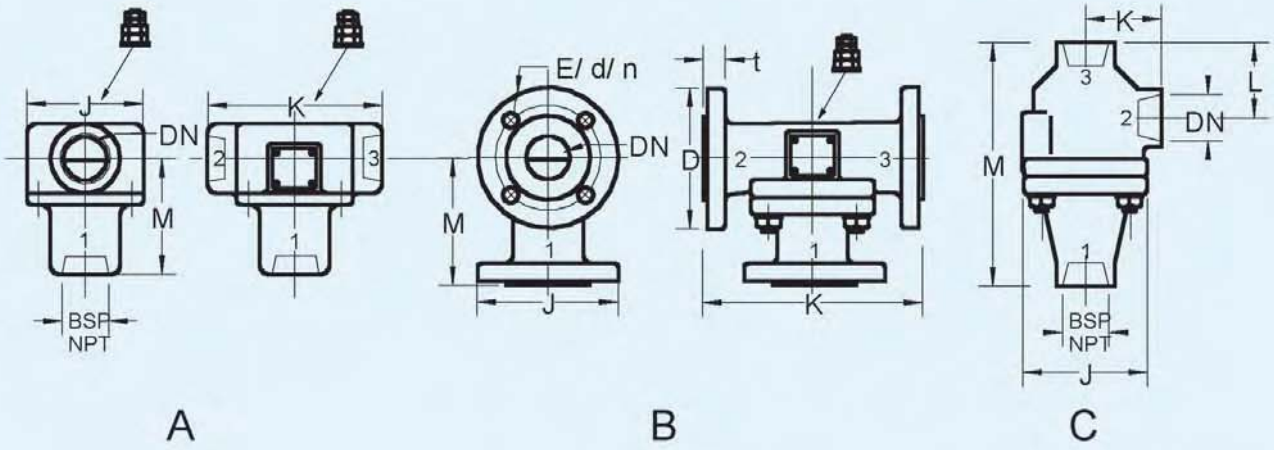
TECHNICAL DATA MODELS M20 ... M40



For the purpose of design engineering deviation of up to 10 mm should be respected. (Exact values on demand)

Dimensions

DN	BSP NPT	A B C	J mm	K mm	L mm	M mm	t mm	PN10/16 D/E/d/n mm	PN25/40** D/E/d/n mm	125/150 lbs D/E/d/n mm	300 lbs** D/E/d/n mm
20	3/4"	C	87	61	50/56**	160/167**					
20T	3/4"	A	89	122		110					
20T		B	105/98,5*	178		101		105/75/18/4	105/75/18/4	98,5/70/16/4	117,5/82,5/19/4
25	1"	C	87	61	50/56**	160/167**					
25T	1"	A	89	122		110					
25T		B	105/98,5*	178		101		105/75/18/4	105/75/18/4	98,5/70/16/4	117,5/82,5/19/4
32	11/4"	C	87	73	39	160/167**					
40J	11/2"	C	87	73	39	160/167**					
40T	11/2"	A	96	156		96					
40T		B	150/127*	178		101	18	150/110/18/4	150/110/18/4	127/99/16/4	155,6/114,3/22/4

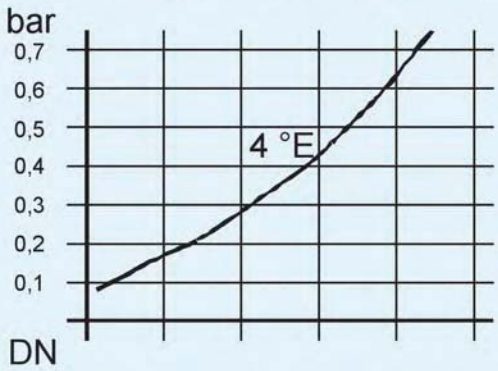
***125/150 lbs** ****SS/CS**

Weights

DN	BSP NPT	A B C	CI DI kg	CS SS kg	Bz kg	Al kg
20	3/4"	C	2,15	2,2	2,2	2,1
20T	3/4"	A	3,1	3,3	3,3	
20T		B	7,7	7,7	9,1	4,8
25	1"	C	2,15	2,2	2,2	2,1
25T	1"	A	3,1	3,3	3,3	
25T		B	7,7	7,7	9,1	4,8
32	11/4"	C	3,0		3,2	2,1
40	11/2"	C	3,0		3,4	2,1
40	11/2"	A	4,1	4,1	4,9	4,2
40		B	7,7	7,7	9,1	4,8

Flow Chart

delta p max. = 1,37 bar (20 p.s.i.)



DN						
20	2,0	2,3	3,8	5,2	5,6	7,0
25	2,2	2,5	4,2	5,7	6,2	7.8
32	2,5	2,8	4,8	6,5	7,1	8,8
40	5,2	8,5	11,0	14,0	16,8	18,5

m^3/h

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CODE FOR THERMOSTATIC VALVES MODEL M 50 … M 150

M 80TC 2 G 120 D A

type of thermostatic valve

M = standard with and without Manual override

size of valve

~~DN 50H with 2" BSP~~
DN 50T with flanges
DN 65T with flanges
DN 80T with flanges
DN 100T with flanges
DN 125 with flanges
DN 150 with flanges

valve housing material

A = aluminium
B = bronze
C = cast iron
D = spheroidal graphite cast iron
E = stainless ASTM A351 CF-8M
S = cast steel ASTM A216 WCB

port connections flanges

1 = DIN 2501-1 PN 6
2 = DIN 2501-1 PN 10
3 = DIN 2501-1 PN 16
4 = ANSI B16.1 (Class 125) RF
5 = ANSI B16.5 (Class 150) RF
6 = DIN 2501-1 PN 25
7 = ANSI B16.5 (Class 300) RF
8 = DIN 2501-1 PN 40
B = BSP parallel

type of element

G = 2001A standard for water and oil
H = 2012A standard with manual over ride
J = 2030A standard for salt water
L = 2030P kanigen plated
M = 2035P kanigen plated with manual override

~~Valve size DN 50 can bee in housing model T (Fig. A,B) and F (Fig. C).~~ Model T has in the coding the „T" added.

for example: M50TC2G110DA

leak hole

A = no leak hole
B = 2 mm leak hole
C = 4 mm leak hole
D = 6 mm leak hole
E = 8 mm leak hole
X = without O-ring element

special requirements

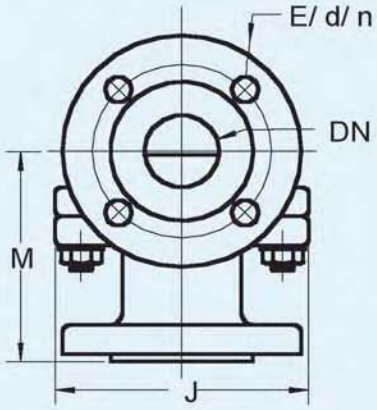
D = standard - bronze seat
03 = special welding-connection
06 = alu-bronce housing
25 = PTFE seals
Others on request

nominal temperature of the elements

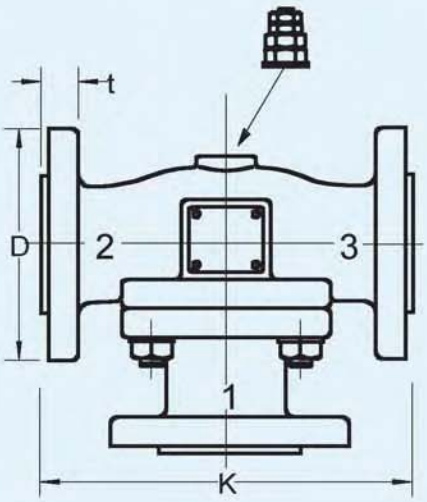
no.		"cold"			"warm"
075 °F	=	24°C	21 °C	-	29 °C
090	=	32	27	-	35
095	=	35	30	-	41
100	=	38	35	-	43
105	=	41	35	-	45
110	=	43	38	-	47
115	=	46	40	-	50
120	=	49	44	-	54
130	=	55	52	-	60
135	=	57	54	-	63
140	=	60	57	-	66
145	=	63	60	-	69
150	=	66	63	-	71
155	=	68	66	-	74
160	=	71	68	-	77
165	=	74	71	-	79
170	=	77	74	-	82
175	=	79	77	-	85
180	=	82	79	-	88
185	=	85	82	-	91
195	=	91	87	-	98
205	=	96	93	-	102
215	=	102	99	-	107
225	=	108	102	-	113
230	=	110	104	-	115
240	=	116	108	-	122

Subject to change without prior notice, issue Sept. 2007

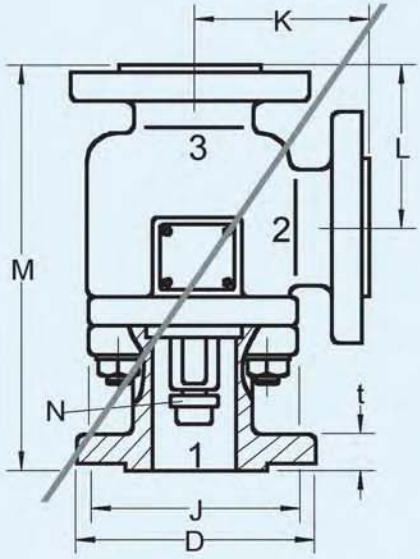
TECHNICAL DATA MODELS M50 ... M150



A



B



~~C~~

Obsolescent model - don't use for new design engineering

For the purpose of design engineering deviation of up to 10 mm should be respected. (Exact values on demand)

Dimensions

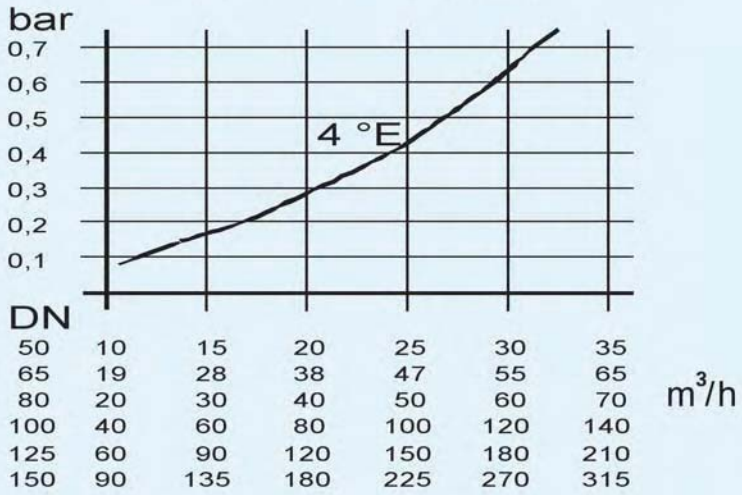
DN	A B C	J mm	K mm	L mm	M mm	N	t mm	PN10/16 D/E/d/n mm	PN25/40** D/E/d/n mm	125/150 lbs D/E/d/n mm	300 lbs** D/E/d/n mm
~~50~~	~~C~~	~~139~~	~~113~~	~~121~~	~~270~~	~~1~~	~~20~~	~~165/125/18/4~~	~~165/125/18/4~~	~~152,4/120,6/19/4~~	~~165/127/19/8~~
50	A B	140	225		150	1	20	165/125/18/4	165/125/18/4	152,4/120,6/19/4	165/127/19/8
65	A B	210	254/267*		165/171*	2	20	185/145/18/4	185/145/18/8	178/140/19/4	190,5/149/22,2/8
80	A B	210	267		171	2	22	200/160/18/8	200/160/18/8	190,5/152/19/4	203,6/168,3/22,2/8
100	A B	284	403/409*		217/220*	4	24	224/180/18/8	235/190/22/8	229/190,5/19/8	254/200/22,2/8
125	A B	349	489		241	6	26	254/210/18/8	270/220/26/8	254/216/22,2/8	279,4/235/22,2/8
150	A B	488	489		254	8	26	285/240/23/8	300/250/26/8	279,4/241,3/22,2/8	317,5/270/22,2/12
			*SS		*SS						

Weights

DN	A B C	CI DI kg	CS SS kg	Al kg
50	C	18	20	7
50	A B	18	20	7
65	A B	24	31	10
80	A B	25	32	14
100	A B	60	60	24
125	A B	125	125	35
150	A B	136	136	48

Flow Chart

delta p max. = 1,37 bar (20 p.s.i.)



Subject to change without prior notice, issue Sept. 2007

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EC Declaration of Conformity
Konformitätserklärung

Kunde/customer :	Voith Turbo GmbH & Co.KG 74564 Crailsheim
Bestell-Nr./order no:	1000/4500582270/210
MVA Komm.-Nr.:	19774
Hersteller/Manufacturer:	AWE GmbH
Lieferant/Supplier:	MVA GmbH Mess- und VerfahrensTechnik Am Kirchenhölzl 7 D-82166 Gräfelfing/München

Hiermit erklären wir, dass das nachfolgend spezifizierte Gerät den maßgeblichen Vorkehrungen der ATEX Richtlinie 94/9/EC v. 23. März 1994 entspricht.
Hereby declares that the Equipment specified below conforms with the relevant provisions of the ATEX directive 94/9/EC of 23 March 1994.

Beschreibung des Druckgerätes:	**3/2-Wege-Temperaturregler (nicht elektrisch)**
Description of Pressure Equipment:	**Thermostatic Valve (Non-Electrical)**

Model/type:	2 Stück	M65TD5G120-59

Serien-Nr./Serial No.	19774-4/1-2

Verwendetes Konformitätsbewertungsmodul: Conformity Assessment Procedure	**Eigenzertifizierung** Self Certification
Benannte Stelle: Notified Body:	nicht anwendbar Not Applicable

Die Konformität ist nachweisbar durch nachfolgende Dokumentation:
Conformity has been demonstrated with reference to the following documentation:

Der technische Ordner Nr. THAX01 hinterlegt bei benannter Stelle BASEEFA
ISO 9001:2000 Qualitätssystem (PED)
The technical file no: THAX01 lodged with notified body BASEEFA
ISO 9001:2000 Quality Management system and PED

Grundlage zur Erfüllung der wesentlichen Gesund- und Sicherheitsanforderungen ist nachfolgender Standard:
Compliance with the essential health and safety requirements has been assessed by reference to the following standard:

BSEN 13463-1:2001 solange das Gerät mit beiliegender Bedienungs- und Wartungsanleitung eingebaut ist.
BSEN 13463-1:2001 as long as the equipment is installed with reference to the supplied instructions.

Gräfelfing, den 18.03.2009

MVA
Mess- und VerfahrensTechnik GmbH

QS Achim Bruns

Mess- und Verfahrenstechnik GmbH
Am Kirchenhölzl 7
D-82166 Gräfelfing
Tel. 089/858369-0
Fax 089/858369-70

14.18 Giunto di collegamento

Numero di disegno Voith:
Numero di disegno Voith:

Tipo: (azionamento)

Nessuna fornitura tramite Voith-Crailsheim

Tipo: (condotta)

Nessuna fornitura tramite Voith-Crailsheim

Descrizione

Descrizione

Indice

Appendice_A_

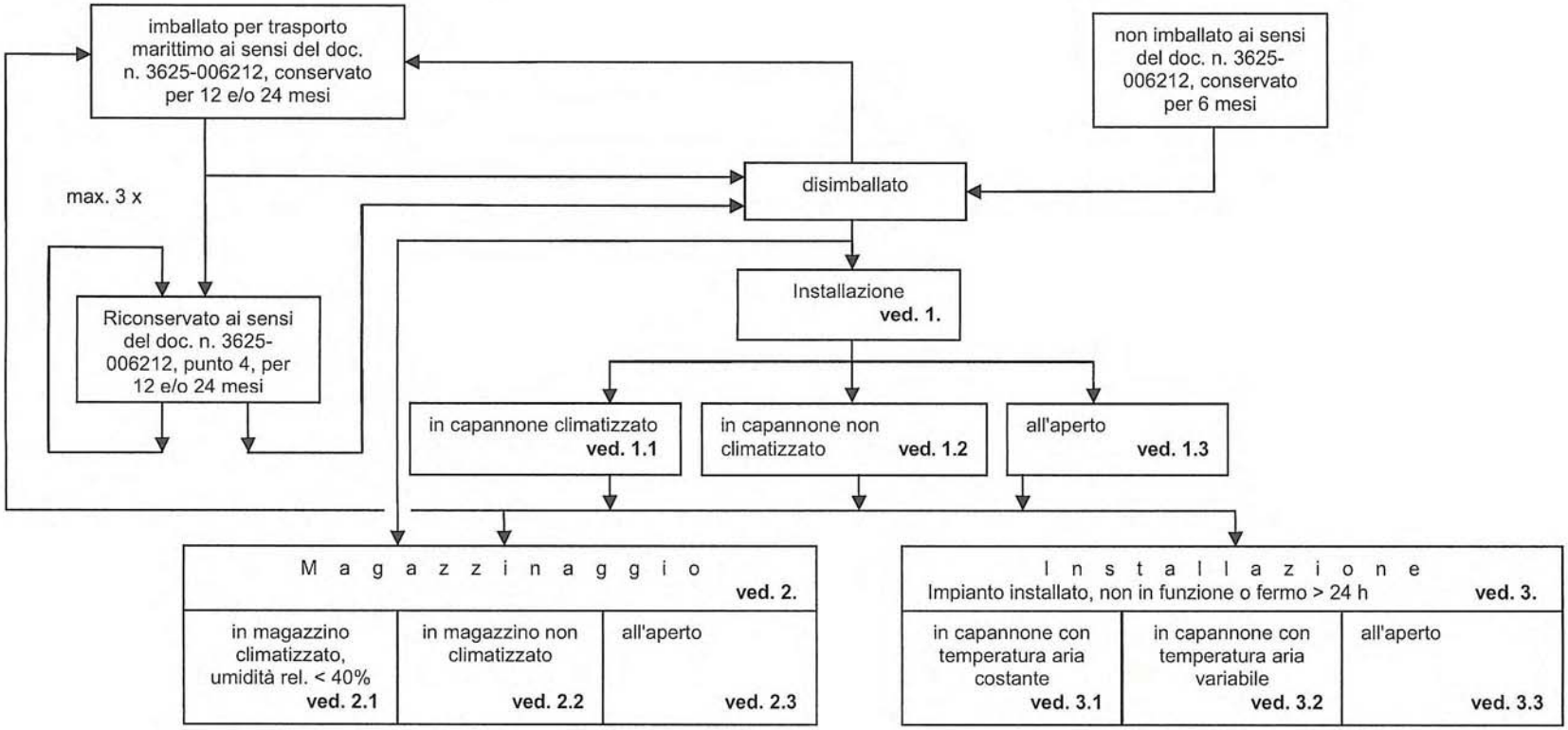
Procedura di conservazione e indicazioni per l'immagazzinaggio dopo la consegna 3625-006714

Documentazione tecnica n. 91800110410_BA1_it, Versione 1.00, airpd / Kapp
N. serie da 8206786 a 8206789

VOITH

Procedura di conservazione e indicazioni per l'immagazzinaggio dopo la fornitura per i tipi di giunti R, RW, S, MDC e convertitori di coppia nonché per gruppi costruttivi

Questa norma contiene un prospetto relativo a conservazione, immagazzinaggio e controllo di macchine e gruppi costruttivi dopo la fornitura nonché ogni altra indicazione generale.



Ricambio per:
3625-006714 del 2004-06-01

Informazioni generali

Gli aggregati Voith e i relativi gruppi costruttivi sono beni d'investimento di elevata qualità, per i quali è necessario mantenere condizioni perfette durante le operazioni di installazione e di montaggio, un prolungato immagazzinamento nonché dopo l'installazione o in caso di arresto limitato all'esercizio. Qui di seguito sono descritti i provvedimenti da adottare in queste fasi e i controlli necessari. I lavori eseguiti devono essere protocollati.

Le procedure di immagazzinaggio e di conservazione descritte sono adatte per un'accurata esecuzione dei lavori, al fine di mantenere le forniture in condizioni perfette dal momento della spedizione da Voith Crailsheim fino alla messa in esercizio.

Oltre alla protezione delle superfici esterne soggette a corrosione tramite l'applicazione di prodotti anticorrosivi idrorepellenti, i provvedimenti descritti si basano sulla creazione di un clima asciutto, in alternativa asciutto e privo di ossigeno all'interno degli aggregati. L'obiettivo è ottenere e mantenere all'interno un'umidità relativa $\leq$ 40%, dato che al disotto di questa umidità, la corrosione non ha luogo.

Per creare il clima asciutto all'interno degli aggregati vengono utilizzati:
- Deumidificatori ad assorbimento
- Aria compressa asciutta
- Azoto tecnico con punto di rugiada sufficientemente basso.

I gruppi costruttivi, come ad es., riduttori a ingranaggi, devono essere trattati come parti metalliche lucide e, in linea di massima devono essere imballati secondo il documento Voith n. 3625-006212, punti 2 – 4, o immagazzinati in locali climatizzati, se non diversamente concordato, oppure forniti in contenitori speciali per una conservazione prolungata a magazzino.

1. Installazione di aggregati Voith in un impianto, indicazioni generali:

Qui c'è da tenere conto in particolare dell'efficacia della conservazione, in quanto spesso non si considerano i pericoli aggiuntivi causati da acqua, impurità grossolane e danni meccanici.

Durante l'installazione è necessario controllare e protocollare regolarmente l'efficacia della conservazione.

- L'installazione deve essere eseguita preferibilmente in edifici dotati almeno di tettoia o tenda di protezione contro gli agenti atmosferici.
- Ai fini del montaggio, dopo aver pulito le superfici lucide metalliche esterne, spruzzare un prodotto anticorrosivo idrorepellente, ad es. Shell Ensis Fluid S.
- Non disimballare aggregati freddi in ambienti caldi (discesa al di sotto del punto di rugiada), ma solo dopo aver raggiunto una compensazione della temperatura.

Attenzione:

Al momento dell'installazione nei locali, non utilizzare azoto per la protezione anticorrosione per via del **pericolo di intossicazione**!

1.1 Installazione di un aggregato Voith in un impianto situato in un capannone climatizzato

Vedere anche punto 1.

I seguenti provvedimenti sono validi per un capannone climatizzato, definito come segue:
- Intervallo di temperatura da 18 a 26 °C
- Umidità relativa dal 35 al 65 %
- Scarso movimento dell'aria
- Variazione di temperatura entro 24h < 8°C

Se una delle condizioni di cui sopra non viene rispettata, è necessario adottare i provvedimenti come da punto 1.2 per "capannoni non climatizzati".

Spruzzare le parti metalliche lucide con un prodotto anticorrosivo idrorepellente, ad es., Shell Ensis Fluid S. (Prima dell'aggiunta o del montaggio di parti, ad es., il collocamento di mozzi, pulire le superfici degli aggregati spruzzate con conservanti, con detergente adeguato, benzina solvente o petrolio). Dopo l'aggiunta o il montaggio delle parti, passare o spruzzare le parti metalliche lucide rimaste con il prodotto anticorrosivo oppure applicare uno strato di colore.

Per la protezione anticorrosione delle parti interne degli aggregati, durante l'installazione è consigliata la seguente procedura:

a) Deumidificazione dell'aria all'interno degli aggregati con un deumidificatore ad assorbimento.*
   - Finché coperchi, flange, ecc. degli aggregati non vengono aperti, l'aria all'interno della macchina deve essere asciugata ogni 3 giorni con un deumidificatore ad assorbimento. Umidità residua relativa consentita ≤ 20%. Il filtro di sfiato deve essere chiuso con una pellicola.
   - Dopo l'apertura dell'alloggiamento sollevando coperchi, flange, ecc., asciugare immediatamente l'interno dell'aggregato con l'ausilio di un deumidificatore ad assorbimento.*

   Coperchi e flange smontati devono essere rimontati il più velocemente possibile al più tardi dopo ½ ora, oppure sostituiti da coperture provvisorie, per ridurre al minimo l'infiltrazione di umidità.

   È ammesso l'approvvigionamento continuo di aria deumidificata all'interno dell'aggregato mediante un deumidificatore ad assorbimento. Si consiglia di regolare l'aggregato tramite un igrostato. L'umidità relativa all'interno della macchina deve essere ≤ 40%.

b) Fornitura di aria compressa asciutta nell'interno dell'aggregato. Portata aria da 5 a 10 l/min ca. (sufficiente fino a 6m³ di volume dell'interno). Il punto di rugiada atmosferico dell'aria compressa deve essere inferiore a -5°C.
   - Finché coperchi, flange, ecc. dell'aggregato non vengono aperti, l'interno della macchina deve essere riempito dopo 3 giorni di aria compressa asciutta. Tale procedura deve essere eseguita con una portata che sia almeno cinque volte superiore al volume interno.
   - Dopo l'apertura di coperchi, flange, ecc., è necessario far passare immediatamente aria compressa asciutta all'interno dell'aggregato.

* vedere pagina 12

Coperchi e flange smontati devono essere rimontati il più velocemente possibile al più tardi dopo ½ ora, oppure sostituiti da coperture provvisorie, per ridurre al minimo l'infiltrazione di umidità.

È ammesso l'approvvigionamento continuo di aria compressa asciutta all'interno dell'aggregato. Il punto di rugiada atmosferico dell'aria compressa deve essere inferiore a -5°C.

1.2 Installazione di un aggregato Voith in un impianto in capannone non climatizzato

Vedere anche punto 1.

I seguenti provvedimenti sono validi per un capannone non climatizzato, definiti come segue:
- Intervallo di temperatura da 10 a 30 °C
- Umidità relativa dal 35 al 70 %
- Moderato movimento dell'aria
- Variazione di temperatura entro 24h < 15°C

Se una delle condizioni di cui sopra non viene rispettata, è necessario adottare i provvedimenti come da punto 1.3 per l'utilizzo "all'aperto".

Spruzzare le parti metalliche lucide con un prodotto anticorrosivo idrorepellente, ad es., Shell Ensis Fluid S. (Prima dell'aggiunta o del montaggio di parti, ad es., il collocamento di mozzi, pulire le superfici degli aggregati spruzzate con conservanti, con detergente adeguato, benzina solvente o petrolio). Dopo l'aggiunta o il montaggio delle parti, passare o spruzzare le parti metalliche lucide rimaste con il prodotto anticorrosivo oppure applicare uno strato di colore.

Per la protezione anticorrosione delle parti interne degli aggregati, durante l'installazione è consigliata la seguente procedura:

a) Deumidificazione dell'aria all'interno degli aggregati con un deumidificatore ad assorbimento.*
   - Finché coperchi, flange, ecc. degli aggregati non vengono aperti, l'aria all'interno della macchina deve essere asciugata ogni 3 giorni con un deumidificatore ad assorbimento. Umidità residua relativa consentita ≤ 15%. Il filtro di sfiato deve essere chiuso con una pellicola.
   - Dopo l'apertura dell'alloggiamento sollevando coperchi, flange o simili, asciugare immediatamente l'interno dell'aggregato con l'ausilio di un deumidificatore ad assorbimento.*

   Coperchi e flange smontati devono essere sostituiti da coperture provvisorie, per ridurre al minimo l'infiltrazione di umidità.

   È ammesso l'approvvigionamento continuo di aria deumidificata all'interno dell'aggregato mediante un deumidificatore ad assorbimento. Si consiglia di regolare l'aggregato tramite un igrostato. L'umidità relativa all'interno della macchina deve essere ≤ 40%.

b) Fornitura di aria compressa asciutta nell'interno dell'aggregato. Portata aria da 10 a 15 l/min ca. (sufficiente fino a 6m³ di volume dell'interno). Il punto di rugiada atmosferico dell'aria compressa deve essere inferiore a -10°C.

* vedere pagina 12

- Finché coperchi, flange, ecc. dell'aggregato non vengono aperti, l'interno della macchina deve essere riempito dopo 3 giorni di aria compressa asciutta. Il filtro di sfiato deve essere chiuso con una pellicola. Tale procedura deve essere eseguita con una portata che sia almeno cinque volte superiore al volume interno.
- Dopo l'apertura di coperchi, flange, ecc., è necessario far passare immediatamente aria compressa asciutta all'interno dell'aggregato.

Coperchi e flange smontati devono essere sostituiti da coperture provvisorie, per ridurre al minimo l'infiltrazione di umidità.

È ammesso l'approvvigionamento continuo di aria compressa asciutta all'interno dell'aggregato (10 - 15 l/min). Il punto di rugiada atmosferico dell'aria compressa deve essere inferiore a -10°C.

1.3 Installazione di un aggregato Voith in un impianto all'aperto

Vedere anche punto 1.

L'installazione degli aggregati e le operazioni di smontaggio di coperchi, flange, ecc. devono essere eseguiti al coperto.
Spruzzare le parti metalliche lucide con un prodotto anticorrosivo idrorepellente, ad es., Shell Ensis Fluid S. (Prima dell'aggiunta o del montaggio di parti, ad es., il collocamento di mozzi, pulire le superfici degli aggregati spruzzate con conservanti, con detergente adeguato, benzina solvente o petrolio). Dopo l'aggiunta o il montaggio delle parti, passare o spruzzare le parti metalliche lucide rimaste con il prodotto anticorrosivo oppure applicare uno strato di colore.

Per la protezione anticorrosione delle parti interne degli aggregati, durante l'installazione è consigliata la seguente procedura:

a) - Approvvigionamento continuo di aria deumidificata all'interno degli aggregati con deumidificatore ad assorbimento.*
   - Coperchi e flange smontati devono essere sostituiti da coperture provvisorie, per ridurre al minimo l'infiltrazione di umidità.

b) - Approvvigionamento continuo di aria compressa asciutta all'interno delle macchine. Punto di rugiada atmosferico dell'aria compressa $\leq$ - 40°C. Portata aria ca. 10-15 l/min. (sufficiente fino a 6m³ di volume dell'interno).
   - Coperchi e flange smontati devono essere sostituiti da coperture provvisorie, per ridurre al minimo l'infiltrazione di umidità.

c) - Approvvigionamento continuo di azoto tecnico all'interno della macchina, portata ca.10 – 15 l/min (sufficiente fino a 6 m³ di volume dell'interno), pressione necessaria ca. 0,002 bar. Punto di rugiada dell'azoto $\leq$ -70°C

Attenzione:
in caso di impiego di azoto, gli interventi sugli aggregati devono essere eseguiti solo adottando determinate misure cautelari, **Pericolo di intossicazione!**

* vedere pagina 12

2. Immagazzinaggio Indicazioni generali

Requisiti relativi all'immagazzinaggio di aggregati Voith o impianti in ambienti chiusi:

- Il magazzino deve essere asciutto, con poca polvere, moderatamente aerato e senza vibrazioni.
- Presupposto fondamentale per l'immagazzinaggio è che qualunque tipo di mezzo aggressivo, come ad es., gas, vapori o aerosol di acidi, soluzioni alcaline o sali possano agire sulle macchine.
- È necessario garantire una stabilità sufficiente anche su superfici inclinate.
- Le macchine imballate possono essere impilate o posizionate l'una sull'altra solo se viene mantenuta la circolazione dell'aria.
- Tutte le macchine devono essere facilmente accessibili per interventi di controllo e di manutenzione per:
  - Lettura degli indicatori di umidità
  - Controlli delle macchine
  - Riparazioni dell'imballaggio
- Non disimballare aggregati freddi in ambienti caldi (discesa al di sotto del punto di rugiada), ma solo dopo aver raggiunto una compensazione della temperatura.
- Il riempimento o l'approvvigionamento continuo di azoto nelle macchine non è consentito nei locali a causa del pericolo di intossicazione.

Immagazzinaggio di gruppi costruttivi, ved. pagina 2, "Informazioni generali"

Requisiti relativi all'immagazzinaggio all'aperto:

- Le macchine disimballate possono essere sistemate all'aperto, se sono previste per l'installazione all'esterno.
- La temperatura di immagazzinaggio deve essere compresa tra 0 e 40 °C.
- Il luogo di collocazione deve essere privo di vibrazioni. Deve avere preferibilmente un fondo stabile, ad es., una piastra in cemento armato, deve essere al riparo da inondazioni e, per quanto possibile, fissato in modo che le macchine e i componenti non sprofondino nel fango anche in caso di piogge di lunga durata. Evitare la formazione di pozzanghere e di acqua stagnante. Sistemare la macchine su barre di legno a sezione quadrata.
- Evitare la luce diretta del sole che, oltre all'effetto dannoso delle radiazioni UV, può causare elevate variazioni di temperatura.
- Fissare i teloni di copertura in modo che siano resistenti agli agenti atmosferici. Prestare attenzione affinché non si formino accumuli di condensa e che sotto i teloni sia garantita la circolazione dell'aria.
- Controllare periodicamente lo stato dei teloni e degli imballi in modo da escludere danni dovuti ad agenti atmosferici, a piccoli roditori e a putrefazione.
  Eliminare immediatamente ogni difetto riscontrato.

Immagazzinaggio di gruppi costruttivi, ved. pagina 2, "Informazioni generali".

2.1 Immagazzinamento in magazzini climatizzati

Vedere anche 2.

I seguenti provvedimenti sono validi per un capannone climatizzato, definito come segue:
- Umidità relativa < 40%

Controllare e protocollare regolarmente il rispetto delle condizioni di immagazzinamento.

aggregati non imballati

Per tutta la durata dell'immagazzinamento rispettare le seguenti norme:
- Al massimo ogni 2 anni, spruzzare le parti metalliche lucide esterne con un prodotto anticorrosivo che formi una pellicola idrorepellente, ad es. Shell Ensis Fluid S. (Prima del montaggio delle macchine, pulire con benzina solvente o petrolio le superfici spruzzate)

- Al massimo ogni 2 anni ruotare gli alberi dei gruppi dotati di cuscinetti volventi di circa un quarto/mezzo giro, per evitare intaccature di stato (corrosione) ai cuscinetti.
- ogni 2 anni spruzzare le superfici interne con olio anticorrosivo privo di solventi, ad es. Shell Ensis Motoröl 20.

È permesso l'immagazzinamento in imballi come da Voith n. 3626-006212, punti da 2 a 4.

2.2 Immagazzinamento in capannoni non climatizzati

Vedere anche 2.

La seguente norma vale per un capannone non climatizzato, definito come segue:
- Intervallo di temperatura da 10 a 30 °C
- Umidità relativa dal 35 al 70 %
- Moderato movimento dell'aria
- Variazione di temperatura entro 24h < 15°C

Se una delle condizioni di cui sopra non viene rispettata, è necessario adottare i provvedimenti come da punto 2.3 per "immagazzinaggio all'aperto".

Per la protezione anticorrosione degli aggregati è possibile utilizzare la seguente procedura:

a)
- Imballi come da Voith n. 3625-006212 Punto 4. Si raccomanda di controllare regolarmente l'efficacia del mezzo d'asciugamento tramite indicatori di umidità, ved. Tabella a pagina 11.
- Verificare lo stato dell'imballo tramite controlli periodici. Eliminare immediatamente ogni difetto riscontrato.
- Dopo 2 anni, sostituire la pellicola in alluminio dell'involucro. (La pellicola in alluminio non è resistente ai raggi UV).
  Nel fare ciò, verificare lo stato di conservazione delle parti metalliche lucide. Eventualmente correggere la conservazione con un prodotto anticorrosivo che formi una pellicola idrorepellente, ad es. Shell Ensis Fluid S.
- Al più tardi dopo 2 anni ruotare gli alberi dei gruppi dotati di cuscinetti volventi di circa un quarto/mezzo giro, per evitare intaccature di stato (corrosione) ai cuscinetti.

b) Aggregati non imballati
Deumidificazione continua delle parti interne dell'aggregato con un deumidificatore ad aspirazione.*
- Al più tardi dopo 1 anno verificare l'efficacia della conservazione, e riproteggere eventualmente le parti metalliche lucide on un prodotto anticorrosivo che formi una pellicola idrorepellente, ad es. Shell Ensis Fluid S.
- Al massimo ogni 2 anni ruotare gli alberi dei gruppi dotati di cuscinetti volventi di circa un quarto/mezzo giro, per evitare intaccature di stato (corrosione) ai cuscinetti.

In alternativa al deumidificatore ad aspirazione potrà avere luogo una alimentazione continua di aria asciutta all'interno degli aggregati. Portata aria da 10 a 15 l/min ca. (sufficiente fino a 6m³ di volume dell'interno). Il punto di rugiada atmosferico dell'aria compressa deve essere inferiore a -10°C.

2.3 Immagazzinaggio all'aperto

Vedere anche 2.

Per la protezione anticorrosione degli aggregati è possibile utilizzare la seguente procedura:

a)
- Imballi come da Voith n. 3625-006212 Punto 4. Si raccomanda di controllare l'efficacia del mezzo d'asciugamento tramite indicatori di umidità, ved. Tabella a pagina 11.
- Al più tardi dopo 1 anno verificare lo stato di conservazione delle parti metalliche lucide esterne. Eventualmente correggere la conservazione con Shell Ensis Fluid S. (Prima del montaggio delle macchine, pulire con benzina solvente o petrolio le superfici spruzzate)
- Al massimo ogni 2 anni ruotare gli alberi dei gruppi dotati di cuscinetti volventi di circa un quarto/mezzo giro, per evitare intaccature di stato (corrosione) ai cuscinetti.
- Dopo 2 anni, sostituire la pellicola in alluminio dell'involucro. (La pellicola in alluminio non è resistente ai raggi UV)

b) Aggregati non imballati:
- Prevedere una protezione antipioggia (tetto, tenda, teloni o simili)
- Spruzzare le parti metalliche lucide con un prodotto anticorrosivo idrorepellente, ad es., Shell Ensis Fluid S.

Per la conservazione delle parti interne degli aggregati è possibile usare:
- Deumidificazione continua dell'interno degli aggregati con deumidificatore ad assorbimento. *
- Approvvigionamento continuo di azoto tecnico all'interno della macchina, portata ca.10 – 15 l/min (sufficiente fino a 6 m³ di volume dell'interno), pressione necessaria ca. 0,002 bar. Punto di rugiada dell'azoto
  $\leq$ -70°C

* vedere pagina 12

- Fornitura di aria compressa asciutta nell'interno dell'aggregato. Punto di rugiada atmosferico dell'aria compressa ≤ - 70°C.
  Portata aria ca. 10-15 l/min. (sufficiente fino a 6m³ di volume dell'interno).

3. Impianti montati installati su fondazioni; non ancora in funzione o in stato di fermo

Qui c'è da tenere conto in particolare dell'efficacia della conservazione, in quanto spesso non si considerano i pericoli aggiuntivi causati da acqua, impurità grossolane e danni meccanici.

Spruzzare le parti metalliche lucide esterno con un prodotto anticorrosivo idrorepellente, ad es., Shell Ensis Fluid S. Ingrassare e muovere mensilmente le parti funzionali, quali gli snodi. Riempire possibilmente l'impianto con olio di servizio, a tale scopo vedere il manuale operativo.

3.1 I seguenti provvedimenti valgono per impianti installati su fondazioni in capannoni temperati in modo omogeneo

Vedere anche punto 3.

Per la protezione anticorrosione delle parti interne degli aggregati è possibile utilizzare la seguente procedura:

a) Impianti pronti per il funzionamento
   Al più tardi ogni 3 mesi, avviare l'impianto e lasciarlo funzionare brevemente (circa 5 minuti) per oliare tutte le parti interne.

b) Impianti non pronti per il funzionamento
   - In caso di pompa di lubrificazione di avviamento elettrica pronta per il funzionamento, azionarla ogni 3 mesi per circa 5 minuti. (Evitare il funzionamento a caldo!)
   - In caso di pompa di lubrificazione di avviamento elettrica non pronta per il funzionamento, prelevare olio dalla coppa ogni 3 mesi, spruzzarlo attraverso le aperture dell'involucro nella zona interna e pomparlo con una pompa dell'olio separata attraverso le tubature per circa 5 minuti. Possibilmente, far girare l'impianto.

c) In alternativa è possibile, in particolare per impianti non riempiti d'olio, impiegare i seguenti procedimenti per la protezione interna anticorrosione:
   - Asciugare mensilmente l'aria all'interno dell'aggregato. L'umidità relativa dell'aria permessa dovrà essere ≤ 40 % alla temperatura ambiente più bassa prevista.

d) Fornitura di aria compressa asciutta nell'interno dell'aggregato.
   Portata aria da 10 a 15 l/min ca. (sufficiente fino a 6m³ di volume dell'interno). Il punto di rugiada atmosferico dell'aria compressa deve essere inferiore a 0°C.

* vedere pagina 12

3.2 I seguenti provvedimenti valgono per impianti installati su fondazioni in capannoni con una temperatura dell'aria avente variazioni scarse

Vedere anche punto 3.

Per la protezione anticorrosione delle parti interne degli aggregati è possibile utilizzare la seguente procedura:

a) Impianti pronti per il funzionamento
Al più tardi ogni 2 mesi, avviare l'impianto e lasciarlo funzionare brevemente (circa 5 minuti) per oliare tutte le parti interne.

b) Impianti non pronti per il funzionamento
- In caso di pompa di lubrificazione di avviamento elettrica pronta per il funzionamento, azionarla ogni 2 mesi per circa 5 minuti. (Evitare il funzionamento a caldo!)
- In caso di pompa di lubrificazione di avviamento elettrica non pronta per il funzionamento, prelevare olio dalla coppa ogni 2 mesi, spruzzarlo attraverso le aperture dell'involucro nella zona interna e pomparlo con una pompa dell'olio separata attraverso le tubature per circa 5 minuti. Possibilmente, far girare l'impianto.

c) In alternativa è possibile, in particolare per impianti non riempiti d'olio, impiegare i seguenti procedimenti per la protezione interna anticorrosione:
- Asciugare mensilmente l'aria all'interno dell'aggregato. Alla temperatura ambiente più bassa prevista, l'umidità relativa dell'aria permessa dovrà essere $\leq$ 40 %. Qualora a causa delle condizioni climatiche ciò non dovesse essere possibile con un passaggio del deumidificatore ad assorbimento, sarà necessario deumidificare l'aria in un circuito chiuso.

In caso di variazioni di temperatura maggiori e/o elevata umidità dell'aria è necessario adottare il provvedimento d) o, a scelta, e).

d) È ammesso l'approvvigionamento continuo con deumidificatore ad assorbimento all'interno dell'aggregato.*

e) Fornitura di aria compressa asciutta nell'interno dell'aggregato. Portata aria da 10 a 15 l/min ca. (sufficiente fino a 6m³ di volume dell'interno). Il punto di rugiada atmosferico dell'aria compressa deve essere inferiore a -10°C.

3.3 I seguenti provvedimenti valgono per impianti installati su fondazioni all'aperto

Vedere anche punto 3.

Per la protezione anticorrosione delle parti interne degli aggregati è possibile utilizzare la seguente procedura:

a) È ammesso l'approvvigionamento continuo di aria deumidificata all'interno dell'aggregato mediante un deumidificatore ad assorbimento. Si consiglia di regolare l'aggregato tramite un igrostato. L'umidità relativa all'interno della macchina deve essere $\leq$ 40%.

* vedere pagina 12

b) - Fornitura di aria compressa asciutta nell'interno dell'aggregato. Portata aria da 10 a 15 l/min ca. (sufficiente fino a 6m³ di volume dell'interno). Il punto di rugiada atmosferico dell'aria compressa deve essere inferiore a -40°C.

c) - Approvvigionamento continuo di azoto tecnico all'interno della macchina, portata ca. 10 – 15 l/min (sufficiente fino a 6 m³ di volume dell'interno), pressione necessaria ca. 0,002 bar. Punto di rugiada dell'azoto ≤ -70°C

Attenzione:
in caso di impiego di azoto, gli interventi sugli aggregati devono essere eseguiti solo adottando determinate misure cautelari, **Pericolo di intossicazione!**

In caso di pompa di lubrificazione di avviamento elettrica pronta per il funzionamento, azionarla mensilmente per un breve periodo (circa 5 minuti).

Tabella degli intervalli di controllo (scadenze di controllo) degli indicatori di umidità secondo le TL 6685.

Valore riportato dagli indicatori di umidità	Intervalli di controllo
blu	ogni 8 settimane
30 % rosa	ogni 2 settimane
40 % rosa	Settimanalmente
50 % rosa	Ripristinare la conservazione a regola d'arte

* La protezione anticorrosione con aria deumidificata si basa sul fatto che al di sotto di una umidità relativa del 40% non ha luogo alcuna corrosione. L'umidità relativa dell'aria dipende dalla temperatura.
L'umidità residua permessa dovrà essere determinata in base alla temperatura ambiente più bassa prevista. Per tale temperatura, essa deve essere ≤ 40 %.

L'umidità relativa dell'aria permessa alla quale è necessario asciugare l'aria all'interno degli aggregati viene determinata tramite lo schema hx per l'umidità dell'aria (ved. esempio).

Esempio:
Ved. lo schema hx per l'aria umida a pagina 13

Ipotesi:
- Condizioni ambientali: temperatura 30 °C, umidità relativa dell'aria 70%
- Temperatura ambiente più bassa prevista 18 °C, umidità relativa dell'aria permessa ≤ 40%.

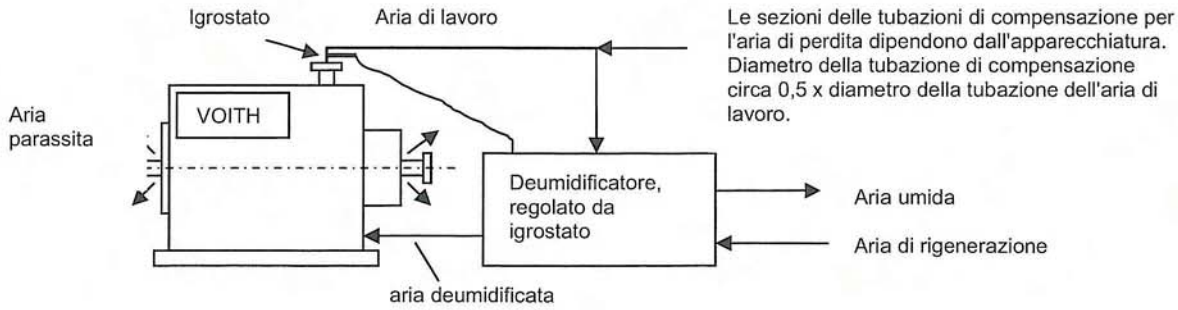
Determinazione dell'umidità relativa dell'aria permessa alla quale è necessario asciugare l'aria a 30°C:
- Determinare il punto di incontro della temperatura di 30°C e della umidità relativa dell'aria del 70% (stato dell'aria prima dell'asciugatura)
- Determinare il punto di incontro della temperatura di 18°C e della umidità relativa dell'aria del 40% (stato nominale dell'aria dopo l'asciugatura)
- Lettura del contenuto di vapore acqueo corrispondente allo stato nominale dell'aria: 5g/kg aria.
- Sulla linea del contenuto di vapore acqueo, procedendo in verticale verso l'alto fino a circa 2 - 4°C sopra la temperatura di partenza (30°C), selezionare 34°C, quindi leggere il punto di incontro con la curva dell'umidità relativa: 15%.

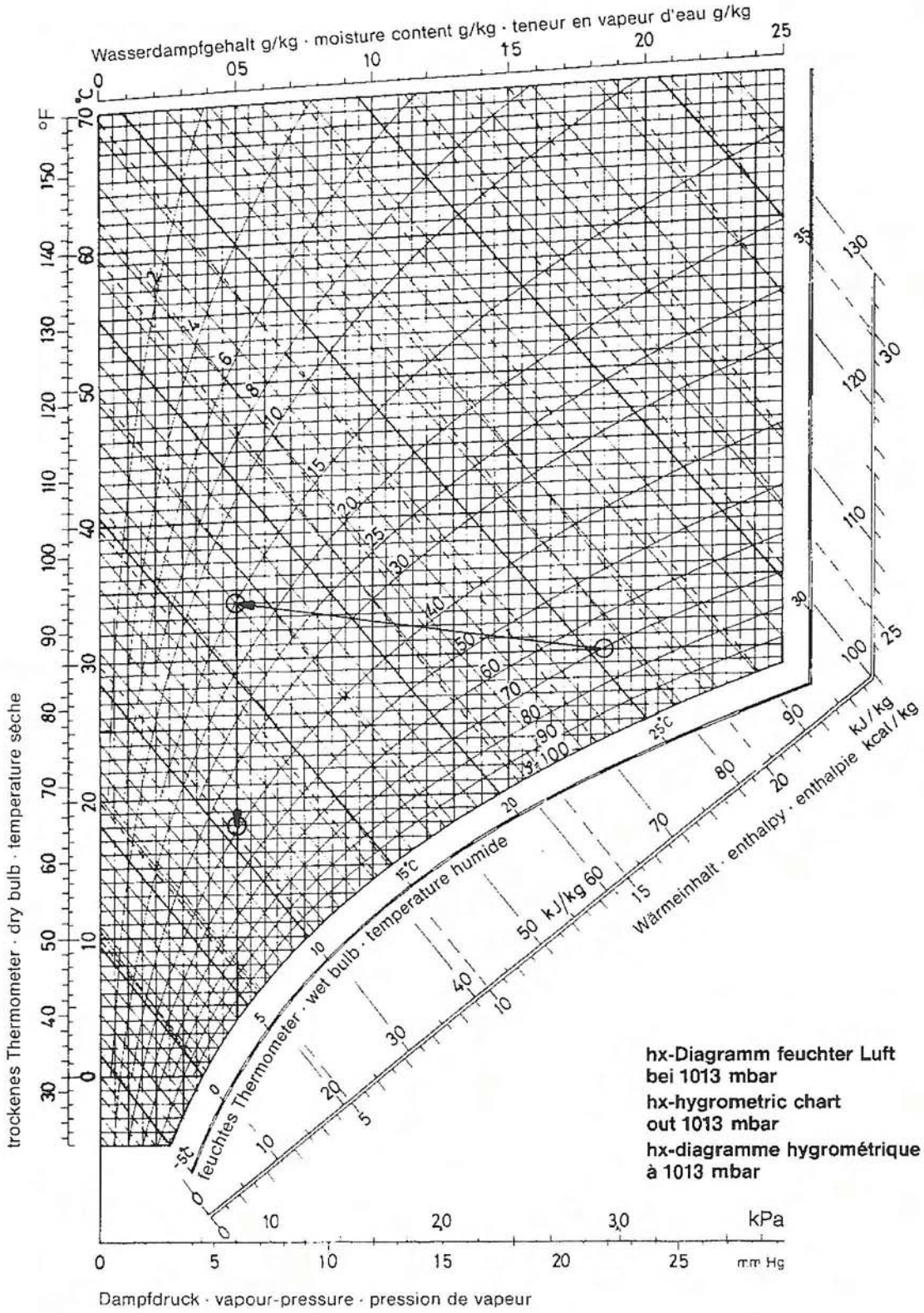
Risultato dell'esempio:
È necessario asciugare l'aria per la temperatura ambiente più bassa prevista di 18°C a una umidità dell'aria relativa del 15%.

Collegamento di un deumidificatore ad assorbimento per l'asciugatura dell'aria all'interno:

Le sezioni dei tubi sono in funzione del deumidificatore e vanno determinate con il produttore di tale apparecchiatura.

L'asciugatura ha luogo in un circuito chiuso:




Wasserdampfgehalt g/kg · moisture content g/kg · teneur en vapeur d'eau g/kg
trockenes Thermometer · dry bulb · temperature sèche
feuchtes Thermometer · wet bulb · temperature humide
Wärmeinhalt · enthalpy · enthalpie kJ/kg kcal/kg
Dampfdruck · vapour-pressure · pression de vapeur
kPa
mm Hg
hx-Diagramm feuchter Luft bei 1013 mbar
hx-hygrometric chart out 1013 mbar
hx-diagramme hygrométrique à 1013 mbar

Indice

Appendice_B_

Fluidi di esercizio ISO VG 32 per circuiti idrodinamici 3625-006072

Documentazione tecnica n. 91800110410_BA1_it, Versione 1.00, airpd / Kapp
N. serie da 8206786 a 8206789

1. Campo d'impiego

Questa norma vale per:
Turbogiunti a velocità variabile tipo "S", convertitori di coppia tipo "E" e rallentatori industriali tipo "VIR".

In singoli casi delle esigenze particolari possono escludere una scelta fatta in base alla presenta tabella. Eventuali norme che si dovessero scostare dalla tabella vengono concordate in fase di perfezionamento dell'ordine e/o indicate nel manuale per l'uso.

2. Requisiti dei liquidi di funzionamento

Caratteristica	Tipo di prova	Condizioni prova	Requisiti	Unità mis.
Viscosità cinematica	DIN 51 562	40 °C	ISO VG 32	mm²/s (cSt)
	ASTM D445			
Indice di viscosità	DIN ISO 2909		≥ 95	
	ASTM D2270			
Densità	DIN 51 757	15 °C	850 - 900	kg/m³
	ASTM D1298		0,85 - 0,9	kg/L
Punto di scorrimento	DIN ISO 3016		uguale o inferiore di -24	°C
	ASTM D 97			
Punto di infiammabilità	DIN EN ISO 2592		maggiore di 175	°C
	ASTM D92			
Temperatura di accensione ***)	DIN 51 794		maggiore di 250	°C
	IEC 60079-4			
Effetto corrosivo su rame	DIN EN ISO 2160	3 ore a 100 °C	max. 2	
	ASTM D130			
Protezione anticorrosione su acciaio	DIN ISO 7120	procedura A	nessuna ruggine	
	ASTM D665			
Capacità demulsificante	ISO 6614	tempo in minuti a 54 °C	max. 30	minuti
	ASTM D1401			
Comportamento di invecchiamento *)	DIN 51.587	1000 ore a 95 °C	aumento NZ max. 2	mg KOH/g
Stabilità d'invecchiamento (TOST) *)	ASTM D943	95°C / NZ = 2mg KOH/g	> 1000	ore
Comportamento schiuma	ISO 6247	sequenze I, II, III	max. 150/0, 75/0, 150/0	ml
	ASTM D892			
Fattore di neutralizzazione (olio nuovo)	DIN 51 558		indicare	mg KOH/g
	ASTM D974			
Capacità di separazione aria	DIN ISO 9120	0,2% a 50 °C	max. 5	minuti
	ASTM D3427			
Prova meccanica nella macchina di prova per tensione delle ruote dentate di veicoli, grado di danneggiamento nella prova	DIN 51354-2 o DIN ISO 14635-1	test A/8,3/90	min. 7 < 7 **)	
Comportamento contro materiale di guarnizione SRE-NBR 1	DIN ISO 1817	SRE-NBR 1 secondo DIN 53 538-1, 7 giorni a 100°C	variazione relativa del volume da 0 a 12	%
	DIN ISO 1817 in collegamento con DIN 53 505		variazione della durezza da 0 a - 7	Shore A

*) in alternativa
**) consentito per modelli con cuscinetti lisci
***) da soddisfare con funzionamento in zone a rischio di esplosione, Classe di temperatura T3 (massima temperatura di superficie 200°C)

Sostituisce:
3625-006072 del 14/09/2007

Voith Turbo GmbH & Co. KG - D-74555 Crailsheim
Postfach 1555 · Telefono (07951) 32-0 · Fax 32-500

Viscosità di partenza alle condizioni del luogo d'impiego con alimentazione olio
- non deve superare 250 mm²/s con pompe centrifughe
- fino a 1000 mm²/s con pompe volumetriche di potenza sufficiente (chiedere informazioni).

3. Scelta dei tipi di olio da parte dell'utente e del fornitore di olio minerale

Attenendosi ai requisiti di cui al par. 2 possono essere utilizzati:
- oli idraulici HLP 32 secondo DIN 51524-2,
- oli per turbine secondo DIN 51515-1 e -2 con sufficiente capacità di carico portante (FZG) per lubrificazione di ingranaggi,
- per unità con cuscinetti lisci anche oli idraulici HL 32 secondo DIN 51524-1 e oli per turbine secondo DIN 51515-1 e -2.

4. Oli idraulici consigliati

La lista che segue riporta oli idraulici secondo DIN 51524-2, oli per turbine secondo DIN 51515-1 e -2 e altri che soddisfanno i requisiti di cui al paragrafo 2, e tipi di oli sperimentati in pratica a normali condizioni d'impiego.

Poiché le condizioni locali di funzionamento e le qualità degli oli variano da sito a sito, non ci possiamo assumere nessuna responsabilità per l'olio usato proposto. In caso di risultati di funzionamento negativi scade automaticamente la garanzia se detti risultati dipendono dall'olio usato.

Fornitore	Denominazione	Temperatura di accensione maggiore di 250 °C
ADDINOL	Olio idraulico HLP 32 *)	sì
	Olio idrodinamico SGL 18	sì
	Olio per turbine TP 32 *)	sì
Agip	Blasia 32	sì
	OSO 32	sì
AP Oil International Ltd.	AP Torque Oil 32	n.c.
ARAL	DEGOL BG 32	sì
	Vitam GF 32	sì
	Kosmol TF 32 *)	sì
AUTOL	Olio idraulico HY-S 32 ISO	sì
AVIA	GEAR RSX 32-S	sì
BHARAT	HYDROL HLP-32 *)	n.c.
BP	Energol HL-XP 32	sì
	Energol HLP-HM 32	sì
CALTEX	Torque Fluid 32	n.c.
CASTROL	HYSPIN AWS 32	n.c.
	HYSPIN SP 32	no
CEPSA	CEPSA EP 125	n.c.
	CEPSA HIDRAULICO HM 32	n.c.
Chevron	Hydraulic Oil AW 32	n.c.
	Clarity Hydraulic AW ISO 32	n.c.
ConocoPhillips	CONOCO Hydroclear AW Hydraulic Fluid 32	sì
ExxonMobil	Mobilfluid 125	sì
	Mobil NUTO H 32	sì
	Mobil DTE 24	sì
	Mobil DTE Oil Light *)	sì

Fornitore	Denominazione	Temperatura di accensione maggiore di 250 °C
FUCHS Europe	Renofluid TF 1500	n.c.
	Renolin ZAF 32 B	n.c..
	Renolin Eterna 32 *)	n.c.
Gulf Oil Corp. Ltd. India	Gulf Harmony AWT 32 *)	n.c.
Hindustan Petroleum Corp. Ltd.	ENKLO HLP 32 *)	n.c.
Indian Oil Corporation Ltd.	Servo Torque 10	n.c.
	Servo System HLP 32 *)	n.c.
KLÜBER LUBRICATION	Lamora HLP 32 *)	n.c.
KNPC	Kuwaitoil Hydraulic Oil ISO 32	n.c.
Kuwait Petroleum Intern. Lubricants	Q8 Haydn 32	sì
	Q8 Holst 32	sì
	Q8 van Gogh EP 32 *)	sì
LUBRIFIN S.A.	LUBRIFIN H 32 EP-HC	n.c.
MOGUL Koramo	MOGUL HM 32	n.c..
	MOGUL OT-HP3	n.c..
OEST	OEST OLIO IDRAULICO H-LP 32	n.c..
OMV	OMV hyd HLP 32	sì
Petro-Canada	Hydrex AW 32	sì
Petro-Oil	HYDROL HLP 32	n.c.
Petrobras	LUBRAX INDUSTRIAL HR-32-EP	n.c.
	LUBRAX INDUSTRIAL EGF-32-PS *)	n.c.
	LUBRAX INDUSTRIAL TURBINA EP 32 *)	n.c.
Petrol Ofisi	Hydro Oil HD 32	n.c.
REPSOL	TELEX E-32	sì
Shell	Tellus 32	sì
	Tellus S 32	sì
	Turbo CC 32 *)	sì
SK Corporation	SK ZIC Supervis AW 32 *)	n.c.
SRS Schmierstoff Vertrieb GmbH	Wintershall WIOLAN HF 32	sì
	Wintershall WIOLAN HX 32	sì
Statoil	HydraWay HMA 32	sì
TEXACO	Rando HD 32	sì
	TEXTRAN V 32	n.c.
TOTAL	Azolla AF 32	sì
	Azolla ZS 32	sì
Valvoline Cummins Ltd.	Valvoline HLP 32 *)	n.c.
WISURA	Kineta 32 V	sì

*) Punto di scorrimento maggiore della specifica. Controllare la viscosità di partenza.
n.c. = non classificato in merito alla temperatura di accensione

La presenta lista di oli proposti non ha alcuna pretesa di completezza.

La lista di oli proposti aggiornata può essere richiesta presso la Voith Turbo GmbH & Co. KG.

Voith Turbo GmbH & Co. KG - D-74555 Crailsheim
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