VM15

Components installation

Installer manual
VM15 – Components installation

9UMEN1506-1200
Release: 220128

VM15 components installation

1. Introduction

1.1. General remarks

1.1.1. Preliminary remarks

This manual contains all information necessary for proper installation of the VM15
Staff targeted:

- Customer which has to do the installation
- Balance Systems

WARNING
It is prohibits the distribution and reproduction, even partial, of this manual, without the written permission of the Company Balance Systems s.r.l. The information contained in this manual can be subject to change without notice.

WARNING
Technical assistance and extraordinary maintenance should be performed only by authorized personnel.

1.1.2. Environmental storage conditions

The material supplied packed should be stored indoors in dry conditions and environmental conditions which respect the limits indicated in table:

Entity	Min	Max
Temperature [°C]	-20	60
Relative humidity @ 25°C without condensing [%]	10	95

NOTE
Do not stack the packaging to prevent damage to material

1.1.3. Environmental operating conditions

The VM15 system must be installed in a closed industrial area and not subject to weathering. The limits of temperature and humidity recommended for proper operation of all system components are as follows:

Entity	Min	Max
Temperature [°C]	5	45
Relative humidity @ 25°C without condensing [%]	10	95

NOTE
Temperatures outside the recommended limits may reduce the MTBF of some components

1.1.4. General information on warranty

The defects of materials are covered by general warranty conditions which will apply unless otherwise agreed between the Customer and Balance Systems, with the following limits:

- Duration: opening of all products within the limits agreed
- Item: all products marked with the Balance Systems part-number and/or serial-number.

1.2. Conformity and safety

1.2.1. Conformity

This product is compatible with the following directives:

- 2004/108/CE, EMC
- 2006/95/CE, Low voltage

according to:

- EN 60950-1: 2006
- EN 61000-6-4: 2007
- EN 61000-6-2: 2007
- EN 61010-1
- EN 61326

This product is designed for industrial applications.

1.2.2. General safety remarks

Security procedures are defined by the manufacturer of the host machine. In this document, if necessary, there are the security procedures for the installation of the VM15 system VM15, which the installer must scrupulously abiding. Ask for Balance Systems' Service in case of operation on VM15 system components.

1.3. General description of the product

The VM15 is a modular multifunction system for grinding process. It is a single integrated unit for automatic balancing, touch detection and pre/in/post-process gauging.

The VM15 system components are:

Rack

- Case unit for electronic cards (differente size and configuration)
- Control panel with HMI operator interface or PC ® Windows VMX HMI software package

Automatic balancer function

- Electronic card to manage the automatic balancing process
- Balancing head which is the electromechanical actuator that compensates the spindle vibration
- Accelerometer or vibration transducer
- Optional hardware and software components

Touch detector function

- Electronic card to manage the touch detection and gap eliminator control, dressing optimization and anti-crash
- Acoustic emission sensors
- Power sensors
- Optional hardware and software components

Gauge function

- Electronic card to manage the measuring Pre/In/Post-process (Part size and roundness shape)
- Gauge head
- Supports, fingers and tips
- Pneumatic and/or hydraulic slide
- Optional hardware and software components.

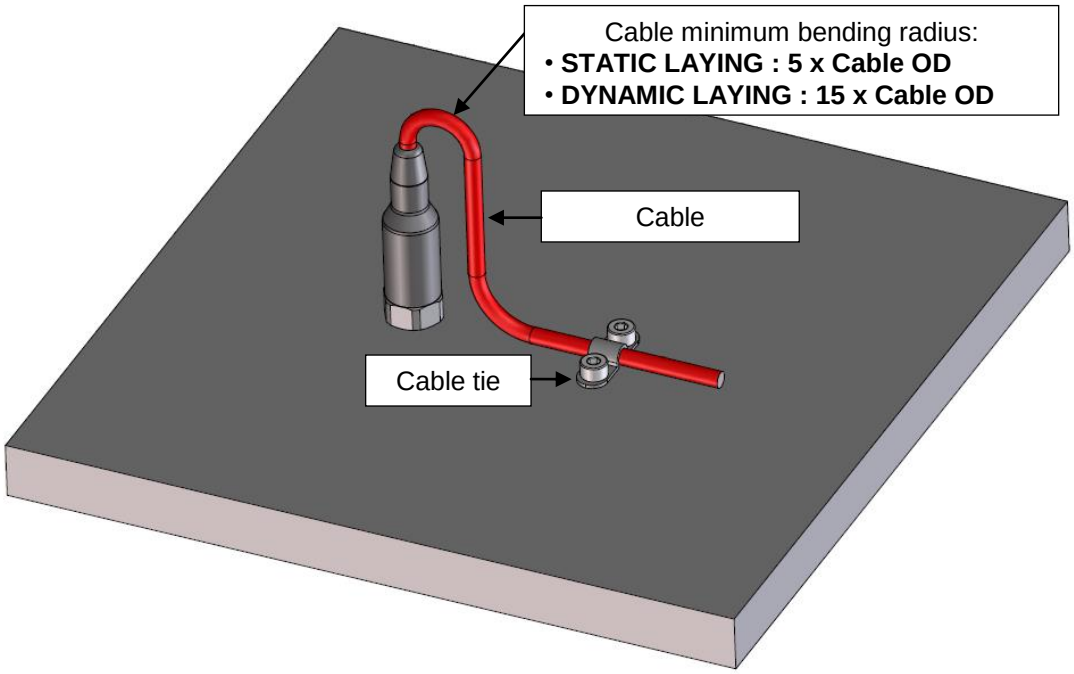
Accessories

- Software package to Backup and Restore the system parameter configuration
- Graphic software library to integrate and customize the operator interface

1.4. Cables setup

Cables and connections should be placed so as not to obstruct the operations of the host machine.

General rule for cable bending:



1.5. Ordinary maintenance

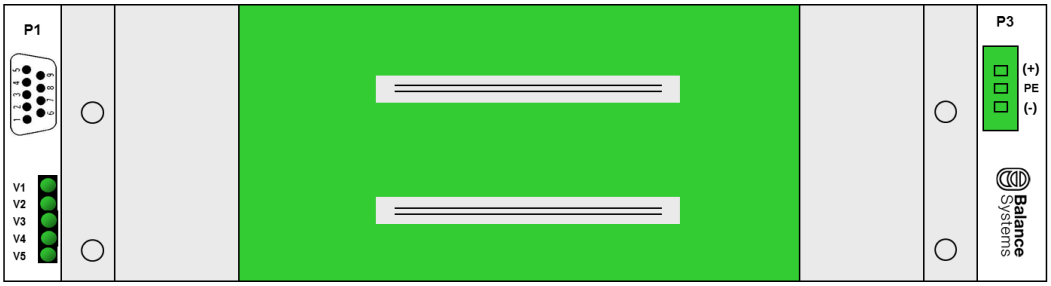
All the external side of rack and panel can be cleaned by denatured alcohol.

NOTE
Do not use solvent or abrasive product

2. Installation

2.1. Power supply connection

2.1.1. 24Vdc power supply unit embedded in the rack ½ 3HE ½ 19”



Quantity	Value
Voltage	24Vdc +20% / -15%
Power	Max 48 Watt

NOTE
Reversing the polarity on connector P3 the PSU does not switch on.

NOTE
In normal operating mode all the green leds V1, V2, V3, V4 and V5 should be lit up.

Led	Voltage
V1	+5 Vdc
V2	+15 Vdc
V3	-15 Vdc
V4	+24 Vdc
V5	-24 Vdc

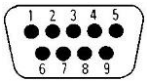
In case of overload or short circuit the PSU will switch off automatically. In this case, it is necessary to proceed as follow:

- Remove the connector P3.
- Search and repair the cause of the fault.
- Re-connect P3.

Connector P3 - phoenix 3 pole male – Power supply

PIN	Name	Description
1	AC (+)	+24 Vdc
2	PE	Earth
3	AC (-)	0 Vdc

Connector P1 - D-Sub 9 pole female – VM15 Control panel or PC VMX HMI connection



PIN	Name	Description
1	- DATA	Data line
2	--	N.C.
3	--	N.C.
4	GND	Ground
5	+24 Vdc	Power supply
6	+ DATA	Data line
7	--	N.C.
8	--	N.C.
9	--	N.C.

2.2. Location and mounting rack and operator panel

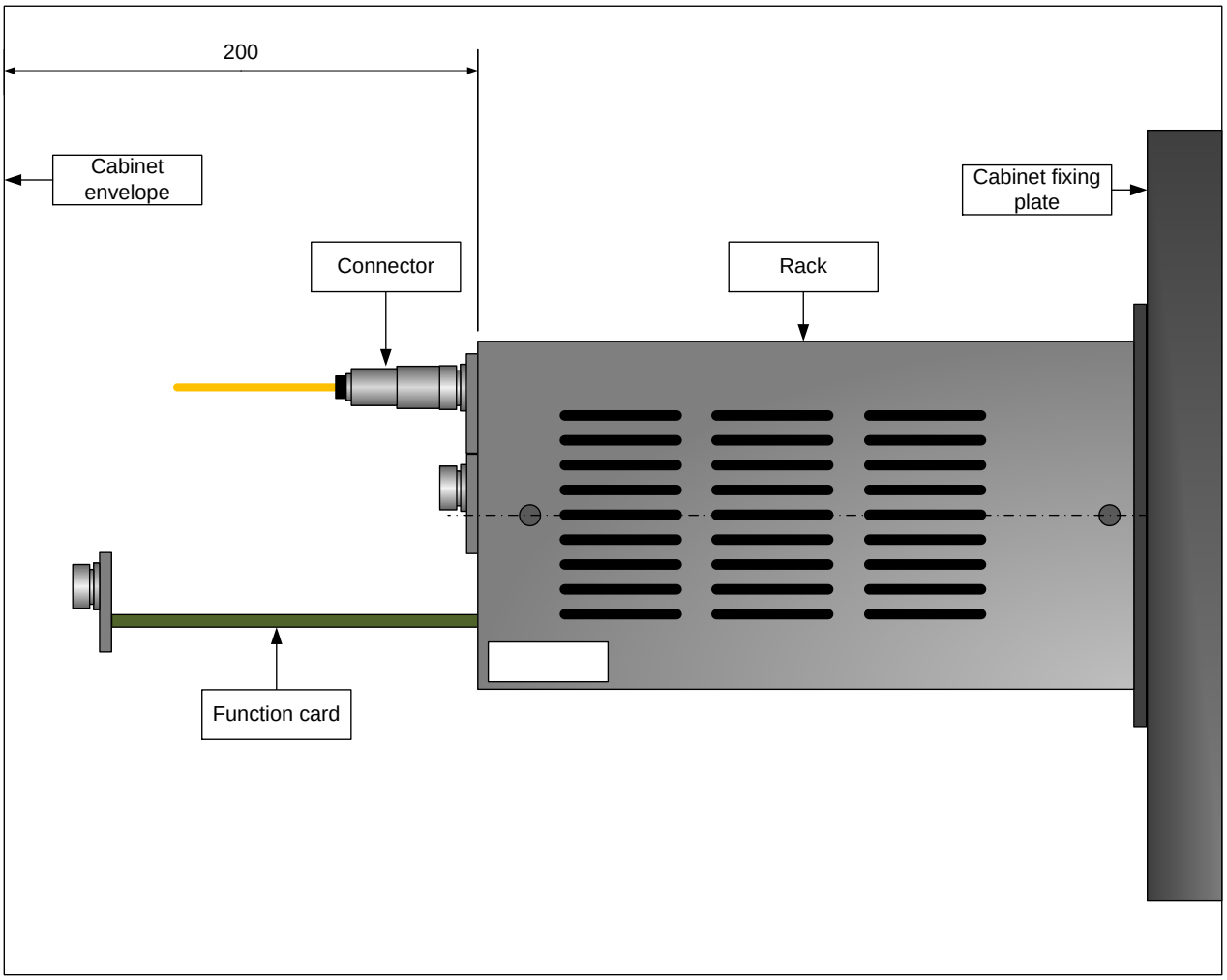
2.2.1. General requirements (valid for all configurations)

We recommend placing the system away from sources of heat or strong magnetic fields, hold protected by water jets and / or aggressive substances that could damage the items.

The operator panel has a front cover made of polycarbonate, which guarantees an IP64 protection degree and resistance to machine coolant.

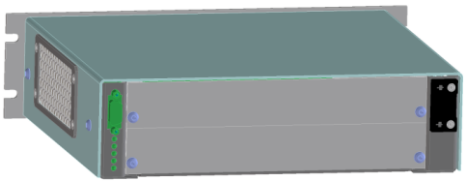
The operator panel must be placed in an accessible area close to the operator and work area. Its positioning must allow easy parameter setting and reading of the screen.

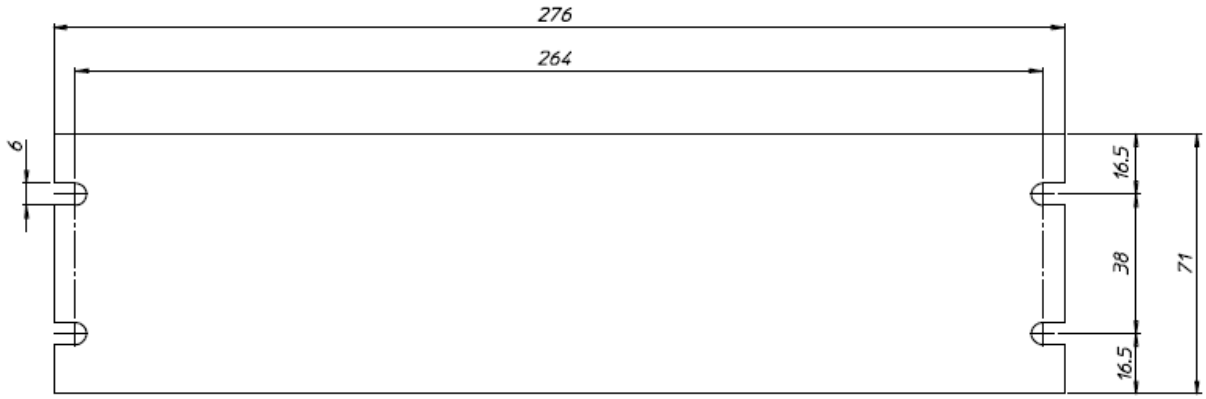
NOTE
During installation of the rack, should pay special attention due to rear connectors, which need approximately 100mm beyond the physical dimensions of the rack. Proper installation includes a room for access to the rack from the back to allow the extraction of circuit boards. To remove a card should be a space of at least 200mm.

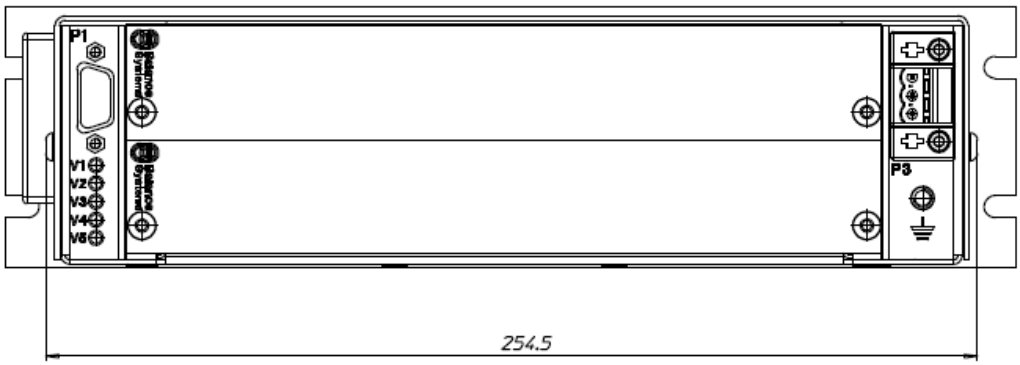


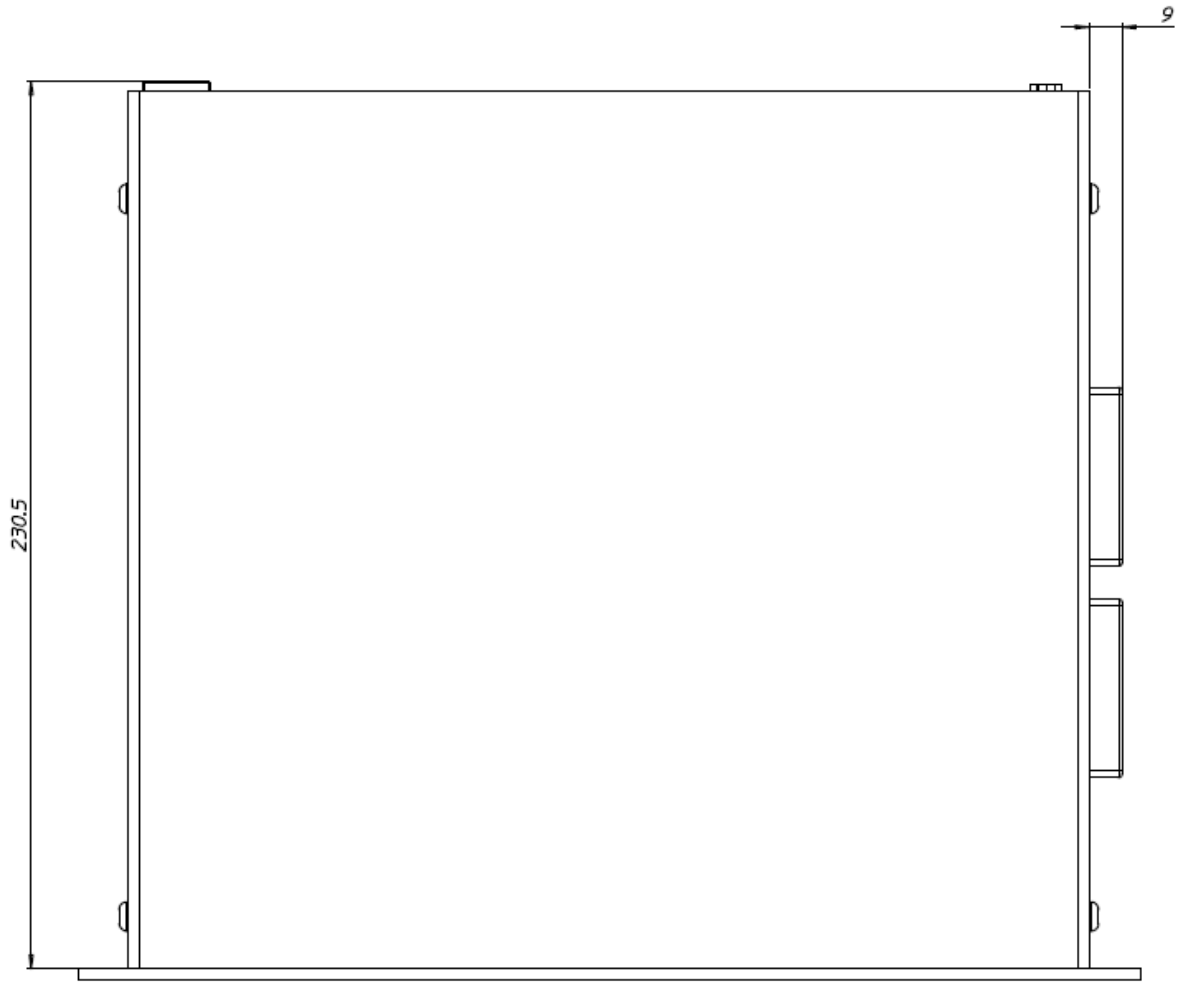
2.2.2. Rack ½ 3HE ½ 19” with built-in 24V psu – Cabinet unit (p/n 9APVM1500RA000)

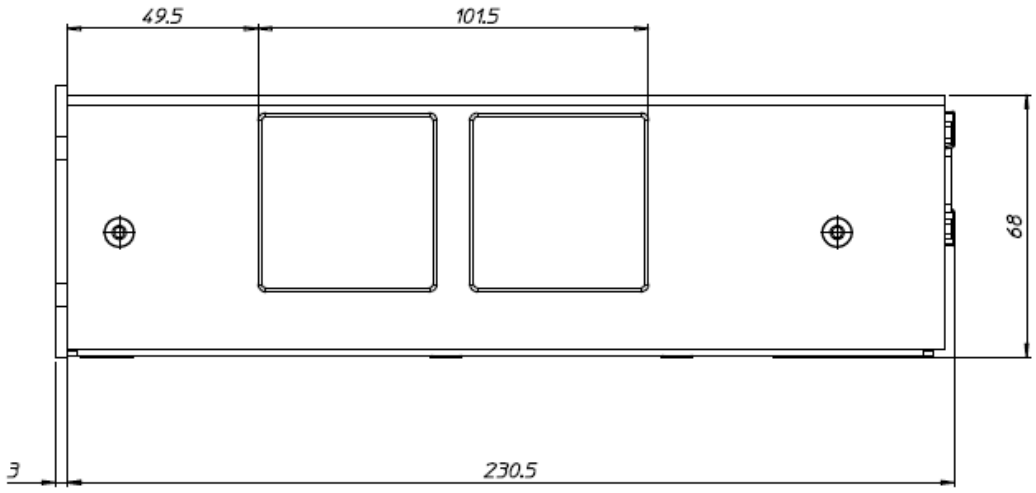
Mounting	Into a cabinet
Width	½ 19”
Height	½ 3HE
Capacity	2 function cards



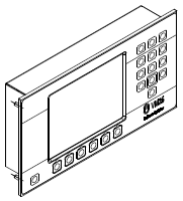




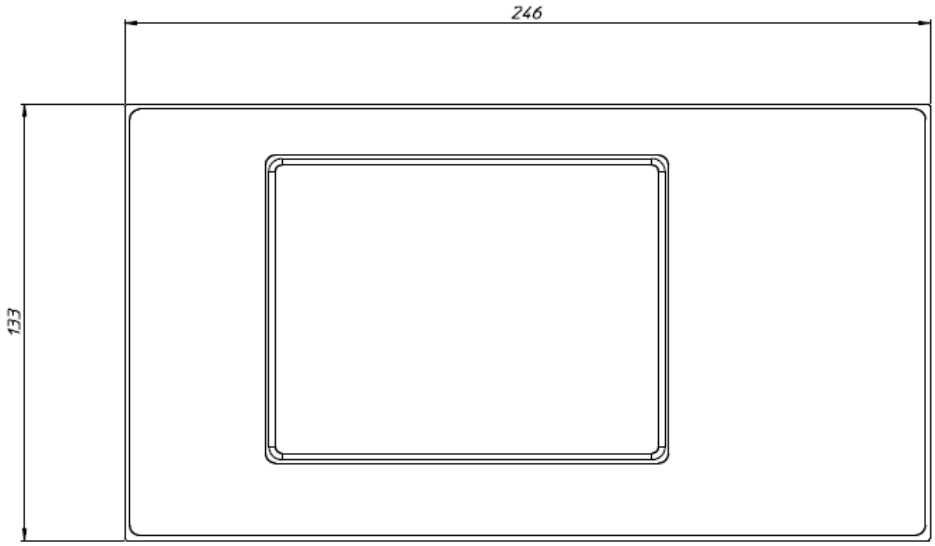

9
230.5

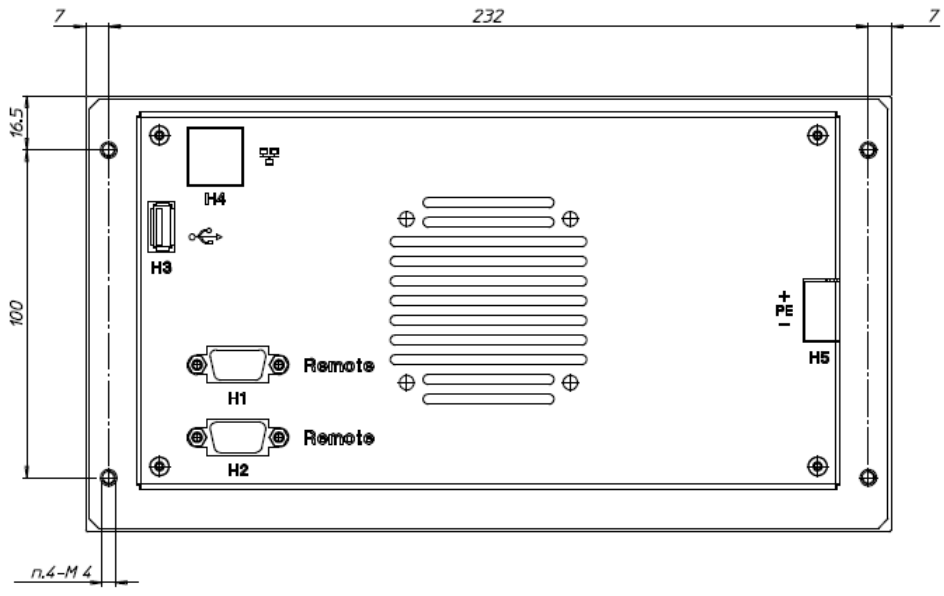

49.5
101.5
68
3
230.5

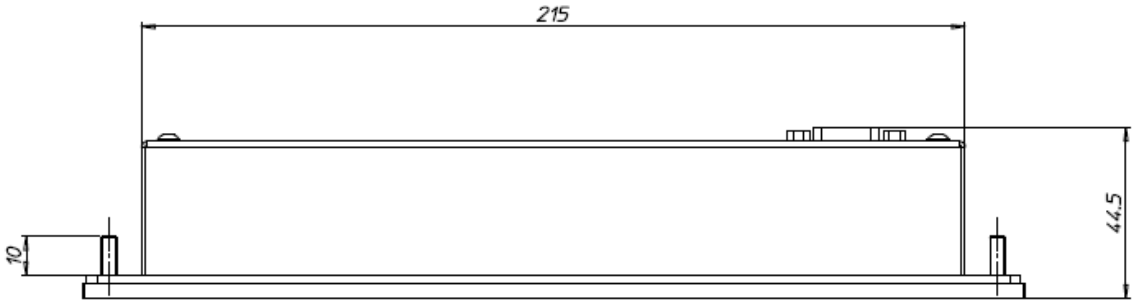
2.2.3. VM15 remote panel

Version	p/n (*)	
Color TFT base	9PAVM15xxCL300	

(*) xx = software version



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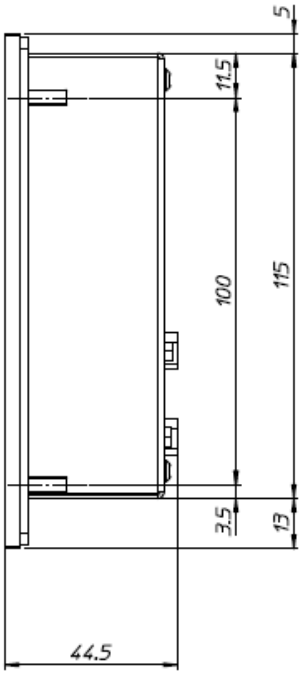
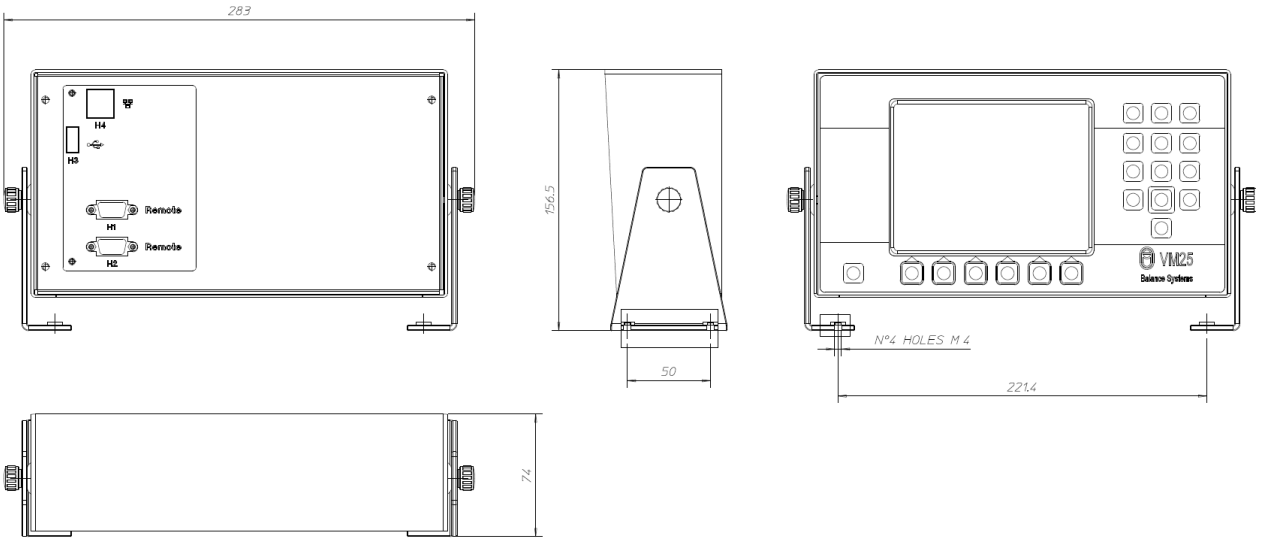
10
44.5

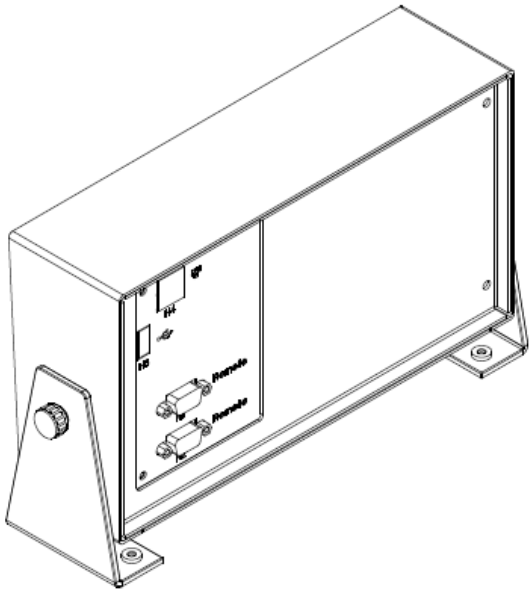

5
11.5
100
115
3.5
13
44.5

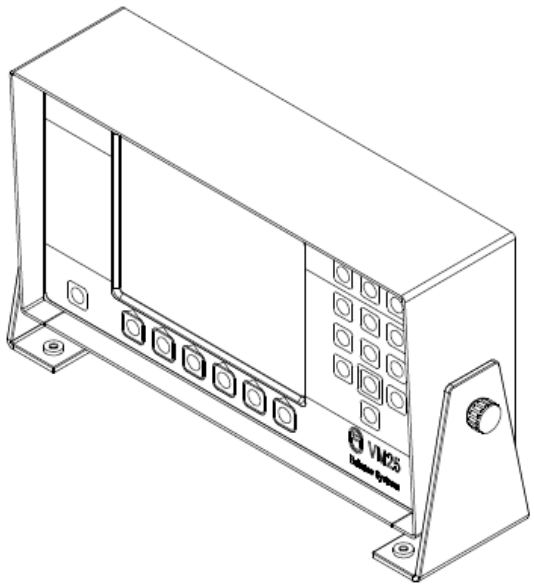
2.2.4. Remote VM15 panel with swing box

Version	p/n (*)	
Color TFT base	9APVM2500RK999 + 9PAVM15xxCL300	

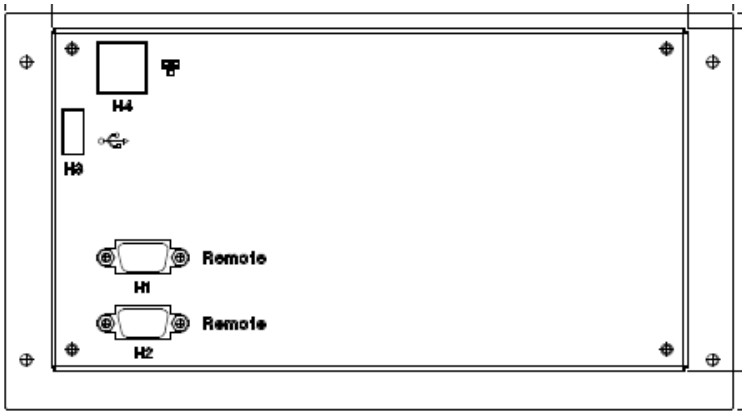
(*) xx = software version







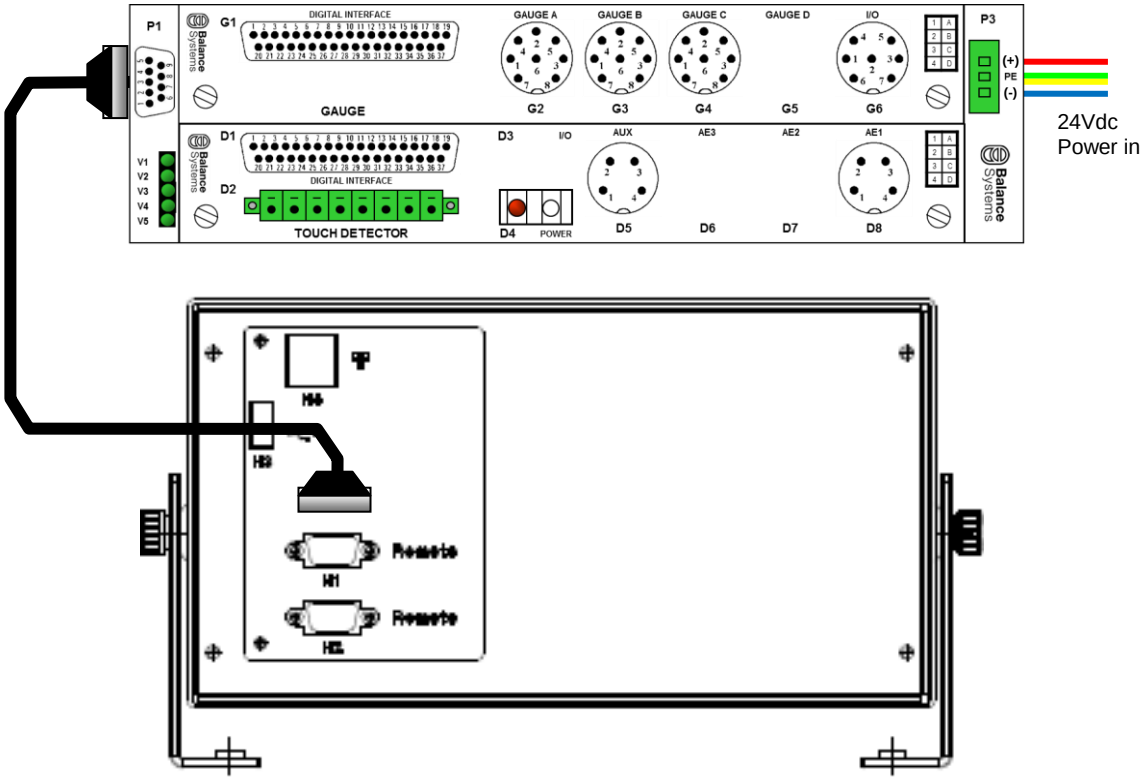
2.2.5. Connection of the remote VM15 panel to the rack



Connector	Description	Use
H1	Bus VM15 BSLink [remote]	Connection to VM15 rack
H2	Bus VM15 BSLink [remote]	Connection to the adapter for VM Service software package
H3	USB 2.0 Host	Connection for a pen-drive: ▪ update the software ▪ data download ▪ screen download (png format)
H4	Ethernet	Remote connection of other VMX HMI (i.e. service operation)

NOTE

Depending on model and options installed some connectors may not be present



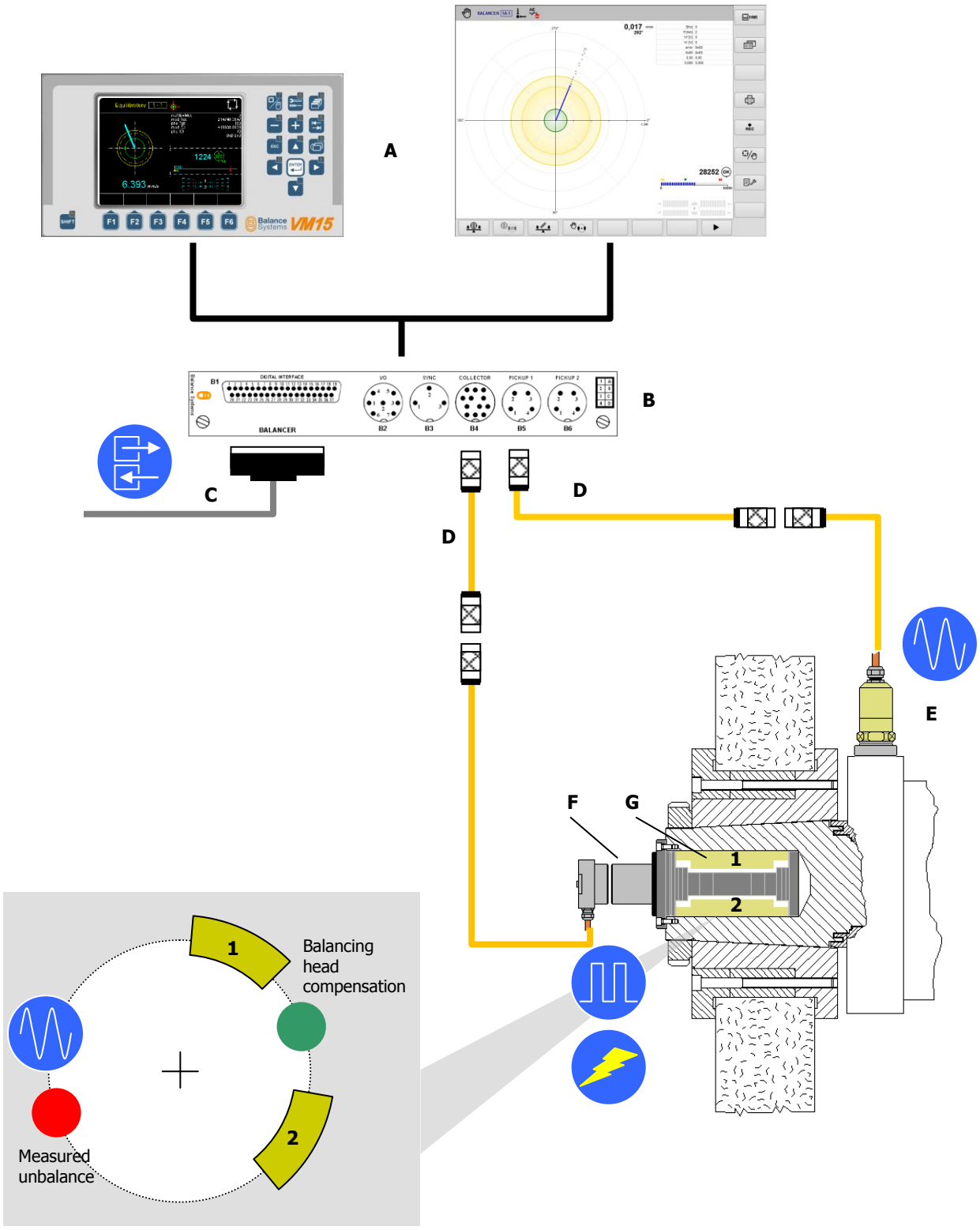
Panel – Rack connection

NOTE

Always screw connectors on both sides.

2.3. BALANCER components

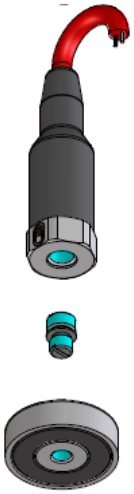
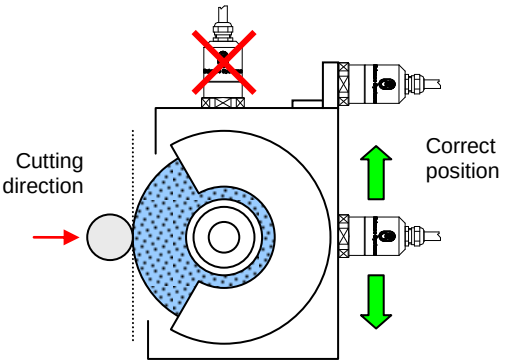
2.3.1. Application scheme

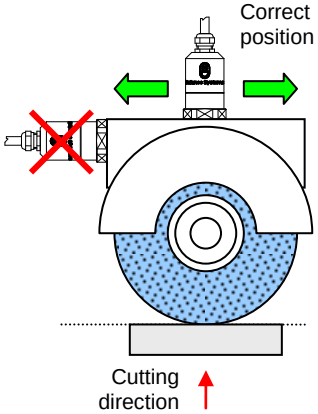
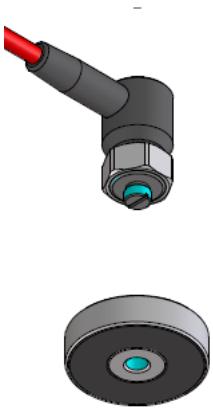


Component	Description
A	User interface: VM15 Panel or VM15 HMI PC Windows
B	Balancing card
C	Digital interface (I/O signals)
D	Extension cable
E	Vibration transducer (accelerometer - pickup)
F	Collector: static and rotating part (power, control and rotation speed signals)
G	Balancing head

2.3.2. Vibration transducer (accelerometer) (p/n 9TRASDACx0xxx0)

The criterion for choosing a spot is that of being able to capture the unbalance vibrations that are most likely to affect the quality of the machined product. It is known that vibrations produced by rotating parts inevitably have an effect on the quality of surface finish, generating "undulating" and “chattering” outlines.
In general, the best results are achieved by positioning the transducer near the grinding wheel, **perpendicular to the spindle’s axis and in the cutting direction**.

<table>
<tr><th>Axial cable exit
9TRASDACC0xx00</th><th>Positioning and mounting</th></tr>
<tr><td>  </td><td rowspan="3"> 


</td></tr>
<tr><th>Side cable exit
9TRASDACx0xx00</th></tr>
<tr><td>  </td></tr>
</table>

As a rule, the transducer should not be placed on outer sheet metal parts where there may be residual vibrations which can be significant but are harmless. It is also important not to place the transducer where it is in contact with auxiliary parts of the machine (pipes, cables, special mechanisms in movement, etc.).
It is attached to the machine either by the magnet base on the transducer or is screwed on. Special care should be taken when positioning,
choosing a flat surface, making sure that it is clean. At least it is recommended **never apply the accelerometer on painted surfaces.**

a) Plane surfaces standard installation

Prepare a smooth flat mounting surface using an abrasive grinder (fig A1).
The mounting surface should be ground flat down R 0.8.
If it is not possible to provide a smooth flat mounting surface, use a steel mounting pad (AISI303) applied by epoxy resin or weld or screws and silicone grease (fig. A2).

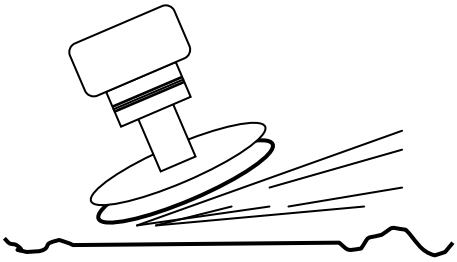


fig. A1

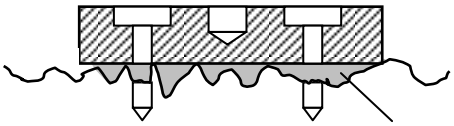


fig. A2

Drill and tap M5 or M6 a perpendicular hole in the prepared surface. The perpendicularity should be respected (< 0.01 mm). Clean accurately the hole neighborhood and spread on a light film of silicone grease (fig A3).

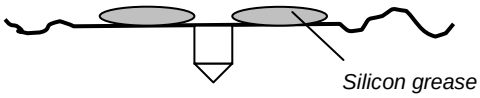


fig. A3

Hand tighten the stud into the sensor base and secure the sensor to the surface with the recommended mounting torque

- 9TRASDACC0xx00: 3 to 6 Nm for
- 9TRASDACx0xx00: 4.1 to 5.4 Nm (stud) – 2.7 to 4.1 (hex nut)

using a dynamometric key (fig A4).

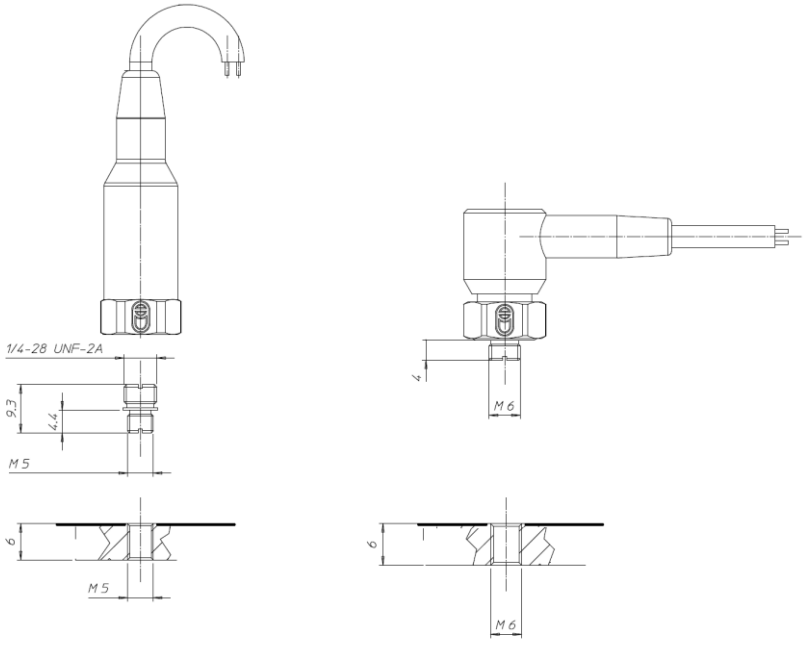


fig. A4

b) Curved surfaces installation

Do not stud mount directly on to curved surface (fig. B1).
If it is possible, prepare a smooth, flat surface and refer to point (a) (fig B2).
In alternative, prepare a curved-plane pad adapter and then fix it using epoxy or weld or screws (fig. B3).

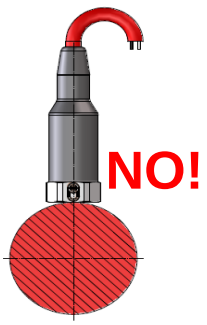


Fig.B1

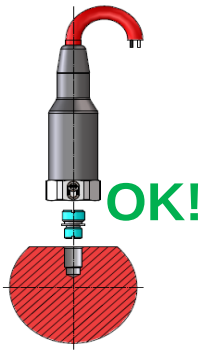


Fig.B2

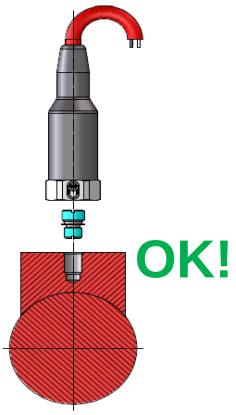


Fig.B3

c) Magnetic base mount installation

Prepare a smooth flat mounting surface using an abrasive grinder (fig C1).
The mounting surface should be ground flat down R 0.8.
If it is not possible to provide a smooth flat mounting surface, use a steel mounting pad (AISI303) applied by epoxy resin or weld or screws and silicone grease (fig. C2).

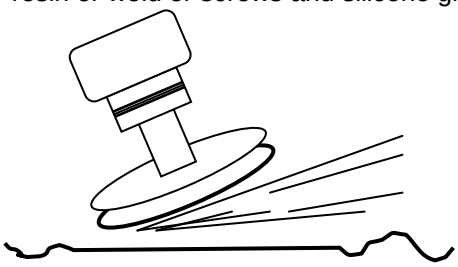


fig. C1

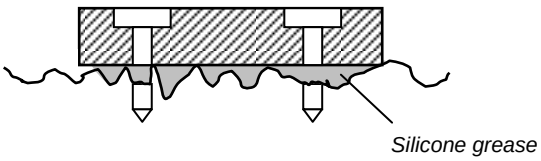


fig. C2

Mount the magnet / sensor assembly to the surface (fig.C3).

WARNING: *Do not "bang" or "slam" the sensor directly to the surface. This can generate high shock level and permanently damage the sensor (fig. C3).*

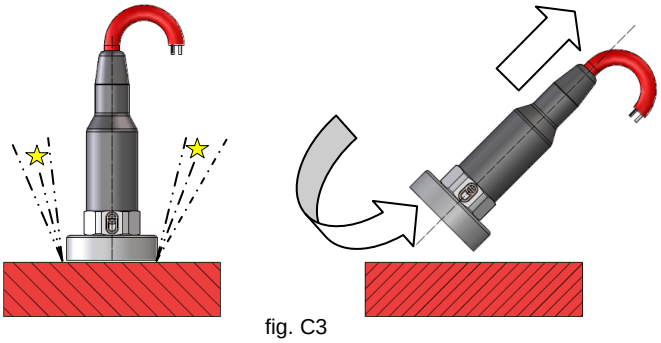
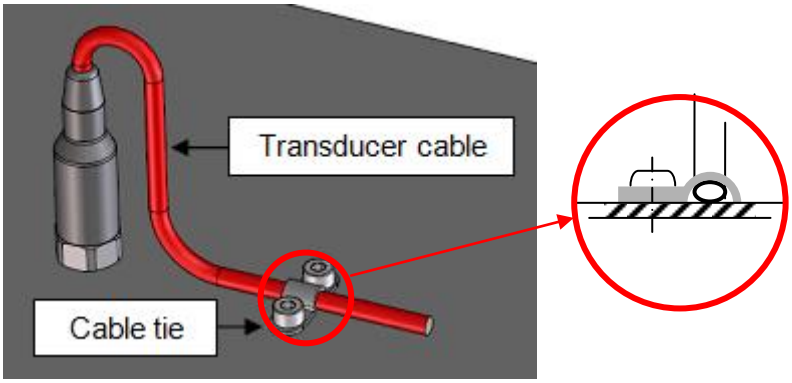


fig. C3

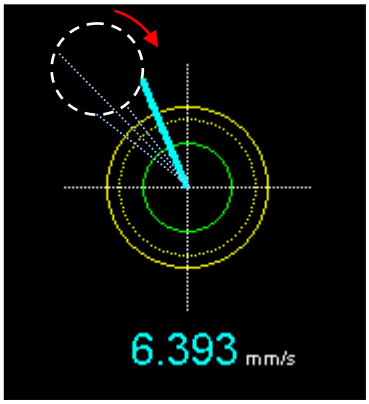
d) Cable setup

Fix the cable as shown in picture below.



NOTE

If the graphical indicator of the unbalance, it tends to describe a circumference, it is in the presence of a beat between the unbalance of the grinding wheel and the unbalance of other rotating parts (eg motor, pulleys, etc.). Check the connections (couplings, belts, etc..) and the quality of balancing different parts in rotation. If the amplitude of the beat is greater than the minimum tolerance set, the system may take longer to perform the automatic balancing procedure.



2.3.3. Rotation speed sensor (optional)

The rotation speed sensor is normally embedded in the balancer collector and does not need to be installed. In case of use of and external inductive rotation speed sensor, follow the instruction to install correctly the sensor.

Positioning

- The sensor must be positioned so as to detect the correct rotation speed of the spindle;
- if possible, select a position on pulley side, so as not to create interference in the work area.
- size the index (ie the width of the groove or the protrusion) in such a way that allows the detection of the maximum speed of the spindle. The minimum width of the index (made of ferrous material), is obtained by the following relationship:

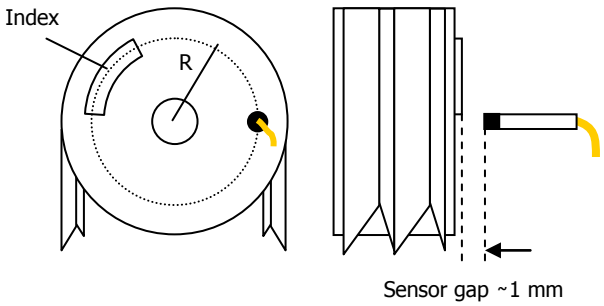
$$I = \frac{V_{max} \cdot R}{10 \cdot f_0}$$

where:

I = index size [mm]
R = distance [mm] of the index from the rotation axis
V_{max} = max rotation speed of the spindle [n/min]
f_0 = max working frequency of the sensor [Hz]

NOTE
The index for the sensor, which is normally obtained by performing a groove directly on the pulley, should not be very deep as not to create unbalance. It is sufficient to a depth of about 2 mm.

- Once designed and built the index, place the sensor at a distance of 0.6 to 1.5 mm



- After installing and connecting the sensor, verify that the reading speed is constant; to run this test turn on the VM15 control unit and operate with balancer functions.

Example

Rotation speed sensor with max working frequency fo = 1 kHz
Max rotation speed of the spindle = 3000 rpm
Distance of the index from the rotation axis = 30 mm

By formula > index size $I = \frac{V_{max} \cdot R}{10 \cdot f_0} = \frac{3000 \cdot 30}{10 \cdot 1000} = 9mm$

2.3.4. Balancing head and collector

The balancing head is the electro-mechanical actuator intended to the grinding wheel unbalance compensation.

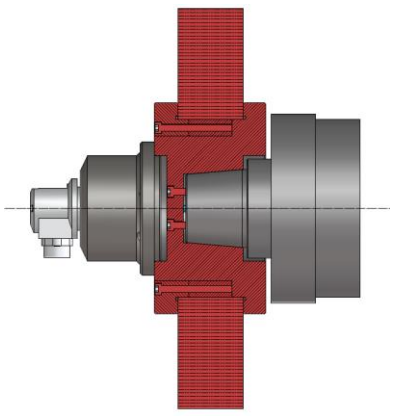
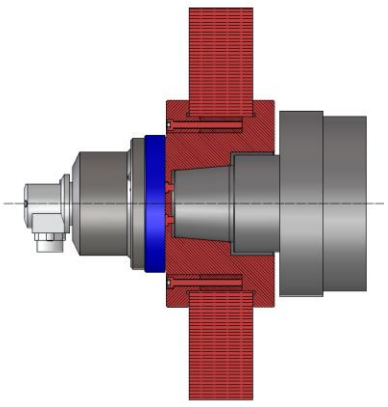
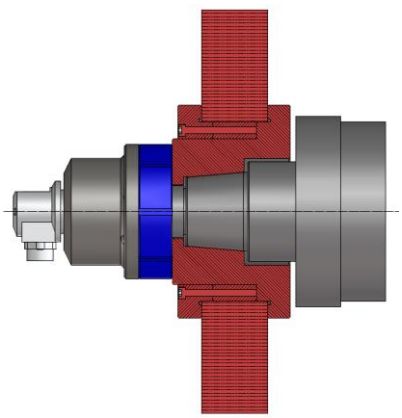
2.3.4.1. External balancing head with brushes collector

NOTE
Balancing head and relative collectors must stay with the spindle axis with a maximum tolerance of 0.02mm. The balancing system elements typical coupling (balancing head and collector) with the lodgement obtained on the grinding spindle shaft is g6–H7. In case the advised coupling conditions are not complied, any failure will not be considered under warranty.

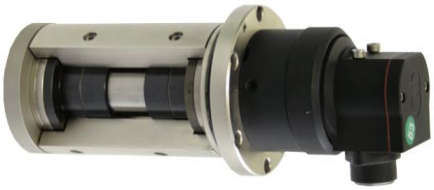
WARNING
During the rotation the balancing head undergoes to high forces due to the centrifugal force.
is important to check that the balancing head fixing screws are correctly fastened before to start the spindle.

The installation consists on the following steps:

- Arrange the grinding wheel flange or fastening system with centering and fixing holes to allow the balancing head mounting
- Install the flange or the fastening system
- Install the balancing head as shown on the following pictures
- Adapt, if needed, a grinding wheel shield in order to accommodate the balancing head
- Arrange and install an anti-rotation bracket to be fixed to the collector
- Connect the balancing head collector to the VM15 amplifier

Installation examples		
Direct installation on grinding wheel support flange	Installation on an intermediate built flange	Direct installation on the grinding wheel fixing bolt
		

2.3.4.2. Internal balancing head with brushes collector

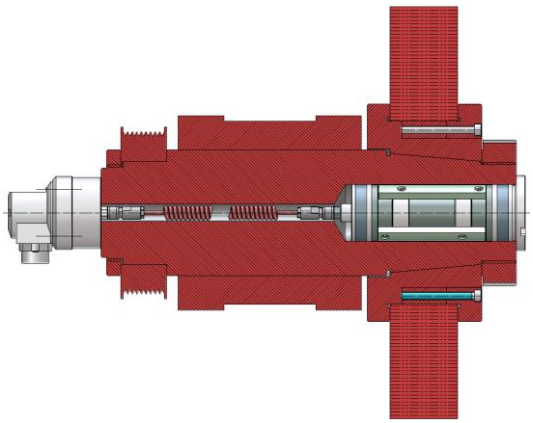
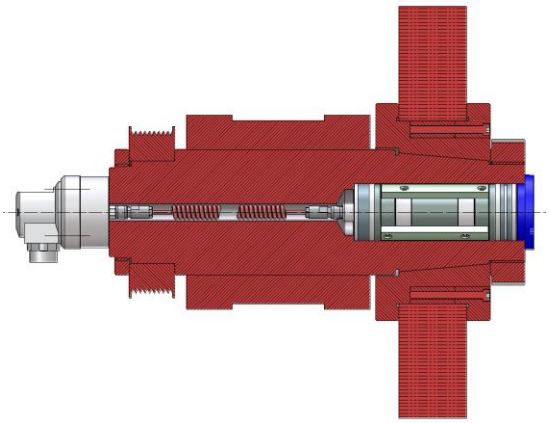
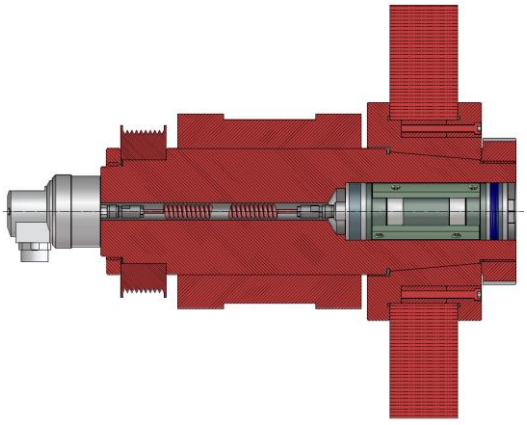
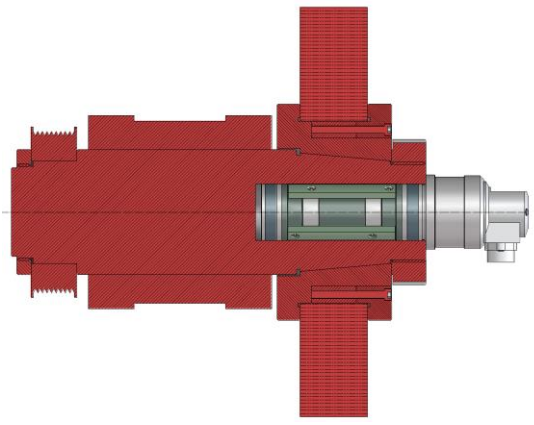


NOTE
Balancing head and relative collectors axis needs to lay with the spindle axis with a maximum tolerance of 0.02mm.
The balancing system elements typical coupling (balancing head and collector) with the lodgement obtained on the grinding spindle shaft is g6–H7. In case the advised coupling conditions are not complied, any failure will not be considered under warranty.

WARNING
During the rotation the balancing head undergoes to high forces due to the centrifugal force.
is important to check that the balancing head fixing screws are correctly fastened before to start the spindle.

The installation consists on the following steps:

- Connect the balancing head to the spiral cable (when expected), that has to pass through the spindle shaft bore up to the pulley side
- Insert the balancing head on the prepared bore
- Fix the balancing head as shown on the below pictures
- Install the sealing cover (if needed)
- Connect the spiral cable to the collector
- Install the balancing head collector using a flange on the pulley side
- Arrange and install an anti-rotation bracket to be fixed to the collector
- Connect the balancing head collector to the VM15 amplifier

Installation examples	
Flange with fixing screws, remoted Brushes collector	
Pressed with anti-rotation pin, remoted Brushes collector	
Springs-lock clamp, remoted Brushes collector	
Flange with fixing screws, front Brushes collector	

2.3.4.3. Anti-rotation bracket for static part of brushes collectors

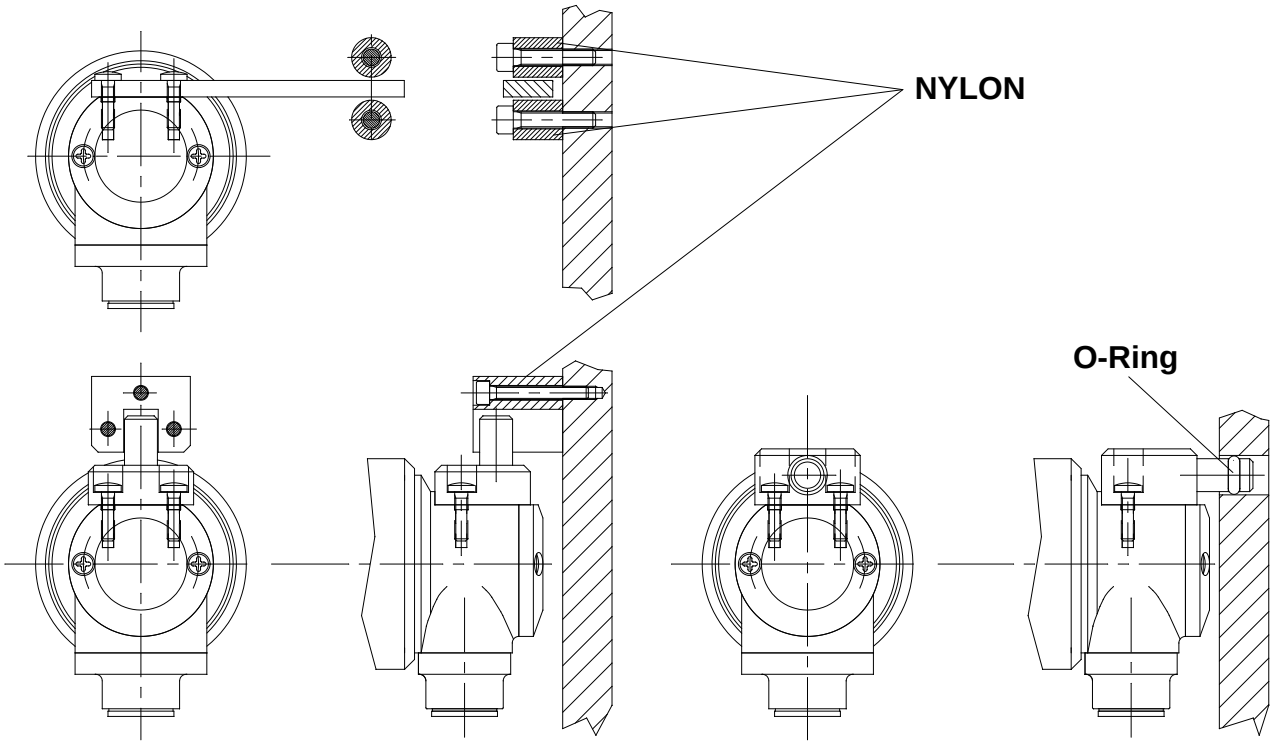
Once the balancing head has been installed, the next part is the anti-rotational system for the collector. This system is important both for having a steady reading of the unbalance by the VM15, and to avoid the breaking of the cable connecting the balancing head to the electronic control system.

It is very important that anti-rotational system, usually consisting on a bracket, is only rigid on one side (collector or machine) allowing, on the other side, a certain amount of movement.

The anti rotational system must also be flexible to avoid the resonance could alter the detection of unbalance signals. It is recommended, therefore, to put some elastic material between the anti-rotational system and the fixed part, for example Nylon or a gasket like O-Ring.

WARNING: Rigidly holding the collector on both sides (collector and machine) can damage the fixed and rotating mechanical parts of the collector. If the above mentioned conditions won't be observed, any repair due to failure will be excluded by warranty condition terms.

In the following picture, some of the possible anti-rotation system solutions:



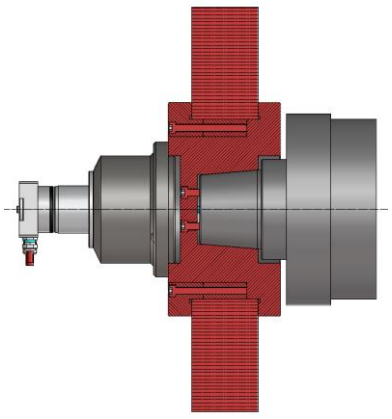
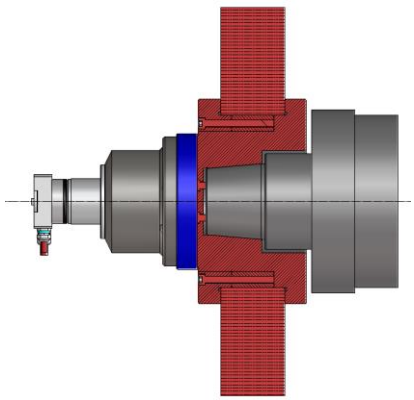
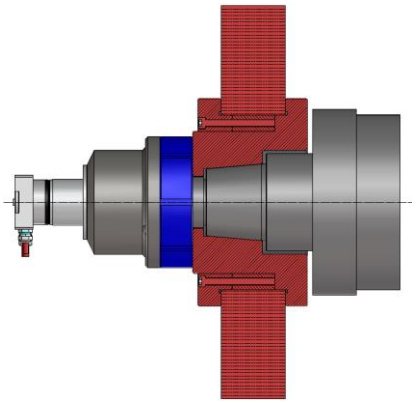
2.3.4.4. External balancing head with No-Link collector

NOTE
Balancing head and relative collectors must stay with the spindle axis with a maximum tolerance of 0.02mm. The balancing system elements typical coupling (balancing head and collector) with the lodgement obtained on the grinding spindle shaft is g6–H7. In case the advised coupling conditions are not complied, any failure will not be considered under warranty.

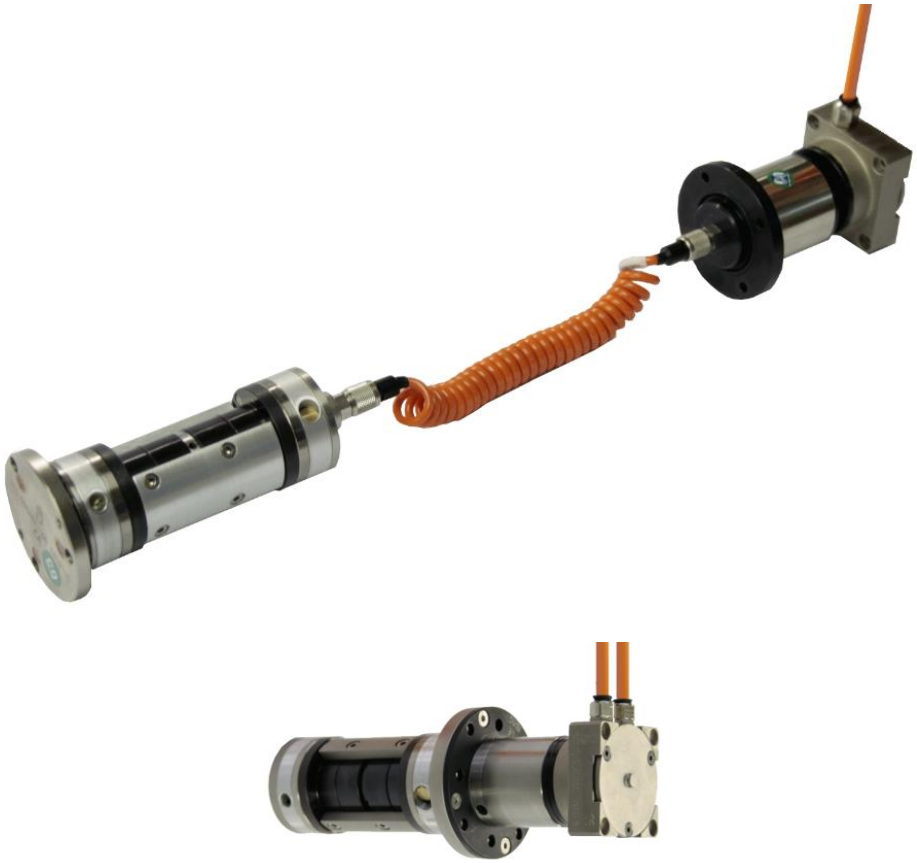
WARNING
During the rotation the balancing head undergoes to high forces due to the centrifugal force.
is important to check that the balancing head fixing screws are correctly fastened before to start the spindle.

The installation consists on the following steps:

- Arrange the grinding wheel flange or fastening system with centering and fixing holes to allow the balancing head mounting
- Install the flange or the fastening system
- Install the balancing head as shown on the following pictures
- Adapt, if needed, a grinding wheel shield in order to accommodate the balancing head
- Arrange and install a support bracket for the balancing head No-link collector
- Install the No-link collector static part in front of the balancing head collector rotating part as per the mounting rules indicated on paraghaph 2.3.4.6
- Connect the No-link collector to the VM15 amplifier

Installation examples		
Direct installation on grinding wheel support flange	Installation on an intermediate built flange	Direct installation on the grinding wheel fixing bolt
		

2.3.4.5. Internal balancing head with No-link collector

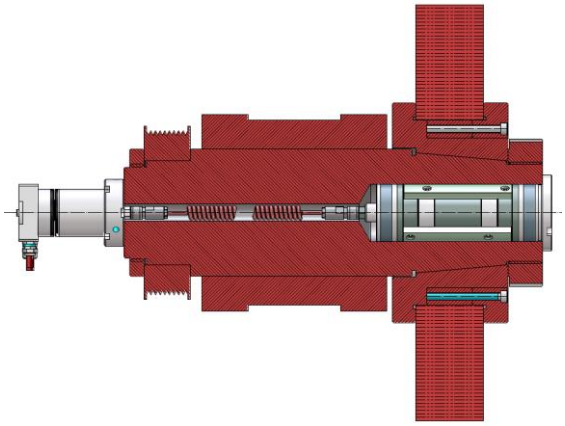
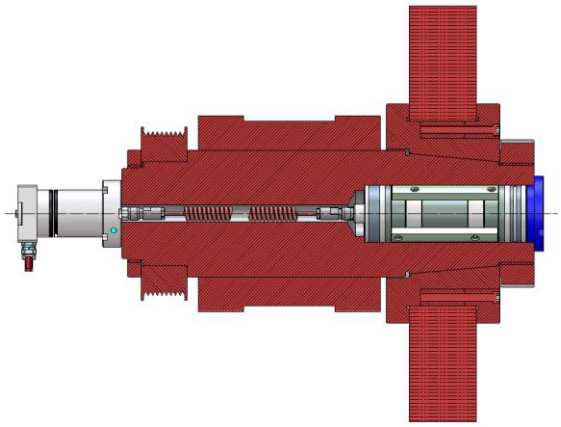
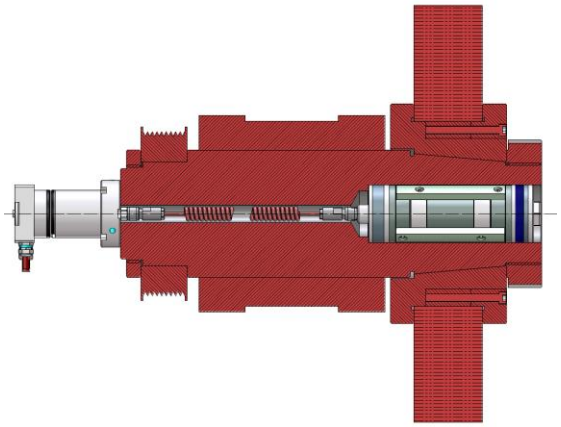
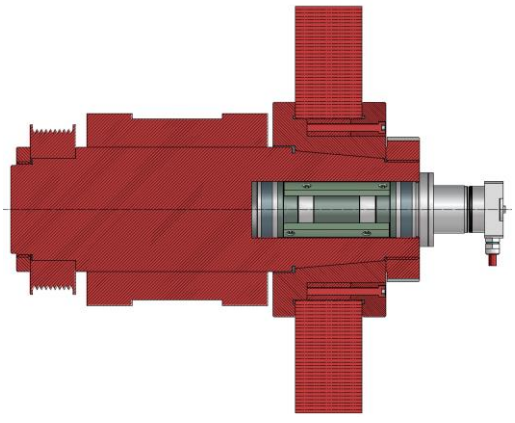


NOTE
Balancing head and relative collectors axis needs to lay with the spindle axis with a maximum tolerance of 0.02mm.
The balancing system elements typical coupling (balancing head and collector) with the lodgement obtained on the grinding spindle shaft is g6–H7. In case the advised coupling conditions are not complied, any failure will not be considered under warranty.

WARNING
During the rotation the balancing head undergoes to high forces due to the centrifugal force.
is important to check that the balancing head fixing screws are correctly fastened before to start the spindle.

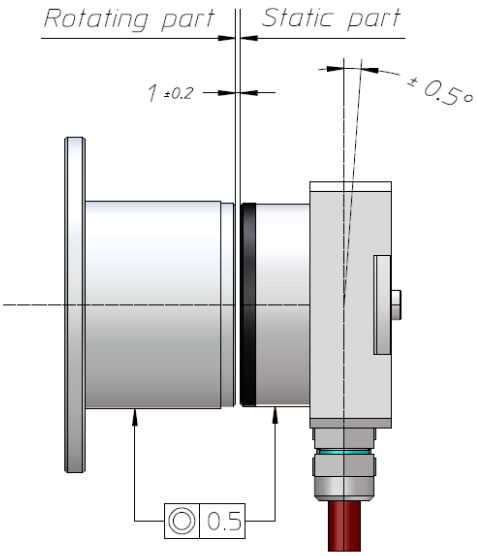
The installation consists on the following steps:

- Connect the balancing head to the spiral cable (when expected), that has to pass through the spindle shaft bore up to the pulley side
- Insert the balancing head on the prepared bore
- Fix the balancing head as shown on the below pictures
- Install the sealing cover (if required)
- Connect the spiral cable to the collector (if remoted)
- Arrange and install a support bracket for the balancing head No-link collector (if required)
- Install the No-link collector static part in front of the collector rotating part as per the mounting rules indicated on paraghaph 2.3.4.6
- Connect the No-link collector to the VM15 amplifier

Installation examples	
Flange with fixing screws, remoted No-link collector	
Pressed with anti-rotation pin, remoted No-link collector	
Springs-lock clamp, remoted No-link collector	
Flange with fixing screws, front No-link collector	

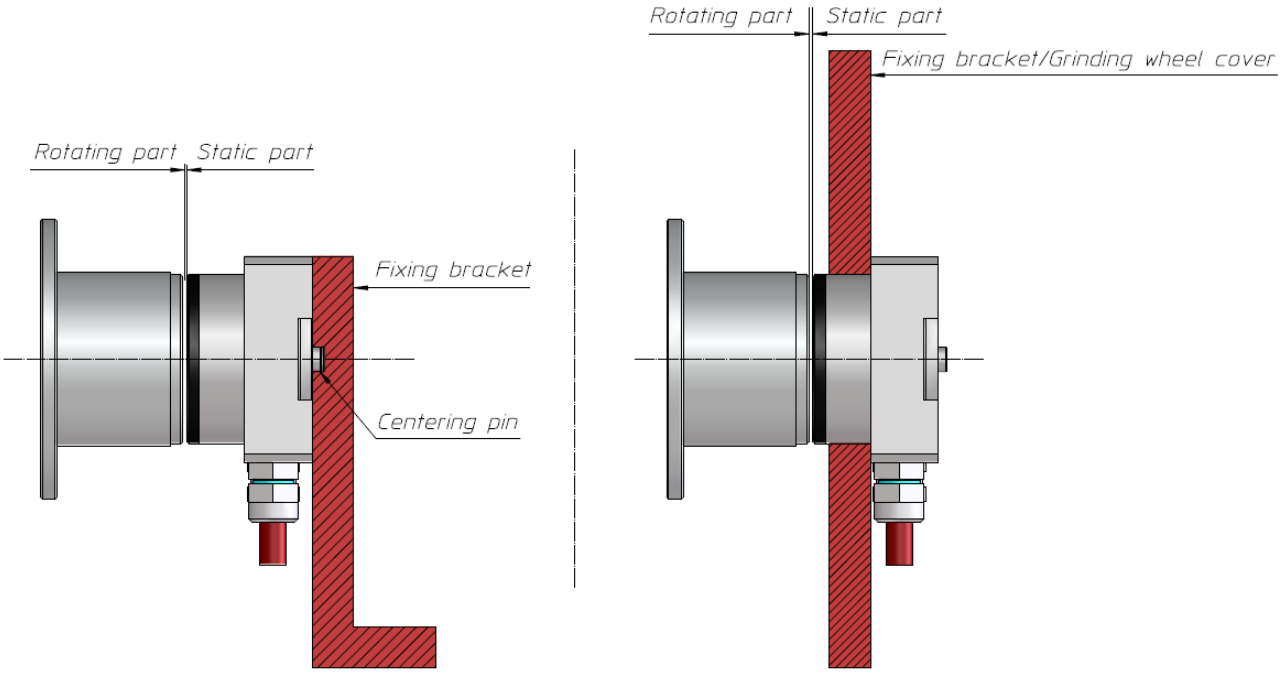
2.3.4.6. No-link collector general mounting rules

To grant the correct power and signal transmission the static part and the rotating part of the No-link collector have to keep the designed reciprocate position. The host structure has to be designed to match the below mounting tolerances:



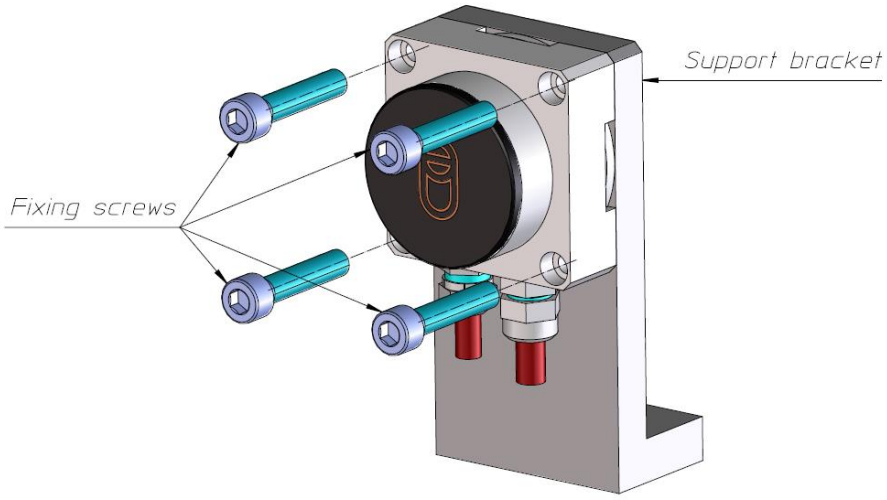
NOTE: always check the components specific drawings to know the specific mounting tolerances.

The static part support bracket/fixture has to be designed in order to comply the below mentioned mounting conditions.



NOTE: foresee a static collector support to avoid any resonance due to the neighbour machine's devices.

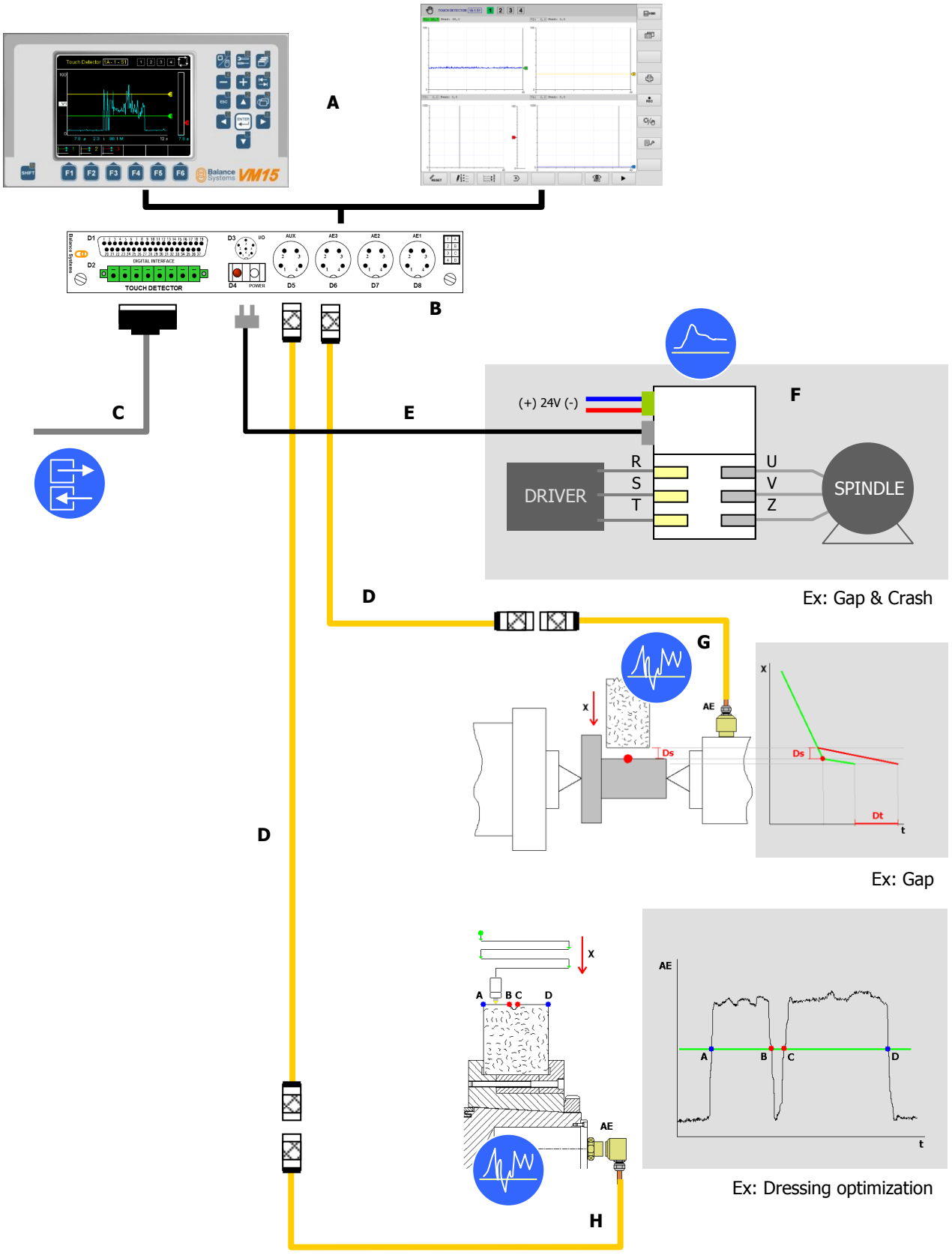
NOTE: Use the static No-link collector's body designed counterbores to fix the support bracket.



NOTE: See the specific static collector part number drawing to know the measure specifications.

2.4. TOUCH DETECTOR components

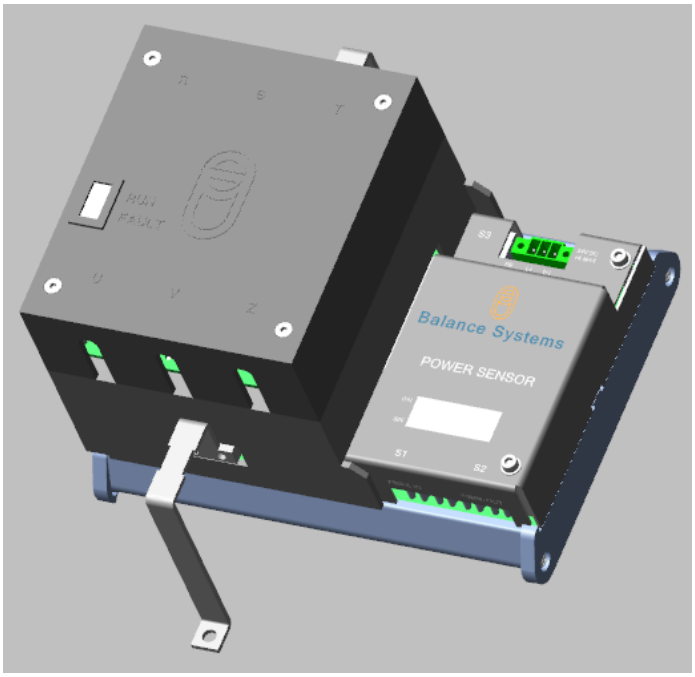
2.4.1. Application scheme



Item	Description
A	User interface: VM15 Panel or VMX HMI PC Windows
B	Touch detector card
C	Digital interface (I/O signals)
D	Extension cables
E	Fiber optic cable (real time power data transmission)
F	Power transducer
G	Acoustic emission (AE) sensor – static mounting type (example)
H	Acoustic emission (AE) sensor – nose spindle mounting type (example)

2.4.2. Power transducer (p/n 9PTVM25xxTDxx0)

The power transducer is used to detect the power absorbed by the electric motor which drives the spindle by an inverter or a control axes.



The instantaneous values of current and voltage detected are processed inside the transducer and sent to the touch detection card for the control of the signaling.
The power transducer must be supplied by +24 Vdc and it sent the instantaneous data of the real power through a serial fiber optic network; the connection by means of fiber optics ensures high immunity to electromagnetic interference.
The architecture of the sensor ensures a complete isolation of the acquisition of the power from the low voltage section and the ability to perform power measurements regardless of the type of motor used (monophase, threephase, DC, etc.).

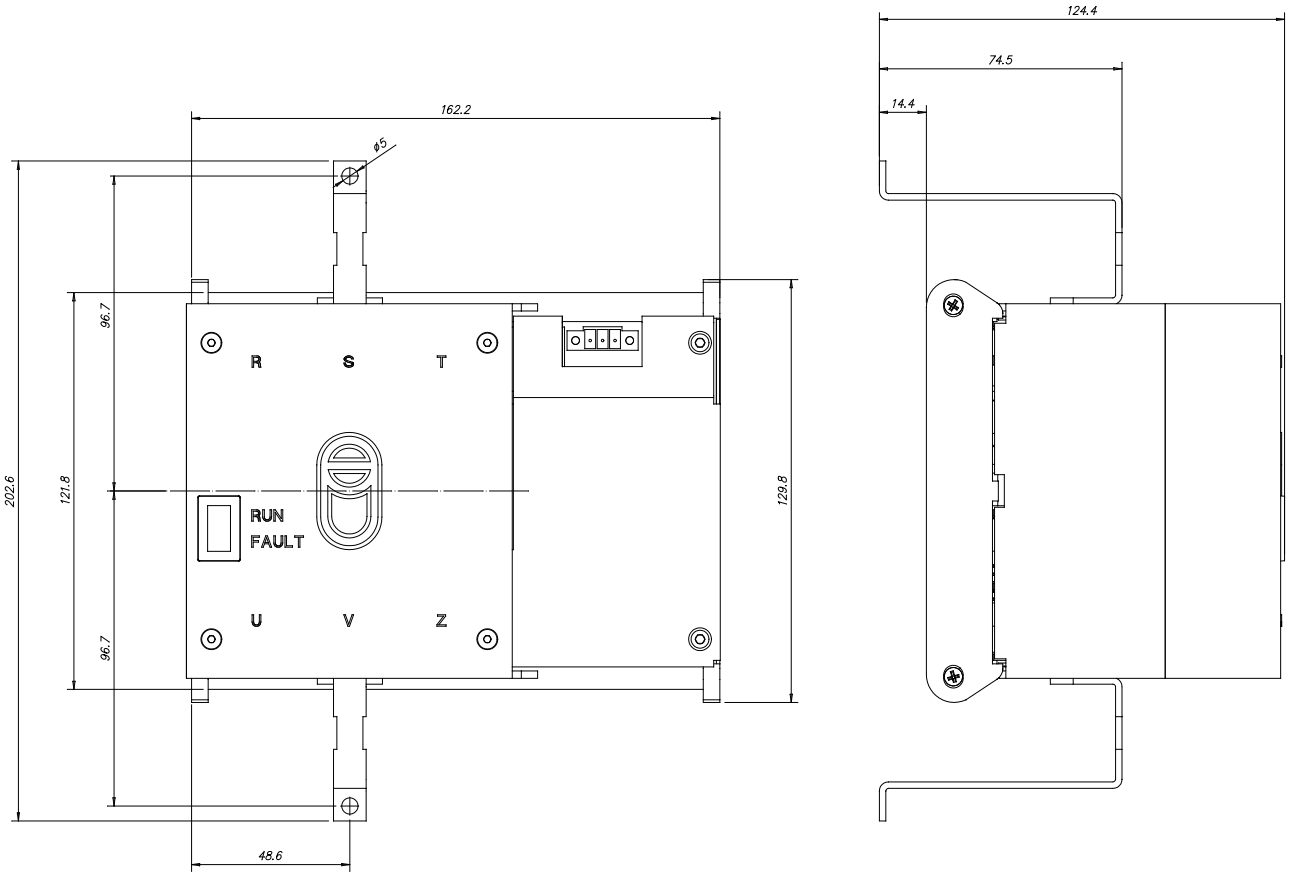
Up to eight power sensor can be connected through a serial line to monitor as many motors. By the touch detection card, up to four sensors can be monitored at a time.

Mechanical mounting

The power sensor has a degree of protection IP20, must be installed in the cabinet of the machine or otherwise in an environment protected from possible infiltration of liquids away from heat sources.

The transducer is fixed with DIN rail plus two brackets for fixing the wires and assure the shield connection.

Refer to the next figure for fixing the transducer, making sure to leave the space for the operations of wiring the high voltage cables. It is also important that the two LEDs on the upper part of the transducer remain visible for diagnostic control.



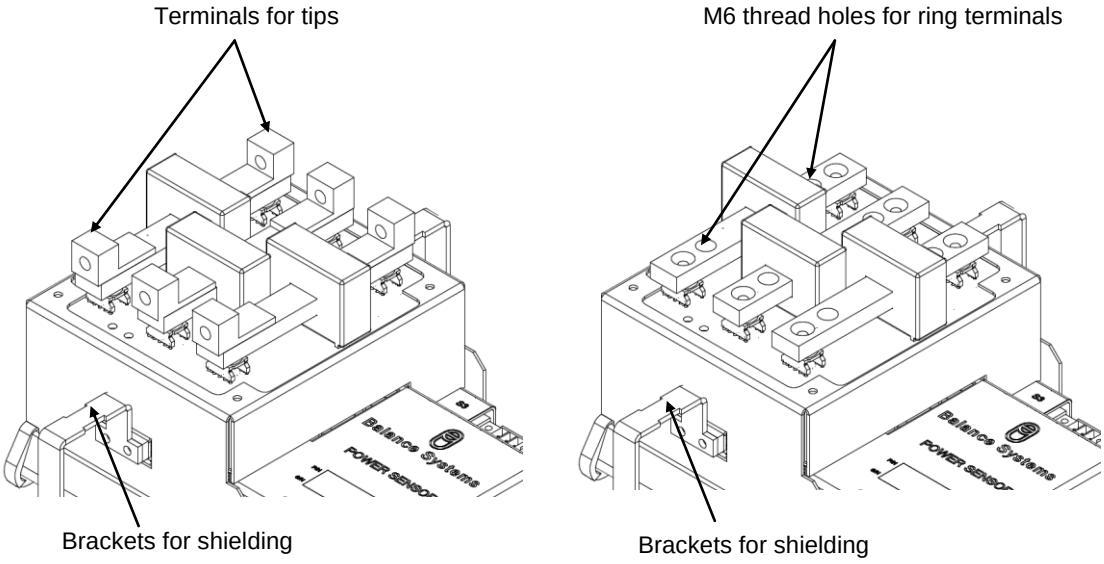
Electrical wiring

- Connection to the motor

  It is possible to make the wiring by means of cables with teriminal tips up to diameter of 5 mm (section 10 mm^2) or, by removing the tips, with ring terminals for M6 screws.

  In the case of shielded cable, the support brackets also perform the function of anchoring and wiring of the shield, ensuring the continuity through the frame of the sensor.

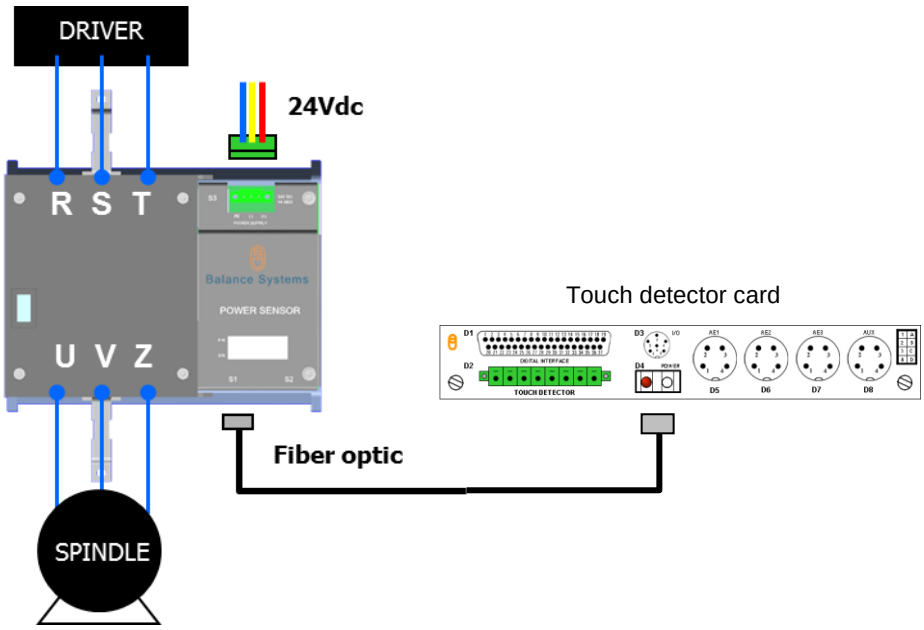
  NOTE
  The maximum diameter of the single conductor with insulating sheath must not exceed 6mm, otherwise it can not pass through the slits of the safety cover.



The power transducer must be connected in series with the load, as shown in the next picture.
The motor supply cables must be interrupted to interpose the power sensor.

Supposing to connect the power sensor to a three-phase motor, the three stages referred to as R, S and T, must be connected respectively to terminals R, S and T.

NOTE
Not invert the input terminals R, S, T with the output terminals U, V, Z of the power sensor. Any reversal causes an incorrect operation of the transducer, producing incorrect power readings.



- Power supply connection

The power sensor must be supplied through the connector S3 from a DC voltage of 24Vdc ± 15%.

The body of the box must be grounded (usually this connection is obtained by fixing the mounting brackets to the electromechanical plate of the control cabinet).

Connector S3 - phoenix 3 pole male – Power supply

PIN	Name	Description
1	AC (+)	+24 Vdc
2	AC (-)	0 Vdc
3	PE	Ground

- Touch detector card connection

The power transducer is connected to the touch detector card through a fiber optic bipolar cable. In the case of multiple sensors, these are connected in series as shown in figure below.

The touch detector card is connected to the first transducer (transducer identified as # 1), then by a second fiber optic cable is reached the second power transducer (transducer identified as # 2) and so on up to a maximum of 8.

Load connection		
Load	**Input**	**Output**
Three-phase power directly or through an inverter or motion control	R, S, T	U, V, Z
Mono-phase power directly or through an inverter or motion control	R, S S, T R, T	U, V V, Z U, Z
Direct current	R, S S, T R, T	U, V V, Z U, Z

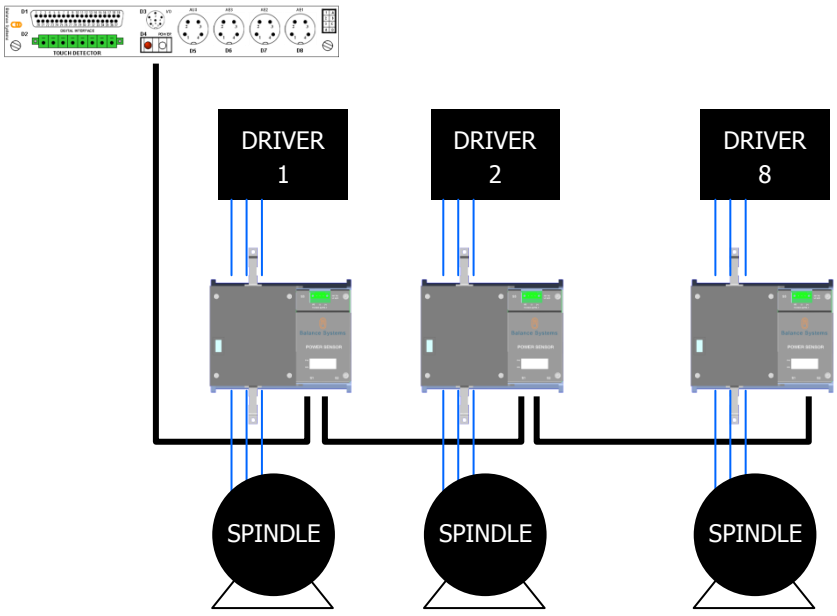
WARNING
After installation, remember to refit the plastic protection of the terminals.

Technical data	
Description	**Value**
Protection degree	IP20
Power supply source	24V ±15%
Max current	800 mA
Measurable voltage	1200 Vdc – 850 Vac
Nominal currtent	100 A
Measurable current	±120 A
Max impulsive voltage	4 kV
Max impulsive current	300 A
Operating temperature	-10 / +50°C
Max measurable power	432 kW

Software setup

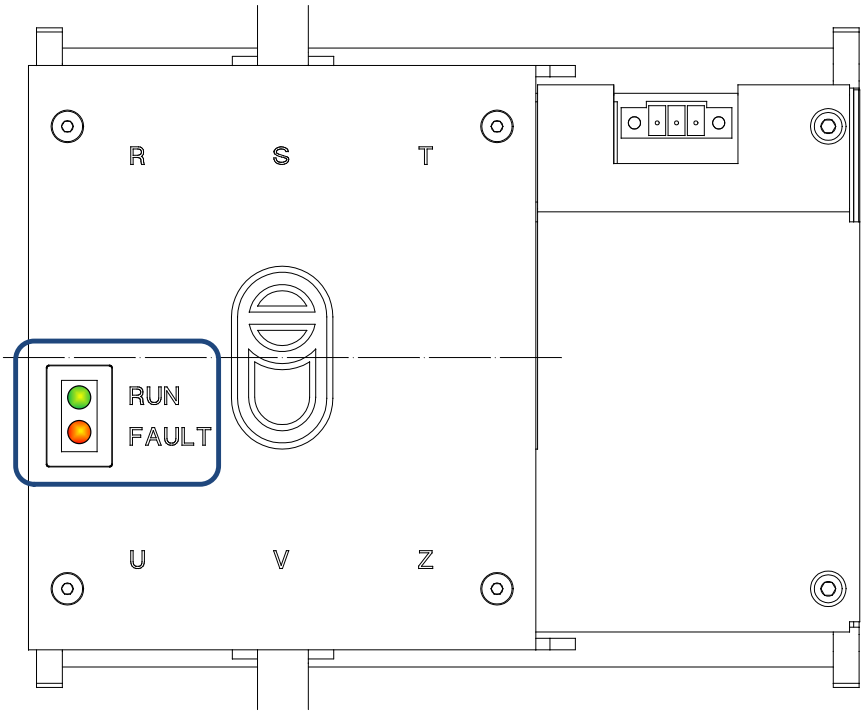
- Automatic configuration of the power transducer network

  The procedure enables to set the hardware address to the power transducers installed. The command must be executed in the case where there are at least two power transducers installed. The cycle numbering assigns addresses increasing from 1 to 8 starting with the transducer closest to the touch detection card.



NOTE
It is important to perform the network configuration procedure, after they are installed and connected. The configuration must be performed every time a transducer is replaced or exchanged the place in the chain.

Diagnostic



Diagnostic signaling		
LEDs	**Status**	**Description**
RUN (green)	Light on	Sensor powered properly
RUN (green)	Blinking	Sensor is working properly and communicating with the touch detector card
FAULT (red)	Light on	Hardware fault

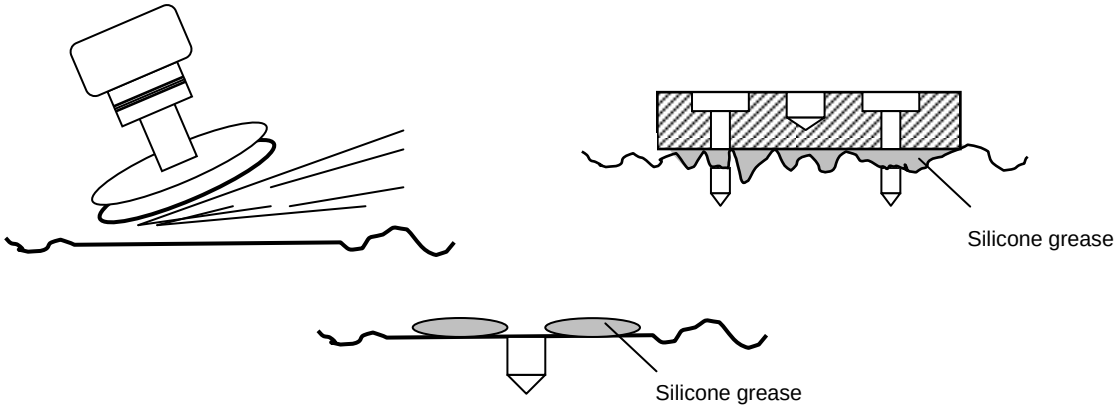
2.4.3. AE sensor setup

2.4.3.1. Type of AE sensors

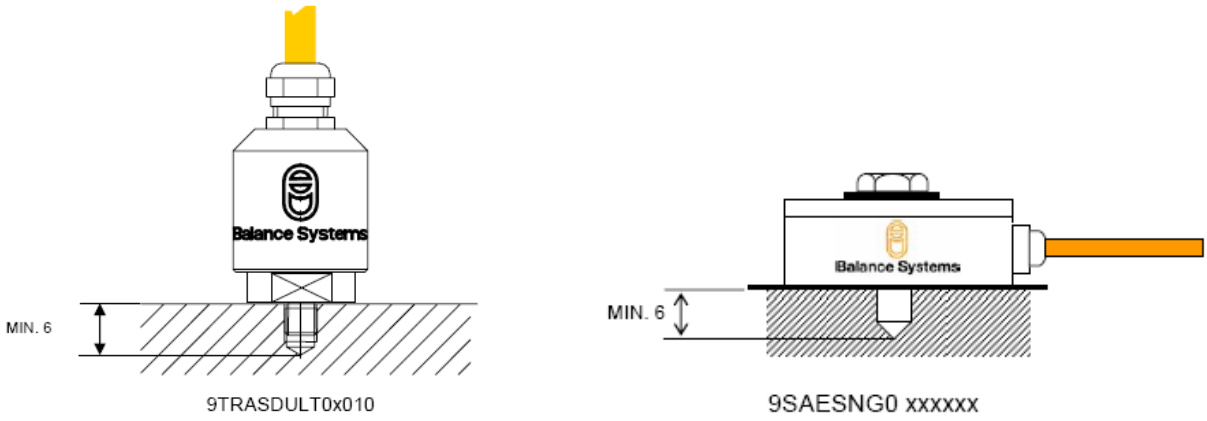
No.	Sensor	Mounting
1		Static mounting (machine table, work head body, tail stock body, blade dresser body, spindle housing, etc.)
2		Static mounting (machine table, work head body, tail stock body, blade dresser body, spindle housing, etc.)
3		Nose spindle mounting (grinding spindle OD - ID, dressing spindle, etc.)
4		Built-in spindle mounting (grinding spindle OD - ID, dressing spindle, etc.)
5		Built-in spindle mounting (grinding spindle OD - ID, dressing spindle, etc.)
6		Rotating ring (grinding spindle, work-head, etc.)
7		Hydrophone static mounting (working coolant through) (grinding area, dressing area, etc.)

2.4.3.2. Mounting of the static AE sensors (No. 1, No. 2)

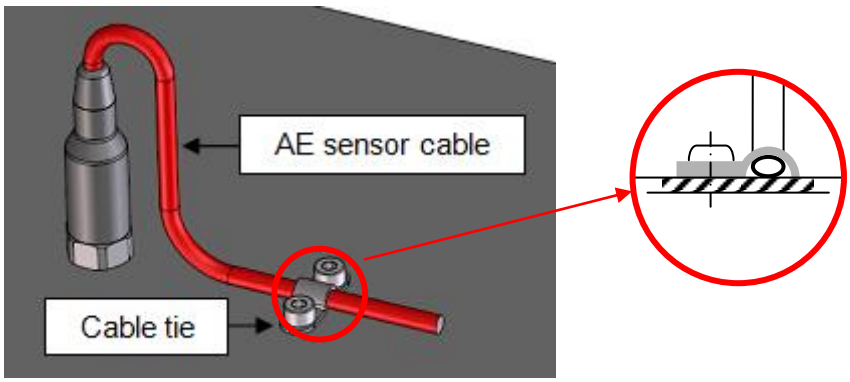
- The body of the sensor must be fixed on a clean and not painted flat metallic surface of the machine. It is suggested to smooth the surface by means of a grinding wheel (Ra 0.8)
  In case the surface can not be smoothed, lay a steel plate (AISI303), which must be glued with epoxy resin (or welded or well screwed) with the interposition of a silicone grease layer (i.e. Arexons 5001 or equivalent type).
  In case of fixing by means of a screw, lay a silicon grease layer.
  It is suggested to use clamping force: 10±1 Nm



- The most suitable fixing point must be found through experimental tests; usually it is located close to the source of the signal. (I.e.: workhead, dresser, near the bearings of the grinding spindle, etc.)



- It is suggested to fix the cable as shown in the picture.

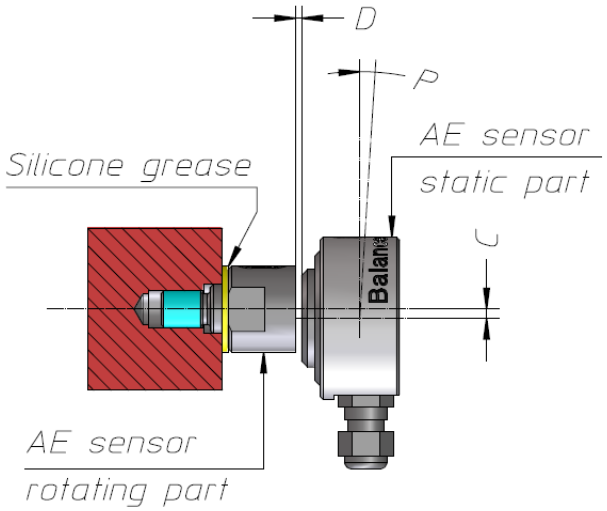


2.4.3.3. Mounting of the rotating contactless AE sensors on nose spindle (No. 3)

The rotating part must be screwed on the spindle nose (normally the M6, but may vary depending on application) observing the picture below.

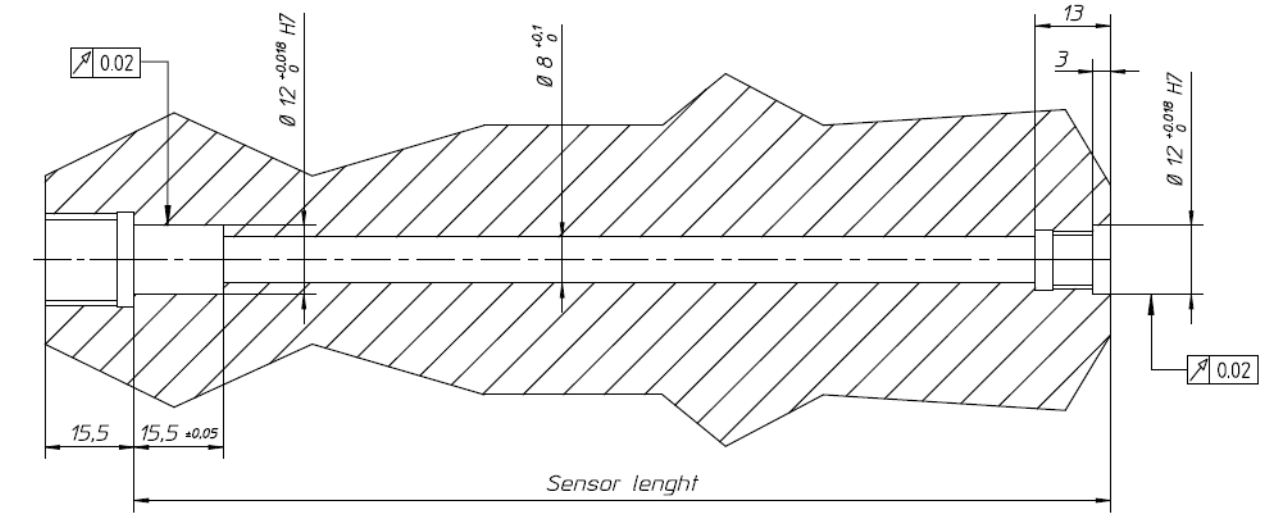
NOTE: To ensure the best coupling of the items it is suggested to apply a thin coat of silicone grease (i.e. Arexons 5001 or equivalent type) between the bottom of the rotating part of the sensor and the contact surface of the spindle.

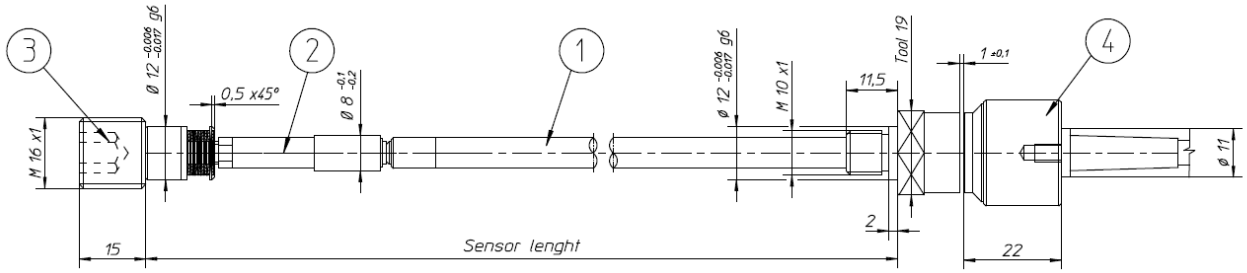
Distance D [mm]	Coax C [mm]	Parallelism P [° deg]
1 ±0.1	± 0.25	± 0.5°

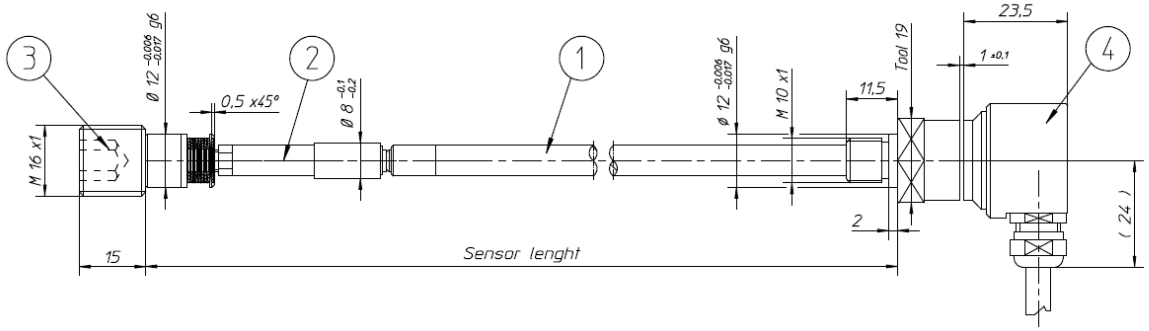


2.4.3.4. Mounting of the rotating contactless AE sensors built-in spindle (No. 4)

Since this sensor is normally made on customer request and the shape depends on the specific application, the full information are provided with the design of the solution.
The following description always valid as generic information.







Assembly steps, with reference to the previous figures:

a) Assemble (1) and tight at 17 Nm torque.
b) Assemble (2) till the spring will be in contact with internal stop wall.
c) To ensure the best coupling of the items it is suggested to apply a thin coat layer of silicone grease (i.e. Arexons 5001 or equivalent type) all around the component in the area (3).
d) Assemble (4) checking the calibrated distance (see table below) between static and rotating parts
e) Connect the cable

Distance D [mm]	Coax C [mm]	Parallelism P [° deg]
1 ±0.1	± 0.25	± 0.5°

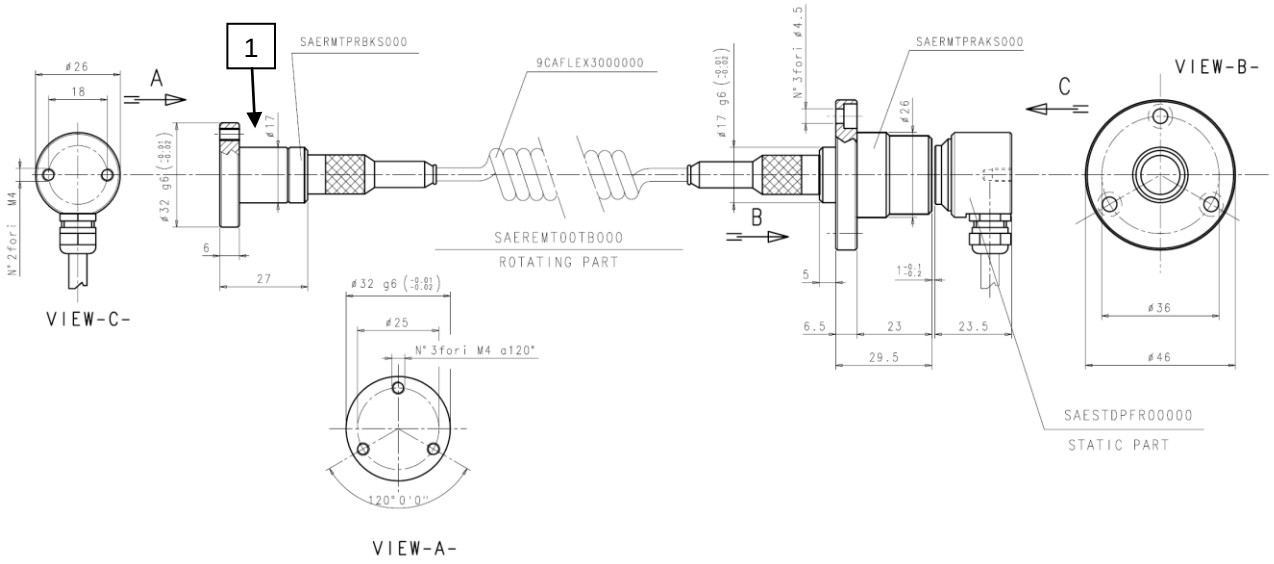
2.4.3.5. Mounting of the rotating contactless AE sensors built-in spindle (No. 5)

Since this sensor is normally made on customer request and the shape depends on the specific application, the full information are provided with the design of the solution.

NOTE: To ensure the best coupling of the items it is suggested to apply a thin coat layer of silicone grease (i.e. Arexons 5001 or equivalent type) all around the component in the area (1)

The following description always valid as generic information.

Distance D [mm]	Coax C [mm]	Parallelism P [° deg]
1 ±0.1	± 0.25	± 0.5°

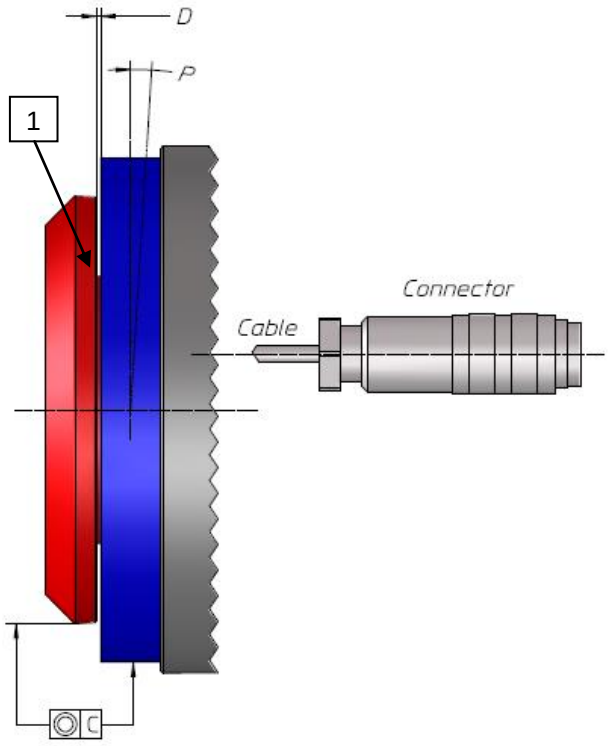


2.4.3.6. Mounting of the rotating contactless AE ring sensors (No. 6)

Since this sensor is normally made on customer request and the shape depends on the specific application, the full information are provided with the design of the solution.
The following description always valid as generic information.

NOTE: To ensure the best coupling of the items it is suggested to apply a thin coat of silicone grease (i.e. Arexons 5001 or equivalent type) between the bottom of the rotating part of the sensor and the contact surface of the spindle (1).

Distance D [mm]	Coax C [mm]	Parallelism P [° deg]
1 ±0.1	± 0.25	± 0.5°



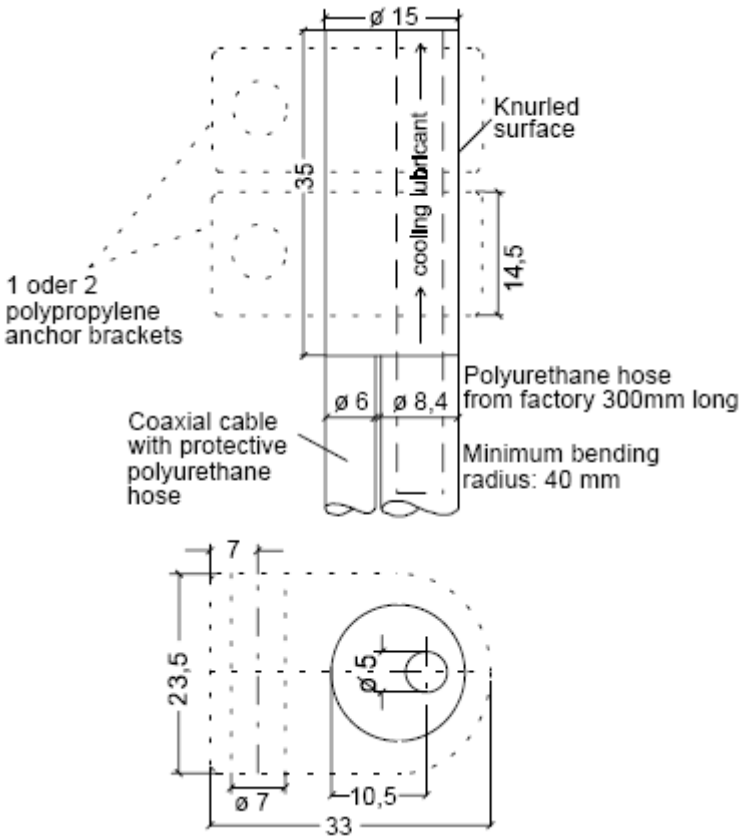
= AE sensor rotating part

= AE sensor static part

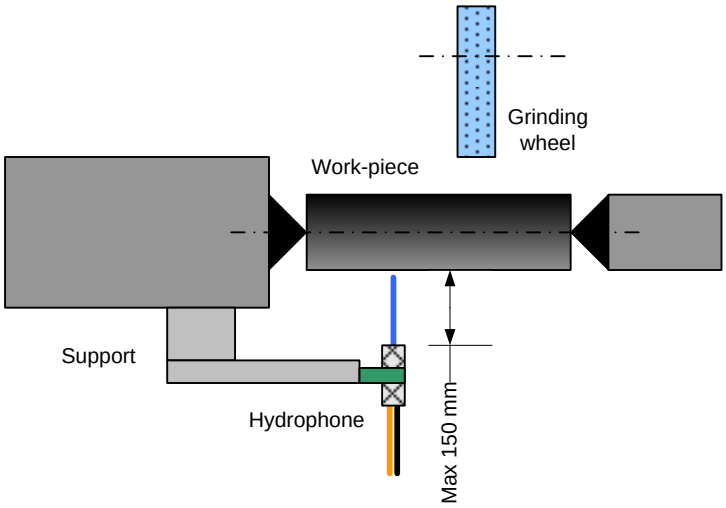
= Spindle static part

2.4.3.7. Mounting of the AE Hydrophone (No. 7)

The acoustic emissions hydrophone receives the acoustic waves via a jet of cooling lubricant which can be coupled directly to the workpiece or tool. For installation details see also 9IMEN2511-0004 Installation manual yy/mm/dd.



The sensor is supplied with a bend and cut resistant polyurethane (PU) hose which is also resistant to cooling lubricant. There is a nozzle on the end of the hose for the connection to a cooling lubricant hose.
The acoustic emission hydrophone is to be mounted so that the liquid measuring stream hits the tool or work piece to be monitored or the clamp for the work piece. The distance of the sensor from the coupling surface (i.e. the point where the measuring stream makes contact) determines the length of the measuring stream.
The greatest possible length for the measuring stream is determined by the viscosity of the cooling lubricant and the quantity that flows through the hose which together determine the “cohesion” of the liquid. The measuring stream must have an uninterrupted cylindrical shape although roughness around the edges from the turbulence of the stream is permitted.
The greatest stream lengths are therefore reached when the cooling lubricant hose is run straight near the sensor. Typically the measuring jet should be set to be shorter than 150 mm. (For a vertically falling stream and the use of cutting oil, which is tougher than emulsion, a theoretical stream length of up to 1 m is possible).
The measurement stream should generally be set to be as short as possible since this is more favorable with respect to background noise and damping. The sensor is mounted with, for example, hose clamps, preferably made of plastic to avoid the transmission of interference noise. If no bracket on the sensor itself is possible for reasons of space or the cable and the feed hose needs to be protected against flying chips, then they should be integrated into a steel pipe (Øi =16 mm) along with the feed lines.

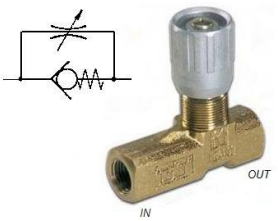


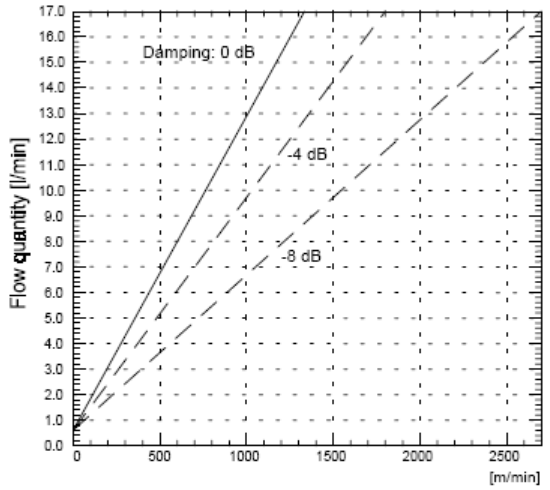
Fix the head of the sensor with the supplied PVC support to assure mechanical damping and electrical insulation.

Adjusting the flow quantity

When coupling the measurement stream to rotating tools or work pieces, a minimum flow quantity must be maintained so that the coupling is not interrupted by liquid which is carried along with it and the rotating air mantle (see solid line in the adjacent diagram). For lower flow quantities the acoustic waves are damped when they make contact (see dashed line). A measurement is possible in spite of the damping.
The sensor can be operated with a flow quantity of up to 17 l/min (= very hard jet). **The flow quantity should**, however, **generally be chosen to be as low as possible to minimize the sound of the jet making contact**.
The adjustment of the flow quantity is done using a valve or pressure reduction valve.

As example: TCA Model PFU 3/8”

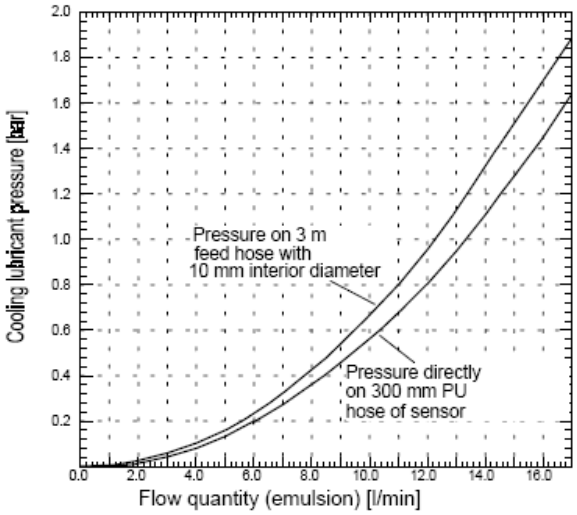




Surface speed V_u of the coupling surface

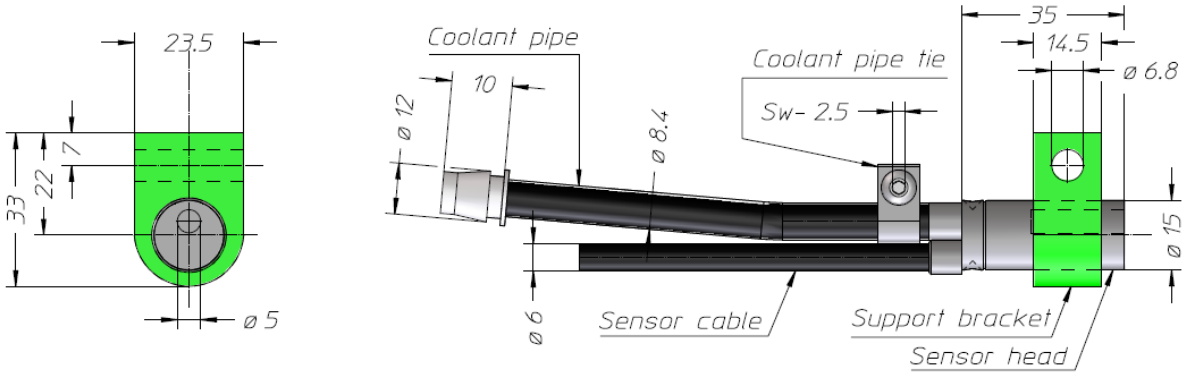
$V_u = \pi \bullet d \bullet n$

V_u = Surface speed
π = 3.14
d = Diameter of the coupling surface
n = rpm

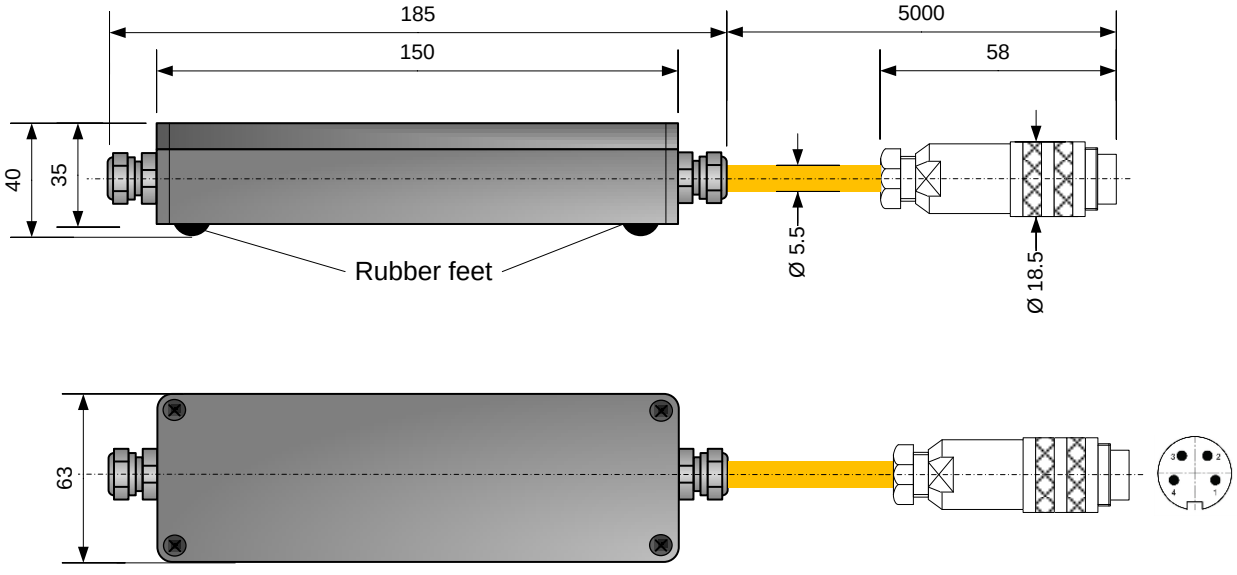


2.4.3.7.1 Hydrophone with separated amplifier – installation and setup

Sensor Layout (P/N 9AECS000SEHxx0)

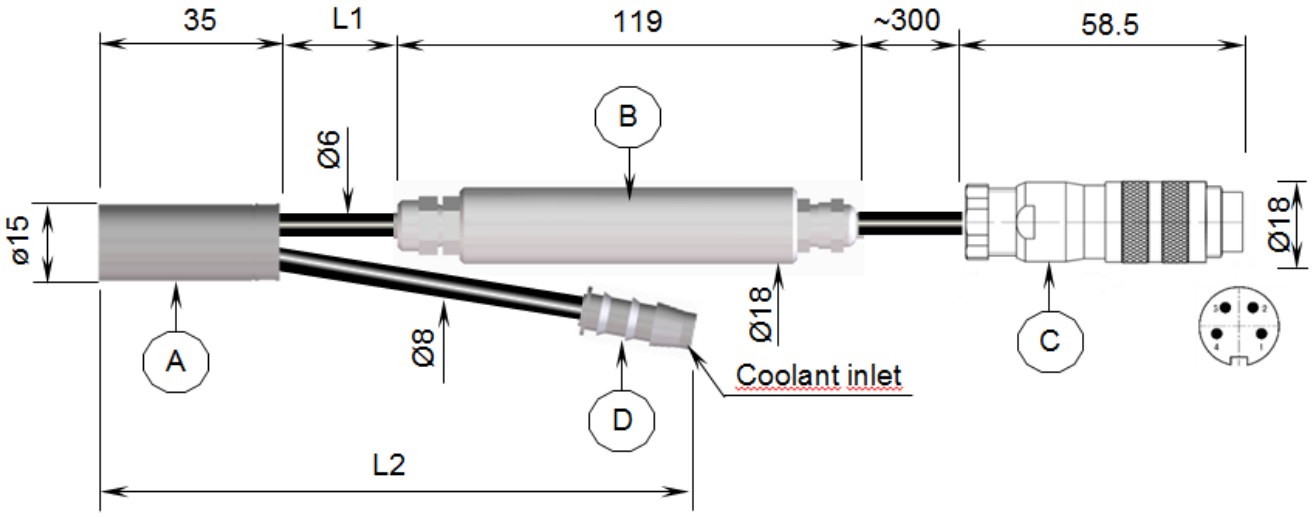


Amplifier Layout (P/N 9TRASD-SEP-AE0)



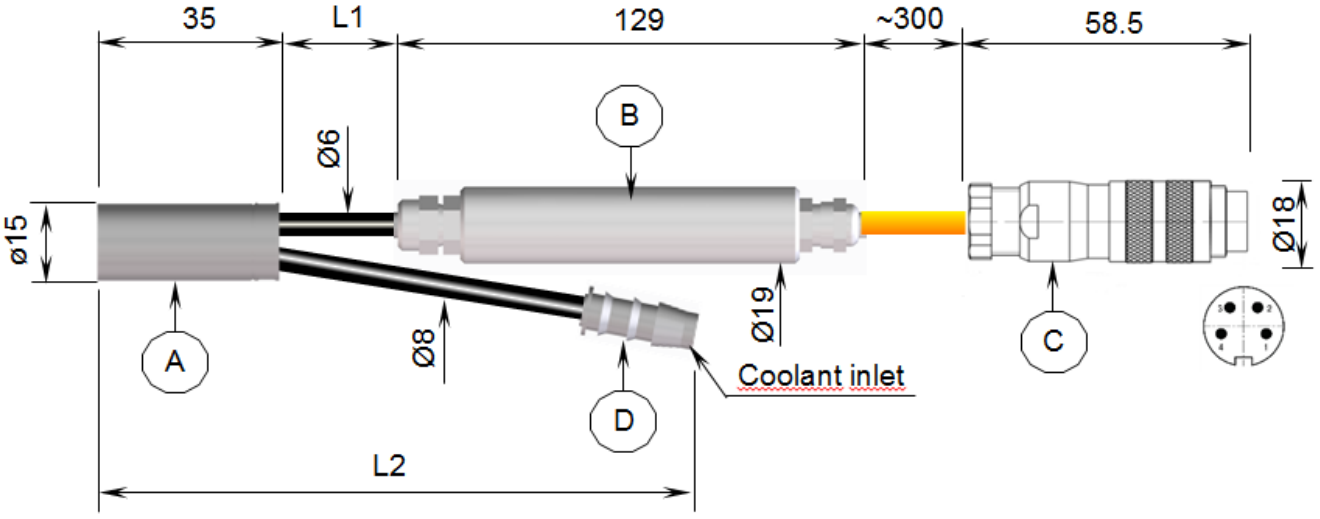
2.4.3.7.2 Hydrophone with embedded amplifier – installation and setup

Layout (P/N: 9AECS00000XXX0)



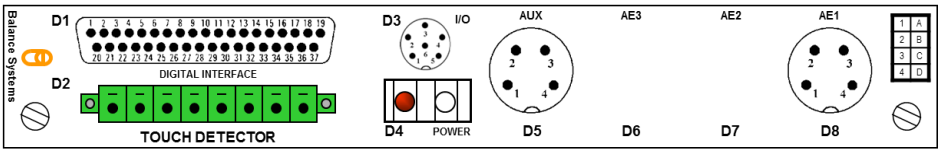
A - Sensor
B - Amplifier
C - Connector
D - Coolant hose
L1 3m
L2 0.3…3 m

Layout (P/N: 9AECS02000XXX0)



A - Sensor
B - Amplifier
C - Connector
D - Coolant hose
L1 3m
L2 0.3…3 m

VM15 TD card



Connect the amplifier to relative input (connector D5-AUX):

VM15 TD parameter setup

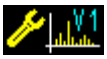
For all the details refer to:

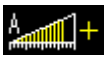
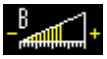
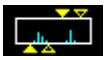
- Parameter Setup
- Panel Installer
- HMI Installer

The default values in are :

SETUP > AE4 / AUX INPUT [D5]

ICP	= OFF
Energizing voltage	= 0.5 V (it does not affect the sensor)
Sensor ready check	= OFF
Sensor ready limit	= 0

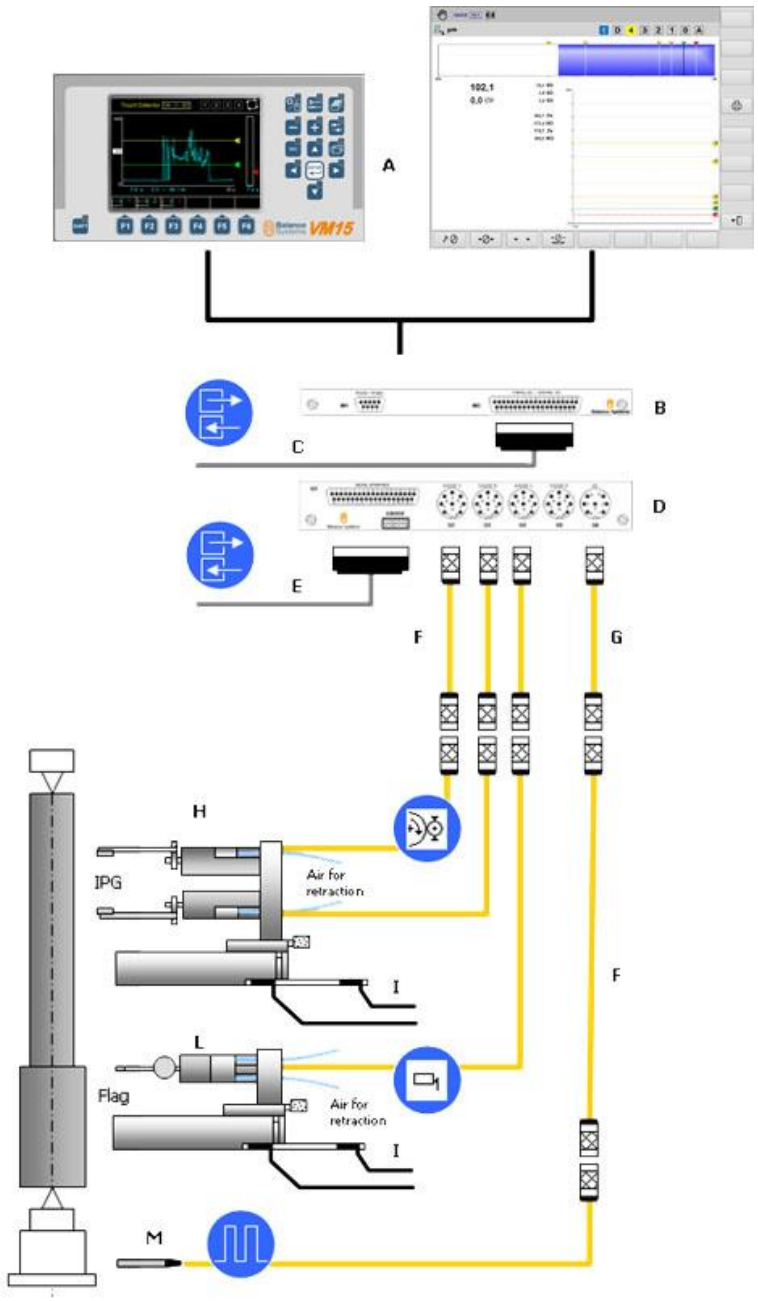
VARIABLE Vx SETUP 

Suggested values				
Parameter	**Icon**	p/n **9AECS00000XXX0**	p/n **9TRASD-SEP-AE0 + 9AECS000SEHxx0**	p/n **9AECS02000XXX0**
Source		>> AE4 / AUX	>> AUX	>> AE4 / AUX HP
Working area		>> 5	-	-
Gain A		>> 80	-	-
Gain B		>> 4	>> 0	>> 2 (Max)
Band Pass Filter		>> OFF	>> OFF	>> OFF
RMS Filter		>> 100	>> 0 to 100	>> 0 to 100
Fullscale		>> 100	>> 200 to 300	>> 100
Analog filter bypass		>> OFF	>> ON	>> ON

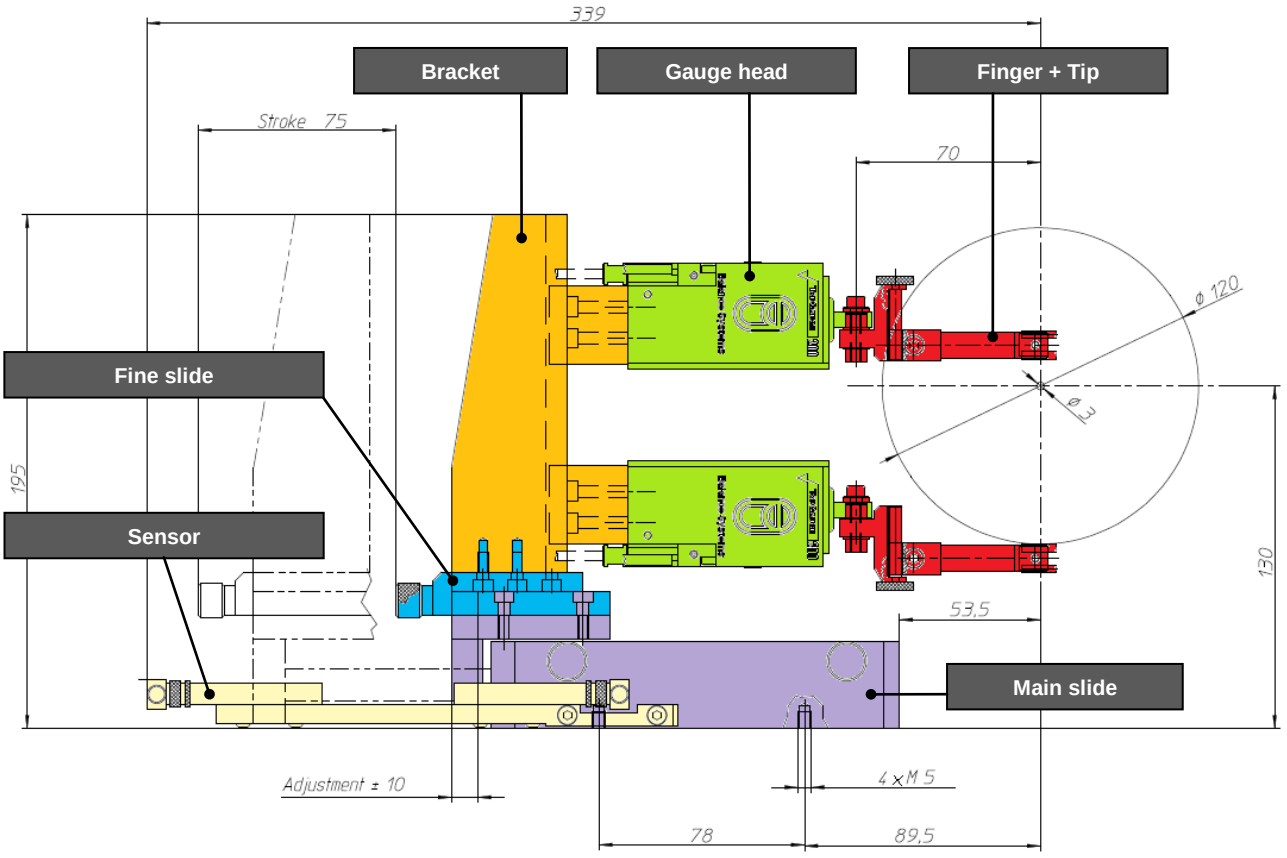
* p/n 9AECS00000XXX0 works only with “Anamod” module installed on TD CARD

2.5. GAUGE components

2.5.1. Application scheme



Component	Description
A	User interface: VM15 Panel or VM15 HMI PC Windows
B	Multinet card (optional): BIN/BCD positional data
C	Digital interface (I/O signals) BIN/BCD
D	Gauge card
E	Digital interface (I/O signals)
F	Extension cables
G	Synchronism signal adapter
H	Diametral gauging equipment
I	Slide sensors
L	Positional gauging equipment
M	Syncrhonism sensor



All the components, be they fixed or adjustable, with or without rapid retooling are defined according to the type of application and to the mechanical characteristics of the host machine.

The drawings and instructions for fitting and adjustment are provided with dedicated documents.

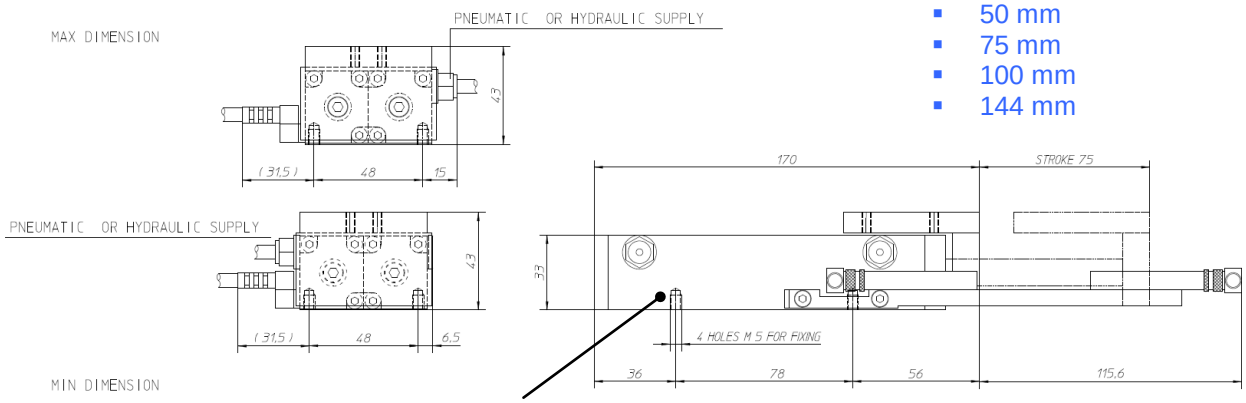
Here are some generalities about the most common parts.

2.5.2. Slide

The slide is the support device of the gauge system which has the function to move the gauge heads in working position (slide-in) and in the rest position (slide-out).

Standard stroke:

- 50 mm
- 75 mm
- 100 mm
- 144 mm



IMPORTANT
Max length of the fixing screw into threaded holes = 6mm

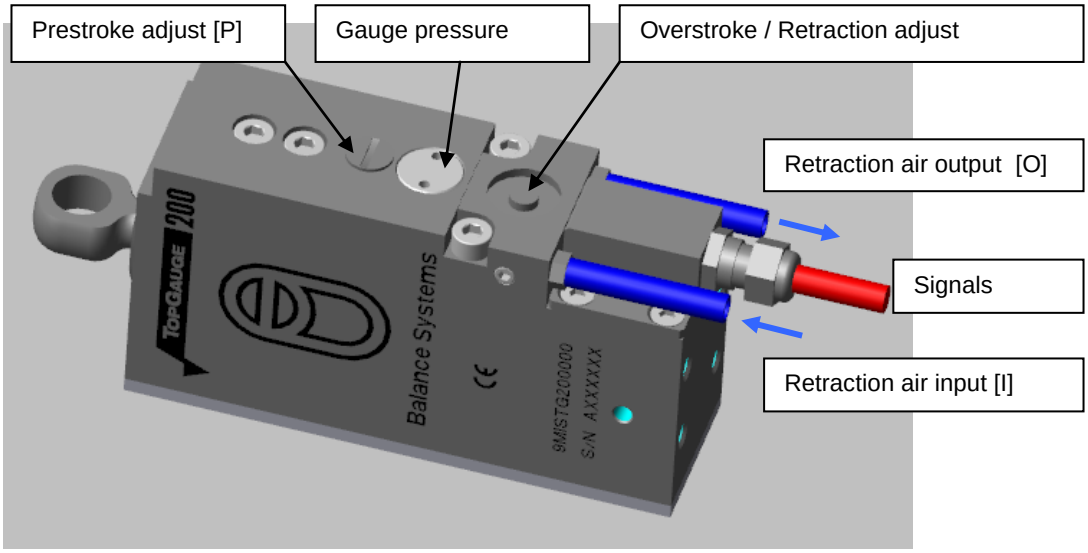
The slide movement is made using the pneumatic or hydraulic system of the machine. The management of the slide movement, which can be equipped with end of stroke inductive sensors (NPN or PNP type), is made by the PLC/NCU of the machine.

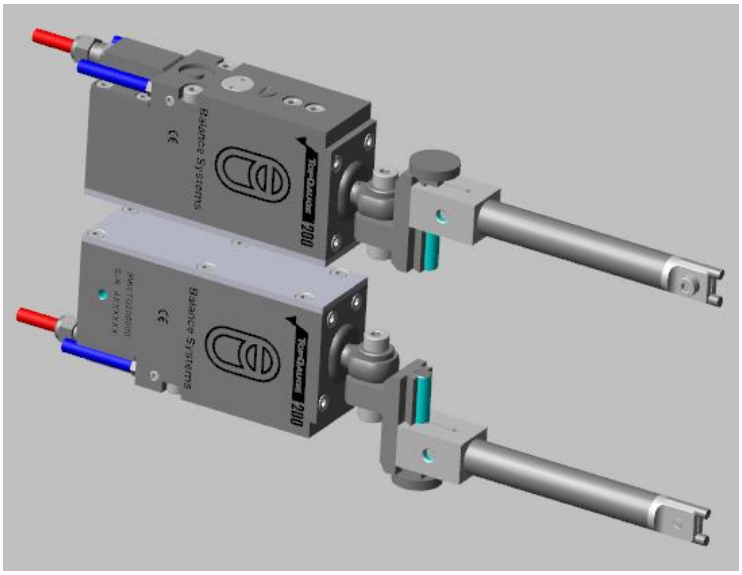
Slide supply	Min	Max	Nominal
Pneumatic: Air pressure [bar], with air flow regulator in output *Dry or lubrified, filtered <10 µm*	5	8	6
Hydraulic: Oil pressure [bar]	8	20	12

It is suggested that while the machine is not opertating for a period, the slide stays in working position (slide-in) so to avoid possible damage due to dirt deposits on the piston rods.

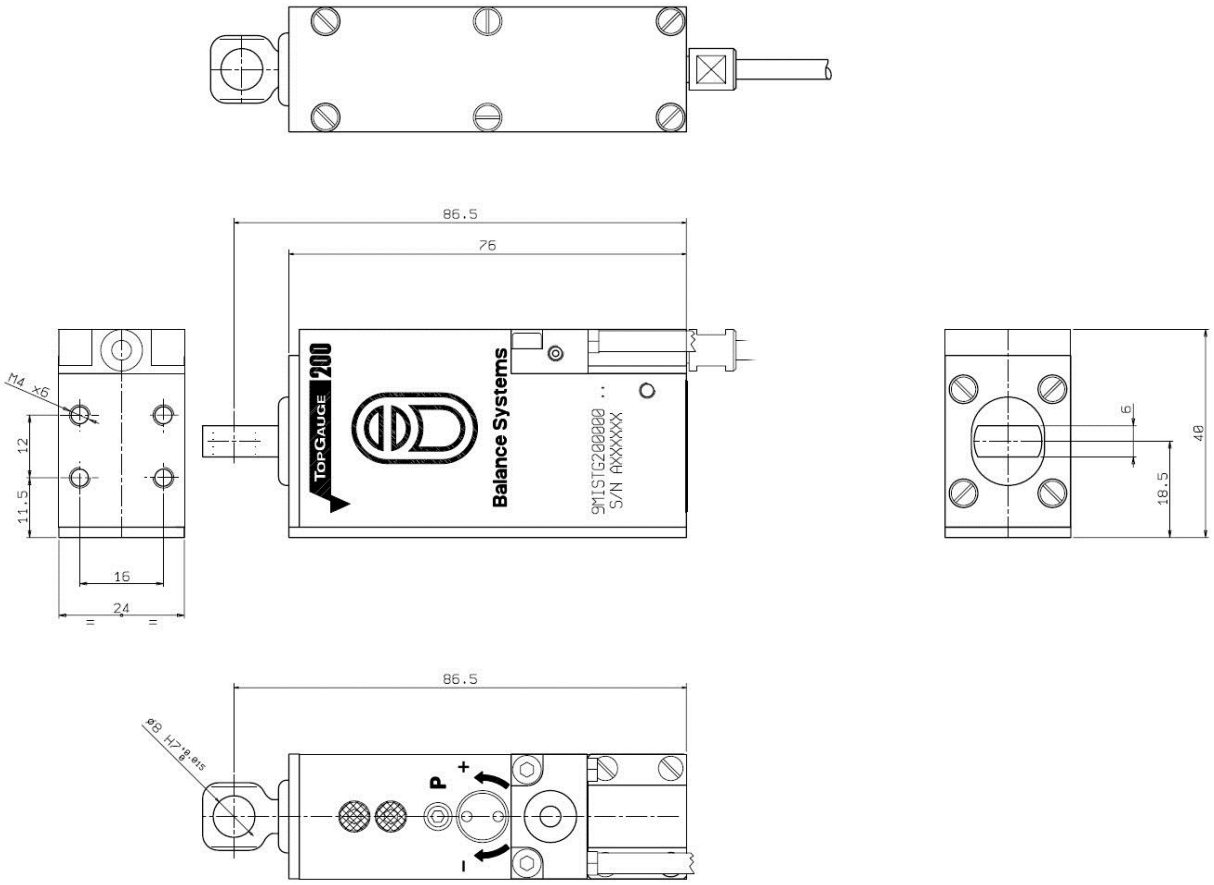
2.5.3. Gauge head TG200

The measuring head TG200 is the component which realizes the function of dimension sensor. This is a modular component that, according to the applications, can be used alone (eg for flagging) or in pairs (eg to measure diameters and / or thicknesses). In special cases can also be used a number of sensors simultaneously (eg 3 or 4 sensors to measure tapers).





TG200 Mechanical layout.



Adjustments

Depending on the model and the choices made by the installer of the system, some adjustments may not be available. Remove the caps to access the setup screws:

A – Prestroke:

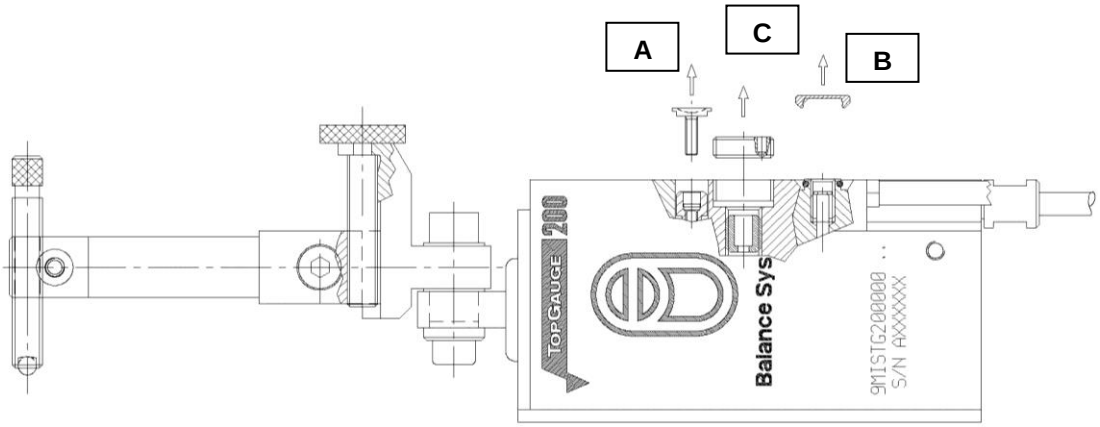
- To decrease the finger negative stroke, turn the internal screw CW
- To increase the finger negative stroke, turn the internal screw CCW

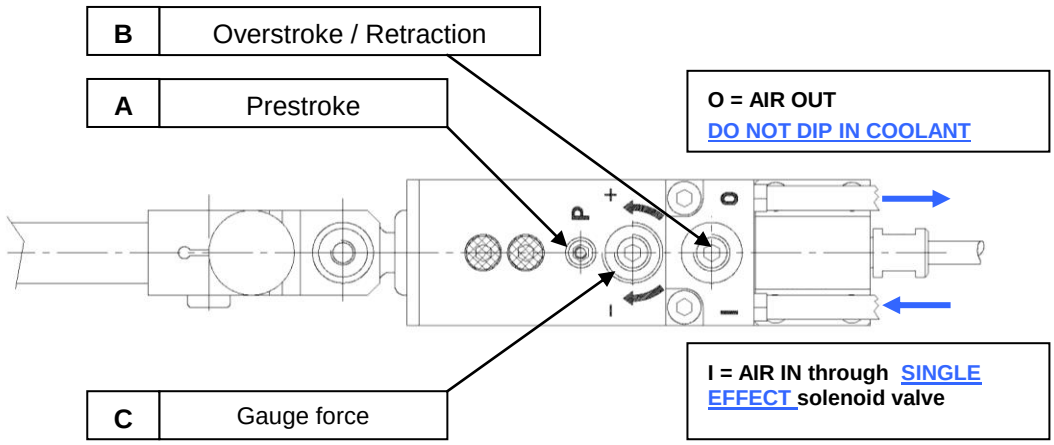
B – Overstroke / Retraction

- To adjust the stroke of retraction system is necessary to provide air to the retraction circuit
- To increase the finger positive or the retraction stroke, turn the internal screw CW
- To decrease the finger positive or the retraction stroke, turn the internal screw CCW

C – Gauge force

- Use a dynamometer calibrated in grams (es. fs=300 grams). Put it under the finger.
- To decrease the force, turn the internal screw CW.
- To increase the force, turn the internal screw CCW.
- Default calibration 130-150 grams



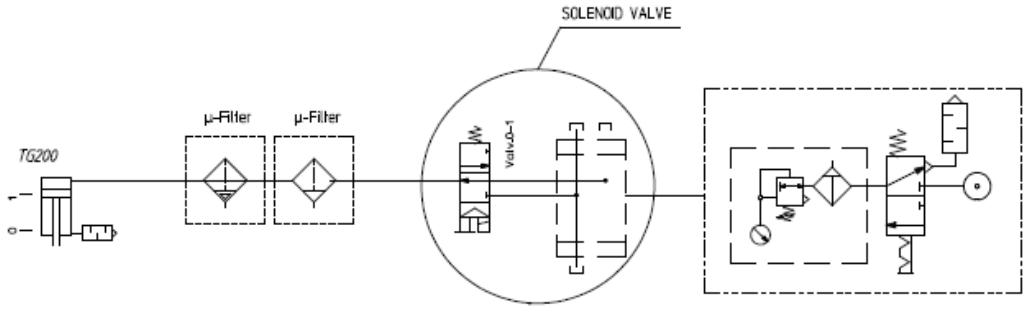


Retraction supply	Min	Max	Nominal
Pneumatic: Air pressure [bar]	4	7	6

Air quality requirements	ISO 8573-1 Class	Ref.Value
Solid particles size	3	Filter <10µm
Water particles (dewpoint)	2	-20°C
Oil particles amount	1	0.01 mg/m³

2.5.4. Recommended pneumatic line to TG200 head

Pneumatic diagram



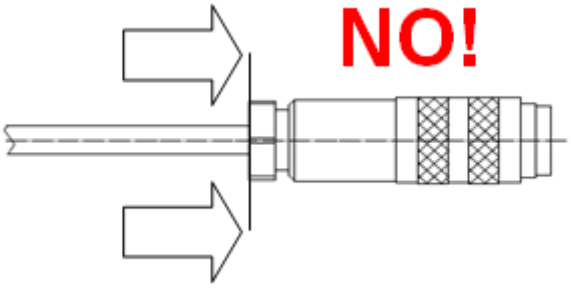
Note: the above pneumatic diagram is purely indicative. The machine manufacturer/installer is responsible to choose the best solution, according to the application, in order to comply the above recommended values.

2.5.5. Connection cable to VM15 function card

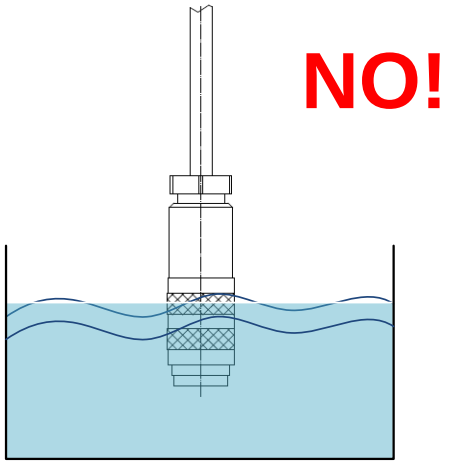
The connection of the TG200 gauge head to the relative function card (9SHVM15xxGAxxx) is made trough the cable, connected to the gauge LVDT and the male connector installed at the end of it. Pending by the application the gauge head cable can be extended using the suitable extensions (extension type defined by gauge head code). The cable sheath is waterproof.

Special care needs to be dedicated to the gauge head cable components. See below the suggested operations to grant a durable components life as well as a correct components installation:

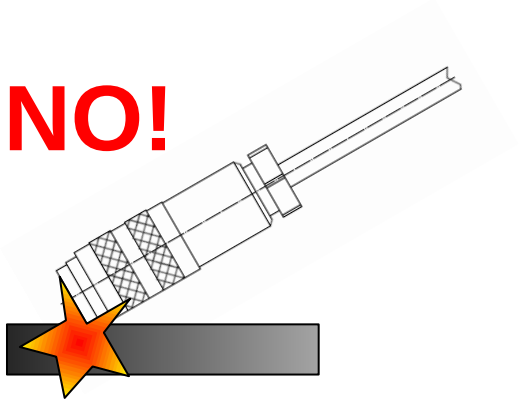
1) Never pull the cable away from the cable



2) Never dip the connector on water



3) Never let the connector side to fall or hit the components



2.5.6. Accessories

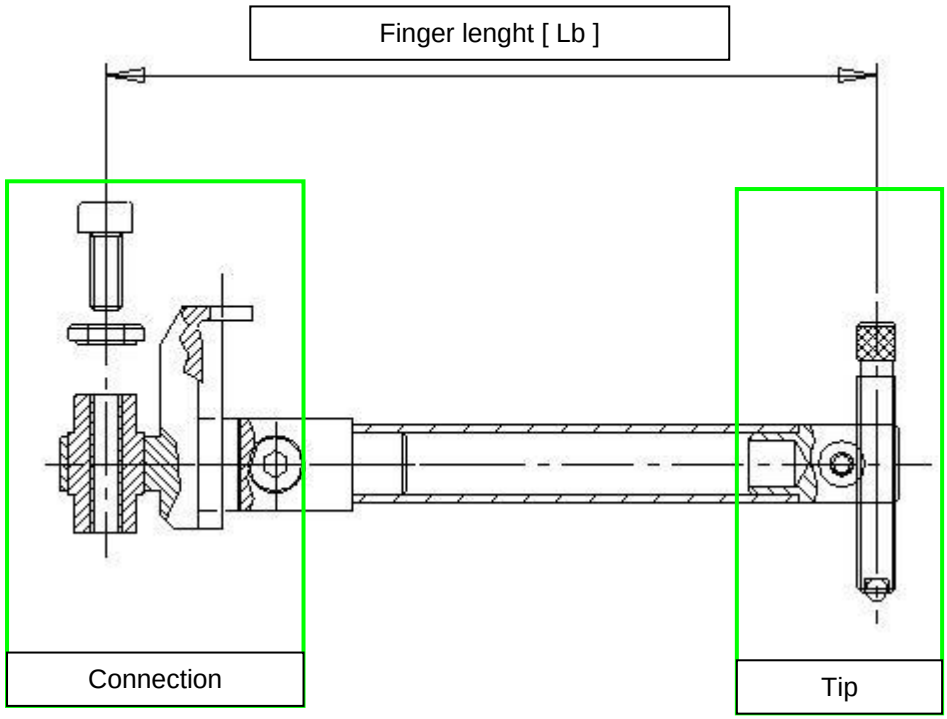
It is available a wide range of accessories to adapt the components to any application of in-process measurement on every kind of surface, and for each type of dimensional measurement.
Accessories are classified as follows:

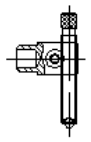
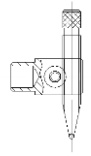
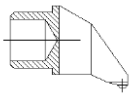
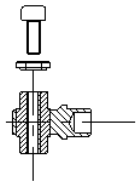
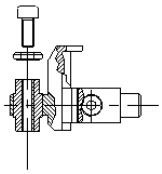
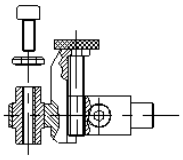
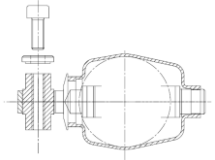
- fingers and tips
- supports
- showers
- workpiece rotation speed sensors

2.5.6.1. Fingers and Tips

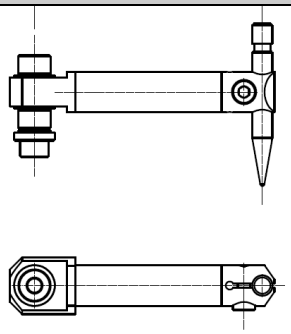
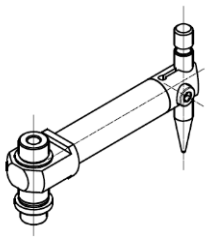
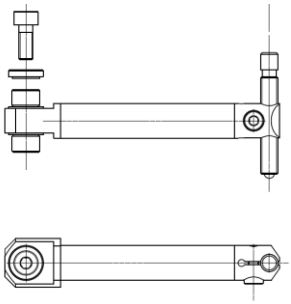
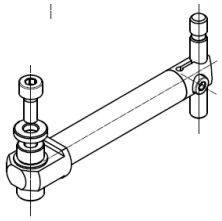
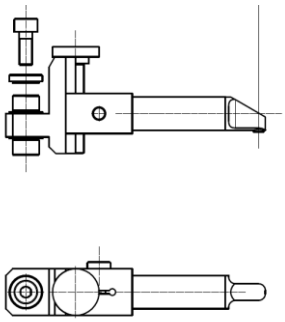
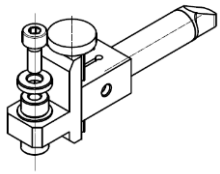
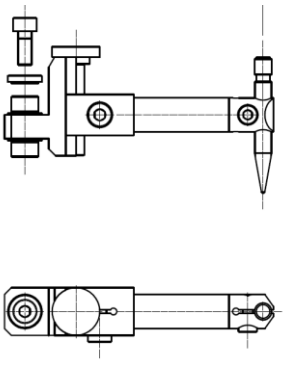
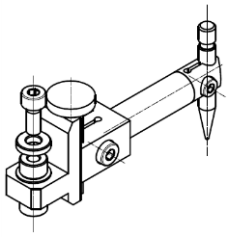
The fingers and the tips are defined according to the type of measurement and the surface of the workpiece. Here are just some examples of standard solutions.

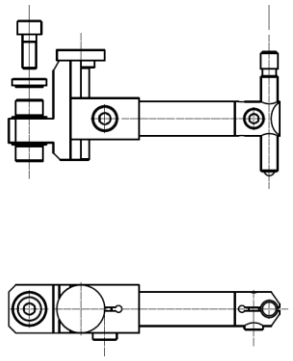
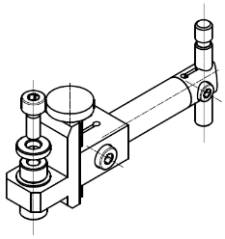
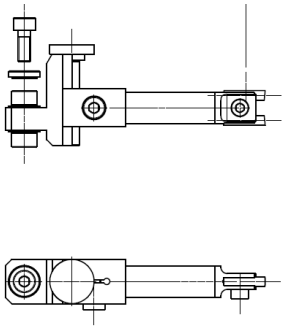
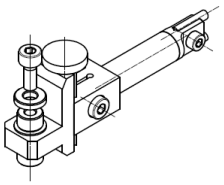
Figure shows the variable elements.



Tip	Type	APPLICATION
	WB-DB	Continuous or synchronized measurement on smooth surfaces. Tungsten carbide or diamond tip. Micrometer screw for fine adjustment of zero.
	WE-DE	Continuous or synchronized measurement on smooth surfaces. Tungsten carbide or diamond tip. Micrometer screw for fine adjustment of zero.
	WC	Continuous or synchronized measurement on interrupted surfaces. interchangeable tungsten carbide bars-
	WF-DF	Positioner for flagging. Tungsten carbide or diamond tip.
Connection	**Type**	**Description**
	XA	Fixed. To be used in combination with tip type WB-DB or WE-DE.
	XB	Adjustable. To be used in combination with tip type WB-DB or WE-DE.
	XC / XH	Adjustable with micrometric screw. To be used in combination with tip type WC or WF-DF
	XE	Anti-crash system. To be used in combination with tip type WB-DB or WE-DE.

Here are some examples of combinations:

Layout	Layout 3D	Example
		Connection: XA Tip: WE o DE
		Connection: XA Tip: WB o DB
		Connection: XC Tip: WF o DF
		Connection: XC Tip: WE o DE

Layout	Layout 3D	Example
		Connection: XC Tip: WB o DB
		Connection: XC Tip: WC

Depending on the length of the finger, is defined the parameter “finger ratio” Rb , which is then used within the part program of measurement to define the formula of the dimension of the workpiece to be checked (see Parameter Setup)

Lb	***Rb = (Lb + 22)/57***
Finger Length **(mm)**	***Fingers Ratio Setting***
56	*1,368*
70	*1,614*
100	*2,140*
120	*2,491*

For special finger length, apply the formula: $R_b = \frac{L_b + 22}{57}$

2.5.6.2. Bracket

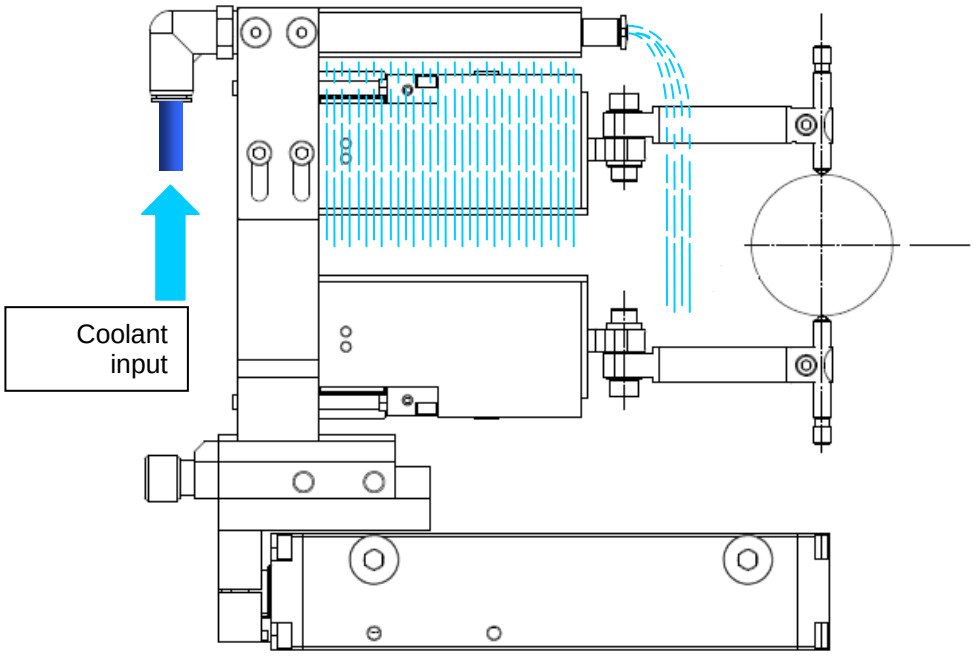
All types of bracket, whether fixed or adjustable, with or without quick retooling are defined according to the type of application and to the mechanical characteristics of the host machine.

The drawings and instructions for fitting and adjustment are provided with documents dedicated.

2.5.6.3. Shower

In order to ensure maximum thermal stability of the system, it is possible to equip the groups of measurement with an irrigation system (shower) which uses the coolant circuit already installed in the machine. There are various solutions, the figure shows an example.

For best results, the jet of coolant should be guaranteed in all machine conditions (in process and in stand-by).



2.5.6.4. Rotation speed sensors for synchronized gauging and roundness analysis (optional)

To make a synchronized gauging localized in limited areas of the workpiece surface or a roundness analysis with evaluation of the shape components, it is necessary to install a rotation speed sensor on the workhead. The sensor used is normally inductive type (NPN or PNP).

Positioning

- The sensor must be positioned so as to detect the correct rotation speed of the spindle;
- if possible, select a position on pulley side, so as not to create interference in the work area.
- size the index (ie the width of the groove or the protrusion) in such a way that allows the detection of the maximum speed of the spindle. The minimum width of the index (made of ferrous material), is obtained by the following relationship:

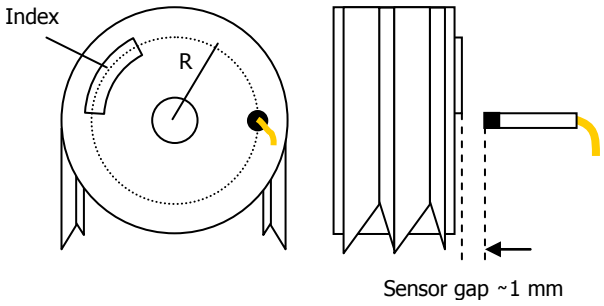
$$I = \frac{V_{max} \cdot R}{10 \cdot f_0}$$

where:

I = index size [mm]
R = distance [mm] of the index from the rotation axis
V_{max} = max rotation speed of the spindle [n/min]
f_0 = max working frequency of the sensor [Hz]

NOTE
The index for the sensor, which is normally obtained by performing a groove directly on the pulley, should not be very deep as not to create unbalance. It is sufficient to a depth of about 2 mm.

- Once designed and built the index, place the sensor at a distance of 0.6 to 1.5 mm



- After installing and connecting the sensor, verify that the reading speed is constant; to run this test turn on the VM15 control unit and operate with balancer functions.

Example

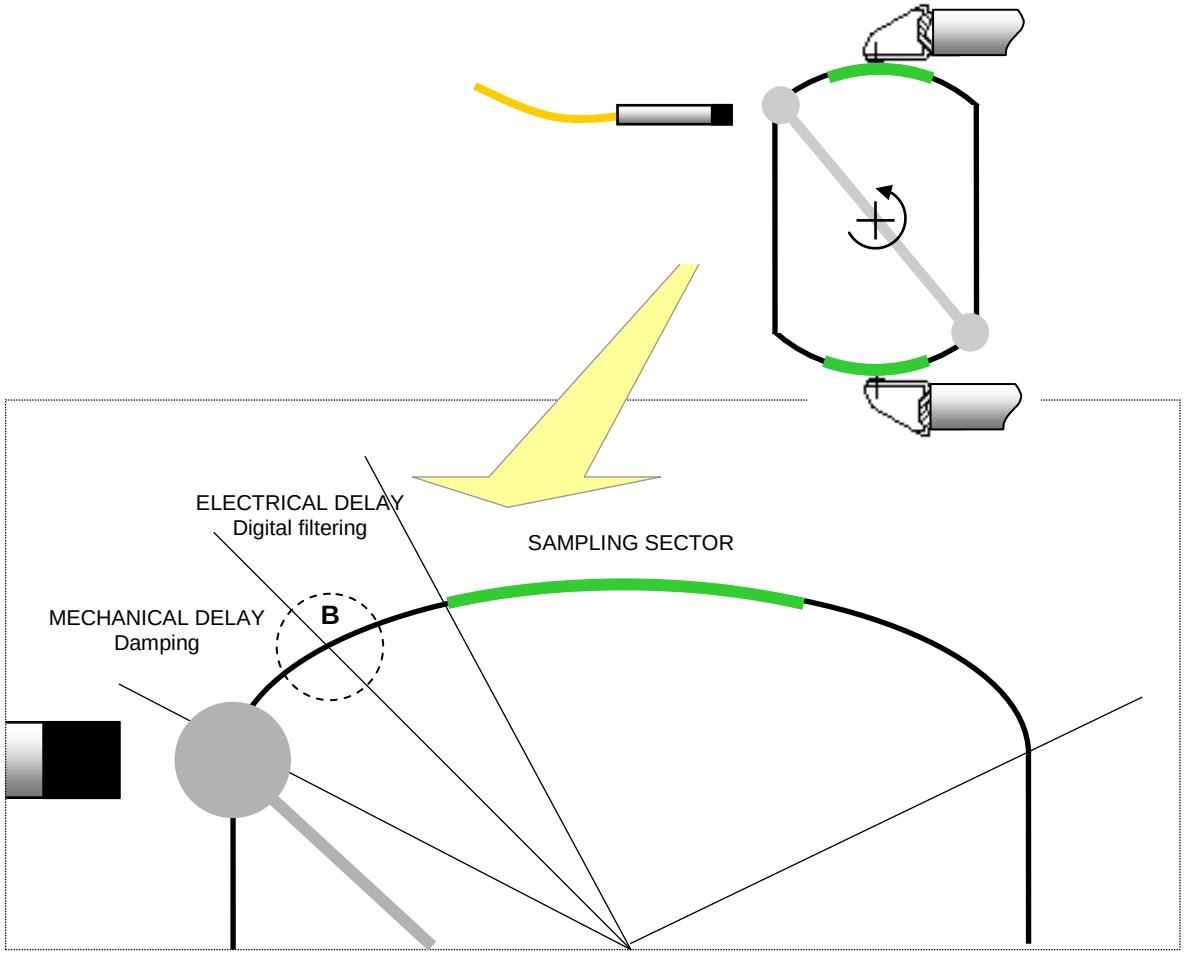
Rotation speed sensor with max working frequency fo = 1 kHz
Max rotation speed of the workpiece = 500 rpm
Distance of the index from the rotation axis = 30 mm

By formula > index size $I = \frac{V_{max} \cdot R}{10 \cdot f_0} = \frac{500 \cdot 30}{10 \cdot 1000} = 2mm$

Gauging parameters setup

To make clear in which way the adjustment should be made, refer to the example that follows. Let us imagine wanting to check the dimension in the two circular zones of the outline shown in the drawing.

NOTE *The piece-holder must have a reference number, for the proximity sensor, the same as the number of gauging areas that are to be defined.*



With reference to the preceding drawing, typical operation can be summarized as follows:

1. MECHANICAL DELAY (damping)

In the moment in which the reference is recognized by the proximity sensor, the countdown of a timer for bringing the gauging head to a steady condition. The timeout value is calculated converting the "MECHANICAL DELAY" parameter into a time interval, shown in degrees, in the page of part-program. This value can be set to zero, usually in the following cases:

- the reference for the proximity sensor is positioned beyond the piece's discontinuity (position B in the drawing) until it takes intrinsic account of the mechanical transients;
- the piece does not show discontinuity.

2. ELECTRICAL DELAY (digital filtering)

Once the mechanical delay time is ended, the countdown by a second timer for the electrical steady condition of the gauging filtering system begins. The timeout value is calculated converting the "ELECTRICAL DELAY" parameter into a time interval, shown in degrees, in the page of part-program. This amount must be set in relation to the weight set according to the filtering of the gauging transducers (see SETUP > TRANSDUCER [Gx] > GAUGING RMS FILTER).

3. SIZE CONTROL

Once the electrical transient has finished, the size control begins. The duration of the sampling period is calculated according to the parameter "SAMPLING SECTOR", set in degrees, in the page of part-program.

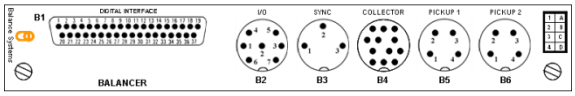
4. AWAITING NEW SYNCHRONISM

At the end of the measuring stage, the system of acquisition is put into standby waiting for a new synchronism impulse. On receiving this impulse, the system restarts from point 1.

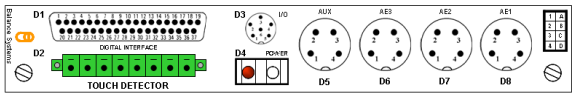
For a complete description of the part-program parameters, refer to Parameter Setup

3. Function cards

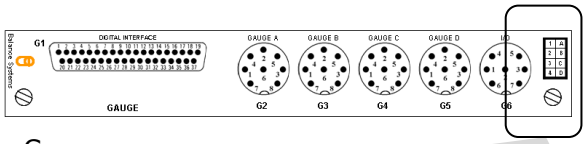
3.1. Introduction



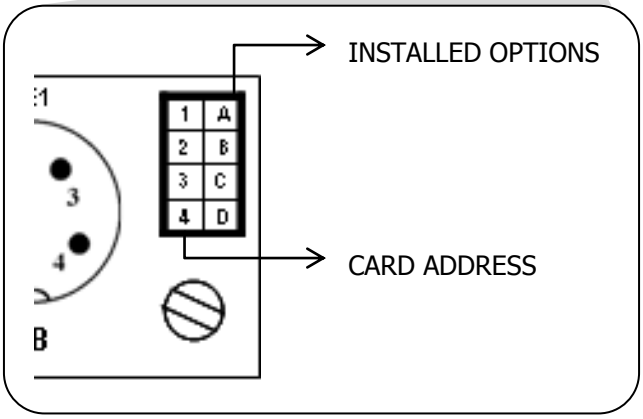
Balancer



Touch Detector

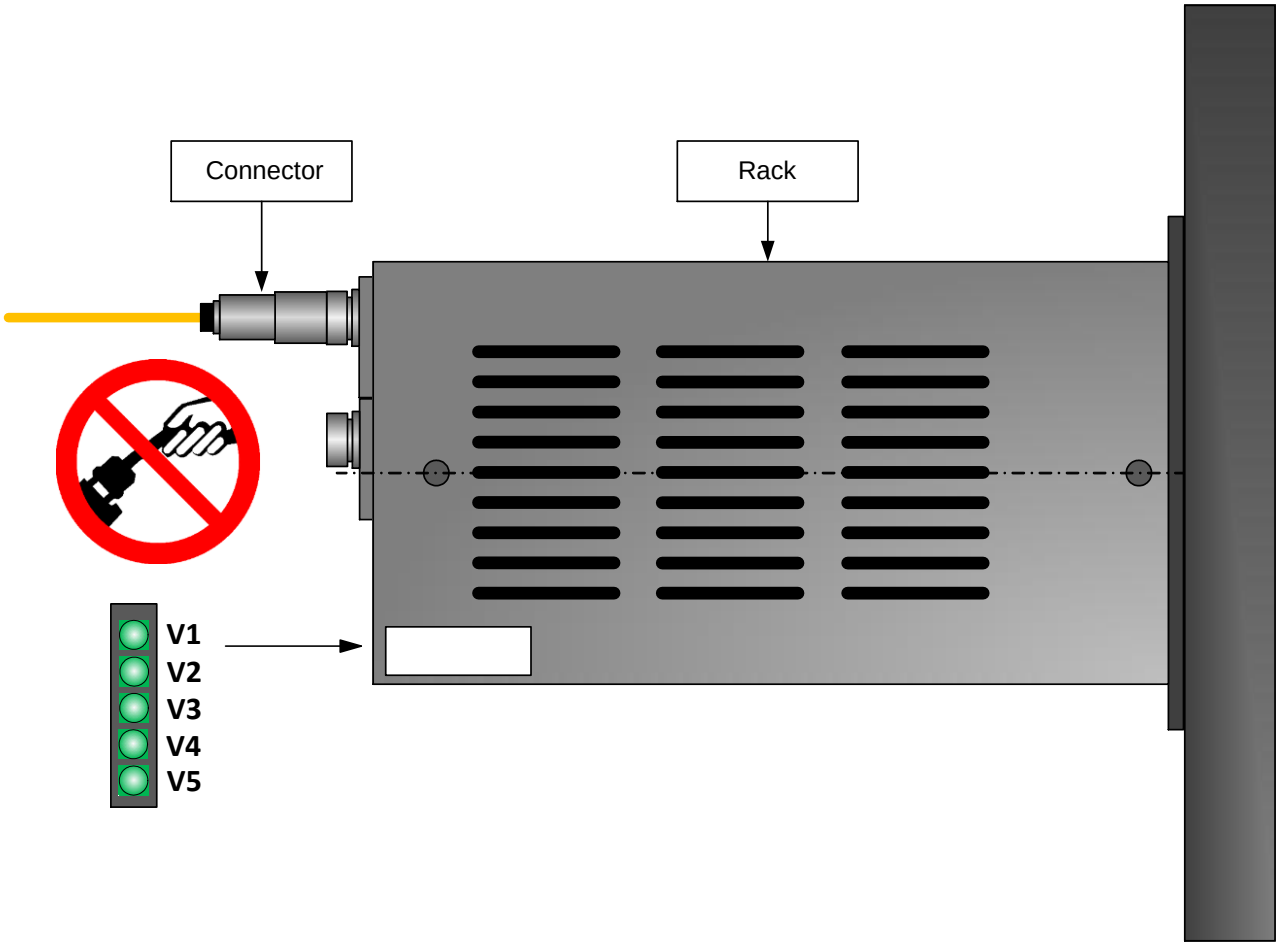


Gauge



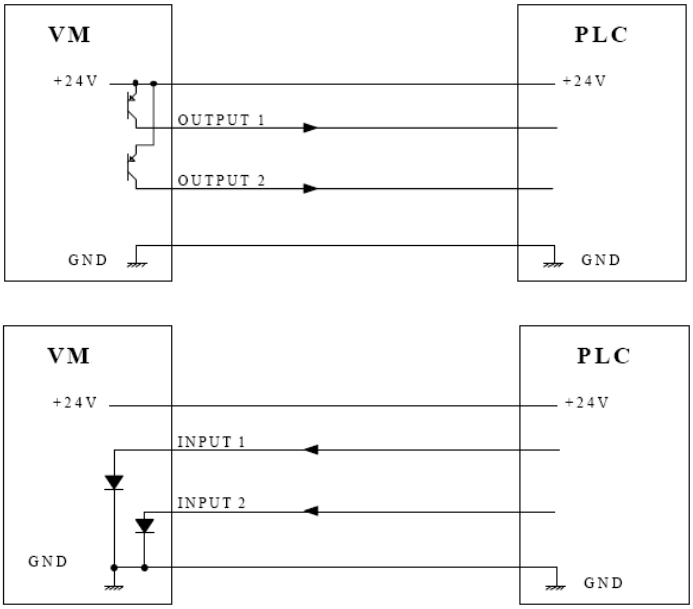
3.2. General warning

Never plug / unplug the connectors while the VM15 electronic is running.
Always look to the Rack V1..V5 leds. If the leds are lit do not plug or unplug the connectors!

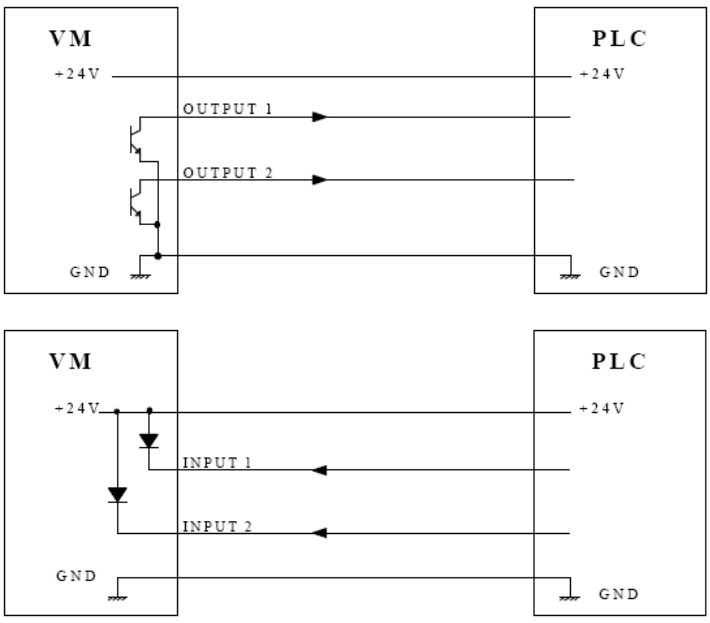


3.3. Digital interface

Digital I/O features	
Type (default)	Source, opto-isolated
Type (on demand)	Sink, opto-isolated
Voltage	10..28 Vdc
Max output current	150 mA
Nominal input current	15 mA

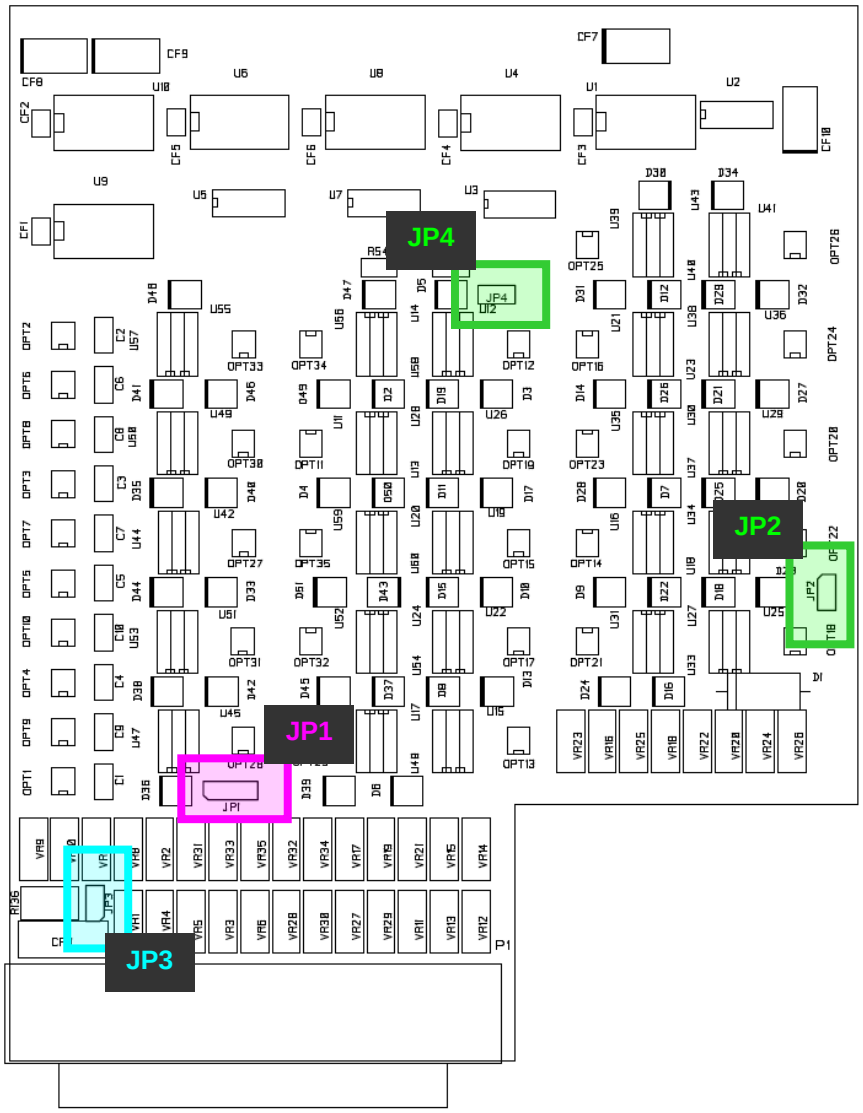


SOURCE Type

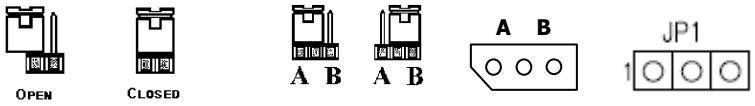


SINK Type

3.3.1. Digital I/O card version 1.0



3.3.1.1. Hardware setup



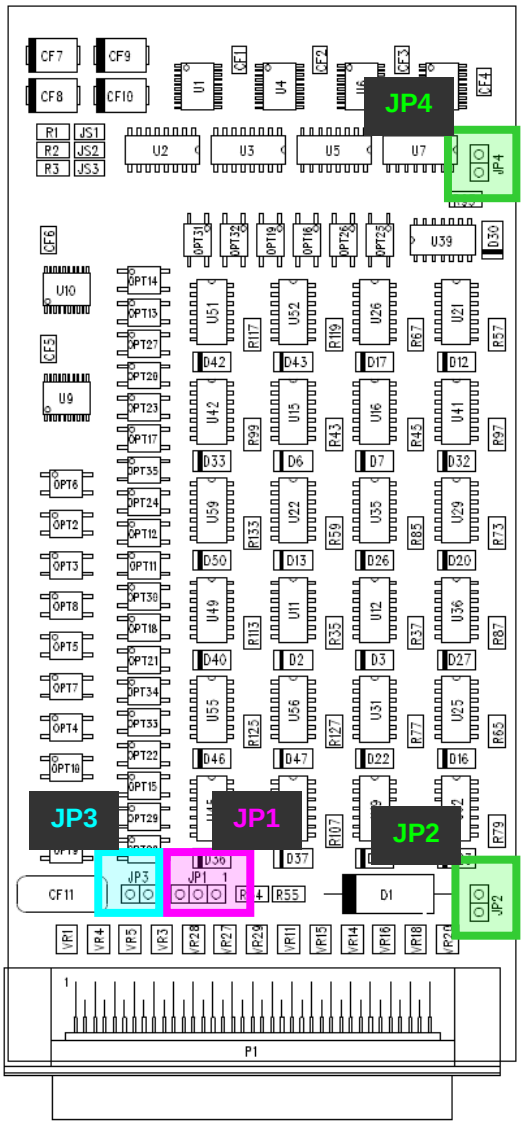
In the table below are highlighted the factory presets.

Digital I/O power supply	JP2	JP4
External (PLC-NCU)	**Open**	**Open**
Internal (VM15 Rack)	Close	Close

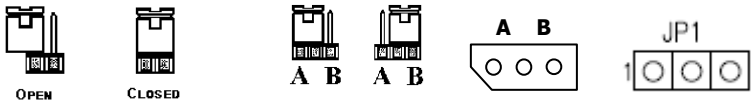
GND vs EARTH connection	JP3	
Indipendent	**Open**	
Connected	Close	

Inputs type	JP1	
Source	**Close A**	
Sink	Close B	

3.3.2. Digital I/O card version 2.0



3.3.2.1. Hardware setup



In the table below are highlighted the factory presets.

Digital I/O power supply	JP2	JP4
External (PLC-NCU)	**Open**	**Open**
Internal (VM15 Rack)	Close	Close

GND vs EARTH connection	JP3	
Indipendent	**Open**	
Connected	Close	

Inputs type	JP1	
Source	**Close A**	
Sink	Close B	

3.4. Signals interface and timing diagrams

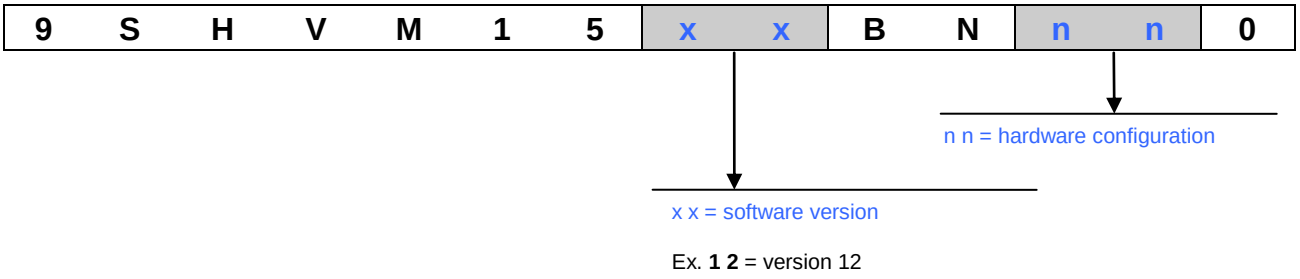
See document Signals interface

3.5. Firmware upgrade

The firmware upgrade is possible by VM Service package. See document Service to know the procedure.

3.6. Balancer [BN type]

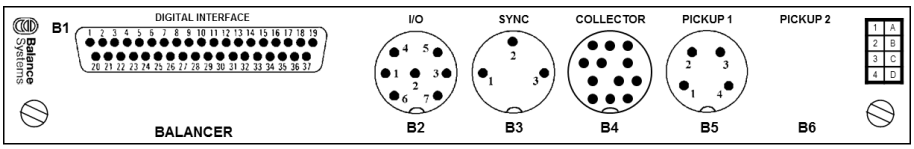
3.6.1. Part number

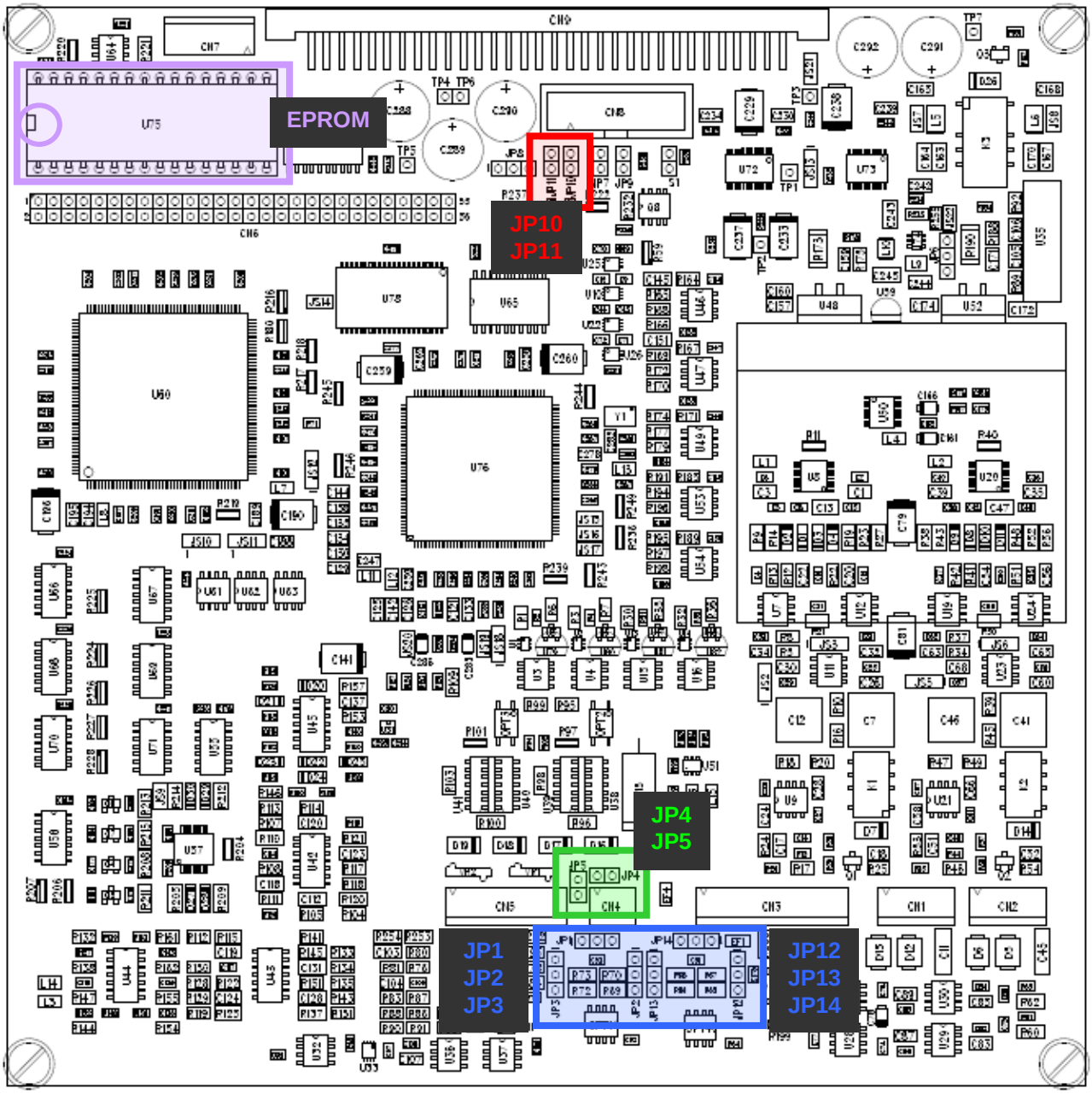


Ex. **1 2** = version 12

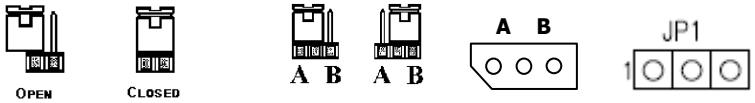
Connections and auxiliary functions depend on the hardware configuration.

3.6.2. Card layout and topographic scheme





3.6.3. Hardware setup



In the table below are highlighted the factory presets.

Card address	JP10	JP11
Balancer 1	**Open**	**Open**

SYNC 1: Synchronism sensor type	JP2	JP3
NPN	**Close A**	**Close A**
PNP / Switch 2 wires	Close B	Close B

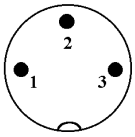
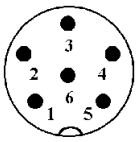
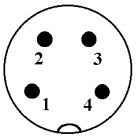
SYNC 1: Power supply	JP1	
24 Vdc	Close A	
15 Vdc	**Close B**	

SYNC 2: Synchronism sensor type	JP12	JP13
NPN	**Close A**	**Close A**
PNP / Switch 2 wires	Close B	Close B

SYNC 2: Power supply	JP14	
24 Vdc	Close A	
15 Vdc	**Close B**	

Digital I/O power supply	JP4	JP5
External (PLC-NCU)	**Open**	**Open**
Internal (VM15 Rack)	Close	Close

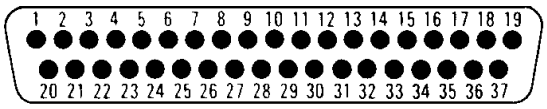
3.6.4. Connectors

Balancer [Type BN]			
Type	**ID**	**Name**	**Description**
 DIN 3 Pole	B3	Sync	Auxiliary synchronism sensor input 1. Ground 2. Signal 3. +15 Vdc power supply
 DIN 12 Pole	B4	Collector	**No-link collector** signals A. - DATA B. Ground C. - Power D. + Power E. +15 Vdc F. N.C. G. +15 Vdc switched H. Sync signal J. -15 Vdc K. + DATA L. N.C. M. N.C.
 DIN 6 Pole	B4	Collector	**Brushes collector** signals 1. Motor 2 2. Motor 1 3. Ground 4. +15 Vdc 5. Sync signal 6. N.C.
 DIN 4 Pole	B5	PickUp 1	Pickup 1 input – Plane A (vibration sensor) 1. -15 Vdc power supply 2. +15 Vdc power supply 3. Ground 4. Signal

3.6.5. Digital interface

3.6.5.1. Balancer card for 1 plane

Connector B1 D-Sub 37 pole male



PIN	Type	Name	Activation (*)	Description
1	Power	GND	--	Ground
19	Power	+24 Vdc	--	+24 Vdc power supply

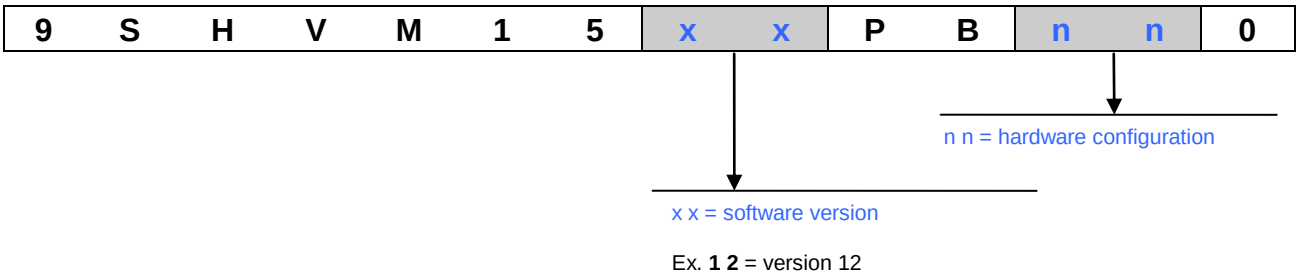
PIN	Type	Name	Activation (*)	Description
6	Input	Automatic lock	STATUS	ACTIVE STATUS: Switches and locks the device in automatic mode
20	Input	Start neutral	LOW > HIGH	Start neutral cycle
21	Input	Start balancing	LOW > HIGH	Start balancing cycle

PIN	Type	Name	Activation (*)	Description
12	Output	Alarm	LOW	ACTIVE STATUS: General alarm: activated to signal error conditions in operation of No-link collector or in the automatic cycles in progress.
13	Output	Cycle in-progress	STATUS	ACTIVE STATUS: Indicates which an automatic cycle is in progress
14	Output	Spindle stop	HIGH	ACTIVE STATUS: The rpm of the spindle is lower than the minimum limit programmed
15	Output	Nominal rpm	HIGH	The wheel has reached the condition of rpm at nominal speed
31	Output	Automatic mode	HIGH	ACTIVE STATUS: signal that the device is operating in automatic mode
36	Output	Max vibration	LOW	ACTIVE STATUS: The detected vibration are higher than the programmed limit of safety. See parameter “Max vibration”
37	Output	Spindle OK	HIGH	ACTIVE STATUS: ▪ While spindle is running signals that the wheel’s imbalance is within the set tolerance limits ▪ While spindle is stopped: signals the end of the "Neutral cycle”

(*) The activation status is always in SAFETY NEGATIVE LOGIC

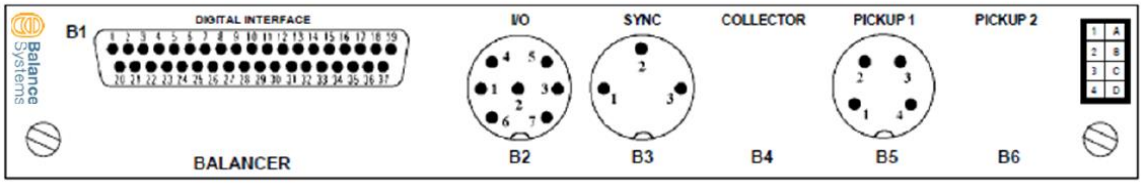
3.7. Pre-Balancer [PB type]

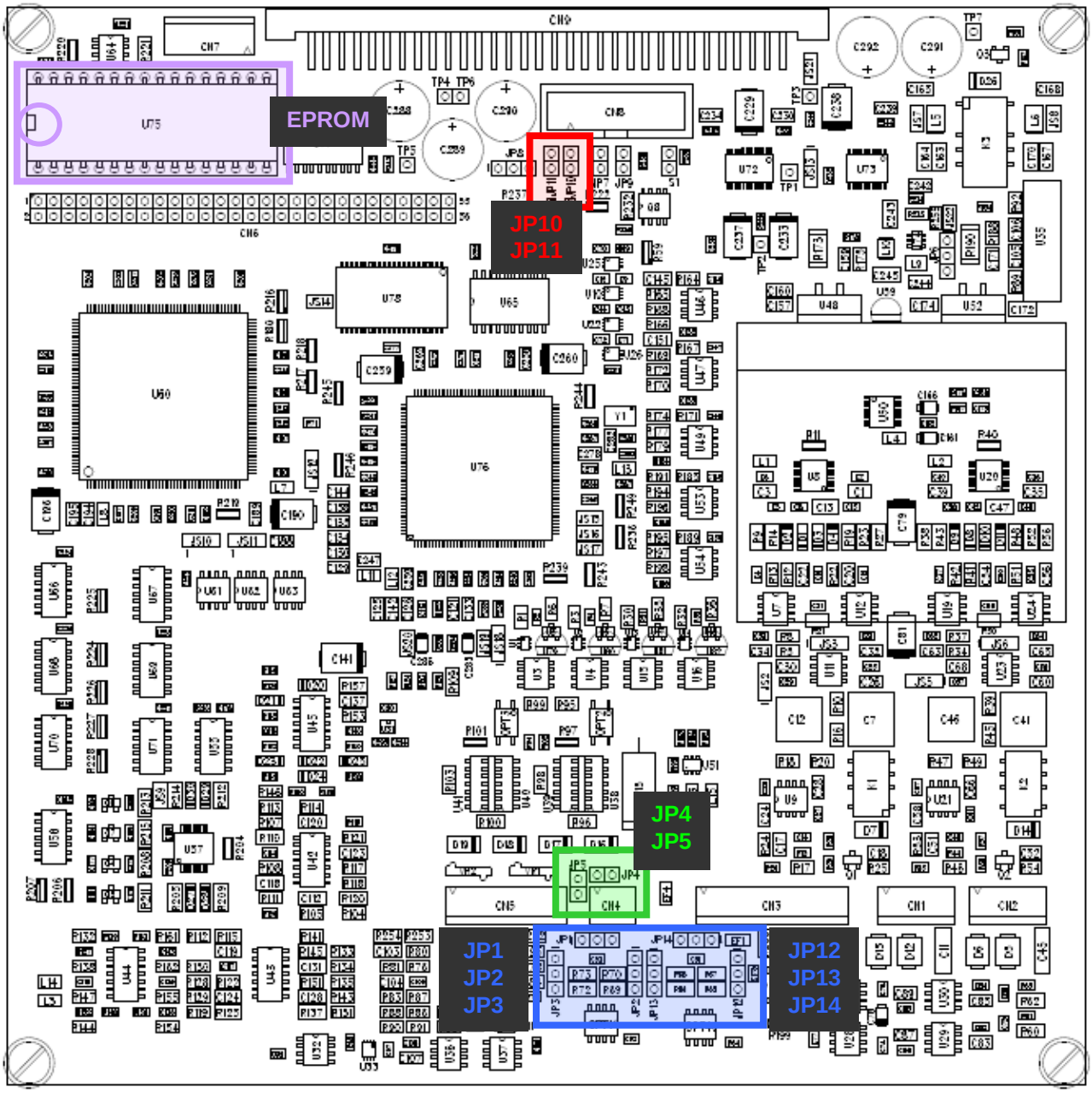
3.7.1. Part number



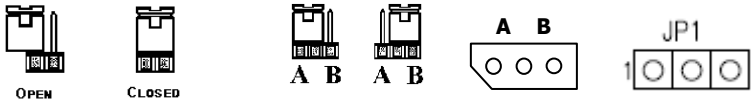
Connections and auxiliary functions depend on the hardware configuration.

3.7.2. Card layout and topographic scheme





3.7.3. Hardware setup



In the table below are highlighted the factory presets.

Card address	JP10	JP11
Balancer 1	**Open**	**Open**

SYNC 1: Synchronism sensor type	JP2	JP3
NPN	**Close A**	**Close A**
PNP / Switch 2 wires	Close B	Close B

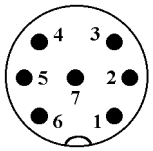
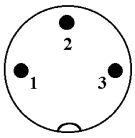
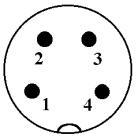
SYNC 1: Power supply	JP1	
24 Vdc	Close A	
15 Vdc	**Close B**	

SYNC 2: Synchronism sensor type	JP12	JP13
NPN	**Close A**	**Close A**
PNP / Switch 2 wires	Close B	Close B

SYNC 2: Power supply	JP14	
24 Vdc	Close A	
15 Vdc	**Close B**	

Digital I/O power supply	JP4	JP5
External (PLC-NCU)	**Open**	**Open**
Internal (VM25 Rack)	Close	Close

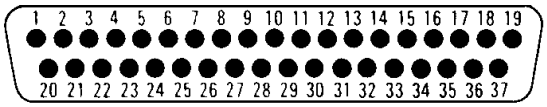
3.7.4. Connectors

Balancer [Type PB]			
Type	**ID**	**Name**	**Description**
 DIN 7 Pole	B2	I/O	I/O signals 1. N.C. 2. Ground 3. Digital output 1 4. +24 Vdc 5. Analog output - positive 6. Digital output 2 7. Analog output - ground
 DIN 3 Pole	B3	Sync	Auxiliary synchronism sensor input 4. Ground 5. Signal 6. +15 Vdc power supply
 DIN 4 Pole	B5	PickUp 1	Pickup 1 input – Plane A (vibration sensor) 5. -15 Vdc power supply 6. +15 Vdc power supply 7. Ground 8. Signal

3.7.5. Digital interface

3.7.5.1. Pre-Balancer card for 1 plane

Connector B1 D-Sub 37 pole male



PIN	Type	Name	Activation (*)	Description
1	Power	GND	--	Ground
19	Power	+24 Vdc	--	+24 Vdc power supply

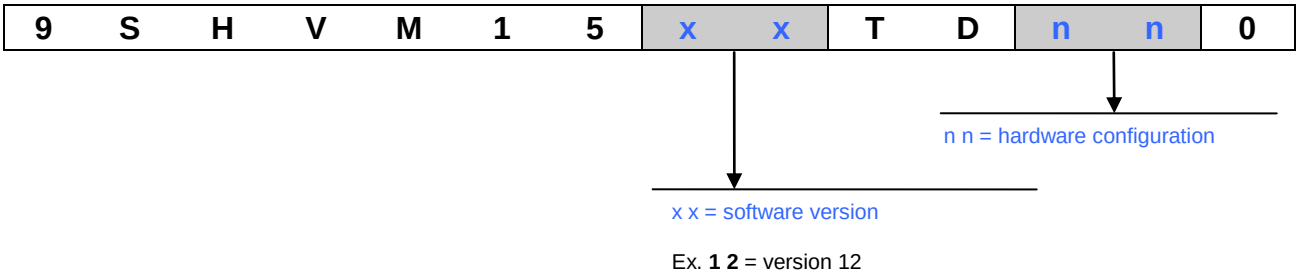
PIN	Type	Name	Activation (*)	Description
6	Input	Automatic lock	STATUS	ACTIVE STATUS: Switches and locks the device in automatic mode

PIN	Type	Name	Activation (*)	Description
8	Output	Pickup 1 ok	STATUS	ACTIVE STATUS: Indicates which the pickup No.1 (connected to B5) is ready to use
12	Output	Alarm	LOW	ACTIVE STATUS: General alarm.
14	Prog. Output	Spindle stop	HIGH	ACTIVE STATUS: The rpm of the spindle is lower than the minimum limit programmed
		Spindle run	HIGH	ACTIVE STATUS: The rpm of the spindle is higher than the minimum limit programmed
15	Prog. Output	Nominal rpm	HIGH	The wheel has reached the condition of rpm at nominal speed
31	Output	Automatic mode	HIGH	ACTIVE STATUS: signal that the device is operating in automatic mode
36	Output	Max vibration	LOW	ACTIVE STATUS: The detected vibration are higher than the programmed limit of safety. See parameter “Max vibration”
37	Output	Spindle OK	HIGH	ACTIVE STATUS: ▪ While spindle is running signals that the wheel’s unbalance is within the set tolerance limits

(*) The activation status is always in SAFETY NEGATIVE LOGIC.

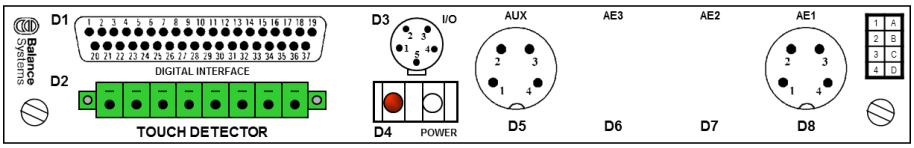
3.8. Touch Detector [TD type]

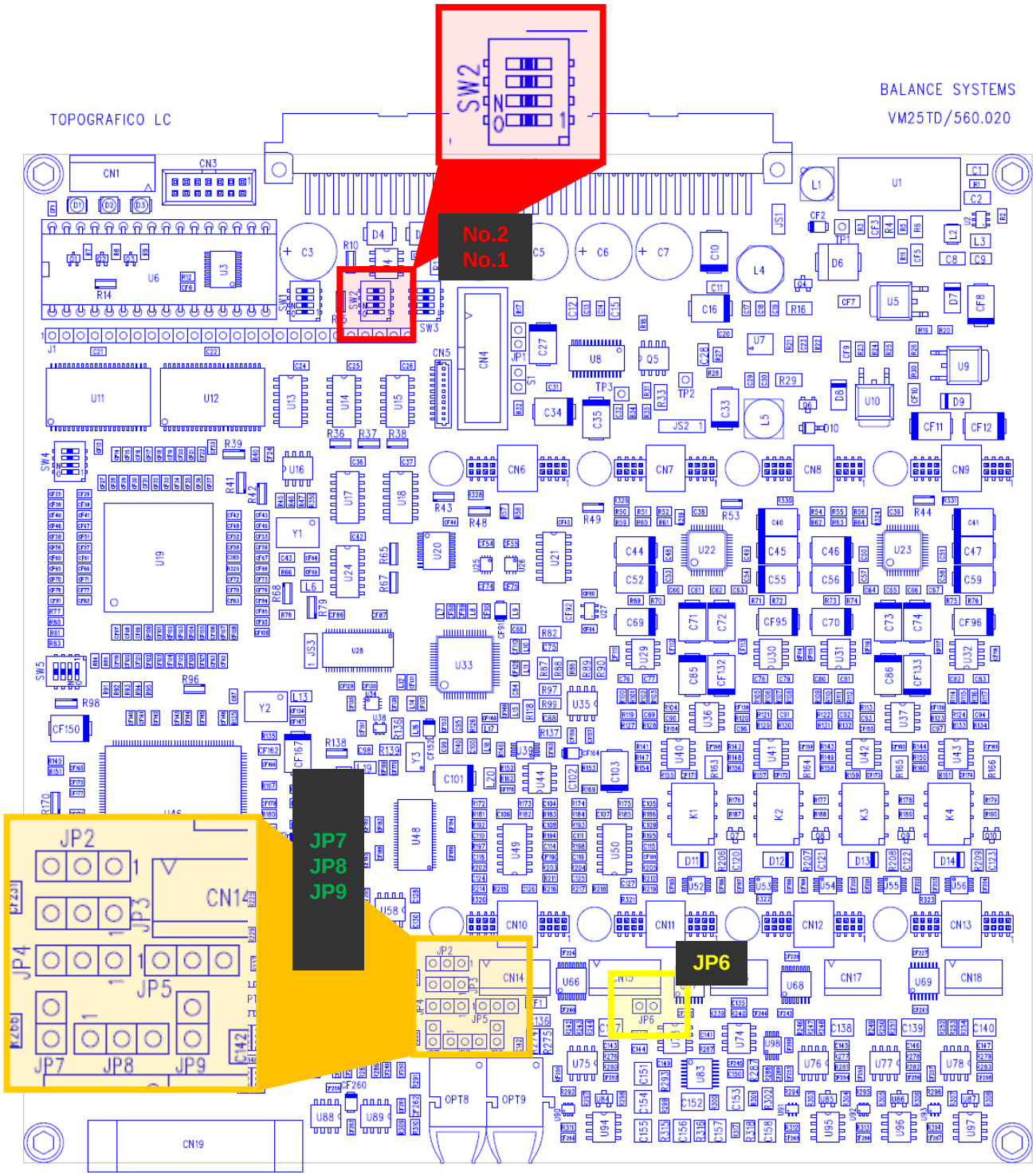
3.8.1. Part number



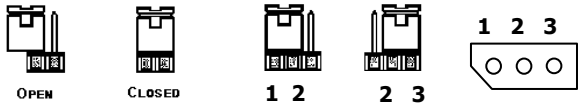
Connections and auxiliary functions depend on the hardware configuration.

3.8.2. Card layout and topographic scheme





3.8.3. Hardware setup



In the table below are highlighted the factory presets.

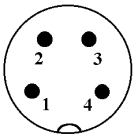
Card address	Switch 2 - No.1	Switch 2 - No.2
Touch detector 1	**OFF**	**OFF**

AUX input config	JP6	
Single ended	**Close**	
Differential	Open	

Digital I/O power supply	JP7	JP9
External (PLC-NCU)	**Open**	**Open**
Internal (VM15 Rack)	Close	Close

Digital Input type	JP8	
Source	**Close 1-2**	
Sink	Close 2-3	

3.8.4. Connectors

Touch Detector [Type TD]			
Type	**ID**	**Name**	**Description**
 DIN 4 Pole	D5 D8	AUX AE1	AE x sensor input 1. -15 Vdc power supply 2. +15 Vdc power supply 3. Ground 4. Signal
 LEMO 5 Pole	D3	I/O	I/O signals 1. Synch 2. Analog output, positive 3. Analog output, ground 4. +Vdc synch 5. Ground synch
 Fiber optic	D4	Power	Fiber optic input for power transducer network

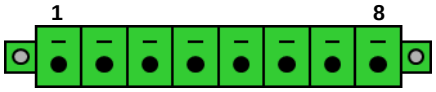
3.8.5. Analogic interface (optional) [Connector D3]

Analog output features	
Insulation voltage	500 V
Output voltage	0 – 10 V
Max current	10 mA
Source	Programmable
Resolution	16bit
Sampling frequency	10kHz

3.8.6. Digital interface

Connector D2 – Digital I/O

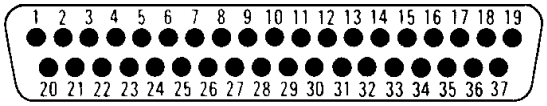
Type Phoenix 8 pin – MC 1,5/13-GF-3,5 THT



PIN	Type	Name	Activation (*)	Description
1	Input	Reset / Enable	Programmable	Limit 1,2,3,4 signaling reset
2	Prog. Input	Select 0 + Change PP	STATUS	For simple application: Part Program selection (LOW = PP1, HIGH = PP2) + Enable
		Automatic mode	STATUS	ACTIVE STATUS: Switches and locks the device in automatic mode
3	Power	+24 Vdc	--	Power supply 24 Vdc
4	Output	Limit 1	LOW	ACTIVE STATUS: Limit 1 signaling
5	Prog. Output	Limit 2 A	LOW	ACTIVE STATUS: Limit 2 signaling
		Fault	LOW	ACTIVE STATUS: General alarm: activated to signal error conditions.
		Echo Select	STATUS	For simple application: Selected Part Program (LOW = PP1, HIGH = PP2) + Data valid
		Cycle in progress	STATUS	ACTIVE STATUS: Cycle in progress. The system is ready for signaling
6	Prog. Output	Limit 3	LOW	ACTIVE STATUS: Limit 3 signaling
		Automatic mode	HIGH	ACTIVE STATUS: signal that the device is operating in automatic mode
		Cycle in progress	STATUS	ACTIVE STATUS: Cycle in progress. The system is ready for signaling
7	Prog. Output	Limit 4	LOW	ACTIVE STATUS: Limit 4 signaling
		Automatic mode	HIGH	ACTIVE STATUS: signal that the device is operating in automatic mode
		Echo Select	STATUS	For simple application: Selected Part Program (LOW = PP1, HIGH = PP2) + Data valid
		Cycle in progress	STATUS	ACTIVE STATUS: Cycle in progress. The system is ready for signaling
		Reset in progress	STATUS	ACTIVE STATUS: Reset in progress. The system is not able to update the outputs Limits
8	Power	GND	--	Power supply Ground

(*) The activation status is always in SAFETY NEGATIVE LOGIC
(**) SELECT = SECLECT "0" + PART-PROGRAM ENABLE.

Connector D1 – Digital I/O



D-Sub 37 pole male

PIN	Type	Name	Activation (*)	Description
1	Power	GND	--	Ground
19	Power	+24 Vdc	--	+24 Vdc power supply

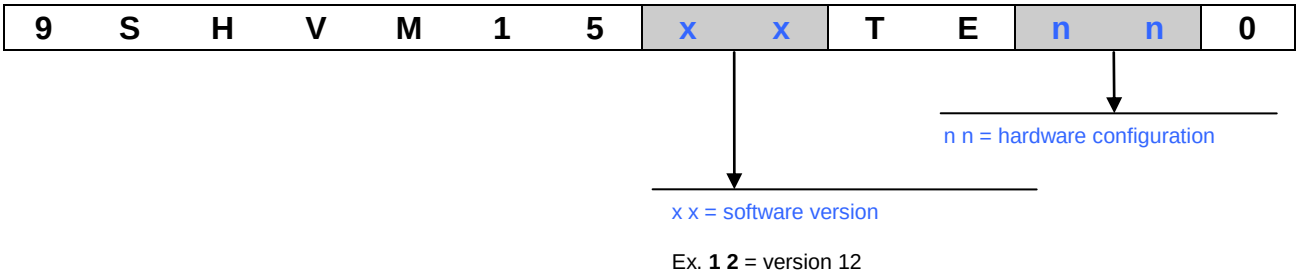
PIN	Type	Name	Activation (*)	Description
6	Input	Automatic lock	STATUS	ACTIVE STATUS: Switches and locks the device in automatic mode
21	Input	Select 0	STATUS	Bit 0 for program/setup selection; together with Select 1,2,3 these are used in binary code for indicating the program to activate
23	Input	PP change	STATUS	Change Part-Program, according to Select 0,1,2,3
24	Input	Select 1	STATUS	Bit 1 for program/setup selection; together with Select 0,2,3 these are used in binary code for indicating the program to activate

PIN	Type	Name	Activation (*)	Description
12	Output	Cycle in progress	STATUS	ACTIVE STATUS: Cycle in progress. The system is ready for signaling
13	Output	Echo PP Sel 0	STATUS	Program selection bit 0 (Select 0) echo
14	Output	Echo PP Sel 1	STATUS	Program selection bit 1 (Select 1) echo
15	Output	Data valid PP	HIGH	Echo PP Select data valid
31	Output	Fault	LOW	ACTIVE STATUS: General alarm: activated to signal error conditions.
36	Output	Automatic mode	HIGH	ACTIVE STATUS: signal that the device is operating in automatic mode

(*) The activation status is always in SAFETY NEGATIVE LOGIC

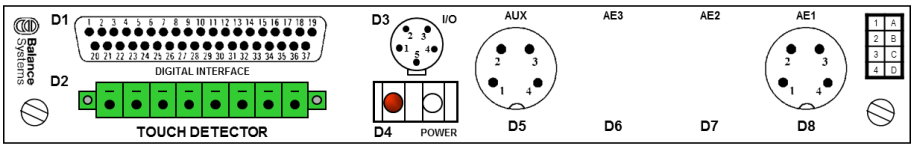
3.9. Touch Detector with Envelope [TD type]

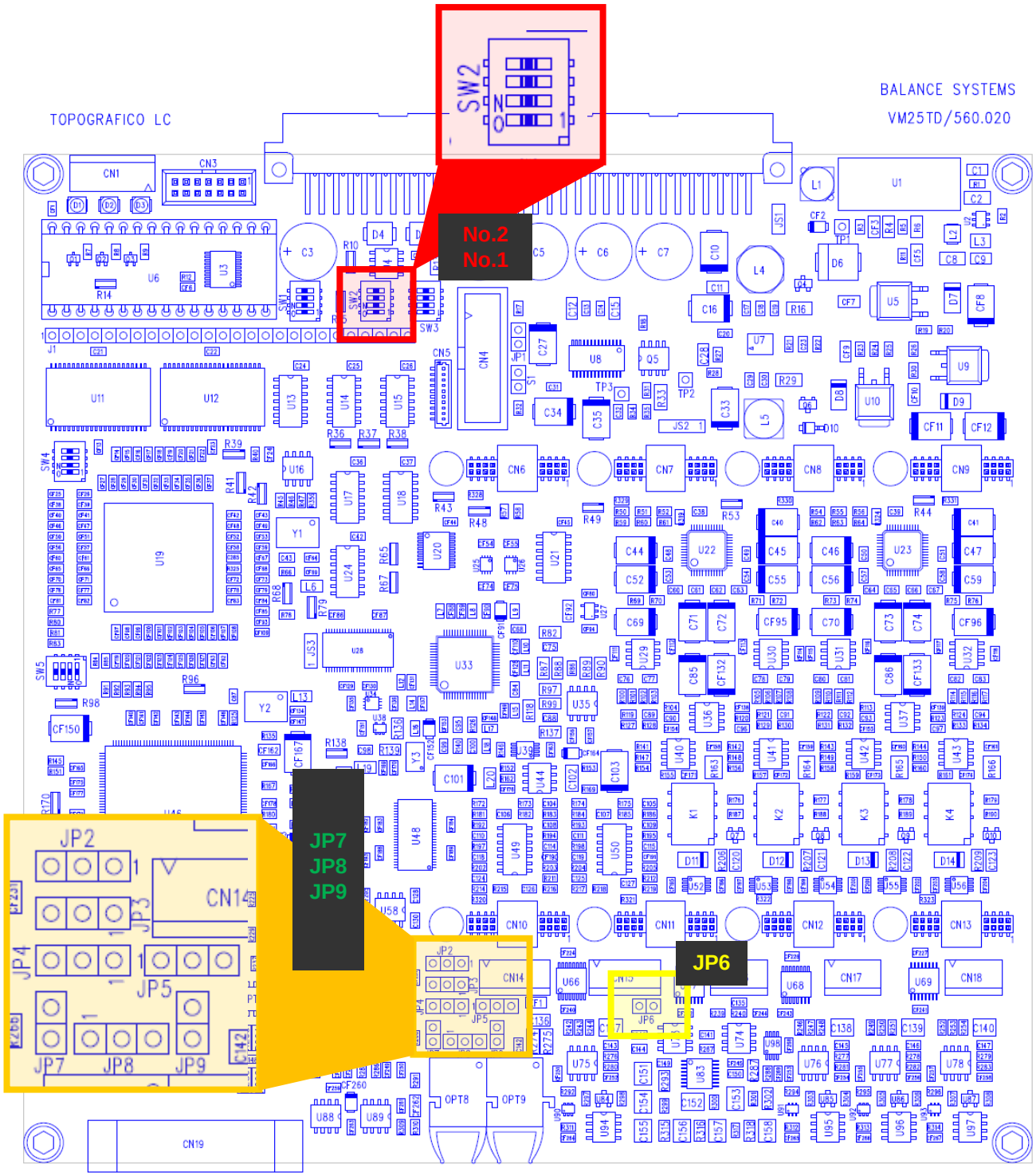
3.9.1. Part number



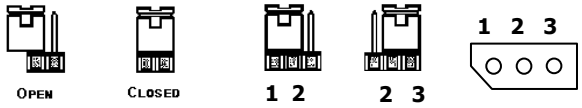
Connections and auxiliary functions depend on the hardware configuration.

3.9.2. Card layout and topographic scheme





3.9.3. Hardware setup



In the table below are highlighted the factory presets.

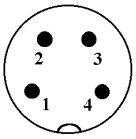
Card address	Switch 2 - No.1	Switch 2 - No.2
Touch detector 1	**OFF**	**OFF**

AUX input config	JP6	
Single ended	**Close**	
Differential	Open	

Digital I/O power supply	JP7	JP9
External (PLC-NCU)	**Open**	**Open**
Internal (VM15 Rack)	Close	Close

Digital Input type	JP8	
Source	**Close 1-2**	
Sink	Close 2-3	

3.9.4. Connectors

Touch Detector [Type TD]			
Type	**ID**	**Name**	**Description**
 DIN 4 Pole	D5 D8	AUX AE1	AE x sensor input 5. -15 Vdc power supply 6. +15 Vdc power supply 7. Ground 8. Signal
 LEMO 5 Pole	D3	I/O	I/O signals 6. Synch 7. Analog output, positive 8. Analog output, ground 9. +Vdc synch 10. Ground synch
 Fiber optic	D4	Power	Fiber optic input for power transducer network

3.9.5. Analogic interface (optional) [Connector D3]

Analog output features	
Insulation voltage	500 V
Output voltage	0 – 10 V
Max current	10 mA
Source	Programmable
Resolution	16bit
Sampling frequency	10kHz

3.9.6. Digital interface

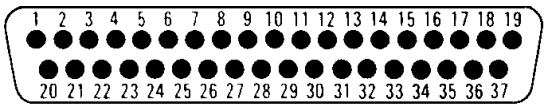
Connector D2 – Digital I/O

Type Phoenix 8 pin – MC 1,5/13-GF-3,5 THT

PIN	Type	Name	Activation (*)	Description
1	Input	Reset	Programmable	Section A Limit 1,2,3,4 signaling reset
2	Input	ENV Master clear ENV Autostart (EXT)	STATUS	If no process has been started and ENV STOP signaling (D1 connector, PIN 22) is on HIGH level, it deletes current stored master shape. If process is currently started (D1 connector, PIN 4), it starts the comparison between current process and stored master shape.
3	Power	+24 Vdc	--	Power supply 24 Vdc
4	Output	Limit 1	LOW	ACTIVE STATUS: Limit 1 signaling
5	Output	Limit 2	LOW	ACTIVE STATUS: Limit 2 signaling
6	Output	Limit 3	LOW	ACTIVE STATUS Limit 3 signaling
7	Output	Limit 4	LOW	ACTIVE STATUS: Limit 4 signaling
8	Power	GND	--	Power supply Ground

(*) The activation status is always in SAFETY NEGATIVE LOGIC
(**) SELECT = SECLECT "0" + PART-PROGRAM ENABLE.

Connector D1 – Digital I/O



D-Sub 37 pole male

PIN	Type	Name	Activation (*)	Description
1	Power	GND	--	Ground
19	Power	+24 Vdc	--	+24 Vdc power supply

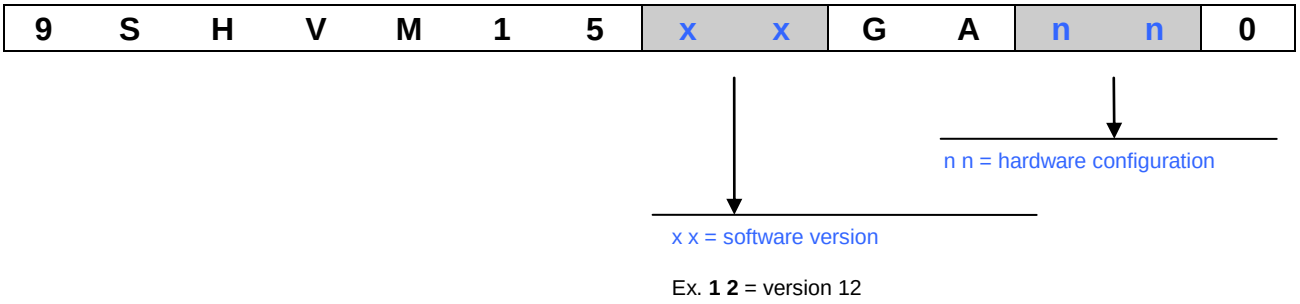
PIN	Type	Name	Activation (*)	Description
3	Input	ENV Learning start / stop	STATUS	Learning cycle enabling / disabling (master shape performing)
4	Input	ENV start	LOW > HIGH	Start current process (master learning or processes comparison)
6	Input	Automatic lock	STATUS	ACTIVE STATUS: Switches and locks the device in automatic mode
21	Input	Select 0	STATUS	Bit 0 for program/setup selection; together with Select 1 these are used in binary code for indicating the program to activate
22	Input	ENV stop	LOW > HIGH	Stop current process (master learning or processes comparison)
23	Input	PP A change	STATUS	Change Part-Program Section A, according to Select 0,1
24	Input	Select 1	STATUS	Bit 1 for program/setup selection; together with Select 0 these are used in binary code for indicating the program to activate

PIN	Type	Name	Activation (*)	Description
8	Output	Reset in progress	STATUS	ACTIVE STATUS: Reset in progress. The system is not able to update the outputs Limits
9	Output	ENV cycle stopped	STATUS	Current process (learning or comparison) has been stopped
10	Output	ENV Learing in progress	STATUS	ACTIVE STATUS: Cycle in progress. Master shape learning process is currently in progress
11	Output	ENV cycle in progress	STATUS	ACTIVE STATUS: Cycle in progress. The system is ready for signaling. Comparison between current process and master shape is currently in progress
12	Output	Cycle in progress	STATUS	ACTIVE STATUS: Cycle in progress. The system is ready for signaling
13	Output	Echo PP Sel 0 A	STATUS	Program selection bit 0 (Select 0) Section A echo
14	Prog. Output	Echo PP Sel 1 A	STATUS	Program selection bit 1 (Select 1) Section A echo
15	Output	Data valid PP A	HIGH	Echo PP Select data valid for Section A
16	Output	ENVprocess over tolerance	STATUS	One or more zones are over higher master shape tolerance. Reported during the comparison process.
17	Output	ENV process below tolerance	STATUS	One or more zones are below lower master shape tolerance. Reported during the comparison process.
18	Output	ENV process completed	STATUS	Comparison process correctly executed
26	Output	ENV cycle duration learning	STATUS	ACTIVE STATUS: Cycle in progress. Cycle duration learning process is currently in progress. In this condition, Autostart parameter is activated.
27	Output	ENV no stored master	STATUS	No master is currently stored. Learning cycle is required
28	Output	ENV zone below tollerance	STATUS	Current zone below lower master shape tolerance. (It is also reported by YELLOW zone) Reported during the comparison process.
29	Output	ENV zone over tollerance	STATUS	Current zone over higher master shape tolerance (It is also reported by ORANGE zone) Reported during the comparison process.
31	Output	Fault	LOW	ACTIVE STATUS: General alarm: activated to signal error conditions.
33	Output	ENV process timeout	STATUS	Stop process signal (D1 connector PIN 22) has not been received after defined time on related parameter.
34	Output	ENV autostart timeout	STATUS	No autostart (EXT) signal (D2 connector PIN 2) or threshold signaling have been received after start signal (D1 connector PIN 4). System waits defined time on related parameter.
35	Output	ENV Ip crash	STATUS	ACTIVE STATUS: crash threshold signalling. Defined by related parameter
36	Output	Automatic mode	HIGH	ACTIVE STATUS: signal that the device is operating in automatic mode

(*) The activation status is always in SAFETY NEGATIVE LOGIC

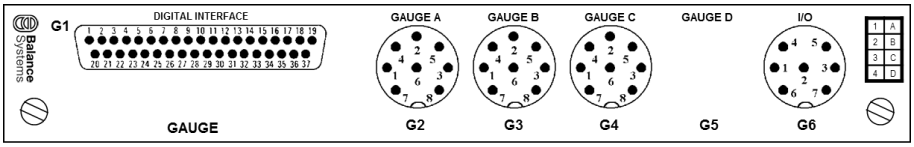
3.10. Gauge [GA type]

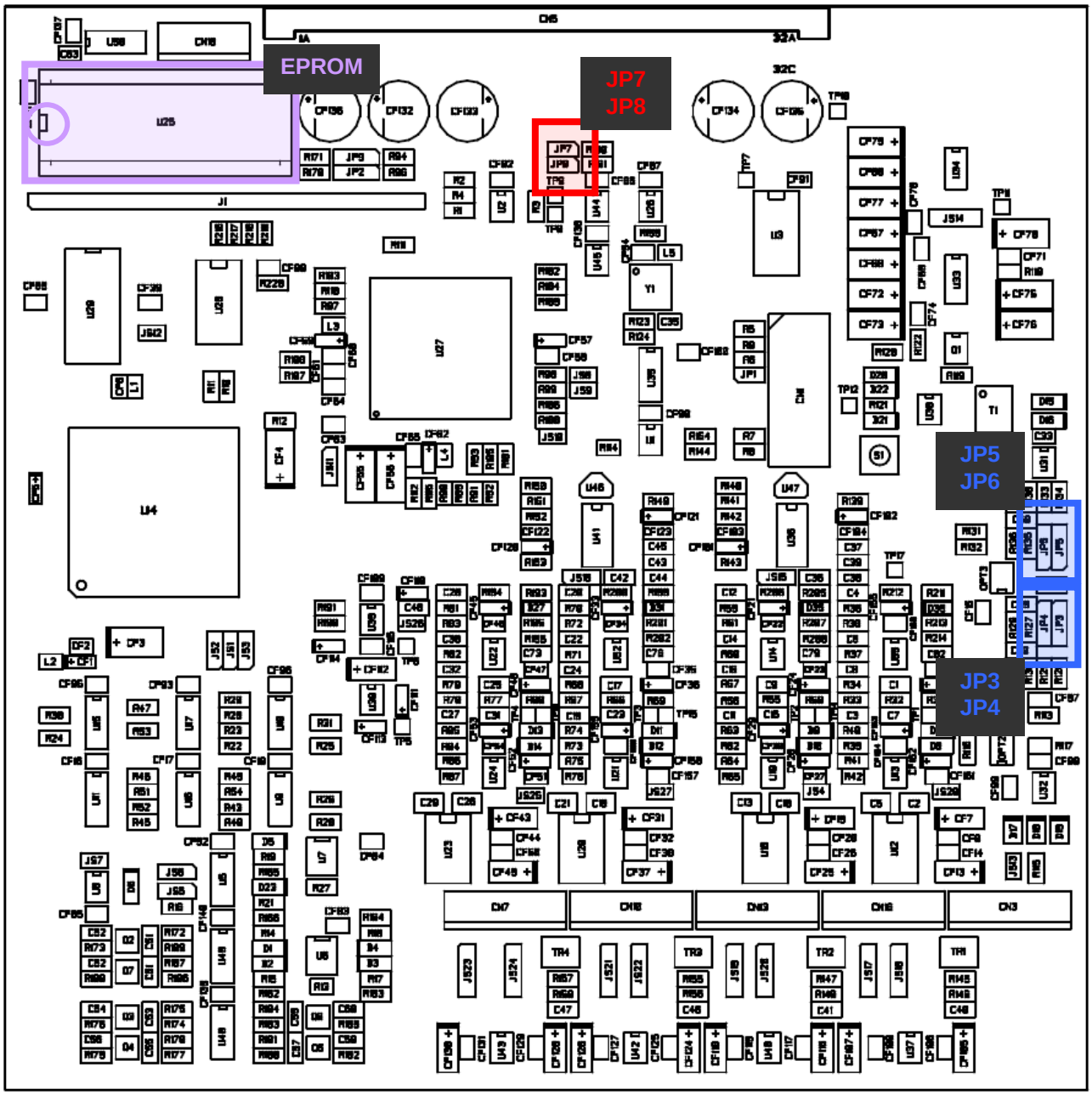
3.10.1. Part number



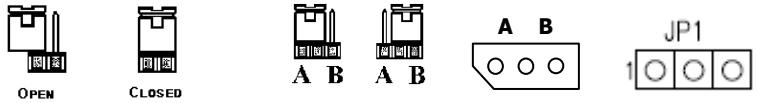
Connections and auxiliary functions depend on the hardware configuration.

3.10.2. Card layout and topographic scheme





3.10.3. Hardware setup



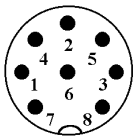
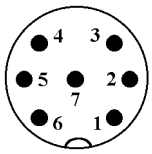
In the table below are highlighted the factory presets.

Card address	JP7	JP8
Gauge 1	**Open**	**Open**

SYNC 1: Synchronism sensor type	JP3	JP4
NPN	**Close A**	**Close A**
PNP / Switch 2 wires	Close B	Close B

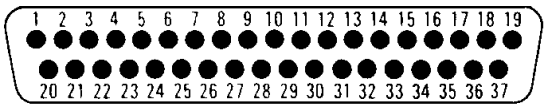
SYNC 2: Synchronism sensor type	JP5	JP6
NPN	**Close A**	**Close A**
PNP / Switch 2 wires	Close B	Close B

3.10.4. Connectors

Gauge [p/n 9SHVM1511GAxx0]			
Type	**ID**	**Name**	**Description**
 DIN 8 Pole	G2 G3 G4	GAUGE 2 GAUGE 3 GAUGE 4	Gauge transducer input 1. + Excitation voltage 2. + Measure signal 3. Ground 4. Data 5. – Measure signal 6. –15 Vdc power supply 7. +15 Vdc power supply 8. – Excitation voltage
 DIN 7 Pole	G6	I/O	I/O signals 1. BUS ground 2. Ground 3. Signal Sync 1 4. +24 Vdc 5. BUS high 6. Signal Sync 2 7. BUS low

3.10.5. Digital interface

Connector G1 D-Sub 37 pole male



PIN	Type	Name	Activation (*)	Description
1	Power	GND	--	Ground
19	Power	+24 Vdc	--	+24 Vdc power supply

PIN	Type	Name	Activation (*)	Description
2	Input	Start / Enable Cycle	STATUS	Start / Enable gauging cycle
3	Input		STATUS	Activation of gauging value freeze. Can be used to hold temporarily the sampling of the gauge (i.e. to allow a dressing cycle during ID operation in oscillation)
4	Input	Zeroing	STATUS	Automatic zeroing input on master piece
5	Input	Retraction	STATUS	Activation of gauging tips retraction
6	Prog. Input	Not Used		
		Offset -	PULSE	Each pulse corresponds to an amount of decrement in the offset correction as programmed in the parameter “OFFSET INCREMENT STEP”
20	Input	Select 0	STATUS	Select PART PROGRAM Bit 0: together with Sel1, Sel2 defines the Part Program that should be activated at the next Start / Enable. The binary combination of the four signals allows up to 8 Part Program (see next paragraph)
21	Prog. Input	Select 1	STATUS	Select PART PROGRAM Bit 1 (see Pin 20)
		Offset +	STATUS	Each pulse corresponds to an amount of increment in the offset correction as programmed in the parameter “OFFSET INCREMENT STEP”
22	Prog. Input	Select 2	STATUS	Select PART PROGRAM Bit 2 (see Pin 20)
		Offset A reset	HIGH	Offset A zeroing
23	Input	Part Program change	HIGH	Enable the PART PROGRAM change
24	Input	Automatic mode	STATUS	ACTIVE STATUS: Switches and locks the device in automatic mode

Depending on part-program definition the automatic outputs are to be interpreted as described below.

3.10.5.1. In-Process gauging Part-Program

CASE 1: In Process Gauge				
PIN	**Type**	**Name**	**Activation (*)**	**Description**
7	Output	Command 3	LOW	ACTIVE STATUS: SKIP 3 (finishing)
8	Output	Command 2	LOW	ACTIVE STATUS: SKIP 2 (super-finishing)
9	Output	Command 1	LOW	ACTIVE STATUS: SKIP 1 (dwell or spark-out)
10	Output	Command 0	LOW	ACTIVE STATUS: SKIP 0 (size or end-cycle)
11	Output	Echo Hold	HIGH	ACTIVE STATUS: The dimension is frozen (Hold input activated)
12	Output	Undersize	LOW	ACTIVE STATUS: Undersize
13	Output	Alarm	LOW	ACTIVE STATUS: Alarm due to measuring system fault
14	Output	Auto	HIGH	ACTIVE STATUS: Gauge is operating in automatic mode
15	Output	Zero	HIGH	ACTIVE STATUS: signaling of zeroing master cycle executed
16	Output	Cycle in progress	HIGH	ACTIVE STATUS: Signaling measuring cycle in progress
17	Output	Overrange	LOW	ACTIVE STATUS: Signaling of measure out of range
18	Output	Retraction OK	HIGH	ACTIVE STATUS: Signaling of retractioned gauging heads
25	Output	Echo select 2	STATUS	Echo of the program selection bit 2 (Select 2)
26	Output	Echo select 1	STATUS	Echo of the program selection bit 1 (Select 1)
27	Output	Echo select 0	STATUS	Echo of the program selection bit 0 (Select 0)
28	Output	Data valid PP	HIGH	ACTIVE STATUS: Echo PP Select data valid
33	Output	Command 4	LOW	ACTIVE STATUS: SKIP 4 (roughing)

(*) The activation status is always in SAFETY NEGATIVE LOGIC

3.10.5.2. Pre-Process gauging Part-Program (Flagging)

CASE 2: Pre-Process Gauge (Flagging)				
PIN	**Type**	**Name**	**Activation (*)**	**Description**
7	Output	Flag OK	STATUS	The flag value is in tolerance
8	Output	Bit 12 MSB - sign	STATUS	dimension bit 12 (MSB) - Sign
9	Output	Bit 11	STATUS	dimension bit 11
10	Output	Bit 10	STATUS	dimension bit 10
11	Output	Bit 9	STATUS	dimension bit 9
12	Output	Bit 8	STATUS	dimension bit 8
13	Output	Alarm	LOW	ACTIVE STATUS: Alarm due to measuring system fault
14	Output	Auto	HIGH	ACTIVE STATUS: Gauge is operating in automatic mode
15	Output	Zero	HIGH	ACTIVE STATUS: signaling of zeroing master cycle executed
16	Output	Cycle in progress	HIGH	ACTIVE STATUS: Signaling measuring cycle in progress
17	Output	Overrange	LOW	ACTIVE STATUS: Signaling of measure out of range
18	Output	Retraction OK	HIGH	ACTIVE STATUS: Signaling of retractioned gauging heads
25	Output	Echo select 2	STATUS	Echo of the program selection bit 2 (Select 2)
26	Output	Echo select 1	STATUS	Echo of the program selection bit 1 (Select 1)
27	Output	Echo select 0	STATUS	Echo of the program selection bit 0 (Select 0)
28	Output	Data valid PP	HIGH	ACTIVE STATUS: Echo PP Select data valid
29	Output	Bit 7	STATUS	dimension bit 7
30	Output	Bit 6	STATUS	dimension bit 6
31	Output	Bit 5	STATUS	dimension bit 5
32	Output	Bit 4	STATUS	dimension bit 4
33	Output	Bit 3	STATUS	dimension bit 3
34	Output	Bit 2	STATUS	dimension bit 2
35	Output	Bit 1	STATUS	dimension bit 1
36	Output	Bit 0 LSB	STATUS	dimension bit 0 (LSB)
37	Output	Data valid	HIGH	Data valid bit: use this bit to synchronize the dimension read operation. The data valid stays active 50 ms to indicate that the value on pins is ready to be red. The data valid signal is delayed 10 ms after outputs update.

(*) The activation status is always in SAFETY NEGATIVE LOGIC

3.10.5.3. Post-Process gauging Part-Program

The outputs are coded according to the limits of tolerance and compensation programmed.

CASE 3: Post Process Gauge				
PIN	**Type**	**Name**	**Activation (*)**	**Description**
7	Output	Bit 2 – coded zone	STATUS	See table below
8	Output	Bit 1 – coded zone	STATUS	See table below
9	Output	Bit 0 – coded zone	STATUS	See table below
10	Output	Data valid	HIGH	ACTIVE STATUS: MEASURE OK, DATA VALID
11	Output	Echo Hold	HIGH	ACTIVE STATUS: The dimension is frozen (Hold input activated)
13	Output	Alarm	LOW	ACTIVE STATUS: Alarm due to measuring system fault
14	Output	Auto	HIGH	ACTIVE STATUS: Gauge is operating in automatic mode
15	Output	Zero	HIGH	ACTIVE STATUS: signaling of zeroing master cycle executed
16	Output	Cycle in progress	HIGH	ACTIVE STATUS: Signaling measuring cycle in progress
17	Output	Overrange	LOW	ACTIVE STATUS: Signaling of measure out of range
18	Output	Retraction OK	HIGH	ACTIVE STATUS: Signaling of retractioned gauging heads
25	Output	Echo select 2	STATUS	Echo of the program selection bit 2 (Select 2)
26	Output	Echo select 1	STATUS	Echo of the program selection bit 1 (Select 1)
27	Output	Echo select 0	STATUS	Echo of the program selection bit 0 (Select 0)
28	Output	Data valid PP	HIGH	ACTIVE STATUS: Echo PP Select data valid

(*) The activation status is always in SAFETY NEGATIVE LOGIC

Post-Process gauging	Bit 2	Bit 1	Bit 0	Data valid
OUT OF UPPER TOLERANCE LIMIT (REJECT +)	HIGH	LOW	LOW	Data valid
COUNTERVAILABLE + +	HIGH	LOW	HIGH	
COUNTERVAILABLE +	HIGH	HIGH	LOW	
IN TOLERANCE	HIGH	HIGH	HIGH	
COUNTERVAILABLE -	LOW	HIGH	HIGH	
COUNTERVAILABLE - -	LOW	HIGH	LOW	
OUT OF LOWER TOLERANCE LIMIT (REJECT -)	LOW	LOW	HIGH	

3.10.5.4. Post-Process roundness Part-Program

In case of post-process roundness analysis it is possible to define the type of signaling associated with the automatic outputs S1, S2, S3 in terms of deviations, value of the shape components (excentricity, ovality, 3-lobe, 4-lobe, 5-lobe) or residual value.

S1 = COMPONENT > VALUE + COMPONENT < VALUE
S2 = COMPONENT > VALUE
S3 = COMPONENT > VALUE

CASE 4: Post Process Gauge				
PIN	**Type**	**Name**	**Activation (*)**	**Description**
7	Output	S1	LOW	ACTIVE STATUS: condition expressed by the formula S1 = TRUE
8	Output	S2	LOW	ACTIVE STATUS: condition expressed by the formula S2 = TRUE
9	Output	S3	LOW	ACTIVE STATUS: condition expressed by the formula S3 = TRUE
10	Output	Data valid	HIGH	ACTIVE STATUS: MEASURE OK, DATA VALID
11	Output	Echo Hold	HIGH	ACTIVE STATUS: The dimension is frozen (Hold input activated)
13	Output	Alarm	LOW	ACTIVE STATUS: Alarm due to measuring system fault
14	Output	Auto	HIGH	ACTIVE STATUS: Gauge is operating in automatic mode
15	Output	Zero	HIGH	ACTIVE STATUS: signaling of zeroing master cycle executed
16	Output	Cycle in progress	HIGH	ACTIVE STATUS: Signaling measuring cycle in progress
17	Output	Overrange	LOW	ACTIVE STATUS: Signaling of measure out of range
18	Output	Retraction OK	HIGH	ACTIVE STATUS: Signaling of retractioned gauging heads
25	Output	Echo select 2	STATUS	Echo of the program selection bit 2 (Select 2)
26	Output	Echo select 1	STATUS	Echo of the program selection bit 1 (Select 1)
27	Output	Echo select 0	STATUS	Echo of the program selection bit 0 (Select 0)
28	Output	Data valid PP	HIGH	ACTIVE STATUS: Echo PP Select data valid

(*) The activation status is always in SAFETY NEGATIVE LOGIC

3.10.5.5. In-Process gauging & Roundness Part-Program

CASE 5: In Process Gauge & Roundness				
PIN	**Type**	**Name**	**Activation (*)**	**Description**
7	Output	Command 3	In Process: LOW	In Process gauge: ACTIVE STATUS: SKIP 3 (finishing)
			Roundness: HIGH	ACTIVE STATUS: Roundness staus ok when: <L1> = FALSE and <L2> = FALSE and <L3> = FALSE (updated while the SKIP 0 is activated)
8	Output	Command 2	LOW	ACTIVE STATUS: SKIP 2 (super-finishing)
9	Output	Command 1	LOW	ACTIVE STATUS: SKIP 1 (dwell or spark-out)
10	Output	Command 0	LOW	ACTIVE STATUS: SKIP 0 (size or end-cycle)
11	Output	Echo Hold	HIGH	ACTIVE STATUS: The dimension is frozen (Hold input activated)
12	Output	Undersize	LOW	ACTIVE STATUS: Undersize
13	Output	Alarm	LOW	ACTIVE STATUS: Alarm due to measuring system fault
14	Output	Auto	HIGH	ACTIVE STATUS: Gauge is operating in automatic mode
15	Output	Zero	HIGH	ACTIVE STATUS: signaling of zeroing master cycle executed
16	Output	Cycle in progress	HIGH	ACTIVE STATUS: Signaling measuring cycle in progress
17	Output	Overrange	LOW	ACTIVE STATUS: Signaling of measure out of range
18	Output	Retraction OK	HIGH	ACTIVE STATUS: Signaling of retractioned gauging heads
25	Output	Echo select 2	STATUS	Echo of the program selection bit 2 (Select 2)
26	Output	Echo select 1	STATUS	Echo of the program selection bit 1 (Select 1)
27	Output	Echo select 0	STATUS	Echo of the program selection bit 0 (Select 0)
28	Output	Data valid PP	HIGH	ACTIVE STATUS: Echo PP Select data valid
33	Output	Command 4	LOW	ACTIVE STATUS: SKIP 4 (roughing)

(*) The activation status is always in SAFETY NEGATIVE LOGIC

3.11. Gauge [NG type]

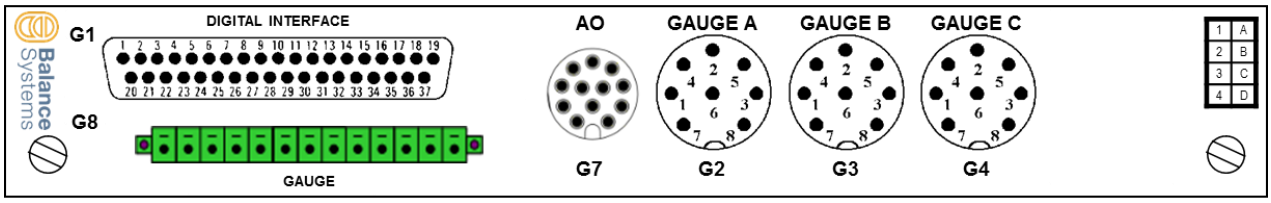
3.11.1. Part number

9	S	H	V	M	1	5	1	2	N	G	n	n	0

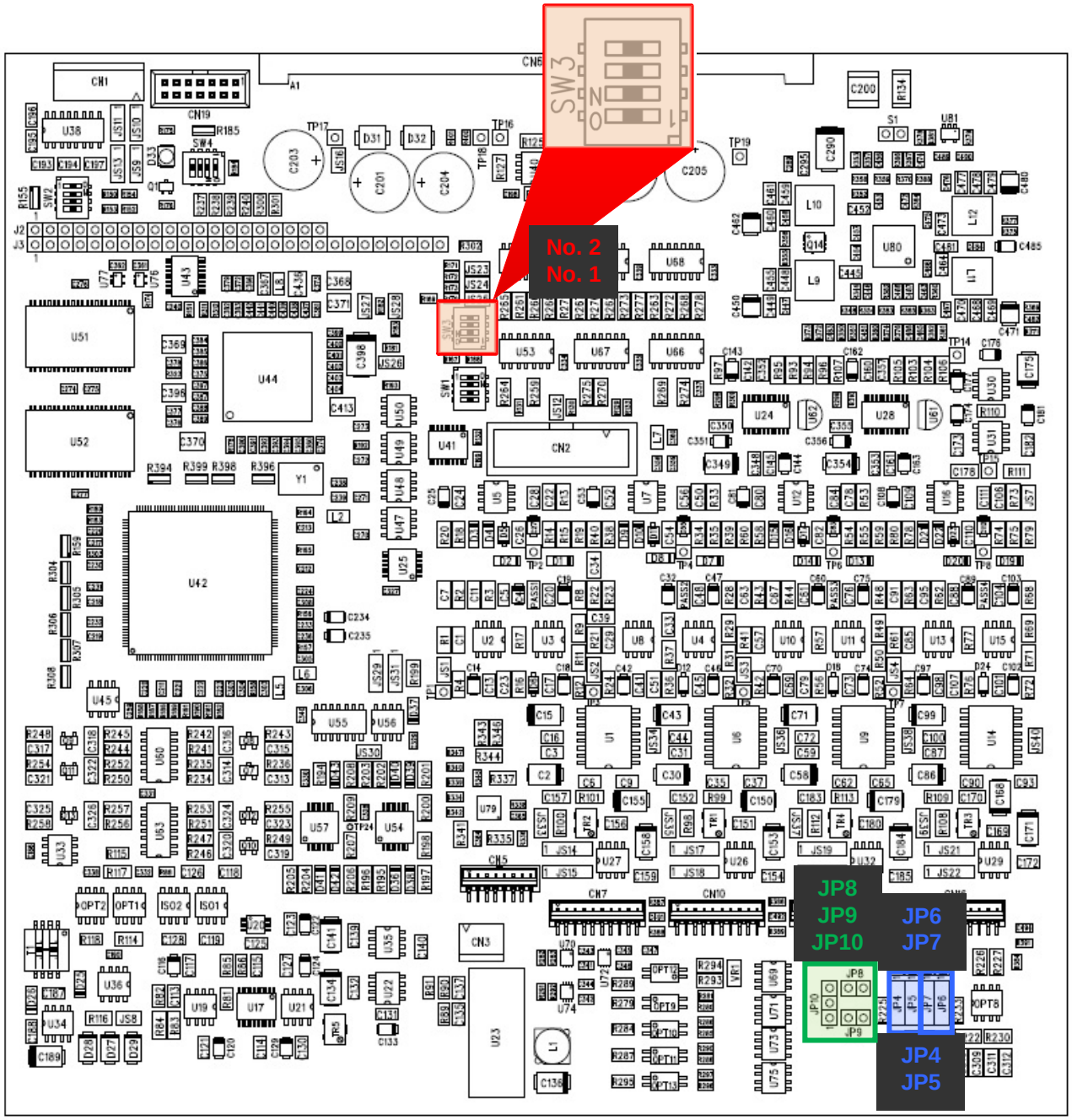
n n = hardware configuration

Connections and auxiliary functions depend on the hardware configuration.

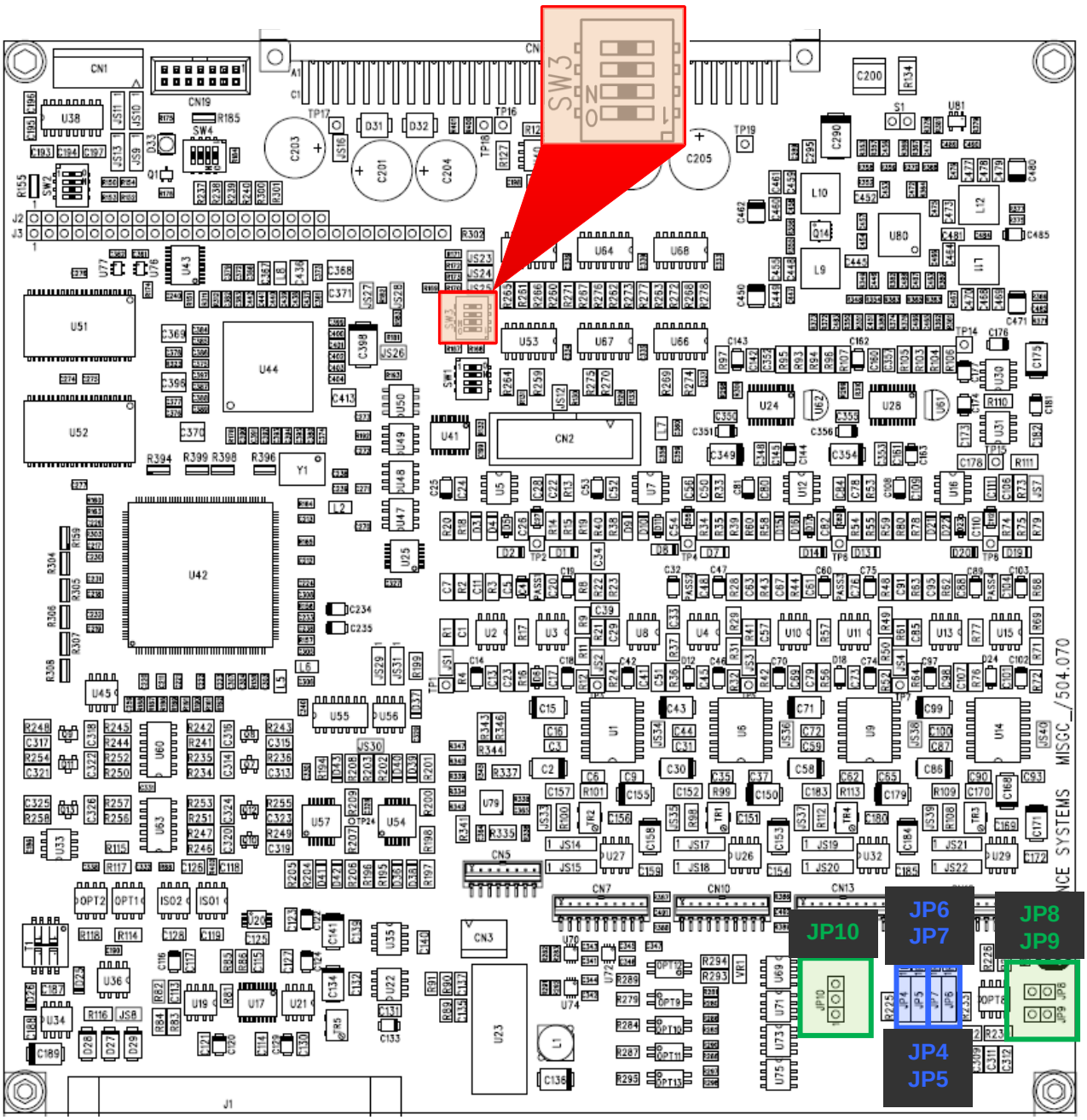
3.11.2. Card layout and topographic scheme



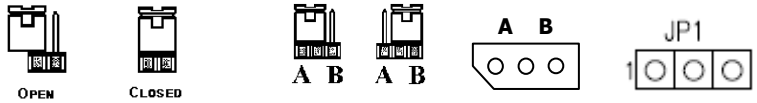
3.11.2.1. Topographic scheme ver. 1.0



3.11.2.2. Topographic scheme ver. 2.0



3.11.3. Hardware setup



In the table below are highlighted the factory presets.

Card address	Switch 3 - No.1	Switch 3 - No.2
Gauge 1	**OFF**	**OFF**

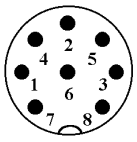
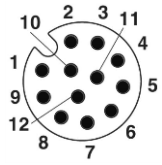
SYNC 1: Synchronism sensor type	JP4	JP5
NPN	**Close A**	**Close A**
PNP / Switch 2 wires	Close B	Close B

SYNC 2: Synchronism sensor type	JP6	JP7
NPN	**Close A**	**Close A**
PNP / Switch 2 wires	Close B	Close B

Digital I/O power supply	JP8	JP9
External (PLC-NCU)	**Open**	**Open**
Internal (VM25 Rack)	Close	Close

Digital Input type	JP10	
Source	**Close A**	
Sink	Close B	

3.11.4. Connectors

Gauge [p/n 9SHVM2512NGxx0]			
Type	**ID**	**Name**	**Description**
 DIN 8 Pole	G2 G3 G4	GAUGE 2 GAUGE 3 GAUGE 4	Gauge transducer input 9. + Excitation voltage 10. + Measure signal 11. Ground 12. Data 13. - Measure signal 14. -15 Vdc power supply 15. +15 Vdc power supply 16. - Excitation voltage
 DIN 12 Pole	G7	AO	Gauge analog output and encoder 1. -- 2. -- 3. -- 4. -- 5. -- 6. -- 7. +5 Vdc power supply 8. -- 9. N.C. 10. Analog output, positive 11. Analog output, ground 12. Shield

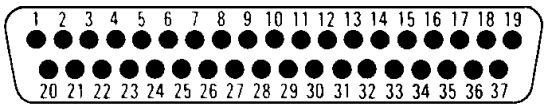
Connector G8 – I/O

Type Phoenix 13 pin – MC 1,5/13-GF-3,5 THT

PIN	Type	Name	Activation (*)	Description
1	--	--		
2	--	--		
3	--	--		
4		Signal Sync 1		Signal Sync 1
5	--	--		
7	Power	+24 Vdc	--	+24 Vdc power supply
13	Power	PE	--	Earth
12	Power	GND	--	Ground

3.11.5. Digital interface

Connector G1 D-Sub 37 pole male



PIN	Type	Name	Activation (*)	Description
1	Power	GND	--	Ground
19	Power	+24 Vdc	--	+24 Vdc power supply

PIN	Type	Name	Activation (*)	Description
2	Input	Start	STATUS	Start / Enable gauging cycle
3	Input	Hold	STATUS	Activation of gauging value freeze. Can be used to hold temporarily the sampling of the gauge (i.e. to allow a dressing cycle during ID operation in oscillation) NOT available for Pre-Process part-program
4	Input	Zero	STATUS	Automatic zeroing input on master piece
5	Input	Retraction	STATUS	Activation of gauging tips retraction
24	Input	Automatic mode	STATUS	ACTIVE STATUS: Switches and locks the device in automatic mode
23	Input	Part Program change	HIGH	Input pin: 20, 21, 22, = PP-Select
			LOW	Input pin 21 = Offset + Input pin 6 = Offset - Input pin 22 = Offset reset
While PIN 23 = HIGH				
20	Input	PP - Select 0	LOW/HIGH	PART PROGRAM Select Bit 0: together with PP-Select 1 and 2, defines the Part Program that should be activated at the next Start / Enable. The binary combination of the 3 signals allows up to 8 Part Program
21	Input	PP - Select 1	LOW/HIGH	PART PROGRAM Select Bit 1
22	Input	PP - Select 2	LOW/HIGH	PART PROGRAM Select Bit 2
While PIN 23 = LOW				
21	Input	Offset +	PULSE	Each pulse corresponds to an amount of increment in the offset correction as programmed in the parameter “OFFSET INCREMENT STEP”
6	Input	Offset -	PULSE	Each pulse corresponds to an amount of decrement in the offset correction as programmed in the parameter “OFFSET INCREMENT STEP”
22	Input	Offset reset	PULSE	Offset zeroing

Depending on part-program definition the automatic outputs are to be interpreted as described below.

3.11.5.1. In-Process gauging Part-Program

CASE 1: In Process Gauge				
PIN	**Type**	**Name**	**Activation (*)**	**Description**
7	Output	Command 3	LOW	ACTIVE STATUS: SKIP 3 (finishing)
8	Output	Command 2	LOW	ACTIVE STATUS: SKIP 2 (super-finishing)
9	Output	Command 1	LOW	ACTIVE STATUS: SKIP 1 (dwell or spark-out)
10	Output	Command 0	LOW	ACTIVE STATUS: SKIP 0 (size or end-cycle)
11	Output	Echo Hold	HIGH	ACTIVE STATUS: The dimension is frozen (Hold input activated)
12	Output	Undersize	LOW	ACTIVE STATUS: Undersize
13	Output	Alarm	LOW	ACTIVE STATUS: Alarm due to measuring system fault
14	Output	Auto	HIGH	ACTIVE STATUS: Gauge is operating in automatic mode
15	Output	Zero	HIGH	ACTIVE STATUS: signaling of zeroing master cycle executed
16	Output	Cycle in progress	HIGH	ACTIVE STATUS: Signaling measuring cycle in progress
17	Output	Overrange	LOW	ACTIVE STATUS: Signaling of measure out of range
18	Output	Retraction OK	HIGH	ACTIVE STATUS: Signaling of retractioned gauging heads
25	Output	Echo select 2	STATUS	Echo of the program selection bit 2 (Select 2)
26	Output	Echo select 1	STATUS	Echo of the program selection bit 1 (Select 1)
27	Output	Echo select 0	STATUS	Echo of the program selection bit 0 (Select 0)
28	Output	Data valid PP	HIGH	ACTIVE STATUS: Echo PP Select data valid
33	Output	Command 4	LOW	ACTIVE STATUS: SKIP 4 (roughing)

(*) The activation status is always in SAFETY NEGATIVE LOGIC

3.11.5.2. Pre-Process gauging Part-Program (Flagging)

CASE 2: Pre-Process Gauge (Flagging)				
PIN	**Type**	**Name**	**Activation (*)**	**Description**
7	Output	Reject	LOW	The flag value is out of tolerance
8	Output	Bit 12 MSB - sign	STATUS	dimension bit 12 (MSB) - Sign
9	Output	Bit 11	STATUS	dimension bit 11
10	Output	Bit 10	STATUS	dimension bit 10
11	Output	Bit 9	STATUS	dimension bit 9
12	Output	Bit 8	STATUS	dimension bit 8
13	Output	Alarm	LOW	ACTIVE STATUS: Alarm due to measuring system fault
14	Output	Auto	HIGH	ACTIVE STATUS: Gauge is operating in automatic mode
15	Output	Zero	HIGH	ACTIVE STATUS: signaling of zeroing master cycle executed
16	Output	Cycle in progress	HIGH	ACTIVE STATUS: Signaling measuring cycle in progress
17	Output	Overrange	LOW	ACTIVE STATUS: Signaling of measure out of range
18	Output	Retraction OK	HIGH	ACTIVE STATUS: Signaling of retractioned gauging heads
25	Output	Echo select 2	STATUS	Echo of the program selection bit 2 (Select 2)
26	Output	Echo select 1	STATUS	Echo of the program selection bit 1 (Select 1)
27	Output	Echo select 0	STATUS	Echo of the program selection bit 0 (Select 0)
28	Output	Data valid PP	HIGH	ACTIVE STATUS: Echo PP Select data valid
29	Output	Bit 7	STATUS	dimension bit 7
30	Output	Bit 6	STATUS	dimension bit 6
31	Output	Bit 5	STATUS	dimension bit 5
32	Output	Bit 4	STATUS	dimension bit 4
33	Output	Bit 3	STATUS	dimension bit 3
34	Output	Bit 2	STATUS	dimension bit 2
35	Output	Bit 1	STATUS	dimension bit 1
36	Output	Bit 0 LSB	STATUS	dimension bit 0 (LSB)
37	Output	Data valid	HIGH	Data valid bit: use this bit to synchronize the dimension read operation. The data valid stays active 50 ms to indicate that the value on pins is ready to be red. The data valid signal is delayed 10 ms after outputs update.

(*) The activation status is always in SAFETY NEGATIVE LOGIC

Pre-Process gauging	Reject	Data valid
OUT OF TOLERANCE LIMIT (REJECT)	LOW	Data valid
IN TOLERANCE	HIGH	

3.11.5.3. Post-Process gauging Part-Program

The outputs are coded according to the limits of tolerance and compensation programmed.

CASE 3: Post Process Gauge				
PIN	**Type**	**Name**	**Activation (*)**	**Description**
7	Output	Bit 2 – coded zone	STATUS	See table below
8	Output	Bit 1 – coded zone	STATUS	See table below
9	Output	Bit 0 – coded zone	STATUS	See table below
10	Output	Data valid	HIGH	ACTIVE STATUS: MEASURE OK, DATA VALID
11	Output	Echo Hold	HIGH	ACTIVE STATUS: The dimension is frozen (Hold input activated)
13	Output	Alarm	LOW	ACTIVE STATUS: Alarm due to measuring system fault
14	Output	Auto	HIGH	ACTIVE STATUS: Gauge is operating in automatic mode
15	Output	Zero	HIGH	ACTIVE STATUS: signaling of zeroing master cycle executed
16	Output	Cycle in progress	HIGH	ACTIVE STATUS: Signaling measuring cycle in progress
17	Output	Overrange	LOW	ACTIVE STATUS: Signaling of measure out of range
18	Output	Retraction OK	HIGH	ACTIVE STATUS: Signaling of retractioned gauging heads
25	Output	Echo select 2	STATUS	Echo of the program selection bit 2 (Select 2)
26	Output	Echo select 1	STATUS	Echo of the program selection bit 1 (Select 1)
27	Output	Echo select 0	STATUS	Echo of the program selection bit 0 (Select 0)
28	Output	Data valid PP	HIGH	ACTIVE STATUS: Echo PP Select data valid

(*) The activation status is always in SAFETY NEGATIVE LOGIC

Post-Process gauging	Bit 2	Bit 1	Bit 0	Data valid
OUT OF UPPER TOLERANCE LIMIT (REJECT +)	HIGH	LOW	LOW	Data valid
COUNTERVAILABLE + +	HIGH	LOW	HIGH	
COUNTERVAILABLE +	HIGH	HIGH	LOW	
IN TOLERANCE	HIGH	HIGH	HIGH	
COUNTERVAILABLE -	LOW	HIGH	HIGH	
COUNTERVAILABLE - -	LOW	HIGH	LOW	
OUT OF LOWER TOLERANCE LIMIT (REJECT -)	LOW	LOW	HIGH	

3.11.5.4. Post-Process roundness Part-Program

In case of post-process roundness analysis it is possible to define the type of signaling associated with the automatic outputs S1, S2, S3 in terms of deviations, value of the shape components (excentricity, ovality, 3-lobe, 4-lobe, 5-lobe) or residual value.

S1 = COMPONENT > VALUE + COMPONENT < VALUE
S2 = COMPONENT > VALUE
S3 = COMPONENT > VALUE

CASE 2: Post Process Gauge				
PIN	**Type**	**Name**	**Activation (*)**	**Description**
7	Output	S1	LOW	ACTIVE STATUS: condition expressed by the formula S1 = TRUE
8	Output	S2	LOW	ACTIVE STATUS: condition expressed by the formula S2 = TRUE
9	Output	S3	LOW	ACTIVE STATUS: condition expressed by the formula S3 = TRUE
10	Output	Data valid	HIGH	ACTIVE STATUS: MEASURE OK, DATA VALID
11	Output	Echo Hold	HIGH	ACTIVE STATUS: The dimension is frozen (Hold input activated)
12	Output	Undersize	LOW	ACTIVE STATUS: Undersize
13	Output	Alarm	LOW	ACTIVE STATUS: Alarm due to measuring system fault
14	Output	Auto	HIGH	ACTIVE STATUS: Gauge is operating in automatic mode
15	Output	Zero	HIGH	ACTIVE STATUS: signaling of zeroing master cycle executed
16	Output	Cycle in progress	HIGH	ACTIVE STATUS: Signaling measuring cycle in progress
17	Output	Overrange	LOW	ACTIVE STATUS: Signaling of measure out of range
18	Output	Retraction OK	HIGH	ACTIVE STATUS: Signaling of retractioned gauging heads
25	Output	Echo select 2	STATUS	Echo of the program selection bit 2 (Select 2)
26	Output	Echo select 1	STATUS	Echo of the program selection bit 1 (Select 1)
27	Output	Echo select 0	STATUS	Echo of the program selection bit 0 (Select 0)
28	Output	Data valid PP	HIGH	ACTIVE STATUS: Echo PP Select data valid

(*) The activation status is always in SAFETY NEGATIVE LOGIC

3.11.5.5. In-Process gauging & Roundness Part-Program

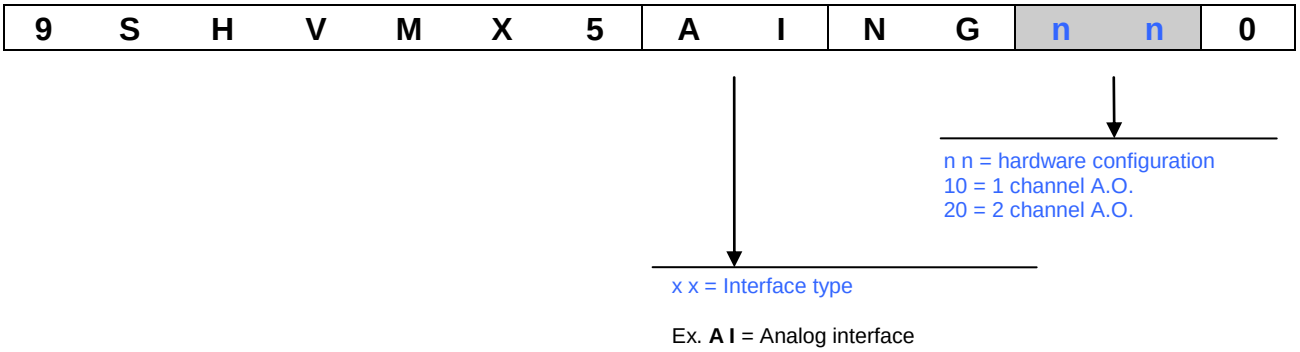
CASE 5: In Process Gauge & Roundness				
PIN	**Type**	**Name**	**Activation (*)**	**Description**
7	Output	Command 3	In Process: LOW	In Process gauge: ACTIVE STATUS: SKIP 3 (finishing)
			Roundness: HIGH	ACTIVE STATUS: Roundness staus ok when: <L1> = FALSE and <L2> = FALSE and <L3> = FALSE (updated while the SKIP 0 is activated)
8	Output	Command 2	LOW	ACTIVE STATUS: SKIP 2 (super-finishing)
9	Output	Command 1	LOW	ACTIVE STATUS: SKIP 1 (dwell or spark-out)
10	Output	Command 0	LOW	ACTIVE STATUS: SKIP 0 (size or end-cycle)
11	Output	Echo Hold	HIGH	ACTIVE STATUS: The dimension is frozen (Hold input activated)
12	Output	Undersize	LOW	ACTIVE STATUS: Undersize
13	Output	Alarm	LOW	ACTIVE STATUS: Alarm due to measuring system fault
14	Output	Auto	HIGH	ACTIVE STATUS: Gauge is operating in automatic mode
15	Output	Zero	HIGH	ACTIVE STATUS: signaling of zeroing master cycle executed
16	Output	Cycle in progress	HIGH	ACTIVE STATUS: Signaling measuring cycle in progress
17	Output	Overrange	LOW	ACTIVE STATUS: Signaling of measure out of range
18	Output	Retraction OK	HIGH	ACTIVE STATUS: Signaling of retractioned gauging heads
25	Output	Echo select 2	STATUS	Echo of the program selection bit 2 (Select 2)
26	Output	Echo select 1	STATUS	Echo of the program selection bit 1 (Select 1)
27	Output	Echo select 0	STATUS	Echo of the program selection bit 0 (Select 0)
28	Output	Data valid PP	HIGH	ACTIVE STATUS: Echo PP Select data valid
33	Output	Command 4	LOW	ACTIVE STATUS: SKIP 4 (roughing)

(*) The activation status is always in SAFETY NEGATIVE LOGIC

4. Interface cards

4.1. Gauge analog interface [AI type]

4.1.1. Part number

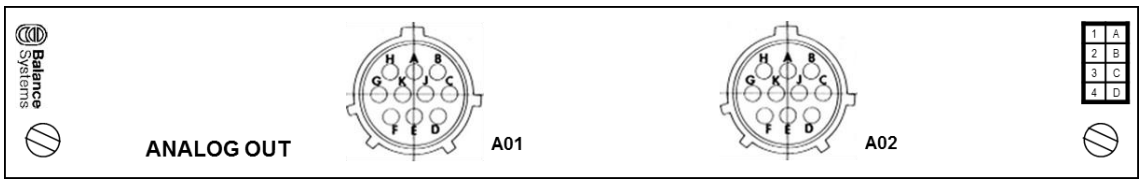


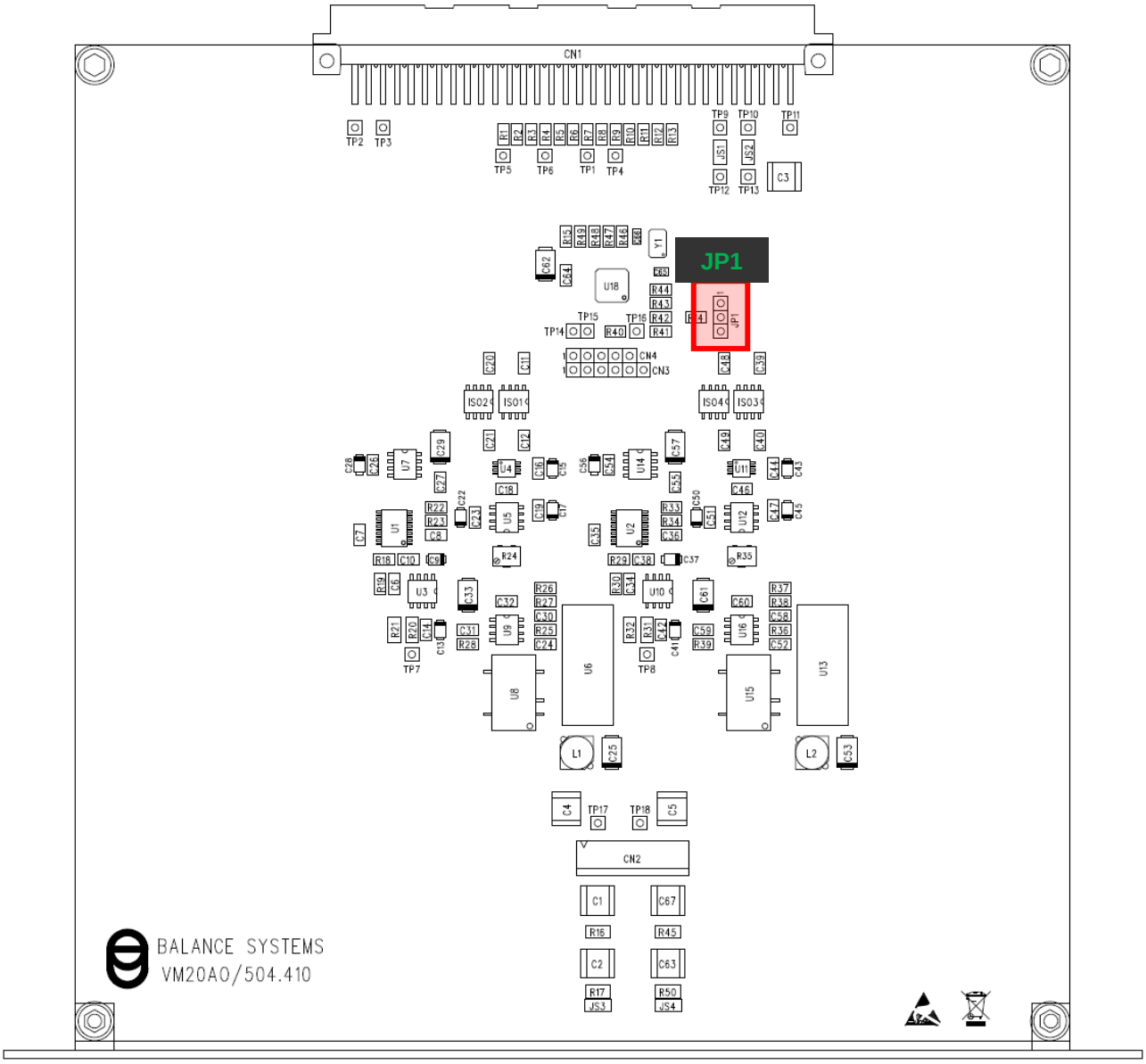
Ex. **A I** = Analog interface

Connections and auxiliary functions depend on the hardware configuration.

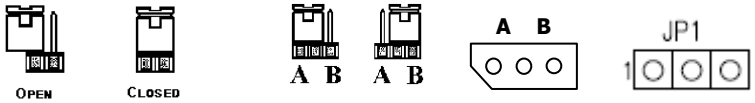
This interface is available for gauge card type NG.

4.1.2. Card layout and topographic scheme





4.1.3. Hardware setup

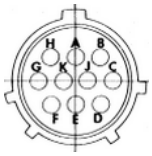


In the table below are highlighted the factory presets.

Card address	JP1
Analog interface card 1	**Close 1-2**
Analog interface card 2	Close 2-3

For each NG gauge card, it is possible to use up to 2 analog interface cards with one or two channels.

4.1.4. Connectors

Gauge analog output [Type AI]			
Type	**ID**	**Name**	**Description**
 AMPHENOL 10 Pole RS 301-4692	A01 A02	Analog output	Segnali: A. 0 V B. ±10 V, 0..+10V

5. Appendix

Reference document		
Doc name	**Paragraph**	**Link**
Parameter Setup	2.4.3.7.2., 2.5.6.1, 2.5.6.4,	9UMEN1505-1200 YYMMGG Parameter Setup.pdf
Panel installer	2.4.3.7.2	9UMEN1515-1200 YYMMGG VM15 Panel Installer.pdf
HMI installer	2.4.3.7.2	9UMENX519-1200 YYMMGG VMx5 HMI Installer.pdf
Service	3.5	9UMEN2512-1200 VM25 Service.pdf