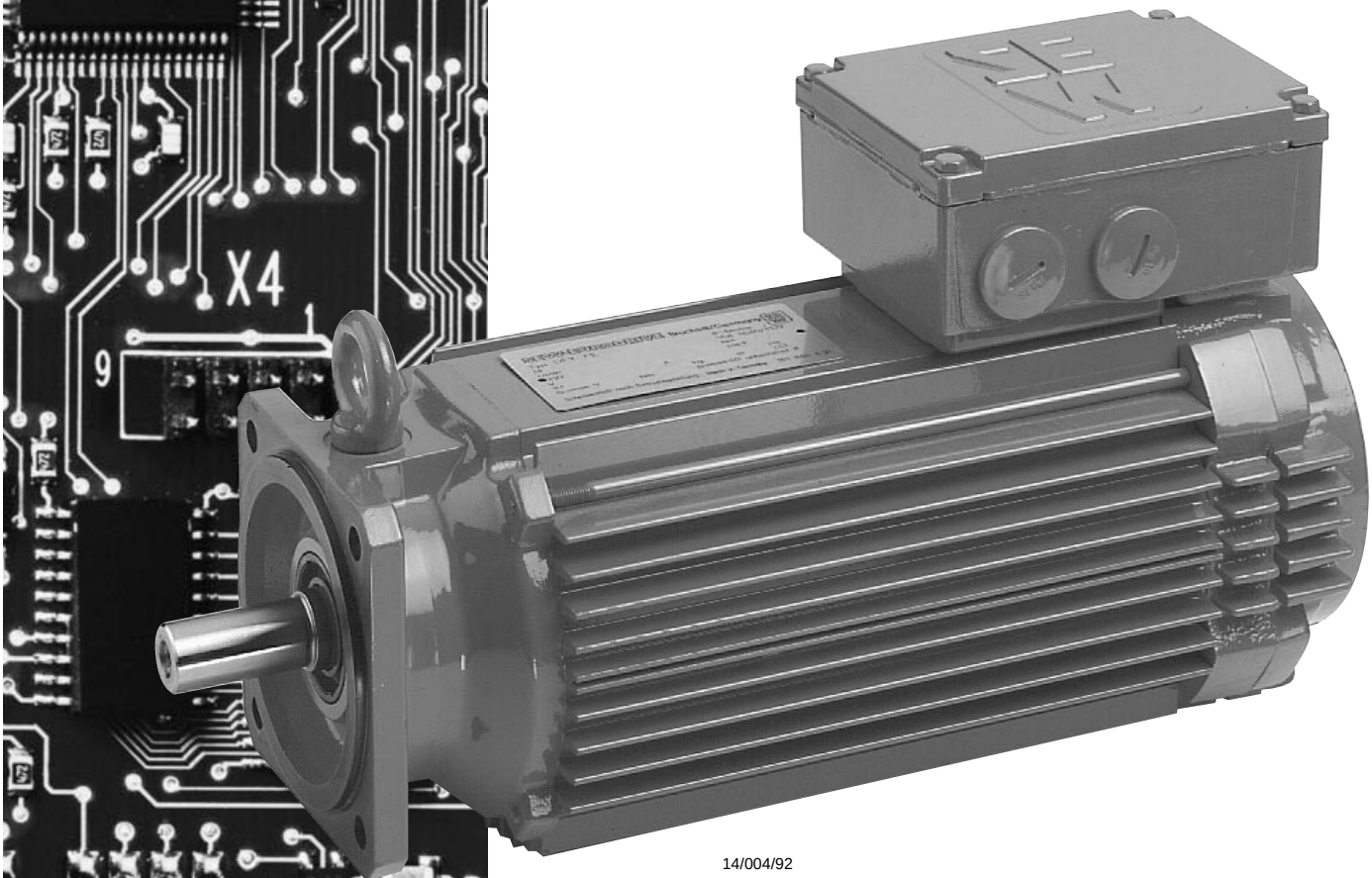
DFS/DFY Synchronous Motors

Operating Instructions

Edition 02/2000



14/004/92

0919 9519 / 0200

TÜV CERT DIN EN ISO 9001

SEW EURODRIVE

Allways follow the warnings and safety instructions contained herein!

Electrical hazard, e. g. during live working.

Mechanical hazard, e. g. when working on hoists.

Important instructions for safe and fault-free operation.

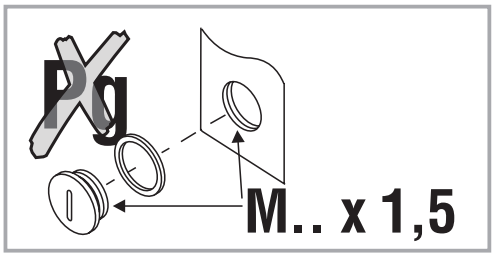
A **requirement of fault-free operation** and any rights to claim under guarantee is that these **Installation and Operating Instructions** are followed. Therefore **read these Installation and Operating Instructions carefully before** you start working with the unit!

The **Installation and Operating Instructions** contain **important service instructions.** They should therefore be kept in the **vicinity of the equipment**.

Disposal (please observe current regulations):
Depending on the material they are made of, stator and rotor are to be disposed of in accordance with the applicable waste disposal regulations for
– steel scrap
– aluminium
– copper
– plastic material

Revisions made in edition *03/98* of the operating instructions "DFY Synchronous Motors with and without Brake and Accessories" (order no. 0922 7113) are indicated by a gray line in the margin.

The **cable screw fittings** used up to this point with sizes Pg 7 to Pg 48 will be replaced by the new metric fittings with M 12 x 1.5 to M 63 x 1.5.
We are enclosing the corresponding adapters for conversion from PG to metric.



Contents

SEW EURODRIVE

1 Safety Instructions

Live and moving parts of electrical machines can cause serious or fatal injuries.

Installation, connection, commissioning and maintenance and repair work may only be carried out by qualified personnel in observance of

- these instructions
- all other project planning documentation, instructions for commissioning as well as wiring diagrams relating to the drive
- current national/regional regulations (safety/accident prevention regulations).

2 Installation/Assembly

2.1 Before you begin

If you do not install the motor straightaway, store it in a dry, dust and vibration-free room at –25 ... + 40 °C.

The drive must only be assembled if:

- **The entries on the motor nameplate match the project planning documentation.**
- The drive is undamaged (no damage caused by carriage or storage).
- It is certain that the following requirements are met:

Standard design	No oil, acids, gases, vapors, radiation, etc. Permissible humidity: 85 %. No condensation! Permissible without derating are: – Coolant temperature between – 25 °C and + 40 °C[1] – Installation height max. 1000 meters above sea level
Special design	For deviating ambient and/or operating conditions the design must be in accordance with the project planning documentation.

Tools / resources required

- Standard tools
- Fitting tool if necessary
- If end ferrules are used: crimping tool and end ferrules (without insulating sleeve, DIN 46228, Part 1, material E-Cu)

if necessary:

- Crimping tool (for connector)
- Removal tool

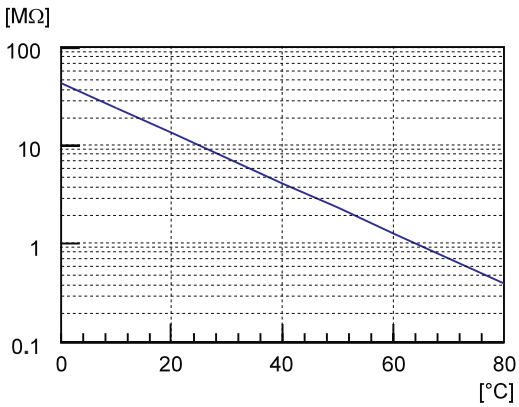
2.2 Preparatory work after an extended period of storage

Check whether the motor has absorbed any moisture during the extended period of storage. For this purpose the insulation resistance of the motor winding (U, V, W to housing) must be measured (measuring-circuit voltage 500 V) .

Note:

The insulation resistance is very much dependent on the temperature.

If the insulation resistance is insufficient, the motor must be dried by skilled personnel.



00056AXX

Fig. 1: Minimum insulation resistance

End drying process when the limit shown in Fig. 1 is exceeded.

1. If the AGY absolute encoder is used in the standard version, the coolant temperature is limited to 0 ... + 40 °C. Please note that the temperature range of the gear unit may be restricted too (see Installation and Operating Instructions of the gear unit).

Check the terminal box/connector to ensure that:
– the inside is clean and dry
– connection and mounting components are free of corrosion
– joint seals are in order
– screwed cable glands are tight.
if not, clean or replace them.

2.3 Installing the motor

The motor or geared motor may be only be mounted or installed in the specified mounting position on a level, vibration-free and torsionally rigid support structure.

- Thoroughly remove anti-corrosion agents from the shaft ends and flange (use a standard solvent). Do not allow the solvent to penetrate the bearings and oil seals - this could cause material damage.
- Carefully align the motor and the driven machine to avoid placing any unacceptable strain on the motor shafts (observe permissible overhung loads and axial thrusts).
- Avoid thrusts and blows on the shaft ends.

- **Protect motors in a vertical mounting position with a VY forced cooling fan with a suitable cover against the ingress of foreign matter and liquid!**
- Ensure an unobstructed cooling air supply.
- Balance components for subsequent mounting on the shaft without key.
- The surface temperature of the motor may exceed 65 °C when in operation. Therefore appropriate measures must be taken to safeguard against accidental contact.

2.3.1 Installation in damp areas or in the open air

- Mount the terminal box so that the cable entries point downwards if possible.
- Use suitable screwed cable glands for the supply lead (use reducing adapters if necessary).
- Coat the threads of screwed cable glands and sealing plugs with sealing compound and tighten them well, then coat them again.
- Seal the cable entries well.
- Clean the sealing faces of terminal boxes and their covers well before reassembly; gaskets must be cemented in on one side. Replace brittle gaskets.
- Restore the anticorrosive coating if necessary.
- Check the type of enclosure.

2.4 Tolerances

Shaft ends	Flanges
Diametric tolerances – ISO k6 for ≤ 50 mm – ISO m6 for > 50 mm (Centring hole to DIN 332, shape DR.. . Use centring hole for mounting transmission elements to prevent damage to the anti-friction bearings.)	Centring shoulder tolerance – ISO j6 for ≤ 230 mm – ISO h6 for > 230 mm

→ “Servo Geared Motors” catalog, Sec. “Notes on Dimension Sheets”

3 Electrical Connection

Carefully read and follow the Safety Instructions in Section 1.

3.1 EMC-compliant wiring

EMC-compliant wiring: → Installation and Operating Instructions of the servo controller (e.g. MOVIDYN®).

Make sure that

- the cabling is in accordance with the applicable regulations (see nameplate for rated current data)
- the signals leads are twisted pairs with a common shield (one pair each for reference, sine, cosine signals and TF PTC thermistors / TH thermostat)
- **brake cables must be run separately from power cables or alternatively power cables must be shielded to avoid any electromagnetic interference with the brake**

3.2 Connecting the motor

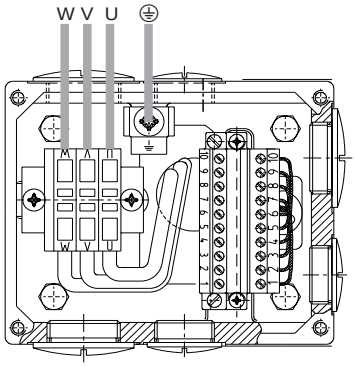
Strictly follow the Installation and Operating Instructions of the servo controller!

3.2.1 DFS56 motors with terminal boxes

- Connect the motor in accordance with the wiring diagram:

Connect motor power cable to the terminal block using cage clamps (Fig. 2):

U	phase U
V	phase V
W	phase W
⏚	PE



02907AXX

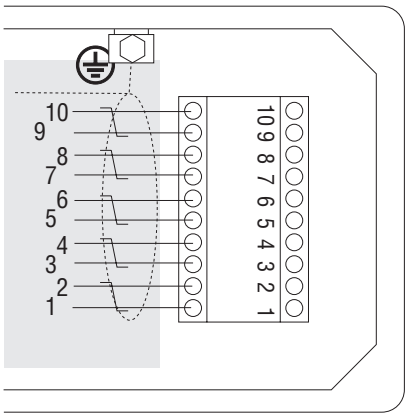
Fig. 2: DFS56 terminal box connection

Note:

It is not possible to reverse the direction of rotation by changing over the phases.

Connect resolver signal leads and the thermal motor protection (TF) to terminal block (Fig. 3):

1	R1	Reference
2	R2	
3	S1	Cosine
4	S3	
5	S2	Sine
6	S4	
7	+	Brake
8	-	
9	TH/TF	Thermal motor protection
10		



02908AXX

Fig. 3: DFS terminal strip terminal block

Tighten all connections.

3.2.2 DFY71…DFY112 motors with terminal box

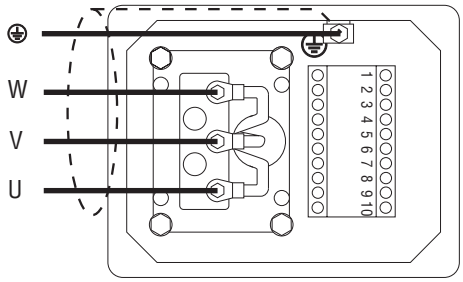
- Connect motor according to wiring diagram:

Motor power supply lines are located on the board (Fig. 4).

U	phase U
V	phase V
W	phase W
⏚	PE

Note:

It is not possible to reverse the direction of rotation by changing over the phases.



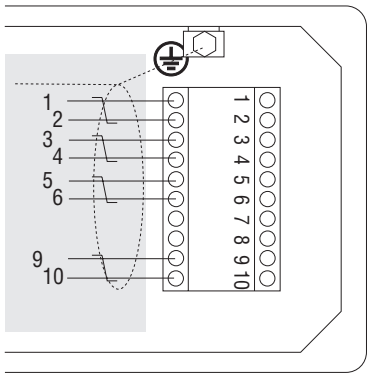
00063BXX

Fig. 4: DFY 71 ... DFY112 terminal box connection

Signal leads from resolver and thermal motor protection (TH/TF) on terminal strip (Fig. 5):

1	R1	Referenz
2	R2	
3	S1	Cosinus
4	S3	
5	S2	Sinus
6	S4	
9	TH/TF	Motorschutz
10		

Tighten all connections.



00064AXX

Fig. 5: DFY71 ... DFY112 terminal strip terminal box

3.2.3 Motors with plug connector

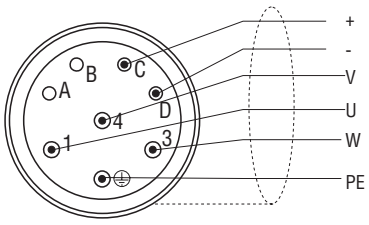
The diagrams show the connector pin assignment for the cable on the connecting side (rear).

Prefabricated cables are available from SEW for connection with plug connectors. The marking (core no. or core colour) of these cables is given in the tables below.

If you fabricate the cables yourself: The assembly of the plug connectors SM21...SM41 is explained in the appendix.

DFY 56 / DFY 56 … B

Connector pin	Connection	Core
1	Phase U	1
3	Phase W	2
4	Phase V	3
⏚	PE	yw/gn
C	Brake +	5
D	Brake –	6

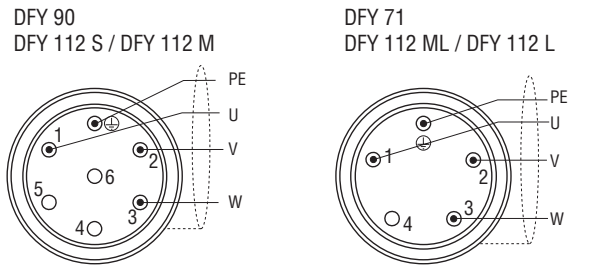


00066BXX

Fig. 6: DFY56 power and brake plug connector

DFY 71, 90, 112

Connector pin	Connection	Core
1	Phase U	1
2	Phase V	2
3	Phase W	3
⏚	PE	yw/gn

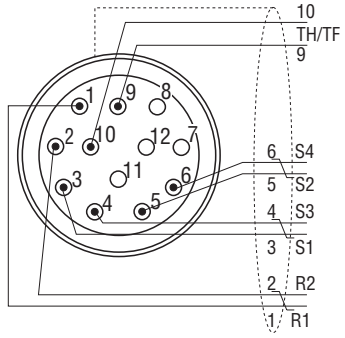


00065BXX

Fig. 7: DFY 71, 90, 112 power connector

Resolver / TF/TH

Connector pin	Connection		Core
1	R1	Reference	pink
2	R2		grey
3	S1	Cosine	red
4	S3		blue
5	S2	Sine	yellow
6	S4		green
9	TH/TF	Motor protection	white
10			brown



00067CXX

Fig. 8: Resolver connection

The power connector (in DFY 56 .. B motors also the brake connector) and the resolver/thermal motor protection connection (TH/TF, in DFY 56 only TF) must be wired by the customer. Prefabricated cables of any length are available from SEW.

- The socket contacts are implemented as crimp contacts (exception: motor connection with SM46 and the resolver connection in DFY 56 motors is by way of solder contacts). Only use suitable crimping tools for crimping.
- Strip insulation of lead wires over length A (see Table 1 of the Appendix).
- Remove incorrectly assembled socket contacts with suitable removal tools only.

Secure connector with coupling ring.

3.3 Connecting the brake

The brake is released electrically. Braking is by mechanical means after the voltage has been removed.

Important:

Observe the applicable regulations of the respective Employers' Liability Insurance Association on phase failure protection and the associated wiring circuits/modifications to wiring circuits.

Note:

Check the cross-section of the cables - brake currents see Appendix, Table 3.

Note:

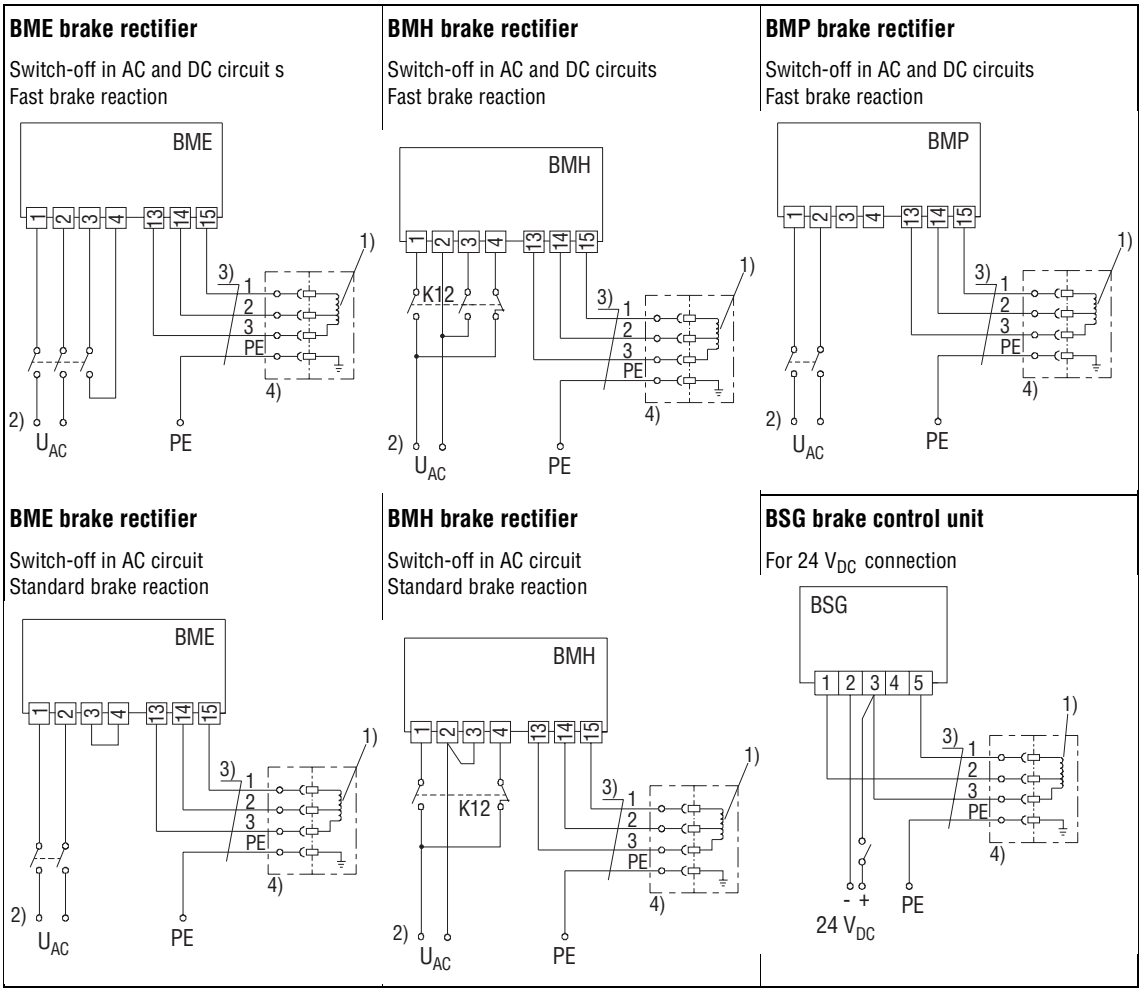
In view of the DC voltage to be switched and the high current load either special brake contactors or AC contactors with contacts in duty class AC3 to EN 60 947-4-1 must be used.

3.3.1 DFS 56 .. B

In DFS 56 .. B brake motors the brake is controlled directly with 24 V_{DC} (24 V ± 10 %).

3.3.2 DFY 71 - 112 .. B

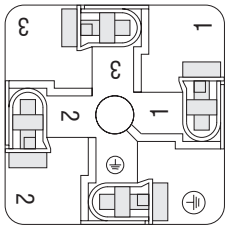
BM.. brake rectifiers or the BSG brake control unit are installed in the switch cabinet. The brake is connected with a 4-core cable.



1) Brake coil
2) For brake release apply voltage specified on nameplate. Switch contacts according to application class AC3 meeting EN 60 947-4-1.
   BMH: For brake release and heating in standstill apply voltage specified on nameplate.
   K12 off = heating mode
   Contact rating of terminals 1 and 4 on BMH: AC11, terimnal 3: AC3 meeting EN 60 947-4-1.
3) Brake cable
4) Right-angle connector 185 871 8

The connector for brake connection to the brake control unit is to be wired by the customer.

Connector Pin	Core
1	1
2	2
3	3
⏚	PE (yw/gn)



00069AXX

Fig. 9: Wiring diagram for the brake

Note:

Secure connector with central screw. Do not undo while energized!

3.4 Connecting the Accessories

Connect the accessories supplied in accordance with the wiring diagrams enclosed.

TF PTC thermistors

The PTC thermistors conform to DIN 44082.
Resistance check (instrument with measuring-circuit voltage V ≤ 7.5 V or I < 1 mA).
Measurements: *standard* 20 ... 500 Ω, thermal resistance > 4000 Ω.

TH embedded thermostats

The thermostats are connected in series and open when the permissible winding temperature is exceeded.

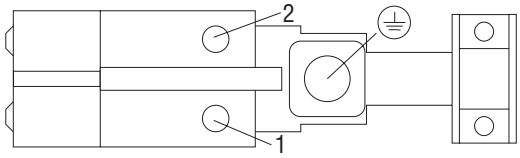
TH data	AC	DC	
Max. voltage	60 V_{AC} 1)	60 V_{DC}	24 V_{DC}
Current (p.f. = 1.0)	2.5 A_{AC}	1.0 A_{DC}	1.6 A_{DC}
Current (p.f. = 0.6)	1.6 A_{AC}		

1) 250 V_{AC} is permissible for terminal box versions.

VY forced cooling fan

Connect the VY forced cooling fan in accordance with the wiring diagram:

Connector pin	Connection	Core
1	Phase	1
2	Neutral conductor	2
⏚	PE	yw/gn



00070AXX

Fig. 10: Forced cooling fan connection (top view)

3.4.1 AV1Y absolute angle encoder

The AV1Y absolute angle encoder is supplied with encoder and connected cable (3 ft./1 m) including pin coupling as well as the required mating connector with socket contacts. SEW also offers a pre-fabricated cable to serve as an extension for the connection to the MOVIDRIVE® drive inverter as well as the MOVIDYN® servo controller.

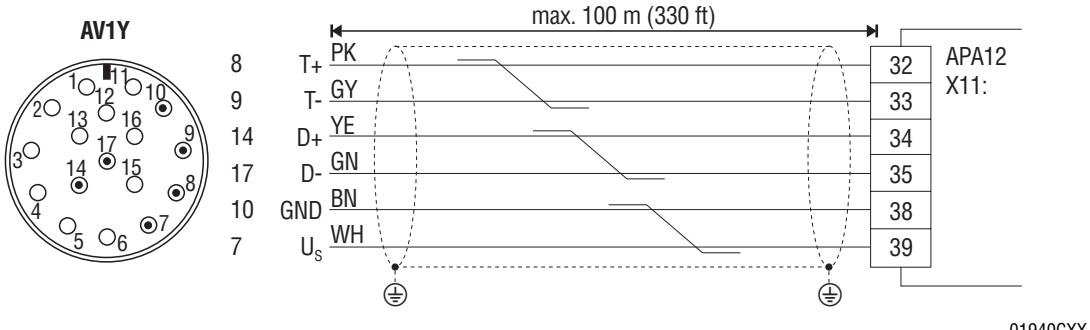


Fig. 11: Connection of AV1Y to MOVIDYN® servo controller

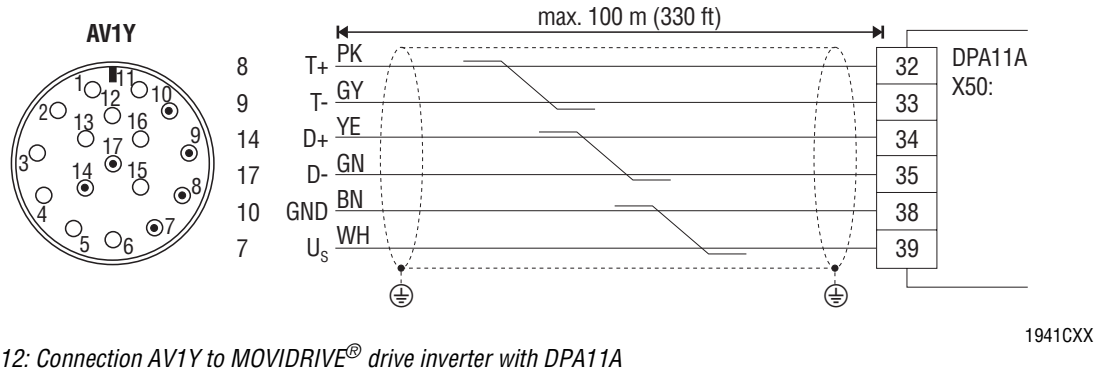


Fig. 12: Connection AV1Y to MOVIDRIVE® drive inverter with DPA11A

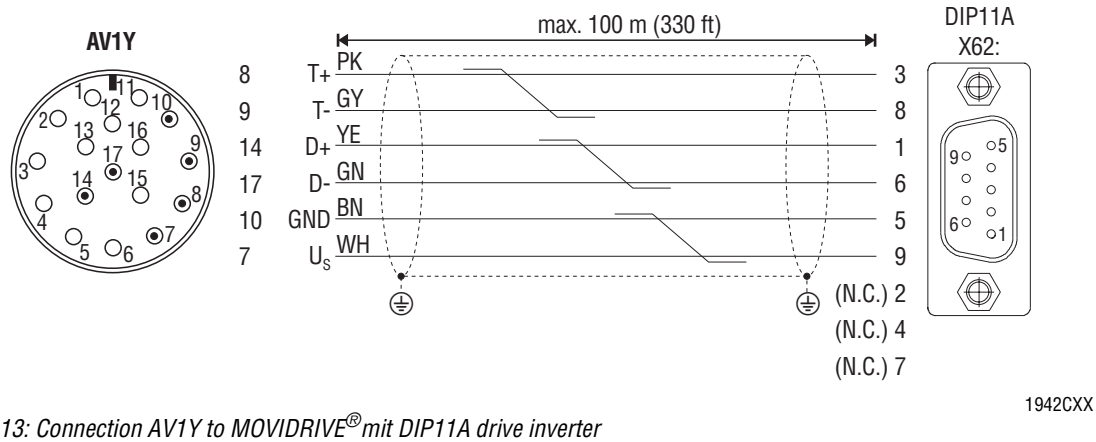


Fig. 13: Connection AV1Y to MOVIDRIVE® mit DIP11A drive inverter

Pin	Connection			Core
10	GND	supply	contact separation from housing	BN
7	V_S		+ 13 ... 15 ... 24 V_{DC}, polarized	WH
14	Data+	data output, serial	high = “1” (positive logic)	BK
17	Data–		high = “0”	VT
8	Pulse+	Takt, Stromschleife	7 mA in direction pulse+ = “1”	PK
9	Pulse–		7 mA in direction pulse– = “0”	GY

- Twisted pair cable with shield connected at both ends over as large an area as possible.
- Clip on with strain relief clamps (over as large an area as possible).
- The socket contacts are implemented as crimp contacts. Use only suitable crimping tools for crimping.
- Strip insulation off lead wires over length A (see Appendix, Table 1). Pull shrink sleeve over connections.
- Remove incorrectly mounted socket contacts with suitable removal tools only.
- Secure plug connector with coupling ring.

4 Startup

Carefully read and follow the Safety Instructions on page 4.

4.1 Before you begin

Before startup ensure that

- all connections have been made correctly and the connectors have been secured against coming loose.
- all motor protection features are active during startup.
- the drive is not blocked.
- no other sources of danger are present.
- the drive is not damaged (no damage caused by carriage/storage)
- in the event of extended periods of carriage/transportation → Sec. 2.2

4.2 Startup

- Follow the Installation and Operating Instructions of the servo controller (e.g. MOVIDRIVE®).
- Use software support where available (e.g.MOVITOOLS, MD_SCOPE).

5 Inspection/Maintenance

Isolate the drive from the supply before you start any maintenance work and safeguard the drive against unintentional power-up. Do not undo connectors while the drive is energized.

Only use original spare parts in accordance with the valid parts list.

5.1 Inspection and maintenance periods

The service life of a part is influenced by many factors and differs for the various parts. Inspection and maintenance periods must therefore be determined individually in accordance with the project planning documentation. Carry out regular visual inspections of the drive.

The bearings should only be changed by SEW-trained personnel since the resolver must be re-set each time the motor has been disassembled.

5.2 Tools / resources required

- Standard tools
- Tools for mounting the encoder
  (EW 1 setting tool by Stegmann, art. no. 81B 001 003 001)
- Stud to DIN 938:
  DFY 71: M5×45
  DFY 90: M6×60
  DFY 112: M8×70

5.3 Inspection/maintenance brake

5.3.1 DFY 56 .. B brake

The brake of the DFY 56 motor does not require any maintenance work.

5.3.2 DFY 71 ... DFY 112 .. B brake

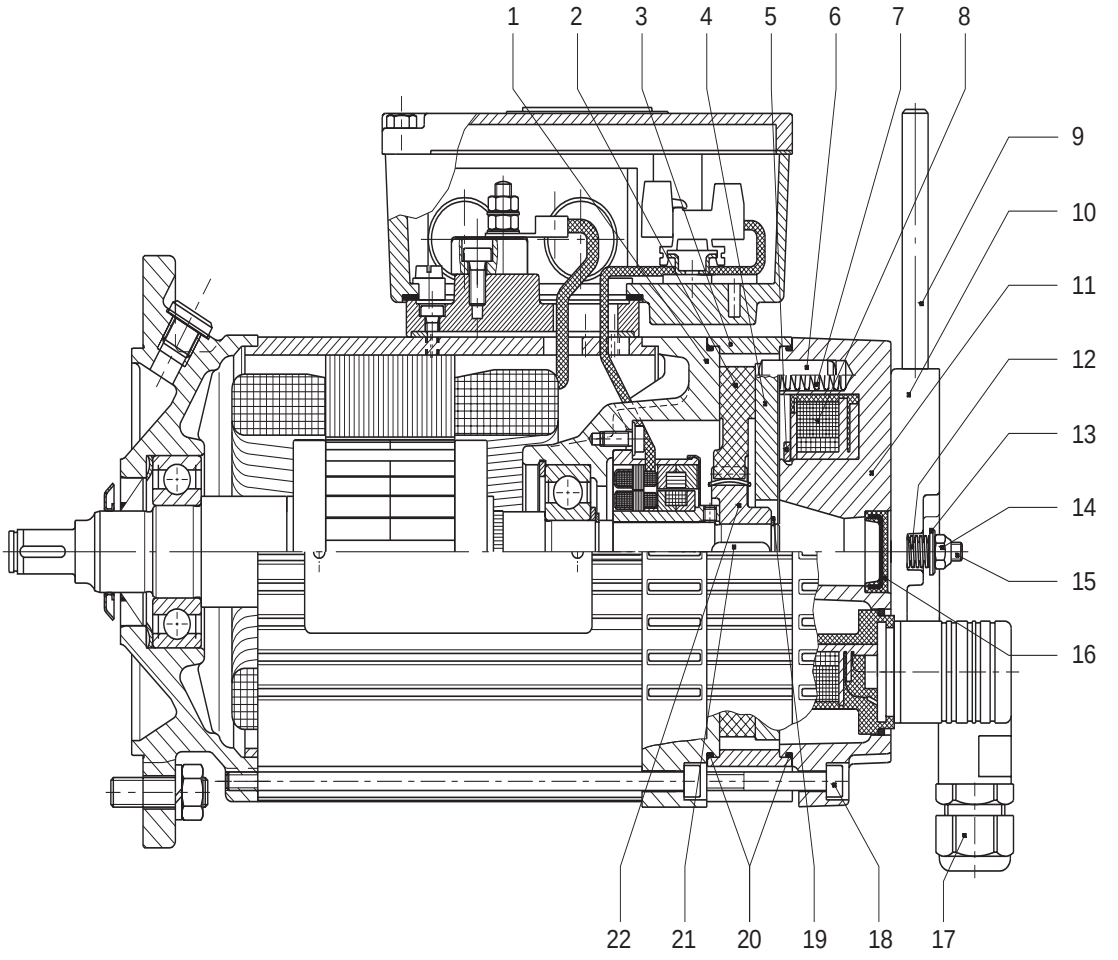


Fig. 14: Cutaway view of the DFY 71... 112 brake motor

1	Brake end shield	7	Brake spring	13	Disc	19	Circlip/snap ring
2	Brake disc complete	8	Brake coil, complete	14	Look nut	20	O-ring
3	Intermediate ring	9	Manual release lever	15	Stud	21	Key
4	Pressure plate	10	Releasing yoke	16	Closing cap	22	Carrier
5	Circlip/snap ring	11	Brake coil body	17	Connector		
6	Parallel pin	12	Compressing spring	18	Cheese head screw		

Checking the working air gap

To check the working air gap, measure the travel of the pressure plate when the brake is released (permissible range: 0.25...0.8 mm).

In brakes with manual brake release:
– Measure the travel on a stud (15) of the releasing yoke.

In brakes without manual brake release:
– Remove plug (23).
– Screw stud (Sec. 5.2) into pressure plate.
(not too deep, since you might damage coating).
– Measure travel.
– Remove stud and replace plug.

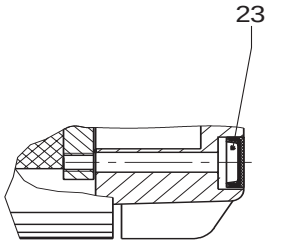


Fig. 15: Detail of Fig. 14

Replacing the brake disc

1. Remove connector (17) and flat gasket.
2. In brakes with manual brake release: Remove the manual release lever. In brakes without manual brake release: Remove plugs (23) from holes.
3. Pull pressure plate (4) on to brake springs using two auxiliary mounting screws and washers. Use studs as per Sec. 5.2. Other screws could damage or even destroy the brake disc.
4. Unscrew coil body (11) incl. O-ring (20).
5. Pull off brake disc (2).
6. Remove abraded material.
7. Slide on new brake disc.
   Be careful not to soil the brake disc with grease or oil.
8. Screw on coil body (11) incl. O- Ring (20). Remove auxiliary mounting screws.
9. Remount manual brake release or closing plug. Reposition gasket and connector and secure with central screw.
   Mounting the manual brake release: The clearance between the disc (13) and the releasing yoke (10) must be 2 mm to ensure correct functioning of the brake.

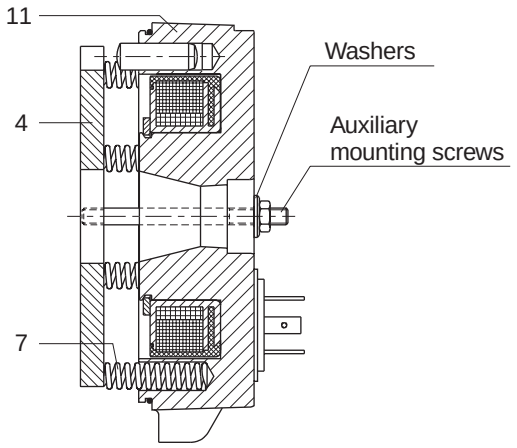


Fig. 16 : Detail of Fig. 14

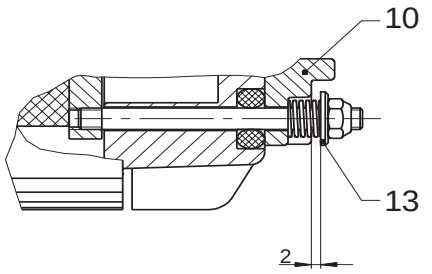


Fig. 17: Detail of Fig. 14

Changing the holding torque

1. to 4. see Sec. “Replacing the brake disc”.
5. Remove abraded material.
6. Loosen pressure plate (4). Insert new brake springs in accordance with Table 4 in the Appendix.
   Arrange symmetrically.
7. Pull pressure plate on to brake springs again, using the auxiliary mounting screws.
8. and 9. see Sec. “Replacing the brake disc”.

Brake motors with AV1Y absolute encoder

The encoder must be removed prior to carrying out any maintenance work on the brakes of DFY motors:

1. Open and remove central screw of the right-angle connector (5).
2. Loosen bolts (11) and turn spring washer (10) to the outside before you remove encoder (12) with coupling half (9).
   Caution: Coupling is a two-piece plug-in connector!
3. Remove protective caps (6, only with DFY71) and flange retaining bolts (3) through the assembly hole (the bolts are on the outside with DFY90 and DFY112). , using an 8mm spanner. Then undo the screw counterclockwise using a 4mm hexagon socket spanner. This will release the expanding shaft, and undo the connection with the coupling (10). For this step the EW1 setting tool by Stegmann can be used (Art. No. 81B 001 003 001).
4. Loosen intermediate flange (8) and center screw on right-angle connector (5) and remove plug.
5. Loosen coupling clamping screw (9) and carefully remove coupling from motor shaft.
6. You may now carry out the brake maintenance work (see Sec. 5.3.2).

Reassemble in reverse order (ensure true running of tacho shaft (max. 0.05 mm)):
Coupling may not display any axial tension in stretched condition.

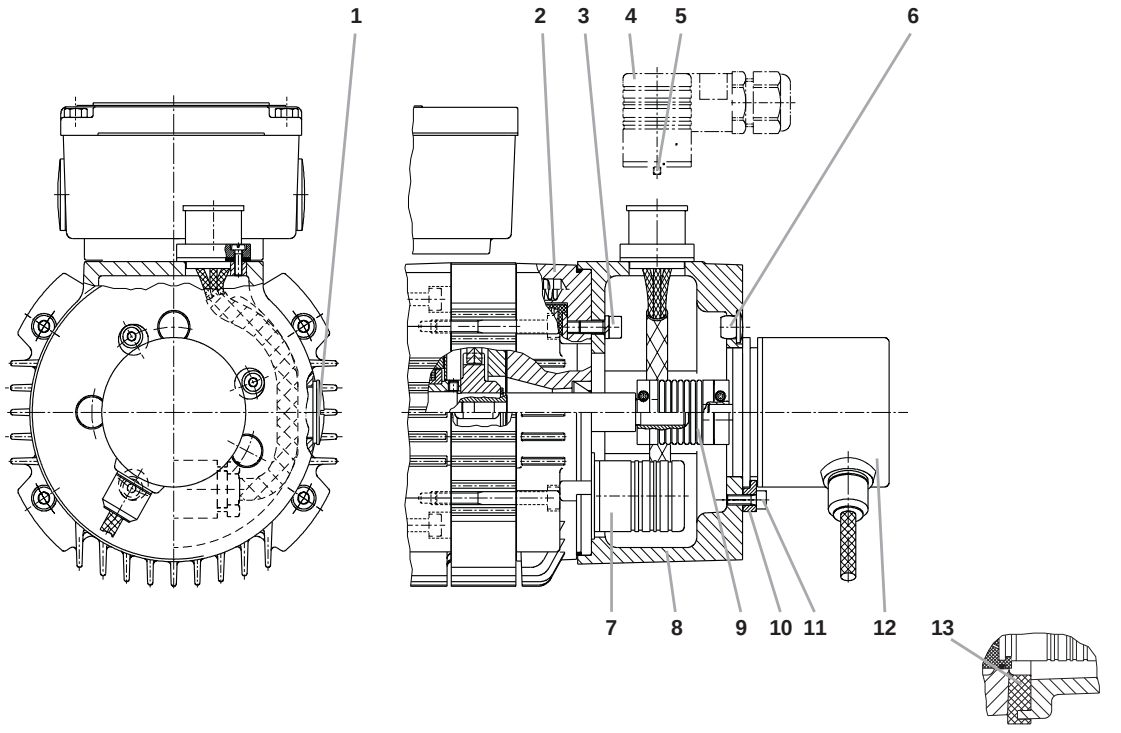


Fig. 18: DFY/B AV1Y brake motor

1	Screw plug	4	Plug connector brake	7	Plug connector brake	11	Bolts
2	Coil body	5	Center screw right-angle connector	8	Encoder flange	12	Encoder
3	Flange retaining screw	6	Protective caps	9	Coupling	13	Rubber seal (DFY112)
				10	Spring washers		

6 Retrofitting the Brake DFY71…DFY112

Check the received parts for completeness.

6.1 Preparing the motor

Part references: (213/19) means part 213 in Fig. 19

- Remove the cheese head screws (213/19) holding down the housing cover.
- Remove the housing cover (304/19).
- Remove circlip/snap ring (62/19) from free second shaft end.
- Pull off bush (308/19) from shaft, using a suitable pull-off device.
  Be careful not to damage the shaft seat and the resolver fitted behind!
- The key (71/19) remains where it is.
- Heat the brake carrier (70/20) and pull on to the shaft on the non-drive end.
- Fit new circlip/snap ring (62/20).
- **Allow the carrier to cool down (warm to the touch).**

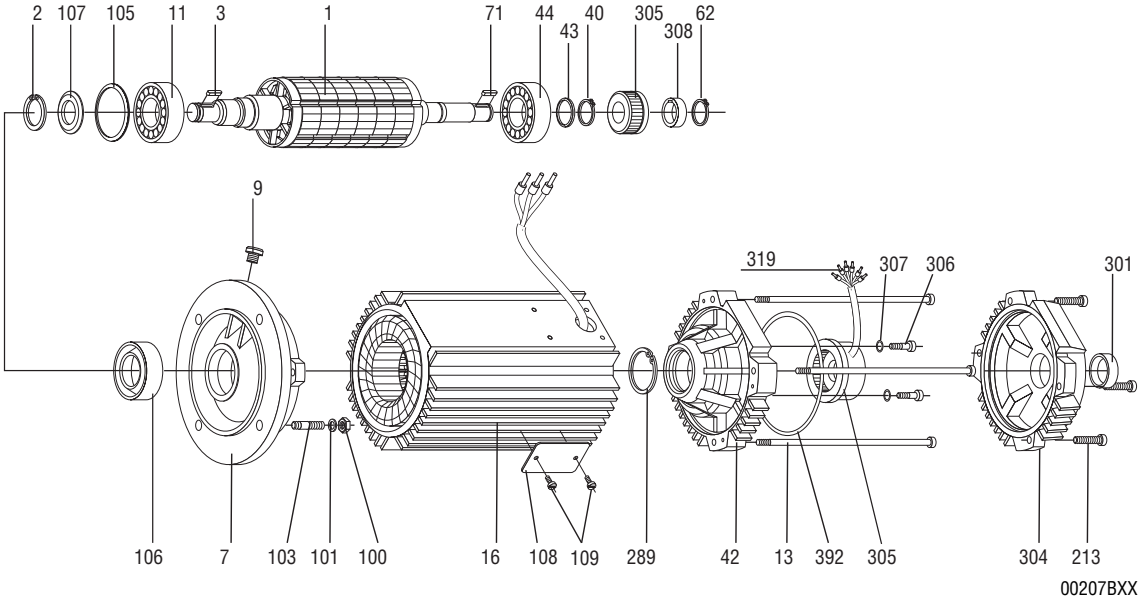


Fig. 19: DFY motor without brake

6.2 Preassembly of the brake coil

- Insert the O-ring (281/20) in the groove provided on the plug connection of the brake coil (286/20).
- Screw the terminal link (295/20) to the brake coil through either hole, using one of the two cheese head screws (310/20) and lock washers (294/20) (there is a thread provided for this at the rear of the plug connection).
  Do not tighten yet!

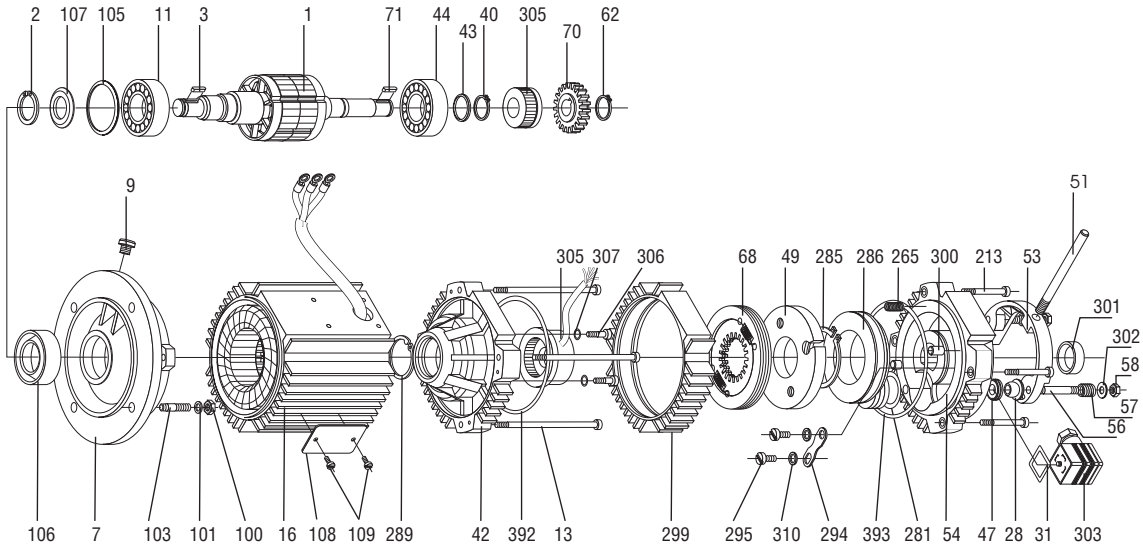


Fig. 20: DFY motor with brake

6.3 Preassembly of the brake

- Insert the preassembled brake coil (see. 6.2) in the coil body (54/20) and lock it axially with the circlip/snap ring (285/20).
  Take care not to damage the O-ring!
- Screw the brake coil to the coil body through the second opening on the terminal link using the second cheese head screw and lock washer.
- The protective ground connection is provided by screwing the terminal link to the brake coil.
- Push the two parallel pins (300/20) into the hole provided in the coil body.
- The pins are pushed in deep enough if they do not project from the pressure plate (49/20).
- Insert the brake springs (265/20) symmetrically into the holes provided over the perimeter of the coil body, depending on the required brake torque (see Table 4).
- Screw one auxiliary mounting nut each on the two cheese head screws (56/20).
- Position the pressure plate (49/20) on the parallel pins and screw the two cheese head screws into the pressure plate through the holes in the coil body (provided for the manual brake release).
- Screw in so that no threads project from the pressure plate.
- Pull pressure plate on to the coil body by tightening the nut.
- Place the O-ring on the coil body.

6.4 Mounting the brake to the motor

- Place clip (69/20) with open side facing front in gearing of carrier (70/20).
- Slide brake disc (68/20) on carrier (70/20) (hub facing front).
- Position one half of the brake disc on the carrier and then push on to the carrier completely, turning it slightly (hold motor shaft in place).
- The intermediate ring (299/20) is ribbed on three sides, the fourth is flat. The non-drive end bearing end shield is designed in a similar way. Position the O-ring (392/20) on the non-drive end bearing end shield. Position the intermediate ring on the centring fit of the non-drive end bearing end shield and align.
- Position the O-ring (393/20) and then position the preassembled coil body with the pressure plate on to the intermediate ring (flat sides facing each other) and screw down loosely with the aid of the four cheese head screws (213/20).
  Do not tighten screws yet!

The brake disc may get damaged by auxiliary mounting screws that may project from the pressure plate.

- Remove auxiliary mounting screws.
- Tighten cheese head screws.
- Tap the protective cap (301/21) into the coil body.
- In versions without manual brake release: close through-holes on the coil body with closing caps (28/21).

6.5 Mounting the manual brake release

- Insert the two grommets (47/21) in the through-holes of the coil body.
- Fasten the releasing yoke (53/21) with the two studs (56/21), the pertinent springs (57/21), washers (302/21) and nuts (58/21) in the coil body. The play between the nuts and the releasing yoke must be 2 mm in each case.
- Insert the manual release lever (51/21) into the releasing yoke.

6.6 Electrical connection

Connect the right-angle connector (303/21) in accordance with the wiring diagram in Sec. 3.3. The brake is now ready for operation. Switch the brake several times to check correct brake operation.

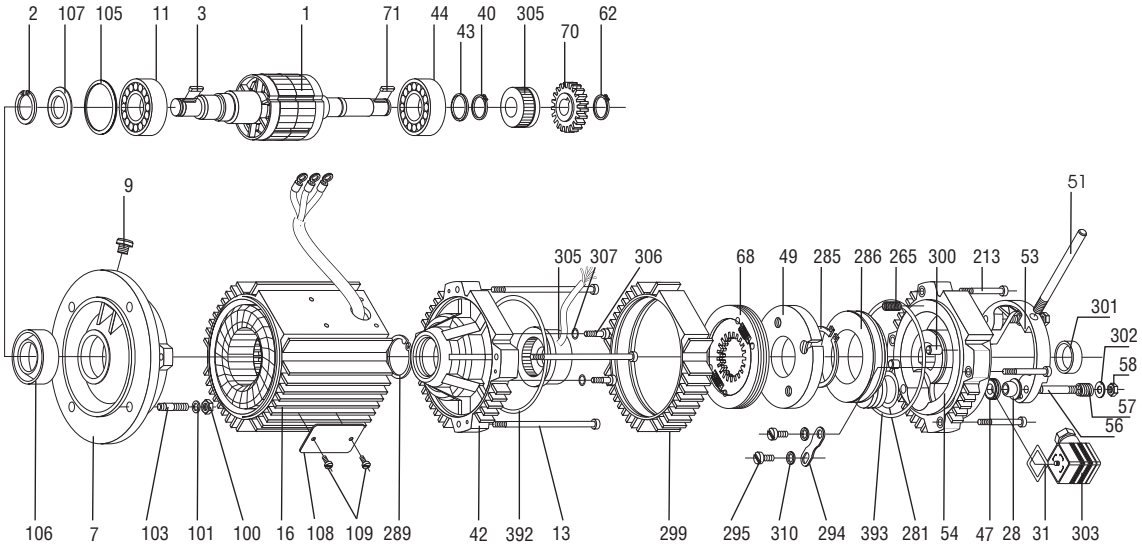


Fig. 21: DFY motor with brake

7 Trouble Shooting

7.1 Problems with the motor

Problem	Possible cause	Solution
Motor will not start	Lead broken	Check and restore the connections
	Fuse blown	Check the servo controller, replace the fuse
	Circuit-breaker tripped	Check the circuit-breaker, adjust if necessary, check drive for possible overload
	Servo controller defective, connected incorrectly, set incorrectly	Check servo controller and wiring
Motor will not start, or starts with difficulty	Servo controller not set correctly or overloaded	Check servo controller and wiring
Wrong direction of rotation	Incorrect control of motor	Check servo controller, check setpoints, change over setpoint leads
Motor hums	Drive blocking	Check the drive
	Fault on resolver lead	Check the resolver lead
	Brake cannot be released	Check the brake
	Servo controller not set correctly	Check servo controller
Motor overheats (check temperature)	Overload	Check load with controller current if necessary check configuration data
	Inadequate cooling	Adjust the cooling air supply, or clear the cooling air passage. Fit forced cooling fan if necessary
	Forced cooling fan not operating	Check the connection and correct it if necessary
	Ambient temperature too high	Reduce the power
	Selected duty exceeded	Match motor duty to required operating conditions. We recommend getting expert advice for the selection of the correct drive
	Servo controller not optimized	Check servo controller
Too noisy	Ball bearings distorted or damaged	Re-align the motor, check the driven machine, replace the ball bearings (refer to Sec. 5.1)
	Rotating parts vibrate	Rectify the cause or correct the imbalance if necessary
	Forced cooling fan: foreign matter in the cooling air passages	Clean the cooling air passages

7.2 Brake problems

Problem	Possible cause	Solution
The brake cannot be released	Wrong voltage at the brake	Apply the correct voltage (see nameplate)
	Brake control unit failed	Replace the brake control unit, check the brake coil (for resistances see Appendix, Table 5), the switching devices and the connection
	Brake connected incorrectly	Check connection of the brake
	Max. permissible working air gap exceeded as the brake lining is worn	Replace the whole brake disc
	Voltage drop on the supply lead > 10 %	Ensure the correct supply voltage is connected and check the lead cross-sections
	Brake coil interturn fault or short circuit to frame	Change the complete brake with control unit (specialist workshop), check the switching devices
Brake will not brake	Braking lining worn	Change the whole brake disc
	Manual brake release incorrectly set	Adjust the setting nuts
	Braking torque incorrect	Change the braking torque
Brake operates after a delay	Brake is switched in the AC circuit	Simultaneous switch-off in the DC and AC circuits; please refer to the wiring diagram
Brake noise	Worn gearing due to jerky starting	Check drive configuration
	Oscillating torques due to incorrect servo controller setting	Check/correct servo controller setting in accordance with the Installation and Operating Instructions

Note:

Should you require the assistance of our customer service department:

- Quote the details on the nameplates of motor and servo controller
- Describe the nature and extent of the fault
- Explain when and under what background conditions the fault occurred
- State the suspected cause

8 Index of revisions

The following modifications and additions have been made in the “Operating instructions DFY synchronous motors with and without brake and accessories“ when compared to the previous edition 03/98:

- Note on modifications of cable screw fittings from Pg to metric
- DFY56 motors are replaced by DFS56 motors
- New section for electrical installation of DFS56 with terminal box
- BMH brake rectifier has been adopted in electrical wiring of brake
- AGY absolute encoder replaced by AV1Y absolute encoder
- Assembly of plug connector for DFS56 resolver, AV1Y and SM11 integrated

Appendix

Table 1: Plug connector data

Connection	Connector	Socket contacts	Cable entry	Max. outside diameter cable	Stripped length A [mm]
DFS 56	SM11	4×1.5 mm^2	variable cable clamp		6 ± 0.5 mm
DFS 56 .. B	SM11	$4 \times 1.5 + 2 \times 0.75$ mm^2			
DFS 56 resolver/TF		$4 \times 2 \times 0.14$ ... 0.60 mm^2			6 ± 1 mm
DFY 71	SM21	4×1.5 mm^2	Pg 13.5	13.5 mm	7 ± 0.5 mm
	SM22	4×2.5 mm^2	Pg 13.5		11 ± 0.5 mm
DFY 90 / DFY 112 S / M	SM32	4×2.5 mm^2	Pg 21	20 mm	11 ± 0.5 mm
	SM34	4×4.0 mm^2	Pg 21		
	SM36	4×6.0 mm^2	Pg 21		
DFY 112 ML / L	SM46	4×6.0 mm^2 (solder contacts)	Pg 29	28 mm	
	SM41	4×10 mm^2	Pg 29		
DFY 71 ... 112 resolver / TF/TH		$4 \times 2 \times 0.22$ ... 0.56 mm^2	Pg 13.5	12	5 ± 1 mm
DFY 71 ... 112 brake		4×1.5 mm^2	Pg 11	7	
DFS 56 ... DFY 112 AV1Y		$3 \times 2 \times 0.24$ ... 1 mm^2	8 mm	-	4 mm
DFY 71 ... 112 VY		3×0.5 mm^2	Pg 7	6.5	

Table 2: Terminal box data

Connection	Terminal block	Max. cross section	Cable entry
DFS56	3 terminals	3 x 2.5 mm^2	3 x M20 x 1.5 + 3 x M16 x 1.5
DFY 71	$3 \times$ M5	4×4 mm^2	2 x M25 x 1.5 + 2 x M16 x 1.5
DFY 90	$3 \times$ M6	4×10 mm^2	2 x M32 x 1.5 + 2 x M16 x 1.5
DFY 112			
DFY 71 ... 112 resolver		$3 \times 2 \times 0.25$ mm^2	2 x M32 x 1.5 + 2 x M16 x 1.5
DFY 71 ... 112 TF/TH		2×1.5 mm^2	2 x M40 x 1.5 + 2 x M16 x 1.5

Table 3: Technical data of the brake

Motor type	M_{B1} [Nm]	M_{B2} [Nm]	W [10^6 J]	I_H (110 V_{AC}) [A]	I_H (230 V_{AC}) [A]	I_H (400 V_{AC}) [A]	I_H (24 V_{DC}) [A]	I_B/I_H
DFS 56M/B DFS 56L/B	/	2.5	/	/	/	/	0.56	/
DFY 71S/B DFY 71M/B DFY 71ML/B DFY 71L/B	6 10 10 15	3 6 6 10	60	0.30	0,15	0.10	1.0	6.7
DFY 90S/B DFY 90M/B DFY 90L/B	20 30 40	12 12 20	90	0.45	0.23	0.13	1.5	6.0
DFY 112S/B DFY 112M/B DFY 112ML/B DFY 112L/B	35 35 60 90	17.5 17.5 35 35	180	0.70	0.35	0.20	2.15	6.0

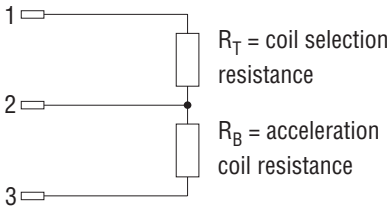
where: M_{B1} = maximum brake torque
M_{B2} = minimum brake torque
I_H = holding current
I_B = starting current
W = total brake work done until brake disc replacement

Table 4: Adjustable brake torques

Type		Brake torque	Number and type of springs		Part numbers	
Brake	Motor	[Nm]	Normal	Red	Normal	Red
B2	DFY 71..	3	-	3	186 662 1	183 742 7
		6	-	6		
		10	3	-		
		15	4	2		
B4	DFY 90..	12	-	6	186 663 X	184 003 7
		20	3	-		
		30	4	2		
		40	6	-		
B10	DFY 112..	17.5	-	3	186 677 X	184 008 8
		35	-	6		
		60	3	-		
		90	4	2		

Table 5: Brake coil resistances

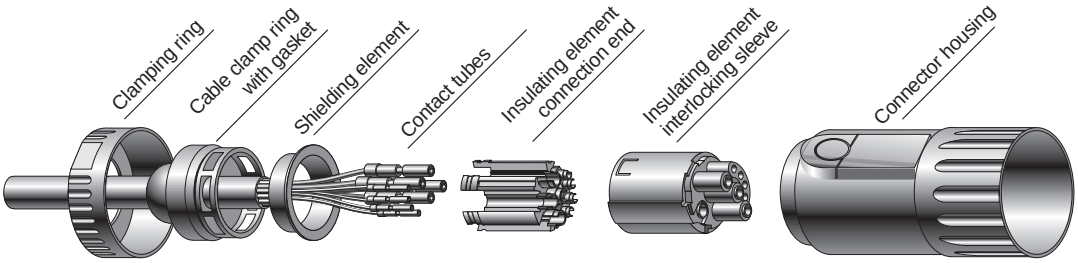
Motor type	Brake rated voltage							
	110 V_{AC}		230 V_{AC}		400 V_{AC}		24 V_{DC}	
	R_B [Ω]	R_T [Ω]	R_B [Ω]	R_T [Ω]	R_B [Ω]	R_T [Ω]	R_B [Ω]	R_T [Ω]
DFS 56 .. B	-	-	-	-	-	-	-	59
DFY 71 .. B	14.5	81	59	332	178	1000	3.6	20.2
DFY 90 .. B	9.9	50	40	203	121	610	2.5	12.4
DFY 112 .. B	7.3	37	30	151	90	454	1.8	9.2



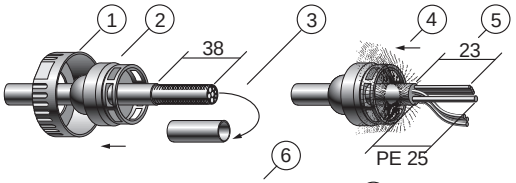
00202AEN

Fig. 22: Brake coil resistances (DFY 71 ... 112)

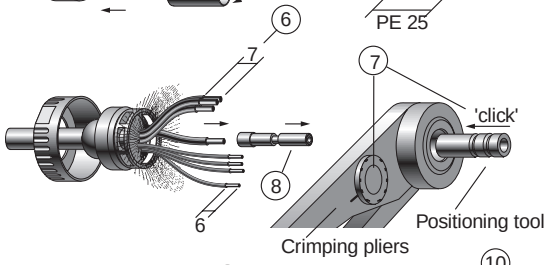
Assembly SM11 plug connector



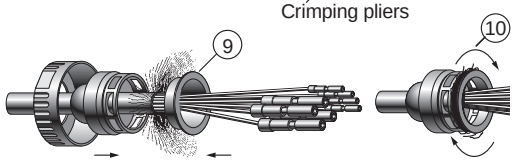
Step A:
1.-2. Slide clamping ring and cable clamp ring with gasket on cable.
3. Remove 38mm of cable insulation.
4. Slide back shield over cable.
5. Reduce power core to 23mm, core PE to 25mm.



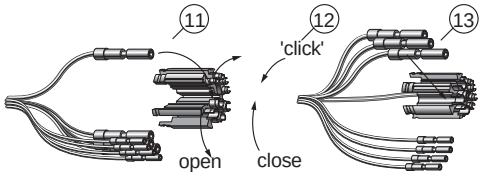
Step B:
6. Remove 7mm of insulation from power and PE cores, remove 6mm of insulation from signal core.
7. Insert positioning tool (019 244 9 / 019 245 7) and select crimping setting.
8. Place contact in crimping pliers (019 243 0) and crimp with core.



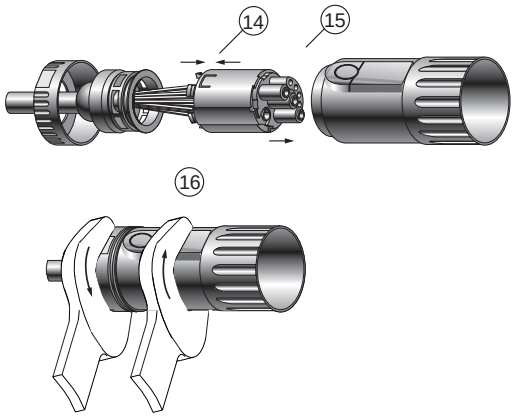
Step C:
9. Install shielding element.
10. Wind excessive shielding material around shielding element.



Step D:
11. Open up insulating element and lock contact into place.
12. Close insulating element and lock.
13. Install outer contacts.



Step E:
14. Slide interlocking sleeve completely over the assembled insulating element.
15. Install pre-fabricated module in connector housing.
16. Install clamping ring on connector housing.



02918AEN

Assembly of the SM21 ... SM41 plug connector

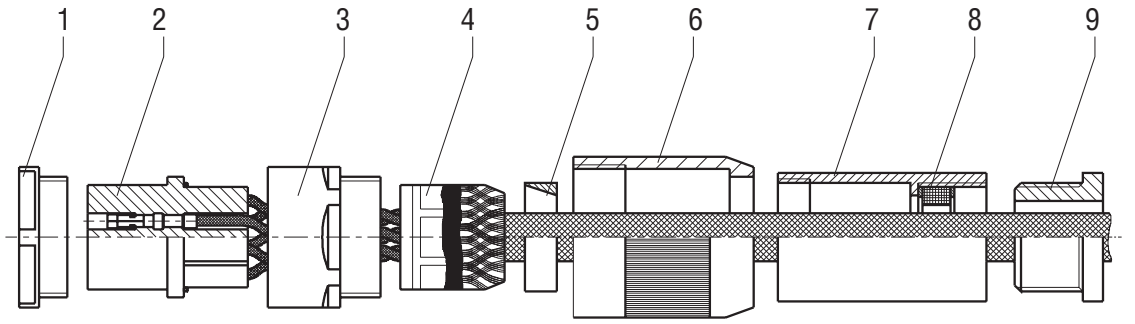


Fig. 23: SM plug connector

1	Coupling ring	4	Shield sleeve	7	End housing
2	Insulating element	5	Conical sleeve	8	Gasket
3	Connector housing	6	Interlocking sleeve	9	Pg sleeve

1. Disassemble the motor power connector.
2. Slide parts 4, 5, 6, 7, 8 and 9 over the cable end in reverse order.
3. Strip off cable sheath according to Table A.
4. Strip off leads according to Table B.
5. Feed leads through connector housing 3.
6. Crimp on socket contacts, in the case of SM46 connectors, solder on.
7. Place the cable braided shield over shield sleeve 4.
8. Press on conical sleeve 5 and cut off projecting wires.
9. Slide end housing 7 over conical sleeve 5 and shield sleeve 4 and screw to connector housing 3.
10. Guide the socket contacts into the insulating element 2 according to the wiring diagram (see Sec. 3.2.2) until they snap into place.
11. Insert the insulating element 2 into the connector housing 3 (careful: snugs) and secure with coupling ring 1.
12. Guide the interlocking sleeve 6 over the connector housing 3.
13. Insert gasket 8 into the end housing and provide the strain relief with Pg sleeve 9.

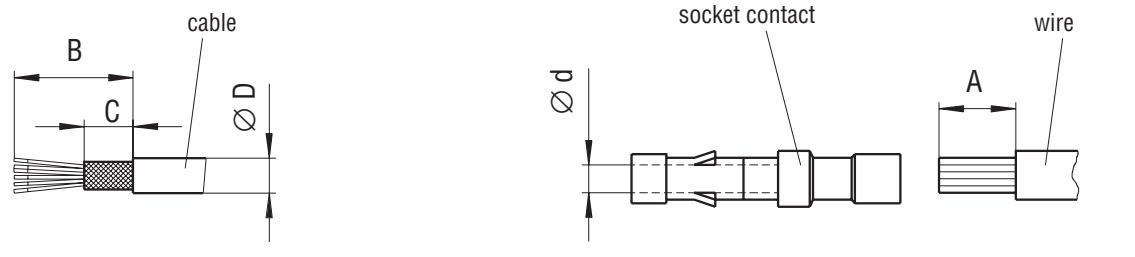


Fig. 24: Stripping dimensions and cable diameter

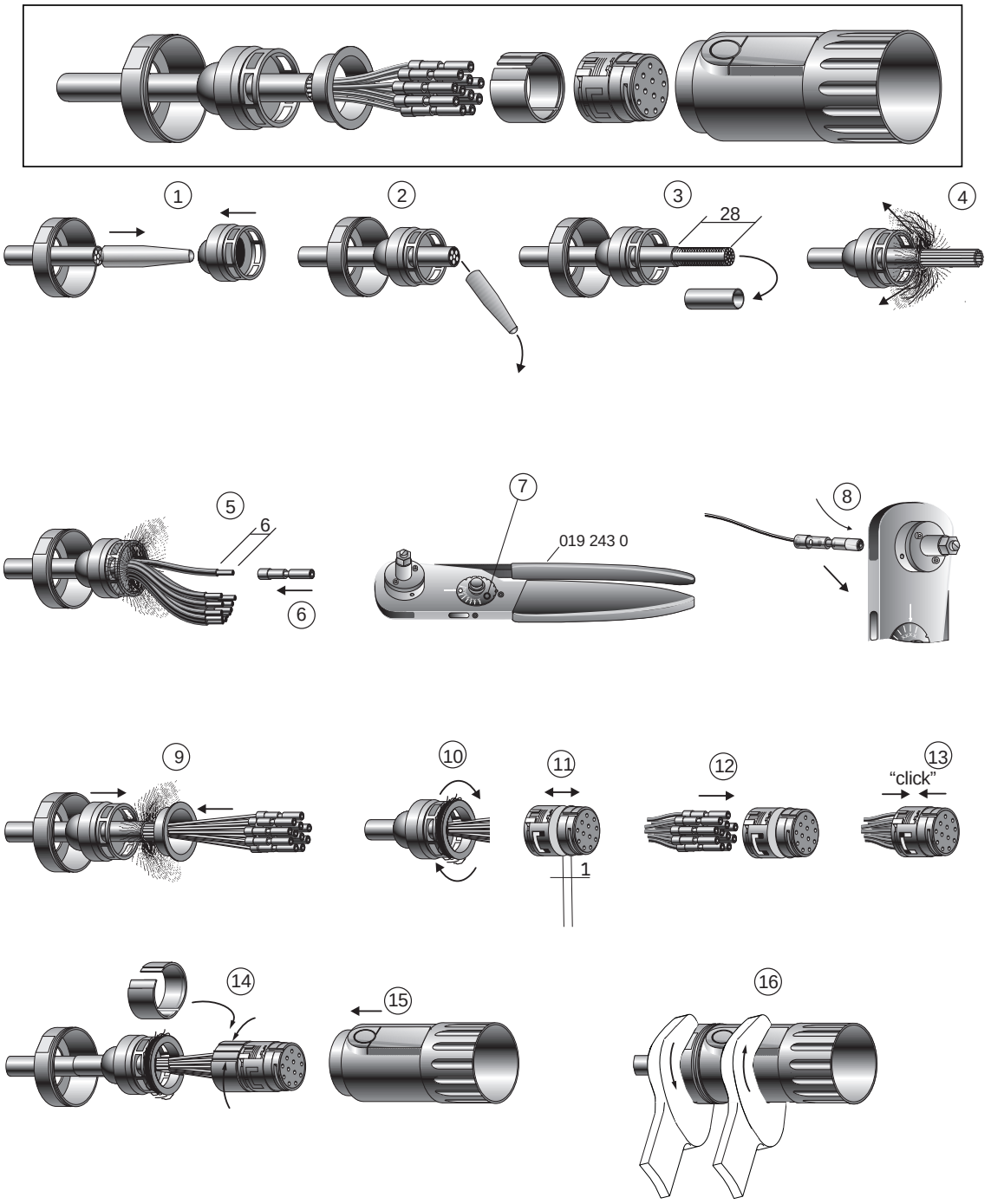
D	B	C
11	45	20
14	50	20
16	55	25
18	55	25
22	60	30

Table A

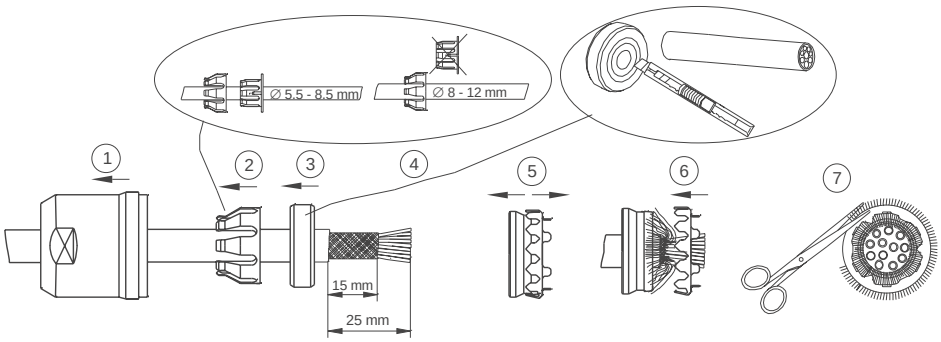
d	A
2.4	7 ± 0.5
3.6	11 ± 0.5
5.0	11 ± 0.5

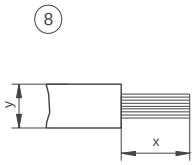
Table B

Assembly plug connector DS56 resolver



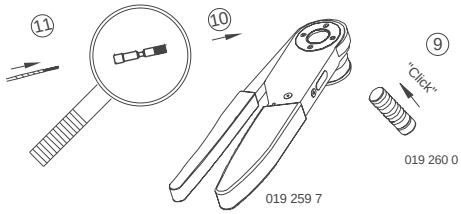
Assembly plug connector AV1Y

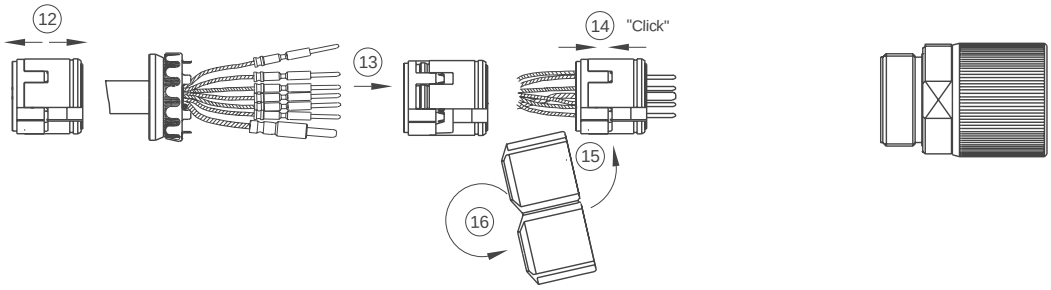




Crimping connection:

Contact ∅ 2: x = 5.5 mm
Contact ∅ 1: y ≤ 2.1: x = 4 mm
Contact ∅ 1: y ≥ 2.1: x = 6 mm





02929AEN

General design of DFY motors frame sizes 71 … 112 with brake and terminal box

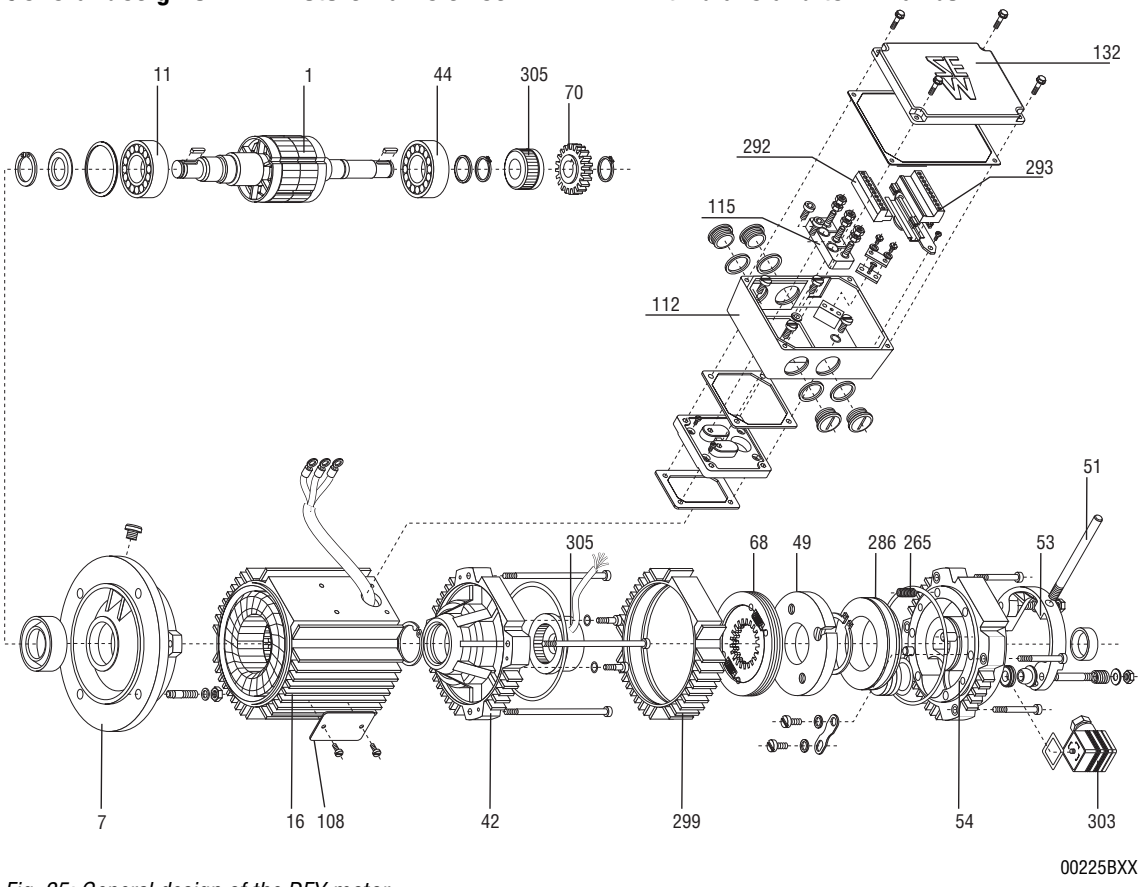


Fig. 25: General design of the DFY motor

1	Rotor, complete	53	Releasing yoke	265	Brake spring
7	Flanged end shield	54	Coil body	286	Brake coil
11	Deep groove ball bearing	68	Brake disc, complete	292	Connector part
16	Stator, complete	70	Carrier	293	Plug-in block
42	Non-drive end bearing end shield	108	Nameplate	299	Adapter plate
		112	Terminal box bottom section	303	Right-angle connector for brake connection, complete
44	Deep groove ball bearing	115	Terminal block		
49	Pressure plate	132	Terminal box cover	305	Resolver
51	Manual release lever				

Germany	**Headquarters Manufacture Sales, Service**	**Bruchsal**	SEW-EURODRIVE GmbH & Co Ernst-Blickle-Straße 42 D-76646 Bruchsal Postfach 3023, D-76642 Bruchsal	Tel. (0 72 51) 75-0 Telefax (0 72 51) 75-19 70 Telex 7 822 391 http://www.SEW-EURODRIVE.com sew @ sew-eurodrive.com
	Manufacture	**Graben**	SEW-EURODRIVE GmbH & Co Ernst-Blickle-Straße 1 D-76676 Graben-Neudorf Postfach 1220, D-76671 Graben-Neudorf	Tel. (0 72 51) 75-0 Telefax (0 72 51) 75-29 70 Telex 7 822 276
	Assembly Service	**Garbsen (near Hannover)**	SEW-EURODRIVE GmbH & Co Alte Ricklinger Straße 40-42 D-30823 Garbsen Postfach 110453, D-30804 Garbsen	Tel. (0 51 37) 87 98-30 Telefax (0 51 37) 87 98-55
		Kirchheim (near München)	SEW-EURODRIVE GmbH & Co Domagkstraße 5 · D-85551 Kirchheim	Tel. (0 89) 90 95 52-10 Telefax (0 89) 90 95 52-50
		Langenfeld (near Düsseldorf)	SEW-EURODRIVE GmbH & Co Siemensstraße 1, D-40764 Langenfeld	Tel. (0 21 73) 85 07-30 Telefax (0 21 73) 85 07-55
		Meerane (near Zwickau)	SEW-EURODRIVE GmbH & Co Dänkritzer Weg 1, D-08393 Meerane	Tel. (0 37 64) 76 06-0 Telefax (0 37 64) 76 06-30
France	**Headquarters Manufacture Service**	**Haguenau**	SEW-USOCOME S.A 48-54, route de Soufflenheim B. P.185 F-67506 Haguenau Cedex	Tel. 03 88 73 67 00 Telefax 03 88 73 66 00 Telex: 870 033 http://www.usocome.com sew@usocome.com
	Manufacture	**Forbach**	SEW-EUROCOME S.A. Zone industrielle Technopole Forbach Sud B. P. 30269, F-57604 Forbach Cedex	
	Assembly Service Technical Offices	**Bordeaux**	SEW-USOCOME Parc d 'activités de Magellan 62, avenue de Magellan - B. P.182 F-33607 Pessac Cedex	Tel. 05 57 26 39 00 Telefax 05 57 26 39 09
		Paris	SEW-USOCOME Zone industrielle, 2, rue Denis Papin F-77390 Verneuil l' Etang	Tel. 01 64 42 40 80 Telefax 01 64 42 40 88
Australia	**Assembly Sales, Service**	**Melbourne**	SEW-EURODRIVE PTY. LTD. 27 Beverage Drive Tullamarine, Victoria 3043	Tel. (03) 93 38-79 11 Telefax (03) 93 30-32 31 + 93 35 35 41
		Sydney	SEW-EURODRIVE PTY. LTD. 9, Sleigh Place, Wetherill Park Sydney N. S. W. 2164	Tel. (02) 97 56 10 55 Telefax (02) 97 56 10 05
Austria	**Assembly Sales, Service**	**Wien**	SEW-EURODRIVE Ges.m.b. H. Richard-Strauss-Straße 24 A-1230 Wien	Tel. (01) 6 17 55 00-0 Telefax (01) 6 17 55 00-30
Belgium	**Assembly Sales, Service**	**Bruxelles**	CARON-VECTOR S.A. Avenue Eiffel 5 B-1300 Wavre	Tel. (010) 23 13 11 Telefax (010) 23 13 36 http://www.caron-vector.be info@caron-vector.be
Brazil	**Manufacture Sales, Service**	**São Paulo**	SEW DO BRASIL Motores-Redutores Ltda. Caixa Postal 201-0711-970 Rodovia Presidente Dutra km 213 CEP 07210-000 Guarulhos-SP	Tel. (011) 64 60-6433 Telefax (011) 64 80-43 43 E-Mail: sew.brasil@originet.com.br
Canada	**Assembly Sales, Service**	**Toronto**	SEW-EURODRIVE CO. OF CANADA LTD. 210 Walker Drive, Bramalea, Ontario L6T3W1	Tel. (905) 7 91-15 53 Telefax (905) 7 91-29 99
		Vancouver	SEW-EURODRIVE CO. OF CANADA LTD. 7188 Honeyman Street, Delta. B.C. V4G 1 E2	Tel. (604) 2 72 42 88 + 9 46 55 35 Telefax (604) 946-2513
		Montreal	SEW-EURODRIVE CO. OF CANADA LTD. 2555 Rue Leger Street LaSalle, Quebec H8N 2V9	Tel. (514) 3 67-11 24 Telefax (514) 3 67-36 77
Chile	**Assembly Sales, Service**	**Santiago de Chile**	SEW-EURODRIVE CHILE Motores-Reductores LTDA. Panamericana Norte Nº 9261 Casilla 23-Correo Quilicura RCH-Santiago de Chile	Tel. (02) 6 23 82 03 + 6 23 81 63 Telefax (02) 6 23 81 79
China	**Manufacture Assembly Sales, Service**	**Tianjin**	SEW-EURODRIVE (Tianjin) Co., LTD No. 46, 7th Avenue, TEDA Tianjin 300457	Tel. (022) 25 32 26 12 Telefax (022) 25 32 26 11
Denmark	**Assembly Sales, Service**	**Kopenhagen**	SEW-EURODRIVE A/S Geminivej 28-30, P.O. BoX 100 DK-2670 Greve	Tel. 4395 8500 Telefax 4395 8509
Finland	**Assembly Sales, Service**	**Lahti**	SEW-EURODRIVE OY Vesimäentie 4, FIN-15860 Hollola2	Tel. (3) 58 93 00 Telefax (3) 7 80 62 11
Great Britain	**Assembly Sales, Service**	**Normanton**	SEW-EURODRIVE Ltd. Beckbridge Industrial Estate P.O. Box No.1 GB-Normanton, West-Yorkshire WF61 QR	Tel.19 24 89 38 55 Telefax 19 24 89 37 02
Hong Kong	**Assembly Sales, Service**	**Hong Kong**	SEW-EURODRIVE LTD. Unit No.801-806, 8th Floor Hong Leong Industrial Complex No. 4, Wang Kwong Road Kowloon, Hong Kong	Tel. 2-7 96 04 77 + 7 96 04 65 Telefax 2-795-91 29

SEW EURODRIVE

Italy	**Assembly** **Sales, Service**	**Milano**	SEW-EURODRIVE di R. Blickle & Co. s.a.s. Via Bernini,14, I-20020 Solaro (Milano)	Tel. (02) 96 79 97 71 Telefax (02) 96 79 97 81
Japan	**Assembly** **Sales, Service**	**Toyoda-cho**	SEW-EURODRIVE JAPAN CO., LTD. 250-1, Shimoman-no, Toyoda-cho, Iwata-gun Shizuoka prefecture, P.O. Box 438-0818	Tel. (053 83) 7 38 11-13 Telefax (053 83) 7 38 14
Korea	**Assembly** **Sales, Service**	**Ansan**	SEW-EURODRIVE CO., LTD. B 601-4, Banweol Industrial Estate 1048-4, Shingil-dong, Ansan 425-120	Tel. (03 45) 4 92-80 51 Telefax (03 45) 4 92-80 56
Malaysia	**Assembly** **Sales, Service**	**Johore**	SEW-EURODRIVE Sdn. Bhd. 95, Jalan Seroja 39 81100 Johore Bahru, Johore	Tel. (07) 3 54 57 07 + 3 54 94 09 Telefax (07) 3 5414 04
Netherlands	**Assembly** **Sales, Service**	**Rotterdam**	VECTOR Aandrijftechniek B.V. Industrieweg 175 NL-3044 AS Rotterdam Postbus 10085, N L-3004 AB Rotterdam	Tel. (010) 4 46 37 00 Telefax (010) 4 15 55 52
New Zealand	**Assembly** **Sales, Service**	**Auckland**	SEW-EURODRIVE NEW ZEALAND LTD. P.O. Box 58-428 82 Greenmount Drive, East Tamaki, Auckland	Tel. (09) 2 74 56 27 2 74 00 77 Telefax (09) 2 74 01 65
Norway	**Assembly** **Sales, Service**	**Moss**	SEW-EURODRIVE A/S Solgaard skog 71, N-1539 Moss	Tel. (69) 24 10 20 Telefax (69) 24 10 40
Portugal	**Assembly** **Sales, Service**	**Coimbra**	SEW-EURODRIVE, LDA. Apartado 15, 3050 Mealhada	Tel. (231) 20 96 70 Telefax (231) 20 36 85
Singapore	**Assembly** **Sales, Service**	**Singapore**	SEW-EURODRIVE PTE. LTD. No 9, Tuas Drive 2 , Jurong Industrial Estate Singapore 638644 Jurong Point Post Office, P.O. Box 813 Singapore 916428	Tel. 86 21 701-705 Telefax 8 61 28 27 Telex: 38 659
South Africa	**Assembly** **Sales, Service**	**Johannesburg**	SEW-EURODRIVE (PROPRIETARY) LIMITED Eurodrive House Cnr. Adcock Ingram and Aerodrome Roads Aeroton Ext. 2, Johannesburg 2013 P.O. Box 27032, 2011 Benrose, Johannesburg	Tel. (2711) 4 94 43 80 Telefax (2711) 4 94 23 00
		Capetown	SEW-EURODRIVE (PROPRIETARY) LIMITED Rainbow Park Cnr. Racecourse & Omuramba Road Montague Gardens, 7441 Cape Town P.O.Box 53 573 Racecourse Park, 7441 Cape Town	Tel. (021) 5 11 09 87 Telefax (021) 5 11 44 58 Telex: 576 062
		Durban	SEW-EURODRIVE (PROPRIETARY) LIMITED 39 Circuit Road, Westmead, Pinetown P.O. Box 10433, Ashwood 3605	Tel. (031) 7 00 34 51 Telex: 622 407
Spain	**Assembly** **Sales, Service**	**Bilbao**	SEW-EURODRIVE ESPAÑA, S.L. Parque Tecnologico, Edificio, 302 E-48170 Zamudio (Vizcaya)	Tel. 9 44 31 84 70 Telefax 9 44 31 84 71
Sweden	**Assembly** **Sales, Service**	**Jönköping**	SEW-EURODRIVE AB Gnejsvägen 6-8 S-55303 Jönköping	Tel. (036) 16 50 70 Telefax (036) 16 44 69 Telex: 70162
Switzerland	**Assembly** **Sales, Service**	**Basel**	Alfred Imhof A.G. Jurastrasse 10 CH-4142 Münchenstein bei Basel	Tel. (061) 4 17 17 17 Telefax (061) 4 17 17 00
Thailand	**Assembly**	**Chon Buri**	SEW-EURODRIVE (Thailand) Ltd. Bangpakong Industrial Park 2 700/456, M007, Tambol Bonhuaroh Muang District, Chon Buri 20000	Tel. 0066-38 21 45 29/30 Telefax 0066-38 21 45 31
Turkey	**Assembly** **Sales, Service**	**Istanbul**	SEW-EURODRIVE Hareket Sistemleri Ticaret Ltd. Sirketi Bagdat Cad. Koruma Cikmazi No. 3 TR-81540 Maltepe ISTANBUL	Telefon (216) 4 41 91 63 + 4 41 91 64 + 3 83 80 14 + 3 83 80 15 Telefax (216) 3 05 58 67
USA	**Manufacture** **Assembly** **Sales, Service**	**Greenville**	SEW-EURODRIVE INC. 1275 Old Spartanburg Highway P.O. Box 518 Lyman, S.C. 29365	Tel. (864) 4 39-75 37 Telefax Sales (864)439-78 30 Telefax Man. (864) 4 39-99 48 Telefax Ass. (864) 4 39-05 66 Telex: 805 550
	Assembly **Sales, Service**	**San Francisco**	SEW-EURODRIVE INC. 30599 San Antonio Road P.O. Box 3910, Hayward California 94544	Tel. (510) 4 87-35 60 Telefax (510) 4 87-63 81
		Philadelphia/PA	SEW-EURODRIVE INC. Pureland Ind. Complex 200 High Hill Road, P.O. Box 481 Bridgeport, NewJersey 08014	Tel. (609) 4 67-22 77 Telefax (609) 8 45-31 79
		Dayton	SEW-EURODRIVE INC. 2001 West Main Street Troy, Ohio 45373	Tel. (513) 3 35-00 36 Telefax (513) 2 22-41 04 Telex: 6 874 204
		Dallas	SEW-EURODRIVE INC. 3950 Platinum Way, Dallas, Texas 75237	Tel. (214) 3 30-48 24 Telefax (214) 3 30-47 24
Venezuela	**Assembly** **Sales, Service**	**Valencia**	SEW-EURODRIVE Venezuela S.A. Av. Norte Sur No. 3, Galpon 84-319 Zona Industrial Municipal Norte Valencia	Tel. (041) 24 32 32 Telefax (041) 25 49 16

We are available, wherever you need us. Worldwide.

SEW-EURODRIVE right around the globe is your competent partner in matters of power transmission with manufacturing and assembly plants in most major industrial countries.

SEW EURODRIVE

SEW-EURODRIVE GmbH & Co · P.O.Box 30 23 · D-76642 Bruchsal/Germany
Tel. +49-7251-75-0 · Fax +49-7251-75-19 70 · Telex 7 822 391
http://www.SEW-EURODRIVE.com · sew@sew-eurodrive.com