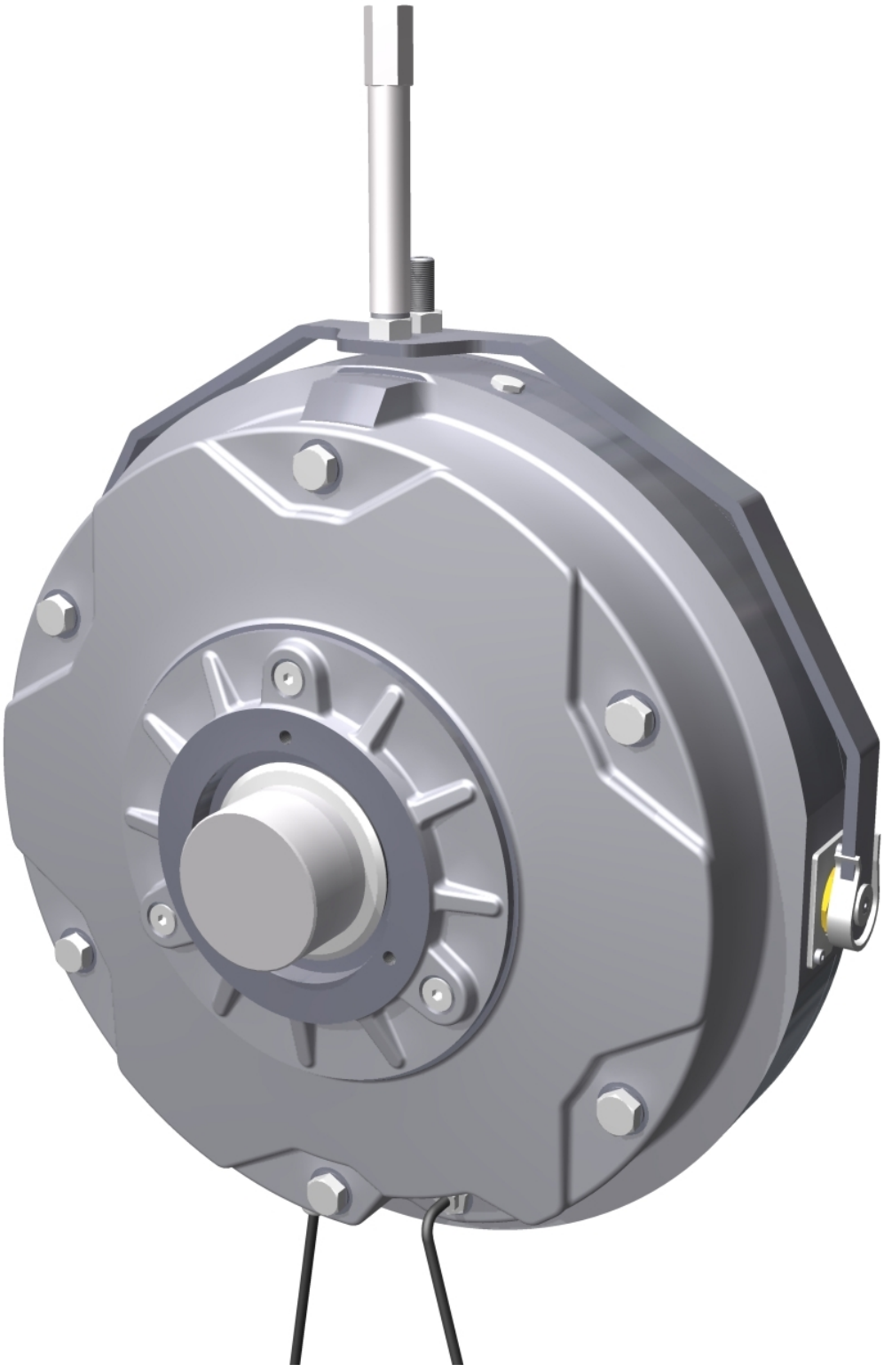
Operating and Assembly Instructions

Version 10.09

for the electromagnetically released

Spring-Applied Brakes (Standard Design)

FDX 26 FDX 30 FDX 40



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1. Information on Operating and Assembly Instructions

1.1 Validity

These operating and assembly instruction (in accordance with their title) are generally valid only for the **standard design of the electromagnetically released spring-applied brakes FDX 26, FDX 30 and FDX 40** of M/s. PRECIMA Magnettechnik GmbH. Moreover, they are a necessary element of every brake delivery and generally only valid for such simultaneously delivered brakes. The operating and assembly instruction will even continue to be valid for such brakes, if a later version of the instructions exists, unless M/s. PRECIMA expressly declare towards the customer that the later version replaces the older one.

In individual cases, the above mentioned principles may be deviated from (e.g. in case of special designs or repeated deliveries). In any case, an indicative or supplementing information of M/s. PRECIMA will be required.

1.2 Purpose and Use

These operating and assembly instructions are to contribute to a safe and proper assembly and a similar operation of the spring-applied brake.

In order to meet this requirement and purpose, all the persons dealing with the assembly and the operation of the brake (qualified according to 2.1.2) have to **completely and thoroughly read** these instructions before carrying out their respective activities (assembly, commissioning, operation, maintenance, etc.). Furthermore, said persons of course have to **observe and implement the given instructions** when carrying out their respective activities. The instructions themselves must be accessible any time (even after completion of the respective activity) and within short time in a clean, complete and well legible condition.

Despite careful and thorough elaboration of the instructions, mistakes, defects and incompleteness in the operating and assembly instructions cannot be excluded. For this reason, please consult M/s. PRECIMA in justified cases of doubt. Other technical questions, notes and suggestions for improvement can also be directed to the following address:

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1.3 Terms and Identification of Notices

Important notices in Chapter **4** (Assembly), Chapter **5** (Operation) and Chapter **6** (Disassembly / Exchange) referring to technical security as well as to industrial safety are particularly highlighted by the following **signal words**:

➔Danger! stands with processes and operation procedures which are to be thoroughly observed in order to exclude a **hazard of persons**.

➔Attention! indicates to safety measures which must absolutely be followed in order to **avoid brake failures**.

➔Stop! is to be found with instructions that have to be **particularly observed** when carrying out the work described.

In order to simplify the text of these operating and assembly instructions, certain longer and complicated terms are replaced by shorter ones which will have the following meanings in the scope of these instructions:

Instructions = Operating and assembly instruction

Working brake = Brake which implements friction work in regular operation, i.e. performs a braking function

Brake = Spring-applied brake = electromagnetically released spring-applied brake
FDX 26, FDX 30, FDX 40

Data sheet = Technical data sheet FDX 26..40

Holding brake = Brake which does not implement friction work in regular operation but merely secures a position reached. In case of an emergency, however, it may also perform a braking function.

End plate = Motor end plate = end plate of an electric motor

Dimension sheet (**brake**) = Dimension drawing (brake) = (dimension drawing M98-080)

PRECIMA = M/s. PRECIMA = PRECIMA Magnettechnik GmbH, Bückeburg

Shaft = Motor shaft = shaft of an electric motor

In the scope of these operating and assembly instructions, the spring-applied brake is considered to be a machine element to be connected to an electric motor since this combination represents the most frequently used variant. Accordingly, certain designations refer to said fact (motor shaft, motor end plate ➔ see above). However, this is no general limitation of the validity of these instruction to such combinations - just as there is no comparable limitation to the application of the spring-applied brake at all.

These operating and assembly instructions furthermore include the following documents to be enclosed:

- Enclosure I: **Technical Data Sheet FDX 26..40**
- Enclosure II: **Dimension Drawing M98-080 ➔ Brake**
- Enclosure III: **Dimension Drawing T90-156 ➔ High-Speed Rectifier**
- Enclosure IV: Dimension Drawings T90-147, T90-158, T90-162 ➔ Proximity Switches (Sensors)
- Enclosure V: Dimension Drawing T90-148, T90-163 ➔ Heating, Temperature Sensor

2. Conditions for Assembly and Operation

2.1 Persons

2.1.1 Operator

Operator is that natural person or entity using the spring-applied brake or instructing the spring-applied brake to be used. The operator and/or a person assigned by him must safeguard the **proper use according to 2.3** and the observance of relevant standards and provisions, regulations and laws. In particular, he has to take care of the fact that only **qualified personnel according to 2.1.2** is entrusted with work at the brake.

2.1.2 Personnel

Personnel to carry out work at the brake must exclusively be qualified personnel who - based upon their education, experience, instructions as well as knowledge concerning relevant standards and provisions, accident prevention regulations and operating conditions - have been authorised by the person being responsible for safety to carry out the activities described in these instructions and who - when doing so - are in a position to recognise possible risks early and to avoid them.

2.2 Product

2.2.1 Area of Application

The area of application of the brake is limited to plants and machines and is defined by the boundary conditions, performance data and dimensions indicated in the **technical data sheet FDX 26..40**, in the **dimension drawing M98-080** and on the **name plate of the brake** (see: **3.1**). Any deviation from these directives require a particular agreement with PRECIMA. Particularly pay attention to the application as a **working** and an application as a **holding brake** (definition: see 1.3).

2.2.2 Environment of Application

The environment of application of the spring-applied brake must be designed such that after its proper assembly the brake may fulfil its function in perfect operation and will not pose any risk for persons and material assets. Changes in the environment of application (e.g. at the machine or plant which the brake is connected with) must only be carried out, if they have no influence on the first mentioned condition.

2.2.3 State of Application

The permissible state of application of the brake includes the operationally perfect state of all components (in case of wear parts: exchange in time) and the observance of the operating and assembly requirements specified in these instructions as well as the omission of any retrofits, changes or modification of the brake, unless authorised by PRECIMA. The latter also includes the use of not original spare and exchange parts.

Furthermore, the friction surfaces and the friction lining by no means must get in contact with oil or grease since already small quantities reduce the braking torque considerably!

2.3 Proper Use

At the time of delivery, the spring-applied brake represents the state of the art and is generally considered to be reliable in operation. Only use it **properly** in order to avoid any risk for persons and material assets caused by it!

The spring-applied brake is properly used, if qualified personnel (according to 2.1.2) by applying the valid operating and assembly instructions (as per 1.1, according to 1.2) **produces and maintains** a permissible state of application (according to 2.2.3 in an admissible environment of application (according to 2.21).

The improper (inappropriate) use includes hazards which could not be completely taken into account when designing and construction the brake and which are unforeseeable in this sense.

2.4 Legal Aspects

2.4.1 Liability

On the basis of the information, data and directions given and of the illustrations and descriptions included in these operating and assembly instructions, no claims for brakes outside the area of application of these instructions (compare 1.1) may be asserted.

In general, an inappropriate use of the brake (compare 2.3) will exclude the liability of M/s. PRECIMA.

2.4.2 Warranty

For the warranty terms refer to the General Terms of Sales and Delivery of M/s. PRECIMA (www.precima.de / AGB). In any case, warranty claims are to be asserted towards PRECIMA immediately after establishing a deficiency or a defect. The exclusion of liability according to 2.4.1 simultaneously means that no warranty claim exists.

2.4.3 Directives and Standards

The spring-applied brake was produced in accordance with the following EC directives and standards:

- EC Directive Machinery (2006/42 EC)
- EN ISO 12100-1 and 12100-2: Safety of Machinery (Basic Concepts)
- EC Directive Electromagnetic Compatibility (2004/108 EG). Compliance with this directive has to be safeguarded with the appropriate switchgear of the user.

The spring-applied brake is no independently operable machine but intended to be installed in another machine. Its commissioning is prohibited until the establishment is reached that the machines comply with the provisions of the EC Directive.

3. Product Description

3.1 Labelling

3.1.1 Name Plate

The name plate of the spring-applied brake includes all important technical data. These data (independent of any other information) in any case have to comply with the intended conditions of application. Otherwise the brake must not be commissioned.

Example: Name plate FDX 40 (attached to the magnet housing):

Braking torque in Nm

Year of manufacture (09 = 2009)

Month of manufacture (10 = October)

Release voltage / holding voltage (DC) in Volt

3.1.2 Type Designation Code

Example:

FDX **40** **H** Ø**75** H7 **360/180VDC**

Release voltage / holding voltage (DC) in Volt

Hub bore

Manual release

Brake size (sizes of the spring-applied brake: **26, 30, 40**)

Brake designation (series)

3.2 Technical Information

3.2.1 Operation of the Brake

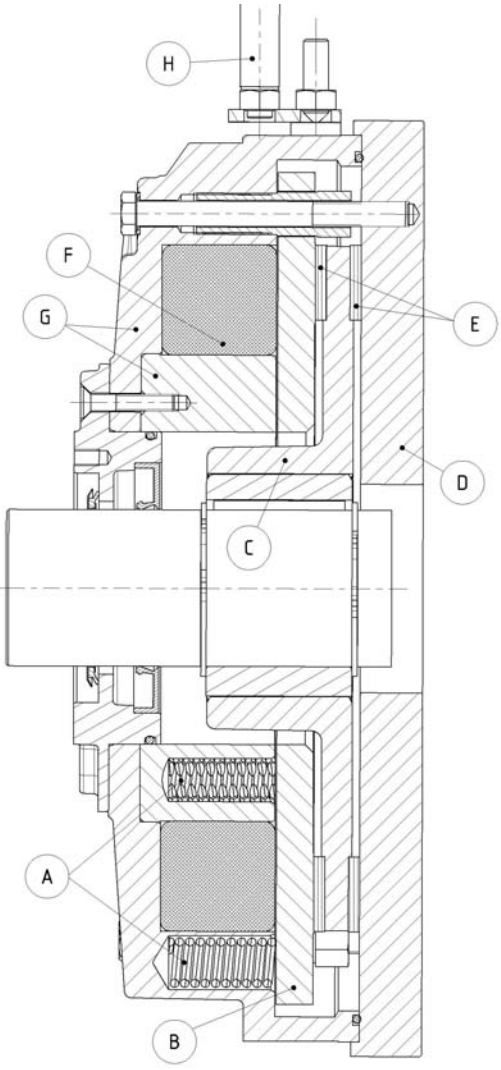
The electromagnetic spring-applied brakes FDX 26, FDX 30, FDX 40 are fail-safe brakes, this means that the braking torque is generated by means of spring force in closed-loop operation and revoked by magnetic force.

During **braking**, the incorporated pressure springs (**A, illustration 1**) through the axially movable armature disk (**B**) press onto the rotor (**C**) radially positively connected with the machine shaft. On the opposite side, the rotor in turn presses against a counter-friction surface (**D**) (➔motor plate). The two-sided friction between the linings of the rotor (**E**) and the armature disk and/or the counter-friction surface produces the braking torque.

During **releasing**, a magnetic force is produced through applying a direct voltage at the magnet body (**G**) via the field winding (**F**). Said magnetic force draws the armature disk to the magnet body and the rotor is released.

During **manual releasing** (*only if the brake is designed with manual release*), the armature disk is mechanically pressed against the magnet body by actuating the manual releasing bracket (**H**) and thus the rotor is released. This enables you to release the brake, for example, even if there is a power failure.

Illustration 1:
Operation of the brake (sectional view)



3.2.2 Main Dimensions and Characteristics

Normally, main dimensions and characteristics are to be found in the enclosed **technical data sheet FDX 26..40**, the enclosed **dimension drawing M98-080** and the **name plate of the brake**. Agreed deviations must be stated in an enclosure to these operating and assembly instructions replacing or supplementing the above mentioned documents.

4. Assembly

4.1 Mechanical Installation

4.1.1 Prerequisites and Preparation

- Check the unpacked spring-applied brake as to being undamaged and to the completeness of the parts (according to delivery note). Complaints regarding visible damages in transit have to be immediately made with the supplier, complaints of visible deficiencies and incompleteness have to be made with PRECIMA.
- Compare the name plate of the brake with the agreed characteristics and the real data.

➔**Attention!** **Should the checks result in any uncertainties or discrepancies, the brake must not be mounted and commissioned without prior consultation with PRECIMA.**

4.1.2 Counter-Friction Surface

- Check whether the existing counter-friction surface meets the relevant requirements (material: steel, steel casting, grey cast iron - *no aluminium / stainless steel with limitations* - surface quality Rz 6.3 ➔ compare dimension drawing M98-080) and whether it is free from grease and oil.

➔**Attention!** **Should the counter-friction surface not meet the relevant requirements, the brake must not be mounted and commissioned without prior consultation with PRECIMA. Completely remove grease and oil from the counter-friction surface before processing the brake further!**

<u>Information concerning further description of the mechanical installation:</u>

If hereinafter a component is marked with a <u>number</u> (1, …, 14), it refers to the appropriate number of the spare parts list (compare illustration 12 and table 7). The designation with a letter (A, B, C, …), however, merely has an enumerative purpose and is only valid for the relevant illustration and its description.

4.1.3 Rotor

➔Stop! **Before actually mounting the rotor, its thickness (S_1, illustration 2) has to be checked. Table 1 states the limits of the admissible rotor thicknesses for the three sizes 26, 30 and 40 of the FDX brake. S_{1max} is the value for a new rotor, S_{1min} is the limiting value when the maximum admissible size of the air gap is reached and a mounting (e.g. after a dismounting caused by maintenance) is no longer useful.**

In the first assembly step, the rotor is fixed as a revolving machine part of the motor to be braked and on its shaft in accordance with **illustration 2**:

- Insert the first locking ring (**A**) into the rear radial groove (**B**)
- Insert the feather key (**C**) into the axial groove (**D**) of the shaft
- Push the hub (**2**) onto the shaft and over the feather key
- Axially fix the hub by inserting the second locking ring (**E**) into the front radial groove (**F**)
- Push the rotor (**1**) onto the hub with the rotor remaining axially displaceable

➔Attention! **Pay attention to the smooth running of the gears!**

Illustration 2: Rotor assembly

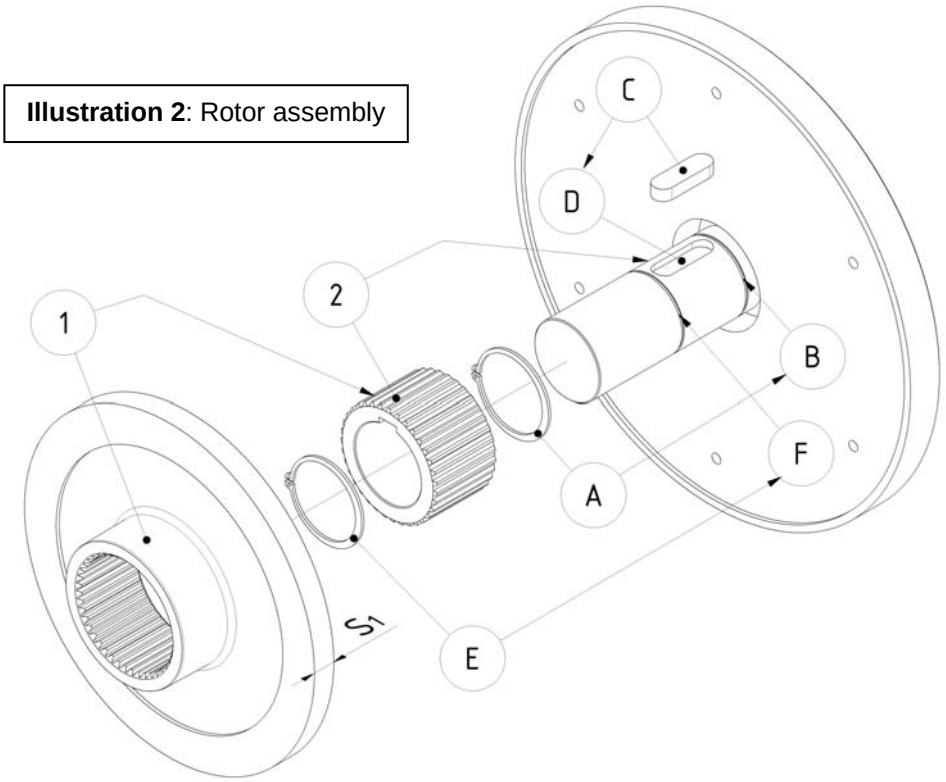


Table 1: Admissible rotor thicknesses in mm		
Size FDX	**$S_{1\ min}$**	**$S_{1\ max}$**
26	**18.80**	**$20.00^{-0,05}$**
30	**18.80**	**$20.00^{-0,05}$**
40	**21.10**	**$22.00^{-0,05}$**

4.1.4 Brake

a) Preliminary remark 1: Continuous and not continuous shaft

In case of spring-applied brakes, a distinction has to be made between the designs for a continuous shaft and those designs for a *not* continuous shaft. Against the latter, the brake does not have to be sealed and the assembly effort is lower. Above all, the already completed and inserted sealing flange does not have to be dismounted again.

Hereinafter, the assembly is described

under **c)** for the variant **"continuous shaft",**
under **d)** for the variant **"not continuous shaft"**.

Under **e)** the *air cap control* to be carried out for **all brakes** after the mechanical installation is described.

b) Preliminary remark 2: Centred mounting

In general, PRECIMA recommend the centred mounting at the motor end plate *for all brakes*. For this purpose, the outer cylindrical fitting surface of the brake has to be joined with an appropriately designed counter-surface being centric towards the motor shaft (**illustration 3**). The following **Table 2** states the dimensions of said counter-surface for the individual sizes:

Illustration 3: Centric counter-surface
(with mounted rotor)

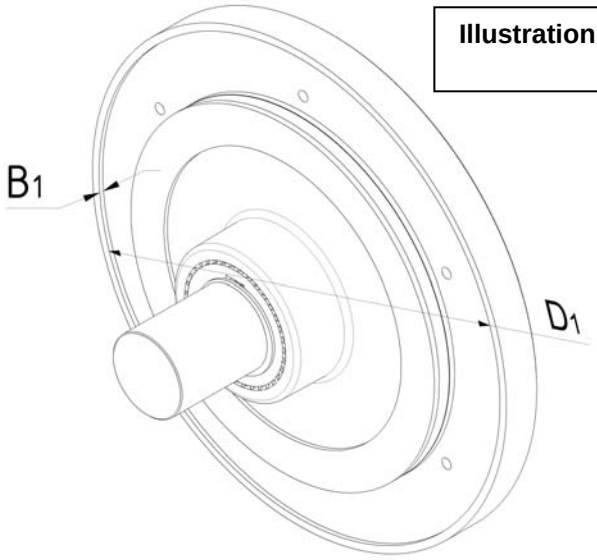


Table 2: Dimensions of centric counter-surface		
Size FDX	D_1 [mm] / Fit **F7**	B_1 [mm]
26	294 / $^{+0,108}_{+0,056}$	4
30	342 / $^{+0,119}_{+0,062}$	4
40	436 / $^{+0,131}_{+0,068}$	4

Dimension "B" of 4 mm must not be exceeded in order to safeguard a perfect positioning of the brake in axial direction and not to affect the release lever reset.

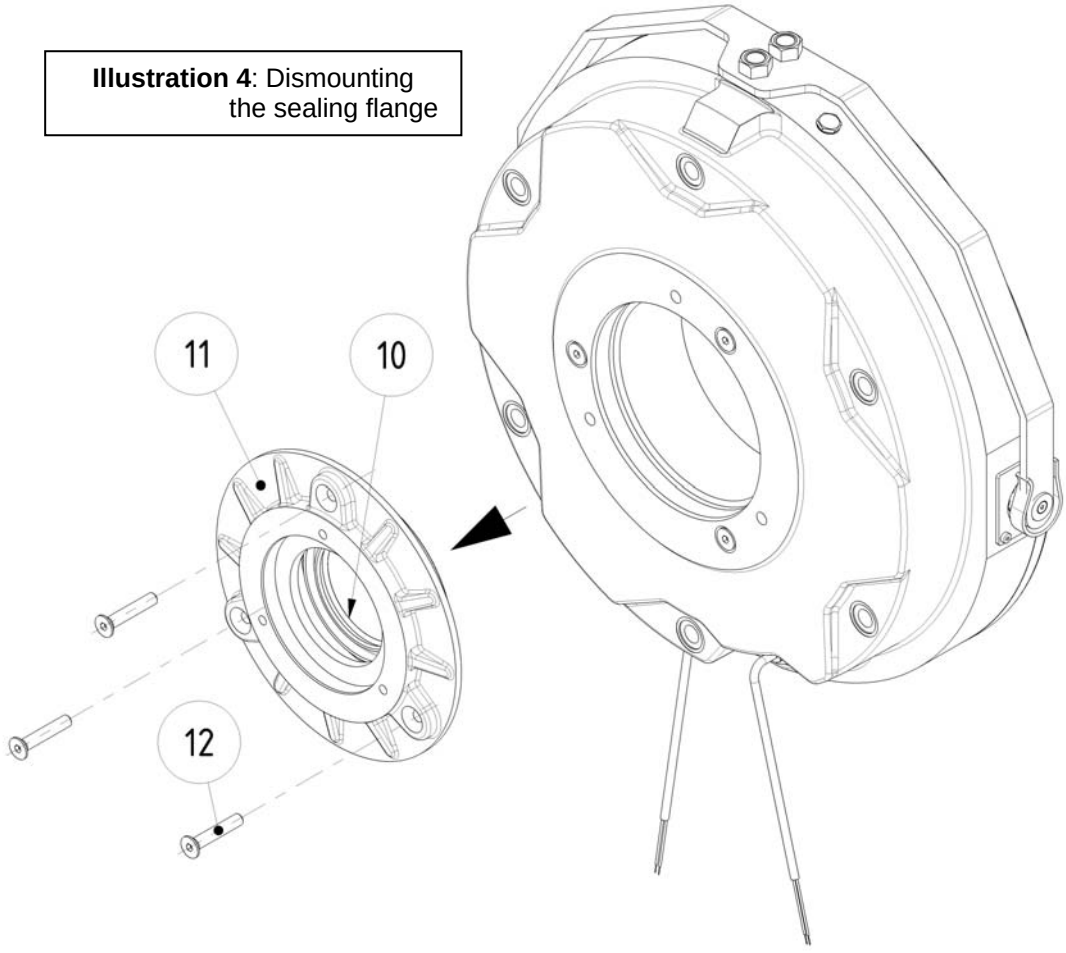
c) Assembly with <u>continuous</u> shaft

c1) Step 1: Dismounting the sealing flange

In general, first of all the sealing flange (**11**) has to be dismounted in accordance with **illustration 4**. The through-holes for the fastening screws (**12**) possess threads themselves which can be used for pulling off the sealing flange.

➔Stop! **The *rotary shaft seal (10)* has already been inserted at the inner side of the sealing flange. Do not damage it during disassembly! Be careful when you reach into the through-hole!**

Illustration 4: Dismounting the sealing flange



c2) Step 2: Screw on the brake

In the next step, the brake is screwed on at the counter-friction surface (motor end plate) according to **illustration 5**:

- Insert the large O-ring (**3**) for sealing the housing into the axial groove at the rear side of the housing (**A** = contact side)
- Arrange a Usit-ring (**7**) which is centred by a recess (**B**) in the housing under each screw (**8**)
- Fix the brake by screwing down the fastening screws (**8**) in the tapped holes (**C**)
- If the brake is **centred** by means of the outer fitting surface (as shown in illustration 6, compare ***preliminary remark 2***), the screws may be readily **tightened** directly
- Otherwise, the brake still has to be **aligned** (compare **step 3**) before tightening the screws.

➔Attention! **Pay particular attention to the correct positioning of the sealing elements before and during the tightening procedure in order to safeguard the tightness of the brake.**

➔Stop! **Tighten the screws at a torque according to Table 5!**

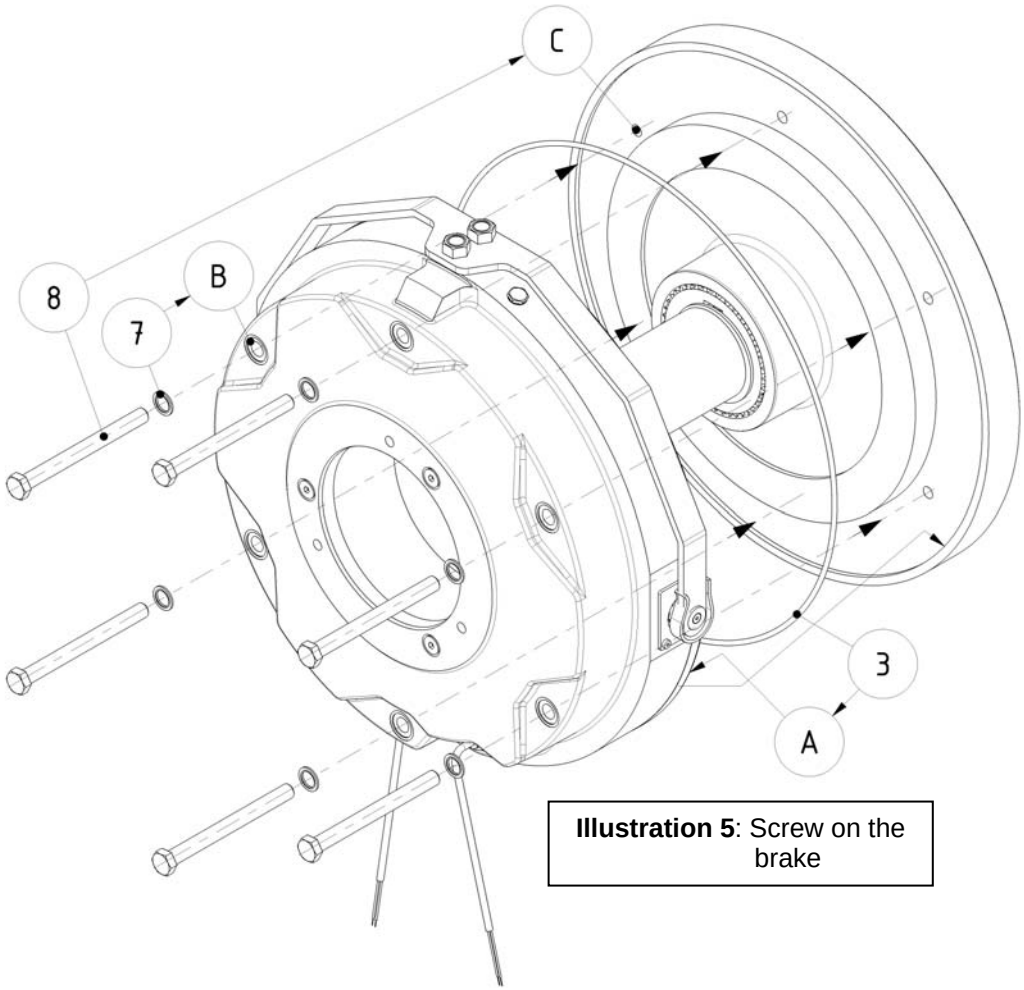


Illustration 5: Screw on the brake

c3) Step 3: Alignment by means of the motor shaft (**illustration 6**) **– not with centred mounting -**

If *no* centric counter-surface (as described before) exists, the brake has to be centrically aligned towards the motor shaft during the tightening procedure in order to safeguard the sealing of the brake towards the shaft. The alignment is made between the housing *without* sealing flange and the shaft by means of a sleeve. The following **Table 3** states the dimensions of fitting surfaces of shaft and housing to be coaxially aligned towards each other.

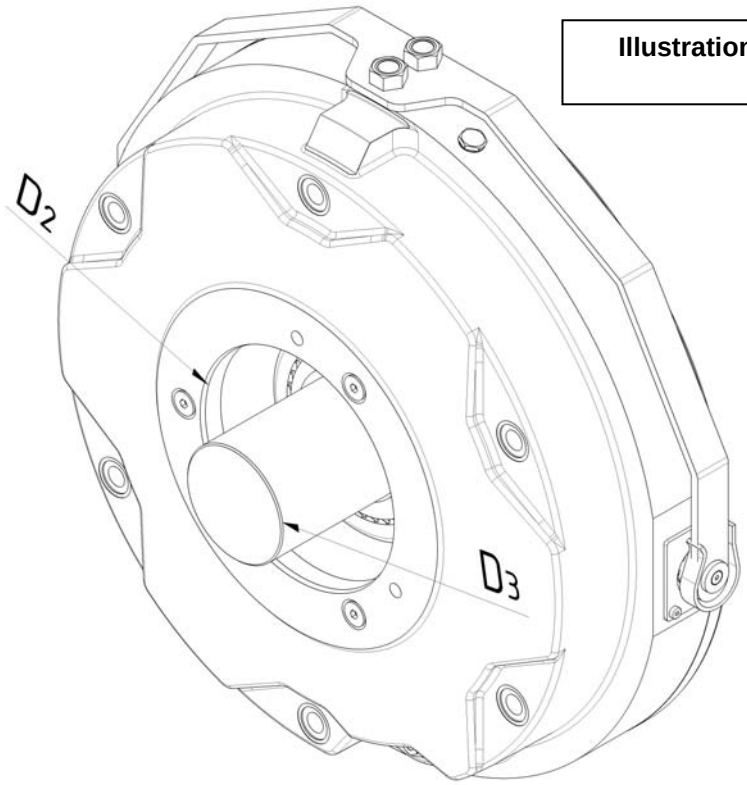


Illustration 6: Aligning the brake

Table 3: Dimensions for aligning the brake		
Size FDX	D_2 [mm] / Fit **H8**	D_3 [mm] / Fit
26	90 / $^{+0,054}_{0}$	Shaft-Ø / Dimensions
30	115 / $^{+0,054}_{0}$	Shaft-Ø / Dimensions
40	150 / $^{+0,063}_{0}$	Shaft-Ø / Dimensions

c4) Step 4: Completion and re-assembly of the sealing flange

The next step is the completion and the re-assembly of the sealing flange according to **illustration 7**:

- Insert the well greased O-ring (**9**) belonging to the sealing flange into the radial groove (**A**) of the sealing flange (**11**)
- Completely fill the space of sealing lip and dust guard lip at the already pre-assembled rotary shaft seal (refer to illustration 4) **with grease** (refer to **illustration 8/II**)
- Carefully (in order not to damage the rotary shaft seal) insert the sealing flange into the housing
- Screw the sealing flange tight (screws = **12**)

➔Stop! **In the area of the rotary shaft seal, the shaft to be sealed must be twist-free ground according to the specifications of the sealing manufacturer with a surface roughness of Rz 3.2.**

*c5) Step 5: Completion of hand release **(illustration 7)***

- Screw in the lever for hand release (**5**) with underlying spring washer (**6**)
- Screw in the threaded pin for locking the hand release (**4**).

➔Stop! **The positioning of the lever shown with underlying spring washer and the threaded pin does <u>not</u> apply to the FDX 26. There the arrangement is changed, compare dimension drawing M98-080.**

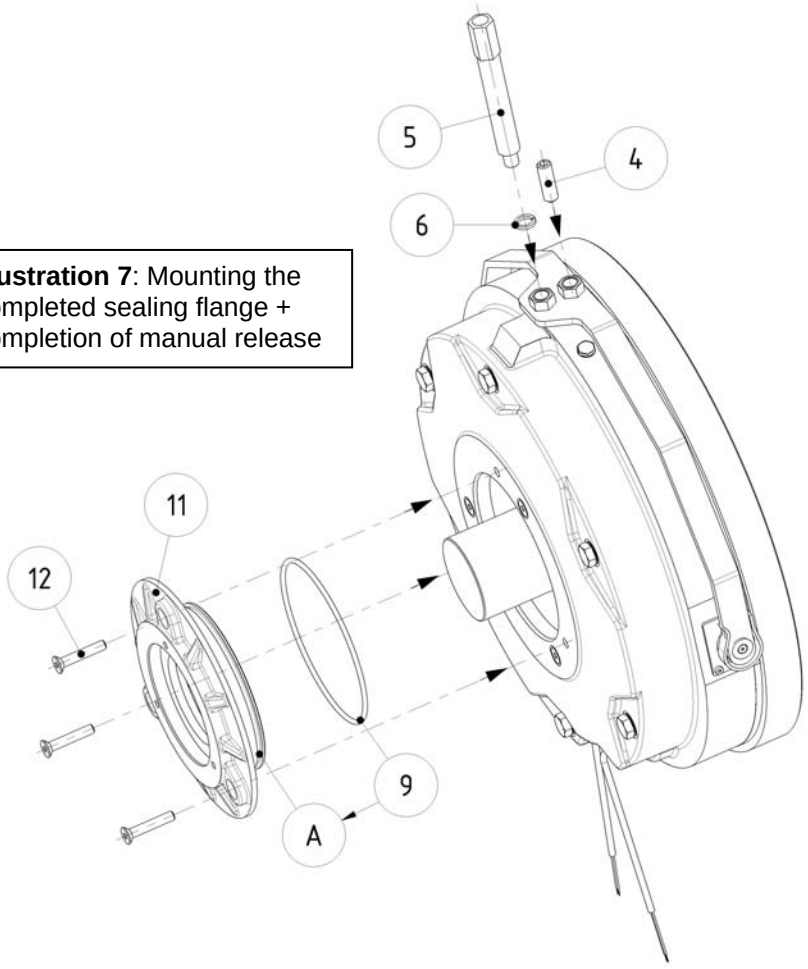


Illustration 7: Mounting the completed sealing flange + completion of manual release

c6) Step 6: Positioning the gamma ring

Completion of mechanical installation:

- Carefully push the **gamma ring** (**13**) (= second seal) onto the shaft (**illustration 8/I**)
- Exactly position it by means of a mounting ring. **Table 4** states the indentation depths according to **illustration 8/II** (dimension $\mathbf{B_2}$; distance from the face of the sealing flange to the gamma ring)

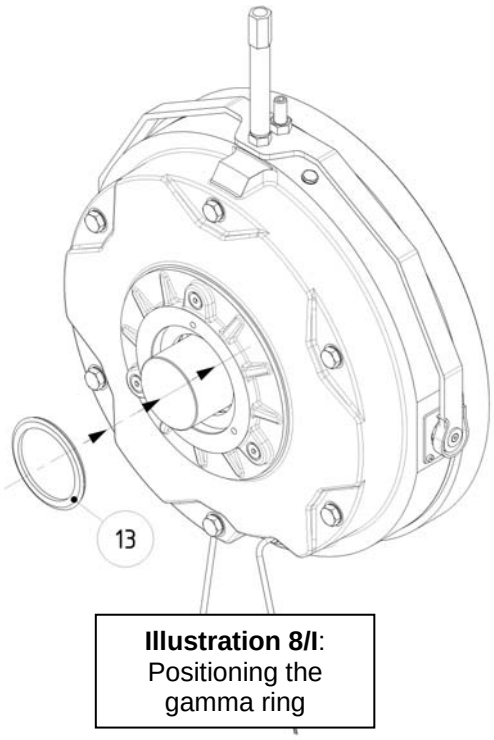


Illustration 8/I: Positioning the gamma ring

Illustration 8/II: Positioned gamma ring (sectional view)

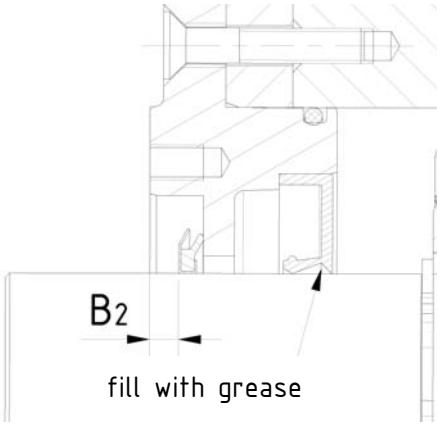


Table 4: Indentation depths of gamma ring		
Size FDX	B_2 [mm]	Observations
26	4.5 / 3.5*)	*) only with shaft-Ø 50
30	6.5	
40	6.5	

Table 5: Tightening torques for screws at housing		
Size FDX	M10	M12
26	**50 Nm**	---
30	**50 Nm**	---
40	---	**85 Nm**

d) Assembly with <u>not continuous</u> shaft

d1) Step 1: Screw on the brake

In case of a **not continuous shaft**, already in the first step, the brake is screwed on at the counter-friction surface (motor end plate) according to **illustration 9**:

- Insert the large O-ring (**3**) for sealing the housing into the axial groove at the rear side of the housing (**A** = contact side)
- Arrange a Usit-ring (**7**) which is centred by a recess (**B**) in the housing under each screw (**8**)
- Fix the brake by screwing down the fastening screws (**8**) in the tapped holes (**C**)
- If the brake is **centred** by means of the outer fitting surface (as shown in illustration 6, compare ***preliminary remark 2***), the screws may be readily **tightened** directly
- Tighten the fastening screws

➔Attention! **Pay particular attention to the correct positioning of the sealing elements before and during the tightening procedure in order to safeguard the tightness of the brake.**

➔Stop! **Tighten the screws at a torque according to <u>Table 5</u>!**

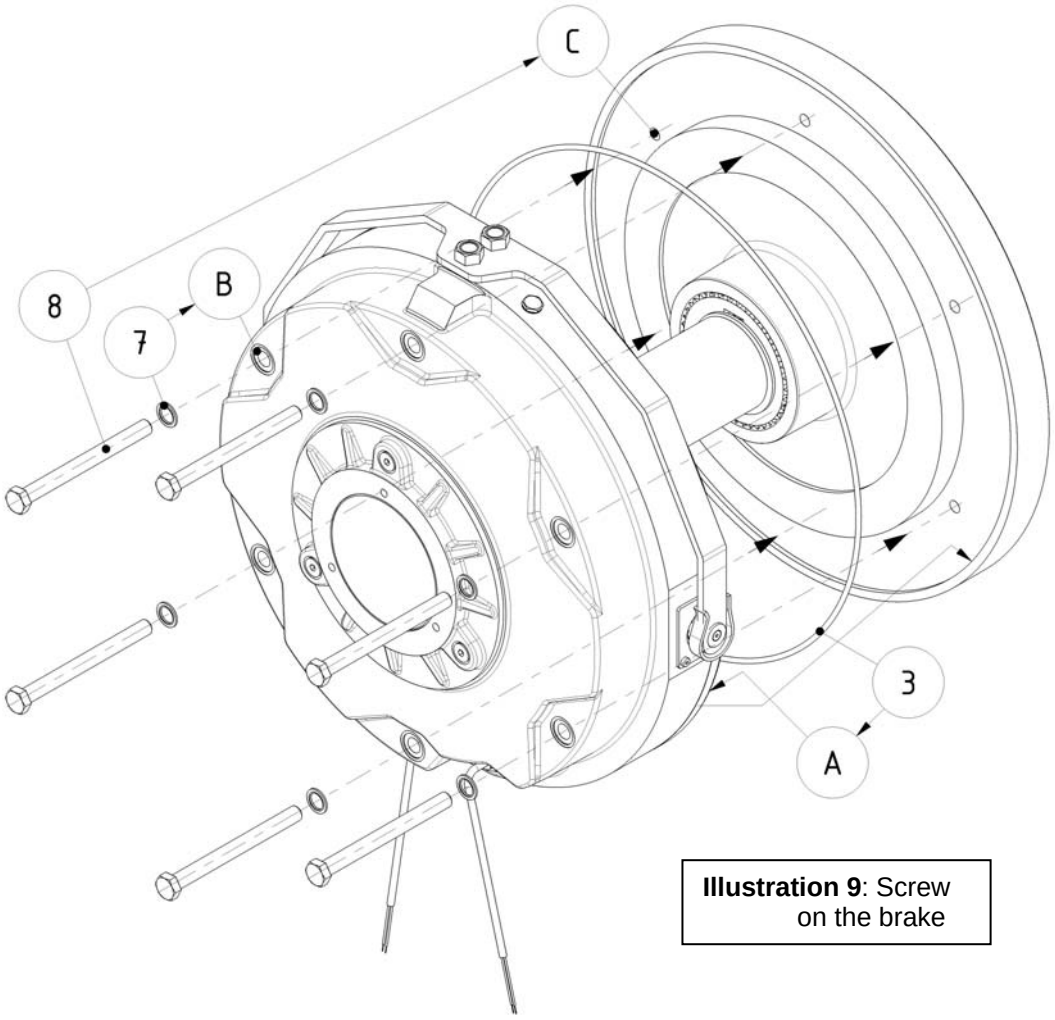


Illustration 9: Screw on the brake

d2) Step 2: Completion of hand release ***(illustration 10)***

- Screw in the lever for hand release (**5**) with underlying spring washer (**6**)
- Screw in the threaded pin for locking the hand release (**4**)

➔Stop! **The positioning of the lever shown with underlying spring washer and the threaded pin does <u>not</u> apply to the FDX 26. There the arrangement is changed, compare dimension drawing M98-080.**

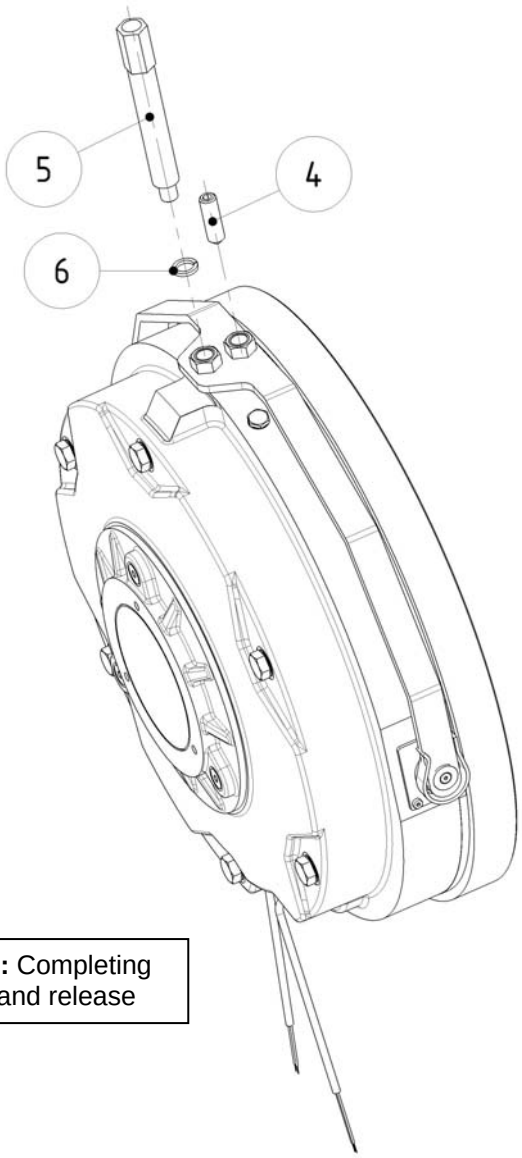


Illustration 10: Completing the hand release

e) Check the air gap *(all brakes)*

In order to complete the assembly, finally check the **size of the air gap** at all brakes.

- Loosen and remove screw plug (**15**, illustration **11/I**) including O-ring (**16**)
- Determine the existing dimension (**a**, illustration **11/II**) by means of a feeler gauge. The dimension must be within the range of admissible dimensions stated in **Table 6**!

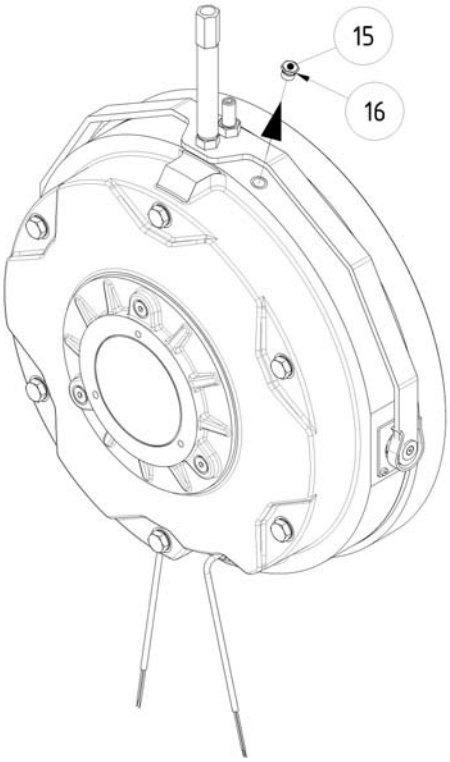


Illustration 11/I: Remove the screw plug

Illustration 11/II: Air gap control (sectional view)

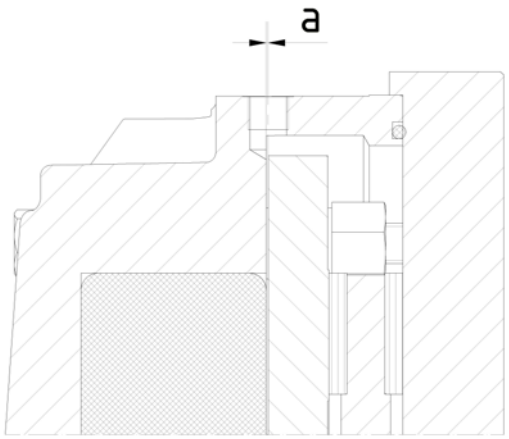


Table 6: Admissible air gaps in mm		
Size FDX	a_{min}	a_{max}
26	**0.5**	**0.7**
30	**0.5**	**0.7**
40	**0.6**	**0.8**

➔Stop! **After control of the air gap, tightly close the opening in the housing again by carefully screwing in and tightening the screw plug with fitted O-ring!**

4.2 Electrical Installation

4.2.1 Basic Information

For the electrical connection of the brake a **voltage source of 400 VAC** is required. In order to gain the direct current required for operation, the interconnection of the **PRECIMA high-speed converter PMG 480** (➔ fast-response excitation of the spring-applied brake) is indispensable. For further information on PMG 480: refer to dimension sheet **T90-156.**

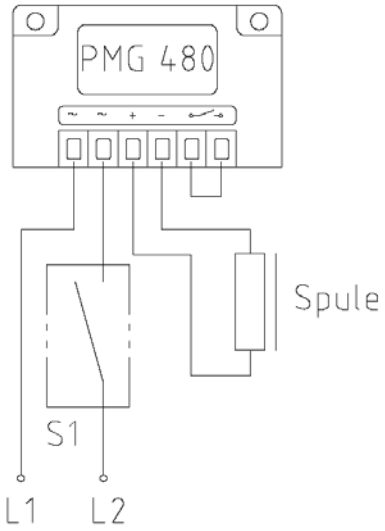
➔Danger! **Have the electrical connection made by qualified electrical personnel only!**
Carry out all connection work in a de-energised state only!
(➔ danger of accidental starts and electric shocks!)

➔Stop! **The supply voltage must comply with the details on the name plate!**

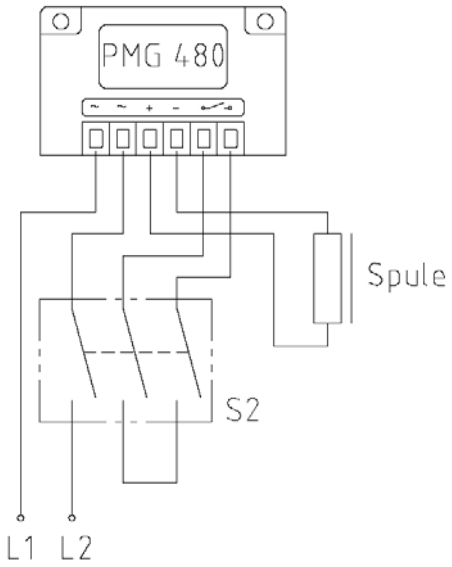
4.2.2 Connection of Brake

Possible circuit options:

1. Connection at alternating current side



2. Connection at direct current side



To 1. Connection at alternating current side

The electric circuit is interrupted before the converter.

➔ The magnetic field decays slowly
➔ The braking torque slowly builds up

Such a connection can be used when switching times are of no importance.
No further protective measures for coil and switching contact are required.

To 2. Connection at Direct Current Side

The electric circuit is interrupted between converter and coil.

➔ The magnetic field decays very fast
➔ The braking torque increases fast

A disadvantage of the second switching option are the occurring voltage peaks possibly resulting in the wear of the switching contacts by sparking.

For this reason, that variant requires a suppressor circuit!

4.2.3 Connection of Sensors (Proximity Switch)

Refer to: Dimension sheet **T90-162**

Technical data of the sensors (proximity switch):
➔ **T90-147** (DC design)
➔ **T90-158** (AC design)

4.2.4 Connection of Heating

Refer to: Dimension sheet **T90-148**

4.2.5 Connection of Temperature Sensor

Refer to: Dimension sheet **T90-163**

➔Stop! **Arrangement and positions of the individual connecting cables are indicated in dimension sheet M98-080!**

5. Operation

5.1 Brake in Operation

5.1.1 Commissioning

Before commissioning the brake, first of all a **functional test** has to be carried out. This can normally and readily be carried out together with the motor the brake is attached to. For possible malfunctions refer to: 5.2.

➔Stop! **The complete braking torque will only be effective after the brake linings at the rotor have run in! ➔ For deviation values refer to the Technical Data Sheet!**

5.1.2 Running Operation

Without any malfunctions occurring, the running operation does not require any particular measures. Merely the **size of the air gap** (increasing through wear at the friction lining at the rotor) has to be checked in accordance with the following schedule (also refer to 5.1.3), unless a particular sensor for wear monitoring has been included in the brake. In case of malfunctions, proceed according to 5.2.

Check intervals:

Working brake:
+ according to service life calculation
+ according to specifications made by the customer

Holding brake:
+ at least every two years
+ according to specifications made by the customer
+ use shorter intervals in case of frequent emergency stops

5.1.3 Maintenance

The spring-applied brake is nearly maintenance-free. However, when the **maximum air gap** stated in the technical data sheet is reached, an **exchange of the rotor** will be required for a safe functioning and operation of the brake. A functional capability of the brake which may in individual cases go beyond the maximum air gap will not change the aforesaid requirement: **a proper use will no longer existing in such a case**. In any case, functional capability and safety function of the brake will be compromised with further increasing wear.

➔Stop! **Even after an exchange of the rotor, the complete braking torque will only be effective after the brake linings at the rotor have run in! ➔ For deviation values refer to the Technical Data Sheet!**

5.2 Brake out of Operation (Malfunctions)

The following table includes typical malfunctions during running operation (partly even during commissioning), their possible causes and instructions on removing them.

Malfunction	Possible cause	Removal
Brake does not release and/or with delay	Air gap too large	Exchange the rotor
	Brake is not supplied with voltage	Check electrical connection
	Supply voltage of the brake coil too low	Check the supply voltage of the coil
Brake does not apply and/or with delay	Voltage at the coil is too high	Check the supply voltage of the coil

6. Disassembly / Exchange

6.1 Dismounting the Brake

Dismounting the brake is achieved analogous to the assembly in reverse order and must only be effected with the brake and motor being **switch off, de-energised and torque-free**. In case of brakes having a continuous shaft, by all means first of all dismount the sealing flange and simultaneously draw off the gamma ring positioned before the flange from the motor shaft (for this reason and because of the inserted O-ring the extraction force in considerably increased in comparison with the disassembly according to **4.1.4** / *c1) step 1*).

➔Danger! **The disassembly of the brake will result in a suspensions of its passive braking functions. No risks must be connected with said suspension!**

6.2 Exchange of Components

The only component to be regularly exchanged on site is the **rotor** when it reaches the wear limit; if the **hub** shows signs of noticeable wear, it may be exchanged as well. Furthermore, those fastening and sealing elements which are used in the scope of the assembly and/or which already exist in the parts to be inserted are available as **spare parts** (refer to: **6.4**).

No other components are intended to be exchanged on site!

➔Attention! **Before any re-assembly of a brake, check the fastening and sealing elements as to their unlimited functional capability and, if necessary, exchange them!**

6.3 Exchange of Brake / Disposal

Because of the different material components, the components of our spring-applied brakes have to be disposed of for recycling separately. Moreover, pay attention to the official regulations.
Important AAV (List of Wastes Ordinance) key numbers are indicated below. Depending on the material connection and the kind of separation, other key numbers may apply to components made of such materials.

- Ferrous metals (key number 160117)
- Non-ferrous metals (key number 160118)
- Brake linings (key number 160112)
- Plastics (key number 160119)

6.4 Spare Parts

Illustration 12 shows all the available spare parts for the spring-applied brakes FDX 26, FDX 30 and FDX 40. **Table 7** lists the appropriate component numbers and/or designations for all three sizes.

When ordering spare parts, please always state the data from the name plate!

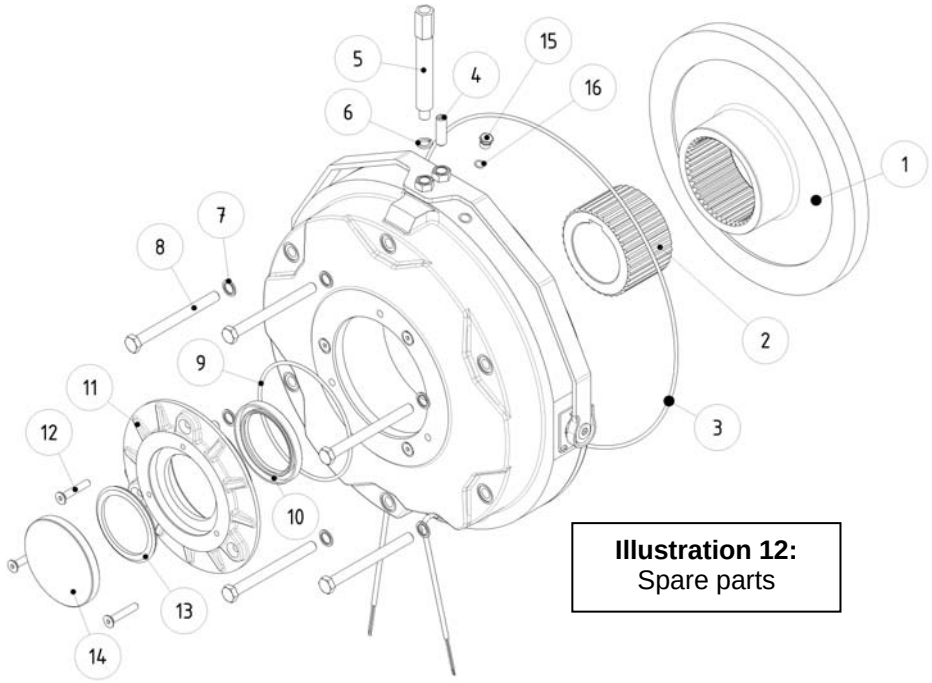


Illustration 12:
Spare parts

Table 7: Spare parts				
No.	*General designation*	***FDX 26***	***FDX 30***	***FDX 40***
1	Rotor	FDX 26.4.021	FDX 30.4.021	FDB 40.4.021
2	Hub (for shaft)	FDX 26.4.242 (Ø40) FDX 26.4.243 (Ø45) FDX 26.4.244 (Ø50)	FDX 30.4.242 (Ø50) FDX 30.4.243 (Ø55) FDX 30.4.244 (Ø60) FDX 30.4.245 (Ø65)	FDX 40.4.242 (Ø65) FDX 40.4.243 (Ø70) FDX 40.4.244 (Ø75) FDX 40.4.245 (Ø80)
3	O-ring housing	260x4	310x4	410x4
4	Threaded pin	ISO 4027 M12x40		
5	Lever hand release	FDB 26.1.312		
6	Spring washer	A2 DIN 7980 Ø12		
7	Usit ring	11.4x16.3x1.5		13.7x20x1.5
8	Screw housing	DIN 4014 M10x115		DIN 4014 M12x130
9	O-ring sealing flange	82x4	105x4	142x4
10	Rotary shaft seal [**Ø shaft**]	RWDR AS **40**x72x10 RWDR AS **45**x72x10 RWDR AS **50**x72x10	RWDR AS **50**x90x10 RWDR AS **55**x90x10 RWDR AS **60**x90x10 RWDR AS **65**x90x10	RWDR AS **65**x120x10 RWDR AS **70**x120x10 RWDR AS **75**x120x12 RWDR AS **80**x120x13
11	Sealing flange (for shaft)	FDX 26.4.591 (Ø40,45) FDX 26.4.592 (Ø50)	FDX 30.4.591 (Ø50,55) FDX 30.4.592 (Ø60,65)	FDX 40.4.591 (Ø65,70) FDX 40.4.592 (Ø75,80)
12	Screw sealing flange	DIN EN ISO 10642 M6x40	DIN EN ISO 10642 M8x40	DIN EN ISO 10642 M8x45
13	Gamma ring [**Ø shaft**]	**40**x57x4.5 **45**x62x4.5 **50**x70x5.5	**50**x70x5.5 **55**x75x5.5 **60**x80x5.5 **65**x85x5.5	**65**x85x5.5 **70**x90x5.5 **75**x95x5.5 **80**x100x5.5
14	Screw cap	72x9	90x12	110x12
15	Screw plug	FDX 26.4.136		
16	O-ring screw plug	9x1.5		

7. Enclosures

The enclosures to these operating and assembly instructions are attached in the following sequence according to their logical coherence:

Enclosure I: **Technical Data Sheet FDX 26..40 ➔ Technical data of brake**

Enclosure II: **Dimensioned Drawing M98-080 ➔ Dimensions of brake, arrangement of components**

Enclosure III: **Dimensioned Drawing T90-156 ➔ Technical data of high-speed converter**

Enclosure IV: Dimensioned drawings T90-147, T90-158, T90-162 ➔ Technical data of proximity switch (sensors), connection of proximity switch

Enclosure V: Dimensioned drawings T90-148, T90-163 ➔ Connection of heating, connection of temperature sensor