Operation and Installation Instructions

Version 04.2013

for the electromagnetically released

Spring-applied Brakes (Standard Design)

FDD 08 … FDD 40

Contents

1. General Information on Operating and Installation Instructions

1.1 Validity

On principle, these operating and assembly instructions are (as can be learned from their title) only apply to and are valid for the **standard designs of the electromagnetically released spring-applied double brakes FDD 08 to FDD 40** of M/s. PRECIMA Magnettechnik GmbH. Moreover, they are a necessary element of every brake delivery and generally only valid for such brakes having been delivered at the same time with the instructions. The operating and assembly instructions 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 (e.g. in case of special designs or repeated deliveries), the above mentioned principles may be deviated from. In any case, an indicative or supplementing information of M/s. PRECIMA will be required in this connection.

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 instructions given** 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 be directed to the following address:

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1.3 Terms and Reference Notes

Important notes 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**:

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

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

è **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 when used within the scope of these instructions:

Instructions = Operating and assembly instructions

Working brake = Brake which implements friction work in regular operation, i.e. performs a braking function (in their standard design, brakes of the FDD series are no working brakes)

Brake = Spring-applied brake = electromagnetically released spring-applied brake

Data sheet = Technical data sheet

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. **In their standard design, brakes of FDD series are generally holding brakes with emergency-stop features.**

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

Dimension sheet = Dimension drawing

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 è 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.

2. Conditions for Assembly and Operation

2.1 Persons

2.1.1 Operator

Operator is any natural person or legal 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 **general operating conditions** stated under **2.2.4** as well as the boundary conditions, performance data and dimensions indicated in the **technical data sheet** and on the **name plate of the brake** (refer to: **3.1**). Any deviation from these directives will require a particular agreement with PRECIMA. The general distinction between the use as a working brake and that of a holding brake is irrelevant for the FDD series since in their standard design this series is generally designed as a **holding brake with emergency-stop features**.

2.2.2 Operational Environment

The environment of application of the spring-operated 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. The latter also includes the use of not original spare and exchange parts.

è **Attention!**

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

2.2.4 General Operating Conditions

Operating time:	100%
Ambient temperature:	-20…+40°C

A different ambient temperature requires a structural adjustment or supplementation of the brake and calls for limiting operating conditions. In any such case, a coordination and agreement with M/s. PRECIMA will be required.

2.3 Appropriate Use

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

The spring-operated brake is appropriately and 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 2.2.1).

The inappropriate (improper) 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 and improper 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-operated 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.

2.5 Delivery Scope and State

Check the scope of delivery and the condition on delivery **immediately after receipt of the brake**.

M/s. Precima will not assume any warranty for defects and deficiencies complained about later. (refer to 2.4.2).

Complaints regarding visible damages in transit have to be immediately made with the supplier, complaints concerning incompleteness of the delivery and visible deficiencies have to be made with the manufacturers immediately.

è **Attention!**

Should the checks result in any uncertainties or discrepancies or should the delivery be incomplete or defective, the brake must not be mounted and commissioned without prior consultation with PRECIMA.

3. Product Description

3.1 Labelling

3.1.1 Lettering

The lettering of the spring-pressure brake includes all important data.

These data and the contractual provisions for the brakes establish the limits of their use.

Lettering on the brake housing:

103V 12 09 40

Braking torque in Nm
Year of manufacture
Month of manufacture
Operating voltage (DC) in Volt

3.1.2 Type Code

Example:

FDD 15 R M 20 H7 24 VDC

Operating voltage

Hub bore

Microswitch .... *Options II*

Friction plate .... *Options I*

Brake size (Size: **08, 10, 13, 15, 17, 20, 23, 26, 30, 40**)

Brake designation (series)

3.2 Technical Information

3.2.1 Operation of the Brake (Illustration 3.1)

The electromagnetically released spring-pressure brakes of the FDD series 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 (item **4, illustration 3.1**) through the axially movable armature disk (item **2**) press the rotor (item **3**) which is radially positively connected with the machine shaft against the counter-friction surface (intermediate flange (item **8**), friction plate (item **7**) or motor flange). The two-sided friction between the linings of the rotor 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 (item **1**) via the field winding. Said magnetic force draws the armature disk (item **2**) to the magnet body and the brake rotor is released.

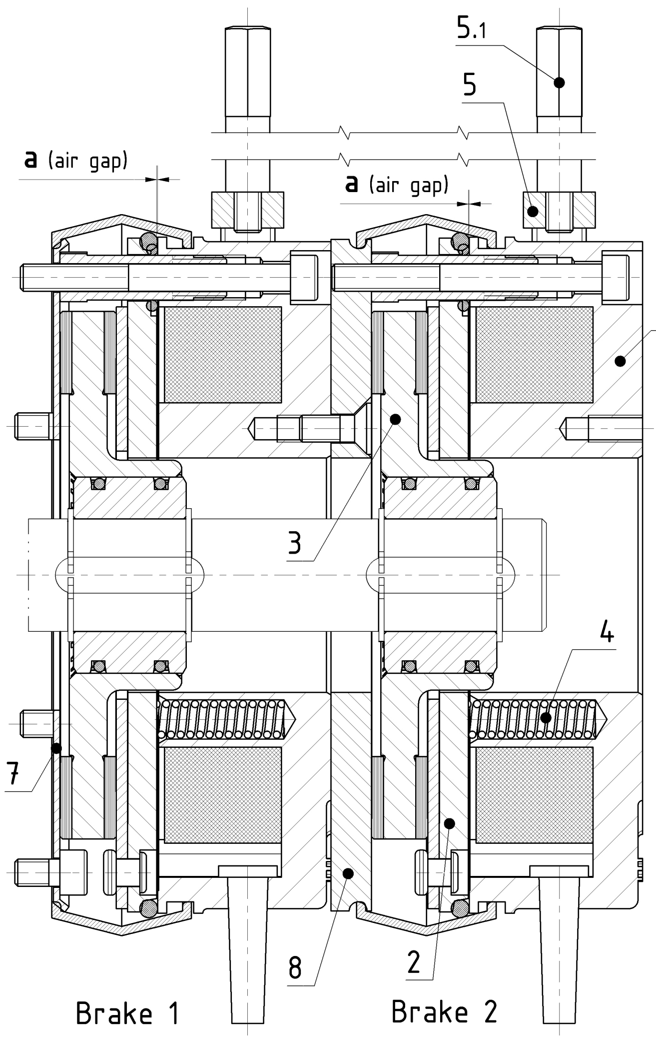
Owing to design, braking and releasing operation take place in a technically separated manner with the two mechanically connected individual brakes (**brake 1**, **brake 2**, illustration 3.1). This is why braking operation is safeguarded even if one brake completely fails (redundant system). By means of this variable controlling of brakes (DC and/or AC switching), a small time delay in braking can be realised.

During **manual releasing**, the armature disks are mechanically pulled against the magnet bodies by slewing the manual releasing brackets (item **5**, with screwed-in manual releasing lever (item **5.1**)) and thus the rotors are released. This enables you to release the brake, for example, even if there is a power failure.

è Attention!

For safety reasons, the adjustment of the manual release must not be changed!

Illustration 3.1: Operation of the brake (sectional view)



The standard type of the spring-pressure brake is delivered with a firmly adjusted braking torque M_{bN}. Via the number of springs (item **4**), this torque can be varied as per **3.2.2.1**, a reduction, however, may only be carried out upon consultation with PRECIMA.

è To be noted:

Spring-applied double brakes of series FDD can also be applied where higher requirements concerning safety exist which cannot be met by a single brake (e.g. PRECIMA series FDB)! FDD brakes, for example, are applied in theatre construction and with elevators (type examination according to EN 81 for elevator brakes existis).

3.2.2 Options (also refer to 3.1.2)

The following options are to be distinguished with the FDD series:

a) *Implicit options:* Already in their standard design, the brakes of series FDD include some options which are generally necessary or in most cases of application reasonable. These include the options T (= tachometer bores), H (= manual release), S (= dust protection ring) and the silenced design of hubs and armature disks. Implicit options do not have to be particularly ordered and they will not be mentioned in the type code (è 3.1.2).

b) *Options I:* Options I have been taken into account in these operating and installations instructions. In case of series FDD, these options only refer to option R (= friction plate) which will have to be included in your order. The friction plate is important when the motor storage plate cannot be used as counter-friction surface (è 4.1.2)

c) *Options II:* Options II have *not* been taken into account in these operating and installations instructions. In case of series FDD, this is option M (= microswitch) which has to be included in your order since it cannot be added subsequently. For Options II, there are separate descriptions and/or adjusting instructions which will have to complied with in addition to this document.

è To be noted:

If there is a technical application where the redundancy of a double brake is not required but nevertheless the above stated implicit options (è silencing) are desired, you can order brake 1 (è illustraion 3.1) separate as well as è „half“ of a FDD brake and/or FDB brake in FDD design.

3.2.3 Technical Data

3.2.3.1 <u>Nominal braking torques and number of springs</u>

Size	**08**	**10**	**13**	**15**	**17**	**20**	**23**	**26**	**30**	**40**
Nominal braking torques M_{bN} [Nm]	**2 x 6**	**2 x 12,5**	**2 x 25**	**2 x 50**	**2 x 75**	**2 x 125**	**2 x 187**	**2 x 300**	**2 x 500**	**2 x 1200**
	2 x 4	2 x 8,5	2 x 17,5	2 x 35	2 x 52	2 x 89	2 x 132	2 x 225	2 x 375	2 x 1000
	2 x 3,5	2 x 7	2 x 14	2 x 28	2 x 42	2 x 70	2 x 107	2 x 150	2 x 250	2 x 800

— Permissible deviations of the real braking torque: ±20% (new) or -10/+30% (run-in) —

Size	**08**	**10**	**13**	**15**	**17**	**20**	**23**	**26**	**30**	**40**
Number of springs for the above M_{bN}	**7 (2x)**	**7 (2x)**	**7 (2x)**	**7 (2x)**	**7 (2x)**	**7 (2x)**	**7 (2x)**	**8 (2x)**	**8 (2x)**	**12 (2x)**
	5 (2x)	5 (2x)	5 (2x)	5 (2x)	5 (2x)	5 (2x)	5 (2x)	6 (2x)	6 (2x)	10 (2x)
	4 (2x)	4 (2x)	4 (2x)	4 (2x)	4 (2x)	4 (2x)	4 (2x)	4 (2x)	4 (2x)	8 (2x)

3.2.3.2 Dimensions, masses, attachment (illustration 3.2)

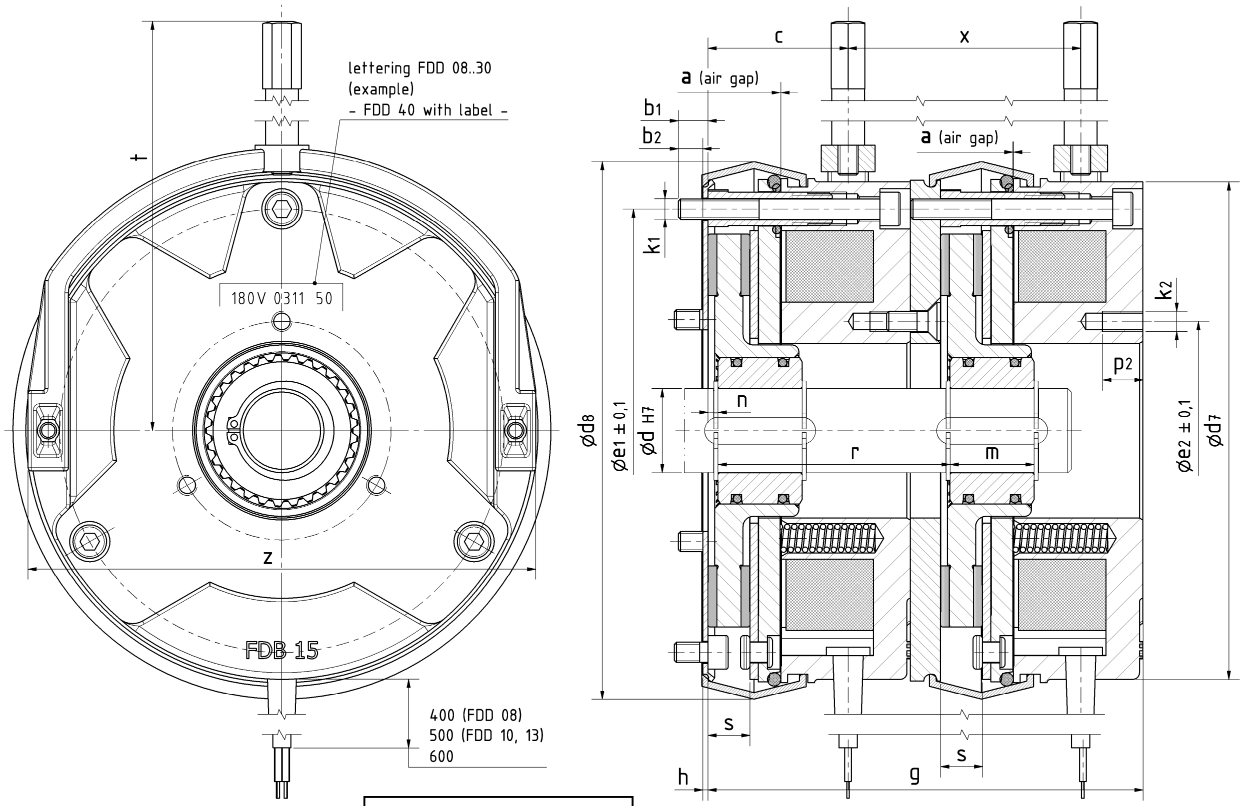


Illustration 3.2:
Main dimensions of the brake

a (air gap) and **s** (rotor size): see 3.2.3.3

Size	Hub dimensions [mm]				General brake dimensions [mm]						Dimensions tachometer bores [mm]		
	Toothed hub Ød H7	Mounting dimensions			Housing / dust guard ring	Brake in new condition (w/o friction plate: h=0)	Manual release				Hole circle Øe1 ±0,1	(Numb. of bores) x thread nom. Ø	Thread depth
	d	***m***	***n***	***r***	***d_7 / d_8***	***g / h***	***c***	***x***	***t***	***z***	***e_2***	***k_2***	***p_2***
08	11/12/15*	18	1,5	44,3	85 / 89	82,6 / 1,5	34,5	44,3	110	89	34	(3 x) M4	8
10	11/12	20	2,5	54,5	105 / 109	102,4 / 1,5	47	54,5	120	111	40	(3 x) M5	12
13	15/20	20	3,5	62	130 / 135	115,2 / 1,5	37,5	62	160	132	54	(3 x) M6	12
15	20/25	25	3	69	150 / 155	129,6 / 1,5	42	69	200	151	65	(3 x) M6	12
17	25/30/35*	30	3	81	170 / 175	150,6 / 2	46	81	220	172	75	(3 x) M8	15
20	30/35/40	30	3	91	195 / 201	171,8 / 2	53	91	220	196	85	(3 x) M8	15
23	35/40/45	35	4,5	101	225 / 231	190,6 / 2	58	101	250	224	95	(3 x) M8	15
26	40/45/50	40	4	110	258 / 264	208,8 / 2	62	110	330	258	110	(6 x) M10	25
30	50/55/60	50	4	115,5	306 / 312	220 / 2	63,5	115,5	357	304	138	(6 x) M10	25
40	65/70/75	70	4	138,5	400 / 408	259,2 / 18**	82,6	138,5	415	403	180	(6 x) M12	43***

Standard feather key groove of the hub as per DIN 6885/1-JS9
* deviating feather key groove as per DIN 6885/**3**-JS9 // ** no design with friction plate; dimension h for flange
*** separate internal pole: 15 mm without thread (through-hole)

Size	Masses [kg]			Attachment dimensions [mm]			Tightening torque [Nm]	Adjusting dimensions [mm]
	Brake w/o manual release cpl.	2 x manual release	Friction plate	Hole circle $Øe_1$ ±0,1	(Numb. of bores) x thread nom. Ø	Penetration depth with / without friction plate	Attachment screws	Manual release
				e_1	k_1	b_1 / b_2	M_A	y
08	2,90	0,11	0,055	72	3 x M4 (2x)	6 / 9,5	**3**	0,8
10	4,80	0,16	0,080	90	3 x M5 (2x)	7 / 10,5	**6**	0,8
13	7,30	0,19	0,130	112	3 x M6 (2x)	9 / 12,5	**10**	0,8
15	11,40	0,26	0,160	132	3 x M6 (2x)	9 / 12,5	**10**	0,8
17	17,80	0,34	0,285	145	3 x M8 (2x)	11 / 14	**25**	0,8
20	23,50	0,48	0,365	170	3 x M8 (2x)	11 / 14	**25**	1
23	34,50	0,59	0,505	196	5 x M8 (2x)	11 / 19	**25**	1
26	48,60	1,60	0,700	230	6 x M10 (2x)	11 / 19	**50**	1,2
30	78,00	1,80	0,940	278	6 x M10 (2x)	19 / 17	**50**	1,2
40	135,00	1,80	14,8**	360	6 x M12 (2x)	17 / 19**	**85**	1,5

** no design with friction plate; dimensions and/or penetration depth for design with flange

Dimension y see 4.3.2 or illustration 4.2

3.2.3.3 Air gaps, rotor values

Size	Nominal air gap [mm]	max. air gap * [mm]	Rotor size (new condition) [mm]	Rotor size (minimum) [mm]	Mass moment of inertia rotor [kgm^2]	Max. speed rotor [min^{-1}]	
	a_{nom}	a_{max}	s_{new}	s_{min}	J	n_{max}	n_{max} Rotor weighed heavy
08	0,3 $^{+0,15}$	0,65	7,5 $^{-0,1}$	4,5	0,015 x 10^{-3}	6000	
10	0,3 $^{+0,15}$	0,65	8,5 $^{-0,1}$	5,5	0,045 x 10^{-3}	6000	
13	0,3 $^{+0,15}$	0,75	10,3 $^{-0,1}$	7,5	0,173 x 10^{-3}	6000	
15	0,3 $^{+0,15}$	0,75	12,5 $^{-0,1}$	9,5	0,45 x 10^{-3}	6000	
17	0,3 $^{+0,15}$	0,75	14,5 $^{-0,1}$	11,5	0,86 x 10^{-3}	3600	**6000**
20	0,4 $^{+0,15}$	0,75	16,0 $^{-0,1}$	12,5	1,22 x 10^{-3}	3600	**6000**
23	0,4 $^{+0,15}$	0,75	18,0 $^{-0,1}$	14,5	2,85 x 10^{-3}	3600	**6000**
26	0,5 $^{+0,2}$	0,90	20,0 $^{-0,1}$	16,5	6,65 x 10^{-3}	1500	**6000**
30	0,5 $^{+0,2}$	0,90	20,0 $^{-0,1}$	16,5	19,5 x 10^{-3}	1500	**6000**
40**	0,6 $^{+0,2}$	1,20	22,0 $^{-0,1}$	18,5	44,5 x 10^{-3}	1500	**6000**

* with max. braking torque / ** switched with fast-acting rectifier (over-excitation)

3.2.3.4 Friction work, friction capacity

Size	Max. permissible friction capacity** [J/h]	Max. permissible friction work / braking [J]	Friction work / 0.1 mm wear [J]	**Size**	Max. permissible friction capacity** [J/h]	Max. permissible friction work / braking [J]	Friction work / 0.1 mm wear [J]
	P_{Rmax}	W_{Rmax}*	*Qr 0,1*		P_{Rmax}	W_{Rmax}*	*Qr 0,1*
08	144×10^3	$1{,}5 \times 10^3$	16×10^6	**20**	450×10^3	25×10^3	140×10^6
10	180×10^3	3×10^3	30×10^6	**23**	540×10^3	37×10^3	170×10^6
13	234×10^3	6×10^3	42×10^6	**26**	630×10^3	52×10^3	230×10^6
15	288×10^3	12×10^3	70×10^6	**30**	720×10^3	75×10^3	310×10^6
17	360×10^3	17×10^3	85×10^6	**40**	810×10^3	100×10^3	400×10^6

*** at W_R] 0,1 * W_{Rmax} the rotor speed and the braking time (discrete braking) must be considered (è consultation with PRECIMA is required)!**
** in case of a uniform timely distribution of brakings

3.2.3.5 Electrical specific values

Size	Electric power (*average*) [W]	Voltage [VDC]	Nominal current (*guide value*) [A]	Size	Electric power (*average*) [W]	Voltage [VDC]	Nominal current (*guide value*) [A]
	$P_{20°C}$	U	I_N		$P_{20°C}$	U	I_N
08	2 x 22	24	0,92	**20**	2 x 85	24	3,30
		103	0,25			103	0,86
		180	0,12			180	0,46
		205	0,11			205	0,44
10	2 x 28	24	1,17	**23**	2 x 76	24	3,20
		103	0,31			103	0,86
		180	0,16			180	0,40
		205	0,13			205	0,34
13	2 x 34	24	1,42	**26**	2 x 105	24	4,17
		103	0,38			103	1,12
		180	0,19			180	0,60
		205	0,15			205	0,54
15	2 x 45	24	1,69	**30**	2 x 140	24	5,90
		103	0,46			103	1,36
		180	0,25			180	0,78
		205	0,24			205	0,68
17	2 x 55	24	2,18	**40**	2 x 144	–	–
		103	0,59			–	–
		180	0,30			180	0,77
		205	0,28			205	0,73

3.2.3.6 Switching times

Size	Nominal braking torque [Nm]	Separating time [ms]	Response delay[ms]	Response delay[ms]
			*switched on **D.C.** side*	*switched on **A.C.** side*
	M_{bN} =	**t_2 =**	**t_{11DC} =**	**t_{11AC} =**
08	**2 x 6**	85	18	50
	2 x 4 // 2 x 3,5	75 / 65	22 / 24	80 / 90
10	**2 x 12,5**	120	16	40
	2 x 8,5 // 2 x 7	100 / 90	20 / 22	70 / 85
13	**2 x 25**	150	18	80
	2 x 17,5 // 2 x 14	135 / 125	20 / 22	110 / 128
15	**2 x 50**	160	14	60
	2 x 35 // 2 x 28	140 / 130	18 / 20	80 / 110
17	**2 x 75**	180	15	70
	2 x 52 // 2 x 42	170 / 150	19 / 22	120 / 140
20	**2 x 125**	200	16	130
	2 x 89 // 2 x 70	150 / 140	20 / 22	180 / 210
23	**2 x 187**	320	22	100
	2 x 132 // 2 x 107	290 / 230	30 / 40	190 / 340
26	**2 x 300**	300	40	180
	2 x 225 // 2 x 150	250 / 200	60 / 70	300 / 530
30	**2 x 500**	400	60	240
	2 x 375 // 2 x 250	320 / 250	70 / 90	400 / 800
40**	**2 x 1200**	550	75	400
	2 x 1000 // 2 x 800	450 / 320	95 / 110	600 / 800

** Switched with fast acting rectifier (over-excitation)

— The switching times indicated are to be understood as tolerance-afflicted guide values with nominal air gap —

t_2 = separating time = time from switching on the current to cessation of braking torque ($M_b \leq 0{,}1 * M_{bN}$)

— Over-excitation by a fast acting rectifier results in approx. half the seperating times —

t_{11}DC = response delay = time from switching off current to the rising of the braking torque with an interruption at DC side by mechanical switches

t11AC = response delay = time from switching off current to the rising of the braking torque with a shut-down at AC side, i.e. by interruption of a *separately* supplied rectifier

— Depending on operating temperature and wear of the brake disks, the real response times (t_2, t_1DC, t_1AC) may deviate from the guide values indicated here. In case of a voltage reduction by a fast acting ractifier, there will be reduced linkage times —

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 (also refer to 2.5).
- Compare the name plate of the brake with the agreed characteristics and the real data

è 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

4.1.2.1 Motor storage plate, etc. as 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**) and whether it is free from grease and oil.

4.1.2.2 Friction plate

- If the counter friction surface ís supplied in the form of a flange (item **7**, **illustration 4.1**), first of all the flange has to be bolted to the engine (independent of the brake). The thread of the screws to be used corresponds with the thread of the fastening screws of the brake. The hole circles are identical as well. *In general, it is also possible to do without this screw connection, however, for reasons of form stability this approach and practice **is not recommended** by M/s. PRECIMA particularly with regard to the friction plate.*

è Attention!

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!

4.1.3 Hub and Rotor (illustration 4.1)

è Stop!

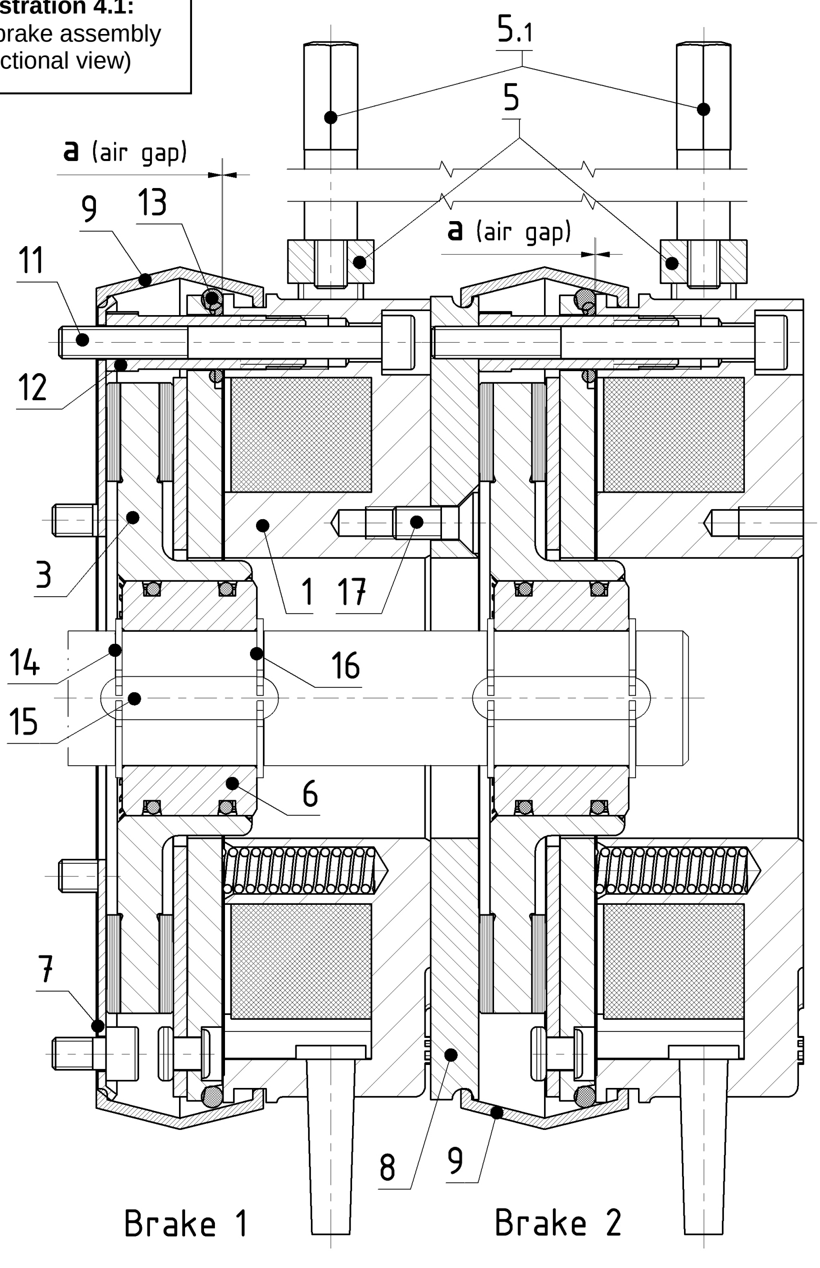
Before actually mounting the rotor, its thickness has to be checked in accordance with 3.2.3.3**.** S_{new} **is the value for a new rotor** (tolerance = 0/-0.1 mm)**,** s_{min} **is the minimum permissible rotor thickness. When installing a new rotor,** $s = s_{new}$ **must be guaranteed. In case of a reassembly (e.g. after a dismounting caused by maintenance work),** $s > s_{min}$ **must be guaranteed, otherwise the rotor has to be replaced.**

The rotor is fixed as a revolving machine part of the engine to be braked via the hub and on its shaft:

- Insert the first locking ring (item **14**) into the rear radial groove of the shaft
- Insert the feather key (item **15**) into the axial groove of the shaft
- Push the toothed hub (item **6**) onto the shaft and over the feather key
- Axially fix the hub by inserting the second locking ring (item **16**) into the front radial groove of the shaft
- Push the first rotor (item **3**) onto the hub with the rotor remaining axially displaceable The O-rings arranged in the hub, however, limit the free movement of the pair rotor/hub to a short axial path. At the same time, the O-rings contribute to reducing the noise in the toothing.

è **Stop! In order to make this assembly easier, slightly greasing the hub O-ring is permissible. Pay attention to the fact that this action will not contaminate the friction surfaces!**

Illustration 4.1:
FDD brake assembly
(sectional view)



4.1.4 Brake 1 (illustration 4.1)

Brake 1 is mounted at the motor flange and the air gap is tested:

- Set the brake (item **1**) onto the rotor, insert and screw in the fastening screws (item **11**) until hollow screws (item **12**) rest on the counter-friction surface
- Check the size of air gap **a** in order to keep the **nominal value** (+ tolerance) by means of a feeler gauge at three positions on the circumference and, if necessary, correct it by turning the hollow screws (for values of nominal air gap and tolerance: see **3.2.2.4**).
  è How to proceed in order to correct the air gap refer to **5.1.3.1**.

- Insert the O-ring (item **13**) into the groove of the armature disk
- Tighten the fastening screws with the tightening torque according to **3.2.2.3**

4.1.5 Intermediate flange (illustration 4.1)

After brake 1 has been mounted, the intermediate flange (item **8**) is to be attached to it by means of countersunk screws (item **17**) (tightening torque as per 3.2.3.3). Secure the countersunk screws by means of a glue with medium strength.

4.1.4 Brake 2 (illustration 4.1)

Similar to brake 1, mount brake 2 at the intermediate flange attached according to 4.1.5 and also test the air gap as with brake 1.

4.1.7 Implicit Options (illustration 4.1)

- Insert the dust guard rings (item **9**)
- Screw the manual release lever (item **5.1**) with the washer in position into manual release bracket (item 5) and tighten it at the hexagon faces

4.2 Electrical Installation

Carry out the electrical connection in a de-energized state only. The operating voltage (DC) of the brake is indicated on the magnet housing (see 3.1.1 and illustration 3.2).

è **Stop! For the electrical connection of the brake, follow the detailed instructions "Electrical installation of the PRECIMA spring-applied brakes"!**

4.3 Reconstructions and Additions

4.3.1 Modification (Reduction) of Braking Torque

A reduction of the braking torque can be achieved by changing the number of springs according to **3.2.3.1**. In doing so, at least pay attention to the uniform distribution of the externally arranged springs. Such a change, however, may only be carried out after consultation with **M/s. PRECIMA** (also refer to note under 3.2.1).

4.3.2 Assembly of Manual Release (illustration 4.2)

The manual releases of the single brakes at all FDD brakes are already mounted and must not be changed in their adjustment (compare safety instruction under 3.2.1). Moreover, however, it may become necessary that a manual release is to be mounted by the customer (e.g. after changing the number of springs è reduction of braking torque).

- Set the manual release bracket (item **5**) onto the magnet body (item **1**) and insert the two pins with cross threaded hole (item **23**) in the appropriate bores of the manual release bracket.
- Insert the screw (item **20**) with the washer in position (item **21**) and the pressure spring (item **22**) into the bores of the armature disk. The screws will reach down through the following bores of the magnet housing; the disk rests below the screw head on the armature disk while the pressure spring is clamped between disk and magnet body.
- Screw the screws into the pins (item **23**) and uniformly adjust the dimension **y** according to **3.2.3.2**. **Lock** both screws in the correct adjusting position **by means of screw sealing wax**.

è Attention!

For safety reasons, the adjustment of the manual release must not be changed even after a subsequent mounting by the customer! A readjustment of the braking air gap a (refer to 5.1.3.1) **does <u>not</u> require any adjustment of dimension y!**
Furthermore, may attention to the correct position when mounting the manual release bracket permitting a release in both directions (inclination of manual release bracket must be positioned on the armature disk side)!

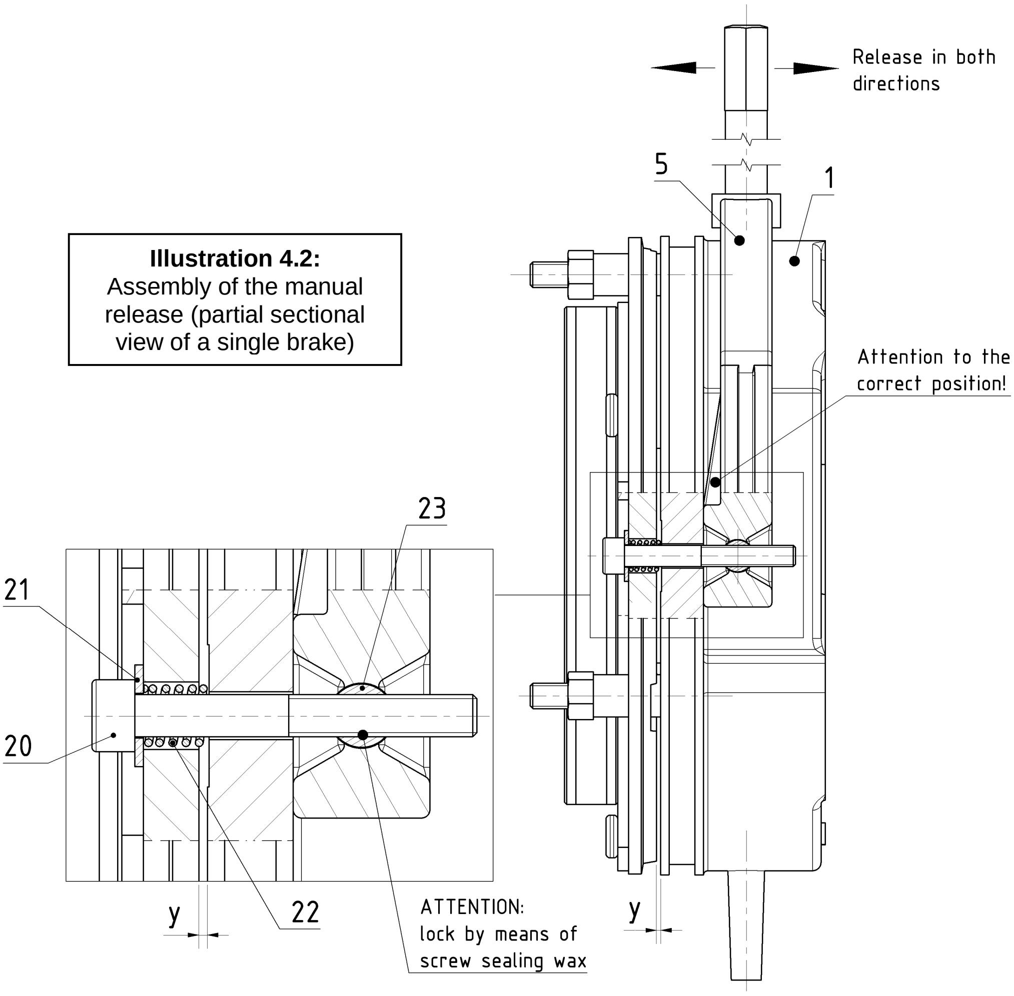


Illustration 4.2:
Assembly of the manual release (partial sectional view of a single brake)

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. In order to check the **redundancy of the system**, brake 1 and 2 have to be switched separately and for both the requirements to be met for keeping the assembly situation have to be established separately. For possible malfunctions refer to: 5.2.

è **Stop!**

The complete braking torque will only be effective after the brake linings at the rotor have run in! è For deviation values to M_{bN}: see 3.2.3.1

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 a** (increasing through wear of the friction lining at the rotor) has to be regularly checked in accordance with the inspection established by the TÜV (German Technical Inspectorate).

After a number of readjustments of the air gap a (see 5.1.3), moreover the **rotor size s** will have to be controlled. A useful control intervall results from the ratio of the difference $\mathbf{s_{new} - s_{min}}$ to difference $\mathbf{a_{nom} - a_{max}}$ under consideration of the respective tolerances.

5.1.3 Maintenance

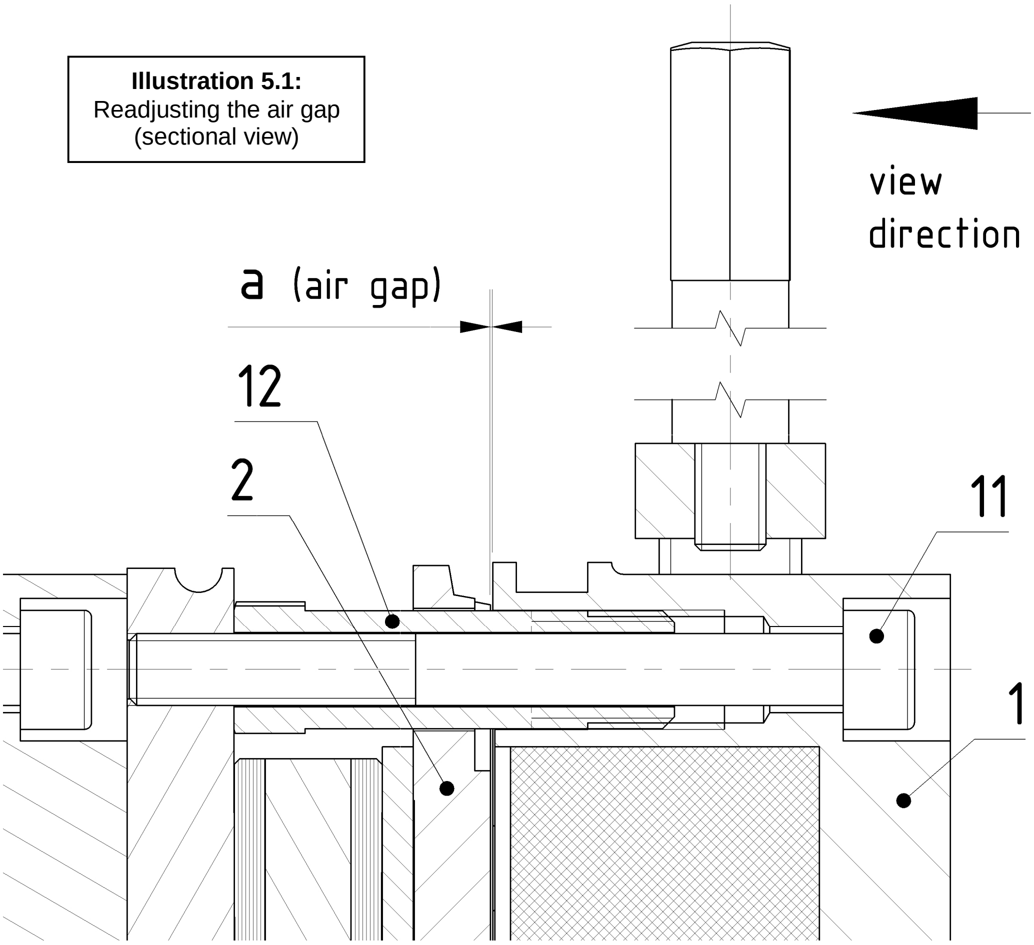
5.1.3.1 Readjusting the air gap (illustration 5.1)

The spring-applied brake is nearly maintenance-free. However, when the **maximum air gap** $\mathbf{a_{max}}$ stated under **3.2.3.3** is reached, a **readjustment (new adjustment) of the air gap a** 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: **an appropriate use no longer exists in such a case.** In any case, functional capability and safety function of the brake will be compromised with further increasing wear.

How to proceed when readjusting the air gap:
- Viewing in direction of the brake (see **illustration 5.1**) loosen the three fastening screws (item **11**) by turning them half a rotation *counter*-clockwise.
- Turn the hollow screws (item **12**) into the magnet body by also turning them *counter*-clockwise.
- Turn the fastening screws (*clockwise*) into the (motor) flange until the *nominal* air gap (to be measured with feeling gauges) exists at three positions on the circumference.
- Reset the hollow screws, i.e. turn them out of the magnet body (*clockwise*) until a firm contact with the counter-friction surface is reached.

- Tighten the fastening screws with the **tightening torque according to 3.2.3.2**
- Subsequently control the air gap between housing (item 1) and armature disk (item 2), if necessary, carry out a readjustment

Illustration 5.1:
Readjusting the air gap
(sectional view)



5.1.3.1 <u>Replace the rotor</u>

When the minimum rotor size $\mathbf{s_{min}}$ according to **3.2.3.3** is reached, a readjustment of the air gap a is no longer possible and the rotor has to be replaced. An operative readiness of the brake in individual cases falling below the minimum rotor size does not change the above statement; **in such a case a proper use is no longer existing**.

è **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!

è **For deviation values to M_{bN}: see 3.2.3.1**

è **Attention!**

In the course of replacing the rotor, the mechanical component parts contributing to the build-up and the transmission of the braking torque have to checked for excessive wear (armature disk, hollow screws) and/or integrity (springs) and, if required, to be replaced!

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	Remedy
Brake does not release	Air gap too large	Check and readjust air gap
	Brake is not supplied with voltage	Check electrical connection
	Voltage at the coil too low	Check the supply voltage of the coil
	Armature plate mechanically blocked	Remove mechanical blocking
Brake releases with delay	Air gap too large	Check and readjust air gap
	Voltage at the coil too low	Check the supply voltage of the coil
Brake does not apply	Voltage at the coil too large	Check the supply voltage of the coil
	Armature plate mechanically blocked	Remove mechanical blocking
Brake applies with delay	Voltage at the coil too large	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 **switched off, de-energised and torque-free**.

è 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 (see 5.1.3.1); if the **hub** shows signs of noticeable wear, it may be exchanged as well. Furthermore, however, all the other components indicated under ***6.4 Spare Parts*** may generally be exchanged.

è Attention!

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

6.3 Exchange/Disposal of Brakes

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

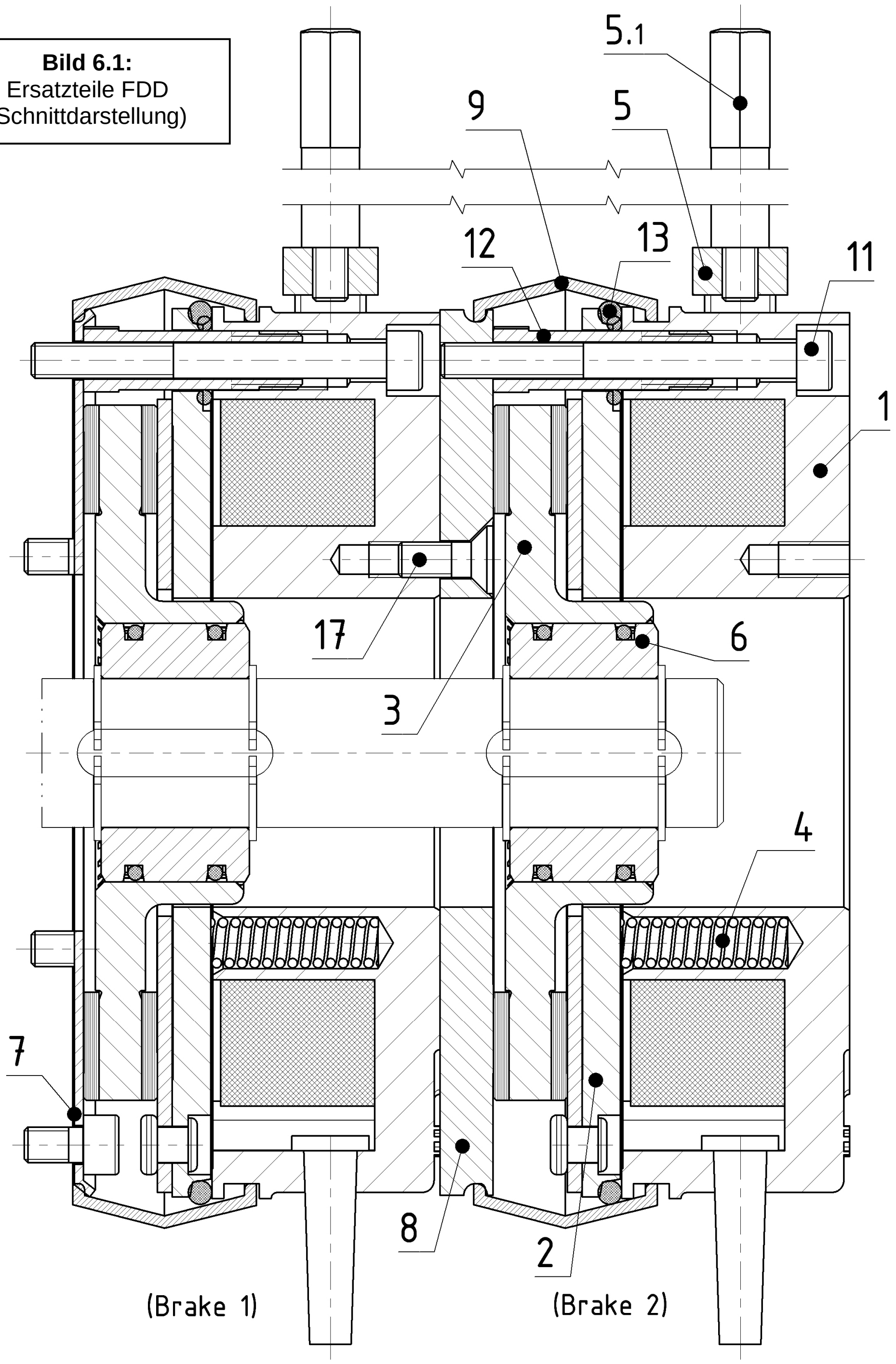
Illustration 6.1 shows all the spare parts that you can order for the spring-pressure brakes of the FDB series indicated in the list below it. Except items 7, 8 and 17 which are used to complete the two single brakes to form a double brake, the parts indicated each are used separately and independent of each other at the single brakes.

When ordering spare parts, please always state the data from the brake lettering (see 3.1.1)!

è Attention!

For damage caused by other than original spare parts and accessories, any liability and warranty on behalf of PRECIMA Magnettechnik GmbH shall be excluded (refer to 2.3.3).

Bild 6.1:
Ersatzteile FDD
(Schnittdarstellung)



Item	Designation	Item	Designation
1	Magnet part cpl.	8	Intermediate flange
2	Rotor disk	9	Dust guard ring
3	Rotor cpl.		
4	Springs	11	Fastening screw
5	Manual release cpl.	12	Hollow screw
5.1	Manual release lever	13	O-ring
6	Hub cpl.		
7	Friction plate	17	Countersunk screw (interm. flange)