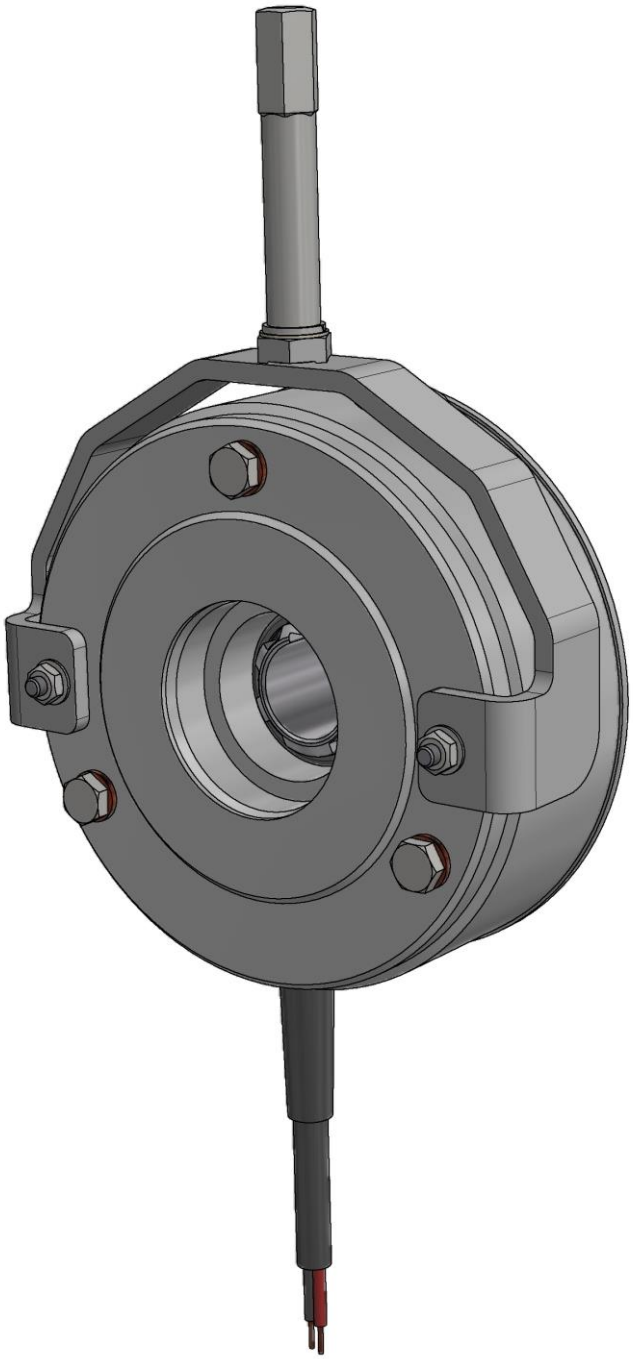
Operating and Assembly Instructions

for the electromagnetically released

Spring-Applied Brakes FDS / BRE 5…20

— Protection Class IP66 —



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1. Preliminary Remarks

1.1 Introduction to the operating and assembly instructions

For validity, purpose and use, as well as terms and labels, see Chapter 1 "Information on the Operating and Assembly Instructions" in the current issue of the *General Introduction (...) PRECIMA Spring-Applied Brakes.* As noted there, please consult PRECIMA in case of doubt. Technical questions, notes and suggestions for improvement can also be sent to the following address:

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1.2 Conditions for assembly and operation

For personnel and product-related conditions, proper application, legal aspects and delivery scope and state, see Chapter 2 "Conditions for Assembly and Operation" in the current issue of the *General Introduction (...) PRECIMA Spring-Applied Brakes*

In addition, the following **general conditions of operation** apply to the FDS brakes:

Humidity: 0…100%

Duty cycle
*(valid for installation on a **self-ventilated motor** with a **speed** of **at least 750 min^{-1}** **or** on a **force-ventilated motor**)*:

S1-100% at an ambient temperature of -20…+40°C
S1-100% at -20**…+60°C** and power reduction through a fast-acting rectifier
S3-60% at -20**...+60°C** generally
S3-60% at -20**…+80°C** and power reduction through a fast-acting rectifier

Not to be used at temperatures below -20°C, as no heating option is available

Consultation with PRECIMA is required:

- with a PWM (pulse width modulation) control

1.3 Structure and functionality

For structure and functionality of a spring-applied brake in general, see the corresponding section (Chapter 3) in the current issue of the *General Introduction (…) PRECIMA Spring-Applied Brakes*

2. Product Description

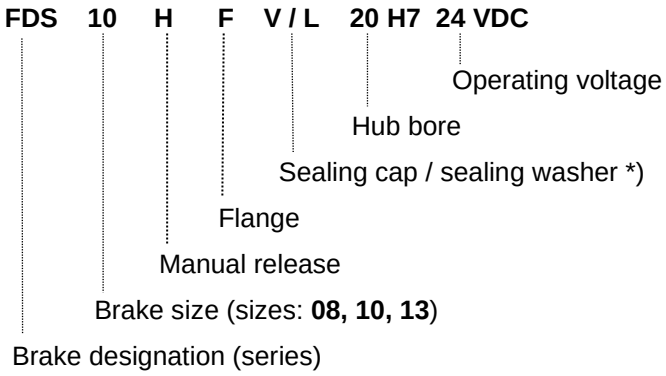
2.1 Marking

2.1.1 Type label

The type label of the spring-applied brake contains all its important data. These data and the contractual agreements for the brakes define the limits of their use.

2.1.2 Type code for FDS brakes (PRECIMA)

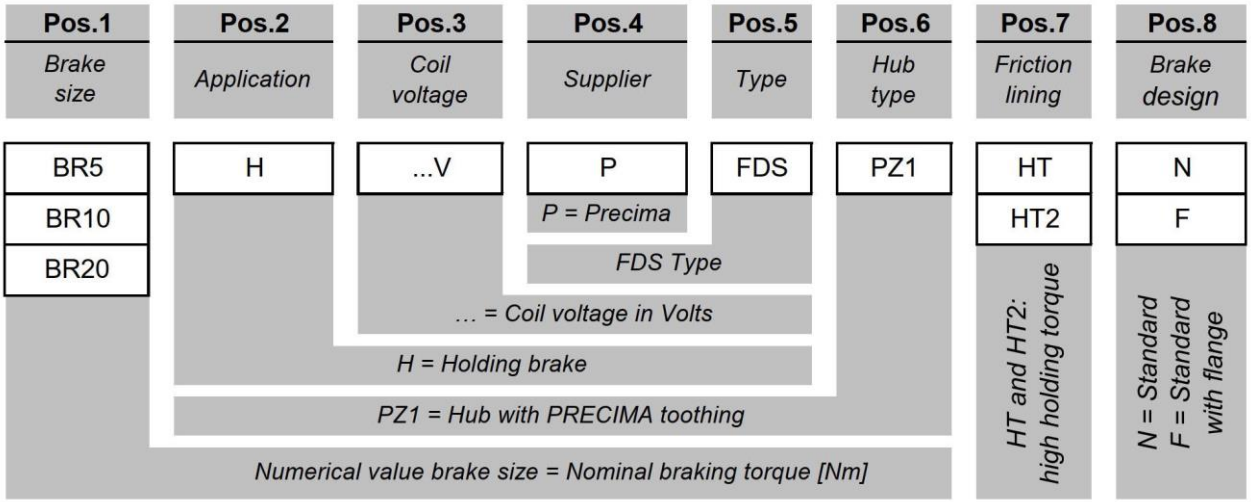
Example:

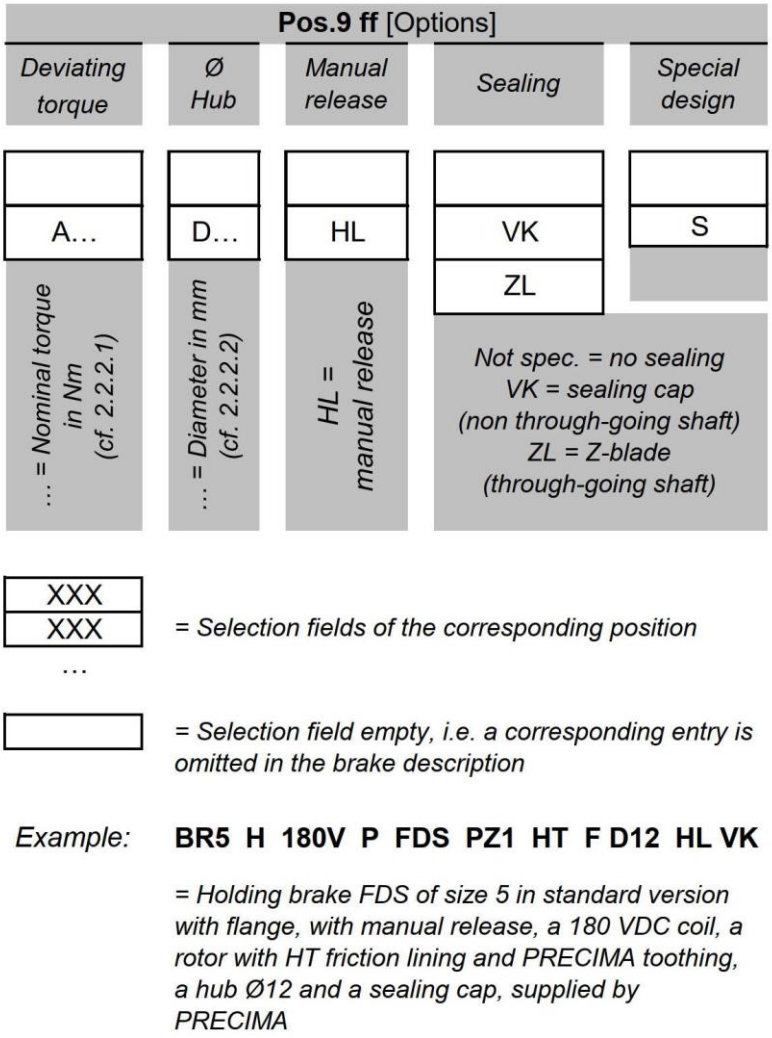


*) V (= sealing cap) only if the shaft is not continuous
L (= sealing washer) or *sealing* option only with continuous shaft
➔ SKF sealing washer with additional sealing by the customer

2.1.3 FDS brake nomenclature (Getriebebau NORD)

The following two diagrams show how an FDS brake is designated by Getriebebau Nord. Pos.1 to Pos.8 must be listed in any case, Positions 9 ff only when the corresponding option is used, but then always in the sequence shown





2.2 Technical information

2.2.1 Special features of the brake

In addition to the general description of the function of the brake (see *General Introduction (...) PRECIMA Spring-Applied Brakes* / Chapter 3 "Structure and Functionality"; cf. 1.3), the **higher protection class** is essential for FDS spring-applied brakes. **Due to their closed housing and sealing elements (O-ring, sealing cap), these brakes comply with protection class IP66. However, with a continuous shaft (with L option or *sealing)* and when using a flange the sealing must be carried out additionally by the customer** (cf. also 3.1 Mechanical installation). In addition to and differently from the other closed brakes of the FDW basic series, FDS series is designed as a cheaper, more compact (= smaller outer Ø; shorter overall length) and simpler (= no brake monitoring options; no heating option) version.

The FDS series **may only be used as a holding brake** (= little or no wear on the friction lining ➔ occasional or no rotor replacement). A friction lining other than the standard **holding brake lining** is only available upon request.

2.2.2 Technical data

2.2.2.1 Nominal braking torques and number of springs

➔ Nominal braking torque / **holding brake** = **static holding torque** (= tearing off torque)
➔ For explanation see: *General introduction (...) PRECIMA spring-applied brakes* / **Chapter 5**

Size	**BR5** *FDS 08*	**BR10** *FDS 10*	**BR20** *FDS 13*
Nominal braking torques ***M_{bN}*** [Nm]	7.5	15	30
	6	12	25
			22
	5	**10**	**20**
	4	7.5	17
	3	6	14

Size	**BR5** *FDS 08*	**BR10** *FDS 10*	**BR20** *FDS 13*
Number of springs for the M_{bN} on the left	*10*	*10 **	*9*
	8	*8 **	*8*
			7
	7	***10***	***6***
	6	*8*	*5*
	4	*6*	*4*

** reinforced springs*

— Permissible deviations of the actual braking torque:
Holding brake (static holding torque)**: -10/+50%** (new) **or -10/+40%** (conditioned*) **—**

***** For explanation see: *General introduction (...) PRECIMA spring-applied brakes* / Chapter 5

2.2.2.2 Dimensions, masses, fastening (Figure 2.1)

Size	**Hub dimensions** [mm]			**General brake dimensions** [mm]							
	Hub with PRECIMA gear teeth Ød H7	Mounting dimensions		Brake with flange	Brake without flange	Through hole Ød6 H7	Length	Brakes with manual release			
	d	***m***	***n***	***d_2 / d_5 / b***	***d_3 / d_4***	***d_6***	***g***	***c***	***v***	***u***	***d***
BR5 *FDS 08*	11 / 12 / 15*	18	1.5	38 / 90 / 1.5	42 / 62	32**	31.5	18.5	97	53	103
BR10 *FDS 10*	15 / 20*	20	2.0	49 / 110 / 2	50 / 78	32	31.5	20	117	60.5	111
BR20 *FDS 13*	20 / 25	20	2.5	60 / 135 / 2.5	62 / 96	42	39.5	24.5	142	76.5	138

Standard keyway of the hub as per DIN 6885/1-JS9
* deviating keyway as per DIN 6885/**3**-JS9
** diameter limited to the sealing element area, see Figure 2.1

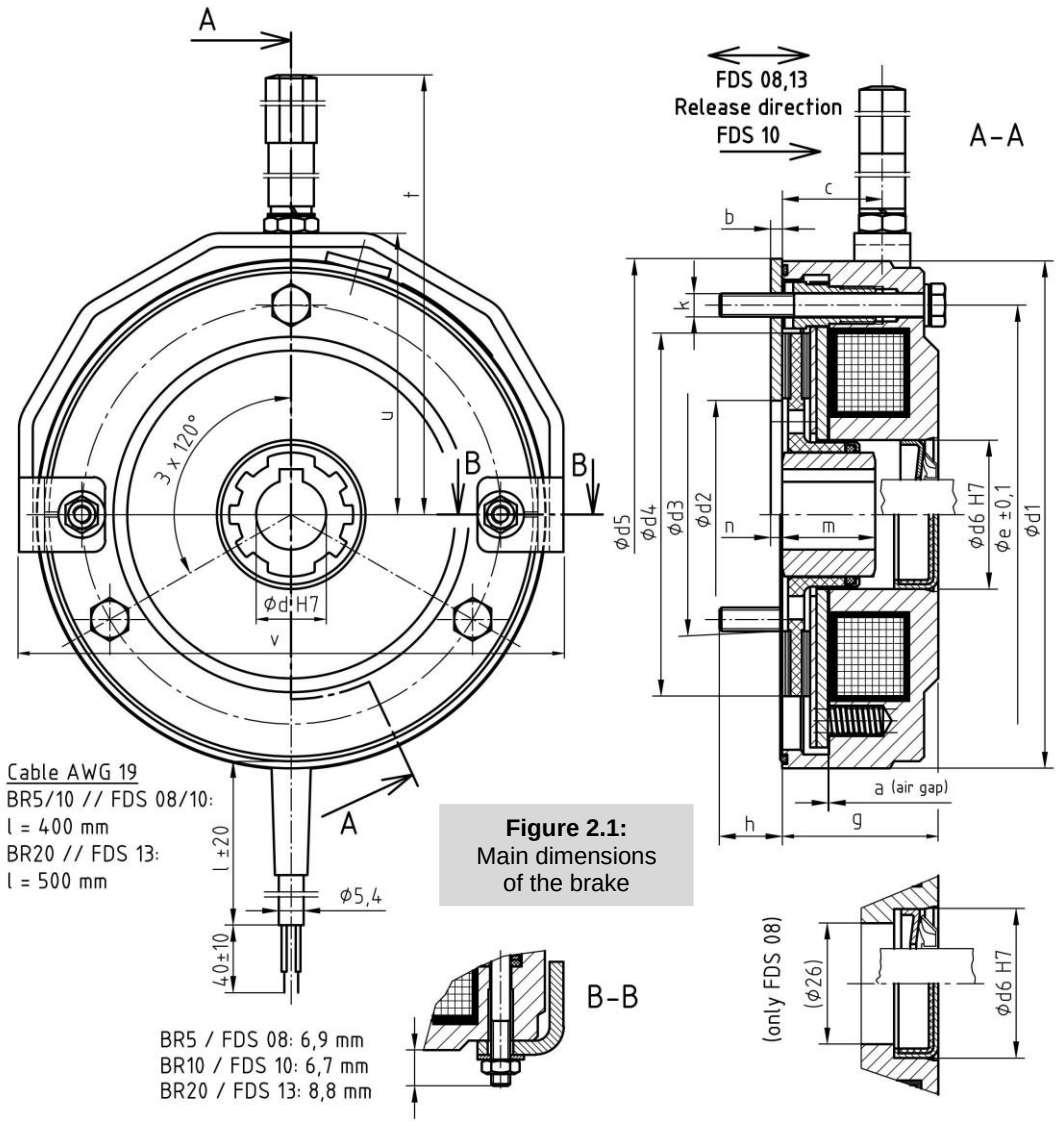


Figure 2.1:
Main dimensions of the brake

Size	**Masses** [kg]			**Mounting dimensions** [mm]				**Tightening torque** [Nm]
	Brake	Manual release	Flange	Outer Ø	Bolt circle Ø	(Number of holes) x thread nominal Ø	Screw-in depth	Fixing screws
				Ød₁	***Øe***	***k***	***h***	***M_A***
BR5 *FDS 08*	0.9	0.08	0.06	89	72	(3x) M4	8.5	**3**
BR10 *FDS 10*	1.4	0.1	0.12	109	90	(3x) M5	9.5	**6**
BR20 *FDS 13*	2.6	0.15	0.2	134	112	(3x) M6	12	**10**

- Brake mass = mass of the basic version without manual release and flange
- Manual release, flange mass = additional mass of the respective option

2.2.2.3 Air gaps, rotor values

Size	Rated torque [Nm]	Min. air gap [mm]	Max. air gap [mm]	Rotor thickness (NEW) [mm]	Rotor thickness (min.) [mm]	Rotor moment of inertia [kgm²]	Maximum rotor speed [min⁻¹]
	$M_{b\ nenn}$	a_{min}	a_{max}	s_{neu}	s_{min}	J	n_{max}
BR5 *FDS 08*	7.5	0.2	0.5	$5^{-0.1}$	4.8	0.015×10^{-3}	**6000**
	6		0.7		4.6		
	5		0.8		4.5		
	4		0.8		4.5		
	3		1.0		4.3		
BR10 *FDS 10*	15	0.2	0.5	$6^{-0.1}$	5.8	0.045×10^{-3}	**6000**
	12		0.6		5.7		
	10		0.7		5.6		
	7.5		0.8		5.5		
	6		0.9		5.4		
BR20 *FDS 13*	30	0.3	0.6	$6^{-0.1}$	5.8	0.173×10^{-3}	**6000**
	25		0.7		5.7		
	22		0.8		5.6		
	20		0.9		5.5		
	17		0.9		5.5		
	14		1.0		5.4		

2.2.2.4 Friction work, friction power

Size	Maximum permissible friction power [J/h]	Max. permissible friction work / braking [J]	Friction work / 0.1 mm wear [J]
	P_{Rmax}	W_{Rmax}	$Qr\ 0.1$
BR5 / *FDS 08*	200×10^3	2.1×10^3	16×10^6
BR10 / *FDS 10*	252×10^3	4.2×10^3	28×10^6
BR20 / *FDS 13*	327×10^3	8.4×10^3	42×10^6

2.2.2.5 Electrical parameters

	BR5 / *FDS 08*		**BR10** / *FDS 10*		**BR20** / *FDS 13*	
Voltage [VDC]	Electrical power [W]	Rated current (*benchmark*) [A]	Electrical power [W]	Rated current (*benchmark*) [A]	Electrical power [W]	Rated current (*benchmark*) [A]
U	$P_{20°C}$	I_N	$P_{20°C}$	I_N	$P_{20°C}$	I_N
24	**28**	**1.14**	**34**	**1.41**	**42**	**1.74**
103	**28**	**0.27**	**35**	**0.34**	**46**	**0.45**
180	**28**	**0.16**	**32**	**0.18**	**41**	**0.23**
205	**28**	**0.14**	**31**	**0.15**	**44**	**0.22**

2.2.2.6 Switching times

Size	Nominal braking torque [Nm]	Disconnection time [ms]	Response delay [ms]	Connection time [ms]	Response delay [ms]	Connection time [ms]
			*switched on the **DC side***		*switched on the **AC side***	
	M_{bN} =	***t_2 =***	***$t_{11\ DC}$ =***	***$t_{1\ DC}$ =***	***$t_{11\ AC}$ =***	***$t_{1\ AC}$ =***
BR5 *FDS 08*	7.5	50	10	28	40	70
	5	35	15	33	70	100
BR10 *FDS 10*	15	60	10	30	50	80
	10	40	15	35	100	130
BR20 *FDS 13*	30	90	10	32	50	90
	20	60	15	38	140	180

— The indicated switching times are to be understood as benchmarks with tolerances for the nominal air gap —

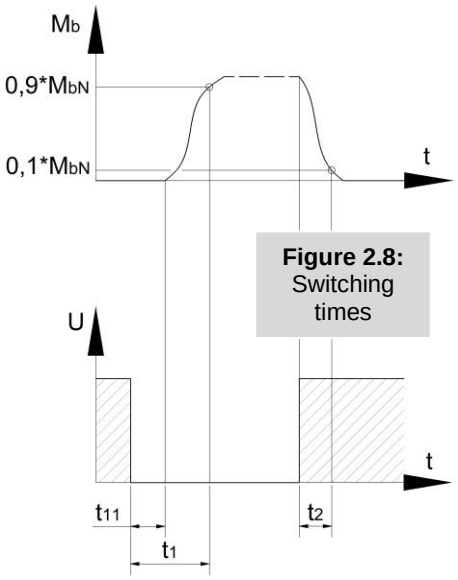


Figure 2.8: Switching times

t_2 = disconnection time = time between the switching on of the current and the ceasing of the braking torque ($M_b \leq 0.1*M_{bN}$)

$t_{1\ DC}$ = connection time = response time during braking with interruption on the DC side by mechanical switches = time between the switching off of the current and the reaching of the full braking torque ($M_b \geq 0.9*M_{bN}$)

$t_{1\ AC}$ = connection time = response time during braking with disconnection on the AC side, i.e. by interruption of a *separately* powered rectifier

$t_{11\ DC}$ / $t_{11\ AC}$ = response delay = time between the switching off of the current and the increase in the braking torque (included in the respective connection time)

– Depending on the operating temperature and the wear status of the brake discs, the actual response delays (t_2, $t_{1\ DC}$, $t_{1\ AC}$) can deviate from the benchmarks indicated here –

3. Assembly

3.1 Mechanical installation

3.1.1 Requirements and preparation

- Check the unpacked spring-applied brake as to being undamaged and complete of all parts (according to the delivery note). Complaints regarding recognizable transport damage must be made immediately to the deliverer, while claims for recognizable defects and incompleteness must be made to PRECIMA (cf. also 2.5 in the *General Introduction (…) PRECIMA Spring-Applied Brakes*).
- Compare the nameplate of the brake with the agreed characteristics and the actual conditions

➔Attention!
Should any ambiguities or contradictions be revealed during the inspection, the brake must not be installed and put into operation without consulting PRECIMA.

3.1.2 Counter friction surface

3.1.2.1 Motor end shield etc. as a counter friction surface

- Check whether the provided counter friction surface meets the requirements (material: steel, cast steel, cast iron - *no aluminium / stainless steel with limitations* -; surface quality **Rz 6.3**) and whether it is free of grease and oil.

3.1.2.2 Flange

- If the counter friction surface is supplied in the form of a flange (item **12**, **Figure 3.1**), this component - which lies directly on the motor end shield - is fixed there together with the brake (see also 3.1.3, 3.1.4 and Figure 3.1). The brake is sealed against the flange by means of an O-ring (item **7**) (analogous to the motor end shield for brakes without flange). **However, the flange itself contains no further sealing element and must be sealed with respect to its mounting surface.**

➔Attention!
If the counter friction surface does not meet the requirements, the brake must not be installed and put into operation without consulting PRECIMA. Grease and oil on the counter friction surface must be removed completely before continuing!

3.1.3 Hub and rotor (Figure 3.1)

➔Stop!
Before the assembly, check the thickness of the rotor according to the information in 2.2.2.3**. S_{neu} is the value for a new rotor** (tolerance = 0/-0.1 mm)**, s_{min} is the lowest permissible rotor thickness. When installing a new rotor, the values must be $s = s_{neu}$; in case of a reassembly (e.g. after a maintenance-related dismantling) the values must be $s > s_{min}$, otherwise the rotor must be replaced.**

The rotor, as a rotating component of the motor to be braked, is fixed onto the shaft via the hub.

- Insert the first circlip (item **10a**) into the rear radial groove of the shaft
- Insert the feather key (item **11**) into the axial groove of the shaft
- Push the hub (item **5**) onto the shaft and over the feather key
- Fix the hub axially by inserting the second circlip (item **10b**) into the front radial groove of the shaft
- If necessary, mount the counter friction surface (flange; item **12**)
- Push the rotor (item **2**) onto the hub, the rotor should still be axially displaceable

➔**Attention!** **Make sure that the rotor/hub pair runs smoothly!**

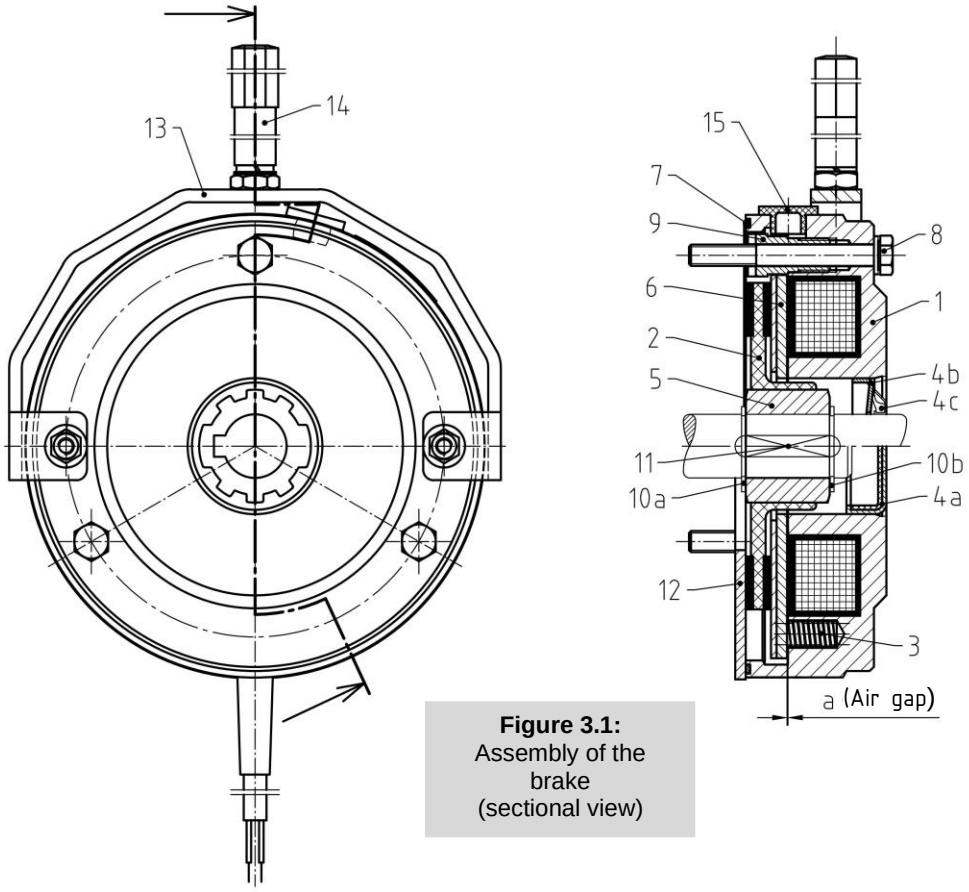


Figure 3.1:
Assembly of the brake
(sectional view)

3.1.4 Brake (Figure 3.1) ➔ ***for self-installation of the manual release, see 3.1.6 first***

The brake is attached to the motor (possibly through the holes in the intermediate flange) and, if required, can be also supplemented with additional components:

- Place the brake on the rotor with the O-ring inserted (item **7**), insert and screw in the fixing screws **with the underlying Cuwashers** (item **8**) until the magnet housing rests on the counter friction surface
- Tighten the fixing screws with the tightening torque according to **2.2.2.2**
- Screw the manual release lever (item **14**) into the manual release bracket (item **13**) with the attached washer and tighten it on the hexagonal surfaces (*only for brakes with manual release = H option*) ➔ **screw-in torque:** (see table below)

Size	Thread lever	Screw-in torque [benchmark in Nm]
BR5/10 // *FDS 08/10*	M5	**5**
BR20 // *FDS 13*	M6	**8**

➔Attention!

The Cu washers under the fixing screws may only be used once for sealing and must be replaced with new ones for each reassembly!
The setting of the manual release (option H or HL) adjusted at the factory or by the customer (➔ 3.1.6.3**) must not be changed!**

3.1.5 Sealing (Figure 3.1)

Depending on whether the brake is mounted over a continuous shaft or not, sealing measures must still be taken:

- With a not continuous shaft, the pre-mounted sealing cap (item **4a**) will close the central opening of the brake, and no further measure is required
- With a continuous shaft, the pre-mounted sealing washer (item **4b**) only forms the first part of the shaft seal. It must always be completed with a V-ring (item **4c**) to be installed on the shaft

3.1.6 Manual release (Figure 3.2) ***— only when assembly or disassembly is carried out by the customer —***

The magnet housing of the brake always has the **necessary holes** for the installation of the **manual release option**. A brake ordered without that option can therefore be retrofitted at any time!

3.1.6.1 Requirements for assembly or disassembly

- The brake must be **dismantled and de-energized** in order to assemble or disassemble the manual release. For brake dismantling, see also **5.1**
- In contrast to the brakes of the FDW series, the **armature plate** (see **Figure 3.2**) does **not** have to be disassembled.

3.1.6.2 Carrying out the assembly or disassembly

The assembly is described below, the disassembly is to be carried out accordingly in reverse order:

- Remove the **protective plugs** from the **holes** to insert the fixing screws into the **magnetic body** (item **1**).
- Push the **screws** (item **21**) with fitted **washer** (item **22**), the **spring** (item **24**), the **intermediate plate** (item **23**) and the **O-ring** (item **25**) through the openings of the armature plate and the holes of the magnet housing. The two O-rings get to lie in the recesses of the magnet housing and seal their respective base area against the enclosed screw shaft
- Place the **manual release bracket** (item **20**) towards the magnet housing so that the actuating screws go through the holes of the fastening clips
- Unscrew the two **nuts** with the washer underneath (item **26**+**22**)

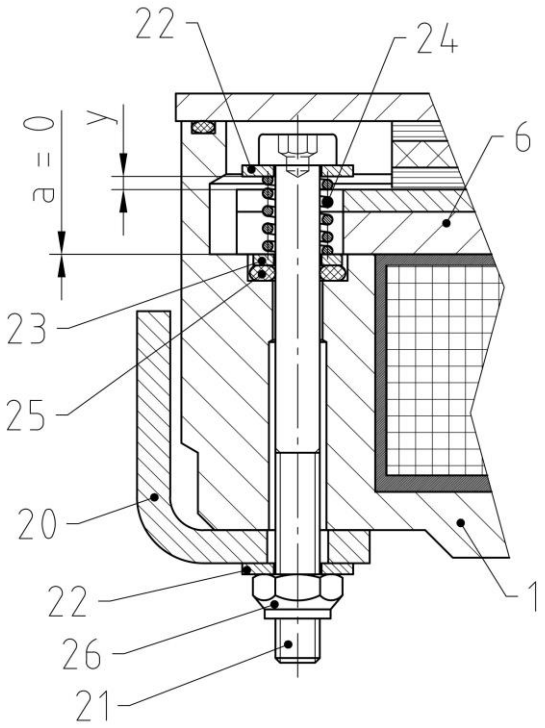


Figure 3.2:
Assembly / disassembly of the manual release (offset sectional view)

3.1.6.3 Adjustment of the manual release

After the actual assembly, the manual release must still be adjusted in order to fulfil the intended function:

- **Tighten** the two **actuating screws** (item **21**, **Figure 3.2**) until the armature plate (item **6**) lies on both sides of the magnet housing ➔ **a = 0**
- **Turn back** the two **actuating screws** by dimension **Y** or by **X** rotations according to **3.1.6.4**
- **Secure the setting position** by applying thread-locking fluid in the area of the nuts (item 26) on both sides of the brake

3.1.6.4 Manual release setting values

Type	Setting dimension **Y**	Thread	Thread pitch	Number of rotations **X**
	[mm]		[mm]	
BR5 *FDS 08*	1	M3	0.5	2
BR10 *FDS 10*	1	M4	0.7	1.5
BR20 *FDS 13*	1	M4	0.7	1.5

3.2 Electrical installation

The electrical connection must only be carried out in a de-energized state. The operating voltage (DC) of the brake is indicated on its nameplate (cf. 2.1.2).

3.3 Modifications and additions

3.3.1 Change of the braking torque

The braking torque can be adjusted by modifying the spring configuration in accordance with **2.2.2.1**. Make sure that the springs are arranged as evenly as possible (for FDS brakes only in the external pole). Should the braking torque be changed on a **brake with manual release**, it is also necessary to first **disassemble** and then **reassemble** the manual release. See **3.1.6**.

4. Operation

4.1 Brake in operation

4.1.1 Commissioning

Before commissioning the brake, a **functional test** must be carried out first. This can normally and readily be done together with the motor to which the brake is attached. For possible malfunctions, see: 4.2.

➔Stop!
The full braking torque is only effective after the brake pads on the rotor have run in! ➔ Deviation values to M_{bN}: see 2.2.2.1

4.1.2 Ongoing operation

Ongoing operation requires no special measures without malfunctions. Only the **size of the air gap** (increasing because of the wear of the friction lining on the rotor) must be checked according to the following arrangement (see also: 4.1.3). In order to do this, temporarily remove the sealing plug (item **15**, Figure 3.1) in the inspection hole. In case of malfunctions, proceed according to 4.2.

Control intervals:

Working brake:
+ according to tool life calculation
+ as per specification to be given by the customer

Holding brake:
+ at least once every two years
+ as per specification to be given by the customer
+ provide shorter intervals in case of frequent emergency stops

4.1.3 Maintenance

4.1.3.1 Replacing the rotor

It is not possible to adjust the air gap for the closed brakes of the FDS series. When the mini-

minimum rotor thickness s_{min} according to **2.2.2.3** is reached, the rotor must then be replaced. Functionality of the brake that falls below the minimum rotor thickness just in individual cases does not change the above statement; **proper use is then no longer available**.

➔Stop!

Even after the rotor has been replaced, the full braking torque is only effective again after the brake linings on the rotor have run in!
➔ Deviation values to M_{bN}: see 2.2.2.1

➔Attention!

When replacing the rotor, the mechanical components involved in the build-up and transmission of the braking torque must be checked for excessive wear (armature plate, hollow screws) or integrity (springs) and replaced if necessary!

4.2 Brake out of operation (malfunctions)

The table below shows typical malfunctions during ongoing operation (in some cases also during commissioning), their possible causes and instructions for their correction.

Malfunction	Possible cause	Remedy
Brake does not release	Air gap too large	Replace the rotor
	Brake is not supplied with voltage	Check electrical connection
	Voltage at the magnetic coil too low	Check magnetic coil supplied voltage
	Armature plate mechanically blocked	Remove mechanical blockage
Brake releases with delay	Air gap too large	Rotor must be replaced
	Voltage at the magnetic coil too low	Check magnetic coil supplied voltage
Brake is not applied	Voltage at the magnetic coil too high	Check supply voltage of the magnetic coil
	Armature plate mechanically blocked	Remove mechanical blockages
Brake is applied with delay	Voltage at the magnetic coil too high	Check supply voltage of the magnetic coil

5. Disassembly / Replacement

5.1 Dismantling of the brake

Dismantling of the brake shall be carried out analogous to the assembly, but in reverse order, and only when the brake and the motor are **switched off, de-energized and torque-free**.

➔Danger!

The disassembly of the brake will result in a suspension of its passive braking function. There are no risks associated with this suspension!

5.2 Component replacement

The only component that can be regularly replaced on site is the **rotor** when it reaches the wear limit (cf. 4.1.3.1); when the **hub** shows signs of noticeable wear, it can be replaced if necessary. Furthermore, all other components listed in ***5.4 Spare parts*** can also be generally replaced.

➔Attention!

Before reassembling a brake, the fastening elements must be checked for proper functionality and replaced if necessary! It is fundamental to replace the Cu washers arranged under the screws, since their sealing function is no longer guaranteed if they are used multiple times!

5.3 Brake replacement / disposal

The components of our spring-applied brakes have to be recycled separately due to the presence of different materials. The official regulations must also be observed.
Important code numbers of the Waste Catalogue Ordinance (German designation: AAV) are given below. Depending on the material composition and the type of disassembling process, other key numbers may also apply to the components made from these materials.

- Ferrous metals (key no.160117)
- Non-ferrous metals (key no.160118)
- Brake pads (key no.160112)
- Plastics (key no. 160119)

5.4 Spare parts

Figure 5.1 shows all the spare parts that can be ordered for the FDS spring-applied brakes, which are listed below.

When ordering spare parts, please provide the nameplate data (see 2.1.2)!

➔Attention!

PRECIMA Magnettechnik GmbH excludes any liability and warranty for damage resulting from the use of non-original spare parts and accessories (cf. 2.2.3 in the *General Introduction (…) PRECIMA Spring-applied Brakes*).

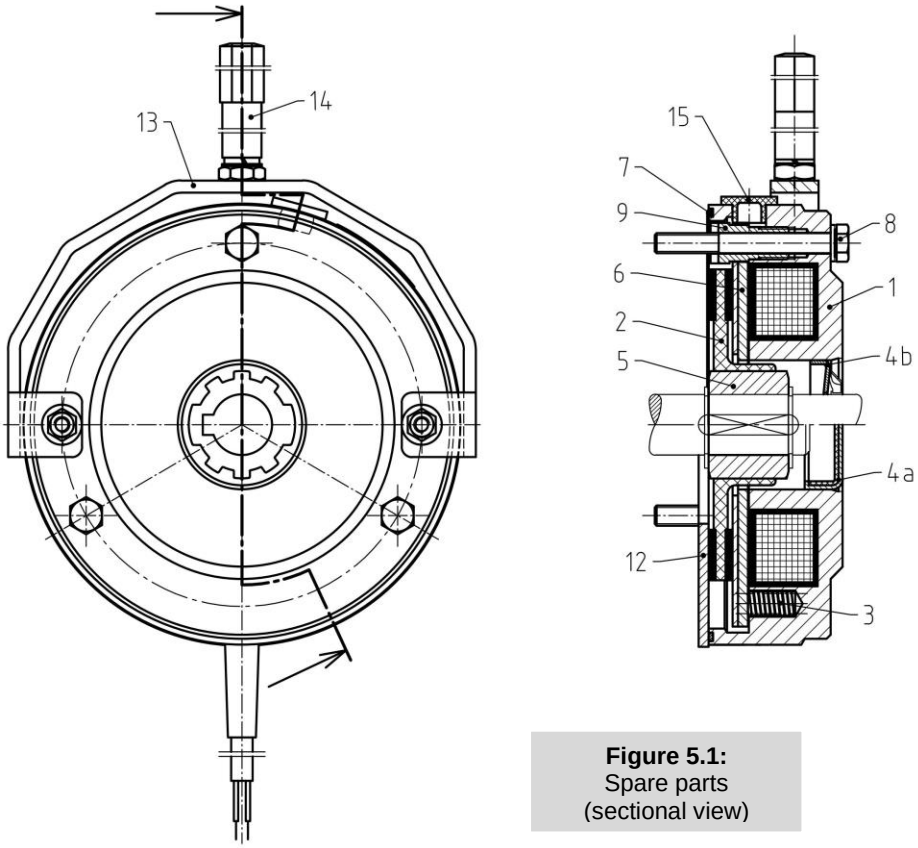


Figure 5.1:
Spare parts
(sectional view)

Position	Designation	Position	Designation
1	Magnetic body	7	O-ring (magnet housing)
2	Rotor complete	8	Fixing screw including Cu washer
3	Spring	9	Hollow screw
4a	Sealing cap	12	Flange
4b	Sealing washer	13	Manual release complete
5	Hub	14	Manual release lever
6	Armature plate	15	Sealing plug

Document history

Issue	Version	Description
05.2020	*0.0*	Created
11.2021	*1.0*	General: FDS as general brake **type** designation, BR5..BR20 as NORD-specific brake **size** designation (instead of BRE...) 2.1.3: Adaptation of Getriebebau NORD nomenclature 2.2.2.1: Definition of nominal braking torques added; tolerance values revised.