

# Operation and Installation Instructions Version 05.2016

for the electromagnetically released  
**Spring-applied Brakes (Standard Design)**

## **FDW 08 ... FDW 30**



## Document history

| Version |     | Description                                                    |
|---------|-----|----------------------------------------------------------------|
| 12.2013 | 0.0 | current version                                                |
| 05.2016 | 1.0 | Description of the directives and standards updated Pkt. 2.4.3 |

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# 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 brakes FDWS 08 to FDW 30** 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**:

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

**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.

**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 ➔ see above). However, this is no general limitation of the validity of these instructions 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. Particularly pay attention to the application as a **working** and an application as a **holding brake** (definition: refer to 1.3). siehe 1.3).

#### 2.2.2 Operation 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.

## ➔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](http://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: Safety of Machinery (Basic Concepts)
- EU Directive Electromagnetic Compatibility (2004/30/EU). 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 or EU 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.

### ➔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 magnet housing:

**103V 12 09 40**

Operating voltage (DC) in Volt  
 Month of production  
 Year of production  
 Torque in Nm

#### 3.1.2 Type Code

Example:

**FDW 15 A H F T M 20 H7 24 VDC**

Brake name (series)  
 Brake size (sizes: **08, 10, 13, 15, 17, 20, 23, 26, 30**)  
 ATEX design  
 Manual release  
 Flange  
 Tachometer bores  
 Sealing cap or SKF sealing rib  
 Micro-switch  
 Hub bore  
 Operating voltage  
 Options I \*)  
 Options II \*)

\*) Options I have been taken into account in these operating and installations instructions. Indicate them in your order (→ abbreviation, if available).

\*\*) Options II are *not* taken into account in these instructions. The included options M (= micro-switch) and A (= ATEX, design for potentially explosive areas of dust zone 22) must be indicated in your order and cannot be retrofitted. For Options II, there are separate descriptions and/or adjusting instructions which will have to be complied with in addition to this document.

## 3.2 Technical Information

### 3.2.1 Operation of the Brake (Illustration 3.1)

The electromagnetically released spring-pressure brakes of the FDW 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.

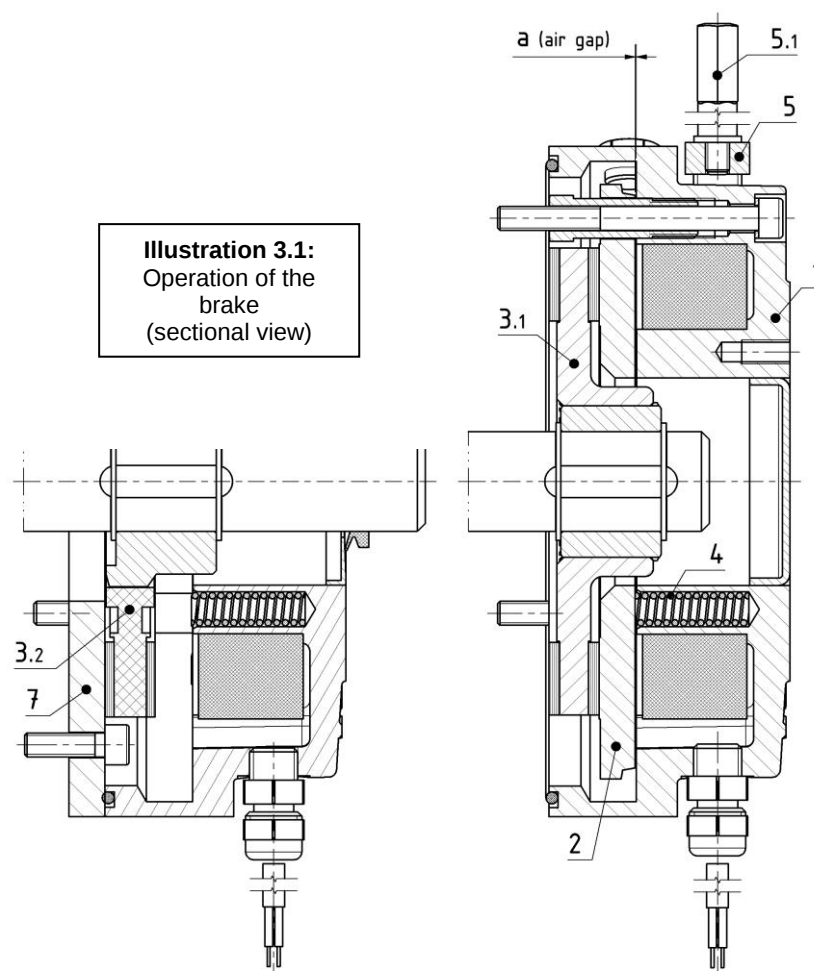
During **braking**, the incorporated pressure springs (item **4**, illustration 3.1) through the axially movable armature disk (item **2**) press the rotor (item **3.1 / 3.2**) which is radially positively connected with the machine shaft against the counter-friction surface (flange (item **7**) or motor 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 **1.1 / 1.2**) via the field winding. Said magnetic force draws the armature disk (item **2**) to the magnet body and the brake rotor is released.

During **manual release** (*only in case of designs with manual release*), the armature disk is mechanically drawn against the magnet body by swivelling the manual release lever (item **5**, with screwed-down manual release lever (item **5.1**)) and the rotor is released. This enables you to release the brake, for example, even if there is a power failure.

### → Attention!

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



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.

### →To be noted:

Because of their enclosed housing and the dust- and water-tight cable screw connection, spring-pressure brakes of series FDW meet the type of protection IP66. With a continuous shaft (option SKF sealing rib) and the use of a flange, however, sealing always has to be performed by the customer (refer to 4.1 Mechanical Installation).

## 3.2.2 Technical Data

### 3.2.2.1 Nominal braking torques and number of springs

| Size                                  | 08   | 10  | 13  | 15  | 17  | 20   | 23   | 26   | 30   |
|---------------------------------------|------|-----|-----|-----|-----|------|------|------|------|
| Nominal braking torques $M_{bN}$ [Nm] | 7,5* | 15* | 30* | 60* | 90* | 150* | 225* | 375* | 600* |
|                                       | 5    | 10  | 20  | 40  | 60  | 100  | 150  | 250  | 400  |
|                                       | 3,5  | 7   | 14  | 28  | 43  | 70   | 107  | 187  | 300  |
|                                       | 3    | 6   | 12  | 23  | 34  | 57   | 85   | 125  | 200  |
|                                       | 2    | 4   | 8   | 17  | 26  | 42   | 65   |      |      |

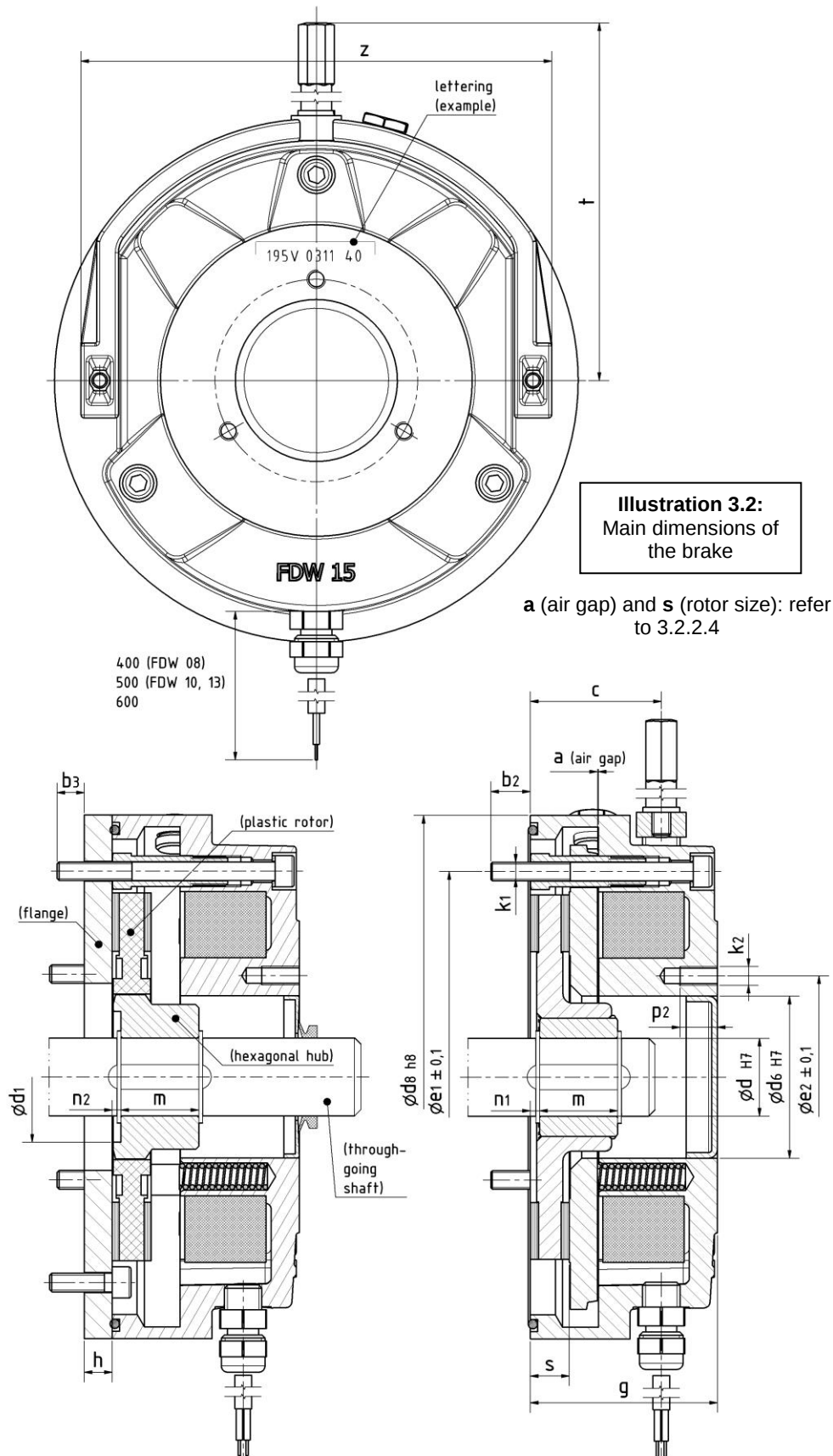
\* only with holding brake with emergency stop features

#### — Permissible deviations of the real braking torque:

Working brake: -30% (new) and/or  $\pm 20\%$  (run in)  $\pm 20\%$  (new) or -10/+30% (run-in) —

| Size                                     | 08                                                                                          | 10 | 13 | 15 | 17 | 20 | 23 | 26 | 30 |
|------------------------------------------|---------------------------------------------------------------------------------------------|----|----|----|----|----|----|----|----|
| Number of springs for the above $M_{bN}$ | - Please inquire the springs required for nominal braking torques deviating from $M_{bN}$ - |    |    |    |    |    |    |    |    |
|                                          | 7                                                                                           | 7  | 7  | 7  | 7  | 7  | 7  | 8  | 8  |
|                                          | 5                                                                                           | 5  | 5  | 5  | 5  | 5  | 5  | 6  | 6  |
|                                          | 4                                                                                           | 4  | 4  | 4  | 4  | 4  | 4  | 4  | 4  |
|                                          | 3                                                                                           | 3  | 3  | 3  | 3  | 3  | 3  |    |    |

### 3.2.2.2 Dimensions, masses, attachment (illustration 3.2)



| Size      | Hub dimensions<br>[mm]              |                                        |                        |          |                      |                      | General brake dimensions<br>[mm]             |                   |                                 |          |          | Dimensions<br>tachometer bores<br>[mm]           |                                                         |                      |
|-----------|-------------------------------------|----------------------------------------|------------------------|----------|----------------------|----------------------|----------------------------------------------|-------------------|---------------------------------|----------|----------|--------------------------------------------------|---------------------------------------------------------|----------------------|
|           | Hexagon<br>hub $\varnothing d_{H7}$ | Toothed<br>hub<br>$\varnothing d_{H7}$ | Mounting<br>dimensions |          |                      |                      | Brake $\varnothing$<br>internal/<br>external | Brake /<br>flange | Brake with<br>manual<br>release |          |          | Hole<br>circle<br>$\varnothing e_2$<br>$\pm 0,1$ | (number<br>of bores)<br>x nom.<br>thread- $\varnothing$ | Thread<br>depth      |
|           | <b>d</b>                            | <b>d</b>                               | <b>d<sub>1</sub></b>   | <b>m</b> | <b>n<sub>1</sub></b> | <b>n<sub>2</sub></b> | <b>d<sub>6</sub> / d<sub>8</sub></b>         | <b>g / h</b>      | <b>c</b>                        | <b>t</b> | <b>z</b> | <b>e<sub>2</sub></b>                             | <b>k<sub>2</sub></b>                                    | <b>p<sub>2</sub></b> |
| <b>08</b> | 11/14/15                            | 11/14*/15*                             | 20                     | 18       | 1,5                  | 0,5                  | 26** / 98                                    | 40 / 6            | 30                              | 100      | 89       | 34                                               | (3 x) M4                                                | 8                    |
| <b>10</b> | 15/19/20*                           | 14/15                                  | 25                     | 20       | 2,5                  | 1                    | 32 / 120                                     | 48 / 7            | 43,5                            | 110      | 111      | 40                                               | (3 x) M5                                                | 12                   |
| <b>13</b> | 15/20/25                            | 15/20                                  | 33                     | 20       | 3,5                  | 1,5                  | 42 / 145                                     | 53 / 9            | 39                              | 130      | 132      | 54                                               | (3 x) M6                                                | 12                   |
| <b>15</b> | 20/25/30                            | 20/25                                  | 42                     | 25       | 3                    | 2                    | 52 / 168                                     | 60 / 11           | 42                              | 140      | 151      | 65                                               | (3 x) M6                                                | 12                   |
| <b>17</b> | -                                   | 25/30/35*                              | -                      | 30       | 3                    | -                    | 62 / 188                                     | 70 / 11           | 46                              | 165      | 172      | 75                                               | (3 x) M8                                                | 15                   |
| <b>20</b> | -                                   | 30/35/40                               | -                      | 30       | 3                    | -                    | 72 / 213                                     | 80 / 11           | 51,5                            | 186      | 196      | 85                                               | (3 x) M8                                                | 15                   |
| <b>23</b> | -                                   | 35/40/45                               | -                      | 35       | 4                    | -                    | 80 / 245                                     | 90 / 8            | 58                              | 200      | 224      | 95                                               | (3 x) M8                                                | 15                   |
| <b>26</b> | -                                   | 40/45/50/55*                           | -                      | 40       | 4                    | -                    | 90 / 276                                     | 99 / 12,5         | 62                              | 285      | 258      | 110                                              | (6 x) M10                                               | 25                   |
| <b>30</b> | -                                   | 50/55/60/65*                           | -                      | 50       | 4                    | -                    | 115 / 324                                    | 105/ 12,5         | 64                              | 310      | 304      | 138                                              | (6 x) M10                                               | 25                   |

**Standard feather key groove of the hub as per DIN 6885/1-JS9**

\* deviating feather key groove as per DIN 6885/3-JS9 // \*\* can be made with  $\varnothing 30$  (7 mm deep)

| Size      | Masses<br>[kg]                                |                   |        | Dimensions<br>tachometer bores<br>[mm]   |                                                      |                                                       | Tightening<br>torque<br>[Nm] |
|-----------|-----------------------------------------------|-------------------|--------|------------------------------------------|------------------------------------------------------|-------------------------------------------------------|------------------------------|
|           | Brake without<br>manual release<br>and flange | Manual<br>release | Flange | Hole circle<br>$\varnothing e_1 \pm 0,1$ | (number of<br>bores) x nom.<br>thread- $\varnothing$ | Penetration<br>depth without /<br>with friction plate | Fastening<br>screws          |
|           |                                               |                   |        | <b>e<sub>1</sub></b>                     | <b>k<sub>1</sub></b>                                 | <b>b<sub>2</sub> / b<sub>3</sub></b>                  | <b>M<sub>A</sub></b>         |
| <b>08</b> | 1,60                                          | 0,05              | 0,28   | 72                                       | (3 x) M4                                             | 6 / 10                                                | <b>3</b>                     |
| <b>10</b> | 2,00                                          | 0,08              | 0,49   | 90                                       | (3 x) M5                                             | 8,5 / 6,5                                             | <b>6</b>                     |
| <b>13</b> | 3,60                                          | 0,10              | 0,92   | 112                                      | (3 x) M6                                             | 12 / 8                                                | <b>10</b>                    |
| <b>15</b> | 5,20                                          | 0,13              | 1,22   | 132                                      | (3 x) M6                                             | 13 / 12                                               | <b>10</b>                    |
| <b>17</b> | 7,20                                          | 0,17              | 1,34   | 145                                      | (3 x) M8                                             | 14 / 13                                               | <b>25</b>                    |
| <b>20</b> | 11,00                                         | 0,24              | 2,35   | 170                                      | (3 x) M8                                             | 14 / 13                                               | <b>25</b>                    |
| <b>23</b> | 16,30                                         | 0,29              | 2,30   | 196                                      | (3 x) M8                                             | 15 / 14                                               | <b>25</b>                    |
| <b>26</b> | 25,00                                         | 0,80              | 4,10   | 230                                      | (3 x) M10                                            | 19 / 16                                               | <b>50</b>                    |
| <b>30</b> | 37,50                                         | 0,90              | 6,20   | 278                                      | (6 x) M10                                            | 17 / 14                                               | <b>50</b>                    |

3.2.2.3 Air gaps, rotor values

| Size      | Nominal braking torques [Nm] | Nominal air gap [mm] | Rotor size (new condition) [mm] | Max. air gap [mm] | Min. rotor size [mm] | Mass moment of inertia rotor [kgm <sup>2</sup> ] | Max. speed rotor [min <sup>-1</sup> ] |                                  |
|-----------|------------------------------|----------------------|---------------------------------|-------------------|----------------------|--------------------------------------------------|---------------------------------------|----------------------------------|
|           | $M_{bN}$                     | $a_{nom}$            | $S_{new}$                       | $a_{max}$         | $S_{min}$            | $J$                                              | $n_{max}$                             | $n_{max}$<br>Rotor weighed heavy |
| <b>08</b> | 7,5* **                      | 0,2 <sup>+0,2</sup>  | 7,5 <sup>-0,1</sup>             | 0,6               | 7,1                  | 0,015 x 10 <sup>-3</sup>                         | 6000                                  |                                  |
|           | 5                            |                      |                                 |                   |                      |                                                  |                                       |                                  |
|           | 3,5                          |                      |                                 |                   |                      |                                                  |                                       |                                  |
|           | 3                            |                      |                                 |                   |                      |                                                  |                                       |                                  |
|           | 2                            |                      |                                 |                   |                      |                                                  |                                       |                                  |
| <b>10</b> | 15* **                       | 0,2 <sup>+0,2</sup>  | 8,5 <sup>-0,1</sup>             | 0,7               | 8,0                  | 0,045 x 10 <sup>-3</sup>                         | 6000                                  |                                  |
|           | 10                           |                      |                                 |                   |                      |                                                  |                                       |                                  |
|           | 7                            |                      |                                 |                   |                      |                                                  |                                       |                                  |
|           | 6                            |                      |                                 |                   |                      |                                                  |                                       |                                  |
|           | 4                            |                      |                                 |                   |                      |                                                  |                                       |                                  |
| <b>13</b> | 30* **                       | 0,3 <sup>+0,2</sup>  | 10,3 <sup>-0,1</sup>            | 0,8               | 9,8                  | 0,173 x 10 <sup>-3</sup>                         | 6000                                  |                                  |
|           | 20                           |                      |                                 |                   |                      |                                                  |                                       |                                  |
|           | 14                           |                      |                                 |                   |                      |                                                  |                                       |                                  |
|           | 12                           |                      |                                 |                   |                      |                                                  |                                       |                                  |
|           | 8                            |                      |                                 |                   |                      |                                                  |                                       |                                  |
| <b>15</b> | 60* **                       | 0,3 <sup>+0,2</sup>  | 12,5 <sup>-0,1</sup>            | 0,9               | 11,9                 | 0,45 x 10 <sup>-3</sup>                          | 6000                                  |                                  |
|           | 40                           |                      |                                 |                   |                      |                                                  |                                       |                                  |
|           | 28                           |                      |                                 |                   |                      |                                                  |                                       |                                  |
|           | 23                           |                      |                                 |                   |                      |                                                  |                                       |                                  |
|           | 17                           |                      |                                 |                   |                      |                                                  |                                       |                                  |
| <b>17</b> | 90* **                       | 0,3 <sup>+0,2</sup>  | 14,5 <sup>-0,1</sup>            | 1,0               | 13,8                 | 0,86 x 10 <sup>-3</sup>                          | 3600                                  | <b>6000</b>                      |
|           | 60                           |                      |                                 |                   |                      |                                                  |                                       |                                  |
|           | 43                           |                      |                                 |                   |                      |                                                  |                                       |                                  |
|           | 34                           |                      |                                 |                   |                      |                                                  |                                       |                                  |
|           | 26                           |                      |                                 |                   |                      |                                                  |                                       |                                  |
| <b>20</b> | 150* **                      | 0,4 <sup>+0,2</sup>  | 16 <sup>-0,1</sup>              | 1,1               | 15,3                 | 1,22 x 10 <sup>-3</sup>                          | 3600                                  | <b>6000</b>                      |
|           | 100                          |                      |                                 |                   |                      |                                                  |                                       |                                  |
|           | 70                           |                      |                                 |                   |                      |                                                  |                                       |                                  |
|           | 57                           |                      |                                 |                   |                      |                                                  |                                       |                                  |
|           | 42                           |                      |                                 |                   |                      |                                                  |                                       |                                  |
| <b>23</b> | 225* **                      | 0,4 <sup>+0,2</sup>  | 18 <sup>-0,1</sup>              | 1,1               | 17,3                 | 2,85 x 10 <sup>-3</sup>                          | 3600                                  | <b>6000</b>                      |
|           | 150                          |                      |                                 |                   |                      |                                                  |                                       |                                  |
|           | 107                          |                      |                                 |                   |                      |                                                  |                                       |                                  |
|           | 85                           |                      |                                 |                   |                      |                                                  |                                       |                                  |
|           | 65                           |                      |                                 |                   |                      |                                                  |                                       |                                  |
| <b>26</b> | 375* **                      | 0,5 <sup>+0,2</sup>  | 20 <sup>-0,1</sup>              | 1,2               | 19,3                 | 6,65 x 10 <sup>-3</sup>                          | 1500                                  | <b>3000 / 6000*</b>              |
|           | 250                          |                      |                                 |                   |                      |                                                  |                                       |                                  |
|           | 187                          |                      |                                 |                   |                      |                                                  |                                       |                                  |
|           | 125                          |                      |                                 |                   |                      |                                                  |                                       |                                  |
|           |                              |                      |                                 |                   |                      |                                                  |                                       |                                  |
| <b>30</b> | 600* **                      | 0,5 <sup>+0,2</sup>  | 20 <sup>-0,1</sup>              | 1,2               | 19,3                 | 19,5 x 10 <sup>-3</sup>                          | 1500                                  | <b>3000 / 6000*</b>              |
|           | 400                          |                      |                                 |                   |                      |                                                  |                                       |                                  |
|           | 300                          |                      |                                 |                   |                      |                                                  |                                       |                                  |
|           | 200                          |                      |                                 |                   |                      |                                                  |                                       |                                  |
|           |                              |                      |                                 |                   |                      |                                                  |                                       |                                  |

\* Holding brakes with emergency stop features

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

### 3.2.2.4 Friction work, friction capacity

| Size | Max. permissible friction capacity** [J/h] | Max. permissible friction work / braking [J] | Max. permissible friction capacity** [J/h] | Max. permissible friction work / braking [J] | Friction work / 0.1 mm wear [J] |
|------|--------------------------------------------|----------------------------------------------|--------------------------------------------|----------------------------------------------|---------------------------------|
|      | Working brake                              |                                              | Holding brake                              |                                              | ***                             |
|      | $P_{Rmax}$                                 | $W_{Rmax}^*$                                 | $P_{Rmax}$                                 | $W_{Rmax}^*$                                 | $Q_{r 0,1}$                     |
| 08   | $288 \times 10^3$                          | $3 \times 10^3$                              | $144 \times 10^3$                          | $1,5 \times 10^3$                            | $16 \times 10^6$                |
| 10   | $360 \times 10^3$                          | $6 \times 10^3$                              | $180 \times 10^3$                          | $3 \times 10^3$                              | $30 \times 10^6$                |
| 13   | $468 \times 10^3$                          | $12 \times 10^3$                             | $234 \times 10^3$                          | $6 \times 10^3$                              | $42 \times 10^6$                |
| 15   | $576 \times 10^3$                          | $25 \times 10^3$                             | $288 \times 10^3$                          | $12 \times 10^3$                             | $70 \times 10^6$                |
| 17   | $720 \times 10^3$                          | $35 \times 10^3$                             | $360 \times 10^3$                          | $17 \times 10^3$                             | $85 \times 10^6$                |
| 20   | $900 \times 10^3$                          | $50 \times 10^3$                             | $450 \times 10^3$                          | $25 \times 10^3$                             | $140 \times 10^6$               |
| 23   | $1080 \times 10^3$                         | $75 \times 10^3$                             | $540 \times 10^3$                          | $37 \times 10^3$                             | $170 \times 10^6$               |
| 26   | $1260 \times 10^3$                         | $105 \times 10^3$                            | $630 \times 10^3$                          | $52 \times 10^3$                             | $230 \times 10^6$               |
| 30   | $1440 \times 10^3$                         | $150 \times 10^3$                            | $720 \times 10^3$                          | $75 \times 10^3$                             | $310 \times 10^6$               |

\* in case of  $W_R$  ] 0.1 \*  $W_{Rmax}$  rotor speed and duration of individual braking operation must be taken into account (→ consultation with PRECIMA required)!

\*\* in case of a uniform timely distribution of brakings

\*\*\* with sizes 08... 13: Lining HT; with sizes 15... 40: Lining HD

### 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] |
|------|------------------------------|---------------|-----------------------------------|------|------------------------------|---------------|-----------------------------------|
|      | $P_{20^\circ C} =$           | $U =$         | $I_N =$                           |      | $P_{20^\circ C} =$           | $U =$         | $I_N =$                           |
| 08   | 29                           | 24            | 1,14                              | 20   | 110                          | 24            | 4,30                              |
|      |                              | 103           | 0,30                              |      |                              | 103           | 1,05                              |
|      |                              | 180           | 0,16                              |      |                              | 180           | 0,59                              |
|      |                              | 205           | 0,14                              |      |                              | 205           | 0,59                              |
| 10   | 40                           | 24            | 1,67                              | 23   | 101                          | 24            | 4,00                              |
|      |                              | 103           | 0,39                              |      |                              | 103           | 0,94                              |
|      |                              | 180           | 0,22                              |      |                              | 180           | 0,58                              |
|      |                              | 205           | 0,20                              |      |                              | 205           | 0,53                              |
| 13   | 49                           | 24            | 1,78                              | 26   | 140                          | 24            | 5,70                              |
|      |                              | 103           | 0,56                              |      |                              | 103           | 1,40                              |
|      |                              | 180           | 0,26                              |      |                              | 180           | 0,78                              |
|      |                              | 205           | 0,23                              |      |                              | 205           | 0,68                              |
| 15   | 59                           | 24            | 2,67                              | 30   | 189                          | 24            | 7,27                              |
|      |                              | 103           | 0,55                              |      |                              | 103           | 1,11                              |
|      |                              | 180           | 0,33                              |      |                              | 180           | 1,16                              |
|      |                              | 205           | 0,28                              |      |                              | 205           | 0,89                              |
| 17   | 87                           | 24            | 3,69                              |      |                              |               |                                   |
|      |                              | 103           | 0,82                              |      |                              |               |                                   |
|      |                              | 180           | 0,46                              |      |                              |               |                                   |
|      |                              | 205           | 0,44                              |      |                              |               |                                   |

3.2.2.6 Switching times

| Size      | Nominal braking torque [Nm] | Separating time [ms] | Response delay [ms]          | Interlinking time [ms] | Response delay [ms]          | Interlinking time [ms] |
|-----------|-----------------------------|----------------------|------------------------------|------------------------|------------------------------|------------------------|
|           |                             |                      | <i>switched on D.C. side</i> |                        | <i>switched on A.C. side</i> |                        |
|           | $M_{bN} =$                  | $t_2 =$              | $t_{11DC} =$                 | $t_{1DC} =$            | $t_{11AC} =$                 | $t_{1AC} =$            |
| <b>08</b> | 7,5*                        | 60*                  | 12*                          | 32*                    | 40*                          | 70*                    |
|           | <b>5</b>                    | 35                   | 18                           | 38                     | 60                           | 90                     |
| <b>10</b> | 15*                         | 85*                  | 15*                          | 45*                    | 80*                          | 125*                   |
|           | <b>10</b>                   | 60                   | 20                           | 50                     | 100                          | 145                    |
| <b>13</b> | 30*                         | 125*                 | 20*                          | 60*                    | 140*                         | 200*                   |
|           | <b>20</b>                   | 85                   | 25                           | 65                     | 220                          | 280                    |
| <b>15</b> | 60*                         | 140*                 | 18*                          | 68*                    | 80*                          | 155*                   |
|           | <b>40</b>                   | 100                  | 20                           | 70                     | 150                          | 225                    |
| <b>17</b> | 90*                         | 190*                 | 18*                          | 78*                    | 120*                         | 210*                   |
|           | <b>60</b>                   | 120                  | 22                           | 82                     | 200                          | 290                    |
| <b>20</b> | 150*                        | 175*                 | 26*                          | 106*                   | 160*                         | 280*                   |
|           | <b>100</b>                  | 150                  | 35                           | 115                    | 300                          | 420                    |
| <b>23</b> | 225*                        | 290*                 | 40*                          | 140*                   | 250*                         | 400*                   |
|           | <b>150</b>                  | 270                  | 45                           | 145                    | 320                          | 570                    |
| <b>26</b> | 375*                        | 360*                 | 46*                          | 166*                   | 200*                         | 400*                   |
|           | <b>250</b>                  | 300                  | 58                           | 178                    | 400                          | 600                    |
| <b>30</b> | 600*                        | 450*                 | 50*                          | 180*                   | 250*                         | 600*                   |
|           | <b>400</b>                  | 400                  | 65                           | 195                    | 550                          | 900                    |

\* Holding brakes with emergency stop features

\*\* 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 ( $M_b \leq 0,1 \cdot M_{bN}$ )

- Over-excitation by fast acting rectifier results in approx. half the separating times -

$t_{1DC}$  = interlinking time = response time during braking with interruption by mechanical switches on DC side = time from switching off power to reaching a full braking torque ( $M_b \geq 0,9 \cdot M_{bN}$ )

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

$t_{11DC} / t_{11AC}$  = response delay = time from switching off the power to the increase of braking torque (included in the respective interlinking time)

- 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. There will be reduced interlinking times in case of a voltage reduction by way of a fast acting rectifier -

## 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

#### ➔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. In addition there must be a level connection and sealing surface in the area of the surrounding O-ring (in the magnet housing groove).

##### 4.1.2.2 Flange

- If the counter friction surface is 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. The brake is sealed against the flange by way of an O-ring (item 13) (analogous with the motor storage plate with brakes without a flange). **The flange itself will not contain any further sealing element and generally has to be sealed against its screw-down surface by the customer.**

#### ➔Attention!

**If the counter-friction surface does 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)

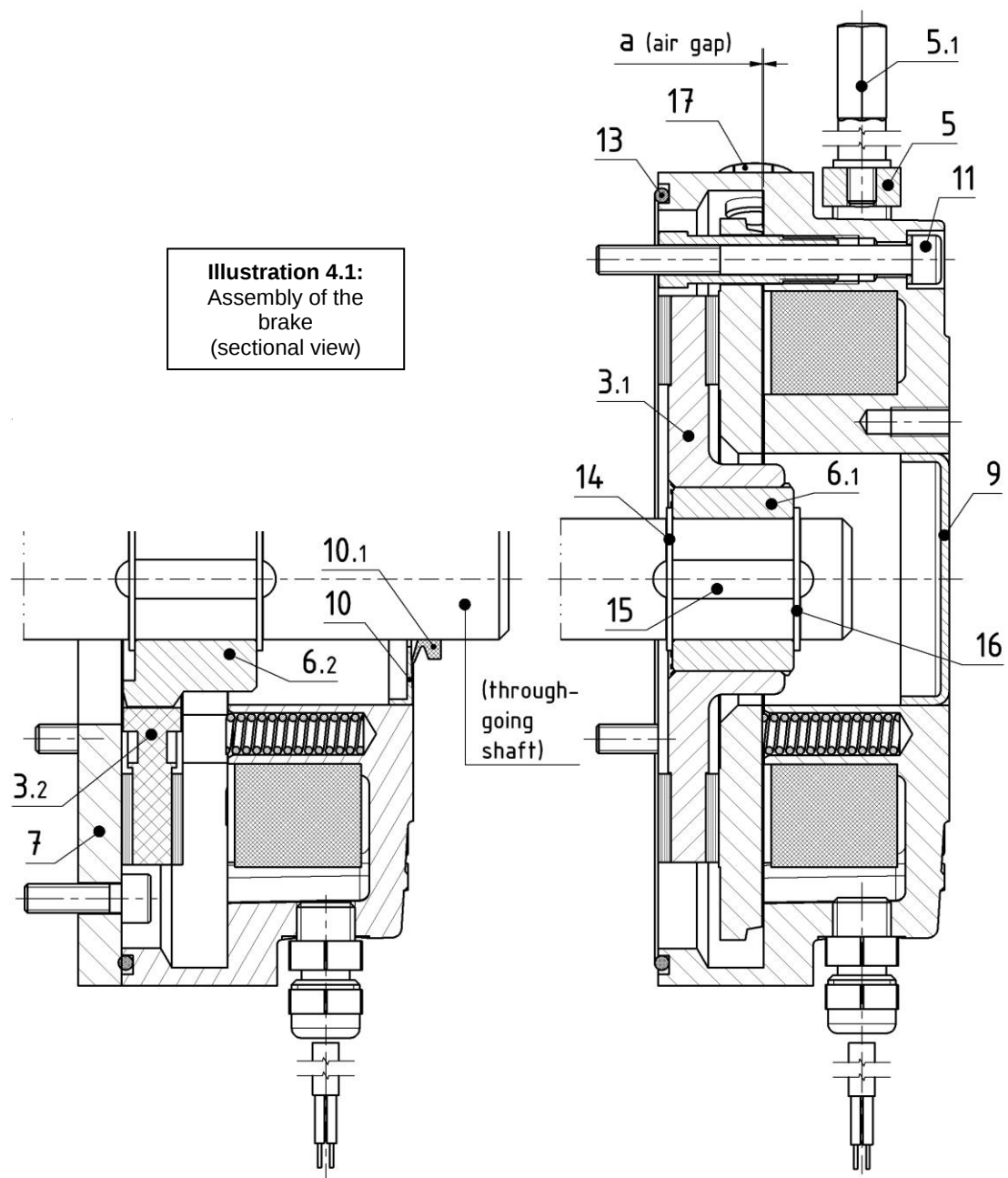
#### ➔Stop!

**Before actually mounting the rotor, its thickness has to be checked in accordance with 3.2.2.3.  $s_{\text{new}}$  is the value for a new rotor (tolerance = 0/-0.1 mm),  $s_{\text{min}}$  is the minimum permissible rotor thickness. When installing a new rotor,  $s = s_{\text{new}}$  must be guaranteed. In case of a reassembly (e.g. after a dismounting caused by maintenance work),  $s > s_{\text{min}}$  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 **6.1**) or the hexagon hub (item **6.2**) 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 rotor (item **3.1** or **3.2**) onto the hub with the rotor remaining axially displaceable

➔ **Attention!** Take care that the rotor/hub pair will remain smooth-running!



#### 4.1.4 Brake (illustration 4.1)

The brake is attached at the motor (if necessary by way of flange bores) and may be supplemented by additional component parts:

- Position the brake on the rotor, insert and screw down the fastening screws **with Cu washers** (item **11**) until the magnet housing rests on the counter-friction surface.
- Tighten the fastening screws with the **tightening torque according to 3.2.2.2**
- 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 (*only with brakes with manual release = option H*)

#### ➔Attention!

**Only use the Cu washers under the fastening screws once for sealing and replace them by new ones with every repeated assembly!**

**Manual release (option H) will be mounted and sealed in our factory; no changes with regard to its adjustment must be made by the customer!**

#### 4.1.5 Sealing (illustration 4.1)

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

- In case of a non-continuous shaft the pre-mounted sealing cap (item **9**) will close the central opening of the brake and no further measures will be required to be taken.
- In case of a continuous shaft the pre-mounted SKF sealing rib (item **10**) will form the first part of the shaft sealing only. In any case, it will have to be completed by a V-ring (item **10.1**) to be mounted on the shaft.

### 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).

#### ➔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 of Braking Torque

A modification of the braking torque can be achieved by changing the number of springs according to **3.2.2.1**. 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).

## 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 to  $M_{bN}$ : refer to 3.2.2.1

#### 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** (growing because of the wear at the rotor's friction lining) will have to be checked according to the following arrangement (also refer to 5.1.3), unless a particular sensor has been installed to monitor the wear in the brake. For this purpose, temporarily remove the locking screw (item 17, illustration 4.1) in the control bore. In case of malfunctions proceed as indicated in 5.2.

#### Control intervals:

##### **Working brake:**

- + according to service life calculation
- + as per specification to be given by customer

##### **Holding brake:**

- + every two years at least
- + as per specification to be given by customer
- + provide for shorter intervals in case of frequent emergency stops

#### 5.1.3 Maintenance

##### 5.1.3.1 Replace the rotor

Adjusting the air gap in closed brake systems of the series FDW is impossible. As soon as the minimum rotor size  $s_{min}$  according to 3.2.2.3 has been reached, replace the rotor. 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.**

#### →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 to  $M_{bN}$ : refer to 3.2.2.1

## ➔ 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 be 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                                 |
|--------------------------------------|------------------------------------|----------------------------------------|
| <b>Brake does not release</b>        | Air gap too big                    | Replace rotor                          |
|                                      | Brake is not supplied with voltage | Electrical connection to be controlled |
|                                      | Voltage at the coil too low        | Supply voltage of to be controlled     |
|                                      | Armature disk mechanically blocked | Remove mechanical blocking             |
| <b>Brake releases with delay</b>     | Air gap too big                    | Replace rotor                          |
|                                      | Voltage at the coil too low        | Supply voltage of to be controlled     |
| <b>Brake is not activated</b>        | Voltage at the coil too high       | Supply voltage of to be controlled     |
|                                      | Armature disk mechanically blocked | Remove mechanical blocking             |
| <b>Brake is activated with delay</b> | Voltage at the coil too high       | Supply voltage of to be controlled     |

## 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**.

#### → Danger!

The disassembly of the brake will result in a suspension 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.

#### → Attention!

Before any re-assembly of a brake, check the fastening elements as to their unlimited functional capability and, if necessary, exchange them! In particular, the Cu washers underneath the screws have to be replaced since their sealing function will no longer be maintained when they are used repeatedly.

### 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

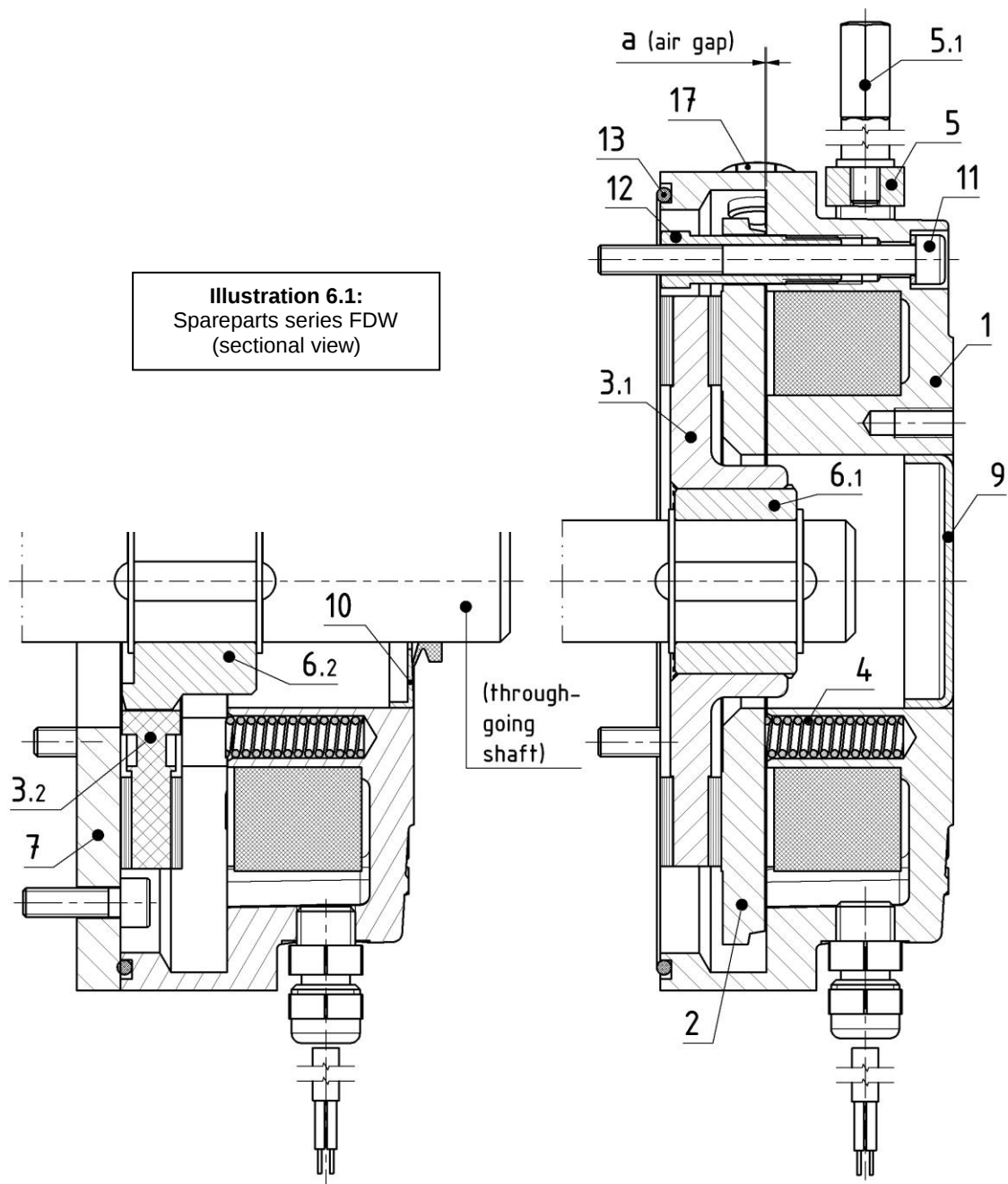
**Illustration 6.1** shows all the spare parts that you can order for the spring-pressure brakes of the FDW series indicated in the list below it.

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

#### → 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 2.2.3).

**Illustration 6.1:**  
Spareparts series FDW  
(sectional view)



| Item | Designation                   | Item | Designation                         |
|------|-------------------------------|------|-------------------------------------|
| 1    | Magnet part cpl.              | 6.2  | Hub for rotor 3.2                   |
| 2    | Armature plate                | 7    | Flange                              |
| 3.1  | Rotor cpl. (aluminium design) | 9    | Sealing cap                         |
| 3.2  | Rotor cpl. (plastic design)   | 10   | SKF sealing rib                     |
| 4    | Springs                       | 11   | Fastening screw including Cu washer |
| 5    | Manual release cpl.           | 12   | Hollow screws                       |
| 5.1  | Manual release lever          | 13   | O-ring (magnet housing)             |
| 6.1  | Hub for rotor 3.1             | 17   | Locking screw with O-ring           |

## AGENDA

*(nicht zum Ausdruck bestimmt)*

### Ausgabe

### Änderung

**11.2012**

**Erstellung Betriebs- und Montageanleitung**

**12.2013**

**Seite 14:** 3.2.2.3 Luftspalte, Rotorwerte

➔ **Korrektur  $S_{\min}$**  in der Tabelle (alle Werte)

➔ **Korrektur  $S_{\text{neu}}$**  in der Tabelle (nur Baugröße 08)

AGENDA