



## KENDRION INDUSTRIAL BRAKES

### EEX Line

Spring-applied single-disc brake

#### Operating Instructions EX..E..B00

|        |             |             |             |             |
|--------|-------------|-------------|-------------|-------------|
| Types: | EX 14E10B00 | EX 16E10B00 | EX 24E10B00 | EX 26E10B00 |
|        | EX 14E11B00 | EX 16E11B00 | EX 24E11B00 | EX 26E11B00 |
|        | EX 14E13B00 | EX 16E13B00 | EX 24E13B00 | EX 26E13B00 |
|        | EX 14E16B00 | EX 16E16B00 | EX 24E16B00 | EX 26E16B00 |
|        | EX 14E19B00 | EX 16E19B00 | EX 24E19B00 | EX 26E19B00 |
|        | EX 14E24B00 | EX 16E24B00 | EX 24E24B00 | EX 26E24B00 |

## Contents

|  |           |
|--|-----------|
| <b>1. General</b>  | <b>3</b>  |
| 1.1 Introduction   | 3         |
| 1.2 Standards and directives   | 3         |
| 1.3 Declaration of Incorporation (in accordance with Annex II, part 1, Section B of Machinery Directive 2006/42/EC)      | 4         |
| 1.4 Declaration of Conformity  | 5         |
| 1.4.1 ATEX Directive 2014/34/EU (equipment and protective systems intended for use in potentially explosive atmospheres) | 5         |
| 1.4.2 Directives 2014/35/EU (Low Voltage Directive) and 2011/65/EU (RoHS Directive)                                      | 6         |
| 1.5 Manufacturer's liability   | 7         |
| <b>2. Product description</b>  | <b>8</b>  |
| 2.1 Operating principle  | 8         |
| 2.2 Brake design   | 8         |
| <b>3. Installation</b>   | <b>11</b> |
| 3.1 Mechanical installation  | 11        |
| 3.2 Installation of the hand release (29) (brake types with hand release)  | 12        |
| 3.3 Electrical connection and operation  | 12        |
| 3.3.1 DC power supply  | 13        |
| 3.3.2 AC power supply  | 14        |
| 3.3.3 Microswitch (13) and thermoswitch (11 & 12) connection   | 16        |
| 3.4 Electromagnetic compatibility  | 17        |
| 3.5 Set-up & start-up  | 19        |
| 3.6 M <sub>2</sub> rated torque adjustments  | 21        |
| <b>4. Maintenance</b>  | <b>22</b> |
| 4.1 Checks and service   | 22        |
| 4.2 Spare parts and accessories  | 25        |
| <b>5. Condition at delivery</b>  | <b>25</b> |
| <b>6. Emissions</b>  | <b>26</b> |
| 6.1 Noise  | 26        |
| 6.2 Heat   | 26        |
| <b>7. Troubleshooting</b>  | <b>27</b> |
| <b>8. Safety</b>   | <b>28</b> |
| 8.1 Intended use   | 28        |
| 8.2 General safety information   | 28        |
| 8.2.1 Set-up   | 29        |
| 8.2.2 Set-up & start-up  | 29        |
| 8.2.3 Installation   | 29        |
| 8.2.4 Operation  | 29        |
| 8.2.5 Maintenance, repair and replacement  | 30        |
| 8.3 Warning symbols  | 30        |
| <b>9. Definitions</b>  | <b>31</b> |
| <b>10. Technical specifications</b>  | <b>33</b> |
| <b>11. Product versions (types)</b>  | <b>36</b> |
| <b>12. Product number / type number / version number</b>   | <b>36</b> |
| <b>13. Specialist repair shops</b>   | <b>36</b> |
| <b>14. Revision history</b>  | <b>36</b> |

### Document information:

Issued by: Kendrion (Villingen) GmbH

Replaces document: -

Document type: translation of original German operating instructions BA EX ..E..B00

Document title: BA EX ..E..B00 Englisch

Last updated: 13/03/2020

Replaces the issue dated: -

Document status: released

## 1. General

### 1.1 Introduction

These operating instructions describe the operating principle and features of the spring-applied brake types EX ..E..B00. The safety information provided in this manual must be strictly observed during the set-up of the machine (e.g. motor) and during the start-up, operation and maintenance of the spring-applied brake.

Should any queries arise with respect to torques, torque variations, installation position, wear, wear reserve, switching work, break-in conditions, release range, ambient conditions and the like, please contact Kendrion (Villingen) and ask for clarification before starting to use the brake. Spring-applied brakes are not ready-to-use devices, but are intended to be incorporated into or assembled with other equipment. Consequently, these brakes will be referred to as **components** in the following sections.

### 1.2 Standards and directives

The state-of-the-art brakes have been designed, built and tested in accordance with the requirements of DIN VDE 0580 concerning electromagnetic devices and components.

The brakes are intended for use in dust and potentially explosive atmospheres. Brake versions protected to IP56 are only designed for use in potentially explosive atmospheres. The brakes are suitable for ambient temperatures between -20°C and +40°C. They are approved to the ATEX Directive (2014/34/EU).

**Approvals:** dust & explosion protection II



EX de IIC T5...T2, Class I, Zone 1, AEx de IIC T5...T2  
Class I, Division 2, Groups C,D  
Class II, Division 1, Groups E, F and G  
Class III  
DIP A21 T<sub>A</sub>=100°C  
Enclosure Type 4, IP66

Being classified as "electromagnetic components", spring-applied brakes are also subject to the Low Voltage Directive 2014/35/EU. The user is required to employ suitable switching devices and controls to ensure use of the brakes in accordance with EMC Directive 2014/30/EU.

The devices are allowed to be marked with the CSA label with the notes "C" and "US" for Canada and US or with the note "US" only for US and without any note only for Canada.

**1.3 Declaration of Incorporation  
(in accordance with Annex II, part 1, Section B of Machinery Directive 2006/42/EC)**

We hereby declare that the products below comply with the essential health and safety requirements specified in Annex I of Machinery Directive 2006/42/EC:

Annex I General Principles and Sections 1.1.2, 1.1.3, 1.1.5, 1.3.2, 1.5.1

The partly completed machinery must not be put into service until the final machinery into which it is to be incorporated has been declared in conformity with the provisions of Machinery Directive 2006/42/EC. The relevant technical documentation required for the partly completed machinery has been compiled in accordance with Annex VII, part B of Machinery Directive 2006/42/EC. The manufacturer undertakes to submit an electronic copy of the relevant technical documentation compiled for the partly completed machinery if reasonably requested by national authorities.

**Manufacturer:** Kendrion (Villingen) GmbH  
Wilhelm-Binder-Str. 4-6  
78048 Villingen-Schwenningen  
Germany

**Person authorized to compile the documentation:** Dominik Hettich  
Kendrion (Villingen) GmbH  
Wilhelm-Binder-Str. 4-6  
78048 Villingen-Schwenningen  
Germany

**Applied harmonized standards and other technical standards and regulations:**

|                        |  |
|------------------------|--|
| EN 60529               | Enclosure protection ratings   |
| DIN VDE 0580           | Electromagnetic devices and components   |
| CAN/CSA-E 60079-0:2002 | Electrical apparatus for explosive gas atmospheres (general requirements)                              |
| CAN/CSA-E 60079-1:2002 | Electrical apparatus for explosive gas atmospheres (equipment protection by flameproof enclosures "d") |
| CAN/CSA-E 60079-7:2003 | Electrical apparatus for explosive gas atmospheres (increased safety "e")                              |
| CAN/CSA-E 61241-1:2002 | Electrical apparatus for use in the presence with combustible dust (general requirements)              |

**Original standards and requirements:**

|                                 |   |
|---------------------------------|---|
| ANSI/ISA-12.00.01: 2000         | Electrical apparatus for explosive gas atmospheres- General Requirements  |
| ANSI/ISA-12.22.01: 2002         | Electrical apparatus for explosive gas atmospheres- Construction and Verification test of flameproof enclosures of electrical apparatus |
| ANSI/ISA-12.16.01: 2002         | Electrical apparatus for explosive gas atmospheres Increased safety   |
| CAN/CSA-EN 60529                | Degrees of protection provided by enclosures (IP code)  |
| CAN/CSA-C22.2 No.25-1966        | Enclosures for Use in Class II Groups E, F and G Hazardous Locations  |
| CAN/CSA-C22.2 No.94-M91         | Special Purpose Enclosures  |
| CSA Std C22.2 No.30-M1986       | Explosion-Proof Enclosures for Use in Class I Hazardous Locations   |
| CSA Std C22.2 No.213            | Type of protection Non incendive  |
| CSA Std C22.2 No.0-M91          | General Requirements- Canadian Electrical Code Part II  |
| CSA B44.1 04/ASME A17.5-2004    | Safety Code for Elevators and Escalators  |
| UL 508 17 <sup>th</sup> edition | Industrial Control Equipment  |

**Product:** Electromagnetically released spring-applied single-disc brake

**Types:** EX 14E10B00 EX 16E10B00 EX 24E10B00 EX 26E10B00 EX 14E11B00  
EX 16E11B00 EX 24E11B00 EX 26E11B00 EX 14E13B00 EX 16E13B00  
EX 24E13B00 EX 26E13B00 EX 14E16B00 EX 16E16B00 EX 24E16B00  
EX 26E16B00 EX 14E19B00 EX 16E19B00 EX 24E19B00 EX 26E19B00  
EX 14E24B00 EX 16E24B00 EX 24E24B00 EX 26E24B00

Kendrion (Villingen) GmbH

Villingen  
13/03/2020

Authorized signatory: .....

  
Dominik Hettich  
(Head of Development)

## 1.4 Declaration of Conformity

### 1.4.1 ATEX Directive 2014/34/EU (equipment and protective systems intended for use in potentially explosive atmospheres)

We hereby declare that the products below, specifically the product versions brought into circulation, have been designed and built in accordance with the requirements of Directive 2014/34/EU (ATEX Directive). This declaration will cease to be valid if modifications are made to the product without prior permission from the manufacturer.

**Manufacturer:** Kendrion (Villingen) GmbH  
Wilhelm-Binder-Str. 4-6  
78048 Villingen-Schwenningen  
Germany

**Person authorized:** Dominik Hettich  
Kendrion (Villingen) GmbH  
Wilhelm-Binder-Str. 4-6  
78048 Villingen-Schwenningen  
Germany

### Applied harmonized standards and other technical standards and regulations:

|                        |  |
|------------------------|--|
| EN 60529               | Enclosure protection ratings   |
| DIN VDE 0580           | Electromagnetic devices and components   |
| CAN/CSA-E 60079-0:2002 | Electrical apparatus for explosive gas atmospheres (general requirements)                              |
| CAN/CSA-E 60079-1:2002 | Electrical apparatus for explosive gas atmospheres (equipment protection by flameproof enclosures "d") |
| CAN/CSA-E 60079-7:2003 | Electrical apparatus for explosive gas atmospheres (increased safety "e")                              |
| CAN/CSA-E 61241-1:2002 | Electrical apparatus for use in the presence with combustible dust (general requirements)              |

### Original standards and requirements:


|                           |   |
|---------------------------|---|
| ANSI/ISA-12.00.01: 2000   | Electrical apparatus for explosive gas atmospheres- General Requirements  |
| ANSI/ISA-12.22.01: 2002   | Electrical apparatus for explosive gas atmospheres- Construction and Verification test of flameproof enclosures of electrical apparatus |
| ANSI/ISA-12.16.01: 2002   | Electrical apparatus for explosive gas atmospheres Increased safety   |
| CAN/CSA-EN 60529          | Degrees of protection provided by enclosures (IP code)  |
| CAN/CSA-C22.2 No.25-1966  | Enclosures for Use in Class II Groups E, F and G Hazardous Locations  |
| CAN/CSA-C22.2 No.94-M91   | Special Purpose Enclosures  |
| CSA Std C22.2 No.30-M1986 | Explosion-Proof Enclosures for Use in Class I Hazardous Locations   |

|                                 |  |
|---------------------------------|--|
| CSA Std C22.2 No.213            | Type of protection Non incendive                       |
| CSA Std C22.2 No.0-M91          | General Requirements- Canadian Electrical Code Part II |
| CSA B44.1 04/ASME A17.5-2004    | Safety Code for Elevators and Escalators               |
| UL 508 17 <sup>th</sup> edition | Industrial Control Equipment                           |

**Product:** Electromagnetically released spring-applied single-disc brake

**Types:** EX 14E10B00 EX 16E10B00 EX 24E10B00 EX 26E10B00 EX 14E11B00  
 EX 16E11B00 EX 24E11B00 EX 26E11B00 EX 14E13B00 EX 16E13B00  
 EX 24E13B00 EX 26E13B00 EX 14E16B00 EX 16E16B00 EX 24E16B00  
 EX 26E16B00 EX 14E19B00 EX 16E19B00 EX 24E19B00 EX 26E19B00  
 EX 14E24B00 EX 16E24B00 EX 24E24B00 EX 26E24B00

|                                 |   |                                   |                     |
|---------------------------------|---|-----------------------------------|---------------------|
| <b>Certification authority:</b> | DEKRA Certification B.V.                        | <b>Type approval certificate:</b> | CSA08.2054312       |
|                                 | Utrechtweg 310<br>6812 AR Arnhem<br>Netherlands |                                   | <b>Certificate:</b> |

|                           |                         |                             |   |
|---------------------------|-------------------------|-----------------------------|---|
| Kendrion (Villingen) GmbH | Villingen<br>13/03/2020 | Authorized signatory: ..... | <br>Dominik Hettich<br>(Head of Development) |
|---------------------------|-------------------------|-----------------------------|---|

## 1.4.2 Directives 2014/35/EU (Low Voltage Directive) and 2011/65/EU (RoHS Directive)

We hereby declare that the products below, specifically the product versions brought into circulation, have been designed and built in accordance with the requirements of Directives 2014/35/EU (Low Voltage Directive) and 2011/65/EU (RoHS Directive). The products are classified as category 11 equipment subject to Directive 2011/65/EU (RoHS Directive). This declaration will cease to be valid if modifications are made to the product without prior permission from the manufacturer.

|                      |   |                           |  |
|----------------------|---|---------------------------|--|
| <b>Manufacturer:</b> | Kendrion (Villingen) GmbH<br>Wilhelm-Binder-Str. 4-6<br>78048 Villingen-Schwenningen<br>Germany | <b>Person authorized:</b> | Dominik Hettich<br>Kendrion (Villingen) GmbH<br>Wilhelm-Binder-Str. 4-6<br>78048 Villingen-Schwenningen<br>Germany |
|----------------------|---|---------------------------|--|

### Applied harmonized standards and other technical standards and regulations:

|                        |  |
|------------------------|--|
| EN 60529               | Enclosure protection ratings   |
| DIN VDE 0580           | Electromagnetic devices and components   |
| CAN/CSA-E 60079-0:2002 | Electrical apparatus for explosive gas atmospheres (general requirements)                              |
| CAN/CSA-E 60079-1:2002 | Electrical apparatus for explosive gas atmospheres (equipment protection by flameproof enclosures "d") |
| CAN/CSA-E 60079-7:2003 | Electrical apparatus for explosive gas atmospheres (increased safety "e")                              |
| CAN/CSA-E 61241-1:2002 | Electrical apparatus for use in the presence with combustible dust (general requirements)              |

## Original standards and requirements:

|                                 |   |
|---------------------------------|---|
| ANSI/ISA-12.00.01: 2000         | Electrical apparatus for explosive gas atmospheres- General Requirements  |
| ANSI/ISA-12.22.01: 2002         | Electrical apparatus for explosive gas atmospheres- Construction and Verification test of flameproof enclosures of electrical apparatus |
| ANSI/ISA-12.16.01: 2002         | Electrical apparatus for explosive gas atmospheres Increased safety   |
| CAN/CSA-EN 60529                | Degrees of protection provided by enclosures (IP code)  |
| CAN/CSA-C22.2 No.25-1966        | Enclosures for Use in Class II Groups E, F and G Hazardous Locations  |
| CAN/CSA-C22.2 No.94-M91         | Special Purpose Enclosures  |
| CSA Std C22.2 No.30-M1986       | Explosion-Proof Enclosures for Use in Class I Hazardous Locations   |
| CSA Std C22.2 No.213            | Type of protection Non incendive  |
| CSA Std C22.2 No.0-M91          | General Requirements- Canadian Electrical Code Part II  |
| CSA B44.1 04/ASME A17.5-2004    | Safety Code for Elevators and Escalators  |
| UL 508 17 <sup>th</sup> edition | Industrial Control Equipment  |

**Product:** Electromagnetically released spring-applied single-disc brake

**Types:** EX 14E10B00 EX 16E10B00 EX 24E10B00 EX 26E10B00 EX 14E11B00  
EX 16E11B00 EX 24E11B00 EX 26E11B00 EX 14E13B00 EX 16E13B00  
EX 24E13B00 EX 26E13B00 EX 14E16B00 EX 16E16B00 EX 24E16B00  
EX 26E16B00 EX 14E19B00 EX 16E19B00 EX 24E19B00 EX 26E19B00  
EX 14E24B00 EX 16E24B00 EX 24E24B00 EX 26E24B00

Kendrion (Villingen) GmbH

Villingen  
13/03/2020

Authorized signatory: .....

  
Dominik Hettich  
(Head of Development)

## 1.5 Manufacturer's liability

The manufacturer will not assume any responsibility for damage caused by failure to use the products in accordance with their intended use or by failure to observe safety information and other instructions provided in this manual. The information in this manual was correct and up-to-date before going to print. The information contained herein shall not entitle users to raise claims with respect to components purchased at an earlier date.

## 2. Product description

### 2.1 Operating principle

The spring-applied single-disc brake is designed to operate dry. The force generated by an electromagnetic field is utilized to overcome the braking effect produced by the spring force. The spring-applied single-disc brake engages in unpowered condition and releases when AC voltage is applied. The form-fit connection between the friction disc and hub and the connection of the hub with the machine shaft (e.g. motor shaft) ensure that the torque generated by the spring-applied single-disc brake (brake torque) is reliably transmitted to the machine (motor). Explosion-protected spring-applied single-disc brakes are characterized by the fact that all components that may ignite explosive mixtures are placed in an enclosure. This enclosure is designed to withstand the specified test pressure in case the mixture explodes inside the enclosure. It also ensures that mixtures outside the enclosure are not affected by the explosion.

### 2.2 Brake design

The solenoid housing (1.1) of the spring-applied single-disc brake accommodates the firmly fitted field coil (1.2) with flying leads. The flying leads are connected to the terminal block (19) inside the junction box (25). The flange (3) and friction plate (33) are screwed to the solenoid housing (1.1) by means of socket head cap screws (22). The solenoid housing (1.1) is pressure-sealed by a cover (7) that is attached with socket head cap screws (20). Owing to the spring force generated by the compression springs (4 & 35), the friction disc (5) is pressed over the armature (2) against the friction plate (33) and flange (3) to generate the braking effect of the spring-applied brake. The friction disc (5) and hub (17), which constitute the rotating part of the spring-applied brake, are connected with the shaft to be braked. The friction disc (5) features a square socket and can be moved on the hub (17) in axial direction. Spacer sleeves (6) are provided to adjust the air gap 's'. The customer-specific connecting cable can be introduced into the junction box (25) through a cable gland (30) (M20x1.5). When AC voltage is applied to the built-in bridge rectifier of the spring-applied single-disc brake, the force of the electromagnetic field thus generated counteracts the spring force. The armature (2) is released and the braking action is neutralized. The shaft to be braked is not exposed to any axial force by the brake. The spring-applied single-disc brake is equipped with a redundant thermoswitch system (2x2 thermoswitches) (11 & 12) and with a microswitch (13)<sup>1</sup>. The microswitch (13)<sup>1</sup> is provided to prevent machine (e.g. motor) start-up before the brake has been released. The four (2x2) thermoswitches (11 & 12) are connected in series with the microswitch (13)<sup>1</sup>. They interrupt the control circuit of the machine (e.g. motor) as soon as the maximum permitted brake temperature is exceeded. When using brakes with hand release (29)<sup>2</sup>, openings must be provided in the part enclosing the brake (e.g. fan cover) so that the hand release can be installed. The hand release (29)<sup>2</sup> allows the brake to be released manually (e.g. in case of power failure).

<sup>1</sup>) Brake types with microswitch.

<sup>2</sup>) Brake types with hand release.



| List of reference numerals in Fig. 10/1: |                           |      |                                |      |                       |
|--|---------------------------|------|--------------------------------|------|-----------------------|
| 1.1                                      | Solenoid housing          | 13.3 | Angle                          | 25   | Junction box          |
| 1.2                                      | Field coil                | 13.4 | Countersunk screw              | 26   | Cover                 |
| 2  | Armature                  | 13.5 | Plate                          | 27   | Socket head cap screw |
| 3  | Flange                    | 13.6 | Socket head cap screw          | 28   | Spring washer         |
| 4  | Compression spring        | 13.7 | Connecting cable (microswitch) | 29   | Hand release          |
| 5  | Friction disc             | 14   | Circlip (outer ring)           | 29.1 | Cam                   |
| 6  | Spacer sleeve             | 15   | Circlip (inner ring)           | 30   | Cable gland           |
| 7  | Cover                     | 16   | O-ring                         | 30.1 | Cap nut               |
| 8  | Mounting surface          | 17   | Hub                            | 30.2 | Connector sleeve      |
| 9  | Flat seal                 | 18   | Deep groove ball bearing       | 30.3 | Sealing ring          |
| 10                                       | Mounting screw            | 19   | Terminal block                 | 31   | Locknut               |
| 11                                       | Thermoswitch (2 switches) | 20   | Socket head cap screw          | 32   | Socket head cap screw |
| 12                                       | Thermoswitch (2 switches) | 21   | Spring washer                  | 33   | Friction plate        |
| 13                                       | Microswitch               | 22   | Socket head cap screw          | 34   | Rating plate          |
| 13.1                                     | Locknut                   | 23   | Spring washer                  | 35   | Compression spring    |
| 13.2                                     | Set screw                 | 24   | O-ring                         | 36   | Duct                  |

Table 9/1: List of reference numerals for spring-applied single-disc brake

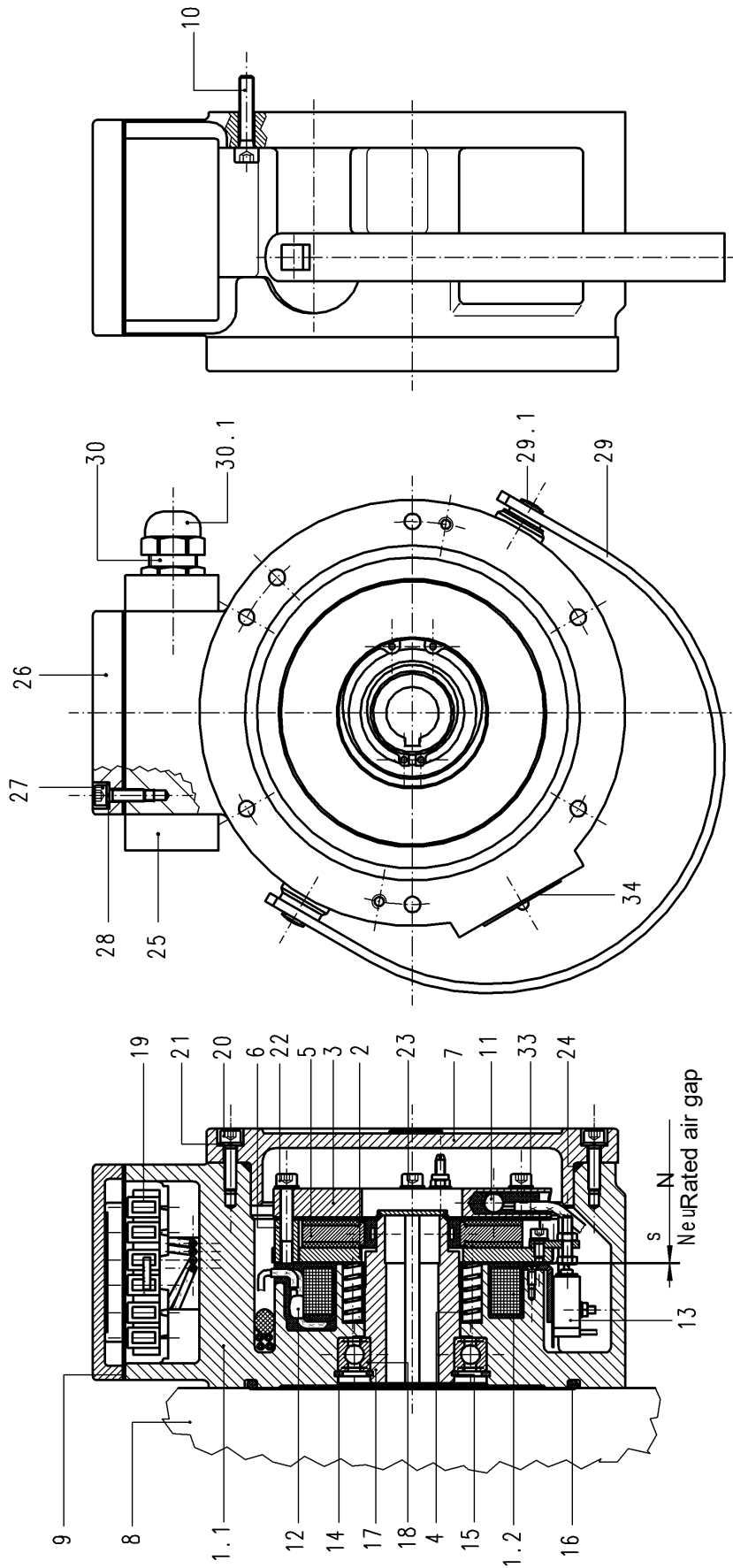
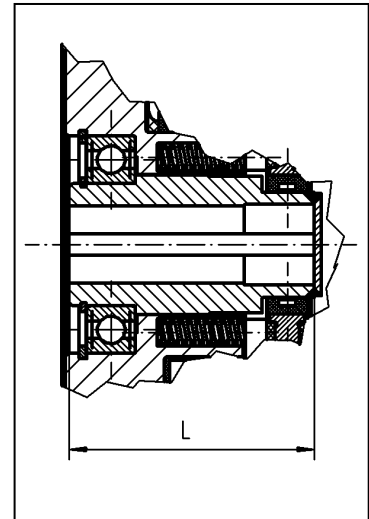


Fig. 10/1: Spring-applied single-disc brake EX 26E..B00

## 3. Installation

### 3.1 Mechanical installation

Slip the hub (17) of the spring-applied single-disc brake on a shaft (tolerance h6) provided with a feather key to DIN 6885, sheet 1. As the hub (17) is firmly fitted to the brake, it need not be axially secured on the machine shaft (e.g. motor shaft). Ensure that no radial forces act on the deep groove ball bearing (18) during installation and operation (vertical installation, if possible) and that the hub (17) is not exposed to any permanent axial force (e.g. exerted by shaft shoulder) after installation has been completed. The spring-applied brake is centred through the deep groove ball bearing (18) of the hub (17). Mounting screws (10) are provided to attach the spring-applied single-disc brake to the mounting surface (8) of the machine (e.g. motor). Before starting installation work, insert the O-ring (16) into the groove provided in the solenoid housing (1.1). Tighten the mounting screws (10) evenly in several steps and make sure not to exceed the specified tightening torque (see Table 11/1).



#### Note!

Ensure that the deep groove ball bearing (18) is not distorted during installation of the spring-applied single-disc brake and that the shaft rotates easily when the brake is released. Check that there are no grinding sounds.

|                     | Size |     |    |    |     |     |
|---------------------|------|-----|----|----|-----|-----|
|                     | 10   | 11  | 13 | 16 | 19  | 24  |
| L [mm]              | 70   | 70  | 90 | 90 | 100 | 100 |
| M <sub>A</sub> [Nm] | 9.7  | 9.7 | 24 | 24 | 45  | 45  |

Table 11/1: Hub (17) dimensions; tightening torques for mounting screws (10)

Check that the mounting surface (8) meets the following requirements before installing the brake:

- Axial runout relative to the shaft end to EN 50347 (measuring radius = hole circle)
- Material: steel, aluminium, cast iron – with excellent thermal conductivity
- Absence of oil and grease

Radial runout of the shaft end relative to the mounting surface (8) to EN 50347



#### Attention!

The specified axial runout of the mounting surface (8) relative to the shaft end and the specified radial runout of the shaft end must be strictly observed in order not to reduce the reliability and service life of the spring-applied single-disc brake. Before installing the brake, the shaft end must be slightly brushed with a high-temperature grease (e.g. Copaslip). This is essential to facilitate brake removal if maintenance work needs to be carried out at a later date.



#### Attention!

The M<sub>A</sub> tightening torque specified for the mounting screws (10) must be strictly observed. Tighten the mounting screws (10) evenly in several steps.

### 3.2 Installation of the hand release (29) (brake types with hand release)

Insert the hand release handle (29) into the square socket of the two cams (29.1) that are firmly fitted to the circumference of the solenoid housing (1.1). Ensure that the handle is correctly positioned. The mechanical release forces  $F$  and the maximum permitted release forces (actuation forces)  $F_{max}$  are specified in Table 12/1.



#### Note!

Machinery-specific regulations and requirements (e.g. for hoists, cranes and elevators) must be observed when using brakes with hand release (29). The hand release (29) must not be used to release (open) the brake during normal operation.



#### Caution!

The brake torque can be neutralized manually by means of the hand release (29). Consequently, the brake must be installed in such a way that any unintentional actuation of the hand release (29) is excluded and reliable brake operation is ensured.

|  | Size       |            |            |            |            |             |
|--|------------|------------|------------|------------|------------|-------------|
|  | 10         | 11         | 13         | 16         | 19         | 24          |
| Release force $F$ [N]                      | approx. 18 | approx. 35 | approx. 45 | approx. 90 | approx. 85 | approx. 170 |
| Max. permitted release force $F_{max}$ [N] | 50         | 50         | 125        | 125        | 240        | 240         |

Table 12/1: Release force  $F$ , max. permitted release force  $F_{max}$  of hand release (29)

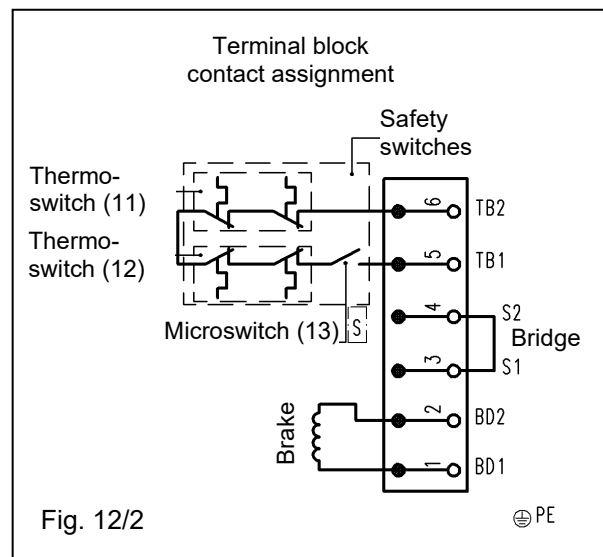
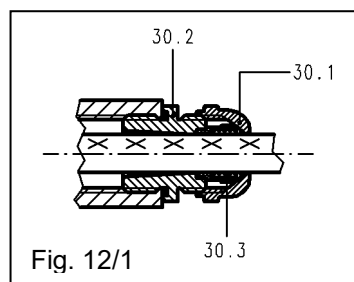


#### Warning!

Check that the mechanical hand release (29) is in a central position (see Fig. 10/1) when not in use. This is crucial to ensure reliable brake engagement. Otherwise, the full braking effect of the spring-applied single-disc brake may not be reached. In this case, the machine (e.g. motor) must be stopped immediately and must not be restarted until correct operation of the hand release (29) and automatic return of the release handle in its central position (see Fig. 10/1) has been ensured.

### 3.3 Electrical connection and operation

Connect the spring-applied brake to a DC power source via terminals 1 (BD1) and 2 (BD2) of the terminal block (19) (see Fig. 12/2). Connect the customer-specific connecting cable to the terminal block (19) by means of a cable gland (30) (M20x1.5). Remove the cover (26) of the junction box (25) so that the individual strands of the connecting cable can be connected to the terminal block (19). The connector sleeve (30.2) of the cable gland (30) is firmly screwed to the solenoid housing (1.1) when delivered (see Fig. 12/1,  $M_A = 12$  Nm). Tighten the cap nut (30.1) to a tightening torque of  $M_A = 12$  Nm to seal, clamp (clamping range 7...13 mm) and strain-relieve the customer-specific connecting cable. After completion of these steps, reinstall the cover (26) of the junction box (25).





### Attention!

When fixing the cover (26) to the junction box (25), the  $M_A$  tightening torques for the socket head cap screws specified in Table 17/1 must be strictly observed. The flat seal (9) and spring washer (28) must be installed as shown in Fig. 10/1.

The supply voltage can be rectified by means of a bridge rectifier or half-wave rectifier or by using a combination of the two rectifier types. Various rectifier types are available (see examples in Table 13/1) to allow the brake to be connected directly to an AC power source. Depending on the brake size and torque, voltage ripple due to intermittent power supply may cause brake humming or incorrect brake operation. Perfect brake operation must be ensured by the user or system manufacturer by providing suitable electrical controls.

| Rectifier series | Rectifier type                                   | Rated input voltage range<br>$U_1/VAC$ (40-60 Hz) | Output voltage<br>$U_2/VDC$             | Max. output current |                 |
|------------------|--|---|---|---------------------|-----------------|
|                  |  |   |   | R-load<br>I/ADC     | L-load<br>I/ADC |
| 32 07.22B.0      | half-wave  | 0-500 ( $\pm 10\%$ )                              | $U_1 \bullet 0.445$                     | 1.6                 | 2.0             |
| 32 07.23B.0      | bridge   | 0-400 ( $\pm 10\%$ )                              | $U_1 \bullet 0.890$                     | 1.6                 | 2.0             |
| 32 17350E..      | overexcitation<br>bridge $\Rightarrow$ half-wave | 48-525 ( $\pm 10\%$ )                             | $U_1 \bullet 0.890 / U_1 \bullet 0.445$ | 2.3                 | 3               |
| 32 17.2.B..      | overexcitation<br>bridge $\Rightarrow$ half-wave | 110-230 ( $\pm 10\%$ )<br>220-415 ( $\pm 10\%$ )  | $U_1 \bullet 0.890 / U_1 \bullet 0.445$ | 1.2<br>0.8          | 1.5<br>1.0      |

The relevant rectifier specification sheets must be observed!

Table 13/1: Recommended rectifiers for single-phase AC voltage supply

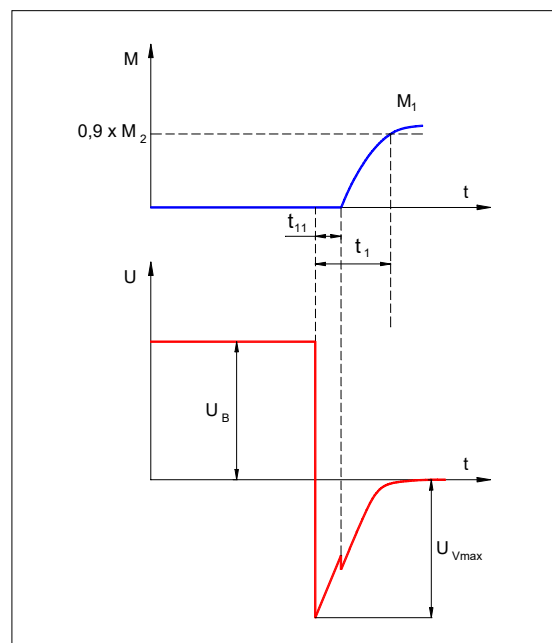
### 3.3.1 DC power supply

The figure to the right shows the voltage curve after the field coil (1.2) has been de-energized.



### Attention!

The peak voltage  $U_{Vmax}$  during disconnection without protective circuit may reach **several thousand volts** in the millisecond region. This may cause irreversible damage to the field coil (1.2), switching contacts and electronic components. Sparking will occur on the switch during disconnection. Consequently, a protective circuit must be provided to reduce the current during disconnection and to limit the voltage. If Kendrion rectifiers are used (see Table 13/1), the protective circuit required for the built-in electronic components and field coil (1.2) is included in the rectifier. This does not apply to the external contacts required for DC side switching as there would be no galvanic isolation of the external contact.



$U_B$  operating voltage (coil voltage)  
 $U_{Vmax}$  disconnection voltage



### Attention!

Sensitive electronic components (e.g. logical components) may also be damaged by the lower voltage.

### 3.3.2 AC power supply

Direct brake connection to an AC power source is only possible if a rectifier is used. Wiring of the brake in case of single-phase AC power supply must be performed in the same way as with three-phase voltage. The coupling times vary depending on the switching type (DC side switching or AC side switching).

#### Half-wave rectification:

In case of half-wave rectification, the  $U_2$  coil voltage is lower by factor 0.445 than the rectifier input voltage. Half-wave rectifiers produce voltage with high residual ripple which, depending on the brake size, may slightly reduce the switching times when compared to bridge rectifiers. Due to the shorter switching times and the lower coil voltage, half-wave rectifiers are generally preferred to bridge rectifiers. However, brake humming may occur when small size brakes are used.

#### Bridge rectification:

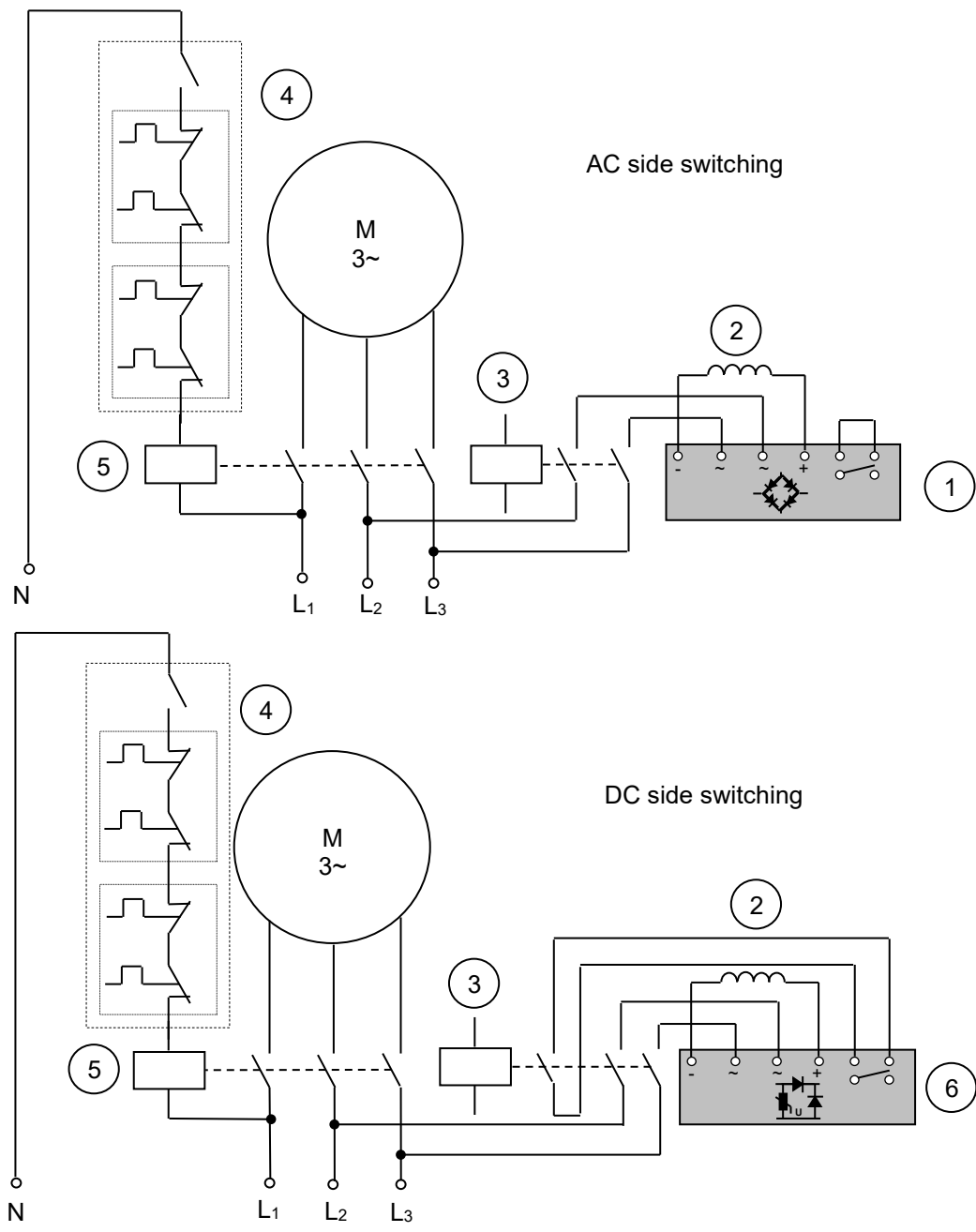
Bridge rectifiers provide voltage with minimum residual ripple. This means that brake humming can be avoided even if small size brakes are used. In case of bridge rectification, the  $U_2$  coil voltage is lower by factor 0.89 than the rectifier input voltage.

#### AC side switching:

In case of AC side switching, the switching contact for the spring-applied single-disc brake is provided on the AC voltage side directly before the bridge rectifier. It must be considered, however, that the bridge rectifier with its free-wheel diode may extend the coupling time significantly (by factor 5 or over) after AC voltage has been removed. The disconnection times remain unchanged.

#### DC side switching:

In case of DC side brake switching, an auxiliary contact is provided on the brake contactor, for example. This auxiliary contact is designed to interrupt the power supply on the DC side.



- |  |   |
|--|---|
| ① Half-wave or bridge rectifier          | ② Brake field coil (1.2)  |
| ③ Control relay for brake                | ④ Safety switches<br>(microswitch contacts – only brake types with microswitch (13) – and thermoswitches (11 & 12)) |
| ⑤ Control relay for machine (e.g. motor) | ⑥ Half-wave or bridge rectifier with DC side disconnection  |

Fig. 15/1: Suggested wiring of brake and safety switches (circuit diagram)

**Attention!**

To avoid damage (e.g. burns or fusing of contacts) to the external circuitry in case of DC side brake switching, additional protection elements (e.g. varistors, spark arresters, etc.) are necessary.

**Warning!**

Work on the brake must only be carried out by suitably qualified personnel. Make sure that no voltage is applied during brake connection. The specifications on the rating plate and the information provided in the circuit diagram in the terminal box or in the operating instructions must be strictly observed.

**Warning!**

The brake is a DC operated system. Permanent voltage variations on the power source of the electromagnetic brake must be limited to +/-10% of the rated voltage.

The following checks must be carried out when connecting the brake:

- Check that the connecting cables are suitable for the intended use and for the voltage and amperage of the brake.
- Check that the connecting cables are secured with screws, clamps or other suitable fixtures to avoid interruptions in the power supply.
- Check that the connecting cables are long enough for the intended use and that suitable torsion, strain and shear relief features as well as bending protections are provided.
- Check that the PE conductor (only for protection class I) is connected to the earthing point.
- Check that no foreign matter, dirt or humidity is trapped inside the terminal box.
- Check that unused cable entries and the terminal box are suitably sealed to ensure compliance with the protection class requirements to EN 60529.

### 3.3.3 Microswitch (13) and thermoswitch (11 & 12) connection

The four (2x2) thermoswitches (11 & 12) and the microswitch (13) provided to control the release status of the spring-applied single-disc brake are factory-connected in series. These safety switches (microswitch (13) and thermoswitches (11 & 12)) must be tied into the control circuit of the machine (e.g. motor) (see Fig. 15/1). This is necessary to ensure that the microswitch (13) prevents machine (e.g. motor) start-up before the brake has been released. The four (2x2) thermoswitches (11 & 12) connected in series with the microswitch (13) interrupt the control circuit of the machine (e.g. motor) as soon as the temperature measured at the individual measuring points of the thermoswitches (field coil (1.2) and flange (3)) exceeds the maximum permitted temperature. The cover (26) of the junction box (25) must be removed to allow the connecting cable of the safety switches (microswitch (13) and thermoswitches (11 & 12)) to be installed. The customer-specific connecting cable for the safety switches can be introduced into the junction box (25) of the spring-applied single-disc brake through the cable gland (30) (M20x1.5) provided (see Section 3.3). The cable strands must be connected to terminals 5 (TB1) and 6 (TB2) of the terminal block (19) (see Section 3.3). After completion of these steps, reinstall the cover (26) of the junction box (25).

**Attention!**

When fixing the cover (26) to the junction box (25), the  $M_A$  tightening torques for the socket head cap screws (27) specified in Table 17/1 must be strictly observed.



|   | Size |     |     |     |    |    |
|---|------|-----|-----|-----|----|----|
|   | 10   | 11  | 13  | 16  | 19 | 24 |
| M <sub>A</sub> tightening torque [Nm] for socket head cap screws (20) of cover (7)                    | 5.6  | 5.6 | 24  | 24  | 45 | 45 |
| M <sub>A</sub> tightening torque [Nm] for socket head cap screws (22) of flange (3)                   | 7.6  | 7.6 | 9.7 | 9.7 | 24 | 24 |
| M <sub>A</sub> tightening torque [Nm] for socket head cap screws (27) of junction box (25) cover (26) | 3    | 3   | 3   | 3   | 3  | 3  |

Table 17/1: Tightening torques for socket head cap screws



**Note!**

Machinery-specific regulations and requirements (e.g. for hoists, cranes and elevators) must be observed when using brakes with microswitches (13).



**Warning!**

The motor circuitry must be protected in such a way that no unintentional motor start-up can occur when the microswitch (13) contact closes.



**Note!**

The suggested brake wiring solution with microswitch (13) shown in Fig. 15/1 is based on the general recommendations for wiring electromagnetic components in electrical machinery (e.g. motors) without load torque impact. When the brake is used for applications during which a load torque is generated, the system user is responsible to ensure correct and safe wiring of the microswitch (13) and spring-applied single-disc brake.

### 3.4 Electromagnetic compatibility

As required by the German Electromagnetic Compatibility Act (EMVG), electromagnetic compatibility is essential to ensure immunity to external electromagnetic fields and conducted interference. Furthermore, the emission of electromagnetic fields and line-conducted interference during brake operation must be minimized. Since the brake features depend on the circuitry and operation, a declaration of conformity with the applicable EMC standard can only be furnished for the wiring type, but not for a specific brake. The spring-applied single-disc brakes in the EX..E..B00 series are designed for industrial applications to which the following EMC standards apply: Generic Immunity Standard EN 61000-6-2 and Generic Emission Standard EN 61000-6-3 / EN 61000-6-4. Other applications may be subject to different generic standards which must be considered by the manufacturer of the overall system. The requirements in terms of electromagnetic compatibility of devices and components are determined by basic standards derived from the generic standards. Brake wiring recommendations will be provided in the following sections to ensure compliance with the individual basic standards that are relevant for industrial brake use and other applications. Please refer to the specification sheets for additional information on electromagnetic compatibility, especially with respect to the recommended electronic rectifiers specified in Section 3.3.

#### Immunity according to EN 61000-4:

##### EN 61000-4-2 Electrostatic discharge:

The spring-applied single-disc brakes EX..E..B00 comply at least with severity level 3 without requiring additional measures. The recommended rectifiers specified in Section 3.3 conform to severity level 3 without additional measures.

##### EN 61000-4-3 Electromagnetic fields:

The brakes comply at least with severity level 3 without requiring additional measures. The recommended rectifiers conform to severity level 3 without additional measures.

### EN 61000-4-4 Fast transients (burst):

The brakes comply at least with severity level 3 without requiring additional measures. The recommended rectifiers conform to severity level 3. When using rectifiers of the 32 17.2.B.. series, which conform to severity level 3, a temporary slight voltage increase may occur which, however, will not interfere with the rectifier function.

### EN 61000-4-5 Surge:

The brakes comply at least with severity level 3 without requiring additional measures. The recommended rectifiers conform to severity level 3 without additional measures.

### EN 61000-4-9 Pulse magnetic fields, EN 61000-4-10 Damped oscillatory magnetic fields:

Since the operating magnetic fields of the electromagnetic brakes are stronger many times over than interference fields, the brake function will remain unaffected. The brakes comply at least with severity level 4. The recommended rectifiers conform at least to severity level 3.

### EN 61000-4-11 Voltage dips, short interruptions, and short supply voltage variations:

#### a) Voltage interruptions:

Brakes that comply with the requirements of DIN VDE 0580 are de-energized after the specified switching times at the latest. The switching time depends on the control and mains conditions (e.g. generator effect of running down motors). Voltage interruptions of shorter duration than the response delay specified by DIN VDE 0580 will not cause any malfunctions. The user must ensure that any consequential damage is avoided (e.g. motor start-up before the brake has been released caused by phase failure in the case of two-phase energized motors or by the slipping of an electromagnetically engaged system due to torque drop). The functional reliability of the electromagnetic brake and its electronic accessories remains unaffected if the aforementioned consequential damage is avoided.

#### b) Voltage dips and short supply voltage variations:

Electromagnetically released systems:

Voltage dips and supply voltage variations to below 60% of the rated voltage and lasting longer than the response delay specified by DIN VDE 0580 may cause the brake to be de-energized temporarily. Consequential damage as described under a) above must be avoided by the user by taking adequate precautions.

Electromagnetically engaged systems:

Voltage dips and supply voltage variations to below the minimum tolerance threshold will cause torque reductions. The user is required to take adequate precautions to avoid consequential damage.

### Radio interference suppression in accordance with EN 55011:

The brakes and the built-in electronic rectifier are classified as Group 1 equipment in accordance with EN 55011. As far as the emissions from this equipment are concerned, one distinguishes between field guided radiated interference and line-conducted interference.

#### a) Radiated interference:

When operated with DC voltage or rectified 50/60Hz AC voltage, all brakes comply with the limit values applicable to Class B equipment.

#### b) Conducted interference:

If the brakes are connected to a 50/60Hz AC power source, no additional interference suppression measures are required to ensure compliance with the limit values applicable to Class A equipment as the built-in rectifier is equipped with interference suppression components. Interference caused during switching operations of the electromagnetic component is generally attributable to the inductive load. Where necessary, assemblies designed to limit the disconnection voltage (e.g. anti-parallel diode) or voltage limiting components (e.g. varistors, suppressor diodes, resistance diodes and the like) can be installed.

However, such components will inevitably change the switching times of the brake and increase the generated noise level. The built-in rectifier is equipped with free-wheel diodes and/or varistors to limit the disconnection voltage.

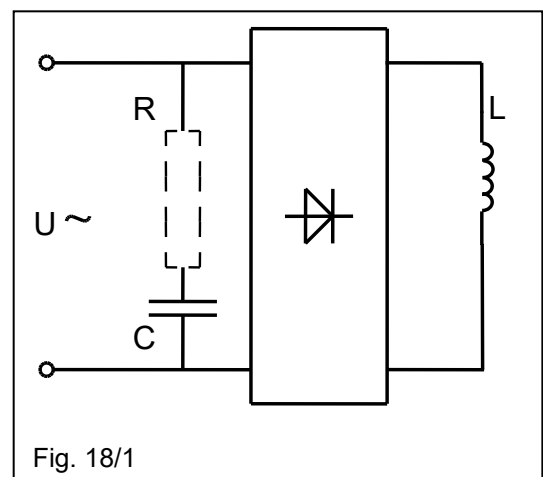


Fig. 18/1

If the brake is used in connection with other electronic accessories, the user is responsible to ensure compliance with EMC requirements. Compliance with applicable standards concerning the design and operation of components, sub-assemblies or equipment employed shall not relieve the user and manufacturer of the overall system from their obligation to furnish proof of conformity of the overall system with such standards.

| Rectifier series                        | Rated input voltage range<br>U <sub>1</sub> /VAC (40-60Hz) | DC at L-load<br>(ADC)  | Capacitor<br>nF (VAC)  |
|---|--|------------------------|--|
| Half-wave rectifier<br>32 07.22B.0      | up to 500 (+10%)   | up to 2.0              | no additional<br>interference suppression<br>measures required |
| Bridge rectifier<br>32 07.23B.0         | up to 400 (+10%)   | up to 2.0              | no additional<br>interference suppression<br>measures required |
| Overexcitation rectifier<br>32 17350E.. | 48 – 525   | up to 3                | no additional<br>interference suppression<br>measures required |
| Overexcitation rectifier<br>32 17.2.B.. | 110 – 230<br>220 – 415                                     | up to 1.5<br>up to 1.0 | no additional<br>interference suppression<br>measures required |

Table 19/1

| Input voltage<br>rectifier (VAC) | Recommended disconnection voltage for<br>DC side switching (V) |
|----------------------------------|--|
| 250                              | 700  |
| 440                              | 1200   |
| 550                              | 1500   |
| 630                              | 1700   |

Table 19/2

### 3.5 Set-up & start-up



#### Warning!

The functional check of the brake must not be performed unless the machine (e.g. motor) has been switched off and secured against accidental or unintentional start-up.

The following checks must be carried out:

Check compliance with the specifications provided on the rating plate with respect to the mounting position and protection class. Provided that the mounting surface (mounting side) (8) for the spring-applied single-disc brake is closed, no further measures need to be taken to ensure compliance with the required protection class. If the mounting surface (mounting side) (8) is open, adequate sealing must be provided in accordance with the installation procedure E76 00A0030 000 recommended by Kendrion. This can also be accomplished by using a sealing device available from Kendrion. In this case, the maximum possible protection rating is IP 56. After connection of the brake, a functional test must be performed to check that the friction disc (5) runs smoothly. For this purpose, turn the shaft while the brake is energized and the machine (e.g. motor) is unpowered. After completion of mounting, all necessary covers and guards must be installed.

Specifications on rating plate (order-specific, example brake type EX 26E11B00):

|   |  |  |
|---|--|--|
| <p>The rating plate contains the following information:</p> <ul style="list-style-type: none"> <li>Type: EX 26E11B00</li> <li>Var. 0002</li> <li>Index: a</li> <li>230 V, 40-60 Hz, 0,27 A, 20 Nm</li> <li>Serial-No: E12345-1/151.01</li> <li>P<sub>max</sub>: 270 kJ/h</li> <li>CE Identification: Ex de IIC T5...T2, Class I, Zone 1, AEx de IIC T5...T2, Class I, Division 2, Groups C,D; Class II, Division 1, Groups E, F and G; Class III, DIP A21, T<sub>a</sub> = 100°C, IP66</li> <li>CSA08 20154312, CSA B44.1/ASME A17.5</li> <li>Enclosure Type 4, Test 27.01.2015 Gr</li> <li>WARNING: DO NOT OPEN UNDER VOLTAGE! PRUDENCE: N' OUVRIEZ PAS SOUS VOLTAGE!</li> </ul> |  | <p>Certification codes:<br/>(to NEC 505, NEC 500, IEC)</p> <p>Ex de IIC T5 flameproof enclosure; increased safety; group II equipment; classification C (gas and vapour atmospheres); temperature class T5</p> <p>Class I, Zone 1 gase or vapours atmosphere; occasional explosion hazard</p> <p>Class I, Division 2 gase or vapours atmosphere; occasional explosion hazard for short periods</p> <p>Class II, Division 1 combustible dust; Zone 21 und 22</p> <p>Class III ignitable fibers</p> <p>IP66 T100°C IP 67 protection; max. surface temperature 100°C</p> <p>A21 Degree of protection in areas with combustible dust (protection by housing) according to method A for zone 21</p> <p>CSA08... Test center, year of approval Approval number</p> |
| <p>Zone 1: occasional explosion hazard</p> <p>Zone 2: occasional explosion hazard for short periods</p> <p>Zone 21: occasional explosion hazard caused by combustible dust in normal operation</p> <p>Zone 22: explosion hazard caused by combustible dust unlikely to occur in normal operation; if it does only for short periods</p>   | <p>Note: The product number of the spring-applied single-disc brake consists of the type number followed by the version number, e.g. EX 26E11B00-0001.</p> |  |



**Warning!**

Before starting the machine (e.g. motor) test run without driven components, the feather key (if used) must be secured in such a way that it cannot be hurled out. The shaft must not be exposed to load torques. Before the machine is re-started, the brake must be de-energized.



**Caution!**

The brake surface temperature may reach up to 100°C. Heat-sensitive parts such as conventional cables or electronic components must not be fixed to or be in contact with these surfaces. If necessary, suitable protections and hand guards must be installed to avoid accidental contact with hot surfaces! If the shaft needs to be turned during set-up operations while the machine (e.g. motor) is switched off, the brake must be released electromagnetically or by means of the hand release (29).



## Attention!

High-voltage tests performed during brake installation within an overall system or during start-up must be carried out in such a way that damage to the built-in electronic accessories is avoided. The limits for high-voltage tests and follow-up tests specified by DIN VDE 0580 must be observed.

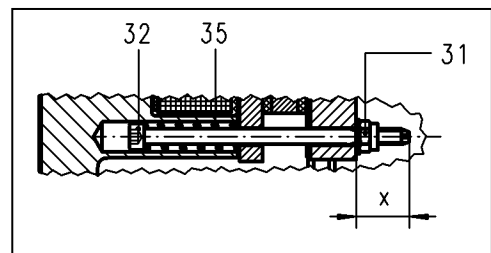


## Attention!

Check that the brake has been connected in accordance with the specifications provided on the rating plate before it is put into operation. Even short-term operation outside the specified supply voltage limits may cause irreversible damage to the brake or electronic accessories. Such damage may not be apparent immediately. DC side brake switching without protective circuit as described in Section 3.4 will cause damage to electronic rectifiers, electronic accessories, switching contacts and to the field coil (1.2).

### 3.6 M<sub>2</sub> rated torque adjustments

The brakes are factory-adjusted to the M<sub>2</sub> rated torque (as specified in the purchase order). The factory-adjusted M<sub>2</sub> rated torque is specified on the rating plate (33) of the brake. In case fine adjustment is required, the M<sub>2</sub> rated torque can be continuously reduced. However, increasing the M<sub>2</sub> rated torque is not allowed. In order to adjust the torque, proceed as follows: Loosen the socket head cap screws (20) provided on the cover (7) and remove the cover (7). Screw in the socket head cap screw (32) clockwise by means of a screwdriver, making sure to secure the nut (31) in such a way that it cannot turn. Fine adjustment must be carried out by tightening the socket head cap screws (32) evenly in several steps. Check that the requirements in terms of the minimum length of projection  $x_{min}$  (see Table 21/1) of the socket head cap screw (32) from the flange (3) are met. The change in the M<sub>2</sub> rated torque resulting from these adjustments is specified in Table 21/1. The factory-set nominal value (approximate value) of the length of projection  $x_{nom}$  (see Table 21/1) is marked on the flange.



|                      | Size |      |      |     |     |    |
|----------------------|------|------|------|-----|-----|----|
|                      | 10   | 11   | 13   | 16  | 19  | 24 |
| $\Delta M_2/mm$ [Nm] | 0.5  | 0.65 | 4    | 7.5 | 7.5 | 10 |
| $x_{nom}$ [mm]       | 10.5 | 10.5 | 11.5 | 11  | 11  | 11 |
| $x_{min}$ [mm]       | 7.5  | 7.5  | 9    | 9   | 9   | 9  |

Table 21/1: Change in the M<sub>2</sub> rated torque from 1 mm axial adjustment of the socket head cap screw (32); minimum permitted projection  $x_{min}$



## Warning!

Any adjustment of the rated torque must be performed by the manufacturer or by authorized specialist personnel.

## 4. Maintenance

### 4.1 Checks and service

The spring-applied single-disc brake does not require any particular maintenance except that the friction disc (5) must be replaced when worn (see "Technical specifications" for information on the maximum air gap  $s_{max}$ ) and that the safety switches (microswitch (13)<sup>3)</sup> and thermostats (11 & 12) need to be checked. These service and maintenance measures must be performed during the general inspection of the electric machine (e.g. motor). Make sure that the spring-applied brake is unpowered and that the explosion protection is not interfered with when carrying out service and maintenance work. When opening the flameproof enclosed solenoid housing (1.1) to replace the friction disc (5), for example, the safety information provided in this manual must be strictly observed. Always check that the flameproof gaps are in perfect condition. Do not use spare parts other than original spares supplied by the manufacturer of the spring-applied brake.



#### Caution!

Before you perform repair work on components which form flameproof gaps, consult the brake manufacturer for information on the gap dimensions. This is crucial because the dimensions of the flameproof gaps of the brake described in this manual may have to be longer and the gap widths may have to be narrower than those specified in Table 2 (3) of EN 60079-1:2014.



#### Warning!

In case the explosion protection features of the spring-applied brake are damaged during maintenance or repair work, the brake must be checked by an authorized expert before it can be reused. Any measures required to restore explosion protection must be performed by the manufacturer or by authorized specialist repair shops (see Section 13).

#### Brake removal from the machine (e.g. motor):

Loosen the socket head cap screws (27) provided on the cover (26) of the junction box (25) and remove the cover (26). Disconnect the strands of the connecting cables (field coil (1.2) and safety switches) from the terminal block (19). Unscrew the cap nut (30.1) of the cable gland (30) and remove the connecting cables from the junction box (25). Loosen the mounting screws (10). Remove the brake from the shaft with the two pull-off threads provided on the solenoid housing (1.1) and by means of socket head cap screws (e.g. in accordance with ISO 4762).

#### Checking the air gap 's':

Loosen the socket head cap screws (20) provided on the cover (7) and remove the cover (7). Place a measuring bridge with dial gauge on the flange (3) to measure the air gap 's'. Position the measuring tip of the micrometer screw on the friction disc (5).

Release the spring-applied brake so that the air gap 's' can be determined from the difference between the values indicated by the dial gauge.



#### Attention!

Temporary electric release of the spring-applied brake is required to allow the air gap 's' to be measured. For information on the electrical connection of the brake to the power source, please refer to Section 3.3.

#### Friction disc (5) replacement:

Remove the self-locking nut (31) from the socket head cap screws (32). Loosen the socket head cap screws (22) provided on the flange (3) and remove the flange (3). Remove the friction disc (5) from the hub (17) and replace it by a new one.

<sup>3)</sup> Brake types with microswitch.



## Attention!

Ensure that the connections of the four thermostiches (11 & 12) are not damaged or loosened when removing the flange (3).

### Deep groove ball bearing (18):

When performing maintenance and repair work, check that the deep groove ball bearing (18) rotates smoothly. If the bearing (18) needs to be replaced, follow the instructions on how to remove the brake from the machine (e.g. motor) and on how to open the solenoid housing (1.1). After having removed the friction disc (5), remove the circlips (14 & 15). Push the hub (17) and deep groove ball bearing (18) out of the solenoid housing (1.1) and remove the bearing (18) from the hub (17). Before reassembling the spring-applied brake, all components (except for the friction disc (5)) must be cleaned with grease-free cleaners. In order to assemble the individual components, proceed in reverse order of removal. When fine adjusting the  $M_2$  rated torque, make sure that the socket head cap screws (32) project from the flange (3) by the length  $x_{nom}$  (approximate value - see Table 21/1). The self-locking nuts (31) (to ISO 10511-04-A2F; 140°C) must be replaced before adjusting the screws.



## Attention!

When the spring-applied single-disc brake is mounted to the machine, it is crucial that the mounting screws (10) be tightened applying the  $M_A$  tightening torque specified in Table 11/1. The socket head cap screws (20) on the cover (7) and the socket head cap screws (22) must be tightened to the  $M_A$  torque specified in Table 17/1. The O-ring (24), spring washer (21 & 28) and flat seal (9) must be installed as shown in Fig. 10/1.



## Attention!

Depending on its operating condition, it may no longer be possible to release the spring-applied single-disc brake when the maximum air gap  $s_{max}$  (see Table 33/1) has been exceeded. In this case, the braking action cannot be neutralized.



## Warning!

If a hand release (29) is fitted to the brake and the maximum air gap  $s_{max}$  (see Table 33/1) has been exceeded (especially in case of a reduced  $M_2$  rated torque), the hand release (29) may limit the axial movement of the armature (2). This would cause the torque to be reduced down to zero. Whenever carrying out service and maintenance work, check the degree of wear of the friction disc (5) and the air gap 's' and replace the friction disc well before the maximum air gap  $s_{max}$  (see Table 33/1) is reached.

## Microswitch (13) adjustment or replacement (relevant only for brake types equipped with microswitch):

The spring-applied single-disc brake must be released electrically before the microswitch (13) can be adjusted. Loosen the socket head cap screws (20) provided on the cover (7) and remove the cover (7). Unscrew the locknut (13.1) and turn the set screw (13.2) clockwise until the microswitch (13) switches (slight audible click or contact closure between contacts 5 and 6 (see Section 3.3). If the microswitch (13) is in the ON position, it must be turned anticlockwise into the OFF position. After the changeover position has been reached, continue to turn the set screw (13.2) by 60° to 90°. Tighten the locknut (13.1). Make sure the set screw (13.2) position remains unchanged when tightening the locknut. Switch the brake on and off to check that the microswitch is in perfect working order. If the microswitch (13) needs to be replaced (e.g. when the maximum service life (switching operations) has been reached) (see Table 33/1), the replacement must be carried out by the manufacturer or by an authorized repair shop due to the complexity of the microswitch assembly with the four thermostwitches (11 & 12).

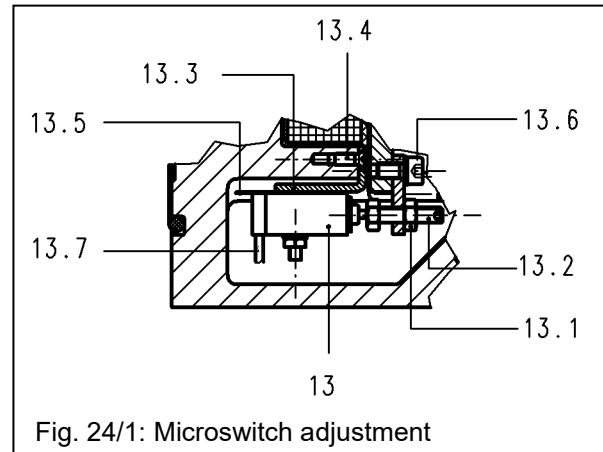


Fig. 24/1: Microswitch adjustment

## Thermostwitch replacement (11 & 12)

The thermostwitches (11 & 12) must be replaced when the maximum service life (switching operations) has been reached. Replacement must be carried out by the manufacturer or by an authorized repair shop due to the complex installation of the thermostwitches with the microswitch (13)<sup>4</sup>. The thermostwitches (11 & 12) will only interrupt the control circuit of the machine (e.g. motor) if the maximum permitted operating temperatures (see Table 33/1) on the measuring points of the thermostwitches (11 & 12) are exceeded. Under normal conditions, the thermostwitches (11 & 12) remain closed during the entire operation of the spring-applied single-disc brake.



### **Attention!**

The socket head cap screws (20) on the cover (7) must be tightened to the  $M_A$  torque specified in Table 17/1. The O-ring (24) and spring washer (21) must be installed as shown in Fig. 10/1.

## Information on flameproof gaps without thread and flameproof thread gaps

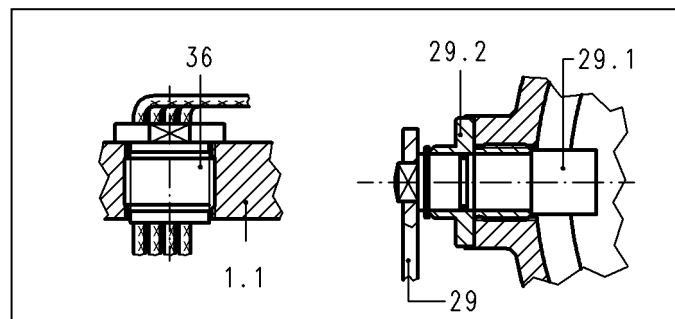
All flameproof gaps are factory-specified. The gap dimensions and surface specifications ( $R_a < 6.3\mu\text{m}$ ) must be maintained. If gap surfaces are found to be damaged or if gap dimensions are different from those specified, it is crucial that original spare parts are used when performing repair work or replacing individual components. Repair work must be carried out by the manufacturer or by authorized specialists!

### Flameproof gaps without thread:

hub (17) / solenoid housing (1.1)  
cover (7) / solenoid housing (1.1)  
cam (29.1) / sleeve (29.2)

### Flameproof thread gaps:

sleeve (29.2) / solenoid housing (1.1)  
duct (36) / solenoid housing (1.1)



<sup>4</sup>) Brake types with microswitch.





## Caution!

Whenever inspection and maintenance work is carried out, ensure that

- the machine (e.g. motor) is secured against accidental or unintentional start-up.
- no load torque acts on the shaft.
- the lock provided to prevent accidental start-up of the machine (e.g. motor) is removed after completion of inspection and maintenance work.
- all friction surfaces are free from grease and oil. An oily or greasy friction disc (5) cannot be cleaned.
- no swelling or glazing of the friction lining has occurred.

## 4.2 Spare parts and accessories

| Size | Designation, order number                     |                    |                  |                          |
|------|---|--------------------|------------------|--------------------------|
|      | Friction disc (5)<br>S                        | Flat seal (9)<br>S | O-ring (16)<br>S | Mounting screw (10)<br>A |
| 10   | 73 24111E00400                                | 76 24E11B00044     | 602633           | 304046                   |
| 11   | 73 24111E00400                                | 76 24E11B00044     | 602633           | 304046                   |
| 13   | 73 24116E00400                                | 76 24E11B00044     | 602635           | 304071                   |
| 16   | 73 24116E00400                                | 76 24E11B00044     | 602635           | 304071                   |
| 19   | 76 14124E00400 / 76 24124E05400 <sup>5)</sup> | 76 24E11B00044     | 602637           | 304107                   |
| 24   | 76 14124E00400 / 76 24124E05400 <sup>5)</sup> | 76 24E11B00044     | 602637           | 304107                   |

Table 25/1: Spare parts (S) and accessories (A)



## Warning!

Maintenance and repair work and adjustments must be performed by the manufacturer or by authorized repair shops only (see Section 13)!

## 5. Condition at delivery

Upon receipt of the shipment, the brake must be checked for transit damage before storage. Ordered accessories (mounting screws) are delivered together with the brake. The spring-applied single-disc brake is delivered ready for mounting with factory-adjusted air gap 's'. The M<sub>2</sub> rated torque is factory-adjusted.



## Note!

If the brake is not installed immediately upon delivery, it must be stored in a dry, dust-free and vibration-proof place.

<sup>5)</sup> Friction disc with special friction material for increased switching work W.



**Note!**

The environmental conditions specified in Table 26/1 and in EN IEC 60721-3-2 / EN IEC 60721-3-1 must be considered during transport and storage of the brake, especially when long-term storage is envisaged.

|                                     | Environmental conditions                   |  |
|-------------------------------------|--|--|
|                                     | Conditions for storage to EN IEC 60721-3-1 | Conditions for transport to EN IEC 60721-3-2 |
| Mechanical environmental conditions | 1M11                                       | 2M4  |
| Climatic environmental conditions   | 1K21 and 1Z2                               | 2K12   |
| Biological environmental conditions | 1B1  | 2B1  |
| Mechanically active substances      | 1S11                                       | 2S5  |
| Chemically active substances        | 1C1  | 2C1  |

Table 26/1: Environmental conditions for storage and transport as specified in EN IEC 60721-3-1 and EN IEC 60721-3-2

## 6. Emissions

### 6.1 Noise

The spring-applied single-disc brake produces switching noise during engagement and release. The noise level is determined by the installation conditions, circuitry (e.g. with overexcitation) and air gap. Depending on the mounting position, operating conditions and state of the friction surfaces, audible vibrations (squealing) may be produced during braking.

### 6.2 Heat

Braking operations and gradual heating of the field coil cause the solenoid housing temperature to increase substantially. Under adverse conditions, the surface temperature may reach up to 100°C.



**Caution!**

Risk of burns in case of contact with hot surfaces! Suitable covers and hand guards must be installed to provide protection against accidental contact.

## 7. Troubleshooting

| Fault                                 | Cause  | Corrective actions  |
|---------------------------------------|--|---|
| Brake release failure                 | • Air gap too large  | Check the air gap. Install a new friction disc, if necessary.                             |
|                                       | • No voltage applied to brake  | Check the electrical connection and correct faults, if found.                             |
|                                       | • Voltage applied to field coil too low  | Check the field coil supply voltage and correct faults, if found.                         |
|                                       | • Armature plate blocked mechanically  | Eliminate mechanical blocks.  |
|                                       | • Damaged rectifier  | Check the rectifier and replace it, if necessary.   |
|                                       | • Damaged field coil   | Check the resistance of the field coil. Install a new brake, if necessary.                |
|                                       | • Friction disc thermally overloaded   | Install a new friction disc or a new brake, if necessary.                                 |
| Delayed brake release                 | • Air gap too large  | Check the air gap. Install a new friction disc, if necessary.                             |
|                                       | • Voltage applied to field coil too low  | Check the field coil supply voltage and correct faults, if found.                         |
| Brake engagement failure              | • Voltage applied to field coil in unpowered condition too high (residual voltage) | Check whether residual voltage is applied to the field coil and correct faults, if found. |
|                                       | • Armature plate blocked mechanically  | Eliminate mechanical blocks.  |
| Delayed brake engagement              | • Voltage applied to field coil too high   | Check the field coil supply voltage and correct faults, if found.                         |
| Machine (e.g. motor) start-up failure | • Microswitch adjustment error (only brake types with microswitch)                 | Check the microswitch switching behaviour and adjust the switch, if necessary.            |
|                                       | • Damaged microswitch (only brake types with microswitch)                          | Check the microswitch and replace it, if necessary.                                       |
| Brake torque too low                  | • Air gap too large  | Check the air gap. Install a new friction disc, if necessary.                             |
|                                       | • Axial armature movement blocked by hand release feature                          | Check the air gap. Install a new friction disc, if necessary.                             |
|                                       | • Oily or greasy friction surfaces   | Air gap too large   |
|                                       | • Broken compression spring  | Check the spring force. Install a new brake, if necessary.                                |

Table 27/1: Possible faults, causes and corrective actions (list not exhaustive)

## 8. Safety

The brakes described in these operating instructions have been designed and built on the basis of an analysis of hazards and in accordance with the requirements of the applicable harmonized standards and technical specifications. They correspond to the state of the art and provide maximum safety. However, safety hazards can only be avoided if the user of the equipment takes adequate precautions and makes sure that safety instructions are strictly adhered to. It is the duty of the machine owner to plan these measures and to check their implementation.

The machine owner is required to ensure that:

- the brakes are only used in accordance with their intended use (see Section 2 Product description).
- the brakes are in perfect working order and checked at regular intervals.
- a complete and fully legible copy of these operating instructions is kept available at the place of use of the brakes at all times.
- start-up, maintenance and repair work is only done by authorized and suitably qualified personnel.
- such personnel are kept informed on all relevant occupational safety and environmental protection issues and familiar with these operating instructions and with the safety information contained herein.
- the brakes are not exposed to other strong magnetic fields.

### 8.1 Intended use

The brakes described in these operating instructions are intended to be mounted to electric machinery, especially electric motors, for use on industrial plant and, more specifically, in potentially explosive atmospheres. The brakes must be used in accordance with the operating requirements detailed in this manual. The rated power limits specified herein must not be exceeded.

### 8.2 General safety information

Brakes fitted to motors feature hazardous live components and rotating parts and may exhibit hot surfaces. Any work associated with the transport, connection, start-up and periodical maintenance of the brakes must be carried out by authorized and suitably qualified specialist personnel in accordance with EN 50110-1, EN 50110-2, IEC 60364-1. Failure to observe safety, operating and maintenance instructions may cause serious personal injury and severe damage to the equipment. Whenever special measures are required in accordance with the instructions contained herein, such measures should be agreed with the brake manufacturer before the machinery into which the brake is to be incorporated is set up. Should any queries arise with respect to torques, torque variations, installation positions, wear, wear reserve, switching work, break-in conditions, release range, ambient conditions and the like, please contact Kendrion and ask for clarification before using the brake. Retrofitting or modification work to be carried out on the brake is subject to the approval from Kendrion (Villingen). Accident prevention regulations applying to the specific field of application of the brake must be strictly observed. The brakes described in this manual are **not designed for use as "safety brakes"**. This means that torque reductions caused by factors beyond the user's control cannot be excluded.

### 8.2.1 Set-up

Requirements in terms of the permitted number of switching operations per hour and the maximum switching work per switching operation (see Fig. 35/1) specified in the technical specifications must be strictly observed during the set-up of machines and plant (inching mode). Failure to observe these instructions may irreversibly diminish the braking effect and cause malfunctions. Normal operating conditions are those specified by DIN VDE 0580. The protection rating conforms to EN 60529. In case of deviations, special measures must be taken after prior consultation with the manufacturer. If vertical brake operation is envisaged, any special requirements must be agreed with the manufacturer. Bear in mind that the friction disc may freeze if ambient temperatures fall below  $-5^{\circ}\text{C}$  or if the brake remains unpowered for prolonged periods of time. In this case, special precautions must be taken after consultation with the manufacturer.

### 8.2.2 Set-up & start-up

The brakes must not be put into operation when:

- power supply cables/wires or connections are damaged.
- the solenoid housing or coil sheath is damaged.
- other defects are suspected.

### 8.2.3 Installation

The voltage level and voltage type specified on the rating plate must be strictly observed when connecting the brakes described in these operating instructions. Sufficient heat dissipation must be ensured when the brake is fitted to or incorporated into other equipment. Adequate precautions must be taken to avoid overvoltage during disconnection or voltage peaks. The magnetic field of the products may cause interference outside the brake or even feedback to the brake in case of adverse installation conditions. Should you have queries concerning mounting and fitting conditions, please contact the brake manufacturer and ask for clarification.

Adequate safety measures (DIN 31000; DIN VDE 0100-420) must be taken by the brake user to avoid hazards to persons and animals or damage to equipment caused by:

- direct or indirect effects of electromagnetic fields,
- heated components,
- mobile parts.

### 8.2.4 Operation

Ensure that live components such as plug contacts or the field coil are not exposed to water. The brake cable connections must not be crushed, squeezed or exposed to mechanical loads. Make absolutely sure that the friction surfaces of the friction elements are not contaminated with grease, oil or other fluids to avoid substantial torque reduction. Bear in mind that the original torque cannot be restored even if the friction surfaces are cleaned after contact with fluids. The gradual brake wear and the resulting torque reduction of spring-applied brakes must be taken into consideration during set-up of the machine/equipment. Due to the diverse ambient conditions in which the brakes may be used, always check that the brake is in perfect working order before start-up. Torque reductions cannot be excluded if the brake is used for applications where only minimum friction work is required. In such cases, the user should ensure that the brake occasionally performs sufficient friction work. Operation of the brake as pure holding brake without friction work is only allowed after prior consultation with the manufacturer. If brakes equipped with hand release are used, the handle of the hand release must only be moved up to the release position in order to avoid deformation or breaks.



**Notice!**

During brake operation, ensure that the coil temperature does not rise above the permissible limit temperature applicable to the insulating materials of the specified insulation class (see Table 33/1). Fast cooling of the field coil with scavenging air is not allowed. Ensure that the permissible relative humidity range (see Table 34/2) is not exceeded.



**Note!**

The maximum air gap  $s_{max}$  (see Table 33/1) must not be exceeded throughout the entire brake service life. (Please refer to Section 4 Maintenance for details.)

## 8.2.5 Maintenance, repair and replacement

Brake service, maintenance, repair or replacement must only be carried out by qualified specialist personnel in accordance with EN 50110-1, EN 50110-2, IEC 60364-1. Failure to perform repairs according to requirements may cause serious personal injury or equipment damage. Make sure that no voltage is applied to the brakes when carrying out maintenance work.



**Danger!**

The warning "DO NOT OPEN WHILE ENERGIZED" affixed to the spring-applied single-disc brake must be strictly observed.

## 8.3 Warning symbols

| Personal injury or equipment damage |                             |   |   |
|-------------------------------------|-----------------------------|---|---|
| Symbol / Term                       | Warns against...            |   | Potential risks and hazards             |
|                                     | Danger                      | imminent personal injury                  | fatal accidents or serious injury       |
|                                     | Warning                     | potential risk of serious personal injury | fatal accidents or serious injury       |
|                                     | Caution                     | potential risk of personal injury         | minor injury                            |
|                                     | Attention!                  | potential risk of equipment damage        | damage to components or other equipment |
| Information                         |                             |   |   |
| Symbol / Term                       | Provides information on ... |   |   |
|                                     | Note                        | the safe use and operation of the product |   |

## 9. Definitions

(based on: DIN VDE 0580:2011-11, not exhaustive)

|  |   |
|--|---|
| <b>Switching torque <math>M_1</math></b>                       | torque acting on the shaft during brake or clutch slip  |
| <b>Rated torque <math>M_2</math></b>                           | switching torque specified by the manufacturer to identify the brake. The rated torque $M_2$ is the mean value of at least 3 measurements of the maximum switching torque $M_1$ after completion of the transient response.                   |
| <b>Transmissible torque <math>M_4</math></b>                   | highest torque that can be applied to the engaged brake or clutch without causing the brake/clutch to slip  |
| <b>Residual torque <math>M_5</math></b>                        | torque transmitted by the released brake or clutch  |
| <b>Load torque <math>M_6</math></b>                            | torque acting on the drive of the engaged brake or clutch; determined by the power requirement of the driven machine at a given speed   |
| <b>Switching work <math>W</math></b>                           | heat generated by friction inside the brake or clutch as a result of the switching operation  |
| <b>Maximum switching work <math>W_{max}</math></b>             | maximum switching work to which the brake or clutch may be exposed  |
| <b>Switching power <math>P</math></b>                          | switching work converted into heat per unit of time   |
| <b>Maximum switching power <math>P_{max}</math></b>            | maximum permitted switching work converted into heat per unit of time   |
| <b>Coil ON time <math>t_5</math></b>                           | time between power on and power off   |
| <b>Coil OFF time <math>t_6</math></b>                          | time between power off and power on   |
| <b>Total cycle time <math>t_7</math></b>                       | coil ON time plus coil OFF time   |
| <b>Duty cycle</b>  | percentage relationship of coil ON time to total cycle time   |
| <b>Switching operation</b>                                     | one complete switching on and off operation   |
| <b>Switching frequency <math>Z</math></b>                      | number of regular switching operations per hour   |
| <b>Response delay during coupling <math>t_{11}</math></b>      | time between power off (releasing systems) or power on (engaging systems) and beginning of torque increase  |
| <b>Rise time <math>t_{12}</math></b>                           | time it takes to reach 90% of the $M_2$ rated torque from the beginning of the torque increase  |
| <b>Coupling time <math>t_1</math></b>                          | response delay $t_{11}$ plus rise time $t_{12}$   |
| <b>Response delay during disconnection <math>t_{21}</math></b> | time between power on (releasing systems) or power off (engaging systems) and beginning of torque decrease  |
| <b>Fall time <math>t_{22}</math></b>                           | time it takes for the torque from the beginning of the torque decrease to fall to 10% of the $M_2$ rated torque   |
| <b>Disconnection time <math>t_2</math></b>                     | response delay $t_{21}$ plus fall time $t_{22}$   |
| <b>Slip time <math>t_3</math></b>                              | time from the beginning of the torque increase up to the end of the braking process (brakes) or until the synchronization torque $M_3$ has been reached (clutches)  |
| <b>Making time <math>t_4</math></b>                            | response delay $t_{11}$ plus slip time $t_3$ (braking or acceleration time)   |
| <b>Operating condition at operating temperature</b>            | condition at which the steady-state temperature is reached. The operating temperature corresponds to the overtemperature according to DIN VDE 0580 plus the ambient temperature. Unless otherwise specified, the ambient temperature is 35°C. |

|   |  |
|---|--|
| <b>Overtemperature <math>\Delta\vartheta_{31}</math></b>        | difference between the temperature of the electromagnetic device or a part thereof and the ambient temperature   |
| <b>Limit temperatures of coil insulating materials</b>          | in accordance with DIN VDE 0580. The individual insulating materials are classified by insulation classes to DIN IEC 60085.  |
| <b>Rated voltage <math>U_N</math></b>                           | supply voltage specified by the manufacturer for voltage windings to identify the device or component  |
| <b>Rated current <math>I_B</math></b>                           | amperage determined by the manufacturer for the specified operating conditions. Unless otherwise specified, the rated current refers to the rated voltage, 20°C winding temperature and to the rated frequency for a given operating mode of voltage windings. |
| <b>Rated power <math>P_N</math></b>                             | power value to identify the device or component  |
| <b>Rated power at 20°C winding temperature <math>P_B</math></b> | determined from the rated current of voltage-controlled devices and components and the $R_{20}$ resistance at 20°C winding temperature   |



## 10. Technical specifications

Product built and tested to DIN VDE 0580

|  | Size  |                       |                       |                       |                       |                       |
|--|---|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
|  | 10  | 11                    | 13                    | 16                    | 19                    | 24                    |
| Rated torque $M_2$ [Nm]  | 10  | 20                    | 50                    | 100                   | 150                   | 270                   |
| Max. speed $n_{max}$ [rpm]   | 6000  | 6000                  | 3600                  | 3600                  | 3600                  | 3600                  |
| Max. switching power $P_{max}$ [kJ/h]                              | 270   | 270                   | 400                   | 400                   | 570                   | 570                   |
| Rated power $P_N$ [W]  | 56  | 56                    | 82                    | 82                    | 91                    | 91                    |
| Coupling time $t_1$ [ms]   | 80  | 70                    | 110                   | 90                    | 180                   | 140                   |
| Disconnection time $t_2$ [ms]                                      | 80  | 110                   | 170                   | 230                   | 240                   | 350                   |
| Moment of inertia $J$ – hub and friction disc [kgcm <sup>2</sup> ] | 2.5   | 2.5                   | 21.5                  | 21.5                  | 125                   | 125                   |
| Weight $m$ [kg]  | 14.5  | 14.5                  | 29                    | 29                    | 57                    | 57                    |
| Rated air gap $s_N$ [mm]   | 0.25 <sup>+0.15</sup>   | 0.25 <sup>+0.15</sup> | 0.25 <sup>+0.25</sup> | 0.25 <sup>+0.25</sup> | 0.25 <sup>+0.22</sup> | 0.25 <sup>+0.22</sup> |
| Max. air gap $s_{max}^{6)}$ [mm]                                   | 0.7   | 0.7                   | 0.9                   | 0.9                   | 1.1                   | 1.1                   |
| Standard rated voltage [VDC]                                       | 205   |                       |                       |                       |                       |                       |
| Temperature class  | T5 (to CAN/CSA-EN 60079-0)  |                       |                       |                       |                       |                       |
| Insulation class   | F   |                       |                       |                       |                       |                       |
| Pollution degree   | 2   |                       |                       |                       |                       |                       |
| Protection to EN 60529   | IP 66 (brakes with dust & explosion protection II)<br>IP 56 (brakes with explosion protection II) |                       |                       |                       |                       |                       |
| Brake type   | dynamic brake   |                       |                       |                       |                       |                       |
| Available rated torques $M_2$ [Nm]                                 | 7.5 – 10  | 12.5 – 20             | 25 – 50               | 58 – 100              | 113 – 150             | 160 – 270             |

Table 33/1: Technical specifications

| Technical specifications                 |                    |
|--|--------------------|
| Max. rated voltage [VAC]                 | 250                |
| Max. current load [A]                    | 2                  |
| Min. service life (switching operations) | 3000000            |
| Movement differential (nominal) [mm]     | 0,05               |
| Min. overtravel [mm]                     | 0,2                |
| Contact type                             | normally open (NO) |
| Temperature range [°C]                   | -20 bis +125       |

Table 33/2: Microswitch specifications (only brake types with microswitch)

<sup>6)</sup> Max. air gap  $s_{max}$  at 70% of rated current. Information on max. air gap  $s_{max}$  with reduced  $M_2$  rated torque to be requested from manufacturer.

|   | Size                           |     |     |     |     |     |
|---|--------------------------------|-----|-----|-----|-----|-----|
|   | 10                             | 11  | 13  | 16  | 19  | 24  |
| Max. rated voltage [VAC]  | 250                            |     |     |     |     |     |
| Rated current (cos φ=1.0) [A]   | 2.5                            |     |     |     |     |     |
| Rated current (cos φ=0.6) [A]   | 1.5                            |     |     |     |     |     |
| Service life (switching operations)   | 5000                           |     |     |     |     |     |
| Contact type  | normally closed (NC)           |     |     |     |     |     |
| Nominal temperature (switching temperature) thermoswitch 11 (flange (3)) [°C] | 140                            | 140 | 140 | 140 | 148 | 148 |
| Nominal temperature (switching temperature) thermoswitch 12 (coil (1.2)) [°C] | 118                            | 118 | 100 | 100 | 109 | 109 |
| Min. current [mA]   | 50                             |     |     |     |     |     |
| Switching temperature change as a function of the current load [K]            | -2.5 at 1.5 A<br>-8.0 at 2.5 A |     |     |     |     |     |

Table 34/1: Thermoswitch specifications

| Rated operating conditions                |   |
|---|---|
| Rated voltage tolerance                   | ±10%  |
| Frequency range                           | ±1% of rated frequency                      |
| Ambient temperature $\vartheta_{13}$ [°C] | -20 to +40 (to CAN/CSA-EN 60079-0)          |
| Relative humidity                         | 30% to 80% within ambient temperature range |
| Other climatic environmental conditions   | 3Z2 and 3Z4 to EN 60721-3-3                 |
| Mechanical environmental conditions       | 3M8 to EN 60721-3-3                         |
| Biological environmental conditions       | 3B1 to EN 60721-3-3                         |
| Mechanically active substances            | 3S2 to EN 60721-3-3                         |
| Chemically active substances              | 3C1 to EN 60721-3-3                         |
| Installation height                       | up to 2000 m a.m.s.l.                       |

Table 34/2: Rated operating conditions for spring-applied single-disc brake

Explanations on the technical specifications:

$W_{max}$  (maximum switching work) is the switching work that must not be exceeded during braking operations at max. 1500 rpm. Braking operations at speeds greater than 1500 rpm substantially reduce the maximum permitted switching work per switching operation. Such operation must be agreed with the manufacturer. The maximum switching power  $P_{max}$  is the switching work  $W$  that can be converted by the brake per hour. In case of applications where the number of switching operations per hour is  $Z > 1$ , Fig. 35/1 applies ( $W_{max}$  as a function of the number of switching operations per hour  $Z$ ). The  $P_{max}$  and  $W_{max}$  values are approximate values. They apply to applications where the brake is mounted between the B-face end shield of the motor and the motor fan or attached to the motor. The specified times apply to the following conditions: DC side (separate) brake switching, operating temperature, rated voltage, and rated air gap. All values are mean values that are subject to variation. In case of AC side brake switching, the coupling time  $t_1$  is substantially longer. The specified rated torques  $M_2$  characterize the torque level of the brakes. Depending on the application the brake is used for, the switching torque  $M_1$  and the transmissible torque  $M_4$  may differ from the specified  $M_2$  values. The switching torque  $M_1$  depends on the speed (rpm). If the friction surfaces are contaminated with oil or grease the transmissible torque  $M_4$  and the switching torque  $M_1$  may drop. The technical specifications apply after the break-in process has been completed (see Table 35/1). Vertical brake operation is only allowed after prior consultation with the manufacturer.

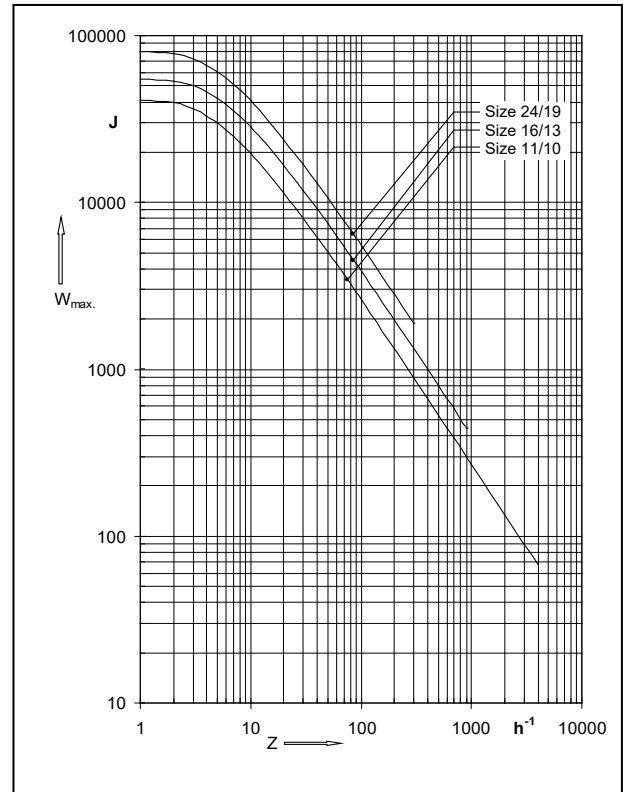


Fig. 35/1: Max. switching work  $W_{max}$  per switching operation as a function of the number of switching operations per hour  $Z$ ; (values based on  $n=1500$  rpm)

|                                   | Size      |           |           |           |           |           |
|-----------------------------------|-----------|-----------|-----------|-----------|-----------|-----------|
|                                   | 10        | 11        | 13        | 16        | 19        | 24        |
| Speed $n$ [rpm]                   | 300       | 300       | 150       | 150       | 100       | 100       |
| Coil ON time $t_5$ [s]            | 4.5       | 11        | 9         | 20        | 13        | 25        |
| Coil OFF time $t_6$ [s]           | 1.5       | 1.5       | 1.5       | 1.5       | 1.5       | 1.5       |
| Break-in period $t_{total}$ [min] | approx. 2 | approx. 2 | approx. 2 | approx. 2 | approx. 2 | approx. 2 |

Table 35/1: Break-in process parameters for the spring-applied single-disc brake

Note: A current level corresponding to 70% of the rated current is reached when the brake is operated at 90% of the rated voltage and at a coil temperature of 90°C.

The required operating conditions specified in Table 34/2 and the information provided in the **EEX LINE specification sheet** and offer drawing for the specific brake types must be observed during operation of the spring-applied single-disc brake!

**Specifications subject to change without notice!**

## 11. Product versions (types)

|           |             |   |
|-----------|-------------|---|
| Versions: | EX 14E..B00 | spring-applied single-disc brake without microswitch and without hand release |
|           | EX 16E..B00 | spring-applied single-disc brake without microswitch, with hand release       |
|           | EX 24E..B00 | spring-applied single-disc brake with microswitch, without hand release       |
|           | EX 26E..B00 | spring-applied single-disc brake with microswitch and hand release            |

Note: The "." wildcard stands for the size of the spring-applied single-disc brake.  
Available sizes are: 10, 11, 13, 16, 19, 24.

## 12. Product number / type number / version number

The product number to be quoted in purchase orders and required to identify the brake version consists of the type number followed by the 4-digit version number. Individual brake types may be available in different versions. So the version number identifies the relevant brake model.

### Example:

Type number: EX 26E11B00

Version number: 0001

Product number: EX 24E11B00-0001

## 13. Specialist repair shops

**Kendrion (Villingen) GmbH**  
Wilhelm-Binder-Straße 4-6  
78048 Villingen-Schwenningen  
Germany  
Tel: +49 (0)7721 877-1417

## 14. Revision history

| Date of issue | Changes    |
|---------------|------------|
| 13/03/2020    | New issue. |

# **KENDRION**

---

## **Kendrion (Villingen) GmbH**

---

Wilhelm-Binder-Straße 4-6  
78048 Villingen-Schwenningen  
Germany

Tel: +49 7721 877-1417  
Fax: +49 7721 877-1462

---

[sales-ids@kendrion.com](mailto:sales-ids@kendrion.com)  
[www.kendrion.com](http://www.kendrion.com)

**PRECISION. SAFETY. MOTION.**

