KENDRION
POWER TRANSMISSION

BINDER CLUTCHES & BRAKES

Operation Instructions 77 500..A..

Spring-Applied Single-Disc Brake Unit

Types: 77 50013A15
77 50019A15
77 50024A15
77 50029A15

MODULE LINE

Kendrion Binder Magnete GmbH
Power Transmission
Mönchweilerstraße 1
78048 Villingen-Schwenningen

POWER OF MAGNETISM AND PARTNERSHIP

Contents Page

Issued by: Kendrion Binder Magnete GmbH
Power Tansmission
Replaces the issue dated: 04.06.2003
Translation of original German operating instruction issue dated: 23.03.2005

01 General information

The brake unit is an electromagnetic component with integral electromagnetically released spring-applied single-disc brake designed to operate dry. The braking effect is produced by the spring force and neutralized electromagnetically for use of the brake as fail-safe holding brake with emergency stop function. If necessary, the brake can also be released by means of the additional hand release lever.

The brake should preferably be mounted to the A-face end shield of electric motors. The brake shaft of the brake unit is supported by suitable bearings.

Rating, mounting, operation and maintenance of the brake must be performed observing the operating instructions as well as the "General technical information and safety instructions" and the data sheet included in the appendix.

Applicable national, local and plant-specific regulations and requirements must be complied with when using the brake.

The technical details of custom-built brake models and variants (and their electrical connections) may differ from the data and information applicable to the standard model. Should you have any questions that go beyond the information provided in these operating instructions, please contact the manufacturer quoting the type designation and the brake number.

02 Design and mode of operation

The magnet housing (1.1) with the cast-in excitation winding (1.2) accommodates the armature (2), the friction disc (4) and the flange (3). The flange is fastened by means of the cheese head screws (10). The pressure springs (7) located in the magnet housing (1.1) are supported on one side by the studs (8) and/or (21) on the adjusting ring (9). These pressure springs generate an axial pressure that is applied to the friction disc (4) through the armature (2) and exerts counterpressure on the flange (3), thus producing the braking effect (torque).

When applying half-wave or bridge rectified voltage to the excitation winding (1.2) (DC voltage system), the electromagnetic force thus generated causes the armature (2) to be pulled towards the pressure springs (7). The friction disc (4) is thus released and the braking effect is neutralized.

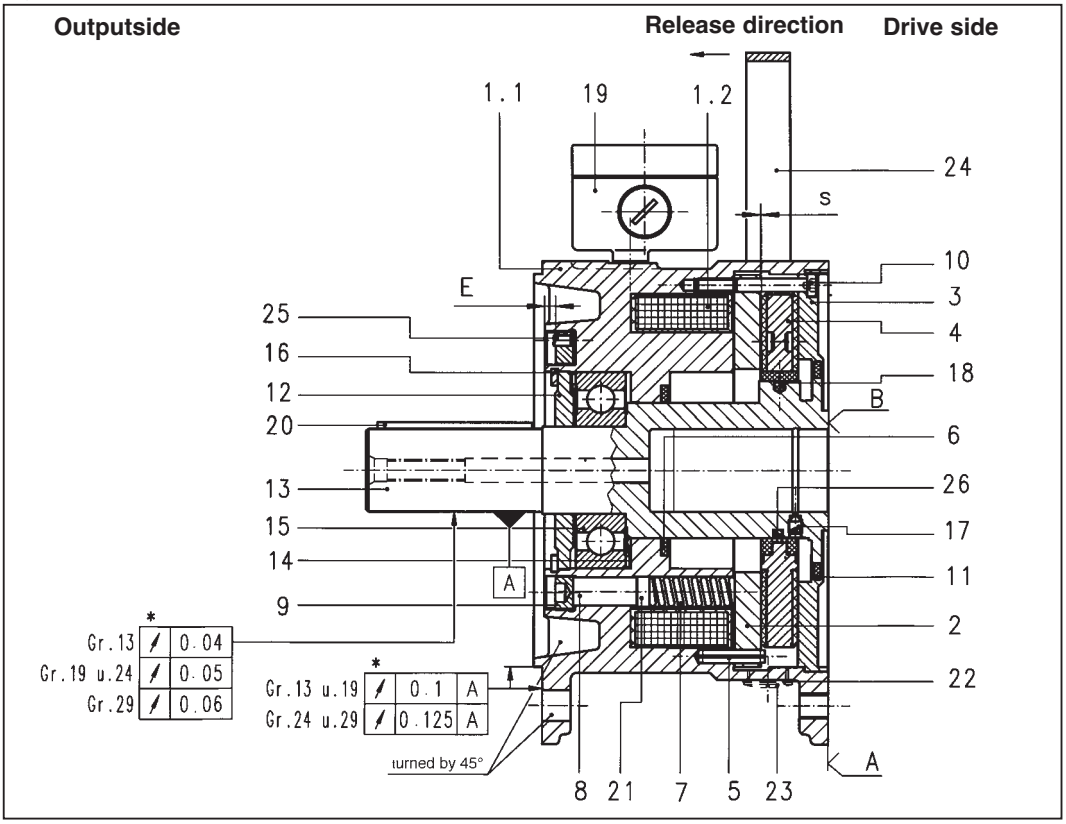
As the brake unit is a closed system, no forces are transmitted outwards away from the brake.

Transmission of the braking force from the axially moveable friction disc (4) to the brake shaft (13) is achieved through the form-fit connection of the square socket in the friction disc with the brake shaft (13), with the brake shaft being rigidly connected with the motor shaft. This applies to size 13, 19 and 24 brakes. In the case of size 29, the friction disc is connected with the brake shaft by means of the teeth provided on the disc and shaft.

The ball bearing (15) located between the magnet housing (1.1) and the brake shaft (13) ensures that the brake can be centred relative to the brake shaft and motor shaft when it is mounted to the motor flange. Additionally, the bearing also allows the output side of the brake shaft to be exposed to a radial load.

The ball bearing is provided with sealing rings on either side. The sealing ring (6) protects the friction disc against dirt or grease in case the ball bearing sealing rings are damaged. The sealing ring (11) prevents ingress of foreign matter and ensures that abrasive grit and dust produced by the friction disc cannot escape.

Fig. 1



1.1	Magnethousing	12	Disc	22	Sealingwasher
1.2	Excitationwinding	13	Brake shaft	23	Cover 2 x 180° (only if no handrelease lever is used)
2	Armature	14	Springwasher	24	Handrelease lever (accessories)
3	Flange		(on the left or right side of the bearing	25	Set screw (secured with Loctite type 243)
4	Friction disc		according to motorball bearing arrangement)	26	O-ring (only size 29)
5	Straightpin	15	Ball bearing	E =	Adjustingring clearance
6	Sealingring	16	Circlip	A =	Contactsurface motorside
7	Pressure spring	17	Screw plug (secured with Loctite type 243)	B =	Contactsurface brake shaft
8	Stud	18	Rubber bolt (only sizes 19+24; included in friction disc of size 13)	S =	Air gap (with energized brake
9	Adjustingring	19	Junction box		Mikroswitch: refer to section 07
10	Cheeseheadscrew	20	Featherkey		* Radial and axial runouttolerances measured according
11	Sealingring	21	Stud (only size 13)		to Din42955. Mounting instructions must be observed.

ball bearing set: 13, 14, 15, 16

03 Condition at delivery

Prior to shipment, the brake unit is preassembled and adjusted to the M4 standard torque. The brake shaft (13), spring washer (14), ball bearing (15), circlip (16), feather key (20) and screw plug (17) are not included in the scope of delivery and must be supplied by the customer.

The rubber bolts (18) are inserted into the friction disc (4) of all size 13 series brakes. In the case of sizes 19 and 24, the rubber bolts have to be ordered separately. The same applies to the O-ring (26) of size 29.
The friction disc (4) with its internal square socket is centred relative to the brake centre to facilitate brake mounting.

This position is secured by the force exerted by the springs (7) on the armature (2). In order to avoid any shift of the friction disc, the brake unit should only be released electromagnetically or by means of the hand release lever when the friction disc is guided by the brake shaft (13).

Brakes equipped with microswitches are delivered with factory-adjusted microswitch.

If the brake unit is not mounted immediately upon delivery, it must be stored in a dry place and protected against dust and vibrations.
The press-fit connection of the

04 Mounting the brake shaft

brake shaft (13) with the motor shaft provides reliable transmission of the brake torque, provided that the motor shaft is not equipped with a feather key groove. The fits and surface roughness depths of the brake shaft bore and motor shaft required for the press-fit connection must be agreed with the brake manufacturer and have to be thoroughly checked.

Before heating the brake shaft, make sure that both the brake shaft and the motor shaft end are dry and free from grease and that the following parts have been removed:
screw plug (17) – any brake size,
rubber bolts (18) – sizes 19 + 24,
O-ring (26) – size 29.

Check the position of the motor shaft contact shoulder relative to the contact surface of the brake on the motor flange and correct it by installing shim rings, if necessary. The permitted tolerance is ī 0.5 mm.

Before mounting the brake shaft, check the radial runout on the motor shaft end and mark the maximum runout angle on the front face of the motor shaft.

After completion of the above operations, the brake shaft must be evenly heated in an electric oven or by means of an inductive heating system until it has reached a temperature of 280°C - 300°C. Once heated, the brake shaft must be slipped onto the motor shaft end until it touches the contact shoulder and secured in axial direction until is has cooled down.

Attention! ⚠
Make sure that the brake shaft is mounted in such a way that the radial runout mark is staggered by 180° relative to the runout mark on the motor shaft.

After the brake shaft has cooled down, the screw plug (17) must be screwed into the brake shaft and secured with Loctite type 243. This applies to all brake sizes. Additionally, the rubber bolts (18) of sizes 19 and 24 must be inserted into the bore of the square socket, making sure that the rounded end points outwards. The O-ring (26) of size 29 brake must be placed into the groove near the brake shaft teeth.

05 Mounting the brake unit to the motor

The brake unit must be mounted to the motor after the heated brake shaft has been assembled on the motor shaft and after it has cooled down to ambient temperature. Make sure that the motor is in an upright position and that the motor shaft end points upwards.

Before mounting the brake unit, check that the rubber bolts (18) have been correctly inserted into the bores of the square socket of the friction disc (4) when using a size 13 brake. In the case of size 19 or 24, the rubber bolts must be inserted into the bores provided in the square socket of the brake shaft (13). When using a size 29 brake, make sure that the O-ring (26) has been placed into the groove provided in the brake shaft. The rubber bolts and O-ring must be slightly greased to ensure smooth sliding. Check that the oil inlet bore is closed with the screw plug (17).

Attention! ⚠
Do not apply any lubricant to the following surfaces:
friction surfaces of all brake units,
square socket guide surfaces of size 13, 19 and 24 brake,
guide surfaces of the friction disc (4) teeth of size 29 brakes,
contact surfaces of brake shaft (13).

The brake unit must be mounted to the motor by slipping it onto the brake shaft until it makes contact with the motor flange. Do not use excessive force and make sure that the brake is parallel to the motor shaft. Depending on the size of the brake unit, either the square socket or the teeth provided on the friction disc must be slipped onto the counterpart on the brake shaft. Extreme caution is advised during mounting in order to avoid damage to the sealing rings (6) and (11). After completion of the above operations, the fastening screws must be screwed in loosely, and voltage must be applied to the brake unit. The brake must not be released by means of the hand release lever (if provided).

Before installing the ball bearings, the spring washers (14) must be placed into the magnet housing (1.1). Size 13 and 19 brakes require only one spring washer each, whereas size 24 and 29 brakes must be equipped with two spring washers.

In order to allow the ball bearing to be installed, pressure must be applied both to the inner and outer races of the bearing until the inner race touches the shaft shoulder of the brake shaft (13). The necessary pressure is generated through a mounting sleeve by means of a mounting device that acts on the thread in the brake shaft. The magnet housing (1.1) is thus centred through the ball bearing. The centring edge on the motor end shield is kept clear in radial direction. Proceed to install the disc (12) and the circlip (16).

Attention! ⚠
The brake shaft and ball bearing must not be exposed to any axial shocks. The disc (12) forms an integral part of the brake unit and must only be replaced by original spares.

After assembly of the brake unit, the fastening screws must be tightened by applying the tightening torque specified in the screw data sheet. The motor shaft must be turned by hand while the brake is released to ensure that the shaft rotates smoothly. The armature movement must be checked by carrying out a functional test. The radial and axial runout (see Fig. 1) must be checked in accordance with DIN 42955-N requirements.

Please refer to the motor manual for information on the break-in conditions and lubricating intervals for the ball bearings.

06 Electrical connections

The integral spring-applied single-disc brake must be supplied with DC voltage which can be obtained by bridge or half-wave rectification of the AC voltage.

Standard voltage rates to be applied are 24 V for bridge rectified voltage and 102 V / 178 V for half-wave rectified voltage.

DC voltage can be supplied separately via a free cable or via a junction box with integral terminal.

If DC voltage is not available, AC voltage can be applied by using a single-phase rectifier with half-wave rectified output voltage. In this case, the rectifier must be suitable for installation in the junction box (e.g. type 32 07322A40).

In this case, standard voltage rates are: input voltage 230 V/400 V, single-phase, 40 - 60 Hz, output voltage 102 V and 178 V, half-wave rectified.

These single-phase rectifiers allow various circuits to be implemented (Fig. 3).

Circuit I
for normal coupling time t1

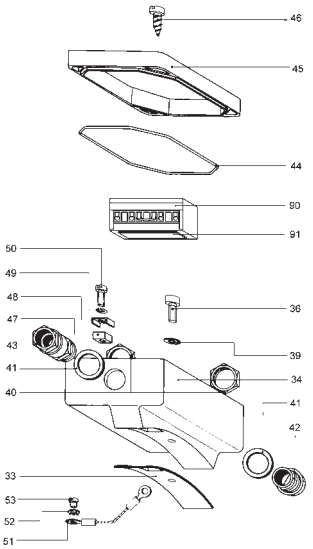
Circuit II
for shorter coupling time t1, as specified in the data sheet.

As shown in circuit diagram I, circuit type I is characterized by AC side switching. The bridge B1 between S1 and S2 must not be removed. The coupling time t1 with this type of circuit is 4 to 6 times longer than with circuit type II.

As shown in circuit diagram II, circuit type II allows DC and AC side switching. The bridge B1 must be removed. This circuit type minimizes the coupling time t1.
The disconnection time t2 remains unaffected by circuits I or II.

Fig. 2

Junction box with single-phase rectifier



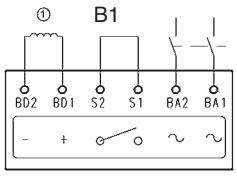
33 Seal
34 Housing
36 Cheeseheadscrew
39 Disc
40 Hexagon nut
41 Sealing ring
42 Screw plug
43 Gland screw
44 Grease cord
45 Cover
46 Panheadtapping screw
47 Plate
48 Clamp strap
49 Springlockwasher
50 Cheeseheadscrew
51 Line
52 Toothlockwasher
53 Cheeseheadscrew
90 Rectifier
91 Adhesivepad

Fig. 3

Single-phase rectifier with half-wave rectification

Circuit I

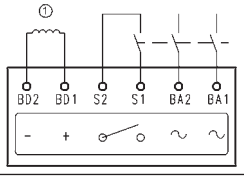
Normal couplingtime t_1



① = excitation winding
B1 = bridge

Circuit II

Short couplingtime t_1



If the required disconnection time t2 must be shorter than the time specified in the data sheet, it is possible to install a single-phase overexcitation rectifier, such as type 32 17350E.., to reduce the disconnection time to approx. 40%.

These rectifiers are characterized by the fact that AC voltage is rectified by time-controlled bridge rectification (overexcitation) during the first stage, followed by electronic change-over to half-wave rectification (rated voltage) during the second stage.

Even when using this type of rectifier, the normal coupling time t1 of circuit type I can be reduced to the shorter coupling time of circuit type II after having removed the bridge B1.

Bridge B2 allows one of two pre-set overexcitation times to be selected. However, overexcitation times may only be changed after prior consultation with the manufacturer.

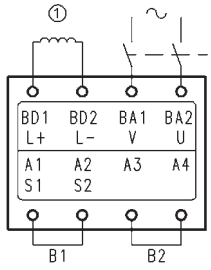
Rectifiers type 32 07322A40 and 32 17350E00 are equipped with a varistor to avoid voltage peaks on the coil during DC side switching. This protective circuit does not affect the coupling time.

Fig. 4

Single-phase overexcitation rectifier

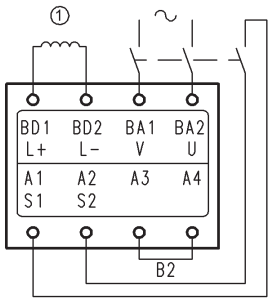
Circuit I

Normal couplingtime t_1



Circuit II

Shorter couplingtime t_1



① = excitation winding
B2 = overexcitation time
closed = short 0,25 s
open = long 1,0 s
B1 = shorter coupling time

Attention:
In the case of DC side switching, AC side switching is also required.

07 Microswitch

The microswitch in the control circuit of the motor is provided to prevent motor start-up before the brake has been released. The microswitch is a normally open contact which remains closed while the armature is pulled towards the pressure springs and the brake is released. Please refer to Fig. 5 for information on how to connect the microswitch.

Attention! ⚠
Specific regulations for the use of microswitches (e.g. regulations for the construction of hoists, cranes and elevators) must be strictly observed.
The optional microswitch must be specifically included in the brake unit order. It is not possible for the microswitch to be retro-fitted to the brake at a later date. The microswitch is factory-adjusted prior to brake shipment and must be re-adjusted if maintenance or repair work is carried out.

Attention! ⚠
The motor circuit must be secured in such a way that any unintentional motor start-up is avoided when the microswitch is closed.
The microswitch can only be adjusted after the brake has been electrically released and after the screws (62) have been slightly loosened. The switching position "open" or "closed" must be determined by means of a continuity tester connected to "No" and "C". When "closed", the microswitch must be pushed back beyond the change-over point in the direction indicated by "B". When "open", the screw (67) must be screwed in to allow the microswitch to be pushed in the direction indicated by "A" up to the change-over point. The switching positions are indicated by the continuity tester.
At his point, the screw (67) must be further tightened by the length "L" specified in Table 1 and positioned by tightening one of the screws (62). The other screw must be secured by means of Loctite type 241 and then tightened. Proceed in the same way when tightening the second screw. The screw (67) must be removed.

Table 1

Brake unit size	Length L	Screw-in angle
13	0,11 mm	90°
19	0,15 mm	120°
24	0,20 mm	160°
29	0,20 mm	160°

Switch the brake on and off to check that the microswitch is in perfect working order.

C = common contact
No = normally open contact

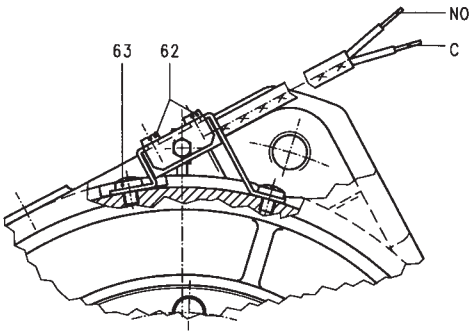
08 Hand release feature

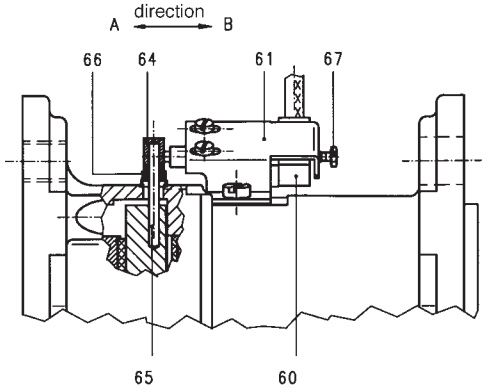
The brake unit can be equipped with a hand release lever to allow the braking effect to be neutralized mechanically. The hand release lever can also be retro-fitted to existing brakes at a later date.
The hand release lever (24.2) must only be moved in one direction. After actuation of the hand release, the lever should be moved back into home position and taken off. This is crucial to avoid damage to the brake or malfunctions which might be caused by the weight of the lever or by the accelerating power exerted on the lever by the cams (24.1) during brake application. For detailed information on the release force and release direction, please refer to Fig. 6 and to the data sheet.
If the lever is not to be taken off, make sure that it is moved into a vertical position and that it points downwards.

Attention! ⚠
Specific regulations for the use of hand releases (e.g. regulations for the construction of hoists, cranes and elevators) must be strictly observed.

Fig. 5

Microswitch





Brake with microswitch
Protection: microswitch IP65

60 Microswitch
61 Strap
62 Cheeseheadscrew (2x)
63 L-screw (2x)
64 Bolzen
64 Stud
65 Straightpin
66 Bellows
67 Hexagonhead cap screw M 2,5 x 8 (not supplied)

Suggested microswitch connection in the control circuit

K1 = contactor
K2 = motor contactor
S1 = ON switch
S2 = microswitch
S3 = OFF switch
V1 = rectifier
Y1 = magnetcoil

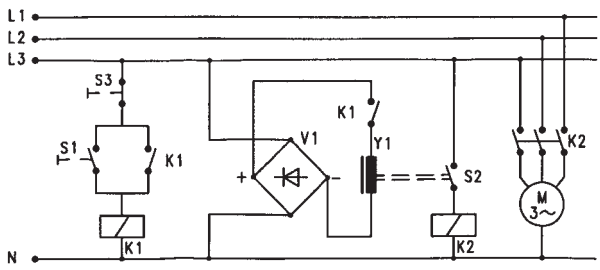
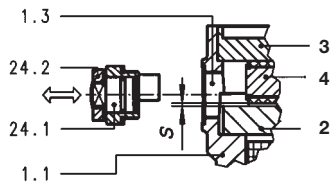


Fig. 6



Handrelease and air-gap measurement

1.3 Bore for air gap measurement (remove cam with accessories and/or cap)

1.1 Magnethousing

24.1 Cam with accessories

24.2 Lever

09 Removal of the brake shaft

Proceed with extreme caution and observe all safety instructions when removing the brake shaft.

The brake shaft (13) must be removed by means of an oil pressure system. To this end, a withdrawal device consisting of a forcing screw (94) and a forcing pin (92) as well as an oil injector or oil pump (93) must be used.
After having removed the screw plug (17), the oil injector or oil pump joint must be screwed into the oil inlet bore (17.1). The forcing pin must then be inserted on the front face of the brake shaft up to the limit stop and slightly tightened by means of the forcing screw.
The pressure oil must be supplied through the oil inlet bore. The oil pressure should be gradually increased to about 60 % of the maximum pressure Pmax and maintained for about 60 minutes. The pressure is to be kept constant throughout this period and subsequently increased to Pmax.

After completion of the above operations, the forcing screw must be screwed in smoothly and evenly to allow the brake shaft to be pulled off the motor shaft.
While removing the brake shaft, the torque arm should be applied to the square socket or to the external teeth of the brake shaft.
Pressure oil type LHDF900 with a viscosity of 900 mm2/s at 20 °C supplied by SKF can be used, for instance. For further information, please refer to Table 2.

Attention! ⚠
As high pressures are generated during the removal of the brake shaft, personal protection equipment, such as face guards, gloves etc., and protection covers must be used.

Fig 7

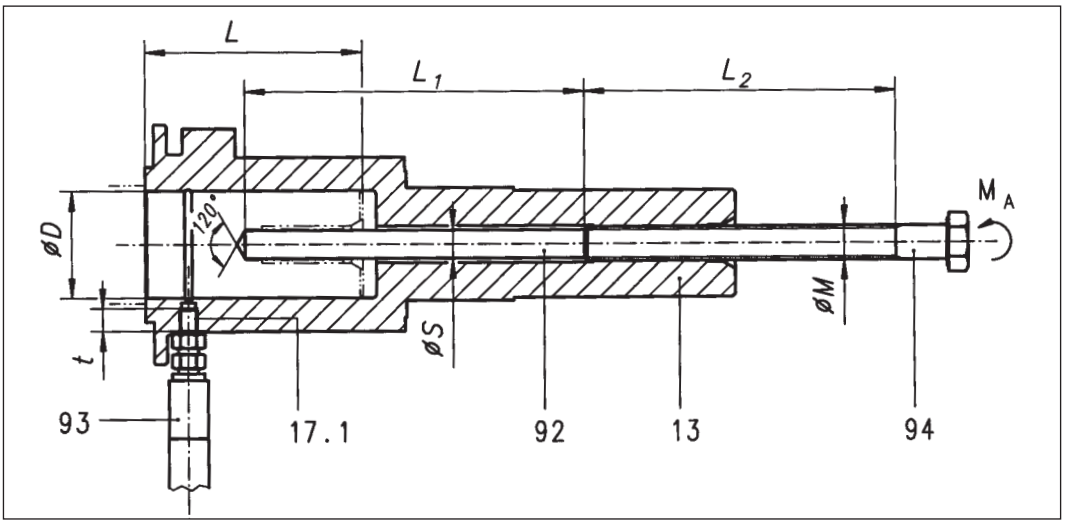


Table 2

Axle height Brake size	Motor type	Shaftend Ø D (mm)	Shaftend Length L (mm)	Oil inletbore/ screw-in depth t	Öil pressure Pmax (bar)	L1	L2	Ø S (mm)	Ø M (mm)	M_A (Nm)
AH80 size 13	1FT608.	32	58	M6/7,5	1400	102	130	9,8	12	15
AH 100 size 19	1FT610. 1PA610.	38 38	80 80	M6/8 M6/8	1400	124 124	130 130	9,8 9,8	12 12	35
AH 132 size 24	1FT613. 1PA613.	48 42	82 110	R1/8“/9,5 R1/8“/10	1400 1400	160 160	170 170	13 13	16 16	60
AH 160 size 29	1PA616.	55	110	R1/8“/10	1400	170	170	17	20	90

10 Setting the torque

The transmissible torque M4 of the brake unit is factory-set to the standard value specified in the data sheet. The pre-set M4 torque is indicated on the rating plate.
The torque can be adjusted by means of the adjusting ring (9). After completion of adjustment, the adjusting ring must be locked by means of the set screw (25). The adjusting ring clearance "E" indicated in Fig. 1 is marked on the bottom of the magnet housing near the set screw.

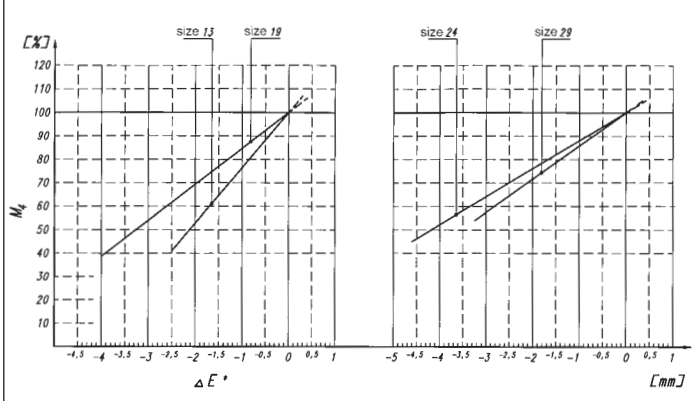
After having loosened the set screw (25), the torque setting can be adjusted by changing the adjusting ring clearance "E" by means of a pin spanner. As indicated in the diagram in Fig. 8, the torque setting can be changed within the limits given by the function M4 = f(DE). After having changed the torque, the new adjusting ring clearance "E" must to be marked on the magnet housing. The adjusting ring must be locked by means of the set screw (25), making sure, however, that the set screw is not within the reach of the studs. To prevent loosening of the set screw, it must be secured with Loctite type 243, for example.

Torque changes will entail only minor variations in the coupling time t1.

However, the reduction of the disconnection time t2 will be proportional to the torque reduction.

Fig. 8

Transmissible torque M_4 = f (Δ adjustingring clearance)



*** Δ adjustingring clearance is an approximate value for M_4 based on the 100% M_4 factory adjustment. Deviations of ± 15% are permitted.**

11 Removal of the brake unit from the motor and replacement of individual parts

Attention! ⚠
Before removing the brake unit from the motor, any components still fitted to the brake shaft, such as gear, coupling half, etc., must be taken off. Extreme caution is advised during these operations. The fastening screws must be loosened to allow the brake shaft to be removed.

Attention! ⚠
Before loosening the fastening screws, check that
• no load torque is applied to the brake shaft;
• the motor is secured to prevent any unintentional start-up;
• no voltage is applied to the brake unit.

After having removed the fastening screws, the brake unit can be pulled off the motor shaft by means of a withdrawal device. The withdrawal device must be applied to the fastening corners of the flange located on the output side and supported by the front face of the brake shaft (13). To avoid damage to the centring piece in the shaft end, a pad must be placed under the withdrawal device.

Attention! ⚠
Substantial forces may have to be applied as the ball bearing (15) has to be pulled off together with the brake shaft. Extreme caution is advised when removing the brake shaft. If the brake shaft is in a horizontal position when removing it from the motor shaft, the brake unit must be supported in radial direction.

Used ball bearings must not be reinstalled, regardless of their service life.
To allow individual components of the brake unit to be replaced, the pressure springs (7) must be relieved by loosening the set screw (25) and unscrewing the adjusting ring (9). The cheese head screws (10) can then be unscrewed to allow the flange (3) and all other components to be removed.

The brake components must only be cleaned with fat-free cleaning agents. Bear in mind that the friction disc cannot be cleaned.

When using brakes equipped with a microswitch, the armature (2) can only be removed after having taken off the stud (64) and the straight pin (65). Used studs and straight pins have to be replaced by new parts after the brake unit has been reassembled.

Reassembly of the brake must be carried out performing the above steps in reverse order after having slightly greased the thread of the adjusting ring (9) and the studs (8) and (21).

The following instructions must be strictly observed:
• The friction disc (4) must be centred relative to the centre of the brake unit.
• The microswitch must be readjusted when using brakes equipped with microswitches.
• No lubricant must be applied to the friction disc!
• The correct adjusting ring clearance "E" must be adjusted (9).
• The cheese head screws (10) in the flange (3) must be tightened applying the tightening torque specified in Table 3.

12 Inspection and maintenance

Attention! ⚠
Before attempting to perform inspection and maintenance work, check that
• the motor is secured to prevent any unintentional start-up,
• no load torque is applied to the brake unit (motor).
Inspection work to be carried out on the brake is generally limited to checking the friction disc for wear. For this purpose, the brake must be energized during motor standstill to allow the air gap "s" between the armature (2) and the friction disc (4) to be measured through the threaded bore 1.3 (Fig. 6) by means of a feeler gauge. The air gap can only be measured after having removed the cover (23) or – when using brakes with hand release – after having removed the lever (24.2) and the complete cam assembly (24.1).
If the maximum air gap smax specified in Table 3 is reached the friction disc must be replaced to ensure functional reliability and safety of the brake.
When replacing the friction disc, check the condition of the armature (2) and the friction surfaces of the flange (3).

For detailed information on the replacement of brake components, please refer to section 11. It is not possible to perform adjustments to compensate for wear.

The ball bearing is lubricated with grease lasting for a maximum three years' operation.

If the ball bearing has to be replaced, make sure to use bearings of the same type or of identical design. For detailed information, please contact the brake manufacturer.

The sealing rings (6) and (11) do not require any maintenance. However, they should be replaced every time the brake unit is opened. The new sealing rings must be glued in place.

To this end, Loctite 480 must be applied to individual spots on the front face of the magnet housing (1.1) and on the circumference of the flange (3) before the sealing rings are inserted and pressed on.

Table 3

Size	Air gap s(mm) nominal value	Air gap s(mm) maximum value with standard M_4	Tightening torque for screws Pos. 10 (Nm)
13	$0{,}30^{+0{,}2}$	0,65	5 (M5)
19	$0{,}35^{+0{,}2}$	0,8	9 (M6)
24	$0{,}40^{+0{,}25}$	1,05	14 (M8)
29	$0{,}45^{+0{,}25}$	1,2	22 (M10)

13 Motor requirements

The motor to which the brake unit is mounted must meet the following requirements:
• Motor construction type IMB5 or IMB 35
• Tolerances of the shaft end and flange (radial and axial run-out) according to DIN 42955-R
• Tolerances of the shaft end and flange of the brake unit after mounting to the motor according to DIN 42955-N
• Motor shaft without feather key groove (owing to oil press fit on brake shaft)
• The fits and surface roughness depths of the brake shaft bore and motor shaft (Rz<6.3) required to ensure a reliable press-fit must be agreed with the brake manufacturer.
• Balancing of the brake shaft with a half key (half key balancing) according to DIN ISO 8821
• For information on the permitted transverse forces acting on the shaft end of the motor/brake unit and on the permitted axial forces, please refer to the data sheets for the brake unit and motor, respectively.
• Mounting of the brake unit to the motor may lead to heat build-up on the A-face motor end shield as heat dissipation towards the machine wall is inhibited. Consequently, only ventilated motors must be used.

14 Appendix

General technical information and safety instructions

Contents

01 General Information

The spring-applied single-disc brake unit is designed for assembly on the A-face end shield of electric motors.
It is provided with a brake shaft that is supported by suitable bearings and forms the extension of the motor shaft.

The brake unit is equipped with an integral electromagnetically released spring-applied single-disc brake that is designed to operate dry. The brake effect is produced by the spring force and neutralized electromagnetically for the brake as a fail-safe holding brake with emergency stop function. If necessary, the brake can also be released by means of the additional hand release lever.

Rating, assembly, operation and maintenance of the brake have to be performed observing the general technical information and safety instructions contained herein as well as the operating instructions and data sheet.

National, local and plant-specific regulations and requirements have to be complied with when using the brake.

The technical details of custom-built brake models (and their electrical connections) may differ from the data and information applicable to the standard model. Should you have any questions that go beyond the information contained in these operating instructions, please contact the manufacturer quoting the type designation and the brake number..

Attention! ⚠
Electric motors with attached brake units present dangerous, rotating and live components and hot surfaces. Transport, connection, commissioning and maintenance of the motor and brake are only to be carried out by suitably qualified personnel (according to VDE 0105; IEC 364). Improper use of the motor and brake may cause injury to persons and damage to the equipment.

02 Intended use

The spring-applied single-disk brake unit is designed for assembly on three-phase motors for use on industrial plant. The brake unit is not to be installed in hazardous locations requiring flame and explosion proofing.

The integral spring-applied single-disc brake (electromagnetically released system) is designed as a holding brake suitable to withstand occasional emergency stops.

Attention! ⚠
The admissible number of switching operations per hour and the max. switching work per switching operation indicated in the data sheet are to be strictly observed, especially when setting up machines and plant (inching operation).

Failure to observe these instructions and data may irreversibly reduce the braking effect and cause malfunctions.

The brake unit can be equipped with a hand release feature to neutralize the braking torque.

Attention! ⚠
The hand release lever is to be secured to prevent unintentional use or use by unauthorised persons. It is also possible for the hand release lever to be taken off. Plant-specific regulations for the use of hand releases, such as the regulations for the construction of hoists, cranes and elevators, are to be observed.

The operating conditions at normal rating and the type of protection refer to DIN VDE 0580 and to DIN VDE 0470, part 1, respectively. Specific measures to be taken in case of different data and operating conditions are to be agreed with the brake manufacturer.

The brake unit is designed for use at an ambient temperature of between –5°C and +40°C. When the temperature falls below –5°C and in case of prolonged standstill periods without the brake being energized, freezing of the friction disc cannot be excluded. In this case, special precautionary measures are to be taken after consultation with the manufacturer.

Attention! ⚠
The brake unit cannot be considered a safety brake as a reduction of the torque caused by controllable faults or troubles cannot be ruled out. The accident prevention regulations applicable to the specific field of application of the brake are to be observed.

Attention! ⚠
Whenever special measures are to be taken to meet specific requirements, the manufacturer should be consulted as early as in the planning stage.

03 Transport and storage

Upon receipt of the brake unit, the unit should be checked for transport damage before it is used or temporarily stored.

The brake unit should be transported and stored in a vertical position with the flange on the output side pointing upwards. This flange is to be provided with eye bolts (e.g. according to DIN 580) that are to be fixed to the two fastening bores located at diagonally opposite ends of the flange. The eye bolts are to be used to attach handling equipment to be secured by means of nuts and for the as-sembly of the brake unit on the motor.

Attention! ⚠
When using brakes equipped with microswitches, any handling gear other than the equipment described above must be kept well clear of the microswitch in order not to change the setting of the microswitch contact. Utmost caution is also advised when handling the junction box.

If the brake unit is to be temporarily stored, the storage location has to be dry and free from dust and must not be exposed to any vibrations.

04 Electrical connections

The brake unit is a DC controlled system that is to be supplied with DC voltage obtained by half-wave or bridge rectification of AC voltage.
Attention! ⚠
The data indicated on the rating plate and in the circuit diagram in the terminal box and operating instructions are to be observed.
The permanently admissible voltage variations at the voltage input point have to be within a tolerance of between +10% and –10% of the nominal voltage.
The DC voltage mean value is equal to the 0,445 fold root mean square AC voltage for half-wave rectifiers, the mean value is equal to the 0,89 fold root mean square AC voltage.
The following instructions are to be observed when connecting the brake:
• Check that the power cables are suitable for the specific application and for the generated voltage rates and current strength.
• Check that the power cables are generously dimensioned for the specific application and that they are provided with strain, thrust and twist reliefs and bending protection.
• Check that the earthed conductor is connected to the earthing point.
• Check that the terminal box is free from matter, dust and humidity.
• Check that cable entries that remain unused and the terminal box are dust-tight and waterproof.
Attention! ⚠
After completion of the electrical connection, the brake unit has to be given a functional test. To this end the motor shaft has to be turned to ensure smooth operation of the friction disc. When using brakes equipped with microswitches, the microswitch has to be check to make sure it is in perfect working order.
Attention! ⚠
The functional test of the motor/brake unit is only to be carried out during motor standstill. To this end, the motor has to be switched off and secured in such a way that it cannot be switched on by unauthorised persons.
Attention! ⚠
Any work on the motor/brake unit is only to be done by suitably qualified personnel.

05 Driven components, balancing

The assembly and removal of driven components, such as clutch, gear, tooth belt, etc., are to be carried out using suitable equipment.

For the assembly of driven components, the thread in the shaft end is to be used. If possible, driven components are to be heated prior to assembly.

In order to protect the centring piece and the thread in the shaft end, a shime is to be inserted before removing driven components (see Fig. …).

Attention! ⚠
During the assembly and removal of driven components, make sure that no shocks (e.g. hammer blow) or axial forces higher than those indicated in the motor data sheet are transmitted to the bearing of the break unit via the shaft end.
If the shaft is exposed to axial forces transmitted by the driving component, any axial displacement of the driven component on the shaft end is to be avoided.

Attention! ⚠
The general requirements for the protection of the driven components against accidental contact are to be complied with.
The brake is an electromagnetic unit, which may generate electromagnetic stray flux. Driven components remain unaffected by the presence of such stray flux.

Attention! ⚠
If a driven component, such as a slip-on gear mechanism, with an integral magnetically conductive bearing is assembled on the brake shaft, the electromagnetic stray flux may gather above the bearing and thus increase the bearing temperatures.

If such a driven component is to be used, the manufacturer of the brake should be consulted as early as in the planning stage of information on the corrective measures to be taken.

The brake shaft is balanced with a half key (half feather key balancing according to DIN ISO 8821).
During the assembly of the driven component, the brake shaft is to be correctly balanced.

Attention! ⚠
If the brake unit is commissioned without a driven component, the feather key has to be locked to make sure it cannot be ejected.

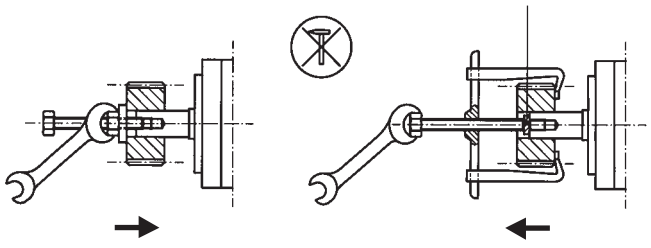
06 Installation and commissioning

Make sure that the conditions at the site of installation comply with the requirements concerning the constructional shape and type of protection indicated on the rating plate.

Attention! ⚠
If the machine's shaft end points upwards suitable measures are to be taken to keep out liquids (water, boring or cooling emulsion) from the upper bearing.

Bild 9

Cushioning disc
(centering protection in the shaft extention)



The brake is to assembled in such a way the sufficient elimination of leakage heat is ensured.

Attention! ⚠
After completion of assembly, all necessary covers and protection devices are to be installed.

Attention! ⚠
Before starting a trial run without driven components, the feather key is to be locked to make sure it cannot be ejected.

Attention! ⚠
Attention! The brake unit may reach surface temperatures of up to about 110°C. Heat-sensitive parts, such as normal cables or electronic components, are to be kept well clear of such surfaces. If necessary, precautionary measures are to be taken for the protection against accidental contact!

If the motor shaft needs to be turned during set-up work before the motor is started, the brake has to be released electromagnetically or by means of the hand release lever.

Attention! ⚠
Make sure that the brake shaft is not exposed to any load torque. Before restarting the motor, the brake unit is to be de-energized.

Attention! ⚠
Especially during set-up work, the admissible number of switching operations per hour and the admissible switching work per switching operation indicated in the data sheet are not to be exceeded during inching operation.

07 Inspection and maintenance

Attention! ⚠
Before attempting to perform inspection and maintenance work, check that,
• The motor is secured to prevent any unintentional start-up,
• No load torque is applied to the brake unit/motor.
Inspection work to be carried out on the brake is generally limited to checking the friction disc for wear.

Attention! ⚠
If the maximum admissible air gap is exceeded, the friction disc has to be replaced to avoid malfunctions.

Attention! ⚠
During maintenance work, make absolutely sure that all friction surfaces are free from grease and oil to avoid any irreversible torque reduction. Bear in mind that friction discs contaminated with oil or grease cannot be cleaned.

Attention! ⚠
After completion of inspection and maintenance work, the motor – previously locked to prevent any unintentional start-up – is to be unlocked.

08 CE marking, Low Voltage Directive, Machinery Directive, EMC Directive

Attention! ⚠
Being an "electromagnetic component", the spring-applied single-disc brake unit is not subject to the provisions of the Low Voltage directive and must not have a CE marking affixed to it.

Attention! ⚠
It is the users responsibility to install suitable switching devices and drive elements to ensure that the brake unit complies with the requirements of the EMC Directive 89/336/EEC.

This also applies even if the brakes are equipped with Kendrion Binder half –wave rectifiers type
32 07322A40 or 32 17350E.. for rectification of AC voltage 230V or 400V, 50Hz, to allow the brake to be supplied with DC voltage.
A separate technical information sheet providing further details and information on recommended wiring methods can be obtained from the manufacturer.

09 Definitions

(based on DIN VDE 0580: July 2000, Extraction)

The switching torque M_1
is the torque acting on the shafting during brake or clutch slip.

The nominal torque M_2
is the switching torque specified by the manufacturer to identify the brake. The nominal torque M_2 is the average value determined from at least 3 measurements of the maximal occurring switching torque M_1 after the fading away of the transient phenomenon.

The transferable torque M_4
is the highest torque that can be applied to the brake without causing the brake or clutch to slip.

The residual torque M_5
is the torque transmitted by the released brake.

The load torque M_6
is the torque of the closed brake or clutch acting on the drive and is determined by the power requirement of the driven machine at a given speed.

The switching work W
of a brake or clutch is the heat generated by friction inside the brake or clutch as a result of the switching operation.

The maximal switching power W_{max} is the switching work with which the brake or clutch may be burdend.

The clutch switching power P
is the transferred switching work per unit of time that is converted into heat.

The maximum switching power P_{max} is the admissible switching work per unit of time that is converted into heat.

The duty cycle t_5
is the time which lies between the energizing and de-energizing of the power.

Powerless brake t_6
is the time which lies between the de-energizing and re-energizing of the power

The cycle time t_7
is the sum of the duty cycle and the de-energized interval.

The relative duty cycle
is the ration between duty cycle and cycle time indicated in percent (% duty cycle).

Operating cycle
comprises a full energizing and de-energizing process.

The switching frequency Z
is the number of regular switching operations per hour.

The response delay during coupling t_{11} is the time between the de-energizing (releasing system) / energizing (closing systems) respectively of the brake until the beginning of the torque increase.

The rise time t_{12}
is the time it takes to reach 90% of the nominal torque M_2 from the beginning of the torque increase

Switching time t_1 is the sum derived from the response delay t_{11} and the rise time t_{12}.

The response delay during disconnection t_{21} is the time between the energizing (releasing systems) / de-energizing (closing systems) respectively of the brake until the beginning of the torque decrease.

The fall time t_{22}
is the time it takes for the torque from the beginning of the torque decrease to fall to 10% of the nominal torque M_2.

The disconnection time t_2
is the sum of the response delay t_{21} and the fall time t_{22}.

The slip time t_3
is the time from the beginning of the torque increase up to the end of the braking process or until the synchronization moment M_3 for clutches is reached.

The duty time t_4
is the sum of the response delay t_{11} and the slip time t_3 (braking time or acceleration time).

The operating state at operating temperature is the operating state at which the steady-state temperature is reached. The operating temperature corresponds to the raised temperature according to DIN VDE 0580 plus the ambient temperature. Unless otherwise specified the ambient temperature corresponds to a temperature of 35°C.

The excess temperature ϑ_{31}
is the difference in temperature between the electromagnetic device or component or a part thereof and the ambient temperature.

The limited temperature of coil insulating materials
correspond to DIN VDE 0580. The individual insulating materials are classified by insulation classes according to DIN IEC 85.

The rated voltage U_n
is the supply voltage specified by the manufacturer to identify voltage-controlled devices.

The rated current I_b
is a current specified by the manufacturer. If not otherwise indicated, it refers to the rated current, 20°C coil temperature and where applicable to the rated frequency of the predetermined mode for the coil voltage.

The nominal output P_n
is an applicable value of the capacity for the description and identification of the unit or the component.

The rated power P_b
results from the related current for voltage units and components and the resistance R20 by 20°C coil temperature.

KENDRION POWER TRANSMISSION

Kendrion Binder Magnete GmbH
Power Transmission
Mönchweilerstraße 1
D-78048 Villingen-Schwenningen
Telefon (0 77 21) 877 455
Telefax (0 77 21) 877 462
www.KendrionAT.com
dialog@KendrionAT.com

Kendrion Binder Magnete
(U.K.) Ltd.
Huddersfield Road, Low Moor
GB-Bradford, West Yorkshire, BD 12 0 TQ
Telefon +44 (0) 12 74 60 11 11
Fax +44 (0) 12 74 69 10 93
www.kendrion-binder.co.uk
sales@kendrion-binder.co.uk