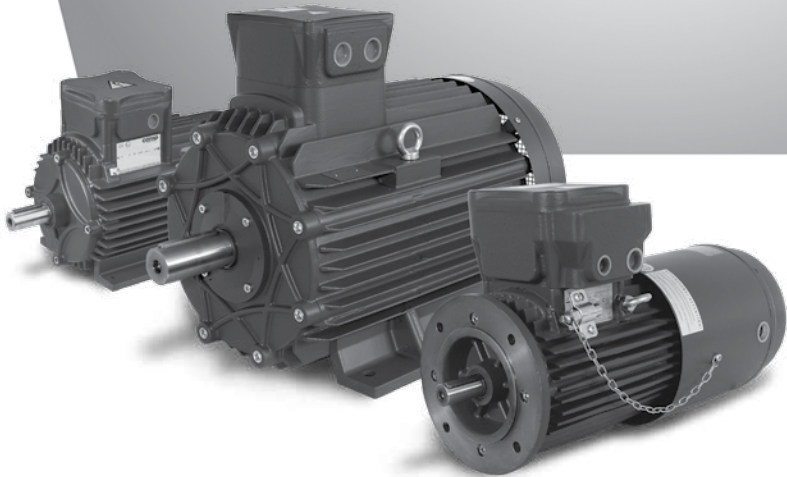


cemp

Flameproof
Motors



Electric Motors with brake

Additional use and maintenance instructions

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1. General information

The use and maintenance instructions refer to flameproof motors with brake, Series D 63÷315 and Series H 71÷160.

This manual is an addition to the basic “Rotating electric machines - low voltage” manual and the “Safety Instructions” manual and must therefore be referred to along with these when installing, starting up, and carrying out maintenance on the motor.

Safety hazards can only be avoided if the user follows all warnings and instructions in this manual.

The user is to specifically ensure that:

- The motors are used according to their technical specifications.
- The motors are in perfect condition when used and maintenance is carried out at regular intervals.
- The instructions are always readily available.
- Installation, start-up, maintenance, and repairs are only carried out by qualified, authorised personnel.

⚠ Accidents due to errors during operation and maintenance may cause serious injury to people and extensive damage to the equipment.

The motors are supplied ready for use, according to the specifications indicated in the order.

If any braking torques, work cycles, or inertias differ from those indicated in the order are required, please contact us.

Noise level: Motors with brake produce noise when the brake opens and when starting up. The noise level depends on the installation conditions and the air gap value.

Table 1A - Motor ranges

Version	Motor type			
	Ex d IIB	Ex de IIB	Ex d IIC	Ex de IIC
Three-phase, 1-speed (2, 4, 6, 8 poles) unventilated or forced ventilation	DB 30	DB 35	DC 30	DC 35
Single speed, three-phase, self-ventilated (2, 4, 6, 8 pole)	HB 30	HB 35	HC 30	HC 35
Two speeds, three-phase, (2/4, 4/8 pole) unventilated or forced ventilation	DB 20	DB 25	DC 20	DC 25
Two speeds, three-phase, self-ventilated (2/4, 4/8 pole)	HB 20	HB 25	HC 20	HC 25
Motors for lifting				
Single speed, three-phase, (6 pole) unventilated or forced ventilation	DB 50	DB 55	DC 50	DC 55
Single speed, three-phase, self-ventilated (6 pole)	HB 50	HB 55	HC 50	HC 55
Two speeds, three-phase, (2/8, 4/12, 4/16 pole) unventilated or forced ventilation	DB 50	DB 55	DC 50	DC 55
Two speeds, three-phase, self-ventilated (2/8, 4/12, 4/16 pole)	HB 50	HB 55	HC 50	HC 55

2. Description of the product

2.1 General operation

The D Series and H Series motors have a built-in brake inside the enclosure. The motor and brake are considered as a single piece of equipment and are covered by a single certificate.

The brakes are designed to work dry.

When the motor is stopped, the brake provides the braking torque indicated on the nameplate.

The brake is housed in a specific enclosure made up of a brake holder shield ⑳, a brake cover enclosure ㉑ and only for motors 180÷315 (by the brake enclosure shield ㉒ bolted together.

The brake holder shield shuts off the motor enclosure and allows the shaft to pass through it ⑰.

In the case of self-ventilated motors (H Series) the shaft protrudes from the brake cover enclosure through a flameproof joint. A fan is applied to the protruding part of the shaft ㉓.

The brake enclosure and the fan are protected by the fan cover ⑰.

The self-ventilated version is not available for size 63. When the brake is powered, the electro-magnet ㉔ attracts the mobile armature ㉕. As this moves the springs are compressed releasing the brake disc ㉖, so that the motor shaft, to which the brake disc is coupled, is able to turn freely.

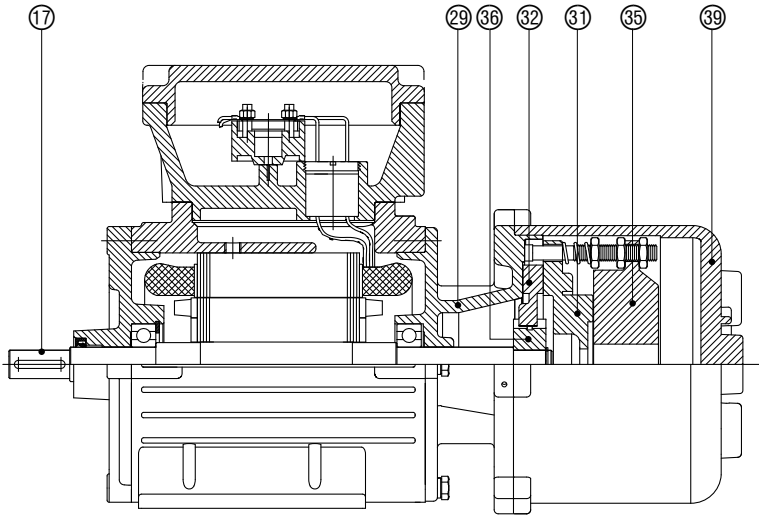
When the voltage to the brake is disconnected the electro-magnet is deactivated and the springs push the mobile armature against the brake disc.

The brake disc causes friction on the brake holder shield and the mobile armature stops the shaft rotating.

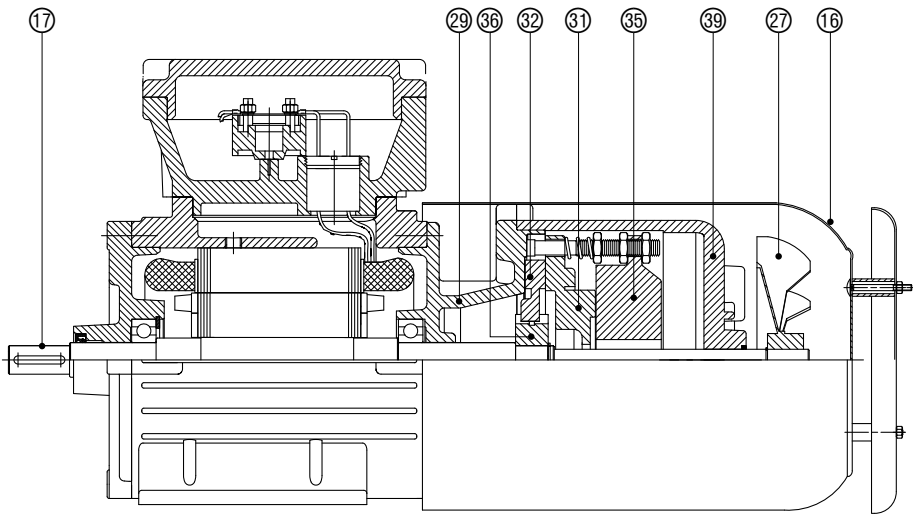
Table 2A - Component classification

Component number	Description	Shown in figure
16	Fan cover (cowl)	2A
17	Shaft	2A - 2B - 2C - 2D
27	Cooling fan	2A
29	Brake holder back shield	2A - 2B - 2D - 2E
31	Mobil armature	2A - 2B - 2D - 2E
32	Brake disc	2A - 2C - 2D - 2E
35	Electro-magnet	2A - 2B - 2C - 2D - 2E
36	Pinion (toothed hub)	2A - 2B - 2C - 2D - 2E
38	Brake shield	2B - 2E
39	Brake cover enclosure	2A - 2B - 2E
48	Fixing screws (studs)	2C - 2D - 2E
49	Screws (nuts) to adjust the braking torque	2C - 2D - 2E
50A-50B	Screws (nuts) to adjust the air gap	2C - 2D - 2E
51	Springs	2C - 2D - 2E

Note: spare parts indicated with numbers from 48 to 51 are not listed in the catalogue, but only in this publication.



Series D
63÷160



Series H
71÷160

Fig. 2A

Series D
180÷315

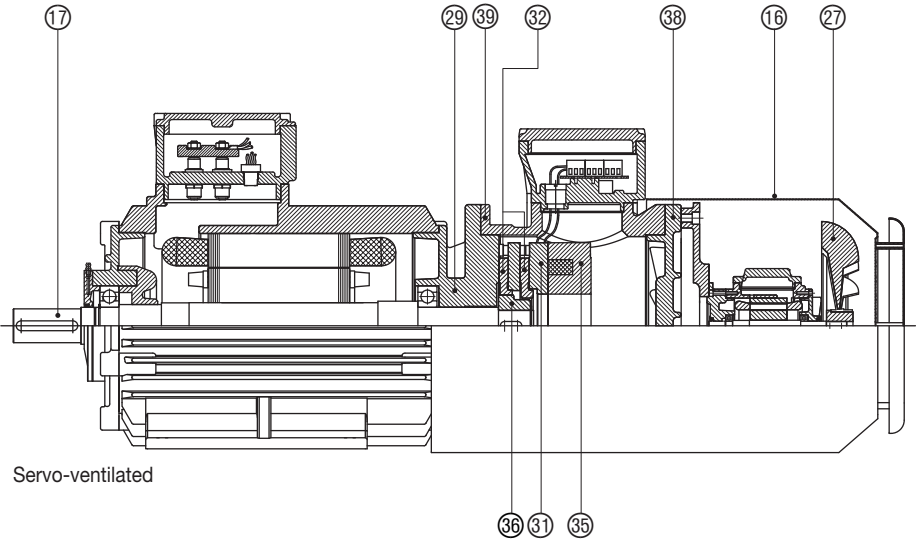
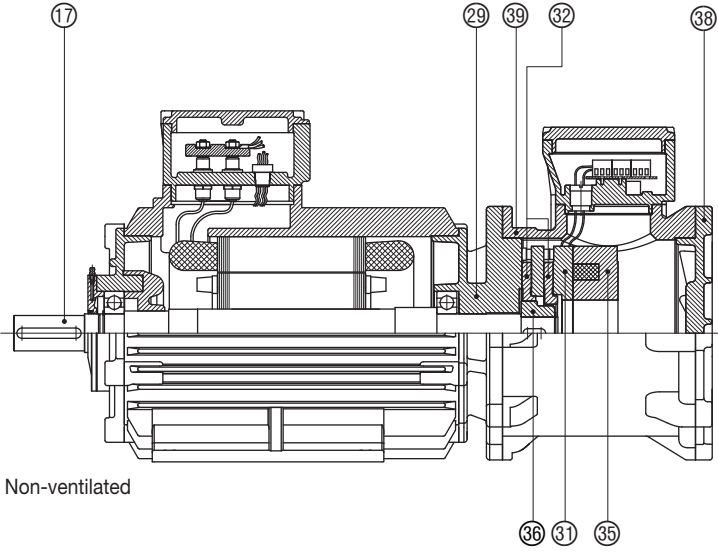


Fig. 2B

2.2 Construction method for the brake motor sizes 71÷160

A pinion (toothed hub) ③⑥ is coupled to the motor shaft ①⑦. The brake disc ③② is fitted on the toothed hub.

The brake disc and the toothed hub, connected to the shaft, make up the rotating part of the brake.

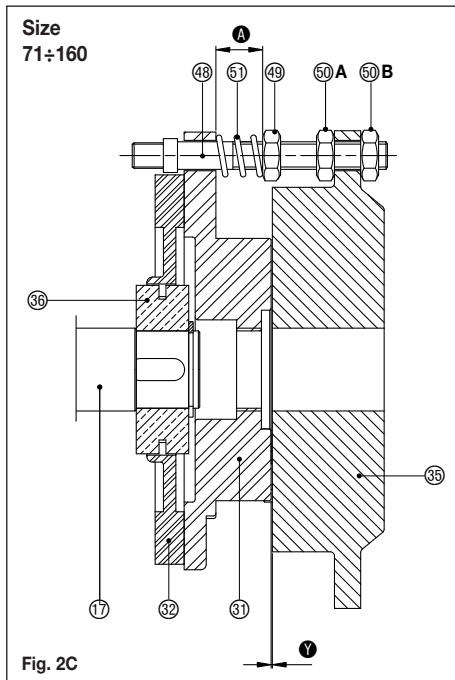
The brake disc can move along the axis of the shaft on the toothed hub towards the brake holder shield, which forms the braking surface along with the mobile armature ③①.

Three studs ④⑧ are screwed into the brake holder shield and the electro-magnet ③⑤ is secured to them using nuts ⑤⑩A and ⑤⑩B. Six studs are used for size 160.

The mobile armature can slide along the axis of the studs.

Springs ⑤① are fitted around each stud, between the mobile armature and the electro-magnet. These springs are compressed using the nuts ④⑨ to adjust the braking torque.

Nuts ⑤⑩A and ⑤⑩B are used to adjust the air gap (see paragraph 4.4), that is, the gap between the mobile armature and the electro-magnet when the brake is not powered.



2.3 Construction method for the brake motor size 63

A pinion (toothed hub) ③⑥ is coupled to the motor shaft ①⑦. The brake disc ③② is fitted on the toothed hub.

The brake disc and the toothed hub, connected to the shaft, make up the rotating part of the brake.

The brake disc can move along the axis of the shaft on the toothed hub towards the brake holder shield, which forms the braking surface along with the mobile armature ③①.

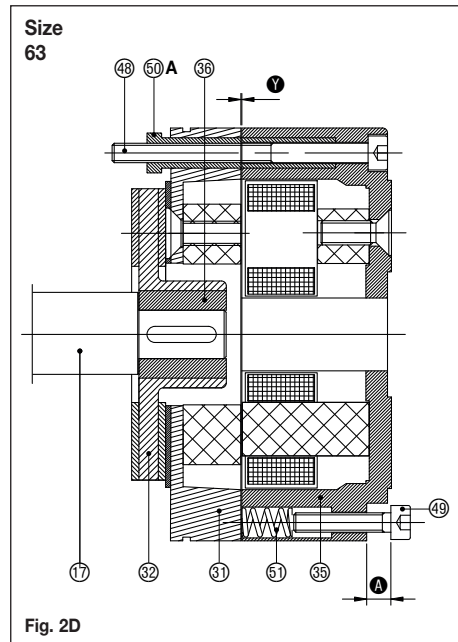
A pre-fitted unit (single piece) comprising the mobile armature ③①, springs ⑤① and electro-magnet ③⑤ completes the brake.

This single unit is secured to the brake holder shield by fixing screws ④⑧.

Adjust the air gap (see paragraph 4.4) by turning the fixing screws after having slackened the air gap adjustment screws (nuts) ⑤⑩A.

Motors from 63 to 160

⚠ If the motor is set up for the brake to be mounted vertically it may feature some construction variations due to the particular installation position.



2.4 Construction method for the brake motor sizes 180÷315

The braking unit is secured to the brake holder shield (29) with eight fixing screws (48).

A pinion (toothed hub) (36) is coupled to the motor shaft. The brake disc (32) is fitted on the toothed hub. The brake disc and the toothed hub, connected to the shaft, make up the rotating part of the brake.

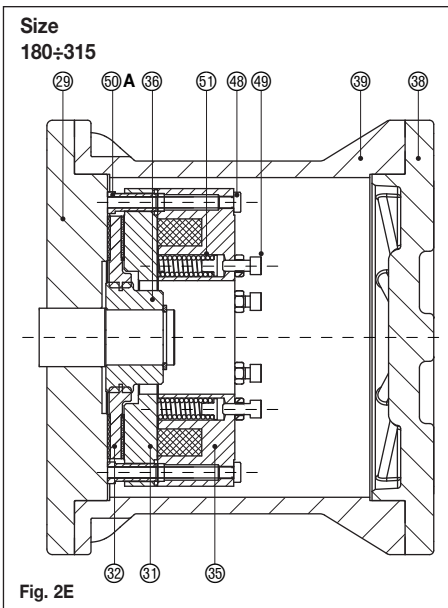
The brake disc can move along the axis of the toothed hub in order to move towards the brake holder shield. The brake holder shield and the mobile armature (31) make up the braking surface.

The electro-magnet (35) is inserted into the braking unit, along with up to nine springs (51). The electro-magnet attracts the mobile armature, allowing the rotation of the motor shaft. The springs push the mobile armature against the brake disc, blocking the rotation of the motor shaft.

The three adjustment screws (49) make it possible to adjust the braking torque.

The eight nuts (50) A permit adjustment of the air gap between the brake disc and the brake holder shield.

⚠ If the motor is set up for installation in vertical position, the brake can present some construction variations.



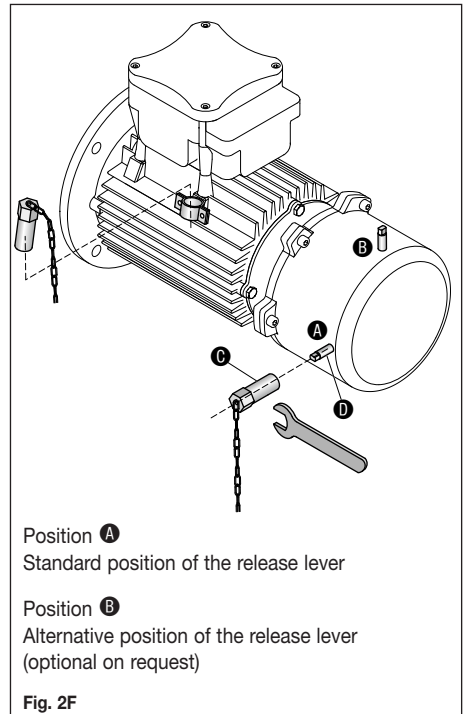
2.5 Manual release 71÷160 (optional on request)

Size 71÷160 motors can be fitted with a manual brake release lever that allows the shaft to rotate even when the power is off.


The hand release lever (D) protrudes from the brake cover enclosure. Use a spanner (C) to rotate the hand release lever clockwise or anticlockwise to free the motor shaft.




⚠ Once the end of the stroke is reached increase the torsion slightly until the motor shaft is released. Do not apply excessive force to the hand release lever.


When the spanner is released the hand release lever automatically returns to its starting position and the brake is applied on the motor.



2.6 Manual release 180÷315 (optional on request)

On request, it is possible to have a manual brake release that allows the shaft to rotate even when the power is off. The release system is fastened to the brake enclosure shield .

Turning the screw  clockwise about 45° releases the motor shaft (figure 2G). Turn in the opposite direction to reset the brake. In non-ventilated motors, the release spanner is not included with the motor (spanners are widely available on the market). If the motor is servo-ventilated (figure 2H), insert the specific release lever (provided with the motor) into the lower part of the slot on the fan cover. Then push towards the Brake Off position . Turn in the opposite direction to reset the brake, Brake On position .

 **Warning:** before restarting the machine, make sure that the brake is in the Brake On position (figure 2H).

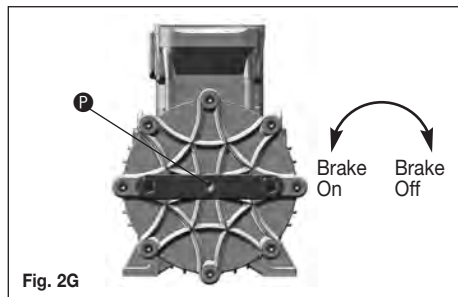


Fig. 2G

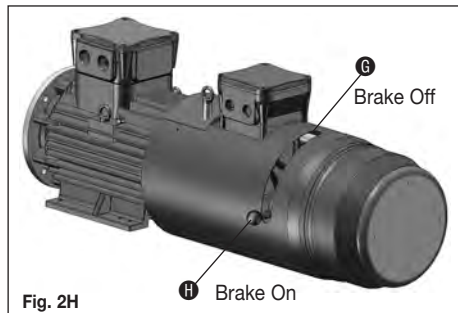


Fig. 2H

3. Installation

3.1 Nameplate (information on the brake)

In addition to information on the motor, the motor's nameplate also shows:

- ① Brake type: Brake model fitted.
- ② Brake voltage: power supply voltage [V] for the brake
- ③ Operation: Maximum number of operating cycles per hour and type of work cycle.
- ④ Power: electrical power absorbed by the brake [VA] for motors 63÷160; [W] for motors 180÷315
- ⑤ Braking torque: Static braking torque [Nm]
- ⑥ Moment of inertia: Maximum moment of inertia for the machine controlled, referred to the motor shaft [kgm²].

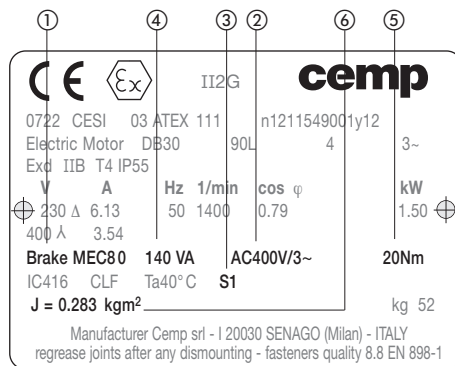


Figure 3A - for motors 63÷160

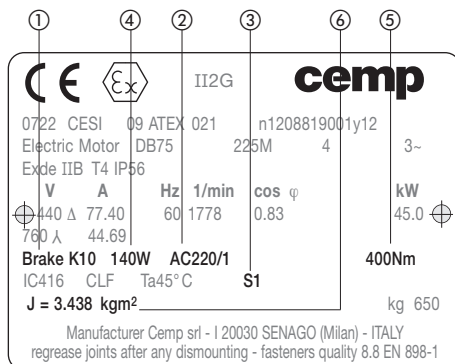




Figure 3B - for motors 180÷315

3.2 Electrical connections

  **Before making the connection check the data shown on the nameplate against that on the connection diagram.**

All electrical connections are to be made by qualified personnel.

Motors from 63 to 160

When making a connection use the diagram supplied with the motor and bear in mind that the brake may be provided for various types of power supply:

- Alternating three-phase power (the voltage may differ from that for the motor). If the voltage of the brake is higher than 420 V, the power supply terminal of the brake is positioned in a separate box.
- DC power.
In the latter case, with direct current electro-magnets, the brake may be powered:
 - Directly via a direct current line.
 - By a single-phase alternating current line via a rectifier in the terminal box (version possible only with Ex-d protection).

Motors from 180 to 315

The braking unit has its own terminal box containing brake terminals and any accessories. Motors with Ex-d type protection have the DC/AC rectifier inside the terminal box, while motors with Ex-de type protection have the rectifier located inside the brake enclosure.


When making a connection use the diagram supplied with the motor and bear in mind that the brake may be provided for various types of power supply:

- Directly via a direct current line.
- by a single-phase alternating current line via a rectifier in the terminal box or in the brake cover enclosure.

3.3 Connection for auxiliary devices

Upon request auxiliary devices can also be fitted on the brake, such as thermal protection devices and anti-condensation heaters.

These auxiliary devices have specific power supply terminals in the terminal box that must be connected as per the diagram supplied with the motor.

 **Adequate precautions must be taken to avoid excess voltages or peak voltages. The cables must not be crushed or exposed to mechanical loading.**



3.4 Manual release (optional on request)

When the motor is fitted with a manual brake release lever it must be installed so as to avoid any accidental activation of the release unit and ensures that it is easy to release when necessary.

The release spanner must not be left on the hand lever when the motor is running.

4. Maintenance

4.1 Introduction


  **Any work on the motor is to be carried out with the machine stopped and disconnected from the power supply.**

Over time the original characteristics of the motor with brake can only be ensured by means of an inspection and maintenance programme prepared and managed by qualified technicians.



The type of maintenance and frequency of checks depends on the ambient and working conditions. Especially wear on the brake disc depends on various factors: load inertia, motor rotation speed, and frequency of engaging.


As a general rule we recommend an initial inspection after about 500 working hours and not later than one year after starting up for the first time. Subsequent inspections must be carried out according to scheduled plans.

In order to work accurately, the motor must be dismantled from the machine and placed on a workbench with all the tools and equipment required to hand.

 **During dismantling and assembly procedures, accident prevention standards and safety information must be complied with rigorously.**

4.2 Dismantling and re-assembling the brake cover enclosure motors 63÷160

For self-ventilated motors (H Series) (fig. 2A) remove the fan cover  by unscrewing the fixing screws and remove the fan .

For motors fitted with a manual brake release (fig. 2F), pull the hand lever  outwards, hold it up and put a pin through the hole.

Unscrew the fixing screws and remove the brake cover enclosure being careful not to damage the flameproof joints.

Having completed the inspection or maintenance, before closing the brake cover enclosure:

- Make sure that the air gap is set correctly (see paragraph 4.4).
- Reinstall the original layer of grease (e.g. Molyduval Bariplex grease) on the flameproof joints.



- Check that the friction surfaces (brake disc, brake holder shield, and mobile armature) are clean and free from oil or grease.

4.3 Adjusting the braking torque motors 63÷160



The motor is supplied with a ready-to-use calibrated brake. Customers with special application needs can ask for a customised calibration setting. The braking torque is shown on the motor's nameplate.


The braking torque can be adjusted to suit working needs. In this case, we suggest avoiding values that are too high as these could prevent normal opening of the brake, or values that are too low as these could cause the brake to slip.

Reducing the braking torque to below the maximum value, under certain load conditions, will result in a reduced wear of the brake's friction material.

For size 71÷160 motors (fig. 2C) the brake torque is adjusted by turning the nuts  to change distance . When these are turned anticlockwise the braking torque is reduced.

For size 63 motors, it is not possible to adjust the braking torque. The reference value of the braking torque is shown in table 4A.

 **In order to obtain even braking torque settings length  must be the same for all the springs.**

The table below shows the braking torque values in relation to distance .

These torque values are subject to a tolerance of -20% compared to the values shown in the table.

Table 4A - Adjusting the braking torque

Frame size	Brake type	A ₀ [mm]	Braking torque [Nm] for A =						
			A ₀	A ₀ +1mm	A ₀ +2mm	A ₀ +3mm	A ₀ +4mm	A ₀ +5mm	A ₀ +6mm
63	AC1	0	4,5	---	---	---	---	---	---
71	MEC 63	14	9,0	6,0	3,0	---	---	---	---
80	T80	12	17,0	13,5	10,0	6,5	---	---	---
90	MEC80	18	35,0	32,0	29,5	27,0	24,0	21,5	18,5
100	MEC90(♦)	17	48,0	42,0	36,0	30,0	24,0	18,0	12,0
112	MEC100(♦)	20	70,0	57,0	44,5	32,0	19,0	---	---
132	MEC112(♦)	23	90,0	77,0	63,0	49,0	35,5	21,5	---
160	T140(♦)	23	130,0	110,0	90,0	70,0	55,0	35,0	---

A₀ = distance for the standard braking torque value

(♦) = 2 braking disks available on request

4.4 Adjusting the air gap motors 63÷160

The recommended air gap, with a tolerance of $\pm 0,05$ mm is shown in table 4B.

The air gap V (fig. 2C and 2D) is the gap between the faces of the electro-magnet and the mobile armature, when the brake is not powered (motor brake on). This value must be adjusted when, due to wear on the brake disc friction material, the air gap increases beyond the values shown in table 4B, affecting the brake's performance.

The maximum acceptable air gap under maximum torque conditions is 0,7 mm.

Table 4B - Recommended air gap

Frame size	Brake type	Air gap [mm]
63	AC1	0,2
71	MEC 63	0,3
80	T80	0,3
90	MEC80	0,3
100	MEC90	0,3
112	MEC100	0,3
132	MEC112	0,5
160	T140	0,3

For size 71÷160 motors (fig. 2C) the air gap is adjusted by turning the nuts A and B to move the electro-magnet to the original gap from the mobile armature.

For size 63 motors (fig. 2D) the air gap is adjusted by turning the fixing screws A after having slackened the adjustment nuts A . Once the required gap has been set, the adjustment nuts must be tightened against the single unit.

Before carrying out this operation make sure that the brake casing has not overheated.

⚠ Failure to adjust the air gap may result in the brake not opening properly, which in turn results in the motor and the brake heating up.

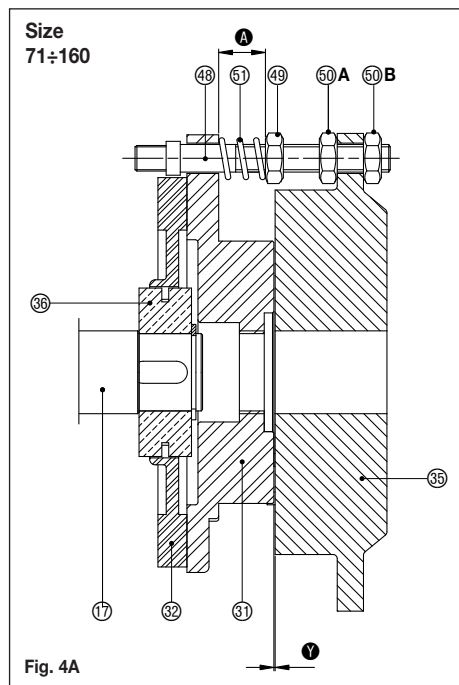
For motors with a manual release, if the air gap exceeds the maximum value, rotating the release spanner may not be sufficient to adequately release the brake.

4.5 Changing the brake disc motors 63÷160

The brake disc must be changed when 1,5 mm of friction material has worn off each side (total wear 3 mm). This corresponds to an overall thickness of the brake disc of about 7 mm for sizes 71÷100, 8 mm for sizes 112÷160, and about 4 mm for size 63.

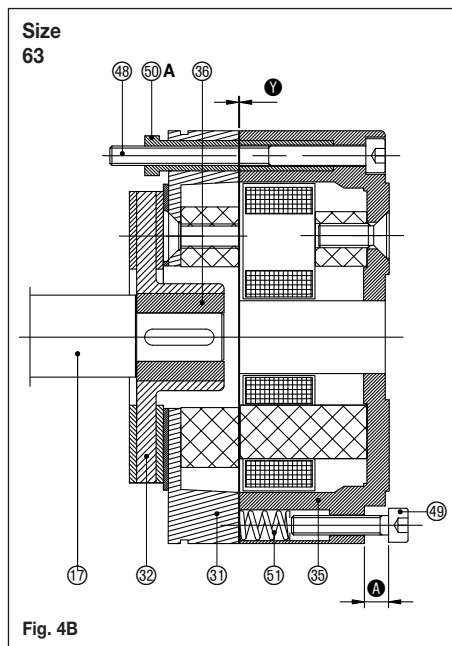
For the 71÷160 range of motors (fig. 4A), proceed as follows:

- Unscrew the first set of nuts **50B** and remove the electro-magnet being careful not to damage the power supply cables for the brake. Unscrew the second set of nuts **50A**, the adjustment nuts **49** and remove the springs. Remove the mobile armature and pull the brake disc off the toothed hub. Replace the brake disc and reassemble the parts removed previously, being careful to set the braking torque (see 4.3) and the air gap (see 4.4).



For size 63 motors (fig. 4B), proceed as follows:

- Unscrew the fixing screws **48** and remove the single unit being careful not to damage the power supply cable for the brake. Pull the brake disc off the toothed hub. Replace the brake disc and reassemble the parts removed previously, being careful to set the braking torque (see 4.3) and the air gap (see 4.4).



4.6 Adjusting the braking torque and replacing the braking unit and/or its parts for motors 180÷315

To replace the braking unit or one of its parts (electro-magnet 35, mobile armature 31, brake disc 32, springs 51, it is necessary to remove both the brake enclosure shield 38 and the brake cover enclosure 39.

A) Disassembly of the brake enclosure shield 38

Remove the eight screws and remove the brake enclosure shield taking care not to damage the coupling joints.

B) Disassembly of the brake cover enclosure 39

Disconnect the two power wires to the electro-magnet, remove the eight screws that hold the brake cover enclosure 39 to the brake holder shield 29 and remove the brake cover enclosure, taking care not to damage the coupling joints.

C) Replacement of the complete braking unit

Disassemble the brake enclosure shield and the brake cover enclosure, disconnect the two power wires to the electro-magnet, remove the rectifier (only in motors with Ex-de type protection), unscrew the eight fixing screws (studs) 48 and remove the braking unit.

Follow the directions in reverse order to mount the new braking unit. When the brake holder shield 29 is in place, adjust the air gap with the eight screws (nuts) 50A.

D) Replacement of the electro-magnet 35

Disassemble the brake enclosure shield and the brake cover enclosure, disconnect the two power wires to the electro-magnet, remove the rectifier (only in motors with Ex-de type protection), unscrew the eight fixing screws of the brake 48 and remove the electro-magnet 35.

Follow the directions in reverse order to mount the new electro-magnet. When the braking unit is fastened to the brake holder shield, adjust the air gap with the eight screws 50A.

E) Replacement of the brake disc 32, the mobile armature 31, the springs 51

Follow the directions given above to disassemble the brake enclosure shield, the brake cover enclosure, the electro-magnet and the DC/AC rectifier (if present). Remove the component(s) to be replaced.

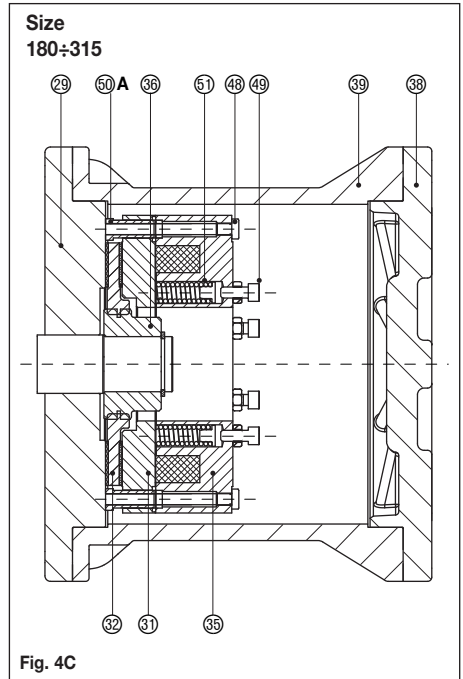


Fig. 4C

Follow the directions in reverse order to mount the new component, and then the electro-magnet, being careful to reconnect the electrical wiring correctly. When the braking unit is fastened to the brake holder shield, adjust the air gap with the eight screws (nuts) 50A.

F) Replacement of the encoder and/or micro-switch (optional - figure 4D)

If the electric motor is fitted with an encoder and a micro-switch to signal whether the brake is open or closed, these parts are installed inside the brake cover enclosure.

f1) To replace the encoder N, first remove the eight screws and the brake enclosure shield 38 taking care not to damage the coupling joints.

Disconnect the encoder's power wires (normally 9 wires) from the terminal box M inside the brake enclosure.

Remove the fixing screw between the encoder and its anti-rotation plate L.

Loosen the encoder fixing screw on the motor shaft and remove it manually.

Follow the directions in reverse order to reassemble the piece.

- f2) To replace the microswitch ①, first remove the eight screws and the brake enclosure shield ⑳ taking care not to damage the coupling joints. Then, disconnect the brake power cables (marked BA1, BA2) and the micro-switch power cables (marked BM1, BM2) from the terminal box ㉓. If present, remove the encoder (see F1). Then disassemble the brake cover enclosure ㉑ and the micro-switch ① that is set on the external circumference of the electro-magnet.
- Follow the directions in reverse order to connect the micro-switch, the brake and the encoder, if present.

G) Final reassembly

Remount the brake cover enclosure and the brake cover with the relative fixing screws, taking care to grease the coupling joints lightly beforehand.

⚠ Proper functioning of the brake can only be guaranteed if original spare parts are used.

4.7 Adjusting the air gap motors 180÷315

The air gap must be regulated at 0.3-0.4 mm.

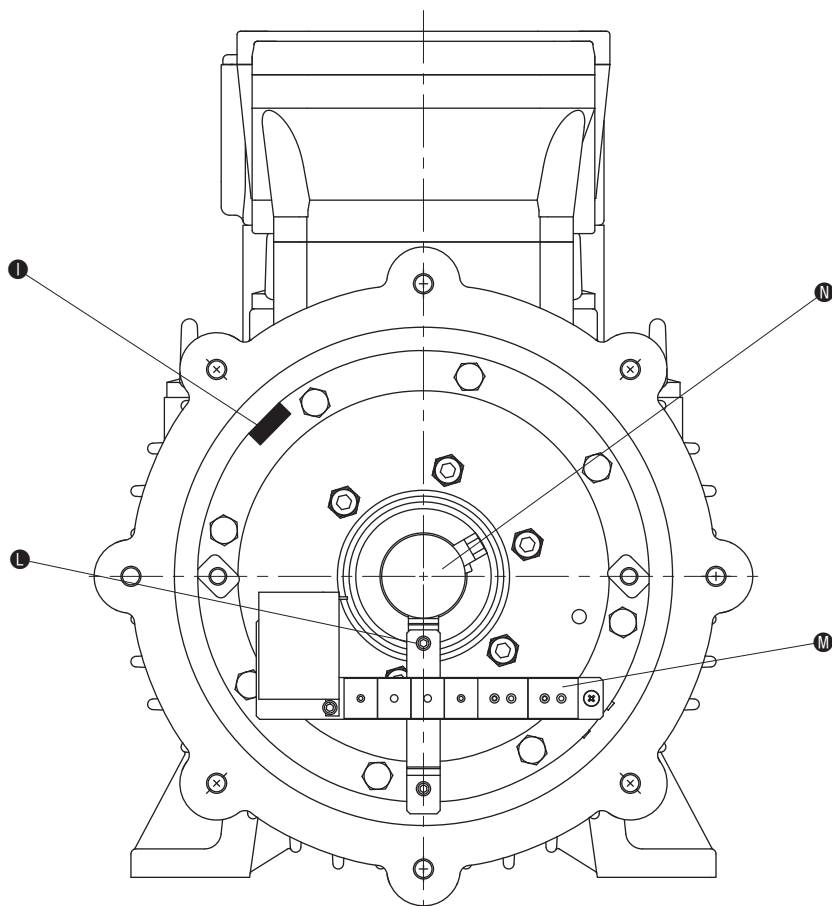


Fig. 4D

5. Troubleshooting

Fault	Possible causes	Solution
The brake does not release	Air gap too big (wear)	Check the air gap. Replace the brake disc if necessary
	No power to the brake	Check electrical connection
	Low power supply voltage for the brake	Check power supply voltage
	Brake disc stuck mechanically	Remove mechanical blockage
	Rectifier damaged (when fitted)	Check rectifier and change if necessary
	Electro-magnet defective	Check electro-magnet and change if necessary
	Brake overheated (if heat sensors are fitted)	Cool brake, check braking torque, and replace any worn parts (disc)
The brake has a delayed action	Power supply voltage high	Check power supply voltage
The brake releases after a delay	Air gap too big (wear)	Check air gap. Replace the brake disc if necessary
	Low power supply voltage for the brake	Check power supply voltage
The brake does not stop the motor	Residual activation voltage too high (when a rectifier is fitted)	Check residual voltage
	Brake disc stuck mechanically	Remove mechanical blockage
	Braking torque too low	See below
Braking torque too low	Springs incorrectly tensioned	Adjust the springs according to table 4A or point 4.6
	Air gap too big	Check the air gap against table 4B or point 4.7. Replace the brake disc if necessary
	Oil or grease on the brake disc surface	Clean dirty parts
	Springs broken	Replace the springs or the brake

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Flameproof
Motors

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