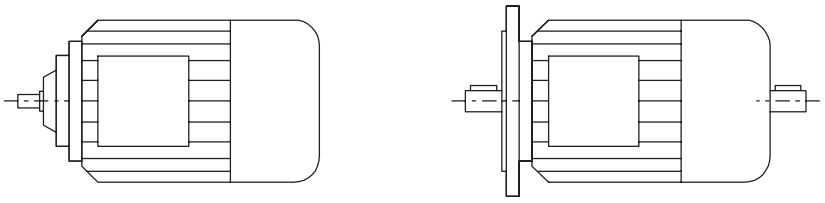
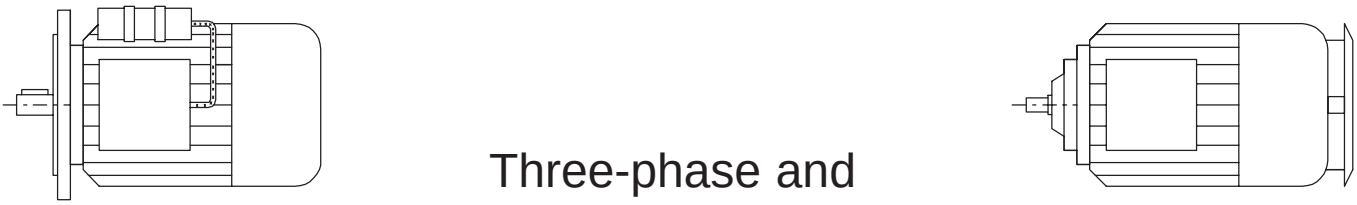
Operating Instructions

BA 2310 EN 05.04



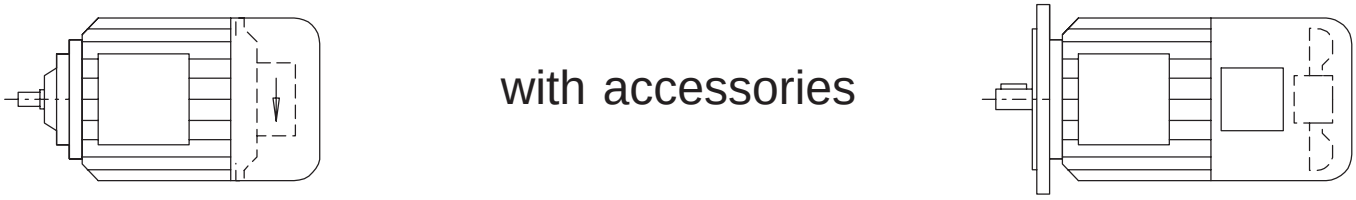


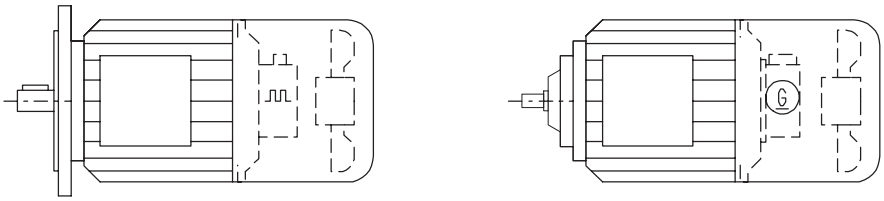
Three-phase and

Single-phase alternating current motor

and brake motors

with accessories





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Contents

1. Important instructions

1.1 Instruction symbols in the operating instructions

Instructions relating to operating safety are emphasized as follows:

Danger.
Possible consequences: Death or very severe injuries.

Caution.
Possible consequences: Damage to the drive and the environment.

Note.
Pointers for application and useful information.

1.2 General instructions

These operating instructions are an integral part of the motor delivery.

These operating instructions apply to the standard version of the motors up to size 200 for the **MOTOX®-N** gear-unit series.

Note.
Special types of motors and their additional equipment are governed by these operating instructions, the special contractual agreements and technical documents. Observe further operating instructions supplied for gear units, couplings, additional fittings, etc.

Note.
We accept no responsibility for damage or disruption resulting from disregard of these operating instructions.

Keep these operating instructions in the vicinity of the motor.

Read these operating instructions before working with the drive.

Only a precise knowledge of these operating instructions will guarantee reliable, faultfree operation of the drive by avoiding operating errors and improper use.

The drives described in these Instructions reflect the state of technical development at the time these instructions went to print.

In the interest of technical progress we reserve the right to make changes to the individual assemblies and accessories which we regard as necessary to preserve their essential characteristics and improve the efficiency and safety of the drive.

Amendments or additions to these operating instructions may be made only by us; otherwise any guarantee claim against us will lapse.

Technical enquiries should be addressed to the following works

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or to one of our customer-services. The addresses of the customer-services are given in section 12. “Stocking spare parts and customer service addresses“.

1.3 Amendments

These operating instruction replace the operating instructions BA M295.

2. Safety instructions

2.1 Intended use

The low-voltage machines described in these operating instructions have been developed for stationary use in general engineering applications. Unless otherwise agreed, the drives have been designed for use in plant and equipment in industral environments.

They comply with the harmonised standards of the EN 60034 (VDE 0530) series. Use in an explosive environment is prohibited.

The drives have been manufactured in accordance with the state of the art and are delivered in a condition for safe and reliable use. Any changes on the part of the user which may affect safety and reliability are prohibited.

The drives are designed only for the application described in section 3. “Technical data“. They must not be operated outside the specified power limits. Other operating conditions must be contractually agreed.

Protection types $\leq$ P54 must not be used out of doors. Air-cooled versions are designed for ambient temperatures of –20 °C to +40 °C and installation altitudes of $\leq$ 1 000 m above mean sea level. Please note deviating specifications on the rating plate. The conditions at the place of use must comply with all the specifications on the rating plate.

Note.
Low-voltage machines are components for installation in machines as defined in the 98/37/EC machinery guideline. Start-up is not permitted until it has been ascertained that the end product complies with this guideline.

2.2 General safety instructions

Low-voltage machines have dangerous, live and rotating parts and possibly hot surfaces.
Incorrect behaviour may cause damage and personal injury.

The drives must be installed, started up, operated, maintained and, if necessary, repaired only by authorised, properly trained and qualified personnel. For definition of expert staff, refer to i.a. IEC 364, EN 50110-1/VDE 0105.

The operator must ensure that all persons involved in installation, operation, maintenance and repair have read and understood these operating instructions and comply with them at all times in order to:

- avoid injury or damage
- ensure the safety and reliability of the drive
- avoid disruptions and environmental damage through incorrect use.

Carry out work on the drives only when they are at a standstill.
Secure the drive units against unintentional starting (e.g. lock key switches or remove fuses in the power supply).
A notice should be attached to the start switch stating clearly that work on the drives is in progress.

Carry out all work with great care and with due regard to safety.

Always observe the instructions on the plates on the drives. The plates must be kept free from paint and dirt at all times. Replace any missing plates.

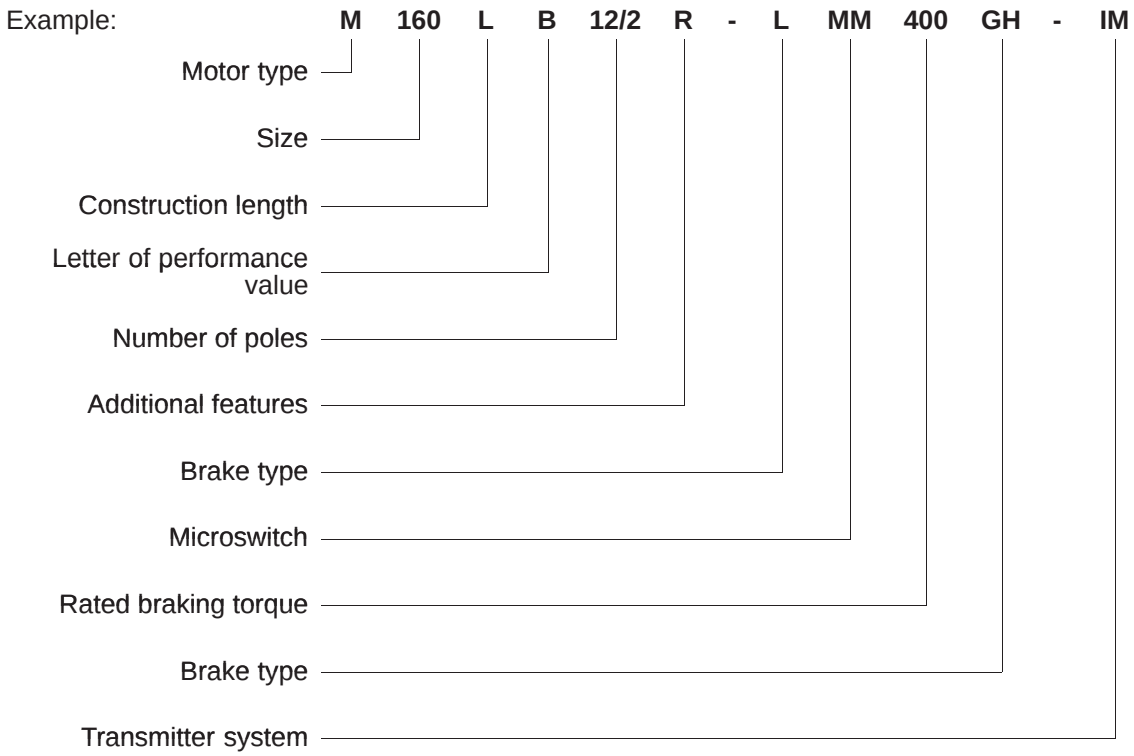
Ensure compliance with the relevant safety and environmental regulations during transport, assembly and dismantling, operation, and care and maintenance of the unit.

Secure rotating drive parts, e.g. couplings, gears or belt drives, against contact by means of suitable safety devices.

When installing the drives in plant or equipment, the manufacturer of such plant or equipment must ensure that the contents of the present operating instructions are incorporated in his own instructions, information and descriptions.

3. Technical data

3.1 Type designations



Motor type

A Three-phase motor, A-series
AB Single-phase motor, A-series, with phase-shifting capacitor
AK Single-phase motor, A-series, with phase-shifting capacitor, starting capacitor and starting relay
G Three-phase motor, G-series
GB Single-phase motor, G-series, with phase-shifting capacitor
GK Single-phase motor, G-series, with phase-shifting capacitor, starting capacitor and starting relay
M Three-phase motor, M1- and M2-series
M Three-phase motor, MODULOG-series
MB Single-phase motor, M1- and M2-series, with phase-shifting capacitor
MI Three-phase motor, IEC MODULOG-series
MK Single-phase motor, M1- and M2-series, with phase-shifting capacitor, starting capacitor and starting relay
Q Three-phase motor, special version
QB Single-phase motor, special version, with phase-shifting capacitor
QK Single-phase motor, special version, with phase-shifting capacitor, starting capacitor and starting relay
R Three-phase motor, R-series
RB Single-phase motor, R-series, with phase-shifting capacitor
RK Single-phase motor, R-series, with phase-shifting capacitor, starting capacitor and starting relay

Size
1
2
56
63
71
80
90S/L
100L
112M
132S/M
160M/L
180M/L
200L

Construction length
S short construction length
M medium construction length
L long construction length

Letter of performance value
A
B
C
D
E
F
G
H
I
K
L
P

Number of poles
2 2-pole
4 4-pole
6 6-pole
8 8-pole
4/2 4/2-pole
6/2 6/2-pole
6/4 6/4-pole
8/2 8/2-pole
8/4 8/4-pole
8/6 8/6-pole
12/2 12/2-pole

Additional features
E Efficiency class EFF1
F Forced ventilation
H Low noise level
I Flywheel ventilator
Q Modified rotor
R Silumine rotor
U Not ventilated
W Protective cover
X Backstop

Brake type
A Working-current-operated
B Direct current, closed-current-operated, B-Type
D Three-phase current
E Alternating current
F Direct current, closed-current-operated, F-Type
G Direct current, closed-current-operated, G-Type
L Direct current, closed-current-operated, L-Type
P Direct current, closed-current-operated, P-Type
T Direct current, Tandem

Microswitch
M one microswitch for monitoring the air gap or wear
MM one microswitch for monitoring the air gap and one for monitoring wear

Rated braking torque
A-Type 30; 60; 120; 240; 480
B-Type 7,5; 15; 35; 75
D-Type 7,5; 15; 35; 75
E-Type 1
G-Type 7,5; 15; 35; 75
L-Type 4; 8; 16; 32; 60; 80; 150; 240; 360
P-Type 4; 8; 16
T-Type 8/8; 16/16; 28/28; 50/50; 100/100; 150/150; 250/250; 400/400

Brake type
G enclosed
GH enclosed with manual lifting
N Standard version
NH Standard design with manual lifting

Transmitter system
IM Pulse generator
IN Incremental transmitter
RE Resolver
TA Tachogenerator

3.2 General technical data

The most important technical data are shown on the rating plate of the gear units of gear motors. These data together with the contractual agreements on the drive units determine the limits of its proper use.

In the case of gear motors a rating plate attached to the motor serves for the entire drive.

In certain cases separate rating plates are attached to the gear unit and the motor.

Examples: Rating plate - gear motor

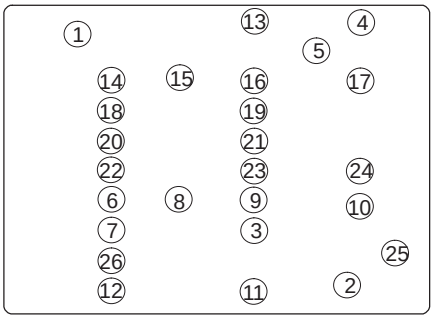


Figure 3.2: Rating plate

1 Company logo
2 Manufacturing date encoded
3 Weight m [kg]
4 Order no. / seq. no.
5 Model - Type - Size
6 Mounting position
7 Speed n_2 [min^{-1}]
8 Type of oil
9 Oil viscosity
ISO VG class to DIN 51519 / ISO 3448
10 Oil quantity [l] Main gear unit /
ancillary transmission+extruder flange
11 Free space for additional data
12 max. ambient temperature TU_{max} [°C]
13 Phase number and type of current of the motor
14 Switch symbols to
DIN EN 60617 T6 / IEC 617-6
15 Rating voltage U [V]
16 Rating current I [A]
17 Rating frequency f [Hz]
18 Rating speed n [min^{-1}]
19 Rating performance P [kW]
20 Operating mode (if ≠ S1)
21 Performance factor cos φ
24 Type of protection to IEC 60034-5 or IEC 529
23 Heat class Th. Cl.
24 applied standard
25 CE-marking or other marking, if any
26 Brake data

For further technical data, please refer to the drawings in the documentation.

3.3 Weights

The weight of the overall drive including motor is indicated on the rating plate of the gear unit or gear motor, if it exceeds 30 kg; in each case it is shown in the delivery documents.

Where there are several rating plates on one drive, the specification on the main gear unit is decisive.

The weight specification refers only to the condition on delivery of the products.

4. Technical description

4.1 General description

Assembly option to EN 60034-7.

Add-on dimensions with surface cooling up to size 200L to

- to Works standard of **FLENDER TÜBINGEN GMBH** in the modular system

- to IEC 60072 for the assembly options $_{IM}$ B5 and $_{IM}$ B14.

Connection drawings to DIN VDE 0530-8, IEC 60034-8.

Type of protection to EN 60034-5.

Type of cooling to EN 60034-6. IC 411 surface cooling.

For details of the design of the motors, please refer to the relevant catalogues.

4.2 Shaft bearing

The motors are fitted with grease-lubricated rolling bearings. The bearings on standard-design surface-cooled motors up to size 200 are life-lubricated.For normal coolant temperatures the bearings are filled at the factory with grease which under normal operating conditions need not be renewed for several years.

4.3 Surface cooling

Layout for rib-cooling, where an external ventilator draws in cooling air through holes in the ventilator cover and expels it over the surface of the stator housing.

4.4 Motor housing

The stator housing and the bearing end plates are of aluminium alloy or grey cast iron, depending on the size. The ventilator cover is made from steel sheet. Stator housing surface with cooling ribs and add-on terminal box.

4.5 Stator winding

The stator winding is designed in heat class (see rating plate) to EN 60034-1. High-quality varnished wires, suitable surface insulation materials and the type of impregnation guarantee high mechanical and electrical strength, combined with a high utility value and long service life.

If required, the winding heads are cast with silicon rubber. Particular advantages are offered by the use of sealing in combination with heat classes F and H, if motors are used in especially difficult starting and braking conditions. The sealing also enables a higher mechanical resistance to short-circuiting of the winding and the motor (in the case of surface cooling) to be protected internally against condensation.

4.6 Rotor

On the smaller motors the rotor has a squirrel cage of die-cast aluminium, on the larger ones and for operation in special starting and braking conditions a cage in hard-soldered construction. The rotor is dynamically balanced.
The balancing condition is specified in the parallel keyway.
The motors in standard design comply with vibration severity level N to DIN VDE 0530-14 / IEC 60034-14, in special cases level R (reduced) or S (special).

4.7 Terminal boxes

Provided in motor terminal box are, if required, additional connection terminals for monitoring equipment as well as the motor connection terminals (terminal board, terminal block, etc.).

On special request an additional terminal box is added to the larger motors.

The number of available terminals is shown on the circuit diagrams located in the terminal box.

4.8 Monitoring equipment (special version)

Monitoring equipment is provided only on special request.

The technical data are shown on the circuit diagrams, the rating plates or documents relating specifically to the order.

4.9 Rating plates

The rating plates of the gear motors are normally of coated aluminium foil. They are covered with a special masking film which guarantees permanent resistance to UV radiation and media of all kinds (oils, greases, salt water, cleaning agents, etc.).

The adhesives and materials are selected to ensure extremely firm adhesion and permanent high legibility, even at the limits of the range of operating temperatures (–40 °C ... +155 °C).

The edges of the rating plates are coated with a matching special paint, see section 4.10 “Paint coats“.

In special cases, i.e. special specifications, riveted or bolted metal plates are used.

4.10 Paint coats

4.10.1 General

All paint finishes are sprayed on.

Note.
Information on repaintability is not a guarantee of the quality of the paint material supplied by your supplier.
Only the paint manufacturer is liable for the quality and compatibility.

4.10.2 Painted version

Paint system	Plastic	2K-PUR	2K-epoxide
Colours	RAL 1007, 1012, 1023, 2000, 2004, 3000, 5007, 5009, 5010, 5012, 5015, 6011, 7001, 7011, 7030, 7032, 7035, 9005, 9006, black-mat	RAL 1003, 1018, 2004, 5002, 5015, 6011, 7000, 7031, 9010, 9011, 9016	RAL 5015, 6018, 7031, 7035
Typical area of application	Standard-1-layer paint finish for interior areas	Standard 2-layer paint finish, especially for outside installation or higher corrosion protection requirements	high-quality paint finish in the outside area or where exposed to dilute acid and alkaline solution (≤ 5 %)
Repaintability	after prior rubbing down with: Plastic or synthetic resin paint	after prior rubbing down with: 2K-PUR paint, 2K-epoxide paint	after prior rubbing down with: 2K-PUR paint, 2K-epoxide paint, 2K-AC paint
Chem. phys. resistance	good resistance to: cleaning agent, oil and petrol; resistant to: exposure to dilute acid and alkaline solution for a short time (≤ 3 %); not solvent-resistant; not steam-resistant	very good resistance to: oil, grease, petrol, water, seawater and cleaning agent; good resistance to: weather action and dilute acid and alkaline solution (≤ 3 %); good mechanical resistance to: abrasion	excellent resistance to: weak acid and alkaline solution (≤ 5 %), oil, grease, petrol, cooling emulsion, salt, solvent; tough and scratchproof paint film
Temperature resistance	–40 °C ... +100 °C temporarily up to 140 °C	–40 °C ... +150 °C	–40 °C ... +150 °C
Remark	Standard paint finish with very good adhesive property, not suitable for: storage or installation outside	Standard paint finish for cooling tower and agitator drives or, if requested, resistance to sea water below deck, etc.	2K-epoxide paint becomes chalky when installed outside (without effect on quality), high gloss with good mechanical resistance

Table 4.10.2: Painted version

4.10.3 Primed version

Paint system	primed	unpainted
Standard colour	RAL 7032	-
Typical area of application	for repainting*): adhesion promoter for all common paint systems, temporary corrosion prevention	for repainting*): temporary corrosion prevention
Repaintability	very good with: plastic paint, synthetic resin paint, 2K-PUR paint, 2K-epoxide paint, SH paint, 2K-AC paint	very good with: Plastic paint, synthetic resin paint, oil paint, bitumen paint, 2K-PUR paint, 2K-epoxide paint
Chem. phys. resistance	good resistance to: cleaning agent, good salt-spray resistance; resistant to: oil and petrol	-
Temperature resistance	–40 °C ... +150 °C	(–40 °C ... +150 °C)
Remark	Adhesion promoter with very good adhesive property and good corrosion prevention	GCI parts, dip-primed, steel parts primed or galvanised, aluminium and plastic parts untreated

Table 4.10.3: Primed version

*) On drive versions which are primed or unpainted the rating plate and the masking film are covered with a paint-protective film, see section 4.9 “Rating plates”. It enables repainting without further preparation, e.g. masking with adhesive tape.

Peel off paint-protective film

The paint coat must have fully hardened before the paint-protective film is peeled off (be at least ”touch-proof”).

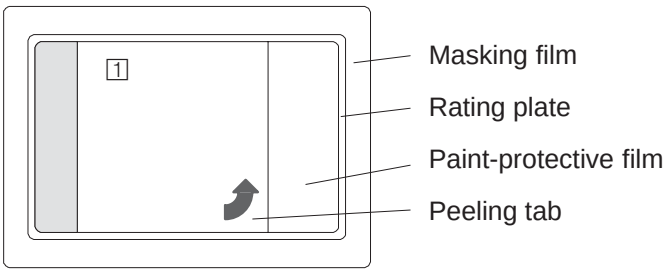


Figure 4.10.3: Peel off paint-protective film

1 Company Logo

1) Pull peeling tab up.

2) Carefully peel the paint-protective film off diagonally from one corner (not parallel to the plate).

3) If necessary, blow paint fragments away or wipe them off with a clean cloth.

5. Incoming goods, Handling and Storage

5.1 Incoming goods

Note.
Inspect the delivery immediately after arrival for completeness and any transport damage.
Notify the freight company of any damage caused during transport immediately, as otherwise it is not possible to have damage rectified free of charge.

Caution.
Ensure that damaged drives are not put into operation.

The drive unit is delivered in the fully assembled condition. Additional items are delivered separately packaged.

The products supplied are listed in the despatch papers.

5.2 Handling

Different forms of packaging may be used, depending on the size of the drive and method of transport. Unless otherwise agreed, the packaging complies with the **HPE Packaging Guidelines** (Bundesverband Holzpackmittel Paletten Exportverpackungen e.V.).

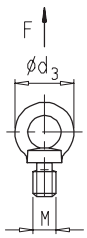
Note the symbols applied to the packing. These have the following meanings:

This way up | Fragile | Keep dry | Keep cool | Centre of gravity | Use no hand hook | Attach here

Figure 5.2–1: Symbols on packaging

Fasten drive for suspended transport

Danger.
Adhere to the maximum load in direction F of the transport eyes and eye bolt axis, see figure and table 5.2–2 “Max. load in kg from drive to be attached“.
Use eye bolt on motor only for transporting the unmounted or demounted motor or as auxiliary support for the drive, e.g. to achieve a horizontal mounting position.
If necessary, use additional, suitable carrying means for transport or on installation.
When attaching by a number of chains and ropes just two strands must be sufficient to bear the entire load. Secure carrying means against slipping.



d_3 [mm]	**36**	**45**	**54**	**63**	**72**	**90**	**108**
M	**M 8**	**M 10**	**M 12**	**M 16**	**M 20**	**M 24**	**M 30**
m [kg]	140	230	340	700	1200	1800	3600

Figure and Table 5.2–2: Max. load in kg from drive to be attached, with pull ↑ in direction F of the bolt axis.

Caution.
Do not use the front threads at the shaft ends to attach eye bolts for transport.

Caution.
The use of force causes damage to the drive unit.
Transport drive carefully. Avoid knocks.
Remove any transport fixtures fitted before putting into operation and keep them safe or render them ineffective. Use them again for further transport or render them ineffective again.

1) Mount the drive on the transport device by the heaviest permissible weight to be attached. This will normally be on the main gear unit.
2) Check that the eye bolt is firmly seated.
3) Drive is slung for transport.

Securing bearings on motors with cylindrical roller bearing

Caution.
The rotor of the motor is blocked to prevent bearing damage through shaking while stationary
- by means of interlock screws marked red in the bearing cover
- or by means of a transport fastening fixed to the shaft end.
Before attaching the motor unscrew the locking screws 10 mm and secure or remove the transport fastening (see information plate on the motor).
Afterwards it must be possible to turn the shaft by hand.

1) Do not release the lock until the drive element has been fitted.
2) Use the transport fastening for further transport.

Caution.
Prevent faults and so avoid personal injury and material damage.
The person responsible for the system must ensure that
- safety instructions and operating instructions are available and are adhered to,
- operating conditions and technical data are observed in accordance with the order,
- safety equipment is used, and
- prescribed maintenance work is carried out.

5.3 Storage

The gear unit must be stored in its position of use on a horizontal wooden support in a dry place not subject to high temperature fluctuations and covered over.

Danger.
Do not stack drive units one on top of another.

Caution.
The correct IP protection type (e.g. IP55) to prevent ingress of water and foreign bodies is available only in the finally assembled and electrically connected condition. The threads of the cable screw connection or the sealing plugs must be correctly sealed.

Caution.
Possible bearing damage due to shaking while stationary.
The storage place must be free from vibration and shaking.

Caution.
Mechanical damage (scratches), chemical damage (acids, alkalis) and thermal damage (sparks, welding beads, heat) cause corrosion which may cause failure of the external protective coating.
Ensure that the paint is not damaged.

Note.
The guarantee period for the standard preservative lasts 6 months and, unless otherwise agreed, begins at the date of delivery of the gear unit.
In the case of longer periods of storage (> 6 months) special arrangements must be made for preservation. Contact the **FLENDER TÜBINGEN GMBH** customer service.

5.3.1 Storage up to 2 years

Storage

Store the motors in a dry, dustfree and temperature-controlled room. Special packing is then not necessary. In all other cases pack the motors in plastic film with moisture-absorbent material (e.g. Branogel) or in airtight welded film. Provide protective cover against sun and rain.

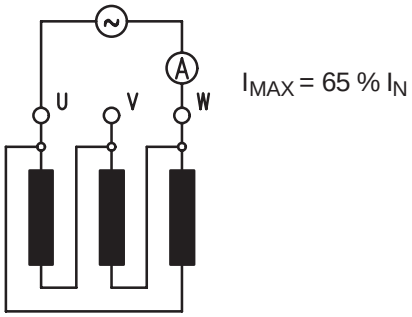
Motors with rolling bearings are fitted with a bearing lock for transport. This must be left locked until start-up or refitted after an inspection or test run. A lock is not required and not fitted, if the bearings are axially pretensioned.

The rolling bearings must be greased with special grease (e.g. Staburags NBU 8 EP) because of the long period of disuse.

Start-up

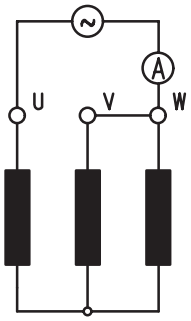
Have the phase-to-phase and phase-to-ground insulation resistance of the winding measured by qualified personnel before starting up the motor. Moist windings may produce leakage current, flashover and disruptive discharge. In the case of values of $\leq$ 1.5 MΩ dry the winding at a winding temperature of 20 °C. Drying may be achieved by putting a single-phase alternating current through the winding. Adjust the voltage so that the heating current does not exceed the values recommended in accordance with the diagram 5.3.1 "Δ circuit and Y circuit". The temperature should rise to about 80 °C and act over several hours. Drying may also be done in a drying oven.

Recommended heating circuits and maximum heating currents:



I_{MAX} = 65 % I_N

Δ-Schaltung



I_{MAX} = 75 % I_N

Y-Schaltung

Figure 5.3.1: Δ circuit and Y circuit

Where motors have bearing locks, release these before operating.

Rolling bearings, lubrication

With correct storage for a long period it may be assumed that the lubricating grease in the bearings will not start to deteriorate for 2 years. Motors with life lubrication may be put into operation after checking the insulation resistance of the winding and after a short test run.

On motors of heat class F use for normal ambient temperature a lithium-saponified rolling bearing grease with a drip point of at least 180 °C.

On motors of heat class H and on special motors use a suitable special lubricating grease.

On motors with relubricating equipment, as a precaution, relubricate both bearings shortly after start-up and with the motor running.

The type and quantity of grease and the relubricating period in the case of relubricating equipment are stamped on an additional plate on the motor.

The grease service life values with relubricating period are reliable for motors of protection type IP55. The bearings must also be protected here against the ingress of fine dust and water from all directions, e.g. in the case of outdoor installation without additional protection.

For motors of protection type IP54 these values apply with the restriction that the environmental damage from dust and water does not exceed the specification in DIN IEC 60034-5 with an inspection to DIN IEC 60034-5.

Note.
In addition to the storage regulations all the specifications in these operating instructions must be observed. Only if all the above mentioned points are observed can the manufacturer's guarantee remain valid.

5.3.2 Storage under special conditions

If the motors are to be stored under the following conditions

- Storage less than 2 years
- Storage outside
- Storage up to –50 °C
- Storage with machine
- Storage under special conditions

please request special storage specifications ("ELV") through our customer service see section 12. "Stocking spare parts and customer service addresses".

6. Installation

6.1 General information on installation

Caution.
Overheating of the drives through exposure to direct sunlight.
Provide suitable safety equipment, such as covers and roofs.

Caution.
Destruction of the bearings through welding.
Do not carry out any welding work on the drive. The drives must not be used as an earthing point for welding operations.

Note.
Use headless bolts of strength class 8.8 or higher to fasten the drives.

Exercise particular care when assembling and installing. The manufacturer cannot be held liable for damage caused by incorrect assembly and installation.

Ensure that there is sufficient space around the drive for assembly, maintenance and repair.

On drives with a fan leave sufficient free space for the entry of air.

Provide sufficient lifting gear at the start of assembly and fitting work.

Use all the fastening means which have been assigned to the relevant assembly option.

6.2 Place and conditions of installation

Note.
The maximum permissible coolant temperature (room temperature at the place of installation) to EN 60034-1 / IEC 60034-1 is 40 °C, the permissible installation altitude up to 1000 m above mean sea level (for other values, see rating plate).
Ensure that the cooling air can flow freely into the air inlets and out of the air outlets and cannot be immediately drawn in again. Protect intake and output holes against blockage and coarse dust.

Manufacture any necessary pipe connections required. Assembly options with the shaft end pointing upwards must be provided with a cover to prevent foreign bodies from falling into the ventilator. The ventilation must not be obstructed and the expelled air - including that of units close by - not be immediately drawn in again.

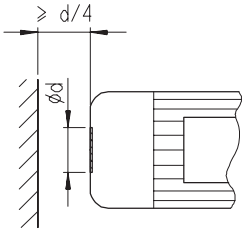


Figure 6.2: Ventilation

6.3 Condensation drain holes

Note.
When installing surface-cooled motors of size 200 note that the condensation drain holes are located at the lowest point.

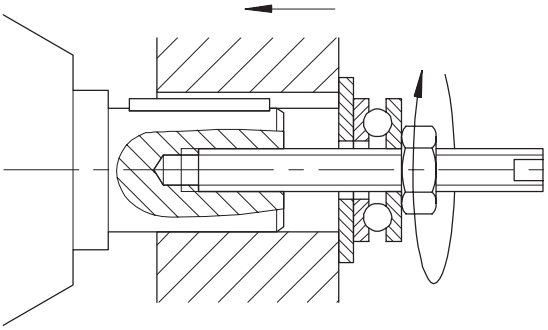
6.4 Drives with foot mounting

Note.
Avoid overstressing when screwing tight. Install motor carefully on a level base. Carefully align machines to be coupled. Use as flexible couplings as possible. We recommend for larger 2-pole motors double-teeth couplings which because of the large number of teeth bear the load evenly and because of the low weight have the lowest moment of inertia.
If using belt-pulleys, gearwheels, etc., ensure that the permissible radial and axial shaft loads are not exceeded.

6.5 Installation of input drive and output drive elements on gear unit shafts

Use a fitting device to fit the drive or output elements.

Located in the shaft end faces are centring holes to DIN 332 which can be used for this.



Example of a fitting device for fitting couplings or hubs on the ends of gear unit or motor shafts. If necessary, the axial thrust bearing on the fitting device can be dispensed with.

Figure 6.5: Fitting device

Note.
Deburr the parts of elements to be fitted in the area of the hole or keyways.
Recommendation: 0.2 x 45°

Caution.
Damage to bearings, housing, shaft and locking rings.
Do not use a hammer to force the drive and output elements to be mounted onto the shaft.

The rotor of the motor is dynamically balanced. The balancing condition is specified in the parallel keyway (H= half-key balancing; F = full-key balancing). When fitting the drive element, note balancing condition!

Adjust the balance of the transmission parts to be fitted to suit the rotor balance. In the case of half-key balancing, machine away the projecting visible portion of the parallel key.

The motor or gear motor must be fitted and operated only in the indicated assembly option (see rating plate).

6.6 Electrical connection

6.6.1 Connection, insulation resistance

Connection must be carried out by a specialist in accordance with the safety regulations in force. The relevant installation and operating regulations and national and international regulations must be adhered to.

Note.
Observe information on the rating plate.
Compare type of current, mains voltage and frequency.
Connect motor in accordance with the circuit diagram located in the terminal box.
Note connections.
Note rated current for setting safety switch.
Protect the motor against excessive heat, e.g. by means of a motor safety switch.

All motors have a non-fused earth conductor terminal inside the terminal box:

To protect against dust and moisture, seal unused cable entries in the terminal box so that they cannot be turned. Firmly tighten all contact screws and nuts to avoid too high transfer resistances.

In the case of terminal boards with U-shaped clips lay the lines to be connected under the terminal clips in the form of a U.

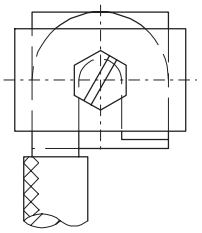


Figure 6.6.1: Terminal clips

In the case of motors with terminal boxes which have ground surfaces between the cover and the lower section apply a thin grease film to seal and protect against freezing.

After long periods of storage or non-operation measure the phase-to-phase and phase-to-ground insulation resistance of the winding before starting up the motor.

Moist windings may produce leakage current, flashover and disruptive discharge. In the case of values of $\leq$ 1.5 MΩ, dry the winding at a winding temperature of 20 °C.

6.6.2 Direction of rotation and terminal designation

Direction of rotation and terminal designation to DIN VDE 0530-8 / IEC 60034-8.

Standard version

The standard-design surface-cooled motors up to size 315 are suitable for both directions of rotation. In the case of motors for only one direction of rotation the direction of rotation is indicated by an arrow on the motor. Terminals U1, V1, W1 to phases L1, L2, L3 (in alphabetical or natural order) always produce clockwise rotation of the motor.

Changing direction of rotation

The direction of rotation can be reversed in the case of direct starting and reversible-pole motors with separate windings by reversing two power lines on the motor terminal board.
In the case of motors with star/delta starting and reversible-pole motors with Dahlander winding 2 power lines on the infeed to the motor switch must be exchanged.
On a machine with only one shaft end or two shaft ends of different thicknesses the direction of rotation is that direction of rotation of the rotor as seen when looking at the end face of the single or thicker shaft end.

6.6.3 Additional equipment (special version)

Temperature monitoring

Connect the temperature sensors for monitoring e.g. the stator winding temperature, the bearings and the cooling medium through additional terminals provided for this in the main terminal box or through one or more additional terminal boxes.

Connect the temperature sensors in accordance with the relevant circuit diagram. Connection is subject to the specifications and instructions set out in section 6.6.1 ”Connection, insulation resistance”.

Electronic speed monitoring

The Electronic Speed Monitoring System comprises essentially the slot initiator and the control segment. It is maintenance-free.

Anticondensation heater

Heater output and connection voltage: see information plate on the motor. Connect the anticondensation heater by means of the terminals provided for this in the main terminal box or by means of an additional terminal box in accordance with the relevant circuit diagram.

Connection is subject to the specifications and instructions set out in section 6.6.1 ”Connection, insulation resistance”. Do not start anticondensation heater until the motor has been switched off. It must not be started while the motor is operating.

Forced ventilation

If forced ventilation is used, the direction of rotation must be indicated separately by an arrow on the forced ventilation system.

Note direction of rotation! (see arrow indicating direction of rotation).

Forced ventilation in accordance with the relevant circuit diagram provided in the terminal box.

While the main motor is operating, the forced ventilation motor must be switched on. The forced ventilation system serves to draw off the lost heat while the main motor is operating. If the main motor is switched off, temperature-dependent run-on of the forced ventilation system is necessary.

Check during start-up of the main motor:

Check whether the forced ventilation can operate properly and operates when the main motor is started.

7. Start-up

After checking and ensuring the following points you can start the motor:

1) Check whether the bearing fastening has been removed.
2) Observe the information on the rating plate.
3) Check whether the voltage and frequency of the motor correspond to those of the mains supply.
4) Check whether the direction of rotation is correct and, in the case of inverter operation, whether the limit speed is not being exceeded.
5) Check whether the motor is protected against overload.
6) Ensure that, with star/delta starting, because of the danger of impermissible operating loads, the change-over from star to delta does not take place until the starting current of the star stage has died down.
7) Check whether the electric connections have been firmly tightened and the monitoring equipment is correctly connected and set.
8) Check the coolant temperature.
9) Check whether the additional equipment - if provided - can operate properly.
10) Check whether the air inlet holes and cooling surfaces are clean.
11) Check whether protective measures have been implemented: earthing.
12) Check whether the motor is correctly fastened in place.
13) In the case of belt drive check the belt tension.
14) Check whether the terminal box cover is shut and the cable entries are properly sealed.

8. Operation

Caution.
Determine the cause of the fault with the aid of the fault table in section 9. “Faults, causes and remedy”.
In case of changes during operation the drive must be switched off immediately. Remedy faults or have faults remedied.

Check the gear unit during operation for:

- excessive operating temperature
- unusual motor noises

9. Faults, causes and remedy

Note.
Faults and malfunctions occurring during the guarantee period and requiring repair work on the drive must be carried out only by **FLENDER TÜBINGEN GMBH** Customer Service. In the case of faults and malfunctions occurring after the guarantee period and whose cause cannot be precisely identified, we advise our customers to contact our customer service.
If you need the help of our customer service, please state the following:
- data on the rating plate
- kind and extent of the fault
- suspected cause.

Malfunctions				Causes	Remedy
Bearing is too warm				too much grease in the bearing	remove superfluous grease.
				bearing contaminated	replace bearing.
				belt tension too high	reduce belt tension.
			Motor runs unevenly	coupling forces pull or push	precisely align motor and adjust coupling.
				cooling agent temperature over 40 °C	adjust cooling air to correct temperature.
				bearing grease discoloured dark	check for bearing currents.
	Bearing noises			too little grease in the bearing	lubricate correctly.
			Motor runs unevenly	motor incorrectly installed	check motor assembly option.
				scoring on inner ring e.g. due to starting motor with bearings locked	replace bearings; avoid shaking while stationary.
			Motor runs unevenly	imbalance through belt pulley or coupling	precise balancing.
				machine fastenings too weak	check fixation.
Motor does not accel-erate		Sharp drop in speed		countertorque too high	check motor and moment of load.
				mains voltage too low	check mains conditions.
			Safety equip-ment triggers	phase interruption	check access network.
	Motor is too warm			incorrect connection	note circuit diagram and rating plate.
				overload	compare rating plate information.
				too high switching frequency	note rated operating mode.
				ventilation unsatisfactory	check cooling air ways, and check direction of rotation.
				ventilation ways fouled up	clean.
			Safety equip-ment triggers	winding and terminal short circuit	measure insulation resistance.
				starting time exceeded	cCheck acceleration conditions.

Table 9.: Faults, causes and remedy
Please consult the **FLENDER TÜBINGEN GMBH** customer service, if the described remedies are ineffective or cannot be carried.

10. Maintenance and repair

10.1 General information for maintenance

All inspection, maintenance and repair work must be done with care by trained and qualified personnel only. Observe the instructions given in section 2. “Safety instructions“.

Note.
Maintenance and servicing must be carried out only by properly trained, authorised personnel. Only parts supplied by **FLENDER TÜBINGEN GMBH** must be used for servicing.

10.2 Description of maintenance and repair work

10.2.1 Clean drive

Caution.
Do not use a high-pressure cleaning appliance to clean the drive.
Do not use tools with sharp edges.

Note.
Keep the drives free from dirt and dust, etc. to ensure adequate heat dissipation.

Switch off the power supply to the drive before cleaning it.

Caution.
Depending on operating conditions in certain intervals of time
check that the terminal areas and terminals are clean,
check that the electrical connections are tight,
clean the cooling air ways.
Protect the intake holes and cooling surfaces against blockage and dirt.

10.2.2 Checking tightness of fastening bolts

Note.
Damaged headless screws must be replaced with new screws of the same type and strength class.

1) Switch off the power supply to the drive.

2) Using a torque wrench, check that all fastening bolts are correctly tightened for torque, acc. to table 10.2.2 “Tightening torque T_A fitted motor“.

Thread size	Tightening torque T_A strength class min. 8.8 [Nm]	Thread size	Tightening torque T_A strength class min. 8.8 [Nm]
M 4	3	M 16	210
M 5	6	M 20	450
M 6	10	M 24	750
M 8	25	M 30	1500
M 10	50	M 36	2500
M 12	90		

Table 10.2.2: Tightening torque T_A fitted motor

10.2.3 Inspection of the drive

Routinely inspect the drive once a year in accordance with the possible criteria listed in section 9. “Faults, causes and remedy”.

Check the drive in accordance with the criteria set out in section 2. “Safety instructions”.

Touch up damaged paintwork carefully.

10.3 Lubrication

Danger.
Secure the drive unit to prevent it from being started up unintentionally. Attach a warning notice to the start switch.

Switch off the power supply to the drive before maintaining and cleaning it.

The bearings on standard-design surface-cooled motors up to size 200 are life-lubricated. If this is not the case, this must be indicated by information plates on the motor. For normal coolant temperatures the bearings are filled at the factory with grease which under normal operating conditions need not be renewed for several years.

10.3.1 Grease service lives

Grease service lives in the case of life-lubrication and grease filling quantities.

Horizontal assembly option ($_{IM}$ B.)

Regardless of the operating hours, renew the rolling bearing grease or the bearing (2Z bearing) after 3-4 years at the latest.

Size	n_N						Grease filling quantity per bearing	
	3600 [min^{-1}]	**3000** [min^{-1}]	**1800** [min^{-1}]	**1500** [min^{-1}]	**1200** [min^{-1}]	≤ **1000** [min^{-1}]	**AS (DE)** [g]	**BS (DE)** [g]
63	33000	33000	33000	33000	33000	33000	7	5
71								5
80							9	9
90							15	11
100	24000						20	15
112							45	25
132		24000					75	50
160	17000						90	70
180							110	80
200								60

Table 10.3.1–1: Grease service lives in operating hours - horizontal assembly option ($_{IM}$ B.)

Vertical assembly option ($_{IM}$ V.)

Size	n_N						Grease filling quantity per bearing	
	3600 [min^{-1}]	**3000** [min^{-1}]	**1800** [min^{-1}]	**1500** [min^{-1}]	**1200** [min^{-1}]	≤ **1000** [min^{-1}]	**AS (DE)** [g]	**BS (DE)** [g]
63	24000	33000	33000	33000	33000	33000	7	5
71							9	9
80		24000						
90							15	11
100	17000						20	15
112		17000	24000				45	25
132	12000			24000			75	50
160							90	70
180		12000			24000		110	60
200								80

Table 10.3.1–2: Grease service lives in operating hours - vertical assembly option ($_{IM}$ V.)

The specified grease service lives apply to a max. ambient temperature of +40 °C.
For each 10 °C rise in temperature the grease service life is reduced by a factor of 0.7 of the table value (max. 20 °C = factor 0.5).

At an ambient temperature of +25 °C twice the grease service life may be expected.

10.3.2 Lubricants

Note.
The service life of the grease is approx. 4.000 operating hours. It is based on a max. ambient temperature of +40 °C. The service life of the grease decreases by a factor of 0.7 for every 10 K rise in temperature.

	Lithium-saponified greases NLGI 3/2
ARAL	Aralub HL3, HL2
bp	Energrease LS3, LS2
Castrol	Longtime PD2 TRIBOL 4020/220-2
DEA	Glissando 30, 20
Esso	Beacon 3
FUCHS	Renolit FWA160, FWA220
KLÜBER LUBRICATION	Centroplex GLP402
Mobil	Mobilux 3, 2
Shell	Alvania RL3, RL2
SRS	Wiolub LFK2

Table 10.3.2: Rolling bearing greases

10.4 Single-disk spring-actuated brake

Caution.
The friction surfaces must not come into contact with oil or grease.

The brake is closed-current-operated and can be operated for as long as required in a lifted condition in any mounting position and is suitable for both directions of rotation. The asbestos-free brake linings are highly wear-resistant.

If re-adjustment is necessary, the correct air-gap ”S” can be restored by turning the readjusting sleeves (415.6).

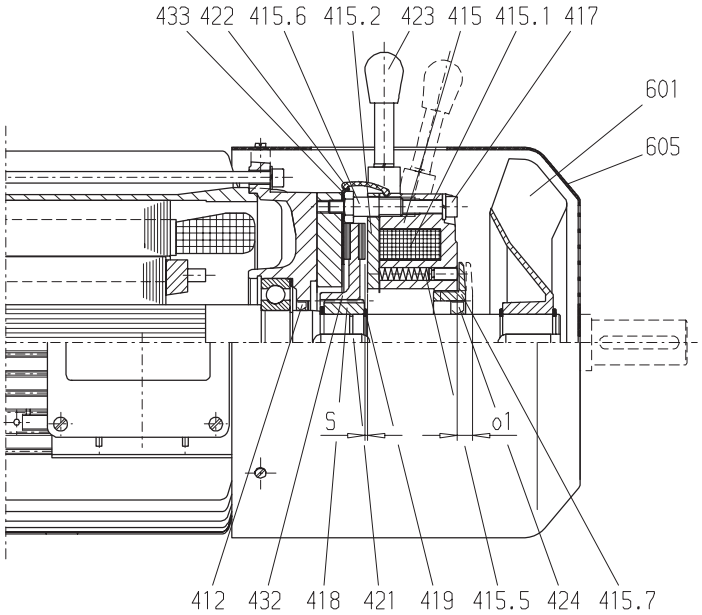


Figure 10.4–1: Single-disk spring-actuated brake

412	Sealing ring	415.7	Adjusting ring	423	Hand ventilation lever
415	Magnet body	417	Fastening bolt	424	Sealing ring
415.1	Brake lifting coil	418	Driver	432	Friction disk
415.2	Armature disk	419	Locking ring	433	Friction plate
415.5	Brake springs	421	Parallel key	601	Ventilator
415.6	Readjusting sleeve	422	Sealing collar	605	Fan cowl

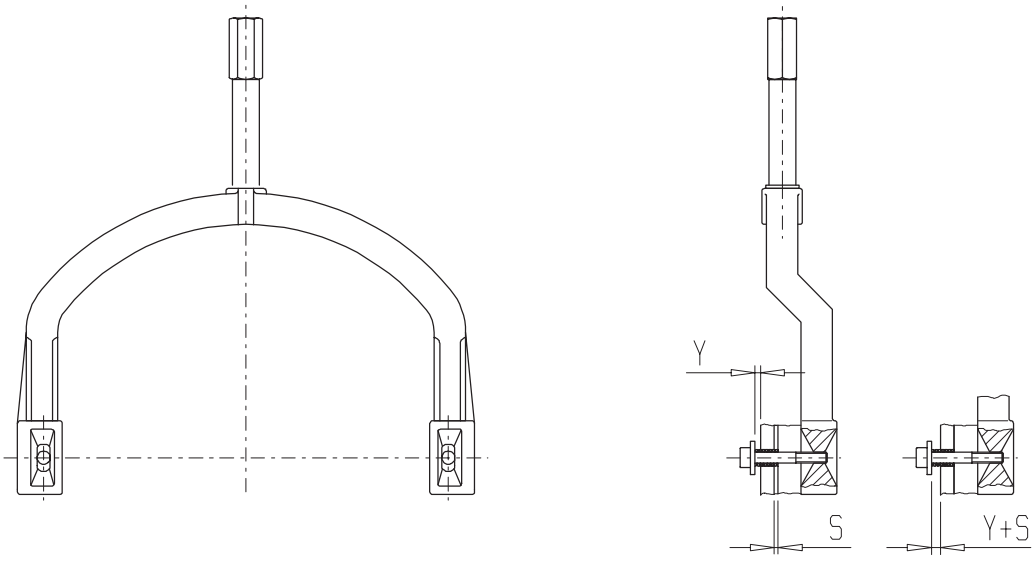


Figure 10.4–2: Hand-lifting device fitted

10.4.1 Key data for braking torque adjustment and readjusting the air gap

Brake size		P5/4 (FDB08)	L4 (06)	L8 (08)	L16 (10)	L32 (12)	L60 (14)	L80 (16)	L150 (18)	L260 (20)	L400 (25)
Rated braking torque	[Nm]	4	4	8	16	32	60	80	150	260	400
Y	[mm]	0.8	1.0	1.0	1.0	1.5	1.5	1.5	2.0	2.0	2.5
$Y+S_{LÜNenn}$	[mm]	1.05	1.2	1.2	1.2	1.8	1.8	1.8	2.4	2.4	3.0
$S_{LÜNenn}$	[mm]	0.25	0.2	0.2	0.2	0.3	0.3	0.3	0.4	0.4	0.5
$S_{LÜmax}$ Operating brake	[mm]	0.7	0.5	0.5	0.5	0.75	0.75	0.75	1.0	1.0	1.25
$S_{LÜmax}$ Holding brake	[mm]		0.3	0.3	0.3	0.45	0.45	0.45	0.6	0.6	0.75
Reduction per lock-in position		0.2	0.2	0.35	0.8	1.3	1.7	1.6	3.6	5.6	6.2
max. readjustment, permissible wear	[mm]	upon request	1.5	1.5	1.5	2.0	2.5	3.5	3.0	4.0	4.5
Rotor thickness min.*)	[mm]		4.5	5.5	7.5	8.0	7.5	8.0	10.0	12.0	15.5
Rotor thickness max.	[mm]		6.0	7.0	9.0	10.0	10.0	11.5	13.0	16.0	20.0
$o1_{max}$	[mm]		4.5	4.5	7.5	9.5	11.0	10.0	15.0	17.0	19.5
Minimum depth of clearing holes (mounting flange)	[mm]		0.5	1.0	2.0	3.0	1.5	0.5	0.8	2.1	5.0
Tightening torque bolts	[Nm]		2.8	5.5	9.5	9.5	23.0	23.0	23.0	46.0	46.0
Tightening torque lever cpl.	[Nm]		2.8	2.8	4.8	4.8	12.0	12.0	23.0	23.0	40.0

Table 10.4.1: Key data for braking torque adjustment and readjusting the air gap

*) The friction lining is dimensioned to enable the brake to be readjusted at least 5 times.

10.4.2 Braking torque adjustment

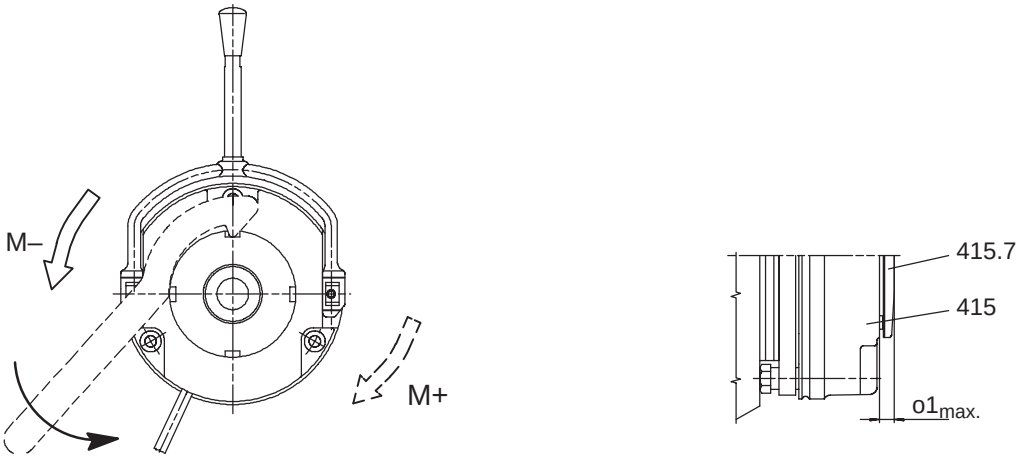


Figure 10.4.2: Braking torque adjustment

415 Magnet body 415.7 Adjusting ring

Caution.
The reduction of the braking torque does not increase the maximum permissible air gap $S_{Lümax}$.
On the version with hand lifting do not change the setting of the hand lifting system.

The brake is delivered with a set rated braking torque. A reduction by unscrewing the adjusting ring (415.7) is possible up to the dimension $o1_{max,}$ acc. to Table 10.4.1 “Key data for braking torque adjustment and readjusting the air gap“.

1) Switch off the power supply to the drive. The brake must be torque-free.
2) Remove the ventilator cover (605) and ventilator (601).
3) Using a hook spanner, turn the adjusting ring (415.7) anticlockwise to reduce the braking torque or clockwise to increase the braking torque.
4) Note the lock-in positions. Positions between lock-in positions are not permitted. Values for braking torque adjustments, acc. to Table 10.4.1 “Key data for braking torque adjustment and readjusting the air gap”.
5) Note the maximum projection of the adjusting ring (415.7) $o1_{max}$ relative to the magnet body, acc. to Table 10.4.1 “Key data for braking torque adjustment and readjusting the air gap”.
6) Fit ventilator cover (605) and ventilator (601).

Request operating and maintenance instructions for single-disk spring-operated brake, as required.

10.4.3 Readjusting air gap

Caution.
The factors that determine brake wear are many and various (switching frequency, use as a holding or working brake, selection, etc.). The brake maintenance intervals can thus be determined only empirically or by individual recalculation for the specific application. As a rule of thumb, we can say: if the brake is used as a working brake, it should be inspected (air gap checked or readjusted) and maintained (worn parts replaced) at least every 3 000 operating hours. If it is used as a holding brake, every 2 to 4 years, depending on load conditions.

Caution.
In the case of the version with flange, if this is fastened with additional screws, note: behind the tapped holes in the flange for the screws there must be clearing holes in the bearing end plate. Without a clearing hole the minimum rotor thickness cannot be fully utilised. The screws must not under any circumstances press against the bearing piece, acc. to Table 10.4.1 “Key data for braking torque adjustment and readjusting the air gap”.

1) Switch off the power supply to the drive. The brake must be torque-free.
2) Undo the screws.
3) Using the open-ended spanner, screw the sleeve screws further into the magnet. 1/6 turn reduces the air way by approx. 0.15 mm.
4) Tighten the screws torques in acc. to Table 10.4.1 “Key data for braking torque adjustment and readjusting the air gap”.
5) Using the feeler gauge, check the air way $S_{Lü}$ near the screw $S_{LüNenn}$ acc. to Table 10.4.1 “Key data for braking torque adjustment and readjusting the air gap”.
6) Repeat the process if there is too great a deviation from $S_{LüNenn}$.

10.4.4 Replace rotor

1) Switch off the power supply to the drive. The brake must be torque-free.
2) Release the connecting cable.
3) Undo the screws evenly and take them out.
4) Remove the magnet from the bearing end plate. Note the connecting cable.
5) Pull the rotor off the hub.
6) Check the hub teeth.
7) If the hub is worn, replace it.
8) Check the friction surface on the bearing end plate. If the friction plate or flange is badly scored, replace it. If the bearing end plate is badly scored, machine the friction surface or insert a new friction plate.
9) Using the slide calliper, measure the rotor thickness (new rotor) and head height of the sleeve screws.
10) Calculate the distance between the magnet and armature disk as follows:
    Distance = rotor thickness + $S_{LüNenn}$ – head height
    $S_{LüNenn}$ acc. to Table 10.4.1 “Key data for braking torque adjustment and readjusting the air gap”.
11) Completely unscrew the sleeve screws evenly until the calculated distance between the magnet and the armature disk is obtained.
12) Fit the new rotor and the brake and adjust them.
13) Connect the connecting cable.

11. Disposal

Dispose of the housing parts, gears, shafts and rolling bearings as steel scrap.

This also applies to grey cast iron parts, if no separate collection is made.

Danger.
Incorrect disposal of used oil is a threat to the environment and health.
After use the oil must be taken to a used oil collection point. Any addition of foreign material such as solvents and brake and cooling fluid is prohibited.
Avoid prolonged contact with the skin.

Collect and dispose of used oil in accordance with regulations.

Remove any oil spillage immediately with an oil-binding agent in compliance with environmental requirements.

12. Stocking spare parts and customer service addresses

12.1 Stocking spare parts

By stocking the most important spare and wearing parts on site you can ensure that the drive is ready for use at any time.

Note.

Please note that spare parts and accessories not supplied by us have not been tested or approved by us.
The installation and/or use of such products may therefore impair essential characteristics of the drive, thereby posing an active or passive risk to safety.
FLENDER TÜBINGEN GMBH will assume no liability or guarantee for damage caused by spare parts and accessories not supplied by **FLENDER TÜBINGEN GMBH**.

We guarantee only the original spare parts supplied by us.

Please note that certain components often have special production and supply specifications and that we always supply you with spare parts which comply fully with the current state of technical development as well as current legislation.

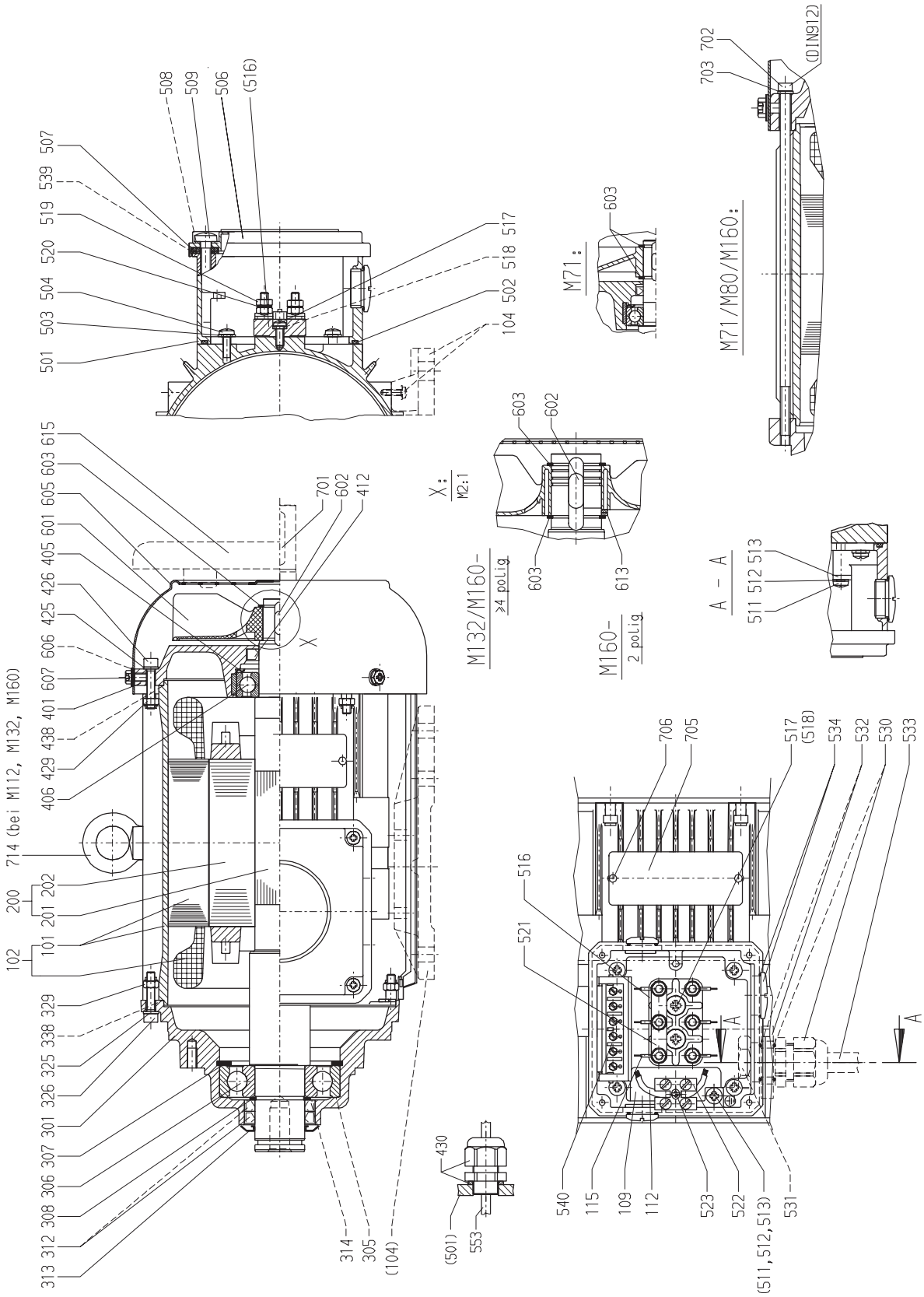
When ordering spare parts, always state the following:

- Order no. (see rating plate 4)
- Type designation (see rating plate 5)
- Part no. (3-digit part no. from spare parts list, 6-digit code no. or 7-digit article no.)
- Quantity

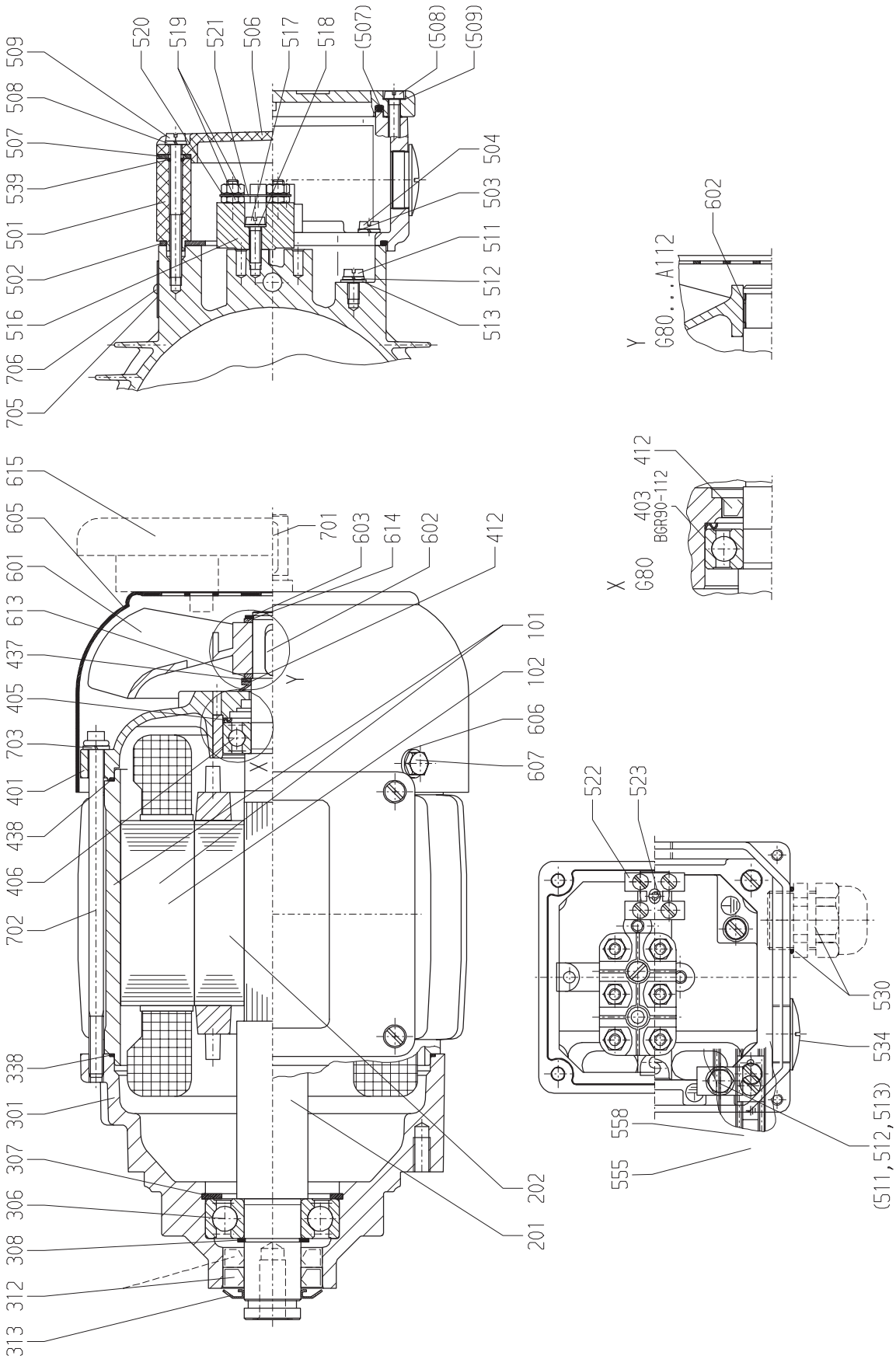
12.2 Spare parts lists

12.2.1 Motors

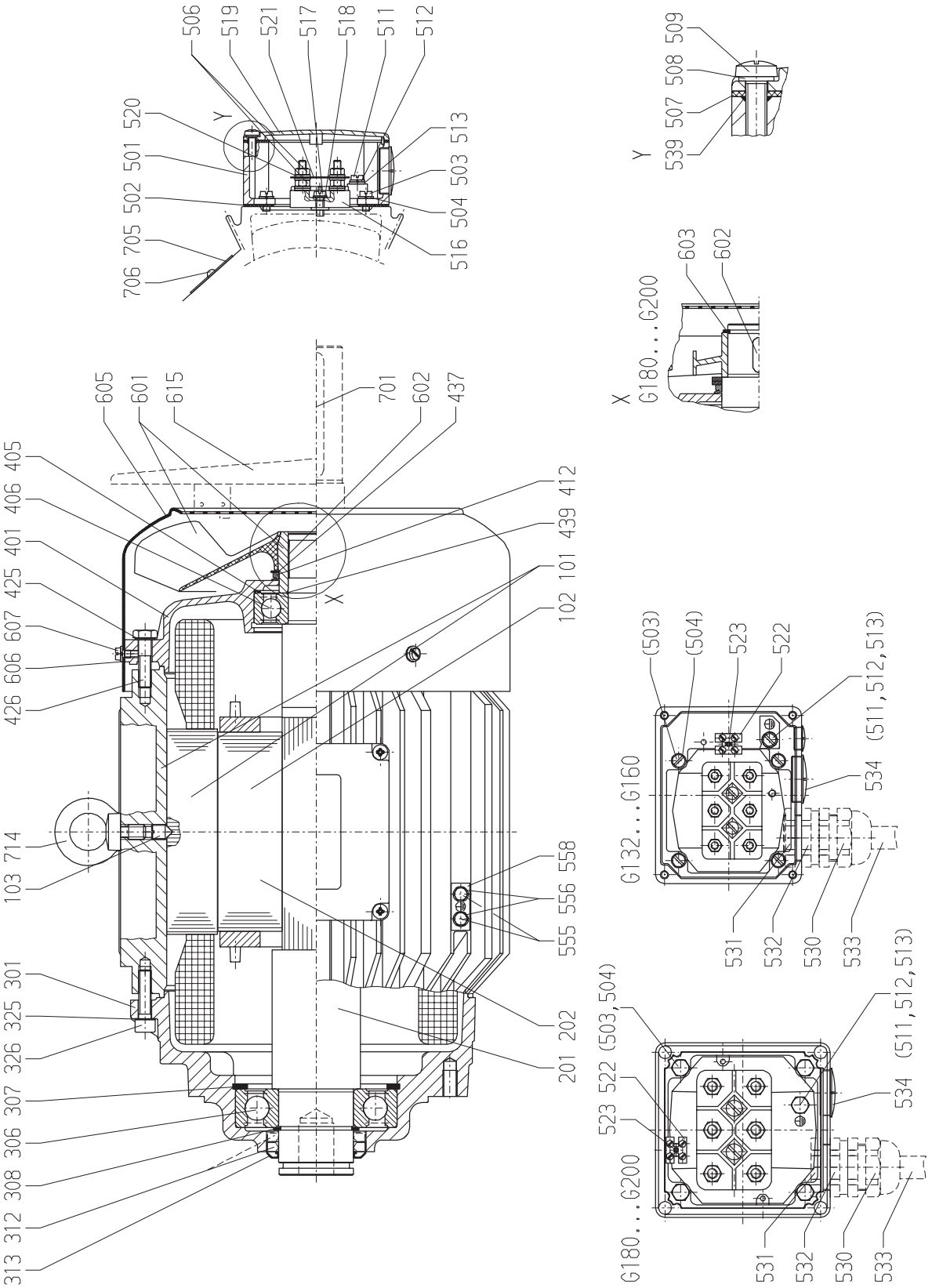
12.2.1.1 MODULOG®-Motor Sizes 71 - 200



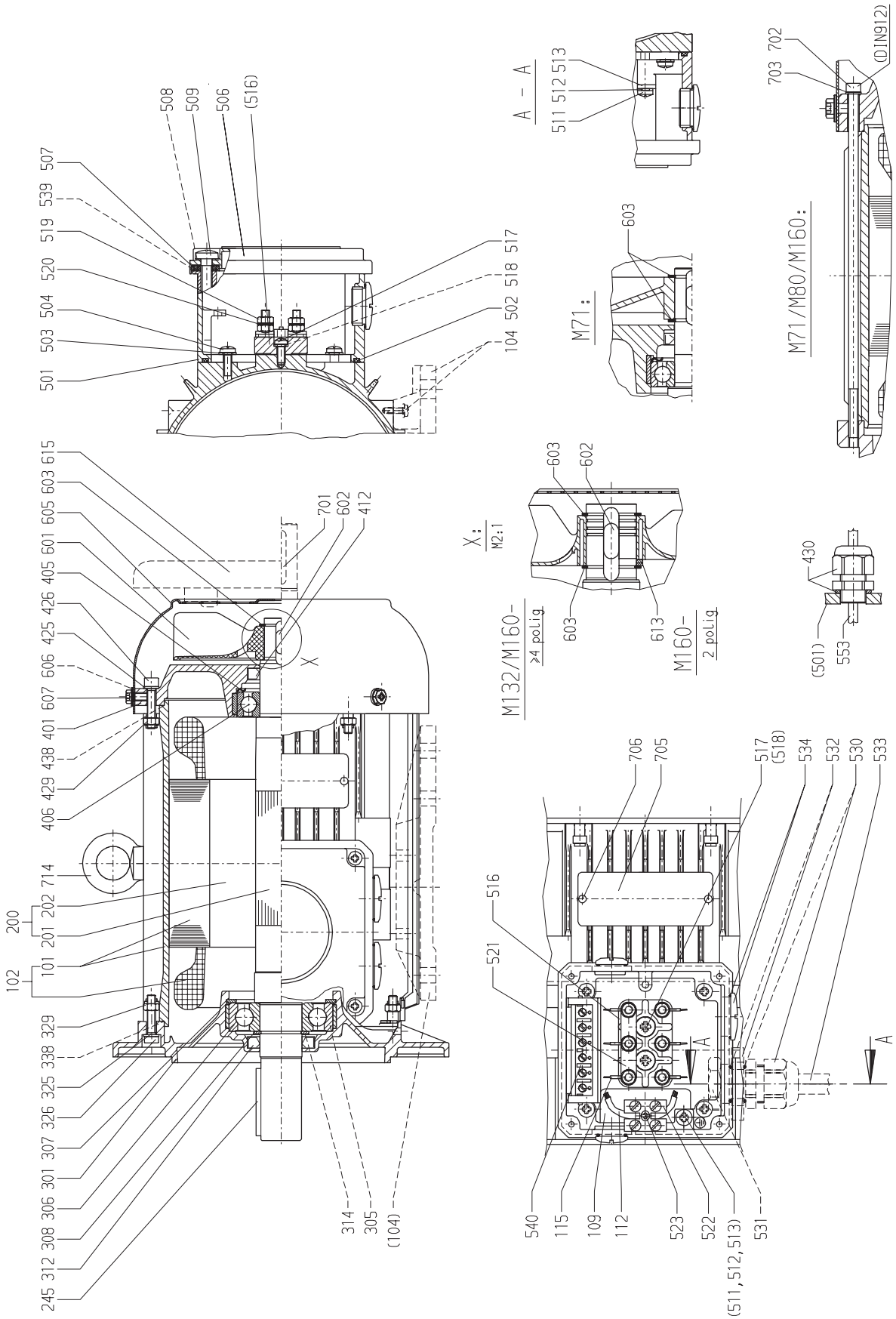
12.2.1.2 Motors M1, G80, A90, A100, A112



12.2.1.3 Motors G132, G160, G180, G200



12.2.1.4 IEC-Motor Sizes 71 - 200

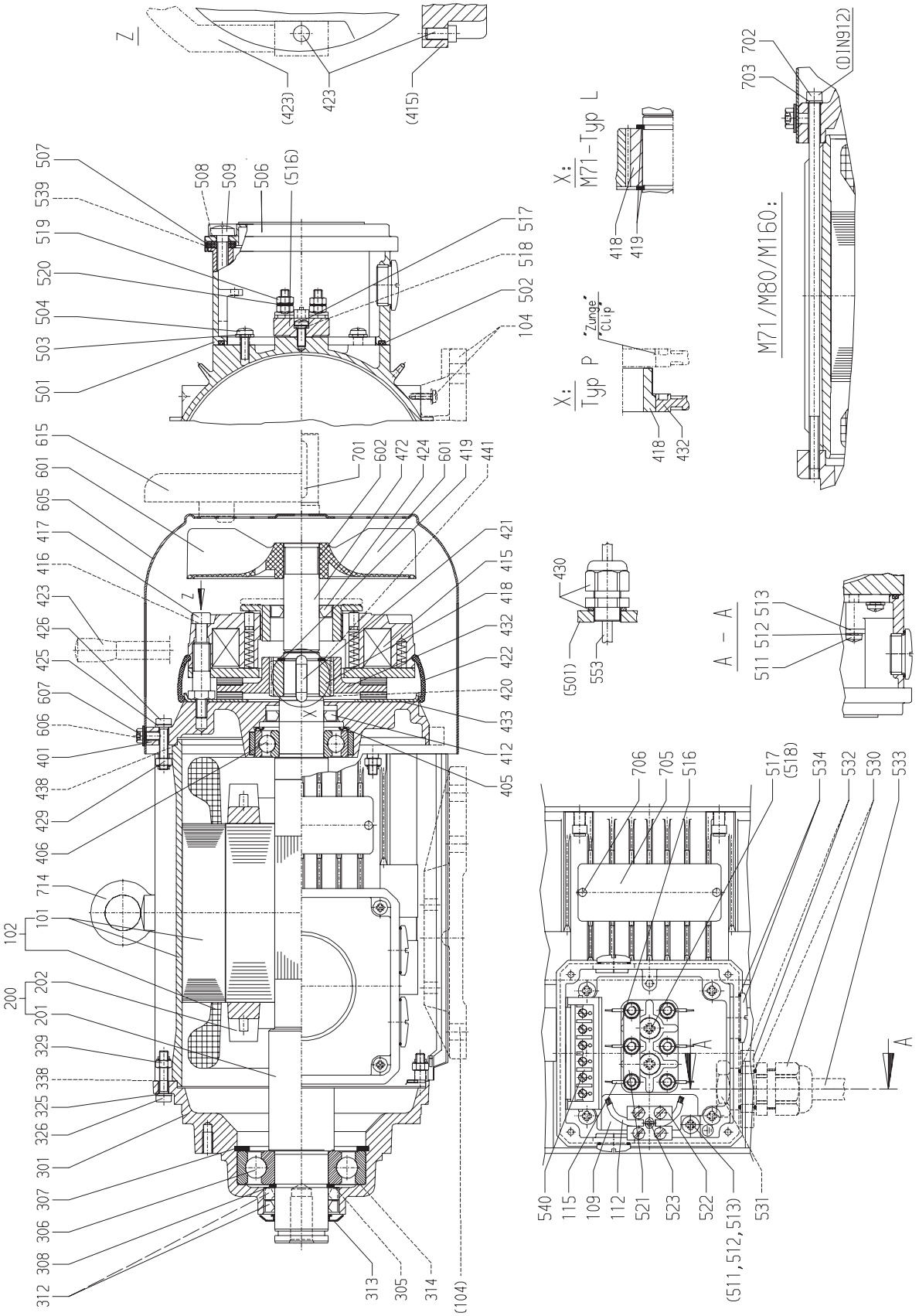


12.2.1.5 Description of components

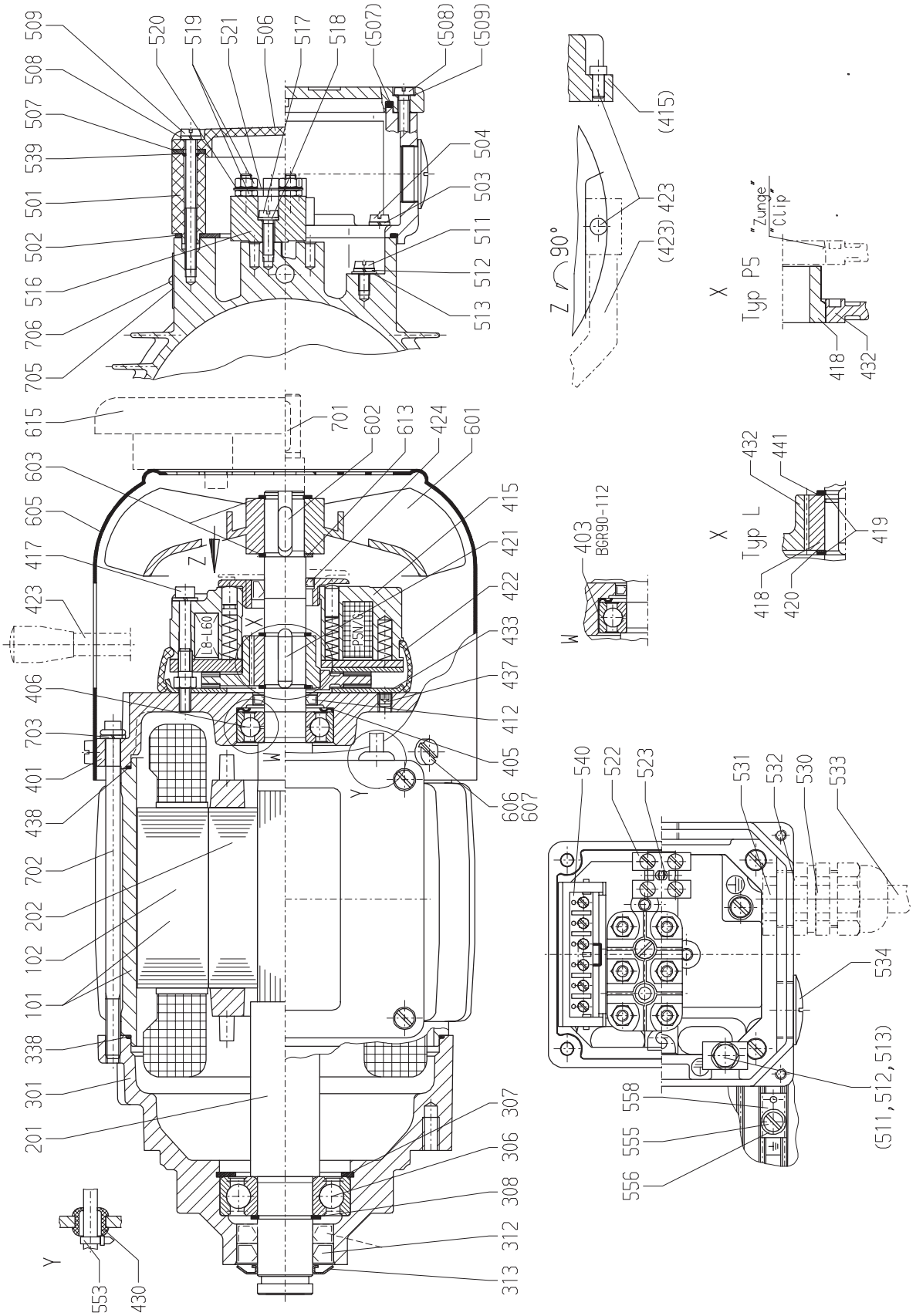
101 Stator housing with laminated core (non-wound)
102 Stator housing with laminated core (wound)
103 Plate fastening
104 Housing bases with fastenings
109 Plug for cable slot
112 Insulating plastic tube
115 Multicore cable end/cable terminal
200 Rotor
201 Shaft
202 Rotor core
301 Bearing end plate (input side)
305 Spring washer/shim
306 Bearings
307 Locking ring
308 Locking ring
312 Shaft seal
313 Deflector
314 Supporting disk/shim
325 Screw lock
326 Bolt
329 Nut
338 Seal
401 Bearing end plate (output-side)
403 Spring band
405 Spring washer
406 Bearings
412 Shaft seal
425 Screw lock
426 Bolt
429 Nut
430 Cable bush, complete
437 Supporting disk/shim
438 Seal
439 Supporting disk/shim
501 Bottom section for terminal box
502 Seal
503 Screw lock
504 Bolt
506 Cover for terminal box
507 Seal
508 Screw lock
509 Bolt
511 Bolt
512 Screw lock
513 Bracket/washer
516 Terminal strip, complete
517 Bolt
518 Screw lock
519 Bolt
520 Washer
521 Terminal connector
522 Terminal strip
523 Support/screw
530 Cable bush, complete
531 Nut
532 Seal
533 Cable/lead
534 Plug, complete
539 Retainer
540 Rectifier
553 Cable/lead
555 Fastening bolt
556 Screw lock
558 Earth plate
601 Fan blades
602 Parallel key
603 Locking ring
605 Fan cowl
606 Screw lock
607 Bolt
613 Supporting disk/shim
614 Supporting disk/shim
615 Protective cover
701 Parallel key
702 Bolt
703 Screw lock
705 Rating plate
706 Rivet/screw
714 Eye bolt

12.2.2 Brake motors

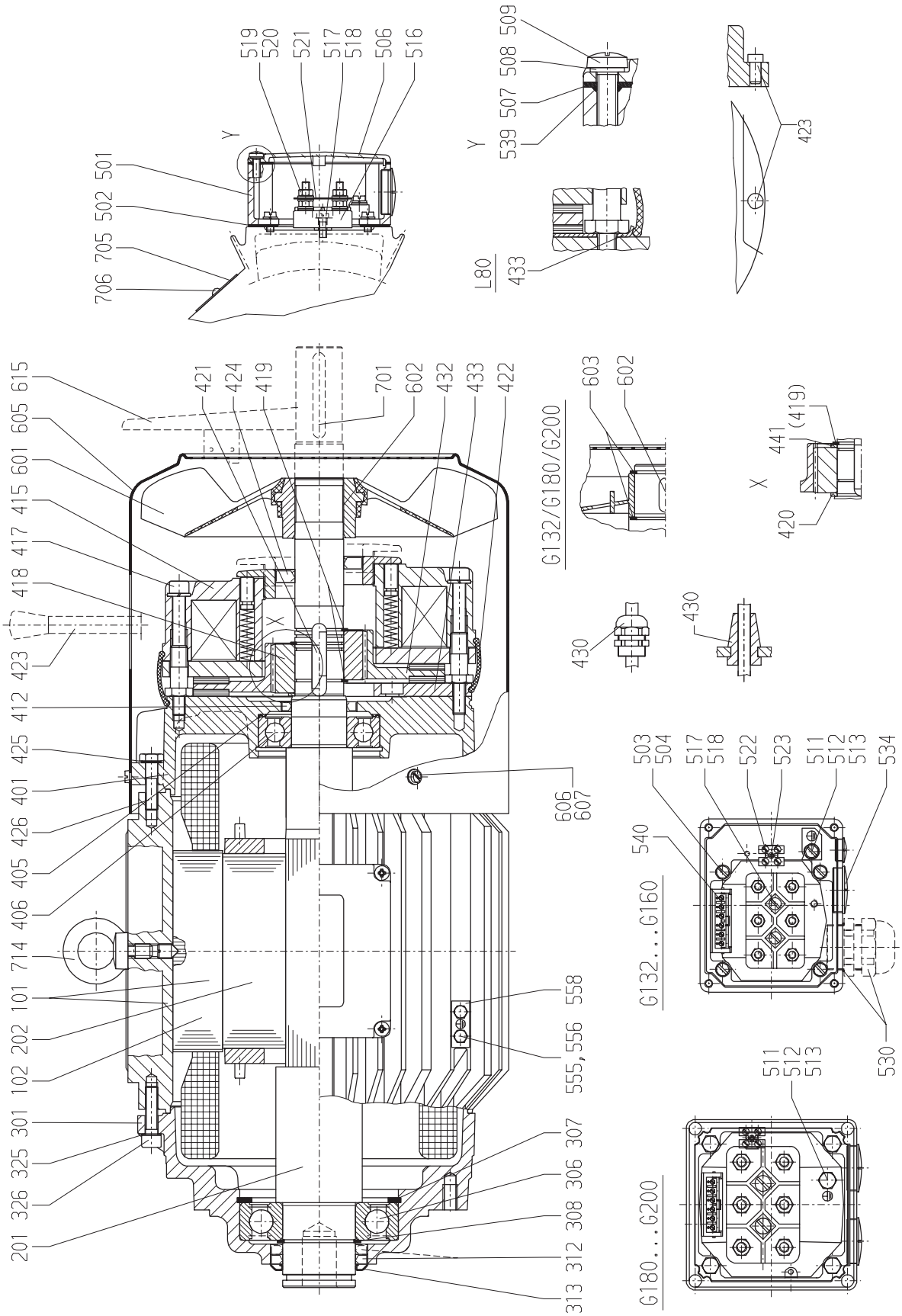
12.2.2.1 MODULOG® Brake motor Sizes 71 - 200



12.2.2.2 Brake motors M1, G80, A90, A100, A112



12.2.2.3 Brake motors G132, G160, G180, G200

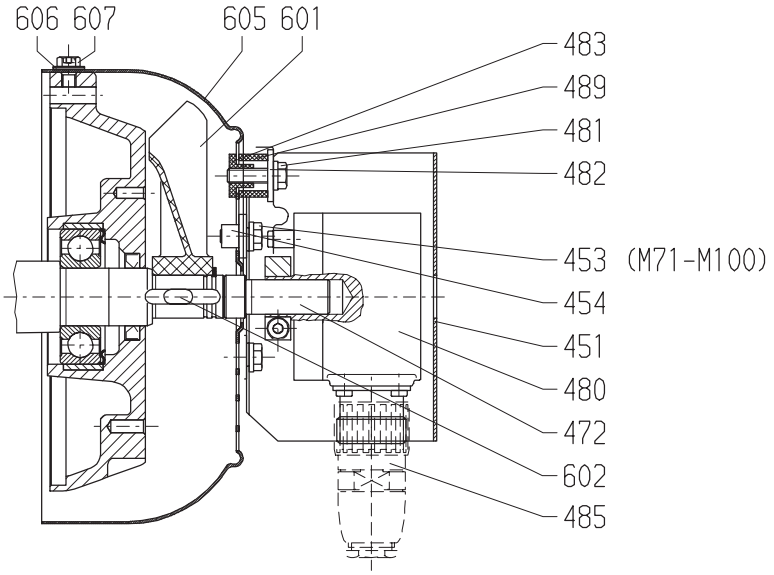


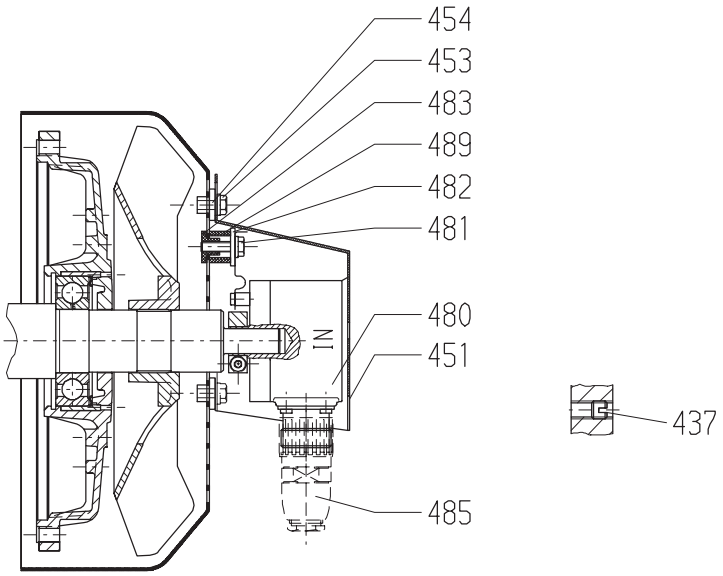
12.2.2.4 Description of components

101 Stator housing with laminated core (non-wound)
102 Stator housing with laminated core (wound)
104 Housing bases with fastenings
109 Plug for cable slot
112 Insulating plastic tube
115 Multicore cable end/cable terminal
200 Rotor
201 Shaft
202 Rotor core
301 Bearing end plate (input side)
305 Spring washer/shim
306 Bearings
307 Locking ring
308 Locking ring
312 Shaft seal
313 Deflector
314 Supporting disk/shim
325 Screw lock
326 Bolt
329 Nut
338 Seal
401 Bearing end plate
403 Spring band
405 Spring washer
406 Bearings
412 Shaft seal
415 Magnet part brake
416 Screw lock
417 Bolt
418 Driver
419 Locking ring
420 Supporting disk/shim
421 Parallel key
422 Supporting disk/shim
423 Hand ventilation lever
423 Plug, if no hand ventilation lever
424 Shaft seal
425 Screw lock
426 Bolt
429 Nut
430 Cable bush, complete
432 Brake disc
433 Friction plate
437 Set screw
438 Seal
441 Supporting disk/shim
472 Shaft extension
501 Bottom section for terminal box
502 Seal
503 Screw lock
504 Bolt
506 Cover for terminal box
507 Seal
508 Screw lock
509 Bolt
511 Bolt
512 Screw lock
513 Bracket/washer
516 Terminal strip, complete
517 Bolt
518 Screw lock
519 Bolt
520 Washer
521 Terminal connector
522 Terminal strip
523 Support/screw
530 Cable bush, complete
531 Nut
532 Seal
533 Cable/lead
534 Plug, complete
539 Retainer
540 Rectifier
553 Cable/lead
555 Fastening bolt
556 Screw lock
558 Earth plate
601 Fan blades
602 Tolerance ring
603 Locking ring
605 Fan cowl
606 Screw lock
607 Bolt
613 Supporting disk/shim
615 Protective cover
701 Parallel key
702 Bolt
703 Screw lock
705 Rating plate
706 Rivet/screw
714 Eye bolt

12.2.3 Pulse generator

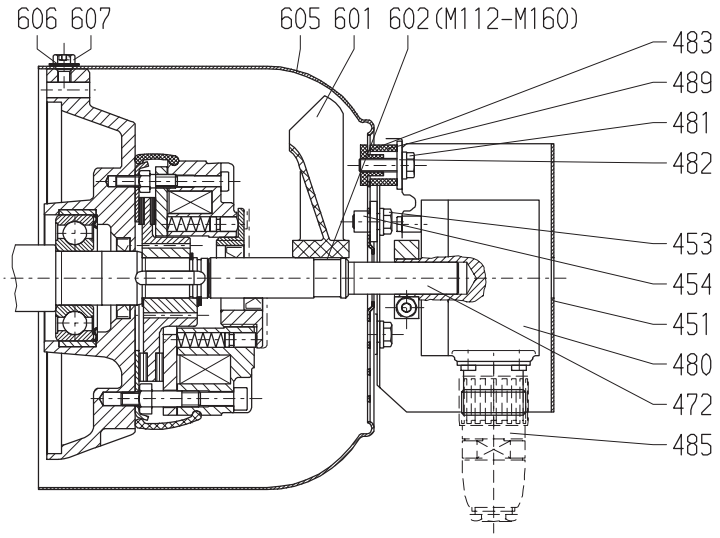
Pulse generator (self-ventilated / not ventilated)

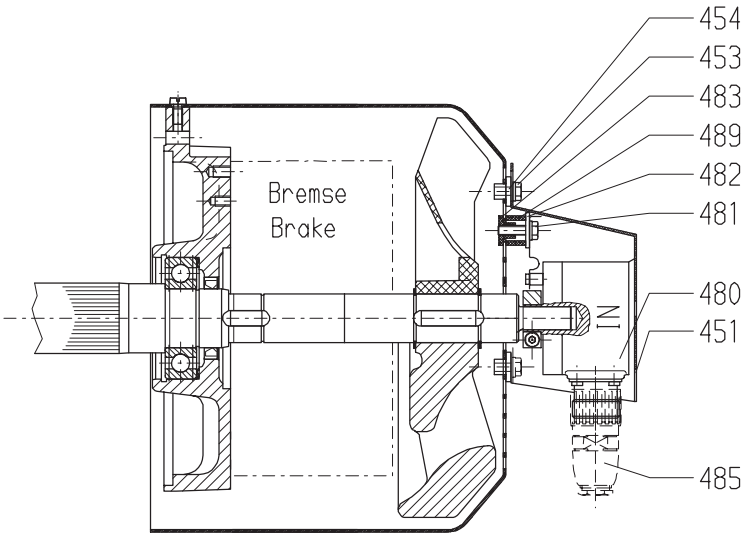




437 Set screw
451 Protective plate for pulse generator
453 Bolt
454 Nut
472 Shaft extension
480 Pulse generator
481 Bolt
482 Washer
483 Nut
485 Coupling
489 Spacer/bush
601 Fan blades
602 Parallel key
605 Fan cowl
606 Screw lock
607 Bolt

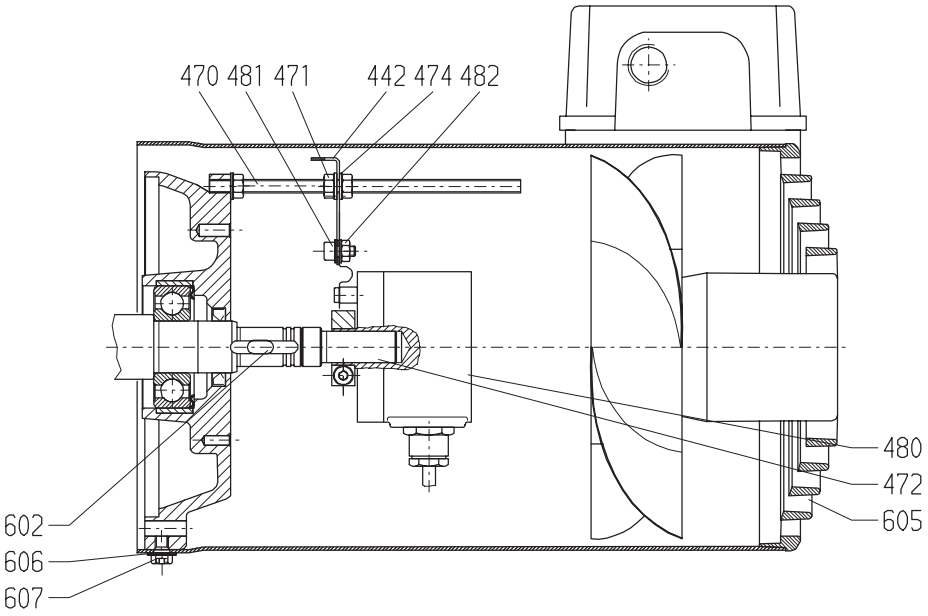
Brake + Pulse generator (self-ventilated / not ventilated)

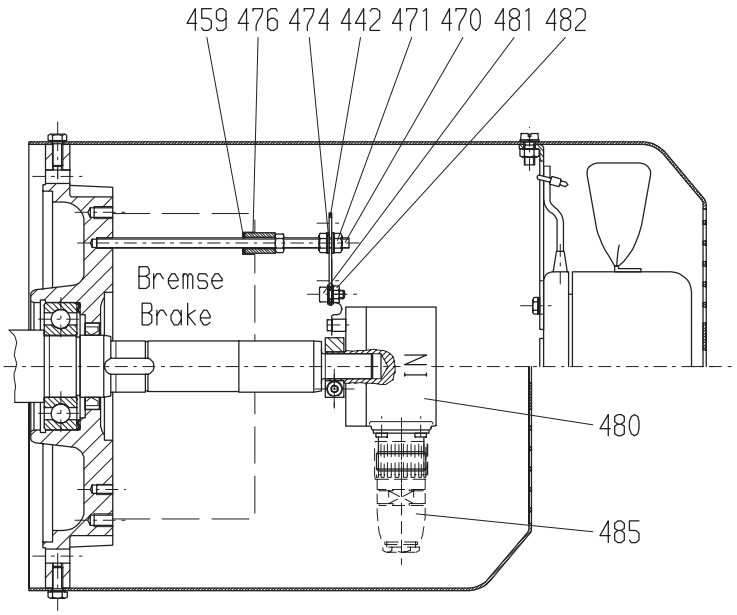




451 Protective plate for pulse generator
453 Bolt
454 Nut
472 Shaft extension
480 Pulse generator
481 Bolt
482 Washer
483 Nut
485 Coupling
489 Spacer/bush
601 Fan blades
602 Parallel key
605 Fan cowl
606 Screw lock
607 Bolt

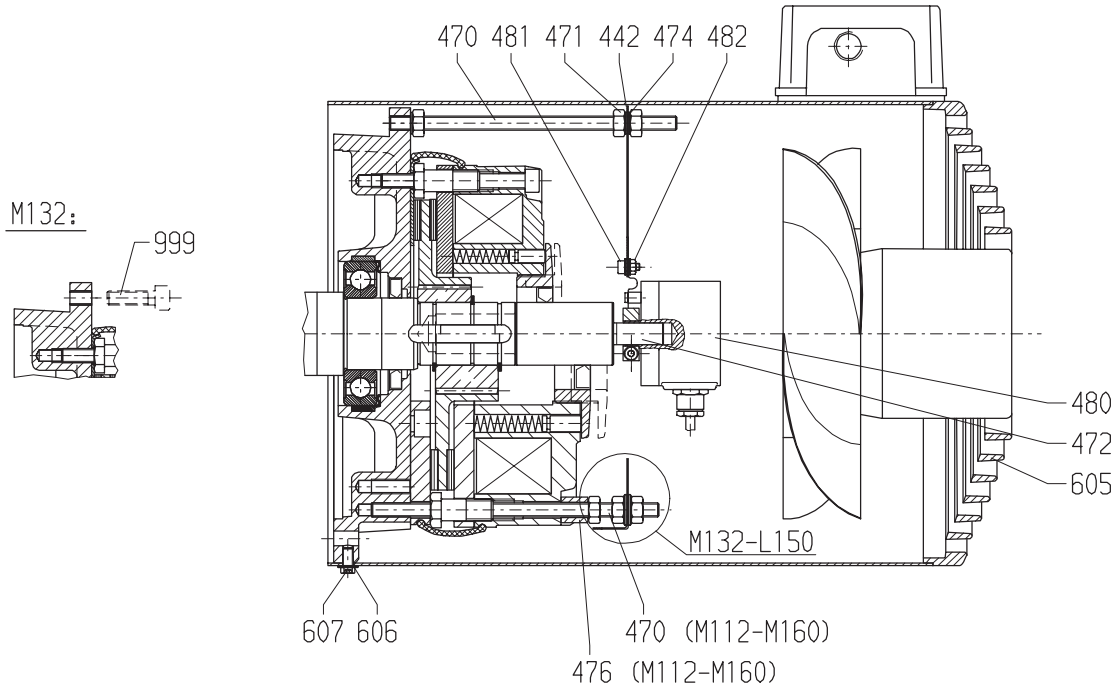
Pulse generator (externally ventilated)

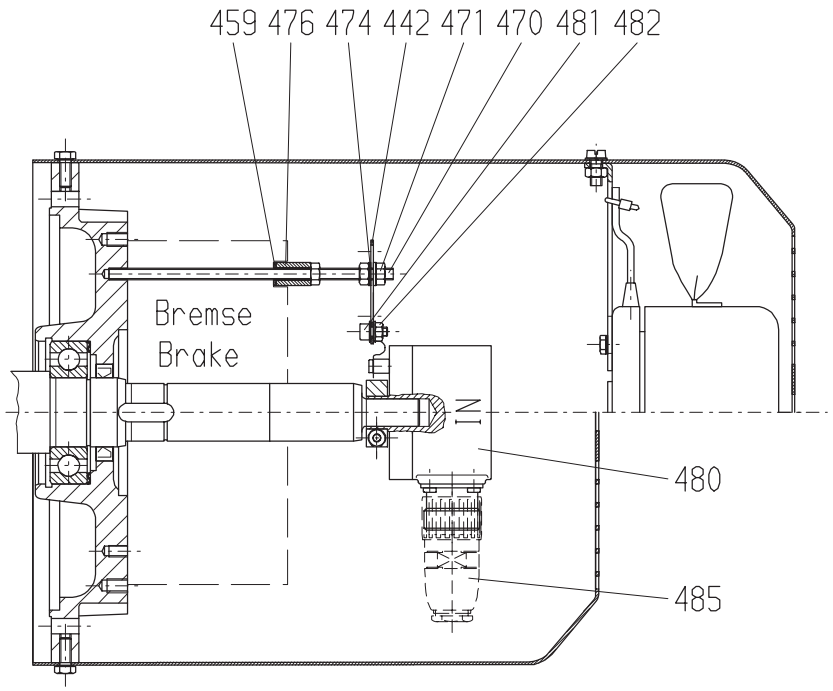




442 Extension for torque arm
459 Washer
470 Bolt
471 Nut
472 Shaft extension
474 Screw lock
476 Spacer/bush
480 Pulse generator
481 Bolt
482 Nut
485 Coupling
602 Parallel key
605 Complete force ventilation
606 Screw lock
607 Bolt

Brake + pulse generator (externally ventilated)



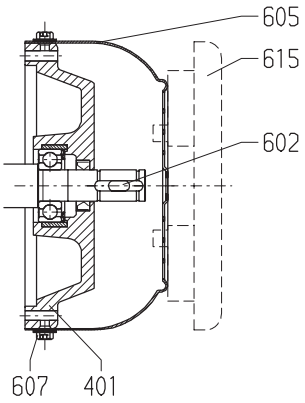


442 Extension for torque arm
459 Washer
470 Bolt
471 Nut
472 Shaft extension
474 Screw lock
476 Spacer/bush
480 Pulse generator
481 Bolt
482 Nut
485 Coupling
605 Complete force ventilation
606 Screw lock
607 Bolt
999 Bolt

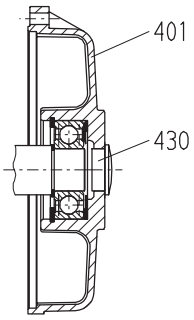
12.2.4 Ventilation

Motor not ventilated

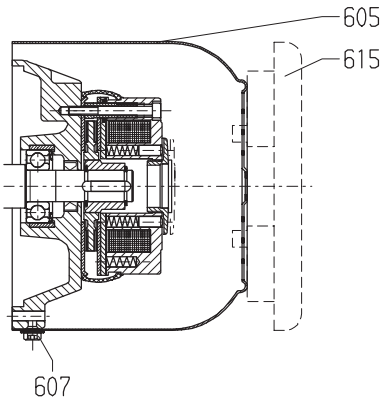
M71 - M160



M1, G-series, A-series

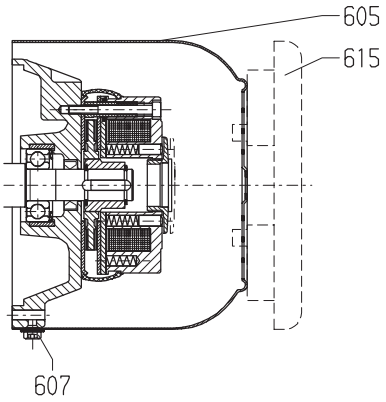


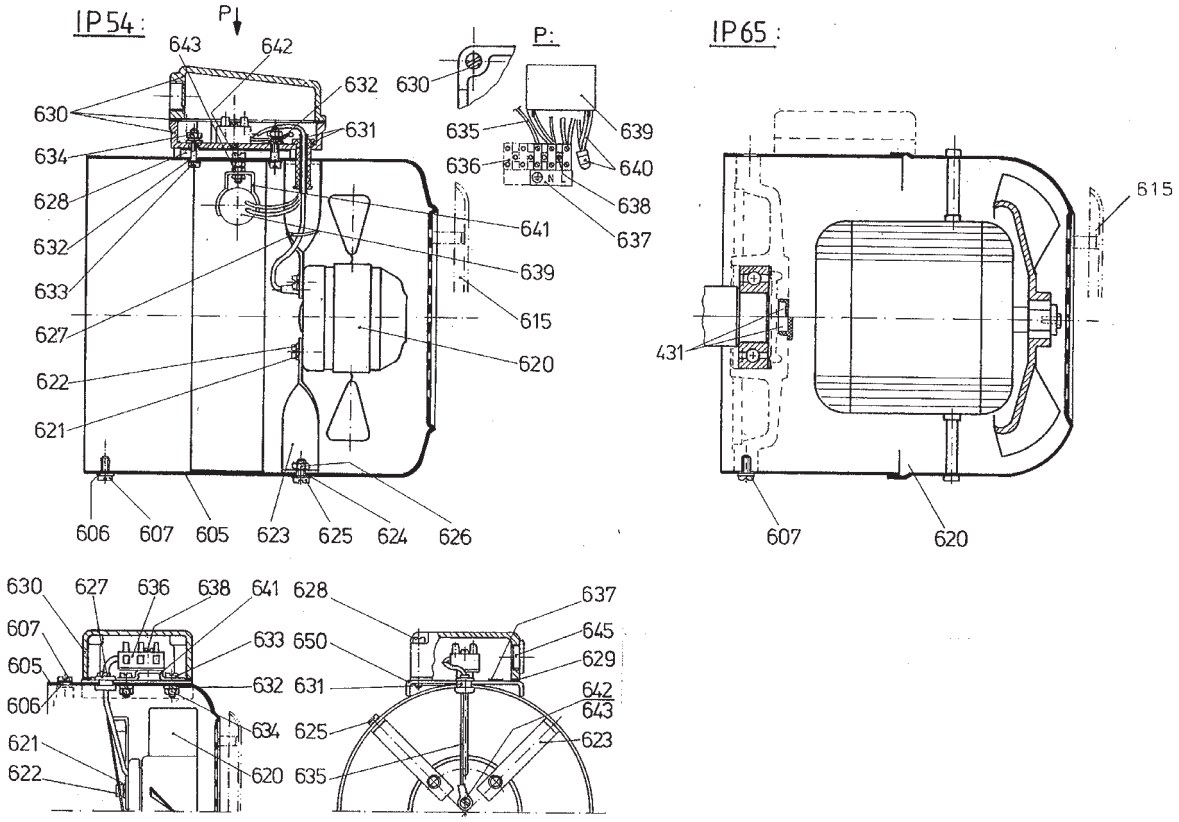
Brake motor not ventilated



401 Bearing end plate (output-side)
430 Plug
602 Parallel key
605 Fan cowl
607 Bolt
615 Protective cover

Motor externally ventilated





431 Plug
602 Parallel key
605 Fan cowl
606 Screw lock
607 Bolt
613 Compensation washer
615 Protective cover
620 Force ventilation, complete
621 Screw lock
622 Bolt
623 Fan mounting
624 Screw lock
625 Bolt
626 Nut
627 Cable tie
628 Bolt
629 Seal
630 Terminal box construction
631 Lead-in tube
632 Screw lock
633 Bolt
634 Nut
635 Stranded wire
636 Terminal strip
637 Marking plate
638 Bracket for terminal strip
639 Capacitor
640 Small parts
641 Bracket for capacitor
642 Screw for bracket
643 Nut for bracket

12.3 Customer-service addresses

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Flender Power Transmission (Pty.) Ltd.
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http://www.flender.cl

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13. Declaration by the manufacturer

13.1 Declaration by the manufacturer

in accordance with EC Engineering Guideline 98/37/EC, Appendix II B

We hereby declare that the

Three-phase asynchronous motors and single-phase alternating current motors with squirrel cage rotor for low voltages of the types

A90	**A100**	**A112**		
G80	**G132**	**G160**	**G180**	**G200**
M1				
M.71	**M.80**	**M.90**	**M.100**	**M.112**
M.132	**M.160**	**M.180**	**M.200**	

described in these operating instructions are intended for incorporation in a machine, and that it is prohibited to put them into service before verifying that the machine into which they are incorporated complies with the EC Guidelines 98/37/EC.

This Manufacturer's Declaration takes into account all the unified standards applying to our products in part or in whole published by the European Commission in the Official Journal of the European Community.

These include in particular:

- EN 292-1
- EN 292-2
- EEN 294
- EEN 349
- EN 60204-1
- EN 50081-2
- EN 50082-2
- EN 60034

Tübingen, 03.05.2004

(p.p. Head of Works Standards)