

**STEINLEN**  
ELEKTRISCHE ANTRIEBSTECHNIK

**MOTOX/MOTOX<sup>®</sup>-N**

**ABM**  **TECNA**  
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**STEINLEN**  
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Our products:  
Bauer G79/G96 · MOTOX/MOTOX-N  
Binder Clutch Brake Unit

Service & Repair: **MOTOX/MOTOX<sup>®</sup>-N**

Operating Instructions

**MOTOX**

LA/LE/LES Motors

BA 2330

Edition

5/2022



**STEINLEN**  
ELEKTRISCHE ANTRIEBSTECHNIK

**MOTOX/MOTOX<sup>®</sup>-N**

## LA/LE/LES motors for mounting on MOTOX gearbox BA 2330

Operating Instructions

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Translation of the original instructions  
03/2021

A5E37460917A/RS-AF-ST

## Legal information

### Warning notice system

This manual contains notices you have to observe in order to ensure your personal safety, as well as to prevent damage to property. The notices referring to your personal safety are highlighted in the manual by a safety alert symbol, notices referring only to property damage have no safety alert symbol. These notices shown below are graded according to the degree of danger.

 <b>DANGER</b>
indicates that death or severe personal injury <b>will</b> result if proper precautions are not taken.

 <b>WARNING</b>
indicates that death or severe personal injury <b>may</b> result if proper precautions are not taken.

 <b>CAUTION</b>
indicates that minor personal injury can result if proper precautions are not taken.

<b>NOTICE</b>
indicates that property damage can result if proper precautions are not taken.

If more than one degree of danger is present, the warning notice representing the highest degree of danger will be used. A notice warning of injury to persons with a safety alert symbol may also include a warning relating to property damage.

### Qualified Personnel

The product/system described in this documentation may be operated only by **personnel qualified** for the specific task in accordance with the relevant documentation, in particular its warning notices and safety instructions. Qualified personnel are those who, based on their training and experience, are capable of identifying risks and avoiding potential hazards when working with these products/systems.

### Proper use of Steinlen products

Note the following:

 <b>WARNING</b>
Steinlen products may only be used for the applications described in the catalog and in the relevant technical documentation. If products and components from other manufacturers are used, these must be recommended or approved by Steinlen. Proper transport, storage, installation, assembly, commissioning, operation and maintenance are required to ensure that the products operate safely and without any problems. The permissible ambient conditions must be complied with. The information in the relevant documentation must be observed.

### Trademarks

All names identified by ® are registered trademarks of Steinlen Elektromaschinenbau GmbH. The remaining trademarks in this publication may be trademarks whose use by third parties for their own purposes could violate the rights of the owner.

### Disclaimer of Liability

We have reviewed the contents of this publication to ensure consistency with the hardware and software described. Since variance cannot be precluded entirely, we cannot guarantee full consistency. However, the information in this publication is reviewed regularly and any necessary corrections are included in subsequent editions.

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## General information and safety notes

### 1.1 General information

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**Note**

Steinlen Elektromaschinenbau GmbH does not accept any liability for damage and failures that result from the non-observance of these operating instructions.

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**Note**

**European RoHS directive**

MOTOX geared motors comply with the stipulations laid down in Directive 2011/65/EU regarding restrictions in the use of certain hazardous substances.

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These operating instructions are part of the motor delivery. Store the operating instructions near the motor. Please read the operating instructions prior to handling the motor and observe the information they contain. This is the best way of ensuring safe and disturbance-free operation.

These operating instructions apply to the standard version of the motors for mounting on the MOTOX gearbox series:

- LA motor, sizes 63 to 71
- LE motor, sizes 63 to 160
- LES motor, sizes 180 to 250

For a description of the precise designation, see Type designation (Page 63).

Table 1- 1 Article number code

Motor	Article number position					
	1	2	3	4	11	12
LA motor with standard efficiency	S	T	3	3	1	1
LE motor with standard efficiency					2	1
LE motor with high efficiency					2	2
LE motor with premium efficiency					2	3
LES motor with standard efficiency					3	1
LES motor with high efficiency					3	2
LES motor with premium efficiency					3	3

## 1.1 General information

The latest versions of the operating instructions, the declaration of incorporation and the declarations of conformity are available in electronic form in the Industry Online Support (<https://www.steinlen.eu>).

### Valid operating instructions for MOTOX

- BA 2010 - operating instructions for MOTOX gearboxes
- BA 2011 - operating instructions for MOTOX worm gearbox SC
- BA 2012 - operating instructions for MOTOX worm gearbox S
- BA 2019 - operating instructions for MOTOX input units
- BA 2310 - operating instructions for three-phase and single-phase AC motors and motors equipped with brake with accessories
- BA 2320 - operating instructions for LA/LG and LAI/LGI motors
- BA 2330 - operating instructions for LA/LE/LES motors
- BA 2510 - operating instructions for MOTOX optional add-on units
- BA 2515 - operating instructions for MOTOX gearboxes for overhead conveyors

## 1.2 Copyright

The copyright to these operating instructions is held by Steinlen Elektromaschinenbau GmbH.

These operating instructions must not be wholly or partly reproduced for competitive purposes, used in any unauthorized way or made available to third parties without agreement of Steinlen Elektromaschinenbau GmbH.

## 1.3 Use as prescribed

The motors described in these operating instructions have been designed for stationary use in general engineering applications.

They comply with the harmonized standards of the series EN 60034 (VDE 0530). They are not approved for operation in hazardous zones and areas.

Unless otherwise agreed, the motors have been designed for use in plants and equipment in industrial environments.

The motors have been built using state-of-the-art technology and are shipped in an operationally reliable condition. Changes made by users could affect this operational reliability and are forbidden.

---

### Note

The data on the rating plate assumes an installation altitude of up to 1000 m above sea level.

The permissible ambient temperature is stamped on the rating plate.

In the case of other ambient temperatures and installation altitudes, contact Technical Support.

---

### 1.4 Installation notes

The motors have been designed for the application described in Section Technical data (Page 63). Do not operate the motor outside the specified power limit. Other operating conditions must be contractually agreed.

Never use degrees of protection  $\leq$  IP54 outdoors. Air-cooled versions are designed for ambient temperatures of -20 °C to +40 °C as standard and for an installation altitude of up to 1 000 m above sea level. Please note any deviations to the data on the rating plate. Conditions at the location of use must comply with all specifications on the rating plate.

Do not climb on the motor. Do not place any objects on the motor.

## 1.4 Installation notes

### Prerequisites for smooth, vibration-free running

- Stable foundation design
- Precise alignment of the machine
- Correct balancing of the parts to be mounted on the shaft extension
- Compliance with vibration severity values according to ISO 20816-1

### Vibration severity

Due to the influencing variables listed below, the vibration response of the system at the location of use can lead to increased vibration severity on the drive unit:

- Transmission elements
- Installation conditions
- Alignment and installation
- Effects of external and internal oscillation

The vibration severity values specified in accordance with ISO 20816-1 must not be exceeded at any point on the surface of the drive. This ensures problem-free operation and a long service life.

### Maximum permissible vibration severity

Observe the values for the maximum permissible radial and axial oscillation vibration severity in the following table. Radial/axial refers to the motor axes.

Vibration frequency	Vibration value
< 6.3 Hz	Vibration displacement $s \leq 0.16$ mm
6.3 Hz to 250 Hz	Vibration velocity $v_{rms} \leq 4.5$ mm/s
> 250 Hz	Vibration acceleration $a_{peak} \leq 10$ m/s <sup>2</sup>

**Maximum permissible axial vibration severity**

Vibration velocity	Vibration acceleration
Vibration velocity $v_{rms} \leq 4.5$ mm/s	Vibration acceleration $a_{peak} \leq 10$ m/s <sup>2</sup>

**Resonant frequencies**

Resonance can occur in the speed range of the geared motor depending on the machine to be driven.

Operation in resonance causes increased noise and vibration levels.

Adherence to the maximum permissible vibration severity is always required.

Operation in the resonant frequency leads to a reduced service life of the geared motor, irrespective of adherence to the maximum vibration severity.

Continuous operation in the resonant frequency must be avoided.

## 1.5 Geared motor with encoder for safety-relevant applications

For a MOTOX geared motor with encoder for safety-relevant applications, it is crucial that you observe the operating instructions BA 2730. These operating instructions are valid for the functionally safe encoders that are mounted onto MOTOX geared motors. The functionally safe encoders are in compliance with the relevant standards for safety-relevant applications listed in the declaration of conformity of BA 2730.

The SMOTOX geared motor with functionally safe encoder has a signal yellow marking on the fan cover. Marking SI04 for the functionally safe encoder is stamped on the rating plate. The safety level is marked on the functionally safe encoder.

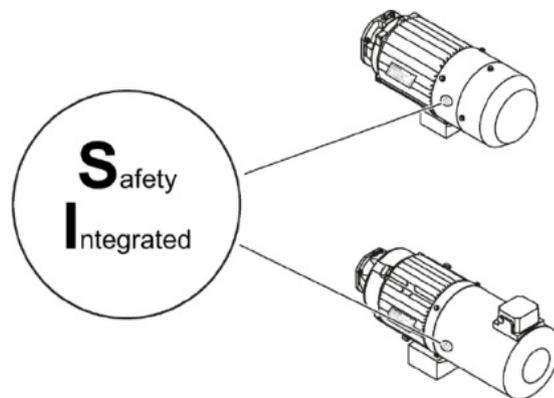


Figure 1-1 Marking for functional safety

## 1.6 Obligations of the user

The company operating the unit must ensure that all persons assigned to work on the geared motor have read and understood these operating instructions and that they comply with them in all points in order to:

- Eliminate the risk to life and limb of users and others
- Ensure the operational safety of the geared motor.
- Avoid disruptions and environmental damage through incorrect use.

### **Comply with the following safety instructions:**

Shut down the geared motors and disconnect the power before you carry out any work on them.

Make sure that the drive unit cannot be turned on accidentally, e.g. lock the key-operated switch. Place a warning notice at the drive connection point which clearly indicates that work is in progress on the geared motor.

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

For all work, carefully comply with the relevant regulations for work safety and environmental protection.

Comply with the instructions on the rating plates attached to the geared motor. The rating plates must be kept free from paint and dirt at all times. Replace any missing rating plates.

In the event of changes during operation, switch off the drive unit immediately.

Take appropriate protective measures to prevent accidental contact with rotating drive parts, such as couplings, gear wheels or belt drives.

Take appropriate protective measures to prevent accidental contact with parts and equipment that heat up to over +70 °C during operation.

When removing protective equipment, keep fasteners in a safe place. Re-attach removed protective equipment before commissioning.

Collect and dispose of used oil in accordance with regulations. Immediately remove any spilt oil with an oil-binding agent.

Do not carry out any welding work on the geared motor. Do not use the geared motor as a grounding point for welding operations.

Carry out equipotential bonding in accordance with applicable regulations and directives by electrotechnology specialists.

Do not use high-pressure cleaning equipment or sharp-edged tools to clean the geared motor.

Comply with the permissible tightening torque of the fastening bolts.

Replace damaged bolts with new bolts of the same type and strength class.

Steinlen Elektromaschinenbau GmbH accepts the warranty only for original spare parts.

The manufacturer who installs the geared motors in a plant must include the regulations contained in the operating instructions in its own operating instructions.

Make sure that you observe the maximum permissible vibration levels specified in ISO 20816-1 (zone limit A) during operation.

## 1.7 The five safety rules

For your own personal safety and to prevent material damage when carrying out any work, always observe the safety-relevant instructions and the following five safety rules according to EN 50110-1 Working in a voltage-free state. Apply the five safety rules in the sequence stated before starting work.

### Five safety rules

1. Disconnect.  
Also disconnect the auxiliary circuits, for example the anti-condensation heating.
2. Secure against reconnection.
3. Verify absence of operating voltage.
4. Ground and short circuit.
5. Cover or safeguard neighboring live parts.

After the work has been completed, undo the measures taken in the reverse order.

## 1.8 Particular types of hazards

 <b>WARNING</b>
<b>Extreme surface temperatures</b> Hot surfaces over +55 °C pose a burn risk. Cold surfaces below 0 °C pose a risk of damage due to freezing. Do not touch the gearbox without protection.

1.8 Particular types of hazards

 **WARNING**

**Hot, escaping oil**

Before starting any work wait until the oil has cooled down to below +30°C.

 **WARNING**

**Poisonous vapors when working with solvents**

Avoid breathing in vapors when working with solvents.

Ensure adequate ventilation.

 **WARNING**

**Risk of explosion when working with solvents**

Ensure adequate ventilation.

Do not smoke!

 **WARNING**

**Risk of eye injury**

Rotating parts can throw off small foreign particles such as sand or dust.

Wear protective eyewear!

In addition to the prescribed personal protection gear, also wear suitable protective gloves and safety glasses.

## Technical description

### 2.1 General technical description

The motor complies with the following regulations:

Table 2- 1 Overview of the standards

Topic	Standard
Dimensions and operation characteristics	EN 60034-1
Degree of protection	EN 60034-5
Cooling	EN 60034-6
Mounting position according to modular system	EN 60034-7
Terminal marking and direction of rotation	EN 60034-8
Noise emission	EN 60034-9
Thermal protection	EN 60034-11
Starting characteristics for rotating electrical motors	EN 60034-12
Vibration severity levels	EN 60034-14
IEC standard voltages	IEC 60038
Safety of machinery	EN 60204-1

The motor is equipped with grease-lubricated roller bearings. The bearings are permanently lubricated.

The stator winding is designed for temperature class 155 (F). The stator winding can be optionally implemented with temperature class 180 (H).

In the standard version, the rotor corresponds to vibration severity level A.

The technical data for the optional monitoring equipment can be viewed in the circuit diagrams, on the rating plate or in the special order documents.

The stator housing and bearing shields are made of die-cast aluminum or cast iron.

The surface of the stator housing is equipped with cooling fins and a mounted terminal box or motor connector.

## 2.2 Cooling

<b>NOTICE</b>
<b>Dust deposits prevent heat radiation</b> Dust deposits prevent heat radiation and cause a high housing temperature. Keep the motor free from dirt, dust etc.

The motor is designed to be cooled by means of fins. An external fan draws in the cooling air through the aperture in the fan cover and blows the air over the surface of the stator housing.

## 2.3 Backstop at the motor

<b>NOTICE</b>
<b>Service life limited</b> Drive speeds below 1 000 rpm or frequent starting and stopping operations ( $\geq 20$ starts / stops per hour) will limit service life. Ensure that the backstop is replaced in time when frequent starting and stopping operations are performed.

<b>NOTICE</b>
<b>Damage or destruction due to incorrect direction of rotation</b> Do not run the motor against the backstop. Note the directional arrow on the motor.

### Note

The backstop is not suitable for ambient temperatures under  $-25\text{ }^{\circ}\text{C}$ .

The motor can be fitted with a mechanical backstop. The backstop permits only the correct direction of rotation during operation. The motor is marked by an arrow pointing in the corresponding direction.

The backstop is fitted with centrifugally operated sprags. When the motor is running in the specified direction, the inner ring and the cage with the sprags also rotate while the outer ring remains stationary.

If the drive speed exceeds the speed listed in the table, the sprag rises. The backstop is wear-free. The backstop does not require any maintenance.

Table 2- 2 Minimum drive speed when using backstops

Motor size	Backstop	Speed
		rpm
71	FXM31-17DX	> 890
80	FXM31-17DX	> 890
90, 100, 112	FXM38-17DX	> 860
132	FXM61-19DX	> 750
160	FXM66-25DX	> 730
180, 200	FXM76-25DX	> 670
225, 250	FXM86-25DX	> 630

## 2.4 Terminal box and application box

The following are contained in the motor terminal box:

- Terminals for the motor (terminal board)
- Terminals for checking equipment
- Terminals for anti-condensation heating
- Connector for the brake

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

## 2.5 SINAMICS G110M frequency inverters

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### Note

SINAMICS G110M inverters are not suitable for ambient temperatures below -10 °C.

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The user documentation for the inverters integrated in the motor will be supplied separately.

## 2.6 Rating plate

### Resetting the parameters to their factory settings

Resetting the parameters to their factory settings means that the motor parameter values deviate from the required values. Restore the relevant motor parameter values.

#### Procedure

1. Set the value of parameter p0010 to 30.
2. Set the value of parameter p0970 to 10.

Detailed information can be found in the G110M List Manual.

## 2.6 Rating plate

The rating plate on the gearbox or geared motor is of coated aluminum foil. The rating plate is glued using a special masking film. The film ensures permanent resistance to UV radiation and media of all kinds, such as oils, greases, salt water and cleaning agents.

The adhesive and the material ensure firm adhesion and long-term legibility within the operating temperature range from -40 °C to +155 °C.

The edges of the rating plate are paint-finished to match the color of the gearbox or motor to which it is affixed.

## 2.7 Surface treatment

### 2.7.1 General information on surface treatment

All paint finishes are sprayed on.

<b>NOTICE</b>
<b>Failure of the external protection</b> If the paint finish is damaged, the geared motor may corrode. Do not damage the paint finish.

---

#### Note

Information about the ability to be repainted does not guarantee the quality of the paint product supplied by your supplier.

Only the paint manufacturer is liable for the quality and compatibility.

---

**Note**

C1 paints are not suitable for ambient air temperatures under -20 °C.

## 2.7.2 Painted version

The corrosion protection system is classified according to the corrosiveness categories in DIN EN ISO 12944-2.

Table 2- 3 Paint according to corrosiveness categories

Paint system	Description
Corrosiveness category C1, unpainted for gearbox and motor housings made of aluminum	
-	<ul style="list-style-type: none"> <li>• Indoor installation</li> <li>• Heated buildings with neutral atmospheres</li> <li>• Resistance to greases and some resistance to mineral oils, aliphatic solvents</li> <li>• Standard</li> </ul>
Corrosiveness category C1 for normal environmental stress	
1-component hydro paint, top coat	<ul style="list-style-type: none"> <li>• Indoor installation</li> <li>• Heated buildings with neutral atmospheres</li> <li>• Resistance to greases and some resistance to mineral oils, aliphatic solvents</li> <li>• Standard paint for gearbox housings made of cast iron</li> </ul>
Corrosiveness category C2 for low environmental stress	
2-component - polyurethane top coat	<ul style="list-style-type: none"> <li>• Indoor and outdoor installation</li> <li>• Unheated buildings with condensation, production areas with low humidity, e.g. warehouses and sports facilities</li> <li>• Atmospheres with little contamination, mostly rural areas</li> <li>• Resistance to greases, mineral oils and sulfuric acid (10 %), caustic soda (10 %) and some resistance to aliphatic solvents</li> </ul>

2.7 Surface treatment

Paint system	Description
Corrosiveness category C3 for medium environmental stress	
2-component epoxy zinc phosphate base coat, 2-component polyurethane top coat	<ul style="list-style-type: none"> <li>• Indoor and outdoor installation</li> <li>• Production areas with high humidity and some air contamination, e.g. food production areas, dairies, breweries and laundries</li> <li>• Urban and industrial atmospheres, moderate contamination from sulfur dioxide, coastal areas with low salt levels</li> <li>• Resistance to greases, mineral oils, aliphatic solvents, sulfuric acid (10 %), caustic soda (10 %)</li> </ul>
Corrosiveness category C4 for high environmental stress	
2-component epoxy zinc phosphate base coat, 2-component polyurethane top coat	<ul style="list-style-type: none"> <li>• Indoor and outdoor installation</li> <li>• Chemical plants, swimming pools, wastewater treatment plants, electroplating shops, and boathouses above seawater</li> <li>• Industrial areas and coastal areas with moderate salt levels</li> <li>• Resistance to greases, mineral oils, aliphatic solvents, sulfuric acid (10 %), caustic soda (10 %)</li> </ul>
Corrosiveness category C5 for very high environmental stress	
2-component epoxy zinc phosphate base coat, 2-component polyurethane intermediate coat, 2-component polyurethane top coat	<ul style="list-style-type: none"> <li>• Indoor and outdoor installation</li> <li>• Buildings and areas with almost constant condensation and high contamination, e.g. malt factories and aseptic areas</li> <li>• Industrial areas with high humidity and aggressive atmosphere, coastal areas and offshore environments with high salt levels</li> <li>• Resistance to greases, mineral oils, aliphatic solvents, sulfuric acid (10 %), caustic soda (20 %)</li> </ul>

In case of corrosiveness category C1, overpainting with a 1-component hydrosystem after prior rubbing down is possible.

In case of corrosiveness categories C2 to C5, overpainting with 2-component polyurethane paint, 2-component epoxide paint and 2-component acrylic paint after prior rubbing down is possible.

### 2.7.3 Primed version

Table 2- 4 Primer according to corrosiveness category

Paint system	Can be overpainted with
Unpainted corrosiveness category C1	
Cast iron parts immersion primed, steel parts primed or zinc-plated, aluminum and plastic parts untreated	<ul style="list-style-type: none"> <li>• Synthetic paint, synthetic resin paint, oil paint</li> <li>• 2-component polyurethane paint</li> <li>• 2-component epoxy paint</li> </ul>
Primed according to corrosiveness category C2 G	
2-component epoxy zinc phosphate, desired coat thickness 60 µm	<ul style="list-style-type: none"> <li>• 2-component - polyurethane paint</li> <li>• 2-component - epoxy paint</li> <li>• 2-component - acrylic paint</li> <li>• Acid-hardening paint</li> </ul>
Primed according to corrosiveness category C4 G	
2-component epoxy zinc phosphate, desired coat thickness 90 µm	<ul style="list-style-type: none"> <li>• 2-component - polyurethane paint</li> <li>• 2-component - epoxy paint</li> <li>• 2-component - acrylic paint</li> <li>• Acid-hardening paint</li> </ul>



## Incoming goods, transport, and storage

### 3.1 Incoming goods

<b>NOTICE</b>
<b>Transport damage impairs correct functioning</b> Do not commission faulty gearboxes or geared motors.

---

**Note**

Do not open or damage parts of the packaging that preserve the product.

---

**Note**

Check that the technical specifications are in accordance with the purchase order.

Inspect the delivery immediately on arrival for completeness and any transport damage.

Notify the freight company of any damage caused during transport immediately (this is the only way to have damage rectified free of charge). Steinlen Elektromaschinenbau GmbH will not accept any claims relating to items missing from the delivery and which are submitted at a later date.

---

The gearbox or geared motor is delivered in a fully assembled condition. Additional items are sometimes delivered packaged separately.

The products supplied are listed in the dispatch papers.

## 3.2 Transport

### 3.2.1 General information on transport

**NOTICE**

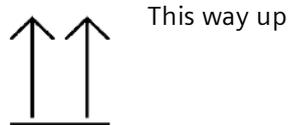
**The use of force will damage the gearbox or geared motor**

Transport the gearbox or geared motor carefully. Avoid knocks.

Before putting the drive into operation, remove any transport fixtures and keep them safe or render them ineffective. You can then use them again for transporting further items or you can apply them again.

Different forms of packaging may be used, depending on the size of the gearbox or geared motor and the method of transport. Unless contractually agreed otherwise, the seaworthy packaging complies with HPE Packaging Guidelines (Bundesverband Holzpackmittel Paletten Exportverpackungen e.V., the German Federal Association for wooden packaging, pallets, and export packaging).

Note the symbols which appear on the packaging. These have the following meanings:



This way up



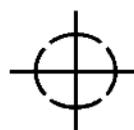
Fragile



Keep dry



Keep cool



Center of gravity



Do not use hand hook



Attach here

### 3.2.2 Fastening for suspended transport

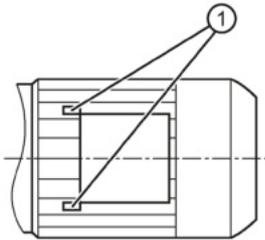
 **WARNING**

**Motors may come loose during transport if not adequately secured**

Do not use the integrally cast lifting eyes ① on the motor to transport the geared motors due to the risk of breaking. Only use the integrally cast eyebolts ① to transport the motor prior to mounting or following removal.

If necessary, use additional, suitable lifting accessories for transport or during installation.

When attaching by a number of chains and ropes just two strands must be sufficient to bear the entire load. Secure lifting equipment so that it cannot slip.



① Integrally cast eye on the motor

Figure 3-1 Motor attached for suspended transport

## 3.3 Storage

 <b>WARNING</b>
--

<b>Injuries caused by falling objects</b>
---

Danger of serious injuries caused by falling objects.
---

<b>NOTICE</b>
---------------

<b>Failure of the exterior protection</b>
---

Mechanical damage, chemical damage and thermal damage, such as scratches, acids, alkalis, sparks, welding beads and heat cause corrosion.
---

Do not damage the paint finish.
---------------------------------

---

**Note**

**Danger of damage to the motor when stacked**

Do not stack gearboxes or geared motors on top of each other.

---

Unless contractually agreed otherwise, the warranty period for the standard preservative lasts 6 months from the date of delivery.

In the case of storage in transit over 6 months, special arrangements must be made for preservation. Please contact Technical Support.

Store the gearbox or geared motor in dry, dust-free rooms that are maintained at a constant temperature.

The storage location must be vibration- and shock-free.

The free shaft ends, sealing elements and flange surfaces must have a protective coating.

Do not store the geared motor on the fan cover.

**Storage up to 36 months (optional)**

Store the gearbox or geared motor in dry, dust-free rooms that are maintained at a constant temperature. Special packing is then not necessary.

If such premises are not available, pack the gearbox or the geared motor in plastic film or air-tight sealed film and materials. The films and materials must be able to absorb moisture. Cover them to provide protection against heat, direct sunlight and rain.

The permissible ambient temperature is -25 °C to +50 °C.

The life of the corrosion protection is 36 months from delivery.

# Installation

## 4.1 Unpacking

<b>NOTICE</b>
<b>Transport damage impairs the correct function of the geared motor</b>
Never commission faulty or defective motors.

Check the motor for completeness and damage. Report any missing parts or damage immediately.

Remove and dispose of the packaging material and transport equipment in compliance with regulations.

## 4.2 General information on installation

 <b>WARNING</b>
<b>Working under load</b>
Under load, the system can start or reverse in an uncontrolled fashion.
The entire system must be load-free so that there is no danger when carrying out this work.

<b>NOTICE</b>
<b>Overheating caused by solar radiation</b>
Overheating of the motor due to exposure to direct sunlight
Provide suitable protective equipment such as covers or roofs. Prevent heat accumulation.

<b>NOTICE</b>
<b>Malfunction resulting from foreign objects</b>
The operator must ensure that no foreign objects impair the function of the motor.

4.3 Thread sizes and tightening torques for fastening bolts

<b>NOTICE</b>
<b>Destruction of the machine</b>
The machine can be mechanically destroyed if the vibration values in operation are not maintained in accordance with DIN ISO 20816-1.
<ul style="list-style-type: none"> <li>In operation, maintain the vibration values according to DIN ISO 20816-1.</li> </ul>

**Note**

Use headless screws of strength class 8.8 or higher to fasten the motor.

Exercise particular care during mounting and installation. The manufacturer cannot be held liable for damage caused by incorrect mounting and installation.

Make sure that there is sufficient space around the motor for mounting, maintenance and repair.

On geared motors with a fan, leave sufficient free space for the entry of air. Observe the installation conditions for the geared motor.

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

Use all the fastening means that have been assigned to the particular mounting position and mounting type.

Cap screws cannot be used in some cases due to a lack of space. In such cases, please contact Technical Support quoting the type of gearbox.

### 4.3 Thread sizes and tightening torques for fastening bolts

The general tolerance for the tightening torque is 10%. The tightening torque is based on a friction coefficient of  $\mu = 0.14$ .

Table 4- 1 Tightening torques for fixing screws

Thread size	Tightening torque for property class		
	8.8	10.9	12.9
	Nm	Nm	Nm
M4	3	4	5
M5	6	9	10
M6	10	15	18
M8	25	35	41
M10	50	70	85
M12	90	120	145
M16	210	295	355

Thread size	Tightening torque for property class		
	8.8	10.9	12.9
	Nm	Nm	Nm
M20	450	580	690
M24	750	1 000	1 200
M30	1 500	2 000	2 400
M36	2 500	3 600	4 200

## 4.4 Installation conditions for the motor

### NOTICE

#### Danger of overheating due to insufficient cooling

Protect intake and outlet ports against blockages and coarse dust.

The cooling air must flow unimpeded into the air inlets and flow out through the air outlets. Exhaust air should not be drawn back in again.

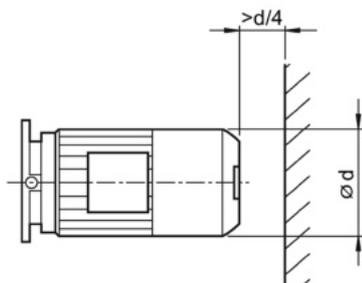


Figure 4-1 Installation condition for the MOTOX motor

The permissible coolant temperature (ambient temperature at installation location) is  $-20^{\circ}\text{C}$  to  $+40^{\circ}\text{C}$  as standard for an installation altitude of up to 1 000 m above sea level. Deviating data are specified on the rating plate.

For the vertical mounting position with the fan cover facing upwards, provide protection to prevent foreign objects falling in, e.g. with an appropriate cover.

## 4.5 Condensation drain hole (optional)

When installing the surface-cooled motor, take care that the condensation drain holes are at the lowest point.

## 4.6 Connecting the motor in the terminal box

### 4.6.1 General information on motor connection



#### Unintentional starting of the drive unit

Any work on the stationary machine must be performed with the machine isolated from the supply and secured so that it cannot be switched back on again. This also applies to auxiliary circuits, e.g. anti-condensation heating.

Check that the unit is in a no-voltage condition.

Deviations in the voltage, frequency, curve shape and/or symmetry of the line feed increase the heating.

This also affects the electromagnetic compatibility.

Before starting work, make sure that a protective conductor is securely connected.

#### Note

Pre-assembled conductors may only be used with fixed routed at temperatures below -30 °C.

Alternating bends are not allowed at these temperatures.

Connect the motor in such a way that a permanently safe electrical connection is ensured. Wire ends must not protrude. Use matching cable end pieces.

Connect the line supply voltage in the terminal box. Arrange the terminal link according to the circuit diagram for star or delta connection in the terminal box.

If the motor has been ordered with a dispatch circuit, the terminal links are already connected to the terminal board as star or delta connection.

Select the connection cables according to DIN VDE 0100. Take into account the rated current and the plant-specific conditions.

The following required information for connection is specified in the technical data:

- Direction of rotation
- Number and arrangement of the connections
- Circuit / connection of the motor winding.

## 4.6.2 Terminal box

 <b>DANGER</b>
<b>Dangerous voltages</b> Can result in death, physical injury, or damage to property. Observe the following safety information before connecting-up the machine: <ul style="list-style-type: none"><li>• Only qualified personnel is permitted to work on the machine.</li><li>• Only perform work when the machine is stationary.</li><li>• Isolate the machine from the power supply and take measures to prevent it being switched back on again. The same applies for auxiliary circuits.</li><li>• Check that the machine really is in a no-voltage condition.</li><li>• If you have loosened terminal blocks, rectifiers and/or similar parts when electrically connecting the motor, then secure these components back in the terminal box. See figure below.</li></ul>

<b>NOTICE</b>
<b>Electrical connections can loosen</b> Please observe the tightening torques for cable glands, nuts and bolts. When performing a test run, secure the featherkeys without output elements.

<b>NOTICE</b>
<b>Malfunctions</b> It must be ensured that there are no foreign bodies, dirt or moisture in the terminal box. The terminal box must be sealed so that dust and water cannot enter. Seal the terminal box with the original seal. Seal cable entries to the terminal box and other open cable entries with an O-ring or suitable flat gasket. Do not damage the terminal box or other functional parts inside the terminal box.

---

**Note**

For a standard terminal board with 6 terminal studs, the terminal box can be turned 4 x 90 degrees on the terminal base of the stator housing.

---

4.6 Connecting the motor in the terminal box

The temperature sensor and anti-condensation heating are connected in the terminal box.

Please note that the motor degree of protection is only obtained after correctly connecting up and tightening the cable glands and blanking plugs. Seal the thread of the cable glands and sealing plugs with a sealing compound or O-ring when connecting.

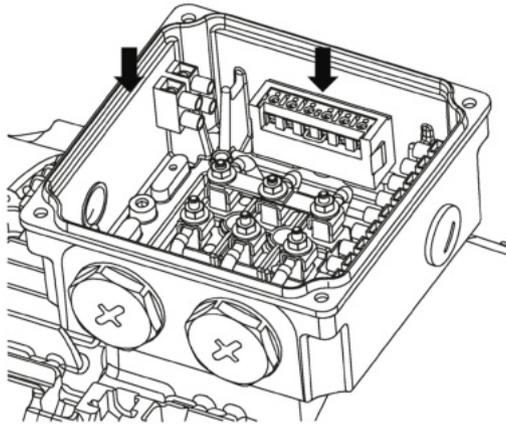


Figure 4-2 Securing in terminal box

4.6.3 Terminal marking

For terminal designations, the following principle definitions apply to three-phase motors:

Table 4-2 Terminal designations using the example 1U1-1

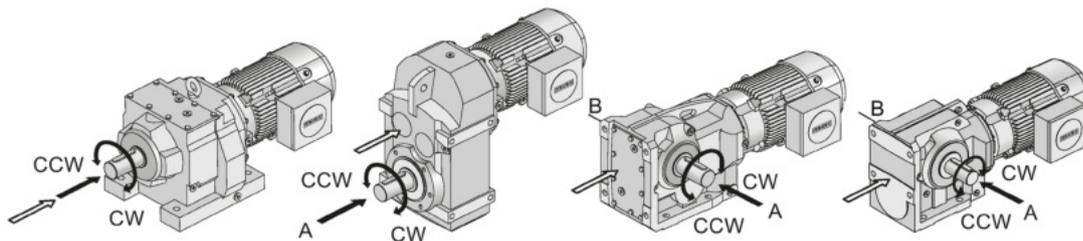
1	U	1	-	1	Designation
x					Index showing the pole assignment for pole-changing three-phase motors (lower number = lower speed) or, in special cases, for a subdivided winding
	x				Phase designation (U, V, W)
		x			Index showing winding start (1) Index showing winding end (2) Additional indexes if there is more than one connection per winding
				x	Additional indices if it is obligatory to connect parallel line feeder cables to several terminals with otherwise identical designations

### 4.6.4 Direction of rotation

The motors are suitable for clockwise and counter-clockwise rotation.

When the line feeder cables are connected in the phase sequence L1, L2, L3 to U, V, W the motor rotates clockwise when looking at the drive end of the shaft extension (DE). If two of the connections are swapped, the resulting direction of rotation is counter-clockwise, e.g. L1, L2, L3 to V, U, W.

In the case of geared motors intended for only one direction of rotation, e.g. with backstop, the prescribed direction of rotation is marked by a direction arrow on the geared motor.



- View in relation to the output shaft
- ⇒ View in relation to the drive shaft / motor shaft

Figure 4-3 Direction of rotation

Table 4-3 Direction of rotation of the geared motor with a view of the output shaft

Gearbox type	View of	Direction of rotation		
		Output shaft	Drive shaft	
Z	Output shaft	Right	Right	
D			Left	
FZ			Right	
FD			Left	
B	DE of the output shaft	Right	Right	
	NDE of the output shaft		Left	
K	DE of the output shaft		Left	Left
	NDE of the output shaft			Left
C	DE of the output shaft	Right		Right
	NDE of the output shaft			Left

### 4.6.5 Connecting the cables in the terminal box

---

**Note**

Direct contact between the cable lug surfaces and the contact nuts ensures that the connection can carry current.

---

In the case of terminals with terminal clamps, distribute the conductors in such a way that the clamping heights are about the same on both sides of the fillet. This method of connection requires a single conductor to be bent into a U shape or connected with a cable lug. The same applies to the inner and outer terminals of the ground conductor.

Select the cable lug size according to the required cable cross-section and stud size. A sloped / angular arrangement is permitted if the required clearances and creepage distances are maintained.

Remove the insulation from the conductor ends so that the remaining insulation is almost long enough to reach the cable lug.

### 4.6.6 External grounding

Ensure the following when making connections:

- The connecting surface must be bare. Protect the surface against corrosion with a suitable substance, e.g. acid-free Vaseline.
- Insert the cable lug between the contact bracket and the grounding bracket. Do not remove the contact bracket which is pressed into the housing.
- Place the spring washer under the bolt head.
- Observe the tightening torque for the locking screw, see Installation and routing (Page 35).

Table 4- 4 Maximum conductor connection of the external grounding

Motor size	Thread size
63 ... 90	M4
100 ... 112	M5
132 ... 180	M6
200	2 x M6
225, 250	2 x M8

### 4.6.7 Installation and routing

**Note**

Match the screw connection to the connection cable used:

- Seal insert
- Armor
- Braid
- Shielding

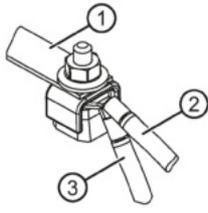
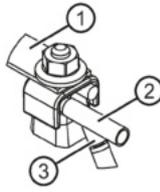
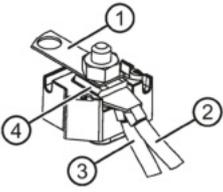
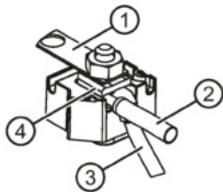
Screw the screw connection into the housing. Or secure the screw connection with a locknut.

**Terminal board connection**

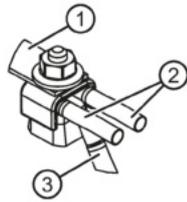
Table 4- 5 Tightening torque for terminal board connection

Thread size	Tightening torque		Thread size	Tightening torque	
	Min.	Max.		Min.	Max.
	Nm	Nm		Nm	Nm
M4	0.8	1.2	M10	9	13
M5	1.8	2.5	M12	14	20
M6	2.7	4	M16	27	40
M8	5.5	8	-	-	-

**Type of conductor connection**

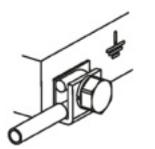
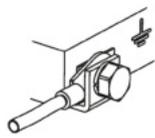
Angle DIN cable lug down for connection. DIN 46234			Conductor cross section ... 25 mm <sup>2</sup>
			
Connecting an individual conductor with terminal clamp.			
			... 10 mm <sup>2</sup>

4.6 Connecting the motor in the terminal box

Connecting two conductors of approximately the same thickness with terminal clamp.	
	... 25 mm <sup>2</sup>

- ① Link rail
- ② Line connecting cable
- ③ Motor connecting cable
- ④ Cover washer

**Grounding connection type**

Connecting an individual conductor under the external grounding bracket.	Conductor cross section
	... 10 mm <sup>2</sup>
Connect with a DIN cable lug under the external grounding bracket DIN 46234.	
	... 25 mm <sup>2</sup>

**Cable gland**

<b>NOTICE</b>
<p><b>Damage to the cable jacket</b></p> <p>An excessively high tightening torque with a different cable jacket material will damage the cable jacket.</p> <p>When different cable jacket materials are used, apply a lower tightening torque.</p>

For metal or plastic cable glands, please use the following tightening torques for direct mounting. The O-ring cross-section is 2 mm.

Table 4- 6 Tightening torque for cable glands and blanking plugs

Thread size	Tightening torque $\pm 10\%$		Thread size	Tightening torque $\pm 10\%$	
	Metal	Plastic		Metal	Plastic
	Nm	Nm		Nm	Nm
M12 x 1.5	8	1.5	M32 x 1.5	18	6
M16 x 1.5	10	2	M40 x 1.5	20	
M20 x 1.5	12	4	M50 x 1.5		
M25 x 1.5			M63 x 1.5		

### 4.6.8 External fan (optional)

Please note the direction of rotation. The direction of rotation is indicated by an arrow on the external fan.

Connect up the external fan according to the applicable circuit diagram.

Before commissioning the motor, check that the external fan is working properly.

The external fan must be switched on during motor operation.

After the motor has been switched off, the external fan must continue to run, depending on the temperature.

#### Circuit diagrams of the external fan

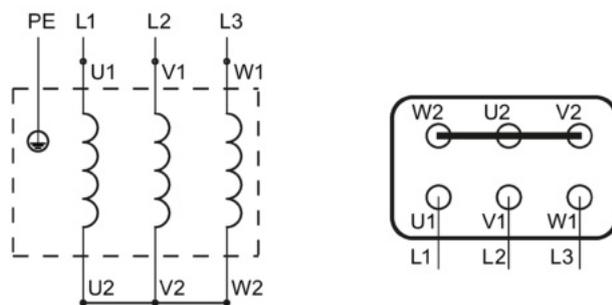


Figure 4-4 Star connection

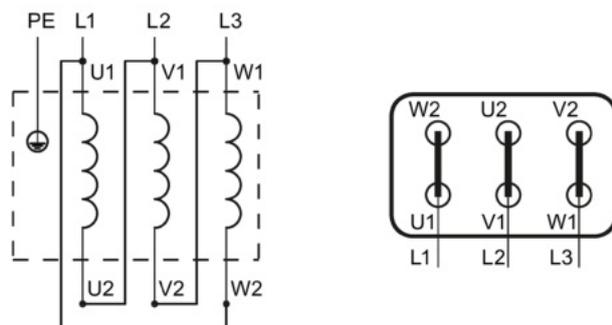


Figure 4-5 Delta connection

4.6 Connecting the motor in the terminal box

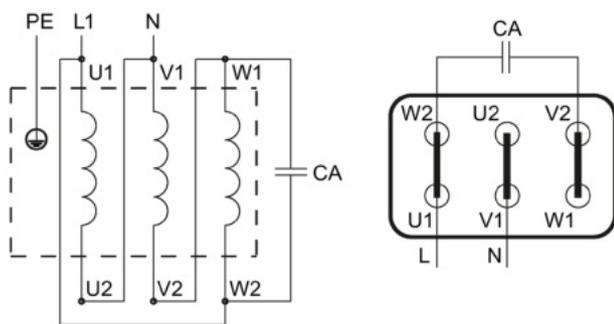


Figure 4-6 Steinmetz delta connection

U1 (T1) Black	V1 (T2) Light blue	W1 (T3) Brown
U2 (T4) Green	V2 (T5) White	W2 (T6) Yellow

Technical specifications of the external fan

Size	Frequency	Rated voltage range	Rated current	Power consumption	Volume flow
	Hz	Phase	A	W	m <sup>3</sup> /h
71	50	1AC 3AC	0.18 0.15 / 0.09	48 29	78
	60	1AC 3AC	0.21 0.13 / 0.07	56 28	99
80	50	1AC 3AC	0.19 0.16 / 0.09	48 33	128
	60	1AC 3AC	0.22 0.13 / 0.07	59 36	151
90	50	1AC 3AC	0.29 0.39 / 0.22	59 78	216
	60	1AC 3AC	0.23 0.32 / 0.18	61 71	258
100	50	1AC 3AC	0.29 0.37 / 0.21	62 80	278
	60	1AC 3AC	0.29 0.30 / 0.18	73 80	328
112	50	1AC 3AC	0.27 0.35 / 0.20	64 87	355
	60	1AC 3AC	0.35 0.29 / 0.17	88 93	418
132	50	1AC 3AC	0.52 0.64 / 0.37	125 160	550
	60	1AC 3AC	0.61 0.55 / 0.32	163 180	650

## 4.6 Connecting the motor in the terminal box

Size	Frequency	Rated voltage range	Rated current	Power consumption	Volume flow
	Hz	Phase	A	W	m <sup>3</sup> /h
160	50	1AC 3AC	0.74 1.28 / 0.76	246 314	980
	60	1AC 3AC	1.52 1.08 / 0.62	390 391	1160
180	50	1AC 3AC	0.74 1.28 / 0.74	246 314	1200
	60	1AC 3AC	1.52 1.08 / 0.62	390 391	1379
200	50	1AC 3AC	0.74 1.28 / 0.74	246 314	1324
	60	1AC 3AC	1.52 1.08 / 0.62	390 391	1575
225, 250	50	3AC	2.0 / 1.15	450	1600
	60		1.05	520	1860

Table 4- 7 Rated voltage range of external fan

Size	Frequency	Rated voltage range		Connection
	Hz	Phase	V	
71, 80	50	1AC	230 ... 277	⊥ (Δ)
		3AC	200 ... 303 / 346 ... 525	Δ / Y
	60	1AC	230 ... 277	⊥ (Δ)
		3AC	220 ... 332 / 380 ... 575	Δ / Y
90, 100, 112	50	1AC	220 ... 277	⊥ (Δ)
		3AC	200 ... 303 / 346 ... 525	Δ / Y
	60	1AC	220 ... 277	⊥ (Δ)
		3AC	220 ... 332 / 380 ... 575	Δ / Y
132, 160	50	1AC	230 ... 277	⊥ (Δ)
		3AC	200 ... 303 / 346 ... 525	Δ / Y
	60	1AC	230 ... 277	⊥ (Δ)
		3AC	220 ... 332 / 380 ... 575	Δ / Y
180, 200	50	1AC	230 ... 277	⊥ (Δ)
		3AC	200 ... 303 / 346 ... 525	Δ / Y
	60	1AC	230 ... 277	⊥ (Δ)
		3AC	220 ... 332 / 380 ... 575	Δ / Y
225, 250	50	3AC	220 ... 240 / 380 ... 420	Δ / Y
	60		440 ... 480	Y

## 4.7 Operation on the converter

### Permissible voltage stress

#### NOTICE

#### Damage to the motor insulation

The motor insulation will be damaged by impermissible voltage peaks produced by converters without an output filter.

Reduce the maximum motor voltage to noncritical values by using an output filter on the converter.

The table below shows a comparison between the maximum admissible peak-peak voltage at the motor terminal as stipulated by DIN EN 60034-18-41 and the peak-peak voltage tolerance of SIMOTICS insulation systems.

	Line voltage $U_N$			
	400 V		480 V	
	IVICC	Steinlen <sup>1</sup>	IVICC	Steinlen <sup>1</sup>
$\hat{U}_{\text{phase-to-ground}}$	1 680	2 200	2 016	2 200
$\hat{U}_{\text{phase-to-phase}}$	2 360	3 000	2 832	3 000

<sup>1</sup> The information specified refers to the standard (basic) insulation system. Other insulation systems on request.

The following applies for the voltage rise time:  $T_a > 0.3 \pm 0.2 \mu\text{s}$ .

The voltages specified are peak-peak values ( $V_{pk/pk}$ ).

### Bearing currents

Additional bearing currents due to steep voltage edges when switching. Without output filters, significant voltage variations can occur at the winding terminals. Make sure the drive system is installed in accordance with EMC requirements.

### Mechanical stress and grease lifetime

High speeds that exceed the rated speed and the resulting increased vibrations alter the mechanical running smoothness and the bearings are subjected to increased stress. This reduces the service life of the grease and bearings.

### Optional add-on units

Connect the temperature sensor of the monitoring system and the anti-condensation heating according to the appropriate circuit diagram. Only switch on the anti-condensation heating after the motor has been switched off.

## 5.1 Checking the insulation resistance

Only qualified personnel may work on power installations.

 **WARNING**

**Unintentional starting of the drive unit**

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

 **WARNING**

**Hazardous voltage and rotating parts**

Before starting commissioning, mount the covers required for the correct air guidance, and prevent contact with active / current-carrying or rotating parts.

 **WARNING**

**Hazardous voltage at the terminals**

In some cases, the terminals can be at hazardous voltage levels during the measurement and immediately afterwards. The terminals must not be touched.  
Carry out a check on the power cables connected to ensure that no voltage can be applied.

**Note**

The insulation resistance must be checked before commissioning and after lengthy periods of storage or non-use.

Before you begin measuring the insulation resistance, please read the operating manual for the insulation resistance meter you are going to use. Before measuring the insulation resistance, disconnect any main circuit cables that are connected to the terminals.

5.1 Checking the insulation resistance

**Note**

If the critical insulation resistance is less than or equal to this value, the windings must be dried or, if the fan is removed, cleaned thoroughly and dried.

Note that the insulation resistance of dried, clean windings is lower than that of warm windings. The insulation resistance can only be properly assessed after conversion to the reference temperature of +25 °C.

If the measured value is close to the critical value, you must check the insulation resistance at suitably frequent intervals.

Measure the minimum insulation resistance of the winding to the motor housing at a winding temperature between +20 °C and +30 °C. Other insulation resistance values apply to temperatures outside this range. When making the measurement, wait until the final resistance value is reached, approx. 1 minute.

Measure the critical insulation resistance at the operating temperature of the winding.

**Limit values**

The following limit values are valid for the insulation resistance at a rated voltage of  $U_N < 2 \text{ kV}$  and a winding temperature of +25 °C.

500 V	Measuring circuit voltage
10 MΩ	Minimum insulation resistance for new, cleaned or repaired windings
0.5 MΩ / kV	Critical specific insulation resistance after a long operating time

Observe the following:

- If you measure a winding temperature other than +25 °C, convert the measured value to the reference temperature +25 °C. The insulation resistance is halved for every 10 K increase in temperature, and it is doubled for every 10 K decrease in temperature.
- If the insulation resistance is close to or below the minimum value, the cause could be humidity and dirt accumulation. Dry the windings.
- During operation, the insulation resistance of the windings can fall to the critical insulation resistance due to ambient and operational influences. To calculate the critical insulation resistance value for a winding temperature of +25 °C, multiply the rated voltage kV by the specific critical resistance value (0.5 MΩ / kV). Example: rated voltage  $U_N$  690 V:  $690 \text{ V} \times 0.5 \text{ M}\Omega / \text{kV} = 0.345 \text{ M}\Omega$ .

## 5.2 Commissioning the motor

---

**Note**

Protect the motor against overload.

Do not exceed or undershoot limit speeds, e.g. during operation with a backstop.

---

**Note****With a backstop:**

Running in the wrong direction of rotation can damage the geared motor.

Check the direction of rotation before commissioning.

Manually rotate the drive end or motor.

Use the phase sequence to check the direction of motor rotation and swap the two external conductors if necessary.

---

**Note****With a brake with manual release:**

No braking effect when the manual brake release lever is locked. The brake is then permanently released.

Before commissioning the geared motor, ensure that the brake is not locked.

Unscrew the manual brake release lever and keep it separate from the geared motor.

---

**Note**

When starting / before switching on, use the appropriate circuit to ensure that the motor brake is released.

---

**Note****With a brake motor:**

After maintenance work, check the constancy of the rated air gap of the brake. The brake motor must be current-free. Check the gap between the armature disk and the solenoid at 3 points with a feeler gauge.

---

**Note**

Additional tests are also required, depending on the particular plant-specific situation.

---

5.2 Commissioning the motor

After checking and ensuring the following items, you can start commissioning the motor:

- Compare the details on the rating plate with the operating conditions.
- Compare the voltage and frequency of the motor with the line supply values.
- Check the direction of rotation.
- A Y /  $\Delta$  start is switched from start to delta when the starting current of the star stage has decayed.
- Check that the electrical connections are securely fastened.
- Check all the touch protection measures for both moving and live parts.
- Check that the monitoring instruments are connected and set correctly.
- Check the coolant temperature.
- Check any supplementary equipment being used.
- Check that air intake openings and cooling surfaces are clean.
- Check the clearances from the geared motor to adjacent components, see Installation conditions for the motor (Page 29).
- Create the appropriate connections for grounding and equipotential bonding.
- Properly mount and fix the motor.
- Check that the ventilation is not impeded and that the discharged air - including that from adjacent units - cannot be drawn back in.
- Check the belt tension if a belt drive is being used.
- Seal the terminal box cover and seal the cable entries.

 **CAUTION**

**Malfunctions can cause personal injuries or motor damage**

In the event of changes during operation, the drive unit must be switched off immediately. Determine the cause of the fault using the fault table (Page 47). Remedy faults or have faults remedied.

Check the motor during operation for:

- Excessive operating temperature
- Unusual noises

**Preconditions for smooth, vibration-free operation**

Comply with the maximum vibration values in operation according to ISO 20816-1. Avoid inadmissible oscillation levels caused, for example, by imbalances (drive output element), external vibration and resonances, over the complete speed range.



## Faults, causes and remedies

### Note

Faults and malfunctions that occur during the warranty period and requiring repair work on the motor may only be remedied by Technical Support. If faults occur without a clearly identifiable cause, Steinlen Elektromaschinenbau GmbH recommends using the services of the Technical Support after the warranty period has elapsed.

If you need the help of the Technical Support, please have the following information ready:

- Rating plate data
- Nature and extent of the fault
- Suspected cause

Table 7- 1    Faults, causes and remedies

Faults	Causes	Remedy
Bearing overheated	Too much grease in the bearing	Remove excess grease
	Bearing contaminated	Replace bearing
	Belt tension too high	Reduce belt tension
	Coupling forces pull or push	Align the motor precisely, correct the coupling
	Coolant temperature outside the permissible range.	Adjust the cooling air to the right temperature
	The bearing grease has a dark color	Check for bearing currents
	Not enough grease in the bearing	Lubricate as prescribed by the manufacturer
	Incorrect motor installation	Check the motor type of construction
Bearing noise	Not enough grease in the bearing	Lubricate as prescribed by the manufacturer
	Incorrect motor installation	Check the motor type of construction
	Brinelling on the inner ring of the bearing, e.g. caused when the motor starts with a locked bearing	Replace bearing, prevent vibration when motor is stationary

Faults	Causes	Remedy
Motor running unevenly	Coupling forces pull or push	Align the motor precisely, correct the coupling
	Incorrect motor installation	Check the motor type of construction
	Out of balance due to belt pulley or coupling	Balance precisely
	Motor mounting too weak	Check the mounting
Motor does not ramp up	Counter torque too high	Check the motor torque and the load torque
	Line voltage too low	Check line conditions
	Phase interruption	Check the line connection
	Circuitry incorrect	Observe the circuit diagram and rating plate
Motor overheated	Circuitry incorrect	Observe the circuit diagram and rating plate
	Overload	Compare data on the rating plate
	Switching frequency too high	Observe the rated duty
	Insufficient ventilation	Check the cooling air ducts, check the direction of rotation
	Cooling air ducts contaminated	Clean cooling air ducts
	Coolant temperature outside the permissible range.	Adjust the cooling air to the right temperature
Significant drop in speed	Counter torque too high	Check the motor torque and the load torque
	Line voltage too low	Check line conditions
	Phase interruption	Check the line connection
	Circuitry incorrect	Observe the circuit diagram and rating plate
	Overload	Compare data on the rating plate
Protective equipment trips	Phase interruption	Check the line connection
	Circuitry incorrect	Observe the circuit diagram and rating plate
	Overload	Compare data on the rating plate
	Switching frequency too high	Observe the rated duty
	Winding and terminal short-circuit	Measure the insulation resistance
	Startup time is exceeded	Check the power-up conditions

## Service and maintenance

### 8.1 General notes about maintenance

 <b>WARNING</b>
<b>Unintentional starting of the drive unit</b> Secure the drive unit to prevent it from being started up unintentionally. Attach a warning notice to the start switch.

<b>NOTICE</b>
<b>Improper maintenance</b> Only authorized qualified personnel may perform the maintenance and servicing. Only original parts supplied by Steinlen Elektromaschinenbau GmbH may be installed.

Only qualified personnel may perform the inspection, maintenance and servicing work. Note the information in the general notes and safety information (Page 7).

### 8.2 Locking the manual release of the brake (optional)

 <b>WARNING</b>
<b>Personal injuries and material damage caused by a locked brake</b> No braking effect when the manual brake release lever is locked. The brake is then permanently released. Before commissioning the geared motor, ensure that the brake can be applied. Unscrew the manual brake release lever and keep it separate from the geared motor.

Keep the lockable manual release in the released state for maintenance work.

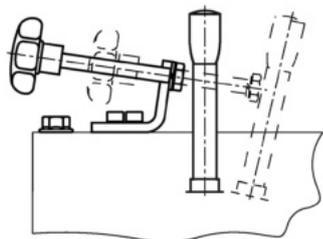


Figure 8-1 Lockable manual release

### Locking the manual brake release lever

1. Screw on the manual brake release lever.
2. Bring the manual brake release lever into the position in which the brake is released.
3. Tighten the locking screw far enough so that the manual brake release lever cannot return to the unreleased position.

You have released the brake.

### Releasing the lock

1. Unscrew the locking screw far enough so that the brake completely returns to the unreleased position. The gap between the locking screw and the manual brake release lever should be 2 to 5 mm.
2. Unscrew the manual brake release lever and keep the lever separately from the geared motor.

You have ensured that the manual brake release is no longer locked.

## 8.3 Lubrication

The standard version of the motors bearings are permanently lubricated (2Z bearings) and cannot be relubricated. If this is not the case, this is indicated by a warning notice on the motor.

The specified grease service life values are valid for an ambient temperature of up to a maximum of +40 °C. For every 10°C increase in temperature, the grease service life is reduced by a factor of 0.7 of the value in the table (max. +20 °C = factor 0.5).

At an ambient temperature of +25 °C, the grease service life can be expected to be doubled.

For versions with closed bearings (2Z bearings), replace the bearings after 3 to 4 years. For options with open bearings (1Z bearing: special greases, food, organic grease) replace the grease after 3 to 4 years independent of the operating hours.

Table 8- 1 Roller-bearing and shaft-sealing-ring grease

Fields of application	Ambient temperature	Manufacturer	Type
Standard	-40 °C to +80 °C	Klüber	Petamo GHY 133N
Foodstuff-compatible for the food industry	-30 °C to +60 °C	Castrol	Optileb GR UF 1 NSF H1
Biologically degradable, for agriculture, forestry and water industries	-35 °C to +60 °C for motor with ISO class F -35 °C to +45 °C for motor with ISO class H	Fuchs	Plantogel 2 S

**Horizontal mounting position (IM B.)**

Table 8- 2 Grease service life in operating hours [h] for permanent lubrication

Size	Motor speed $n_M$ in rpm						Grease quantity in the bearing	
	3 600	3 000	1 800	1 500	1 200	≤ 1 000	D-end	ND-end
	Operating hours in h						g	
63	33 000	33 000	33 000	33 000	33 000	33 000	7	5
71							7	5
80							9	9
90							15	11
100							20	15
112	24 000	24 000	24 000	24 000	24 000	24 000	45	25
132							75	50
160	17 000	17 000	17 000	17 000	17 000	17 000	90	70
180							110	80
200							90	90
225, 250	Grease service life = bearing service life							

**Vertical mounting position (IM V.)**

Table 8- 3 Grease service life in operating hours [h] for permanent lubrication

Size	Motor speed $n_M$ in rpm						Grease quantity in the bearing	
	3 600	3 000	1 800	1 500	1 200	≤ 1 000	D-end	ND-end
	Operating hours in h						g	
63	24 000	33 000	33 000	33 000	33 000	33 000	9	9
71								
80		24 000	24 000	24 000	24 000	24 000	15	11
90		17 000	17 000	17 000	17 000	17 000	20	15
100	17 000	17 000	24 000	24 000	24 000	24 000	45	25
112								
132	12 000	12 000	12 000	12 000	12 000	12 000	75	50
160							90	70
180							110	60
200	12 000	12 000	12 000	12 000	12 000	12 000	110	80
225, 250	Grease service life = bearing service life							

## 8.4 Cleaning the motor

 **WARNING**

**Explosion hazard due to overheating of the machine caused by a layer of dust**

Deposits of dust have a thermally insulating effect, which can lead to the machine overheating. The maximum surface temperature of the machine cannot be adhered to. Dust can be ignited causing an explosion. This can result in death, serious injury or material damage.

- Regularly remove dust from the machine.
- Do not allow dust layers thicker than 5 mm to build up.
- Do not switch the machine on until the dust has been completely removed.

**NOTICE**

**Dust deposits cause higher housing temperatures**

Dust deposits prevent heat radiation.

Keep the geared motor free from dirt and dust.

**NOTICE**

**Cleaning with a high-pressure cleaning appliance**

Water can penetrate into the geared motor. Seals can become damaged.

Do not use a high-pressure cleaning appliance to clean the geared motor.

Do not use tools with sharp edges.

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

## 8.5 Checking the tightness of fastening bolts

**Note**

Replace damaged headless bolts with new bolts of the same type and strength class.

Switch off the power supply to the drive unit. Check all fastening bolts for tightness using a torque wrench.

The general tolerance for the tightening torque is 10%. The tightening torque is based on a friction coefficient of  $\mu = 0.14$ .

Table 8- 4 Tightening torques for fixing screws

Thread size	Tightening torque for property class		
	8.8	10.9	12.9
	Nm	Nm	Nm
M4	3	4	5
M5	6	9	10
M6	10	15	18
M8	25	35	41
M10	50	70	85
M12	90	120	145
M16	210	295	355
M20	450	580	690
M24	750	1 000	1 200
M30	1 500	2 000	2 400
M36	2 500	3 600	4 200

## 8.6 Inspection of the motor

Check the motor in accordance with the criteria set out in General information and safety notes (Page 7).

Touch up damaged paintwork carefully.

## 8.7 Servicing the brake

### 8.7.1 Wear of the spring-operated brake

The friction lining and the mechanical components of the brake are subject to wear due to their inherent function. For safe and fault-free operation, the brake must be regularly checked and adjusted, and if necessary, replaced.

8.7 Servicing the brake

The following table describes the different causes of wear and their effects on the spring-operated brake components. The important influencing factors have to be quantified in order to calculate the service life of the rotor and the brake and determine the stipulated maintenance intervals. Here, the most important factors are the work as a result of the frictional force, the speed at the start of braking and the switching frequency. If several of the listed causes of wear to the friction lining occur at the same time in a single application, the influencing factors should be added together for the wear calculation.

Table 8- 5 Causes of wear to the spring-operated brake

Component	Cause	Effect	Influencing factor
Friction lining	Operational braking	Friction lining wear	Work as a result of the frictional force
	Emergency stops		
	Wear caused by overlap when starting and stopping the geared motor		
	Active braking by the motor supported by the brake (quick stop)		
	Low speed and mounting position 'motor at top'		
	Wear when starting for motor a mounting position with vertical shaft, even when the brake is released		Number of start / stop cycles
Armature disk and flange	Friction of the brake lining	Run-in of armature disk and flange	Work as a result of the frictional force
Braking rotor gear teeth	Relative movement and impacts between rotor and hub	Wear of the teeth (primarily on the rotor side)	Number of start / stop cycles
Support of the armature disk	Load change and impacts in the backlash between the armature disk, sleeve screws and guide pins	Deflection of armature disk, sleeve screws and pins	Number of start / stop cycles, strength of braking torque
Springs	Axial load cycle and shear stresses in the springs due to radial backlash in the armature disk	Decrease in the spring force or fatigue failure	Number of switching operations of the brake

## 8.7.2 Maintenance intervals for the brake

For safe and trouble-free operation, check and maintain the spring-operated brake at regular intervals.

For operational braking, the maintenance intervals depend on the loading on the brake in the application. Take all causes of wear into account when calculating the maintenance intervals. Steinlen Elektromaschinenbau GmbH recommends a regular inspection at fixed time intervals for low loaded brakes, e.g. holding brakes with an emergency stop.

Failure to maintain the brake can lead to operating faults, production outage or damage to the plant. Specify a maintenance plan for each application that is appropriate to the operating conditions and loading of the brake. The maintenance intervals and maintenance work for the pneumatic brake are listed in the table.

Table 8- 6 Maintenance interval for the brake

<b>Brake</b>	<b>Maintenance interval</b>
Operational brake	According to service life calculation
	Otherwise every six months
	After 4 000 operating hours at the latest
Holding brake with emergency stop	Minimum every 2 years
	After 1 million cycles at the latest
	Shorter intervals for frequent emergency stops

### 8.7.3 Adjusting the air gap

**⚠ WARNING**

**Unintentional starting of the drive unit**

Switch off the power supply to the drive unit.

The brake must be in a torque-free condition.

Secure the drive unit to prevent it from being started up unintentionally.

Attach a warning notice to the start switch.

**⚠ WARNING**

**Decrease of braking effect due to contamination**

Do not allow oil or grease to come into contact with friction surfaces.

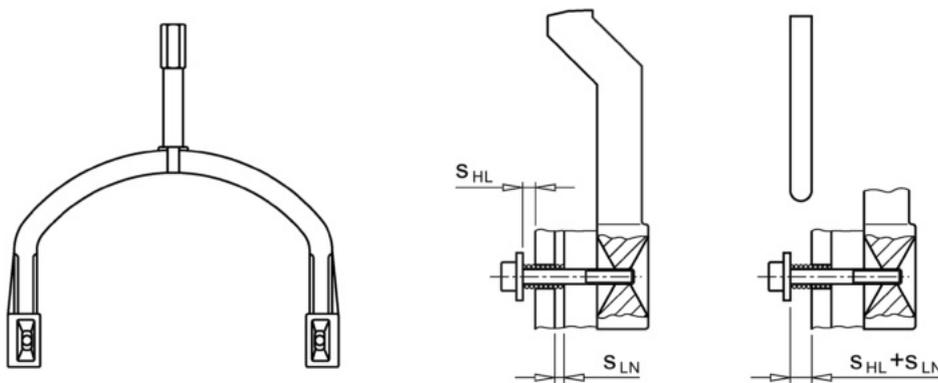


Figure 8-2 Setting dimension for air gap

#### Procedure

1. Remove the fan cover.
2. Loosen the fastening screws of the brake.
3. Screw the sleeve screws further into the solenoid using an open-ended spanner.
4. Tighten the fastening screws of the brake.
5. Check the air gap  $s_{LN}$  in the vicinity of the screws using a feeler gauge.
6. If necessary, correct the air gap  $s_{LN}$  and then check it again.
7. When combined with manual brake release:  
Check the setting dimension  $s_{HL}$  and correct  $s_{HL}$  if necessary.
8. Mount the fan cover.

You have now set the air gap.

Table 8- 7 Air gap values

Brake type	Nominal air gap SLN (+0.1 / -0.05) mm	Maximum air gap for		Reference gage SHL mm
		Standard excitation SLmax.	Overexcitation SLmax.	
		mm	mm	
L4/1,4	0.2	0.65	0.7	1.0
L4/2		0.6		
L4/3		0.55		
L4		0.5		
L4/5		0.4		
L8/3, L8/4		0.6		
L8/5, L8/6,3		0.55		
L8		0.5		
L8/10		0.45		
L16/4, L16/8, L16/10, L16/13, L16		0.2		
L16/20	0.5			
L32/8, L32/14, L32/18, L60/25, L60/35	0.3	0.9	0.9	1.5
L32/23, L60/38		0.85		
L32, L60/50, L60		0.75		
L32/40		0.65		
L80/25, L80/35, L80/50, L80/63, L80		0.9		
L80/100		0.7		
L150/60, L150/80, L150/100, L150/125, L150	0.4	1.2	1.2	2.0
L260/100, L260/145, L260/180, L260/200, L260/240, L260			1.5	
L260/315		1.05		
L400/265, L400/300, L400/360, L400	0.5	1.5	1.8	2.5
L400/600		0.9		
FDX30	0.5	-	1.9	-
FDX40	0.6	-	1.7	-

Table 8- 8 Tightening torque for the brake screw

Brake type		Thread size	Tightening torque
Steinlen	Brake supplier		Nm
L4	INTORQ BA BFK458 (06E)	3 x M4	2.8
L8	INTORQ BA BFK458 (08E)	3 x M5	5.5
L16	INTORQ BA BFK458 (10E)	3 x M6	9.5
L32	INTORQ BA BFK458 (12E)	3 x M6	9.5
L60, L80	INTORQ BA BFK458 (14E), INTORQ BA BFK458 (16E)	3 x M8	23
L150	INTORQ BA BFK458 (18E)	6 x M8	23
L260, L400	INTORQ BA BFK458 (20E), INTORQ BA BFK458 (25E)	6 x M10	46
FDX30	Precima FDX30	6 x M10	50
FDX40	Precima FDX40	6 x M12	85

### 8.7.4 Replacing the friction lining

 **WARNING**

**Unintentional starting of the drive unit**

Switch off the power supply to the drive unit.

The brake must be in a torque-free condition.

Secure the drive unit to prevent it from being started up unintentionally.

Attach a warning notice to the start switch.

#### Procedure

1. Remove the fan cover.
  - When combined with manual release:  
Unscrew the manual brake release lever.
  - With external fan:  
Remove the fan cover together with the external fan.
2. Detach the connection cable.
3. Remove the fan locking ring and pull out the fan.
4. Loosen the brake screws evenly and remove the screws completely. Adjust the solenoid, see .
5. Pull the rotor completely off the hub.
6. Check the teeth on the hub.

7. Check the friction surface on the bearing shield. If there is severe scoring on the friction plate or flange, replace the friction plate or flange. Rework the friction surfaces if there is severe scoring on the bearing shield.
  8. Measure the thickness of the new rotor and the head height of the sleeve screws with a caliper gauge.
  9. Calculate the gap between the solenoid and the armature disk as follows:  
Gap = rotor thickness +  $s_{LN}$  - head height.
  10. Unscrew the sleeve screws evenly until the calculated gap between the solenoid and the armature disk is reached.
  11. Mount the new rotor and solenoid. Set the air gap of the brake, see Adjusting the air gap (Page 56).
  12. Connect the connection cable.
  13. Mount the fan cover.
- You have now replaced the friction lining of the brake.

Table 8- 9 Brake data

Brake type	Nominal air gap $s_{LN}$ (+0.1 / -0.05)	Minimum rotor thickness	Maximum permissible			
			Operating speed if max. permissible operating energy utilized		No-load speed with emergency stop function	
			Normal friction lining	Wear-resistant friction lining	Normal friction lining	Wear-resistant friction lining
			mm	mm	rpm	rpm
L4	0.2	4.5	4 000	3 600	6 000	6 000
L8	0.2	5.5	4 000	3 600	5 000	4 500
L16	0.2	7.5	3 600	3 600	4 000	3 600
L32	0.3	8	3 600	3 600	3 600	3 600
L60	0.3	7.5	3 600	3 000	3 600	3 000
L80	0.3	8	3 600	3 000	3 600	3 000
L150	0.4	10	3 600	1 800	3 600	1 800
L260	0.4	12	3 600	1 800	3 600	1 800
L400	0.5	15.5	3 000	1 800	3 000	1 800
FDX30	0.5	18.6	3 000	-	6 000	-
FDX40	0.6	20.9	3 000	-	6 000	-



# Disposal

# 9



## Recycling and disposal of MOTOX geared motors

For environmentally friendly recycling and disposal of your old device, please contact a company certified for the disposal of old electrical and/or electronic devices and dispose of the device in accordance with the regulations in your country.



## Technical data

### 10.1 Type designation

Table 10- 1 Example of the type designation structure

<b>Example:</b>	<b>LE</b>	<b>80M</b>	<b>4</b>	<b>EF -</b>	<b>L8 / 4NH -</b>	<b>IN</b>
Motor type	LE					
Motor size		80				
Number of poles			4			
Special features				EF		
Brake					L8 / 4NH	
Encoder						IN

Table 10- 2 Type designation code

Motor type	
LA, LE, LES	AC induction motor, integrated
Special features	
E	High efficiency
P	Premium Efficiency
F	Forced ventilation
I	High inertia fan
W	Protective canopy
D	Handwheel
X	Backstop
M	SINAMICS G110M
Brake	
L, FDX	Spring-operated single-disk brake, DC excited
16	Size
../10	Adjusted braking torque
N	Standard version
G	Enclosed version
H, HA	Manual brake release, lockable manual brake release
M	Microswitch
Encoder	
IN	Incremental encoder
IR	Resolver
IA	Absolute encoder
IV	Prepared for encoder mounting
IM	Magnetic encoder

## 10.2 Rating plate data

### 10.2.1 General technical data

The most important technical data appears on the rating plate of the gearboxes and geared motors.

This data, together with the contractual agreements for the geared motors, determines the limits of intended use.

In the case of geared motors, a rating plate attached to the motor usually indicates the data for the entire drive.

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

### 10.2.2 Rating plate MOTOX geared motors

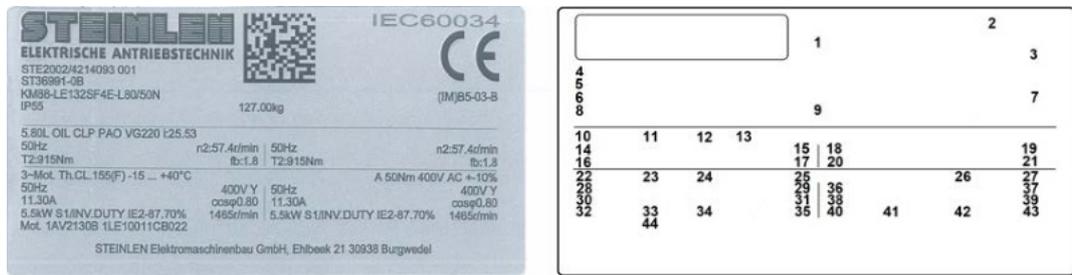


Figure 10-1 Example of a MOTOX rating plate for geared motors

- 1 Data matrix code
- 2 Applicable standard
- 3 CE marking or other marking, if required
- 4 Factory serial number
- 5 Article number
- 6 Type designation
- 7 Mounting position
- 8 Degree of protection acc. to IEC 60034-5
- 9 Weight m kg
- 10 Oil quantity [l] main gearbox / intermediate gearbox + extruder flange
- 11 Type of oil
- 12 Oil viscosity ISO VG class to DIN 51519 / ISO 3448
- 13 Total transmission ratio i
- Frequency 1
- 14 Rated frequency f [Hz]
- 15 Gearbox output speed n<sub>2</sub> [rpm]

- 16 Geared motor output torque  $T_2$  [Nm]
- 17 Service factor  $f_B$
- Frequency 2
- 18 Rated frequency  $f$  [Hz]
- 19 Gearbox output speed  $n_2$  [rpm]
- 20 Geared motor output torque  $T_2$  [Nm]
- 21 Service factor  $f_B$
- Motor and brake data
- 22 Phase number and type of current for the motor
- 23 Temperature class Th.Cl.
- 24 Ambient temperature
- 25 Motor protection
- 26 Rated braking torque  $T_{Br}$  [Nm]
- 27 Brake supply voltage  $U$  [V]
- Frequency 1
- 28 Rated frequency  $f$  [Hz]
- 29 Rated voltage / range  $U$  [V]  
Circuit, graphic symbols according to DIN EN 60617 Part 6 / IEC 60617-6
- 30 Rated current  $I_N$  [A]
- 31 Power factor  $\cos \varphi$
- 32 Rated output  $P_N$  [kW]
- 33 Duty type
- 34 Efficiency class marking according to IEC 60034-30
- 35 Rated speed  $n_N$  [rpm]
- Frequency 2
- 36 Rated frequency  $f$  [Hz]
- 37 Rated voltage / range  $U$  [V]  
Circuit, graphic symbols according to DIN EN 60617 Part 6 / IEC 60617-6
- 38 Rated current  $I_N$  [A]
- 39 Power factor  $\cos \varphi$
- 40 Rated output  $P_N$  [kW]
- 41 Duty type
- 42 Efficiency class marking according to IEC 60034-30
- 43 Rated speed  $n_N$  [rpm]
- 44 Motor designation

## 10.3 Weight

The weight of the entire geared motor is given in the shipping papers.

The weight is stated on the rating plate of the motor, gearbox or geared motor.

The weight specification refers only to the product in the delivery state.

## 10.4 Circuit diagrams

The circuit diagrams include the information about:

- Assembling the connections
- Motor connection
- Use in electric circuit diagrams

The circuit diagrams are placed in the terminal box, and supplied with the motor.

Table 10- 3 Example of the circuit diagram numbering

Example:	A	0	100	000
1st position	A			
2nd position		0		
3rd position			100	
4th position				000

Table 10- 4 Explanation

1st position	Identification letter for circuit diagrams
2nd position	Marking for the connection type: 0: Standard connection at the terminal board (motor), terminal block (auxiliary connections) 1: Standard connection at the connector box
3rd position	Identification for the circuit diagram content
4th position	Consecutive number for additional versions

10.4 Circuit diagrams

**Modular structure of the circuit diagrams**

The circuit diagrams have a modular structure and have been simplified.

Table 10- 5 Structure of the circuit diagrams

Supple- mentary device	Terminal marking	Supple- mentary device	Terminal marking	Terminal numbering	Designation	Function
Europe	Europe	Nema	Nema			
1TP	1TP1; 1TP2	P	P1; P2	01; 02	Temperature monitor motor winding	Temperature monitor line disconnection in case of option PTC thermistor for warning and disconnection
1TB	1TB1; 1TB2	P	P3; P4	03; 04	Temperature monitor motor winding	Temperature monitor line disconnection in case of option WT for warning and disconnection
1BD	1BD1; 1BD2	B	B1; B2	05; 06	Brake control	DC connection, brake
1BA	1BA1; 1BA2	B	B3; B4	07; 08	Brake control	AC voltage connection, brake rectifier
1S	1S1; 1S2	B	B5; B6	09; 10	Brake control	Jumper, DC circuit, brake rectifier
2TP	2TP1; 2TP2	P	P1; P2	01; 02	Temperature monitor motor winding	Temperature monitor line disconnection in case of option PTC thermistor for disconnection
2TB	2TB1; 2TB2	P	P3; P4	03; 04	Temperature monitor motor winding	Temperature monitor line disconnection in case of option WT for disconnection
1HE	1HE1; 1HE2	H	H1; H2	15; 16	Heater	Standstill heater, motor
3TP	3TP1; 3TP2	P	P9; P10	17; 18	Temperature monitor motor winding	Temperature monitor line warning in case of option PTC thermistor for warning and disconnection
3TB	3TB1; 3TB2	P	P11; P12	19; 20	Temperature monitor motor winding	Temperature monitor line warning in case of option WT for warning and disconnection
1R	+1R1; -1R2	P	P19; P20	27; 28	Temperature monitor motor winding	Temperature sensor KTY 84-130
1R	R1; 1R2	P	P25; P26	57; 58	Temperature monitor motor winding	1 PT100 resistance thermometer
1R	1R1; 1R2	P	P27; P28	95; 96	Temperature monitor motor winding	PT1000 resistance thermometer
2S	2S1; 2S2; 2S3	-	-	32; 33; 34	Brake control	Release monitoring, brake
3S	3S1; 3S2; 3S3	-	-	35; 36; 37	Brake control	Brake wear monitoring

Supplementary device	Terminal marking	Supplementary device	Terminal marking	Terminal numbering	Designation	Function
Europe	Europe	Nema	Nema			
8BA	8BA1;8BA2; 1BD1; 1BD2; 1I1; 1I2	B	B44; B45; B1; B2; I1; I2	86; 87; 05; 06; 71; 72	Brake control	High-speed rectifier with current sensing and arc quenching element for disconnection on the DC side
9BA	9BA1;9BA2; 1BD1; 1BD2	B	B48; B49; B1; B2	88; 89; 05; 06	Brake control	High-speed rectifier with voltage sensing and arc quenching element for disconnection on the DC side
7R	7R1; 7R2.1; 7R2.2	P	P29; P30.1; P30.2	97; 98.1; 98.2	Temperature monitor gearbox	Resistance thermometer 1 PT100 oil sensor



## 11.2 Lists of spare parts

### 11.2.1 Motor sizes 63 - 250

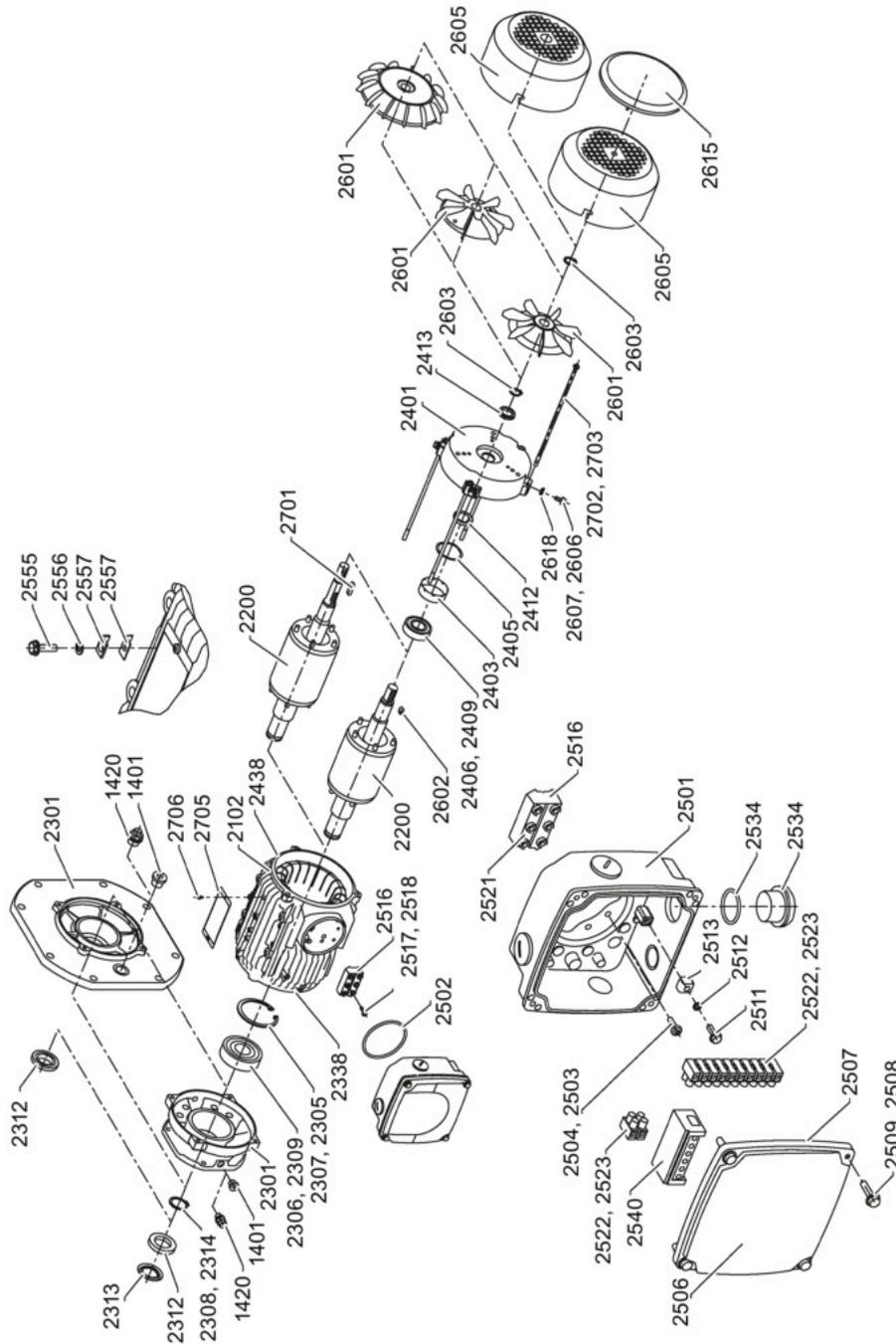


Figure 11-3 Motor sizes 63 - 90



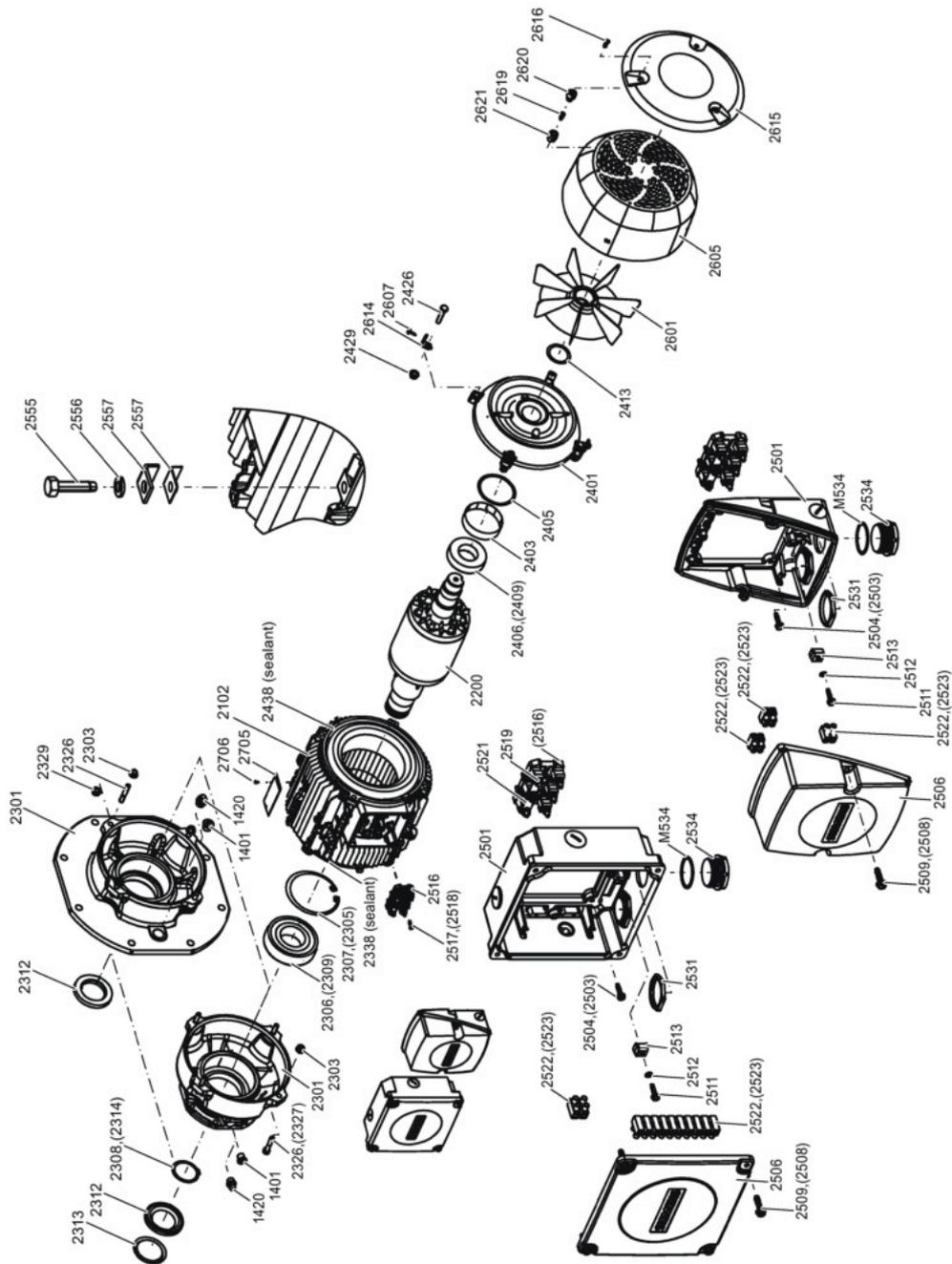


Figure 11-5 LEP motor frame sizes 100 - 160



## Spare parts list for motor sizes 63 - 250

1401 Screw plug	2512 Screw locking
1420 Vent filter	2513 Bracket
2102 Stator	2516 Complete terminal board
2200 Rotor	2517 Screw
2301 Bearing shield	2518 Screw locking
2303 Nut	2519 Nut
2305 Shim	2521 Terminal connector
2306 Bearing	2522 Terminal block
2307 Locking ring	2523 Screw
2308 Locking ring	2526 Mounting plate
2309 Grease	2531 Nut
2312 Shaft sealing ring	2534 Screw plug complete
2313 Oil splasher	2540 Rectifier
2314 Shim	2555 Screw
2326 Screw	2556 Screw locking
2327 Screw locking	2557 Bracket
2329 Nut	2601 Fan blade
2338 Seal	2602 Tolerance ring
2401 Bearing shield	2603 Locking ring
2403 Spring band	2605 Fan cover
2405 Spring washer	2606 Screw locking
2406 Bearing	2607 Screw
2409 Grease	2614 Mounting bracket fan cover
2412 Shaft sealing ring	2615 Protective canopy
2413 V-ring	2616 Screw
2426 Screw	2617 Riveting nut
2427 Screw locking	2618 Damping disk
2429 Nut	2619 Screw
2438 Seal	2620 Spacer / bush
2501 Lower terminal box section	2621 Spacer / bush
2502 Seal	2701 Feather key
2503 Screw locking	2702 Screw
2504 Screw	2703 Screw locking
2506 Terminal box cover	2705 Rating plate
2507 Seal	2706 Screw
2508 Screw locking	2714 Eyebolt
2509 Screw	M534 O-ring
2511 Screw	

### 11.2.2 Brake

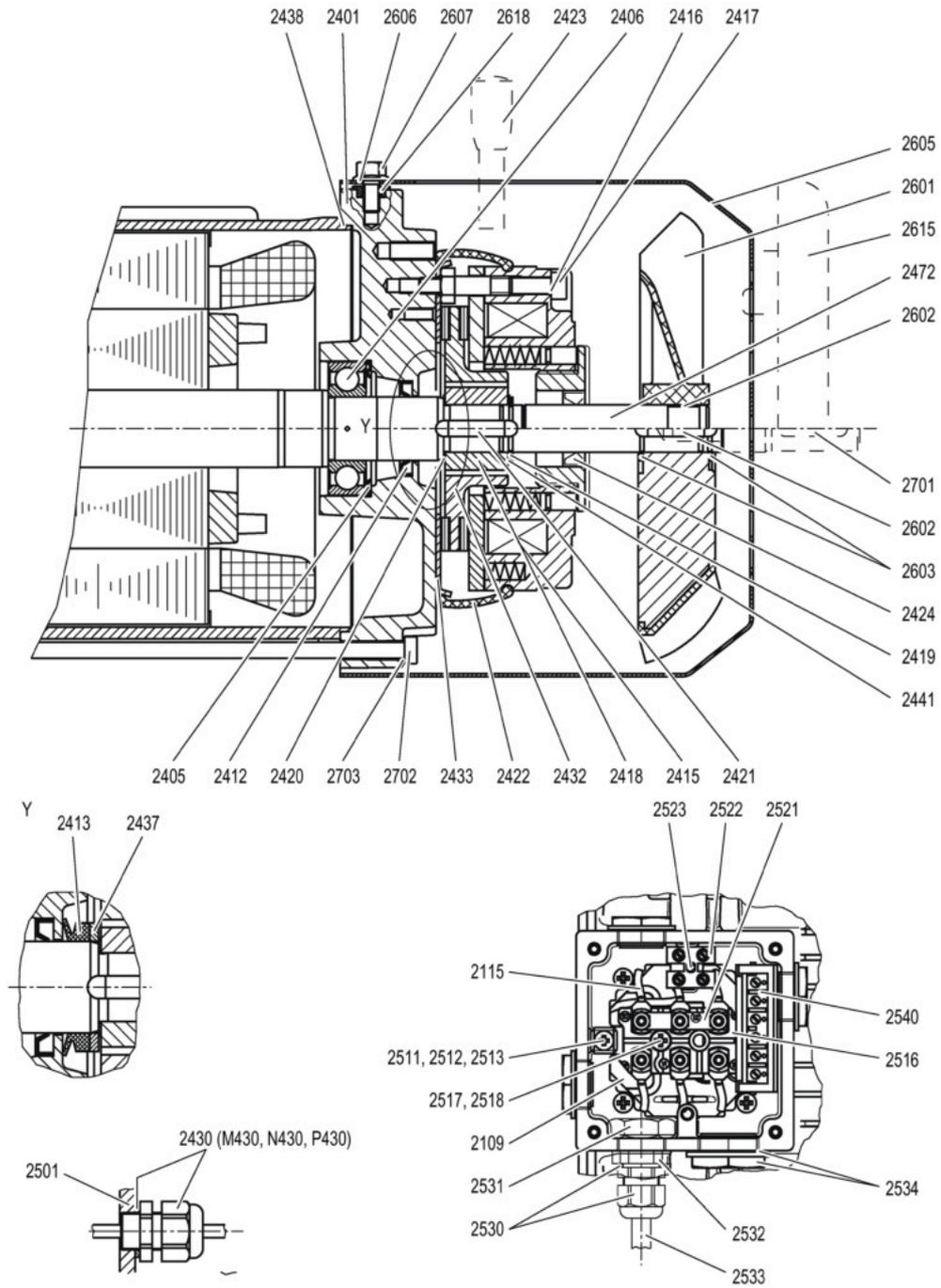


Figure 11-7 L brake

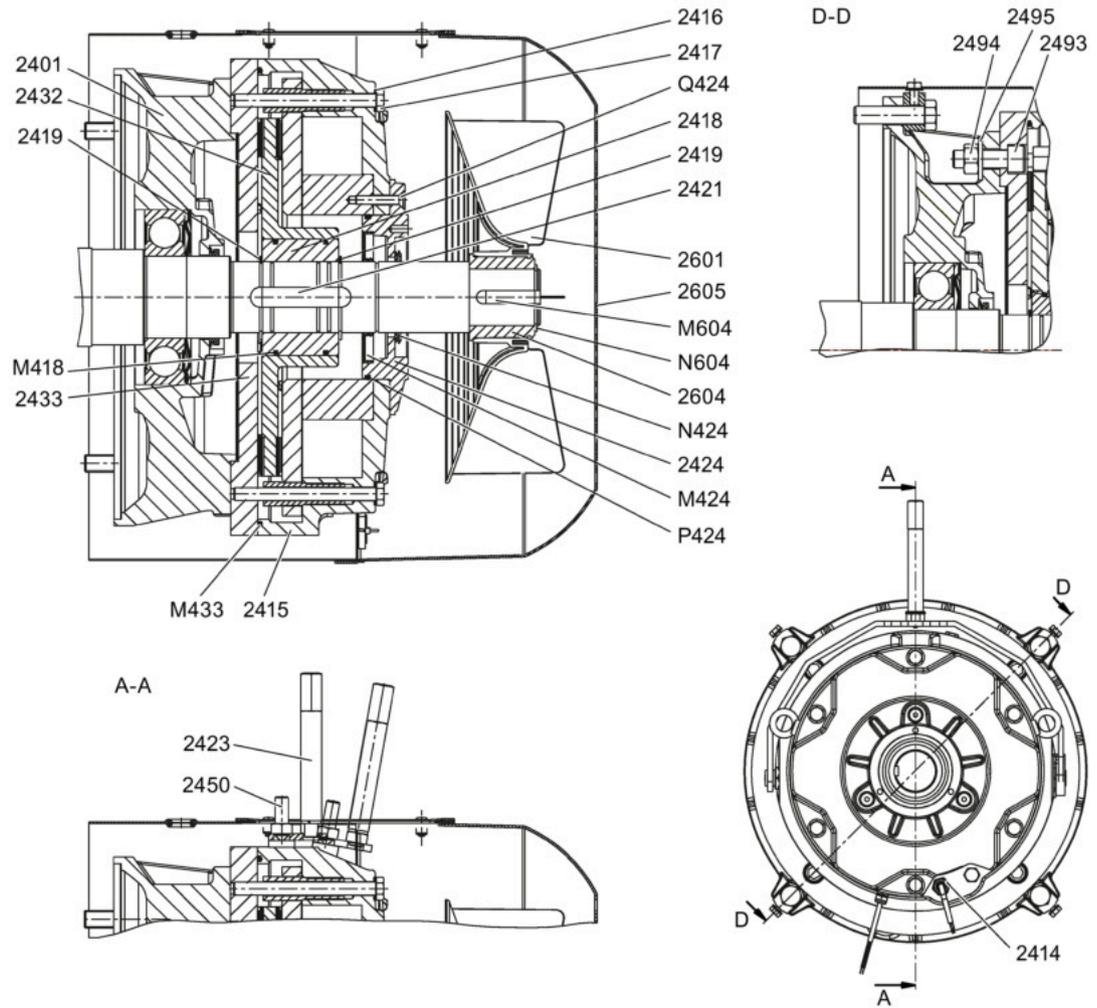
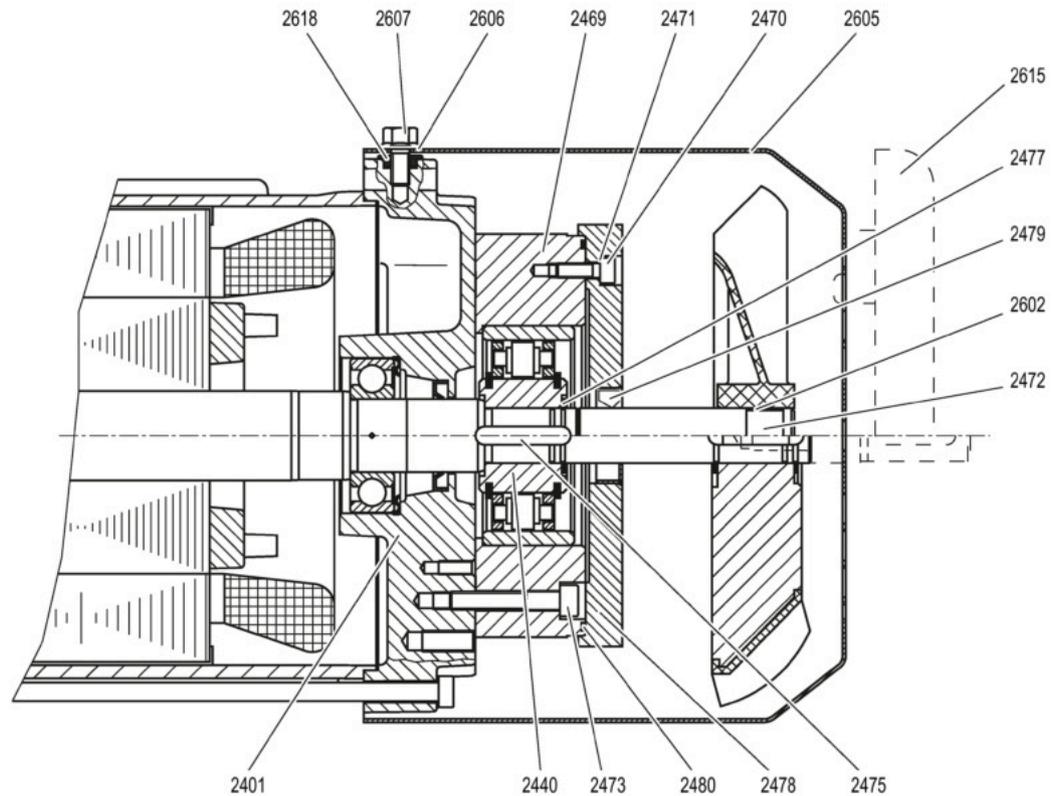


Figure 11-8 FDX brake

Spare parts list for brakes			
2109	Plugs for cable slot	2472	Shaft extension
2115	End sleeve / cable lug	2493	Screw
2401	Bearing shield	2494	Nut
2405	Spring washer	2495	Screw locking
2406	Bearing	2501	Lower terminal box section
2412	Potting compound	2511	Screw
2413	V-ring	2512	Screw locking
2414	Microswitch	2513	Bracket
2415	Brake	2516	Complete terminal board
2416	Screw locking	2517	Screw
2417	Screw	2518	Screw locking
2418	Coupling driver	2521	Terminal connector
M418	O-ring	2522	Terminal block
2419	Locking ring	2523	Screw
2420	Supporting disk / shim	2530	Cable gland
2421	Feather key	2531	Nut
2422	Dust protection ring	2532	Reduction / expansion
2423	Manual release lever	2533	Cable
2424	Shaft sealing ring	2534	Screw plug
M424	Shaft sealing ring	2540	Rectifier
N424	Shaft sealing ring	2601	Fan blade
P424	O-ring	2602	Tolerance ring
Q424	Screw	2603	Locking ring
2430	Complete bushing, complete	2604	Bush
M430	Cable gland	M604	Feather key
N430	Seal (O-ring)	N604	Locking ring
P430	Seal insert	2605	Fan cover
2432	Friction disk	2606	Screw locking
2433	Friction plate	2607	Screw
M433	O-ring	2615	Protective canopy
2437	Supporting disk / shim	2618	Damping disk
2438	Seal	2701	Feather key
2441	Supporting disk / shim	2702	Screw
2450	Lockable manual brake release	2703	Screw locking
2472	Shaft extension		
2493	Screw		

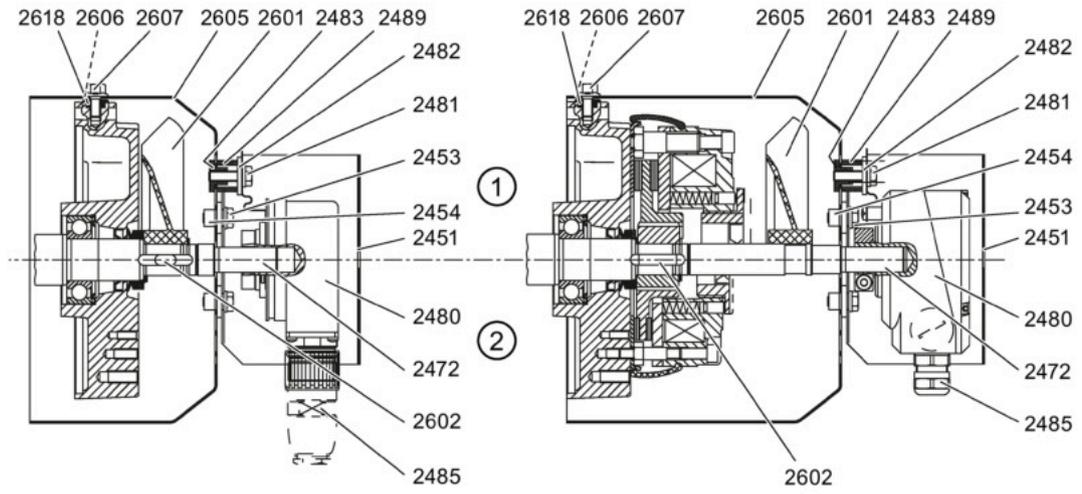
### 11.2.3 Backstop



- 2401 Bearing shield
- 2440 Backstop, inner ring
- 2469 Backstop, outer ring
- 2470 Bolt
- 2471 Screw lock
- 2472 Shaft end
- 2473 Bolt
- 2475 Featherkey
- 2477 Locking ring
- 2478 Guard
- 2479 Sealing ring
- 2480 Seal
- 2602 Featherkey
- 2605 Fan cover
- 2606 Screw lock
- 2607 Bolt
- 2615 Protective canopy
- 2618 Damping disk

Figure 11-9 Backstop

### 11.2.4 Encoder on fan cover

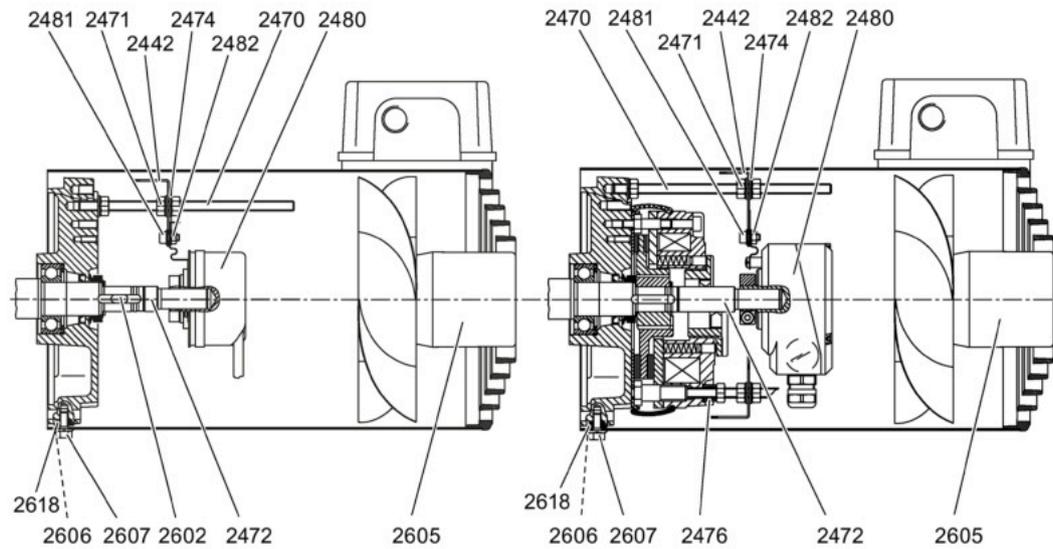


- ① Self-ventilated motor
- ② Unventilated motor

- 2451 Cover
- 2453 Bolt
- 2454 Nut
- 2472 Shaft end
- 2480 Encoder
- 2481 Bolt
- 2482 Screw lock
- 2483 Nut
- 2485 Coupling
- 2489 Spacer / bush
- 2601 Fan
- 2602 Featherkey
- 2605 Fan cover
- 2606 Screw lock
- 2607 Bolt
- 2618 Damping disk

Figure 11-10 Encoder on fan cover

### 11.2.5 Encoder in the motor with external fan



2442	Torque arm
2470	Bolt
2471	Screw lock
2472	Shaft end
2474	Screw lock
2476	Supporting disk / shim
2480	Encoder
2481	Bolt
2482	Screw lock
2602	Featherkey
2605	Fan cover
2606	Screw lock
2607	Bolt
2618	Damping disk

Figure 11-11 Encoder in the motor with external fan

### 11.2.6 SINAMICS G110M frequency inverters

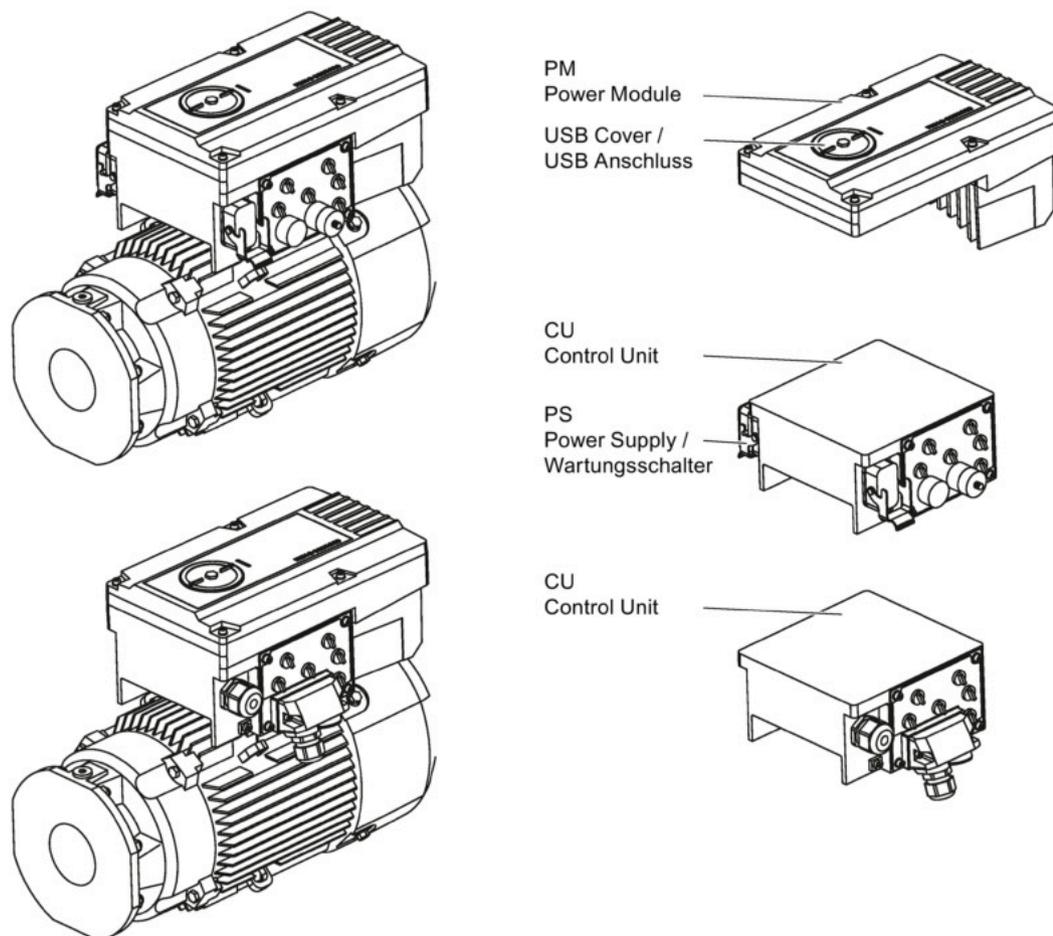


Figure 11-12 SINAMICS G110M frequency inverters



## Original EU-Konformitätserklärung Original EU-declaration of conformity Nr. / No. EK-10B

Produktbezeichnung: Getriebemotor ST36  
Product identification: Geared motor ST36

A .. – BCD .. E .. – F .. – G ..

Getriebe: A .. = [A = E, Z, D, F, B, K, C, S]  
Gearbox:  
Motor: BCD .. E .. = [B = L; C = E; D = \_, S; E = \_, F, I, U]  
Motor:  
Bremsen: F .. = [F = \_, L, F]  
Brake:  
Drehgeber: G .. = [G = \_, I]  
Encoder:

Hersteller: Steinlen Elektromaschinenbau GmbH .....  
Manufacturer .....  
Anschrift: Ehlbeek 21 .....  
Address DE-30938 Burgwedel .....

Name, Anschrift bevollmächtigte Person für technische Unterlagen: Axel Brinkmann.....  
Name, address of authorised person for technical file Steinlen Elektromaschinenbau GmbH  
Ehlbeek 21, DE-30938 Burgwedel.....

Der oben beschriebene Gegenstand der Erklärung erfüllt die einschlägigen Harmonisierungsrechtsvorschriften der Union: **The object of the declaration described above is in conformity with the relevant Union harmonisation legislation:**

**Niederspannungsrichtlinie:** **Low Voltage Directive:**  
2014/35/EU Richtlinie des Europäischen Parlaments und des Rates vom 26. Februar 2014 zur Harmonisierung der Rechtsvorschriften der Mitgliedstaaten über die Bereitstellung elektrischer Betriebsmittel zur Verwendung innerhalb bestimmter Spannungsgrenzen auf dem Markt; Amtsblatt der EU L96, 29/03/2014, S. 357–374  
2014/35/EU Directive of the European Parliament and of the Council of 26 February 2014 on the harmonisation of the laws of the Member States relating to the making available of electrical equipment designed for use within certain voltage limits; Official Journal of the EU L96, 29/03/2014, p. 357–374

**RoHS-Richtlinie:** **RoHS Directive:**  
2011/65/EU Richtlinie des Europäischen Parlaments und des Rates vom 8. Juni 2011 zur Beschränkung der Verwendung bestimmter gefährlicher Stoffe in Elektro- und Elektronikgeräten; Amtsblatt der EU L174, 1/07/2011, S. 88–110  
2011/65/EU Directive of the European Parliament and of the Council of 8 June 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment; Official Journal of the EU L174, 1/07/2011, p. 88–110

**Verordnung (EG) Nr. 640/2009:** **Regulation (EC) No 640/2009:**  
Verordnung der Kommission vom 22. Juli 2009 zur Durchführung der Richtlinie 2005/32/EG des Europäischen Parlaments und des Rates im Hinblick auf die Festlegung von Anforderungen an die umweltgerechte Gestaltung von Elektromotoren  
Commission Regulation of 22 July 2009 implementing Directive 2005/32/EC of the European Parliament and of the Council with regard to ecodesign requirements for electric motors

Diese Erklärung bescheinigt die Übereinstimmung mit den genannten Richtlinien, ist jedoch keine Beschaffenheits- oder Haltbarkeitsgarantie. Die Sicherheitshinweise der mitgelieferten Produktdokumentation sind zu beachten.

*This declaration is an attestation of conformity with the indicated Directive(s) but does not imply any guarantee of quality or durability. The safety instructions of the accompanying product documentation shall be observed.*

Die Übereinstimmung des bezeichneten Produkts mit den Vorschriften der angewandten Richtlinie(n) wird nachgewiesen durch die vollständige Einhaltung folgender Normen / Vorschriften:

*The conformity of the designated product with the provisions of the applied Directive(s) is proved by full compliance with the following standards / regulations:*

Harmonisierte Normen / Harmonized standards:

Referenznummer <i>Reference number</i>	Ausgabedatum <i>Date of issue</i>
EN 60034-1	2010+AC:2010
EN 60034-2-1	2014
EN 60034-5	2001+A1:2007
EN 60034-8	2007+A1:2014
EN 60034-30-1	2014
EN 60529	1991+A1:2000+A2: 2013

Zusatzinformation:

*Additional Information:*

Kurzschlussläufermotoren fallen laut Leitfaden nicht unter die EMV-Richtlinie 2014/30/EU, somit ist keine CE-Kennzeichnung zur EMV-Richtlinie nötig.  
*According to the guideline, squirrel-cage induction motors do not fall under the directives of EMC Guideline 2014/30/EC, and thus no CE identification for the EMC guideline is required.*

Untersignet für und im Namen von: / *Signed for and on behalf of:*

Steinlen Elektromaschinenbau GmbH

Burgwedel

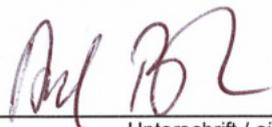
Ort / *place*

01.08.2021

Datum der Ausstellung / *Date of issue*

Axel Brinkmann

Name / *name*



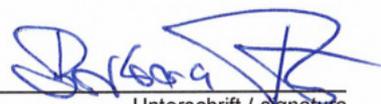
Unterschrift / *signature*

Managing Director

Funktion / *function*

Barbara Reinke

Name / *name*



Unterschrift / *signature*

Quality Manager

Funktion / *function*

Diese Erklärung bescheinigt die Übereinstimmung mit den genannten Richtlinien, ist jedoch keine Beschaffenheits- oder Haltbarkeitsgarantie. Die Sicherheitshinweise der mitgelieferten Produktdokumentation sind zu beachten.

*This declaration is an attestation of conformity with the indicated Directive(s) but does not imply any guarantee of quality or durability. The safety instructions of the accompanying product documentation shall be observed.*

## EU-Konformitätserklärung / EU Declaration of Conformity DIN EN 80079-36

Dokument Nr. / Document no. EK 20 – 04/21

Hersteller: / Manufacturer: Steinlen Elektromaschinenbau GmbH, Ehlbeek 21, D-30938 Burgwedel, Germany  
Produktbezeichnung: / Product designation: Getriebereihe ST3...  
Getriebetypen: / Gearbox types: E, Z, D, F, B, K, C  
Baugrößen: / Sizes: 18 bis 208  
Antriebsgruppen: / Drive groups: A, K, P

Das bezeichnete Produkt stimmt mit den Vorschriften folgender europäischer Richtlinie überein: / The product referred to complies with the provisions of the following European directive:

Richtlinie 2014/34/EU des Europäischen Parlaments und des Rates vom 26. Februar 2014 zur Harmonisierung der Rechtsvorschriften der Mitgliedstaaten in Bezug auf Ausrüstungen und Schutzsysteme zur Verwendung in explosionsgefährdeten Bereichen, ABl. L 96/309 vom 29.03.2014 / Directive 2014/34/EU of the European Parliament and of the Council of 26 February 2014 on the harmonisation of the laws of the Member States relating to equipment and protective systems intended for use in potentially explosive atmospheres, OJ. L 96/309 of 29.03.2014

Die Übereinstimmung mit den Vorschriften dieser Richtlinie wird nachgewiesen durch die Einhaltung folgender Normen: / The compliance with the provisions of this regulation is proven by the adherence to the following standards:

- DIN EN 1127-1: 2011
- DIN EN 80079-36: 2016
- DIN EN 80079-37: 2016
- DIN EN 80079-34: 2012
- DIN EN 60079-0: 2014
- DIN EN 15198: 2007

Zündschutzart für Gerätegruppe II der Kategorien 2 und 3: / Ignition protection type for device group II of categories 2 and 3:

- II 2G Ex h IIB T4 Gb
- II 2G Ex h IIC T4 Gb • II 2D Ex h IIIB T120° C Db
- II 2D Ex h IIIC T120° C Db
- II 3G Ex h IIB T4 Gc • II 3G Ex h IIC T4 Gc
- II 3D Ex h IIIB T120° C Dc
- II 3D Ex h IIIC T120° C Dc

Die spezifische Kennzeichnung des Getriebes ist auf dem Leistungsschild vermerkt. / The specific marking of the gearbox is noted on the rating plate.

Die technische Dokumentation für Getriebe der Kategorie 2 ist hinterlegt bei der benannten Stelle / Hinterlegungsnummer: / The technical documentation for gearboxes of the category 2 is deposited at the notified body / accession number:

TÜV Nord Cert GmbH, Am TÜV 1, 30519 Hannover, Germany / 35295208.

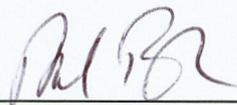
Unterzeichnet für und im Namen von: / Signed for and on behalf of:

Steinlen Elektromaschinenbau GmbH

Burgwedel, 26.04.2021

Ort / place, Datum der Ausstellung / Date of issue

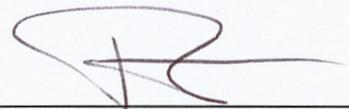
Axel Brinkmann  
Name / Name



Unterschrift / Signature

Managing Director  
Funktion / Function

Barbara Reinke  
Name / Name



Unterschrift / Signature

Quality Manager  
Funktion / Function

## UK Declaration of Conformity BS EN 80079-36

Document no. EK 21 – 04/22

Manufacturer: Steinlen Elektromaschinenbau GmbH, Ehlbeek 21, D-30938 Burgwedel, Germany  
Product designation: Gear series ST3...  
Gearbox types: E, Z, D, F, B, K, C  
Sizes: 18 to 208  
Drive groups: A, K, P

The product referred to complies with the provisions of the following European directive:

Directive 2014/34/EU of the European Parliament and of the Council of 26 February 2014 on the harmonisation of the laws of the Member States relating to equipment and protective systems intended for use in potentially explosive atmospheres, OJ. L 96/309 of 29.03.2014

The compliance with the provisions of this regulation is proven by the adherence to the following standards:

- EN 1127-1:2011
- EN 80079-36:2016
- EN 80079-37:2016
- EN 80079-34:2012
- EN 60079-0:2014
- EN 15198:2007

Ignition protection type for device group II of categories 2 and 3:

- II 2G Ex h IIB T4 Gb
- II 2G Ex h IIC T4 Gb • II 2D Ex h IIIB T120° C Db
- II 2D Ex h IIIC T120° C Db
- II 3G Ex h IIB T4 Gc • II 3G Ex h IIC T4 Gc
- II 3D Ex h IIIB T120° C Dc
- II 3D Ex h IIIC T120° C Dc

The specific marking of the gearbox is noted on the rating plate.

The technical documentation for gearboxes of the category 2 is deposited at the notified body / **Firm Quotation Ref:**

Element Materials Technology, Unit 1 Pendle Place, Skelmersdale, WN8 9PN, United Kingdom / **TRA-058512-00.**

Signed for and on behalf of:

**Steinlen Elektromaschinenbau GmbH**

Burgwedel, 28.04.2022  
Place, Date of issue

Axel Brinkmann  
Name



Signature

Managing Director  
Function

Barbara Reinke  
Name



Signature

Quality Manager  
Function





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