

SIEMENS



SIMOGEAR

LA/LE/LES motors for mounting on SIMOGEAR gearbox

BA 2330

Operating instructions

Edition

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Answers for industry.

SIEMENS

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LA/LE/LES motors for mounting on SIMOGEAR gearbox BA 2330




Operating Instructions

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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.

 DANGER
indicates that death or severe personal injury will result if proper precautions are not taken.
 WARNING
indicates that death or severe personal injury may result if proper precautions are not taken.
 CAUTION
indicates that minor personal injury can result if proper precautions are not taken.
NOTICE
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 Siemens products

Note the following:

 WARNING
Siemens 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 Siemens. 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 Siemens AG. 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

Note

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

These operating instructions are part of the motor delivery. Store the operating instructions near the motor.

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

- LA motor, sizes 63 to 71
- LE motor, sizes 80 to 160
- LES motor, sizes 180 to 250

For a description of the precise designation, see Type designation (Page 57).

Table 1- 1 Order number code

Motor	Order number location					
	1	2	3	4	11	12
LA motor	2	K	J	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

Note

In addition to these operating instructions, special contractual agreements and technical documentation apply for a special motor design and the associated supplementary equipment.

Please refer to the other operating instructions supplied with the product.

The described motors correspond to the state-of-the-art at the time these operating instructions were printed.

1.2 Copyright

Siemens AG reserves the right to change individual components and accessory parts in the interest of further development. The changes serve to improve the capability and safety. The significant features are retained.

If you have any technical questions, please contact Technical Support.

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Internet English: <http://www.siemens.com/automation/support-request>

Applicable operating instructions

- BA 2030 - Operating instructions for SIMOGEAR gearbox
- BA 2039 - Operating instructions for SIMOGEAR adapter for gearboxes
- BA 2330 - Operating instructions for LA/LE motors for mounting on a SIMOGEAR gearbox

1.2 Copyright

The copyright to these operating instructions is held by Siemens AG.

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 Siemens AG.

1.3 Intended use

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 ambient temperature of -20 °C to +40 °C and an installation altitude of up to 1 000 m above sea level.

Data deviating from this are specified on the rating plate.

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

The motors have been designed for the application described in Section Technical data (Page 57). 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 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 Obligations of the user

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

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

Note the following safety information:

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, observe the relevant regulations for work safety and environment protection.

Read 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. Remove oil spillages immediately with an oil-binding agent in compliance with environmental requirements.

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.


Observe the permissible tightening torque of the fastening bolts.


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


Siemens AG 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.


1.5 Particular types of hazards

 WARNING
Extreme surface temperatures 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.

 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.

Housing

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.

The fan cover is made of sheet steel.

2.2 Cooling

NOTICE
Dust deposits prevent heat radiation 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

NOTICE
Service life limited Drive speeds below 1 000 rpm or frequent starting and stopping operations (≥ 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.

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

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	FXN31-17DX	> 890
80	FXN31-17DX	> 890
90, 100, 112	FXN38-17DX	> 860
132	FXN61-19DX	> 750
160	FXN66-25DX	> 730
180, 200	FXN76-25DX	> 670
225, 250	FXN86-25DX	> 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

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

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.

NOTICE
Failure of the exterior protection
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 quality and compatibility.

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"> • Indoor installation • Heated buildings with neutral atmospheres • Resistance to greases and some resistance to mineral oils, aliphatic solvents • Standard
Corrosiveness category C1 for normal environmental stress	
1-component hydro paint, top coat	<ul style="list-style-type: none"> • Indoor installation • Heated buildings with neutral atmospheres • Resistance to greases and some resistance to mineral oils, aliphatic solvents • Standard paint for gearbox housings made of cast iron

Paint system	Description
Corrosiveness category C2 for low environmental stress	
2-component polyurethane base coat, 2-component polyurethane top coat	<ul style="list-style-type: none"> • Indoor and outdoor installation • Unheated buildings with condensation, production areas with low humidity, e.g. warehouses and sports facilities • Atmospheres with little contamination, mostly rural areas • Resistance to greases, mineral oils and sulfuric acid (10 %), caustic soda (10 %) and some resistance to aliphatic solvents
Corrosiveness category C3 for medium environmental stress	
2-component polyurethane base coat, 2-component polyurethane top coat	<ul style="list-style-type: none"> • Indoor and outdoor installation • Production areas with high humidity and some air contamination, e.g. food production areas, dairies, breweries and laundries • Urban and industrial atmospheres, moderate contamination from sulfur dioxide, coastal areas with low salt levels • Resistance to greases, mineral oils, aliphatic solvents, sulfuric acid (10 %), caustic soda (10 %)
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"> • Indoor and outdoor installation • Chemical plants, swimming pools, wastewater treatment plants, electroplating shops, and boathouses above seawater • Industrial areas and coastal areas with moderate salt levels • Resistance to greases, mineral oils, aliphatic solvents, sulfuric acid (10 %), caustic soda (10 %)

Paint system	Description
Corrosiveness category C5 for very high environmental stress	
2-component epoxy zinc phosphate base coat, 2-component epoxy iron mica intermediate coat, 2-component polyurethane top coat	<ul style="list-style-type: none">• Indoor and outdoor installation• Buildings and areas with almost constant condensation and high contamination, e.g. malt factories and aseptic areas• Industrial areas with high humidity and aggressive atmosphere, coastal areas and offshore environments with high salt levels• Resistance to greases, mineral oils, aliphatic solvents, sulfuric acid (10 %), caustic soda (20 %)

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

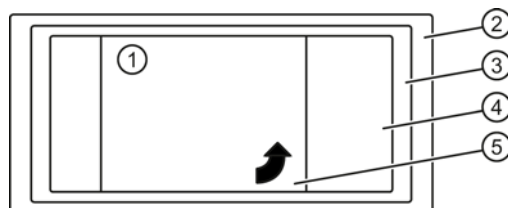
Table 2- 4 Primer according to corrosiveness category

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"> • Synthetic paint, synthetic resin paint, oil paint • 2-component polyurethane paint • 2-component epoxy paint
Primed according to corrosiveness category C2 G	
2-component metal primer, desired coat thickness 60 µm	<ul style="list-style-type: none"> • 2-component polyurethane paint • 2-component epoxy paint • 2-component acrylic paint • Acid-hardening paint
Primed according to corrosiveness category C4 G	
2-component epoxide zinc phosphate, desired coat thickness 120 µm	<ul style="list-style-type: none"> • 2-component polyurethane paint • 2-component epoxy paint • 2-component acrylic paint • Acid-hardening paint

A paint-protective film must be applied to the rating plate and the masking film for the primed or unpainted variant. They can be repainted without further preparation, e.g. masking with adhesive tape.

Peeling off the paint-protective film

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



- ① Company logo
- ② Masking film
- ③ Rating plate
- ④ Paint-protective film
- ⑤ Peeling tab

Figure 2-1 Rating plate with paint-protective film

Procedure

1. Pull the peeling tab ⑤ up.
2. Carefully peel the paint-protective film ④ off diagonally from one corner (not parallel to the plate).
3. Blow any paint fragments away or wipe them off with a clean cloth.

You have now removed the paint-protective film.

Incoming goods, transport, and storage

3.1 Incoming goods

NOTICE
Transport damage impairs correct functioning 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). Siemens AG 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.

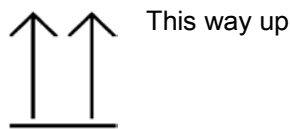
3.2 Transport

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

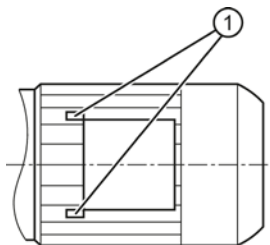
3.2.2 Fastening for suspended transport

⚠ 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

 WARNING
Danger of serious injuries caused by falling objects Danger of damage to the motor when stacked Do not stack gearboxes or geared motors on each other.

NOTICE
Failure of the exterior protection 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.

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.

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

NOTICE
Transport damage impairs the correct function of the gearbox
Never commission faulty gearboxes or geared motors.

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

Remove and dispose of the packaging material and transport fixtures appropriately.

4.2 General information on installation

 WARNING
The plant can accelerate or decelerate uncontrolled under load
The entire system must be load-free so that there is no danger when carrying out this work.

NOTICE
Overheating of the motor due to exposure to direct sunlight
Provide suitable protective equipment such as covers or roofs. Prevent heat accumulation.

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

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.

4.3 Thread sizes and tightening torques for fastening bolts

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 fastening bolts

Thread size	Tightening torque for strength 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

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.

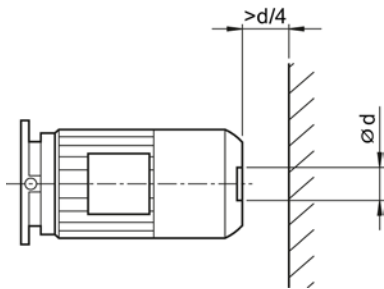


Figure 4-1 Installation condition for the SIMOGEAR motor

The permissible coolant temperature (ambient temperature at installation location) is -20 °C to $+40\text{ °C}$ for an installation altitude of up to 1 000 m above sea level. Any alternative requirements are stamped on the rating plate.


If the motor is in a vertical mounting position with the motor shaft extension facing upwards, cover the fan to prevent foreign objects falling in.

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

 DANGER
<p>Unintentional starting of the drive unit</p> <p>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.</p> <p>Check that the unit is in a no-voltage condition.</p> <p>Deviations in the voltage, frequency, curve shape and / or symmetry of the line feed increase the heating.</p> <p>This then affects the electromagnetic compatibility.</p> <p>Before starting work, make sure that a protective conductor is securely connected.</p>

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 disconnecting link according to the circuit diagram for star or delta connection in the terminal box.

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

NOTICE**Electrical connections can loosen**

Please observe the tightening torques for cable glands, nuts and bolts.

When performing a test run, secure the featherkeys without output elements.

NOTICE**Malfunctions**

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.

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.

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

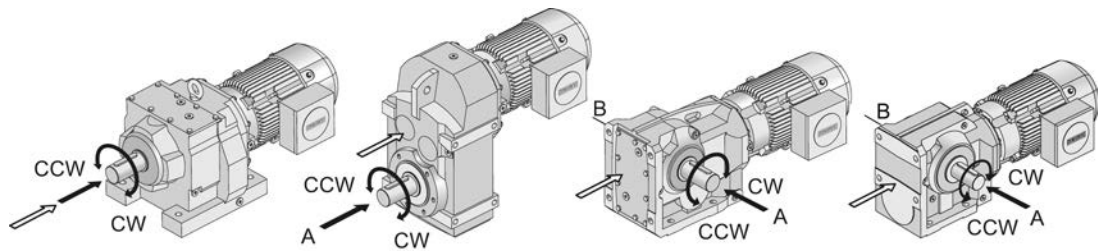
1	U	1	-	1	Designation
x					Index showing the pole assignment for pole-changing three-phase motors (lower number = lower speed) or, in special cases, for a subdivided winding
	x				Phase designation (U, V, W)
		x			Index showing winding start (1) Index showing winding end (2) Additional indexes if there 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 4-2 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
	NDE of the output shaft		Left
C	DE of the output shaft		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 Connecting the motor in the terminal box

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 32).

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
-

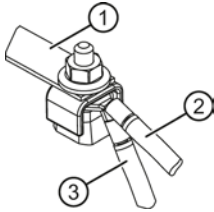
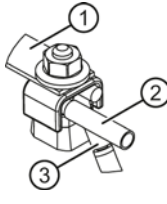
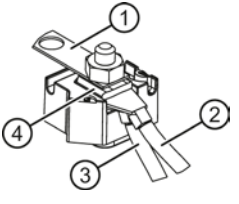
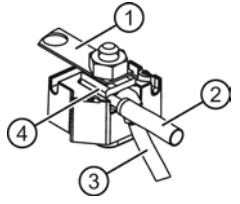
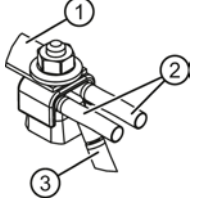
Screw the screw connection into the housing. Or secure the screw connection with a locknut.

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	-	-	-

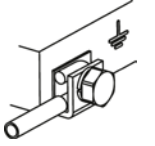
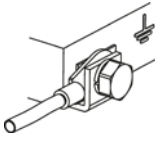
Type of conductor connection

Angle DIN cable lug down for connection. DIN 46234			... 25 mm ²
			
Connecting an individual conductor with terminal clamp.			
			... 10 mm ²
Connecting two conductors of approximately the same thickness with terminal clamp.			
			... 25 mm ²

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

4.6 Connecting the motor in the terminal box

Grounding connection type

Connecting an individual conductor under the external grounding bracket.	
	... 10 mm ²
Connect with a DIN cable lug under the external grounding bracket DIN 46234.	
	... 25 mm ²

Cable gland

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

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 ±10 %		Thread size	Tightening torque ±10 %	
	Metal	Plastic		Metal	Plastic
	[Nm]	[Nm]		[Nm]	[Nm]
M12 x 1.5	8	4	M32 x 1.5	18	6
M16 x 1.5	10		M40 x 1.5	20	
M20 x 1.5	12		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

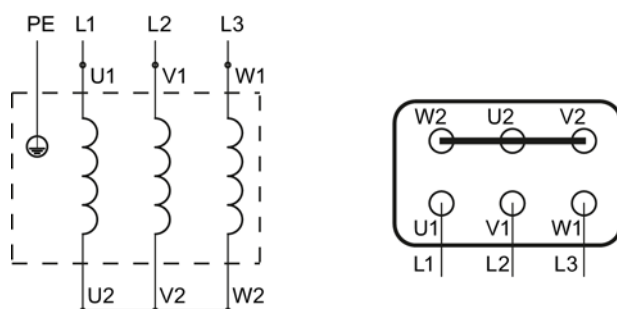


Figure 4-3 Star connection

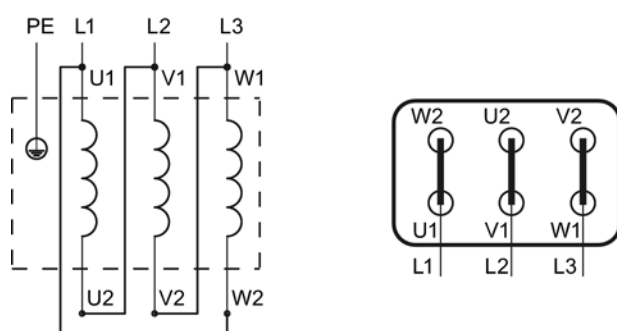


Figure 4-4 Delta connection

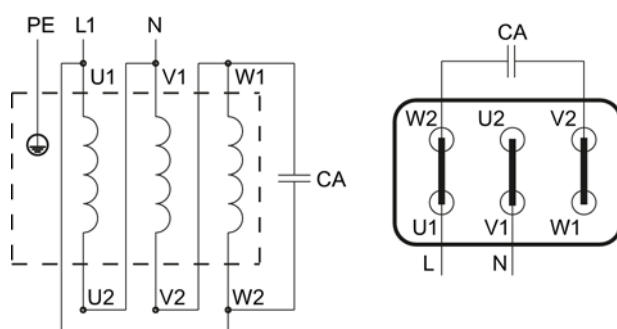


Figure 4-5 Steinmetz delta connection

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	Measuring current	Power consumption	Volume flow
	[Hz]	Phase	[A]	[W]	[m³/h]
71	50	1AC 3AC	0.12 0.11 / 0.06	33 31	78
	60	1AC 3AC	0.12 0.11 / 0.06	33 31	98
80	50	1AC 3AC	0.14 0.11 / 0.06	37 34	127
	60	1AC 3AC	0.14 0.11 / 0.06	37 34	148
90	50	1AC 3AC	0.29 0.38 / 0.22	65 91	200
	60	1AC 3AC	0.29 0.38 / 0.22	65 91	240
100	50	1AC 3AC	0.30 0.37 / 0.22	75 91	260
	60	1AC 3AC	0.30 0.37 / 0.22	75 91	310
112	50	1AC 3AC	0.37 0.35 / 0.20	94 103	337
	60	1AC 3AC	0.37 0.35 / 0.20	94 103	411
132	50	1AC 3AC	0.57 0.58 / 0.33	149 148	532
	60	1AC 3AC	0.57 0.58 / 0.33	149 148	633
160	50	1AC 3AC	0.91 0.93 / 0.56	253 360	935
	60	1AC 3AC	- 0.93 / 0.56	- 360	1068
180	50	1AC 3AC	0.93 0.71 / 0.40	225 220	860
	60	1AC 3AC	- 0.85 / 0.51	- 280	
200	50	1AC 3AC	0.93 0.85 / 0.51	225 220	950
	60	1AC 3AC	- 0.71 / 0.40	- 280	
225. 250	50	3AC	2.0 / 1.15	450	1600
	60		1.05	520	1860

Table 4- 7 Rated voltage range of motor

Size	Frequency	Rated voltage range		
	[Hz]	Phase	[V]	Connection
71 - 112	50	1AC	220 ... 277	⊥ (Δ)
		3AC	220 ... 290 / 380 ... 500	Δ / Y
	60	1AC	220 ... 277	⊥ (Δ)
		3AC	220 ... 332 / 380 ... 575	Δ / Y
132 - 160	50	1AC	230 ... 277	⊥ (Δ)
		3AC	220 ... 290 / 380 ... 500	Δ / Y
	60	1AC	230 ... 277	⊥ (Δ)
		3AC	220 ... 332 / 380 ... 575	Δ / Y
180	50	1AC	230 ... 277	⊥ (Δ)
		3AC	220 ... 290 / 380 ... 500	Δ / Y
	60	1AC	230 ... 277	⊥ (Δ)
		3AC	220 ... 332 / 380 ... 575	Δ / Y
200	50	1AC	230 ... 277	⊥ (Δ)
		3AC	220 ... 290 / 380 ... 500	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		460	Y

4.7 Operation on the converter

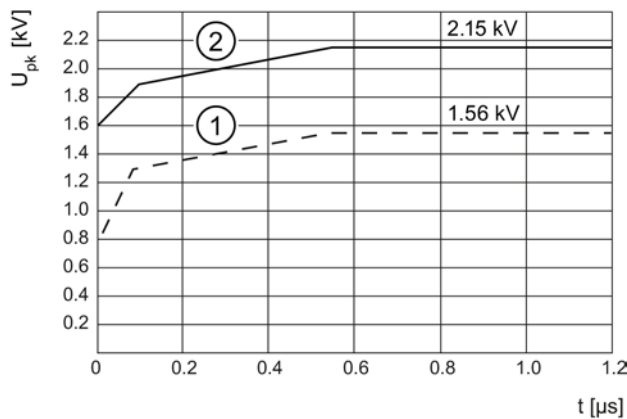
Permissible voltage stress

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.



- ① Standard insulation
- ② Reinforced insulation
- U_{pk} Pulse voltage
- t Rise time

Figure 4-6 Limit curves for the pulse voltage

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 rest.

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.

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.

5.1 Checking the insulation resistance

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 $U_N < 2$ kV and a winding temperature of +25 °C.

500 V	Measuring circuit voltage
10 MΩ	Minimum insulation resistance with 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**For brakes with a lockable 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 can be applied.

Siemens AG recommends unscrewing the manual brake release lever.

Note**With a brake motor:**

Before commissioning, 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.

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 / Δ start is switched from start to delta when the starting current of the star stage has decayed.
- Check the electrical connections are fixed securely.
- Check all the touch protection measures for both moving and live parts.
- Check that the monitoring instruments are connected and set correctly.

5.2 Commissioning the motor

- Check the coolant temperature.
- Check any supplementary equipment being used.
- Check that air inlet ports and cooling surfaces are clean.
- 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 45). Remedy faults or have faults remedied.

Check the motor during operation for:

- Excessive operating temperature
- Unusual noises

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, Siemens AG 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 above +40 °C	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
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

8.1 General notes about maintenance

▲ 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.

NOTICE
Improper maintenance Only authorized qualified personnel may perform the maintenance and servicing. Only original parts supplied by Siemens AG 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)

▲ WARNING
Personal injuries and material damage caused by a locked brake 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. Siemens AG recommends unscrewing the manual brake release lever for operation.

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

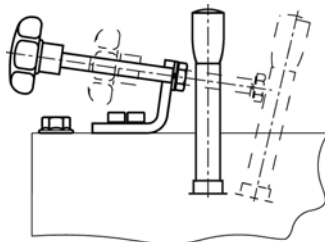


Figure 8-1 Lockable manual release

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 must be 2 to 5 mm.
2. Unscrew the manual brake release lever.

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

8.3 Lubrication

The bearings of the standard versions of surface-cooled motors (up to size 160) are permanently lubricated. 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 max. +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.

Irrespective of the number of operating hours, renew the roller bearing grease or the bearing (2Z bearing) after 3 or 4 years at the latest.

Horizontal mounting position (IM B.)

Table 8- 1 Grease service life in operating hours [h] with permanent lubrication

Size	Motor speed n_N [rpm]						Grease quantity in the bearing	
	3 600	3 000	1 800	1 500	1 200	≤ 1 000	D-end	ND-end
	Operating hours [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	24 000	24 000	24 000	24 000	24 000	24 000	20	15
112							45	25
132	17 000	24 000	24 000	24 000	24 000	24 000	75	50
160							90	70
180							110	80
200								90

Vertical mounting position (IM V.)

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

Size	Motor speed n_N [rpm]						Grease quantity in the bearing	
	3 600	3 000	1 800	1 500	1 200	≤ 1 000	D-end	ND-end
	Operating hours [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								
100	17 000	17 000	24 000	24 000	24 000	24 000	20	15
112							45	25
132	12 000	12 000	12 000	12 000	12 000	12 000	75	50
160							90	70
180							110	60
200								80

8.4 Cleaning the motor

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- 3 Tightening torques for fastening bolts

Thread size	Tightening torque for strength 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 strength 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

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 checked regularly, adjusted and, if necessary, replaced.

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- 4 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'		

Component	Cause	Effect	Influencing factor
	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. Siemens AG 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- 5 Maintenance interval for the brake

Brake	Maintenance interval
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.

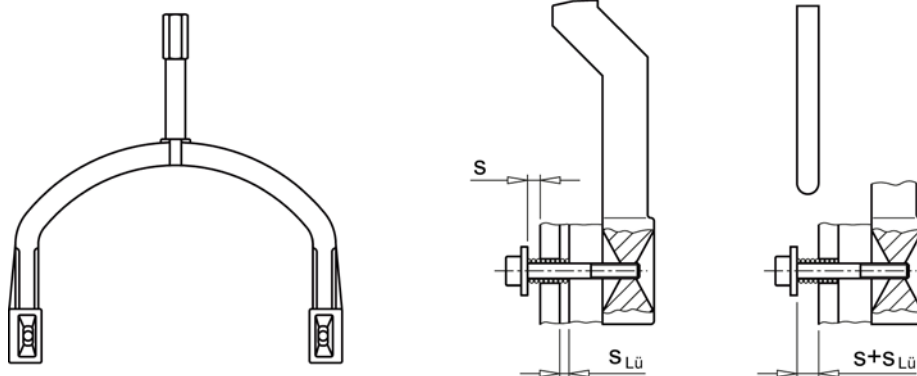


Figure 8-2 Setting dimension s

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 $s_{Lü}$ in the vicinity of the screws using a feeler gauge.
6. If necessary correct the air gap $s_{Lü}$, and then check it again.
7. When combined with manual brake release:
Check the setting dimension "s", and correct "s" if necessary.
8. Mount the fan cover.

You have now set the air gap.


Table 8- 6 Air gap values

Brake type	Rated air gap $SL_{\dot{U}Nenn}$ (+0.1 / -0.05)	Max. air gap at		Setting dimension "s"
		Standard excitation $SL_{\dot{U}max}$	Overexcitation $SL_{\dot{U}max}$	
	[mm]	[mm]	[mm]	[mm]
L4/1.4	0.2	0.65	0.65	1.0
L4/2		0.6	0.6	
L4/3		0.55	0.55	
L4		0.5	0.5	
L4/5		0.4	0.4	
L8/3, L8/4		0.6	0.6	
L8/5, L8/6.3		0.55	0.55	
L8		0.5	0.5	
L8/10		0.45	0.45	
L16/8, L16/10, L16/13, L16		0.6	0.6	
L16/20		0.5	0.5	
L32/14, L32/18, L60/25	0.3	0.9	0.9	1.5
L32/23, L60/38		0.85	0.85	
L32, L60/50		0.75	0.75	
L32/40, L60		0.65	0.65	
L80/25, L80/35, L80/50, L80/63, L80		0.9	0.9	
L80/100		0.7	0.7	
L150/60, L150/80, L150/100, L150/125, L150, L260/100, L260/145, L260/180, L260/200, L260/240, L260	0.4	1.2	1.2	2.0
L260/315		1.05	1.05	
L400/265, L400/300, L400/360, L400	0.5	1.5	1.5	2.5
L400/600		0.9	0.9	

Table 8- 7 Tightening torque for the brake screw

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

8.7.4 Replacing the friction lining

<p> WARNING</p> <p>Unintentional starting of the drive unit</p> <p>Switch off the power supply to the drive unit.</p> <p>The brake must be in a torque-free condition.</p> <p>Secure the drive unit to prevent it from being started up unintentionally.</p> <p>Attach a warning notice to the start switch.</p>

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.
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.

8.7 Servicing the brake

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 + $S_{LüNenn}$ - 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. Adjust the solenoid, see Adjusting the air gap (Page 53).
 12. Connect the connection cable.
 13. Mount the fan cover.
- You have now replaced the friction lining of the brake.

Table 8- 8 Brake data

Brake type	Rated air gap $S_{LüNenn}$ (+0.1 / -0.05)	Min. rotor thickness	Max. permissible	
			operating speed if max. permissible operating energy utilized	No-load speed with emergency stop function
	[mm]	[mm]	[rpm]	[rpm]
L4	0.2	4.5	3 600	6 000
L8	0.2	5.5	3 600	6 000
L16	0.2	7.5	3 600	6 000
L32	0.3	8	3 600	6 000
L60	0.3	7.5	3 600	6 000
L80	0.3	8	3 600	5 300
L150	0.4	10	3 600	4 400
L260	0.4	12	3 600	3 700

Technical data

9.1 Type designation

Table 9- 1 Example of the type designation structure

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

Table 9- 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	Spring-operated single-disk brake, DC excited
16	Size = rated braking torque
../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

9.2 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 mounted on the gearbox and the motor.

SIEMENS		IEC60034		SIEMENS		1		2	
FDU0412/8999999 nnn		CE		3				4	
2KJ3105-1EM22-2AV1-Z		M1		5				6	
ZF59-LE90SG4E-L32/14N				6				7	
IP55		30kg		8		9		9	
K-Id: 1234567890				10				10	
1.5L OIL CLP PG VG220 i=28				11		12		13	
50Hz		n2:49.3/min		60Hz		n2: 59.7/min		16	
T2: 213Nm		fB:2.1		T2: 203Nm		fB:2.2		19	
3-Mot. ThCl.155(F)		14 Nm		205-240V AC		25		26	
50Hz		230/400V +/-10%		D/Y		60Hz		460V Y	
4.33/2.5A		cosPhi 0.78		2.2 A		cosPhi 0.78		30	
1.1kW IE2-81.4%		1425/min		1.27kW IE2-84%		1725/min		36	
Mot. 1LE1001-0EBO								37	
								27	
								38	
								40	
								43	
								44	

Figure 9-1 Example of a SIMOGEAR rating plate

- 1 Matrix code
- 2 Applied standard
- 3 Serial number
FDU = Siemens AG, Bahnhofstr. 40, 72072 Tübingen, Germany
- 4 CE marking or other marking, if required
- 5 Order No.
- 6 Model - Type - Size
- 7 Mounting position
- 8 Degree of protection according to IEC 60034-5 and / or IEC 60529
- 9 Weight m [kg]
- 10 Customer ID
- 11 Oil quantity [l] main gearbox / intermediate gearbox
- 12 Type of oil
- 13 Oil viscosity ISO VG class according to DIN 51519 / ISO 3448
- 14 Total transmission ratio i


Frequency 1

- 15 Rated frequency f [Hz]
- 16 Gearbox output speed n_2 [rpm]
- 17 Geared motor output torque T_2 [Nm]
- 18 Service factor f_B

Frequency 2

- 19 Rated frequency f [Hz]
- 20 Gearbox output speed n_2 [rpm]
- 21 Geared motor output torque T_2 [Nm]
- 22 Service factor f_B

Motor data

- 23 Phase number and type of current for the motor
- 24 Temperature class Th. Cl.
- 25 Symbols (IEC 60617-2):  = brake
- 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]
- 30 Circuit, graphical symbols according to DIN EN 60617 Part 6 / IEC 60617-6
- 31 Rated current I_N [A]
- 32 Power factor $\cos \varphi$
- 33 Rated power P_N [kW], duty type (if $\neq S1$)
- 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]
- 38 Rated current I_N [A]
- 39 Power factor $\cos \varphi$
- 40 Circuit, graphical symbols according to DIN EN 60617 Part 6 / IEC 60617-6
- 41 Rated power P_N [kW], duty type (if $\neq S1$)
- 42 Efficiency class marking
- 43 Rated speed n_N [rpm]
- 44 Motor designation, active part

9.3 Weight

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

If the weight exceeds 30 kg, the weight of the entire geared motor is indicated on the rating plate of the gearbox or geared motor.

Where there are several rating plates on one geared motor, the specification on the main gearbox is decisive.

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

9.4 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 9- 3 Example of the circuit diagram numbering

Example:	A	0	100	000
1. position	A			
2. position		0		
3. position			100	
4. position				000

Table 9- 4 Explanation

1. position	Identification letter for circuit diagrams
2. 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
3. position	Identification for the circuit diagram content
4. position	Consecutive number for additional versions

Modular structure of the circuit diagrams

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

Table 9- 5 Structure of the circuit diagrams

Supplementary device	Terminal marking	Supplementary device	Terminal marking	Function
Europe	Europe	Nema	Nema	
1TP	1TP1; 1TP2	P	P1; P2	Disconnection, 1st temperature monitor line
1TB	1TB1; 1TB2	P	P3; P4	Disconnection, 1st temperature monitor line
1BD	1BD1; 1BD2	B	B1; B2	DC current brake connection, brake
1BA	1BA1; 1BA2	B	B3; B4	AC voltage connection, brake
1S	1S1; 1S2	B	B5; B6	Jumper, DC circuit, brake
2TP	2TP1; 2TP2	P	P5; P6	Disconnection, 2nd temperature monitor line
2TB	2TB1; 2TB2	P	P7; P8	Disconnection, 2nd temperature monitor line
1HE	1HE1; 1HE2	H	H1; H2	Motor
3TP	3TP1; 3TP2	P	P9; P10	Prewarning, 1st temperature monitor line
3TB	3TB1; 3TB2	P	P13; P14	Prewarning, 2nd temperature monitor line
4TP	4TP1; 4TP2	P	P11; P12	Prewarning, 1st temperature monitor line
4TB	4TB1; 4TB2	P	P15; P16	Prewarning, 2nd temperature monitor line
1R	1R1; 1R2	P	P17; P18	KTY winding
2R	2R1; 2R2	P	P19; P20	KTY winding
1SP	1SP1; 1SP2; 1SP3	-	-	-
2S	2S1; 2S2; 2S3	-	-	Fan monitoring
3S	3S1; 3S2; 3S3			Wear monitoring
4S	4S1; 4S2	-	-	-
5S	5S1; 5S2; 5S3	K	K1; K2; K3	-
1CA	1CA1; 1CA2	J	J1; J2	Operation
2CA	2CA1; 2CA2	J	J3; J4	Start
3CA	3CA1; 3CA2	J	J5; J6	-
4CA	4CA1; 4CA2; 4CA3	J	J7; J8; J9	
2BA	2BA1; 2BA2; 2BA3; 2BA4; 2BA5; 2BA6	B	B11; B12; B13; B14; B15; B16	Three-phase AC voltage, brake
3R	3R1; 3R2	P	P21; P22	PT100 bearing DE
4R	4R1; 4R2	P	P23; P24	PT100 bearing NDE
5R	5R1; 5R2	P	P25; P26	1 PT100 winding

9.4 Circuit diagrams

Supplementary device	Terminal marking	Supplementary device	Terminal marking	Function
Europe	Europe	Nema	Nema	
	5R11; 5R12; 5R21; 5R22; 5R31; 5R32	P	P25.1; 26.1; P25.2; 26.2; P25.3; 26.3	3 PT winding
6S	6S1; 6S2	-	-	-
7S	7S1; 7S2	-	-	-
8S	8S1; 8S2	-	-	-
3BA	3BA1; 3BA2; 1BD1; 1BD2; 1I1; 1I2	B	B17; B18; B1; B2; I1; I2	-
9S	9O1; 9I2; 9S1; 9S2		B21; B22; B23; B24	-
4BA	4BA1; 4BA2; 1BD1; 1BD2	B	B25; B26; B1; B2	Type1: Half-wave / rectifier bridge
5BA	5BA1; 5BA2; 1BD1; 1BD2; 1I1; 1I2	B	B30; B31; B1; B2; I1; I2	Type2: Half-wave / rectifier bridge with current sensing and arc quenching element for disconnection on the DC side
6BA	6BA1; 6BA2; 1BD1; 1BD2	B	B35; B36; B1; B2	Type3: Half-wave / rectifier bridge with voltage sensing and arc quenching element for disconnection on the DC side
7BA	7BA1; 7BA2; 1S1; 1S2; 1BD1; 1BD2	B	B37; B38; B1; B2	Type4: High-speed rectifier with arc quenching element
8BA	8BA1; 8BA2; 1BD1; 1BD2; 1I1; 1I2	B	B44; B45; B1; B2; I1; I2	Type2: High-speed rectifier with current sensing and arc quenching element for disconnection on the the DC side
9BA	9BA1; 9BA2; 1BD1; 1BD2	B	B48; B49; B1; B2	Type2: High-speed rectifier with voltage sensing and arc quenching element for disconnection on the DC side

Spare parts

10.1 Stocking of spare parts

By stocking the most important spare and wearing parts on site, you can ensure that the gearbox or geared motor is ready for use at any time.

<p>NOTICE</p> <p>Safety impairment caused by inferior products</p> <p>The installation and / or use of inferior products can have a negative impact on the design characteristics of the geared motor and might consequently impair the active and / or passive safety features of the machine.</p> <p>Siemens AG states explicitly that only spare parts and accessories supplied by Siemens have been tested and approved by Siemens.</p> <p>If you do not use original spare parts and original accessories, Siemens AG excludes every liability and warranty.</p> <p>Siemens AG accepts the warranty only for original spare parts.</p>

Note that special manufacturing and delivery specifications often apply to individual components. All spare parts offered by Siemens AG are state-of-the-art and conform to the latest legal regulations.

Please state the following data when ordering spare parts:

- Serial number shown on the rating plate ③
- Type designation shown on the rating plate ⑥
- Part number
 - 4-digit item number from the spare parts list
 - 6-digit object number
 - 7-digit article number
 - 14-digit material number
- Quantity

<p>SIEMENS</p> <p>FDU0412/8999999 nnn</p> <p>2KJ3105-1EM22-2AV1-Z</p> <p>ZF59-LE90SG4E-L32/14N</p> <p>IP55</p> <p>K-Id: 1234567890</p> <p>30kg</p> <p>1.5L OIL CLP PG VG220 i=28</p> <p>50Hz n2:49.3/min 60Hz n2: 59.7/min</p> <p>T2: 213Nm fB:2.1 T2: 203Nm fB:2.2</p> <p>3~Mot. ThCl.155(F)</p> <p>50Hz 230/400V +/-10% D/Y 60Hz 14 Nm 205-240V AC</p> <p>4.33/2.5A cosPhi 0.78 2.2 A 460V Y</p> <p>1.1kW IE2-81.4% 1425/min 1.27kW IE2-84% 1725/min</p> <p>Mot. 1LE1001-0EB0</p>	<p>IEC60034</p> <p>CE</p> <p>M1</p>	<p>SIEMENS</p> <p>1</p> <p>2</p> <p>3</p> <p>4</p> <p>5</p> <p>6</p> <p>7</p> <p>8</p> <p>9</p> <p>10</p> <p>11 12 13 14</p> <p>15</p> <p>16 19</p> <p>17 18 21</p> <p>20</p> <p>22</p> <p>23</p> <p>24</p> <p>25 26</p> <p>27 28 29 30 36 37</p> <p>31 32 39</p> <p>33 34 35 41 42</p> <p>38</p> <p>40</p> <p>43</p> <p>44</p>
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Figure 10-1 Example of a SIMOGEAR rating plate

10.2 Lists of spare parts

10.2.1 Motor sizes 63 - 250

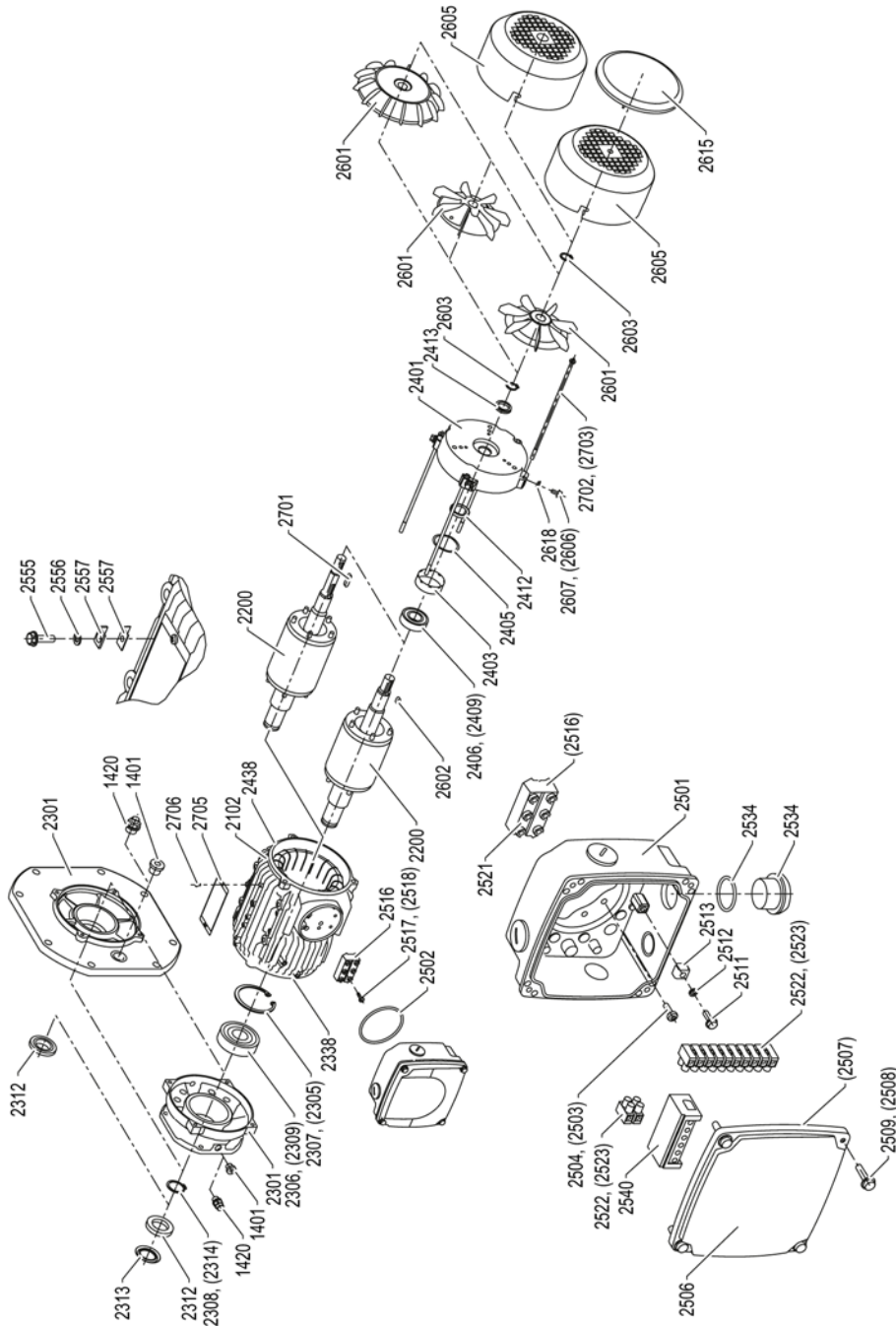


Figure 10-2 Motor sizes 63 - 90

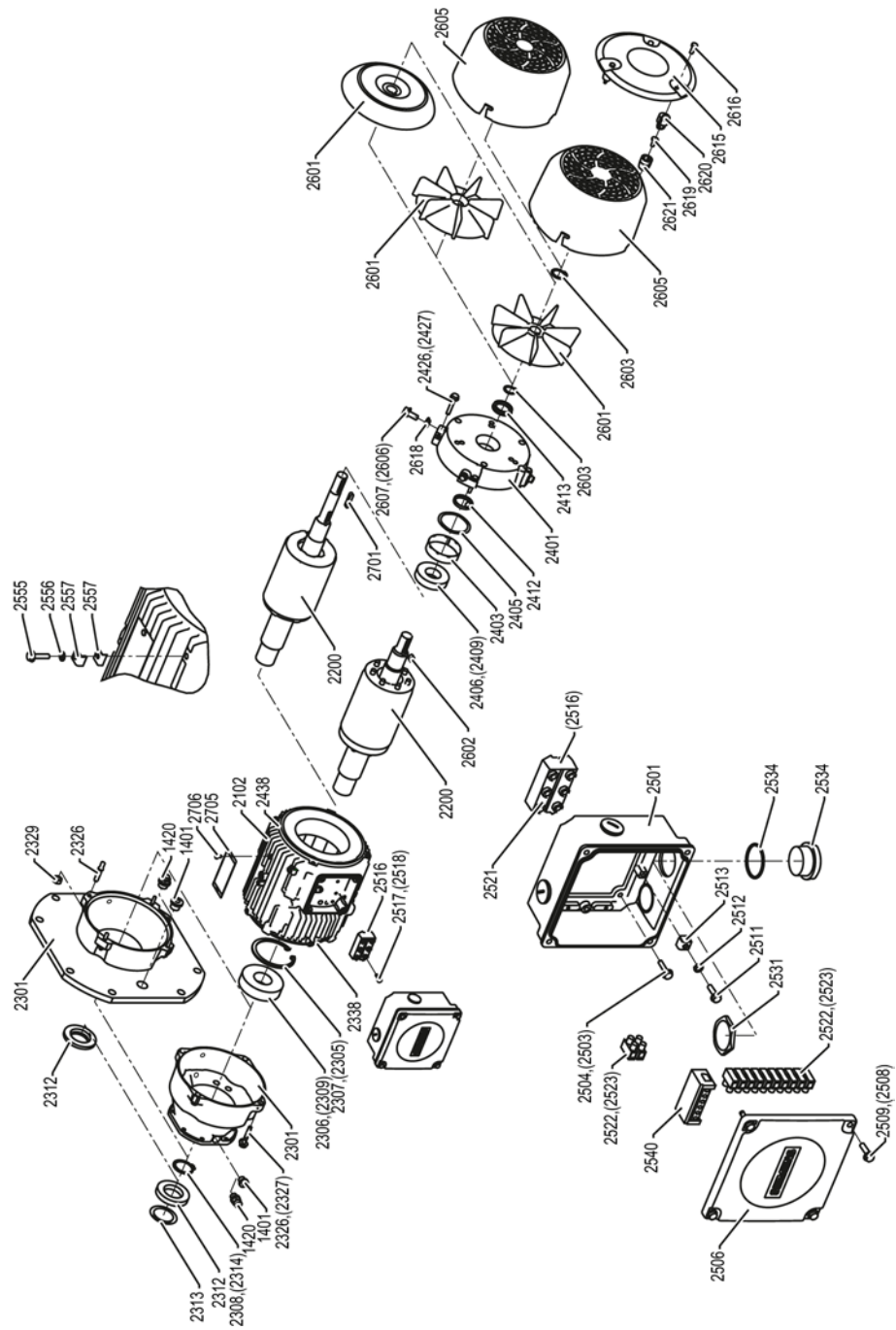


Figure 10-3 Motor sizes 100 - 160

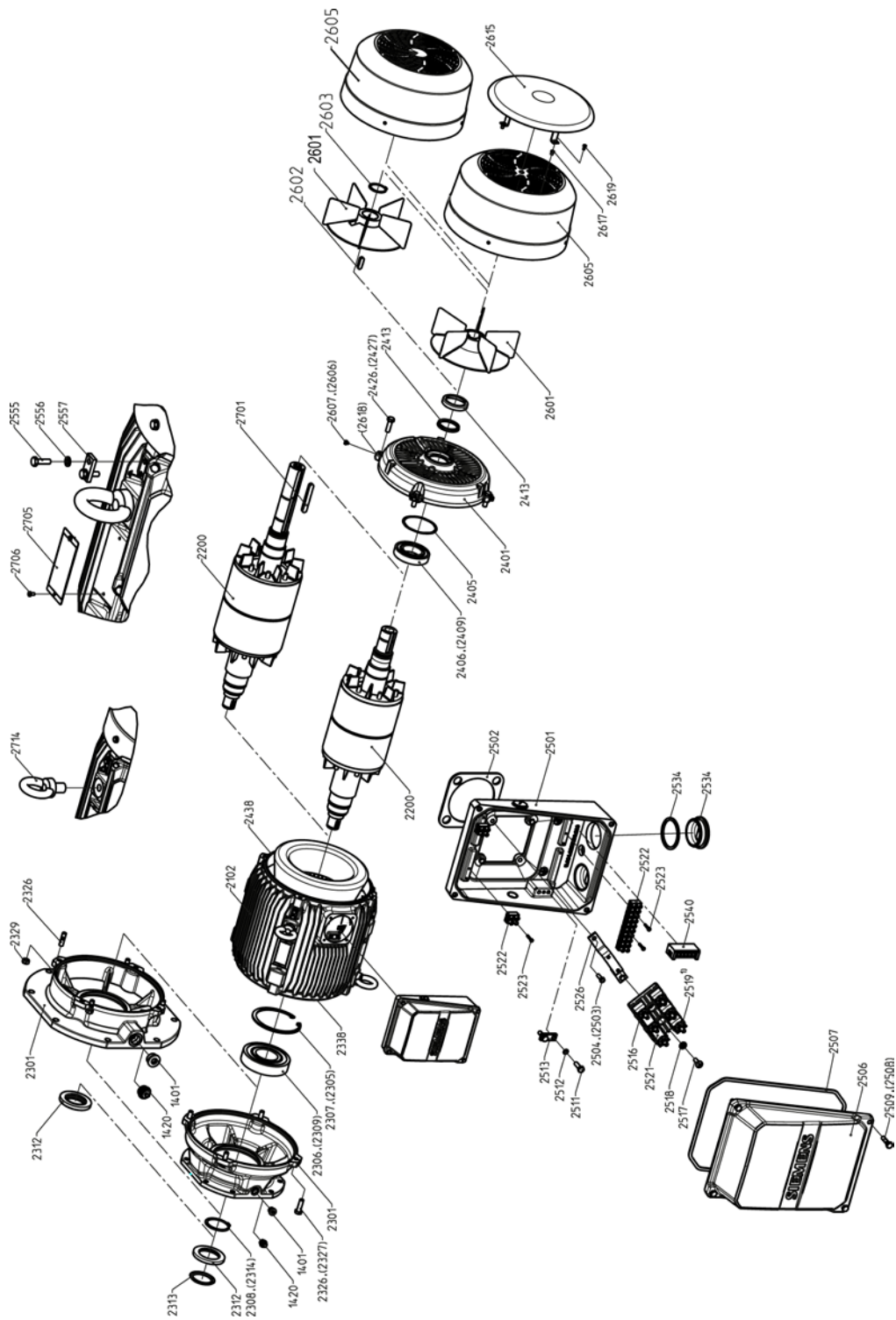
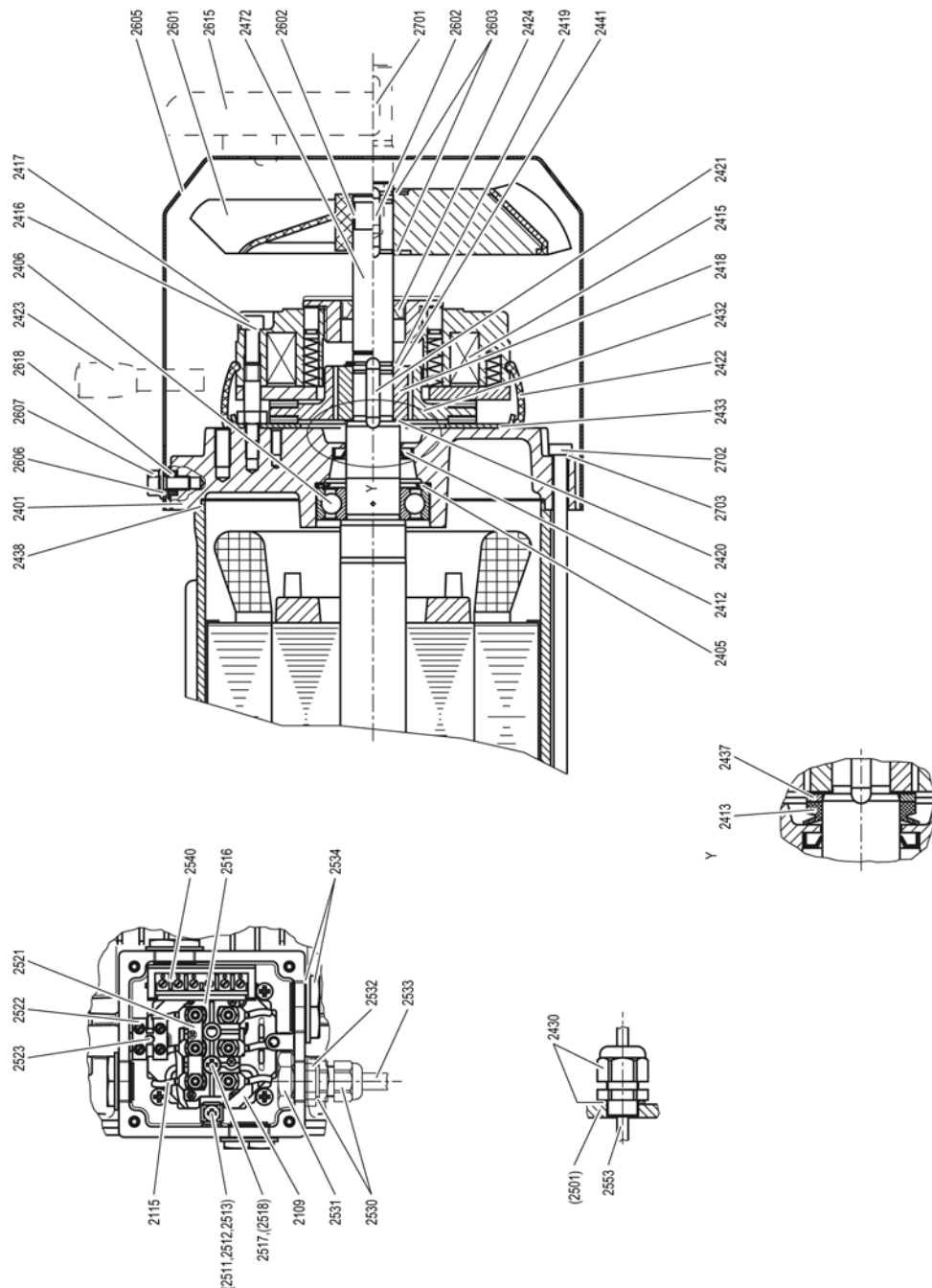


Figure 10-4 Motor sizes 180 - 250

Spare parts list for motor sizes 63 - 250

1401	Screw plug	2513	Bracket
1420	Vent filter	2516	Complete terminal board
2102	Stator	2517	Bolt
2200	Rotor	2518	Screw lock
2301	Bearing shield	2519	Nut
2305	Shim	2521	Terminal connector
2306	Bearing	2522	Terminal block
2307	Locking ring	2523	Bolt
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	Bolt
2326	Bolt	2556	Screw lock
2327	Screw lock	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 lock
2406	Bearing	2607	Bolt
2409	Grease	2615	Protective canopy
2412	Shaft sealing ring	2616	Bolt
2413	V ring	2617	Riveting nut
2426	Bolt	2618	Damping disk
2427	Screw lock	2619	Bolt
2438	Seal	2620	Spacer / bush
2501	Lower terminal box section	2621	Spacer / bush
2502	Seal	2701	Featherkey
2503	Screw lock	2702	Bolt
2504	Bolt	2703	Screw lock
2506	Terminal box cover	2705	Rating plate
2507	Seal	2706	Bolt
2508	Screw lock	2714	Eyebolt
2509	Bolt		
2511	Bolt		
2512	Screw lock		

10.2.2 Brake

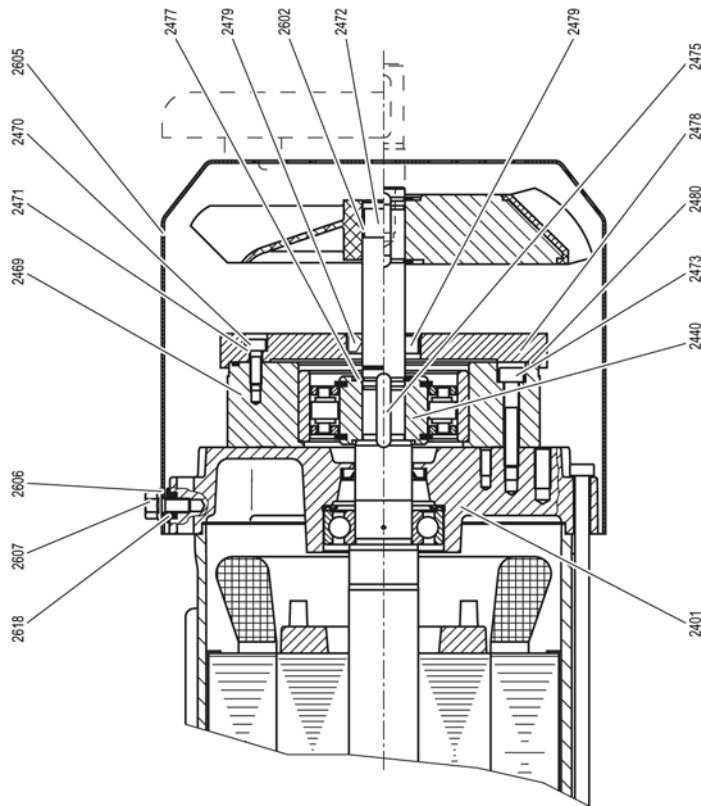


- 2401 Bearing shield
- 2413 V ring
- 2415 Brake
- 2416 Screw lock
- 2417 Bolt
- 2418 Coupling driver
- 2419 Locking ring

- 2420 Supporting disk / shim
- 2421 Featherkey
- 2422 Dust protection ring
- 2423 Manual release lever
- 2424 Shaft sealing ring
- 2430 Complete cable gland
- 2432 Friction disk
- 2433 Friction plate
- 2437 Supporting disk / shim
- 2441 Supporting disk / shim
- 2501 Lower terminal box section
- 2522 Terminal block
- 2523 Bolt
- 2540 Rectifier
- 2605 Fan cover
- 2606 Screw lock
- 2607 Bolt
- 2618 Damping disk

Figure 10-5 Brake

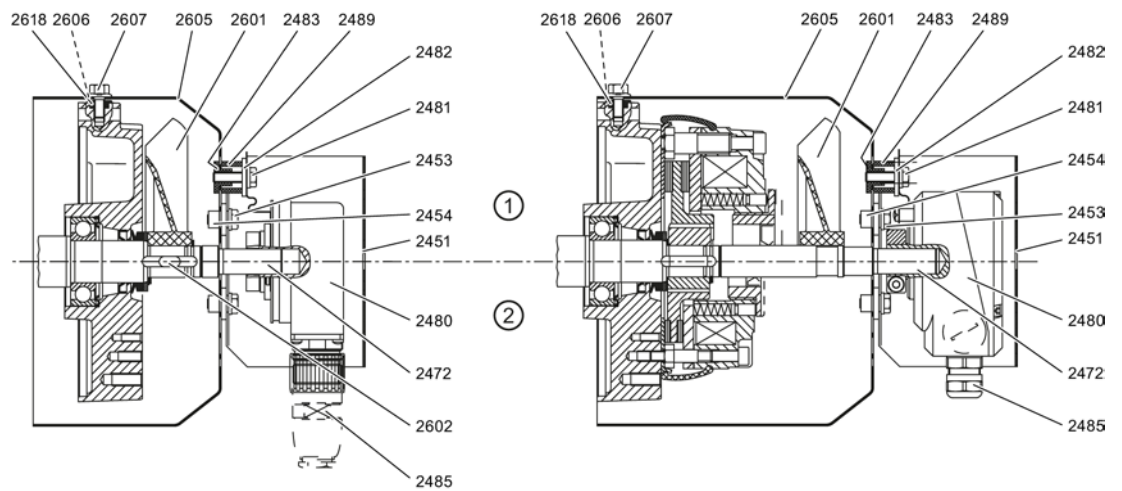
10.2.3 Backstop



- 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
- 2605 Fan cover
- 2606 Screw lock
- 2607 Bolt
- 2615 Protective canopy
- 2618 Damping disk

Figure 10-6 Backstop

10.2.4 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

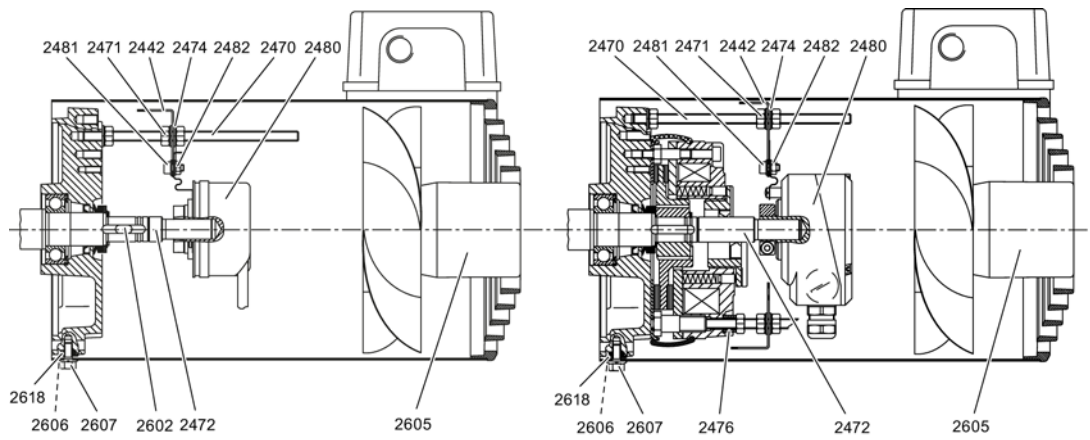
2606 Screw lock

2607 Bolt

2618 Damping disk

Figure 10-7 Encoder on fan cover

10.2.5 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 10-8 Encoder in the motor with external fan

10.2.6 SINAMICS G110M frequency inverters

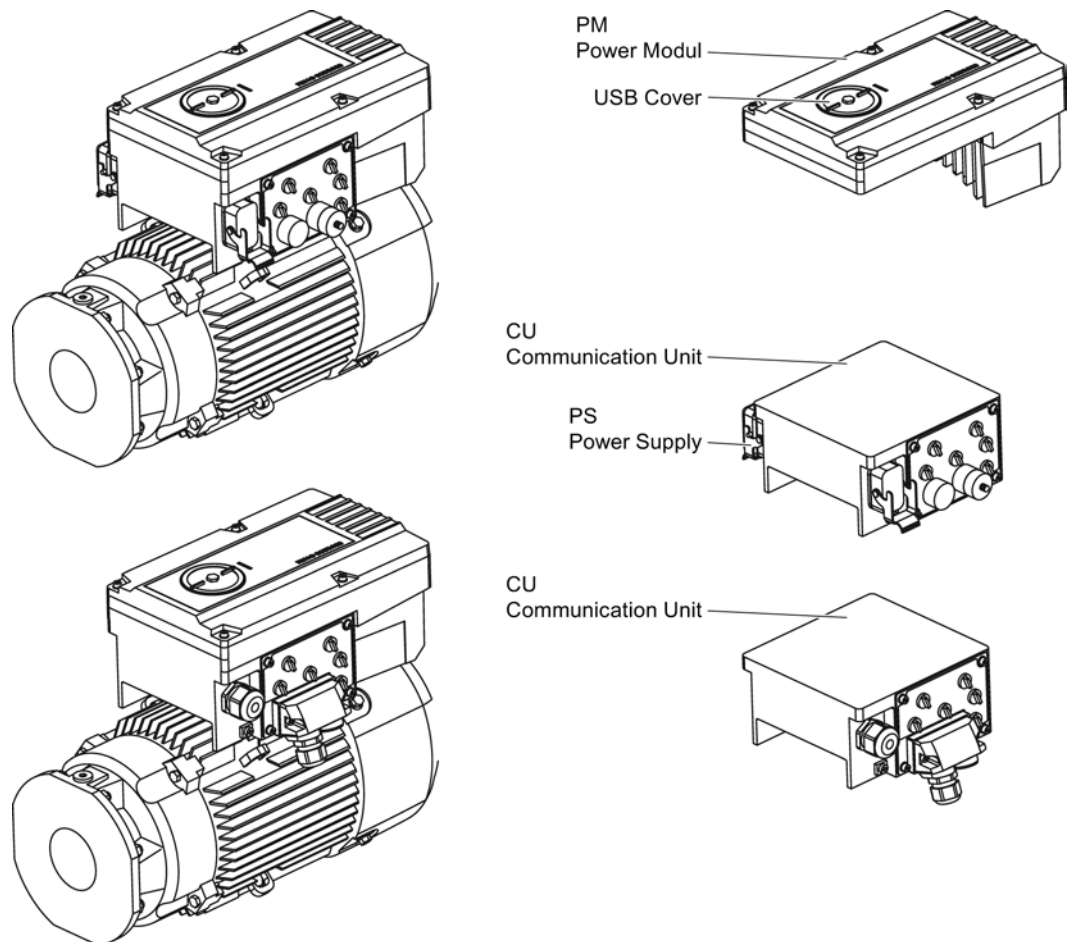


Figure 10-9 SINAMICS G110M frequency inverters

EC Declaration of Conformity

Document No. KE DMA 1D 04.14

Manufacturer: Siemens AG
Address: Bahnhofstraße 40, 72072 Tübingen, Germany
Product designation: Low-voltage motors, types

- LA sizes 63 to 71
- LE sizes 80 to 160
- LES sizes 100 to 315

The designated product complies with the regulations of the following European Directive:

2006/95/EC Directive of the European Parliament and Council of December 12, 2006, on the harmonization of the laws of the Member States relating to electrical equipment designed for use within certain voltage limits (Low-Voltage Directive).

Conformance with the regulations laid down in these directives is proven by fully complying with the following standards:

- EN 60034-1: 2010
- EN 60034- all relevant sections in the latest version in each case
- EN 60204-1: 2006

EC Declarations of Conformity and / or manufacturer's declarations for all subassemblies, integrated and add-on units are available. Specifically, these are:

- Electromagnetic brakes L, ZL, P, FDX, FDW, KFB with connected accessories such as rectifiers and switching devices
- External fan units F
- Shaft encoders IA, IM, IN, RE
- G110 motor-integrated frequency inverters

The designated product also complies with the regulations of the following legal acts:

Commission Regulation (EC) no. 640/2009 of July 22, 2009 implementing Directive 2005/32/EC (2009/125/EC) of the European Parliament and of the Council with regard to ecodesign requirements for electric motors and the Regulation (EU) no. 4/2014 of January 6, 2014 amending Regulation (EU) No. 640/2009.

Conformance with the regulations laid down in these legal acts is proven by fully complying with EN 60034-30: 2009.

The designated product is designed for installation and mounting in another machine.
Commissioning is prohibited until it has been established that the end product conforms with
Directive 2006/42/EC.

First application of the CE marking 2005.

Tübingen, April 1, 2014

i.V. Raster

i.V. L. Hirschberger

Thomas Raster
Head of Specification Electrical Components

Lothar Hirschberger
Head of Quality Management

This declaration certifies compliance with the Directives named above, but does not
guarantee any specific properties or durability according to §443 BGB.

Please observe the safety information in the supplied product documentation.

Further information

SIMOGEAR in the Internet
www.siemens.com/simogear

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