

SIEMENS

For employment in zone 1 or zone 2 (IEC/EN 60079-10-1)

CE⁰¹⁰²  II 2G Ex e IIC T. Gb

LOHER CHEMSTAR

Induction motor

Type 1PS2

Operating Instructions / Installation Instructions N-R 601e

Edition

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Answers for industry.

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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

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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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Introduction

These instructions describe the machine and explain how to handle it, from initial delivery to final disposal of the equipment. Keep these instructions for later use.

Read these operating instructions before you handle the machine and follow the instructions to become familiar with its design and operating principles and thus ensure safe, problem-free machine operation and long service life.

If you have suggestions for improving the document, please contact the Service Center (Page 99).

Text format features

The warning notice system is explained on the rear of the inside front. Always follow the safety instructions and notices in these instructions.

In addition to the safety-related warning notices which you must read, you will find the text in these instructions is formatted in the following way:

1. Handling instructions are always formatted as a numbered list. Always perform the steps in the order given.
- Lists are formatted as bulleted lists.
 - Lists on the second level are hyphenated.

Note

A Note is an important item of information about the product, handling of the product or the relevant section of the document. Notes provide you with help or further suggestions/ideas.

Safety notes

2.1 Information for the nominated person in control of the electrical installation

This machine has been designed and built in accordance with Directive 94/9/EC ("Explosion Protection Directive") and is intended for use in industrial plants with potentially explosive atmosphere.

Commissioning in the European Community in accordance with directive 2006/42/EU ("Machine Directive") is forbidden until the plant into which the machine will be installed has been shown to conform with this directive. Please observe the country-specific regulations when using the machine outside the European Community.



WARNING

Commissioning prior to determining the conformance

If the machine is commissioned prior to determining the plant conformance, the explosion protection of the plant is not guaranteed. An explosion can result that can lead to death, serious injury or material damage.

Commission the machine only when the plant conformance with the explosion protection directive has been confirmed.

2.2 The five safety rules

For your personal safety and to prevent material damage when carrying out any work, always observe the safety instructions and the following five safety rules, according to EN 50110-1 "Dead working". Apply the five safety rules in the sequence stated before starting work.

Five safety rules

1. Disconnect completely.
Disconnect the auxiliary circuits, for example anti-condensation heating.
2. Secure against reconnection.
3. Verify absence of operating voltage.
4. Carry out earthing and short-short-circuiting.
5. Provide protection against adjacent live parts.

To energize the system, apply the measures in reverse order.

2.3 Qualified personnel

All work at the machine must be carried out by qualified personnel only. For the purpose of this documentation, qualified personnel is taken to mean people who fulfill the following requirements:

- Through appropriate training and experience, they are able to recognize and avoid risks and potential dangers in their particular field of activity.
- They have been instructed to carry out work on the machine by the appropriate person responsible.


2.4 Safe handling

Workplace safety depends on the attentiveness, care, and common sense of the personnel who install, operate, and maintain the machine. In addition to the safety measures cited, as a matter of principle, the use of caution is necessary when you are near the machine. Always pay attention to your safety.

Also observe the following to prevent accidents:

- General safety regulations applicable in the country where the machine is deployed.
- Manufacturer-specific and application-specific regulations
- Special agreements made with the operator
- Separate safety instructions supplied with the machine
- Safety symbols and instructions on the machine and its packaging



 WARNING
Live parts Electric machines contain live parts. Fatal or severe injuries and substantial material damage can occur if the covers are removed or if the machine is not handled, operated, or maintained properly. <ul style="list-style-type: none">• Always observe the "five safety rules (Page 13)" when carrying out any work on the machine.• Only remove the covers using the methods described by these operating instructions.• Operate the machine properly.• Regularly and correctly maintain the machine.



! WARNING

Rotating components

Electric machines contain dangerous rotating parts.

Fatal or severe injuries and substantial material damage can occur if the covers are removed or if the machine is not handled, operated, or maintained properly.

- Only remove the covers using the methods described by these operating instructions.
- Operate the machine properly.
- Perform regular maintenance on the machine.
- Secure free-standing shaft ends.



! WARNING

Hot surfaces

Electric machines have hot surfaces. Do not touch these surfaces. They could cause burns.

- Allow the machine to cool before starting work on the machine.
- Only remove the covers using the methods described by these operating instructions.
- Operate the machine properly.



! CAUTION

Hazardous substances

Chemical substances required for the setup, operation and maintenance of machines can present a health risk.

Poisoning, skin damage, cauterization of the respiratory tract, and other health damage may result.

- Read the information in these operating instructions and the product information supplied by the manufacturer.
- Observe the relevant safety regulations and wear the personal protective equipment specified.


! CAUTION

Flammable substances

Chemical substances required for the setup, operation and maintenance of machines may be flammable.

Burns and other damage to health and material may result.

- Read the information in these operating instructions and the product information supplied by the manufacturer.
- Observe the relevant safety regulations and wear the personal protective equipment specified.

 WARNING
Noise emissions
During operation, the machine's noise emission levels can exceed those permitted at the workplace, which can cause hearing damage.
Take steps to reduce noise, such as introducing covers and protective insulation or adopting hearing protection measures, so that the machine can be operated safely within your system.

2.5 Use in hazardous areas

Electrical systems in hazardous zones must be assembled, installed, and operated by the applicable responsible persons in accordance with the applicable rules and regulations.

Note

The basic requirements relating to electrical systems and their operation in hazardous areas are described, for instance, in EU Directive 1999/92/EC as well as in IEC / EN 60079-14.

Ignition hazards

The assessment of operating risks and local operating conditions and the necessary monitoring methods must be clarified and made binding by the system operator in consultation with the responsible supervisory authority. The required measures must be adhered to at all times. The machine manufacturer cannot provide any generally applicable recommendations. Please observe the information in these operating instructions.

Note

The basic requirements relating to the assessment of ignition hazards arising from electrical equipment and their operation in hazardous zones are specified, for instance, in 94/9/EC and 1999/92/EC directives as well as in the IEC / EN 60079 series of standards.

If a third-party certification is available for the machine, then carefully comply with the technical data defined in it and any special conditions.

The certificate must be available before commissioning.

2.6 Electrostatic sensitive devices

ESD protective measures



NOTICE

Electrostatic discharge

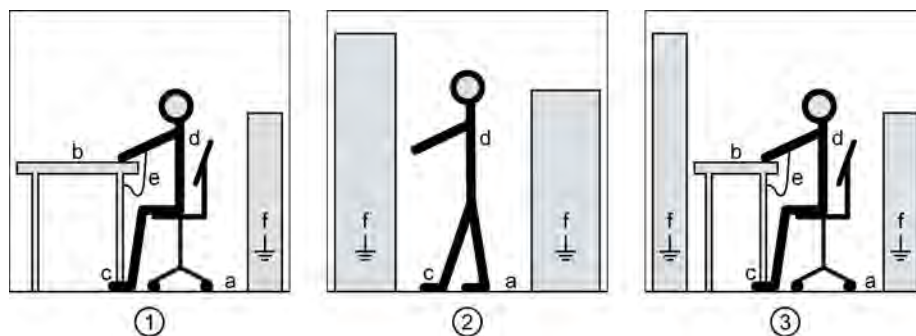
Electronic modules contain components that can be destroyed by electrostatic discharge.

These modules can be easily destroyed by improper handling.

To protect your equipment against damage, follow the instructions given below.

- Never touch electronic modules unless absolutely necessary in the course of maintenance and repair procedures.
- If the modules have to be touched, the body of the person concerned must be electrostatically discharged immediately beforehand and be grounded.
- Electronic modules should not be brought into contact with electrically insulating materials such as plastic film, plastic parts, insulating table supports or clothing made of synthetic fibers.
- Always place electrostatic sensitive devices on conductive bases.
- Always pack, store and transport electronic modules or components in conductive packaging, e.g. metallized plastic or metal containers, conductive foam material or domestic aluminum foil.

The necessary ESD protective measures for electrostatic sensitive devices are illustrated once again in the following drawings:



(1) Sitting

a = conductive floor surface

d = ESD overall

(2) Standing

b = ESD table

e = ESD wristband

(3) Standing/sitting

c = ESD shoes

f = cabinet ground connection

WARNING

Risk of explosion due to electrostatic discharge

Electrostatic discharge poses a potential ignition source. In an explosive atmosphere, there is a risk of an explosion. This can result in death, serious injury or material damage.

Please comply with ESD protective measures.

2.7 Electromagnetic compatibility


This machine is designed in accordance with IEC/EN 60034 and when used as prescribed it satisfies the requirements of European Directive 2004/108/EC on Electromagnetic Compatibility.

2.8 Interference immunity

The machine fulfills the requirements regarding interference immunity in accordance with IEC/EN 61000-6-2.

For machines with integrated sensors (e.g. PTC thermistors), the manufacturer of the complete system must ensure sufficient interference immunity by selecting suitable sensor signal leads and evaluation units.

2.9 Electromagnetic fields when operating electrical power engineering installations

 WARNING
Interference to electronic devices caused by electrical power equipment
Electrical power equipment generate electric fields during operation. Potentially lethal malfunctions can occur in medical implants, e.g. pacemakers, in the vicinity of electrical power equipment. Data may be lost on magnetic or electronic data carriers.
<ul style="list-style-type: none">• It is forbidden for people with pacemakers to enter the vicinity of the machine.• Protect the personnel working in the plant by taking appropriate measures, such as erecting identifying markings, safety barriers and warning signs and giving safety talks.• Observe the nationally applicable health and safety regulations.• Do not carry any magnetic or electronic data media.

2.10 Ventilation

NOTICE
Ventilation
<ul style="list-style-type: none">• Do not obstruct ventilation.• Prevent the air expelled by neighboring equipment from being immediately drawn in again.• On the vertical type of machine construction with air intake from above, protect the air inlets from the ingress of foreign bodies and water.• If the shaft extension is facing upwards, liquid must be prevented from entering by moving along the shaft.

Description


Applications

This electrical machine is designed for driving rotating machines in industrial environments and also for energy conversion. It is characterized by a high level of safety, long lifetime, and overall reliability.

The machine was designed in accordance with the ordering party's specification and may only be used for the contractually agreed purpose.

Type of protection Ex e

This machine has "increased safety" (Ex e) type of protection according to IEC / EN 60079-7. It can therefore be operated in hazardous **Zones 1 and 2** according to IEC / EN 60079-10-1.

 WARNING
<p>Explosion hazard</p> <p>This machine is not designed for use in the presence of explosive dust or in areas where an explosion hazard exists due to hybrid mixtures. An explosion can occur if the machine is operated in these areas. This can result in death, serious injury or material damage.</p> <p>Never operate this machine in the presence of explosive dust or in areas where an explosion hazard exists due to hybrid mixtures.</p>





Use in hazardous areas

Explosion-proof electrical machines correspond to standards of the IEC / EN 60034 and IEC / EN 60079 series. Only operate the machine in hazardous areas, strictly complying with the specifications of the responsible supervisory authority. The relevant supervisory authority is responsible for determining the hazard level of each area and classifying the zones. The type of protection as well as special regulations are stamped on the rating plate or in the test certificate. If the certificate number is supplemented by an X, to safely operate the machine observe the special notes in the operating instructions or if available in the EC type examination certificate or in the IECEx Certificate of Conformity. Operation with a converter must be certified. It is essential that you observe the separate manufacturer's information and instructions.

NOTICE
Use of machines without CE marking
Machines without CE marking are intended for operation outside the European Economic Area (EEA). Do not use any machines without a CE marking in the EEA!

Machines with Ex e type of protection can have the following Ex marking:

Table 3-1 Marking machines with Ex e type of protection

Directive	Ex marking
Directive 94/9/EC with EC type-examination certificate	CE ⁰¹⁰²  II 2G Ex e IIC T1 toT4 Gb
	CE ⁰¹⁰²  II 2G Ex e d IIC T1 toT4 Gb
	CE ⁰¹⁰²  II 2G Ex e ib IIC T1 toT4 Gb
	CE ⁰¹⁰²  II 2G Ex e d ib IIC T1 toT4 Gb
IECEX-Scheme with Certificate of Conformity	Ex e IIC T1 toT4 Gb
	Ex e d IIC T1 toT4 Gb
	Ex e ib IIC T1 toT4 Gb
	Ex e d ib IIC T1 toT4 Gb

Machine design

The regulations and standards used as the basis to design and test this machine are stamped on the rating plate.

The machine design basically complies with the subsequent standards. Please refer to the EC Declaration of Conformity for the versions of the harmonized standards referenced.

Table 3-2 Machine design

Feature	Standard
Rating and performance	IEC/EN 60034-1
Degree of protection	IEC/EN 60034-5
Cooling	IEC/EN 60034-6
Type of construction	IEC/EN 60034-7
Terminal markings and direction of rotation	IEC/EN 60034-8
Noise emission	IEC/EN 60034-9
Starting characteristics, rotating electrical machines	IEC/EN 60034-12*
Vibration severity grades	IEC/EN 60034-14
Vibration limits	DIN ISO 10816-3

* For machines in line operation only

See also

Quality documents (Page 103)

The following standards additionally apply for explosion-protected machines:

Table 3-3 Machine type with type of protection Ex e

Characteristic	Standard
Type of protection Ex e	IEC / EN 60079-0 IEC / EN 60079-7

Rating plate

The rating plate shows the identification data and the most important technical data. The data on the rating plate and the contractual agreements define the limits of proper usage.

Motor enclosure with surface, hollow-rib or tube cooling

Depending on their size, the stator frame and bearing shields are manufactured out of cast iron or steel. The fan cover is made of sheet steel. The stator frame surface has cooling ribs, hollow ribs, or tubes and mounted terminal box.

Cooling for machines with surface cooling, hollow rib cooling or tube cooling

For machines with rib, hollow rib or tube cooling, the cooling air is drawn in through openings in the fan cover. The air is blown over the surface or through the cooling tubes of the stator frame. With hollow-fin or tube cooling, a closed cooling air circuit inside the motor assists with heat dissipation.

Stator winding

The stator winding has a temperature class according to EN 60034-1, see rating plate. High-quality enameled wires, suitable surface insulating materials, and the type of impregnation guarantee great mechanical and electrical stability together with a high utility value and a long service life.

Rotor

The rotor has a squirrel cage rotor manufactured out of die-cast aluminum or a brazed copper rotor. The rotor is dynamically balanced. The balance condition is stated on the shaft end face or rating plate.

Risk of ignition on the rotor

Note that the manufacturer has performed a risk assessment for all machines with regard to sparking between the rotor and the stator. There is a risk of explosion if potentially explosive gas is drawn in at startup. If purging is required, an additional plate must be attached to the electric machine.

Additional plate:

Purging is required before the start in compliance with the risk evaluation for squirrel-cage rotors according to IEC / EN 60079–15:2010

Refer to "Purging before the start"

Bearings

The motors are equipped with grease-lubricated roller bearings.

- The bearings of the standard version motors (up to size 280) are permanently lubricated.
- The bearings of motors from size 315 upwards have a relubrication facility and automatic grease quantity control.

Terminal boxes

In the motor terminal box, additional connecting terminals are available if required for monitoring equipment. For larger machines, an additional terminal box can be optionally mounted. You can see the number of available terminals in the circuit diagrams.

Paint finish

The machine is painted according to the instructions in your order.

Monitoring equipment

Monitoring equipment is provided corresponding to what has been ordered. KTY83 and KTY84 semiconductor sensors are electrostatic sensitive devices (ESD). These elements can be damaged by electrostatic discharge. Observe the ESD protective measures.

External fan

The machine can be fitted with an external fan. For IC 666, there are two external fans. The electrical connection data are stamped on the rating plate of the external fan.

Anti-condensation heating

The machine can be fitted with anti-condensation heating. The connection data is listed on an additional plate on the machine.

Preparations for use

Good planning and preparation of machine applications are essential in terms of keeping installation simple and avoiding errors, ensuring safe operation, and allowing access to the machine for servicing and corrective maintenance.

This chapter outlines what you need to consider when configuring your plant in relation to this machine and the preparations you need to make before the machine is delivered.

4.1 Safety-related aspects to consider when configuring the plant

A number of residual risks are associated with the machine. These are described in the chapter titled "Safety information" and in related sections.

Take appropriate safety precautions (covers, barriers, markings, etc.) to ensure the machine is operated safely within your plant.

Observing the operating mode

Observe the machine's operating mode. Use a suitable control system to prevent overspeeds, thus protecting the machine from damage.

4.2 Machines without final paint coating

For machines, which are only delivered with primer, you must paint them to comply with the applicable guidelines for the specific application. The primer alone does not provide adequate corrosion protection.

The paint applied must conform to the requirements to avoid electrostatic charging, see EN 60079-0.

Note

Please contact the Service Center for recommendations relating to the paint finish.

See also

Repainting (Page 83)

4.3 Ensuring adequate cooling

Ensure that the machine is sufficiently cooled by the cooling air flow at the installation site:

- Ensure that the cooling air can flow in and out unobstructed. The full air flow provided by the fan is only possible if air can freely enter the impeller. Maintain a clearance of at least 1 x inlet diameter in the axial direction.
- Make sure that the machine does not draw in the hot discharged air again.
- For machines with a vertical type construction with an air intake from above, ensure that the air inlets are protected against the ingress of foreign bodies and water.

4.4 Interlock circuit for anti-condensation heating


If the anti-condensation heating is operated while the machine is running, this can increase the temperatures inside the machine.

- Install an interlock circuit that switches off the anti-condensation heating once the main machine is switched on.
- Only operate anti-condensation heating when the machine is switched off.

4.5 Interlock circuit for the external fan motor

For machines with external fans, install an interlock circuit that prevents the main machine being switched on if the external fan is not operational.

4.6 Noise emissions

 WARNING
Noise emissions
During operation, the machine's noise emission levels can exceed those permitted at the workplace, which can cause hearing damage.
Take steps to reduce noise, such as introducing covers and protective insulation or adopting hearing protection measures, so that the machine can be operated safely within your system.

4.7 Voltage and frequency fluctuations during line operation

The ranges stated on the rating plate and in the documentation (e.g. range B acc. to IEC / EN 60034 1) for voltage fluctuation ($\pm 10\%$) and frequency fluctuation ($\pm 2\%$) must be maintained at all times.

The following always applies: Under practical operating conditions, a machine may sometimes have to be operated outside the tolerance limits. Exceptions of this sort should be limited with regard to the values that arise, how often and for how long they occur. Where possible and within a reasonable time take corrective actions such as reducing the power. Such actions can avoid thermal ageing leading to a reduction in the service life of the machine.

NOTICE

Overheating of the winding

Exceeding the permissible tolerances for voltage and frequency can lead to an impermissibly high temperature rise in the windings and thus cause long-term damage to the machine.

4.8 Protection against impermissible temperature rise

Every machine must be protected against an inadmissible temperature rise. Observe the following notes:

- Protect every machine according to IEC / EN 60079–14 using a current-dependent, delayed, circuit breaker with phase failure protection corresponding to IEC / EN 60947 or a similar device in all phases.
- Set the protective device to the rated current (value is stamped on the rating plate).
- Select the protective device so that the motor is thermally protected even with a locked rotor.
- For explosion-protected electrical machines with type protection "Increased safety", also monitor the starting (starting monitoring with EC type examination certificate according to Directive 94/9/EC or IECEx–Scheme with Certificate of Conformity). When the rotor is locked, the protective device must trip within the tE time (safe locked rotor time). This requirement is satisfied if the tripping time is not longer than the specified tE time.
- Protect the windings in a delta connection in such a way that the tripping unit or relay is connected in series with the winding phases. When selecting and setting the tripping unit, define the rated value of the phase current. The phase current is 0.58 times the rated motor current. Any thermal motor protection via direct temperature monitoring to be used in addition to the motor starter protector is stated on the rating plate if required.

4.9 System-inherent frequencies

NOTICE

Machine damage caused by system resonances

The system consisting of the foundation and machine set must be configured and matched in such a way that no system resonances can arise and result in the permissible vibration levels being exceeded. Excessive vibrations can damage the machine set. The vibration limit values according to DIN ISO 10816-3 must not be exceeded.

4.10 Transport and storage

4.10.1 Transport markings

The packing differs depending on the transport type and size. If not otherwise contractually agreed, the packaging corresponds to the packing guidelines for International Standards for Phytosanitary Measures (ISPM).

Comply with the images shown on the packaging. Their meaning is as follows:



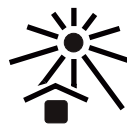
This way up



Fragile goods



Keep dry



Keep cool



Center of gravity



Do not use hand hook



Attach here

When carrying out any work on the machine, observe the general safety instructions and the specifications contained in EN 50110-1 regarding safe operation on electrical equipment.

4.10.2 Checking the delivery

The components are assembled on an individual basis. When you take receipt of the delivery, please check immediately whether the scope of the delivery matches up with the accompanying documents. No claims relating to defects/items missing from the delivery will be accepted if they are submitted at a later date.

- Report any apparent transport damage to the delivery agent immediately.
- Immediately report any apparent defects/missing components to your contact partner.

These Operating Instructions are part of the scope of delivery; keep them in a location where they can be easily accessed.

4.10.3 Checking the load handling attachments

Inspect the load handling attachments such as the load stands, lifting eyes and ring bolts and also the lifting gear, before lifting the machine:

- Inspect the load handling attachments on the machine for possible damage. Replace any load handling attachments that are found to be damaged.
- Check before use that the load handling attachments are correctly secured.
- When lifting the machine, use only approved and undamaged lifting gear of sufficient rated capacity. Check these before using them.

 **WARNING**

The machine can be dropped


If the load handling attachments and lifting gear are damaged or not correctly secured, the machine may be dropped during lifting. This can result in death, serious injury or material damage. Inspect the load handling attachments and lifting gear before use.


4.10.4 Lifting and transportation


- Persons driving cranes and fork lift trucks must hold appropriate qualifications.
- When lifting the machine, use only approved and undamaged sling guides and spreaders of sufficient rated capacity. Check these before using them. The weight of the machine is stated on the rating plate.

4.10 Transport and storage

- When lifting the machine, refer to the information on the lifting plate:
 - Comply with the specified spreading angles.
 - Lift the machine without jerking it.
- When lifting, use only the load handling attachments on the stator casing, such as lifting eyes or eye bolts.

 WARNING
Transporting or lifting the machine
The machine or the machine set may be transported and lifted only using the load handling attachments.
Otherwise, death, serious injury, or material damage may result.
<ol style="list-style-type: none">1. Always use the load suspension device provided on the stator frame to lift the motor.2. Use suitable rope guidance or spreading devices. The weight of the machine is stated on the rating plate.

 WARNING
Center of gravity when transporting or lifting the motor
If the center of gravity of a load is not located centrally between the attachment points, the motor can tip over or slip out of the lifting gear when it is being transported or lifted.
This can result in death, serious injury, or material damage.
<ol style="list-style-type: none">1. Always take account of the center of gravity when transporting or lifting the machine. The machine's center of gravity is indicated in the relevant dimension diagram.2. Observe the handling instructions on the motor when transporting it. If the center of gravity is not located centrally between the attachment points, then position the hoisting hook above it.3. Be aware of the possibility of different loads on the sling ropes or lifting straps and the carrying capacity of the lifting equipment.

 WARNING
Falling down of the machine
The lifting lugs on the machine are designed only for the weight of the machine. If a machine set is lifted and transported on a single machine, this can lead to mechanical failure of the lifting lug. The machine or machine set may fall. This can result in death, serious injury or material damage.
<ul style="list-style-type: none">• Do not lift machine sets by attaching lifting tackle to the individual machines.• Use only the equipment provided, e.g. the openings or lugs on the base plates, for transporting machine sets. Note the maximum capacity of the lifting lug.

Note

Store the rotor locking device

Be sure to store the rotor locking device. It must be remounted for possible disassembly and transport.

Note

Place the machine in a secure and raised position

In order to obtain easy and safe access to the underside of the machine, place it in a secure and raised position.



DANGER

Standing under suspended loads

If the lifting gear or load handling attachments were to fail, the machine could fall. This can result in death, serious injury or material damage.

Never remain under or in the immediate vicinity of the machine when it is raised.

4.10.5 Attaching the rotor shipping brace prior to storage

NOTICE

Bearing damage caused by vibration

If storage conditions are inappropriate there is a risk of bearing seizure damage. This can result in material damage, such as damage to bearings caused by vibration.

- On machines that have been supplied with a rotor shipping brace, secure the rotor as per the notes on transportation.
- Protect the machine against strong radial vibrations, since the rotor shipping brace might not absorb these completely.

NOTICE

Bearing damage when being transported

If the customer has already mounted parts, for example coupling, belt pulley, etc., the bearing can be damaged during transport.

- In this case, make sure that the customer uses a rotor shipping brace.

4.10.6 Storage for up to two years

4.10.6.1 Storage conditions

- Store the machines in a dry, dust-free room where the temperature is controlled. Special packing is therefore not necessary. In all other cases, pack the machines in a plastic film with a substance that absorbs moisture, e.g. Branogel, or in hermetically sealed welded foil. Use a protective cover to protect against sun and rain.
- Store the machines only in vibration-free rooms in order to avoid consequential damage to the bearings due to vibration at standstill.
- For machines with closed condensation water drain holes, check whether there is any condensation and if so, drain it. Then reseal the drain holes.

 **WARNING**

Risk of explosion due to damaged sealing materials

Storing the machine at temperatures that do not fall within the specified limits can damage the material of the seals and cause them to fail. As a result, a potentially explosive gaseous atmosphere can enter the machine and be ignited during commissioning. Explosions can occur. This can result in death, serious injury or material damage.

The materials used are specially designed for the temperature range required by the customer. Do not store the motor in conditions that lie outside the specified temperature limits. The relevant temperature limits are specified on the rating plate.

4.10.7 Storage for between two and four years

If machines are to be stored for between 2 and 4 years, then also observe the following:

When ordering, the manufacturer must know the storage time.

Grease caps must be available at the shaft outlet and at the terminal box cover. Do not rotate the motor shaft before commissioning as the protective grease coating will be destroyed. If rotating parts have to be turned, then apply a new protective coating of grease.

4.10.8 Storage at low temperatures

If machines are stored at temperatures of down to -50° C, then also take into account the following:

- The normal roller bearing grease of machines is suitable for operating temperatures of between -30 °C and +130° C. Temperatures down to -50° C are harmless for the roller bearing grease if the machine is non operational or is in storage.
For operation at -50 °C, the bearings have a special grease, e.g. Aeroshell Grease 7.
- Machines with regreasing system must be regreased when commissioning. Double the amount of grease that is specified on the lubricant plate.

4.10.9 Storing motors together with the driven machine

- Before mounting the motors, grease the free parts of the shaft extension, as well as all other bare metal parts, such as mounting foot surfaces, flange surfaces, terminal box and cover contact surfaces. Attach caps filled with roller bearing grease to the shaft output gland to provide protection against dust and humidity.
- Fill the terminal boxes of the machines with a substance that will absorb moisture, e.g. Branogel.
- Store the machines in a dry, dust-free room where the temperature is controlled.

See also

Storage conditions (Page 30)

4.10.10 Storage outdoors

If the machine is stored outdoors, then the following should additionally be observed:

- Provide protective cover against the effects of sun and rain. Air must freely circulate to avoid condensation forming.
- Every two months check the following:
 - Free parts of the shaft extension and other bare metal parts, e.g. mounting foot surfaces or the flange faces, terminal box and cover contact surfaces must be greased.
 - Caps filled with grease attached to the shaft output gland to provide protection against the ingress of dust and moisture are still effective.

See also

Storage conditions (Page 30)

4.10.11 Commissioning after storage

4.10.11.1 Insulation resistance and polarization index

Measuring the insulation resistance and polarization index (PI) provides information on the condition of the machine. It is therefore important to check the insulation resistance and the polarization index at the following times:

- Before starting up a machine for the first time
- After an extended period in storage or downtime
- Within the scope of maintenance work

The following information is provided regarding the state of the winding insulation:

- Is the winding head insulation conductively contaminated?
- Has the winding insulation absorbed moisture?

As such, you can determine whether the machine needs commissioning or any necessary measures such as cleaning and/or drying the winding:

- Can the machine be put into operation?
- Must the windings be cleaned or dried?

Detailed information on testing and the limit values can be found here:

"Testing the insulation resistance and polarization index" (Page 59)

4.10.11.2 Lubricating the roller bearings

If you correctly store the machine for a longer period of time, it can be assumed that within a period of two years, the grease in the bearings will not deteriorate.

- For motors with thermal class 155, for normal ambient temperatures, use a lithium-soap roller bearing grease with a melting point of at least 180° C.
- For machines with thermal class 180, and for certain special machines, use the special grease specified on the machine lubricant plate.

4.10.11.3 Regreasing roller bearings after storage periods of up to two years

- For machines with regreasing systems, briefly lubricate both bearings after commissioning with the motor running as a precautionary measure.
- Grease type, grease quantity and relubrication intervals for the regreasing system are stamped on a supplementary plate attached to the machine.

4.10.11.4 Regreasing roller bearings after storage periods of between two and four years

- For machines with regreasing system, lubricate machines immediately after commissioning while the machine is running with approximately twice the grease quantity. This causes the old grease to be spun out.
- Then regrease the bearings with the amount of bearing grease specified on the lubricant plate.

Note

Increased bearing noise


Increased bearing noise can occur while the bearings are being run in. The bearing noise is not dangerous, if the operating temperature has not yet been reached and the noise is caused by the viscosity and the dynamic viscosity of the bearing grease.


Assembling

When carrying out any work on the machine, observe the general safety instructions (Page 13) and the specifications contained in EN 50110-1 regarding safe operation on electrical equipment.

5.1 Preparations for installation

5.1.1 Safety instructions for installation

 WARNING
Danger caused by inappropriate fastening material
If screws of an incorrect property class have been selected or if they have been fastened to an incorrect tightening torque, they may break or become loose. This will cause the machine to move, which could damage the bearings. The rotor could smash into the machine enclosure and machine parts could be flung out of place. This can result in death, serious injury or material damage.
<ul style="list-style-type: none">• Comply with the required property classes for screwed connections.• Tighten the screwed connections to the specified tightening torques.

 WARNING
Tensions on the fastening parts
If the machine has not been properly aligned, this will mean the fastening parts are subjected to stress/distortion. Screws may become loose or break, the machine will move, machine parts could be flung out of place. This can result in death, serious injury or material damage.
<ul style="list-style-type: none">• Carefully align the machine to the driven machine.

NOTICE
Damage to the mounted parts
Mounting parts such as temperature sensors or speed sensors are attached to the machine and could be ripped off or destroyed as a result of improper handling. This could lead to machine malfunctions, extending even to total loss of the machine.
<ul style="list-style-type: none">• Where necessary, use suitable steps when performing installation work on the machine.• Do not stand on cables or attachments during installation. Do not use attachments as steps.

Note

Loss of conformity with European directives

In the delivery state, the machine corresponds to the requirements of the European directives. Unauthorized changes or modifications to the machine lead to the loss of conformity with European directives and the loss of warranty.

5.1.2 Requirements for installation

The following requirements must be satisfied prior to starting installation work:


- Staff have access to the operating and installation instructions.
- The machine is unpacked and ready for mounting at the installation location.

Note

Measure the insulation resistance of the winding before starting installation work

Wherever possible, measure the insulation resistance of the winding before starting installation work. If the insulation resistance lies below the specified value, take appropriate remedial measures. These remedial measures may necessitate the machine being removed again and transported.

NOTICE
High temperatures The motor components get very hot during operation. High temperatures can damage mounting parts such as the cable insulation. <ul style="list-style-type: none">• Temperature-sensitive parts such as normal cables or electronic components must not rest against or be attached to mounted machine parts.• Only use heat-resistant mounting parts. The connecting cables and cable entries must be suitable for the ambient temperature.

 WARNING
Explosion hazard when making modifications to the machine Substantial modifications to the machine are not permitted – or may only be performed by the manufacturer. Otherwise an explosion can occur in an explosive atmosphere. This can result in death, serious injury or material damage. Please contact the Service Center, if necessary.

5.1.3 Prepare the mating faces for wall mounting

- Ensure that the wall surface is flat and free of contaminations.
- Check the dimensions of the mounting-foot holes.
- Support the machine from below, e.g. using a wall bracket or by bolting it.

5.2 Lift the machine to where it will be installed, and position it

5.2.1 Preconditions for correct alignment and secure attachment

Detailed specialist knowledge of the following measures is required in order to correctly align and securely fit the equipment.

- Preparing the foundation
- Selecting and mounting the coupling
- Measuring the concentricity and axial eccentricity tolerances
- Positioning the machine

If you are not familiar with the prescribed measures and procedures, then you can make use of the services offered by the local Service Center.

5.2.2 Checking the load handling attachments

Inspect the load handling attachments such as the load stands, lifting eyes and ring bolts and also the lifting gear, before lifting the machine:

- Inspect the load handling attachments on the machine for possible damage. Replace any load handling attachments that are found to be damaged.
- Check before use that the load handling attachments are correctly secured.
- When lifting the machine, use only approved and undamaged lifting gear of sufficient rated capacity. Check these before using them.


 **WARNING**


The machine can be dropped

If the load handling attachments and lifting gear are damaged or not correctly secured, the machine may be dropped during lifting. This can result in death, serious injury or material damage. Inspect the load handling attachments and lifting gear before use.

5.2.3 Lifting and transportation

- Persons driving cranes and fork lift trucks must hold appropriate qualifications.
- When lifting the machine, use only approved and undamaged sling guides and spreaders of sufficient rated capacity. Check these before using them. The weight of the machine is stated on the rating plate.
- When lifting the machine, refer to the information on the lifting plate:
 - Comply with the specified spreading angles.
 - Lift the machine without jerking it.
- When lifting, use only the load handling attachments on the stator casing, such as lifting eyes or eye bolts.

 WARNING
Transporting or lifting the machine
The machine or the machine set may be transported and lifted only using the load handling attachments.
Otherwise, death, serious injury, or material damage may result.
1. Always use the load suspension device provided on the stator frame to lift the motor.
2. Use suitable rope guidance or spreading devices. The weight of the machine is stated on the rating plate.

 WARNING
Center of gravity when transporting or lifting the motor
If the center of gravity of a load is not located centrally between the attachment points, the motor can tip over or slip out of the lifting gear when it is being transported or lifted.
This can result in death, serious injury, or material damage.
1. Always take account of the center of gravity when transporting or lifting the machine. The machine's center of gravity is indicated in the relevant dimension diagram.
2. Observe the handling instructions on the motor when transporting it. If the center of gravity is not located centrally between the attachment points, then position the hoisting hook above it.
3. Be aware of the possibility of different loads on the sling ropes or lifting straps and the carrying capacity of the lifting equipment.

Note

Place the machine in a secure and raised position

In order to obtain easy and safe access to the underside of the machine, place it in a secure and raised position.

**DANGER****Standing under suspended loads**

If the lifting gear or load handling attachments were to fail, the machine could fall. This can result in death, serious injury or material damage.

Never remain under or in the immediate vicinity of the machine when it is raised.

5.2.4 Putting the machine down

Requirements

The following preconditions must be satisfied before setting down the machine at the installation location:

- The mating faces must be clean.
- The anti-corrosion protection paint has been removed from the mating faces, such as the machine mounting feet, flange, ...
- There is no condensation present within the machine.

Setting down the machine

- Set down the machine slowly and carefully at the installation location to avoid any impact.

5.2.5 Roughly aligning the machine

Requirement

The transmission element such as a coupling half has already been pulled on.

Roughly aligning the machine

- For horizontal positioning, push the motor sideways across the foundation. When doing so, ensure that the axial position is maintained.

5.2.6 Draining condensate

Under the following conditions it is possible that condensate may accumulate in the machine:

- Wide fluctuations in the ambient temperature, such as direct sunshine combined with high atmospheric humidity
- Intermittent operation or load fluctuations during operation

NOTICE
Damage due to condensate If the stator winding is damp, its insulation resistance will be reduced. This can result in voltage flashovers that can seriously damage the windings. Condensate can also cause rust to form in the machine. Ensure that condensate can drain away.

Ensure that condensate can drain away

In the end shields or in the casing at the drive end and non-drive end, water drainage holes are situated lower down and opposite the regreasing devices. They are sealed with screw plugs and retaining washers.

- Regularly remove the screw plugs to allow the condensate to drain away.
- Then re-fit the screw plugs and lock washers, so that the machine's degree of protection is ensured.

Drainage plugs which allow the water to drain away automatically can also be fitted. Depending on the type of installation, the water drainage holes are located at the bottom.

- Regularly check the drainage plugs. The water must be able to drain away freely.

NOTICE
The degree of protection is reduced The degree of protection of the machine is nominally reduced to IP44 when a plug or screw is removed.

5.3 Installing the machine

5.3.1 Preconditions for smooth, vibration-free operation

Preconditions for smooth, vibration-free operation:

- Stable foundation design
- Precise alignment of the machine

- Correct balancing of parts to be fitted to the shaft end.
- Maintaining the vibration velocity according to ISO 10816-3

5.3.2 Aligning the machine to the driven machine and mounting

5.3.2.1 Horizontal types of construction with mounting feet

1. Refer to any instructions for aligning the driven machine and those of the coupling manufacturer.
2. Align the machines with coupling output to the driven machine in such a manner that the center lines of the shafts are parallel with no offset. This ensures that no additional forces affect their bearings during operation.
3. For the vertical positioning ($x \rightarrow 0$) place thin shims under the machine feet. The number of shims should be kept as low as possible, i.e. stack as few as possible. This also prevents the machine being subjected to any stress/distortion. If available, use the existing tapped holes for the forcing-off bolts to somewhat raise the machine.
4. When positioning the machine, ensure that a uniform axial gap ($y \rightarrow 0$) is maintained around the coupling.
5. Fix the machine to the foundation. The choice of fixing elements depends on the foundation and is the plant operator's responsibility.

Note**Machine expansion**

When aligning, make allowance for the thermal expansion of the machine when the temperature increases.

5.3.2.2 Vertical types of construction with flange

The standard flange is provided with a centering. The choice of fit for the mating flange on the driven machine is the system manufacturer's or the plant operator's responsibility.

Note

If the machine is not fitted with a standard flange, align the machine to suit the driven machine.

Procedure

The machine axis must be vertical when it is lifted and the flange must be parallel to the mating flange, so as to avoid seizing and stressing. Otherwise damage to the centering will result.

1. Grease the centering flange with assembly paste to make the process easier.
2. Screw in two studs into tapped holes on opposite sides of the driven machine flange. The studs act as positioning aids.

5.3 Installing the machine

3. Lower the machine slowly toward the driven machine and into the centering, so that the flanges do not quite touch. Lowering too quickly risks damaging the centering.
4. If necessary, rotate the machine into the right position so that the clearance holes in the flange are central to the tapped holes.
5. Lower the machine completely onto the mating flange so that it is fully in contact; then remove the studs.
6. Fix the machine using the flange fixing bolts.

NOTICE

Damage to the bearing

Dismantling the rotor shipping brace when the machine is in a horizontal position could damage the bearings.

Only remove the rotor shipping brace when the machine is in a vertical position.

NOTICE

Damage to the bearing

Failure to fit the rotor shipping brace can result in damage to the bearings while the machine is being turned onto its side.

Fix the rotor in place before you turn the machine into a horizontal position.

5.3.3 Removing the rotor shipping brace

If a rotor shipping brace is attached to the machine, remove it at the last possible moment, for example, when you are ready to push on the output or drive element.

Note

Store the rotor locking device

Be sure to store the rotor locking device. It must be remounted for possible disassembly and transport.

5.3.4 Alignment accuracy

The alignment accuracy required depends essentially on the configuration of the overall machine train. Observe the required alignment accuracy of the coupling manufacturer in all cases when aligning the machine.

Table 5-1 Recommended alignment accuracy

Speed [rpm]	Parallel offset [mm]	Angular offset [mm per 100 mm coupling diameter]
750	0.09	0.09
1500	0.06	0.05
3000	0.03	0.025

5.3.5 Mounting the output elements

Balance quality

The rotor is dynamically balanced. For shaft extensions with feather keys, the balancing type for machines with a frame size < 100 is stamped on the rating plate. For machines with a frame size ≥ 100 , the balancing type is specified using the following marking on the face of the drive end of the shaft:

- "H" means balancing with a half feather key
- "F" means balancing with a whole feather key.

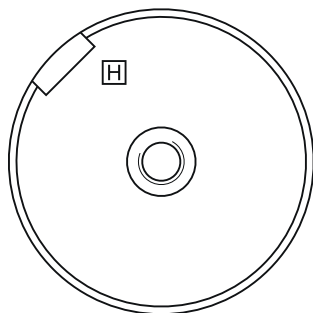


Figure 5-1 Balancing type on the drive-end side

Pushing on the power output elements

- Prerequisites:
 - The coupling and/or the output element must be appropriately dimensioned for the operating case at hand. The balance quality must satisfy the following requirements.
 - Comply with the coupling manufacturer's instructions.
 - Make sure that the balancing type of the transmission element correctly matches the type of balance of the rotor.
 - Use only ready drilled and balanced transmission elements. Check the hole diameters and the balancing status before pulling them on. Thoroughly clean the shaft extension.
- Pulling on:
 - Warm up the transmission elements to expand them before pulling them on. Select the temperature difference for the heating process to suit the coupling diameter, fit and material. See the coupling manufacturer's instructions.
 - Power output elements may only be pushed on or pulled off with the correct equipment. The transmission element must be pulled on in one continuous operation via the front thread holes in the shaft or pushed on by hand.
 - Do not strike it with a hammer, as this would damage the bearings.


Shaft extensions with feather key

To maintain the balancing quality, you have the following options:

- If the transmission element is shorter than the feather key with balancing type "H", then you must machine off the section of feather key protruding from the shaft contour and transmission element in order to maintain the balance quality.
- If the transmission element is drawn up on to the shoulder of the shaft, you must ensure that the part of the coupling groove where the feather key is not inserted is taken into consideration when balancing the coupling.

The following applies for all 2-pole machines and 4-pole machines with a frequency ≥ 60 Hz:

- The feather key must be shortened if the coupling hub is shorter than the feather key.
- The center of gravity of the coupling half should be within the length of the shaft end.
- The coupling used must be prepared for system balancing.
The number of poles of the machine is specified on the rating plate (in the designation of the motor type).

 WARNING
The feather key can fall out
The feather keys are only locked against falling out during shipping. If a machine with two shaft extensions does not have an output element on one shaft extension, the feather key can fall out during operation.
Death or serious injury can result.
<ul style="list-style-type: none">• Do not operate the machine unless the transmission elements have been pulled on.• On shaft extensions without output element, make sure that the feather key cannot fall out and shorten it by approximately half for balance type "H".

5.3.6 Axial and radial forces

You can obtain the permissible values for axial and radial forces by contacting the Siemens Service Center or referring to the machine catalog.

NOTICE
Damage to bearings or the shaft
Large output masses and their centers of gravity outside the shaft extensions can lead to resonance in operation. This can result in damage to the bearings and shaft.
Ensure that the permissible loads for the forces on the shaft extension are adhered to in accordance with the catalog data or configuration data.


Electrical connection

When carrying out any work on the machine, observe the general safety instructions (Page 13) and the specifications contained in EN 50110-1 regarding safe operation on electrical equipment.

Note

Service Center

If you require support when electrically connecting up the machine, please contact the Service Center (Page 99).

 WARNING
Connected parts can loosen
<p>If you use fixing elements made from the wrong material or apply the wrong tightening torque, this could impair current transfer or cause connecting parts to become loose. Fastening elements can work loosely, so that the minimum air clearances are no longer maintained. Sparking formation may occur, in an explosive atmosphere it can lead to an explosion. This could result in death, serious injury or material damage to the machine or even in failure, which could in turn lead indirectly to material failure of the system.</p> <ul style="list-style-type: none">• Tighten the screwed connections to the specified tightening torques.• Observe any specifications regarding the materials from which fixing elements must be made.• When performing servicing, check the fastenings.

6.1 Preparation

6.1.1 Selecting cables

Take the following criteria into account when selecting the connecting cables:


- Rated current
- Rated voltage
- If required, service factor
- System-dependent conditions, such as ambient temperature, routing type, cable cross-section as defined by required length of cable, etc.
- Requirements according to IEC/EN 60204-1


6.2 Connecting


- Requirements according to IEC/EN 60079-14 when used in Zones 1, 2 or 21, 22
- Configuration notes

6.2 Connecting

6.2.1 Terminal boxes with type of protection "Ex e"

 WARNING
<p>If the seal of the pressure relief flap (preset breaking point) in the lower section of the terminal box is damaged, then the explosion type of protection is no longer guaranteed.</p> <p>An explosion may occur during operation. This can result in death, serious injury or material damage.</p> <p>The damaged seal may only be repaired with original sealing material.</p>

 WARNING
<p>No cable or line entries or simple designs of sealing plug may be used on terminal boxes with the "Ex e" type of protection.</p> <p>An explosion may occur during operation. This can result in death, serious injury or material damage.</p> <ul style="list-style-type: none">• Use only cable entries that have been tested and certified in accordance with IEC / EN 60079-7 .• Use only sealing plugs that have been tested and certified in accordance with IEC / EN 60079-7 to close openings that are not to be used.

 CAUTION
<p>Working on terminal boxes of the "Ex e" type of protection with undrilled cable entry plate</p> <p>This can result in death, serious injury or material damage.</p> <p>Ensure that the cable entry plate is still strong enough after drilling the threads.</p>

6.2.2 Connecting the grounding conductor

The cross-section of the machine grounding conductor must comply with the installation regulations and also with IEC / EN 60204-1.

Table 6-1 Determining the cross-section of the grounding conductor

External cable cross-section S	Cross-section of the grounding conductor [mm ²]
$S \leq 16 \text{ mm}^2$	S
$16 \text{ mm}^2 < S \leq 35 \text{ mm}^2$	16 mm ²
$S > 35 \text{ mm}^2$	S/2

A terminal strip for grounding is fitted either on the stator casing or on the flanged endshield, depending on the frame size. The grounding point is marked.

The terminal strip is suitable for connecting stranded cables with cable lugs or connecting flat straps. In addition, all motors have a PE terminal within the terminal box.

When connecting up the grounding conductor, ensure that the contact surface of the connection is bare and protected against corrosion using a suitable agent, e.g. with acid-free Vaseline.

6.2.3 Circuit diagram in the terminal box cover

Data on the connection and connecting the motor winding can be found in the circuit diagram in the cover of the terminal box.

6.2.4 Terminal designation

According to IEC / EN 60034-8, the following basic definitions apply to the terminal designations for 3-phase machines:

Table 6-2 Terminal designations using the 1U1-1 as an example

1	U	1	-	1	Designation
x					Index for pole assignment for pole-changing machines where applicable. A lower index signifies a lower speed. Special case for split winding.
	x				Phase designation U, V, W
		x			Index for winding start (1) or end (2) or if there is more than one connection per winding
				x	Additional indices for cases in which it is obligatory to connect parallel power feed cables to several terminals with otherwise identical designations

6.2.5 Connecting the machine for a specific direction of rotation

If the machine has one shaft extension or two shaft extensions with different diameters, the direction of rotation when looking at the front of the single or the thicker shaft extension is defined as follows:

- If you are connecting power supply cords with a phase sequence of L1, L2, L3 at U, V, W, the resulting rotation will be clockwise.
- If you transpose two connections, e.g. L1, L2, L3 at V, U, W, the resulting rotation will be counter-clockwise.

Machines which must run only in one specific direction of rotation are marked with a direction of rotation arrow.

6.2.6 Terminal box

- The number and size of the cable entry tapped holes can be found in the machine dimension drawing.
- Only use cable entries that are suitable for the cable.
- Only use suitable cable entries and cables for the prevailing ambient temperature.
- Check the cable glands and cables to ensure that they are correctly sealed and firmly seated.
- Correctly close and seal threads or holes that are not being used ensuring that the IP degree of protection is maintained. The IP degree of protection is specified on the rating plate.

Please note the following points for explosion-protected machines:

- Replace the cable glands that are not being used by appropriately certified screw plugs.
- If you are using cable glands, use only appropriately certified cable glands with strain relief. Comply with the installation and operation conditions specified in the certificate for these cable glands and check that they have been fully complied with.

Note

Undrilled entry plate

If the entry plate is undrilled, you should match the number and size of the cable glands to the operating conditions. Not applicable for terminal boxes of the Ex d type of protection.

1. Unscrew the cable entry plate.
2. Drill the required number of holes or threads in the required size into the cable entry plate. The thickness of the plate is selected in such a way as to give a sufficient number of turns when the holes are tapped.
Please note that you are responsible for ensuring that the entry plate still has sufficient strength after the holes have been drilled and tapped.

3. Mount the cable entry plate and the cables with the cable glands onto the terminal box.
After the cables have been inserted into the terminal box, tighten the cable glands and parts for strain relief to the torque specified by the manufacturer.
4. Seal the screwed sockets on the cable glands in accordance with the degree of protection.

Use only sealing plugs, cable entries and conductor entries, that are certified and marked for use in the respective hazardous area (the zone).

6.2.7 Minimum air clearances

After proper installation, verify that the minimum air clearances between non-insulated parts are maintained. Be aware of any protruding wire ends.

Table 6-3 Minimum air clearance dependent on rms value of the alternating voltage U_{rms}


Rms value of the alternating voltage V_{rms}	Minimum air clearance
≤ 500 V	8 mm
≤ 630 V	10 mm
≤ 800 V	12 mm
≤ 1000 V	14 mm
≤ 1250 V	18 mm

Values apply at an installation altitude of up to 2000 m.

When determining the required minimum air clearance, the voltage value in the table may be increased by a factor of 1.1, so that the rated input voltage range is taken into account during general use.

6.2.8 Cable ends with wire end sleeves

Preferably use end sleeves instead of soldering cable ends. Before connecting, correctly clamp the end sleeve onto the cable to establish a connection capable of conducting current.

<p> WARNING</p> <p>Securely and reliably clamping and enclosing the end of the conductor</p> <p>If the end of the conductor is not correctly enclosed by the end sleeve, but is clamped together with it, then this can lead to overheating. The temperature class of the machine can be exceeded. This can trigger ignition of an explosive mixture. This can result in death, serious injury or material damage.</p> <ul style="list-style-type: none"> • Insert only one conductor end into each end sleeve. Attach the end sleeve correctly.
--

6.2.9 Connection with terminal board

Note that for terminal boards with U-shaped terminal clamps, the conductors to be connected must be placed under the terminal clamps in a U shape. Alternatively, with multi-stranded and finely-stranded conductors, evenly divide the conductor (into two parts) and lay in a straight line under the U-shaped terminal clamps. See sketch!

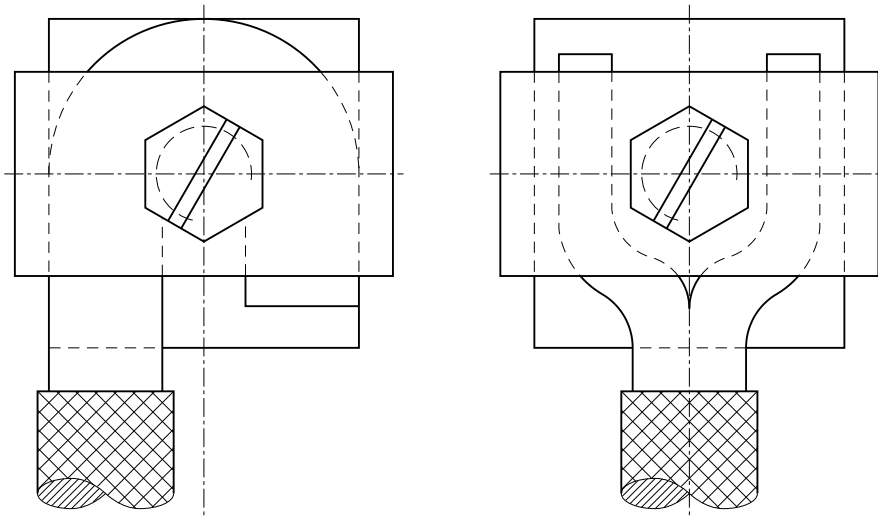
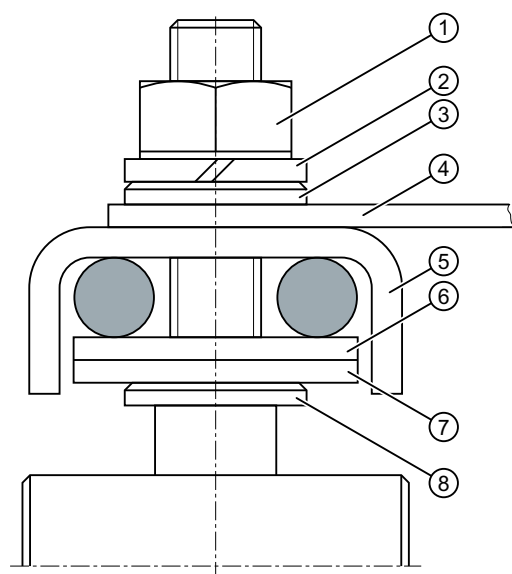


Figure 6-1 Example for conductor connection



- 1 Hexagonal nut – DIN934
- 2 Spring washer – DIN128
- 3 or alternatively a spacer washer – DIN125 Cu (for a star connection)
- 4 alternatively a circuit connection
- 5 Terminal clamp
- 6 alternatively a spacer washer Cu
- 7 Angled cable lug
- 8 Washer – DIN125 St

Figure 6-2 Example for conductor connection

6.2.10 Tightening torques for cable glands

- Tighten the cable gland and the parts of terminal box intended to act as a strain relief to the appropriate torque as specified by the manufacturer after inserting the feeder cables. The tightening torques depend on the cable gland used and the cable or wire used.
- Tighten the standard cable glands supplied with the motor in accordance with the following table.

Table 6-4 Tightening torques for standard cable glands [Nm]

Nominal size	Cable gland for Ex e II Type HSK-M		Cable gland for Ex e / Ex d IIC Type ADE 1F, ADE 4F R... / B...	
	Union nut	Connection thread	Union nut / connection thread	Union nut / connection thread
M12 x 1.5	5	7	7.5	-
M16 x 1.5	5	7	12.5	17

6.2 Connecting

Nominal size	Cable gland for Ex e II Type HSK-M		Cable gland for Ex e / Ex d IIC Type ADE 1F, ADE 4F R... / B...	
	Union nut	Connection thread	Union nut / connection thread	Union nut / connection thread
M20 x 1.5	5	7	20	23
M25 x 1.5	7	10	30	29
M32 x 1.5	7	10	55	33
M40 x 1.5	7	10	75	41
M50 x 1.5	7	10	100	50
M63 x 1.5	7	10	135	75
M75 x 1.5	-	-	175	100

6.2.11 Connecting aluminum conductors

If you are using aluminum conductors, comply in addition with the following:

- Use only cable lugs that are suitable for connecting aluminum conductors.
- Immediately before inserting the aluminum conductor, remove the oxide layer from the contact areas on the conductor and/or the mating piece, by brushing or filing.
- Then grease the contact areas immediately using neutral vaseline in order to avoid re-oxidation.

<p>NOTICE</p> <p>Aluminum flow due to contact pressure</p> <p>Aluminum flows following installation due to the contact pressure. The connection with the clamping nuts can loosen as a result. The contact resistance would increase and the current-carrying impeded; as a consequence the terminal box and the surrounding components could burn. This could result in material damage to the machine or even in total failure, which could in turn lead to indirect material damage to the system.</p> <p>Retighten the clamping nuts after approximately 24 hours and then again after approximately four weeks. Make sure that the terminals are de-energized before you tighten the nuts.</p>

6.2.12 O-ring seal

If O-ring seals are present, you should check that they are in perfect condition and that the O-ring seals are properly seated in the grooves between the components. Replace any damaged O-ring seals.

O-ring seals can be present on the following components, for instance:

- Tapers
- Cable glands
- Bearing seals

- Bearing plate seals
- Terminal box seals
- Cable glands
- etc.

6.2.13 Finishing connection work

1. Before closing the terminal box, please check that:
 - The electrical connections in the terminal box are tight and in full compliance with the specifications above
 - The motor is connected so that it rotates in the direction specified
 - The inside of the terminal box is clean and free of any cable debris
 - All gaskets and seals are intact
 - Unused **cable glands** must be replaced with certified closures or closed with other suitable closure types. Comply with the installation and operation conditions specified in the certificate for these plug elements and check that they have been complied with.
 - The pressure relief device is intact Depending on the type of terminal box being used, the pressure relief device can be implemented either by sealing the slots or by using a pressure relief diaphragm.



WARNING

Damaged pressure relief device

Water and foreign bodies can penetrate the enclosure if the pressure relief device is damaged: The degree of protection of the terminal box is no longer guaranteed, a short-circuit can occur, which can result in death, serious injury or material damage.

- Do not operate the machine with a damaged pressure relief device.
- Any damage may only be repaired after prior discussion with the person responsible for the safety of the plant or system and only using original parts. Any damage may only be repaired after prior discussion with the person responsible for the safety of the installation and only by using original parts.

2. Close the terminal box.
See section "Tightening torques for screw and bolt connections" for the tightening torque of the fixing bolts for the cover.

6.2.14 Internal equipotential bonding

The equipotential bonding between the ground terminal in the terminal box enclosure and the motor frame is established via the terminal box metallic contact faces. The contact faces are protected against corrosion.

6.2 Connecting

The equipotential bonding is achieved by means of a stranded wire. A copper braided strip, a stranded wire or a metal contact is used to ensure potential equalization between the cable entry plate and the terminal box enclosure.

Commissioning

When carrying out any work on the machine, observe the general safety instructions (Page 13) and the specifications contained in EN 50110-1 regarding safe operation on electrical equipment.

7.1 Checks to be carried out prior to commissioning

Once the system has been correctly installed, you should check the following prior to commissioning:

Note

Checks to be carried out prior to commissioning

The following list of checks to be performed prior to commissioning does not claim to be complete. It may be necessary to perform further checks and tests in accordance with the specific situation on-site.

7.2 Testing the securing and alignment

- The machine is undamaged.
- The machine has been correctly installed and aligned, the transmission elements are correctly balanced and adjusted.
- All fixing screws, connection elements, and electrical connections have been tightened to the specified tightening torques.
- The operating conditions match the data provided in accordance with the technical documentation, such as degree of protection, ambient temperature, etc..
- Moving parts such as the coupling, brake, etc. move freely.
- If the second shaft extension is not in use, its feather key is secured to prevent it from being thrown out, and cut back to roughly half its length if the rotor has balancing type "H" (standard type).
- All touch protection measures for moving and live parts have been taken.
- The rotor can spin without coming into contact with the stator.
- The bearing insulation is not bridged.
- Appropriately configured control and speed monitoring functions ensure that the permissible speeds specified on the rating plate cannot be exceeded.
- Any supplementary motor monitoring devices and equipment have been correctly connected and are fully functional.

Force-ventilated motors

- All external fans are ready for operation and have been connected. The external fans are bidirectional as standard. For unidirectional ventilation systems, the direction of rotation is stated on the extra rating plate of the machine.
- The flow of cooling air is not impeded.

Electrical connection

- The grounding and equipotential bonding connections have been made correctly.
- The machine is connected so that it rotates in the direction specified.
- Appropriately configured control and speed monitoring functions ensure that the motor cannot exceed the permissible speeds specified in the technical data. For this purpose, compare the data on the rating plate or, if necessary, the system-specific documentation.
- The minimum insulation resistance values are within tolerance.
- Minimum air clearances have been maintained.
- Any supplementary motor monitoring devices and equipment have been correctly connected and are functioning correctly.
- All brakes and backstops are operating correctly.
- At the monitoring devices, the values for "Warning" and "Shutdown" are set.

7.3 Insulation resistance and polarization index

Measuring the insulation resistance and polarization index (PI) provides information on the condition of the machine. It is therefore important to check the insulation resistance and the polarization index at the following times:

- Before starting up a machine for the first time
- After an extended period in storage or downtime
- Within the scope of maintenance work

The following information is provided regarding the state of the winding insulation:

- Is the winding head insulation conductively contaminated?
- Has the winding insulation absorbed moisture?

As such, you can determine whether the machine needs commissioning or any necessary measures such as cleaning and/or drying the winding:

- Can the machine be put into operation?
- Must the windings be cleaned or dried?

Detailed information on testing and the limit values can be found here:

"Testing the insulation resistance and polarization index"

7.4 Testing the insulation resistance and polarization index



WARNING

Hazardous voltage at the terminals

During and immediately after measuring the insulation resistance or the polarization index (PI) of the stator winding, hazardous voltages may be present at some of the terminals. Contact with these can result in death, serious injury or material damage.

- If any power cables are connected, check to make sure line supply voltage cannot be delivered.
- Discharge the winding after measurement until the risk is eliminated, e.g. using the following measures:
 - Connect the terminals with the ground potential until the recharge voltage drops to a non-hazardous level
 - Attach the connection cable.

Measure the insulation resistance

1. Before you begin measuring the insulation resistance, please read the operating manual for the insulation resistance meter you are going to use.
2. Make sure that no power cables are connected.
3. Measure the winding temperature and the insulation resistance of the winding in relation to the machine enclosure. The winding temperature should not exceed 40° C during the measurement. Convert the measured insulation resistances in accordance with the formula to the reference temperature of 40° C. This thereby ensures that the minimum values specified can be compared.
4. Read out the insulation resistance one minute after applying the measuring voltage.

Limit values for the stator winding insulation resistance

The following table specifies the measuring voltage and limit values for the insulation resistance. These values correspond to IEEE 43-2000 recommendations.

Table 7-1 Stator winding insulation resistance at 40° C

$V_N [V]$	$V_{Meas} [V]$	$R_C [M\Omega]$
$U \leq 1000$	500	≥ 5
$1000 \leq U \leq 2500$	500 (max. 1000)	100
$2500 < U \leq 5000$	1000 (max. 2500)	
$5000 < U \leq 12000$	2500 (max. 5000)	
$U > 12000$	5000 (max. 10000)	

U_{rated} = rated voltage, see the rating plate

U_{meas} = DC measuring voltage

R_C = minimum insulation resistance at reference temperature of 40° C

Conversion to the reference temperature

When measuring with winding temperatures other than 40° C, convert the measuring value to the reference temperature of 40° C according to the following equations from IEEE 43-2000.

(1) $R_C = K_T \cdot R_T$	R_C	Insulation resistance converted to 40° C reference temperature
	k_T	Temperature coefficient according to equation (2)
	R_T	Measured insulation resistance for measuring/winding temperature T in °C
(2) $K_T = (0.5)^{(40-T)/10}$	40	Reference temperature in °C
	10	Halving/doubling of the insulation resistance with 10 K
	T	Measuring/winding temperature in °C

In this case, doubling or halving the insulation resistance at a temperature change of 10 K is used as the basis.

- The insulation resistance halves every time the temperature rises by 10 K.
- The resistance doubles every time the temperature falls by 10 K.

For a winding temperature of approx. 25° C, the minimum insulation resistances are 20 MΩ (U ≤ 1000 V) or 300 MΩ (U > 1000 V). The values apply for the complete winding to ground. Twice the minimum values apply to the measurement of individual assemblies.

- Dry, new windings have an insulation resistance of between 100 and 2000 MΩ, or possibly even higher values. An insulation resistance value close to the minimum value could be due to moisture and/or dirt accumulation. The size of the winding, the rated voltage and other characteristics affect the insulation resistance and may need to be taken into account when determining measures.
- Over its operating lifetime, the motor winding insulation resistance can drop due to ambient and operational influences. Calculate the critical insulation resistance value depending on the rated voltage by multiplying the rated voltage (kV) by the specific critical resistance value. Convert the value for the current winding temperature at the time of measurement, see above table.

Measuring the polarization index

1. To determine the polarization index, measure the insulation resistances after one minute and ten minutes.
2. Express the measured values as a ratio:

$$PI = R_{\text{insul } 10 \text{ min}} / R_{\text{insul } 1 \text{ min}}$$

Many measuring devices display these values automatically following the measurement.

For insulation resistances > 5000 MΩ, the measurement of the PI is no longer meaningful and consequently not included in the assessment.

$R_{(10 \text{ min})} / R_{(1 \text{ min})}$	Assessment
≥ 2	Insulation in good condition
< 2	Dependent on the complete diagnosis of the insulation

NOTICE**Damage to insulation**

If the critical insulation resistance is reached or undershot, this can damage the insulation and cause voltage flashovers.

- Contact the Service Center.
- If the measured value is close to the critical value, you must subsequently check the insulation resistance at shorter intervals.

See also

Insulation resistance and polarization index (Page 32)


Limit values of the anti-condensation heating insulation resistance

The insulation resistance of the anti-condensation heating with respect to the machine housing should not be lower than 1 M Ω when measured at 500 V DC.


When carrying out any work on the machine, observe the general safety instructions (Page 13) and the specifications contained in EN 50110-1 regarding safe operation on electrical equipment.


8.1 Safety instructions during operation




 WARNING
<p>All terminal boxes must be closed</p> <p>Terminal boxes contain live electrical parts. Death, serious injury or material damage can result if terminal box covers are removed.</p> <p>When the machine is in operation, the terminal boxes must remain closed at all times. Terminal boxes may be opened only when the machine is stopped and de-energized.</p>




 WARNING
<p>Do not remove covers when the motor is running</p> <p>Rotating or live parts are dangerous. Death, serious injury or material damage can result if the required covers are removed.</p> <p>Any covers that prevent live electrical or rotating parts from being touched, or that ensure compliance with a particular degree of protection or are required for ensuring proper air flows, and hence effective cooling, must not be opened during operation.</p>


 WARNING
<p>Faults in operation</p> <p>Deviations from normal operation such as increased power consumption, temperatures or vibrations, unusual noises or odors, tripping of monitoring devices, etc., indicate that the machine is not functioning properly. This can cause faults which can result in eventual or immediate death, serious injury or material damage.</p> <ul style="list-style-type: none"> • Immediately inform the maintenance personnel. • If you are in doubt, immediately switch off the motor, being sure to observe the system-specific safety conditions!

 CAUTION
Fire hazard Certain parts of the motor may reach temperatures above 50° C. Touching them can result in burns. <ul style="list-style-type: none">• Check the temperature of the parts before touching them and take appropriate protective measures if necessary.

NOTICE
Risk of corrosion due to condensate Humid air can condense inside the machine during operation as a result of intermittent duty or load fluctuations. Condensate can collect inside the motor. Damage such as rust can result. <ol style="list-style-type: none">1. Depending on the environmental requirements and operating conditions, remove the screw plugs with retaining washers to drain the water.2. Then refit the screw plugs and retaining washers. If the machine is equipped with drainage plugs, the water can drain away automatically.

 CAUTION
Terminal boxes with current transformers If you are using current transformers, make sure that the secondary circuit from the current transformer is protected against unintentional opening while the equipment is in use.

NOTICE
Excessive machine temperature If the anti-condensation heating is operated while the machine is running, this can increase the temperatures inside the machine. This can result in material damage. <ul style="list-style-type: none">• Make sure that the anti-condensation heating is switched off before the machine is switched on.• Only operate anti-condensation heating when the machine is switched off.

 WARNING
Explosion hazard If the anti-condensation heating is switched on during operation, the temperature class or the maximum surface temperature of the machine can be exceeded. In an explosive atmosphere, there is a risk of an explosion. This can result in death, serious injury or material damage. Only switch the anti-condensation heating on after the motor has been switched off.

8.2 Switching on the machine

1. If at all possible, run the machine without load and check that it is running smoothly.
2. If it runs perfectly, connect a load.
3. If this is possible using the available measuring equipment, check the bearing and stator winding temperatures.

8.3 Switching off the external fan

If the controller does not switch off the external fan automatically, switch it off when the machine is stopped.

8.4 Switching on again after an emergency switching-off

- Check the machine before recommissioning the driven machine after an Emergency Off.
- Eliminate all the causes that have led to the emergency off


8.5 Stoppages

The stoppage is a shutdown for a period of time, during which the machine is stopped but remains at the location of use.

Under normal ambient conditions, e. g. the stopped machine is not exposed to any vibration, no increased level of corrosion, etc. in general, the following measures are necessary during stoppages.

8.5.1 Switching on the anti-condensation heater

If the machine has anti-condensation heating, then switch it on when the machine is not in operation.

 WARNING
Explosion hazard
If the anti-condensation heating is switched on during operation, the temperature class or the maximum surface temperature of the machine can be exceeded.
In an explosive atmosphere, there is a risk of an explosion. This can result in death, serious injury or material damage.
Only switch the anti-condensation heating on after the motor has been switched off.

8.5.2 Avoidance of damage to roller bearings during stoppages

Extended stoppages at the identical or almost identical resting position of the roller bearings can lead to damage such as brinelling or formation of corrosion.

- During stoppages, regularly start the machine up for a brief period once a month, or at least turn the rotor over several times.
If you have uncoupled the machine from the driven machine and secured the rotor with a rotor shipping brace, then remove this before turning the rotor over or starting the machine up.
Make sure that the resting position of the roller bearings after the rotor has been turned over is different from what it previously had been. Use the fitted key or the coupling halves as reference markers.
- During re-commissioning, refer to the information in the "Commissioning" section.

8.6 Decommissioning the machine

NOTICE
Damage as a result of an extended period out of service
If the machine is going to be out of service for longer than six months, then take the necessary measures for preservation and storing. Otherwise damage to the machine will result.

Record the decommissioning steps. This log will be useful upon recommissioning.

8.7 Re-commissioning the machine

When you re-commission the machine, proceed as follows:

- Study the record made when the machine was decommissioned, and reverse the measures that were taken for conservation and storage.
- Perform the measures listed in the "Commissioning" section.

8.8 Faults

8.8.1 Inspections in the event of faults

Natural disasters or unusual operating conditions, such as overloading or short circuit, are faults that overload the machine electrically or mechanically.

Immediately perform an inspection after such faults.

Correct the cause of the fault as described in the respective remedial measures section. Repair any damage to the machine.

8.8.2 Electrical faults

Note

If you are operating the motor with a converter, the operating instructions of the converter must also be observed if electrical faults occur.

Table 8-1 Electrical faults

↓ Motor fails to start							
↓ Motor accelerates sluggishly							
↓ Rumbling noise during startup							
↓ Rumbling noise during operation							
↓ High temperature rise during no-load operation							
↓ High temperature rise with load							
↓ High temperature rise of individual winding sections							
					Possible causes of faults	Remedial measures	
X	X		X		X	Overload	Reduce the load.
X						Interrupted phase in the supply cable	Check the switches and cables.
	X	X	X		X	Interrupted phase in the feeder cable after switching on	Check the switches and cables.
	X					Mains voltage too low, frequency too high	Check the power supply conditions.
				X		Mains voltage too high, frequency too low	Check the power supply conditions.
X	X	X	X		X	Stator winding incorrectly connected	Check the winding connection in the terminal box.
	X	X	X		X	Winding short circuit or phase short circuit in stator winding	Determine the winding resistances and insulation resistances. Carry out repair work after consultation with the manufacturer.
					X	Incorrect direction of rotation	Check the connection.

8.8.3 Mechanical faults

Table 8-2 Mechanical faults

↓ Grinding noise			
↓ Radial vibrations			
↓ Axial vibrations			
		Possible causes of faults	Remedial measures
X		Rotating parts grind	Establish the cause and realign the parts.
	X	Stator or coupling not balanced.	Disconnect the stator or coupling and rebalance. If the machine has two shaft ends, and a transmission element is only fitted to one end, secure the fitted key at the other end to prevent it from being thrown out. If the rotor has balance type "H" (standard type), the fitted key must be cut back to roughly half of its length.

↓ Grinding noise			
		↓ Radial vibrations	
		↓ Axial vibrations	
		Possible causes of faults	Remedial measures
X		Rotor out of true, shaft bent	Consult the manufacturing plant.
X	X	Poor alignment	Align the machine set; check the coupling. ⁽¹⁾
X		Coupled machine not balanced	Rebalance the coupled machine.
	X	Shocks from coupled machine	Investigate the coupled machine.
X	X	Uneven running of gear unit	Fix the gearing.
X	X	Resonance of the overall system comprising motor and foundation	Stabilize the foundation following consultation.
X	X	Changes in foundation	Establish the cause of the changes and eliminate them if necessary; realign the machine.

⁽¹⁾ Take any changes into account when warming up the machine.

8.8.4 Roller bearing faults

Note

Damage to roller bearings can be difficult to detect in some cases. If in doubt, replace the bearing. Use other bearing designs only **after consulting the manufacturer**.

Table 8-3 Roller bearing faults

↓ Bearing overheats			
		↓ Bearing "whistles"	
		↓ Bearing "knocks"	
		Possible causes of faults	Remedial measures
X		High coupling pressure	Align the machine more accurately.
X		Belt tension too high	Reduce the drive belt tension.
X		Bearing contaminated	Clean the bearing or replace it. Check the seals.
X		High ambient temperature	Use a suitable high-temperature grease.
X	X	Insufficient lubrication	Grease the bearings as instructed.
X	X	Bearing canted	Properly install the bearing.
X	X	Insufficient bearing play	Only after consultation with the manufacturer: Fit a bearing with greater play.
	X	Excessive bearing play	Only after consultation with the manufacturer: Fit a bearing with lower play.
X	X	Bearing corroded	Replace the bearing. Check the seals.
X		Too much grease in bearing	Remove surplus grease.
X		Wrong grease in the bearing	Use the correct grease.

	X	Friction marks on raceway	Replace the bearing.
	X	Scoring (brinelling)	Replace the bearing. Avoid any vibration at standstill

8.8.5 Faults at the external fan

The following table shows the possible causes of and remedial measures for faults on forced-ventilated machines.

Table 8-4 Cooling system faults

↓ High temperature rise with load		
	Possible causes of faults	Remedial measures
X	Wrong direction of rotation of the external fan	Check the electrical connections to the external fan.
X	External fan is not running	Check the external fan and its connections.
X	Reduced air flow	Check the air ducts; clean the machine.

Through careful and regular maintenance, inspections, and overhauls you can detect faults at an early stage and resolve them. This means that you can avoid consequential damage.

Operating conditions and characteristics can vary widely. For this reason, only general maintenance intervals can be specified here. Maintenance intervals should therefore be scheduled to suit the local conditions (dirt, starting frequency, load, etc.).


When carrying out any work on the machine, observe the general safety instructions (Page 13) and the specifications contained in EN 50110-1 regarding safe operation on electrical equipment.


Comply with the IEC / EN 60079-17 standard during all service and maintenance work on the machine.

Note**Service Center**

Please contact the Service Center, if you require support with servicing, maintenance or repair.

9.1 Inspection and maintenance

 WARNING
Rotating and live parts Electric machines contain live and rotating parts. Fatal or serious injuries and substantial material damage can occur if maintenance work is performed on the machine when it is not stopped or not de-energized. <ul style="list-style-type: none">• Perform maintenance work on the machine only when it is stopped. The only operation permissible while the machine is rotating is regreasing the roller bearings.• When performing maintenance work, comply with the five safety rules.

 WARNING
Machine damage If the machine is not maintained it can suffer damage. This can cause faults which can result in eventual or immediate death, serious injury or material damage. Perform regular maintenance on the machine.

 **CAUTION**

Dust disturbances when working with compressed air

When cleaning with compressed air, dust, metal chips, or cleaning agents can be whirled up. Injuries can result.

When cleaning using compressed air, make sure you use suitable extraction equipment and wear protective equipment (safety goggles, protective suit, etc.).

NOTICE

Damage to insulation

If metal swarf enters the winding head when cleaning with compressed air, this can damage the insulation. Clearance and creepage distances can be undershot. This may cause damage to the machine extending to total failure.

When cleaning with compressed air, ensure there is adequate extraction.

NOTICE

Machine damage caused by foreign bodies

Foreign bodies such as dirt, tools or loose components, such as screws etc., can be left by accident inside the machine after maintenance is performed. These can cause short circuits, reduce the performance of the cooling system or increase noise in operation. They can also damage the machine.

- When carrying out maintenance work, make sure that no foreign bodies are left in or on the machine.
- Securely attach all loose parts again once you have completed the maintenance procedures.
- Carefully remove any dirt.

Note

Operating conditions and characteristics can vary widely. For this reason, only general intervals for inspection and maintenance measures can be specified here.

 **WARNING**

Risk of explosion when cleaning with compressed air

If you clean the machine with compressed air, plastic components may become statically charged and ignite a potentially explosive atmosphere; an explosion can occur. This can result in death, serious injury or material damage.

Do not use compressed air to clean plastic parts in an explosive atmosphere. When cleaning the machine, make sure that the air in the vicinity of the motor is free of gas and dust.

9.1.1 Inspections in the event of faults

Natural disasters or unusual operating conditions, such as overloading or short circuit, are faults that overload the machine electrically or mechanically.

Immediately perform an inspection after such faults.

9.1.2 First inspection

Perform the following checks after approximately 500 operating hours or one year, whichever comes first:

Table 9-1 Checks after installation or repair

Check	When the motor is running	At standstill
The electrical parameters are maintained.	X	
The permissible bearing temperatures are not exceeded.	X	
The smooth running characteristics and machine running noise have not deteriorated.	X	
The motor foundation has no cracks and indentations. (*)	X	X

(*) You can perform these checks while the motor is at standstill or, if required, while running.

Further checks

Further checks may be required if so specified in supplementary instructions or in accordance with the plant-specific conditions.

NOTICE
If you detect any deviations during the inspection, you must rectify them immediately. They may otherwise damage the motor.

9.1.3 General inspection

Check that the installation conditions are observed. We recommend that the following checks are performed after approx. 16 000 operating hours or at the latest after two years:

Table 9-2 Checks that have to be performed during the general inspection

Checking	When the motor is running	At standstill
The electrical parameters are maintained	X	
The permissible bearing temperatures are not exceeded	X	
The smooth running characteristics and machine running noise have not deteriorated	X	

9.1 Inspection and maintenance

Checking	When the motor is running	At standstill
The motor foundation has no cracks and indentations (*)	X	X
The machine is aligned within the permissible tolerance ranges		X
All the fixing bolts/screws for the mechanical and electrical connections have been securely tightened		X
All the potential connections, grounding connections and shield supports are correctly seated and properly bonded		X
The winding insulation resistances are sufficiently high		X
Any bearing insulation is fitted as shown on the plates and labels		X
The CABLES and insulating parts and components are in good condition and there is no evidence of discoloring		X

(*) You can perform these checks while the motor is at standstill or, if required, while running.

NOTICE
Machine damage
When carrying out the inspection, if you detect any impermissible deviations from the normal state, you must rectify them immediately. They may otherwise cause damage to the machine.

9.1.4 Servicing the roller bearings

When inspecting rolling-contact bearings, it is generally not necessary to dismantle the machines. The motor only has to be dismantled if the bearings are to be replaced.

9.1.5 Mechanical explosion protection for roller bearings

All machines marked in accordance with directive 94/9/EG must be regularly inspected for mechanical damage that could constitute a risk of ignition in accordance with IEC / EN 60079-17 .

- Comply with the following intervals:
 - Bearing replacement intervals
 - Relubrication intervals
 - Grease replacement intervals
 - Oil change intervals
- Roller bearing service life
 - Replace the roller bearings once the nominal service life is reached. Alternatively, you can verify they are free of mechanical damage as part of an inspection.
 - In the case of roller bearings without a regreasing system, it is ensured that the nominal service life will only be achieved clearly after achievement of the service life of the grease in the bearings.
 - The roller bearing service life under full specified load is at least 20 000 hours for machines subject to radial or axial forces.
 - The nominal roller bearing service life of machines which are not subject to any forces is at least 40 000 hours.
- For roller bearings with external oil supply, monitor that lubrication is maintained.

9.1.6 Maintenance

9.1.6.1 Insulation resistance and polarization index

Measuring the insulation resistance and polarization index (PI) provides information on the condition of the machine. It is therefore important to check the insulation resistance and the polarization index at the following times:

- Before starting up a machine for the first time
- After an extended period in storage or downtime
- Within the scope of maintenance work

The following information is provided regarding the state of the winding insulation:

- Is the winding head insulation conductively contaminated?
- Has the winding insulation absorbed moisture?

As such, you can determine whether the machine needs commissioning or any necessary measures such as cleaning and/or drying the winding:

- Can the machine be put into operation?
- Must the windings be cleaned or dried?

9.1 Inspection and maintenance

Detailed information on testing and the limit values can be found here:

"Testing the insulation resistance and polarization index"

9.1.6.2 Grease service life and fill quantities

Standard roller bearings

Size	Grease stability time for permanent lubrication or relubrication interval for a regreasing system in operating hours at rated speed						Grease filling quantity for permanent lubrication or grease quantity for relubrication in g per bearing			
	Horizontal type of construction (B)			Vertical type of construction (V)			Permanent lubrication		Relubrication	
	3000 rpm	1500 rpm	≤1000 rpm	3000 rpm	1500 rpm	≤1000 rpm	3000 rpm	≤1500 rpm	3000 rpm	≤1500 rpm
71	33000			24000	33000		3	3	-	-
80							3	3	-	-
90							4	4	-	-
100							9	9	-	-
112							9	9	-	-
132	24000	40000	40000	16000	26000	40000	18	18	-	-
160							32	32	-	-
180							51	51	-	-
200							63	63	-	-
225							79	79	-	-
250							99	99	-	-
280							99	132	-	-
315	4000	8000	11000	2800	5600	8000	-	-	35	25
355					4000	5600	-	-	35	50

The specified grease stability times and/or relubrication intervals are valid for maximum ambient temperatures of 40 °C. Reduce the lubrication interval for a 10 °C increase in temperature by a factor of 0.7 of the value listed in the table (max. 20 °C = factor 0.5). With an ambient temperature ≤ 25 °C, twice the grease stability time can be expected; but a maximum of 40000 hours. Times for operation on 60 Hz systems on request. With pure coupling operation with flexible coupling, the calculated bearing life is L10h greater than 50000 hours. Comply with the grease service life and relubrication intervals.

Reinforced roller bearings

Size	Grease stability time for permanent lubrication or relubrication interval for a regreasing system in operating hours at rated speed						Grease quantity for relubrication in g per bearing	
	Horizontal type of construction (B)			Vertical type of construction (V)			3000 rpm	≤1500 rpm
	3000 rpm	1500 rpm	≤1000 rpm	3000 rpm	1500 rpm	≤1000 rpm		
180	2800	5600	8000	2000	4000	5600	17	17
200							20	20
225							25	25
250	2000	4000	5600	1400	2800	4000	25	25
280							25	35
315							35	25
355							2800	5600

The specified relubrication intervals are valid for maximum ambient temperatures of 40 °C. Reduce the relubrication intervals for a

10°C increase in temperature by a factor of 0.7 of the value listed in the table (max. 20 °C = factor 0.5). Times for operation on 60 Hz systems on request.

9.1.6.3 Grease stability times and fill quantities

The details for the grease stability times and relubrication intervals are stated on the lubrication rating plate of the machine. The specified grease stability time applies to the ambient temperature range stated on the rating plate. Reduce the lubrication interval for a 10° C increase in temperature by a factor of 0.7 of the value listed in the table (max. 20° C = factor 0.5). Irrespective of the operating hours, the roller bearing grease and the bearing (2Z bearing) must be replaced after four years of service.

9.1.6.4 Regreasing intervals and types of grease for operating rolling-contact bearings

Regreasing intervals

The regreasing intervals for roller bearings in operating hours and the grease types are stated on the machine's lubricant plate. Regardless of the actual number of operating hours reached, the machine must be regreased at least once a year. The lubrication information can be found on the lubricant plate.

Note

Observe the regreasing intervals for the roller bearings

The regreasing intervals for roller bearings are different from the service/inspection intervals for the machine. Failure to regrease the roller bearings at the specified intervals can result in bearing damage.

Regreasing

The spent grease chamber is designed to accommodate the spent grease for a computed, rated service life of 40000 operating hours.

- Clean the grease nipples before regreasing and then gradually press in an appropriate type and amount of grease, as described on the lubricant plate. The shaft must then be rotated so that the new grease can be distributed throughout the roller bearing. The roller bearing temperature rises sharply at first, then drops to the normal value again after the excess grease has been displaced out of the bearing.
 - If the machine is fitted with **grease removal sliders** :
After the bearings have been regreased, with the motor running, the used grease should be removed by pulling the slider fitted to the bearing to its stop several times.
 - If the machine is fitted with **grease collection chambers** :
Unbolt the grease collection chambers at the intervals shown on the notice plate with the motor stopped, and remove the used bearing grease. If this is not done, the grease will clog and the bearings will overheat.



WARNING

Rotor can fall out

If the machine is in a vertical position, the rotor can fall out while work is being performed on the locating bearing. This can result in death, serious injury or material damage.

Support or relieve the rotor when carrying out work with the machine in a vertical position.

Grease types

For the standard operating range, a grease for temperatures down to -20 °C is normally used for the initial greasing of roller bearings. If the machine has been ordered for use in the extended temperature range of below -20 °C, the permissible type of grease is indicated on the lubricant plate.

Note

Grease quantity control

The grease quantity control only operates correctly if the specified greases are used. This is specified on plates attached to the machine.

9.1.6.5 Alternative types of grease for the operation of roller bearings

In the following table, you will find a list of approved alternative types of grease.

Filling with oil for the first time	Alternative permissible greases
Shell Gadus S2 V100 3	Aral Aralub HL3 BP Energrease LS3 Castrol Optimol Olista Longtime 3 Exxon Mobil Beacon EP3 Mobilux EP3 OMV Signum L3 SKF LGMT 3
Shell Gadus S5 V42P 2.5 Aeroshell Gadus S7	Currently no comparable grease with $Dm \cdot n \geq 1,000,000$ is known.
Shell Gadus S5 V100 2	Exxon Mobil Mobilith SHC 100
Esso Unirex N3	Exxon Mobil Mobilgrease XHP 103 Shell Gadus S5 V100 2
Shell Gadus S3 T100 2	BP Energrease SY2202 Castrol Firetemp XT2 Chevron Grease SRI2 Klüber Petamo GHY 133N SKF LGHP 2 Exxon Mobil Polyrex EM

Observe the following when changing over to an alternative type of grease that is permitted according to the table:

Bearings with permanent lubrication:

- Completely remove the old grease from the bearing before regreasing it.
- Fill roller bearings completely with grease and cavities in the bearing cover only up to one third.

Bearings with regreasing:

If complete replacement of grease and cleaning of the bearing is not possible, keep the operating time to a minimum when different greases are mixed. To do this, thoroughly grease the bearing when the machine is running with about twice the amount of grease until spent grease has been removed from the greasing ducts. Then regrease 4x at intervals of ¼ of the

normal greasing interval. During this time, very carefully monitor the bearing locations involved. Then resume the normal greasing intervals.

NOTICE

Damage due to mixing grease types

If you mix greases and oils with different soap or oil bases, then the lubricating properties may no longer be guaranteed.

Mixing low-temperature grease with normal temperature grease can cause lumps to form in the lubricant. The consequence can be damage to the roller bearings due to overheating.

Never mix greases that have different thickening agents and different base oils.

Cleaning

- To ensure problem-free machine cooling, the air ducts (ventilation grilles, channels, cooling fins, tubes) must be free of any dirt.

WARNING

Explosion hazard

Cleaning the machine in an explosive atmosphere is forbidden. This can result in death, serious injury or material damage.

Surfaces can become statically charged and discharge to ignite potentially explosive atmospheres.



WARNING

Rotating or live parts

Live electrical parts are dangerous. Contact with them can cause death, serious injury or material damage.

Before carrying out any maintenance work on the external fan, disconnect it from the mains, particularly before opening the terminal box. Make sure that the device cannot be switched back on.

Servicing the external fan

The external fan is essentially maintenance-free. However, dirt and dust deposits on the impeller and the motor, particularly in the gap between the impeller and the inlet nozzle can impair its function.

- Remove the dirt and dust deposits regularly; the intervals depend on how dirty the surrounding area is.
- Make sure that the impeller is evenly cleaned, as irregular deposits can lead to an imbalance.

Note

Flowrate

The full flowrate is only achieved if the inward flow of air to the impeller is unrestricted.

Servicing the external fan motor

- Perform an occasional visual inspection of the external fan motor and check it electrically and mechanically every time the roller bearings are replaced.
- Replace permanently lubricated roller bearings in the external fan motor as specified in the operating instructions for the external fan motor.

9.1.6.6 Maintaining terminal boxes

Requirement

The machine is de-energized.

Checking the terminal box

- Terminal boxes must be regularly checked for tightness, undamaged insulation, and tight terminal connections.
- If dust or humidity have infiltrated the terminal box, this should be cleaned and dried (particularly the insulators).
Check all the seals and sealing surfaces and address the cause of the leakiness.
- Check the insulators, connectors and cable connections in the terminal box.
- Line entries inside the terminal box are part of the regular inspection in accordance with IEC/EN 60079-17.
- Replace the damaged components if necessary.



WARNING

Short-circuit hazard

Short-circuits can occur as a result of damaged components that can lead to death, serious injury or material damage.

Replace damaged components.

9.1.6.7 Touch up any damaged paintwork

If the paint is damaged, it must be repaired in order to protect the unit against corrosion.

Note**Paint system**

Contact the Service Center before you repair any paint damage. They will provide you with more information about the correct paint system and methods of repairing paint damage.

9.1.6.8 Repainting

 WARNING
--

Repainting explosion-proof motors

The paint coat can become electrostatically charged where there is a thick coat. Electrostatic discharges can occur. There is a risk of explosion if potentially explosive mixtures are also present at this moment. This can result in death, serious injury or material damage.

You must comply with one of the following requirements when you repaint painted surfaces:

- Limit the total paint coating thickness according to the explosion protection group:
 - IIB: Total paint coating thickness ≤ 2 mm
 - IIC: Total paint coating thickness ≤ 0.75 mm for motors of group II (gas)
 - III: Total paint coating thickness ≤ 0.45 mm for group III motors (dust)
According to tests, paint repair work up to the total paint coating thickness of the non-conductive paint coating listed has also been examined and is harmless.
- Limit the surface resistance of the paint used:
 - IIB, IIC, III: Surface resistance ≤ 1 G Ω for motors of groups II and III (gas and dust)
- Breakdown voltage ≤ 4 kV for explosion group III (dust only)
- Charge transfer limit:
 - IIB: Limit value for the largest transferred charge < 30 nC
 - IIC: Limit value for the largest transferred charge < 10 nC for group II motors (gas)
 - III: Limit value for the largest transferred charge < 200 nC for group III motors (dust)
- Incapability, dangerous charge to be saved:
 - IIB: Limit value for the maximum capacity ≤ 15 pF
 - IIC: Limit value for the maximum capacity ≤ 5 pF for group II motors (gas)
 - III: Limit value for the maximum capacity ≤ 10 pF for group III motors (dust)

See also

Machines without final paint coating (Page 23)

9.2 Repair

When carrying out any work on the machine, observe the general safety instructions (Page 13) and the specifications contained in EN 50110-1 regarding safe operation on electrical equipment.

Note

If the motor has to be transported, please observe the information and instructions in the "Transport" section.

Note

Service Center

Please contact the Service Center, if you require support with servicing, maintenance or repair.

9.2.1 Anti-condensation heating spare parts



WARNING

Risk of explosion

If repairs to the anti-condensation heating are not carried out correctly, e.g. if unauthorized or untested spare parts are used, this can result in explosions during operation in a potentially explosive gaseous atmosphere. This can result in death, serious injury or material damage.

Repairing and mounting the anti-condensation heating and the subsequent routine testing must always be undertaken by experts from the Service Center, because this work requires extensive specialist knowledge. Only authorized and tested spare parts may be used.

Spare parts

10.1 Ordering data

When ordering spare parts, in addition to the precise designation of the spare part, specify the motor type and the serial number of the motor. Ensure that the spare part designation matches the designation in the spare part lists and add the associated part number.

Example:

Bearing shield, drive end (Part 105)

Machine type ENGV-160LB-04C

Serial number LDX/30000001


The machine type and serial number can be found on the rating plate data and in the technical data. The serial number is also stamped on the end face of the shaft extension at the drive end.

10.2 Replacing roller bearings


Rolling-contact bearings

When ordering roller bearings, in addition to the bearing identification code, the supplementary specifying code is also necessary for the bearing version. Both of these codes are stamped on the lubricant plate and specified in the motor documentation, or can also be taken from the installed bearings.

10.3 Using commercially available spare parts

 WARNING
Risk of explosion
If you use parts other than the original spare parts, the type of protection can no longer be guaranteed. This can result in an explosion during operation in a potentially explosive gaseous atmosphere. This can result in death, serious injury or material damage.
<ul style="list-style-type: none">• Use only original spare parts for explosion-proof machines; this also applies to components such as seals, terminals, cables and cable entries. Should you have any questions, please contact the Service Center .• Commercially available equivalent standard parts such as screws may be used.

10.4 Anti-condensation heating spare parts

 WARNING
Risk of explosion If repairs to the anti-condensation heating are not carried out correctly, e.g. if unauthorized or untested spare parts are used, this can result in explosions during operation in a potentially explosive gaseous atmosphere. This can result in death, serious injury or material damage. Repairing and mounting the anti-condensation heating and the subsequent routine testing must always be undertaken by experts from the Service Center (Page 99), because this work requires extensive specialist knowledge. Only authorized and tested spare parts may be used.

10.5 Spare parts list, frame sizes 071 to 132

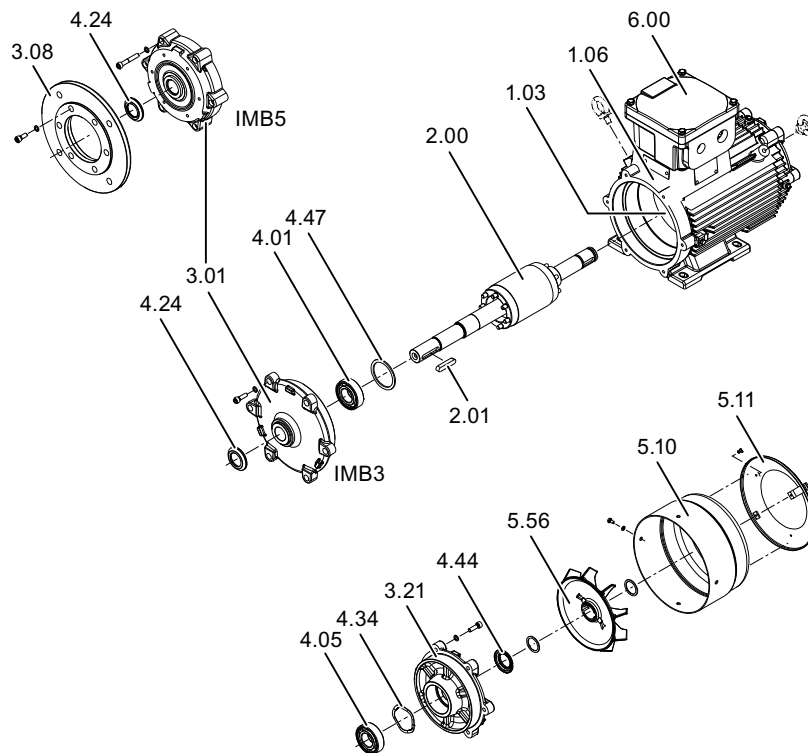


Figure 10-1 D-DN000-0007

Parts Number	Designation	Parts Number	Designation
1.03	Stator laminated core with winding	4.18	Grease slinger
1.06	Stator frame	4.24	Gamma ring
2.00	Shaft with rotor	4.34	Spacer washers
2.01	Feather key	4.44	Gamma ring
3.01	End shield, drive end	5.10	Fan cover
3.08	Flange plate	5.11	Protective cover
3.21	End shield, non-drive end	5.56	Fan
4.01	Roller bearing, DE	6.00	Terminal box
4.05	Roller bearings, NDE		

10.6 Spare parts list, frame sizes 160 to 280

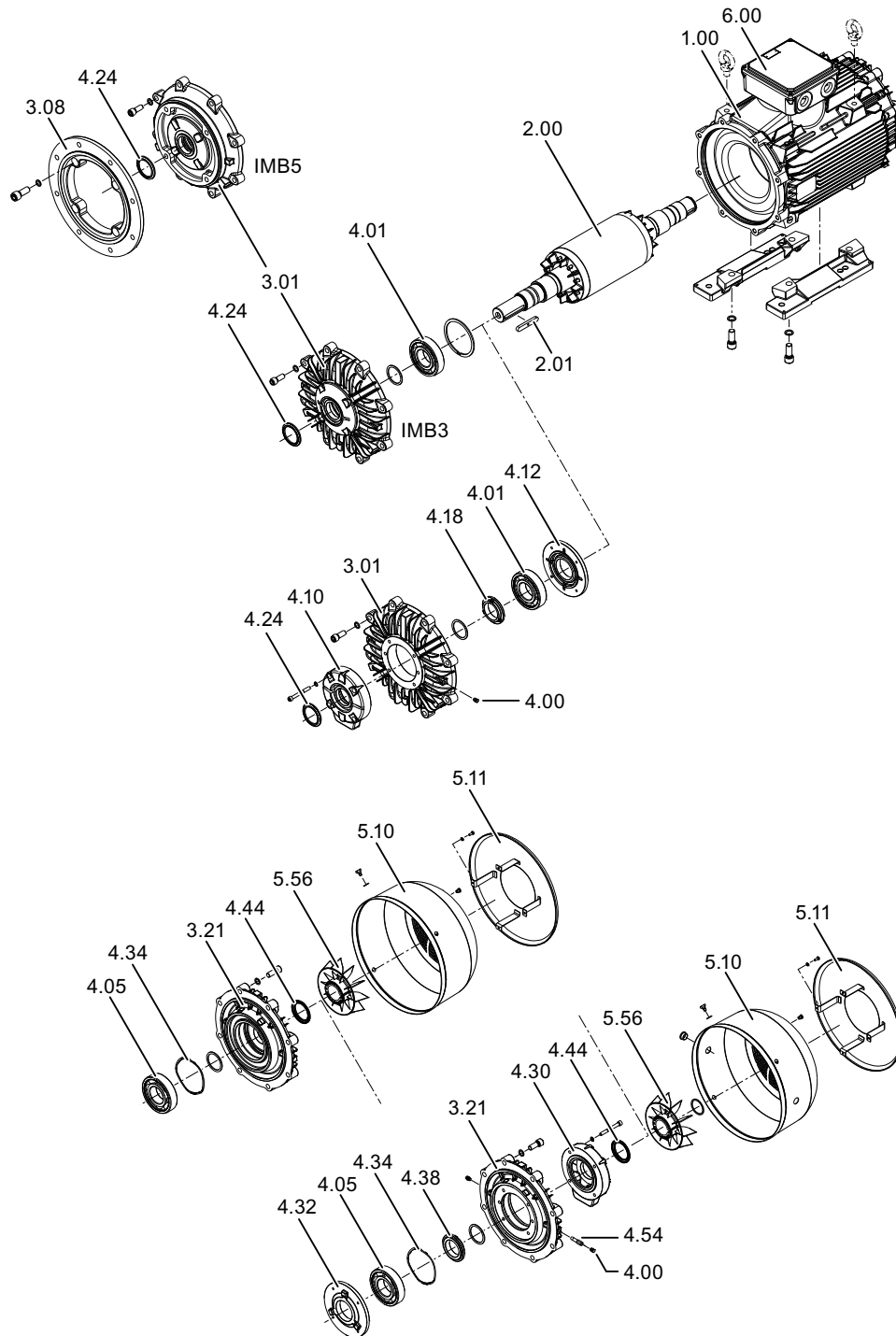


Figure 10-2 E-AN000-0004

10.6 Spare parts list, frame sizes 160 to 280

Parts Number	Designation	Parts Number	Designation
1.00	Stator, complete	4.18	Grease slinger DE
2.00	Rotor, complete (balanced)	4.24	Sealing ring DE, outer
2.01	Keyway	4.30	Grease chamber cover NDE, outer
3.01	Bearing shield DE	4.32	Grease chamber cover NDE, inner
3.08	Flange plate DE	4.34	Spacer washer NDE
3.21	Bearing shield NDE	4.38	Outer grease chamber cover
4.00	Bearing shield NDE	4.44	Sealing ring NDE, outer
4.01	Bearing DE	4.54	Relubrication NDE
4.05	Bearing NDE	5.10	Complete fan cowl
4.10	Grease chamber cover DE, outer	6.00	Terminal box
4.12	Grease chamber cover DE, inner		

10.7 Spare parts list, frame size 315

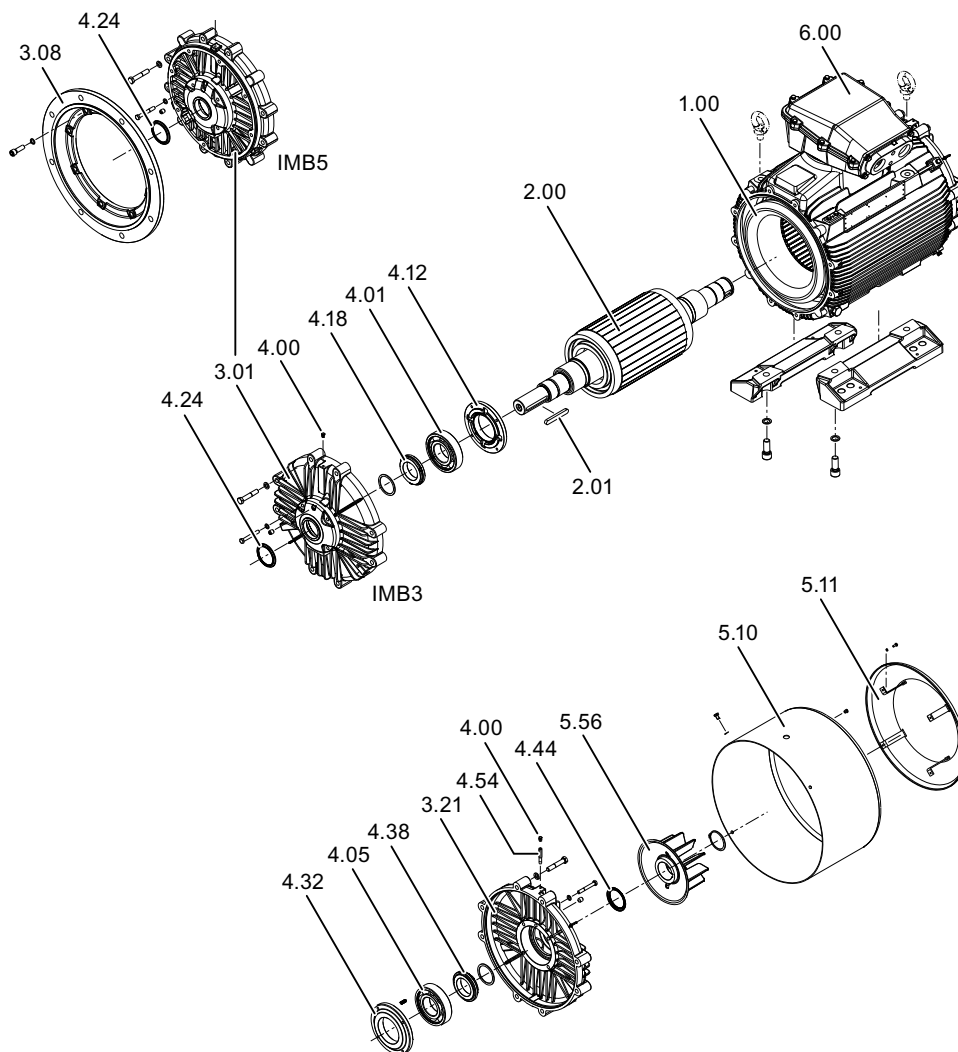


Figure 10-3 E-AN000-0005

Parts Number	Designation	Parts Number	Designation
1.00	Stator, complete	4.18	Grease slinger DE
2.00	Rotor, complete (balanced)	4.24	Sealing ring DE, outer
2.01	Keyway	4.30	Grease chamber cover NDE, outer
3.01	Bearing shield DE	4.32	Grease chamber cover NDE, inner
3.08	Flange plate DE	4.34	Spacer washer NDE
3.21	Bearing shield NDE	4.38	Outer grease chamber cover
4.00	Bearing shield NDE	4.44	Sealing ring NDE, outer

Parts Number	Designation	Parts Number	Designation
4.01	Bearing DE	4.54	Relubrication NDE
4.05	Bearing NDE	5.10	Complete fan cowl
4.10	Grease chamber cover DE, outer	6.00	Terminal box
4.12	Grease chamber cover DE, inner		

10.8 Spare parts list for terminal boxes with type of protection "Ex e", frame sizes 071-160

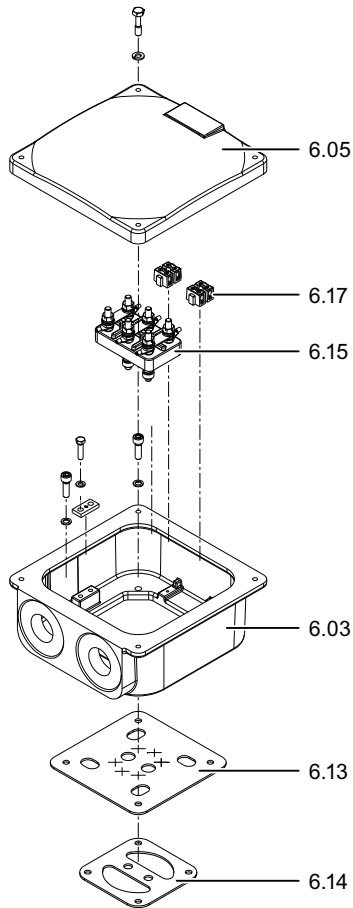


Figure 10-4 E-9-101_162-0001

Part number	Designation	Part number	Designation
6.03	Terminal box base	6.14	Mounting plate
6.05	Terminal box cover	6.15	Complete terminal board
6.13	Terminal box seal	6.17	Additional terminal

10.9 Spare parts list for terminal boxes with type of protection "Ex e", frame sizes 180-225

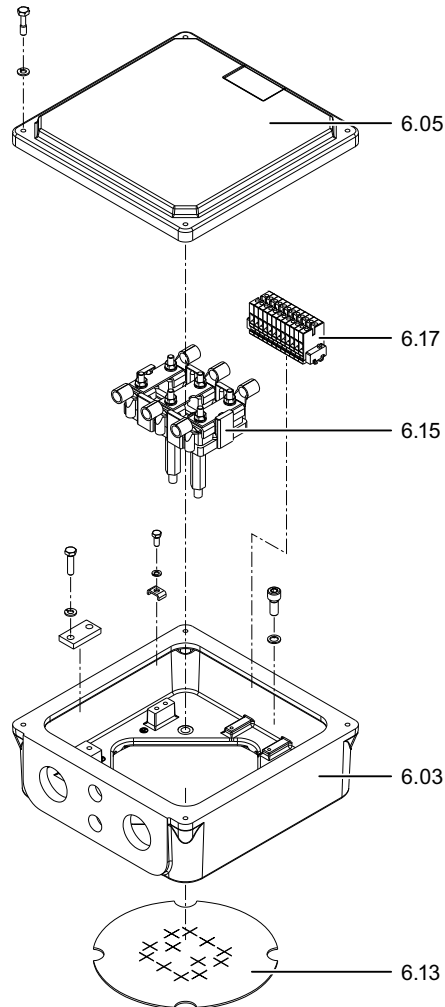


Figure 10-5 E-9-101_208-0001

Part number	Designation	Part number	Designation
6.03	Terminal box base	6.15	Complete terminal board
6.05	Terminal box cover	6.17	Additional terminal
6.13	Terminal box seal		

10.10 Spare parts list for terminal boxes with type of protection "Ex e", frame sizes 250 to 355

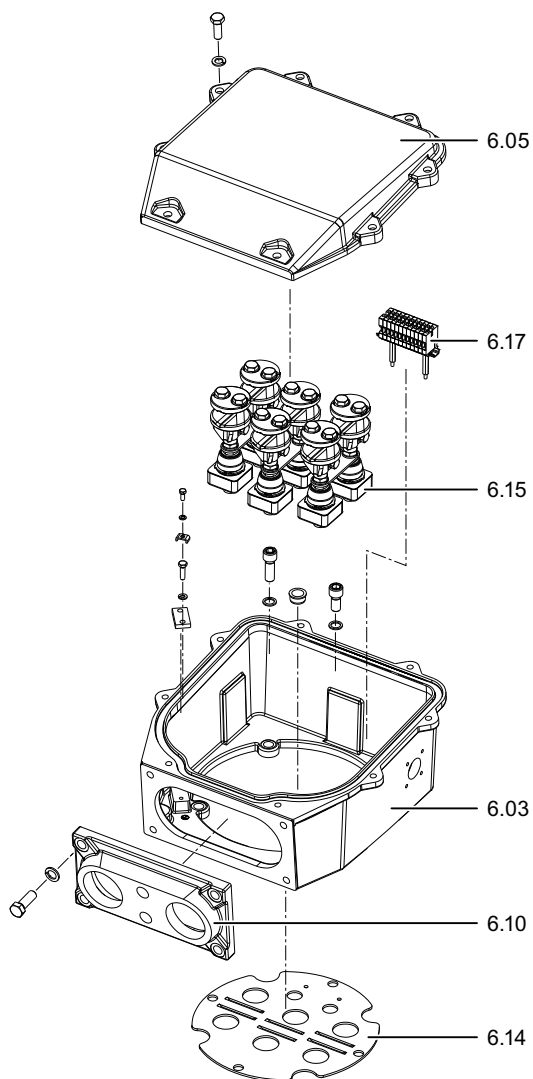


Figure 10-6 E-9-101_285-0001

Part number	Designation	Part number	Designation
6.03	Terminal box base	6.14	Mounting plate
6.05	Terminal box cover	6.15	Gland terminal
6.07	Gland plate	6.17	Additional terminal
6.10	Cable gland		

Disposal

11.1 Introduction

Protecting the environment and preserving its resources are corporate goals of the highest priority for us. Our worldwide environmental management system to ISO 14001 ensures compliance with legislation and sets high standards in this regard. Environmentally friendly design, technical safety and health protection are always firm goals even at the product development stage.

Recommendations for the environmentally friendly disposal of the machine and its components are given in the following section. Be sure to comply with local disposal regulations.

11.2 Preparing for disassembly

Disassembly of the machine must be carried out and/or supervised by qualified personnel with appropriate expert knowledge.


1. Contact a certified waste disposal organization in your vicinity. Clarify what is expected in terms of the quality of dismantling the machine and provision of the components.
2. Follow the five safety rules (Page 13).
3. Disconnect all electrical connections and remove all cables.
4. Remove all liquids such as oil and cooling liquids. Collect the liquids separately and dispose of them in a professional manner.
5. Detach the machine fixings.
6. Transport the machine to a suitable location for disassembly.

See also

Maintenance (Page 71)

11.3 Dismantling the machine

Dismantle the machine using the general procedures commonly used in mechanical engineering.

 WARNING
Machine parts can fall
The machine is made up of heavy parts. These parts are liable to fall during dismantling. This can result in death, serious injury or material damage.
Before you release any machine parts, secure them so that they cannot fall.

11.4 Disposal of components

Components

The machines consist mainly of steel and various proportions of copper and aluminum. Metals are generally considered to be unlimitedly recyclable.

Sort the components for recycling according to whether they are:

- Iron and steel
- Aluminum
- Non-ferrous metal, e.g. windings
The winding insulation is incinerated during copper recycling.
- Insulating materials
- Cables and wires
- Electronic waste

Process materials and chemicals

Sort the process materials and chemicals for recycling according to whether they are for example:

- Oil
- Grease
- Cleaning substances and solvents
- Paint residues
- Anti-corrosion agent
- Coolant additives such as inhibitors, antifreeze or biocides

Dispose of the separated components according to local regulations or via a specialist disposal company. The same applies for cloths and cleaning substances which have been used while working on the machine.

Packaging material

- If necessary, contact a suitable specialist disposal company.
- Wooden packaging for sea transport consists of impregnated wood. Observe the local regulations.
- The foil used for water-proof packaging is an aluminum composite foil. It can be recycled thermally. Dirty foil must be disposed of via waste incineration.

Service and Support

A.1 Siemens Industry Online Support

Details regarding the design of this electrical machine and the permissible operating conditions are described in these instructions.

On-site service and spare parts

If you wish to request local service or order spare parts, please contact your local Siemens sales office. This office will contact the responsible service center on your behalf.

Technical queries or additional information

If you have any technical queries or you require additional information, please contact the Siemens Service Center.

Please have the following machine data ready:

- Machine type
- Machine number

You can find this data on the rating plate of the machine.

Contact at Central Technical Support for our customers in Germany




 +49 911 895 7222
 +49 911 895 7223
 support.automation@siemens.com (<mailto:support.automation@siemens.com>)

Outside Germany, you can find your contact partners here:

<http://support.automation.siemens.com/WW/view/de/16604999> (<http://support.automation.siemens.com/WW/view/en/16604999>)

You can also call the following numbers directly during local working hours to reach a contact partner who speaks the corresponding national language.

Americas

 +1 423 262 5710
 +1 423 262 2231
 support.america.automation@siemens.com
(<mailto:support.america.automation@siemens.com>)

Asia/Pacific



+86 10 6475 7575



+86 10 6474 7474



support.asia.automation@siemens.com

(<mailto:support.asia.automation@siemens.com>)

See also

<http://www.siemens.com/automation/support-request> (<http://www.siemens.de/automation/support-request>)

A.2 RoHS - restricting the use of certain hazardous substances

In compliance with RoHS ("Restriction of certain Hazardous Substances") we replace substances that are damaging to the environment by those that are not based on state-of-the-art technology. In doing so, safety in operation and handling will take priority at all times.

Technical data and drawings

B.1 Tightening torques for screw and bolt connections

Bolt locking devices

- Refit nuts or bolts that are mounted together with locking, resilient, and/or force-distributing elements with identical, fully-functional elements when re-assembling. Always renew keyed elements.
- When screwing together threads secured with a liquid adhesive, use a suitable medium such as Loctite 243.

Tightening torques

The bolted connections with metal contact surfaces, such as end shields, bearing cartridge parts, terminal box parts bolted onto the stator frame, should be tightened to the following torques, depending on the thread size:

Table B-1 Tightening torques for bolted connections with a tolerance of $\pm 10\%$.

Case	M4	M5	M6	M8	M10	M12	M16	M20	M24	M30	M36	M42	M48	M56	
A	1.2	2.5	4	8	13	20	40	52	80	150	-	-	-	-	Nm
B	1.3	2.6	4.5	11	22	38	92	180	310	620	108 0	170 0	260 0	420 0	Nm
C	3	5	8	20	40	70	170	340	600	120 0	200 0	310 0	470 0	750 0	Nm

Applications

The above-mentioned tightening torques apply for the following applications:

- Case A
Applies to electrical connections in which the permissible torque is normally limited by the bolt materials and/or the current carrying capacity of the insulators, with the exception of the busbar connections in case B.
- Case B
Applies to bolts screwed into components made from materials with lower property class (e. g. aluminum) and to bolts with property class 8.8 according to ISO 898-1.
- Case C
Applies to bolts with property class 8.8 or A4-70 according to ISO 898-1, however only to bolts screwed into components made from materials with higher property class, e.g. cast iron, steel or cast steel.

Note

Non-standard tightening torques

Different tightening torques for electrical connections and bolted connections for parts with flat seals or insulating parts are specified in the relevant sections and drawings.

Quality documents

C.1 IECEx certificate

If available, you can obtain the IECEx certificate on the Internet at the following address:

[Http://iecex.iec.ch/iecex/iecexweb.nsf/home?openform](http://iecex.iec.ch/iecex/iecexweb.nsf/home?openform)

IECEx Certified Equipment [PUBLIC AREA]

You are welcomed in as an IECEx Guest User [reader] and have full access to public information.

IECEx Certification Bodies please login to create or edit certificates [Password Protected] :

Quick access:
Type in CoC ref. number (e.g.: "IECEx BAS 10.0001")

Free text search:
You can use boolean operators "AND", "OR"

The IECEx Online Certified Equipment Scheme enables:

- IECEx Certification Bodies to issue new IECEx Certificates of Conformity "On-line"
- Full Public access to consult, view and print issued IECEx Certificates
- View Statistical information
- Export data to an Excel worksheet

For any questions, please contact Mr. Chris Agius , IECEx Secretary.

The IECEx ID for the IECEx certificate can be found on the rating plate of the machine or on the extra plate for explosion protection.

1. Enter the IECEx ID in the "Quick access" field.
You then have access to the certificate.
2. If you scroll down completely to the bottom of the page shown, you can open the certificate as a PDF file and download it.

C.2 EC Declaration of Conformity

SIEMENS

Industry

EG Konformitätserklärung EC Declaration of Conformity

Hersteller: **Siemens AG**
 Manufacturer: **Hans-Loher-Straße 32
 94099 Ruhstorf/Rott, Germany**

Produktbezeichnung: **Drehstrom-Asynchronmaschinen der Zündschutzart**
 Product name: **Three phase asynchronous motors of the protection type
 Erhöhte Sicherheit "e" / Increased safety „e“**

Typ Type: **E ... 071 ... bis / to E ... 800 ...
 J ... 355 ... bis / to J ... 800 ...**

Alternative Typenbezeichnung / alternative type
**1PS.07. - bis / to 1PS.80. -
 1MV.35. - bis / to 1MV.80. -**

Das bezeichnete Produkt stimmt bei Ex-Kennzeichnung auf dem Typenschild mit den Vorschriften folgender Europäischer Richtlinien überein:
The indicated product with an adequate ex-marking on the rating plate is in conformity with the requirements of the following European Directives:

- 94/9/EG** **Richtlinie des Europäischen Parlaments und des Rates zur Angleichung der Rechtsvorschriften der Mitgliedstaaten für Geräte und Schutzsysteme zur bestimmungsgemäßen Verwendung in explosionsgefährdeten Bereichen**
- 94/9/EC** **Directive of the European Parliament and the council of the approximation of the Laws of the Member States concerning equipment and protective systems intended for use in potentially explosive atmospheres**


Die Übereinstimmung mit den Vorschriften dieser Richtlinien wird nachgewiesen durch die vollständige Einhaltung folgender Normen:
Conformity with the requirements of these directives is testified by complete adherence to the following standards:

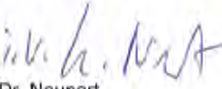
EN 60079-0:2012 EN 60079-1:2007 EN 60079-7:2007 EN 60079-11:2012

Die EG-Baumusterprüfbescheinigungen für das bezeichnete Produkt sind in der Anlage angegeben.
The EC-Type Examination Certificates for the indicated product are specified in the appendix.

Die Sicherheitshinweise der Produktdokumentation und die einschlägigen Errichtungsbestimmungen (z.B. EN 60204-1) sind zu beachten.
The safety notes in the product documentation and the relevant erection rules (e.g. EN 60204-1) must be observed.

Ruhstorf/Rott, den 03. März 2015


 Hofbauer
 Leiter Qualitätssicherung
 Manager Quality assurance


 Dr. Neupert
 Leiter Technik
 Manager Engineering

Diese Erklärung ist keine Zusicherung von Eigenschaften im Sinne der Produkthaftung.
This declaration is not a warranty of attributes within the meaning of the Law concerning product liability. Rev. AQ

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 Roland Busch, Lisa Davis, Klaus Helmrich, Janina Kugel, Siegfried Russwurm, Ralf P. Thomas
 Sitz der Gesellschaft: Berlin und München, Deutschland; Registergericht: Berlin Charlottenburg, HRB 12300, München, HRB 6664
 WEEE-Reg.-Nr. DE 23691322

Anlage zur EG Konformitätserklärung
Erhöhte Sicherheit „e“
Appendix to EC Declaration of Conformity
Increased safety “e”

Gerät Equipment			Umrichter- betrieb converter operation	EG-Baumusterprüf- bescheinigung EC-Type Examination Certificate
Typ type	Alternativer Typ alternative type	Spannung Voltage		
E***-071**	1PS207*-*****	Niederspannung / low voltage	-	PTB 08 ATEX 3003
			-	PTB 14 ATEX 3007
E***-080**	1PS208*-*****	Niederspannung / low voltage	-	PTB 08 ATEX 3004
			-	PTB 14 ATEX 3006
E***-090**	1PS209*-*****	Niederspannung / low voltage	-	PTB 07 ATEX 3132
			-	PTB 14 ATEX 3008
E***-100**	1PS210*-*****	Niederspannung / low voltage	-	PTB 07 ATEX 3006
			-	PTB 14 ATEX 3014
E***-112**	1PS211*-*****	Niederspannung / low voltage	-	PTB 07 ATEX 3007
			-	PTB 14 ATEX 3013
E***-132**	1PS213*-*****	Niederspannung / low voltage	-	PTB 07 ATEX 3008
			-	PTB 14 ATEX 3005
E***-160**	1PS216*-*****	Niederspannung / low voltage	-	PTB 07 ATEX 3010
			-	PTB 14 ATEX 3002
E***-180**	1PS218*-*****	Niederspannung / low voltage	-	PTB 08 ATEX 3002
			-	PTB 13 ATEX 3023
E***-200**	1PS220*-*****	Niederspannung / low voltage	X	PTB 06 ATEX 3004 X
			-	PTB 07 ATEX 3137
E***-225**	1PS222*-*****	Niederspannung / low voltage	-	PTB 14 ATEX 3003
			-	PTB 07 ATEX 3009
E***-250**	1PS225*-*****	Niederspannung / low voltage	-	PTB 14 ATEX 3004
			X	PTB 06 ATEX 3033 X
E***-280**	1PS228*-*****	Niederspannung / low voltage	X	PTB 11 ATEX 3015 X
			-	PTB 07 ATEX 3133
E***-315**	1PS231*-*****	Niederspannung / low voltage	-	PTB 11 ATEX 3004
			-	PTB 07 ATEX 3011
E***-355**	1PS235*-***** 1MV235*-*****	Niederspannung / low voltage	X	PTB 11 ATEX 3019
		Hochspannung / high voltage	X	PTB 11 ATEX 3020 X
E***-400**	1PS240*-***** 1MV240*-*****	Niederspannung / low voltage	-	PTB 06 ATEX 3018
		Hochspannung / high voltage	-	PTB 07 ATEX 3012
E***-450**	1PS245*-***** 1MV245*-*****	Niederspannung / low voltage	-	PTB 08 ATEX 3005
		Hochspannung / high voltage	-	PTB 08 ATEX 3003
E***-500**	1PS250*-***** 1MV250*-*****	Niederspannung / low voltage	-	PTB 08 ATEX 3006
		Hochspannung / high voltage	-	PTB 07 ATEX 3135
E***-560**	1PS256*-***** 1MV256*-*****	Niederspannung / low voltage	-	PTB 07 ATEX 3134
		Hochspannung / high voltage	-	PTB 08 ATEX 3007
E***-630**	1PS263*-***** 1MV263*-*****	Niederspannung / low voltage	-	PTB 08 ATEX 3008
		Hochspannung / high voltage	-	PTB 07 ATEX 3020
E***-710**	1PS271*-***** 1MV271*-*****	Niederspannung / low voltage	-	PTB 07 ATEX 3021
		Hochspannung / high voltage	-	PTB 08 ATEX 3009
E***-800**	1PS280*-***** 1MV280*-*****	Niederspannung / low voltage	-	PTB 08 ATEX 3010
		Hochspannung / high voltage	-	PTB 08 ATEX 3012
J***-500**	1PS250*-***** 1MV250*-*****	Niederspannung / low voltage	-	PTB 08 ATEX 3014
		Hochspannung / high voltage	-	PTB 08 ATEX 3015
J***-560**	1PS256*-***** 1MV256*-*****	Niederspannung / low voltage	-	PTB 07 ATEX 3014
		Hochspannung / high voltage	-	PTB 07 ATEX 3015
J***-710**	1PS271*-***** 1MV271*-*****	Niederspannung / low voltage	-	PTB 07 ATEX 3151
		Hochspannung / high voltage	-	PTB 07 ATEX 3152
J***-800**	1PS280*-***** 1MV280*-*****	Niederspannung / low voltage	-	PTB 06 ATEX 3031
		Hochspannung / high voltage	-	PTB 07 ATEX 3023
J***-560**	1PS256*-***** 1MV256*-*****	Niederspannung / low voltage	-	PTB 07 ATEX 3024
		Hochspannung / high voltage	-	PTB 07 ATEX 3024
J***-710**	1PS271*-***** 1MV271*-*****	Niederspannung / low voltage	X	PTB 07 ATEX 3029 X
		Hochspannung / high voltage	-	PTB 07 ATEX 3031
J***-800**	1PS280*-***** 1MV280*-*****	Niederspannung / low voltage	-	PTB 07 ATEX 3032
		Hochspannung / high voltage	-	PTB 08 ATEX 3021
J***-800**	1PS280*-***** 1MV280*-*****	Niederspannung / low voltage	-	PTB 08 ATEX 3022
		Hochspannung / high voltage	-	PTB 08 ATEX 3022

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