SIEMENS

SIMOTICS M-1PH8

Induction motor

Type 1PH818., 1PH822., 1PH828. forced ventilated

Operating Instructions / Installation Instructions

Edition 08/2015

Answers for industry.

SIEMENS

Induction motor

SIMOTICS M-1PH8 1PH818., 1PH822., 1PH828. forced ventilated

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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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GERMANY

Order number: A5E35768675A AB
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Table of contents

Tables

Figures

Introduction

1

These operating instructions are valid for 1PH8 induction motors in shaft heights 180 ... 280 in the force-ventilated version.

- 1PH818.1 and 1PH818.3
- 1PH822.1 and 1PH822.3
- 1PH828.1

The serial number of the motor can be found on the rating plate.

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 135).

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

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

This electric machine has been designed and built in accordance with the specifications contained in Directive 2006/95/EC ("Low-Voltage Directive") and is intended for use in industrial plants. Please observe the country-specific regulations when using the electric machine outside the European Community. Follow the local and industry-specific safety and setup regulations.

The persons responsible for the plant must ensure the following:

- Planning and configuration work and all work carried out on and with the machine is only to be done by qualified personnel.
- The operating instructions must always be available for all work.
- The technical data as well as the specifications relating to the permissible installation, connection, ambient and operating conditions are taken into account at all times.
- The specific setup and safety regulations as well as regulations on the use of personal protective equipment are observed.

Note

Use the services and support provided by the appropriate Service Center (Page 135) for planning, installation, commissioning, and servicing work.

You will find safety instructions in the individual sections of this document. Follow the safety instructions for your own safety, to protect other people and to avoid damage to property.

Observe the following safety instructions for all activities on and with the machine.

2.2 The five safety rules

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

Five safety rules

1. Disconnect the system.
   Also disconnect the auxiliary circuits, for example, anti-condensation heating.
2. Secure against reconnection.
3. Verify absence of operating voltage.

4. Ground and short-circuit.
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.

- Always observe the "five safety rules (Page 15)" 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 Electrostatic sensitive devices

ESD protective measures

NOTICE

Electrostatic discharge

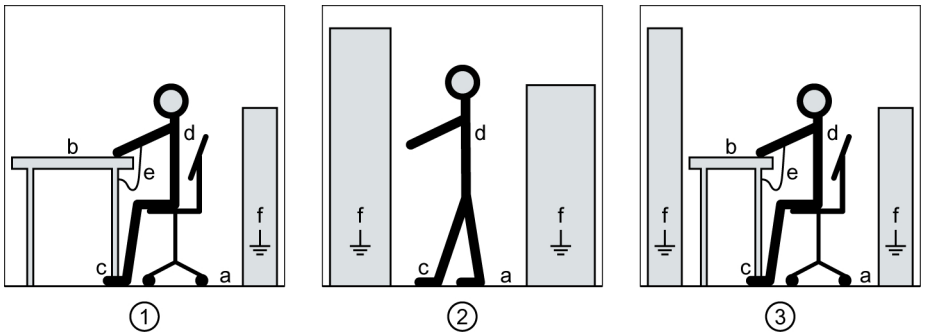
Electronic modules contain components that can be destroyed by electrostatic discharge.

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

See also

Replacing the DRIVE-CLiQ interface (encoder module) (Page 115)

2.6 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.

2.7 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.

2.8 Interference voltages when operating the converter

⚠ WARNING

Interference voltages when operating the converter

When a converter is in operation, the emitted interference varies in strength depending on the converter (manufacturer, type, interference suppression measures undertaken). On machines with integrated sensors (e.g. PTC thermistors), interference voltages caused by the converter may occur on the sensor lead. This can cause faults which can result in eventual or immediate death, serious injury or material damage.

In order to avoid exceeding the limit values set for the drive system (machine and converter) in IEC/EN 61000-6-3, the EMC information provided by the converter manufacturer must be observed. You must put appropriate EMC measures in place.

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.

- 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.

Description

3

Application range

The motors of the 1PH818., 1PH822., 1PH828. series are used as industrial drives. They have been designed to address a wide range of drive applications exclusively fed from converters.

They are characterized by their high power density, ruggedness, long lifetime, and overall reliability.

> **⚠ WARNING**
>
> **Risk of explosion**
>
> This machine is not designed for use in hazardous areas. An explosion can occur if the machine is operated in these areas. This can result in death, serious injury or material damage.
>
> **Never** operate this machine in hazardous areas.

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.

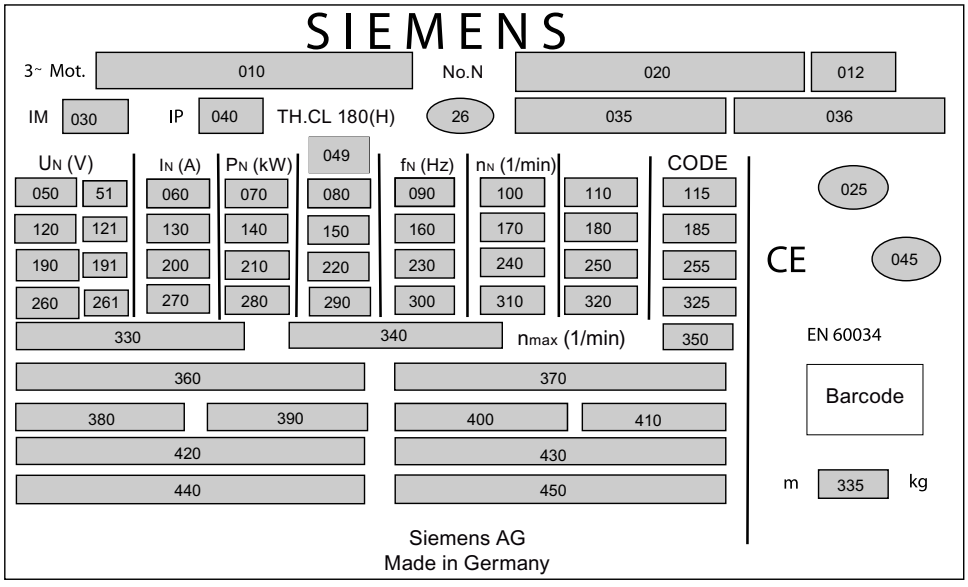


Figure 3-1 Schematic layout of rating plate

Table 3-1 Elements on the rating plate

No.	Description	No.	Description
010	MLFB	200	Rated current I_N (3)
012	Consecutive number, part of serial number	210	Rated power P_N (3)
020	Serial number	220	cos φ (3)
025	UL approval	230	Rated frequency f_N (3)
026	(empty)	240	Rated speed n_N (3)
030	Type of construction	250	Operating mode (3)
035	(empty)	255	Code for operating point 3
036	(empty)	260	Rated voltage V_N (4)
040	Degree of protection	261	Switching mode 4
045	Type of balancing	270	Rated current I_N (4)
049	Power factor (asynchronous)	280	Rated power P_N (4)
050	Rated voltage V_N (1)	290	cos φ (4)
051	Switching mode 1	300	Rated frequency f_N (4)
060	Rated current I_N (1)	310	Rated speed n_N (4)
070	Rated power P_N (1)	320	Operating mode (4)
080	cos φ (1)	325	Code for operating point 4
090	Rated frequency f_N (1)	335	Weight
100	Rated speed n_N (1)	330	Maximum current I_{MAX}
110	Operating mode (1)	340	Maximum torque M_{MAX}
115	Code for operating point 1	350	Maximum speed n_{MAX}
120	Rated voltage V_N (2)	360	Temperature sensor
121	Switching mode 2	370	Tachometer/resolver
130	Rated current I_N (2)	380	Cooling method
140	Rated power P_N (2)	390	Throughput l/min (m^3/s)
150	cos φ (2)	400	System pressure
160	Rated frequency f_N (2)	410	Maximum coolant temperature
170	Rated speed n_N (2)	420	Options (I)
180	Operating mode (2)	430	Options (II)
185	Code for operating point 2	440	Optional customer information
190	Rated voltage V_N (3)	450	Anti-condensation heater / place holder
191	Switching mode 3		

Rotor

This machine is an induction motor for low voltage with squirrel-cage induction motor and integrated cooling circuit.

Machine design

The regulations and standards used as basis for designing and testing 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
Dimensions and operation characteristics	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
Mechanical vibrations	IEC / EN 60034-14
IEC-standard voltages	IEC/DIN IEC 60038
Vibration limit values	DIN ISO 10816-3

Drive

The motor speed is controlled using a converter.

NOTICE
Destruction of the machine when operated directly from the line supply The machine will be destroyed if it is directly connected to the line supply. Only operate the machine using a converter.

Types of construction

The motor is supplied with two attached lifting eyes. The type construction can be found on the rating plate.

Vertical type of construction

For IM V5 and IM V15 types of construction with "shaft extension pointing downward", the motor is equipped with two additional Vario eye bolts. The Vario eyebolts are in the terminal box.

NOTICE
Protection against falling parts For vertical types of construction, protect the air intake or discharge against falling parts, e.g. by attaching a canopy. Otherwise the machine could be damaged.

Cooling with external fan

The machine has cooling method IC 416 in accordance with IEC / EN 60034-6. The separately driven fan unit and the terminal box can be mounted in a different position depending on the order.

⚠ WARNING

Improper use of the external fan

Improper use of the external fan can result in death, serious injury, and material damage.

- Observe and follow the operating instructions of the external fan.

External fan with three-phase motor

For 1PH828. motors, external fans with three-phase motor are used as standard.

Using option L75, these external fans can also be used for 1PH818. and 1PH822. types instead of the EC external fan.

EC external fan

For 1PH818. and 1PH822. motors, EC external fans with EC motors are used. This are especially designed fan units for this motor series, with a permanently set operating speed.

Degree of protection

Depending on the version, the machine has degree of protection IP23 or IP55.

Supplementary devices

A temperature sensor is integrated (Page 68) in the stator winding to monitor the winding temperature. The type of temperature sensor is specified on the rating plate.

Depending on the order options, various supplementary devices such as encoder systems can be either installed or mounted.

Holding brake

Depending on the order, a special version of a holding brake from the Stromag company is mounted. Various types of holding brake are mounted depending on the shaft height.

NOTICE

Technical data for the special version of the holding brake

The following technical data applies to the special version of the mounted holding brake. The corresponding data in the manufacturers operating instructions do not apply.

Table 3-3 Technical data of the holding brake

Technical data			NFF-A 63 AH180	NFF-A 100 AH225
Braking torque	M_{Brake}	[Nm]	1000	1600
Max. speed	n_{Brake}	[rpm]	3500	3100
Weight incl. hollow shaft	m_{brake}	[kg]	63	88
Moment of inertia	J_{brake}	[kgm^2]	0,022	0,051
Total moment of inertia (emergency stop)	J_{total}	[kgm^2]	1,3	3,9
Rated voltage	U	[V]	230 V (AC)	230 V (AC)
Permitted single switched energy	P	[W]	98	210
Coil current	I	[A]	2,21	2,70
Number of emergency stops	Z	-	2100	1200
Opening time		[ms]	300	300
Closing time		[ms]	80	100

Note

More information

- Magnetic field when the brake is open (Page 71)

See also

Operating instructions, holding brake (Page 145)

Ambient conditions

The standard machines are not suitable for use in corrosive atmospheres, atmospheres with a high salt content, or outdoor applications.

Roller bearings

The machines are equipped with different types of roller bearings depending on the version and the operating conditions described in the order. If the machine is equipped with a regreasing system, you will find the relevant data on the machine's lubricant plate.

The following standard roller bearing versions are available:

Table 3-4 Roller bearing versions

Design	Bearings
Standard design and "Performance"	Drive end deep-groove ball bearing as spring-loaded floating bearing Non-drive end deep-groove ball bearing as fixed bearing
Version for increased radial forces	Drive end cylindrical-roller bearing as floating bearing Non-drive end deep-groove ball bearing as fixed bearing

NOTICE
Maintain the minimum radial forces Operating cylindrical roller bearings without a load can damage them. Maintain the minimum radial forces specified when using cylindrical-roller bearings.

Table 3-5 Minimum radial forces

Type	Minimum radial force
1PH818.	4 kN
1PH822.	5 kN
1PH828.	9 kN

Preparations for use 4

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.

4.2 Observing the operating mode

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

4.3 Interlock circuit for the external fan motor

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.

See also

Connecting an external fan (Page 62)

4.4 Ensure the cooling of force-ventilated motors

Note

Note also the technical data on the rating plates on the motor enclosure.

Preconditions for adequate cooling

- For motors that are cooled by the ambient air, the cooling air must be able to flow unimpeded to and from the motors. Hot discharged air should not be drawn in again.

NOTICE
Overheating If the required cooling air flow cannot be maintained, the machine can overheat. This can result in material damage. • Maintain the required minimum clearance (Page 31) for customer-supplied mounted accessories at the air intake opening and at the air discharge openings to ensure the required cooling air flow.

- The requirements of the IP degree of protection must be observed.
  More stringent requirements regarding the IP degree of protection may necessitate the installation of suitable filters and special arrangement of the intake and outlet openings.
- Equipment and cables must be connected without strain.

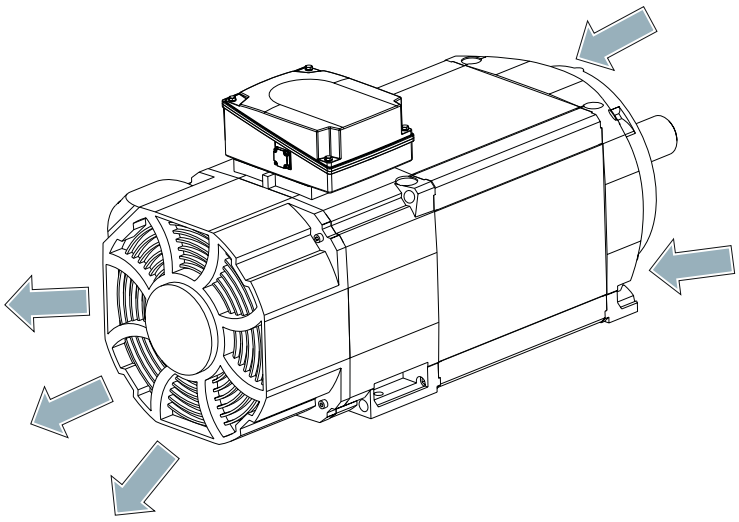


Figure 4-1 Air guidance from the DE to the NDE (schematic representation, types 1PH818. and 1PH822.)

A bypass is available for 1PH822. with IP23 degree of protection and air guidance from the DE to the NDE.

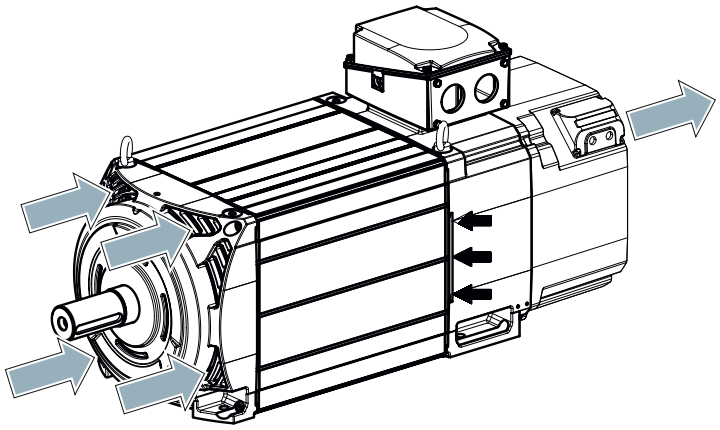


Figure 4-2 Bypass for 1PH822. for IP23

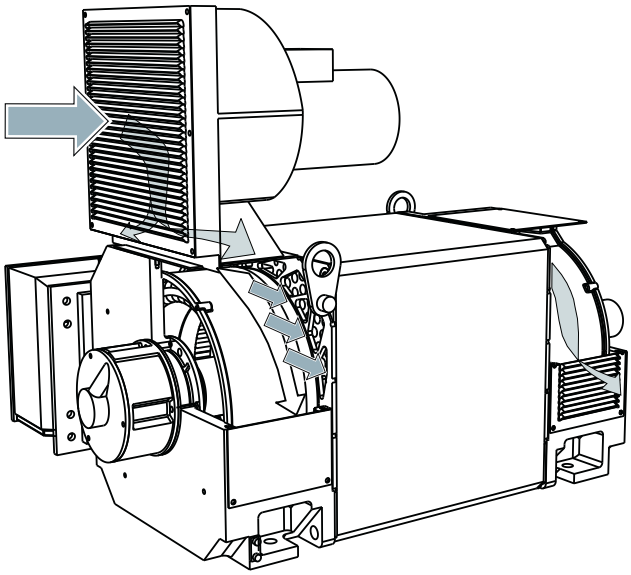


Figure 4-3 Air guidance from the NDE to the DE (schematic representation, type 1PH828.) for IP55

External fan

The code for the external fan is the eleventh position of the order number, e.g. 1PH8.....0. For details of the order number, which also tells you which type of external fan is installed (pressure or extraction), please refer to the motor rating plate.

Machines with pipe connection

You must mount and connect pipes and a fan of suitable type and dimensioning to machines that are intended for the connection of pipes and/or for operation with an external fan. An adapter is not included in the scope of supply.

Please observe the following when connecting pipes:

- Additional pressure drop in the system.
- Shipping covers on the ventilation openings must have been removed.

For machines with a pipe connection, the potential pressure drop inside the machine is given in the following table:

Table 4-1 Pressure drop in motors with pipe connection

Type	Degree of protection	Volume flow	Pressure drop	Flow resistance
1PH818.	IP23	0.21 m^3/s	450 Pa	10204 Ns^2/m^8
	IP55	0.17 m^3/s	550 Pa	19030 Ns^2/m^8
1PH822.	IP23	0.33 m^3/s	600 Pa	5510 Ns^2/m^8
	IP55	0.31 m^3/s	650 Pa	6760 Ns^2/m^8
1PH828.	IP23	0.52 m^3/s	600 Pa	2220 Ns^2/m^8
	IP55	0.42 m^3/s	600 Pa	3400 Ns^2/m^8

4.5 Cooling air quality

The cooling air is only permitted to have weak chemically aggressive properties and must only have low levels of oil or dust.

4.6 Voltage fluctuations

Force-ventilated 1PH818. and 1PH822. motors are equipped with electronically commutated motors (EC motor).

NOTICE
Voltage fluctuations
The electronics of the external fan equipped with EC motor can be damaged as a result of voltage fluctuations. Supply the external fan with power from the line supply and not via a frequency converter.

4.7 Overheating during periodic duty

NOTICE
Periodic duty
In all of the operating modes, always operate the external fan according to DIN EN 60034-1. For non-periodic operation, it is possible that the machine is thermally overloaded. This can result in damage to the machine. • In the case of extended non-operational periods, the fan should be in operation until the machine has approximately reached the temperature of the coolant, see S2 duty type in DIN EN 60034-1. • Use a suitable circuit to ensure that the external fan is appropriately operated.

NOTICE
EC fan control via an input signal
The fan motor can overheat if the EC fan is operated at low fan speeds as a result of the setpoint signal it receives. • Monitor the motor using the integrated temperature sensors. • Connect the temperature monitoring into the interlocking circuit.

See also

Interlock circuit for the external fan motor (Page 27)

4.8 Space requirements

NOTICE
Overheating
If the required cooling air flow cannot be maintained, then the machine can overheat. This can result in material damage. • For customer-supplied mounted accessories maintain the following minimum clearances at the air intake opening and at the air discharge openings to ensure the required cooling air flow: – 1PH818. / 1PH822. types: 100 mm – 1PH828 type: 170 mm

4.9 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.

4.10 Rotational speed limit values

⚠ WARNING

Excessively high speeds

Excessive rotational speed can lead to serious damage to the machine. This can result in death, serious injury, or material damage.

- Avoid operation above the permissible speed by using the appropriate control function.
- Observe the speeds stamped on the rating plate.

4.11 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.

4.12 Torsional loading of the shaft assembly due to faults in the electrical supply

In the event of faults in the electrical connection during operation, excessive air gap torques can lead to additional mechanical torsional load on the line shaft.

⚠ WARNING

Serious damage to the machine

If the configuration does not correctly recognize the mechanical torsional loadings of the shaft assembly, this can lead to serious damage to the machine. This can result in death, serious injury or material damage.

When planning the system, consider the configuration data in the catalog.

Note

The system planner is responsible for the entire shaft assembly.

4.13 Thermal motor protection

The machine is equipped as standard with a temperature sensor, optionally with PTC thermistors to directly monitor the motor temperature in order to protect the machine against overload in operation. Plan a corresponding circuit for monitoring.

4.14 Transport and storage

When carrying out any work on the machine, observe the general safety instructions (Page 15) and the specifications contained in EN 50110-1 regarding safe operation on electrical equipment.

4.14.1 Checking the delivery

Checking the delivery for completeness

The drive systems are put together on an individual basis. When you take receipt of the delivery, please check immediately whether the items delivered are in accordance with the accompanying documents. Siemens will not accept any claims relating to items missing from the delivery and which are submitted at a later date.

- Report any apparent transport damage to the delivery agent immediately. Never commission a damaged motor.
- Report any apparent defects/missing components to the appropriate Siemens office immediately.

These safety instructions are part of the scope of supply; keep them in a location where they can be easily accessed.

4.14.2 Requirements for safe lifting and transporting

To safely lift and transport the machine, the following requirements must be met:

- Personnel operating cranes and fork-lift trucks must be appropriately qualified.
- When lifting the machine, use only approved and undamaged sling guides and spreaders of sufficient rated capacity. Check the lifting equipment prior to its use. The weight of the machine is shown on the rating plate.
- When lifting the machine, refer to the information on the lifting plate.
  - Comply with the specified spreading angles.
  - Do not exceed the maximum lifting acceleration and lifting speed specified on the lifting plate. Lift the machine without jerking it.
    Acceleration a ≤ 0.4 g (≈ 4 m/s^2)
    Velocity v ≤ 20 m/min
- Use only the load carrying device on the stator frame for lifting.

⚠ WARNING

The machine can tip over, slip or fall down during transport if a different construction is used

If you do not transport or lift the machine in a position appropriate for its construction, the machine can tip, slip into the lifting equipment or fall down. This can result in death, serious injury or material damage.

- Use only the load carrying device on the stator frame for lifting.
- Use the load carrying device appropriate for the machine position.
- Use suitable rope guiding or spreading devices. The weight of the machine is shown on the rating plate.

⚠ WARNING

The machine can fall over, shift or fall down during transport if the center of gravity is not symmetrical

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 equipment and fall when it is being transported or lifted. This can result in death, serious injury or material damage.

- Comply with the handling instructions on the machine when transporting it.
- Be aware of the possibility of different loads on the sling ropes or lifting straps and the carrying capacity of the lifting equipment.
- Always take account of the center of gravity when transporting or lifting the motor. If the center of gravity is not located centrally between the attachment points, then position the hoisting hook above the center of gravity.

4.14.3 Lifting and transporting

There are two lifting eyebolts for horizontal transport of the motor. Always transport and lift the motor by the lifting eyebolts.

- Only lift the motor at the lifting eyebolts on the bearing end shields. To hoist the motor, in particular if there are built-on assemblies, use suitable cable-guidance or spreading equipment.

NOTICE
Damage to the terminal box The terminal box can be damaged when lifting without using suitable spreading equipment,. Only lift the machine using suitable spreading equipment.

- Pay attention to the lifting capacity of the hoisting gear. The weight of the motor is specified on the rating plate.

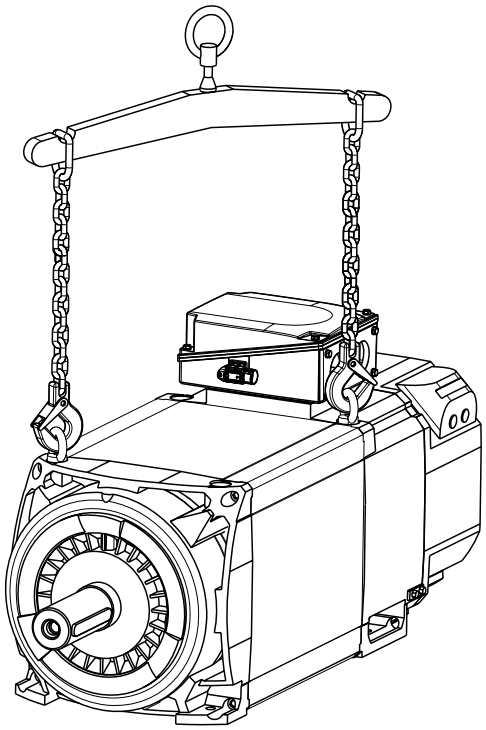


Figure 4-4 Lifting the machine (schematic representation)

Lifting force-ventilated motors in type of construction IM V5 with side-mounted terminal boxes

Proceed as follows if you wish to lift a machine with type of construction IM V5 and with side-mounted terminal box:

1. Screw off the external fan.
2. Screw in the eyebolts supplied and use these to lift the machine.
3. Screw on the external fan again after the work has been completed.

Rotor shipping brace

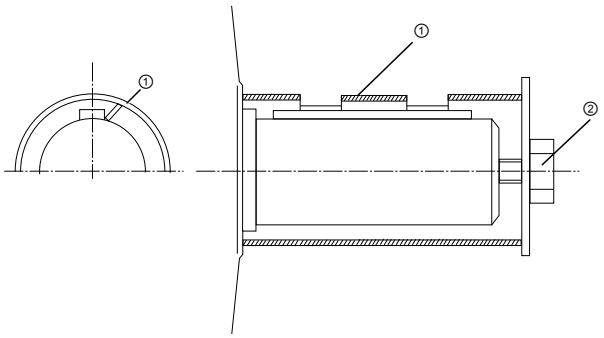
Machines ordered with the "Increased radial force" option are equipped with cylindrical-roller bearings and a rotor shipping brace.

NOTICE

Transport damage if the rotor shipping brace device is not used.

The motor can be damaged if it is jolted during transport. This can result in material damage.

- Always transport the motor with the rotor shipping brace supplied. The rotor shipping brace must be attached during transportation.
- Only remove it before pushing on the drive element.
- If you transport the machine after the output transmission element has been pushed on you must take other appropriate measures to fix the axial position of the rotor.



① Sleeve
② Shaft screw

Figure 4-5 Rotor shipping brace

Table 4-2 Tightening torque for rotor shipping brace

Type	Thread in the shaft end	Tightening torque	Preload
1PH818.	M20	50 Nm	12 kN
1PH822.	M20	50 Nm	12 kN
1PH828.	M24	100 Nm	20 kN

Note

Store the rotor locking device

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

4.14.4 Transporting a force-ventilated motor that has already been in operation

If you have already operated the motor and now want to transport it, proceed as follows:

1. Allow the motor to cool down.
2. Remove the connections provided by the customer.
3. Fit the rotor shipping brace.
4. Only use the eyebolts on the bearing shields to transport and lift the motor.

4.14.5 Transporting the machine set

⚠ 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.

- 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

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.

4.14.6 Storage

The motors can be stored for up to two years in dry, dust-free and vibration-free rooms without reducing the specified storage time.

NOTICE
Seizure damage to bearings If the motors are stored incorrectly there is a risk of bearing seizure damage such as brinelling, for example as a result of vibrations. Read the following storage instructions.

Preparation

- Fit the rotor shipping brace.
- Apply a preserving agent such as Tectyl to bare external components such as shaft ends, if this has not already been applied in the factory.

Storing indoors

NOTICE
Damage caused as a result of outdoor storage Storing the machine outdoors can result in it being damaged. Ensure that the machine is only stored in areas that comply with the following conditions.

- Store the motor in an area that meets the following criteria:
  - Dry, dust-free, frost-free and vibration-free The relative air humidity should be lower than 60% and the temperature should not drop below -15 °C in accordance with EN 60034-1.
  - It must be well ventilated.
  - Offers protection against extreme weather conditions
  - The air in the storage area must not contain any harmful gases.
- Protect the motor from shocks and humidity.
- Cover the motor properly.
- Avoid contact corrosion:
  - Every three months, remove the shipping brace and rotate the shaft end by hand.
  - Then reattach the rotor shipping brace.

Protection against humidity

- If a dry storage area is not available, then take the following precautions:
  - Wrap the motor in humidity-absorbent material and then wrap it in film to create an air-tight unit.
  - Include several bags of desiccant in the seal-tight packaging. Check the desiccant and replace as required.
  - Place a humidity meter in the seal-tight packaging to indicate the level of air humidity inside it.
  - Inspect the motor regularly.

Long-term storage

If you are storing a machine for more than six months, you must check its condition every six months.

- Check the machine for damage.
- Carry out any necessary maintenance work.
- Document all preservation measures taken so that they can be reversed before the machines are put back into service.
- Provide air-conditioning for the storage room.

Condensation

Condensation can collect in the machine as a result of sharp fluctuations in ambient temperature, exposure to direct sunlight, high levels of humidity in the storage location or intermittent operation/variations in load during operation.

NOTICE
Damage due to condensation If the stator winding is damp, its insulation resistance is reduced. This results in voltage flashovers that can destroy the winding. Condensation can also cause rusting inside the machine.

Water drain holes (option L12)

Depending on the order concerned, the bearing shields at the DE and NDE are equipped with water drainage holes in the foot area and opposite the regreasing system. Make sure that the condensation can always drain away freely.

- Shaft heights 180 and 225: The plug that has been inserted into the water drainage holes allows the condensation to drain away. Do not remove the plug, otherwise the machine's degree of protection will be affected.
- Shaft height 280: There are no plugs in the water drain holes. The water must be able to drain away freely.

NOTICE
Water drain holes The water drain holes only function when the motor is mounted horizontally for types of construction IM B3, IM B35 and IM B5.

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.

4.14.7 Protection against corrosion

If the machine is stored in dry conditions, then apply the subsequently listed anti-corrosion measures:

- Storage up to six months:
  Apply a coat of corrosion protective compound to all accessible bare metal parts such as the exposed shaft extension, flange or machine feet.
- Storage for longer than six months:
  Apply a coat of anti-corrosion compound which provides long-term protection, e.g. Tectyl 506.
- Inspect the machine regularly and apply an additional coating of corrosion protection if necessary.

Document all preservation measures taken so that they can be reversed before the machines are put back into service.

4.15 Converter operation

4.15.1 Connection to a converter

Selecting and connecting the cable

- Use Motion Connect cables or symmetrically constructed, shielded cables to connect the motor to a converter. The cable shielding, made up of as many strands as possible, must have good electrical conductivity. Braided shields made of copper or aluminum are well suited.
- The shield must be connected at both ends to the motor and the converter; unshielded cable ends must be kept as short as possible.
- To ensure effective discharge of high-frequency currents, make the shield contact over the largest possible area, i.e. as a 360° contact on the converter and motor, e.g. using EMC glands at the cable entry points.

Measures to reduce bearing currents

To specifically reduce and prevent damage caused by bearing currents, you must consider the system as a whole, which comprises the motor, converter, and driven machine. The following precautions help to prevent bearing currents:

- Setting up a properly meshed grounding system in the system as a whole, with low impedance for high-frequency currents
- No potential difference between the motor, converter, and working machine.
  - Use symmetrical, shielded connecting cables.
  - Connect the cable shield at both ends over the greatest possible surface area (360° contact).
  - Use equipotential bonding conductors between the motor and the driven machine as well as between the motor and the converter
- Use iron cores mounted above the motor connecting cable at the converter output. These help to reduce common-mode components. The Siemens sales representative is responsible for selection and dimensioning.
- Limit the voltage rate of rise by using an output filter to dampen harmonic components in the output voltage

Assembling 5

5.1 Safety instructions

When carrying out any work on the machine, observe the general safety instructions (Page 15) and the specifications contained in EN 50110-1 regarding safe operation on electrical equipment.

NOTICE
High temperatures The motor components get very hot during operation. High temperatures can damage mounting parts such as the cable insulation. • 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.

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.

5.2 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"

NOTICE

Damage to the converter

The electronics of the integrated converter can be destroyed when measuring the insulation resistance at the EC external fan with a voltage exceeding 305 V.

- Do not measure the insulation resistance of the EC external fan.
- More information can be found in the instructions of the EC external fan.

5.3 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 5-1 Stator winding insulation resistance at 40° C

V_N [V]	V_{Meas} [V]	R_C [MΩ]
U ≤ 1000	500	≥ 5
1000 ≤ U ≤ 2500	500 (max. 1000)	100
2500 < U ≤ 5000	1000 (max. 2500)	
5000 < U ≤ 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:
   $PI = R_{insul\ 10\ min} / R_{insul\ 1\ min}$
   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.

$R_{(10\ min)} / R_{(1\ min)}$	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.

5.4 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 (Page 135).

5.5 Vibration severity

Due to the influencing variables listed below, the vibration response of the system at the site of operation can lead to increased vibration severity at the motor:

- Transmission elements
- Assembly conditions

- Alignment and installation
- Effects of external vibrations

Under certain circumstances, the rotor may have to be balanced completely with the output element.

Please take care to ensure that the vibration severity specified to ISO 10816 is not exceeded at the defined measuring points on the motor. By doing this, you can ensure problem-free operation and a long service life.

Maximum permitted vibration severity

The values for the maximum permitted radial and axial vibration severity must both be maintained.

Table 5-2 Maximum permitted radial vibration severity

Vibration frequency	Vibration values[1)]
< 6.3 Hz	Vibration displacement s ≤ 0.25 mm
6.3 to 63 Hz	Vibration velocity v_{rms} ≤ 7.1 mm/s
> 63 Hz	Vibration acceleration a ≤ 4.0 m/s²

Table 5-3 Maximum permitted axial vibration severity

Vibration velocity	Vibration acceleration
v_{rms} = 7.1 mm/s	a_{peak} = 3.55 m/s²

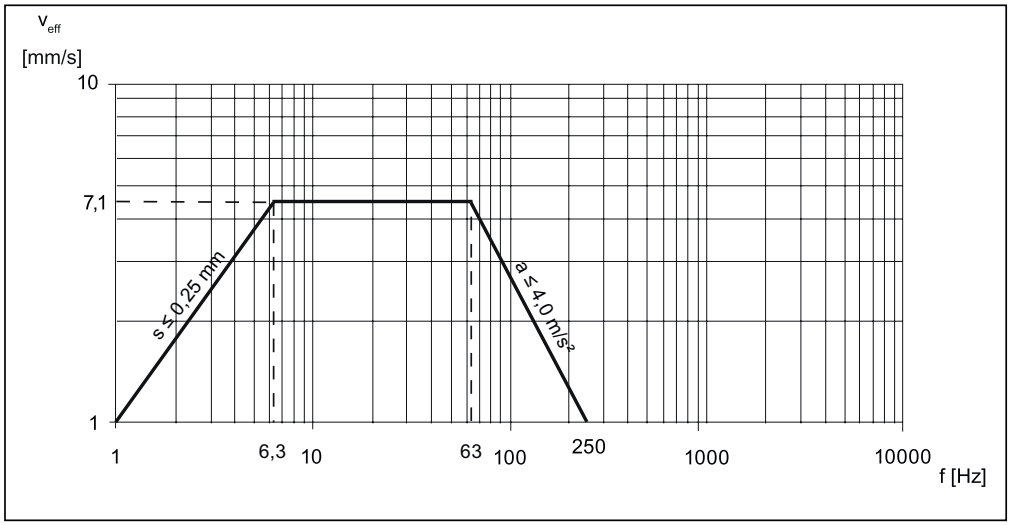


Figure 5-1 Max. permissible vibration velocity, taking into account the vibration displacement and vibration acceleration

To evaluate the vibration velocity, the measuring equipment must fulfill the requirements of ISO 2954.

The vibration acceleration must be measured as a peak value in the time range in a frequency band of 10 to 2000 Hz.

If excitation in excess of 2000 Hz (e.g. meshing frequencies) is to be expected, the measurement range must be adapted accordingly. This does not alter the maximum permissible values.

5.6 Aligning the machine

Vertical and horizontal alignment

The following measures are required in order to compensate any radial offset at the coupling and to horizontally adjust the electric motor with respect to the driven load:

- Place shims under the motor feet to position it vertically and to prevent stress/distortion. The number of shims should be kept as low as possible, so use as few thicker shims as possible, instead of several thinner shims.
- For horizontal positioning, push the motor sideways on the foundation Pay attention to maintaining the axial position.
- When positioning the motor, ensure that a uniform axial gap is maintained around the coupling.

Note

Alignment accuracy

Remember to take account of data concerning the alignment accuracy of the driven load and the coupling.

Alignment accuracy

1. Align the motors with coupling output 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.
2. Perform the fine adjustments with plates under the entire motor foot.

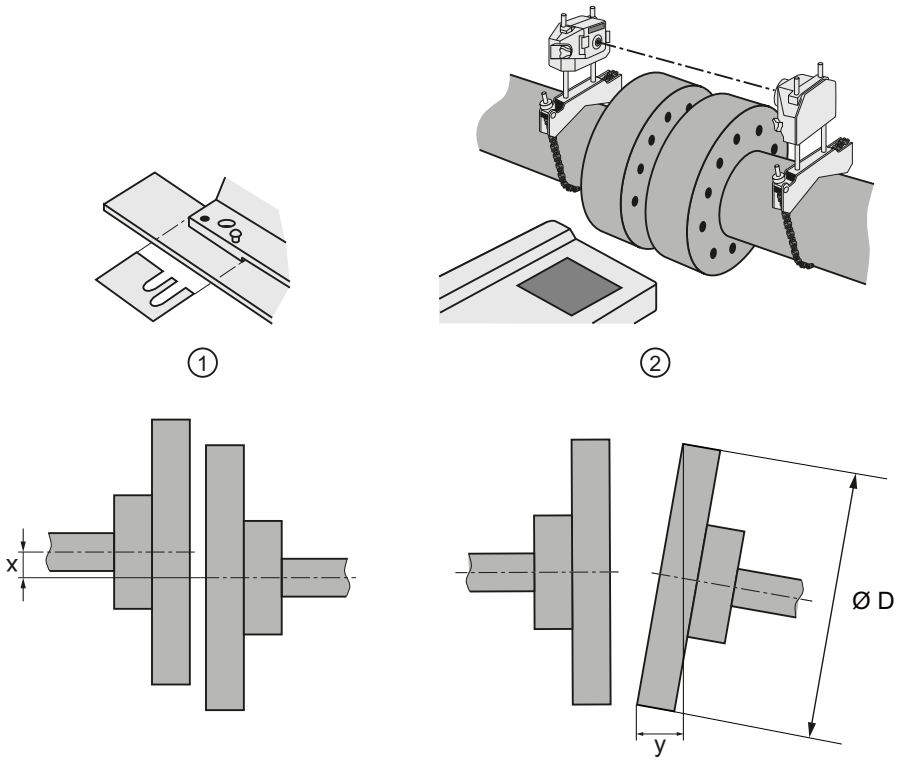


Figure 5-2 Aligning the machine

Table 5-4 Permissible deviations when aligning the motor

Permissible deviations	Radial shaft offset [x]	Axial shaft offset [y]
Flexible coupling	0.05 mm	0.05 mm

5.7 Securing the machine

Fixing by means of motor feet

- The contact surfaces of the motor feet must lie on one plane. If the motor needs to be aligned, position metal shims underneath the feet in order to prevent machine deformation. The number of shims should be kept as low as possible i.e. stack as few as possible.
- Select foot screws as per ISO 898-1 in compliance with the loading conditions and machine type:

- Use foot screws with a minimum property class of 8.8.
- Pin the mounting feet to the customer foundation for motors with types of construction B6, B7, B8, V5 and V6.

Type	Foot screw size
1PH818.	M12
1PH822.	M16
1PH828.	M20

Flange mounting

The flange is only used to transfer the torque. Due to the empty weight or as a result of vibrations that arise if the flange is too soft, the motor can be damaged if it is only fastened via the flange.

1. Fasten the flange-mounted motors via a stable motor suspension and support them via the end shield feet (foot flange type of construction).
2. During commissioning, ensure that the permitted vibration values are maintained in accordance with ISO 10816-3.
   If the motor is to be only flange mounted, then the maximum speed n_{max} is reduced for rigid foundations according to the following table:

Type	Maximum speed n_{max}
1PH818.	3000 $^{1}/_{min}$
1PH822.	2500 $^{1}/_{min}$
1PH828.	2000 $^{1}/_{min}$

Maximum speed for a rigid foundation and flange mounting

See also

Tightening torques for screw and bolt connections (Page 137)

5.8 Mounting the output elements

Balance quality

The rotor is dynamically balanced. For shaft extensions with featherkeys, the balancing type is specified using the following coding 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 5-3 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.
  - 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 output element is mounted up to the shaft shoulder for motors with full-key balancing "F", or if the output element is longer than the motor shaft extension, then when balancing the coupling or belt pulley, take into account that the feather key does not completely fill the slot in the hub.

⚠ 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.

- 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".

Note

Type of balancing

In the case of shaft extensions with feather keys, the type of balancing is also included on the rating plate next to the CE mark.

5.9 Open the water drain holes (option L12)

For types 1PH818. and 1PH822., a water drain hole with plugs is available in the DE and NDE bearing shields. For type 1PH828., there are water drain holes without plugs at the DE and NDE.

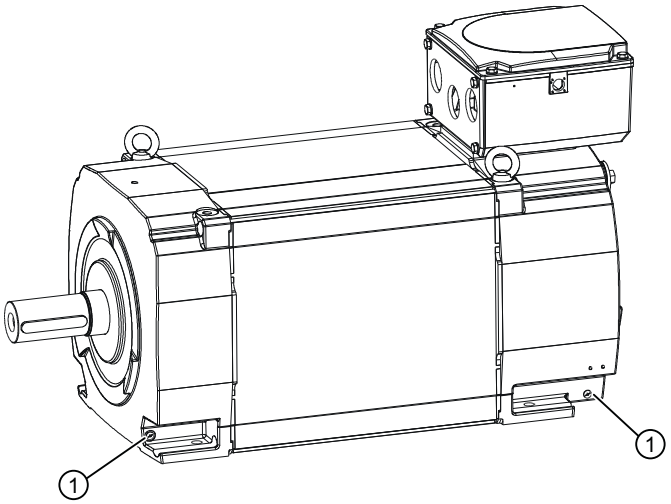


Figure 5-4 Water drain hole (type 1PH818., 1PH822.)

- Make sure that the condensation can always drain away freely.
- The plug that has been inserted into the water drainage holes allows the condensation to drain away. Do not remove the plug, otherwise the machine's degree of protection will be affected.
- If you have any questions, contact the Siemens Service Center.

NOTICE
Damage due to condensation If the stator winding is damp, its insulation resistance is reduced. This results in voltage flashovers that can destroy the winding. Condensation can also cause rusting inside the machine. Make sure that the condensation can always drain away freely.

5.10 Refitting the external fan

Subsequently moving the external fan from NDE to DE or vice versa must only be carried out by qualified personnel or a Siemens Service Center (Page 135).

Electrical connection

6

When carrying out any work on the machine, observe the general safety instructions (Page 15) 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 135).

NOTICE

Electrostatically sensitive devices

The DRIVE-CLiQ interface contains components that are susceptible to electrostatic charging. Touching connections with electrostatically charged hands or tools can cause malfunctions.

Maintain the ESD protective measures (Page 18) as well as the five safety rules (Page 15).

6.1 Connect the ground conductor to the motor

The grounding conductor of the motor must be in full conformance with the installation regulations, e.g. in accordance with IEC/EN 60204-1.

- Connect the ground conductor to the end shield of the motor. There is a fixing lug ① for the ground conductor at the designated connection point.
  - The fixing lug ① is suitable for grounding high-frequency currents using HF ribbon cable with appropriately formed conductor ends.

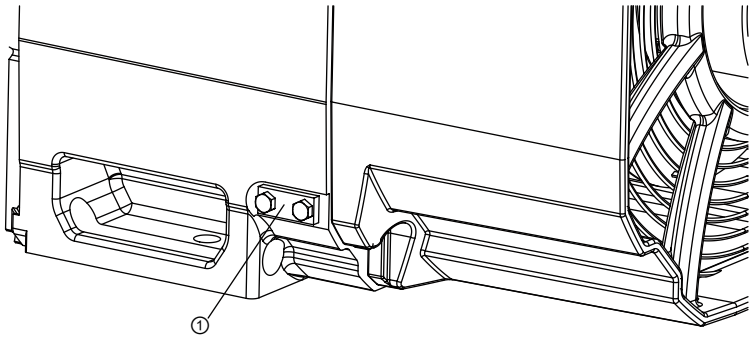


Figure 6-1 Detailed view: Connection point ① for ground conductor

- When making connections, ensure the following:
  - the connecting surface is bare and protected against corrosion using a suitable substance, e.g. acid-free Vaseline
  - the flat and spring washers are located under the bolt head.

6.2 Circuit diagram

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

6.3 Terminal designation

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

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

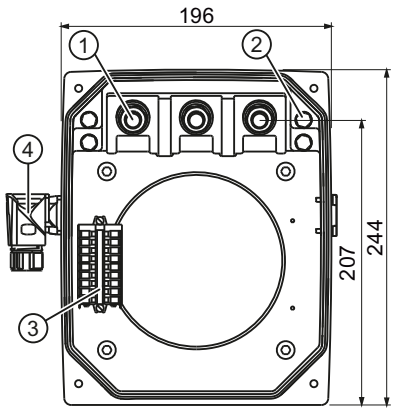
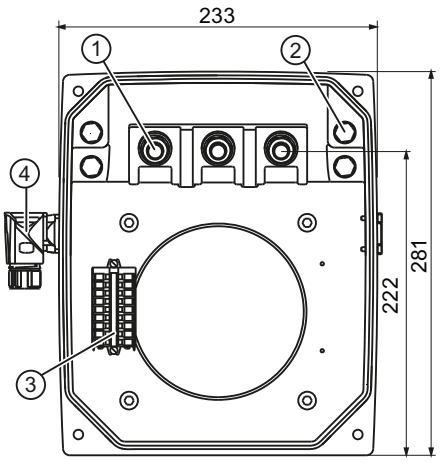
1	U	1	-	1	Designation
x					Index for pole assignment for pole-changing machines where applicable. A lower index signifies a lower speed. Special case for split winding.
	x				Phase designation U, V, W
		x			Index for winding start (1) or end (2) or if there is more than one connection per winding
	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

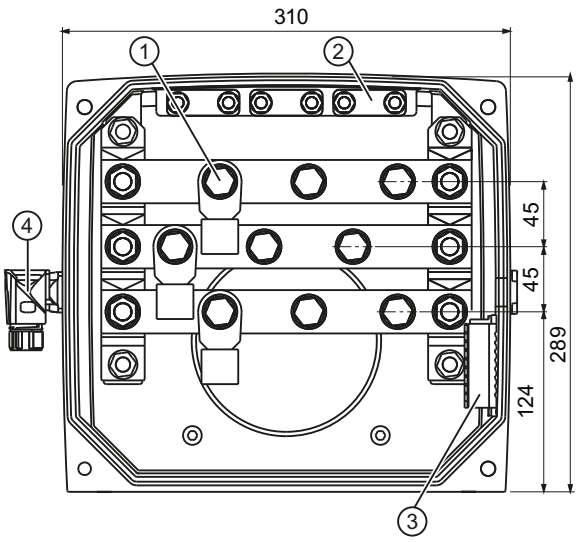
6.4 Laying cables

- Lay the cables in accordance with IEC/EN 60364-5-52.
- Use EMC cable glands for permanently installed entry fittings. Screw the EMC cable glands into the threaded holes in the entry plate, which can be unscrewed.
- Use shielded cables whose shields are conductively connected to a large area of the terminal box of the motor via EMC cable glands.
- Arrange the exposed connecting cables in the terminal box so that the PE conductor has excess length and the insulation of the cable strands cannot be damaged.
- Close off unused bushings with a metal threaded plug. This is the way to achieve a high frequency-proof shielding.

6.5 Electrical connection data

Cable entry and technical connection data depend on the mounted terminal box. You can find more information on the terminal box that is mounted in the ordering documentation or in the catalog.

	
1XB7 322	1XB7 422



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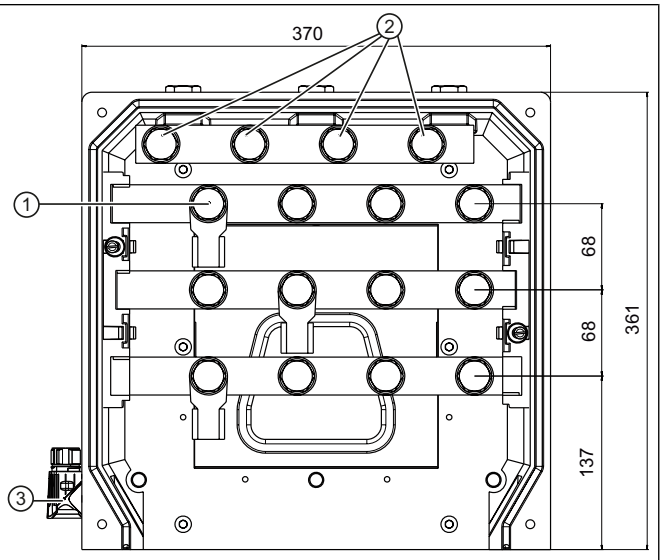


1XB7 712 (*)

① main terminal	③ signal connection terminal
② ground terminal	④ signal connection

Table 6-2 Data for electrical connection

Terminal box type	1XB7 322	1XB7 422	1XB7 700	1XB7 712 (*)
Cable entry	2 x M50 x 1.5	2 x M63 x 1.5	3 x M75 x 1.5	4 x M75 x 1.5
Max. poss. cable outer diameter	38 mm	53 mm	68 mm	68 mm
Number of main terminals	3 x M12	3 x M12	3 x 3 x M12	3 x 4 x M16
Max. cross-section per terminal	2 x 50 mm^2	2 x 70 mm^2	3 x 150 mm^2	4 x 185 mm^2
Max. current per terminal ①	210 A	270 A	700 A	1150 A
Number of ground terminals	4 x M6	4 x M8	Terminal strip	4 x M16

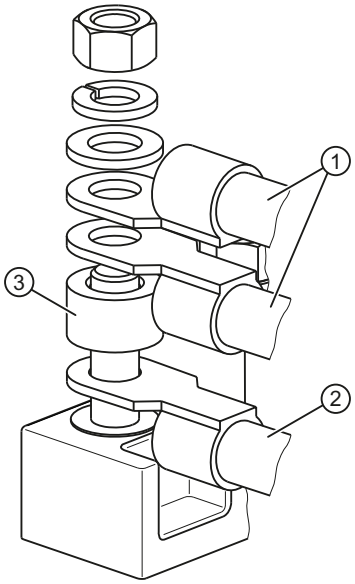
① Current carrying capacity based on IEC / EN 60204-1 or IEC / EN 60364-5-32

6.6 Connection with cable lugs

1. To connect the cables to the main terminals, select cable lugs that match the necessary cable cross-section and appropriate screw size.
   The connectable cable cross section is determined by the cable lug size for example.
   - Cable lug in accordance with DIN 46234 from 35 mm^2 to 185 mm^2,
   - Cable lug in accordance with DIN 46235 from 35 mm^2 to 185 mm^2.
     Observe the possible outer diameter of the connecting cable in the chapter entitled "Electrical connection data".
     Connect only one conductor per cable lug.
2. Remove the insulation from the conductor ends so that the remaining insulation is almost long enough to reach the cable lug.

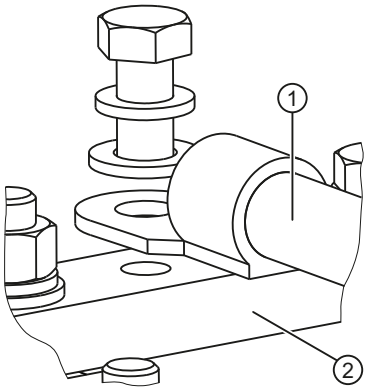
3. Fasten the cable lug to the end of the conductor correctly, e.g. by crimping.
4. If necessary, insulate the cable lugs in order to maintain the minimum clearances of 10 mm and the 20 mm creepage distance, which are normally available.
   The tightening torque for contact nuts and fixing screws depends on the size of the screw, see Case A in the table in Chapter Technical data (Page 137).

Connection using a cable lug at terminal boxes 1XB7 322 / 1XB7 422



① Customer connecting cable
② Internal motor connecting cable
③ Copper spacer ring

Connection using a cable lug at terminal boxes 1XB7 700 / 1XB7 712



① Customer connecting cable
② Connection bar

6.7 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.

NOTICE
Aluminum flow due to contact pressure 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. 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.

6.8 Stepless mating face for the seal in the terminal box cover

The sealing face of the terminal box cover is formed by the terminal box enclosure and the cable entry element. Therefore make sure these parts are correctly aligned, so as to ensure the seal and hence the degree of protection.

Align the cable entry support and the cable entry plate to the terminal box enclosure so that the sealing surface between the terminal box and the terminal box cover form a flat face. There must be no steps in the sealing area.

6.9 Completing connection work

1. Before closing the terminal box, please check that:
   - The electrical connections in the terminal box are tight and are in full compliance with the specifications above.
   - The required clearances in air of 10 mm are maintained.
   - Wire ends do not protrude.
   - The inside of the terminal box is clean and free of any cable debris.
   - All seals and sealing surfaces are undamaged.
   - The connecting cables are arranged so that they do not come into contact with the machine, and the cable insulation cannot be damaged.
   - unused entry points are sealed. The sealing elements are firmly screwed in, i.e. they can only be removed with a tool.
   - The cable/conductor glands are fitted compliant with the specifications regarding degree of protection, cable routing type, permissible cable diameter etc.
2. Then close the terminal box with the terminal box cover fixing screws.

See also

Technical data (Page 137)

6.10 Internal equipotential bonding

The internal equipotential bonding between the grounding terminal in the box enclosure and the motor frame is established through the terminal box retaining bolts. The contact locations underneath the bolt heads are bare metal and protected against corrosion.

The standard cover fixing screws are sufficient for equipotential bonding between the terminal box cover and terminal box housing.

Note

Connecting points are provided on the enclosure or end shield to allow an outer PE conductor or equipotential bonding conductor to be connected; see "Connecting the grounding conductor".

See also

Connect the ground conductor to the motor (Page 56)

6.11 Auxiliary circuits

6.11.1 Selecting cables

Take the following criteria into account when selecting the connecting cables for the auxiliary circuits:

- Rated current
- Rated voltage
- 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

6.11.2 Connecting an external fan

Preconditions

- Only use cables that comply with the relevant installation regulations regarding voltage, current, insulation material, and load-carrying capacity.
- Before connecting the device, make sure that the line voltage matches the device voltage.
- Check whether the data on the fan rating plate matches the connection data.
- Cable glands are not included in the scope of supply. Close unused cable entries, otherwise, the degree of protection is not maintained.

Type	Supply voltage	Current consumption
1PH818.	Single-phase, 1 AC 200 V … 277 V / 50 Hz, 60 Hz (± 10 %)	1.2 ... 0.88 A *
1PH822.	Single-phase, 1 AC 200 V … 277 V / 50 Hz, 60 Hz (± 10 %)	1.9 ... 1.35 A *
1PH828.	Three-phase, 3 AC 400 V / 50 Hz (± 10 %)	2.55 A
	Three-phase, 3 AC 400 V / 60 Hz (± 10 %)	2.50 A
	Three-phase, 3 AC 480 V / 60 Hz (± 10 %)	2.50 A

Connection values for external fans

* For EC fans for 1PH818. and 1PH822., as a result of the electronic input circuitry, the current drawn can briefly reach four times the specified current.

- The line voltage corresponds to the quality attributes laid down in DIN EN 50160 and the defined standard voltages laid down in DIN IEC 60038.

Procedure

1. Open the terminal box of the external fan and route the cables into it. The cables are not included in the scope of supply.
2. Connect the protective conductor (PE).
3. Connect the other cables to the relevant terminals, refer to the connection diagram in the terminal box.
   Connection cables must not be subject to excessive tensile stress.

Note

For fans equipped with EC motor, the fan motor starts with a delay after the line voltage is connected.

Protection against humidity

Protect the external fan against moisture. Water must not be allowed to run along the cables and into the terminal box of the external fan.

- Use suitable cables at the connection cable gland on the terminal box.
- Attach the terminal box cover of the external fan orrectly and completely.

⚠ WARNING

Voltages at the internal motor connections

The motor may continue running, e.g. due to airflow, or may run on after being shut down. This means that dangerous voltages of over 50 V can occur at the internal motor connections. This can result in death, serious injury or material damage.

- For safety reasons, it is not permissible to make any unauthorized modifications or changes to the fan.
- Wait until the external fan has come to a standstill before approaching it.
- Provide a protective circuit that prevents the main motor from being switched on when the external fan is not in operation.
  - After a power failure or when the power has been disconnected, the external fan starts up automatically again when the voltage is restored.
  - The external fan can automatically switch on and switch off as a result of its inherent function.

See also

Operating instructions of the EC external fan (Page 167)

Connecting an external fan (type 1PH818., 1PH822.)

The external fan is connected in the external fan terminal box. If necessary, you can rotate the external fan through 90°.

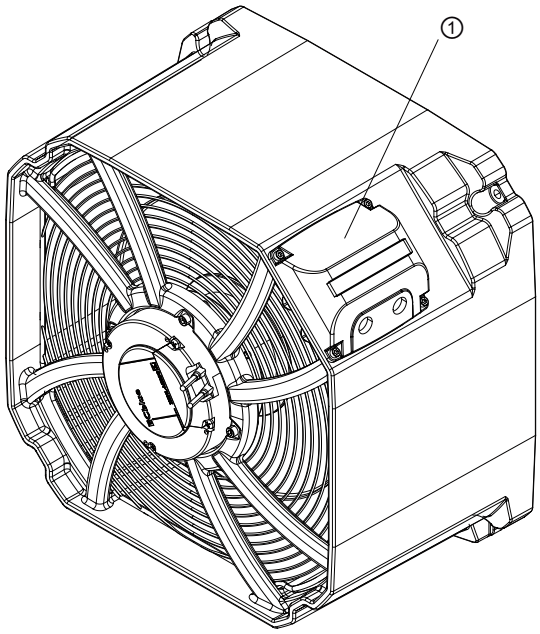


Figure 6-2 External fan terminal box ① (schematic representation)

NOTICE
Rotating the external fan
If you rotate the external fan through 90°, then it is not permissible that the cable outlet faces upwards. Water that accumulates at the cable glands can result in a short circuit.
Rotate the terminal box cover of the external fan through 180°.

6.11.3 Connecting an external fan (option L75)

The external fan has a terminal box that is mounted on the external fan motor.

	Air flow direction	3 AC 400 V / 50 Hz (± 10 %)	3 AC 400 V / 60 Hz (1) (± 10 %)	3 AC 480 V / 60 Hz (1) (+5 %, - 10 %)	Sound pressure level LpA (1 m) Motor + external fan unit 50 Hz operation Tolerance + 3 dB Rated pulse frequency 2 kHz	Air flow rate at 50 Hz, approx.
		[A]	[A]	[A]	[dB]	[m³/s]
1PH8 forced ventilation, degree of protection IP55, L75						
1PH818.-...0.-...1-Z 1PH818.-...1.-...1-Z	DE → NDE NDE → DE	2,4	2,4	2,3	76 (2)	0,17

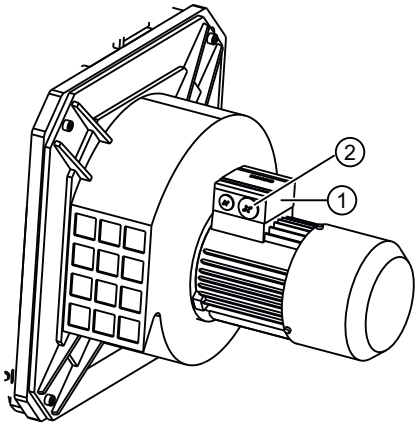
	Air flow direction	3 AC 400 V / 50 Hz (± 10 %)	3 AC 400 V / 60 Hz (1) (± 10 %)	3 AC 480 V / 60 Hz (1) (+5 %, - 10 %)	Sound pressure level LpA (1 m) Motor + external fan unit 50 Hz operation Tolerance + 3 dB Rated pulse frequency 2 kHz	Air flow rate at 50 Hz, approx.
		[A]	[A]	[A]	[dB]	[m³/s]
1PH822.-...0.-...1-Z 1PH822.-...1.-...1-Z	DE → NDE NDE → DE	2,4	2,4	2,3	76 (2)	0,31
1PH8 open-circuit ventilation, degree of protection IP23, L75						
1PH818.-...3.-...1-Z 1PH818.-...4.-...1-Z	DE → NDE NDE → DE	2,4	2,4	2,3	76 (3)	0,21
1PH822.-...3.-...1-Z 1PH822.-...4.-...1-Z	DE → NDE NDE → DE	2,4	2,4	2,3	76 (3)	0,33

(1) 60 Hz operation only permissible with throttle plate

(2) Speed ranges: 1PH818. up to 5000 rpm, 1PH822. up to 3500 rpm

(3) Speed ranges: 1PH818. up to 3000 rpm, 1PH822. up to 2000 rpm

1. Connect the power supply in the terminal box. The terminal diagram is in the terminal box cover.



① Terminal box of the external fan

② Cable entry

NOTICE

Incorrect direction of rotation

The external fan is only suitable for one direction of rotation. Operation with the wrong direction of rotation can destroy the motor.

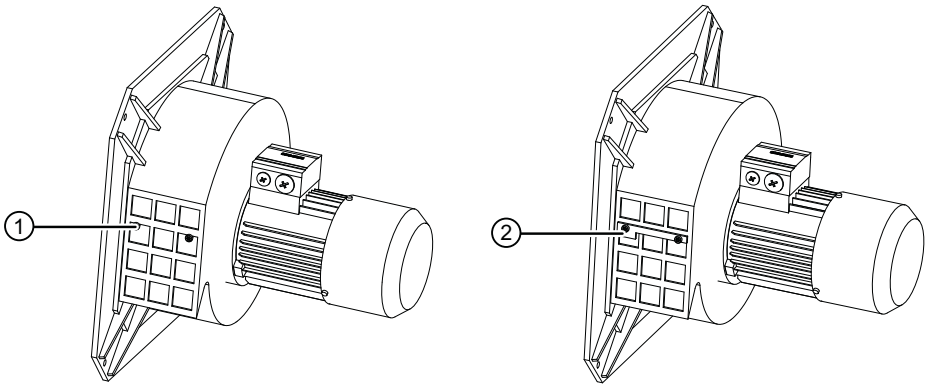
- If necessary, change the direction of rotation by interchanging two phase conductors in the terminal box. The direction of rotation arrow and the direction of rotation of the fan impeller can be seen at the rear of the fan.

6.11.4 Throttle plate for operation at 60 Hz (option L75)

When operated from a 60 Hz line supply, you require the air discharge throttle plate provided in the terminal box.

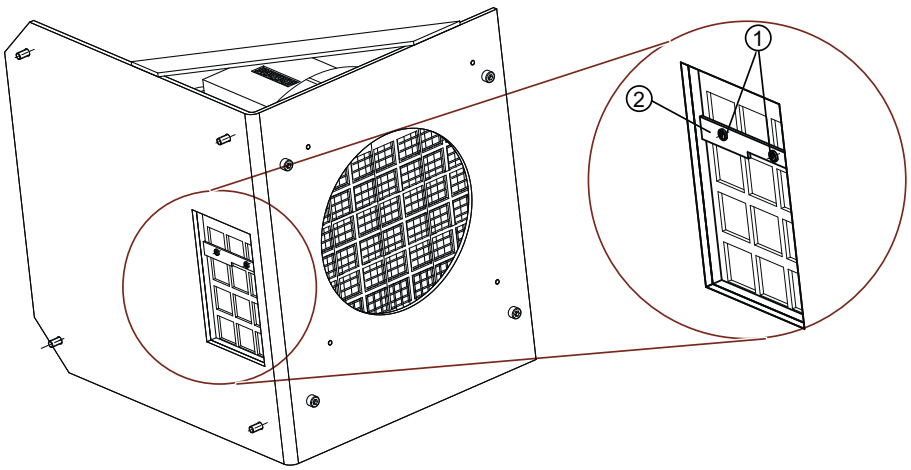
NOTICE
Operation at 60 Hz The external fan motor can be damaged if it is operated on a 60 Hz line supply without air discharge throttle plate.

- Screw the air discharge throttle plate ② to the air discharge mesh.



① Fixing screws for air discharge throttle metal plate
② Air discharge throttle metal plate

Figure 6-3 Throttle plate for suction-type ventilation (DE to NDE)



① Fixing screws for air discharge throttle metal plate
② Air discharge throttle metal plate

Figure 6-4 Throttle plate for forced-draft ventilation (NDE to DE)

6.11.5 Connecting the speed encoder

The speed encoder is connected at the terminal box using a plug connection ①. This is located on the terminal box enclosure.

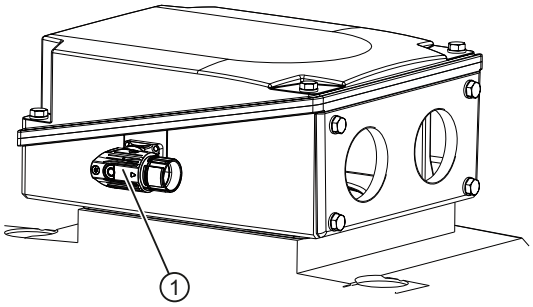


Figure 6-5 Detailed view: Plug-in connection

Note

The plug-in connection may differ from the standard layout in the case of special orders. For versions without speed encoder, connection thread M16x1.5 is located here.

Connecting a speed encoder via DRIVE-CLiQ

The signal connection between the motor and the converter is established via the DRIVE-CLiQ cable MOTION-CONNECT.

- Always use prefabricated cables from Siemens. These cables reduce the mounting/ installation time and costs and increase operational reliability.
- Push the connector of the DRIVE-CLiQ cable into the socket until the catch spring latches into place. Pay attention to the coding of the connector.

Cable outlet directions

The sensor module is mounted on the motor terminal box. The sensor module can be rotated through approximately 235°. You can change the cable outlet directions by rotating the sensor module, as shown in the diagram below.

NOTICE
Damage to the sensor module
You can damage the sensor module if you turn it with a pipe wrench, a hammer, or similar tools.
Turn the sensor module by hand. The typical torque is approx. 4 ... 8 Nm.

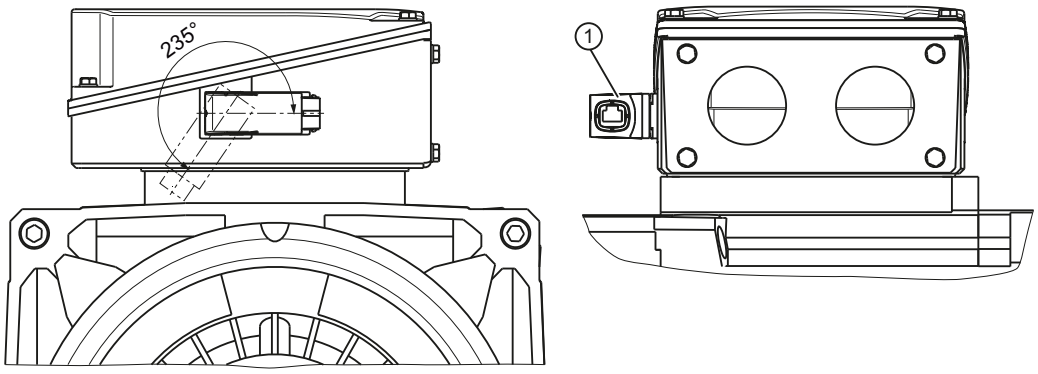


Figure 6-6 Sensor Module ① mounted on the terminal box

NOTICE
Modifying the cable outlet direction Changing the cable outlet direction by any improper means will damage the connecting cables. The permissible rotation range must not be exceeded. A maximum of ten changes to the rotation angle of the Sensor Module are permissible within the rotation range.

6.11.6 Connect the holding brake

Information for electrically connecting the holding brake can be found in the operating instructions supplied by the manufacturer in the appendix.

6.11.7 Connecting the temperature sensor

- The temperature sensor is connected to the signal connector together with the speed encoder signal.
- For the version without speed encoder, the temperature sensor is connected at the terminal strip.
- The motor has a reserve temperature sensor, which is also connected at the auxiliary terminal strip. Reconnect the temperature sensor as needed, e.g. if the previous temperature sensor fails.

⚠ WARNING

Hazard due to electric shock

The installation of the temperature sensors for the winding monitoring with respect to the winding is implemented according to the requirements for basic insulation. The temperature sensor connections are located in terminal boxes, safe to touch, and have no protective separation. This is the reason that in the case of a fault, a hazardous voltage can be present at the measuring sensor cable. When touched, this can result in death, severe bodily injury and material damage.

- When connecting the temperature sensor to external temperature monitoring devices, when required, apply additional measures to fully comply with the requirement "Hazard due to electric shock", see IEC 60664-1 or IEC 61800-5-1.

6.11.8 Connection to a converter

Selecting and connecting the cable

- Use Motion Connect cables or symmetrically constructed, shielded cables to connect the motor to a converter. The cable shielding, made up of as many strands as possible, must have good electrical conductivity. Braided shields made of copper or aluminum are well suited.
- The shield must be connected at both ends to the motor and the converter; unshielded cable ends must be kept as short as possible.
- To ensure effective discharge of high-frequency currents, make the shield contact over the largest possible area, i.e. as a 360° contact on the converter and motor, e.g. using EMC glands at the cable entry points.

Measures to reduce bearing currents

To specifically reduce and prevent damage caused by bearing currents, you must consider the system as a whole, which comprises the motor, converter, and driven machine. The following precautions help to prevent bearing currents:

- Setting up a properly meshed grounding system in the system as a whole, with low impedance for high-frequency currents
- No potential difference between the motor, converter, and working machine.
  - Use symmetrical, shielded connecting cables.
  - Connect the cable shield at both ends over the greatest possible surface area (360° contact).
  - Use equipotential bonding conductors between the motor and the driven machine as well as between the motor and the converter

- Use iron cores mounted above the motor connecting cable at the converter output. These help to reduce common-mode components. The Siemens sales representative is responsible for selection and dimensioning.
- Limit the voltage rate of rise by using an output filter to dampen harmonic components in the output voltage

6.11.9 Converter operation on a grounded network

NOTICE
Damage resulting from protective conductor currents When the machine is operated on a converter with current limiter, but without ground-fault monitoring, protective conductor currents of up to 1.7 times the external conductor current can arise if there is a ground fault on the output side. Neither the PE conductors of normally rated multi-core connecting cables nor the PE connecting points of normal terminal boxes are suitable for this purpose. Material damage can result. • Use an appropriately sized PE conductor. • Connect the PE conductor to the grounding terminal on the motor enclosure.

Commissioning 7

When carrying out any work on the machine, observe the general safety instructions (Page 15) and the specifications contained in EN 50110-1 regarding safe operation on electrical equipment.

7.1 Magnetic field when the brake is open

⚠ WARNING

Magnetic field when the holding brake is open

If the motor is equipped with a holding brake, then the shaft extension is magnetized when the holding brake is open, i.e. if a voltage is connected to it.

Magnetic objects will then be suddenly attracted as a result of this magnetic field. This can result in death, severe injury or material damage.

- Working close to the shaft extension is only permissible in exceptional, justified cases. Clear access rules must be applied and complied with corresponding to magnetic fields at the workplace. Clearly mark the boundaries of the areas where standing is permitted.
- People who need to use electronic or magnetic medical aids such as pacemakers, hearing aids, implants or similar devices, are at particularly high risk. Such persons must undergo an occupational health assessment.
- Observe the following measures.

Personal protective measures

- Ensure that you never wear or carry any of the following objects and that they are kept a safe distance from the machine:
  - All kinds of magnetic metal parts such as, keys, glasses, tools, knives, scissors, tape measures, etc.
  - Magnetic jewelry such as rings, chains, needles, watches, etc.
  - Electronic devices and data carriers such as service cards, check cards, credit cards, calculators, cell phones, etc.
  - Wallets or other iron-containing objects
  - Electrically conductive foreign bodies
- Do not use any magnetic tools or lifting devices.
- Wear only occupational safety items without magnetic metal parts, e.g. occupational safety shoes with non-magnetic protective caps and soles.
- Keep your shoes and clothing free from chips and waste containing iron.

- Exercise caution when installing accessories. Ensure that no parts fall into the inside of the machine.
- Do not perform any cutting at the machine, e.g. drilling threaded holes. Any exceptions require written approval from the manufacturer.

See also

The five safety rules (Page 15)

7.2 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 44)

NOTICE
Damage to the converter The electronics of the integrated converter can be destroyed when measuring the insulation resistance at the EC external fan with a voltage exceeding 305 V. • Do not measure the insulation resistance of the EC external fan. • More information can be found in the instructions of the EC external fan.

7.3 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.

- 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 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.

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.

See also

Set values for monitoring the bearing temperature (optional) (Page 76)

Converter operation

- If the design of the motor requires connection to a particular converter type, the rating plate will contain corresponding additional information.
- The converter is correctly parameterized. The parameterization data is specified on the rating plate of the machine. Information about the parameters is available in the operating instructions for the converter.
- Any supplementary motor monitoring devices and equipment have been correctly connected and are functioning correctly.
- In continuous operation, the motor cannot exceed the specified upper speed limit n_{max} or undershoot the lower speed limit n_{min}.
  The permissible acceleration time to the limit speed n_{min} depends on the parameter assignment.
- If the motor has been stored for more than two years in a dry, dust-free and vibration-free room, prepare for commissioning as follows:
  - Replace the rolling-contact bearings on motors with lifetime lubrication.
  - Replace the grease in motors with re-greasing system.
- If stored under less favorable conditions, replacement of bearings or re-greasing must be carried out after a storage period of approx. 18 months.
- Appropriately configured control and speed monitoring functions ensure that the 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 fitted are ready for operation and have been connected so that they rotate in the direction specified.
- The flow of cooling air is not impeded.

7.4 Switching on

- See the operating instructions of the frequency converter for switching on.
- Before you switch on the motor, ensure that the parameters of the frequency converter have been assigned correctly.
- Use appropriate commissioning tools, such as "Drive ES" or "STARTER".

NOTICE
Operation noise or abnormal noises The motor can be damaged by improper handling during transport, storage or set up. If a damaged motor is operated damage to the winding, bearings or, complete destruction of the motor can be the result. If the motor is not running smoothly or is emitting abnormal noises, de-energize it, and determine the cause of the fault as the motor runs down.

Maximum speed

The maximum rotational speed n_{max} is the highest permissible operating speed. The maximum rotational speed is specified on the rating plate.

7.5 Test run

After installation or inspection, carry out a test run:

1. Start up the machine without a load. To do this, close the circuit breaker and do not, if at all possible, switch off prematurely. Check whether it is running smoothly.
   Maximum number of permissible consecutive starts for machines on the power supply: Three cold / two warm
   The start conditions for converter machines can be found in the catalog.
   Switching the machine off again while it is starting up and still running at slow speed should be kept to a bare minimum, for example for checking the direction of rotation or for checking in general. Allow the machine to run down before switching it on again.
2. Continue to observe the machine for a while in no-load operation.

3. If it runs perfectly, connect a load.
   - Check whether it is running smoothly.
   - Read the values for voltage, current, and output and log them.
   - If possible, read and log the corresponding values for the working machine.
   - If this is possible using the available measuring equipment, check the bearing and stator winding temperatures until they have reached steady-state values.
   - Check the machine for noise or vibrations on the bearings or bearing shields as it runs.
4. In case of uneven running or abnormal noise, switch off the machine. As the machine runs down, identify the cause.
   - If the mechanical operation improves immediately after the machine is switched off, then the cause is magnetic or electrical.
   - If the mechanical operation does not improve immediately after switching the machine off, then the cause is mechanical. For example, this can be caused by imbalance in the electrical machine or the driven load, inadequate alignment of the machine set, operation of the machine at the system resonance point (system = motor, base frame, foundation etc.).

NOTICE
Serious damage to the machine
The vibration values encountered during operation must be satisfied in accordance with DIN ISO 10816-3, otherwise the machine could be damaged or destroyed.
During operation, observe the vibration values in accordance with DIN ISO 10816-3.

7.6 Set values for monitoring the bearing temperature (optional)

Prior to commissioning

If the machine is equipped with bearing thermometers, set the temperature value for disconnection on the monitoring equipment before the first machine run.

Table 7-1 Set values for monitoring the bearing temperatures before commissioning

Set value	Temperature
Alarm	115 °C
Shutting down	120 °C

Normal operation

Measure the normal operating temperature of the bearings T_{op} at the installation location in °C. Set the values for shutdown and warning corresponding to the operating temperature T_{op}.

Table 7-2 Set values for monitoring the bearing temperatures

Set value	Temperature
Alarm	$T_{operation}$ + 5 K ≤ 115 °C
Shutting down	$T_{operation}$ + 10 K ≤ 120 °C

Operation 8

When carrying out any work on the machine, observe the general safety instructions (Page 15) and the specifications contained in EN 50110-1 regarding safe operation on electrical equipment.

8.1 Safety guidelines in operation

⚠ WARNING

Live parts

Terminal boxes contain live electrical parts. If you open the terminal box cover, this can result in death, serious injury or material damage.

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.

⚠ WARNING

Rotating and live parts

Rotating or live parts are dangerous. If you remove the required covers, this can result in death, serious injury or material damage.

Any covers that prevent live electrical or rotating parts from being touched, 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.

⚠ WARNING

Fire hazard resulting from hot surfaces

Certain parts of the machine become hot during operation. Severe burns can result from contact with these parts.

- Check the temperature of parts before touching them. If required, apply suitable protective measures.
- Allow the machine to cool before starting work on the machine.

⚠ WARNING

Faults in operation

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.

- Immediately inform the maintenance personnel.
- If you are in doubt, immediately switch off the motor, being sure to observe the system-specific safety conditions.

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.

Make sure that any condensation can drain away freely.

See also

Open the water drain holes (option L12) (Page 53)

NOTICE

Periodic duty

In all of the operating modes, always operate the external fan according to DIN EN 60034-1. For non-periodic operation, it is possible that the machine is thermally overloaded. This can result in damage to the machine.

- In the case of extended non-operational periods, the fan should be in operation until the machine has approximately reached the temperature of the coolant, see S2 duty type in DIN EN 60034-1.
- Use a suitable circuit to ensure that the external fan is appropriately operated.

NOTICE

EC fan control via an input signal

The fan motor can overheat if the EC fan is operated at low fan speeds as a result of the setpoint signal it receives.

- Monitor the motor using the integrated temperature sensors.
- Connect the temperature monitoring into the interlocking circuit.

8.2 Switching on the machine

- After starting the motor, observe it for a while to see if it is running smoothly and check the monitoring devices.
- Monitor operation and the monitoring devices regularly and record the values you read off.

NOTICE
Speed monitoring The motor is designed for a certain speed range. If a motor is operated at impermissible speeds damage to the winding, bearings, or complete destruction of the motor can be the result. Ensure that the speeds specified on the rating plate are not exceeded by appropriately configuring controller and speed monitoring components.

8.3 Switching-off force-ventilated motors

- When switching-off, also observe the converter operating instructions.
- Switch off the external fan during longer standstill periods. Leave the fan on for approximately 30 minutes after switching off the motor to avoid overheating of the motor.
- If a standstill heating unit is available, switch it on.

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.

Measures for machines ready to operate during longer non-operational periods

- For longer periods when the machine is not being used, either energize it at regular intervals (roughly once a month), or at least spin the rotor.
- Please refer to the section"Switching on" (Page 75) before switching on to recommission the motor.

NOTICE
Damage due to improper storage The machine can be damaged if it is not stored properly. If the motor is out of service for extended periods of time, implement suitable anti-corrosion, preservation, and drying measures. When recommissioning the motor after a long period out of service, carry out the measures recommended in the chapter entitled "Commissioning (Page 71)".

8.5.1 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.

8.5.2 Measurement of the insulation resistance after an extended stoppage

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"

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 at force-ventilated motors

Note

When operating the machine with a converter, also refer to the operating instructions of the frequency converter if electrical faults occur.

Table 8-1 Electrical faults

↓ Motor fails to start								
	↓ Motor accelerates sluggishly							
		↓ Humming noise when starting						
			↓ Humming noise in operation					
				↓ High temperature rise during no-load operation				
					↓ High temperature rise under load			
						↓ High temperature rise of individual winding sections		
							Possible causes of faults	Remedial measures
X	X		X		X		Overload	Reduce the load.
X							Interruption of a phase in the supply cable	Check frequency converters and supply cables.
	X	X	X		X		Interruption of a phase in the supply after switching on	Check frequency converters and supply cables.
	X	X	X			X	Winding short circuit or phase short circuit in stator winding	Determine the winding and insulation resistances. Contact the Service Center.
				X			Converter output voltage too high, frequency too low	Check the settings at the frequency converter and perform the automatic motor identification.
					X		External fan is not running	Check the external fan and its connections.
					X		Reduced air intake	Check the air ducts; clean the machine.

8.8.3 Mechanical faults

The following table shows the possible causes of and remedial measures for mechanical faults.

Table 8-2 Mechanical faults

↓ Grinding noise					
	↓ Overheating				
		↓ Radial vibrations			
			↓ Axial vibrations		
				Possible causes of faults	Remedial measures
X				Rotating parts are grinding	Establish the cause and realign the parts.
		X		Rotor not balanced	Decouple the rotor and then rebalance it.
		X		Rotor out of true, shaft bent	Contact the Service Center.
		X	X	Poor alignment	Align the machine set and check the coupling. [1)]

↓ Grinding noise					
	↓ Overheating				
		↓ Radial vibrations			
			↓ Axial vibrations		
				Possible causes of faults	**Remedial measures**
		X		Coupled machine not balanced	Rebalance the coupled machine.
			X	Shocks from coupled machine	Examine the coupled machine.
		X	X	Resonance of the overall system comprising motor and foundation	Reinforce the foundation after prior consultation with the Service Center.
		X	X	Changes in foundation	Determine the cause of the changes and, if necessary, rectify. Realign the machine.
	X			Reduced air supply, direction of rotation of fan possibly incorrect	Check the air ducts; clean the machine.
		X	X	Uneven gearbox operation	Resolve any gearbox faults.

[1] Take into account possible changes which may occur during overheating.

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 Holding brake faults

Information on holding brake faults can be found in the manufacturer's operating instructions in the (Page 145) appendix.

Maintenance 9

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 and the specifications contained in EN 50110-1 regarding safe operation on electrical equipment.

Note

Service Center

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

9.1 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.

9.2 Component operating instructions

When carrying out any maintenance and repair work, always carefully observe the manufacturer's operating instructions for additional components.

See also

Operating instructions, holding brake (Page 145)

Operating instructions of the EC external fan (Page 167)

9.3 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.

- 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.

9.3.1 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.

9.3.2 Initial inspection

Perform the following checks after approximately 500 operating hours or at the latest after six months:

Table 9-1 Checks after installation or repair

Check	When the motor is running	At stand-still
The electrical parameters are maintained.	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 running or at a standstill.

Additional checks may also be required according to the system-specific conditions.

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

9.3.3 Main inspection

- While the motor is running, check that:
  - The stated electrical characteristics are being observed
  - The smooth running characteristics and machine running noise have not deteriorated
- Once the machine has been shut down, check that:
  - The motor foundation has no indentations or cracks
  - The machine is aligned within the permissible tolerance ranges
  - All the fixing bolts/screws for the mechanical and electrical connections have been securely tightened
  - The winding insulation resistances are sufficiently high
  - Any bearing insulation has been fitted as shown on plates and labeling.
  - Cables and insulating parts and components are in good condition and there is no evidence of discoloring

NOTICE
Deviations from the normal state If you detect any defects or malfunctions during the inspection, you must rectify them immediately. They may otherwise cause damage to the machine.

9.3.4 Rolling-contact bearing inspection

Inspections in the event of faults

Perform an inspection immediately in the event of faults or exceptional operating conditions indicating an electrical or mechanical overload, e.g., overload, short circuit.

Regreasing intervals

NOTICE

Observe the regreasing intervals for the rolling-contact bearings

The regreasing intervals for roller bearings are different from the servicing intervals for the machine. Failure to regrease the rolling-contact bearings at the specified intervals can result in them sustaining damage. Comply with the regreasing intervals for roller bearings, the regreasing intervals are specified on the lubricant plate.

9.3.5 Changing bearings when using permanently lubricated rolling-contact bearings

The replacement of the permanently lubricated roller bearing is determined by the number of operating hours and is required around every three years.

9.3.6 Maintenance

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

⚠ 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.

- 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.

9.3.6.1 Measuring the insulation resistance during the course of maintenance work

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"

9.3.6.2 Maintenance intervals

Perform the following maintenance measures after the operating time or the intervals specified in the following table elapse.

Table 9-2 Maintenance measures

Maintenance measures	Maintenance intervals
Initial inspection	After 500 operating hours, at the latest after six months
Regreasing	See the lubricant plate
Permanent lubrication (with coupling output)	Replace bearings after approximately 20,000 operating hours, at the latest after three years
Cleaning	Depending on the degree of pollution
Main inspection	After approximately 16,000 operating hours, at the latest after two years

9.3.6.3 Rolling-contact bearings

The motors have rolling-contact bearing bushes for grease lubrication. Depending on the version, the motors are permanently lubricated or are equipped with a regreasing device.

Depending on the type of load, a deep-groove ball bearing or a cylindrical-roller bearing is fitted as a floating bearing on the drive end.

The DE bearing contains built-in compression springs that help to rebalance the axial play of the external bearing rings.

9.3.6.4 Lubrication

The specified grease data apply for the data specified on the rating plate data and for high-quality grease in accordance with the specifications in these operating instructions. These greases significantly exceed the requirements according to DIN 51825 and ISO 6743-9, therefore permitting the specified relubrication intervals.

Initial lubrication

For initial lubrication of the bearings (when delivered), the lubricating grease ESSO / Unirex N3 (standard version) or Lubcon / Sintono GPE702 (Performance version) is used.

Grease selection criteria

High qualityISO-L-X BDEA3 grease according to ISO 6743-9 and K3N-20 grease according to DIN 51825 with lithium soap as a thickener and an upper service temperature of at least +140 °C / +284 °F are permissible for standard applications without special requirements.

When selecting the lubricating grease, ensure that the technical data of the grease is suitable for the application.

The lubricating grease must satisfy the criteria listed in the table below and must match the operating conditions.

Table 9-3 Criteria for selecting roller bearing greases

Criteria	Standard	Property, characteristic value	Unit
Type of base oil	-	Mineral oil	-
Thickener	-	Lithium	-
Consistency according to NLGI class	DIN 51818	• 3 for vertical and horizontal types of construction • 2 alternatively for horizontal type of construction with reduced lubrication interval	-
Worked penetration	DIN ISO 2137	220–295	0.1 mm
Operating temperature range	-	At least -20 °C ... +140 °C	°C
Dropping point	DIN ISO 2176	At least +200 °C	°C
Basic oil viscosity	DIN 51562-1	• Approx. 100 mm²/s at 40 °C • Approx. 10 mm²/s at 100 °C	mm²/s
Additive	-	• Antioxidation (AO), Anti-Wear (AW) • No solid lubricants • Alternative: Extreme-pressure (EP) only after consultation with grease and bearing manufacturers	-
FE9 test: A/1500/6000	DIN 51821-1/-2	F10 ≥ 50 h at +140 °C F50 ≥ 100 h at +140 °C	h
Behavior with respect to water	DIN 51807	0 or 1 at a test temperature of +90 °C	-
Corrosive effect on copper	DIN 51811	0 or 1 at a test temperature of +140 °C	Corr.°
Resistance to corrosion (EMCOR)	DIN 51802 / ISO 11007	0 - 0 (0 - 1, permissible for special greases)	Corr.°
Solid matter content, particle sizes > 25 µm	DIN 51813	< 10 mg/kg	mg/kg
Suitability of bearings Speed characteristic nxdm	-	Suitable for the built-in motor bearings, seals and these speeds	- mm/min

If different special lubricating greases are stated on the lubricant plate, then different criteria apply.

NOTICE
Other ambient temperatures and operating conditions For other ambient temperatures and operating conditions, an alternative grease to the one stated on the lubricant plate may only be used after prior consultation with the manufacturer. Otherwise the roller bearing could be damaged.

NOTICE
Use of other greases If other greases are used, there can be no guarantee of compatibility with the overall system. Otherwise the roller bearing could be damaged. If you use greases that satisfy only the minimum requirements of DIN 51825 or ISO 6743-9, then reduce the lubrication intervals by half or appropriately adapt them. If in doubt, consult the manufacturer.

Recommended greases for roller bearings

For standard applications, the following high-quality greases are recommended for roller bearings for vertical and horizontal motor types of construction due to their technical properties:

Table 9-4 Roller bearing greases for vertical and horizontal types of construction

Manufacturer	Grease type
ExxonMobil	Unirex N3
Esso	
Fuchs	Renolit H443 HD88
Lubcon	Turmoplex 3
FAG	Arcanol Multi 3

For motors with a horizontal type of construction, you can alternatively use greases with NLGI Class 2. However, this reduces the lubrication interval by 20 %.

Table 9-5 Alternative greases with NLGI Class 2 for motors with a horizontal type of construction

Manufacturer	Grease type
ExxonMobil	Unirex N2
Esso	
Castrol	Longtime PD2
Lubcon	Turmogrease L 802 EP plus
Shell	Retinax LX2
FAG	Arcanol Multi 2

Table 9-6 Lubricating grease for the Performance version (Option L37)

Manufacturer	Grease type
Lubcon	Sintono GPE702

For the Performance version, only this special lubricating grease may be used.

NOTICE
Damage caused by mixing lubrication types
Mixing different greases adversely affects the lubricating properties and must therefore be avoided. Only the manufacturer can provide a guarantee as to whether certain greases can be mixed.

Regreasing

Regreasing data are stamped on the lubricant plate of the machine:

- Relubrication intervals in operating hours
- Regreasing amount in grams
- Grease type

Irrespective of the actual number of operating hours, the machine must be regreased every 12 months at the latest.

NOTICE
Relubrication intervals
The relubrication intervals for roller bearings are different from the servicing intervals for the machine. Failure to observe the relubrication intervals can result in damage to roller bearings.
Pay attention to the instructions on the lubricant plate.

Grease replacement intervals

The grease replacement intervals in these operating instructions or the relubrication intervals indicated on the plate apply for the following conditions:

- Normal load
- Operation at speeds in accordance with the rating plate
- Low-vibration operation
- Neutral ambient air
- High-quality roller bearing greases

In the case of unfavorable operating conditions, the relubrication intervals must be reduced after consultation with the manufacturer.

Regreasing

The shaft must rotate during regreasing, so that the new grease can be distributed throughout the bearing. For motors that are be operated with a converter, regreasing should be carried out at low-to-medium speed where possible (n_{min} = 250 rpm, n_{max} = 3600 rpm) to ensure an even distribution of grease.

⚠ WARNING

Rotating parts

When regreasing, pay attention to all rotating components. This can result in death, serious injury or material damage.

Clean the grease nipples before regreasing and then gradually press in an appropriate type and amount of grease, as described on the lubricant plate and by the specifications in these Operating Instructions.

The roller bearing temperature rises sharply at first, then drops to the normal value again after the excess grease has being expelled from the bearing.

The used grease collects outside each bearing in a spent grease chamber. If the specifications on the lubricant plate are observed, the spent grease chamber will provide capacity for a calculated service life of at least 20 000 operating hours (approx. 2.5 years).

Lubricating using the regreasing system

A flat grease nipple in accordance with DIN 3404, size M10x1, is provided at both the DE ① and the NDE ② for regreasing.

1. Clean the grease nipples at the DE and NDE.
2. Press in the type and quantity of grease specified (see lubrication instruction plate). The shaft should rotate so that the new grease can be distributed throughout the bearing. The bearing temperature rises sharply at first, then drops to the normal value again after the excess grease has been displaced out of the bearing.

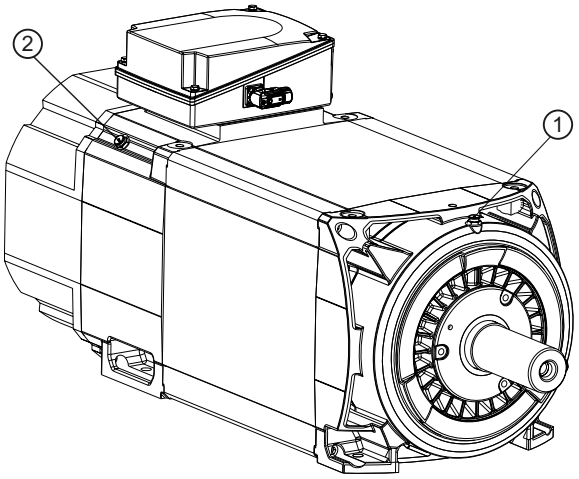


Figure 9-1 Flat grease nipples ① and ② (schematic representation for types 1PH818. and 1PH822.)

9.3.6.5 Cleaning the spent grease chamber

The rolling-contact bearing's spent grease chamber only has room for a limited amount of spent grease. When the spent grease chamber is full, the spent grease must be removed, otherwise it will penetrate into the interior of the machine. The information on the amount of grease to be used when regreasing can be found on the lubricant plate. When changing the bearings remove the spent grease that has collected in the spent grease chamber and in the outer bearing cover.

To remove the spent grease, proceed as follows:

1. Remove the transmission element.
2. Remove the spent grease:
   – At the DE, unscrew the outer bearing cover and empty the spent grease from the outer bearing cover.
   – At the NDE, remove the cover of the speed sensor and the cover of the spent grease chamber. Empty the spent grease chamber.

   Note

   For types 1PH818. and 1PH822., you must remove the fan before removing the speed encoder cover. At the NDE, remove the fan and then the speed encoder cover.

9.3.6.6 Cleaning the cooling air passages

- Regularly clean the cooling air passages through which the ambient air flows, e.g. using dry compressed air.

NOTICE
Cleaning intervals depend on the degree of fouling
The frequency of the cleaning intervals depends on the local degree of fouling. The machine will overheat if the cooling air ducts are polluted and the cooling air cannot flow without obstruction.
Regularly check for pollution, and clean the cooling air ducts through which the ambient air flows.

9.3.6.7 Servicing the external fan

Servicing the external fan

- Check the external fan every 12 months for mechanical vibrations as specified in DIN ISO 10816. The maximum permissible vibrational severity is 2.8 mm/s measured on the end shield of the impeller-side motor bearing.
- Regularly clean and inspect the fan. Impeller and frame are subject to natural wear depending on the area of application and displacement medium.

⚠ WARNING

Impeller can crack

Due to deposits and the resulting imbalance there is a hazard of fatigue fracture of the impeller. The impeller can crack in operation. Death, serious injury, or material damage can result.

Regularly clean and inspect the fan.

⚠ WARNING

Voltages at the internal motor connections

The motor may continue running, e.g. due to airflow, or may run on after being shut down. This means that dangerous voltages of over 50 V can occur at the internal motor connections. Death, serious injury, or material damage can result.

- For safety reasons, it is not permissible to make any unauthorized modifications or changes to the fan.
- The external fan can automatically switch on and switch off as a result of its inherent function.
- After a power failure or when the power has been disconnected, the external fan starts up automatically again when the voltage is restored.
- Wait until the external fan has come to a standstill before approaching it.
- Provide a protective circuit that prevents the main motor from being switched on when the external fan is not in operation.

Clean the external fan

⚠ WARNING

Danger of shearing

Death, severe injury and material damage can occur if you come into contact with the rotating fan impeller.

- The fan impeller must be stationary when carrying out any work on the external cooling system.
- Interrupt/disconnect the external cooling unit circuit.
- Lock out the circuit so that it cannot be switched on again.

NOTICE
Applying force If excessive forces are present, this can damage the fan impeller.

- Use a suitable cloth or brush to clean the external fan, ensuring that moisture does not enter the motor.
- Once the voltage has been disconnected on all poles, wait for five minutes before touching the device.
- Never open the external cooling unit during operation.
- Never loosen any fixing screws for the external cooling unit during operation.

Changing the filter mat of the external fan (option)

Check the state of the filter mat regularly depending on the prevailing conditions. Change it if it is dirty.

⚠ CAUTION
Changing the filter only when the fan is stationary When the mesh is removed, the degree of protection is no longer guaranteed. There is a risk of injury. Only change the filter when the fan is stationary.

1. Unscrew the fan guard and remove the old filter mat.
2. Insert the new filter mats and screw the fan guard back into position.

You can order the filter mat as a spare part.

- Spare parts, external fan (Page 120)
- Spare parts kits (Page 117)
- Ordering spare parts via the Internet (Page 118)

9.3.6.8 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.
- Replace the damaged components if necessary.

⚠ WARNING

Short-circuit hazard

Damaged components can cause short circuits, possibly resulting in death, serious injuries and property damage.

Replace damaged components.

9.4 Repair

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.

Note

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

9.4.1 Prepare servicing work

- The drawings and parts lists do not contain any detailed information about the type and dimensions of fixing elements and components. For this reason, you should establish this information when dismantling them and make a note of it for the purpose of reassembly.
- Document the type, dimensions and arrangement of the parts so that you will be able to reassemble the machine to its original state.
- Use suitable tools to disassemble the machine.
- Take measures to prevent parts from dropping down before you dismantle them, e.g. by replacing fastening elements with extra-long screws, threaded bolts or similar. This ensures that the part is supported after it is pulled off.
- The centerings in the shaft extensions have reset threads. Use lifting gear which is suitable for the rotor weight and direction of loading.

⚠ WARNING

Rotor can fall down

Eyebolts in accordance with DIN 580 are unsuitable for suspending the rotor. The rotor can fall off. This can result in death, serious injury or material damage.

Use lifting gear which is suitable for the rotor weight and direction of loading.

⚠ WARNING

Machine damage caused by improper repair work

Improper servicing work can damage the machine. This can cause damages and/or faults which can result in eventual or immediate death, serious injury, or property damage.

- Properly assemble or disassemble the machine.
- Use only suitable tools and equipment.
- Immediately replace damaged components.
- Contact the Service Center, if necessary.

9.4.2 Disassembling the machine

The drawings and parts lists do not contain any detailed information about the type and dimensions of fixing elements, etc.

NOTICE

Removing centered parts

Centered parts can be damaged if removed improperly with unsuitable tools.

Use pullers or suitable devices to remove parts and components attached to the motor shaft.

Disassembly

1. Ensure you do not damage insulation when dismantling the device. Check the insulation for possible damage prior to re-installing.
2. To disassemble the motor, disconnect the connecting cables from the terminals and the entry plate from the terminal box housing.
   In this way, the respective positioning of the cables in relation to one another and the sealing of the cables in the cable entries are maintained to a large extent.
3. Remove the connecting cables in the terminal box of the fan motor, and if necessary the cable on the ground terminal and the cables laid out on the motor.
4. Pull out the connector of the speed sensor.

Links

The circuit diagram shows the relationships required when connecting to the line supply.

Component assignment

When dismantling or assembling the bearing pay attention to the proper arrangement of the components particularly if the bearing is the same size on the DE side and NDE side, for example:

- Bearing shield
- Bearings
- Compression springs
- Spacer washers,
- Covers with different centering length, etc.

If roller-contact bearings with an insulated design are installed, use roller bearings of the same type as spare parts. This will prevent any bearing damage being caused by bearing currents.

9.4.3 Removing and installing the protecting ring

The protecting ring acts as an outer bearing seal. It sits on the shaft outside the bearing end shield.

Disassembly

- Once the coupling is detached, you can remove the protective ring from the shaft. After it has been removed, the protective ring will be deformed and must be replaced.

Assembly

- Push the protecting ring over the end of the shaft.
- For 1PH818. or 1PH822. motors, ensure that the outer collar is placed with a space of 1 mm from the bearing end shield (detail Z).

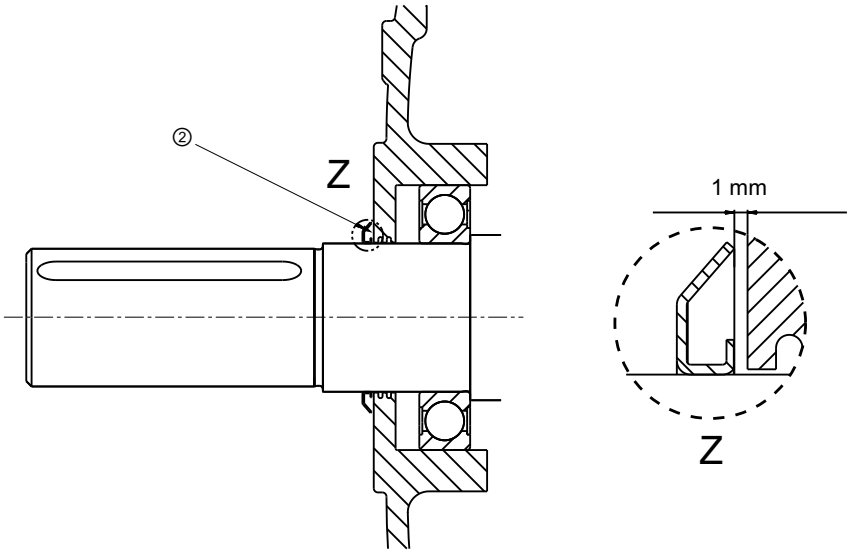


Figure 9-2 Fitting the protecting ring

9.4.4 Removing and mounting the bearing shields

1. Unscrew the belt pulleys. The belt pulleys may be jammed or distorted, in which case you should lever them off carefully.
2. Remove the bearing shield.
   When removing the bearing shields, take care that the windings are not damaged.

For assembly, proceed in reverse order.

9.4.5 Installing the machine

Strictly ensure the greatest possible care and cleanliness when repairing the machine.

Mount the machine on an alignment plate. This ensures that the contact surfaces of the motor feet are all on the same level.

NOTICE
Do not damage windings Windings protrude from the stator housing and can be damaged when attaching the end shield. This can damage the motor. When mounting the end shield, ensure that the windings that project from the stator housing are not damaged.

Sealing the machine (types 1PH818. and 1PH8225.)

- Clean bare joints between parts before re-assembling (e.g. between enclosures, end shields and the active parts of bearings).
- Brush the bare joints with the non-hardening sealing agent "Hylomar M".
- Note that these joints between parts (e.g. the sealing gap on the active part of the bearing) must also be resealed with a suitable, silicone-free sealant during assembly.
- Check the sealing elements fitted (e.g. at the terminal boxes) and replace them if they do not provide an adequate seal.
- Follow the manufacturer's application and safety instructions when using the sealant.
- Replace parts that are subject to wear such as the adjusting springs.

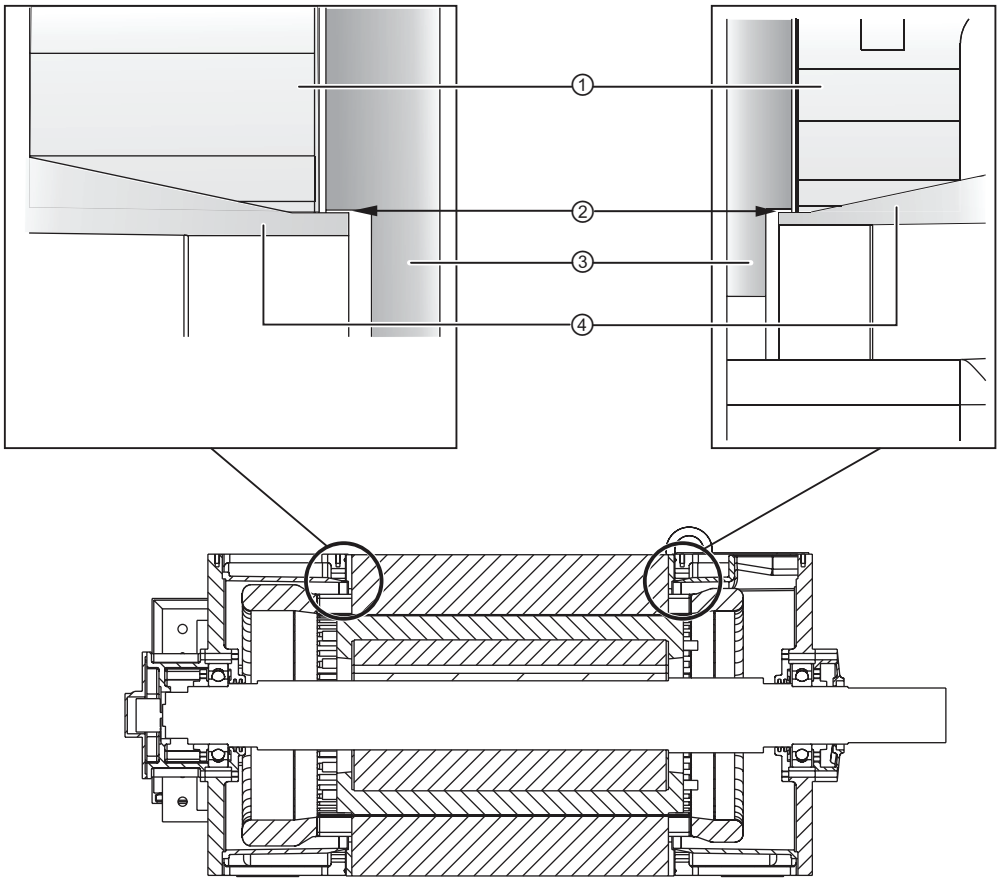
Installing the bearing inserts

1. First position the parts that must be arranged on the shaft within the bearing.
2. To fit the bearings on the shaft, heat them up to about 80 °C in oil or air.
3. Then push the bearings onto the shaft up to its shoulder. Avoid any heavy blows that might damage the bearings.
4. Fill the bearing to the top with the specified lubricating grease.

9.4.6 Sealing (type 1PH828.)

Sealant must be used due to the higher requirements for degree of protection IP55. In addition to the previous instructions, please note the following:

1. When assembling, seal the joints between parts, such as the sealing gap between the enclosure and bearing shield, using suitable, silicon-free sealing compound.
2. Seal the gap ② using a non-hardening sealant, which remains permanently plastic, before screwing on the bearing shields, for example "Hylomar M".
3. Check all sealing elements/gaskets, such as those on the terminal boxes, for elasticity, aging or damage, and renew them if they are no longer effective.



① End shields
② Sealing gap
③ Housing
④ Protective tube

Figure 9-3 Sealing gap between the enclosure and bearing shields (schematic representation)

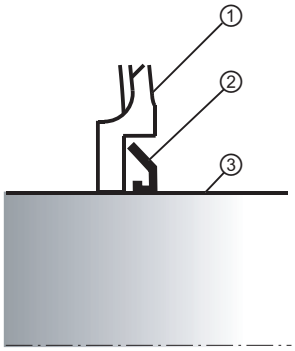
Installing the active parts of the bearings

- Follow the instructions given in the previous section "Installing the machine (Page 105)".
- When installing/replacing the bearing, ensure that an insulated bearing is again installed at the NDE.
- If rotary shaft seals without helical springs are installed, the replacement part must also be installed without a spring.

Sealing the bearings

The outer bearing seal comprises a rotary shaft seal. When installing the bearings, make sure that the seat of the shaft is not greased.

The correct axial position of the rotary shaft seal is reached when the outer edges of the bearing cap end face ① and rotary shaft seal ② are flush.



① Bearing cap end face
② Rotary shaft seal
③ Seat of shaft

Figure 9-4 Installing the rotary shaft seal

9.4.7 Relocating the external fan (type 1PH828.)

Subsequently moving the external fan from NDE to DE or vice versa must only be carried out by qualified personnel or a Siemens Service Center.

9.4.8 Removing the external fan

⚠ WARNING

Live parts

Contact with live parts can cause death, serious injury or material damage.

1. Before carrying out any maintenance work on the device, disconnect it from the line supply, particularly before opening the terminal box.
2. Make sure that the device cannot be switched back on.

Removing the external fan

1. Before carrying out any maintenance work on the device, disconnect it from the line supply.
2. Unscrew the screws ① and remove the external fan.

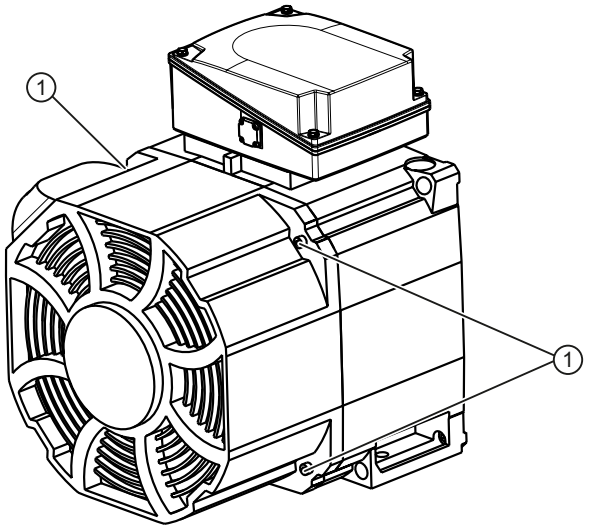


Figure 9-5 Unscrewing the external fan (1PH818., 1PH822.)

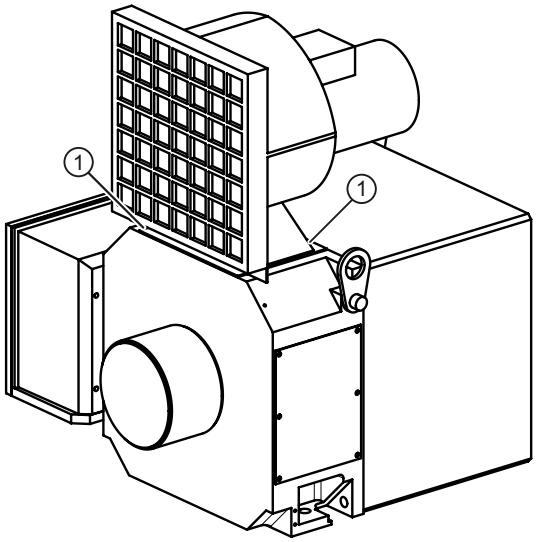


Figure 9-6 Unscrewing the external fan (1PH828.)

For assembly, proceed in reverse order.

See also

Operating instructions of the EC external fan (Page 167)

9.4.9 Removing an external fan with three-phase motor

For 1PH828. motors, external fans with three-phase motor are used as standard. With option L75, these external fans are also mounted for 1PH818. and 1PH822. types.

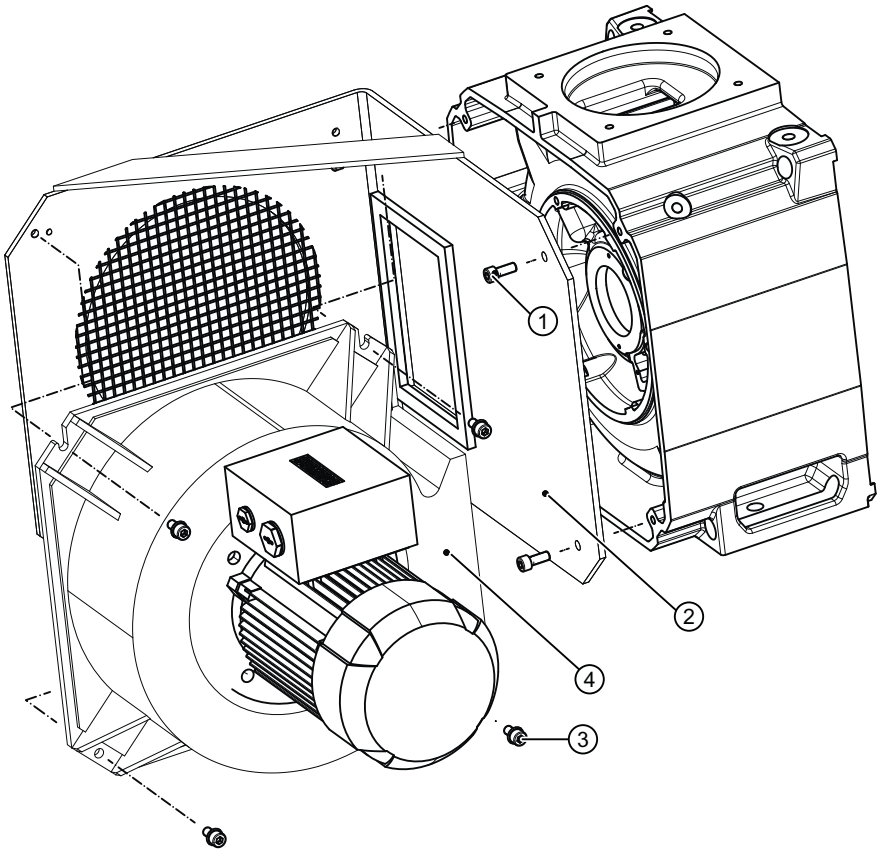
⚠ WARNING

Live parts

Contact with live parts that are at a specific voltage level can cause death, serious injury or material damage.

1. Before carrying out any maintenance work on the device, disconnect it from the line supply, particularly before opening the terminal box.
2. Make sure that the device cannot be switched back on.

Complete external fun unit



1. Before carrying out any maintenance work on the device, disconnect it from the line supply.
2. Secure the fan unit ② so that it cannot fall.
3. Release the four screws ① using an Allen key.
4. Withdraw the fan unit.

To install, proceed as follows:

1. Position the fan unit ② at the NDE bearing shield.
2. Fix the fan unit using two screws ① on the upper side.
3. Screw in the remaining screws ① and tighten them.

Attaching the throttle plate

1. Secure the fan ④ so that it cannot fall.
2. Release the four screws ③ using an Allen key.
3. Withdraw the fan ④.
4. Attach the throttle plate (Page 66).

Proceed as follows to mount the fan:

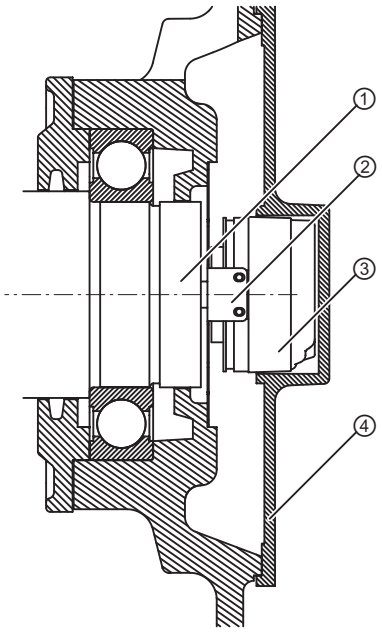
1. Position the fan ④ at the NDE bearing shield.
2. Fix the fan using two screws ③ on the lower side.
3. Screw in the remaining screws ③ and tighten them.

9.4.10 Removing and mounting the speed sensor

NOTICE
Electrostatic discharge Electronic modules contain components that can be seriously damaged by electrostatic discharge. These modules can easily be destroyed unless they are handled properly. To protect your equipment against damage, follow the instructions given in the section headed "Electrostatic Sensitive Devices".

Preparation

For 1PH818. and 1PH822. motors, the speed encoder can only be removed and replaced if the external fan (Page 108) has been removed.



①	Shaft	③	Speed encoder
②	Torque arm	④	Encoder cover

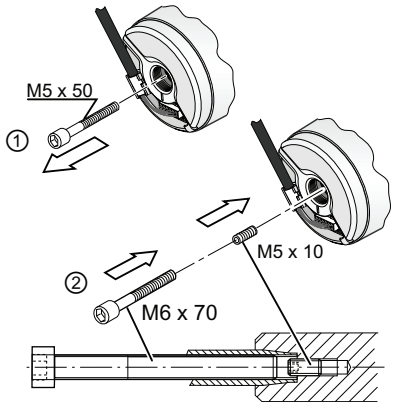
Figure 9-7 Detailed view of the speed encoder

1. Unscrew the cover of the speed encoder.
2. Detach the electrical connection.
   - Pull the cable carefully out of its holder.
   - Pull out the connector.
3. Remove the screwed union connections for the speed encoder from the bearing shield.

Separating the speed encoder

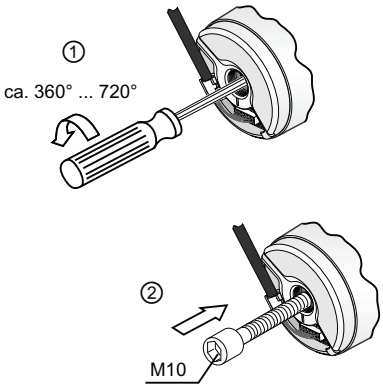
The following options are available for the purpose of separating the speed encoder from the shaft by means of a clamping screw:

Disassembling the speed encoder - Version A



1. Remove screw M5x50 (①).
2. Screw in screw M5x10 and screw M6x70 one after the other. This releases the encoder cone in the motor shaft (②).
3. Remove the speed encoder.

Removing the speed encoder - version B



1. Loosen the retaining screw (①).
2. Press screw M10 onto the original screw. This will then drop out (②).
3. Remove the speed encoder.

Mounting the speed encoder

1. Screw the torque arm to the speed encoder, tightening the two screws by hand.
2. Use the M5x50 screw to secure the speed encoder over the internal cone, ensuring a tightening torque of 5 Nm at the shaft extension.
3. Attach the torque arm to the bearing cover with a tightening torque of 3 Nm.
4. Loosen the screws of the torque arm so as to relieve the stress and tighten them crosswise, with a tightening torque of 0.6 Nm.

5. Establish the electrical connection.
6. Screw on the cover of the speed encoder.

9.4.11 Connecting the speed encoder

NOTICE
Electrostatic discharge Electronic modules contain components that can be seriously damaged by electrostatic discharge. These modules can easily be destroyed unless they are handled properly. To protect your equipment against damage, follow the instructions given in the section headed "Electrostatic Sensitive Devices".

1. Insert the connector into the socket.
2. Press the cable into the holder provided for it.
3. Screw on the sensor cover. Take care that you do not catch the cable as you screw it in.

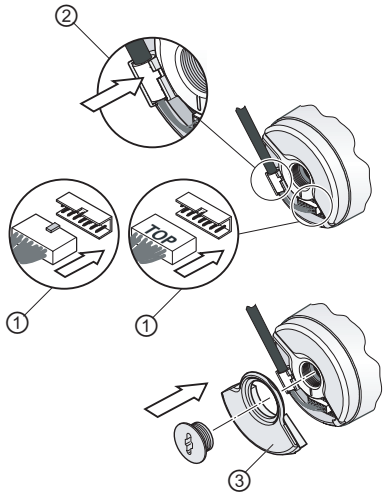


Figure 9-8 Electrical connection of the speed sensor

9.4.12 Replacing the DRIVE-CLiQ interface (encoder module)

Only trained Siemens service engineers are authorized to replace the DRIVE-CLiQ interface (sensor module).

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 in the chapter ESD Guidelines.

⚠ WARNING

Motor-specific sensor module

The Sensor Module contains motor-specific and sensor-specific data and an electronic nameplate.

If you operate a different Sensor Module on the motor, this can result in serious injury or death, or cause considerable material damage.

Only operate the sensor module on the original motor. Do not install the sensor module on other motors. Do not replace the sensor module with a sensor module from a different motor.

9.4.13 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.

Spare parts 10

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:

Spare part	Spare parts kit, drive-end bearing (Part 3.00)
Machine type	1PH81841JD202FA1
Serial number	N-W91246206010001

The machine type and the serial number are indicated on the rating plate and in the technical data, and are also embossed on the drive end of the shaft.

Note

Bar code on rating plate

You can also read the machine type and serial number from the bar code on the rating plate.

Note

The graphics in this chapter are **schematic representations** of the basic versions. They are used for spare parts definitions. The supplied version may differ in details from these representations.

10.2 Spare parts kits

The spare parts are bundled with the necessary wearing parts in a logical way so as to create spare parts kits. The spare parts kits for the bearings also contain the bearing grease.

The following spare parts kits are available for you to order:

3.00	Spare parts kit, non-drive-end bearing (complete)
4.00	Spare parts kit, drive-end bearing (complete)
32.00	Spare parts kit, separately driven fan (only force-ventilated motors)
55.00	Spare parts kit, relevant version of speed encoder

Additional spare parts are available on request.

For an overview of the services available from Technical Support, please visit:

Technical Support (http://support.automation.siemens.com/WW/view/en/16605654)

If you wish to submit a service request directly, you can do so via the following page:

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

Note

DRIVE-CLiQ interface

If you order a DRIVE-CLiQ interface, please specify when ordering from Spares on Web that the DRIVE-CLiQ interface must be described along with the motor data.

If roller-contact bearings with an insulated design are installed, use roller bearings of the same type as spare parts. This will prevent any bearing damage being caused by bearing currents.

10.3 Holding brake

Contact your Service Center for spare parts for the holding brake.

See also

Operating instructions, holding brake (Page 145)

10.4 Ordering spare parts via the Internet

Spare parts can be ordered online from the spare parts service "Spares on Web":

Spares on Web (https://b2b-extern.automation.siemens.com/spares_on_web).

You can use "Spares on Web" to determine the order numbers for motor spare parts quickly and easily.

A short description of how to use "Spares on Web" is available on the Internet.

Guide for Spares on Web (http://support.automation.siemens.com/WW/news/en/25248626).

10.5 Spare parts force-ventilated motor

10.5.1 Force-ventilated motor, complete

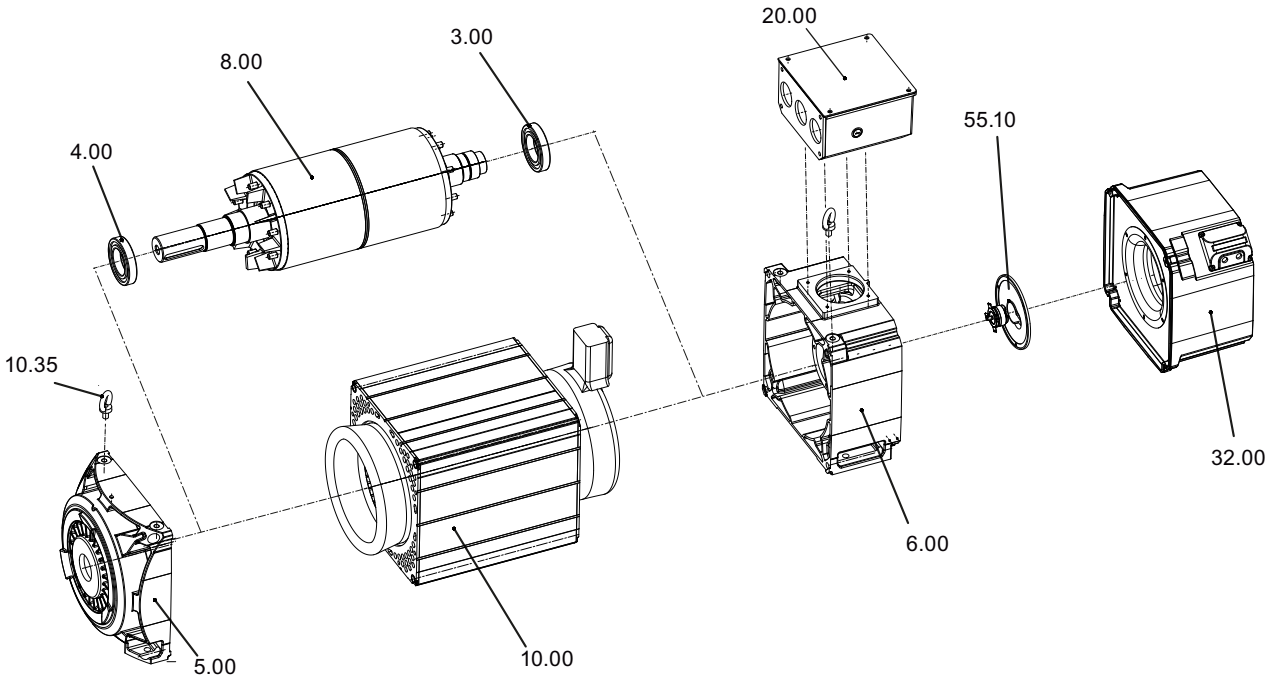


Figure 10-1 Schematic representation of the motor, complete

Table 10-1 Motor, complete

Number	Designation	Number	Designation
3.00	Spare parts kit, NDE bearing	10.00*	Stator housing (with laminated core and winding)
4.00	Spare parts kit, DE bearing	10.35*	Eyebolt
5.00*	Bearing shield, DE	20.00*	Terminal box
6.00*	Bearing shield, NDE	32.00	External fan
8.00*	Rotor, complete	55.10	Spare parts kit, speed encoder

* On request

10.5.2 External fan

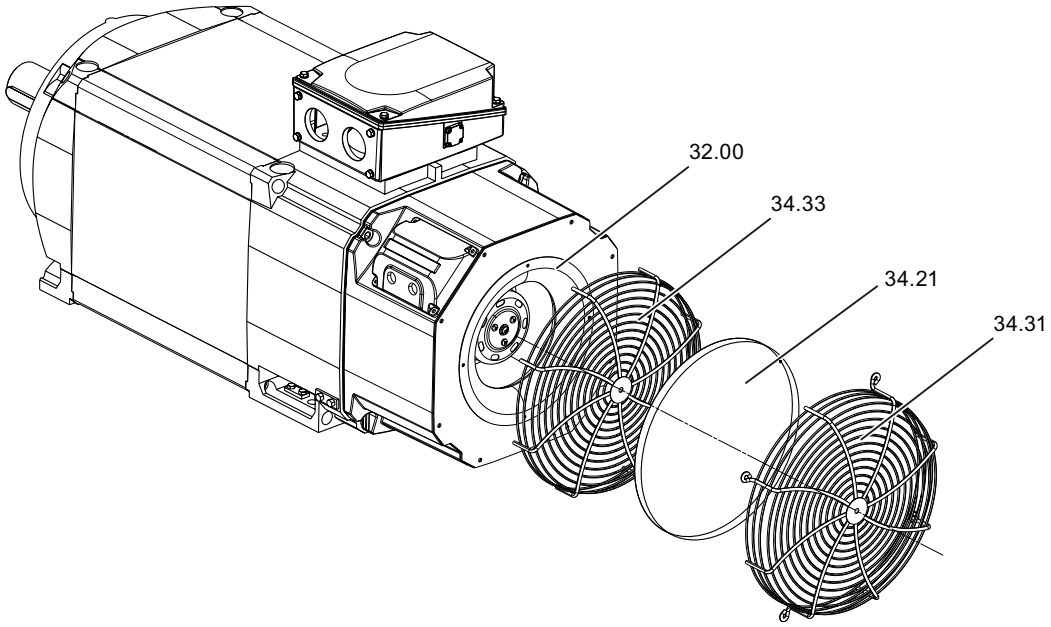


Figure 10-2 Spare parts for external fan (type 1PH818., 1PH822.)

Table 10-2 Spare parts for external fan

Part	Description	Part	Description
32.00	Fan	34.31	External grill cover
34.21	Filter element *	34.33	Inside basket

* Option for type 1PH828.

10.5.3 External fan (option L75)

The external fan for option L75 can only be ordered as one part. Contact the Service Center, if necessary.

10.5.4 Roller bearing cartridge DE with radial shaft sealing ring with regreasing

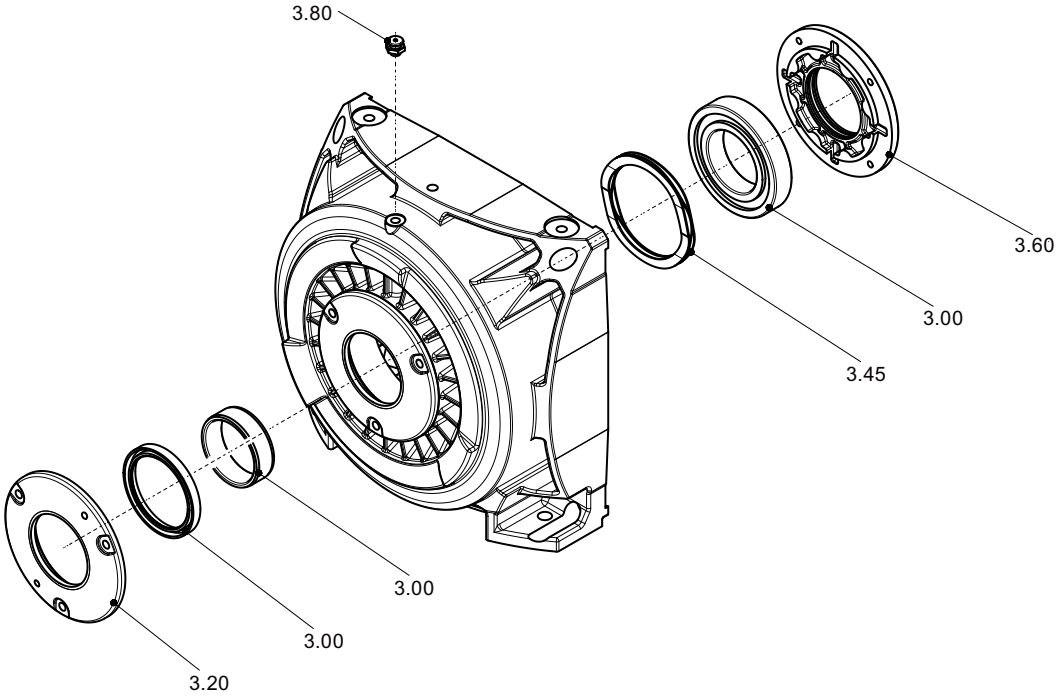


Figure 10-3 Rolling-contact bearing bush drive end with mounted gearing, with regreasing

Table 10-3 Spare parts for rolling-contact bearing bush drive end with mounted gearing, with regreasing

Number	Designation	Number	Designation
3.00	Spare parts kit, drive-end bearing • Deep-groove ball bearing (floating bearing) • Radial shaft sealing ring • Inner ring	3.60*	Inner bearing cover
3.20*	Outer bearing cover	3.80*	Grease nipple
3.45*	Corrugated spring/compression springs		

* On request

10.5.5 Roller bearing cartridge DE, belt coupling

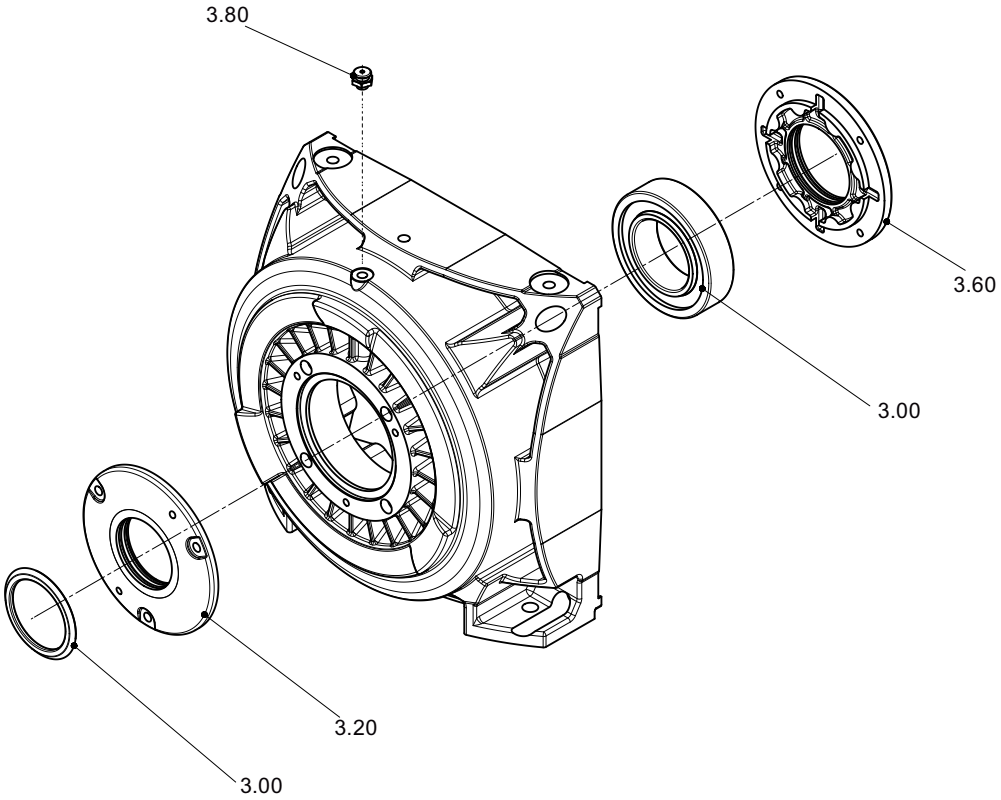


Figure 10-4 Rolling-contact bearing bush drive end with belt coupling, with regreasing

Table 10-4 Spare parts for rolling-contact bearing bush drive end with belt coupling, with regreasing

Number	Designation	Number	Designation
3.00	Spare parts kit, drive-end bearing • Cylindrical-roller bearing (floating bearing) • Protecting ring (rotating)	3.60*	Inner bearing cover
3.20*	Outer bearing cover	3.80*	Grease nipple

* On request

10.5.6 Roller bearing cartridge DE, coupling output, with regreasing

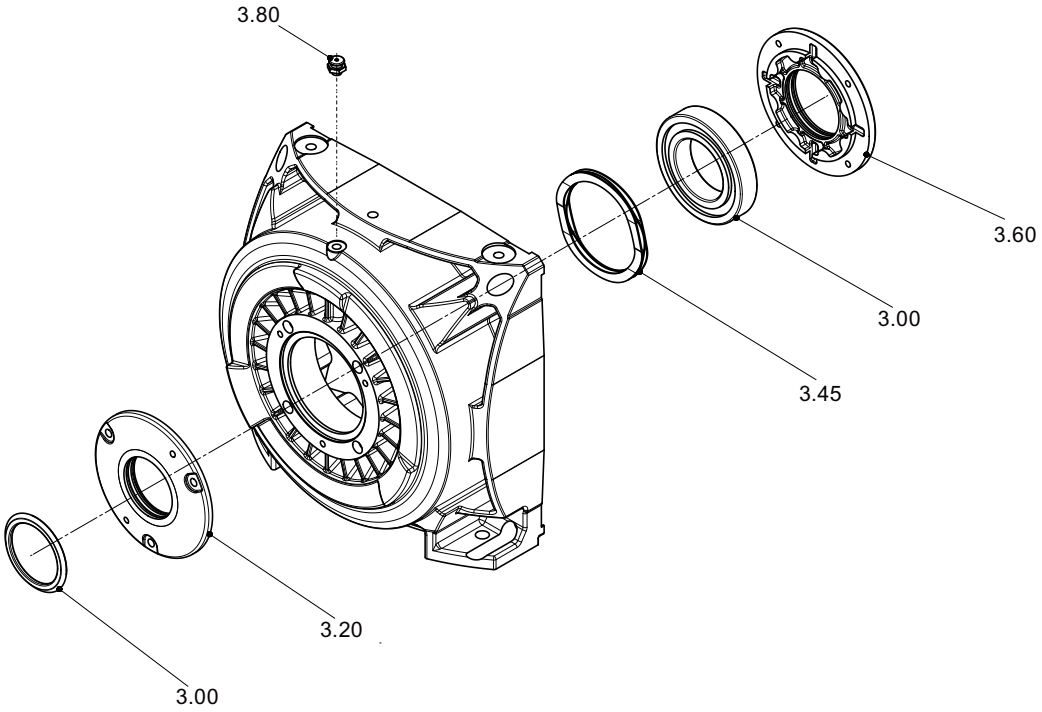


Figure 10-5 Rolling-contact bearing bush drive end, with coupling output, with regreasing

Table 10-5 Spare parts for rolling-contact bearing bush drive end, with coupling output, with regreasing

Number	Designation	Number	Designation
3.00	Spare parts kit, drive-end bearing • Deep-groove ball bearing (floating bearing) • Protecting ring (rotating)	3.60*	Inner bearing cover
3.20*	Outer bearing cover	3.80*	Grease nipple
3.45*	Corrugated spring		

* On request

10.5.7 Roller bearing cartridge DE, coupling output, with permanent lubrication

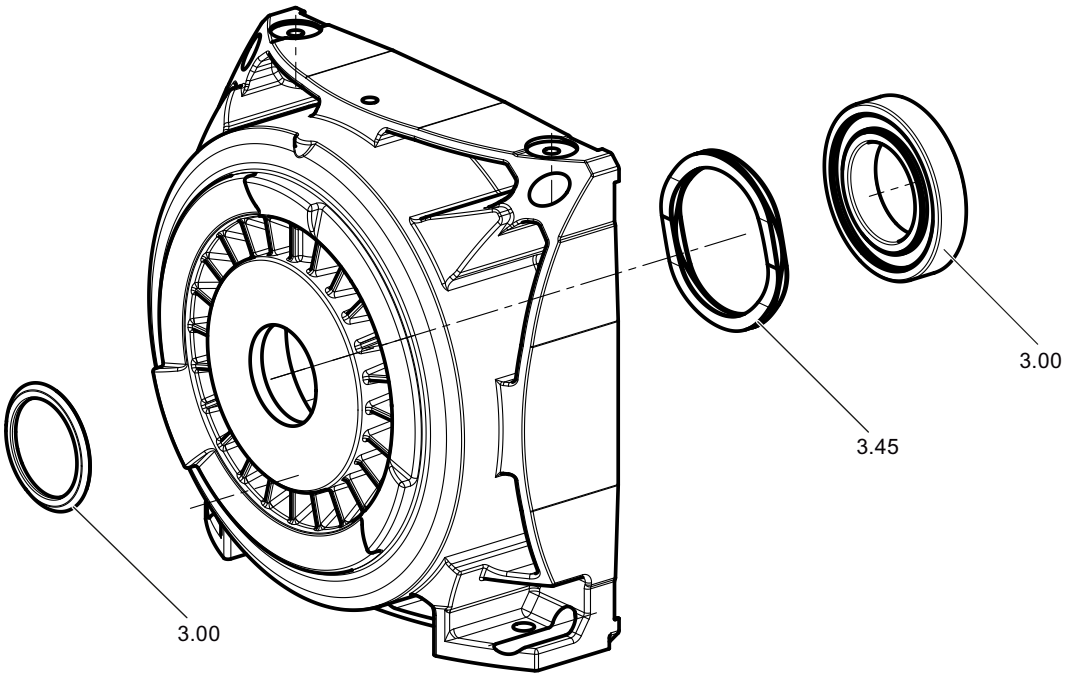


Figure 10-6 Rolling-contact bearing bush drive end, with coupling output, with permanent lubrication

Table 10-6 Spare parts for rolling-contact bearing bush drive end, with coupling output, with permanent lubrication

Number	Designation
3.00	Spare parts kit, drive-end bearing • Deep-groove ball bearing (floating bearing) • Protecting ring (rotating)
3.45*	Corrugated spring/compression springs

* On request

10.5.8 Roller bearing cartridge NDE, with permanent lubrication

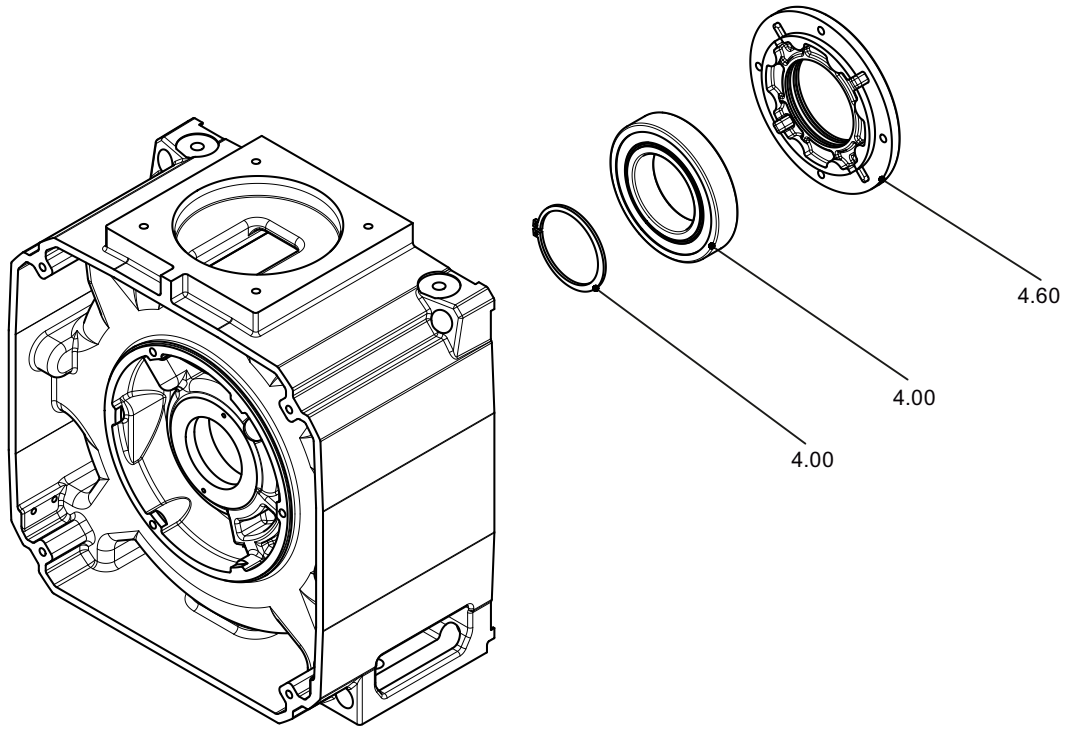


Figure 10-7 Roller bearing cartridge, non-drive end, permanent lubrication

Table 10-7 Spare parts for roller bearing cartridge, non-drive end, permanent lubrication

Number	Designation
4.00	Spare parts kit, NDE bearing • Deep-groove ball bearing (locating bearing) • Retaining ring
4.60*	Inner bearing cover

* On request

10.5.9 Roller bearing cartridge NDE, with regreasing (type 1PH818., 1PH822.)

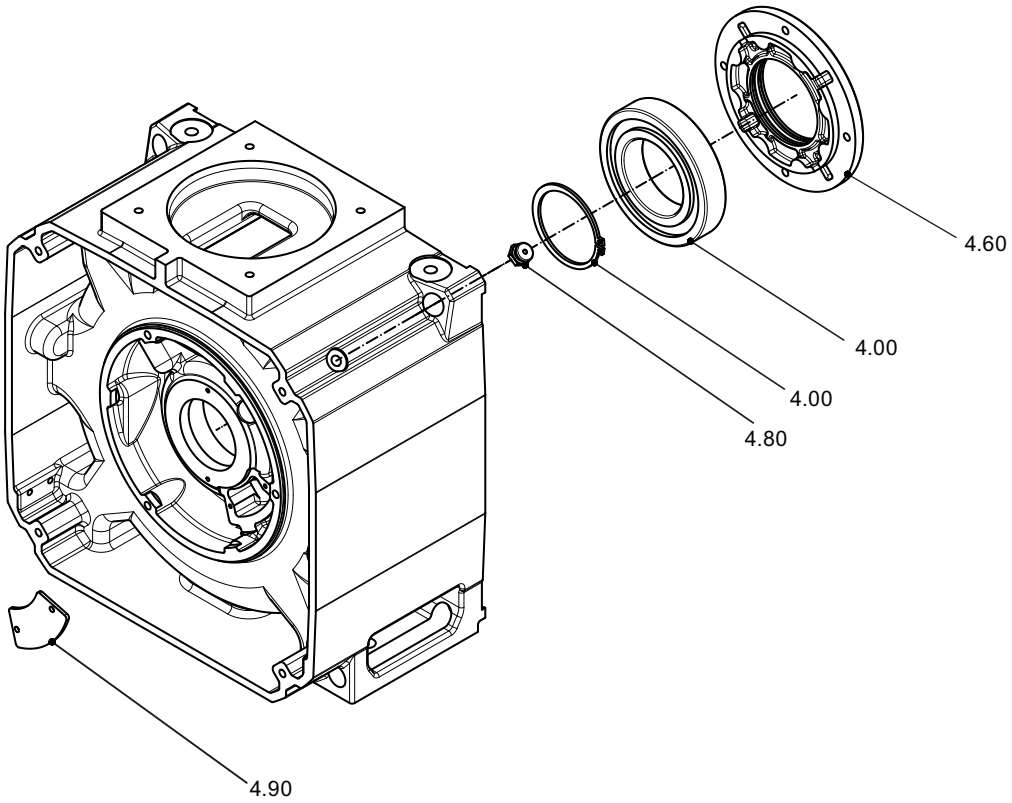


Figure 10-8 Roller bearing cartridge NDE, with regreasing (type 1PH818., 1PH822.)

Table 10-8 Spare part, roller bearing cartridge NDE, with regreasing (type 1PH818., 1PH822.)

Number	Designation	Number	Designation
4.00	Spare parts kit, NDE bearing • Deep-groove ball bearing (locating bearing) • Retaining ring	4.80*	Grease nipple
4.60*	Inner bearing cover	4.90*	Cover of spent grease chamber

* On request

10.5.10 Roller bearing cartridge NDE, with regreasing (type 1PH828.)

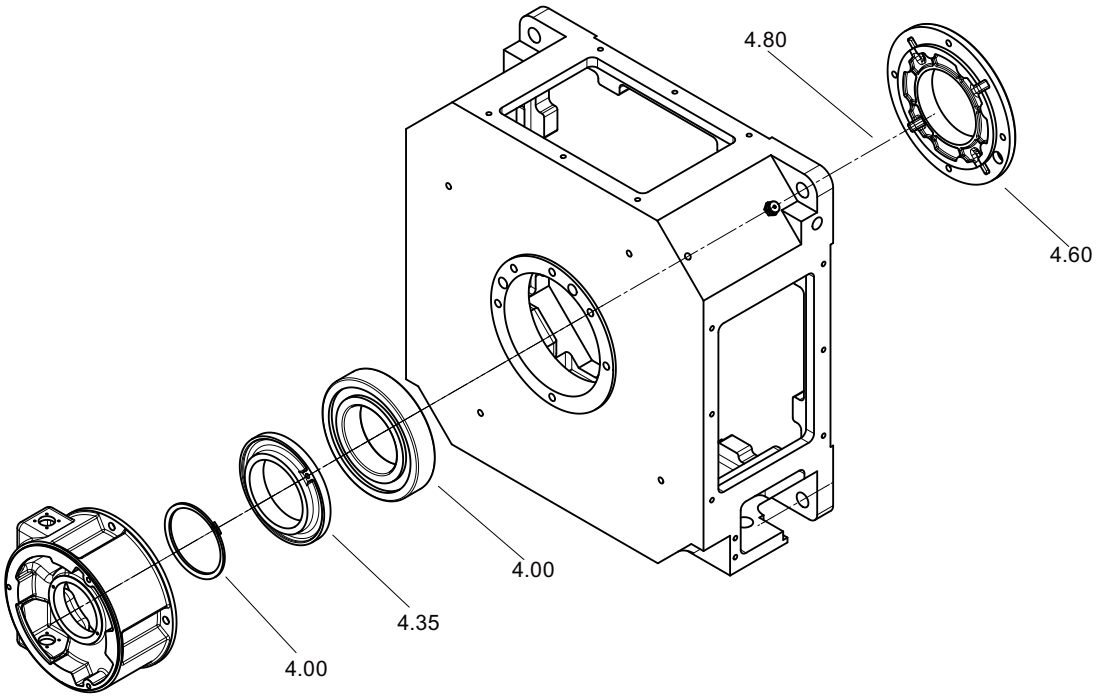


Figure 10-9 Roller bearing cartridge NDE, with regreasing (type 1PH828.)

Table 10-9 Spare part, roller bearing cartridge NDE, with regreasing (type 1PH828.)

Number	Designation	Number	Designation
4.00	Spare parts kit, NDE bearing • Deep-groove ball bearing (locating bearing) • Retaining ring	4.80*	Grease nipple
		4.60*	Inner bearing cover

* On request

10.5.11 Roller bearing cartridge NDE, "Performance"

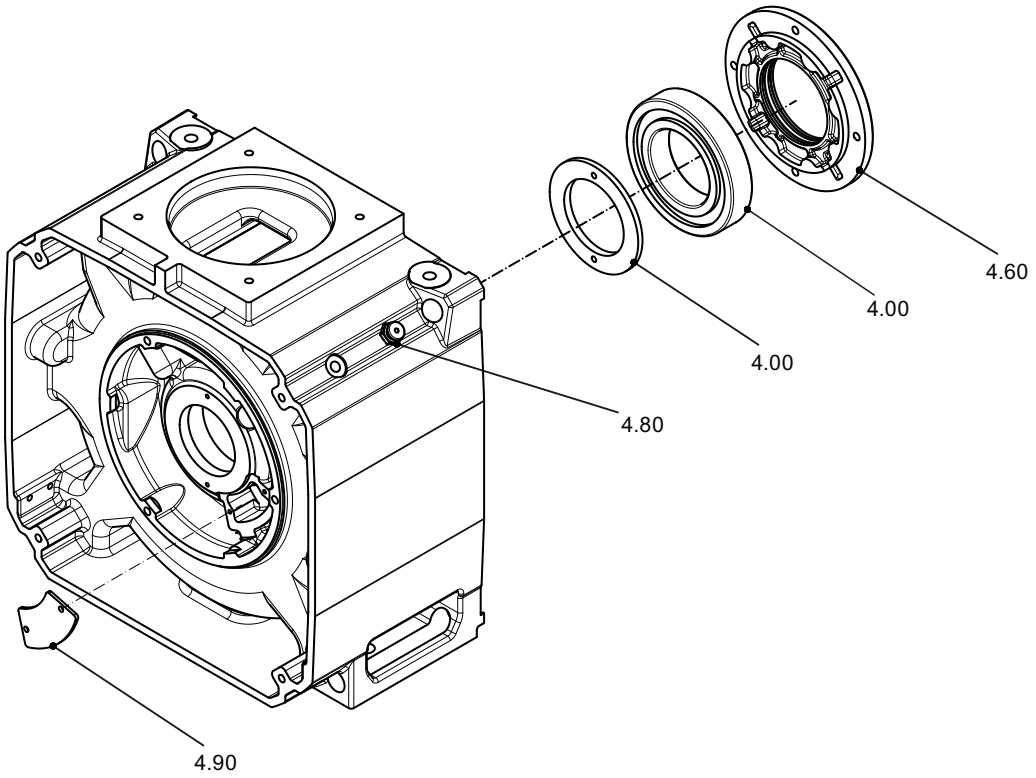


Figure 10-10 Rolling-contact bearing bush non-drive end with regreasing

Table 10-10 Spare parts for rolling-contact bearing bush non-drive end with regreasing

Number	Designation	Number	Designation
4.00	Spare parts kit, non-drive-end bearing • Deep-groove ball bearing (locating bearing) • Shrink ring	4.80*	Grease nipple
4.60*	Inner bearing cover	4.90*	Cover of spent grease chamber

* On request

10.6 Terminal box

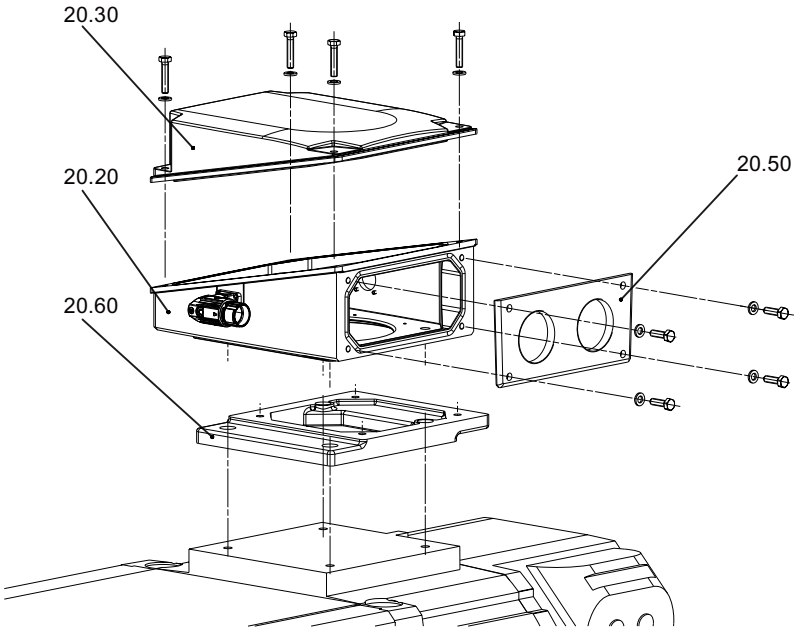


Figure 10-11 Terminal box

Table 10-11 Spare parts for terminal box

Number	Designation	Number	Designation
20.20*	Enclosure	20.50*	Entry plate
20.30*	Cover	20.60*	Adapter plate (optional)

* On request

10.7 Speed encoder (type 1PH818., 1PH822.)

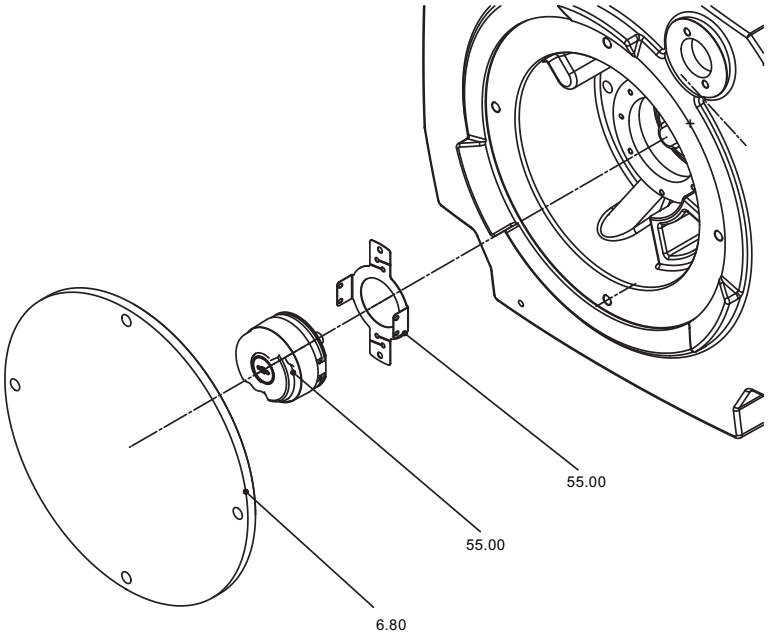


Figure 10-12 Speed encoder

Table 10-12 Spare part, speed encoder (type 1PH818., 1PH822.)

Part	Description
55.00	Spare parts kit, speed encoder • Speed encoder • Torque arm
6.80*	Cover

* On request

10.8 Speed encoder (type 1PH828.)

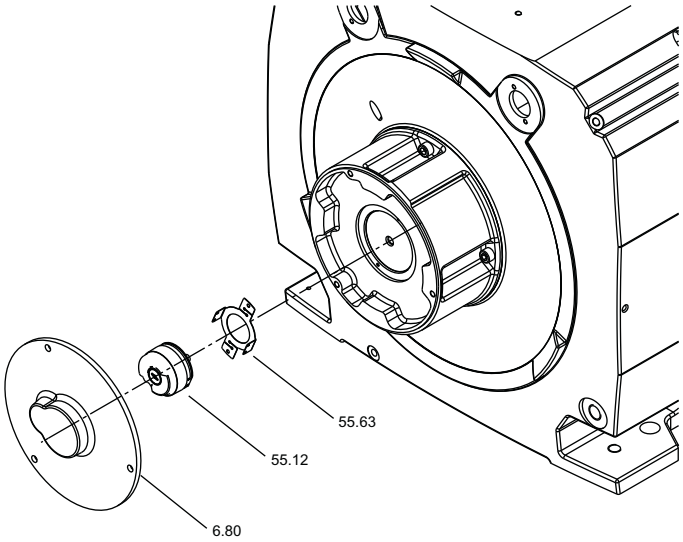


Figure 10-13 Speed encoder (type 1PH828.)

Table 10-13 Spare part, speed encoder (type 1PH828.)

Part	Description	Part	Description
6.80	Cover	55.63	Torque arm
55.12	Speed encoder		

Disposal

11

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 15).
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.

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

Contact for further information

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

Service numbers

If you wish to request local field service or order spare parts, or if you require answers to technical queries or any additional information, please contact the relevant service number below.

Please have the following machine data ready:

- Machine type
- Machine number

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

Table A-1 Service numbers

Local field service	Phone	+49 (0)911 895 7444
	Fax	+49 (0)911 895 7445
Technical queries or additional information	Phone	+49 (0)911 895 7448
	Fax	+49 (0)911 895 7449
Spare parts and repairs	Phone	+49 (0)911 895 7222
	Fax	+49 (0)911 895 7223

Contact:

- http://www.siemens.com/automation/support-request (http://www.siemens.com/automation/support-request)
- ld-service.i-cs@siemens.com (mailto:ld-service.i-cs@siemens.com)

Technical data

B

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.
- Always use suitable securing devices or removable adhesives (e.g., Loctite 243) when installing fixing bolts with a clamping length of less than 25 mm. The clamping length is taken as the distance between the head of the bolt and the point at which the bolt is screwed in.

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 ±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	1080	1700	2600	4200	Nm
C	3	5	8	20	40	70	170	340	600	1200	2000	3100	4700	7500	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

C.1 EC Declaration of Conformity 2006/95/EC

SIEMENS

EG-Konformitätserklärung

(nach der EG-Richtlinie 2006/95/EG, NSR)
Nr. A5E02034600A – AG / 05.2010

Hersteller:	Siemens Aktiengesellschaft	
	Bereich Automation and Drives	
	Geschäftsgebiet Large Drives	A&D LD
Anschrift:	Postfach 4743	Vogelweiherstr. 1-15
	D-90025 Nürnberg	D-90441 Nürnberg

Produktbezeichnung: Drehstrom Asynchronmotor mit Käfigläufer, wasser- bzw. luftgekühlt
Permanentmagneterregter Synchronmotor, wasser- bzw. luftgekühlt
Typ: 1PH8
Achshöhe: 180, 225 und 280 mm

Das bezeichnete Produkt stimmt mit den Vorschriften folgender Europäischer Richtlinien überein:

2006/95/EG **Richtlinie des Europäischen Parlaments und des Rates vom 12.Dezember 2006 zur Angleichung der Rechtsvorschriften der Mitgliedsstaaten betreffend elektrische Betriebsmittel zur Verwendung innerhalb bestimmter Spannungsgrenzen**

Wir bestätigen die Konformität des oben genannten Produktes mit den Normen:

Referenznummer	Ausgabedatum	Referenznummer	Ausgabedatum
EN 60034 – 1	04.2005	EN 60034 – 5	09.2007
EN 60034 – 6	08.1996	EN 60034 – 9	01.2008
EN 60204 – 1	06.2007		

Anbringung der CE-Kennzeichnung:

Nürnberg, den 27.05.2010

Siemens Aktiengesellschaft

i.V. .....
Name, Unterschrift
Jürgen Amedick
Leiter Geschäftszweig Products

i.V. .....
Name, Unterschrift
Dr. Martin Kaufhold
Produktsicherheitsbeauftragter Geschäftsgebiet

Diese Erklärung bescheinigt die Übereinstimmung mit den genannten Richtlinien, ist jedoch keine Beschaffenheits- oder Haltbarkeitsgarantie nach §443 BGB.
Die Sicherheitshinweise der mitgelieferten Produktdokumentation sind zu beachten.
Die EG-Konformitätsbewertung ist archiviert unter der Nummer A5E02034532A.
Siemens Aktiengesellschaft: Chairman of the Supervisory Board: Gerhard Cromme; Managing Board: Peter Löscher, Chairman, President and Chief Executive Officer; Johannes Feldmayer, Heinrich Hiesinger, Joe Kaeser, Rudi Lamprecht, Eduardo Montes, Juergen Radomski, Erich R. Reinhardt, Hermann Requardt, Uriel J. Sharef, Klaus Wucherer;
Registered offices: Berlin and Munich; Commercial registries: Berlin Charlottenburg, HRB 12300, Munich, HRB 6684 WEEE-Reg.-No. DE

Additional documents

D

If you have any questions or problems, contact your Siemens service center (Page 135).

D.1 Reader notes on the operating instructions of the holding brake

Holding brake

Depending on the order, a special version of a holding brake from the Stromag company is mounted. Various types of holding brake are mounted depending on the shaft height.

NOTICE
Technical data for the special version of the holding brake The following technical data applies to the special version of the mounted holding brake. The corresponding data in the manufacturers operating instructions do not apply.

Table D-1 Technical data of the holding brake

Technical data			NFF-A 63 1PH818. (SH180)	NFF-A 100 1PH822. (SH225)
Braking torque	M_{Brake}	[Nm]	1000	1600
Max. speed	n_{Brake}	[rpm]	3500	3100
Weight incl. hollow shaft	m_{brake}	[kg]	63	88
Moment of inertia	J_{brake}	[kgm^2]	0.022	0.051
Total moment of inertia (emergency stop)	J_{total}	[kgm^2]	1.3	3.9
Rated voltage	U	[V]	230 V (AC)	230 V (AC)
Permitted single switched energy	P	[W]	98	210
Coil current	I	[A]	2.21	2.70
Number of emergency stops	Z	-	2000	1200
Opening time		[ms]	300	300
Closing time		[ms]	80	100

Note

More information

- Magnetic field when the brake is open (Page 71)

See also

Operating instructions, holding brake (Page 145)

D.2 Operating instructions, holding brake

Stromag Dessau
safety in motion

Service Instructions

NFF

Electromagnetic - Double - Face Spring - Applied Brake

These operating instructions are intended to enable the user to operate the Stromag Dessau product safely and effectively, to use it sensibly and to maintain it properly so as to exclude the possibility of any damage or incorrect operation.

Stromag Dessau GmbH
Dessauer Str. 10
D-06844 Dessau-Roßlau
Telefon: 0340-2190-0
Telefax: 0340-2190-201
E-mail: vertrieb.dessau@stromag.com
Internet: http://www.stromag-dessau.de

Service Instructions NFF **IP 66**

Stromag Dessau
safety in motion

Electromagnetic Double Face Spring – Applied Brake

01.06.2009

Contents

Service Instructions NFF **Stromag Dessau**
IP 66 **safety in motion**
Electromagnetic Double Face Spring – Applied Brake 01.06.2009

1 Technical data

1.1 Nameplate data

The following data is stated on the nameplate (73). It is provided on the front side of the brake.

Series / Size	
Order – Ref. – No.	
Delivery date month /year	
Nominal voltage	V DC
Nominal wattage	W
Nominal current	A
Brake torque	Nm
Connexion on	V AC
Airgap "off" norm.	mm
max.	mm

This data must comply with the identifications of the order acknowledgement.

1.2 Torque, speed, and other technical data

Table 1

size	M_{dyn}	M_{stat}	n_0	n_{zn}	U_n *	P_k	Airgap	W	P_{VN}	J	m
NFF	Nm	Nm	min^{-1}	min^{-1}	V-DC	W	min/max	KJ	kW	kgm^2	kg
2	20	22	5300	3000	103	89,9	0,6/1,0	25	0,080	0,00040	6,3
4	40	44	4900	3000	103	90,7	0,6/1,0	30	0,067	0,00043	10,4
6,3	63	70	4500	3000	103	113,9	0,6/1,2	65	0,103	0,00080	13
10	100	110	4100	2500	103	110,4	0,6/1,2	75	0,110	0,00125	14
16	160	175	3800	2400	103	115,8	0,6/1,2	120	0,124	0,00340	21
25	250	275	3500	2100	103	136,6	0,6/1,2	150	0,149	0,00430	30
40	400	440	3200	1800	103	212,9	0,6/1,3	250	0,170	0,01212	40
63	630	700	3000	1600	103	227,3	0,6/1,5	320	0,249	0,01463	68
100	1000	1100	2800	1300	103	277,6	0,6/1,6	450	0,270	0,04171	85,5
160	1600	1750	2200	1000	103	353,5	0,6/1,6	450	0,325	0,14821	133
250	2500	2750	1900	900	207	367,0	0,6/1,8	700	0,400	0,23515	176
400	4000	4400	1600	**	207	400,9	0,6/1,8	**	0,482	0,43412	278
630	6300	7000	1400	**	207	489,6	0,6/1,6	**	0,601	1,01607	367
1000	10000	11000	1200	**	207	535,5	0,6/1,6	**	0,587	1,56099	491

* other voltages on request
** on request

Service Instructions NFF **IP 66** Stromag Dessau safety in motion

Electromagnetic Double Face Spring – Applied Brake 01.06.2009

M_{dyn}	dynamic torque (friction torque, nominal value for working brake) applies to dry operation with an oil- and grease-free friction lining after running-in
M_{stat}	static torque (torque of adhesion)
n_o	maximum idling speed
n_{zn}	nominal switching speed
P_k	excitation output at 20°C
P_{vn}	nominal breaking capacity (S4-40% I.O.)
W	switch work per switching operation for z = 1-5 h^{-1}
J	mass moment of inertia of rotating parts
m	weight
Protection class	IP 66 in accordance with DIN 40050
Mode of operation	S1, S4 - 40% I.O.
thermical class	155 'F' in accordance with DIN VDE 0580
The main parameters are also given on the nameplate	
AC control	via rectifier

The max. admissible speed as well as the other technical data are stated on the dimensional drawing which is binding for the pertinent order and can be inquired at our after-sales service; address is given in chap. 10.3.

1.3 Bore and keyway dimensions, connections

The binding dimensions for the bore, keyway and connections are stated on the dimensional drawing as mentioned in chap. 1.2.

1.4 Application range and utilization as per specification

in docks:
in harbour cranes, container loading facilities for crane, hoisting and trolley travel gears.

Operating conditions:

Protection class IP 66 in accordance with DIN 40050 (VDE 0470). Electrical design of brakes in accordance with DIN VDE 0580 in thermical class 155 (F). The brake corresponds to Directive 93/68/EEC (Low Voltage Directive).
The Directive 89/336/EEC (EMC) must be ensured by the user, taking into account the instructions given by the manufacturer.
The products are marked accordingly.
Mode of operation S1, S4.
Horizontal installation. Vertical operation after consultation with manufacturer.
With the friction combination steel/ organic friction lining the brake may only be used for dry running under the conditions described in chapters 7.1 and 7.3
In addition, compliance with the assembly, dismantling, commissioning and maintenance conditions specified by the manufacturer must be ensured.
Non-compliance with these conditions or any use beyond this shall be deemed use not in accordance with the specification.
The manufacturer shall not be liable for any such use, the risk shall be exclusively borne by the user.

Service Instructions NFF **IP 66** **Stromag Dessau** **safety in motion**

Electromagnetic Double Face Spring – Applied Brake 01.06.2009

If the brake is to be used outside this contractual scope of operation, contact Stromag Dessau for further details (Address see Chapter 10.3).

2 Safety guidelines

2.1 Symbol for safety at work

This symbol denotes all the safety instructions in this manual which deal with danger to life and limb of personnel. These instructions must be adhered to and particular caution exercised in these cases. All users must be familiarised with the safety instructions.

2.2 Instructions **Caution!**

The term "Caution!" denotes those sections in this manual which require special attention, in order that the guidelines, recommendations and correct procedures are complied with to prevent damaging or destroying the brake.

2.3 Safety instructions for working

The following recommendations are of particular importance:
The brake has been manufactured to the highest up to date standard and is operationally safe. However, the brake can become a risk to safety when used improperly by untrained personnel or for an application it is not designed for.
Every person involved in assembling, disassembling, commissioning, operating and maintaining (inspecting, servicing and repairing) the brake must be authorised, adequately trained and instructed. Each such person must have read and understood this instruction manual, especially in respect to the safety instructions.
We do not accept liability for damage or malfunctioning, resulting from non - adherence to this manual.

Repair and maintenance works must be carried - out by skilled and trained workmen only meeting the minimum requirements for aptitude and qualification according to DIN VDE 1000-10.
Any work process involving the brake which impairs safety is to be avoided.
The user is obliged to inform the supplier immediately of any change occurring to the brake which adversely affects safety; address see chap. 10.3.
The user is obliged to only operate the brake when it is functioning correctly.
Unauthorised changes and modifications which impair safety, as well as the use of non - authentic components is not permitted.
To exclude any danger to people, domestic animals and goods by parts in motion, the user has to take protective measures according to DIN 31000 / VDE 1000.
As protection against hazardous shock currents, the user has to take protective measures according to DIN VDE 0100 - 410 and DIN EN 50274.
To avoid dangerous influences due to heating of the units and in case of a failure, the user has to take suitable protective measures according to DIN 31000 / VDE 1000 and DIN VDE 0100 - 420.
To exclude any danger to people, domestic animals and goods by direct or indirect effect of electromagnetic fields, the user has to take suitable measures according to DIN V VDE V 0848-4/A3.

Service Instructions NFF **IP 66** **Stromag Dessau** **safety in motion**

Electromagnetic Double Face Spring – Applied Brake 01.06.2009

Caution! In every case the local safety and accident prevention regulations are also applicable, the user must ensure that these are complied with.

We reserve the right to make modifications of a technical nature to this manual if required for brake development.
We recommend that these instructions are incorporated into the service manual of the user (machine manufacturer).

2.4 Electromagnetic Compatibility

The Electromagnetic Compatibility of Equipment Act (EMVG) demands to meet defined protective requirements when using electrical equipment so that this equipment can operate in its electromagnetic environment without mutual impairment of function.
Machine manufacturers, system and plant constructors must assure that the product is installed as required and that the installation of the pertinent current supply is made correctly in order to adhere to the protective requirements of the EMVG.
Please inquire our leaflet "EMC - notes", No. 900 - 00001 at Stromag Dessau GmbH; address as per chap. 10.3.

3 Transportation

3.1 Packing

The type of packing complies with the agreements with the orderer as stated in the order acknowledgement. If no type of packing has been agreed, it depends on the transportation route. The symbols marked on the packing must be adhered to.

3.2 Pre-mounting conditions

The brakes will be supplied completely mounted and with all settings made. The pinion (15) is supplied as a loose part. If a hand lever is required (4) it is loosely attached and has to be mounted.

3.3 Sensitivity

Caution!

Make sure to avoid damage as a result of shocks or impacts during transportation. Special care should be exercised with regard to the radial connecting cable (version without terminal box). For **direct transportation** or assembly of the brake, from size 16 there are threaded bores provided in the coil body (1) for screwing of supporting eyes, see figure 1.

Caution!

The support eye shall **not** be used for transport and for mounting of the unit motor with mounted brake.
Make sure to avoid the generation of condensation water as a result of strong temperature fluctuations.

3.4 In - process stocking

All parts are made of stainless material or are provided with a surface protection by gas nitrocarburizing. In addition they are prined with a zinc phosphate painting.
Bore and keyway of the driving hub (15) are supplied greased.
Should it be intended to stock the brake in - process, another protection against corrosion has to be provided. Please consult our after - sales service (address given in chapter 10.3).

3.5 Delivery extent

On receipt check the consignment for completeness (see packing list).
Possible damage during transportation and/or missing parts must be advised immediately and in writing.

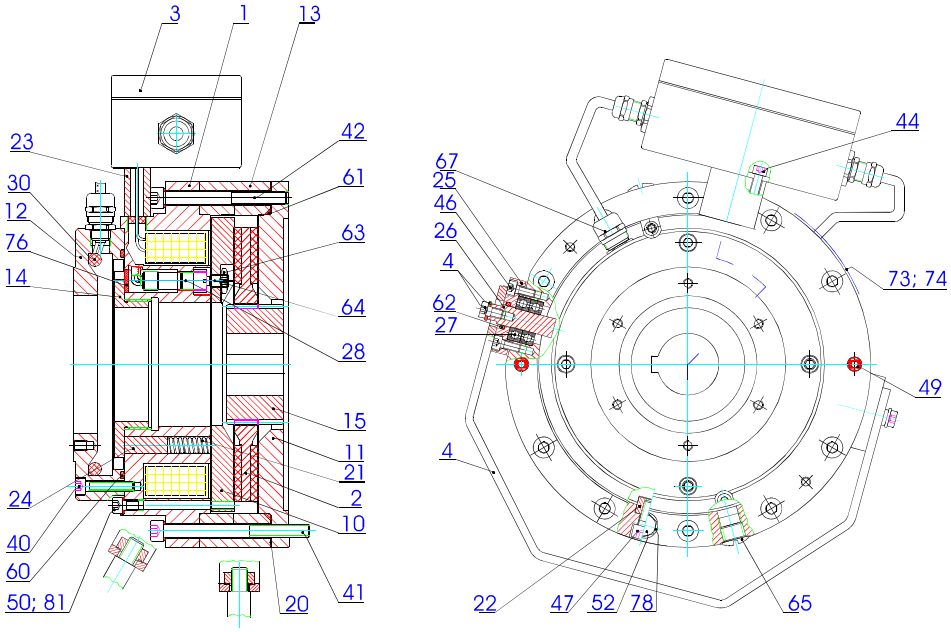
Service Instructions NFF **Stromag Dessau**

IP 66 **safety in motion**

Electromagnetic Double Face Spring – Applied Brake 01.06.2009

4 Construction, functioning, construction characteristics

Fig. 1



4.1 Designation of individual components
(shown size NFF 16 with option speedometer installation)

1 Coil body with coil
2 friction lining assy.
3 terminal box assy.
4 hand lever assy.
10 armature disc
11 brake flange
12 tacho flange
13 outer body
14 adjusting ring
15 hub
20 shim
21 compression spring
22 locating doc
23 terminal box spacer
24 brass pin
25 hand release end cap
26 hand release pivot pin
27 grooved ball bearing
28 micro switch
30 condensation heater
40 screw for tacho flange
41 brake mounting screw
42 cylindric screw
46 mounting screw for hand release end cap
47 screw for locating dog
49 emergency release screw
50 cap screw for emergency release
52 screw for lockable hand release
60 seal ring for tacho
61 seal ring for brake flange
63 counter nut for micro switch
64 set screw (micro switch)
65 cap screw for airgap measurement
67 gland
73 nameplate
74 metal tack (to mount identification plate)
76 adhesive
78 washer for pos. 52
81 seal ring for pos. 50

Service Instructions NFF **IP 66** Stromag Dessau safety in motion

Electromagnetic Double Face Spring – Applied Brake 01.06.2009

4.2 Functioning and design characteristics of the standard version

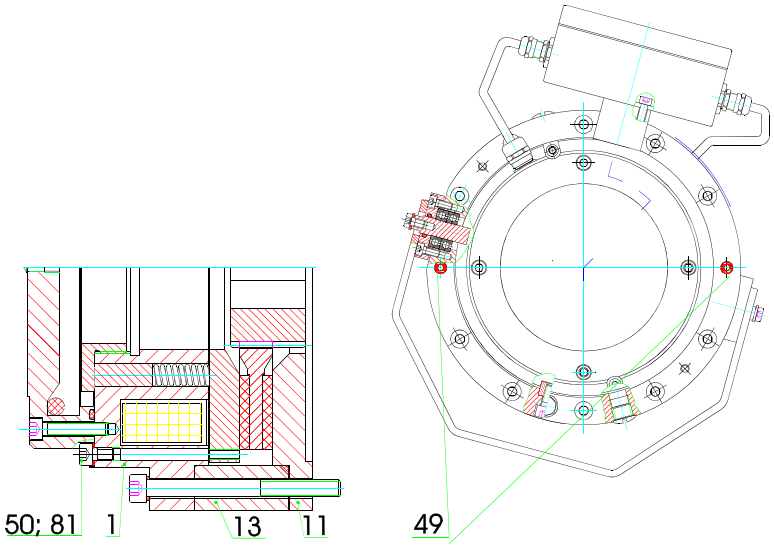
The brake **NFF** is a spring-loaded electromagnetic double-face brake which brakes without current and is released electromagnetically.
The brake type **NFF** meets highest requirements with regard to fatigue strength and robustness and is seawater-proof. The brakes are manufactured and tested in accordance with DIN VDE 0580.
The brake is screwed to a motor or any other machine part by means of cyl. screws (mounting screws pos. 41).

The coil body contains a coil which is potted with a synthetic resin compound in accordance with thermical class 155 (F), (max. limit of temperature 155°C).

If the coil is not excited, the springs (21) press the armature disc (10) against the friction disc (2), which is firmly clamped between the torsion-protected armature disc (10) and the brake disc (11) and thus prevented from rotating. The braking effect is transmitted from the geared friction disc (2) via the hub (15) and a fitting key to the shaft. If the coil is connected to a direct voltage as specified on the identification plate (73), the magnetic force will draw the armature disc (10) to the coil body (1) overcoming the spring pressure. The friction disc (2) is released, the braking effect is cancelled and the brake is released.

4.3 Mechanical release by means of emergency release screws

Fig. 2



1 coil body with coil
11 brake flange
13 outer body
49 emergency release screw
50 cap screw for axial emergency release
81 seal ring

Service Instructions NFF **IP 66** Stromag Dessau safety in motion

Electromagnetic Double Face Spring – Applied Brake 01.06.2009

For the mechanical release in case of emergency of the system use red marked screws (49) which have to be removed of its position (coil body (1) – outer body (13) – brake flange (11)) (up to size NFF 10 loosely attached) – up to size NFF 63-2 screws, up size NFF 100 –3 screws).
For release, unscrew the cap screws (50) from the coil body (1). In the now free holes, screw in the release screws (49). The release is made by alternating clockwise turning of the screws until the braking effect is cancelled.

Caution!

The emergency release is self-locking; for normal operation it must be re-turned into the initial position, i.e. the screws (49) are re-turned counter-clockwise. Then re-screw the release screws (49) into the original threaded hole (coil body (1) – outer body (13) – brake flange (11)). Then screw the cap crews (50) into the coil body (1). We recommend to seal the threaded holes with hylomar.

Take care that the seal rings (81) are also re-fitted. This is necessary to assure the full electrical operation and **sealing effect (IP 66).**


Manual emergency release shall **not** be used to maintain temporary operation!

4.4 Mechanical release by means of hand lever (optional)

By pulling the hand lever (4) at approx. 30° towards the back of the brake the armature disc (10) is moved axially until it is lying against the coil body (1) thus the friction disc lining (2) may rotate freely.


Manual emergency release shall **not** be used to maintain temporary operation!

4.5 Current supplies and electrical connections

Make sure that the electrical connection is performed by expert personnel taking into account the installation regulations (such as DIN IEC 92).

The coil has been designed for 100% duty factor and connection to D.C. supply only, given on the identification plate (residual ripple< 0.5).
According to DIN VDE 0580 the permanently admissible voltage change is +5% to –10% of the nominal voltage.
To protect the coil or the power supply unit it is recommended to connect a varistor of the corresponding operating A.C. voltage range and with the required power to the rectifier output.

5 Assembly and dismantling

(individual parts with Item-No. see chap. 4.1)

Caution! The brake must only be operated, maintained and repaired by accordingly authorized, trained and instructed people. Each such person must have read and understood the complete instruction manual and must have been informed in particular about possible risks and danger.

Service Instructions NFF **IP 66** **Stromag Dessau** safety in motion

Electromagnetic Double Face Spring – Applied Brake 01.06.2009

5.1 Assembly

The assembly to the motor is simple, no dismantling of the brake is required.

- Check the connecting dimensions for compatibility with the brake.
- Remove any existing transportation or bearing protections devices, as well as any burr or impact damage.
- Check face run out of the flange mounting surface relative to the shaft to be braked (tolerance class N in accordance with DIN 42955 should not be exceeded).
- Slightly grease shaft and fitting key with assembly paste. Mount pinion (15) and secure it axially.
- Use suitable slings (shackles or equivalent) to move the brake cautiously across the pinion (15) and turn the shaft or swivel the brake to engage pinion teeth with the mating teeth of the friction disc (2). (The friction disc is pre-centered during the final acceptance of the brake).

Caution!

Do not use force! Do not tilt! Pay attention of the cable!

- offer brake onto the motor in the position specified
- tighten the mounting screws (41) to correct bolt tightening torque (as specified on the drawing)
- To prevent mechanical blocking of the stainless steel screws (41) we recommend to grease these screws with Klüber paste HEL 46-54
- Make sure that the electrical connection is performed by expert personnel taking into account the installation regulations (such as DIN IEC 92).

Caution!

When mounting always assure that all seal rings and sealings are properly lying in the accordingly provided positions (IP 66).

5.2 Mounting accuracy

The concentric run of the shaft piece on which the driving hub (15) is fixed as well as the coaxiality and the run - out of the fixing flange must comply with tolerance class "N" of DIN 42955.

5.3 Dimensions, space requirement and mass

The binding dimensions, the mass (weight) and the other technical data are stated on the dimensional drawing which is binding for the pertinent order. This drawing can be inquired at our after - sales service; address is given in chap. 10.3.

5.4 Dismantling

Dismantling is subject to the same instructions and regulations as installation. Carry out the operations in inversed order of succession!

Important note!

Check up: The brake must be torque-free on the output side.
Before removing the brake, disconnect it from the mains and secure with slings.

Service Instructions NFF **IP 66** Stromag Dessau safety in motion

Electromagnetic Double Face Spring – Applied Brake 01.06.2009

6 Initial setting into service

(Single parts with item designation as per chap. 4.1)

Before the initial setting into service, the following test measures are necessary:

- As the new friction lining does not yet dispose of optimum friction characteristics, some electric releases have to be carried - out to smooth the friction face pinpoints.
- The electric connection values on the nameplate (73), see chap. 1.1, must comply with the values at site
- The brake must be undamaged, i.e. it must not have any damage generated during transportation, stocking, etc.
- The prescribed service conditions (chap. 7.1) must comply with those ones at site
- Not only the emergency manual release as per chap. 4.3 but also the hand lever emergency release as per chap. 4.4 or 9.3 must not be active.

7 Operation

Notwithstanding any instructions given below, operation of the brake must always comply with local mandatory safety and accident prevention rules. Compliance with these rules shall be ensured by the user.

7.1 Operating conditions

The operating conditions to be maintained for a faultless operation of the brake are given below:

- The operating temperature should not be below **–30°C** and not above **+50°C**.
- In the case of higher and/or lower ambient temperatures, please contact our after-sales service (for address see Chapter 10.3).
- Air humidity may be 100%.

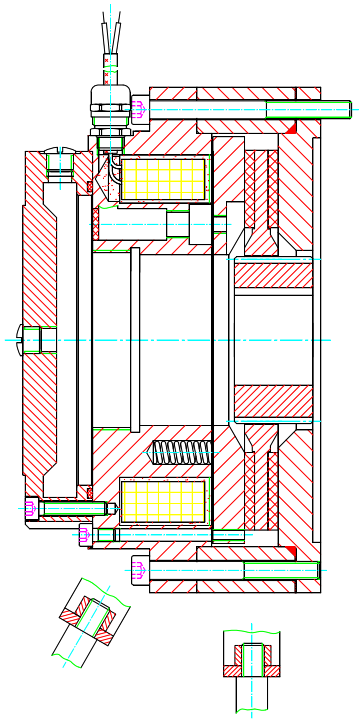
Service Instructions NFF **IP 66** **Stromag Dessau** **safety in motion**

Electromagnetic Double Face Spring – Applied Brake 01.06.2009

7.2 Protection classes

In completely mounted condition and under consideration of the following hints assembled, the brake as standard execution (as shown in fig 3) complies with protection class IP 66, in accordance with DIN 40050 and DIN VDE 0530.
When using original Stromag accessory, such as terminal box, cable glands (see Fig. 1) the type of protection is maintained. The same applies when the speed encoder is rigidly connected to the cover by means of a flange gland which is sealed by round ring.
Sealings of through-shafts (by means of shaft seal ring), reduce the type of protection in relation to the execution. Please consult the manufacturer.

Fig. 3



Important note!

The contact surfaces of the brake to the motor, as well as the surfaces of the "speedometer connection" option shall be sealed with suitable means (e.g. Hylomar or sealing ring) to guarantee the protection class.

The user has to provide a sealing element on the shaft in direction to the motor side in order to prevent the penetration of grease from the motor bearing.

Service Instructions NFF **IP 66** **Stromag Dessau** **safety in motion**

Electromagnetic Double Face Spring – Applied Brake 01.06.2009

7.3 Duty cycle, switching frequency

The design as well as admissible loads on brakes as per braking torque, speed, switching capacity are given under „Technical Data“ (see Chapter 1) and the dimensional drawing (appendix). If any of these data are exceeded consult the manufacturer.

7.4 Trouble shooting (individual parts with Item-No. see chapter 4)

Störungen	Mögliche Ursachen	Erforderliche Maßnahmen
Insufficient braking effect	Friction surfaces are not free from grease	replace friction disc (2)
	Max. Air gap “off” exceeded due to wear of friction lining	re-adjust brake (chapter 8.3.), if necessary replace friction disc (2)
	Brake not completely run-in	Let brake run in
	Brake has been overloaded	Replace brake
	Spring rupture	Dismantling of brake contact manufacturer
No braking effect	Manual release (4) has been actuated and not re-set	See Chapter 4.3
Brake does not release	Max. Air gap „off“ too large due to wear of friction lining	Re-adjust brake (chapter 8.3.) if necessary replace friction disc (2)
	Friction disc (2) is stuck on pinion (15)	Replace friction disc (2) and pinion (15) (chapter 8.4.)
	Armature disc (10) distorted	Replace brake (chapter 5)
	Coil connecting voltage too low	Check DC voltage supply
	Coil defective	Replace brake (chapter 5)
	Feed line defective	Renew feed line
	Contact points loose	Re-tighten contact points
	foreign particles in the air gap (e.g. spring rupture)	Dismantling of brake, contact manufacturer
when micro switch is used:	Armature plate is not being attracted against the coil body because of:	Re-adjust brake (chapter 8.3.) if necessary replace friction disc (2)
No operational switch indication	- max. air gap has been exceeded	Check position of micro switch under consideration of adjustment procedure of micro switch
	- foreign particles in the air gap	Dismantle and clean the brake

Service Instructions NFF **IP 66** Stromag Dessau safety in motion

Electromagnetic Double Face Spring – Applied Brake 01.06.2009

8 Maintenance

8.1 Maintenance and inspection work


Make sure to comply with Chapter 2 "Safety guidelines" during all maintenance and inspection work.

As the brakes work under varying operating conditions, it is not possible to pre-define wear check, inspection, maintenance and repair intervals.
Higher loads on the brake (e.g. as a result of torque, speed, switching frequency, ambient temperature etc.) require shorter maintenance intervals.
Therefore it is first of all necessary to observe the brake with regard to safety and wear, and then adapt the maintenance intervals in accordance with the observations made.
Wear of the friction lining will result in a greater air gap „off".
Depending on the load on the brake, the air gap must be checked from time to time. This will be done by measuring the air gap according to chapter 8.2.
If the max. air gap as determined in chap. 1.1. is reached please readjust the air gap described in chap.8.3.

Caution!

If wear re-adjustment is not carried out early enough, both the transmission of the rated load torque and the lifting of the brake will not be ensured.

8.2 Measurement of the air gap

The measurement of the air gap between coil body (1) and armature disc (10) can only be done when the coil is currentless.
The measurement of the air gap must be taken on two places be opposited 180°. Therefore remove the two cap screws (65) in the outer body and control with a finger gauge. The air gap between the armature disc (10) and coil body (1) must be between „off min." and „off max." described in chap.1.1.
After the measurement the thread hole must be closed with cap screw (65) and sealing ring for protection of IP 66.

8.3 Wear re-adjustment

When the maximum 'air gap off' has been reached in brakes (chap.1.1) a onetime wear re-adjustment is possible.


Important! Check up: the brake must be torque-free on the output side.

Disconnect the brake from current.

Proceed as follows (fig. 1)

- Remove the mounting screws (41) and (42)
- dismantle the complete coil body assembly with outer body (13) from the brake flange (11) taking care not to damage armature disc (10)
- remove shim (20) and re-assemble in inversed order coil body assembly and outer body.
- offer brake onto the motor in the position specified
- tighten the mounting screws (41) to correct bolt tightening torque (as specified on the drawing)

To simplify maintenance works the armature disc (10) may be retained in position by using the emergency release screws (49). Ensure these are removed before setting into operation.

Note: If the shim (29) has previously been removed, a new friction disc (2), see chap. 8.4., together with shim (20) has to be fitted.

Attention: On assembling the brake or replacing the friction disc, care should be taken that the linings do not come in contact with grease etc. Greasy substances if any, can be removed by suitable degreasing agents. Never use petrol or paraffin.

8.4 Replacement of the friction disc

Proceed as follows:


Important ! Check up: The brake must be **torque-free on the output side.**

- Remove the mounting screws (41) and (42)
- dismantle the complete coil body assembly with outer body (13) from the brake flange (11) taking care not to damage armature disc (10)
- take the friction disc (2) from the pinion (15)
- clean the brake
- push the friction disc (2) onto the toothing of the pinion (15)
- fit the shim (20)
- mount in inversed order coil body assembly (1) and outer body (13)
- offer brake onto the motor in the position specified
- tighten the mounting screws (41) to correct bolt tightening torque (as specified on the drawing)

To simplify maintenance works the armature disc (10) may be retained in position by using the emergency release screws (49). Ensure these are removed before setting into operation.


The new friction linings on the friction disc will transmit the full braking torque only after a certain run-in period.

Service Instructions NFF **IP 66** **Stromag Dessau** **safety in motion**

Electromagnetic Double Face Spring – Applied Brake 01.06.2009

9 Variants (optional)

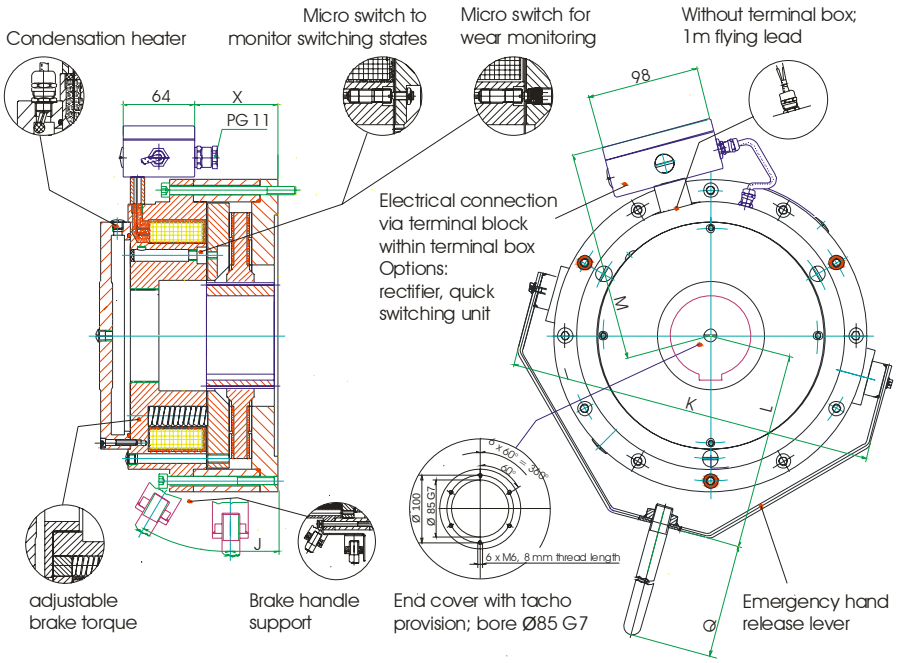


Fig. 4

Brake Size	2	4	6.3	10	16	25	40	63	100	160	250	400	630	1000
M	115.5	128.5	128	125	151	165	179	196	238	260	290	327	364	420
K	179.5	198	201	216	251	276	300	343	408	Refer to Stromag Dessau				
J	20.9	28	29	29	32	39	40	45	54					
L	95	110	110	123	140	150	170	200	220					
X	19	33.75	33.75	38	48	62	83	86	113	125.5	133.5	168	172	182
Q	110	110	110	110	110	150	150	250	500					

Service Instructions NFF **IP 66** Stromag Dessau safety in motion

Electromagnetic Double Face Spring – Applied Brake 01.06.2009

9.1 Execution with micro switch

If the switching condition of the brake should be controlled, a micro switch (28) could be used. When the armature disc (10) is moved against the coil body (1) as a result of the electromagnetic force of the coil or the actuation of the mechanical emergency release device, (chap. 4.3), it will operate a micro switch (28) via set screw (64). The micro switch (28) may be included in the control circuit of the motor contactor as a normally open or normally closed contact.

The micro switch is preset in our works and should not require adjustment. If replacement of the micro switch is required this must be done by our agreed procedure (096-701:181)

9.2 Execution with adjusting ring to reduce the brake torque

The torques given in the technical data (chap. 1.1.) were obtained only by fully tightening the adjusting ring (14). By turning the adjusting ring (14) this changes the pre-load of the cylindrical pressure springs (21) and the brake torque is altered accordingly.

The table shown here below indicates the dimension X and the respective torque rating.

These are approx. figures only

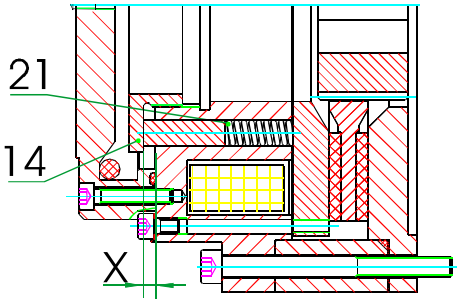


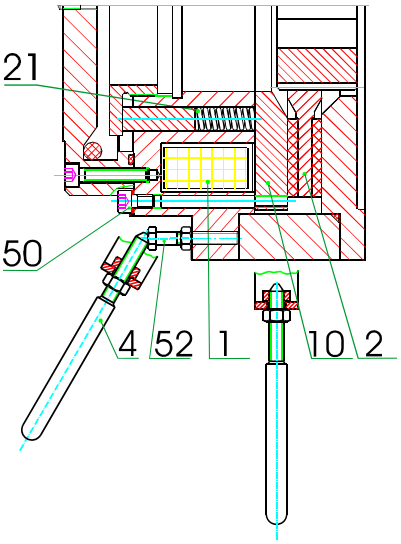
Fig. 5

Brake size	100% X(mm)	90% X(mm)	80% X(mm)	70% X(mm)	60% X(mm)	50% X(mm)	40% X(mm)	30% X(mm)	20% X(mm)	10% X(mm)
2	0	0.7	1.4	2.1	2.8	3.5	4.2	4.9	5.6	6.3
4	0	1.1	2.2	3.3	4.4	5.5	6.6	7.7	8.8	9.9
6.3	0	0.95	1.9	2.85	3.8	4.75	5.7	6.65	7.6	8.55
10	0	1.3	2.6	3.9	5.2	6.5	7.8	9.1	10.4	11.7
16	0	1.3	2.6	3.9	5.2	6.5	7.8	9.1	10.4	11.7
25	0	0.7	1.4	2.1	2.8	3.5	4.2	4.9	5.6	6.3
40	0	0.55	1.1	1.65	2.2	2.75	3.3	3.85	4.4	4.95
63	0	2.2	4.4	6.6	8.8	11.0	13.2	15.4	17.6	19.8
100	0	1.03	2.06	3.09	4.12	5.15	6.18	7.21	8.24	9.27
160	0	1.05	2.10	3.15	4.20	5.25	6.3	7.35	8.4	9.45

Service Instructions NFF **IP 66** **Stromag Dessau** safety in motion

Electromagnetic Double Face Spring – Applied Brake 01.06.2009

9.3 Hand lever emergency with self locking



Optionally the brake can be equipped with a self - locking hand lever release allowing the manual release in case of emergency, e.g. current failure. By pulling the hand lever (4) at approx. 30° towards the back of the brake the armature disc (10) is moved axially until it is lying against the coil body (1) thus the friction disc lining may rotate freely. The handle (4) must be screwed in at this position to operate the locking mechanism. Please ensure brake is fully released. Then screwed out to release.

Please note: the cap screws (50) can be removed and the emergency release screws can be fitted (see chapt. 4.3) to release brake (this is recommended method of brake release).

Fig. 6

Manual emergency release shall <u>not</u> be used to maintain temporary operation! Please note: this is a Fail Safe Brake and "fails to safety" when there is a power failure. When locking handles are used this disables the Fail Safe system and we do not recommend using them.

9.4 Execution with condensation heater

If strong temperature fluctuations are expected, a condensation heater (30) may be used to prevent the generation of condensation water. A special feed line will be provided accordingly. In case of questions please contact the manufacturer.

9.5 Speedometer installation

If a speedometer connection is required for the brake, the brake is provided with a tacho flange (12) with connecting bores in accordance with „Euro dimensions" (Diameter 85/100).

It is recommended to connect the tachometer or the encoder to the shaft through a plug-type coupling.

Caution!

The type of protection only maintains when the speed encoder is rigidly connected to the cover by means of a flange gland which is sealed by round ring.

Service Instructions NFF **IP 66** **Stromag Dessau** **safety in motion**

Electromagnetic Double Face Spring – Applied Brake 01.06.2009

10 Spare parts stocking, after-sales service

10.1 Spare parts stocking

Stocking of spare and parts subject to wear is an important precondition for permanent and reliable functioning of the brake.
Friction disc (2), armature disc (10), brake flange (11) and pinion (15) (for item see Chapter 4.1) are parts subject to wear.

Warranty will be provided only for the original spare parts supplied by us. We expressly state that the installation or use of spare parts other than the original ones supplied by us will negatively affect the design characteristics of the brake and thus have an impact on active and/or passive safety.
Stromag Dessau GmbH shall have no warranty obligations for any damage caused by the use of spare parts or accessories other than the original ones supplied by us.
Please bear in mind that often particular manufacturing and delivery specifications exist for parts manufactured by us or bought from others, and that we offer spare parts to the up-dated technical conditions and the up-dated legal prescriptions.

10.2 Data for spare parts orders

Please specify the following details when ordering spare parts:
- Series and size of brake
- article code
- Location and designation of spare part (see chapt. 4.1. and fig. 1)
- Number of pieces

10.3 Address of after-sales service

This is our address for after-sales service and spare parts distribution:

Stromag Dessau GmbH
Dessauer Str. 10
D-06844 Dessau-Roßlau

Telefon : +49 (340) 2190-203
Telefax : +49 (340) 2190-201
E-Mail : vertrieb.dessau@stromag.com
Internet : http://www.stromag-dessau.de

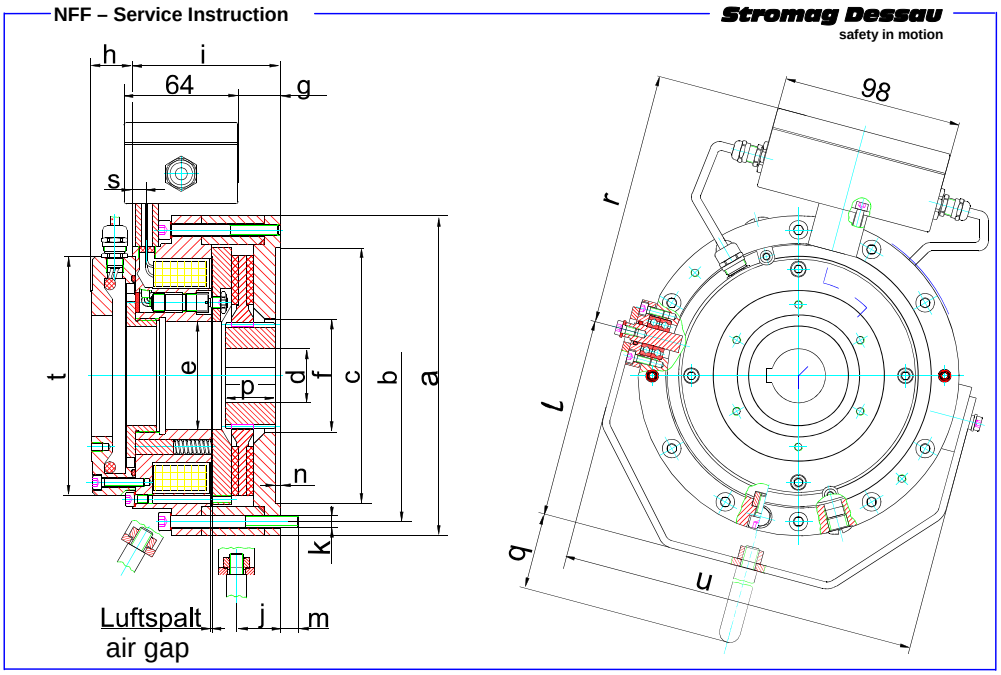
If you require a service engineer, please contact our "Technical after-sales service" under the above address.

Service Instructions NFF **IP 66** **Stromag Dessau** **safety in motion**

Electromagnetic Double Face Spring – Applied Brake 01.06.2009

11 Listed standards and regulations

DIN 6885	Sheet 1 Fitting keys
DIN 40050	(VDE 0470) Protection classes
DIN 42948	Fastening flanges for electrical machines
DIN 42955	Concentricity of shaft ends, co-axial and true running of fastening flanges of rotating electrical machines
DIN IEC 92	Electrical equipment on ships
DIN VDE 0530	Rotating electrical machines
DIN VDE 0580	Regulations for electrical devices
VDE 0660 T 200/09.82,	Section 4.2.4, Table 1 - Inductive load
89/336/EEC (EMC)	Electromagnetic compatibility
93/68/EEC	Low Voltage Directive



Brake size		2	4	6.3	10	16	25	40	63	100	160	250	400	630	1000
Brake torque	Nm	20	40	63	100	160	250	400	630	1000	1600	2500	4000	6300	10000
Nom. speed	min^{-1}	5300	4900	4500	4100	3800	3500	3200	3000	2800	2200	1900	1600	1400	1200
Moment of Inertia B side	kgm^2	0.0004	0.00043	0.00080	0.00125	0.00340	0.00430	0.01212	0.01463	0.04171	0.14821	0.23515	0.43412	1.0161	1.5610
Weight	kg	6.3	10.4	13	14	21	30	40	68	85,5	133	167	278	367	491
Nom. voltage	V DC	103	103	103	103	103	103	103	103	103	103	207	207	207	207
Nom. power	W	89,9	90,7	113,9	110,4	115,8	136,6	212,9	227,3	277,6	353,5	367	400,9	489,6	535,5
Nom. current	A	0,87	0,88	1,11	1,07	1,12	1,37	2,07	2,21	2,70	3,43	357	3,89	4,75	5,2
Air gap norm.	mm	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
Air gap max.	mm	1	1	1.2	1.2	1.2	1.2	1.3	1.5	1.6	1.6	1.8	1.8	1.6	1.6
a	mm	150	165	175	190	225	250	270	314	350	440	500	560	650	750
b	mm	135	152	162	175	205	225	250	292	325	418	472	530	620	710
c H8	mm	120	140	140	160	180	200	220	240	270	340	390	460	530	600
d max H7	mm	25	30	40	40	45	50	60	60	80	110	120	130	140	160
e	mm	53	55	55	65	76	78.5	90	96	100	200	215	240	270	300
f	mm	47	80	80	65	80	90	105	120	158	220	255	280	320	330
g	mm	19	33,7	33,75	38	48	62	83	86	113	125,5	133,5	168	172	182
h	mm	30	33	31	26	29	30	32	32	32	33	33	33	33	33
i	mm	73.5	89.6	92.8	95.3	104	121	141	145	168	182.6	191	226	225	265
j	mm	20,9	28	29	29	32	39	40	45	54	On request				
6 screws k	mm	M5	M6	M6	M6	M8	M8	M8	M10	M10	M12	M16	M16	M16	M20
l	mm	95	110	110	123	140	150	170	200	220	On request				
m	mm	10.5	7.8	13	14	14	13	14.2	19.5	19	24.4	21.4	26.3	30	30
n	mm	2.5	2.5	2.5	3.5	3.5	3.5	4	4	5	5.5	5	5	6	6
p	mm	24	28	30	30	35	45	45	55	75	125	130	150	185	210
q	mm	110	110	110	110	110	150	150	250	500	On request				
r	mm	115,5	128,5	128	125	151	165	179	196	238	260	290	327	364	420
s	mm	8.5	10.5	10	10	10	10	10	12	10	10	10	10	10	10
t	mm	123	140	150	146	168	172	184	230	255	270	280	320	340	380
u	mm	179,5	198	201	216	251	276	300	343	408	On request				

D.3 Operating instructions of the EC external fan

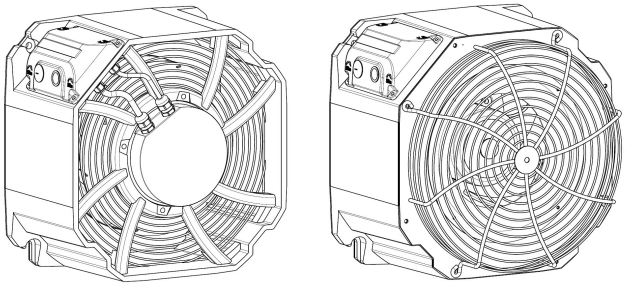
english

ECblue

GR25V-6IK.BD.1R / GR31M-6ID.BD.2R

Ventilation units with reverse curved impeller and ECblue fan motor size B

Assembly instructions



Keep for reference!

L-BAL-F065-GB 1526 Index 002 Part.-No. 00702801-GB

ZIEHL-ABEGG

Content

1 General notes

1.1 Validity

This document is valid for ventilation units with reverse curved impeller and ECblue fan of motor size **B** (090).
The used motor size is recognisable from the type designation (☞ rating plate).
e. g.:. Type: GR31M-6ID.**B**D.2R

In the case of fans with the quality mark (☞ rating plate), please note the related specifications depending on the application location.

1.2 Structure of the assembly instructions

Before installation and start-up, read this assembly instructions carefully to ensure correct use!
We emphasize that these assembly instructions apply to specific units only, and are in no way valid for the complete system!
Use these assembly instructions to work safely with and on the device. They contain safety instructions that must be complied with as well as information that is required for failure-free operation of the device.
Keep these assembly instructions together with the device. It must be ensured that all persons that are to work on the device can refer to the assembly instructions at any time.
Keep the assembly instructions for continued use. They must be passed-on to all successive owners, users and final customers.

1.3 Target group

The assembly instructions address persons entrusted with planning, installation, commissioning and maintenance and servicing and who have the corresponding qualifications and skills for their job.

1.4 Exclusion of liability

Concurrence between the contents of these assembly instructions and the described hardware and software in the device has been examined. It is still possible that non-compliances exist; no guarantee is assumed for complete conformity. To allow for future developments, construction methods and technical data given are subject to alteration. We do not accept any liability for possible errors or omissions in the information contained in data, illustrations or drawings provided.
ZIEHL-ABEGG SE is not liable for damage due to misuse, incorrect use, improper use or as a consequence of unauthorized repairs or modifications.

1.5 Copyright

2 Safety instructions

This chapter contains instructions to prevent personal injury and property damage. These instructions do not lay claim to completeness. In case of questions and problems, please consult our company technicians.

2.1 Intended use

Attention!

- The fans are only intended for the conveyance of air or mixtures similar to air.
- Any other use above and beyond this is considered not for the intended purpose unless agreed otherwise by contract. The manufacturer will not be liable for any damage resulting from this. The individual or company using it bears the sole risk.
- Do not connect built-in fans to open flue pipes of gas and other firing devices.
- VDE-approved ZIEHL-ABEGG fans (☞ rating plate) may only be used as built-in fans for internal-wiring.
- Proper use of VDE-approved ZIEHL-ABEGG fans assumes indirect wiring in the terminal unit.
- Reading these document and complying with all contained instructions -especially the safety notifications contained therein -are considered part of intended use.
- To consider is also the documentation of attached components.

2.2 Improper use

Improper use / reasonably foreseeable misuse

- Conveyance of aggressive and explosive gaseous media.
- Use in areas at risk of explosion for conveying gas, mist, vapours or mixtures of the above.
- The transfer of solids or solids content in the transfer medium.
- Operation with iced up fan impellers.
- Conveyance of abrasive or adhesive media.
- Conveyance of liquid media.
- Use of the fan and add-on parts (e.g. safety grille) as a resting surface or climbing aid.
- Fans are not designed for walking on even with an additive diffusor attachment (retrofit kit)! Do not climb onto fans without suitable aids.
- Unauthorised constructional modifications to the fan.
- Operation of the fan as a safety component or for the performance of safety-relevant functions in the sense of EN ISO 13849-1.
- Blocking or braking of the fan by inserting objects.
- Loosening of fan blade, impeller and balancing weight.
- All applications not listed in the intended use.

Not the manufacturer, rather the operator of the frequency inverter is liable for any personal harm or material damage arising from non-intended use.

2.3 Explanations of symbols

Safety instructions are highlighted with warning triangles and are depicted according to the degree of hazard as follows.

	**Attention!** General hazardous area. Death or severe injury or significant property damage can occur if the corresponding precautions are not taken!
	**Danger due to electric current** Danger by dangerous, electric voltage! Death or severe injury can occur if the corresponding precautions are not taken!

Information
Important additional information and advice for user.

2.4 Product safety

The device conforms to the state of the art at the time of delivery and is fundamentally considered to be reliable. The device and its accessories must only be used in a flawless condition and installed and operated in compliance with the assembly instructions and/or operating instructions. Operating outside the device's technical specifications (☞ name plate and attachment / technical data) can lead to a defect in the device and additional damage!

A separate fault and performance monitoring-system with an alarm signal function is necessary in order to prevent personal injuries and material damages during malfunctions and in case the device fails. Substitute operation must be taken into consideration! The design and installation of the system must comply with local regulations and directives.

2.5 Requirements placed on the personnel / due diligence

Persons entrusted with the planning, installation, commissioning and maintenance and servicing in connection with the frequency inverter must have the corresponding qualifications and skills for these jobs.
In addition, they must be knowledgeable about the safety regulations, EU directives, rules for the prevention of accidents and the corresponding national as well as regional and in-house regulations.
Personnel to be trained or instructed and apprentices are only permitted to work on the device under the supervision of an experienced person. This also applies to personnel undergoing general training.
Comply with the legal minimum age.
This device is not intended to be used by people (including children) who have restricted mental, sensory or intellectual abilities or who have a lack of experience and/or knowledge.

2.6 In operation

Danger due to electric current
- Any faults detected in the electric system/modules/operating equipment must be corrected immediately. If these faults are not corrected, the device/system is potentially very dangerous. The device/system must therefore not be operated when it is faulty.
- Fuses must always be only replaced; never repaired or bridged. The specifications for the maximum series fuse must always be adhered to (☞ Technical data). Only fuses cited in the electrical circuit diagram may be used.
- When opening cable glands on the fan / motor, check the condition of the threaded connections and seals. Always replace defective or brittle threaded connections and seals.

Danger of being sucked in!
Do not wear loose or hanging clothing, jewellery, etc., tie together long hair and cover it.

2.7 Working on device / Hazards through “residual voltage”

Information
Mounting, electrical connection, and start-up operation may only be carried out by an electrical specialist in accordance with electrotechnical regulations (e.g. EN 50110 or EN 60204)!

Danger due to electric current
- It is generally forbidden to carry out work on electrical live parts!
- The 5 electrical safety rules must be observed!
- Only remove the lid from the terminal compartment (available depending on the model) with the line voltage switched off!
- Opening of the base lid is prohibited. Loosening the safety screws will void the guarantee!
  - Protection class of the device when complete open is IP00! It is possible to touch hazardous voltages directly.
  - Through use of capacitors, danger of death exists even after switching off the device!
- The rotor is not protected against indirect contact neither by supplementary or reinforced insulation

nor by connection to safety-earth in accordance with EN 60204-1, therefore the system constructor must provide protection by enclosure in accordance with EN 61140 before the motor is connected to a power source. This protection can be achieved for example by a guard grille (☞ Product overview: Application operational area and Mounting: General notes).
- When the motor runs independently due to air flowing through or if it continues to run down after being turned off, dangerous voltages of over 50 V can arise on the motor internal connections through operation of the generator.
- The safe isolation from the supply must be checked using a **two-pole** voltage detector.
- Even after disconnecting the mains voltage, life-threatening charges can appear between the protective ground “PE” and the mains connection.
- The protective earth is conducting high discharge currents (dependent on the switching frequency, current-source voltage and motor capacity). Earthing in compliance with EN specifications shall therefore be observed even for testing and trial conditions (EN 50 178, Art. 5.2.11). Without earthing, dangerous voltages can be present on the motor housing.
- Maintenance work may only be carried out by suitably qualified personnel.

Attention, automatic restart!
- The motor may switch on and off automatically for functional reasons.
- Automatically restart after a power failure or mains disconnection!
- Wait for the motor to come to a complete standstill before approaching it!
- The exterior rotor turns during operation of the external rotor motor!

Attention, hot surface!
- Temperatures of above 85 °C can occur on the motor surfaces, especially on the controller housing!

2.8 Modifications / interventions in the device

Attention!
For reasons of safety, no unauthorized interventions or modifications may be made on the device. All planned modifications must be authorized by the manufacturer in writing.

Use only genuine spare parts / genuine wearing parts / genuine accessories from ZIEHL-ABEGG.These parts were specifically designed for the device. There is no guarantee that parts from non-original sources are designed and manufactured in correspondence with load and safety requirements.
Parts and optional equipment not supplied by ZIEHL-ABEGG are not approved by ZIEHL-ABEGG for use.

2.9 Operator’s obligation of diligence
- The contractor or owner must also ensure that the electric systems and equipment are operated and maintained in accordance with electro-technical regulations.
- The owner is obliged to ensure that the device is operated in perfect working order only.
- The device may only be used as intended (☞ “area of application”).
- You must periodically examine the safety equipment for their properly functioning condition.
- The assembly instructions and/or operating instructions are always readily available at the location where the device is being used, are complete and are in legible condition.
- These persons are regularly instructed in all applicable questions regarding occupational safety and environmental protection and are knowledgeable regarding the assembly instructions and/or operating instructions and, especially, are familiar with the safety instructions contained therein.
- All safety and warning notices attached to the device are never removed and remain legible.

2.10 Employment of external personnel
Maintenance and service work are frequently carried out by external employees who often do not recognize the specific situations and the thus resulting dangers.These persons must be comprehensively informed about the hazards in their area of activity.
You must monitor their working methods in order to intervene in good time if necessary.

3 Product overview

3.1 Application operational area

The fans motors are not ready-for-use products, but conceived as components for ventilation systems (type designation ☞rating plate). The fans may only then be operated when they are installed in accordance with their intended use, and safety has been secured through protective devices in accordance with EN ISO13857 (EN ISO 12100) or other structural protective measures.

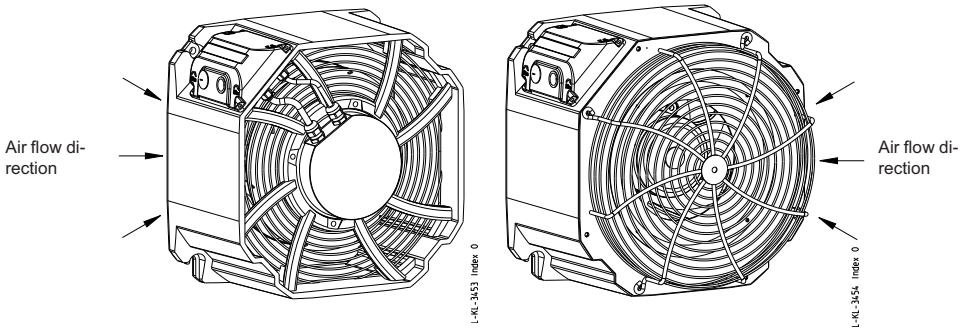
3.2 Functional description

ECblue stands for EC fans and motors with maximum efficiency. Highly efficient, electronically commutated motors with permanent magnets are used the speed of which is controlled by the integrated controller.
The devices are constructed in accordance with the general requirement in EN 61800-2 for adjustable speed electrical power systems and is intended for one-quadrant drives.

The ventilation units for drive units are available in sucking and pressing versions.

Suction side version

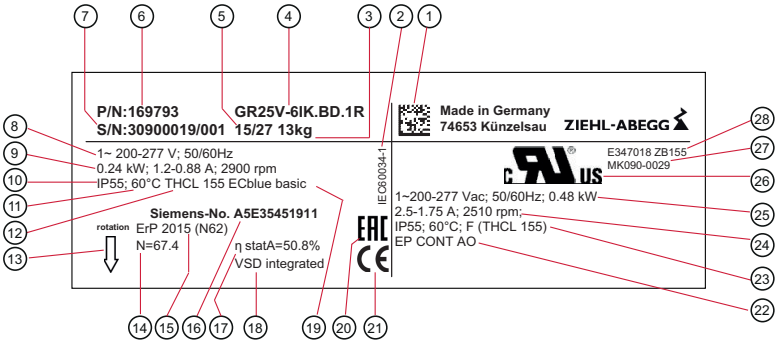
Blower side version



3.3 Rating plate

The rating plate carries the technical data valid for the delivered product.

Example for rating plate



no.	Description	no.	Description
ZIEHL-ABEGG related data		UL related data	
1	DATA MATRIX Code confirmation number	22	UL motor type EP: Electronically protected Cont: Continuous duty motor AO: Air over
2	Product standard		
3	Weight		
4	Type designation		
5	Date of manufacture	23	Protection class Max. media temperature Thermal class F
6	Partnumber ZIEHL-ABEGG SE		
7	Confirmation number		
8	Symbols current type and rated voltage range Rated frequency	24	Rated current Rated speed
9	Rated power Rated current Rated speed	25	Symbols current type and rated voltage range Rated frequency Rated power
10	Protection class	26	Certification symbol
11	Max. media temperature	27	Motor identification UL
12	Thermal class F	28	UL file and insulation system
13	Direction of rotation arrow		
14	Efficiency standardised		
15	Efficiency N for ERP 2015		
16	Customer article number		
17	Static efficiency fan		
18	**V**ariable **S**peed **D**rive integrated		
19	Name of series		
20	Eurasian mark of conformity		
21	European mark of conformity		

3.4 Criteria for long service life

The service life of devices with power electronics is decisively dependent on the ambient temperatures. The longer electronic components are exposed to high ambient temperatures, the faster the deterioration and the more probable the failures.

The device is designed with a service life of at least 40,000 h when S1 operated at full power in the maximum permissible ambient-temperature environment.
In order to achieve this, the device protects itself by active temperature management.

3.5 Note on the ErP directive

ZIEHL-ABEGG SE wishes to point out that, based on the directive (EU) no. 327/2011 of the Commission of 30th of March 2011 for enforcing directive 2009/125/EC (hereinafter referred to as ErP directive), the operational area of certain fans within the EU is bound by certain prerequisites.
The fan may only be used within the EU when it meets the requirements of the ErP directive.
If the said fan does not have a CE mark (cf. especially the rating plate), use of this product within the EU is not admissible.
All ErP-relevant information comprises measurements which are determined using a standardised measurement set-up. More details can be obtained from the manufacturer.
Further information about the ErP directive (Energy related Products-Directive) can be found on www.ziehl-abegg.de ☞search key: "ErP".

3.6 Transport, storage

Attention!

- Observe the weight specifications (☞ rating plate) and the permissible carrying loads of the means of transport.
- Wear safety shoes and gloves for handling!
- Transport the fan(s) either in the original packaging or, in the case of larger fans, on the dedicated transportation fixtures.
  – axial fans: holes drilled in support arms, wall ring plates and motor block
  – centrifugal fans depending on type: holes drilled in the housing flange, motor block, fastening brackets and support plates,
- Do not transport the fan by the connecting cable!
- Avoid shocks and impacts to the device during the transport.
- Avoid extreme humidity, heat or exposure to cold (☞ Technical Data).
- Watch out for possible damage to the packaging or fan.
- Radial impellers, fans with scroll RG.., RD.. or built-in fans type ER../GR.. are generally delivered on europallets, and can be transported using lift trucks.
- Fix pallets during transport.
- Do not stack pallets.
- Only handle with suitable hoisting gear.
- **Design RG.. / RD.. / ER.. / GR..** : Fan unit may only be lifted and transported when using a suitable hoisting device (load spreader). Ensure sufficient cable or chain length.
- Position the lifting beam transversely to the motor axis. Pay attention to adequate width of the lifting beam.
- Never stand underneath the suspended fan because defective transport equipment could cause death.
- Store the fan / motor in the original packaging in a dry area protected from the weather and protect it from dirt and weather until final installation.
- Avoid prolonged storage; we recommend a maximum of one year (consult the manufacturer before starting if stored for longer).
- Inspect the motor bearings for proper operation prior to installation.
  – Recommendation: Turn the impeller evenly by hand to avoid jamming and damaging the bearing.

3.7 Disposal / recycling

Disposal must be carried out professionally and in an environmentally friendly way in accordance with the respective national legal stipulations.
▷ Separate the materials by type and in an environmentally friendly way.
▷ If necessary, commission a specialist company with the waste disposal.

4 Mounting

4.1 General notes

Attention!

- Check the fan for damage, e.g. cracks, dents or damage to the electric cables, before assembly. Start-up is not allowed in the case of transport damage!
- Mounting is only to be undertaken by trained service personnel. The system manufacturer or the machine builder and/or the user is responsible that the inherent installation and security information are harmonized with the valid standard and guidelines (EN ISO 12100 / 13857).
- Wear safety shoes and gloves for handling!
- Lift the fan out of the packaging with a lifting gear (lifting beam). Attachment points are solely the holes on the housing flange, motor bed, support plate, motor suspensions, fastening brackets and any crane eyes of the fan (depending on the shape of the fan).
- The chain/rope may not touch the impeller and the possibly mounted frequency inverter when lifting with the lifting beam. Otherwise damage is possible.
- At a weight greater than 25 kg for men / 10 kg for women, the fan should be lifted out by two persons (according to REFA). The values may differ from country to country.
- Prior to installing the fan, it is to be checked whether the safety zone as per EN ISO 13857 and in household appliances as per EN 60335 are met. If the installation height (danger zone) above the reference level is greater than or equal to 2700 mm and is not reduced by auxiliary means such as chairs, ladders, work platforms or bases on vehicles, a guard grille against accidental contact is not necessary at the fan.
- If the fan is located in danger zone, then the manufacturer or operator shall ensure that hazards shall be prevented by appropriare protective constuctions which meet the requirements to EN ISO 13857.
- The custom designs must suit the prevailing conditions.
- Tighten the fastenings with the specified torques.
- Do not allow drilling chips, screws and other foreign bodies to reach the device interior!
- Any use below -10 °C is dependent on not being subjected to unusual, sudden or mechanical loads or stresses on the material (min. ambient temperature ☞ Technical data).
- Corrosion is possible at the cutting edges on sendzimir galvanised parts.

Before the first switch-on, remove any items that may be present (borings, screws and other foreign objects) from the intake area - risk of injury from any objects that may fly out!

4.2 Mounting of centrifugal fans, GR design

Fastening depending on housing design on flange or fastening brackets.

Attention!

- Observe the data on the dimensional sheet of the ventilation unit for the respective article number.
- Avoid structural damage or stress with installation. Flange and mounting bracket must be fixed flat on a level surface.
- Provide screwed connections with suitable screw locking.
- Erect in the open air only if this is expressly mentioned and confirmed in the ordering information. There is a risk of damage to the bearings if the fan remains stopped in a moist environment. Avoid corrosion by suitable protective measures. Roofing is required.
- All contact points must be fixed securely. If the fixing is inadequate there is a risk of the fan overturning.
- Making your own alterations/conversions on the fan module is unacceptable - safety risk.

Permissible tightening torque with flat washer in Nm (µtot.=0.12):			
M5	M6	M8	M10
5.5	9.5	23	46

Permissible tightening torque with spring lock washer/contact disk in Nm (µtot.=0.16):			
M5	M6	M8	M10
6.6	11.3	27.4	54

Information

When using screws with different friction values or strength classes, different tightening torques may be necessary.

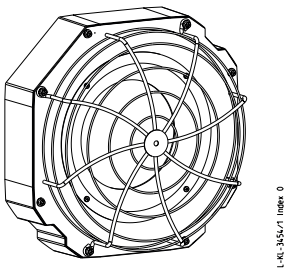
4.3 Mounting filter unit

The protective grille must be removed to mount the filter unit.

The following parts are required additionally:

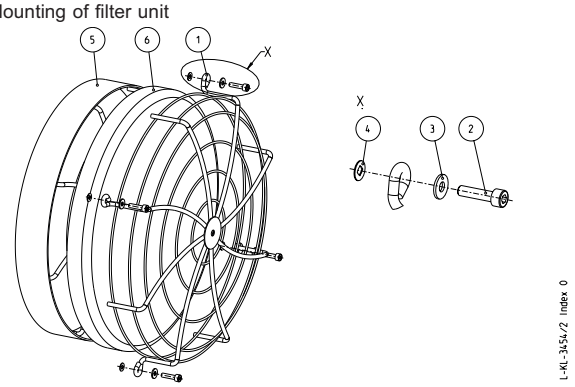
- Filter cage “5”
- Filter “6” according to DIN EN 779 filter class G3

Without mounting filter unit



L-KL-3454/1 Index 0

Mounting of filter unit



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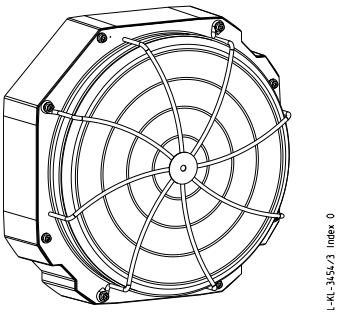
1 Guard grille
2 4 x screws for fastening guard grille
3 4 x contact washer
4 4 x anti-loss washer
5 Filter cage
6 Filter

Procedure

1. Loosen 4 screws “2” and remove the protective grille “1”.
2. The screws “2”, contact washers “3” and anti-loss washers “4” stay on the protective grille.
3. Join the filter unit. Consisting of: Protective grille “1”, fastening parts “2”, “3”, “4”, filter cage “5” and filter “6”. Make sure that the filter is inserted in the centre and overlaps the sheet metal ring of the filter cage “5” .
4. Fasten the complete filter unit to the fan, observe tightening torques ☞assembly centrifugal fans design GR.

Fan with filter unit



Replace filter

1. Loosen 4 screws “2” and remove the complete filter unit from the fan.
2. Separate the protective grille “1” from the filter cage“5” and remove the filter “6”. The four screws “2”, contact washers “3” and anti-loss washer “4” remain respectively on the protective grille “1”.
3. Reassemble the filter unit with new filter according to DIN EN 779 - G3 as described in "Filter unit assembly“ and fasten to the fan.

4.4 Connection lead & terminal box

Information
In demanding environments (wet areas, open air installation) all connections must incorporate water drainage curves. To ensure that water cannot penetrate through to the controller housing from the connections install a terminal box lower than the motor.

4.5 Outdoor fans in a humid atmosphere

Information
If a fan / motor is stationary for long periods in a humid atmosphere, it should be switched ON for minimum of two hours every month to remove any moisture that may have condensed within the motor.

4.6 Motorheating

A continuous power supply is required for safe operation down to the minimum permitted outer temperature (☞ technical data).
If the motor is not switched on with an existing power supply (no setting signal, switch off by enable), the motorheating switches back off automatically at a controller inside temperature of -19 °C and heating up to -15 °C.
Heating takes place via the motor winding whereby a current is induced which cannot cause rotation.

5 Electrical installation

5.1 Safety precautions

Danger due to electric current

- **Work on electric components may only be carried out by trained electricians or by persons instructed in electricity under the supervision of an electrician in accordance with electrical engineering regulations.**
- The 5 electrical safety rules must be observed!
- It is forbidden to carry out work on electrically live parts. Even after disconnection, the dc-link is still live. Always wait at least 3 minutes.
- Other measures may be necessary to achieve safe electrical isolation.
- A second person must always be present when working on energized parts or lines who disconnects in case of emergency.
- Connect fan only to electrical circuits that can be disconnected with an all-pole isolating switch.
- Operating the device with the housing cover removed is prohibited because energized, exposed parts are present inside the device. Disregarding this regulation can lead to severe personal injury.
- The device owner is responsible for the EMC of the entire plant according to the locally applicable standards.
- Inspect electrical equipment periodically: retighten loose connections – immediately replace damaged lines and cables.
- Never clean electrical equipment with water or similar liquids.

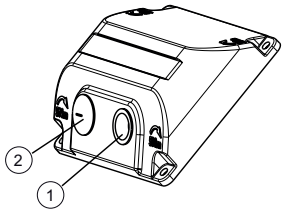
5.2 Connecting to the terminal box

Information

The respective connections are represented in the enclosure of this assembly instructions (☞ Connection diagram)!

Procedure:

▷ Remove the lid from the terminal box for connection.
▷ Both cable entry points are in a sealed condition at delivery.
  – Inlet “1” is provided for the mains connection and therefore only sealed with a plug.
  – Inlet “2” is provided for the optional connection of the control and is equipped with a stopper.
▷ Insert and connect cables properly and ensure tightness of the cable glands.



1 M20 cable inlet for mains connection
2 M20 cable inlet for control

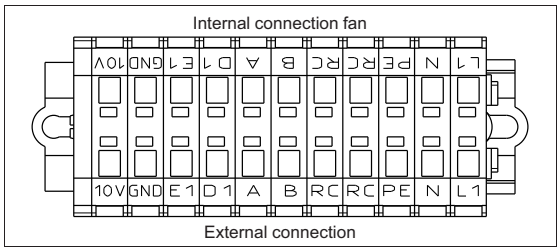
▷ Unused entry points must be sealed!
▷ Move the terminal box lid carefully to the right position before commissioning (tightening torque of the lid screws 5 Nm).

Attention!

- Cables glands are not part of the scope of supply. The manufacturer’s specifications for tightening torque and sealing area must be observed!
- Only use lines which can guarantee a permanent seal around the cable glands (pressure-resistant, dimensionally-stable, round-centred jacket; e.g. by means of gusset filling)!
- Make absolutely sure that different connections do not come into contact (e.g. by splaying or loose connecting wires).

- Remants from installation and foreign object may not remain on the inside!
  Remants from installation, foreign objects and dirt has to be removed from the sealing area between cover and housing!

Terminal block



Connection data of terminals

Connection technique	Spring terminal
Single wire connection	0.08 … 1.5 mm^2 / 28 … 16 AWG
Thin wire connection	0.08 … 1.5 mm^2 / 28 … 16 AWG
Stripping length	8 … 9 mm / 0.31 … 0.35 inch
The data refer to the connection possibilities of the terminals. The necessary conductor cross section must be dimensioned according to the respective prevailing conditions.	

5.3 EMC-compatible installation of control lines

Pay attention to sufficient distance from powerlines and motor wires to prevent interferences. The control cable may not be longer than 30 m. Screened control cables must be used when the cable length is longer than 20 m. When using a shielded cable connect the shielding to one side only, i.e. only to the signal source with the protective earth (keep cable short and with as little inductance as possible!).

5.4 Mains connection

5.4.1 Line voltage

Mains connection: PE, L1 and N. Here, it must be strictly observed that the mains voltage lies within the allowable tolerance specifications (☞ technical data).

Danger due to electric current

- Between the mains connection of the device and the protective earth “PE” is in no case a higher voltage permissible than the indicated line voltage of the device!
- To activate the on current limitation, you must **wait** at least **5 minutes** after switching off the line voltage before switching back on!

5.4.2 Required quality attributes for the mains voltage

Danger due to electric current

The mains voltage must comply with the EN 50160 quality characteristics and the defined standard voltages in IEC 60038!

5.4.3 Operating in IT-System

Danger due to electric current
- In the IT-System the neutral point of voltage supply is not grounded; in the case of a short-circuit between a phase (e.g. “L1”) and protective earth “PE” becomes the protective earth potential = phase.
- Between the mains connection of the device and the protective earth “PE” is in no case a higher voltage permissible than the indicated line voltage of the device!

For 1 ~ fan types
1 ~ types can be used in IT-System in standard version. These may only be used in 3 ~ IT-Systems if no higher voltage to the “PE” can occur than the specified mains voltage of the device even in case of a fault to earth of a mains phase which is not used by the device (of none of the two power supplies).
In order to ensure a trouble free operation in IT-System the “GND” potential of the control ports have to be connected with the protective earth potential.
As a consequence of these connection must be considered for the control ports (exception floating relay contacts):
1. Connection only with wires, suitable for mains voltage and surrounding area.
2. Connection with suitable isolated amplifiers only.

5.5 Residual-current-operated protective device

Danger due to electric current
To ensure as high a degree of reliability as possible we recommend a release current of 300 mA, where a residual current circuit breaker (type A) is used.

Residual current circuit breaker (type A)

Exception: All-current-sensitive fault current circuit breaker on the 3 ~ 230 V line
When connecting the device between two outer conductors, “all-current-sensitive” fault current circuit breakers must be used (☞ EN 50 178, Art. 5.2).

5.6 Motor protection

Integrated overload protection, preceding motor protection device unnecessary (max. prefusing ☞ Technical details).

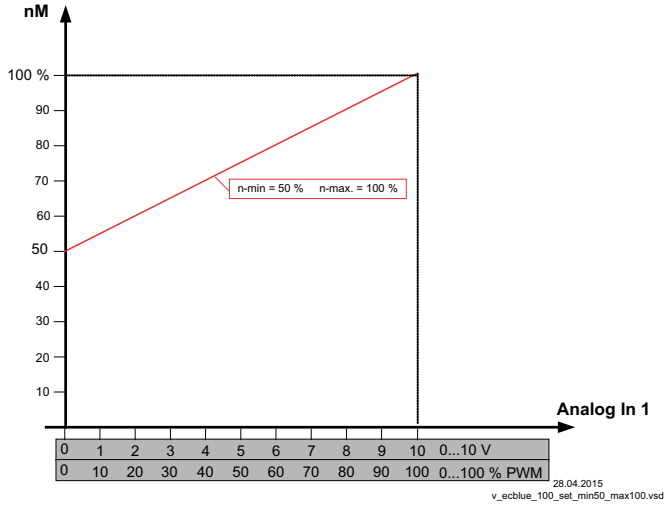
5.7 Operation with 100 % speed / alternatively speed control by specification signal

In the as-delivered state operation with 100 % speed
After switching on the mains voltage and a run-up time of approx. 20 seconds the fan is operated constantly with 100 % speed (reference speed). For this function a bridge is installed at the factory on the terminal block between the analogue input “E1” and the power supply “10 V” (specification signal 10 V ≙ specification 100 % speed).

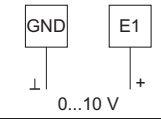
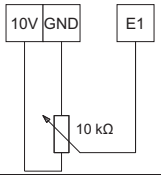
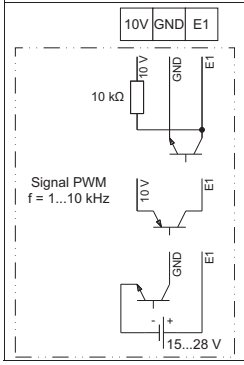
Speed control via setting signal
If necessary, a speed specification between 50 and 100 % of the specified reference speed is possible via the analogue input (specification signal 0...10 V ≙ specification 50..100 % speed).
For this, remove the factory-installed bridge between “E1” and “10 V”, connection of specification signal to “E1” / “GND” (R_i ☞ Technical data).

Danger due to electric current
- Ensure correct polarity!
- Never apply line voltage to analog inputs!

Diagram for setting via external signal.



nM Motor speed
100 % Rated speed
Si Speed setting signal 0...10 V / 0...100 % PWM

Possibilities for speed setting	
	• Control via external setting signal **0...10 V**. • By external wiring with a resistor (499 Ω / 0,25 W) between the terminals “E1” and “GND” parallel to the input signal, activation with a **0...20 mA** signal is possible.
	• Speed setting by 10 kΩ potentiometer at terminals “+10 V” and “GND” pick-off at terminals “E1”.
	• Control via external setting signal PWM.

5.8 Voltage supply “10 V DC”

Voltage supply for external components, e.g. for a potentiometer for speed setting (PELV current source according to EN 60204-1).
Connection: “10 V” - “GND” (max. load ☞ Technical data und connection diagram).
During an overload or short-circuit (10 V - GND), the control voltage (and thus the device) is disconnected . Automatic start after elimination of the cause of error.
It is not permissible to connect outputs of several devices to each other!

5.9 Relay output “K1” for fault indication

An external fault indicator is available over the potential-free contact of the built-in relays (max. contact rating ☞Technical data and connection diagram).
For operation the relay is energized, connections “11” and “14” are bridged. For fault the relay is de-energized.

5.10 MODBUS (RS-485) interface

Via the MODBUS interface (terminals “A” and “B”) Siemens customer service can check the operating state of the fan.

5.11 Potential at control voltage connections

The control voltage connections (< 50 V) relate to the joint GND potential (Exception: Relay contacts are potential free). There is a potential separation between the control voltage connections and the protective earth. It must be ensured that the maximum external voltage at the control voltage connections cannot exceed 50 V (between “GND” terminals and “PE” protective earth). If necessary, a connection to the protective earth potential can be established, install bridge between “GND” terminal and the “PE” connection (terminal for screening).

6 Start-up

6.1 Prerequisites for commissioning

Attention!

- During commissioning, unexpected and hazardous conditions can arise in the entire installation due to defective adjustments, defective components or incorrect electrical connections. Remove all persons and objects from the hazardous area.
- Do not start the fan until all safety instructions (DIN EN 50110, IEC 364) have been checked, the fan is out of range (DIN EN ISO 13857) and danger can be ruled out.

Before first-time start-up, check the following:

1. Installation and electrical connection have been properly completed?
2. Has any leftover installation material and other foreign material been removed from the fan area?
3. That safety devices -if necessary- are mounted (EN ISO 13857)?
4. The impeller is out of reach?
5. Connection data complies with the specifications on the rating plate?

During start-up check the following:

1. Check the direction of rotation (☞ rotation direction arrow on the fan blade, impeller base plate or support plates on suction side or rating plate).
2. Check for quiet, low vibration operation. Strong vibrations due to erratic operation (unbalanced), e.g. caused by transportation damage or improper use, can lead to failure.
3. A-rated sound power levels of over 80 dB(A) are possible, see product catalogue.
4. Fans from ZIEHL-ABEGG SE are delivered balanced in accordance with ISO 1940-1 for the appropriate fan category in accordance with ISO 14694. Check the fan for mechanical vibrations after installation. If the limit values of the corresponding fan category are exceeded in start-up, you must have the motor/impeller unit checked by an expert and rebalanced if necessary before continuous operation is permitted.

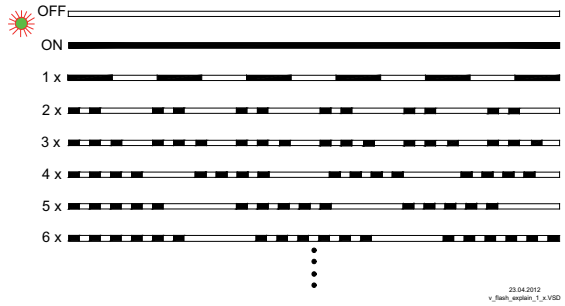
7 Diagnostic

7.1 Trouble shooting

Type of error	**Possible cause**	**Adjustment**
Fan does not run (anymore)	No line voltage line failure Under - or overvoltage	Check line voltage
	Earth fault	Check motor connection and line voltage
	Short circuit winding	Replace fan
	Thermal motor protection has triggered (motor is overheated)	Check for free air passages; remove foreign bodies if necessary ☞ "Impeller blocked or dirty" Check temperature of supply air Check voltage
	Impeller blocked or dirty	- Switch off power to the motor and secure against switching back on - Check safe isolation from supply - Remove safety grille - Remove foreign bodies or soiling - Remount the safety grille - Further procedure as in the chapter “Start-up”
Fan will not start	Temperature too low for bearing grease	Insert bearing with cold greasing
	Air stream wrong direction (Motor turns in wrong direction at high speed)	Check air stream
	☞ "Fan does not run"	
Fan turns too slowly	Impeller / blade scrapes / brushes	When indicated, clear foreign bodies/dirt from the fan
Air flow to low	Fan turns too slowly	☞ "Fan turns too slowly"
	Airways blocked	Check for free air passages (supply/exhaust air vents, filters) ☞ "Impeller blocked or dirty"
	Pressure loss different to planned	Check fan selection
Vibrations	Imbalance	Check blades for damage, soiling or ice ☞ "Impeller blocked or dirty"
	No or wrong vibration dampers (only in radial)	Install correct vibration dampers
Unusual noises	Bearing damaged / worn	Change bearings (for motor size “Z” replace fan)
	Impeller / blade scrapes / brushes	When indicated clear foreign bodies / dirt from the fan ☞ "Impeller blocked or dirty"
	Operation beyond stall point (for axial fans)	Check for free air passages (supply/exhaust air vents, filters)
	Wrong overlap on nozzle (for centrifugal fans)	Observe the installation instructions

7.2 Status Out with flash code

Status LED in the lid of the fan (may not be available in the ATEX version).



Information
Operating states are indicated by the status LED in the fan lid by a flashing code. A description of the flashing code is available from Siemens Service if required.

8 Service work

8.1 Repairs / maintenance

Attention!

- Allow maintenance work to be carried out by trained specialists only.
- Wear safety shoes and gloves for handling!
- Please observe the safety regulations and the worker´s protection rules by all maintenance and service work (EN 50 110, IEC 364).
- Before working on the fan, this must be disconnected from the power supply and secured against switching back on!
- Generator operation can produce dangerous voltages ☞ Safety instructions!
- Keep the airways of the fan free - danger because of objects dropping out!
- No maintenance work at running fan!
- Watch out for vibration free motion!
- The impeller is subject to natural wear depending on the area of application and the conveying medium. Deposits on the impeller can lead to imbalance and damage (danger of permanent fracture). The impeller can burst!
- If highly aggressive media for which the product is not suited are conveyed, the severe corrosion may result in the impeller breaking. Any impellers corroded in this way must be replaced immediately.
- Deposits on the motor, particularly on the cooling vanes and in recesses on the rotor, can lead to reduced cooling performance and the motor switching off prematurely. For this reason, remove deposits quickly (☞ Chapter: Cleaning).
- Maintenance interval in accordance with the degree of contamination of the impeller!
- Check the fan at regular intervals (recommendation: every 6 months) for mechanical oscillations. Observe the limits specified in ISO 14694 and, if they are exceeded, implement remedial measures (e.g. rebalancing by specialist staff).
- Check the impeller, in particular the weld-seams, for possible cracks.
- Repair, e.g. by welding is prohibited!
- The fan or motor is maintenance-free due to the use of ball bearings with “life-time lubrication”. At the end of the grease service life (☞ Technical Data), it is necessary to change the bearing. The grease service life may be lower than the theoretical value stated there (F_{10h}) if particular operating conditions such as vibrations, humidity or soiling in the bearing, unfavourable control modes, etc. are present. Please consult our Service Department with regard to changing the bearing as for all other damage (e.g. to the coil or electronics).

- Bolted-on wheels and/or wings may only be replaced by authorised ZIEHL-ABEGG SE staff. The manufacturer shall not be liable for damage caused through improper repair work.
- Regular inspection and possibly cleaning is necessary to prevent imbalance and blockage of the condensation bores due to ingress of dirt.

Information
Confirmation number for inquiries or in service cases ☞ rating plate.
State the additionally engraved confirmation number (available depending on the motor build) if the rating plate is no longer legible. This can be found under the affixed rating plate or on the stator flange (in external rotor motors) depending on the motor size.

8.2 Cleaning

Danger due to electric current
Voltage supply for motor must be interrupted and secured against restoration!

Clean the fans`s flow area.

Attention!

- Do not use any aggressive, paint solvent cleaning agents when cleaning.
- Make sure that no water gets inside the motor and the electronics (e.g. by direct contact with seals or motor openings), observe protection class (IP).
- In case of improper cleaning work, no warranty is assumed regarding corrosion formation / paint adhesion for unpainted / painted fans.
- To avoid accumulation of moisture in the motor, the fan must be operated for at least 1 hour at 80% to 100 % of the maximum speed before the cleaning process!
- After the cleaning process, the fan must be operated for at least 2 hours at 80 to 100 % of the maximum speed for drying purposes!

9 Enclosure

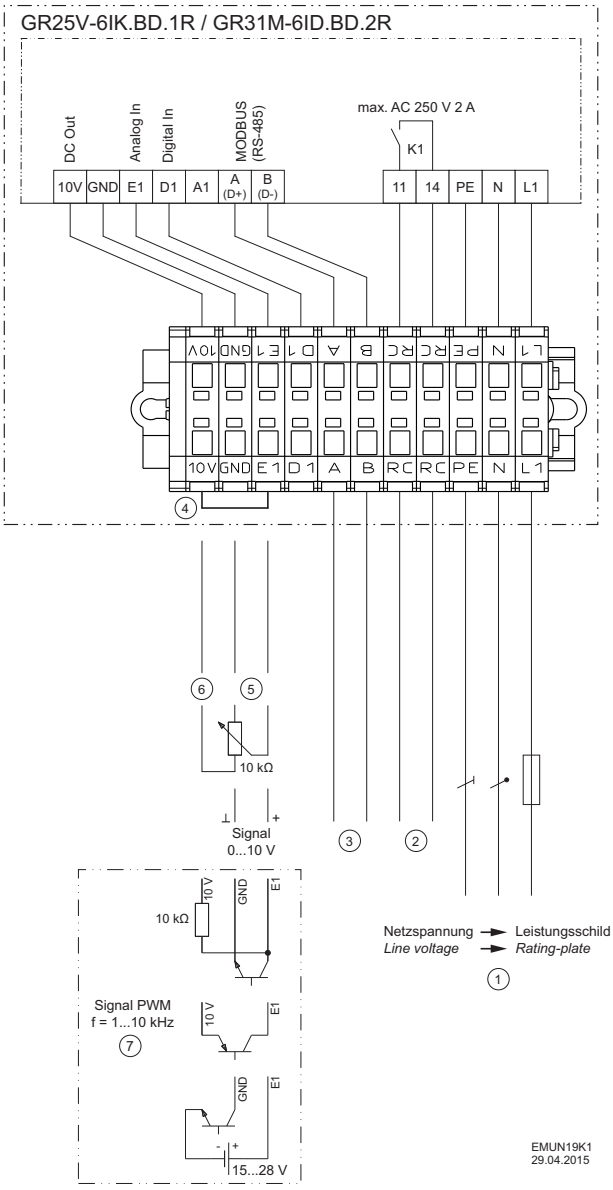
9.1 Technical data

Rated voltage range (☞ Rating plate)	1 ~ 200...277 V, 50/60 Hz
Maximal line fuse	16 A
Max. load limit integral of cut-in current approx.	2.0 A^2s
Switching Freq.	16 kHz
Voltage supply for external devices	+10 V (-2 %), I_{max} 50 mA (short-circuit-proof)
Analogue input “E1”	Input resistance: R_i > 100 kΩ Specification speed setting signal PWM Voltage: 15...28 V DC Switching frequency: 1...10 kHz On-off ratio: 0...100 %
Digital input “D1”	Input resistance: R_i approx. 2 kΩ Voltage range high level: 7.1...19 V DC Voltage range low level: 0....2.7 V DC
Contact rating of the internal relay “K1”	AC 250 V 2 A
Permissible minimal and maximal ambient temperature for operation	-15...60 °C (☞ rating plate) To avoid condensation the drive must be continuously energized due to the application of heat, with interruptions such that cooling to the point of condensation does not occur.
Max. permitted conveyor temperature	80 °C
Permissible temperature range for storage and transport	-25...+70 °C
Max. permissible installation height	height 1000 m amsl without derating
Permissible rel. humidity	98 % (briefly 100 %)
Electromagnetic60038compatibility for the standard voltage 230 / 400 V according to IEC 60038	Interference emission EN 61000-6-3 (domestic household applications)
	Interference immunity EN 61000-6-2 (industrial applications)
Harmonics current	Active power factor adjustment for sinusoidal input current (PFC = Power - Factor - controller), harmonic current in accordance with EN 61000-3-2 are guaranteed.
Max. leakage current according to the defined networks of EN 60990	< 3.5 mA
dB(A) values	☞ Data sheets available at Siemens
Ball bearings grease service-life (F_{10h})	during standard usage approx. 40.000 h
Protection class of motor according to EN 60034-5	IP55

* *Regarding the mains connection, these devices are to be classified as category “C2” devices according to the relevant DIN EN 61800-3. The increased requirements placed on electrical interference > 2 kHz for category “C1” devices are complied with in addition.*

For motors with the corresponding quality mark (☞ rating plate)		
Authorization:	FILE No. E347018	UL 1004-3 UL 1004-7
	c UL us	Electronically Protected Motors - Component

9.2 Connection diagram



1 Line voltage ☞ rating plate
2 Relay output for fault indication (contact rating max. AC 250 V 2 A)
3 MODBUS (RS-485) interface
4 Factory-installed bridge between 10 V and E1 for 100 % speed
5 Input for speed setting by 0...10 V signal / potentiometer (R_i > 100 kΩ)
6 Voltage supply 10 V DC (I_{max} 50 mA)
7 Speed setting by PWM signal (f = 1...10 kHz)

9.3

EC Declaration of Incorporation

ZA87-GB-12/13 Index 004
00296702-GB

as defined by the EC Machinery Directive 2006/42/EC, Annex II B

The design of the incomplete machine:

- Axial fan FA.., FB.., FC.., FE.., FF.., FS.., FT.., FH.., FL.., FN.., VR.., VN.., ZC.., ZF.., ZN..
- Centrifugal fan RA.., RD.., RE.., RF.., RG.., RH.., RK.., RM.., RR.., RZ.., GR.., ER..
- Cross-flow fan QK.., QR.., QT.., QD.., QG..

Motor type:

- Induction internal or external rotor motor (also with integrated frequency inverter)
- Electronically commutated internal or external rotor motor (also with integrated EC controller)

complies with the requirements in Appendix I, Articles 1.1.2, 1.1.5, 1.4.1, 1.5.1 in EC Machinery Directive 2006/42/EC.

The manufacturer is the **ZIEHL-ABEGG SE**
Heinz-Ziehl-Strasse
D-74653 Künzelsau

The following standards are applied:

EN 60204-1:2006	Safety of machinery; electrical equipment of machines; Part 1: General requirements
EN ISO 12100:2010	Safety of machinery; basic concepts, general principles for design
EN ISO 13857:2008	Safety of machinery; safety distances to prevent danger zones being reached by the upper limbs
Note:	The maintenance of the EN ISO 13857:2008 relates only to the installed accidental contact protection, provided that it is part of the scope of delivery.

The specific technical documentation in accordance with Appendix VII B has been written and is available in its entirety.

The person authorised for compiling the specific technical documentation is: Dr. W. Angelis, address see above. The specific documentation will be transmitted to the official authorities on justified request. The transmission can be electronic, on data carriers or on paper. All industrial property rights remain with the above-mentioned manufacturer.

It is prohibited to commission this incomplete machine until it has been secured that the machine into which it was incorporated complies with the stipulations of the EC Machinery Directive.

Künzelsau, 22.11.2013 Dr. W. Angelis - Technical Director Ventilation Division

i.V. W. Angelis

9.4 Index

9.5 Manufacturer reference CE

Our products are manufactured in accordance with the relevant international regulations. If you have any questions concerning the use of our products or plan special uses, please contact:

ZIEHL-ABEGG SE
Heinz-Ziehl-Straße
74653 Künzelsau
Telephone: +49 (0) 7940 16-0
Telefax: +49 (0) 7940 16-504
info@ziehl-abegg.de
http://www.ziehl-abegg.de

9.6 Service information

If you have any technical questions while commissioning or regarding malfunctions, please contact the Siemens Service Center at the following contact data:
https://support.industry.siemens.com/My/ww/en/requests#createRequest or
mailto:ld-service.i-cs@siemens.com

Index

S

T

V

W

AG EC declaration of Conformity 1PH8 35
AA Manual STROMAG Break
AB Manual Ziehl Abegg external fan

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