

Three-phase induction motor  
AC COMPACT DRIVES  
Type 1PL618.

ac motor

**SIEMENS**



## Three-phase induction motor

### AC COMPACT DRIVES 1PL618

#### Operating Instructions

Safety information **1**

Description **2**

Transport, assembly, and connection **3**

Start-up **4**

Operation **5**

Faults **6**




Maintenance **7**

Spare parts **8**

Notes **9**

## Safety Guidelines

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

 <b>DANGER</b>
indicates that death or severe personal injury <b>will</b> result if proper precautions are not taken.
 <b>WARNING</b>
indicates that death or severe personal injury <b>may</b> result if proper precautions are not taken.
 <b>CAUTION</b>
with a safety alert symbol, indicates that minor personal injury can result if proper precautions are not taken.
<b>CAUTION</b>
without a safety alert symbol, indicates that property damage can result if proper precautions are not taken.
<b>NOTICE</b>
indicates that an unintended result or situation can occur if the corresponding information is not taken into account.


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 device/system may only be set up and used in conjunction with this documentation. Commissioning and operation of a device/system may only be performed by **qualified personnel**. Within the context of the safety notes in this documentation qualified persons are defined as persons who are authorized to commission, ground and label devices, systems and circuits in accordance with established safety practices and standards.

## Prescribed Usage

Note the following:

 <b>WARNING</b>
This device may only be used for the applications described in the catalog or the technical description and only in connection with devices or components from other manufacturers which have been approved or recommended by Siemens. Correct, reliable operation of the product requires proper transport, storage, positioning and assembly as well as careful operation and maintenance.

## Trademarks

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

## Disclaimer of Liability

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

# Table of contents

<b>1</b>	<b>Safety information</b> .....	<b>7</b>
1.1	Observing the five safety rules.....	7
1.2	Safety and application instructions .....	7
1.3	Electromagnetic fields.....	9
1.4	ESD-sensitive components.....	10
1.5	EC Declaration by the Manufacturer.....	12
1.6	EC Declaration of Conformity .....	13
<b>2</b>	<b>Description</b> .....	<b>15</b>
2.1	Applications.....	15
2.2	Siemens Service Center .....	15
2.3	Scope of delivery .....	16
2.4	Rating plate .....	16
2.5	Layout .....	17
2.5.1	Cooling .....	17
2.5.2	Drive.....	18
2.5.3	Construction types .....	18
2.5.4	Regulations .....	19
2.5.5	Degree of protection .....	20
<b>3</b>	<b>Transport, assembly, and connection</b> .....	<b>21</b>
3.1	Transport, storage, and maintenance .....	21
3.1.1	Transport, storage.....	21
3.1.2	Storage.....	22
3.1.3	Preservation.....	23
3.2	Assembly.....	24
3.2.1	Installation.....	24
3.2.2	Mounting .....	26
3.3	Electrical connection .....	27
3.3.1	Safety note for the drive-CLIQ interface .....	27
3.3.2	Connecting the stator winding.....	27
3.3.3	Connecting the ground conductor.....	31
3.3.4	Connecting the fan.....	32
3.3.5	Connecting the speed sensor .....	34
3.3.6	Connecting the Sensor Module.....	35
3.3.7	Connecting the temperature sensor .....	36
<b>4</b>	<b>Start-up</b> .....	<b>39</b>
4.1	Preparations.....	39

4.2	Measures to be performed prior to commissioning.....	41
4.3	Power on .....	42
<b>5</b>	<b>Operation.....</b>	<b>43</b>
5.1	Operation.....	43
5.2	Stoppages .....	44
5.3	Deactivating .....	45
<b>6</b>	<b>Faults.....</b>	<b>47</b>
6.1	Fault diagnosis table .....	47
<b>7</b>	<b>Maintenance .....</b>	<b>49</b>
7.1	Maintenance.....	49
7.1.1	Maintenance instructions .....	49
7.1.2	Maintenance intervals .....	50
7.1.3	Maintenance of the external fan.....	51
7.1.4	Bearings .....	51
7.1.5	Lubrication (optional).....	52
7.1.6	Cleaning .....	54
7.2	Inspection .....	55
7.2.1	General inspection specifications .....	55
7.2.2	Initial inspection.....	55
7.2.3	Main service .....	56
7.3	Corrective Maintenance .....	57
7.3.1	Instructions for repair .....	57
7.3.2	Dismantling .....	57
7.3.3	Re-assembly .....	61
7.3.4	Screw-type connections .....	62
7.3.5	Replacing the sensor module .....	63
<b>8</b>	<b>Spare parts .....</b>	<b>65</b>
8.1	Orders for spare parts .....	65
8.2	Spare parts 1PL6 .....	66
<b>9</b>	<b>Notes .....</b>	<b>69</b>
	<b>Index.....</b>	<b>73</b>

**Tables**

Table 2-1	Technical support.....	15
Table 2-2	Motor rating plate – technical specifications .....	16
Table 2-3	Compliance with standards .....	20
Table 3-1	Weights of standard versions (IM B3).....	21
Table 3-2	Pressure drop in motors with pipe connection .....	25
Table 3-3	Terminal designations (with the 1U1-1 as an example).....	28
Table 3-4	Terminal box assignment, max. connectable cross-section per terminal .....	29
Table 3-5	Tightening torque for the fixing screws on the lid .....	31

Table 4-1	Stator winding insulation resistance at 25 °C .....	40
Table 6-1	Diagnosis table for mechanical faults .....	47
Table 6-2	Diagnosis table for electrical faults .....	48
Table 7-1	Operating period intervals.....	51
Table 7-2	Rolling-contact bearing greases .....	52
Table 7-3	Tightening torque for screwed union connections .....	62
Table 8-1	Spare Parts .....	67

## Figures

Figure 1-1	ESD protective measures .....	10
Figure 2-1	Example - 1PL6 motor rating plate .....	16
Figure 2-2	Cooling process for ventilating from the drive end to the non-drive end (basic type).....	17
Figure 2-3	View from above onto construction type IM B3 .....	19
Figure 3-1	(1) Cover sheet (detailed view) .....	26
Figure 3-2	Connecting direction UVW for connection voltages of 400 V/480 V.....	28
Figure 3-3	Tightening torques for contact nuts and mounting bolts ① contact nut ② mounting bolt .....	30
Figure 3-4	Detailed view of fan for operation at 50 Hz.....	33
Figure 3-5	Fan for operation at 60 Hz .....	33
Figure 3-6	Detailed view: Plug-in connection .....	34
Figure 3-7	Electrical connection of the speed sensor .....	35
Figure 3-8	Sensor Module ① mounted on terminal box .....	36
Figure 7-1	D-end and N-end end shields with grease nipples .....	53
Figure 7-2	Detailed view of the speed sensor .....	59
Figure 7-3	Disassembling the speed sensor: forcing off, 1st option .....	60
Figure 7-4	Disassembling the speed sensor: forcing off, 2nd option .....	61
Figure 8-1	Spare parts 1PL6 .....	66





## Safety information

### 1.1 Observing the five safety rules

For your personal safety and to prevent material damage when working on the device, always observe the safety instructions on the product and the following **five safety rules**: You must read the information provided in "Safety information".

#### The five safety rules:

1. isolate,
2. Protect against reconnection,
3. verify that the equipment is not live,
4. Ground and short circuit,
5. Cover or enclose adjacent components that are still live

#### Qualified personnel

Commissioning and operation of this machine are to be carried out by qualified personnel only. For the purpose of the safety information in this Instruction Manual, a "qualified person" is someone who is authorized to energize, ground, and tag equipment, systems, and circuits in accordance with established safety procedures.

### 1.2 Safety and application instructions

#### The safe use of electrical machines



#### **WARNING**

##### **Rotating or live parts**

Rotating or live parts are dangerous.

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

Only remove covers in accordance with regulations and operate machines correctly. Perform regular maintenance on the machine.

## **Qualified personnel**

These operating instructions only contain the information that is necessary for the machines to be used by qualified personnel in accordance with their intended purpose.

Those responsible for plant safety must ensure the following:

- The basic planning work for the system and all work relating to transportation, assembly, installation, commissioning, maintenance and repairs is carried out by qualified personnel and checked by responsible, suitably skilled personnel.
- The operating instructions and machine documentation are always available.
- The technical data and specifications relating to installation, connection, ambient and operating conditions are taken into account at all times.
- The system-specific installation and safety regulations are observed.
- Personal protective equipment is used.
- Work on or in the vicinity of these machines by unqualified persons is prohibited.
- If the machines are used outside industrial areas, the installation site must be safeguarded against unauthorized access by means of suitable protection facilities (e.g., safety gates) and appropriate warning signs.

These operating instructions therefore only contain the information which is necessary for the machines to be used by qualified persons in accordance with their intended purpose.

---

### **Note**

#### **Siemens Service Center**

We recommend engaging the support and services of your local Siemens Service Center for all planning, installation, commissioning, and maintenance work.

---


[ID 2.02]

## **See also**

Siemens Service Center (Page 15)

## 1.3 Electromagnetic fields

### Safety information

 <b>WARNING</b>
<b>Electromagnetic fields "electro smog"</b> Electromagnetic fields are generated by the operation of electrical power engineering installations such as transformers, converters or motors. Electromagnetic fields can interfere with electronic devices, which could cause them to malfunction. For example, the operation of heart pacemakers can be impaired, potentially leading to damage to a person's health or even death. It is therefore forbidden for persons with heart pacemakers to enter these areas. The plant operator is responsible for taking appropriate measures (labels and hazard warnings) to adequately protect operating personnel and others against any possible risk.

- Observe the relevant nationally applicable health and safety regulations. In Germany, "electromagnetic fields" are subject to regulations BGV B11 and BGR B11 stipulated by the German statutory industrial accident insurance institution.
- Display adequate hazard warning notices.



- Place barriers around hazardous areas.
- Take measures, e.g. using shields, to reduce electromagnetic fields at their source.
- Make sure that personnel are wearing the appropriate protective gear.

[ID5003.011]

## 1.4 ESD-sensitive components

### ESD guidelines

<b>CAUTION</b>
<b>Electrostatic discharge</b>
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 foil, plastic parts, insulating table supports or clothing made of synthetic fibers.
- Always place electrostatic endangered assemblies on conductive bases.
- Always store and transport electronic modules or components in conductive packaging (e.g. metallized plastic or metal containers).

#### Note

If the modules are to be stored and/or transported in non-conducting packings anyway, they must be wrapped in conducting materials before doing so. Always use suitable material for this purpose, for example, conductive foam rubber or household aluminum foil.

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

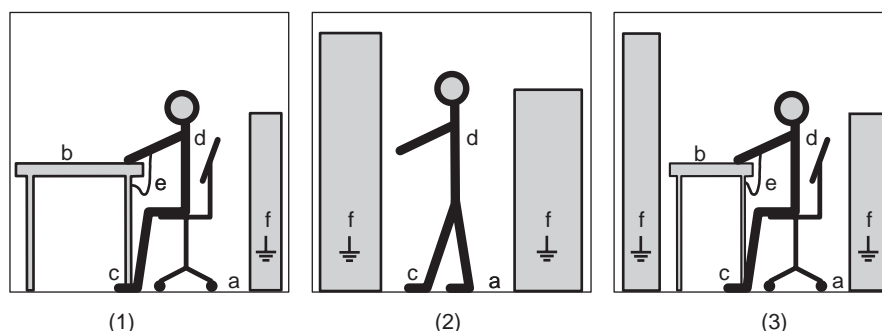


Figure 1-1 ESD protective measures

- (1) Sitting
  - (2) Standing
  - (3) Standing/sitting
- ESD protective measures
- a = conductive floor
  - b = ESD table
  - c = ESD footwear
  - d = ESD coat
  - e = ESD wrist strap
  - f = cubicle ground connection

[ID 6006.01]

## 1.5 EC Declaration by the Manufacturer

# SIEMENS

### EU Supplier's Declaration

(in accordance with Art. 4 Para. 2 of EU Directive 98/37/EU)

No. A1A 3436.H002 DE / 05.01

Manufacturer: Siemens Aktiengesellschaft  
Automation and Drives Group  
Large Drives Division  
Industry Subdivision

Address: Vogelweiherstraße 1 - 15  
90441 Nuremberg  
Federal Republic of Germany

Product designation: **Three-phase asynchronous machine 1PL6...  
Shaft height 18 to 28.**


The designated product is only intended for installation in another machine.  
Start-up is forbidden until it has been confirmed that the final product conforms with Directive 98/37/EU.

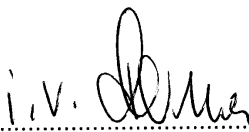
We confirm that the products designated above conform with the following standards:

EN 60034-1  
EN 60034-5  
EN 60034-6  
EN 60034-9  
EN 60204-1, Section 16

Siemens Aktiengesellschaft

Nuremberg, .....28/12/07..... (date)

  
.....  
A&D LD I, Jürgen Amedick  
Head of Industry Subdivision

  
.....  
A&D LD I BA, Klaus Hermes  
Business Administration Head of Industry  
Subdivision

This declaration does not constitute a guarantee of product characteristics in the sense of product liability.  
The safety notes in the product documents must be complied with.

## 1.6 EC Declaration of Conformity

# SIEMENS

### EU Declaration of Conformity

No. A1A 3436.K002 DE / 05.01

Manufacturer: Siemens Aktiengesellschaft  
Automation and Drives Group  
Large Drives Division  
Industry Subdivision

Address: Vogelweiherstraße 1 - 15  
90441 Nuremberg  
Federal Republic of Germany

Product designation: **Three-phase asynchronous machine 1PL6...  
Shaft height 18 to 28.**

The designated product agrees with the stipulations of the following European directive:

Directive 73/23/EEC Directive of the council for harmonization of the legal regulations of member states with regard to electrical equipment for use within certain voltage limits, altered by RL 93/68/EWG of the council

Agreement with this Directive is verified by conformance with the following standards:

Harmonized European standards: EN 60 034-1  
EN 60 034-5  
EN 60 034-6  
EN 60 034-9  
EN 60 204-1

Safety notes and operating instructions are also to be adhered to.

CE marking first attached: 1996

Siemens Aktiengesellschaft

Nuremberg, .....28/2/07..... (date)

.....i.v. Amedick.....  
A&D LD I, Jürgen Amedick  
Head of Industry Subdivision

.....i.v. Hermes.....  
A&D LD I BA, Klaus Hermes  
Business Administration Head of Industry  
Subdivision

This declaration certifies agreement with the directives referred to but does not constitute a guarantee of product characteristics in the sense of product liability.





## Description

### 2.1 Applications

#### Overview

Three-phase motors of the 1PL6 series are used as industrial drives. They have been designed for a wide range of applications in the fields of drive engineering and power conversion.

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

[ID: 301]

### 2.2 Siemens Service Center

#### Contact for further information

Details regarding the design of this electrical machine and the permissible operating conditions are described in these operating instructions. If you have any questions or suggestions, or if you require additional information, please contact the Siemens Service Center:

Table 2-1 Technical support

Europe - Germany:	Phone:	+49 (0)180 - 50 50 222
	Fax	+49 (0)180 - 50 50 223
America - USA:	Phone:	+1 423 262 2522
Asia - China:	Phone:	+86 1064 719 990
E-Mail:		support.automation@siemens.com
Internet English:		<a href="http://www.siemens.com/automation/support-request">www.siemens.com/automation/support-request</a>
Internet Deutsch:		<a href="http://www.siemens.de/automation/support-request">www.siemens.de/automation/support-request</a>

## 2.3 Scope of delivery

### Checking the scope of 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 scope of the delivery matches up with the accompanying documents. Siemens will not accept any claims relating to items missing from the delivery and that are submitted at a later date.

- Report any apparent transport damage to the delivery agent immediately.
- Report any apparent defects/missing components to the appropriate SIEMENS office immediately.

These Operating Instructions are included in the scope of delivery and must be kept in a location where they can be easily accessed.

The rating plate enclosed as a loose item with the delivery ensures that the motor data can also be affixed on or near the machine or system.

[ID: 303.02]

## 2.4 Rating plate

The motor rating plate shows the technical specifications applicable to the supplied motor.

SIEMENS		UL		CE				
①	3~Mot. 1PL6 184-4HD000AC3			NoN- T91164901010001 / 2005			⑨	
②	IMB3	IP 23		Th.Cl. F	Gew./WT. 370 kg		⑩	
③	V		A	kW	cosφ	Hz	1/min	⑪
④								⑫
⑤								⑬
⑥	345 Y		122	57	0.87	34	1000	⑭
	400 Y		121	65	0.86	39	1150	
	460 Y		119	74	0.86	46	1350	
⑦	EN / EC 60034-1			max		5000 1/min		⑮
⑧	KTY84 ENCODER_H01_1024_SR						⑯	
MADE IN GERMANY D-90441 Nürnberg						DEW0244		

Figure 2-1 Example - 1PL6 motor rating plate

Table 2-2 Motor rating plate – technical specifications

- |   |  |
|---|--|
| 1 | Motor type: Three-phase induction motor  |
| 2 | Type of construction                     |
| 3 | Degree of protection                     |
| 4 | Rated voltage [V] and winding connection |
| 5 | Rated current [A]                        |

6	Rated output [kW]
7	Standards and regulations
8	Code sensor type, temperature sensor KTY84
9	Serial number
10	Motor weight [kg]
11	Temperature class
12	Rated speed [rpm]
13	Rated frequency [Hz]
14	Power factor [ $\cos \phi$ ]
15	Maximum speed [rpm]

[ID: 307.02]

## 2.5 Layout

### 2.5.1 Cooling

#### Description

The three-phase motors of the 1PL6 series are externally and enclosed-ventilated, low-voltage induction motors with a squirrel-cage rotor and a separately driven fan unit mounted as standard. The motors have an internal cooling circuit (cooling method IC06 according to DIN EN IEC 60034-6).

#### Cooling process (basic type)

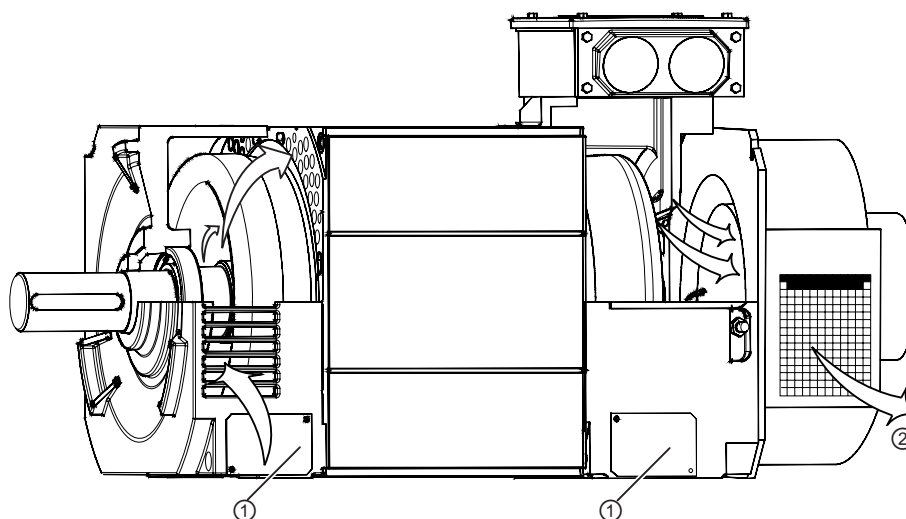


Figure 2-2 Cooling process for ventilating from the drive end to the non-drive end (basic type)

- ① Cover sheet
- ② Cooling flow

A KTY 84 temperature sensor is installed in the stator winding to monitor the winding.

Depending on the order, various additional devices such as sensor systems can be installed or built on.

**NOTICE**

A minimum clearance of 100 mm from devices added on by the customer must be observed at the air intake opening and at the air outlet openings, in order to guarantee the necessary flow of cooling air.

### Securing the cooling capacity

**CAUTION**

Missing cover sheets can result in considerably reduced cooling capacity and thus cause an inadmissible temperature rise within the motor.

Please ensure that the cover sheets are always mounted.

[ID: 973.00]

## 2.5.2 Drive

### Description

The variable-speed, three-phase motors of the 1PL6 series are supplied with power by a frequency converter.

[ID: 313]

## 2.5.3 Construction types

### Further potential applications

The construction type of the motor is stated on the rating plate.

 **CAUTION**

During transportation, motors must only be hoisted in a position corresponding to their basic construction type.

Basic construction type acc. to rating plate	Type	Other applications in construction type
IM B3	1PL6 184...1PL6 186	IM B6, IM B7, IM B8, IM V5, IM V6
IM B35 (1)	1PL6 184...1PL6 186	IM V36, IM V15

The maximum permissible speed for flange-mounted construction types (IM B5, IM V1, IM V3) is restricted to 3000 rpm (see also "Planning Guide").

#### Note

For additional instructions and restrictions for construction types that do not correspond to the basic type, please refer to the "Planning Guide".

### Additional hoisting points for different construction types (option)

Additional hoisting points are provided for those construction types that differ from the basic construction types IM B3 and IM B35 (see Fig.).

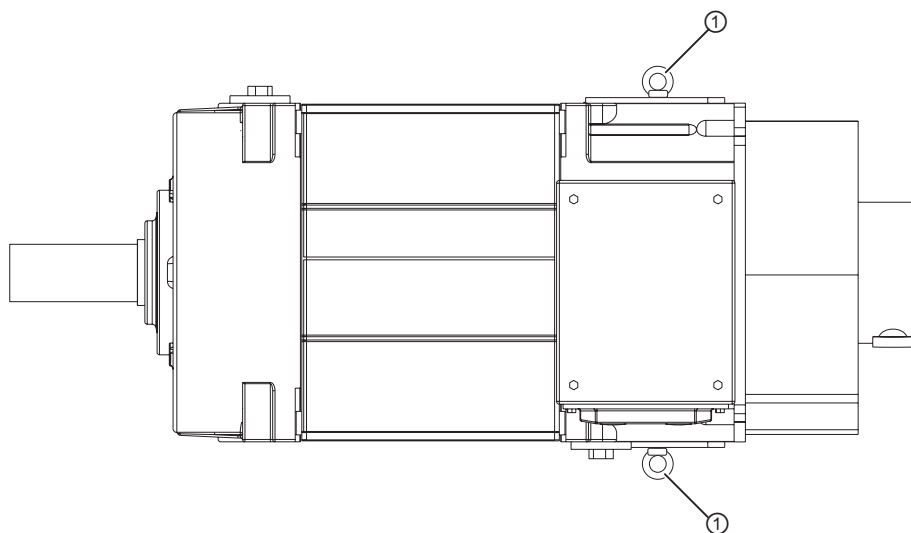


Figure 2-3 View from above onto construction type IM B3

① Hoisting points  
[ID: 318.01]

## 2.5.4 Regulations

### Overview

The motors comply with the following regulations under IEC EN 60034:

Table 2-3 Compliance with standards

<b>Feature</b>	<b>Standard</b>
Dimensions and operating performance	IEC/EN 60034-1
Degree of protection (1)	IEC/EN 60034-5
Cooling	IEC/EN 60034-6
Type of construction	IEC/EN 60034-7
Noise emission	IEC/EN 60034-9
Vibration severity levels	IEC/EN 60034-14

(1) See the rating plate for the degree of machine protection.

[ID: 319.01]

### 2.5.5 Degree of protection

The three-phase motors of the 1PL6 series are built to degree of protection IP23 in accordance with IEC EN 60034-5.

The standard version of the motors is not suitable for operation in a salt-laden or corrosive atmosphere, nor for installation outdoors.

[ID: 391]

## Transport, assembly, and connection

### 3.1 Transport, storage, and maintenance

#### 3.1.1 Transport, storage

##### Instructions relevant to safety

Please observe the following instructions on the transportation and storage of motors.


 <b>WARNING</b>
<p>Motors may only be attached to and hoisted by the main eyebolts that are located at the end shields. Auxiliary eyebolts, e.g. on fan cowls and cooler attachments, are suitable only for hoisting the respective parts.</p> <p>To hoist the motor, in particular at attachments and built-on assemblies, use suitable cable-guidance or spreading equipment.</p> <p>Observe the lifting capacity of the hoisting gear.</p> <p>(For weight, see rating plate and table "Weights of standard versions")</p>

Table 3-1 Weights of standard versions (IM B3)

Type	Weight
1PL6 184	Approx. 370 kg
1PL6 186	Approx. 440 kg

<b>NOTICE</b>
<p>If the motor is not immediately commissioned, then it should be stored in a dry room which is free from vibration and shock.</p>

### Transporting motors with a rotor shipping brace

Motors with cylindrical-roller bearings have a rotor shipping brace (shaft block), in order to prevent the bearings from becoming damaged during transportation/shipping.

- Only remove this brace before fitting the drive element.

<b>NOTICE</b>
Take other suitable measures to axially fix the rotor if the motor has to be transported after you have fitted the drive element.

[ID: 325.01]

### 3.1.2 Storage

<b>CAUTION</b>
<b>Seizure damage to friction bearings and rolling-contact bearings</b> If storage conditions are inappropriate there is a risk of bearing seizure damage. This can result in brinelling, for example. Read the following notes on storage.

#### Storing outdoors

Store the machine in a location that meets the following criteria:

- Choose a dry storage location with plenty of space, which is safe from flooding and free from vibrations.
- Repair any damage to the packaging before putting the equipment into storage insofar as this is necessary to ensure proper storage conditions.
- Position machines, devices, and crates on pallets, wooden beams or foundations that guarantee protection against ground dampness.
- Prevent the machine sinking into the ground.
- Ensure that the air circulation under the equipment is not impeded.
  - Covers or tarpaulins used to protect the equipment against the weather must not make contact with the surfaces of the equipment.
  - Covers or tarpaulins must not trail on the floor around the machine.
  - Place wooden spacer blocks between the covers and the machine.

#### Storing indoors

- Store the machine in a room that meets the following criteria:
  - Dry, dust-free, frost-free and vibration-free
  - Well ventilated



- Offers protection against extreme weather conditions
- The air in the room must not contain any harmful gases.
- Protect the machine from shocks and humidity.

[ID 1079.01xx]

### 3.1.3 Preservation

#### Preservation

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 a constant source of low heat to the machine windings, along with forced air ventilation.

#### CAUTION

##### Bearing damage caused by vibrations

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

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

#### Condensation water

Condensation water 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.

#### CAUTION

##### Damage caused by condensation water

If the stator winding gets damp, its insulation resistance decreases. This results in voltage flashovers, which can destroy the winding. Condensation can also cause rusting inside the machine.

Ensure that condensation water is drained off.

In the end shields at the drive end and non-drive end, water drain holes are situated in the foot area and opposite the regreasing devices. They are sealed with small plastic plugs or screw plugs. Depending on the type of installation, the water drain holes are located at the bottom.


1. Remove the screw plugs or plastic plugs regularly to drain off the condensation water.
2. Replace the plugs afterwards.

<b>NOTICE</b>
<b>Degree of protection</b> Nominally the degree of protection of the machine is reduced to IP44 by removing the plastic plug or screw plug. [ID 1079.02]

## 3.2 Assembly

### 3.2.1 Installation

#### Instructions relevant to safety

 <b>CAUTION</b>
The enclosure components of electric motors can become very hot (possibly > 100 °C). Do not touch enclosure components while the motor is running or immediately after it has been running.
<b>CAUTION</b>
When positioning temperature-sensitive components (wires etc.), make sure that they are not in contact with the motor enclosure.
<b>NOTICE</b>
Note also the technical specifications on the rating plates on the motor enclosure.

#### Cooling conditions in general

- In the case of 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 must not be reinducted (see also "Cooling").

#### Cooling conditions for motors with pipe connection

Motors that are configured to allow pipes to be connected and/or for operation with a separately driven fan must have pipes and a fan of suitable type and dimensioning mounted and connected to them.

Please refer to the table below for the potential pressure drop inside the motor for motors with a pipe connection:

Table 3-2 Pressure drop in motors with pipe connection

1PL6 18.	
Volumetric flow (V)	Pressure drop ( $\Delta p$ )
0.27 m <sup>3</sup> /s	650 Pa

#### NOTICE

Please consider the additional pressure drop that arises in the system when connecting the pipes.

Also ensure that:

- you comply with the conditions of the IP degree of protection.  
Higher IP requirements may necessitate the installation of suitable filters and special positioning of the intake and outlet openings.
- units and wires are mounted without distortion.
- the shipping covers of the ventilation openings are removed.

### Balancing quality

The rotors are balanced dynamically. In the case of shaft ends with feather keys, the method used to balance the rotors can be identified from the following coding to be found on the end face at the drive end of the shaft end:

- Code "H" means balancing with half a feather key (standard version); this means that in order to maintain the balancing quality it may be necessary to cut back the part of the feather key protruding from the drive element and the shaft profile if the motor has a short output element.
- "F" means balancing with a whole featherkey (optional version).

Make sure that the balancing method of the output element is correct!

#### CAUTION

A suitable tool must always be used for fitting and pulling off output elements.

The feather keys are only locked against falling out during shipping.

### Noise emission

Motors of the 1PL618. series have a measuring surface sound pressure level Lp(A) of approx. 73 dB(A) + 3 dB (tolerance) in a speed range from 0 through 2000 rpm.

The motors are certified for a wide range of installation and operating conditions. In some cases, these conditions (e.g. rigid or vibration-isolated foundation design, use of sound-absorbing elements) can have a significant influence on noise emissions.

When evaluating the noise levels at the workplaces of the system operators, consider the fact that the A-weighted sound pressure level (measured in accordance with DIN EN 21680 Tl.1) of 70 dB(A) is exceeded when the three-phase motors are operated at nominal load.

[ID: 329.01]

### 3.2.2 Mounting

#### Requirements

In order to ensure smooth, vibration-free motor operation, a stable foundation design is required, the motor must be precisely aligned, and the components that are to be mounted on the shaft end must be correctly balanced.

#### Removing the cover sheets

Cover sheets are attached by means of the screw positions on the motor feet.

The cover sheets (1) have to be removed before mounting the motor

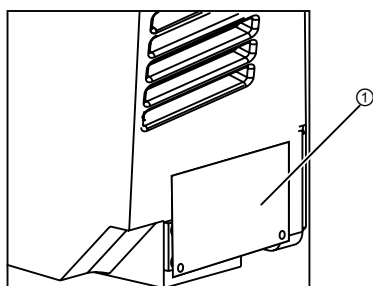


Figure 3-1 (1) Cover sheet (detailed view)

#### CAUTION

The cover sheets ensure the cooling of the motor.

Please make sure that the cover sheets are always screwed back onto the motor after mounting the motor via the motor feet.

#### Fixing by means of motor feet

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.

## Fixing bolts

To securely mount the motor and reliably transfer the drive torque, use motor fixing bolts (M12) with the required strength class (8.8) in accordance with ISO 898-1.

NOTICE
All flange motors must have stable suspension and be supported by means of the end-shield feet (foot-flange type of construction). When carrying out commissioning, make sure that the vibration values permitted in accordance with DIN ISO 10816-3 are maintained.  Motors that are mounted, as a result of their type of construction, to the wall using the motor feet, must be fixed in place using an adequately dimensioned positive form fit (e.g. using studs or mounting rails).

[ID: 331.02]

## 3.3 Electrical connection

### 3.3.1 Safety note for the drive-CLIQ interface

CAUTION
<b>Electrostatically sensitive devices</b> The drive-CLIQ interface contains components that are susceptible to electrostatic charging. DTouching connections on the sensor module with electrostatic charged hands or tools can cause malfunctions. Comply with ESD protection measures (Page 10).

[ID 962.01]

### 3.3.2 Connecting the stator winding

#### Circuit diagram

Details with respect to wiring and connecting the motor winding are laid down in the circuit diagram. The circuit diagram is attached to the lid of the terminal box.

3.3 Electrical connection

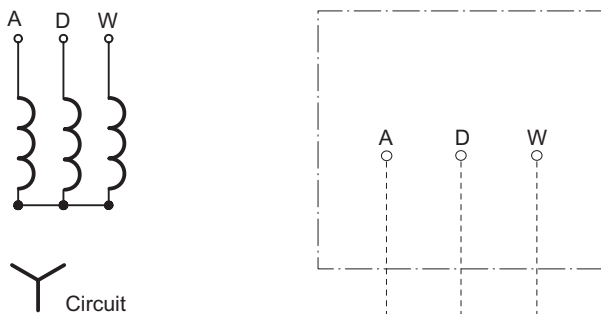


Figure 3-2 Connecting direction UVW for connection voltages of 400 V/480 V

Select the connecting cables taking into account the rated current and the system specific conditions (e.g. ambient temperature, routing type etc. in accordance with IEC EN 60204-1).

**Direction of rotation**

Connection of the power cables in the phase sequence L1, L2, L3 to U, V, W results in clockwise rotation. If two of the connections are swapped then the resulting direction of rotation is counter-clockwise (e.g. L1, L2, L3 to V, U, W).

**Note**

These restrictions in terms of the direction of rotation relate to the particular type of motor design and result, for example, from the use of unidirectional fans. Any restrictions in terms of the direction of rotation resulting from the installation itself are not shown in the information on the rating plate and need to be considered separately when making the connections.

**Terminal designations**

The following definitions apply in principle to the terminal designations of three-phase motors in accordance with DIN VDE 0530 Part 8 or IEC 60034-8:

Table 3-3 Terminal designations (with the 1U1-1 as an example)

1	U	1	-	1	Identifier
x					Index showing the pole assignment for pole-changing motors (where applicable, a lower number indicates a lower speed) or, in special cases, for a subdivided winding
	x				Phase designation (U, V, W)
		x			Index showing the start (1) / end (2) or tapping point of the winding (if there is more than one connection per winding)
				x	Additional index for cases in which it is obligatory to connect parallel power feed cables to several terminals with otherwise identical designations

**Connecting using cable lugs**

To connect the cables to the main terminals, select cable lugs that match the necessary cable cross-section and bolt size M12.

Table 3-4 Terminal box assignment, max. connectable cross-section per terminal

Motor type	Terminal box type	Cable entry	Max. poss. outer diameter of cable [mm]	No. of main terminals	Max. connectable cross-section per terminal [mm <sup>2</sup> ]	Max. poss. current per terminal [A] (Reduction factor 0.6)
8. th digit of the MLFB = 4, 6						
1PL6 184-..B	1XB7 322	2 x PG 42	40	3 x M12	2 x 50	191
1PL6184-..D						
1PL6184-..F						
1PL6184-..L	1XB7 422	2 x M72 x 2	56	3 x M12	2 x 70	242
1PL6186-..B	1XB7 322	2 x PG 42	40	3 x M12	2 x 50	191
1PL6186-..D						
1PL6186-..F	1XB7 422	2 x M72 x 2	56	3 x M12	2 x 70	242
1PL6186-..L	1XB7 700	3 x M72 x 2	56	3 x 2 x M12	3 x 150	583
8. th digit of the MLFB = 7, 8						
1PL6 184-..B	1XB7 322	2 x M50 x 1.5	38	3 x M12	2 x 50	191
1PL6184-..D						
1PL6184-..F						
1PL6184-..L	1XB7 422	2 x M63 x 1.5	53	3 x M12	2 x 70	242
1PL6186-..B	1XB7 322	2 x M50 x 1.5	38	3 x M12	2 x 50	191
1PL6186-..D						
1PL6186-..F	1XB7 422	2 x M63 x 1.5	53	3 x M12	2 x 70	242
1PL6186-..L	1XB7 700	3 x M75 x 1.5	68	3 x 2 x M12	3 x 150	583

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

If necessary, insulate the cable lugs in order to maintain the minimum clearances in air of 10 mm and the 20 mm creepage distance normally present.

The tightening torque for M12 contact nuts and mounting bolts is 40 Nm.

3.3 Electrical connection

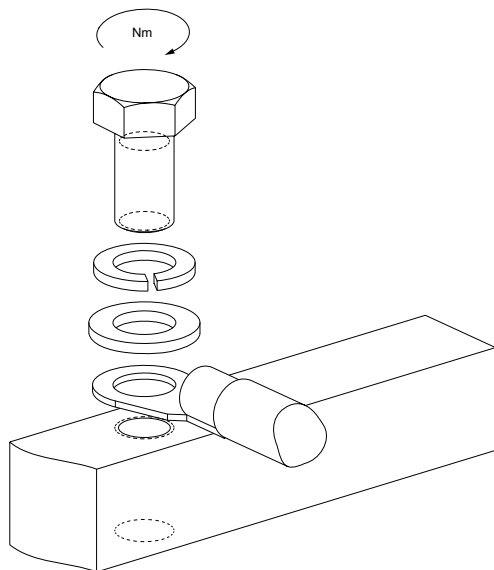


Figure 3-3 Tightening torques for contact nuts and mounting bolts  
① contact nut  
② mounting bolt

### Principles of fitting and laying cables

Lead in permanently laid entries using EMC cable glands. Screw the cable glands into the threaded holes in the entry plate, which can be unscrewed.

Arrange the exposed connecting cables in the terminal box such that the PE conductor has excess length and the insulation of the cable strands cannot be damaged.

#### Note

We recommend you use shielded cables whose shields are conductively connected to a large area of the metal terminal box of the motor (with an EMC cable gland made of metal).

#### NOTICE

Unused threads must be sealed with a metallic screw plug.

### Internal equipotential bonding

The equipotential bonding between the ground terminal in the terminal box housing and the motor frame is established via the terminal box mounting bolts. The contact points underneath the bolt heads are bare metal and are protected against corrosion.

The standard terminal box cover mounting screws are adequate as potential bonding between the terminal box cover and terminal box itself.

### Final checks

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.
- no wire ends are standing proud.
- The inside of the terminal box must be clean and free of any pieces of cable.
- all seals and sealing surfaces are not damaged.
- the connecting cables are laid in an open arrangement and the cable insulation cannot be damaged.
- cable entries which are not used are sealed and the plugs are tightly screwed in (i.e. so that they can only be removed using the suitable tools).
- the right cable glands are fitted with respect to the correct degree of protection, method of laying, permissible cable diameter etc., as stated in the specifications.

Then close the terminal box.

Table 3-5 Tightening torque for the fixing screws on the lid

Bolt	Terminal box type	Tightening torque
M6	1XB7 322	4.5 Nm
M8	1XB7 422	11 Nm
M10	1XB7 700	22 Nm

[ID: 335.01]

### 3.3.3 Connecting the ground conductor

#### General

The cross-section of the ground conductor of the motor must comply with the regulations for electrical installations, e.g. DIN EN IEC 60204-1.

#### Wiring

Connect-up the ground-conductor in the motor terminal box. For this purpose, a clamping lug is provided at the appropriately marked connecting point for the ground conductor. This lug can be used for connecting stranded conductors with cable lugs or ribbon cables with an appropriately shaped conductor end.

When making connections, ensure that

- The contact surface is clean and protected with a suitable anti-corrosion agent (e.g. acid-free Vaseline).
- the flat and spring washers are located under the bolt head.
- the minimum necessary screw-in depth and the tightening torque for the clamping bolts must be maintained.

Mandatory tightening torques:

3.3 Electrical connection

Bolt	Terminal box type	Tightening torque
M5	1XB7 322	2.6 Nm
M8	1XB7 422	11 Nm
	1XB7 700	11 Nm

[ID: 354]

### 3.3.4 Connecting the fan

#### Instructions relevant to safety

Please observe the following safety instructions relating to connecting a fan:

<b>CAUTION</b>
Provide a protective circuit that prevents the main motor from being switched on when the fan unit is not in operation.

<b>CAUTION</b>
Please note that the separately driven fan unit is only suitable for the direction of rotation shown by the direction-of-rotation arrow. The fan must not be operated with the wrong direction of rotation as this could lead to the motor being destroyed.

#### Note

The direction-of-rotation arrow and the direction of movement of the fan impeller are indicated on the rear side of the blower.

If necessary, switch the direction of rotation by swapping over two phase conductors in the terminal box.

#### Connection

Connect up the fan in the terminal box of the fan unit.

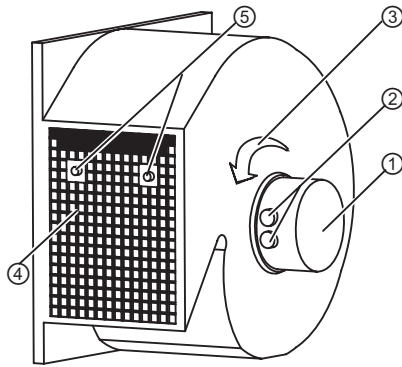


Figure 3-4 Detailed view of fan for operation at 50 Hz

- ① Fan unit terminal box
- ② Cable entry
- ③ Direction of rotation of fan impeller
- ④ Air outlet grille
- ⑤ Air outlet throttle sheet fixing points

**CAUTION**

If the standard fan is operated with ventilation from the DE to the NDE on a 60 Hz system, you must screw on the air outlet throttle sheet included in the terminal box.

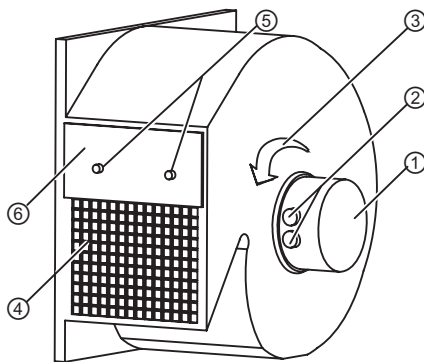


Figure 3-5 Fan for operation at 60 Hz

- ① Fan unit terminal box
- ② Cable entry
- ③ Direction of rotation of fan impeller
- ④ Air outlet grille
- ⑤ Air outlet throttle sheet fixing points
- ⑥ Throttle sheet

[ID: 338.01]

### 3.3.5 Connecting the speed sensor

#### Connection

Connect the speed sensor to the terminal box by means of a plug-in connection ①. It is located on top of the box housing.

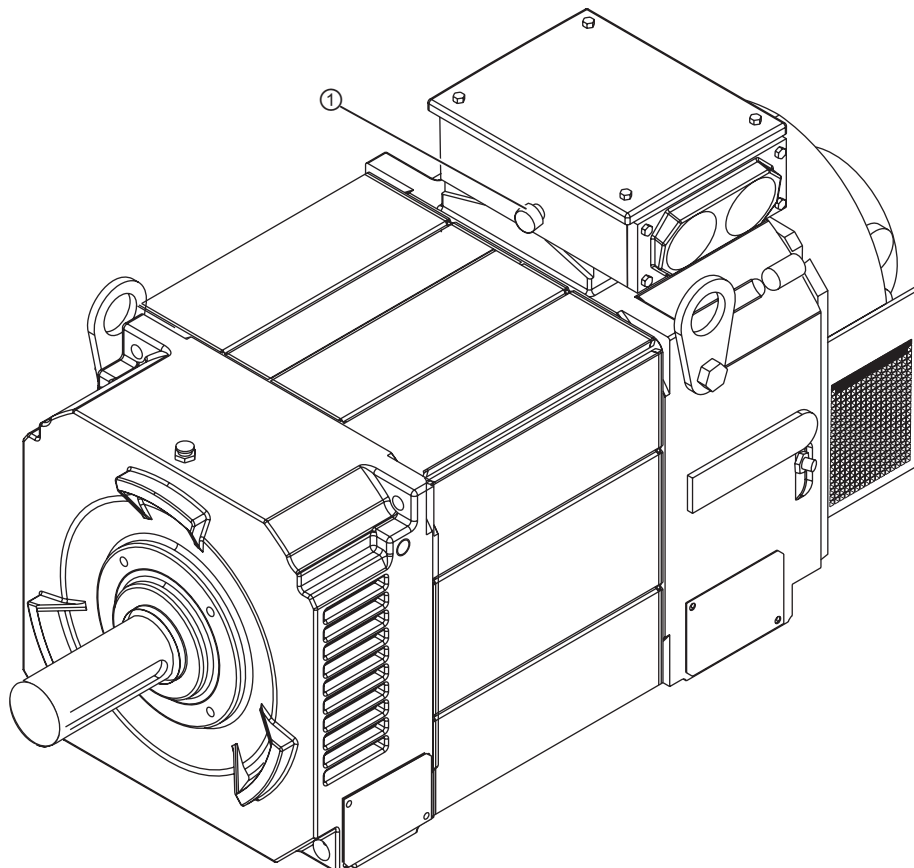


Figure 3-6 Detailed view: Plug-in connection

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#### Note

The plug-in connection may differ from the standard layout in the case of special orders.  
In the version "without sensor", an armored conduit union is located here.

---

## Electrical connection of the speed sensor

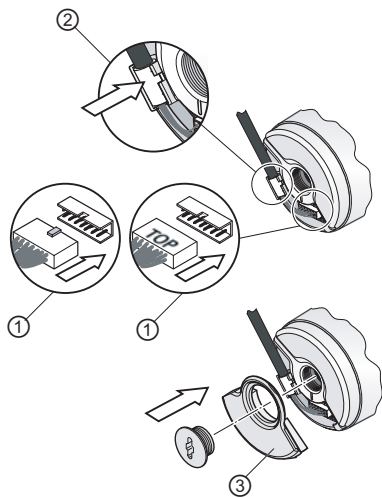


Figure 3-7 Electrical connection of the speed sensor

- 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.

[ID: 977.00]

### 3.3.6 Connecting the Sensor Module

#### Signal connection

The signal connection between the motor and the converter is 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 on 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**

Do not turn the Sensor Module with a pipe wrench or hammer or any similar tool as this could damage the Sensor Module.

Turn the Sensor Module by hand.

Typical twisting moment: 4 ... 8 Nm

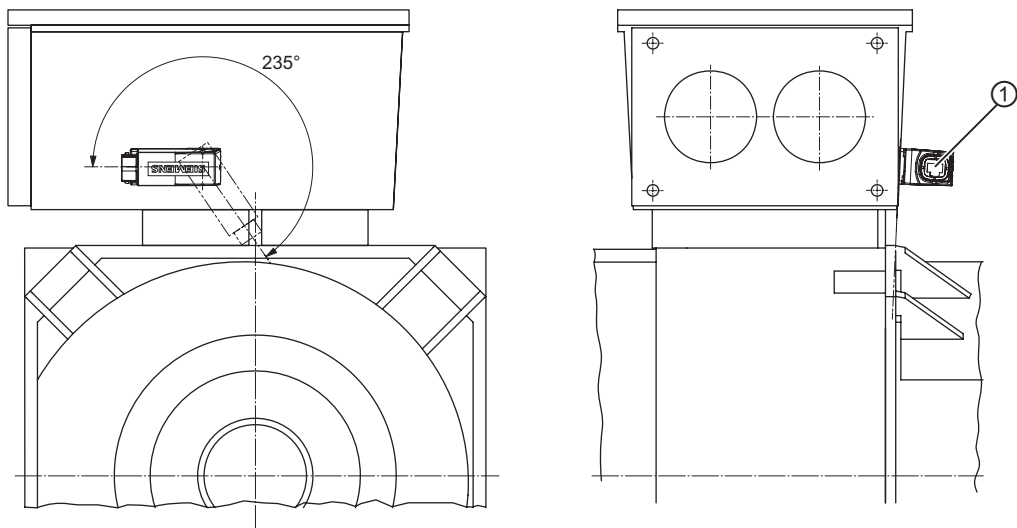


Figure 3-8 Sensor Module ① mounted on terminal box

**NOTICE**

Changing the cable outlet direction by any improper means will cause damage to 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.

[ID 964]

### 3.3.7 Connecting the temperature sensor

#### Connection

Connect the wires of the temperature sensor to the speed sensor connector with the aid of connecting leads (see section entitled "Connecting the speed sensor").

---

**Note**

The plug-in connection may differ from the standard layout in the case of special orders.  
In the version "without sensor", an armored conduit union is located here.

---

[ID: 342]





## Start-up

### 4.1 Preparations

#### Safety note

 <b>WARNING</b>
--

Only expert personnel should be entrusted with work on power installations.
---

#### Checking the insulation resistance

---

##### Note

There is no need to check the insulation resistance when commissioning. We only recommend doing so after long storage or shutdown periods.

After long storage or shutdown periods, the insulation resistance of the windings must be measured to ground with direct voltage.

---



 <b>WARNING</b>
--

<b>Hazardous voltage</b>
--------------------------

During the measurement, and immediately afterwards, hazardous voltage levels are applied on some of the terminals and they should not be touched. Touching live components can be result in death or serious injury.
--

Never touch the terminals when measuring or immediately after the measurement.
--

Check the supply feeder cables connected in order to ensure that the line supply voltage cannot be connected.
---

<b>CAUTION</b>
----------------

Before you begin measuring the insulation resistance, please read the manual for the insulation resistance meter you are going to use.
--

- Always measure the insulation resistance of the winding to the motor enclosure when the winding temperature is between 20 and 30°C.

- When measuring, wait until the final resistance value is reached; this takes approximately one minute.

### Stator winding insulation resistance limit values

The following table shows the measuring circuit voltage and the limit values for the minimum insulation resistance and the critical insulation resistance for the stator winding.

Table 4-1 Stator winding insulation resistance at 25 °C

	Rated voltage $U_N < 2 \text{ kV}$
Measuring circuit voltage	500 V (min. 100 V)
Minimum insulation resistance with new, cleaned or repaired windings	10 MΩ
Critical specific insulation resistance after a long operating time	2.5 MΩ/kV

Note the following:

- Dry, new windings have insulation resistance of between 100 and 2000 MΩ, or possibly values that are even higher.  
If the insulation resistance is close to the minimum value, then the cause could be humidity and/or fouling.
- Over its operating lifetime, the motor winding insulation resistance can drop due to ambient and operational influences. The critical insulation resistance at a winding temperature of 25°C is 2.5 MΩ

#### NOTICE

##### Critical insulation resistance is reached or insufficient

If the critical insulation resistance is reached or is insufficient, damage to the insulation and flashover voltages can result.

Dry the windings or clean and dry them thoroughly, having first removed the rotor.

If the clean windings have not cooled to 25°C, then lower insulation resistance will be measured. The insulation resistance can only be properly assessed after conversion to the reference temperature of 25°C. Allow the windings to cool to 25°C or convert the insulation resistance using 25°C as the reference temperature.

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

[ID: 344.01]

## 4.2 Measures to be performed prior to commissioning

---

### Note

This list below does not claim to be complete. It may be necessary to perform additional checks and tests in accordance with the situation specific to the particular place of installation.

---

### Inspections after proper installation, prior to commissioning the plant

- All electrical and mechanical connections are securely seated and functioning properly.
- The motor has been assembled and aligned properly.
- The cover sheets have been remounted correctly to ensure that the motor is cooled.
- The operating conditions correspond to the data specified on the rating plate.
- Any supplementary motor monitoring devices and equipment have been correctly connected and are fully functional.
- Appropriately configured control and speed monitoring functions ensure that the motor cannot exceed the permissible speeds specified on the rating plate.
- The power output elements have the proper setting conditions according to type, for example.
  - Couplings are aligned and balanced.
  - The belt tension is properly adjusted if there is a belt drive.
  - Gear tooth flank play and gear tooth tip play as well as radial play are properly adjusted if there is gearwheel drive.
- The minimum insulation resistance values are maintained.
- The grounding and equipotential bonding connections have been established correctly.
- All fixing screws, connecting elements and electrical connections are firmly tightened.
- The rotor can spin without coming into contact with the stator.
- All touch protection measures for moving and live parts have been taken.
- if the second shaft end has not been used, its feather key has been secured to prevent it from being thrown out.
- 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.
- All brakes are operating correctly.

<b>NOTICE</b>
<p><b>Lubricating capacity of lubricating greases</b></p> <p>Grease loses its lubricating property over time.</p> <p>After longer period of storage or standstill (&gt; 2 years) lubricate the bearings or replace the grease.</p>

[ID: 399.02]

## 4.3 Power on

### Measures

Before you energize the motor, make sure that the parameters of the frequency converter have been assigned correctly.

We recommend you use appropriate commissioning tools (e.g. Drive ES or STARTER).

<b>CAUTION</b>
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.


<b>NOTICE</b>
The critical speed $n_{max} = 5000$ rpm is the maximum operating speed permissible over short periods.


[ID: 369.01]

# Operation

## 5.1 Operation

### Safety notes

 <b>WARNING</b>
Please follow all instructions contained in the "Safety information and application information (Page 7)" chapter of these operating instructions precisely and ensure that only persons who have the necessary specialist know-how are entrusted to carry out work on power installations.

 <b>WARNING</b>
<b>Rotating components</b> Covers prevent contact with live or rotating parts, or are used for proper air routing and thus effective cooling of the motor. Removing the covers during operation can result in death, serious injury, and property damage. Never open covers during operation.


<b>CAUTION</b>
<b>Speed monitoring</b> 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.

### Switching on

- See the operating instructions of the frequency converter for switching on.
- After starting the motor, observe it for a while to see if it is running smoothly and check the monitoring devices.

## Operation

- Monitor operation and the monitoring devices regularly and record the values you read off.

 <b>WARNING</b>
<b>Faults</b> All deviations from normal operation, such as higher power consumption, higher temperatures and vibration levels, unusual noises and odors and tripped monitoring devices, are indications that the motor is no longer functioning correctly.  In this case, the maintenance technician must be notified immediately to prevent disturbances that could either directly or indirectly lead to severe personal injury or substantial material damage.  If in doubt, switch off the drive in question immediately.

[ID: 348]

## See also

Rating plate (Page 16)

Power on (Page 42)

## 5.2 Stoppages

### Measures when motors are at standstill and ready for operation

- For longer periods when the motor is not being used, either energize the motor at regular intervals (roughly once a month), or at least spin the rotor.
- Please refer to the section "Energizing" before restarting the motor.

<b>NOTICE</b>
<b>Damage due to improper storage</b> The motor 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 restarting the motor after a long shutdown period, carry out the measures recommended in the section entitled "Commissioning".

[ID: 349.01]

## See also

Power on (Page 42)

Measures to be performed prior to commissioning (Page 41)

## 5.3 Deactivating

### Measures

Always refer to the respective manual of the frequency converter when de-energizing.

---

#### Note

The fan must be shut down during longer periods in which the motor is not operated.

---

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

We strongly recommend that you continue operating the fan for approx. 30 min after shutting down the motor.
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[ID: 351]





# Faults

## 6.1 Fault diagnosis table

### Diagnosis table for mechanical and electrical faults

The tables below list general faults caused by mechanical and electrical influences.

Table 6-1 Diagnosis table for mechanical faults

Overview of mechanical faults				
Mechanical fault characteristics				
- rubbing/grinding noise		↗		
- significant temperature rise			↗	
- radial vibration				↗
- axial vibration				↗
Possible causes of faults	Remedial measures <sup>1)</sup>			
- Rotating parts rubbing/grinding	Determine cause and adjust parts	x		
- Air supply restricted, possibly wrong direction of rotation of fan	Check air passages, clean filter, replace fan if necessary		x	
- Rotor not balanced	Rebalance rotor			x
- Rotor out of true, shaft bent	Consult the manufacturer			x
- Poor alignment	Align motor unit, check coupling <sup>2)</sup>			x x
- Coupled motor not balanced	Rebalance coupled motor			x
- Shocks from coupled motor	Check coupled motor			x
- Imbalance originating from gearing	Adjust/repair gearing			x x
- Resonance with the foundation	After consultation, reinforce foundations			x x
- Changes in foundation	Determine cause of changes, eliminate if necessary; realign motor			x x
<sup>1)</sup> As well as eliminating the cause of the fault (as described under "Remedial measures"), you must also rectify any damage the motor may have suffered. <sup>2)</sup> Take into account possible changes due to a rise in temperature.				

6.1 Fault diagnosis table

Table 6-2 Diagnosis table for electrical faults

<b>Overview of electrical faults</b>	
Electrical fault characteristics	
- Motor will not start up	<b>Note:</b> If electrical faults occur, please refer to the manual for the frequency converter.
- Motor starts up slowly	
- Drumming noise during startup	
- Drumming noise during operation	
- Drumming noise in time with twice slip frequency	
- High temperature rise at no load	
- High temperature rise under load	
- High temperature rise of individual winding sections	


[ID: 353]


# Maintenance

## 7.1 Maintenance

### 7.1.1 Maintenance instructions


#### Safety information

 <b>WARNING</b>
Please follow all the instructions contained in the "Safety information" section of these Operating Instructions precisely and ensure that only persons who have the necessary specialist know-how are entrusted to carry out work on power installations.  In addition to the main phases, also ensure that supplementary and auxiliary circuits are also de-energized.


 <b>CAUTION</b>
Be careful of those parts of the motor that get hot, and let them cool down before starting maintenance work.

#### Safety regulations

Always comply with the following safety rules before starting maintenance work:

 <b>DANGER</b>
<ul style="list-style-type: none"><li>• Disconnect</li><li>• Protect against reconnection</li><li>• Disconnect from supply</li><li>• Fence off or cover up adjacent live parts</li></ul>

### Other safety-related measures

 <b>CAUTION</b>
When cleaning using compressed air, make sure you use suitable extraction equipment and wear protective gear (safety goggles, protective suit, etc.).

<b>CAUTION</b>
If you use chemical cleaning agents, observe the instructions and any warnings given in the relevant safety data sheet.  Chemical agents must be compatible with the components/parts, especially when they contain plastics.

---

#### Note

If anything is unclear, we **urgently** recommend that you consult us stating the type and serial number of the three-phase motor or get one of the SIEMENS Service Centers to carry out the maintenance work for you.

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[ID: 401.01]

### See also

Siemens Service Center (Page 15)

## 7.1.2 Maintenance intervals

### General

Careful and regular maintenance, inspections, and overhauls are essential for detecting and eliminating faults in good time before they can cause any damage.

Operating situations 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.).

<b>NOTICE</b>
If faults or exceptional conditions occur that lead to the three-phase motor being overloaded either electrically or mechanically (e.g. overload, short circuit, etc.), carry out the inspections immediately.

### Measures, intervals

Measures after operating period intervals have elapsed:

Table 7-1 Operating period intervals


Measures	Operating period intervals	Intervals
Initial inspection	After 500 operating hours	after 6 months at the latest
Continuous lubrication (Machines without regreasing device )	Belt operation 12 000 h	
	Coupling operation 20 000 h	
Machines with regreasing device (option)	(see lubrication instruction plate)	
Clean	depending on local degree of pollution	
General inspection	Approximately every 16000 operating hours	

[ID: 356]

### 7.1.3 Maintenance of the external fan

#### Procedure

- Check the external fan VDI 2056 annually for mechanical vibrations. 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.

 <b>WARNING</b>
<p><b>Impeller can crack</b></p> <p>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.</p> <p>Regularly clean and inspect the fan.</p>

- Refer to the maintenance and service information provided by the manufacturer of the external fan.

### 7.1.4 Bearings

#### Description

The three-phase motors have grease-lubricated, rolling-contact bearings. A regreasing device is optional.

A deep-groove ball bearing is installed at the NDE as a locating bearing. Depending on the type of load, a deep-groove ball bearing or cylindrical-roller bearing is installed at the DE as a floating bearing.

For the bearing assignments as well as the associated permissible lateral forces and minimum loads when cylindrical-roller bearings are installed at the DE, refer to the catalog or contact us.

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

**NOTICE**

Permanently lubricated bearings should be exchanged approx. every three years, regardless of the length of use (operating hours)

[ID: 359.01]

### 7.1.5 Lubrication (optional)

#### Relubrication intervals

The relubrication intervals are stated on the lubrication instruction plate of the three-phase motor.

**NOTICE**

Observe the basic lubrication interval (see section entitled "Measures, intervals").

**NOTICE**

If there is a long interval between delivery and commissioning of the motor, the bearings must be relubricated.

The grease change intervals apply for normal loads, operation at speeds corresponding to those specified on the nameplate, precision-balanced running, almost neutral ambient air and the use of high-quality rolling-contact bearing greases.

#### Grease types

The following high-quality rolling-contact bearing greases have been tested and are suitable:

Table 7-2 Rolling-contact bearing greases

<b>K3N greases</b>
ARAL Aralub 4340
ESSO / Unirex N 3
DEA Glissando 30
ESSO Beacon 3
FUCHS Renolit FWA 220
SHELL Alvania RL3

<b>K3N greases</b>
--------------------

WINTERSHALL Wiolub LFK 3
--------------------------

These greases have lithium soap as the thickening agent and mineral oil as the base oil. They exceed the standard requirements of DIN 51825 in several important respects and are, therefore, compatible with the specified regreasing intervals.

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

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

### Initial lubrication

ESSO Unirex N grease is used for initial lubrication of the bearings (prior to delivery).

### Lubricating using the regreasing device

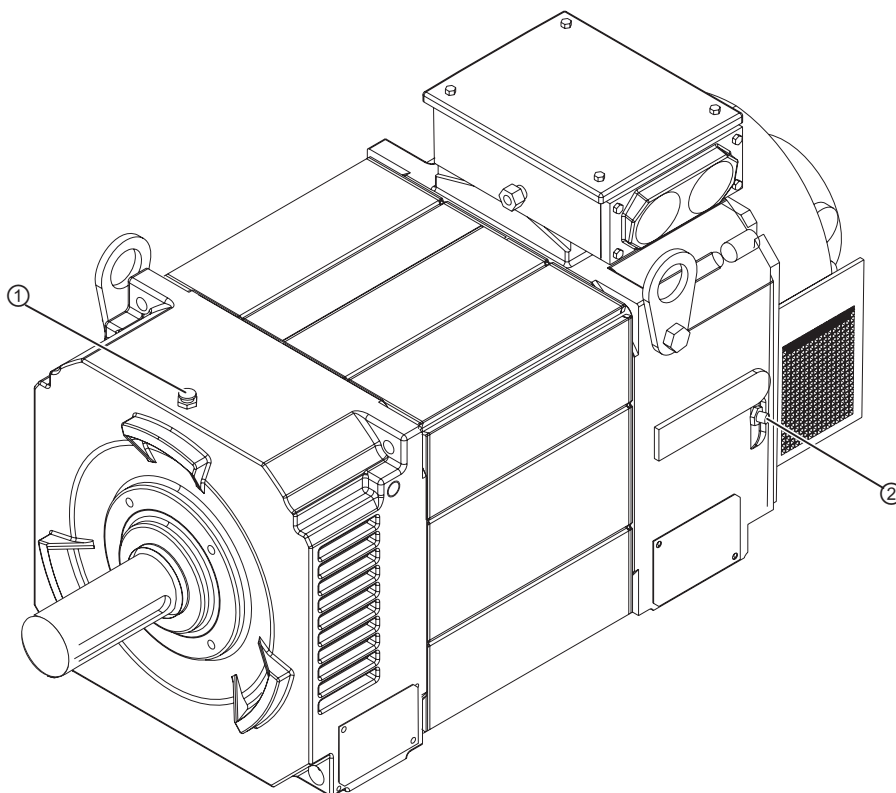


Figure 7-1 D-end and N-end end shields with grease nipples

- ① Button head lubricating nipple to DIN 3404, size M10x1, drive end (DE)
- ② Button head lubricating nipple to DIN 3404, size M10x1, non-drive end (NDE)

1. Clean the grease nipples at the DE and NDE.
2. Press in the type and quantity of grease specified (see lubrication instruction plate).

---

**Note**

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.

[ID: 968.01]

## 7.1.6 Cleaning

### Cleaning the greasing channels and used grease chambers

The used grease collects outside each bearing in the used grease chamber of the outer bearing cap. Remove the used grease when you replace a bearing.

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

You have to separate the active parts of the bearings to replace the grease that is in the greasing channel.
--

### Cleaning the cooling air passages

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

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

The frequency of the cleaning intervals depends on the local degree of pollution.
---



<b>WARNING</b>
----------------

Particularly when cleaning using compressed air, make sure you use suitable extraction equipment and wear protective gear (safety goggles, respiratory filter, etc.).
---

[ID: 363]



## 7.2 Inspection

### 7.2.1 General inspection specifications

#### Instructions relevant to safety

<b>NOTICE</b>
The required regreasing intervals for rolling-contact bearings (optional) are not the same as the servicing intervals. They must be observed.

#### Note

When servicing a three-phase motor, you do not generally need to dismantle it. The motor only has to be dismantled if the bearings are to be replaced.

[ID: 366]

### 7.2.2 Initial inspection

#### Inspection interval for initial inspection

The initial inspection once the three-phase motor is assembled and commissioned is, under normal circumstances, conducted after approx. 500 operating hours, but at the latest after 6 months.

#### Conducting the initial inspection

- While the motor is running, check that:
  - the equipment conforms to the stated electrical characteristics.
  - the smooth running characteristics and motor noise during operation have not deteriorated.
- When the motor has been shut down, check that:
  - the motor foundation has no indentations or cracks.

Correct any deviations that are determined in the inspection without delay.

<b>NOTICE</b>
<b>Adapt the inspection to the plant-specific conditions</b> This list does not claim to be complete. Further tests also should be carried out in accordance with the additional instruction manuals (e.g. bearings, cooler, etc.) or in accordance with the particular system-specific conditions.

[ID: 367.02]

### 7.2.3 Main service

#### Inspection interval for major inspection

The main inspection is conducted after approx. 16,000 operating hours or at the latest after 2 operating years.

#### Conducting the major inspection

- While the motor is running, check that:
  - the equipment conforms to the stated electrical characteristics.
  - the smooth running characteristics and motor noise during operation have not deteriorated.
- When the motor has been shut down, check that:
  - the motor foundation has no indentations or cracks.
  - the motor is aligned within the permissible tolerance ranges.
  - all of the fixing bolts for the mechanical and electrical connections are tight.
  - The winding isolation resistances are sufficiently high.
  - cables and insulating parts and components are in a good condition and are not discolored.

<b>NOTICE</b>
Any inadmissible deviations from these requirements detected during this inspection must be rectified immediately.

[ID: 368]

## 7.3 Corrective Maintenance


### 7.3.1 Instructions for repair


#### Qualified personnel

Commissioning and operation of this machine should be carried out by qualified personnel only. In the safety notes in this documentation, "qualified personnel" refers to those persons who are authorized to commission, ground, and mark devices, systems, and circuits in accordance with established safety procedures.

#### Safety notes



 <b>WARNING</b>
<p><b>Rotating or live parts</b></p> <p>Rotating or live parts are dangerous. Death, serious injury, or material damage can result if the required covers are removed or if the device is not operated properly.</p> <p>Before starting work on the motor and, in particular, before opening the covers of live parts, make sure that the motor or system is properly isolated.</p>

 <b>WARNING</b>
<p><b>Proper transport</b></p> <p>Only transport the motor in accordance with the transport guidelines. Death, serious injury, or material damage can be the result of improper transport.</p> <p>Whenever you have to transport the motor, follow the instructions provided in the section entitled "Transport, storage".</p>

[ID: 370.01]

#### See also

Transport, storage (Page 21)

Observing the five safety rules (Page 7)

### 7.3.2 Dismantling

#### Disassembly instructions

The drawings and parts lists do not contain any detailed information about the type and dimensions of retaining elements and the like.

<b>NOTICE</b>
Before you start dismantling them, you should therefore mark up the respective assignment of retaining elements and the layout of the internal connections for assembly if they have to be disconnected for maintenance work.

<b>NOTICE</b>
Use pullers or suitable devices to disassemble parts and components attached to the motor shaft.

Three-phase motors of a vertical construction type can be dismantled in the horizontal position.

**Working with three-phase motor in vertical position**

<b>NOTICE</b>
When working on the locating bearing when the three-phase motor is in its vertical position, support the rotor.

When attaching the rotor in the vertical position, make sure that the centering recesses in the shaft ends (DIN 332) - DS M20 have a recessed thread; eye-bolts must have a minimum length of 35 mm.

The rotor weights for the 1PL6 three-phase motors can be found in the following table:

1PL618.		
Size	184	186
Weight (kg)	100	120

**Disassembling the three-phase motor**

- 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 sealing of the cables in the cable entries is largely maintained.
- Disconnect the connecting cables in the terminal box of the fan motor and, if necessary, the cable from the ground terminal. In addition, disconnect the speed sensor plug connector.

**Links**

The terminal diagram (see "Connecting the stator winding") contains the conditions required for line connection.

## Installing the active parts of the bearings

### NOTICE

We recommend that you label the components that comprise the active part of the bearing before dismantling them, in order to ensure correct reassembly.

### NOTICE

When dismantling and assembling the bearings, make sure that you match up the components correctly (bearings, preloading springs, equalizing rings, caps with different centering length, etc.), especially when the bearings at the drive end and non-drive end are the same size.

### NOTICE

Label the components before dismantling.

### NOTICE

Whenever you work on the locating bearing when the three-phase motor is in its vertical position, support/unload the rotor.

## Disassembling the speed sensor

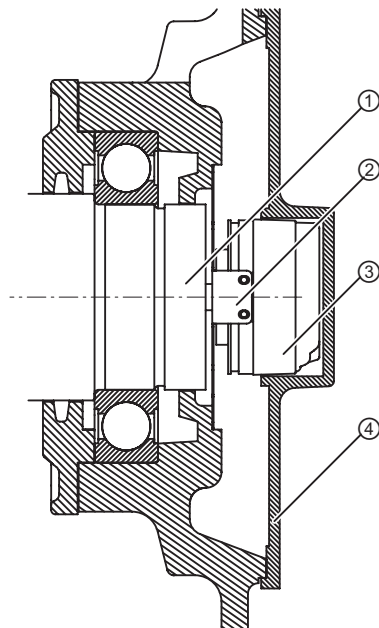


Figure 7-2 Detailed view of the speed sensor

① Shaft

- ② Torque transmission element
- ③ Speed sensor
- ④ Sensor cover

<b>NOTICE</b>
Always disassemble the speed sensor before you dismantle the three-phase motor, in order to prevent it from becoming damaged.

To disassemble the speed sensor, proceed as follows:

1. Screw off the sensor cover.
2. Detach the electrical connection.
  - Pull the cable carefully out of its holder.
  - Pull out the connector.
3. Remove the screw connections holding the sensor on the end shield.
4. Pull the sensor off the shaft with the aid of a puller. There are two ways of doing this:

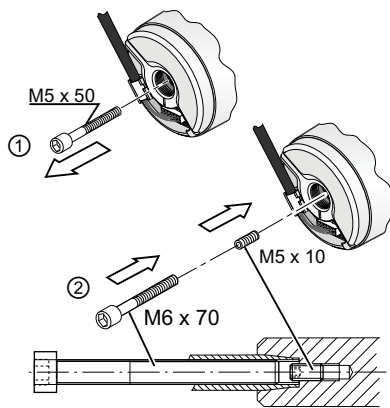


Figure 7-3 Disassembling the speed sensor: forcing off, 1st option

- ① Unscrew the screw M5x50.
- ② Screw in the screw M5x10 and the screw M6x70 one after the other. This releases the sensor cone in the motor shaft.
- ③ Remove the sensor.

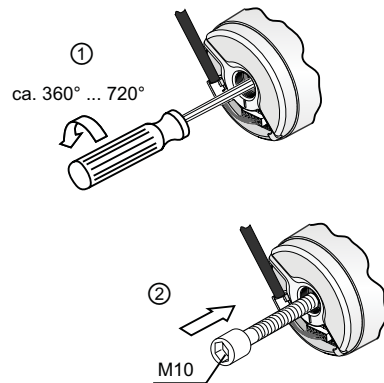


Figure 7-4 Disassembling the speed sensor: forcing off, 2nd option

- ① Release the retaining screw.
- ② Press the screw M10 onto the original screw. This causes it to fall out.
- ③ Remove the sensor.

[ID: 374.01]

### 7.3.3 Re-assembly

#### Re-assembly instructions

If possible, assemble the motor on a straightening plate. This ensures that the feet surfaces are all on the same level.

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

When mounting the end shield, make sure that the windings that project from the stator housing do not become damaged.
---

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

Take great care and pay attention to cleanliness when fitting and assembling the bearings.
--

#### Sealing measures when reassembling

Clean bare joints between parts before reassembling (e.g. between enclosures, end shields and the active parts of bearings).

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

Check the sealing elements fitted (e.g. at the terminal boxes) and replace them if they do not provide an adequate seal.
--

### Installing the active parts of the bearings

**NOTICE**

Before mounting the bearings, ensure that the parts and components that are to be located on the shaft inside the bearing have been mounted beforehand!

To fit the bearings on the shaft, heat them up to about 80°C in oil or air.  
Then push the bearings onto the shaft up to its shoulder.

**NOTICE**

Avoid any heavy blows that might damage the bearings.

Fill the bearings with specified grease (see section entitled "Types of grease") until it is flush.  
Also observe the following installation condition:

- If rotary shaft seals without helical springs are installed, the replacement part must also be installed without a spring.

[ID: 378.01]

### 7.3.4 Screw-type connections

#### Tightening torque for screwed union connections

The screwed union connections with metal contact surfaces (end shields, active bearing parts, terminal box parts bolted onto the stator frame) should be tightened to the following torque with a tolerance of ± 10 %, depending on the thread size.

Table 7-3 Tightening torque for screwed union connections

Thread size	M6	M8	M10	M12	M16	M20	M24
Tightening torque [Nm]	8	20	40	70	170	340	600

Please refer to the relevant sections and drawings for all other tightening torques (electrical connections and bolted connections for parts with flat gaskets).

#### Bolt locking devices

Nuts or bolts that are mounted together with locking, resilient and/or force-distributing elements (e.g., safety plates, spring-lock washers, etc.) must be refitted together with identical, fully functional elements.


Always replace keyed elements.

[ID: 379.01]



### 7.3.5 Replacing the sensor module

Only trained service engineers are authorized to replace the sensor module.

 <b>WARNING</b>
<b>Motor-specific sensor module</b> 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.

[ID 967.01]

#### See also

Siemens Service Center (Page 15)



# Spare parts

## 8.1 Orders for spare parts

### Ordering data

Please state the following when ordering spare parts:

- Precise part designation of the spare part and associated spare part number according to the spare part list,
- Machine type,
- Serial number of the motor,

The motor type and serial number can be found on the rating plate. The serial number is also stamped on the end face of the shaft end on the drive end.

- Serial number of the motor.

Example:

- End shield, drive end (part 5.00)
- See rating plate for motor type and serial number

Commercially available, standard components can be used, but ensure that they have the same construction type, dimensions, strength class etc.

When replacing rolling-contact bearings, in addition to the bearing identification code, the replacement code for the bearing version is also required. Both of these codes are specified on the lubricant plate and in the motor documentation, or on the installed bearing.

[ID: 382.02]

## 8.2 Spare parts 1PL6

### Spare parts

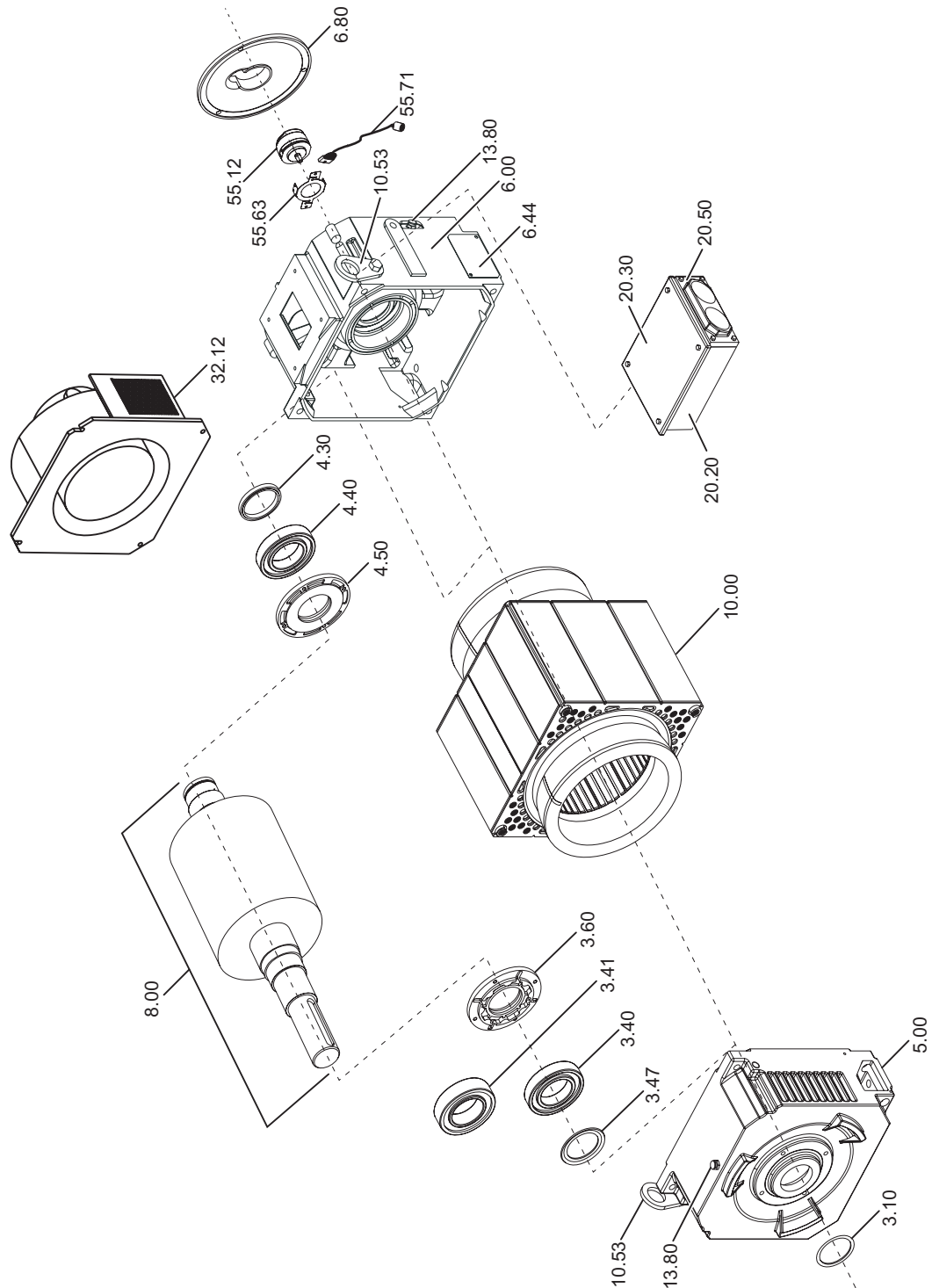


Figure 8-1 Spare parts 1PL6

Table 8-1 Spare Parts

<b>Spare part no.</b>	<b>Description</b>
3.10	Gamma ring
3.40	Deep-groove ball bearings (floating bearing)
3.41	Cylindrical-roller bearing
3.47	Plain washer
3.60	Inner bearing cap
4.30	Retaining ring
4.40	Deep-groove ball bearing (locating bearing)
4.50	Inner bearing cap
5.00	End shield (DE)
6.00	End shield (NDE)
6.44	Cover
6.80	Sensor cover
8.00	Rotor, complete
10.00	Stator housing (with laminated core and winding)
10.53	Hoisting lug
13.80	Grease nipple
<b>Terminal box</b>	
20.20	Terminal box with terminal support
20.30	Lid (terminal box)
20.50	Entry plate (terminal box)
32.12	Fan unit complete
55.12	Speed sensor
55.63	Torque transmission element
55.71	Cable with plug connector

[ID: 387.01]













# Index

## B

Bearing seizure damage, 22

## C

Condensation water, 23

## D

Degree of protection, 20

## E

External fan  
Maintenance, 51

## I

Initial inspection, 55  
Inspection interval, 55

## P

Preservation, 23

## R

Rating plate, 16

## S

Sensor module, 27, 63  
Siemens Service Center, 15  
Storage, 22  
Storage location, 22

## T

Tightening torque  
Screwed union connections, 62







AB U151 Herstellererklärung  
AB U161 Konformitätserklärung

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