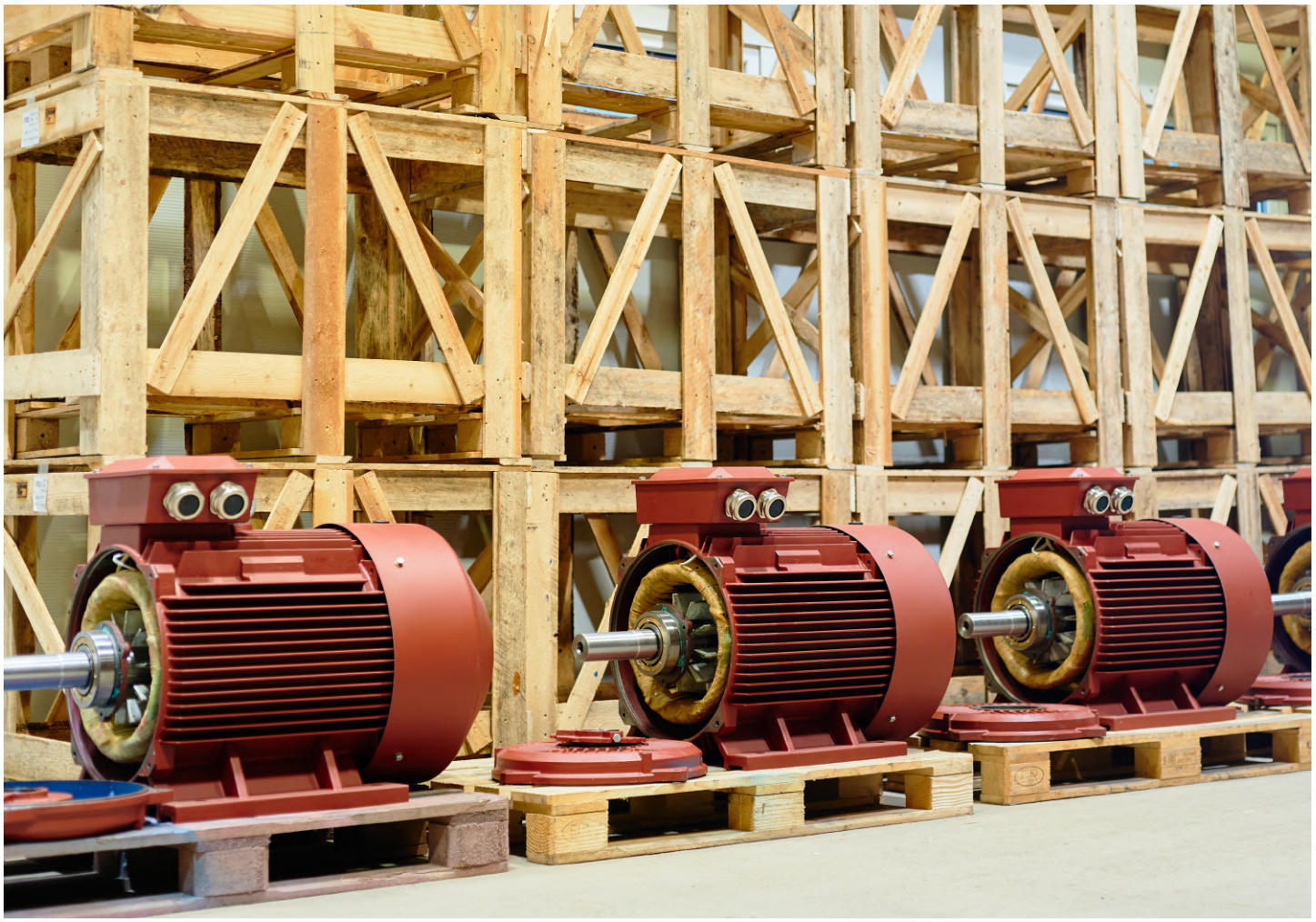
Electric motors

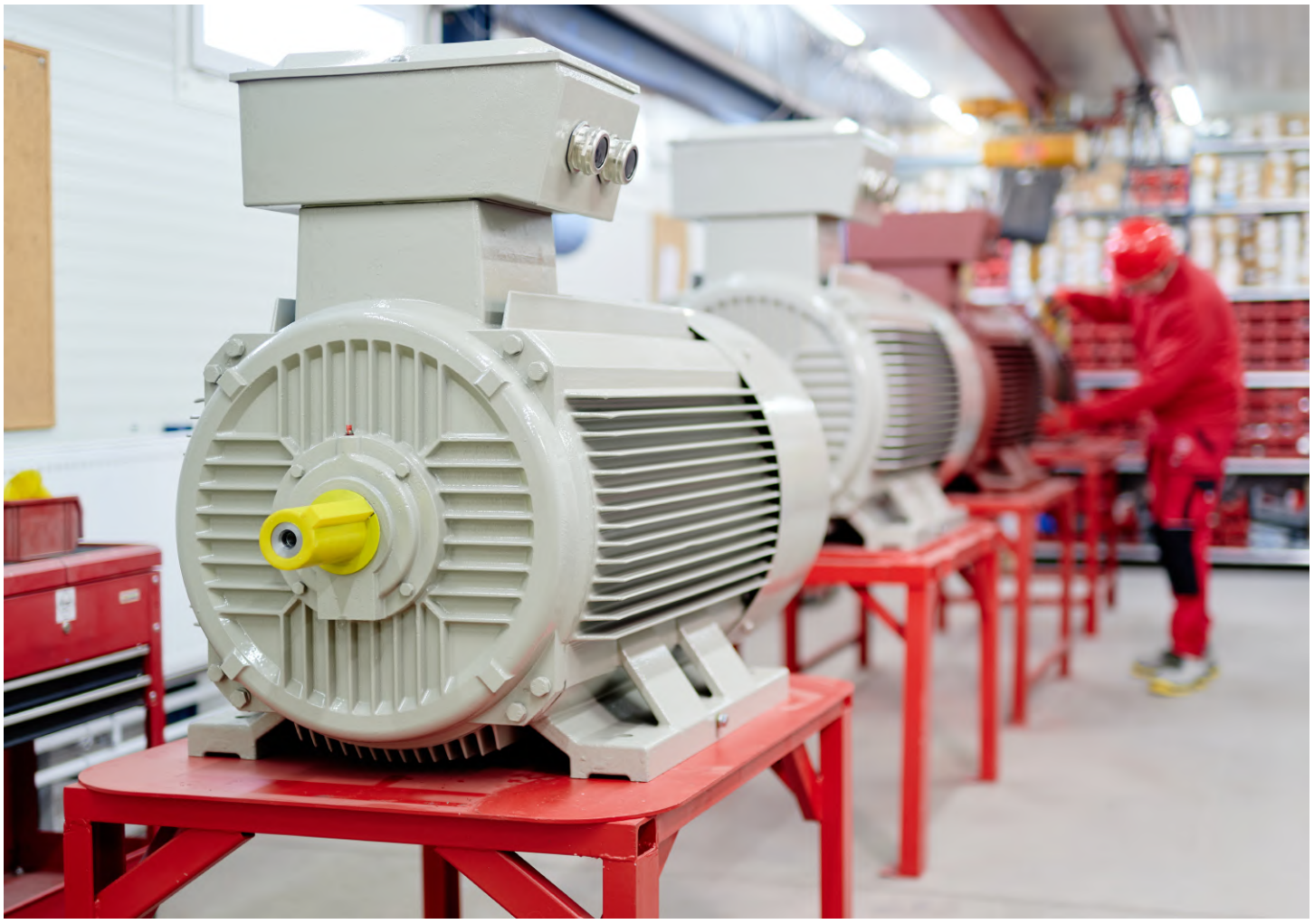
1AL,2AL,2LC,3LC,4LC,2F,1SR,2SR

Instructions for installation and maintenance

Version 1.0

VYBO Electric



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1. GENERALLY

This manual describes the installation and maintenance of electric motors 1AL, 2AL, 2LC, 3LC, 4LC, 2F. The electric motors contained in this manual are continually improved and upgraded and therefore the information contained in this manual is subject to change without prior notice.
Please contact your business partner for more detailed information.
It is essential that all persons involved in the installation and maintenance of electric motors are appropriately qualified and guided by the guidelines of this manual.
Care must be taken to avoid injury during transport and handling of the electric motor to the final destination.
CAUTION: The installation must be carried out by an appropriately qualified and trained person.

2. DELIVERY AND STORAGE

After supply of the electric motor, check for signs of external damage. If the electric motor is damaged, immediately contact the carrier and claim damages packaging. Make sure that the data on the electric motor plate matches the data on your order. Verify that the engine specifications and parameters match your application.
The electric motor must be stored in a dry and clean environment at a temperature of -20 ° C to + 40 ° C. Turn the engine shaft once a month. In the case of a longer storage period, the bearing lubricant must be checked before using the electric motor. The electric motor can not be stored in the vicinity of devices that cause vibration.

3. LIFTING AND MANIPULATION

Always use the correct lifting and handling equipment. Observe nominal mass values for lifting and carrying loads and related regulations in force in the country concerned.
Lifting anchorage points are available for all cast iron and aluminium electromotors with an axis height of 100 or more.
The other lifting anchorage point is supplied with all the electric motors with a flange to allow installation in a vertical mounting position in the IM V5 shape.
Other devices cannot be lifted using the lifting anchorage point. Lifting eyes are only designed to lift the electric motor.
CAUTION: Observe the nominal mass values for lifting and carrying loads and the related regulations in force in the country concerned.

4. MECHANICAL INSTALLATION

The electric motor must be installed on a stable flat surface. Appropriate fastening screws must be used together with the washers and appropriate tightening torques must be

observed.
Make sure the airflow to the engine fan is not blocked.
Under no circumstances can the ambient temperature exceed 40°C (unless a required motorized electric motor is required for a higher operating temperature).
Ensure that all the gaskets, pads and covers are fitted correctly.
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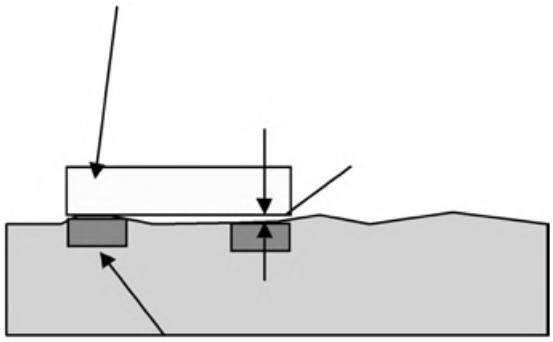


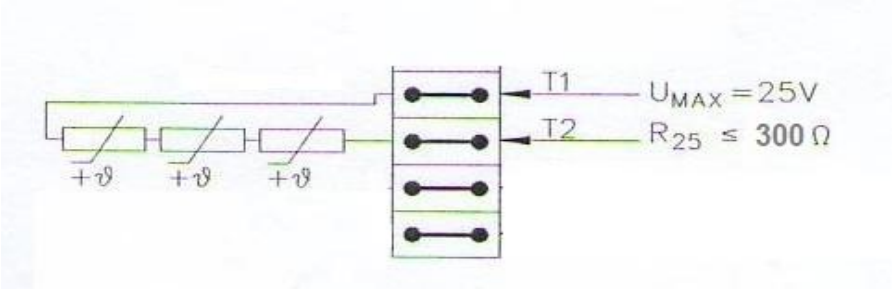
Comment! Height difference shall not exceed ± 0,1 mm in relationship to any other foot.

5. ELECTRICAL INSTALLATION

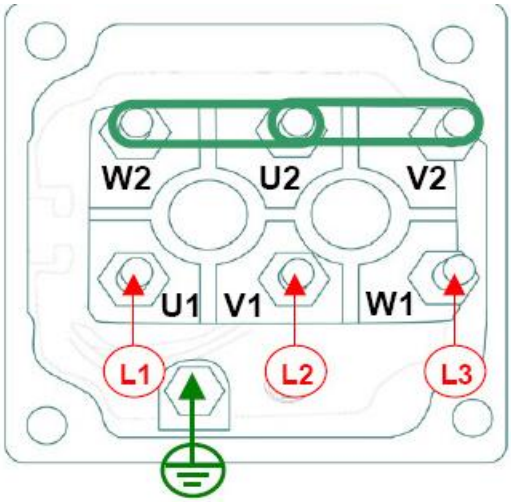
The connection cables and earthing conditions must be in accordance with the IEE guidelines.
It is necessary to use appropriate overload protection and motor winding protection.
Fuses of electrical wiring protect the wires from short circuits, but not the electric motor.
Ensure that all terminals are sealed and that the conditions for proper operation of the terminal block are met. Smaller electric motors are suitable for power supply 230/400V and larger electric motors are suitable for power supply 400/690V. For electric motors with windings Δ/Y 400/690V and Δ 400V, 400V star/triangle can be used, for this type of connection / start, the internal connections of the terminal block.
CAUTION: The electrical installation must be carried out by a qualified and authorized person.

5.1 Thermal protection

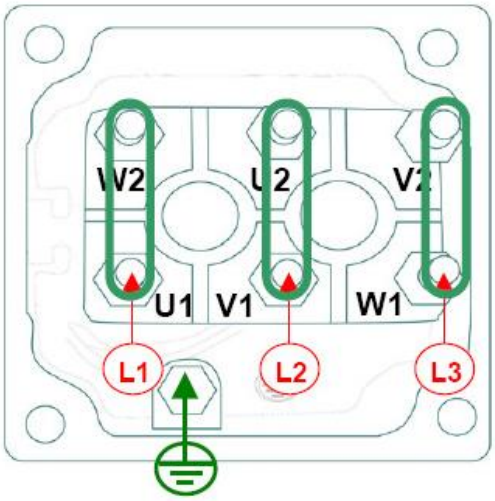
Most motors described in this manual are equipped with three PTC thermistors in stator windings. It is recommended to connect them to the frequency inverters by appropriate instruments. In the absence of a frequency inverter, connect the thermal protection via the thermistor relay and the corresponding power disconnect contactor. The average resistance of thermistors at 20° C is about 280 Ω.



STAR CONNECTION Y:
It is a higher voltage of two
voltages on the plate,
400V for electric motor 230/400V
690V for electric motor 400/690V.



TRIANGLE CONNECTION Δ:
It is a lower voltage of two
voltages on the plate,
400V for electric motor 230/400V
690V for electric motor 400/690V.



6. CHECK BEFORE START

If the electric motor is stored for a long time, it is important to check that the insulation resistance of the winding is adequate. Insulation resistance should be at least 10 MΩ - measurement using a 1000 V Megger. If the insulation resistance is lower than the above, the electric motor must be dried and then overcoated or rewound.
Check all connectors and set all thermal protections to the correct current value.
Turn on the electric motor without load to determine the direction of rotation.
Always load the electric motor and check for vibration-free operation.

7. REGULAR MAINTENANCE

Electric motors series 1AL, 2AL, 2LC, 3LC, 4LC, 2F require minimal maintenance. Nevertheless, we recommend that you regularly check the electric motor for dirt and maintain the required lubricant level in the bearings. We also recommend that you regularly check the working environment of the electric motor for increased humidity and vibration.
It is important to keep the cooling grill free of dirt because it has a significant effect on the electric motor's operating temperature and impurities can cause premature failure.
If the electric motor is not operating for a longer period of time, it is recommended that the electric motor be switched on from time to time to prevent the ingress of moisture into the winding.
If the electric motor has excessive vibration, it may be due to the loosening or loss of fastening screws. Another cause of vibration may be the coupling misalignment or excessive tension of the belt drive coupled to the electric motor shaft.
Longer lasting vibration may cause premature failure of the electric motor and therefore the cause of the vibration should be removed as soon as possible in order to minimize its negative effect on the electric motor.
Bearings of electric motors with an axial height from 56 to 132 mm are fitted with sealed bearings ZZ or 2RS, which are filled with a high quality lubricant with a lithium base.
Recommended lubricant: SKF GMT 2
Seamless electric motors require no maintenance except for increased noise and temperature control over the life of the electric motor. Electric motors with axle heights from 160 to 355 mm are equipped with a lubricating valve and the bearings should be lubricated during the operation of the electric motor. Some types of electric motors are equipped with a lubrication system, but they can be fitted with covered ZZ bearings and the lubricators are not installed. If lubrication is required, it is necessary to remove the bearings of the bearings during regular maintenance.
Recommended lubricant: BP LS3, SHELL ALVANIA R3, ESSO UNIREX N3, TIMKEN GR220C.
The automatic lubrication system will push out the old lubricant and push in the new lubricant. Application of this system ensures that the bearings are not excessively lubricated and protect against damage.

8. EXCHANGE OF BEARINGS

Bearings must be uninstalled from the electric motor shaft using appropriate tools. After uninstalling the bearing, the shaft must be cleaned and thoroughly inspected.
Heat the new bearing using an electric induction heater up to max. 80 ° C, then quickly attach it to the shaft until it stops.
In the case of a roller bearing, heat and install only the inner bearing ring on the shaft, then the remaining part.
Under no circumstances should the cold bearing be applied with excessive force. In no case should pressure be applied to the outer ring of the ball bearing - a suitable cuff should be used to carefully apply the inner bearing ring. Please check the bearing size according to the VYBO Electric manual.

CAUTION: Do not install the engine cover until the bearing has cooled down!

9. BEARING LUBRICATION INTERVAL

It is recommended to replace the bearing lubricant after a certain period of operation. The replacement interval depends on the engine speed, the adverse conditions affecting the electric motor, the mounting position and the load on the electric motor bearings.
Therefore, it is not possible in all cases to determine the exact lubricant exchange interval.
Please follow these recommendations:
- at normal load and operating conditions, the quality of used lubricant for bearings ensures the correct operation of the electric motor for approximately 10,000 operating hours for 2 pole electromotors and 20,000 operating hours for 4, 6 and 8-pole electric motors.
- in most cases it is not necessary to exchange the bearing lubricant during this interval.
It is advisable to check the lubricant condition every 1000 operating hours to ensure trouble-free operation.

At room of environment above 40°C, the lubrication interval should be shortened to 1/2.

Axis size	number of poles 2P	4P	6P	8P
56 až 132 mm	15.000 hours	20.000 hours	25.000 hours	30.000 hours
160 mm	8.000	14.500	18.500	22.000
180 mm	7.500	13.000	17.500	20.000
200 mm	7.000	11.500	16.500	19.000
225 mm	6.500	11.000	15.000	18.000
250 mm	6.000	10.500	14.000	17.000
280 mm	5.500	10.000	13.000	15.000

Table of alternative greases:

Producer	Product	Lubricant component	Oil	Temperature range [°C]	Kinematic viscosity of base oil [mm2/s, cSt At 40°C]	Kinematic viscosity of base oil [mm2/s, cSt at 100°C]	Consistency [NLGI scale]
ESSO	UNIREX N2	Li-com.	Mineral	-30 to+150	115	12,2	2
ESSO	BEACON 2	LI	Mineral	-40 to +120	100	9,5	2
SKF	LGMT 2	Li	Mineral	-30 to 120	110	11	2
SKF	LGMT 3	Li	Mineral	-30 to 120	120	12	2
MOBIL OIL	Mobilux 2	Li	Mineral	-30 to +120	100	10,0	2
SHELL	Alvania RL3	Li	Mineral	-25 to +130	100	11	3
BP	Energrease LS2	Li	Mineral	-30 to +110	92	9,5	2
STATOIL	Uniway Li442	Li	Mineral	-30 to +120	100	12,0	2
TEBOIL	Multi-Purpose Grease	Li	Mineral	-30 to +110	110	10,5	2
ESSO	UNIREX N3	Li-comp.	Mineral	-30 to +165	115	12,2	3
SKF	LGHT 3	Li-comp.	Mineral	-30 to +150	110	13,0	3
MOBIL OIL	Mobiltemp. SHC 100	Bentonit	Synthetic	-40 to +200	100	12,5	2
SHELL	Albida EMS2	Li-comp.	Synthetic	-40 to +150	100	21,0	2
TEBOIL	Syntex Grease	Li-comp.	Synthetic	-40 to +140	150	20,0	2
STATOIL	Uniway LiX 42 PA	Li-comp.	Polyalfa	-35 to +150	100	18,0	2
CHEVRON	SRI 2	Polyr.	Mineral	-30 to +150	115	14,0	2
NESTE	Rasva 606	Li-comp.	Synthetic	-40 to +150	150	20,0	2

10. REPEATED LUBRICATION PROCESS

When re-lubricating the bearings, the bearings must be thoroughly cleaned before use with a suitable solvent. Use the recommended bearing lubricant recommended by the manufacturer.

Temperature range from -30°C to +110°C, for example. SKF-GMT 2; TIMKEN GR220C.

The bearing should be filled with lubricant only up to 2/3 to prevent overheating of bearings during operation. Only high-quality bearings with bearing allowance C3 are recommended for electric motors with an axle height of 90 mm or more.

11. FIXING ON THE SHAFT

If the clutch is used, the shaft of the electric motor must be exactly one axis with the driven shaft. Fixed clutches are not recommended for electric motors. If flexible couplings are used, manufacturers' recommendations should be followed. If the belt drive is used, it is recommended to mount the electric motor on the sliding guide or on the base plate to achieve the correct strain tension.

Pulley should be of a suitable size to prevent slipping or insufficient tension.

Inappropriate size of the pulleys can cause serious damage to the shaft or bearings.

All used pulleys and couplings should be dynamically balanced. Electric motors are balanced in the half of the key.

CAUTION: Always use appropriate hand tools!

12. Protection of the winding of the electric motor and adjustment of temperature sensors Pt100.

If the electric motor is equipped with Pt100 temperature sensors for wind protection, set the alarm and shutdown levels as follows:

	Warning / Alarm	Switch off /Trip
(T= maximum expected working temperature)	T + 10 K	T + 15 K

Maximum values		
Using according to temperature class B	125 °C	130 °C
Using according to temperature class F	145 °C	150 °C
Using according to temperature class H	165 °C	170 °C

13. Thermal protection of electric motor bearings by temperature sensors Pt100

	Warning / Alarm	Switching off /Trip
(T= maximum expected working temperature)	**T + 5 K**	**T + 10 K**

Maximum values		
Ball bearing roller bearings	90 °C	100 °C
Encapsulated bearings ZZ and RS		
□ Detectors in the bearing shield	90 °C	95 °C
□ Detectors in oil tub	70 °C	75 °C

14. Solving some problems with electric motors

PROBLEM	CAUSE	SOLVING
The engine didn't start	**Burned fuses**: Replace fuses with new fuses of the correct type and performance.	
	Switching off at overload: Check and reset the overload in the starter.	
	Incorrect power supply voltage: Check that the supply voltage corresponds to the voltage on the rating plate of the motor and the load factor.	
	Incorrect connection: Check connection according to the diagram supplied with the engine.	
	Interrupted circuit in winding or in control switch: The noise appear, when the switch is off.	Locate loose winding connections. Also check that all control contacts can close.
	Mechanical failure: Check if the motor and shaft are rotating freely. Check bearings and lubrication.	
	Short circuit on stator: Incorrect stator winding causes burning of fuses.	The engine needs to be rewound. Remove the shields and find a fault.
	Rotor fault: Look for broken bars and end blades. The engine may be overloaded. Reduce the load.	
The engine stopped.	**One phase may be interrupted**: check the interrupted phase connection.	
	Incorrect use: change type or size. Consult your device vendor.	
	Overload: reduce the load.	
	Low voltage: Make sure the voltage corresponds to the voltage indicated on the nameplate.	Check the connection.
	Interrupted circuit: burnt fuses. Check the protection relay, stator and pushbuttons.	
The engine runs and then slows down until it stops	**Power failure**: Check for loose connections, fuses and controls.	
The engine does not accelerate to the nominal speed	**Incorrect use**: Contact your device vendor and get the correct type.	
	There is too low a voltage on the motor terminals due to its drop on the line:	Use a higher voltage or transformer or reduce the load. Check the connection. Check that the wires have the correct cross-section.
	Too high starting load: Check initial engine load.	
	Interrupted primary circuit: Use the examiner to find an fault and fix it.	

15. General information about the electric motor

15.1. General information about the electric motor.

Electric motors have dangerous voltage components and rotating parts as well as surfaces that can be hot. All work on transport, connection, commissioning and routine maintenance must be carried out by qualified, responsible specialists (see VDE 0105, ICE 364). Incorrect handling can result in serious injury and damage to property. Appropriate government, local and labour regulations and requirements must be observed.

15.2. Purpose of use of electric motors.

These electric motors are designed for commercial installations. They comply with the harmonized standards of the EN60034 (VDE 0530) series. It is not allowed to be used in areas where there is a risk of explosion; unless explicitly designated for this purpose (see additional notes). In some special cases; for example when used in non-commercial installations where there are more strict requirements (e.g. Protection against contact with children's fingers); is the responsibility of the customer; to ensure that they are met when installing the device.
Electric motors are designed for ambient temperatures from -20°C to + 40°C (2KG: -10°C to 40°C) and for an altitude of <1000m. All different information on the type plate of the electric motor must be observed. The on-site conditions must comply with all specifications on the nameplate of the electric motor.

Low voltage electric motors are components for installation in machinery within the meaning of Directive 89/392 / EEC Machinery. The commissioning of electric motors must not be carried out, until proven, that the finished product meets this Directive (please see EN 60204-1).

15.3. Transport and storage of electric motor.

If the electrical motor damage is discovered after delivery, the shipping company must be notified immediately and, if necessary, the electric motor must not be put into operation. When transporting, all available fixing points on an electric motor must be used and tightened when fastened. They are designed and manufactured on the weight of an electric motor only. Do not add extra load. If necessary, use appropriate, properly dimensioned transport means (for example, ropes).
Before put into operation the electric motor, remove all the supports for transport and store them for further use when transporting. When storing electric motors, it is important that the environment is dry, dust-free and with low vibration (V r m s <0.2 mm / s) (to prevent damage to bearings). Long-term storage of the electric motor reduces the bearing lubrication interval.
When stored for more than 12 months, the condition of the grease must be checked. If the grease is found to be contaminated (condensation water penetration leads to changes in the consistency of the grease), the grease must be replaced.

Insulation resistance.

The minimum insulation resistance of a new, cleaned or repaired electric motor winding should be at least 10 MΩ in relation to the ground.
Inspect the insulating resistor on the electric motor before commissioning. At resistance values below 0.5 MΩ / kV of the design voltage, drain the winding.

15.4. Installation of an electric motor.

After installing the electric motor, the hinged eyes must either be securely screwed or removed!
Ensure a flat surface, good leg or flange fastening, and precise positioning for direct electrical motor connection. It is important to ensure that the mounting status does not cause resonance with a rotational frequency and a double supply frequency. Rotate the rotor on the electric motor manually and listen for unusual grinding sounds.
Check the direction of rotation on the electric motor in the disconnected state. Always mount and dismantle the drive components (pulley, clutch, etc.) using appropriate tools (heating) and cover them to avoid contact. Prevent inadvertent tensioning of the belt (see catalogue and specifications).
For engine balancing, see front shaft or nameplate (H= balancing on half of key, F= balancing on whole key, N= balancing without sliding key) DIN IEC ISO 8821. Check the balance when connecting the driven element!

For outdoor use or storage, we recommend installing an electric motor under the shelter or equipping it with an extra cover to prevent the long-term effects of direct sunlight, rain, snow, ice or dust. Where the end of the motor shaft is pointing upwards, the water has to be prevented along the shaft on the engine.
Do not block the fan in an electric motor! Exhaust air, even from neighbouring devices, mustn't be immediately sucked in again.

15.5. Electrical motor connection.
Work may only be performed by qualified specialists on a stopped electric motor that is disconnected and secured before re-energizing. T This also applies to auxiliary power circuits (e. g. anti-condensation heating). **Check that there is no potential on the device!**
If the motor tolerance limits specified in EN 60034, Part 1 / IEC 34-1 (voltage + - 5%, frequency + - 2%, curve shape, symmetry) are exceeded, the heating effect increases and electromagnetic compatibility impacts. Please read the specifications on the nameplate of the electric motor and the wiring diagram in the motor terminal block. Connections must be made to ensure that a permanently secure electrical connection (no protruding ends of the wires) is maintained; use the appropriate cable terminals. Create a secure earth connection to the motor.
Tightening torques for connection in terminal block.
The air gap between the loose and live components must be > 5.5 mm (U rated <690V). It must be ensured that there are no foreign objects in the motor terminal block; dirt or moisture. Secure all unused cable glands against dust and water.
Inputs to the electric motor terminal block (see DIN 42925); other open inlets, must be sealed with an O-ring or a suitable flat sealing ring and the motor terminal block itself must be sealed with an original seal; to be dust-proof and waterproof. When testing the electric motor without the driven components, secure the sliding key. On electric motors with brakes before startup, check that the brake is working reliably.

15.6. Operation of electric motors.
In the connected state of the electric motor, vibration levels Vr m <3.5mm s (Pn <15kW) or Vr m s <4.5mm/s (Pn> 15kW) are acceptable. If there is a deviation from normal operation - e.g. to increase temperature, noise, vibration - the electric motor must be switched off in case of doubt. Identify the causes and, if necessary, contact the manufacturer. Do not disassemble protective equipment; even during trial operation. If there is an increased amount of pollution during the operation of the electric motor, regularly clean the air ducts. Occasionally, open all closed holes in condensed water!

Regardless of the number of engine operating hours, the bearings should be replaced on a used electric motor every three years to reduce the efficiency of the grease.
On electric motors without lubricating points, the bearings or grease must be replaced according to the manufacturer's instructions at least every three years.
On electric motors with lubricating points follow the instructions on the lubrication data plate!
Lubrication must be carried out on a running electric motor!
In the case that the electric motors with roller bearings for higher radial loads are used with a radial load that is lower than the minimum, damage occurs. The radial load of the engine must be at least 30% of the permissible radial load. In the case of electric motors with separate ventilation, a separate fan drive must be switched on during the whole operation of the electric motor.

15.7. Additional information for the electric motor.
Information on all additional equipment, such as instructions from different manufacturers for cable joints containing sealing elements, must be observed. Further information is available in our detailed operating and maintenance instructions. On request, we will send you further details by specifying the type and serial number of your electric motor.