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## **Installation, Operating and Maintenance Instructions Single-Phase Squirrel-Cage Induction Motors, Standard Version**

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### **1. General**

To avoid damage to the motors and equipment to be driven, the operating and maintenance instructions must be observed. In particular, the separately attached safety instructions must be strictly observed to avoid hazardous situations. In the interest of clarity, the present instructions cannot provide information on any conceivable special fields of applications and areas and special requirements associated therewith. Therefore, when installing motors, the user will have to take himself appropriate safety precautions as will be needed in his specific application. Additionally the Operating and Maintenance Instructions Three-Phase Squirrel-Cage Induction Motors have to be paid in attention!

### **2. Description**

The motors conform to IEC 34-1, DIN EN 60034-1, DIN VDE 0530 as well as other applicable DIN norms. Additional separate instructions apply to the following motor versions:

- Brake motors
- Motors with separately driven fans
- Motors with integral sensors

### **3. Degree of protection**

The degree of protection of the motors is indicated on the rating plate. The degree of protection of attachments may differ from that of the motor. This shall be taken into account when installing the motors. For motors to be installed outdoors (degree of protection = IP 44), bear in mind that the motors must be protected from direct atmospheric exposure (fan may freeze when directly exposed to rain, snow and ice).

### **4. Types of construction**

The type of construction of motors is indicated on the rating plate. Any use in types of construction deviating therefrom shall be subject to the manufacturer's approval and may possibly be permissible only following modification according to the manufacturer's instructions. The user shall make sure that no foreign items can fall into the fan cowl, in particular, in types of construction where the shaft end points upwards.

### **5. Transport and storage**

The motors should be stored in a closed, dry room. Storage in roofed outdoor areas is permissible only for a short period of time. In such a case, appropriate measures must be taken to protect the motors from any harmful environmental action. They must also be protected from mechanical damage. The motors may neither be transported nor stored on the fan cowls. For handling the motors, use the eye-bolts of the motors as well as suitable lifting tackle. The eye-bolts are designed only for lifting the motors without any additional attachments such as base plates, gearboxes etc. If the eye-bolts are removed after installation, the threaded holes must be permanently sealed in accordance with the degree of protection.

## 6. Installation

Since the surface of electric motors can reach high temperatures of over 100°C during normal operation, take precautions to prevent contact if the motors are installed in accessible areas. Similarly, no temperature-sensitive items should be attached to or touching these surfaces. Ventilation openings and cooling ribs must be kept clear, and the minimum distances specified in the dimension sheets must be kept so that the flow of cooling air will not be obstructed. Also make sure that the discharged heated cooling medium will not be drawn in again.

With types of construction IMB14 and IMB34, be sure that the maximum usable screw-in depth indicated in the catalogue will not be exceeded (damage to winding!).

The featherkey in the shaft end is protected by the shaft end guard only for transportation and storage. Carrying out commissioning or a trial run with the featherkey being secured only by the shaft end guard is strictly forbidden because of the risk that the featherkey will be thrown out.

Use suitable mounting devices for fitting the transmission element (e.g. coupling, pinion or pulley), or heat the part to be fitted. To facilitate fitting, the shaft ends are provided with tapped centre holes according to DIN 332 Part 2. For fitting transmission elements on the shaft, never strike on them, because this may cause damage to the shaft, bearings and other parts of the motor.

All elements to be fitted on the shaft end must be carefully dynamically balanced in accordance with the balancing system used for the motor (full or half featherkey). The rotors of the motors have been balanced with half featherkey as is indicated by the letter H after the motor No. on the rating plate. Motors for which the letter F is indicated after the motor No. have been balanced with full featherkey. The motors should be installed such that they will be free from vibrations to the greatest possible extent. For precision-balanced motors, special instructions shall be observed. Following completion of installation, the user must take appropriate steps for protecting all moving parts and ensuring a reliable operation.

If a motor is to be directly coupled to the driven machine, it must be particularly carefully aligned. The axes of both machines must be in exact alignment. Use appropriate shims for bringing the axial height of the motor in exact alignment with that of the driven machine.

With belt drives, the motor is exposed to relatively high radial forces. When dimensioning belt drives, take into account, apart from the regulations and calculation programmes of the belt manufacturer, that the radial force permitted according to our specifications at the shaft end of the motor will not be exceeded by the cantilever load and initial tension of the belt. Be sure, in particular, that the initial tension will be exactly set in accordance with the belt manufacturer's instructions when installing the motor.

## 7. Insulation test and bearing replacement

Prior to initial start up of the motor or after long periods of storage, measure the insulation resistance of the winding to ground and between the phases. The voltage applied may be 500 V maximum. While the measurement is being taken and immediately afterwards, the terminals carry dangerous voltages and must not be touched. Precisely follow the operating instructions supplied for the insulation measuring instrument! Dependent on the rated voltage  $U_N$ , the values determined at a winding temperature of 25 °C must not be lower than the following minimum values:

| Nominal power $P_N$<br>[kW] | Insulation resistance related to<br>rated voltage kΩ/V |
|-----------------------------|--|
| $0,06 < P_N < 2,2$          | 6,3  |

If the values found are lower than the minimum values, properly dry the winding until the insulation resistance meets the specified value.

After a storage time of four years, the bearings must be replaced by new ones of the same type.

## 8. Commissioning

In all commissioning operations, the information on safety must be strictly observed. Before carrying out any work on the motor, disconnect the motor from the power supply. The installation must be carried out by appropriately trained qualified personnel in accordance with the applicable regulations. Make sure that the system data (voltage and frequency) are in agreement with the data given on the rating plate of the motor. The connecting leads must be sized in accordance with the rated motor currents.

The coding of the electrical connections of the motor conforms to DIN EN 60034 Part 8. Carry out the connection in accordance with the circuit diagrams shown in section 16 of the present instructions. These are the diagrams applying in most cases to the basic version of single-phase motors.

**For other versions, special circuit diagrams are supplied, which are glued onto the inside of the terminal box cover or enclosed.** An additional terminal box may be provided for connecting auxiliary and protective devices (e.g. separately driven fan). In respect of this terminal box, the same regulations apply as to the main terminal box.

The motor must be started with an overcurrent protective device which is set according to the 1.05-fold rated data of the motor. Otherwise, no warranty claims for winding damage will be accepted. Before switching the motor on for the first time, it is advisable to check the insulation resistances between winding and ground and between the phases (see section 7). After long periods of storage, it will always be necessary to measure the insulation resistance. Before coupling the driven machine, check the direction of rotation of the motor to avoid damage to the machine. The permissible tightening torques for the terminal board bolts can be seen from the following table:

| Terminal board | Bolt thread | Permissible tightening torque in Nm |
|----------------|-------------|-------------------------------------|
| 16 A           | M4          | 1,2 + 0,5                           |

Before closing the terminal box, always check that

- connections have been made according to the terminal diagram
- all terminal box connections have been firmly tightened
- all minimum clearances are kept (greater than 8 mm for up to 500 V, greater than 14 mm for up to 1000 V)
- the interior of the terminal box is clean and free from foreign items
- unused cable entries are closed and the screw plugs with gasket are firmly tightened
- the gasket in the terminal box cover is clean and all sealing surfaces are in a condition meeting the requirements of the degree of protection.

Before switching on the motor, check that all safety regulations are complied with, the machine has been properly installed and aligned, all fastening elements and earthing connections are firmly tightened, auxiliary and additional devices are in working order and properly connected, and that the featherkey of a possibly existing second shaft end is secured so that it will not be thrown out.

If possible, the motor should be switched on without load. If it runs smoothly and without emitting abnormal noises, you can load it by operating it together with the driven machine. When commissioning the motor, it is advisable to monitor the amps drawn while the motor is operated together with the driven machine so that any overloading will be immediately detected. The safety information must be observed both during operation and when switching the motor off.

## 9. Maintenance

We expressly emphasise the need to observe the safety information, in particular, the information in respect of disconnection from the power supply, securing against reconnection, checking that all parts connected to a voltage source are dead.

If the motor has to be disconnected from the power supply for the purpose of maintenance operations, be sure that any possibly existing auxiliary circuits such as anti-condensation heaters, separately driven fans, brakes are also disconnected from the power supply.

If the motor has to be disassembled for the purpose of maintenance, remove the sealing compound present on the centring edges. When reassembling the motor, seal these surfaces again with a suitable motor sealing compound. Be sure to fit back in place any existing copper sealing washers.

## 10. Bearings and lubrication

The rolling-contact bearings of the standard motors are provided by the bearing manufacturer (or factory) with rolling-contact bearing grease to DIN 51825 in accordance with the following table:

| Construction series  | Grease                             | Grease base  |
|--|------------------------------------|--------------|
| quirrel-cage motors<br>IEC/DIN 56 - 132T and<br>transnorm 56 - 100 | Asonic GLY 32<br>or<br>Multemp SRL | Lithium soap |
| Separately ventilated motors                                       |                                    |              |
| Brake motors   |                                    |              |

Unless agreed otherwise, the grease quality will allow a 2-pole motor at full utilisation to be operated without a renewal of the rolling-contact bearing grease for about 10,000 operating hours and a multi-pole motor for about 20,000 operating hours. The operating hour numbers given apply only to an operation at nominal speed.

## 11. Condensate drain (optional)

In applications where condensation and, thus, condensed water will have to be expected inside the motor, the condensed water which has accumulated at the lowest point of the endshield must be drained at regular intervals and the opening then closed again.

## 12. Cleaning

To ensure adequate cooling, all parts of the motor must be cleaned at regular intervals. In most cases, blowing away the dirt with water- and oil-free compressed air will suffice. In particular, the ventilation openings and spaces between ribs must be kept clean. It is advisable to include also the electric motors in the regular inspections of the driven machine.

## 13. Motors with PTC thermistor (TPM)

It is strictly forbidden to perform a continuity test of the PTC thermistor detector circuit with test lamp, magneto generator and the like, because this would immediately result in the destruction of the detectors. If a new measurement of the cold resistance (at approx. 20 °C) of the detector circuit becomes necessary, the measuring voltage must not exceed 2.5 V DC. The measurement should be carried out with a Wheatstone bridge using a supply voltage of 4.5 V DC. The cold resistance of the detector circuit must not exceed 810 Ω. Measuring the hot resistance will not be required. For motors with thermal winding protection sensor, precautions must be taken to prevent hazardous situations by an unintentional automatic restart after tripping of the thermal winding protection device and subsequent cooling down of the motor.

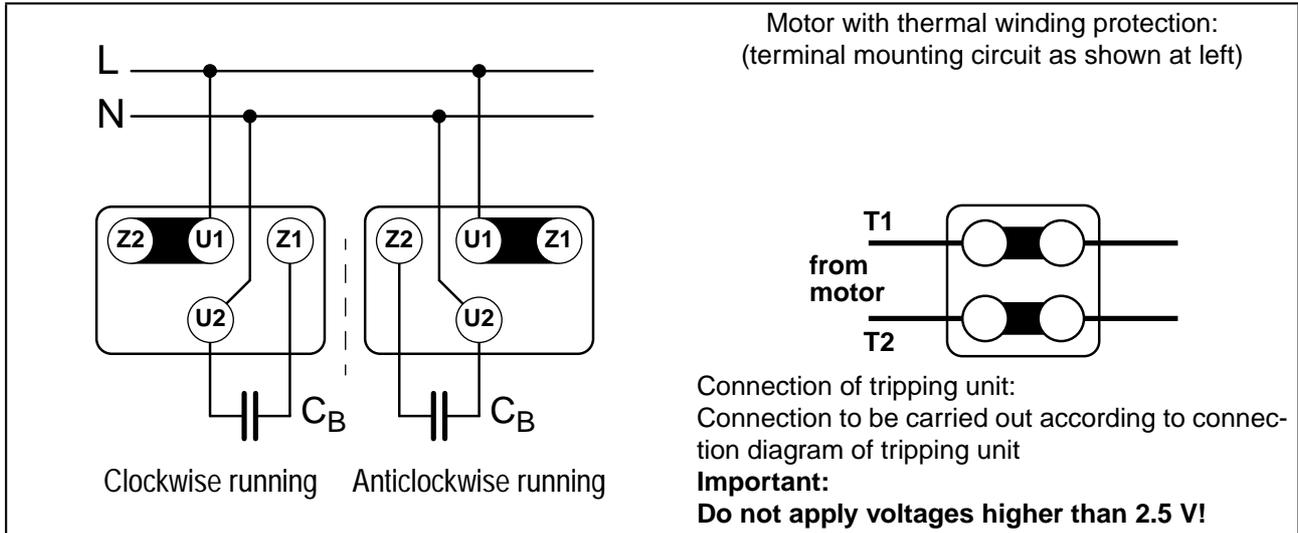
## 14. Warranty, repair, spare parts

Unless expressly agreed otherwise, our authorised field service shops will be responsible for carrying out repairs covered by the warranty. Any other repairs possibly required will also be carried out in an expertly manner by these shops. For information on the organisation of our customer service, you can contact our company. To the extent specified in the "Maintenance" section, appropriate maintenance operations will not be considered as tampering in the sense of the warranty provisions and, thus, will not relieve the company from its warranty obligations.

## 15. Electromagnetic compatibility

The motors have been tested as non-self-contained units for conformity with EMC norms. The owner of installations is responsible for ensuring through appropriate measures that devices and systems conform in their totality to the applicable electromagnetic compatibility norms.

## 16. Terminal mounting circuits (standard version):



**Before commissioning the motor, check all clamp connections for firm fit!**