

Operating Instructions
Single Phase Motors
with operating and starting capacitor

1. General information

To avoid damage to the motors and the equipment they drive, follow the instructions in the operating and maintenance manual. To avoid danger, observe in particular the safety instructions which are provided separately.

Since the operating and maintenance manual, for the sake of brevity, cannot provide specific information for all conceivable special applications and areas with special requirements, the operator needs to take appropriate precautions during assembly.



Also observe the applicable information from the operating and maintenance manual for three-phase asynchronous motors!

2. Description

The motors conform to IEC 60034-1, DIN EN 60034-1 (VDE 0530-1) and additional applicable DIN standards.

Separate additional instructions apply to the following motor modifications:

- Brake motors
- Motors with separately driven fan units
- Motors with attached transmitters

3. IP code

The IP code of each motor is indicated on its rating plate; attached additional devices may have different IP codes from the motor; this needs to be taken into account when installing the motor. If setting up motors (IP code \geq IP 44) outdoors, care must be taken to protect the motors from the immediate effects of the weather (freezing of the fan if exposed directly to rain, snow and ice).

4. Configurations

The configuration of each motor is indicated on its rating plate. Use in configurations other than those specified is only permitted after the manufacturer has given permission and the motor has, if necessary, been converted according to the manufacturer's instructions. The operator must ensure, especially for configurations with a vertical shaft, that foreign objects cannot fall into the fan cover.

5. Transport and storage

The motors should, if possible, only be stored in enclosed, dry spaces. Outdoor storage under a roof is only permissible for a short time and must include protection from adverse environmental effects. Motors must also be protected from mechanical damage. Do not move or store motors resting on their fan covers.

6. Installation and assembly

During the regular operation of electric motors, surface temperatures of over 100°C can occur; for this reason, the motors must be protected from accidental contact if they are located in accessible areas. No temperature-sensitive components may be attached or kept adjacent to the motor. Keep ventilation openings and cooling fins unobstructed, and observe the minimum distances specified in the dimension sheets to ensure that the cooling air can flow freely. Ensure that the warm cooling medium that has been expelled is not drawn in again.

For configurations IMB14 and IMB34, make sure not to exceed the maximum usable depth of engagement specified in the catalogue (damage to the coil!). The feather key in the shaft is protected by the shaft protection sleeve for transport and storage only; do not put the motor into operation or perform a test run with the feather key protected only by the shaft protection sleeve, due to the risk of the feather key being ejected.

When mounting the transmission element (such as a coupling, pinion, or belt pulley), use mounting devices or heat up the part to be mounted. For mounting, the shaft extensions have centring devices with threaded holes in accordance with DIN 332 part 2. Ensure that transmission elements cannot collide with the shaft; otherwise, the shaft, bearing and other parts of the motor may be damaged. All elements that will be attached to the shaft extension require careful dynamic balancing according to the balancing system of the motor (full/half feather key). The motors must be installed free from vibration, if possible. Special instructions apply to motors in low-vibration configurations. After assembly is complete, the operator must make sure that movable parts are protected and that operational safety is ensured.

If the motor is coupled directly to the machine it drives, the alignment must be particularly precise. The axes of both machines must be in line. To adjust the axis height of the machine being driven, use appropriate shimming.

Belt drives put relatively large radial loads on the motor. With regard to belt drive sizing, in addition to following the regulations and calculation programs of the belt manufacturers, also make sure that belt pull and belt pre-tension do not exceed the maximum radial force at the shaft extension of the motor according to our specifications. During assembly, the belt pre-tension in particular must be adjusted exactly according to the belt manufacturer's instructions.

7. Insulation check and bearing replacement

When first putting into operation and especially after longer storage, test the insulation resistance of the coil against chassis ground and between the phases. Do not apply more than 1500 V. During and directly after the measurement, there will be dangerous voltages at the terminals. Do not touch the terminals under any circumstances; follow the operating manual of the insulation

tester exactly! Based on the nominal voltage U_N and a coil temperature of 25°C, the following minimum values must be achieved:

Nominal power P_N [kW]	$0.12 < P_N < 3,7$
Insulation resistance relative to nominal voltage $k\Omega/V$	6.3

If the values are below the minimum values, the coil needs to be dried properly until the insulation resistance corresponds to the required value. After a storage time of four years, the bearings must be replaced with new ones of the same type.

8. Putting the motor into operation

Make absolutely sure to observe all safety instructions. Work on the motor only if it has been de-energised. The installation must be carried out by properly trained personnel in compliance with the applicable regulations. First, compare the mains power properties (voltage and frequency) to the specifications on the rating plate of the motor. The dimensions of the connecting cables must be adequate for the nominal currents of the motor.

The designation of the connection points of the motor corresponds to DIN EN 60034 part 8. Item 16 in this manual shows the most common circuit diagrams used for the connection of single-phase motors in their basic configuration. For other configurations, special circuit diagrams are supplied which are either affixed to the terminal box lid or otherwise included. For the connection of auxiliary and safety devices (e.g. separate fans) an additional terminal box can be provided, which is subject to the same regulations as the main terminal box.

The motors must operate with overcurrent protection adjusted to 1.05 times the nominal motor specifications. Otherwise, no warranty claims can be made for coil damage. Before switching on the motor for the first time, it is advisable to check the insulation resistance between coil and chassis ground and between the phases (see section 7). After prolonged storage, this insulation test is absolutely required. Before coupling the work machine to the motor, check the rotational direction of the motor to prevent damage to the drive motor. The table below specifies the permissible fastening torque for the terminal board bolts:

Terminal board	20 A
Connecting bolt thread	M4
Permissible fastening torque in Nm	$1.2 + 0.5$

Before closing the terminal box, it is absolutely necessary to check that:

- The connection has been made in accordance with the connection diagram.
- All terminal box connections have been tightened securely.
- The interior of the terminal box is clean and free from foreign objects.
- Unused cable entry points have been sealed and the screw plugs with gaskets have been tightly fastened.
- The gasket in the terminal box lid is clean and all sealing surfaces are in proper condition in compliance with the IP code.

Before switching on the motor, check to ensure that all safety regulations have been adhered to, that the machine has been properly installed and aligned, that all fastening parts and earth connections are tightly fastened, that the additional devices and accessories are functional and properly connected, and that the feather key of any second shaft extension is protected against being ejected.

Switch on the motor without load, if possible. If it runs quietly and without abnormal noise, add the load of the driven machine. When putting the motor into operation, it is advisable to monitor the electric current input when the motor is loaded with the driven machine to ensure that any overload is recognised early. Observe the safety instruction both during the operation of the motor and when switching it off.

9. Maintenance

Observe all safety instructions, in particular regarding disconnection, securing isolation, and proving dead of all parts connected to a power source.

When disconnecting the motor from the mains for maintenance work, make sure to also disconnect any auxiliary electric circuits, e.g. standstill heaters, separate fans, brakes, etc.

If the motor needs to be dismantled for maintenance, the sealant at the centring flanges needs to be re-moved; during re-assembly, a suitable motor sealant must be re-applied. Any copper sealing washers must always be re-installed.

10. Bearings and lubrication

The roller bearings of the motors in standard design are equipped with closed bearings. These contain lifetime lubrication.

11. Draining Condensate (optional)

At sites where condensation and the formation of condensate inside the motor must be expected, the accumulated condensate needs to be drained at regular intervals using the condensate drainage opening at the lowest point of the bearing shield; when done, the opening must be closed again.

12. Cleaning

To ensure the effectiveness of the air cooling, all parts of the motor need to be cleaned regularly. Usually, cleaning with compressed air (water-free and oil free) is sufficient. In particular the ventilation openings and spaces between the fins need to be kept clean. It is recommended to include the electric motors in the regular inspections of the driven machine.

13. Motors with PTC resistors

Continuity testing of the PTC resistor sensor circuit with test lamp, magneto or similar is strictly prohibited, since this would lead to the immediate destruction of the sensor. If an additional measurement of the cold resistance (at approx. 20°C) of the sensor circuit is necessary, the measurement voltage may not exceed 2.5 V DC. A measurement of hot resistance is not required. For motors with thermal coil protection, precautions need to be taken to ensure that after the thermal coil protection has responded and after the motor has cooled down, an unintentional automatic restart will not cause any danger.

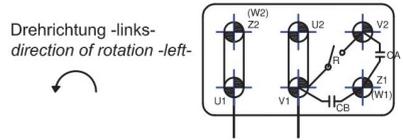
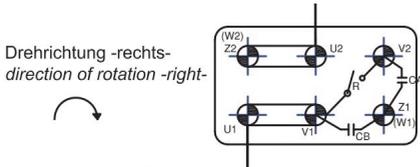
14. Warranty, repair, spare parts

Our authorised repair shops are responsible for repairs under warranty, unless expressly agreed otherwise. They can also perform any other repair work that may become necessary in a professional manner. For information about how our customer service works, please contact the factory. Proper maintenance as specified in the Maintenance section does not count as tampering under the terms of the warranty. It therefore does not release the factory from its agreed obligations under the warranty.

15. Electromagnetic compatibility

The compliance of the motors as dependent components with the EMC standards has been verified. The system operator is responsible for ensuring by means of suitable measures that devices or entire systems meet the relevant electromagnetic compatibility standards.

16. Connection diagram for 2 + 4 pole single phase motors with centrifugal switch

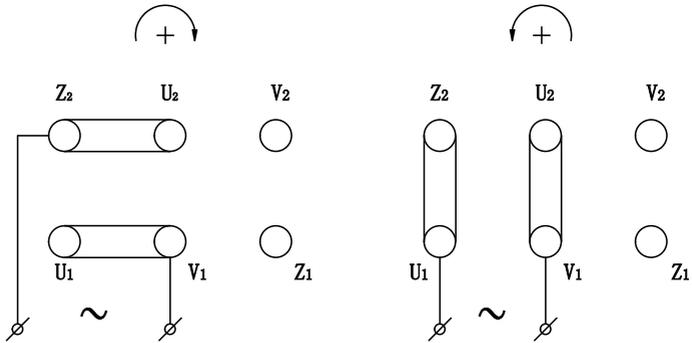


R= interner Fliehkraftschalter / internal centrifugal switch
CB= Betriebskondensator / capacitor
CA= Anlaufkondensator / starting capacitor



Check that all terminal connections are firmly seated before putting the machine into operation!

17. Connection diagram for 6 pole single phase motors with starting relay



Wiring diagram

Main winding: U1 + U2

Secondary winding: Z1 + Z2

Run capacitor: V1 + Z1

Start capacitor: V2 + Z2

Starting relay: red goes to V2, blue goes to Z1, white goes to V1, black goes to Z2



Check that all terminal connections are firmly seated before putting the machine into operation!