

# MMG-W IE3, IE4

Low voltage 3-phase induction motor

Installation and operating instructions



## English (GB) Installation and operating instructions

### Original installation and operating instructions

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## 1. General information



Read this document before you install the product. Installation and operation must comply with local regulations and accepted codes of good practice.

### 1.1 Hazard statements

The symbols and hazard statements below may appear in Grundfos installation and operating instructions, safety instructions and service instructions.



#### DANGER

Indicates a hazardous situation which, if not avoided, will result in death or serious personal injury.



#### WARNING

Indicates a hazardous situation which, if not avoided, could result in death or serious personal injury.



#### CAUTION

Indicates a hazardous situation which, if not avoided, could result in minor or moderate personal injury.

The hazard statements are structured in the following way:

#### SIGNAL WORD

##### Description of the hazard

Consequence of ignoring the warning

- Action to avoid the hazard.



### 1.2 Notes

The symbols and notes below may appear in Grundfos installation and operating instructions, safety instructions and service instructions.



Observe these instructions for explosion-proof products.



A blue or grey circle with a white graphical symbol indicates that an action must be taken.



A red or grey circle with a diagonal bar, possibly with a black graphical symbol, indicates that an action must not be taken or must be stopped.



If these instructions are not observed, it may result in malfunction or damage to the equipment.



Tips and advice that make the work easier.

## 2. General safety warnings



Persons responsible for the installation, commissioning, operation, maintenance and repair of motors, must receive full technical training to understand the hazards to people and property. If the motor is not installed, operated and maintained correctly, it can cause serious or fatal injuries. For specific safety requirements, follow the relevant national regulations.

### WARNING

#### Electric shock

Death or serious personal injury

- Before starting any work on the motor, switch off the power supply connected to the motor and its auxiliary parts. Make sure that the motor has completely stopped.
- The motor and the protection devices must be earthed to prevent accidents and failures.
- The protection devices cannot be open circuit and must be used. They ensure extended life of the motor.
- Do not touch any live parts. In the case of automatic start, automatic stop or remote start, place a sign to warn that the motor may start at any time.
- Prevent water from entering the inside of the motor.



### WARNING

#### Rotating parts

Death or serious personal injury

- The motor must be properly protected to prevent persons from coming into contact with rotating parts. Do not touch the rotating parts when the motor is running.
- Apply appropriate safety measures to avoid accidents in case of brake failure.
- Some MMG-W motors are equipped with greasing nipples for continuous lubrication. If the motor needs to be lubricated during operation, it must be carried out by qualified persons familiar with relevant safety requirements. Make sure that internal rotating parts and live parts are protected.



### WARNING

#### Body injury

Death or serious personal injury

- Before starting the motor, make sure that all shaft keys are fitted securely.



### WARNING

#### High noise level

Death or serious personal injury

- In environments with high noise levels, ear protection must be worn. For more information about noise levels, contact your local Grundfos company or refer to the relevant product specification of Grundfos.



In order to prevent the motor from overloading, we recommend installing a winding temperature monitor. Grundfos can install the temperature monitor on the motor winding, and its lead wire can be directly connected to the controller for automatic power-off protection.



- Do not run the motor without phase. We recommend installing a phase failure protection device.
- Never fit a coupling or pulley by using a hammer, so as to avoid damage to the motor bearing.



When the motor is used for variable speed operation, make sure that it does not exceed the maximum safe speed of the motor and it operates without overload. At lower speeds, the ventilation of the totally-enclosed fan-cooled motor is reduced and an auxiliary cooling fan must be added. For more information, contact your local Grundfos company.

### 3. Receiving the product

- Make sure that the parameters on the nameplate meet your requirements.
- Make sure that the motor is not damaged.
- Remove the shaft holder (if any) from the shaft extension and reinstall it before transport.
- The lifting eyebolts and other lifting devices must be tightened before use, and they can only be used for lifting the motor. If the motor has more than one lifting eyebolt, they must be used together to evenly distribute the load.
- After installation, make sure that the mounting (IM) is in line with the identification on the nameplate and that the drain holes are at the lowest position. For more information, contact your local Grundfos company.
- Turn the shaft extension slowly to make sure that the motor can rotate freely.

### 4. Mechanical installation

#### 4.1 Checking before installation

- Make sure that the values on the nameplate are consistent with the operating requirements, the wiring is consistent with the wiring diagram and the thermal protection circuit is connected.
- Measure the insulation resistance of the motor with a megohmmeter. If the resistance is lower than 5 MΩ, the stator winding must be dried out thoroughly. The drying temperature must not exceed 100 °C.
- Check the motor for damage, deformities and loose parts. Turn the rotor by hand to check for abnormalities.
- Check that the motor mounting arrangement is in line with the requirements. For example, the basic arrangement IM B3 can be modified to IM V5 by adding additional support or replacing the bearings to bear the axial load.
- Clean the dust and dirt on the surface of the motor.
- If the motor is stored for a long period of time (generally over one year), check the grease and change it if necessary.

#### 4.2 Foundation

##### **WARNING**

##### **Body injury**

Death or serious personal injury

- The foundation must be carried out in accordance with the following instructions. Insufficient rigidity or improper structure of the foundation leads to abnormal vibration and noise and even shaft fracture, and this can cause accidents when the motor is running.



The motor must have a rigid foundation. If the motor is not installed together with the driven machine, both must be installed on a foundation made of concrete. A suitable mounting arrangement must be selected for motors that are moved frequently.

Any height differences between the motor and the driven machine must be adjusted. The surface of the shims must be bigger than that of the motor feet. A maximum of two shims are allowed.

The installation location must be spacious enough for daily operation and maintenance.

Motors can be connected by couplings. When couplings are used, the centre lines of coupled shafts must coincide.



When couplings are used, there must be enough clearance between the coupling of the motor and the coupling of the driven machine to prevent axial force caused by thermal expansion, which damages bearings.

Make sure that all mounting holes are fixed by steel bolts and nuts. In places prone to rust, use stainless steel bolts, and in case of high vibration, use antivibration pads.

In the case of motors with drain holes, make sure that the drain holes are at the right position. When the drain holes are open, measures must be taken to prevent any objects from entering the motor.

## 5. Electrical connection

- The electrical connections of the motor, controller, overload protection and earthing must comply with relevant wiring and safety standards.
- Note the markings on the nameplate and the wiring diagram in the terminal box.
- Connect the terminals of the thermal protector directly to the motor control equipment.
- Motors with Pt100 protection devices generally have auxiliary terminal boxes. Connect them according to the wiring diagram.
- Before starting the motor, make sure that the supply voltage and frequency correspond to the values stated on the motor nameplate.
- For multi-speed motors, perform the connection according to one of the related wiring diagrams. The rotation direction at different speeds must be confirmed during debugging. For more information, contact your local Grundfos company.

## 6. Startup

### 6.1 No-load running

Make sure that the rated current of the fuse in the control equipment complies with the requirements and the installation is safe.

Make sure that the connection of the starting device is correct, the contacts are in good condition and the starting device is reliably earthed.

The motor can have direct-on-line starting or auto-transformer starting.



The starting current is 5-8 times greater in the case of direct-on-line starting, and the starting torque is proportional to the square of voltage in the case of auto-transformer starting. Use the auto-transformer starting in undervoltage conditions, when the motor must be started under no-load or light-load conditions. If the static load is large, only direct-on-line starting can be used.

Check the direction of rotation of the motor. If it is not correct, interchange the connection of any two phases to solve the problem.

After the above inspections, the motor can be tested with no load. The no-load test takes 1-2 hours. During this time, observe whether there are any abnormalities, unusual noise or vibration, and whether the bearings are overheated or there is oil leakage. All of these problems must be solved before running the motor with load.

### 6.2 Running with load

After the no-load test, running with load can be carried out.

Start the motor with load. If the motor does not start immediately or run smoothly, switch off the power supply and check the installation and the wiring.

Coupling misalignment, loose fixing bolts, insufficient rigidity of the foundation or vibration transferred from other machines can all lead to abnormal vibration causing damage to the motor.

Low voltage, rotor overload, unfinished electrical connections or the combination of such problems can lead to abnormal noise causing damage to the motor.

When the motor is running, make sure that the current equals to the rated current on the nameplate. Keep current balance between the three phases.

According to the technical specifications, the number of starts of the motor is limited. The number of cold starts per hour must not exceed three. If the motor has run for a long period of time or the motor is hot, do not restart it immediately after stopping (once the motor temperature has stabilised, do not exceed that temperature), and do not restart it twice in quick succession otherwise the motor gets damaged.

If one transformer is shared by several motors and the capacity of the transformer is not large enough, start the motors in the order of large to small.

## 7. Service

### 7.1 Maintenance

In order to ensure the safe and reliable operation of the motor, regular inspection and maintenance must be carried out, and hidden risks must be identified to prevent failures. Perform the inspection and maintenance of the motor according to the principles below.

#### 7.1.1 Routine inspections during operation



- In case of any sudden increase in noise or vibration of the motor, the motor must be stopped immediately.
- In case of continuous operation, perform periodic inspections at least once a day.
- The motor must be kept clean to prevent oil, water or other dirt entering the motor.
- Make sure that the motor is well-ventilated, the air inlets and outlets are not obstructed and meshes are cleaned frequently.
- The operation of the motor must be frequently monitored. If you detect any abnormalities, stop the motor immediately for inspection to prevent failures.

#### 7.1.2 Shutdown inspection

If any of the following abnormal conditions occur, the motor must be stopped immediately for inspection:

- heavy vibration
- damage to the driven machine
- bearing damage or overheat
- bearing misalignment and axial vibration
- sudden drop in speed
- friction between stator and rotor, enclosure overheat
- motor or starting device emits fumes
- personal injury.

#### 7.1.3 Periodic inspection

Depending on the operating conditions, the motor must be inspected periodically.

- Check if the fixing bolts are loose or corroded, affecting the fixing performance.
- Check that the electrical connection is fastened and there is no rust affecting the contact performance.
- Check that the earthing is fastened and there is no rust affecting the earthing performance.
- Check if the shaft seal is worn. If yes, replace it. Contact your local Grundfos company for any detailed specifications.

- Check that the coupling is firmly fixed and ensure concentricity.
- Check if there is liquid inside the motor affecting the motor performance. If yes, discharge it.
- Check the bearings and replace them immediately if worn.
- Check the paint on the motor. If needed, repaint the motor to prevent excessive corrosion.

#### 7.1.4 Motor maintenance



Motors must be maintained periodically and faults must be eliminated immediately. In general, a minor maintenance per month and a major maintenance per year is needed.

##### 7.1.4.1 Minor maintenance

- Clean the dust on the surface of the motor.
- Measure the insulation resistance of the motor.
- Fasten the fixing bolts, earth studs and other connecting bolts.
- Clean the starting device and the insulating terminals.
- Clean the mesh on the fan cover to ensure that the air inlet and outlet are not obstructed.

### 7.1.4.2 Major maintenance

- Perform all the tasks included in minor maintenance.
- Clean the inside of the motor to keep the stator winding clean, free of grease and with no exposed copper.
- Replace the bearings if damaged. Under normal operating conditions, we recommend replacing the bearings once a year (runtime is approximately 8000 hours per year).
- If there is no need to replace the bearings, clean the bearings and change the grease.
- Clean or replace other parts of the motor.

## 7.2 Lubrication

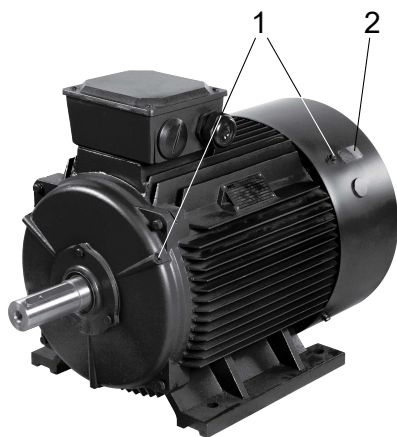
The correct lubrication directly affects the lifetime of the bearings and motors, so it is important to grease the bearings correctly and regularly.

For smaller motors, bearings of ZZ types are usually permanently greased. These pre-greased bearings do not need to be regreased.

Larger motors (H180 and above) and motors with specific requirements are equipped with a greasing device. These motors are factory greased, but it is necessary to change the lubrication at regular intervals. The exact interval depends on the size and usage of the motor.



If the machine is equipped with a regreasing plate, follow the given values.



TW1040218

*Dust seals, lubricator fittings and regreasing plate on MMG-W*

Pos.	Description
1	Dust seals and lubricator fittings
2	Regreasing plate

REGREASING		
Grease Interval:	XXXX	hours
Grease amount:	XX	gr.
Grease type:	Polyrex EM-2	

TW1040217

*Regreasing plate*



## 7.2.1 Lubrication methods

### 7.2.1.1 Regreasing while the motor is running

1. Before regreasing, remove the dust seals at the lubricator fittings and the grease outlet plug to ensure that the lubricator fittings are open.
2. Use a grease gun to inject the specified amount of grease into the bearing.
3. After regreasing, run the motor for 10-20 minutes to ensure that all excess grease is forced out of the bearing. Close the grease outlet plug.

### 7.2.1.2 Regreasing while the motor is at standstill

If it is not possible to regrease the bearings while the motor is running, lubrication can be carried out while the motor is at a standstill.

1. In this case, use only a small amount of grease and then run the motor for a few minutes at full speed.
2. When the motor has stopped, apply the rest of the specified amount of grease to the bearing.
3. After regreasing, run the motor for 10-20 minutes to ensure that all excess grease is forced out of the bearing. Close the grease outlet plug.

### 7.2.2 Types of grease

Grease with the correct properties is available from all the major lubricant manufacturers. If the make of grease is changed and compatibility is uncertain, contact your local Grundfos company.



If regreasing is to be performed when the motor is running, it must be done by authorised persons and rotating parts and live parts must be protected against accidental contact.

## 8. Storage



- The motor must be stored in a clean, dry and corrosion-free environment.
- The storage location must not be subject to drastic changes in the surrounding environment.
- The storage period must not be too long.
- The motors must not be stacked too high to avoid damage to the motors.

If the motor is stored in a humid environment, measure the insulation resistance before starting the motor.



The insulation resistance must exceed 5 MΩ. If the resistance is lower than 5 MΩ, the winding is too damp and must be oven dried. If the resistance value is still under 5 MΩ after oven drying, the motor must be repaired.

### Motor-drying methods:

- **Method 1:** Dismantle the motor and put the stator winding into the oven. The oven temperature must be less than 100 °C. Keep good ventilation inside and outside the oven. When the insulation resistance exceeds 5 MΩ and the value is steady, the drying is completed.
- **Method 2:** Stall the rotor and apply low voltage to the winding. Make sure that the applied current is 1/3 to 1/2 of the rated current on the nameplate. The temperature of the winding must be less than 100 °C. When the insulation resistance exceeds 5 MΩ and the value is steady, the drying is completed.

Check the bearings for rust after long storage periods. Rusted bearings must be replaced and greased.



If the motor is equipped with space heater, the space heater must be switched on to prevent the motor from dampness.

## 9. Fault finding

### 9.1 Fail to start

Cause	Remedy
Power disconnected	<ul style="list-style-type: none"> <li>Check the power connection.</li> </ul>
Stator winding failure	<ul style="list-style-type: none"> <li>Check the winding circuit.</li> </ul>
Overload or transmission stuck	<ul style="list-style-type: none"> <li>Select a larger motor or reduce the load. If the transmission is stuck, clear the obstacle.</li> </ul>
Wrong wiring	<ul style="list-style-type: none"> <li>Correct the wiring.</li> </ul>

### 9.2 Low speed when running on load

Cause	Remedy
Low power supply	<ul style="list-style-type: none"> <li>Check the terminal voltage.</li> </ul>
Overload	<ul style="list-style-type: none"> <li>Select a larger motor or reduce the load.</li> </ul>

### 9.3 Current leakage on the enclosure

Cause	Remedy
Incorrect power and ground connection	<ul style="list-style-type: none"> <li>Correct the connection.</li> </ul>
Winding aged or damp	<ul style="list-style-type: none"> <li>Dry or replace the winding.</li> </ul>
Lead wire contacts enclosure	<ul style="list-style-type: none"> <li>Check if the lead wire contacts the enclosure. In case of contact with the enclosure, insulate the wire.</li> </ul>

### 9.4 Abnormal noise

Cause	Remedy
Phase-deficient running	<ul style="list-style-type: none"> <li>Check the electrical connection to exclude phase-loss fault.</li> </ul>
Bearing damage or lack of grease	<ul style="list-style-type: none"> <li>Replace the bearing or the lubricating oil.</li> </ul>
Friction between the stator and the rotor	<ul style="list-style-type: none"> <li>Check if there is any debris on the inner surface of the stator.</li> </ul>

### 9.5 Abnormal vibration

Cause	Remedy
Motor or load assembly loose	<ul style="list-style-type: none"> <li>Check and tighten the foot bolt.</li> </ul>
Coupling or belt pulley eccentric or out of balance	<ul style="list-style-type: none"> <li>Calibrate eccentricity or rebalance.</li> </ul>
Shaft extension bent after impact	<ul style="list-style-type: none"> <li>Replace the stator or shaft.</li> </ul>
Rotor out of balance	<ul style="list-style-type: none"> <li>Rebalance the rotor.</li> </ul>

## 9.6 Bearing overheat

Cause	Remedy
Bearing damaged	<ul style="list-style-type: none"> <li>Replace the bearing.</li> </ul>
Inadequate grease or poor quality of grease	<ul style="list-style-type: none"> <li>Replace the grease and keep the amount between 1/2 and 2/3.</li> </ul>
Coupling misalignment or overtightness of pulley belt	<ul style="list-style-type: none"> <li>Calibrate the shaft coupling or adjust the tension of the belt.</li> </ul>
Friction between the bearing housing and the bearing	<ul style="list-style-type: none"> <li>Replace the worn cover, shaft or rotor.</li> </ul>
Poor assembly of the motor	<ul style="list-style-type: none"> <li>Reassemble the motor.</li> </ul>

## 9.7 High temperature or smoke

Cause	Remedy
Overload	<ul style="list-style-type: none"> <li>Select a larger motor or reduce the load.</li> </ul>
Temperature too high	<ul style="list-style-type: none"> <li>Reduce the temperature or the load.</li> </ul>
Voltage too high or too low	<ul style="list-style-type: none"> <li>Check if the voltage is too high or too low. Lower the load or stop the motor.</li> </ul>
Two-phase operation	<ul style="list-style-type: none"> <li>Check the electrical connection to exclude phase-loss fault.</li> </ul>
Blocked airflow	<ul style="list-style-type: none"> <li>Clean the dirt and debris in the inlet and outlet.</li> </ul>

## 10. Technical data

### 10.1 Operating conditions

The ambient temperature must be between -20 to +40 °C, and the relative humidity must be less than 90 %. The maximum altitude is 1000 m above sea level.



In case of deviation from the above operating conditions, such as ambient temperature below -20 or above +40 °C, relative humidity above 90 %, altitude more than 1000 m above sea level or a high vibration, check the suitability of the motor for the operation. For more information, contact your local Grundfos company.

The deviation between the supply frequency and the rated frequency must not exceed 2 %, and the deviation between the supply voltage and the rated voltage must not exceed 5 % (except for special designs according to agreements).

Open drip-proof motors (IP23, IP21) are suitable for operating in clean, dry, well-ventilated and corrosion-free indoor environments. For more information, see IEC 60034-1.

Totally enclosed fan-cooled motors (IP44, IP54, IP55) are suitable for operating in relatively dirty, humid or dusty environments. For more information, see IEC 60034-1.

Outdoor anticorrosion motors are suitable for operating outdoors or in corrosive and high humidity environments.

Adequate ventilation of the motor must be ensured under all working conditions. If there are other ventilators, make sure that they do not affect the effective ventilation of the motor. If motor ventilation is affected, the air volume of the ventilator must be adjusted or the ventilation path of the motor must be changed to ensure effective motor ventilation.



## 11. Disposing of the product

This product or parts of it must be disposed of in an environmentally sound way.

1. Use the public or private waste collection service.
2. If this is not possible, contact the nearest Grundfos company or service workshop.



The crossed-out wheeled bin symbol on a product means that it must be disposed of separately from household waste. When a product reaches its end of life, take it to a collection point designated by the local waste disposal authorities. The separate collection and recycling of such products will help protect the environment and human health.

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See also end-of-life information at [www.grundfos.com/product-recycling](http://www.grundfos.com/product-recycling).

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