Driving efficiency and sustainability

Installation, operation and maintenance manual of electric motors

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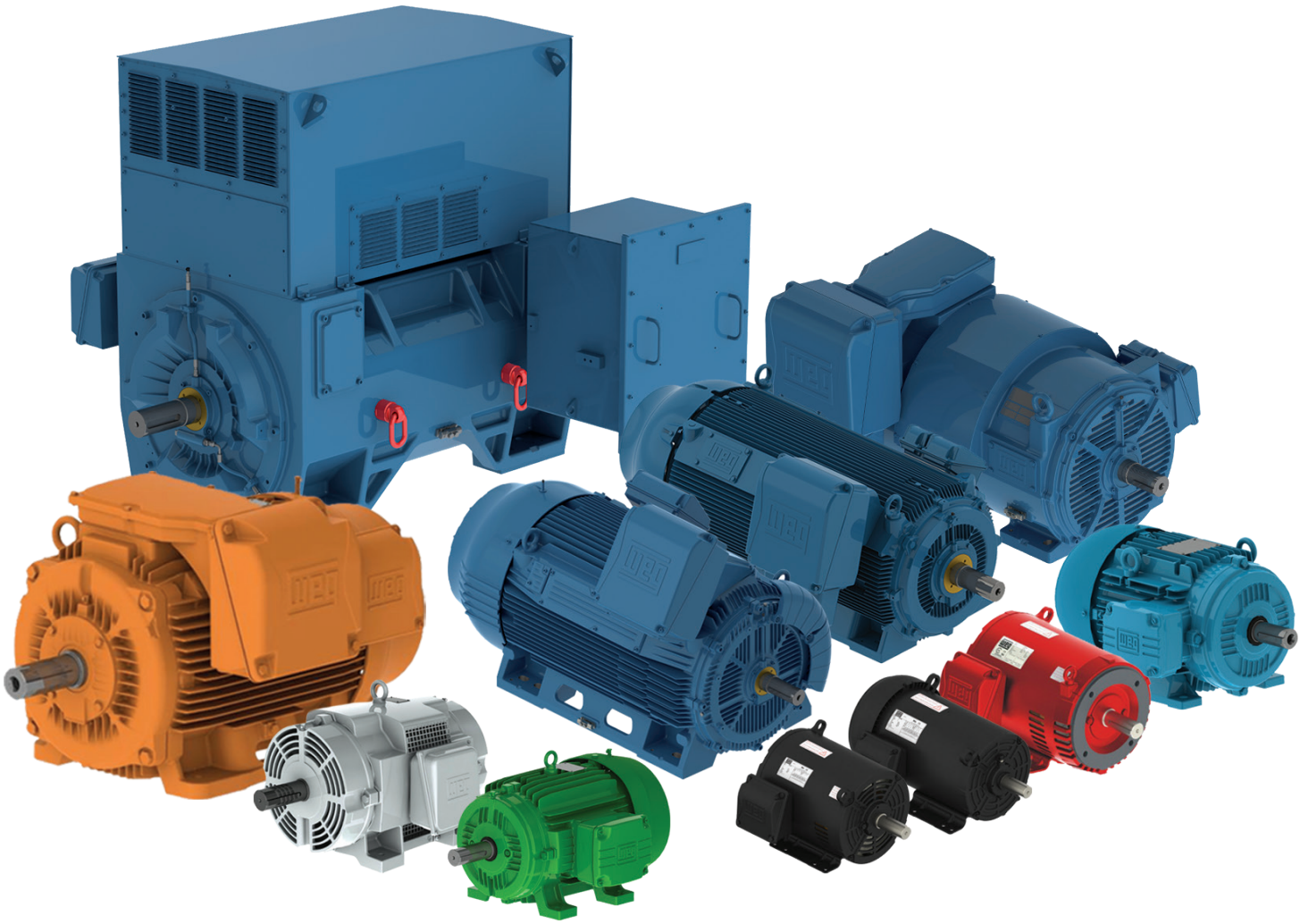

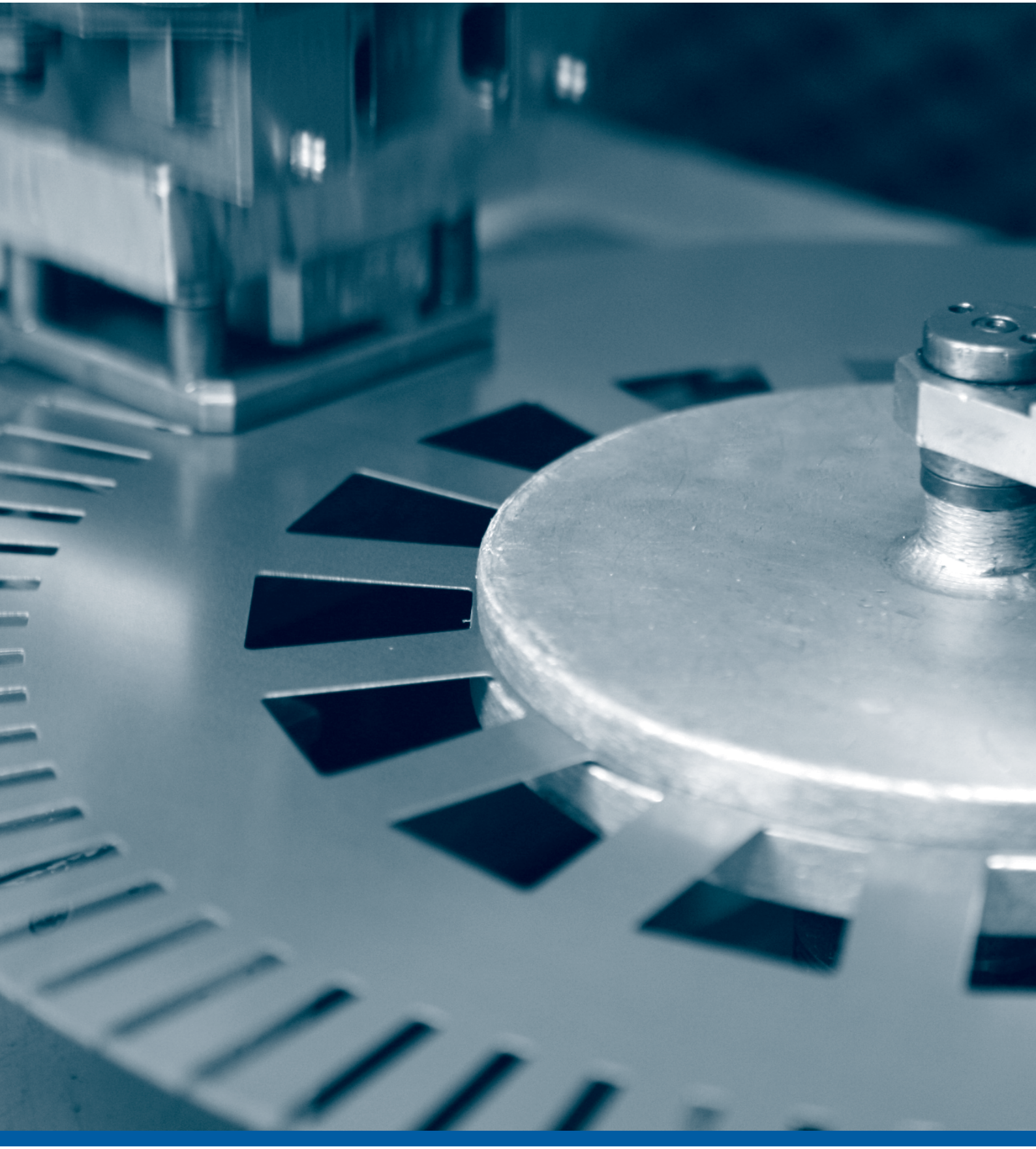

INSTALLATION, OPERATION AND MAINTENANCE MANUAL OF ELECTRIC MOTORS

This manual provides information about WEG induction motors fitted with squirrel cage, permanent magnet or hybrid rotors, low, medium and high voltage, in frame sizes IEC 56 to 630 and NEMA 42 to 9606/10.
The motor lines indicated below have additional information that can be checked in their respective manuals:

- Smoke Extraction Motors;
- Electromagnetic Brake Motors;
- Hazardous Area Motors.

These motors meet the following standards, if applicable:

- NBR 17094-1: Máquinas Elétricas Girantes - Motores de Indução - Parte 1: trifásicos.
- NBR 17094-2: Máquinas Elétricas Girantes - Motores de Indução - Parte 2: monofásicos.
- IEC 60034-1: Rotating Electrical Machines - Part 1: Rating and Performance.
- NEMA MG 1: Motors and Generators.
- CSA C 22.2 N°100: Motors and Generators.
- UL 1004-1: Rotating Electrical Machines - General Requirements.

If you have any questions regarding this manual please contact your local WEG branch, contact details can be found at www.weg.net.

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1. TERMINOLOGY

Balancing: the procedure by which the mass distribution of a rotor is checked and, if necessary, adjusted to ensure that the residual unbalance or the vibration of the journals and/or forces on the bearings at a frequency corresponding to service speed are within specified limits in International Standards.
[ISO 1925:2001, definition 4.1]
Balance quality grade: indicates the peak velocity amplitude of vibration, given in mm/s, of a rotor running free-in-space and it is the product of a specific unbalance and the angular velocity of the rotor at maximum operating speed.
Grounded Part: metallic part connected to the grounding system.
Live Part: conductor or conductive part intended to be energized in normal operation, including a neutral conductor.
Authorized personnel: employee who has formal approval of the company.
Qualified personnel: employee who meets the following conditions simultaneously:
- Receives training under the guidance and responsibility of a qualified and authorized professional;
- Works under the responsibility of a qualified and approved professional.

Qualified personnel: employee previously qualified and registered with the competent class council.
Qualified personnel: employee who proves completion of a specific course in the electrical area by the official education system.

Note*: The qualification is only valid for the company that trained the employee in the conditions set out by the authorized and qualified professional responsible for training.*

2. INITIAL RECOMMENDATIONS

Electric motors have energized circuits, exposed rotating parts and hot surfaces that may cause serious injury to people during normal operation. Therefore, it is recommended that transportation, storage, installation, operation and maintenance services are always performed by qualified personnel.
Also the applicable procedures and relevant standards of the country where the machine will be installed must be considered.
Noncompliance with the recommended procedures in this manual and other references on the WEG website may cause severe personal injuries and/or substantial property damage and may void the product warranty.

For practical reasons, it is not possible to include in this Manual detailed information that covers all construction variables nor covering all possible assembly, operation or maintenance alternatives.
This Manual contains only the required information that allows qualified and trained personnel to carry out their services. The product images are shown for illustrative purpose only.
For special applications and operating conditions(50026367 manual for Smoke Extraction Motors, 50021973 manual for Brake Motors, 50078700 manual for Electronically Conmutated Motors, 14629920 manual for Roller Table motors, 50106963 manual for WEG Lift Gearless motors) refer to the applicable manual on the website www.weg.net or contact WEG.
For motors supplied with WEG Motor Scan sensor, see installation guidelines Overview of Receipt to Operation Manual (10008475131) available on www.weg.net.

For information about permissible radial and axial shaft loads, please check the product technical catalogue.

The user is responsible for the correct definition of the installation environment and application characteristics.

During the warranty period, all repair, overhaul and reclamation services must be carried out by WEG authorized Service Centers to maintain validity of the warranty.

2.1 WARNING SYMBOL

Warning about safety and warranty.

2.2 RECEIVING INSPECTION

All motors are tested during the manufacturing process.
The motor must be checked when received for any damage that may have occurred during the transportation. All damages must be reported in writing to the transportation company, to the insurance company and to WEG. Failure to comply with such procedures will void the product warranty.
You must inspect the product:

- Check if nameplate data complies with the purchase order;
- Remove the shaft locking device (if any) and rotate the shaft by hand to ensure that it rotates freely. The shaft might not rotate freely in WMagnet and WQuattro motors, due to alignment torque from the magnets. It might be necessary to use a lever;

When rotating the shaft, it is necessary to certify that the terminals are insulated to eliminate the risc of electric shock from induced voltage.

- Check that the motor has not been exposed to excessive dust and moisture during the transportation.

Do not remove the protective grease from the shaft, or the plugs from the cable entries. These protections must remain in place until the installation has been completed.

2.3 NAMEPLATES

The nameplate contains information that describes the construction characteristics and the performance of the motor. Figure 1, Figure 2 and Figure 3 show nameplate layout examples.

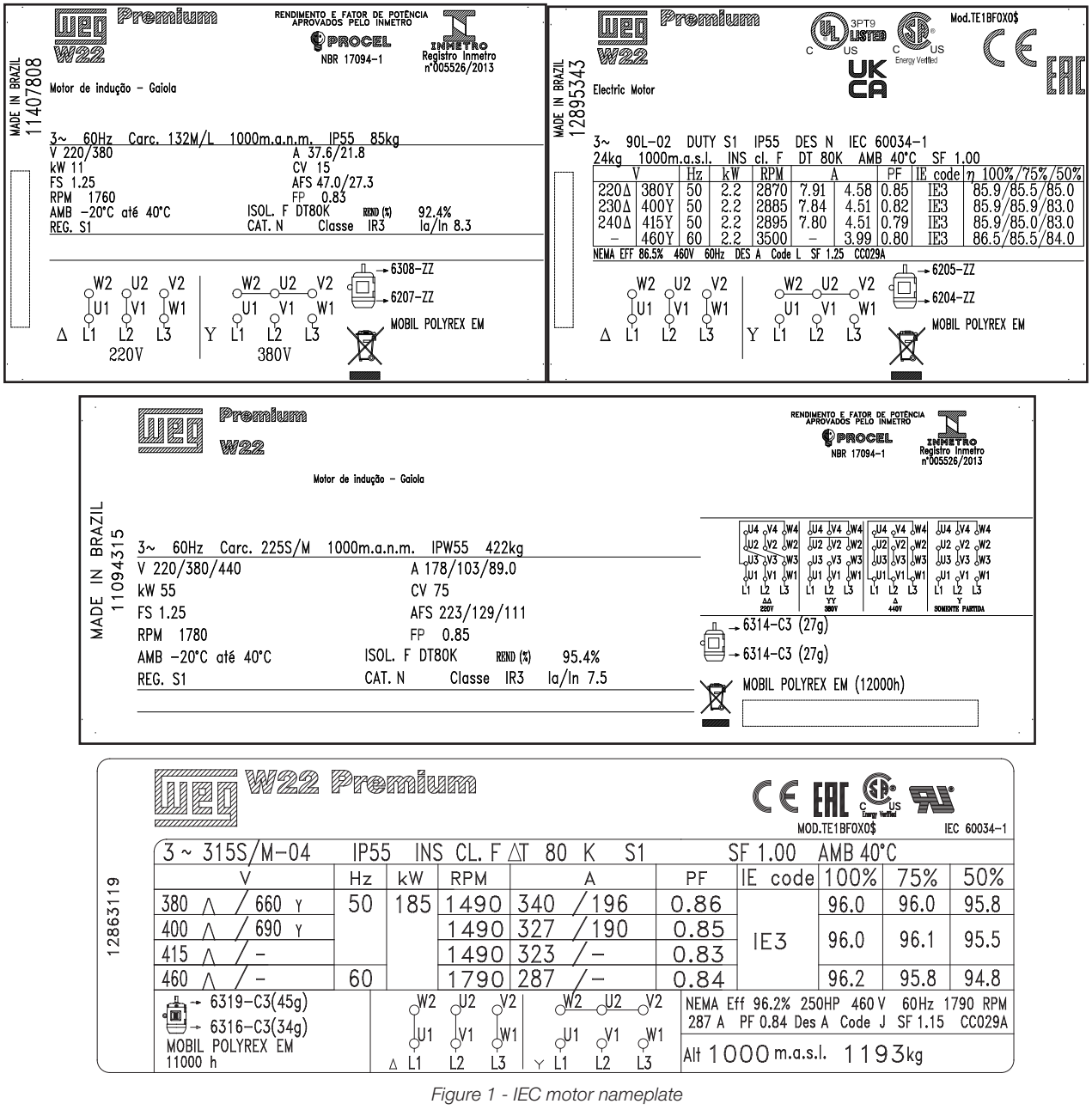


Figure 1 - IEC motor nameplate

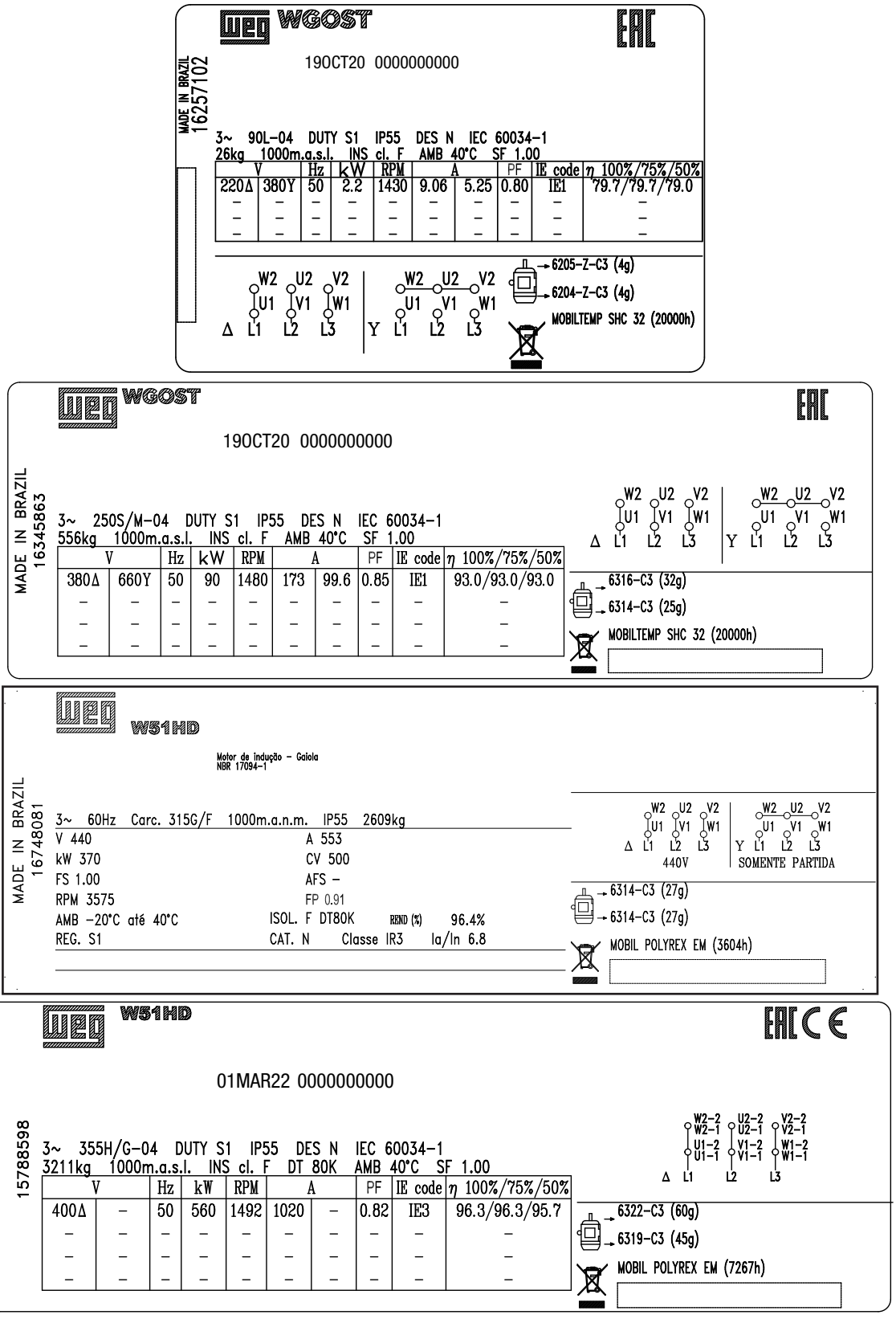
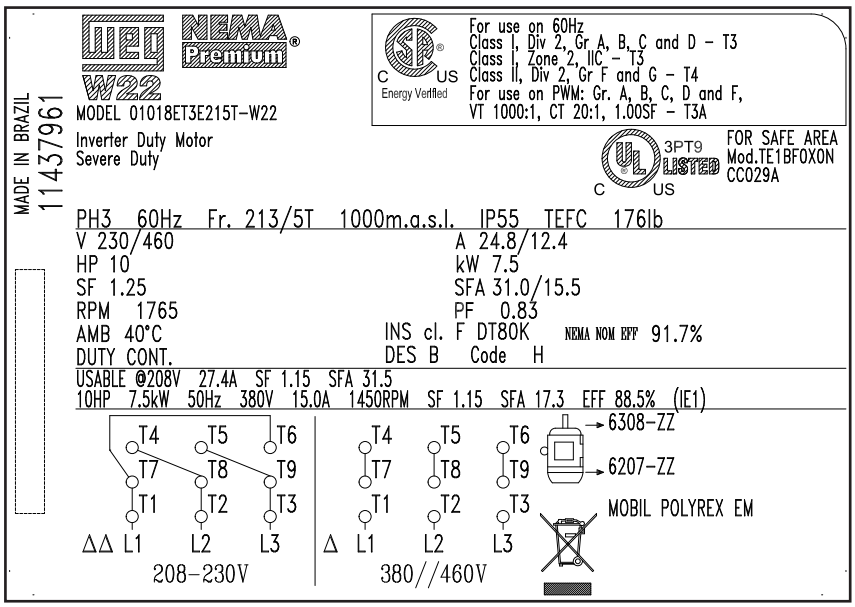
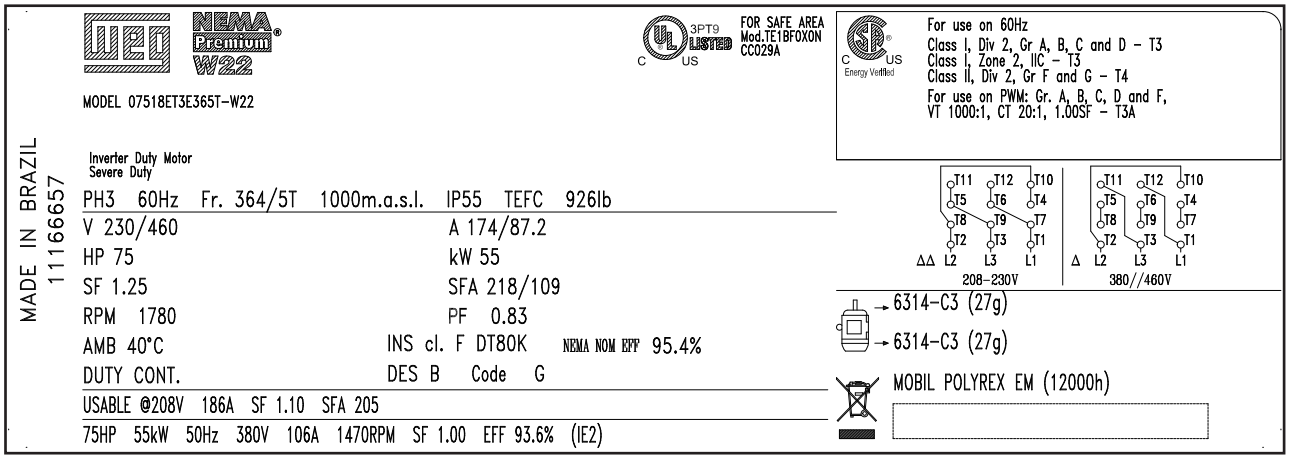


Figure 2 - IEC motor nameplate





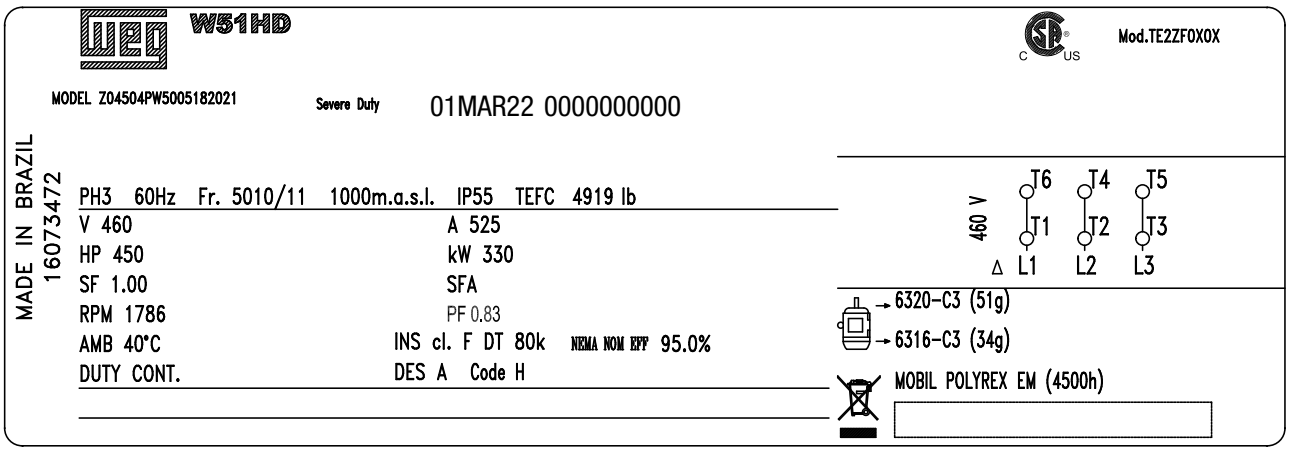


Figure 3 - NEMA motor nameplate

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3. SAFETY INSTRUCTIONS

The motor must be disconnected from the power supply and be completely stopped before conducting any installation or maintenance procedures. Additional measures should be taken to avoid accidental motor starting.

Professionals working with electrical installations, either in the assembly, operation or maintenance, should use proper tools and be instructed on the application of standards and safety requirements, including the use of Personal Protective Equipment (PPE) that must be carefully observed in order to reduce risk of personal injury during these services.

Electric motors have energized circuits, exposed rotating parts and hot surfaces that may cause serious injury to people during normal operation. It is recommended that transportation, storage, installation, operation and maintenance services are always performed by qualified personnel.

Pacemaker users and unqualified personnel shall not open WMagnet and WQuattro motors, because high energy magnets are used.

Always follow the safety, installation, maintenance and inspection instructions in accordance with the applicable standards in each country.

4. HANDLING AND TRANSPORT

Individually packaged motors should never be lifted by the shaft or by the packaging. They must be lifted only by means of the eyebolts, when supplied. Use always suitable lifting devices to lift the motor. Eyebolts on the frame are designed for lifting the machine weight only as indicated on the motor nameplate. Motors supplied on pallets must be lifted by the pallet base with lifting devices fully supporting the motor weight. The package should never be dropped. Handle it carefully to avoid bearing damage.

Eyebolts provided on the frame are designed for lifting the machine only. Do not use these eyebolts for lifting the motor with coupled equipment such as bases, pulleys, pumps, reducers, etc..

Never use damaged, bent or cracked eyebolts. Always check the eyebolt condition before lifting the motor.

Eyebolts mounted on components, such as on end shields, forced ventilation kits, etc. must be used for lifting these components only. Do not use them for lifting the complete machine set.

Handle the motor carefully without sudden impacts to avoid bearing damage and prevent excessive mechanical stresses on the eyebolts resulting in its rupture.

Do not handle the motors by the polymeric components: fan cover, drip cover, terminal box and / or terminal box cover.

To move or transport motors with cylindrical roller bearings or angular contact ball bearings, use always the shaft locking device provided with the motor.
All HGF, W50, W51 HD and W60 motors, regardless of bearing type, must be transported with shaft locking device fitted.
Vertical mounted motors with oil-lubricated bearings must be transported in the vertical position. If necessary to move or transport the motor in the horizontal position, install the shaft locking device on both sides (drive end and non-drive end) of the motor.

4.1 LIFTING

Before lifting the motor ensure that all eyebolts are tightened properly and the eyebolt shoulders are in contact with the base to be lifted, as shown in Figure 4. Figure 5 shows an incorrect tightening of the eyebolt.
Ensure that lifting machine has the required lifting capacity for the weight indicated on the motor nameplate.

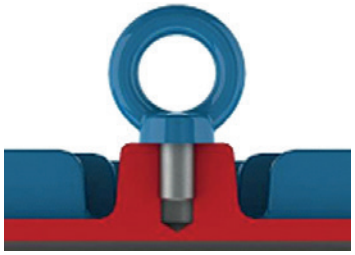

Figure 4 - Correct tightening of the eyebolt

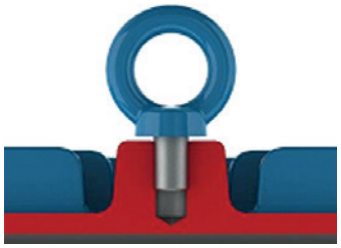

Figure 5 - Incorrect tightening of the eyebolt

The center-of-gravity may change depending on motor design and accessories. During the lifting procedures the maximum allowed angle of inclination should never be exceeded as specified below.

4.1.1 Horizontal motors with one eyebolt

For horizontal motors fitted with only one eyebolt, the maximum allowed angle-of-inclination during the lifting process should not exceed 30° in relation to the vertical axis, as shown in Figure 6.

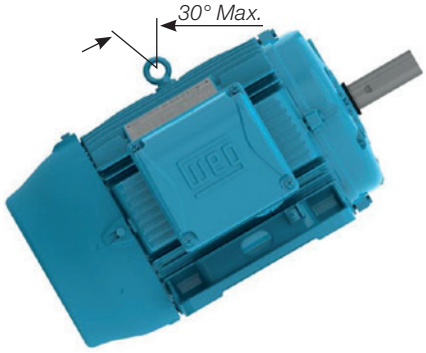

Figure 6 - Maximum allowed angle-of-inclination for motor with one eyebolt

4.1.2 Horizontal motor with two eyebolts

When motors are fitted with two or more eyebolts, all supplied eyebolts must be used simultaneously for the lifting procedure.
There are two possible eyebolt arrangements (vertical and inclined), as shown below:

- For motors with vertical lifting eyebolts, as shown in Figure 7, the maximum allowed lifting angle should not exceed 45° in relation to the vertical axis. We recommend to use a spreader beam for maintaining the lifting elements (chain or rope) in vertical position and thus preventing damage to the motor surface;

Figure 7 - Maximum resulting angle for motors with two or more lifting eyebolts

- For HGF, W40, W50 and W51 HD motors, as shown in Figure 8, the maximum resulting angle should not exceed 30° in relation to the vertical axis;

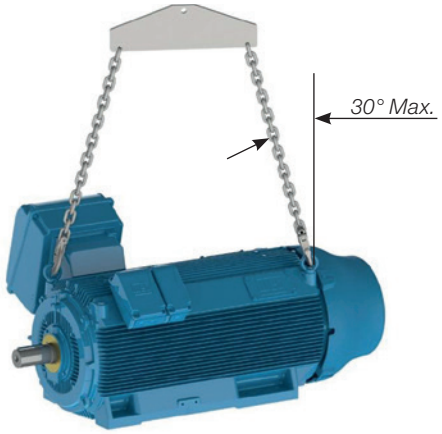

Figure 8 - Maximum resulting angle for horizontal HGF, W40, W50 and W51 HD motors

For W60 motors, as shown in Figure 9, the use of a spreader beam is required for maintaining the lifting elements (chain or rope) in vertical position and thus preventing damage to the motor surface.

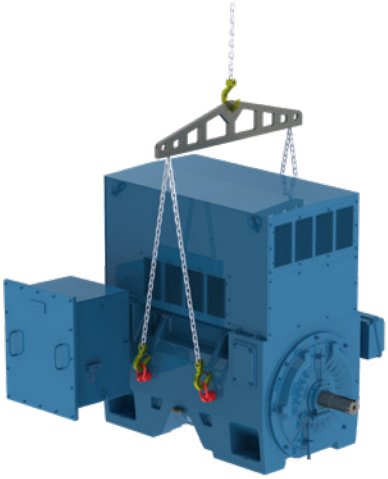

Figure 9 - Lifting for W60 motors with paralel chains

- For motors fitted with inclined eyebolts, as shown in Figure 10, the use of a spreader beam is required for maintaining the lifting elements (chain or rope) in vertical position and thus preventing damage to the motor surface.

Figure 10 - Use of a spreader beam for lifting

4.1.3 Vertical motors

For vertical mounted motors, as shown in Figure 11, the use of a spreader beam is required for maintaining the lifting element (chain or rope) in vertical position and thus preventing damage to the motor surface.

Figure 11 - Lifting of vertical mounted motors

Always use the eyebolts mounted on the top side of the motor, diametrically opposite, considering the mounting position. See Figure 12.

Figure 12 - Lifting of HGF, W50 and W51 HD motors.

4.1.3.1 Procedures to place W22/WEG General Purpose/WIN motors in the vertical position

For safety reasons during the transport, vertical mounted Motors are usually packed and supplied in horizontal position.
To place W22/WEG General Purpose/WIN motors fitted with eyebolts (see Figure 10), to the vertical position, proceed as follows:

1. Ensure that the eyebolts are tightened properly, as shown in Figure 4;
2. Remove the motor from the packaging, using the top mounted eyebolts, as shown in Figure 13;

Figure 13 - Removing the motor from the packaging

3. Install a second pair of eyebolts, as shown in Figure 14;

Figure 14 - Installation of the second pair of eyebolts

4. Reduce the load on the first pair of eyebolts to start the motor rotation, as shown in Figure 15. This procedure must be carried out slowly and carefully.

Figure 15 - End result: motor placed in vertical position

These procedures will help you to move motors designed for vertical mounting. These procedures are also used to place the motor from the horizontal position into the vertical position and vertical to horizontal.

For motors of IEC 112 to 200 frame (and equivalent NEMA), WEG has a kit of devices to facilitate the motor tipping to the vertical, with the point up or down (as shown in Figure 16 and Figure 17).

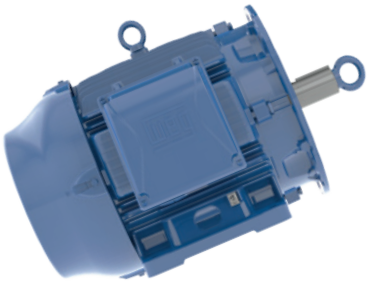

Figure 16 - Eyebolt to place the motor in vertical position, with the shaft end up (V6/V36)

Figure 17 - Eyebolts with extension fixed at NDE side to place the motor in vertical position, with the shaft end down (V5/V35)

4.1.3.2 Procedures to place HGF, W50 and W51 HD motors in the vertical position

HGF motors are fitted with eight lifting points: four at drive end and four at non-drive end. W50 and W51 HD motors are fitted with nine lifting points: four at drive end, one in the central part and four at non-drive end. The motors are usually transported in horizontal position, however for the installation they must be placed in the vertical position.
To place an these motors in the vertical position, proceed as follows:

1. Lift the motor by using the four lateral eyebolts and two hoists, see Figure 18;

Figure 18 - Lifting of HGF, W50 and W51 HD motors with two hoists

2. Lower the hoist fixed to motor drive end while lifting the hoist fixed to motor non-drive end until the motor reaches its equilibrium, see Figure 19;

Figure 19 - Placing HGF, W50 and W51 HD motors in vertical position

3. Remove the hoist hooks from the drive end eyebolts and rotate the motor 180° to fix the removed hooks into the two eyebolts at the motor non-drive end, see Figure 20;

Figure 20 - Lifting HGF, W50 and W51 HD motors by the eyebolts at the non-drive end

4. Fix the removed hoist hooks in the other two eyebolts at the non-drive end and lift the motor until the vertical position is reached, see Figure 21.

Figure 21 - HGF, W50 and W51 HD motors in the vertical position

These procedures will help you to move motors designed for vertical mounting. These procedures are also used to place the motor from the horizontal position into the vertical position and vertical to horizontal.