Three-Phase Induction Motors

Master Line

Three-Phase Induction Motors

- Powers up to 50,000 kW
- Voltages from 220 to 13,800 V
- Speed from 3,600 to 300 rpm

Master Line

The motors of the Master line (M line) stand out for the flexibility of their electrical and mechanical project.

They are versatile motors with different configurations suitable for severe environments which demand high resistance and durability, adapting to different applications.

Their design is easily customized so as to make them interchangeable with already existing motors, cutting down operating costs with downtime for motor replacement.

They can also be designed for inverter operation, enabling accurate speed control, as well as high torques during start.

Maximum efficiency is obtained from the motors by means of modern software applications, which provide high precision to the project. Optimized design, high quality materials and strict control of all the manufacture phases make WEG motors ideal for different industries, such as:

- **Mining**
- **Waste Water**
- **Cement**
- **Oil & Gas**
- **Shipbuilding**
- **Steel**
- **Sugar & Ethanol**
- **Cellulose & Paper**

Mounting Characteristics

Manufactured with different configurations regarding mounting, cooling method and degree of protection, they adapt to different operating and environmental conditions.
Motors with IEC frame sizes 280 to 560 may be manufactured with cast iron or welded steel plate frames. For IEC sizes 630 and above, the frames are made of welded steel plates only.

Main Construction Characteristics

- Protection degree IP23, IP24(W), IP55(W), IP56(W), IP65(W)
- Rotor
  - Cage
  - Rings (wound) - fixed or motorized brush holder
- Bearings
  - Hydrodynamic oil-lubricated
  - Grease (with taconite seal) and oil-lubricated rolling bearing

Advantages of Using the Motors of the Master Line

- High efficiency
- Low noise level
- Simple and reduced maintenance
- Easily interchangeable with existing motors
- Optimized project

Furthermore, this great versatility allows you to choose the most suitable motor for your application or installation conditions. In order to meet the most demanding world markets, WEG's quality system is certified by the Bureau Veritas Quality Institute, in compliance with the requirements of ISO 9001, ISO 14001 and ISO 50001. The motors of the Master line are certified by internationally recognized certifying bodies, including INMETRO, CSA, PTB and Baseefa.

Terminology

M G F 560

Motor Line

M - Master Line

Rotor Type

G - Cage
A - Rings (wound)

Cooling System

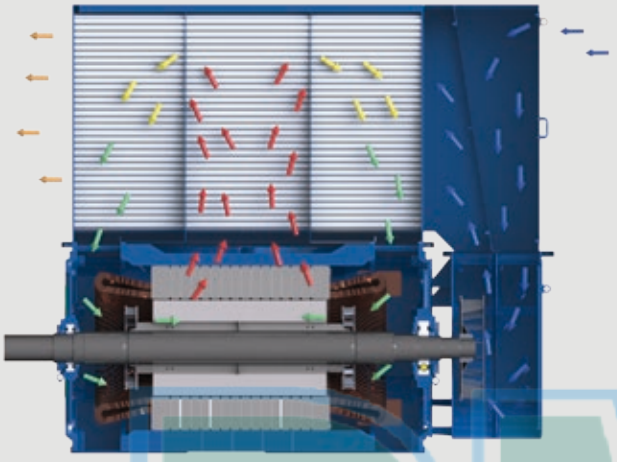
A - Open self-ventilated - IP23(W)
P - Open self-ventilated - IP24(W)
D - Self-ventilated, air inlet and outlet by ducts
T - Forced ventilation, air inlet and outlet by ducts
V - Forced ventilation, ventilation on the motor and outlet by ducts
F - Self-cooled with air-air heat exchanger on the motor
R - Self-cooled with air-air heat exchanger around the motor
I - Forced ventilation in the internal and external air circuit; air-air heat exchanger
L - Air-water heat exchanger, forced ventilation in the internal air circuit
W - Air-water heat exchanger

Frame

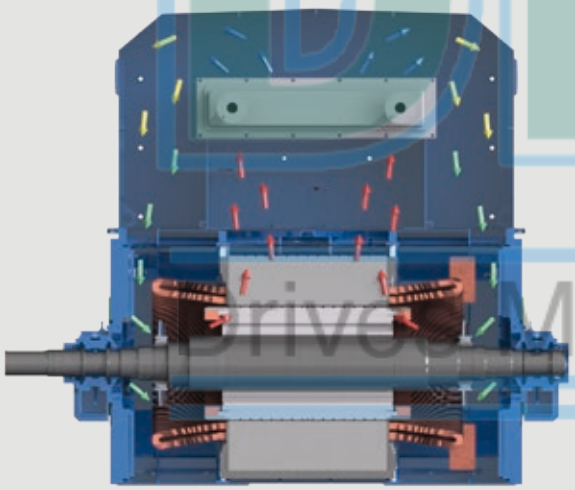
ABNT / IEC / NEMA

Cooling

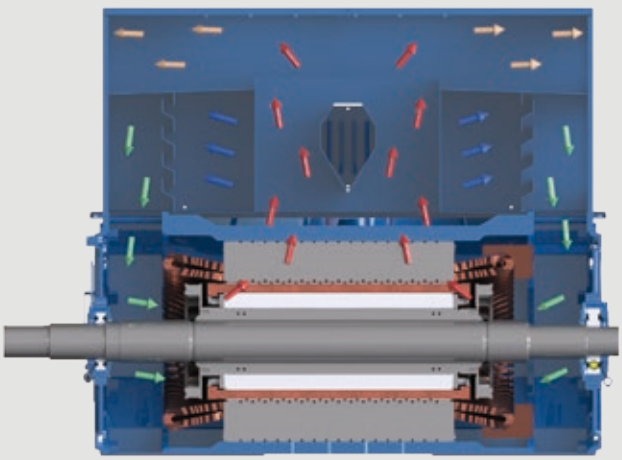
The motors of the Master line can be supplied with cooling systems which vary according to the type of driven machine, application and environment where they will be installed.



- Totally enclosed
- Air-air heat exchanger
- IC 0611
- IP55 / IP56 / IP65



- Totally enclosed
- Air-water heat exchanger
- IC 37A81(W)
- IP55 / IP56 / IP65



- Open (self-ventilated)
- IC 01
- IP24(W)

Other Cooling Methods Available

- Totally enclosed
- Independent ventilation
- Air-water heat exchanger
- IC 37A86(W)
- IP55 / IP56 / IP65

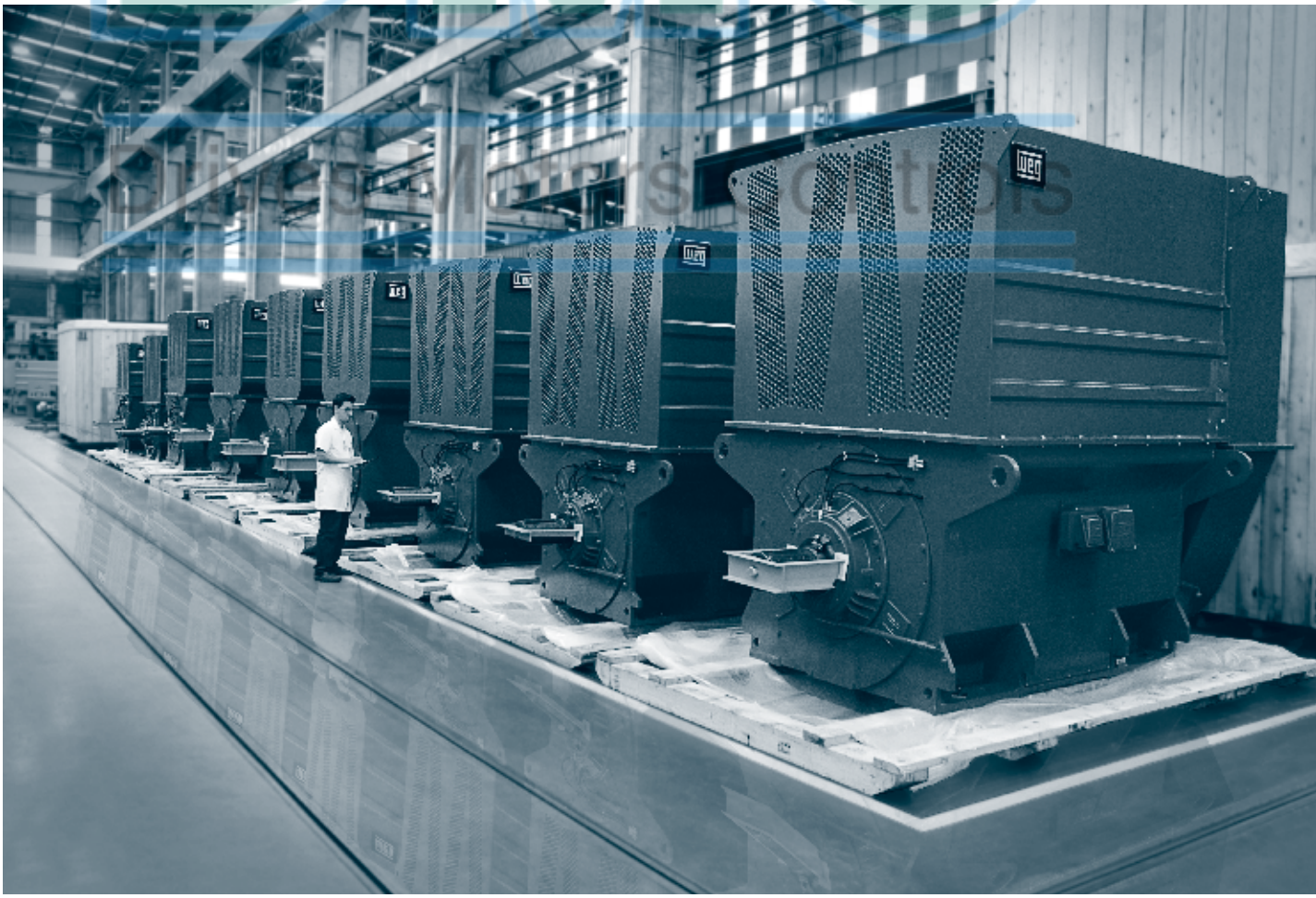
- Totally enclosed
- Independent ventilation
- Air-air heat exchanger
- IC 0666
- IP55 / IP56 / IP65

- Totally enclosed
- Self-cooled by ducts
- IC 31
- IP55 / IP56 / IP65

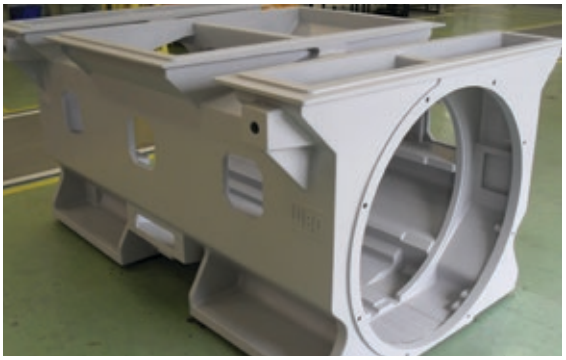
- Totally enclosed
- Independent ventilation by ducts
- IC 37
- IP55 / IP56 / IP65

- Open
- Independent ventilation
- IC 06
- IP23 without ducts
- IP24(W) with ducts

- Open (self-ventilated)
- IC 01
- IP23(W)



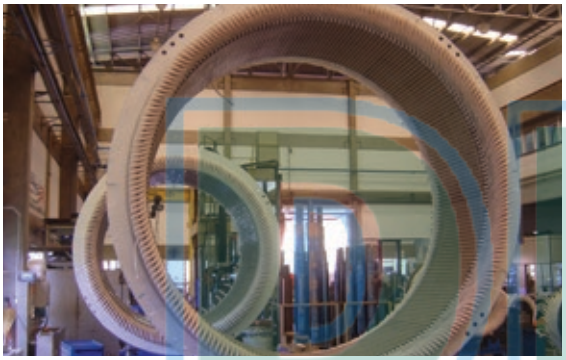
Manufacturing



Frame

Frame

Made of welded steel plate or cast iron, it is the structural part of the motor, housing, supporting and protecting the active magnetic part of the motor. With rugged construction, it provides excellent strength and low vibration levels to the motor.



Stator

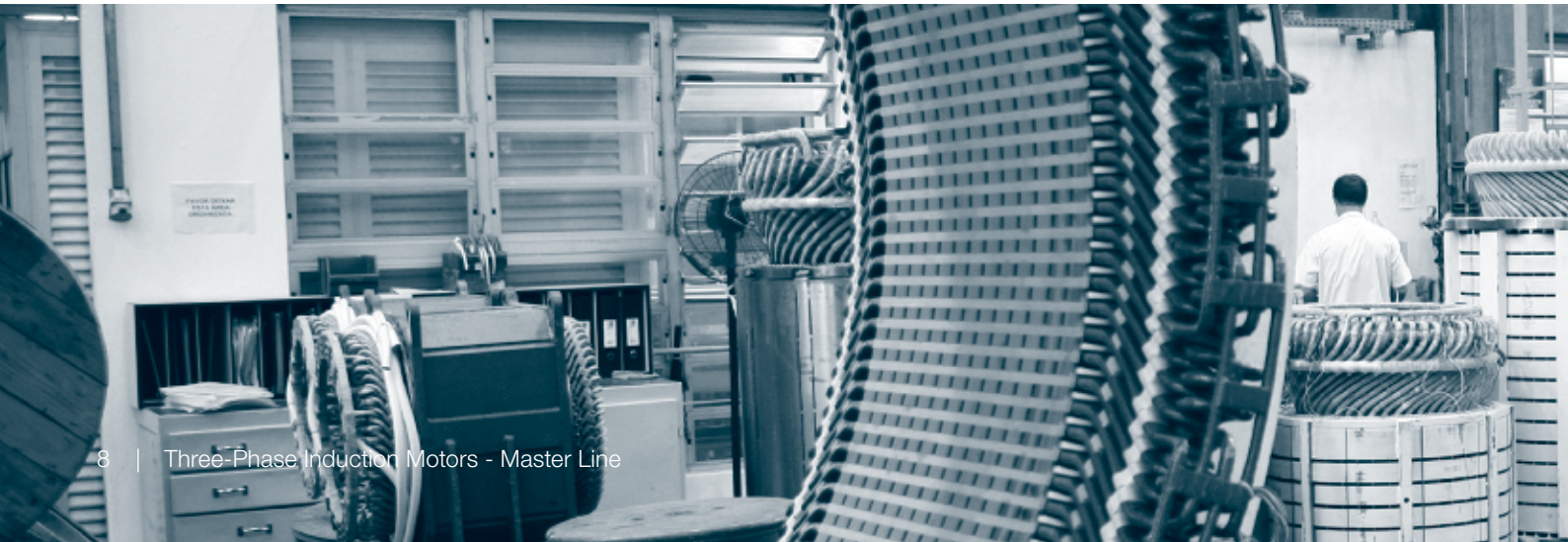
Stator

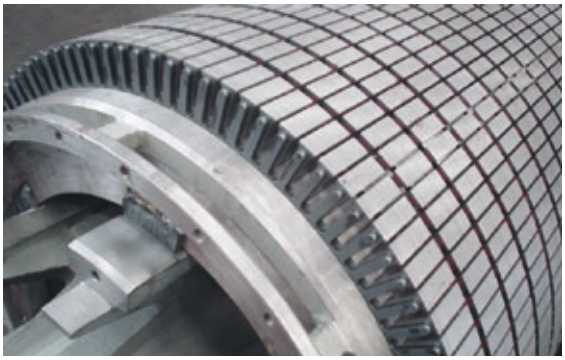
It is the active magnetic static part of the motor. It is a core composed of pressed silicon steel laminations with slots which house the coils forming the stator winding. The stator core is mounted directly on the frame.

Winding

Winding

The winding process adopted by WEG is especially developed for the voltage and application the motor is intended for. The coils can be made of round or rectangular copper wire, depending on the motor voltage. The round-wire coils are normally used in low-voltage motors, while the rectangular-wire coils are form wound and used in medium and high voltage motors. The coils of high-voltage motors are normally insulated with porous mica tape, and the protection against the corona effect is ensured by the application of conducting and semiconducting tapes.





Rotor

Rotor

It is the rotating component of the electric motor. Basically composed of the shaft and a pressed silicon steel lamination core.
The slots of the core house the cage or the rotor coils, in case of wound-rotor motors. The cage can be made of cast aluminum or manufactured in copper or brass.
The rotor is sized considering the torque required at the start and operating conditions of the motor.

Vacuum impregnation (VPI)

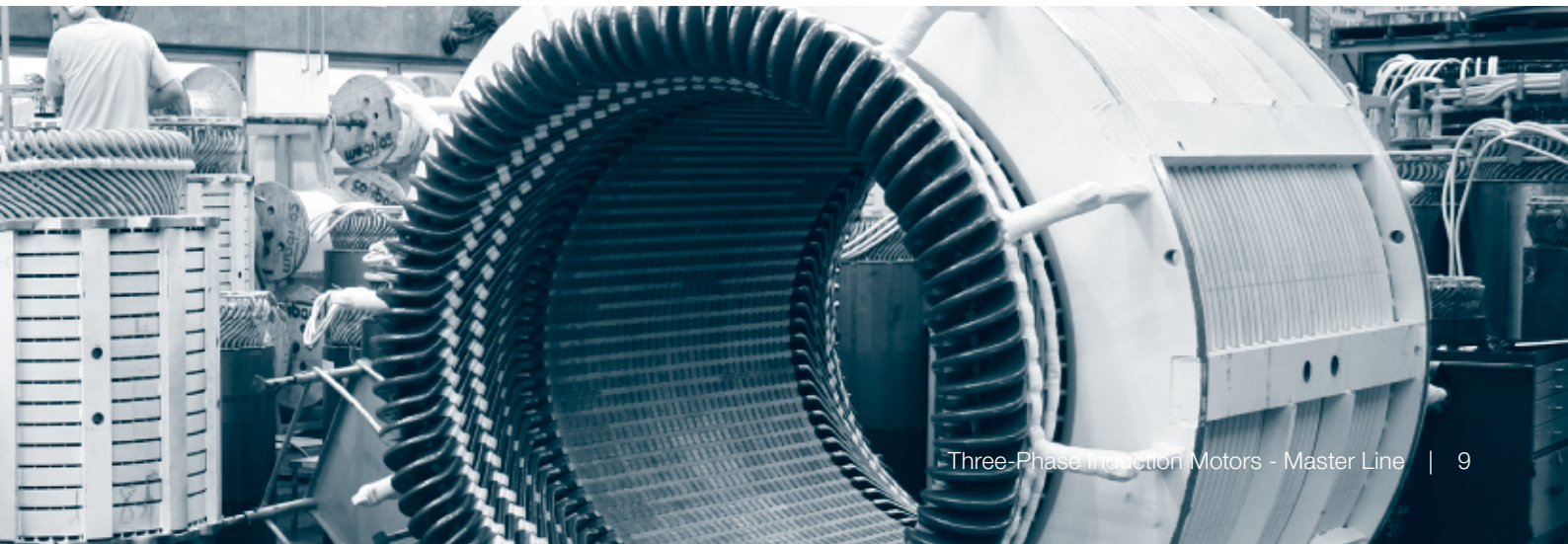
Insulation System

The WEG MICATHERM insulation system is based on the Vacuum Pressure Impregnation process (VPI).
Using special epoxy resins, this system ensures perfect insulation of the motor coils, in a process totally free from gases harmful to the environment.
For many years the VPI process has proved its efficiency and reliability in rotating electrical machines in many different applications.
The insulation system is applied to machines with voltage of 380 to 15,000 V.

Balancing

Balancing

WEG uses equipment that allows performing balancing at up to 3,600 rpm. Computerized balancing equipment allows the accurate balancing of the motors. As a result, WEG motors present very low vibration levels.
The standard balancing is done in two planes, but WEG can perform the balancing in three planes when required or specified by the customer.



Applications

Squirrel Cage Motor

Due to the versatility of the project, the motors of the Master line can be used in different industries to drive machines or equipment that require variable or constant torque, such as fans, pumps, crushers, conveyor belts, compressors, mills, mixers and others.

Wound-Rotor Motors

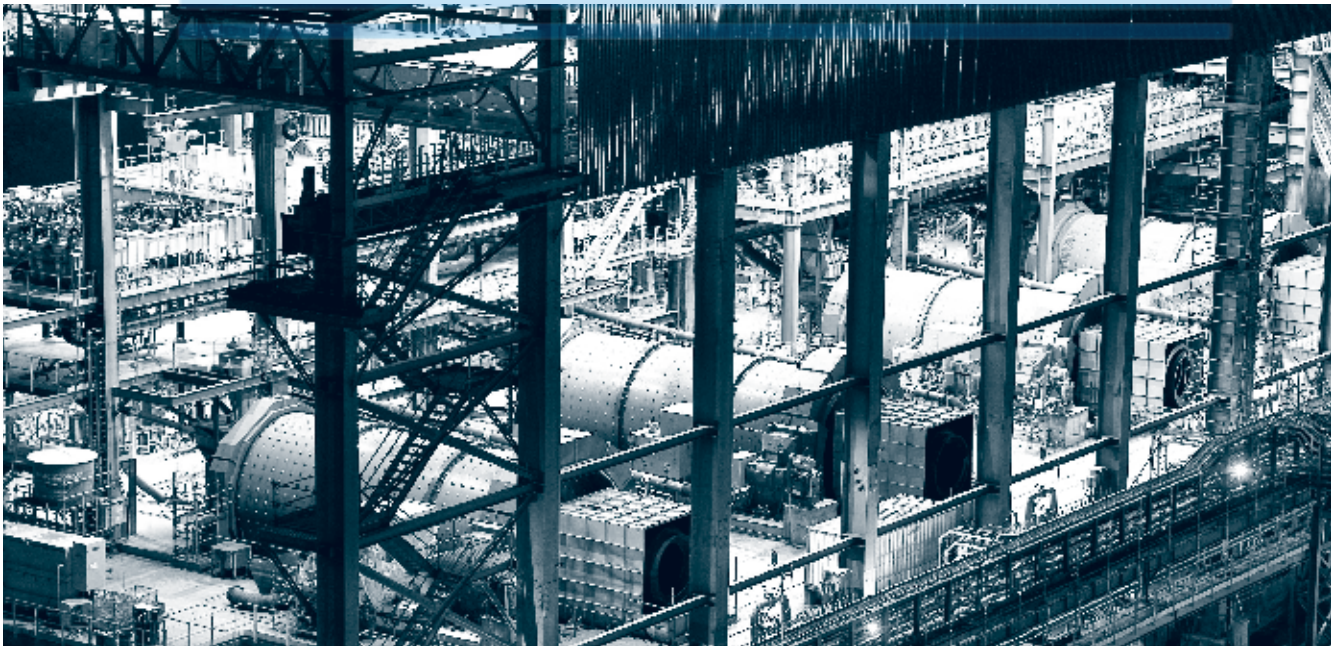
The wound-rotor motors are normally used in loads with high inertia or high resistive torque at startup. They are also used when starting current limitations are present in the power supply system. They are used to drive loads such as: ball mills, cement mills, fans, exhaust fans, shredders and rolling mills employed in the cement, mining and steel industries, among others. They can be supplied with withdrawable (motorized/manual) brush holders or fixed brush holders, according to the load or operation requirements. The slip ring tracks are made of material with excellent electric conductivity. The wound-rotor motors with withdrawable (motorized/manual) brush holder present important advantages in terms of maintenance, because they enable the brushes to be in contact with the slip rings only during the start, minimizing the wear of brushes and slip rings, thereby extending intervals between maintenance.

Vertical Motors

The motors of the Master line with vertical mounting are designed and manufactured to meet the customer's requirements so as to apply them to pumps, crushers, mixers and motors. They can be supplied with rolling bearings or sleeve bearings (hydrodynamic).

Motors for Explosive Atmospheres

For applications in explosive atmospheres, WEG manufactures motors with specific safety features, able to operate in locations where flammable materials are handled, processed or stored, preserving human life and ensuring the integrity of property. The motors of the Master line with Ex-e (increased safety), Ex-n (nonincendive) and Ex-p (pressurized) protection, motors class I, division 2, according to NEC 500, meet the requirements of national and international standards and are tested and approved by certifying bodies recognized worldwide.



Supply: 9,900 HP, 13,200 V, 8 poles, IC01
Application: Fan

Supply: 9,000 kW, 6,600 V, 8 poles, IC81W
Application: Exhaust fan

Supply: 2,000 kW, 11,000 V, 4 poles, IC611
Application: Water pump

Supply: 6,500 kW, 11,000 V, 6 poles, IC611
Application: Ball mill

Supply: 14,000 kW, 10,000 V, 4 poles, IC86W
Application: Test laboratory

Supply: 12,000 kW, 6,000 V, 4 poles, IC81W
Application: Centrifugal compressor

Accessories and Special Features

The motors of the Master line can be supplied with the accessories and special features listed below, as requested by the customer. In the specification of the motor, it is important to inform WEG of the accessories and special features to be included in the motor.

Accessories

- PT-100 temperature sensors on the stator windings
- PT-100 temperature sensors on the bearings
- Thermocouple and thermistors temperature sensors
- Space heater (for dehumidification)
- Brush for grounding the shaft
- Motorized/manual system for lifting brushes (for wound-rotor motors)
- Vibration sensors
- Accessories for bearings
- Thermometer
- Thermometer for oil
- Flow switch for oil
- Hydraulic unit for lubrication and oil cooling
- System for injecting oil under pressure to start and stop the motor (Hydrostatic Jacking)
- Capacitors for correction of power factor or protection against voltage surges
- Lightning arrester for protection against voltage surges
- Current transformers (CT) for measurement or differential protection
- Temperature sensors for air inlet and outlet (ventilation)
- Position or speed indicators (encoder or tacogenerator)
- Accessories for air-water heat exchanger
- Flow switch for water
- Sight glass of water flow
- Temperature sensor for water
- Water leak sensor
- Anchor plate and anchors
- On base
- Ratchet for no rotation reverse
- Partial discharge monitoring system
- Other accessories on request

Special Features

- Class H insulation
- Reduced vibration level
- Reduced noise level
- Degree of protection IP56 / IP56(W) / IP65 and IP66(W)
- Hydrodynamic bearings
- Oil-lubricated rolling bearings
- Special shaft:
  - Tapered shaft end
  - Double shaft end
  - Hollow shaft
  - Shaft with collar
  - Material different from standard
- Modified main terminal box
- Additional main terminal box
- Additional terminal box for neutral or accessories
- Motors for hazardous areas
  - Ex-n (nonincendive)
  - Ex-e (increased safety)
  - Ex-p (pressurized)
- Class I, division 2
- Certified accessories for hazardous areas
- Reduced starting current

Test Laboratory

WEG motors are tested according to NBR 5383, IEC 60034, NEMA MG 1 and API in modern laboratories. Capable of testing low and high voltage motors with power up to 20,000 kVA and voltages up to 15,000 V, WEG laboratories feature highly accurate controls and fully computerized test monitoring systems.
The tests are divided into three categories: routine, type and special tests. Routine tests are performed in all motors.
In addition to routine tests, type and special tests are usually performed in one of a series of the same motors or under the customer's request.

Test laboratory

Surge test

Control room

Applied Tests

Routine Tests
- Cold ohmic resistance measurement
- No load test
- Blocked-rotor test
- Applied potential test
- Measurement of insulation resistance

Type Tests
- All routine tests
- Measurement of maximum torque
- Temperature rise test
- Test under load with constant voltage

Special Tests
- Noise level measurement
- Shaft voltage measurement
- Overspeed test
- Vibration test
- Cold vibration measurement

Technical Assistance

WEG technical team provides the customers with full after sale support. The services include consulting in general and services in the field, such as diagnosis, commissioning of machines and 24x7 support.

The technical assistance team is highly qualified and experienced, able to handle many different situations in the field and to give remote support, using state-of-the-art equipment, which ensures reliable results.
WEG also provides its network of authorized repair shops, present in Brazil and worldwide.

Services

In order to restore medium and large electrical machines, count on WEG service team.
The same technology used to manufacture motors and generators is used for inspection and restoration. The services are executed in the field (at the customer's premises) or at two factories: Jaraguá do Sul Unit (Brazil) and São Bernardo do Campo Unit (Brazil), which is also homologated to execute services on equipment for use in explosive atmospheres. Those plants count on the full structure and support of the engineering, industrial process and quality control departments, enabling fast, reliable and quality service.

Service of WEG products and other brands:

- DC generators and motors
- Three-phase induction motors (squirrel cage or slip ring; medium and high voltage)
- Synchronous motors (with or without brushes; medium and high voltage)
- Synchronous condensers
- Turbogenerators
- Hydrogenerators

WEG Services: Flexibility, agility and experience to optimize your time and productivity.

Parts and Components

After years in operation, the motors of the master line need restoration to continue working properly.
For this restoration, we recommend that you use original spare parts supplied by the manufacturer. WEG team is available to promptly assist you in the correct identification of the component parts.

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