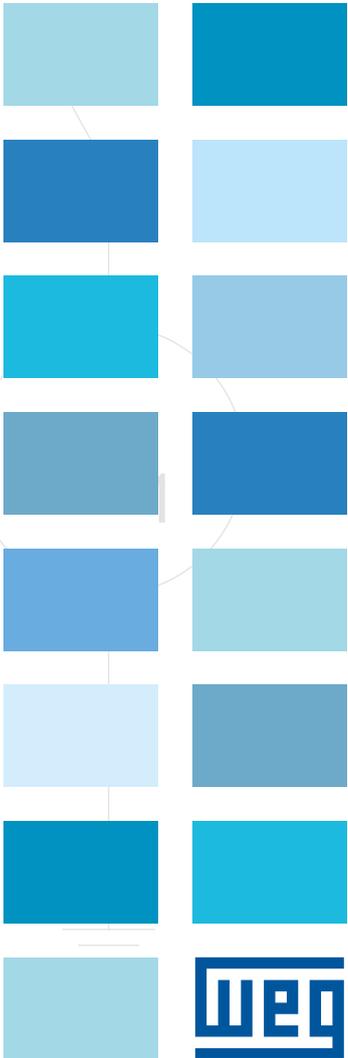


# Three-phase Induction Motors

M Line





## Three-phase Induction Motors M Line

The M line of motors, also named Master line, stands out for the flexibility of their electrical and mechanical design, which makes them suitable for the most demanding operational requirements in a high number of applications.

Their mechanical design allows different modifications to allow them to be interchangeable with existing motors.

This innovative development has resulted in a flexible product with high efficiency levels compatible with international standards requirements and in line with world market trends.

This evidences WEG's commitment to its customers and to the environment, offering optimized solutions with products and systems.



Maximum performance can be achieved from these motors with the application of updated software's developed in partnership with European, American and Brazilian universities which ensure design accuracy.

Optimized design, quality materials used and the control in all phases of the manufacturing process allow WEG motors to be applied in several market segments such as: mining, sanitation, refrigeration, cement, petrochemical, steel industries, sugar and ethanol, pulp and paper, among others. The M line of motors allows the choice of a suitable product for any application or installation conditions.

To meet the most demanding world markets, WEG has its quality system certified by Bureau Veritas Quality Institute in compliance with the requirements of ISO 9001 and ISO 14001. These motors are also certified by recognized certifying institutions, including CSA from Canada, PTB from Germany and Baseefa from the UK.



## Mounting Characteristics

The M line of motors is manufactured in different configurations in reference to cooling method and degree of protection. This means that the motor configuration can be defined to best suit the operating and environment conditions.

The motors built in frame sizes IEC 280 to 560 are made of cast iron or welded steel plates, while IEC frame sizes 630 and above are made of welded steel plates only.

Main mounting characteristics:

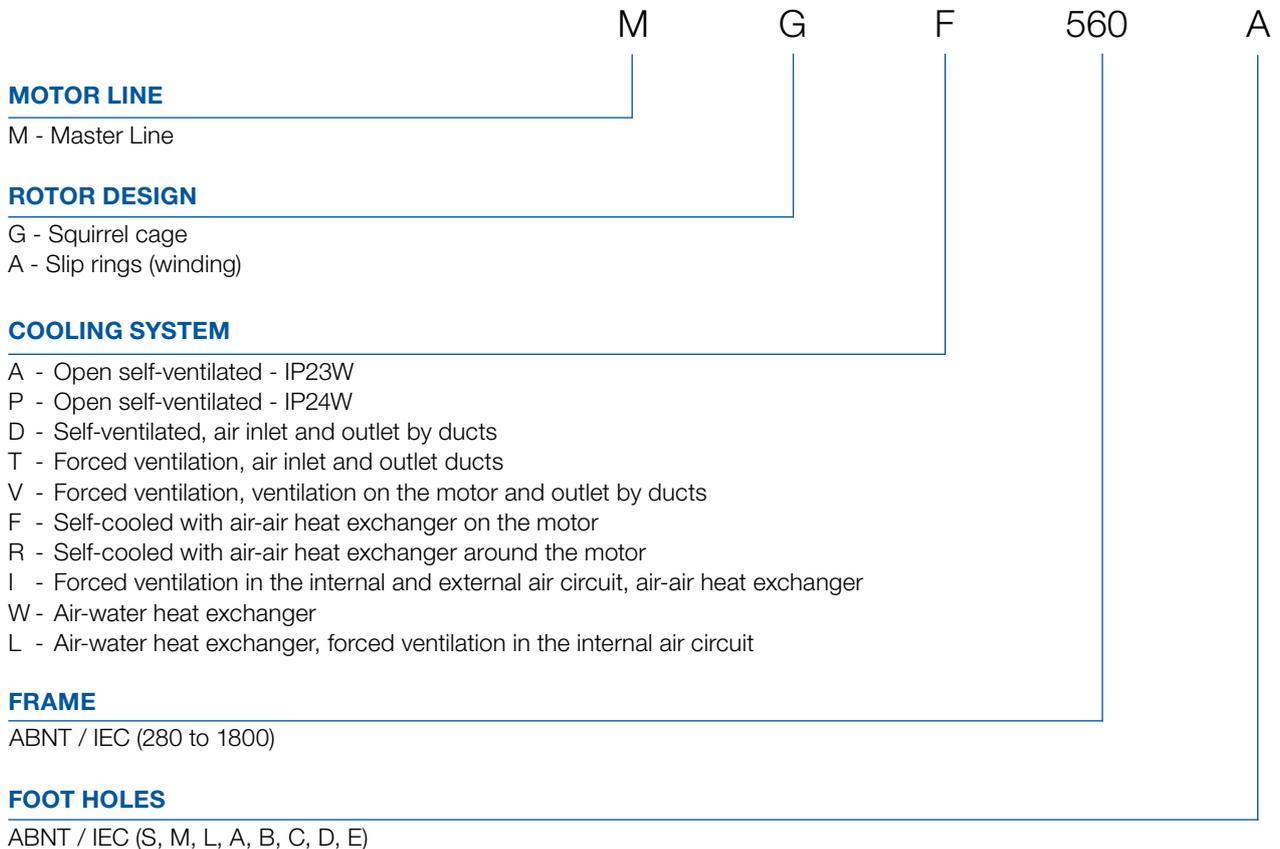
- Degree of protection IP23, IP24(W), IP55(W), IP56(W), IP65(W)
- Rotor design
  - Squirrel cage
  - Slip rings (winding) – fixed or motorized brush holder
- Bearings
  - Oil lubricated (with taconite seal)
  - Grease lubricated bearings (with taconite seal), oil or oil mist system.

Advantages of using the M line of motors:

- High performance
- Low noise level
- Simple and low maintenance
- Easily interchangeable with existing motors.

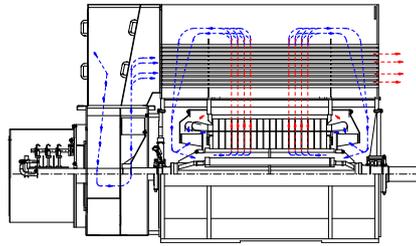
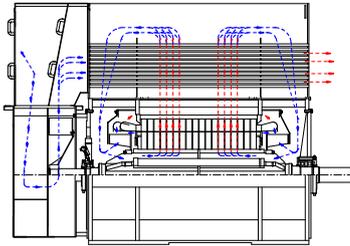


## Product Coding

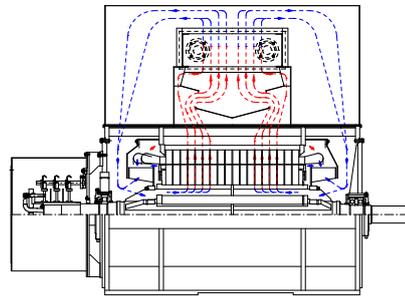
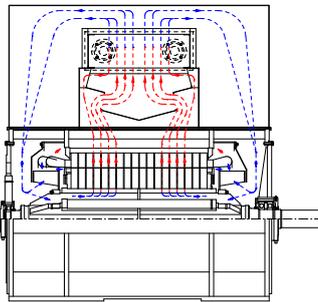


# Cooling

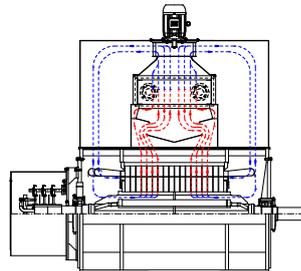
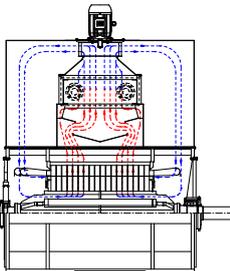
The M line of motors offers a cooling systems which varies according to the type of machine to be driven, application and environment where it is installed.



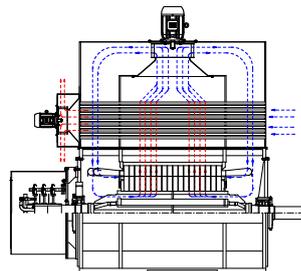
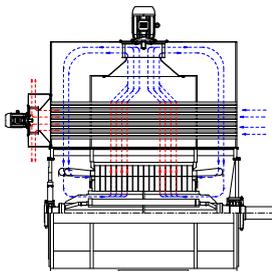
- Totally enclosed
- Air-air heat exchanger
- IC 0611
- IP55(W) / IP56(W) / IP65(W)
- MGF, MAF



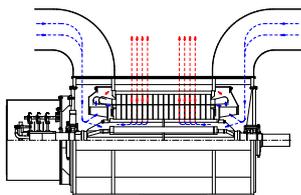
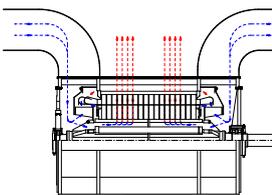
- Totally enclosed
- Air-water heat exchanger
- IC 37A81(W)
- IP55(W) / IP56(W) / IP65(W)
- MGW, MAW



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

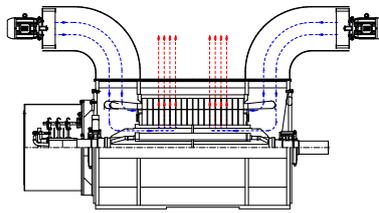
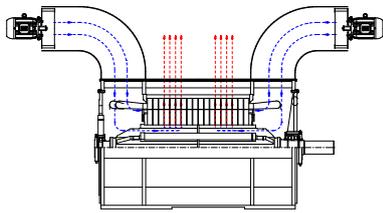


- Totally enclosed
- Independent ventilation
- Air-air heat exchanger
- IC 0666
- IP55(W) / IP56(W) / IP65(W)
- MGI, MAI

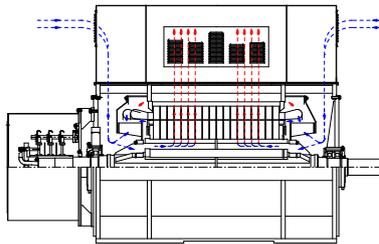
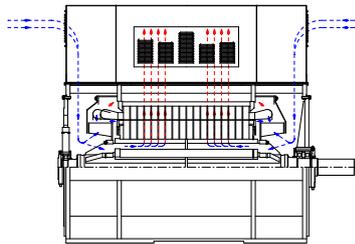


- Totally enclosed
- Self-cooled by ducts
- IC 31
- IP55(W) / IP56(W) / IP65(W)
- MGD, MAD

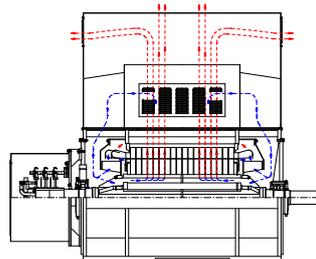
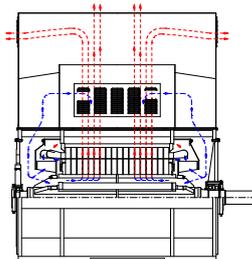
# Refrigeração



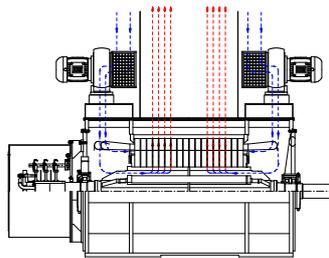
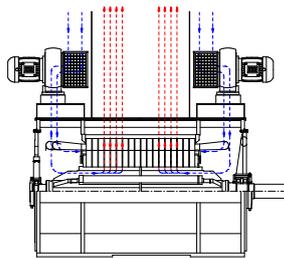
- Totally enclosed
- Independent ventilation by ducts
- IC 37
- IP55(W) / IP56(W) / IP65(W)
- MGT, MAT



- Open (self-cooled)
- IC 01
- IP23 - IP24(W)
- MGA, MAA



- Open (self-cooled)
- IC 01
- IP23 - IP24(W)
- MGP, MAP



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



## Manufacturing Process



Frame

### Frame

Made of welded steel plates or cast iron, the frame is the structural component of the motor that holds, supports and protects the active magnetic part of the motor. With tough construction, it provides the motor with excellent strength and low vibration levels.



Machining

### Stator

The stator is the active magnetic static part of the motor. It consists of a core built with pressed steel laminations where the coils forming the stator winding are inserted into the slots. The stator core is mounted directly in the frame.



Winding

### Winding

The winding process used by WEG is especially designed and specified for the voltage and application the motor is intended for. The coils of the low and high voltage motors are manufactured with flat copper wire, and completely insulated with porous mica tape. Conducting and semi conducting tapes are also used in the winding process, covering the coils and ensuring high strength.



Rotor

### Rotor

The rotor is the rotating component of the electric motor and consists of a shaft and a pressed steel lamination core. For squirrel cage rotor motors, the squirrel cage is mounted into the core slots, while for slip ring motors, the form coils are mounted into the core slots. The squirrel cage can be made of die cast aluminum or fabricated with copper or brass bars.

Motor starting torque and operating conditions are taken into account when designing the rotor. Shafts are manufactured with materials that comply with ABNT 1040/45, 1524 or 4140H thermally treated materials.



Vacuum pressure impregnation (VPI)

### Insulation system

WEG MICATHERM insulation system is based on the Vacuum Pressure Impregnation (VPI) system, which was developed together with the world's most renowned suppliers of insulating materials. Using special epoxy resins, this system ensures improved insulation of the motor winding, in a process totally free from gases harmful to the environment.

For many years the VPI system has shown its efficiency and reliability in rotating electrical machines in many different applications. The insulation system is used in low and high voltage machines that use form coils of 380 to 15,000 V.



Balancing

### Balancing

WEG counts on equipment that allow balancing up to 3600 rpm

Computerized balancing equipment allows balancing of motors accurately. Therefore, WEG motors present very low vibration levels. Standard balancing is performed in two plans. However, the factory can perform balancing in three plans when required or when specified by the customer.

## Applications

### Squirrel cage rotor motor

Because of design versatility and excellent operation conditions, the M line of motors is used in several industries, for driving machines or equipment that require variable or constant torque such as fans, pumps, crushers, conveyor belts, compressors, mills, mixers and others.

### Slip ring motors

The slip ring motors are normally applied to high inertia loads or highly resistive starting torque. They are also used when there are starting current limitations in the power system.

Typical driven loads are: ball mills, cement mills, fans, exhaust fans, shredders and laminators, applied in the cement, mining, steel industries among others.

They can be supplied with removable brush holders (motorized) or fixed brush holders, based on the load or operating conditions.

The slip ring motors with removable brush holder (motorized) have offer key advantages in terms of maintenance since they allow the brushes to remain in contact with the slip rings only during the starting, minimizing the wear of brushes and slip rings, thus extending maintenance intervals.

### Vertical motors

The M line vertically mounted motors are designed and manufactured to meet the customer requirements for pump, crusher, mixer applications and others.

They can be supplied with grease or oil-lubricated ball, roller ball or angular contact bearings.

Depending on the application, specially when subject to high axial thrust loads, they can be manufactured with oil-lubricated ball bearings or sleeve bearings.

### Hazardous area motors

For hazardous area applications, WEG manufactures motors with specific safety features which are suitable to operate in locations where flammable materials are handled, processed or stored for preservation of human life and avoid property damage.

The M line of motors featuring Ex-e (increased safety), Ex-n (non-sparking) and Ex-p (pressurized) protection meet the both national and international standard requirement and are tested and approved by worldwide recognized certifying institutions.



## Application References



Supply: 9900 HP, 13,200 V, 8 poles, frame 900  
Application: Fans



Supply: 9900 HP, 6,600 V, 8 poles, frame 900  
Application: Exhaust fan



Supply: 2000 kW, 11,000 V, 4 poles, frame 560  
Application: Water pumps



Supply: 6500 kW, 11,000 V, 6 poles, frame 900  
Application: Ball mills



Supply: 1250 HP, 4160 V, 6 poles, frame 560  
Application: Pump



Supply: 12,000 kW, 6000 V, 4 poles, frame 800  
Application: Centrifugal compressor

## Accessories and Special Features

Whenever requested by the customer, the M line of motors can be supplied with the accessories and special features listed below. When specification of the product, it is important to inform WEG about accessories and special features to be included in the motor.

### Accessories

- Pt-100 temperature detectors for stator winding
- Pt-100 temperature detectors for bearings
- Thermocouple-type and thermistors
- Space heaters
- Shaft grounding brush on all motors driven by frequency drives or when requested by the customer
- Motorized brush lifting system
- Vibration detectors
- Accessories for bearings
  - Thermometer
  - Thermometer for oil
  - Flowmeter for oil
  - Hydraulic unit for lubrication and oil cooling
  - Oil pressure pump system for motor start and stop (hydrostatic jacking)
- Power factor correction capacitors or voltage surge protection
- Lightning arrester for voltage surge protection
- Current transformers (CT) for differential measuring or protection
- Temperature detectors for air inlet and outlet (ventilation)
- Air thermometer (ventilation)
- Position or speed indicator (encoder or tacogenerator)
- Accessories for air-water heat exchanger
  - Water flowmeter
  - Sight glass of water flow
  - Water thermometer
  - Water leakage detector
- Anchorage plate and anchors
- Noise muffler
- Ratchet for no-rotation reverse
- Mounting rails
- Other accessories, under request

### Special features

- Mounting configuration
- Special coating
- Class H insulation
- Reduced vibration level
- Reduced noise level
- Degree of protection IP56 / IP56W / IP65 and IP66W
- Hydrodynamic bearings
- Oil-lubricated roller bearings
- Oil mist lubricated bearings
- Special shaft
  - Tapered shaft end
  - Double shaft end
  - Hollow shaft
  - Shaft with collar
  - Non-standard materials
- Squirrel cage rotor material
  - Copper
  - Brass
- Modified main terminal box
- Additional main terminal box
- Neutral or accessory additional terminal box
- Hazardous area motors
  - Ex-n (non-sparking)
  - Ex-e (increased safety)
  - Ex-p (pressurized)



Thermometer



Pt-100 for bearings



Tapered shaft  
taconite seal



Hydrodynamic bearing



Pressurization system for  
hazardous area

## Testing Laboratory

WEG motors are tested in accordance with NBR 5383, IEC 60034, NEMA MG 1 and API in a modern laboratory. Having the capacity to test low and high voltage motors with power rating up to 20,000 kVA and voltages of up to 15,000 V, WEG testing laboratory features high accuracy test controls and fully computerized monitoring systems.

The tests are divided into three categories: routine, type and special tests. Routine tests are performed on all motors. In addition to routine tests, type and special tests are usually performed in one piece within a series of equal motors or as per customer request.

### Routine tests

- Ohmic resistance measurement at cold
- No load test
- Locked rotor test
- Hi-pot test
- Insulation resistance measurement

### Type tests

- All routine tests
- Vibration measurement at cold
- Breakdown torque measurement
- Temperature rise test
- Constant voltage load test

### Special tests

- Noise level measurement
- Shaft voltage measurement
- Overspeed test
- Vibration test
- Determination of curves



Test laboratory (20 MVA)



Surge test



Control room

## Service

WEG offers to its customers a package of service, along with a complete after sales support.

Included in this package are general support service, field service, full checking, commissioning of motors and 24/7 customer service.

The company also counts on a network of authorized service centers on over the country as well as overseas. Technical manuals supplied with each equipment provide accurate information about safety, operation, installation and maintenance instructions.

WEG's service team has been duly trained and has the technical expertise to handle any required field situation with the support of state-of-the-art tools and equipment.



## Other Services

As market leader in motors and generators, the company can also offer inspection services, rebuilding and retrofitting of any size electrical machine. These services are performed at the factory or on the field and include other brands of products as follows:

- DC motors and generators up to 10,000 kW;
- Three-phase induction motors (squirrel cage or slip ring) up to 50,000 kW (low, medium and high voltage);
- Synchronous motors (brushless or with brushes) up to 50,000 kW (low, medium and high voltage);
- Turbogenerators up to 62,500 kVA;
- Hydrogenerators up to 25,000 kVA.

When performing repair services, WEG uses the same technology and processes applied in the manufacture of new machines.



## Replacement Parts and Components

For prompt support to our customers and to our network of service centers, WEG counts on a well-structured sales team which can serve both domestic and overseas markets.



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