

Synchronous Motors



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WEG offers complete industrial solutions with outstanding products designed in conjunction with international specialized consulting companies. Among these products, the company offers its Synchronous Motors, which are highly used by the industry for their special operating characteristics.

High efficiency on applications that require power factor correction, high torques and constant speed under load variation resulting in low operating and maintenance cost are just some of the reasons in selecting WEG Synchronous Motors to drive a wide variety of applications.

Optimized designs developed in cooperation with European, North American and Brazilian Universities, quality of the material applied as well as the full manufacturing process fully controlled along all phases of production make the WEG Synchronous motors suitable for most of the industrial segments.

WEG Quality system is certified by Bureau Veritas Quality Institute in accordance with ISO 9001. These Synchronous Motors are also certified by renown certifying institutions including API, NEMA, IEC, CSA, BVQI, NBR, ABS and DNV.

Why to use Synchronous Motors

Due to their special operating characteristics, Synchronous Motor applications usually result in economical and operational advantages to end users.

Included in the economical advantages of using Synchronous Motors are:

Power factor correction

WEG Synchronous Motors can help you to reduce electrical energy cost as well as to improve energy system efficiency by correcting power factor of the power supply on which they are installed. A few years after installation, saving in electric energy may correspond to the amount invested with the electric motor.

Keeping Constant Speed

WEG Synchronous Motor speed is kept constant either on overload variations or on voltage drop cases, in addition to following pull-out torque limitations.

Getting high efficiency

The performance in converting electric energy into mechanical power is more efficient resulting in significant energy saving. WEG Synchronous Motors can be designed for high efficiency operation on a wide speed range along with providing significant energy saving for a large variety of loads.

High torque capacity

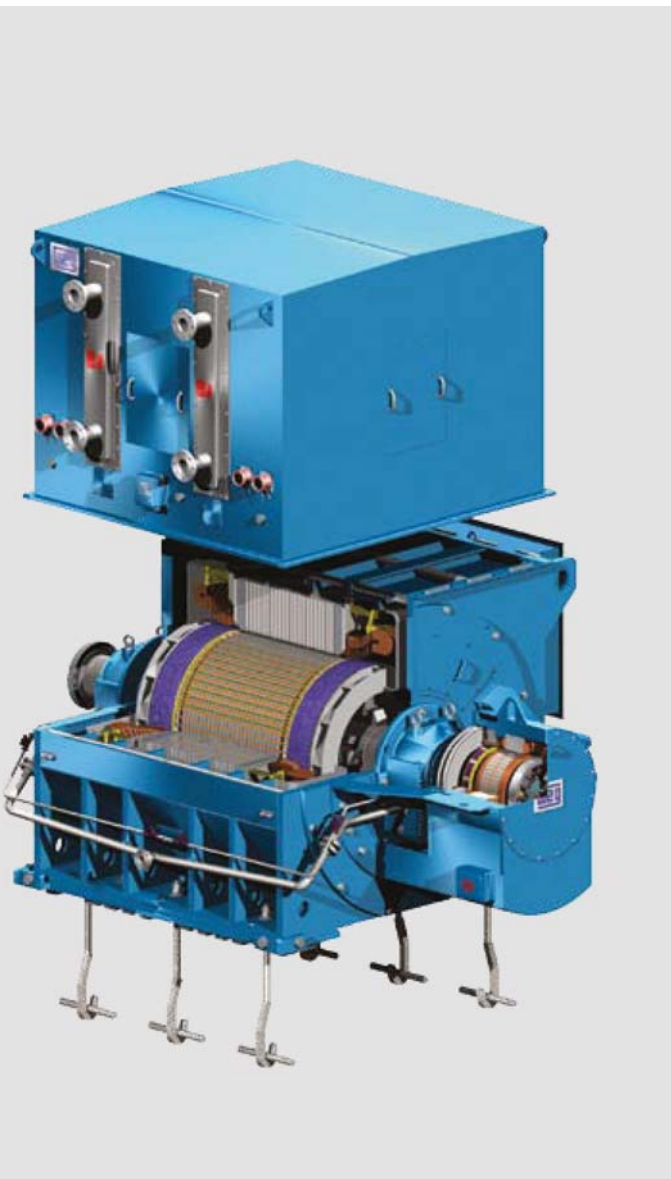
For those applications requiring high torque (Ex: crushers, extruders, etc), breakdown torque can be five times higher than the rated torque.

Reduce Maintenance Cost

Since they do not require slip electric contacts for their operation, BRUSHLESS synchronous motors are not manufactured with brushes nor with slip rings. Hence, maintenance, inspection and cleaning on these components are not required.

Improve stability on VFD applications

These motors are suitable to operate at any speed range from zero to maximum speed, keeping the stability independent from load variation (Ex: laminators, plastic extruders, etc.).



Outputs: up to 50,000kW
Voltages: 220 to 13,800V
Speed: 1800 to 180rpm

Nomenclature

S E W 800

MOTOR LINE

S – Engineered Synchronous Machine

EXCITATION CHARACTERISTICS

D – Synchronous Motor with Brushes
 E – Brushless Synchronous Motor and without auxiliary exciter
 F – Brushless Synchronous Motor and with auxiliary exciter (PMG)

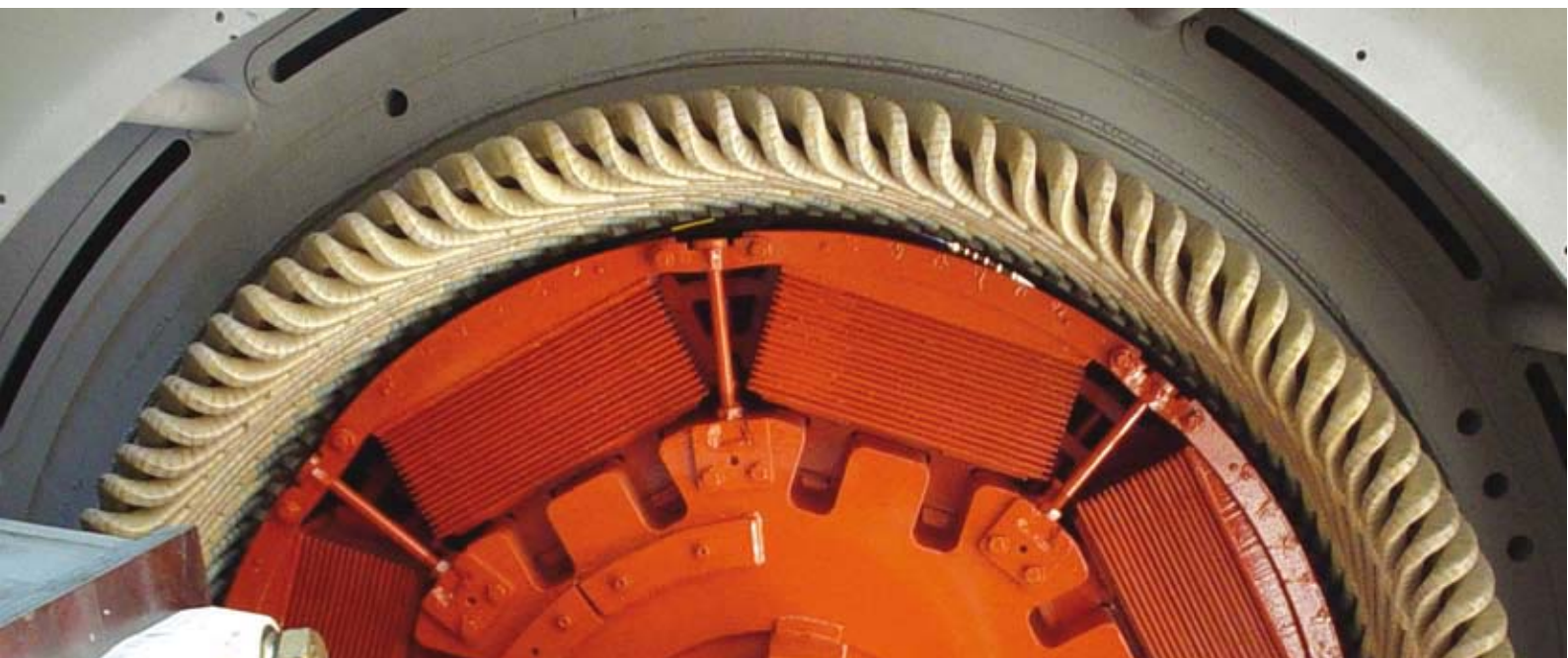
COOLING SYSTEM

A – Open self-ventilated
 D – Self-ventilated, air inlet and outlet by ducts
 T – Forced ventilation, air inlet and outlet by ducts
 V – Forced ventilation over the motor
 F – Self ventilated with air-to-air heat exchanger on top of motor
 R – Self-ventilated with air-to-air heat exchanger around the motor
 I – Forced ventilation on the internal and external air flow, air-to-air heat exchanger
 W – Air-to-water heat exchanger
 L – Air-to-water heat exchanger, forced ventilation on the internal air flow

FRAME

ABNT/IEC 355 to 3.150

Example: SEW800



Applications



Synchronous Motors SEF900 (Ex-p), 3600 kW, 13,200 V.
Application: Reciprocating compressors.



Synchronous Motors SDL800, 3000 kW, 3100 V.
Application: Laminating machines (steel plants).

WEG Synchronous Motors are manufactured specifically to meet all application requirements. Due to their constructive characteristics, high efficiency operation and compatible to all types of environments, they are used on all industrial segments including:

- Mining (crushers, mills, conveyor belts and others)
- Steel plants (laminating machines, fans, pumps, compressors)
- Pulp and paper (extruders, chippers, debarkers, compressors, grinders)
- Sewage systems (pumps)
- Chemical and Petrochemical (compressors, fans, exhausters)
- Cement (Crushers, mills, conveyor belts)
- Rubber (extruders, mills, mixers)

Vertical Synchronous Motors

WEG also offers Vertical Synchronous Motors which can be built with either grease-lubricated roller, ball or angular contact bearings. Depending on the application, mainly when subject to high axial load applications, motors can be built with oil lubricated roller bearings or sleeve bearings. Vertical Synchronous Motors are designed and manufactured to meet customer requirements to be used in pumps, crushers, mixers, among others.

Synchronous Motors for Explosive Atmospheres

For explosive atmosphere applications, WEG manufactures motors with specific safety characteristics and suitable to operate where flammable products are handled, processed and stored continually with full protection to people and

manufacturing premises.

These motors are supplied with different protections such as Ex-n (non-sparking) and Ex-p (pressurized) meeting national and international standard requirements, in addition of being tested and approved by worldwide certifying institutions.

Fixed speed

Synchronous Motor applications with fixed speed are recommended due to low operational cost once they offer high efficiency and can be used as synchronous compensators of power factor correction.

Variable speed

Synchronous Motors with variable speed are recommended for applications with high torque, low speed and wide speed adjusting range.

Depending on load and environment characteristics, motor construction for such applications can be supplied with or without brushes.

Due to their higher efficiency level, reduced size and higher output rating capacity, synchronous motors can replace DC motors on high performance applications.

On several cases, a motor with lower torque values compared to standard values can be actually applied. This brings positive reduction on motor starting current, resulting in less electric system troubles during starting, along with reduction on mechanical thrusts resulting from motor winding.

For a correct design and application of WEG Synchronous Motors, the company recommends, when specifying a Synchronous Motor, to supply complete application data.

Constructive Characteristics

Frame

It is mainly intended to support and protect the lamination core and stator winding. The frame can be constructed both in horizontal or vertical mounting configurations and with degree of protection that meets application characteristics. It is manufactured with steel plates and welded with MIG welding resulting in a solid and rugged structural construction. The whole frame construction is duly treated for stress release caused by welding process.

This construction results in an excellent structural piece so as to withstand mechanical strengths originated from eventual short-circuits and vibrations, and then making the motor suitable for the most severe applications.

Stator

The stator consists of a high quality silicon steel lamination core fitted with slots to accommodate the winding which operates with AC power supply for generation of the magnetic rotating field.



Insulation System

The WEG MICATHERM insulation system is based on the “Vacuum Pressure Impregnation” (VPI) system which was developed in cooperation with renowned suppliers of insulating materials all over the world. Applying special epoxy resins, this system ensures perfect motor winding insulation which has no emission of harmful gases to the environment.

For many years, the VPI process has evidenced its efficiency and reliability on electric rotating machines for a wide variety of applications. The insulation system is applied on low and high voltage machines which are built with form coils of 380 to 15,000 V.

Rotor

Depending on motor constructive characteristics and on the application, the rotor can be built with cylindrical or salient poles. The rotating active parts include rotor ring, field winding and amortisseur winding. The field poles are magnetized through the exciter direct current or directly through slip rings and brushes; they gear themselves magnetically by the air gap and rotate in synchronism with the stator rotating field. The poles are built with laminated steel plates that are fixed with steel bar and welded on the ends. The field coils are constructed with enameled copper wires or flat copper bars.

Bearings

Based on the application, Synchronous Motors can be supplied with grease-lubricated ball or roller bearings or with oil lubricated sleeve bearings.



Ball/Roller Bearings

Depending on the speed and on axial and radial thrusts applied, these can be roller or ball bearings. Some specific applications may require special bearings. Roller or ball bearings can be oil or grease lubricated.

Sleeve bearings

Sleeve bearings can be naturally lubricated (self lubricated) or with a forced lubrication system (independent lubrication system).

Excitation Types

Synchronous Motors require a DC power supply to power the field winding (rotor winding), which is usually done through slip rings and brushes (static exciter) or through a brushless rotating exciter.

Static exciter (with brushes)

Synchronous motors supplied with static exciter are fitted with slip rings and brushes that allow current powering of the rotor poles through slipping contacts.

The DC power supply for the poles must come from an AC/DC converter and static controller.

The static exciter is much used on VFD applications.

Brushless exciter

Synchronous Motors with brushless excitation system are fitted with a rotating exciter, normally installed on the backside of the motor.

Depending on motor operation, the exciter consists of:

- Exciter with DC power supply on the stator
- Exciter with AC power supply on the stator

The exciter rotor powers the motor excitation winding through a three phase bridge rectifier.



Static exciter (with brushes)



Brushless exciter

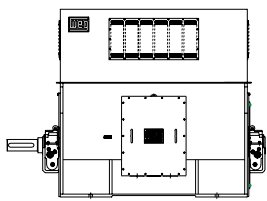


Cooling System

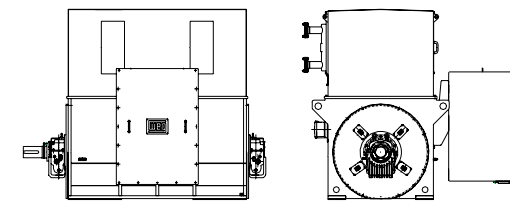
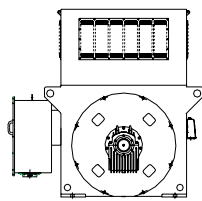
The cooling systems most commonly used are:

- Open self-ventilated motors, Degree of Protection IP23
- Enclosed motors with air-to-air heat exchanger, Degree of Protection IP54 to IPW65
- Enclosed motors with air-to-water heat exchanger, Degree of Protection IP54 to IPW65

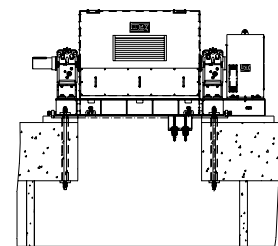
Besides the cooling methods mentioned above, motors can be supplied with forced ventilation, air inlet and outlet by ducts, and other cooling methods, always meeting installation environment and application characteristics.



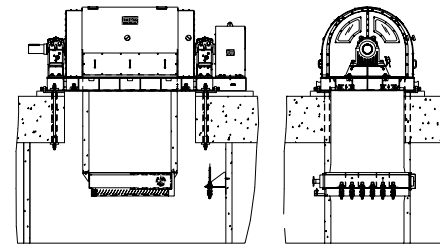
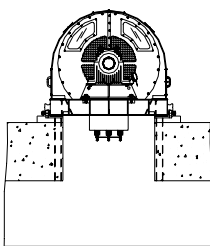
Open self-ventilated motors
Mounting B3



Enclosed motors with air-to-water heat exchanger
Mounting B3



Open self-ventilated motors
Mounting D6



Enclosed motors with air-to-water heat exchanger
Mounting D6

Accessories

WEG Synchronous Motors are supplied with standard accessories required for correct operation and monitoring of the main components. When specifying a motor, the end user must inform the required accessories that should be included in the design and motor manufacture.

Accessories (supplied as standard)

- Stator winding temperature detectors PT-100
- Bearing temperature detectors
- Space heaters

Special Accessories

- Capacitors
- Lightning arrestors
- Current Transformer (CT)
- Vibration detectors
- Encoder
- Frame lifting device
- Temperature detectors for air inlet and outlet
- Water flow valve
- Water flow meter
- Oil flow meter
- Oil flow sight
- Water flow sight
- Hydraulic unit for bearing lubrication
- Oil pressure pumping system for motor starting and stop (Hydrostatic Jacking)
- Oil thermometer (bearings)
- Water thermometer (heat exchanger)
- Air thermometer (Cooling)
- Anchorage plate



Thermometer



Pressurization device



Pt-100

Tests

WEG Synchronous Motors are tested in accordance with IEC60034 at its modern testing laboratory for low, medium and high voltage motors in output ratings up to 20,000 kVA and voltage range up to 15,000 V, with full computerized and high precision monitoring.

Tests are grouped in three categories: routine, type and special.

Routine Tests

- Visual Inspection
- Air gap checking and bearing tolerances
- Winding Ohmic resistance
- Insulation resistance.
- Temperature and space heater inspection
- Bearing and rotation direction marking
- Vibration checking
- No load test
- Short-circuit curve
- Hi-pot test
- Excitation system test

Type tests

- Temperature rise test
- No load curve (V curve)
- Overspeed
- Loss and efficiency test
- Waveform measurement
- Polarization index
- Synchronous motor starting

Special tests

- Noise level test
- Instantaneous short-circuit
- Shaft voltage check
- Starting current



Support Service and Repair Shop Services

Support Service

WEG offers its customers complete service and after service support. Included in this package of services are response to general requirement and field service including identification of problem causes and commissioning of machines. In addition to that, its skilled Service Team is permanently available to give prompt support all over the world. Manuals supplied together with the equipment provide detailed and precise information related to safety, installation and maintenance instructions. WEG Service Department counts on a qualified and well-trained team capable to provide support on any field requirement with the application of modern equipment so as to ensure reliable results.

Service

As leading provider of motors and generators, WEG offers a complete package of additional services to its customers including repairs, rerating of small and large size machines, including other manufacturers machines, specialized applications within the following scope:

- DC and traction motors and generators (AC)
- Squirrel cage and slip ring motors in output ratings above 250HP and voltages up to 13,800V
- Synchronous generators, brushless or with brushes, low and high voltage

When performing repair services, WEG employs the same technology and facilities used on the plant manufacturing process for superior performance.

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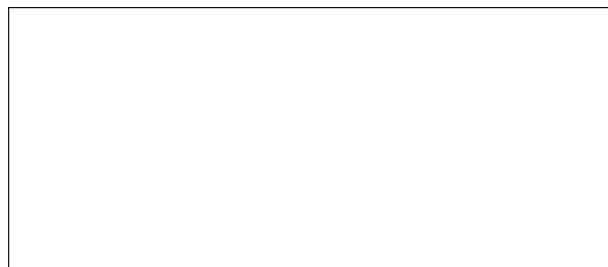
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648.02/072008 - The values shown are subject to change without prior notice. The information is for reference only.