Critical Duty Motors You Can Depend On.
Innovation is Why.

above nema MOTORS

SIEMENS

Large Motors Built to Meet the Most Demanding Standards

For over 100 years, Siemens large motors have earned a reputation for high performance, low maintenance and long service life in some of the world's most demanding applications. It is this reputation combined with unmatched service and support that has made Siemens the leading supplier of motors around the world.

Siemens Meets or Exceeds Recognized Standards

Siemens keeps its industry-leading reputation by staying at the forefront of important industry standards such as:

- IEEE 841
- API 541, 4th Edition
- API 547
- ANSI
- NEMA and CSA
- NEMA Premium® efficiency

Siemens Meets the Toughest Standard of All – Yours

At Siemens, we listen to the needs of our customers and how they use motors. We then respond with motors that are designed and manufactured to provide maximum value for specific applications such as:

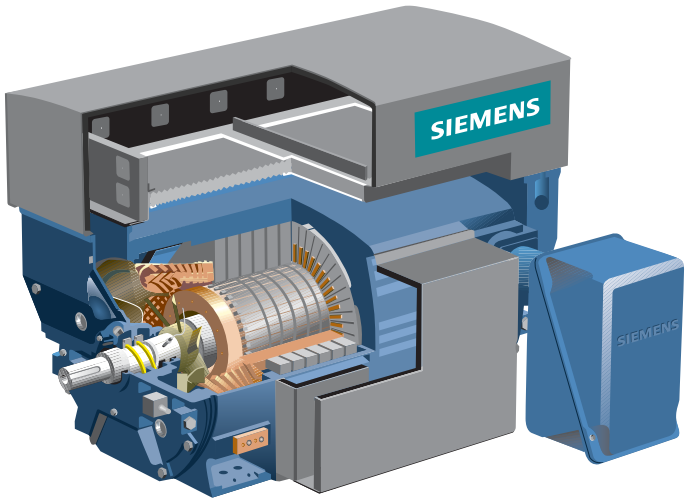
- Petroleum and chemical processing
- Mining applications
- Metal producing and processing
- Utilities
- Compressors and centrifugal pumps
- Air separation
- Pulp and paper

In addition to providing industry-specific solutions, Siemens offers the quality standards to back our promise of the ultimate in large motor value:

- ISO 9001 certified quality standards at our Norwood, Ohio USA technical and manufacturing center.
- Full load dynamometer testing of motors up to 10,000 HP. It is the best assurance of build quality.

Investing in Your Future

We are also making major investments to remain the industry leader in large motors. In late 2005, a $30 million project was begun to expand our Norwood, Ohio facility. This expansion includes added manufacturing and testing space, as well as advances in manufacturing and inspection equipment. This investment will also contribute to enhancements in Siemens motors sold throughout the world.



A Systems Approach to High Performance, Extended Service Life and Value

Siemens engineers evaluated every component that affects the performance and service life in our motors and developed individual systems within them to provide maximum value. In each of these systems, options are available to meet specific application, performance, cost and efficiency requirements. Together, these systems unite to provide a highly engineered, custom-purposed motor, built with highly reliable standard components for maximum value.

Siemens low vibration two-pole motors are the popular choice for compressors and centrifugal pumps.

Stator Insulation Systems

Siemens offers two stator NEMA Class F insulation systems to meet your motor performance needs.

Random Wound
This stator insulation system is commonly used for general-purpose performance in frame sizes through 580 and ratings to 600 volts. It features:

- Polyester/amide-imide enamel-insulated round wire that is wound into individual coils and inserted into precision-machined, semi-enclosed slots.
- After inserting into the stator frame, coils are connected and braced, and then immersed twice in a NEMA Class H hybrid epoxy-insulating resin.
- Completed stators are high-temperature baked to produce a very solid and rigid stator winding suitable for tough performance including across the line starting.

Form Wound
Siemens MiCLAD™ form wound stator insulation system provides the ultimate in electrical protection, mechanical and electrical strength for long service life. It features a highly engineered, sealed epoxy mica design for optimum electrical and ambient operating performance and meets or exceeds NEMA MG1-20 sealed winding standards. Features of this system include:

Copper Coil System – A heavy polyester or Dacron® glass tape is used for individual strand insulation for coils.

- For high voltage applications, supplemental mica insulation is added for extra protection.
- When ultimate protection against corona damage is required in voltage applications, conductive armor tape is added to the slot portion of the coil.

Stator Assembly System – After insulating, coils are assembled into the stator slots with polyester film/fiber slot liners and connected together.

- For high voltage applications, conductive polyester mat slot liners are used to resist the effects of high corona.
- Coil end surge rings, blocking and tying are applied to the finished assembly for maximum strength.

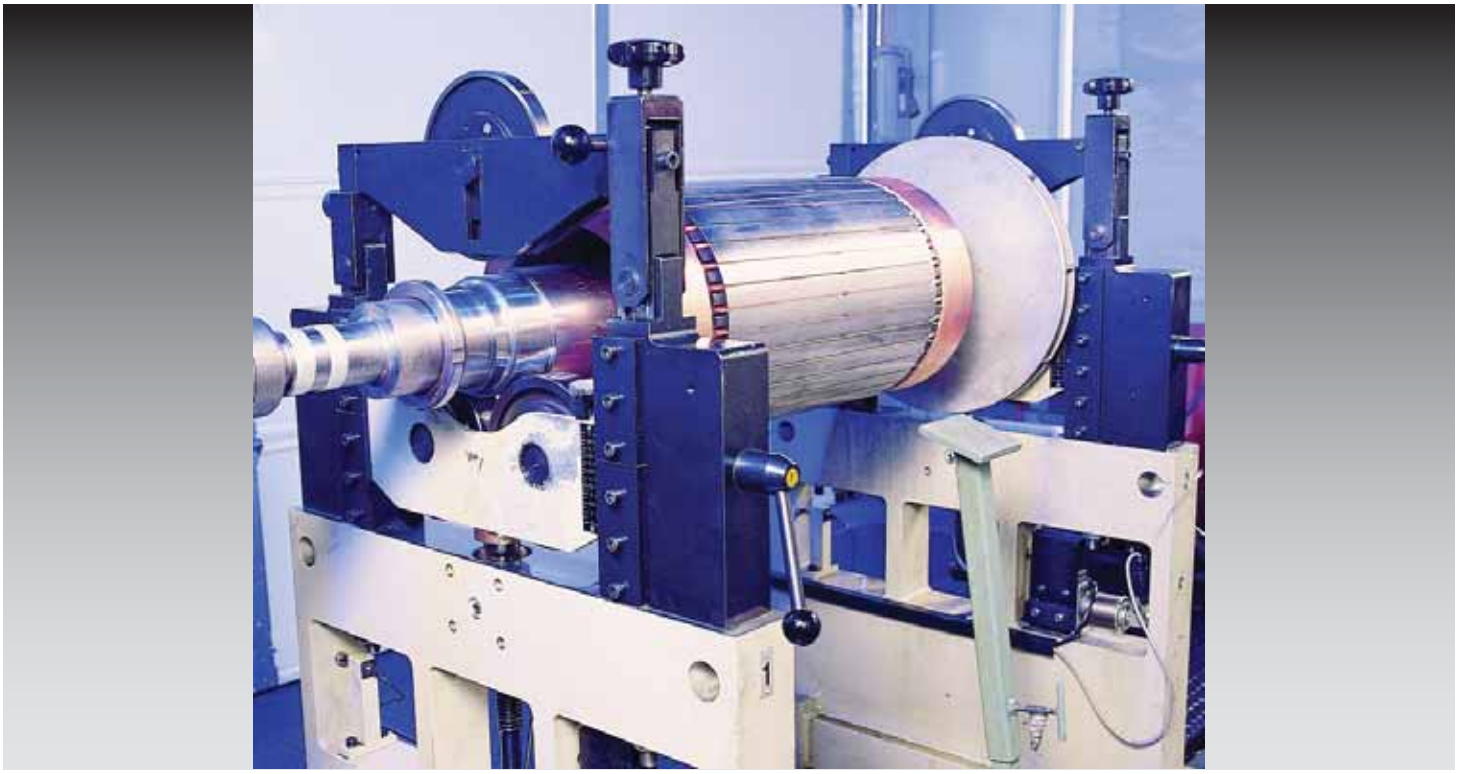
Vacuum Pressure Impregnation (VPI) – Each stator assembly receives two VPI treatments to provide exceptional protection against moisture, chemical and electrical damage.

- The VPI process uses high vacuum pressures to draw out air and gasses from the stator assembly and winding.
- After the vacuum is applied, a 100% solid thermosetting epoxy resin is introduced to the stator and fills voids and gaps within the windings with resin.
- While submerged within the resin, the stator is pressurized to several times the atmospheric pressure for maximum insulation penetration and coverage.
- After the VPI process, the stator assembly is high-temperature baked to catalyze the resin to produce a very rugged, solid and sealed stator insulation system.

Stator Core System
For optimum electrical and magnetic performance, stator cores are assembled with laminations punched from high-grade (C5 core plate) silicon steel. These laminations are stacked, keyed, compressed and secured with heavy gauge steel rings to provide a strong, rigid assembly to minimize vibration and noise while assuring a precision air gap.

Frame System
Depending on motor size or the type of enclosure, motor frames are either high-grade cast iron or fabricated steel. No matter which you choose, each frame features:

- Precision machining of end shields and frame ends provides close tolerance mating. It helps assure precise rotor and stator alignment, regardless of high shaft loads for long bearing life and low vibration and harmonics.
- Precision-machined mounting feet surfaces assure long-term accurate alignment with driven equipment to extend bearing life and minimize vibration.



Rotor System

The rotor is the workhorse of any motor. It must endure and transmit heavy loads, aid in the cooling of the motor and provide high electrical performance. Siemens engineers have designed the rotor system to provide optimal performance for various applications through the use of thoughtful designs and high-grade materials.

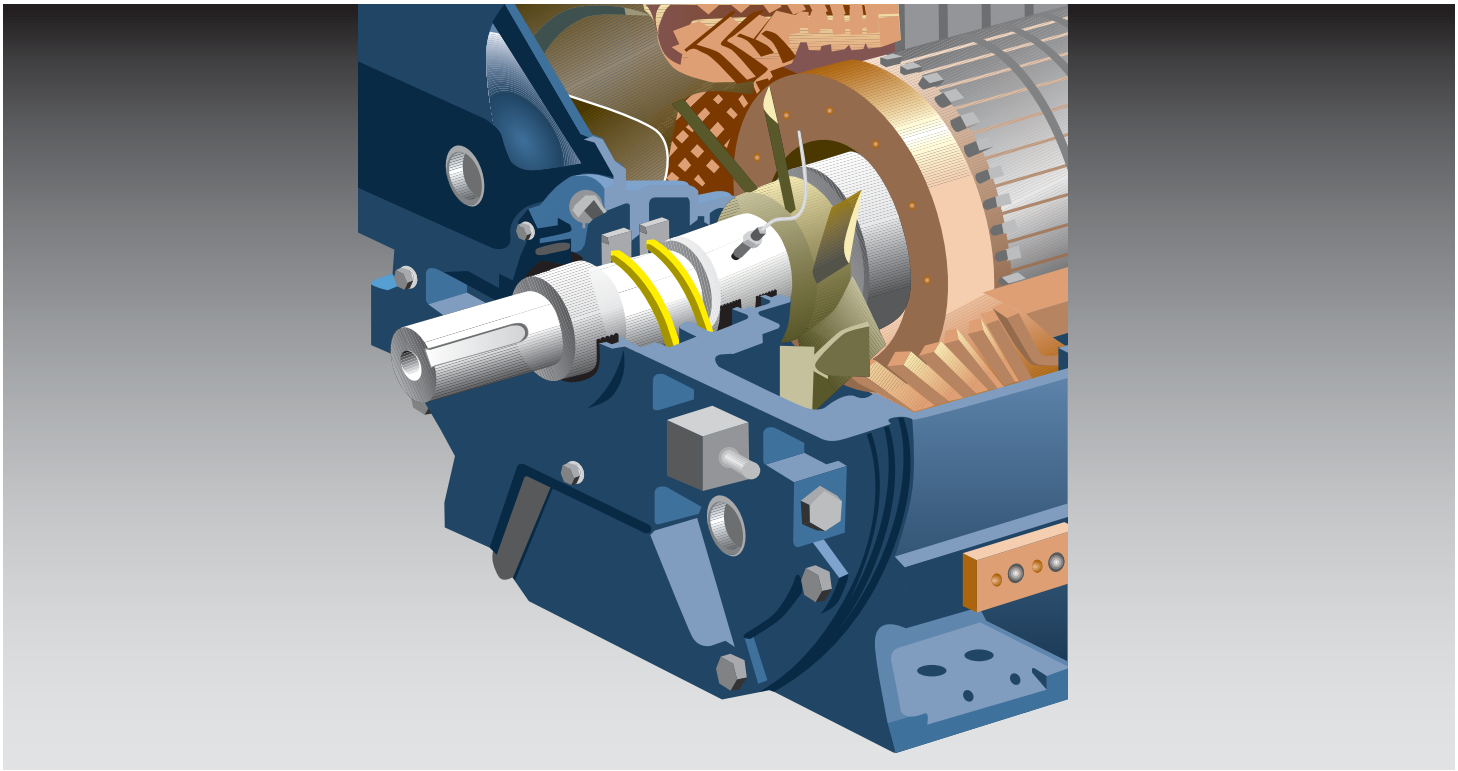
High Strength Shafts – Siemens uses generously sized medium carbon steel bar stock for shafts for maximum strength. They are precision ground to assure reduced operating stresses.

Innovative Cooling System – All rotors feature cooling passageways and vents in the rotor core. The axial vents that are parallel to the shaft, carry cooling air to radial vents in the rotor core that expel heat away from the rotor.

Precision Balanced – All completed rotors are dynamically balanced at full operating speed to ensure long bearing life and minimize noise and vibration.

Two Rotor Choices to Meet Your Needs – To meet specific application needs, Siemens offers aluminum die cast and fabricated copper rotors.

- Aluminum Die Cast Rotors. These rotors are ideal for general-purpose applications.
- Constructed of stacked steel laminations that are compressed, then molten aluminum cast into a solid rotor core. This construction casts bars and end rings into one rugged, solid piece to eliminate the possibility of bond faults or flexing failures at the joints.
- Fabricated Copper Bar Rotors. These rotors are ideal for high performance applications and provide exceptional energy efficiency.
- Fabricated from stacked steel laminations that are compressed and then shrink fit onto a keyed shaft. Heavy steel end heads with tooth supports are added to prevent flaring at the ends.
- Copper, or copper alloy bars are press fit into rotor slots that are lined with steel shims to assure a tight fit. Large copper end connections are added and joined with silver braze for maximum strength and electrical conductivity.



Bearing Systems

To meet specific application requirements, two types of bearing systems are available.

Sleeve Bearings – Split sleeve bearings are optional on any motor below 680 frame, and standard on 680 frame and larger motors. These bearings feature:

- Tin-based babbitt liners bonded to bearing bushing shells.
- A large lubricant reservoir provides self-cooling of the lubricant for some motors.
- Dual one-piece rings deliver the lubricant from the reservoir to channeled grooves where it is delivered to the bearing.
- For ease of inspection, the top half of the horizontally split bearing housing can be removed without disturbing the bearing or its alignment. A port is included in the housing to view the bearing condition.
- Flood lubrication is available for these bearings.
- Both sides of these bearings have labyrinth seals and are vented to the atmosphere to prevent lubricant migration.
- Sight gauges are available to monitor lubricant levels and constant level oilers are available.
- When required, bearings are insulated from the housing to prevent damaging shaft currents.

Anti-friction Bearings – These bearings are standard on 500 and 580 frame motors, as well as 8-pole and slower speed motors. They feature:

- Single-row, open construction, regreasable ball bearings.
- New grease is added through external fittings and expelled grease is relieved through drain ports.
- A large grease reservoir protects the bearings from contaminants while a stationary metal end cap protects the stator end turns from excessive grease.
- Bearings are interference-fit on the shaft and slip-fit between the bearing and the housing to allow thermal expansion.

Siemens Above NEMA Motor Features at a Glance

	OPEN MOTORS IP23 OR IP24	
	CG / CGI 	**CGII** 
CONSTRUCTION FEATURES		
Enclosure	ODP / WPI (IC01)	WPII (IC01)
Degree of Protection	IP23	IP24
HP Range	200-10,000 HP	200 - 10,000 HP
Frame Size	500, 580, 680, 800 & 1120	500, 580, 680, 800 & 1120
Voltage	460 - 690 V (through 800 HP) 2300 - 13,200 V	460 - 690 V (through 800 HP) 2300 - 13,200 V
Service Factor	1.0 (1.15 optional)	1.0 (1.15 optional)
Warranty (months)	12 operational, not to exceed 18	12 operational, not to exceed 18
CONSTRUCTION MATERIALS		
Frame	Cast Iron Yoke (500 - 800 frames) Fabricated Steel (1120 frame)	Cast Iron Yoke (500 - 800 frames) Fabricated Steel (1120 frame)
Bearing Housings*	Cast Iron (500 - 800 frames) Fabricated Steel (1120 frame)	Cast Iron (500 - 800 frames) Fabricated Steel (1120 frame)
Main Terminal Box	Cast Iron (500 - 800 frames) (fabricated steel optional) Fabricated Steel (1120 frame)	Cast Iron (500 - 800 frames) (fabricated steel optional) Fabricated Steel (1120 frame)
Auxiliary Boxes	Cast Iron (NEMA 4x optional)	Cast Iron (NEMA 4x optional)
Shaft	AISI 1045 (AISI 4140 optional)	AISI 1045 (AISI 4140 optional)
Rotor	Die Cast Aluminum (500 & 580 frames)** Fabricated Copper (680 - 1120 frames)	Die Cast Aluminum (500 & 580 frames)** Fabricated Copper (680 - 1120 frames)
Lamination Material	C5 Core Plate	C5 Core Plate
External Cooling Fan	Not Applicable	Not Applicable
Fan Cover	Not Applicable	Not Applicable
Top Cover/Heat Exchanger/ Tube Material	Not Applicable (500 frames) Fabricated Steel (580 - 1120 frames)	Fabricated Steel - Provisions for Filters
Insulation	<600 = Class F Random Wound >600 V = Class F-VPI Miclad™	<600 = Class F Random Wound >600 V = Class F-VPI Miclad™
Hardware	300 Series Stainless Steel	300 Series Stainless Steel
GENERAL INFORMATION		
Noise Level	90 dB(A) Typical (lower on 4 pole & slower) (<85dB(A) low noise optional on most ratings)	90 dB(A) Typical (lower on 4 pole & slower) (<85dB(A) low noise optional on most ratings)
Vertical Mounting	Yes	Yes
Inverter Operation	VFD Duty - Consult Siemens for Specifics	VFD Duty - Consult Siemens for Specifics
Paint	Two-part Epoxy (special paint optional)	Two-part Epoxy (special paint optional)
Paint Color	Siemens Motor Blue (other colors optional)	Siemens Motor Blue (other colors optional)
Bearing Type	Ball Bearing (500 & 580 frames) (sleeve bearings optional) Sleeve Bearing (680 - 1120) (ball bearings available on some ratings)	Ball Bearing (500 & 580 frames) (sleeve bearings optional) Sleeve Bearing (680 - 1120) (ball bearings available on some ratings)
Vibration	0.12 IPS or as defined by NEMA	0.12 IPS or as defined by NEMA

Built in the USA

* The bearing housings are one-piece with ball bearings and two-piece with sleeve bearings. ** Some larger 580 frames are provided with fabricated copper bar rotors. Copper bar rotors are optional for 500 and 580 frames. *** Consult Siemens for a complete list of clarifications, exceptions and bills of material that may apply. Motors built to API 541 3rd Edition are still available.

Siemens Above NEMA Motor Features at a Glance

	ENCLOSED MOTORS IP54		
	CGG 	**CZ / CGZ** 	**CAZ** 
CONSTRUCTION FEATURES			
Enclosure	TEWAC (ICW81)	TEFC (IC411)	TEAAC (IC611 or IC616)
Degree of Protection	IP54	IP54	IP54
HP Range	200 - 10,000 HP	200 - 2250 HP	900 - 7000 HP
Frame Size	580, 680, 800 & 1120	500, 580, 708, 788 & 880	580, 680, 800 & 1120
Voltage	2300 - 13,200 V	460 - 690 V (through 800 HP) 2300 - 11,000 V	2300 - 13,200 V
Service Factor	1.0 (1.15 optional)	1.0 (1.15 optional)	1.0 (1.15 optional)
Warranty (months)	12 operational, not to exceed 18	12 operational, not to exceed 18	12 operational, not to exceed 18
CONSTRUCTION MATERIALS			
Frame	Cast Iron Yoke (580 - 800 frames) Fabricated Steel (1120 frame)	Cast Iron	Cast Iron Yoke (580 - 800 frames) Fabricated Steel (1120 frame)
Bearing Housings*	Cast Iron (580 - 800 frames) Fabricated Steel (1120 frame)	Cast Iron (500 & 580 frames) Fabricated Steel, 1-piece (708 -880 frames)	Cast Iron (580 - 800 frames) Fabricated Steel (1120 frame)
Main Terminal Box	Cast Iron (580 - 800 frames) (fabricated steel optional) Fabricated Steel (1120 frame)	Cast Iron (fabricated steel optional)	Cast Iron (580 - 800 frames) (fabricated steel optional) Fabricated Steel (1120 frame)
Auxiliary Boxes	Cast Iron (NEMA 4x optional)	Cast Iron (NEMA 4x optional)	Cast Iron (NEMA 4x optional)
Shaft	AISI 1045 (AISI 4140 optional)	AISI 1045 (AISI 4140 optional)	AISI 1045 (AISI 4140 optional)
Rotor	Die Cast Aluminum (580 frames)** Fabricated Copper (680 - 1120 frames)	Die Cast Aluminum (500 & 580 frames)** Fabricated Copper (708 -880 frames)	Die Cast Aluminum (580 frames)**' Fabricated Copper (680 -1120 frames)
Lamination Material	C5 Core Plate	C5 Core Plate	C5 Core Plate
External Cooling Fan	Not Applicable	Aluminum (other materials available - consult Siemens for details)	Aluminum (other materials available - consult Siemens for details)
Fan Cover	Not Applicable	Cast Iron (500 frame), Fiberglass (580 frame), Steel (708 - 880 frames)	Fabricated Steel
Top Cover/Heat Exchanger/ Tube Material	Fabricated Steel Single-tube, CuNi (double-tube & stainless optional)	Not Applicable	Fabricated Steel Aluminum Tubes (stainless optional)
Insulation	<600 = Class F Random Wound >600 V = Class F-VPI Miclad™	<600 = Class F Random Wound >600 V = Class F-VPI Miclad™	<600 = Class F Random Wound >600 V = Class F-VPI Miclad™
Hardware	300 Series Stainless Steel	300 Series Stainless Steel	300 Series Stainless Steel
GENERAL INFORMATION			
Noise Level	85 dB(A) Typical (on most ratings) (<85dB(A) low noise optional on most ratings)	90 dB(A) Typical (lower on 4 pole & slower) (<85dB(A) low noise optional on most ratings)	90 dB(A) Typical (lower on 4 pole & slower) (85dB(A) low noise optional on most ratings)
Vertical Mounting	No	Yes - 500 & 580 Frames Only	Yes - 680 - 1120- Frames Only
Inverter Operation	VFD Duty - Consult Siemens for Specifics	VFD Duty - Consult Siemens for Specifics	VFD Duty - Consult Siemens for Specifics
Paint	Two-part Epoxy (special paint optional)	Two-part Epoxy (special paint optional)	Two-part Epoxy (special paint optional)
Paint Color	Siemens Motor Blue (other colors optional)	Siemens Motor Blue (other colors optional)	Siemens Motor Blue (other colors optional)
Bearing Type	Ball Bearing (580 frames) (sleeve bearings optional) Sleeve Bearing (680 - 1120) (ball bearings available on some ratings)	Ball Bearing (500, 580 4 pole & slower 708 - 880 frames) (sleeve bearings optional) Sleeve Bearing Standard on 2 pole 708 - 880 frames	Ball Bearing (580 frames) (sleeve bearings optional) Sleeve Bearing (680 - 1120) (ball bearings available on some ratings)
Vibration	0.12 IPS or as defined by NEMA	0.12 IPS or as defined by NEMA	0.12 IPS or as defined by NEMA

Siemens Above NEMA Motor Features at a Glance

	SPECIALTY PRODUCTS	
	CZ / CGZ 	**All Types-per API data sheet** 
CONSTRUCTION FEATURES		
Enclosure	IEEE 841***	API 541 4th Edition***/API 547***
Degree of Protection	IP55	IP23, IP24, IP54, IP55
HP Range	200 - 500 HP	250 - 10,000 HP
Frame Size	500 & 580	500 - 1120
Voltage	Through 4,000 V	2300 - 13,200 V
Service Factor	1.0	1.0
Warranty (months)	12 operational, not to exceed 18	12 operational, not to exceed 18
CONSTRUCTION MATERIALS		
Frame	Cast Iron	Cast Iron Yoke (500 - 800 frames) Fabricated Steel (1120 frame)
Bearing Housings*	Cast Iron	Cast Iron (500 - 800 frames) Fabricated Steel (1120 frame)
Main Terminal Box	Cast Iron (ANSI Type II with Standoff Insulators optional)	Cast Iron (500 - 800 frames) (fabricated steel optional) Fabricated Steel (1120 frame)
Auxiliary Boxes	Cast Iron (NEMA 4x optional)	Cast Iron (NEMA 4x optional)
Shaft	AISI 1045 (AISI 4140 optional)	AISI 1045 (AISI 4140 optional)
Rotor	Die Cast Aluminum	Die Cast Aluminum (500 & 580 frames)** Fabricated Copper (all other frames)
Lamination Material	C5 Core Plate	C5 Core Plate
External Cooling Fan	Bronze Alloy	If Applicable, Aluminum (other materials optional)
Fan Cover	Cast Iron	Refer to Specific Enclosure and Frame-size for Details
Top Cover/Heat Exchanger/ Tube Material	Not Applicable	Refer to Specific Enclosure and Frame-size for Details
Insulation	<600 = Class F Random Wound >600 V = Class F-VPI Miclad™	Class F-VPI Miclad™
Hardware	300 Series Stainless Steel	300 Series Stainless Steel
GENERAL INFORMATION		
Noise Level	90 dB(A) Typical (lower on 4 pole & slower) (<85dB(A) low noise optional on most ratings)	(<=85dB(A) available on most ratings)
Vertical Mounting	Not Applicable	Refer to Specific Enclosure and Frame-size for Details
Inverter Operation	VFD Duty - Consult Siemens for Specifics	VFD Duty - Consult Siemens for Specifics
Paint	Two-part Epoxy (special paint optional)	Two-part Epoxy (special paint optional)
Paint Color	Siemens Motor Blue (other colors optional)	Siemens Motor Blue (other colors optional)
Bearing Type	Ball Bearings	Refer to Specific Enclosure and Frame-size for Details
Vibration	0.08 IPS (except 2 pole motors = 0.10 IPS)	0.10 IPS on HSG / 1.5 mils on shaft

Application-Matched Modifications

To meet your exact requirements, Siemens offers a variety of application- and performance-matched modifications.

Bearing Protection

Resistance Temperature Detectors (RTDs) – These detectors are placed under the bearing babbitt and monitor any change in bearing bushing resistance to produce a direct temperature reading. RTDs available are platinum with a nominal 100 Ohm resistance.

Thermocouples – These temperature detectors are available as chromel-constantan (type E).

Thermometers – Direct reading dial thermometers detect bearing temperatures and are normally mounted on the motor frame.

Vibration Detectors – These detectors provide optimum bearing protection since excessive vibration in the bearings is detected before excessive heat occurs. Detectors are mounted near anti-friction bearings and are available with switches and/or 4-20 mA outputs.

Proximity Probes – These are non-contact vibration amplitude sensing proximity probes for sleeve bearing motors. They are eddy current devices that measure distance and change in distance to forewarn of impending bearing problems.

Stator Protection

Resistance Temperature Detectors (RTDs) – RTDs can be embedded into stator slots for a direct temperature reading of the hottest area of the motor's windings. RTDs with 100 Ohm resistance are standard.

Thermistors – Thermistors provide a large resistance change in relation to a small temperature change and provide a warning from an overload.

Surge Protection – Capacitors are placed in each phase of the stator with built-in discharge resistors and connected to cabinet-mounted three station class arrestors to prevent surges.

Differential Protection – Six extra long leads for connecting to current transformers are included in an oversized terminal box for differential protection.

Space Heaters – These heaters are energized when the motor is at rest in damp or high humidity environments to reduce internal condensation build-up.

Special Modifications

These modifications and more are available to meet specific requirements:

- Extra quiet enclosures
- Precision balancing beyond NEMA standards
- High inertia drives
- Reduced voltage starting

Comprehensive Testing

All Siemens motors are tested in accordance to applicable NEMA, ANSI and IEEE standards and results from these tests accompany each motor we ship. In addition to these tests, the following performance tests are also available:

- Complete testing to IEEE 112 in Methods E, E1, F or F1 with a maximum horsepower of 3,000 for F or F1.
- Sound pressure testing to IEEE 85 and NEMA MG1 20 standards.
- Bearing temperature testing.
- Speed versus torque/current testing.
- Polarization index testing per IEEE 45 standards.

Application-Focused Engineering Support

Making one of our motors the exact right fit for your application is the job of the Siemens large motor engineering team. Our staff of highly trained and experienced motor engineers can help solve the toughest application problems with intelligent solutions. Look to them for:

- Severe operating conditions and loads.
- Variable frequency drive solutions.
- Reducing motor acquisition and operating costs.
- High efficiencies.
- Extending maintenance intervals.
- Methods to extend service life.

Quality Manufacturing
From designs, to materials and workmanship, quality is built into every Siemens motor. The high quality we are known for is a result of over 100 years of motor experience capped with today's advanced quality control procedures used in our Certified Quality Performance Program.

Service Around the Corner, or Around the World
Professional technical assistance is readily available through your local Siemens sales office. In addition to providing a complete line of spare parts, Siemens can provide troubleshooting support, preventive maintenance services and repair and upgrades at our highly qualified Norwood, Ohio, Service Center. Contact your local Siemens sales office for details.

Siemens Motors and Drives – Performance-Matched Systems
Performance-matched variable-speed motors and drives from Siemens make perfect sense. They are designed to work in harmony for ease of selection and start up, as well as long-term reliability and exceptional performance.

Whether your application requires variable torque or constant torque capability in general purpose or severe duty environments, there is a Siemens motor / drive system ready to go to work for you.

Siemens IEC Motors –
Worldwide Production for Global Applications
Siemens produces a complete line of IEC motors built in our European factories. The H-Compact line of motors utilizes torsionally rigid, robust frame design, manufactured from cast iron with external and internal cooling ribs. The H-Compact line has output up to 3,000 kW.

The H-Compact Plus is available in shaft heights 450 mm, 500 mm, 560 mm and 630 mm. It utilizes a modular cooling concept and is built using a cast iron frame with fabricated steel heat-exchangers. The H-Compact Plus is available with outputs up to 7,500 kW.

The H-Modyn, built in Berlin, Germany, features a high-density and compact design that provides a smaller overall package with an optimized cooling design for exceptional efficiencies. It is available as induction and synchronous and has an output capability beyond 50,000 kW.

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For details about typical performance data, technical information or dimensional information, contact your local Siemens sales representative, call **1-800-964-4114,** or go to our web site **www.sea.siemens.com/motors**

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