

# ELECTRICAL MOTORS

CATERING TO CORE SECTORS OF THE ECONOMY



One of the leading electrical machine manufacturers and having a dominant presence in the Indian market, BHEL has designed and supplied over 34,000 HT AC machines for various applications in the Indian and overseas markets during the last five decades. The applications include Power Plants, Nuclear energy, Defence, Transportation, Petrochemicals, Fertilizers, Refineries, Cement, Steel Industries, Lift Irrigation Projects, Pipelines, Motors for Strategic Applications etc. BHEL offers Electrical Motors/Generators with high efficiency, exceptional reliability, easy installation and minimal maintenance costs.

BHEL AC machines are designed and manufactured in accordance with the latest technology available globally with state-of-the-art automated production methods and technology, ensuring highest level of consistent quality. High performance is achieved through optimum utilization of the active materials and components.

The motors are offered in both standard as well as customized designs to meet the specific requirements of the customer/ end-user.



## Power Plants

Motors are provided for entire gamut of power plant applications covering various types of fans, compressors, conveyors, crushers, mills, pumps etc. in the range of 150 kW to 22,000 kW.



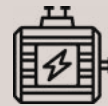
12 MW, 11 kV, 4P BFP Motor for Power Plants

## Lift Irrigation

Slow speed vertical synchronous as well as asynchronous motors with high thrust bearing capability of 130 T can be offered upto 15 MW in speed range 167- 1000rpm.



5.2 MW, 11KV, 372 RPM Vertical Syn Motor for Lift Irrigation



## Product Profile

Equipment	Range
<b>AC Machines for Safe Area Application</b>	
Squirrel Cage Induction Motors	150 kW - 22,000 kW
Slip Ring Induction Motors	150 kW - 10,000 kW
Synchronous Machines	1,000 kW to 25,000 kW
Variable Speed Motors (Squirrel Cage Motors)	150 kW to 22,000 kW
Variable Speed Motors (Synchronous Motors)	1,000 kW to 15,000 kW
<b>AC Machines for Hazardous Area Application (Fixed speed /with VFD)</b>	
Flame Proof (Ex'd') Squirrel Cage Induction Motors	150 kW to 1,300 kW
Non-sparking (Ex 'n') Squirrel cage Induction Motors	150 kW to 22,000 kW
Increased Safety (Ex 'e') Squirrel Cage Induction Motors	150 kW to 4,000 kW
Pressurized (Ex 'p') Squirrel Cage Induction Motors	150 kW to 22,000 kW
Pressurised (Ex 'p') Synchronous Machines	1,000 kW to 25,000 kW
<b>Special Design Motors</b>	
Permanent Magnet AC Motors & Generators - For Strategic Applications	
Radiation resistant Motors for Nuclear applications	

## Manufacturing Range

Voltage Rating	415 V to 13.8 kV
Frequency	50 Hz/ 60 Hz
Pole	2 to 36
Starting Method	DOL/ VFD/ Soft Starter/ LRS/ GRR
Enclosures	TETV/ TEFC/ CACA/ CACW/ SPDP
Mounting	Horizontal (B3, B35)/ Vertical (V10)
Insulation System	Class F/ H
Standard	IEC 60034/ IEC 60079

## Refinery and Petro-chemicals

Hazardous Motors complying to IEC:60079 for compressors, pumps etc. from 150 kW to 22MW. These motors are offered in flameproof, non-sparking, increased safety and pressurized enclosures.

## Cement Industries

Slip ring motors and VFD operated Squirrel cage motors are offered for Mills, Fans, Kiln and Crusher applications for ratings from 500 kW to 10 MW.

## Nuclear and Defence

Special motors are offered for primary and secondary side of nuclear power plants and strategic applications of defence i.e. MMG, permanent magnet based frequency converters and reserve propulsion motors. BHEL has supplied motors for critical applications like 6 MW PCP & 10.7 MW BFP for Nuclear power projects



5.8MW/ 6.6 kV/ 4P CACA ExP motor



3.3MW/ 11kV/ 36P vertical cage pump motor



Vertical Boring & Milling Machine



7-axis Auto Taping Machine



Turn Mill Centre

## Manufacturing Facilities

- In-house foundry & fabrication facility to cater requirements of various types of castings and fabrication of motor components.
- CNC machines for machining operations like grinding, drilling, turning, milling, etc. for complete range of motors and generators. This facility includes CNC Lathe, CNC Vertical Borer and milling, Turn mill centre, Vertical Plate Bending Machine and CNC Jig Boring Machine etc.
- World-class manufacturing facilities for notching stampings and burr grinding using state-of-the-art machines. Facility is equipped with varnishing plant for lamination sheets.
- Coil manufacturing facility includes Insulation Taping of Motor Coils, 7-axis Auto Taping Machine, Coil Pulling Machine, Loop Winding Machine, VPI plant and Impulse Test Facility.
- Insulation system is provided with Global Vacuum Pressure Impregnation technology to provide excellent electrical, mechanical and thermal properties.
- High-capacity EOT cranes and dedicated clean area for material storage.
- Well-qualified team of welders, brazers, fitters, electricians and other technicians.
- Well-equipped assembly and test plants



## Certifications

- Complete Flameproof motor Ex'd' series are BIS & CCOE, India certified as per IEC 60079-0 & IEC60079-1
- Increased safety Ex'eb' and Non sparking motors Ex'ec' as per IEC 60079-0 & IEC60079-7.
- Pressurized motors Ex'P' as per IEC 60079-0 & IEC60079-2.
- CCOE / ATEX / IECEx certifications for Hazardous area motors
- Stator and Rotor gas tests certified as per IEC 60079-7
- Radiation compliant insulation system for Nuclear application
- Fault level certificate for terminal box certified by CPRI (Central power research institute- Government of India)
- Impulse & surge withstand capability test as per IEC60034-15

## Product Testing

BHEL motors are tested in accordance to applicable BIS/IEC/NEMA/ IEEE standards.



*Permanent magnet motor under test with controller*

Testing facilities includes multiple MG sets of various capacities, state-of-the-art testing Equipment & Data acquisition system for Performance testing of Machines assuring BHEL quality assurance procedures and customer requirements. Product Testing offers

- Testing of motor with variable speed drive systems with frequency converter & input transformer.
- Full load performance, Back to back, Full Load & Indirect loading systems. Direct loading -

upto 6 MW & In-direct load test (Mixed Frequency Method) up to 25MW as per IEC60034-29 and IEEE standards.

- Vibration and Noise level analysis and testing

## Raw Material Inspection

In-house NABL (National Accreditation Board for Testing and Calibration Laboratories) accredited Laboratory for carrying out electromechanical and chemical testing of RAW materials and finished products.



*Potential Divider*



*1000 kN UTM Test Facility*

## Major Products

- 21.8 MW/ 11 kV/ 4P horizontal cage asynchronous motor for Boiler feed pump for 800 MW Super critical power plant
- 14.45 MW/ 11 kV/ 8P horizontal cage asynchronous motor for combined ID fan for 800 MW Super critical power plant
- 4.8 MW/ 11 kV/ 22 pole vertical cage asynchronous motor for CW Pump for 800 MW Super critical power plant
- 12 MW/ 11 kV/ 12 P vertical synchronous motor for lift irrigation projects
- 3.3 MW/ 11 kV/ 36 P vertical cage asynchronous motor for lift irrigation projects for pump thrust upto 140 T
- 25 MVA/ 11 kV/ 4 P horizontal synchronous generator for captive power plants
- End-shield mounted generators for diesel engines up to 10 MW
- 4 MW/ 11 kV/ 16P Vertical Cooling Water Pump Motor (CWP) for Thermal Power Plant
- Complete series certification of Flameproof motors by CCOE & BIS upto 1300 kW SCIM
- 4.7 MW/ 11 kV/ 20 P vertical synchronous motor for CWP application
- TEFC (IC411) motors up to 560mm centre height in safe area, Ex'eb' & Ex'ec' applications
- Low voltage Permanent Magnet Motors and High Frequency Converters



Main Motor Generator (MMG)



4 MW, 11 kV, 16 P Vertical Pump Motor



Permanent Magnet Reserve Propulsion Motor



Permanent Magnet Frequency Converter



[www.bhel.com](http://www.bhel.com)

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