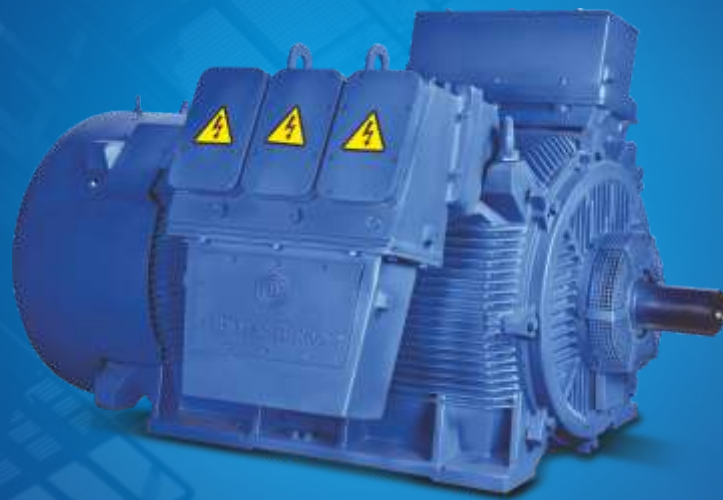


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 Bharat Bijlee



# HIGH VOLTAGE MOTORS FOR ALL APPLICATIONS

## BHARAT BIJLEE TEFC HIGH VOLTAGE INDUCTION MOTORS

This product literature covers Bharat Bijlee's high voltage three phase squirrel cage induction motors range for general industrial application. These motors are manufactured using Bharat Bijlee's tried and tested DCCA technology, offering high performance and better reliability with the use of dual cooling circuits.

These motors are suitable for use in various industrial sectors such as Power Generation, Mining, Chemical, Cement, Iron and Steel, Paper and Pulp, Water, Waste Water treatment etc. The motors can serve various applications such as Pump, Compressor, Conveyor, Mill, Fan, Blower, etc.



### PERFORMANCE

- 01 High efficiency and power factor
- 02 Optimized heat dissipation
- 03 Magnetic slot wedges to reduce iron loss and no-load current
- 04 Axial ventilated design to reduce temperature gradients

### RELIABILITY

- 01 Vacuum Pressure Impregnated stator
- 02 Optimum designed frame size
- 03 Class 'F' insulation. Temperature rise < Class B

## Technology

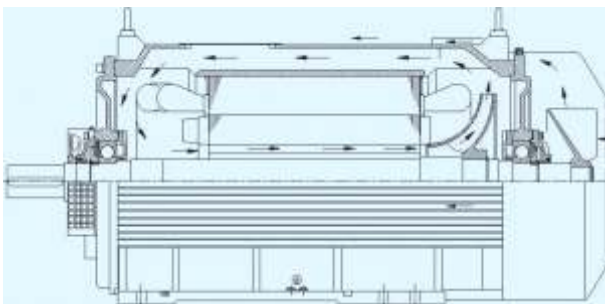
Dual Circuit Cooling Arrangement (DCCA) is new efficient cooling system used by Bharat Bijlee for all its High Voltage motors in frame 315 and above. This technology consists of two independent cooling systems which improves the overall cooling of the motor.

The primary cooling circuit is the regular stator casing with cooling fins. The shaft mounted external fan blows air over the body fin and cools the motor by forced convection and radiation.

The secondary internal cooling circuit consists of rotor with vent holes, an impeller and ventilating passage on the stator body. The air inside the motor is circulated by the impeller which passes through the ventilating passage where it gets cooled on its way from non driving end to the driving end by the primary circuit. This cool air then passes over the DE overhangs and through the rotor vents to the non driving end and on its way absorbs heat from the overhangs and from the rotor. This heated air again passes through the impeller to the ventilating ducts and the cycle repeats.

### The advantages of this technology are:

- Better heat dissipation resulting in lower temperature rise of the winding
- Reduced temperature gradient between DE and NDE sides of the winding on account of uniform distribution of heat
- Enhanced insulation life due to lower hot spot temperature for the same (average) temperature rise by resistance
- Increased motor reliability due to lower driving end bearing temperatures and lower hot spot temperatures
- Reduction in motor size making the transportation & installation easier and saving on space



Dual Circuit Cooling Arrangement

## Product Range

Type	Frame Size	kW range
MV	315F to 450L	160kW to 1000kW

## Standards

The motors comply with all the applicable IS and IEC standards for industrial use in safe areas.

They also comply with various industrial standard specifications such as CBIP, EIL, IP55 etc.

## Supply Conditions (Voltage & Frequency)

Voltage	:	690, 3300 and 6600 Voltage
Variation	:	±10%
Frequency	:	50Hz
Frequency variation	:	±5%
Combined variation	:	± 10%

Motors can be offered with any combination of voltage ranging from 690V to 6600V and frequency of 50Hz or 60Hz or other frequencies on request.

## Ambient

Standard motors are designed for an ambient temperature of 40° C. Motors can be offered for higher ambient temperatures on request.

## Altitude

Motors are designed for an altitude of up to 1000m above mean sea level. Motors can be offered for higher altitudes on request.

## Method of Starting

Motors are suitable for Direct Online (DOL) starting. They are also suitable for starting at 80% of the rated voltage for most popular applications. Customers are requested to furnish torque speed curve and inertia of their application so that suitability is checked and confirmed.

## Starting Time and Duty Cycle

Motors are designed for continuous duty - S1. Motors suitable for other duties can be offered on request. Motors are suitable for 1 hot or 2 cold starts under normal loading and starting conditions. Motors suitable for other severe starting conditions such as high load inertia, additional number of starts and stops, intermittent duty etc. can be offered on request.

## Insulation and Endurance

The Motors are provided with class F insulation scheme with temperature rise limited to class B limits. Motors can be provided with class H insulation on request.

### Winding and Insulation

The motors have diamond shaped Mica polyester PET formed coils made from mica-paper covered insulated rectangular copper conductors and are generally connected in star. The complete formed coil is insulated with a combination of mica glass and mica polyester tapes. The mica covering on conductors provides resistance against corona, unlike with enamel or glass covering ensuring capability to withstand fast surges due to AC drives or re-striking transients.

The insulation system is Epoxy and Mica based Resin Poor type with Vacuum Pressure Impregnation (normally called as VPI type) using reconstituted porous mica paper tapes to build adequate thickness and electrical and mechanical strength. The mica paper in the tapes is supported by glass/polyester with small quantity of binder. When the wound core is impregnated under vacuum and pressure cycles for full impregnation in epoxy resin and cured, the winding gets very high electrical and mechanical strength and becomes resistant to humidity and chemicals.

The system meets the requirements of IEC 60034-15 as applied to coils of high voltage motors i.e. Surge withstand capacity between conductor and earth-31kV peak for waveform 1.2/ 50 microsecond and rated steep front impulse withstand voltage of 20kV peak 6.6kV motor coils.

Motors are suitable of 150% rated voltage during bus transfer, due to the phase difference between the incoming voltage and residual voltage. Motors can be offered suitable for inverter duty application after checking the expected rise time and amplitude of the surge at motor terminals which varies depending on cable length and inverter characteristics.



**Thermal Protection** All motors are provided with 6 simplex or duplex PT100 platinum RTD's for winding temperature detection.

Both DE-acid NDE bearings are provided with simplex or duplex PT100 Platinum RTD's for bearing temperature detection.

Additional RTD's, Duplex RTD/BTD, indicating type dial type thermometer with alarm and trip contacts for bearing temperature monitoring can also be provided on request.

### Earthing Terminals

Two earthing terminals are provided on the body and one terminal each is provided in the main and neutral terminal box. Grounding pads are also provided on the terminal box and adaptor box.

### Anti-condensation Method

Built in space heaters are provided in order to avoid condensation of water.

### Enclosure Material

Frame	Enclosure Material
315F	Fabricated MS body with Fabricated end shields
355L/K	Cast Iron (CI) body with CI end shields
400L	Fabricated MS body with CI end shields
450M	Fabricated MS body with CI end shields
450L	Fabricated MS body with CI end shields

### Cooling

The method of cooling is IC411 as per IS: 6362-1995 (IC4A1A1 as per IEC 34-6:1991).

Forced cooling arrangement (IC416) can also be provided based on the application requirement on request.

Special bearing cooling fan arrangement is provided at DE to reduce bearing temperature and increase bearing life.

### Construction

The motors can be offered in B3, V1 and B3/B5 construction as per IS: 1231/2253/8223.

### Degree Protection

All motors and terminal boxes have IP55 degree of protection as per IS/IEC 60034-5. Higher degree of protection such as IP56, IP65/1P66 can be provided on request.

### Bearings

Motors have single row deep groove ball bearings of SKF/ FAG or other reputed make as given in table below.

Frame Size		Bearing	
		DE	NDE
315F	2P	6322/C3	6322/C3
	4P		
	6P		
355L/K	2P	6319/C3	6319/C3
	4P		
	6P	6322/C3	6322/C3
	8P		
400M/L	2P	6324/C3	6322/C3
	4P		
	6P	6324/C3	6322/C3
450M/L	4P		
	6P	6326/C3	6326/C3
	8P		

Motors can also be provided with insulated bearing and/or with cylindrical roller bearing (NU) on request. The motors are suitable for 40,000 hours of L<sub>10</sub> bearing.

### Grease

Bearings are lubricated with LGMT3 grease of SKF make. Special high temperature grease can be provided on request.

Motors have arrangement for on line re-greasing. A grease sump is provided for expelled grease at DE/NDE.

### Method of Coupling

Standard motors are suitable for direct drive through flexible couplings with no external thrust on motor bearings. However, suitable bearing and shaft arrangement may be offered for pulley drive or other methods of coupling for which please contact sales office.

### Rotor

All motors have dynamically balanced aluminum pressure die cast rotors. Motors can also be provided with copper rotor bars on request.

### Shaft

Shafts are made of ultrasonically tested EN8 or EN19 material. Shafts with special grade of material and/or special shaft extensions can be provided on request.

### Balancing and Vibration

All motors have rigid rotors which are dynamically balanced with half key. All motors conform to N (normal) class of vibration according to IS: 12075.

Reduced or special class of balancing can also be provided on request.

### Paint

All motors are painted with acrylic RAL 5000 paint. Motors can be offered with paint having different base (epoxy polyurethane etc.), different shade, or special scheme on request.

### Mounting

Motors can be offered with B3, V1 and B3/B5 mounting. The mounting dimensions conform to IEC 60072-1 and IEC 60072-2 for foot mounted motors.

Motors with other non standard mountings may be offered on enquiry.

### Terminal Box

Motor have M.S. fabricated high voltage main terminal box A separate neutral box can be provided on the opposite side of the main terminal box for star connection. Alternatively a phase segregated neutral terminal box can also be provided on request. Phase segregated terminal box is suitable to withstand three phase to earth internal fault of 500MVA, 44kA for 0.25sec at 6.6kV.

The main and the neutral terminal boxes are capable of rotation in steps of 90 or 180 degrees and their locations are interchangeable.

Two separate auxiliary terminal boxes are provided for termination of space heater and RTD terminals.

The PSTB (phase segregated TB) can be provided with a non magnetic gland plate in order to avoid localized heating on request.



Non Sparking Categories construction Motors (Ex"n") as per IS/IEC 60079-0:2007 & IS/IEC 60079-15:2005 can be provided based on Customer requirement.

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