

LOW VOLTAGE MOTORS

0.12kW to 1250kW



Hazardous Area Motors

Over the last 67 years, we have become a reflection of the strength and purpose that today represent Indian Industry and its growing power internationally. Bharat Bijlee has evolved from a pioneer of electrical engineering in India to one of the most trusted names in the industry. Our portfolio of products and services includes Power Transformers, Projects, Motors, Drives and Elevator Systems and caters to a spectrum of industries and the builders of the nation's infrastructure: Power, Refineries, Steel, Cement, Railways, Machinery, Construction and Textiles.

Our products must perform faultlessly and we must fulfill the most demanding delivery schedules. We value innovation and are proud of the customer - centric outlook that enables us to develop specialised solutions for a wide range of utility and industrial markets. Our plant near Mumbai & our extensive network of Sales and Service offices are integrated by enterprise - wise management and information systems. Technology and innovation coverage to offer our customers integrated solutions that meet their specific needs. We are growing; expanding both our manufacturing range and capacities, venturing into related diversifications and exploring new markets with new partners.



Transformers



Projects



LT Motors
0.12kW to 1250 kW, up to 690V



MV Motors
160kW to 1000kW, up to 6.6kV



Drives



Elevator Systems

**Complete range of BBL motors from frame 56 to 450
(0.12kW to 1250kW) suitable for all applications across industries.**



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PRODUCT RANGE

Bharat Bijlee manufactures a complete range of three phase squirrel cage induction motors.

Motor Type	Frame	Power (kW)	Polarity	
Standard Motors	63 to 355	0.18 to 315	2, 4, 6, 8	
IE2 Motors	71 to 355	0.37 to 375	2,4,6	
Large LT Motors(DCCA)	355 to 450	280 to 1250	2, 4, 6, 8	
Standard Flame Proof Motors	80 to 280	0.37 to 90	2, 4, 6, 8	
IE2 Flame Proof Motors	80 to 315	0.37 to 200	2, 4, 6	
Non - Sparking Motors	63 to 400	0.12 to 560	2, 4, 6, 8	
Increased Safety Motors (For details, please contact our Sales Office)	63 to 450		2, 4, 6, 8	
Crane & Hoist Duty Motors	71 to 355	0.37 to 400	4, 6, 8	
Brake Motors	71 to 132	0.25 to 9.3	2, 4, 6, 8	
Slip ring Motors	100 to 160	1.1 to 10	4,6	
Textile Motors - Ring Frame	100 to 160	1.1 to 15	4	
Cane Unloader Motors	160 to 225	11 to 30	6	
Marine Duty Motors	63 to 450	----	----	
Roller Table Motors	As per requirement	----	----	
Railway Auxilliary Motors	As per requirement	----	----	
Medium Voltage Motors	355 to 450	160 to 1000	2,4,6,8	

Flame Proof Induction Motors

Product Range

Motor type	Series Type	Frame size	kW range
Standard Flame Proof Motors – Ex (d)	Standard (MD)	80 to 280M	0.37 TO 90
High efficiency IE2 series Flame Proof Motors – Ex (d)	IE2 (2J)	80 to 315L	0.37 TO 200

Reference Standards

All motors comply with following Standards, viz.:

IS/IEC 60079-0:2004	Electrical apparatus for Explosive gas atmosphere-Part 0 General Requirements
IS/IEC 60079-1:2007	Electrical apparatus for Explosive gas atmosphere-Equipment protection by flame proof enclosures "d"
IS 5572:2009	Classification of Hazardous areas (other than mining) having flammable gases and vapors for electrical installations.
IS 5571:2009	Guide for selection and installation of electrical equipment for hazardous areas (other than mines)
IS 325	Three Phase Induction motor-specifications. (For Standard TEFC SCR Motors)
IS 12615:2011	Energy Efficient Induction Motors - Three Phase Squirrel Cage (For IE2 Series Motors)
IS 4029	Guide for testing three phase induction motors (For Standard TEFC SCR Motors)
IS 4889	Methods of determination of efficiency of rotating electric machines (For Standard TEFC SCR Motors)
IS 15999 - (Part2/Sec 1):2011	Standard Methods for determining Losses and Efficiency from Tests. (For IE2 Series Motors)
IS/IEC 60034-1	Rotating Electrical Machines - Rating & Performance
IS /IEC 60034-5	Degree of protection provided by the integral design of Rotating Electrical Machines (IP code) : classification
IS 6362 / IEC 60034-6	Designation of method of cooling for Rotating Electrical Machines / Method of cooling (IC code)
IS 12065 / IEC 60034-9	Permissible limits of noise level for Rotating Electrical Machines
IS 12075:2008	Mechanical Vibration of Rotating Electrical Machines

IEC 60072-1:1991	Dimension & Output rating of Rotating Electrical Machines
IS 900:1992	Code of practice for installation and maintenance of induction motors
IS 1231:1974	Dimensions of Foot Mounted AC Induction motors
IS 2223:1983	Dimensions of Flange mounted AC Induction motors

Hazardous Areas

Hazardous areas are defined as areas where explosive atmosphere is present, or may be expected to be present, in quantities such as to require special precautions for the construction, installation and use of equipment.

The decision as to whether an area is hazardous as per the relevant regulations and specifications rests entirely with the user, or in case of doubt, with the competent inspecting authority.

IS 5572:2009 classifies the hazardous areas into three zones, depending on the frequency and duration for which dangerous concentrations are likely to be present.

Classification of Hazardous Areas (Gases and Vapors) and selection of Electrical Equipment

Classification of these zones and selection of electrical equipment is as under.

Zone	Classification of area as per ref. std. IS 5572:2009	Selection of electrical equipment based on ref. std. IS 5571:2009
Zone '0'	An area in which Hazardous atmosphere is continuously present.	Generally, use of electrical equipment is to be avoided. But when this is not practicable, Intrinsically safe or pressurized electrical equipment to be used.
Zone '1'	Hazardous atmosphere is likely to be present under normal operating conditions.	For this area, electrical equipment used, must be in flame proof enclosure type Ex (d) conforming to IS/IEC 60079-1.
Zone '2'	In this area hazardous atmosphere is likely to be present only under abnormal operating conditions and for a short period.	Apparatus with type of protection Ex (e) in accordance with IS/IEC 60079-7 may be used without any special enclosure. Apparatus having type of protection Ex (nA) in accordance with IS/IEC 60079-15 are also permitted for use.

Temperature Class

The ignition temperature of the gas classified as T1 to T6 is as under:

Temp. Class as required by the area classification	Ignition Temperature of gas or vapor in °C	Allowable temperature classes of equipment
T1	>450	T1 – T6
T2	>300	T2 – T6
T3	>200	T3 – T6
T4	>135	T4 – T6
T5	>100	T5 – T6
T6	>85	T6

The maximum surface temperature under the worst operating condition must not exceed the ignition temperature of gas.

The maximum surface temperature refers to that surface which is coming in contact with the explosive gas.

In case of Flame Proof Ex(d) Motors, this refers to external surface temperature whereas in case of Non sparking Ex (nA) motors, this refers to the internal temperature as well.

Temperature Class of Bharat Bijlee Motors

Frame Size		Temp Class
IEC frame size	BBL frame size	
80	MJ 80	T6
90	MJ 90	T5
100	MJ 100	T5
112	MJ 112	T5
132	MJ 132	T5
160	MJ 160	T5
180	MJ 180	T5
200	MJ 200	T5
225	MJ 225	T5
250	MJ 250	T4
280	MJ 280	T4
315	MJ 315	T4

Classification of Hazardous Gases

Hazardous Gases have been classified in IS/IEC 60079-1 and are associated only with flame proof enclosures.

Bharat Bijlee Flame proof motors are offered suitable for gas Gr. I, IIA and IIB only. Additionally, frame MJ132 is suitable for gas group IIB + H₂ (Hydrogen).

List of hazardous gases, their group specification and ignition temperatures have been specified in IS/IEC 60079-20. Some of the gases are listed in the following table.

Gas Group	Gas or Vapor	Temp. Class	
I	Methane (firedamp)	T1	
IIA	Industrial Methane*	T1	
	Carbon monoxide	T1	
	Decane	T3	
	Xylene	T1	
	Methyl acetate	T1	
	Hexane	T3	
	Heptane	T3	
	Iso-octane	T2	
	Propane	T1	
	Butane	T2	
	Benzene	T1	
	Cyclohexane	T2	
	Acetone	T1	
	Ethyl acetate	T1	
	Chloroethylene	T1	
IIB	Methanol	T1	
	Ethanol	T2	
	Butyl acetate	T2	
	1,3-Butadiene	T2	
	Ethylene	T2	
	Diethyl ether	T4	
	Ethylene oxide	T2	
	Coke-oven Gas	T1	
	IIC	Hydrogen	T1
		Acetylene	T1

***Note:** Industrial Methane includes Methane mixed with not more than 10% volume of Hydrogen.

Statutory Approvals and Licenses

Motors used in hazardous areas need statutory approvals from various statutory authorities depending upon their area of jurisdiction before marketing. Statutory / Licensing authorities accord their approval / License based on the test reports issued by their recognized test houses such as CIMFR Dhanbad, ERTL (East) Kolkata etc.

Statutory Authority	Scope	Area of Jurisdiction
Central Institute of Mining & Fuel Research CIMFR Dhanbad (formerly CMRI)	Testing & Certification	-
Electronics Regional Test Laboratory ERTL (East) Kolkata	Testing & Certification	-
Directorate General of Mines Safety DGMS Dhanbad	Approving	Coal mines & Oil mines.
Petroleum & Explosives Safety Organization PESO Nagpur (formerly CCOE)	Approving	All areas where explosive liquids/ gases are stored & transported
Directorate General Factory Advice Service and Labour Institutes DGFASLI Mumbai	Approving	All areas where explosive liquids/ gases are Processed.
Bureau of Indian Standards BIS	Licensing	-

All Flame Proof Motors have License mark IS/IEC 60079-1:2007.

DGMS identification mark is mandatory for motors used in coal mines & oil mines.

Electrical Features:

Standard operating Conditions

Supply conditions (Voltage & Frequency)

Voltage : 415 V \pm 10%

Frequency : 50Hz \pm 5%

Combined variation : \pm 10%

(absolute sum with max frequency variation 5%)

Ambient

Motors are designed for ambient temperature of 45°C as mentioned in the performance table.

Higher ambient temperature motors can be offered on request.

Altitude

The motors are designed for an altitude up to 1000m above mean sea level.

Motors suitable for higher altitude can be offered on request.

Re-Rating Factors

The Re-Rating factors applicable under different conditions of supply voltage, frequency, ambient and altitude are obtained by multiplying rated output kW by following factors.

Variation in Supply Voltage & Frequency

Voltage Variation %	Frequency Variation %	Combined Voltage & Frequency (%)	Permissible output as % of rated value
\pm 10	\pm 5	\pm 10	100
\pm 12.5	\pm 5	\pm 12.5	95
\pm 15	\pm 5	\pm 15	90

Variation in Ambient & Altitude

Amb. Temp. °C	Permissible output as % of rated value	Altitude above sea level (m)	Permissible output as % of rated value
-	-	1000	100
-	-	1500	97
<30	107	2000	94
30-45	100	2500	90
50	96	3000	86
55	92	3500	82
60	87	4000	77

Method of Starting

Bharat Bijlee Motors are suitable for following methods of starting.

kW rating	Method of starting	No. of Leads
Upto & including 1.5 kW	DOL	3 (Internal star connection)
Above 1.5 kW	DOL or Star/Delta	6

Starting current measurement of Bharat Bijlee motors

Induction motor starting current is generally 6 to 7 times the full load current of the motor. This is a characteristic feature of the motor and though undesirable, it is inevitable in the design of the motor.

Measurement of this starting current at rated voltage becomes difficult since it demands higher capacity of the supply system as well as use of appropriate CTs in the circuit of meters. Generally a fraction of rated starting current is passed in the motor due to capacity constraints. This current is extrapolated to rated voltage. If this measurement is done at higher voltage then the estimated starting current is more accurate.

kW Range	Measurement at % of voltage to rated voltage
0.12 kW to 90 kW	70%
90 kW to 200 kW	60%
200 kW to 355 kW	35%
355 kW to 560kW	25%
560kW and above (with rated voltage 690V or higher)	25%

Duty, Starting Time & Number of Consecutive Starts

Motors are designed for continuous (S1) Duty. Other types of duty (S2 to S9) can be offered on request. For load $GD^2 \leq \text{Motor } GD^2$, the motors can safely withstand 3 consecutive starts from cold condition & 2 consecutive starts from hot condition. In application where more severe starting conditions are encountered, a special enquiry should be made to our Sales Office. e.g.

- Drives with high inertia e.g flywheel drives, eccentric presses, large fans etc.
- Drives involving intermittent duty of motors with frequent starts e.g. rolling mills, centrifuges and conveyor motors, etc.

The enquiry should be accompanied with following information.

- GD^2 and relevant speed of driven equipment
- Duty cycle / sequence of operation / no. starts / hour
- Speed-Torque diagram of driven equipment
- Method of braking (Electrical or Mechanical)
- Method of starting
- Method of coupling

Motors for Intermittent Duty

Motors required for intermittent duty (S3 or S4) application (crane or hoist) can be supplied in frame sizes MJ80 to MJ132. BBL has acquired necessary statutory certification for this. However please note that efficiency class is not applicable to these motors. Please refer to our sales office for further details.

Insulation and Endurance

The motors are provided with class F Insulation system with temperature rise limited to class B.

All insulating materials used are adequately resistant to the action of microbes and fungi. Gel coat is applied on winding overhangs as an additional protection, against ingress of moisture.

Standard Winding

- Motors are wound with modified polyester enamel covered (IS 13730: Part 3 Thermal class 155) copper wires and are flood impregnated.
- Gel coat is applied on winding overhangs as an additional protection against ingress of moisture.

Insulation for Converter Fed Motors

- The stators are wound with polyesteramide coated with polyamide-imide top coat, (dual coated) wires as per IS 13730: part 13, thermal class 200 copper wires.
- Vacuum Pressure Impregnation (VPI) is provided to windings on request.
- Depending on the voltage wave rise time (dv/dt) and the maximum peak to peak voltage at the motor terminals, suitable insulation schemes are provided on request.
- On customer's demand, insulated bearings are offered from frame size 160 and onwards on the non driving end side of the motor.

Options (On request)

- Class 'H' insulation.
- VPI for frame 80 to 280M.
- Winding with dual coated wires.

Thermal Protection for Winding

PTC Thermistors can be embedded in stator winding on request.

Earthing Terminals

Two earthing terminals are provided, one on each motor foot. Also, two earthing terminals are provided in the terminal box.

Anti-condensation Method

Motors can be offered with built in space heaters in frame sizes 90 and above. For 315 frame, space heaters are provided as a standard feature.

Mechanical Features

Enclosure

The motors are offered with totally Enclosed Fan Cooled (TEFC) construction. All foot mounted motors are with integral feet construction.

The frame, end shields, terminals boxes and bearing covers of all motors are made of grey cast iron.

These motors are so designed that the frame temperature will remain below the ignition temperature of gas-air mixture involved.

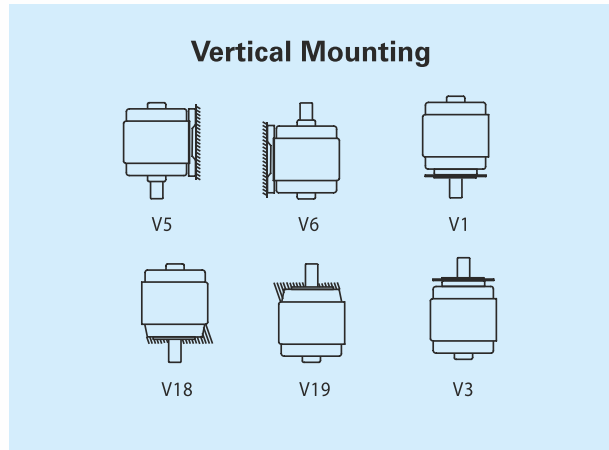
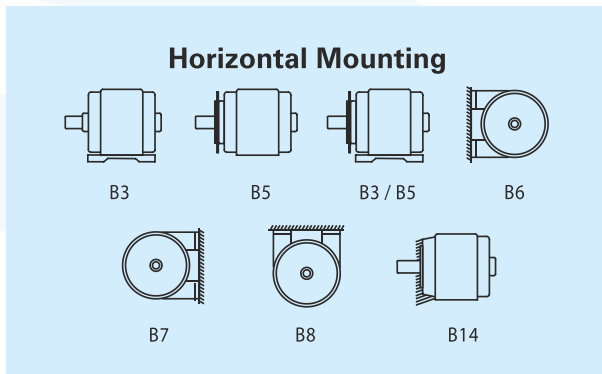
All cast iron parts forming flame proof enclosures are subjected to hydraulic pressure test, after final machining as per IS/IEC 60079-1.

Type of Construction

Standards motors are designed for foot mounting (B3). These are also suitable for B6, B7, B8, V5 and V6 mounting without any change.

Motors can be supplied in Flange mounting (B5). These are also suitable for V1 and V3 mounting without any change.

Mounting



Cooling

All motors are totally Enclosed Fan cooled (TEFC). The cooling is effected by self-driven, bi-directional cast iron or fabricated centrifugal fan protected by fan cover. The type of cooling is IC 411 as per IS 6362/IEC 60034-6.

Minimum cooling distance as indicated in GA drawing has to be provided for effective cooling of the motor.

Note: For more details, refer to annexure I on page no.120.

Degree of Protection

All motors have IP55 Degree of protection as per IS/IEC 60034-5. Higher degree of protection can be provided on request. All flanged motors are additionally provided with oil tight shaft protection on driving end side. A drain plug is not permissible in FLP motors.

Note: For more details, refer to annexure II on page no. 121.

Bearing and Terminal Box Details

Frame Size	Bearing Nos. C3 Clearance		Terminal Box Type/ Location	Terminal		Cable entries No. & size in**	Max cond Cross Sec. area mm ²
	DE	NDE		Nos	Size		
80	6204 2Z	6204 2Z	MJ80/TOP	3	M5	1 x M20	4
90	6205 2Z	6205 2Z	MJ132 /TOP	3/6 *	M6	1 x M25	6
100	6206 2Z	6206 2Z					16
112	6206 2Z	6206 2Z					50
132	6308 2Z	6308 2Z					70
160	6209 2Z	6209 2Z	MJ200/TOP	6	M8	2 x M32 2 x M40	150
180	6310 2Z	6310 2Z					240
200	6212 2Z	6212 2Z	MJ280/TOP	6	M12	2 x M50	150
225	6213	6213					240
250	6215	6215					240
280	2P	6316	MJ315/TOP	6	M16	2 x M63	240
	4,6 & 8P	6317					
315	6319	6319	MJ315/TOP	6	M16	2 x M63	240

*3 Terminals up to & including 1.5 kW & 6 terminals for higher kW Outputs.

**Cable entries other than those mentioned in the table can be offered subject to availability of statutory approval

Note: L10 bearing life is 50,000 hours for directly coupled loads through flexible couplings only.

Alternate T. Box Location

Frame Size	T. Box Location
112 & 132	RHS Only
160 to 315	RHS or LHS

Roller Bearing and Insulated Bearing

Motors with insulated bearing on NDE side can be offered from frame size 132 & above on request.

Motors can also be offered with cylindrical roller bearing (NU) on DE side for frame sizes 132 and above on request.

Bearing Lubrication

Sealed bearing (ZZ) are filled with grease Unirex N3-ESSO. Others are filled with SKF LGMT3 of SKF make. Special high temperature grease can be provided on request.

On line Greasing

On line greasing arrangement is provided in frame sizes 225 and above. For frame sizes 180 and 200L it can be provided on request.

Bearing	Pole	Re-lubrication	
		Quantity (g)	Interval (Hrs)
6213	2	120	3200
	4		9000
	6		15000
	8		21000
6215	2	150	2800
	4		8200
	6		10000
	8		18000
6316	2	180	2000
6317	4		7500
	6		13000
	8		17500
6319	2	220	2000
	4		5000
	6		7500
	8		10000

Separate T. Box for Thermister / Thermostat / Space Heater

Only one separate T. Box either for Thermister / Thermostat or Space Heater can be offered from frame size 200 to 280. In such cases the Main terminal box location will be either on RHS or LHS only.

In case of 315 frame, separate space heater terminal box will be provided as a standard feature. One separate T. Box for thermister can be offered on request.

Cable Entries

Motors for mining application (i.e. Coal mines and oil mines) are provided with cable entries with compound filling sealing boxes suitable for Paper Insulated Lead Covered Double Wire Armored (PILCDWA) PVC Cables. Cable entries with flame proof glands can also be provided to suit PVC armoured cables (For application in hazardous

area Gas Group IIA and IIB only). A cable sealing box is mandatory for all motors for use in Coal Mines and Oil Mines.

Rotors

All motors are fitted with dynamically balanced aluminum pressure die cast squirrel cage rotors.

Shaft

All motors are provided with single shaft extension in accordance with IS: 1231. The shaft material is C40 (EN8) steel. However, special shaft extension and /or special shaft material e.g. EN24 or stainless steel, is provided on request.

Balancing and Vibration

Rotors are dynamically balanced with a half key in the shaft extension.

The balancing grade is G2.5 as per ISO:1940.

Vibration grade is 'Normal grade' conforming to IS: 12075:2008. Other grades as per IS 12075:2008 or IEC 60034-14 can be provided on request.

Note: For more details, refer to annexure VIII on page no. 131.

Direction of Rotation

All motors are suitable for bi-directional rotation.

Lifting Arrangement

All motors are provided with lifting hooks. When two or more hooks are provided, all hooks to be used simultaneously for lifting the motor.

Noise Level

Motors are designed for noise level well below the limits specified in IS: 12065 and IEC 60034 - 9.

Note: For more details, refer to annexure IV on page no.123.

Paint

All motors are given a special treatment of primer and paint to internal as well as external surface. All external surfaces are coated with epoxy polyamide base acid/alkali resistant paint of dark Admiralty Grey Shade (No. 632 as per IS: 5)

Name Plate

Stainless steel name plate is provided on each motor. Special data such as efficiency class, starting current, starting torque, gas group, temperature class and statutory approval references are also provided with usual name plate details.

Packing

Motors are packed in wooden packing boxes. Export packing / sea worthy case for home market (without fumigation certificate) is also available on request.

Shipping Dimension

FRAME	TYPE REF	PACKING BOX DIMENSIONS			MOTOR GROSS WEIGHT IN Kg
		LENGTH	WIDTH	HEIGHT	
80	2J080453G	440	440	310	34
90L	2J09L653G	510	470	340	51
100L	2J10L233G	510	310	510	66
112M	2J11M653G	510	310	510	73
132M	2J13M693G	610	330	550	118
160ML	2J16L293G	790	440	540	216
180L	2J18L633G	790	460	690	267
200L	2J20L253G	940	540	690	408
225SM	2J22M643G	920	540	790	534
250M	2J25M4A3G	1100	660	820	696
280SM	2J28M453G	1220	660	890	860
315SM	2J31M653G	1300	870	1000	1,120
315L	2J31L6B3G	1500	870	1003	1,625

Special Features

- Sturdy housing that prevents an internal explosion from spreading to the external environment and also resists the explosion pressure.
- Robust bearing shields and caps bolted to the frame in a manner where the gaps remain unaffected in the event of an internal explosion.
- Screen on air intake with a mesh size not exceeding 8mm.
- External two earth terminals on motor feet.
- Protective earth conductor terminal in the terminal box.
- Ex (d) mark on the motors.
- CIMFR certificate no, PESO, DGFASLI certificate no. and BIS License mark on the name plate. Special DGMS mark plate is provided with DGMS approval no. in case of motors to be used in coal mines or oil mines.
- Special varnishing and painting treatment to resist highly corrosive atmosphere.
- All vertical mounted motors will be provided with 3 lifting lugs.

Special Maintenance Care During Operation

Each motor must be provided with protective circuit breaker or an equally effective device.

In order to maintain safety protection, the following care must be taken on site during operation;

- The joint faces must not be re-machined nor finished or coated with varnish or paint. The surfaces must be kept metallically clean. A thin film or oil grease must be applied as protection against rust. The use of gaskets at point where there were originally none, is not permitted.
- Defective mounting screws and bolts must be replaced promptly by new ones of a material with at least the same tensile-strength as the original ones.

- Care should be taken to see that all screw, bolts, nuts etc. used for fixing the parts of flame proof enclosure are provided with spring washer wherever originally supplied, to prevent them from getting loose due to shocks and vibration during operation.
- Enough ventilating space must be provided for efficient cooling of the motor. Refer GA drawing given in the catalogue.

Industrial Applications

- Coal Mines
- Petro Chemicals & Chemicals
- Oil Mines & Rigs
- Fertilizers
- Solvent Extraction Plant
- Paints & Varnish Industry
- LPG Bottling Plants
- Agro Chemicals
- Drugs & Pharmaceuticals
- General Industry

Special Design Features Available

- Dual Voltage (550/1100V) with 9 terminal connections as per NCB 625
- Non standard voltage and frequency variation
- Dual Voltage (1:2 or 1:3 ratio)
Triple Voltage (1:3:2 ratio)
- Energy Efficient Motors (Ie2)
- 10,12,16,18,24,32 pole motors
- Special performance requirements
- Class H insulated motors
- Low vibration and noise level
- Special Bearings
- Special Shaft Material
- Canopy
- Flange/Foot cum Flange mounting
- Space Heater, Thermisters
- Multispeed Motors
- Double/ taper/non standard shaft extension
- Non Standard paint Shade
- Motors fir use with variable frequency inverter supply

Effect of Converter (VFD) Supply Voltage on Motor Performance

Note : Refer to page no. 6, 7, 8, 9, 10 & 11 of Industrials Motors, Technical Information section.

Statutory Requirement for Flame Proof Induction Motors Fed with VFD Supply

Combined Testing of Flame Proof Motor and Converter:

Bharat Bijlee motors have been tested and approved by statutory authorities for given temperature class with sinusoidal supply. Since VFD supply contains more harmonics, temperature rise of motor increases on VFD supply. This leads to increase in surface temperature. Also, with the VFD, motor speed is varied. When motor speed is reduced, it leads to poor cooling and higher temperature rise. So the new temperature class needs to be verified by statutory authority.

IS 5571 (Guide for selection and installation of electrical equipment for hazardous areas - other than mines) or IEC 60079-14 (Explosive atmospheres - Part 14: Electrical installations design, selection and erection) is the selection guide for the user.

The statutory testing authorities insist that the motors intended for use in hazardous area, which are to be supplied with varying voltage and frequency by converter, shall be tested, certified, and approved in association with the converter to determine the temperature class / maximum surface temperature. The authorities give reference to IS 5571:2009 clause 10.6.1 (a) for this testing.

This is also mentioned in the international standard IEC 60079-14:2007 (Explosive atmospheres - Part 14: Electrical installations design, selection and erection), clause 10.6.1 (a).

Note:

1. Additional factors may also need to be taken into account, which include provision by the user of additional output filters or reactors and the length of cable between converter and motor. Both these affect motor input voltage and cause additional motor heating.
2. High frequency switching in converters can lead to rapid rise time voltage stress in the windings and cable circuits and therefore a further potential source of ignition. It is necessary to consider the effects of this stress according to the type of protection. It will be necessary to add an additional output filter after the converter.

3. Bearing currents require special consideration. Possible solutions include the use of insulated bearings, either alone, or in accordance with a filter that reduces common mode voltages and / or dv/dt.

Cable Length Between Motor and Converter

Whenever flame proof motor is fed through converter supply, converter is placed in safe area and motor is working in hazardous area. Hence the cable length is generally high, i.e. 500 to 800 meters long. For effective and trouble free operation of motor, use of filters (preferably sine wave filter) at converter output terminals is a must, when using such high cable length. The customer and / or his system integrator has to ensure that the voltage appearing at motor terminals is $\leq 1.56\text{kV}$.

Warranty clause of motor is applicable only if sine wave filter is provided at converter output terminals by the motor user.

Use of Thermal Protective Devices

Use of thermistors / thermostats is recommended to monitor the temperature rise of stator winding of motor.



STANDARD FLAME PROOF MOTORS

Performance table for standard Flame Proof (Ex d) 2 Pole motors TEFC 3 Phase Squirrel Cage Induction Motors - Frame size 80 to 315L

Voltage : 415V ± 10%
Frequency : 50Hz ± 5%
Combined Variation : ± 10%

Ambient : 45°C
Duty : S1 (Continuous)
3000 rpm (2-Pole)

Ins. Class : F
Temp. Rise : B
Protection : IP55

Rated Output		Frame size IEC	Frame size BBL	Type ref. B3 construction	Rated Speed RPM	Rated Current Amps.	Rated Torque kg-m	Operating characteristics at rated output				With DOL starting		Pullout Torque to Rated Torque Ratio	Rotor GD ² kgm ²	Net Weight B3 constr. kg		
kW	HP							Power Factor			% Efficiency		Starting Current to Rated Current Ratio				Starting Torque to rated torque ratio	
		FL	3/4L	1/2L	FL	3/4L	1/2L											
*0.37	0.5	80	MJ80	MD0802A3	2880	0.81	0.125	0.85	0.78	0.70	75.00	72.00	67.0	6.0	2.7	3.0	0.0037	31
*0.55	0.75	80	MJ80	MD0802B3	2860	1.24	0.187	0.82	0.74	0.62	75.00	73.00	68.0	5.5	2.7	3.0	0.0037	31
0.75	1	80	MJ80	MD080213	2830	1.65	0.258	0.82	0.74	0.62	77.0	76.0	72.0	5.0	2.5	2.8	0.0037	31
1.1	1.5	80	MJ80	MD080233	2840	2.36	0.377	0.82	0.75	0.63	79.0	79.0	76.0	5.9	2.7	3.0	0.0051	32
*1.5	2	90L	MJ90	MD091233	2825	3.01	0.517	0.86	0.83	0.76	80.6	78.0	74.0	5.5	2.7	3.0	0.0071	48
2.2	3	90L	MJ90	MD091253	2830	4.36	0.757	0.85	0.82	0.74	82.5	80.0	76.0	6.0	3.0	3.0	0.0093	50
3.7	5	100L	MJ100	MD101213	2900	7.12	1.24	0.85	0.80	0.70	85.0	83.0	78.0	6.5	2.8	3.0	0.0188	62
*5.5	7.5	132M	MJ132	MD13M233	2920	10.1	1.83	0.88	0.85	0.77	86.0	85.0	80.0	6.5	2.3	3.0	0.0690	104
*7.5	10	132M	MJ132	MD13M253	2920	13.6	2.50	0.88	0.84	0.76	87.0	86.0	82.0	6.5	2.5	3.0	0.0820	114
9.3	12.5	132M	MJ132	MD13M293	2920	16.5	3.10	0.89	0.85	0.76	88.0	86.0	83.0	6.5	2.4	2.9	0.0980	120
11	15	160M	MJ160	MD16M213	2920	19.3	3.67	0.89	0.87	0.83	89.0	88.0	86.0	5.8	2.0	3.0	0.134	145
15	20	160M	MJ160	MD16M253	2920	26.2	5.00	0.89	0.88	0.82	89.5	89.0	87.0	6.0	2.0	3.0	0.171	154
18.5	25	160L	MJ160	MD16L273	2920	31.6	6.17	0.90	0.88	0.86	90.5	90.0	88.0	6.5	2.0	3.0	0.225	168
*22	30	180L	MJ180	MD18L213	2930	37.6	7.31	0.89	0.87	0.80	91.5	90.5	88.0	6.5	2.2	2.7	0.300	220
30	40	200L	MJ200	MD20L233	2950	51.2	9.91	0.88	0.85	0.79	92.6	92.0	89.5	6.5	2.5	2.5	0.520	260
37	50	200L	MJ200	MD20L253	2945	62.9	12.2	0.88	0.85	0.79	93.0	92.5	91.0	6.5	2.5	2.5	0.610	320
45	60	225M	MJ225	MD22M233	2960	74.4	14.8	0.90	0.87	0.83	93.5	93.0	91.0	6.0	2.5	2.5	1.04	420
55	75	250M	MJ250	MD25M213	2960	89.1	18.1	0.92	0.91	0.86	93.3	92.8	91.5	6.0	2.1	2.6	2.11	570
75	100	280S	MJ280	MD28S213	2970	122	24.6	0.91	0.89	0.84	93.7	92.5	90.0	6.0	1.8	2.7	2.63	690
90	120	280M	MJ280	MD28M233	2970	146	29.5	0.91	0.89	0.84	94.0	93.0	91.0	6.0	1.8	2.7	3.01	740

All performance values are subject to tolerance as per IS 325

* These ratings are offered in higher frame size

**This rating is suitable for 40° C ambient temperatures

STANDARD FLAME PROOF MOTORS

Performance table for standard Flame Proof (Ex d) 4 Pole motors TEFC 3 Phase Squirrel Cage Induction Motors - Frame size 80 to 315L

Voltage : 415V ± 10%
Frequency : 50Hz ± 5%
Combined Variation : ± 10%

Ambient : 45° C
Duty : S1(Continuous)
1500 rpm (4-Pole)

Ins. Class : F
Temp. Rise : B
Protection : IP55

Rated Output		Frame size IEC	Frame size BBL	Type ref. B3 construction	Operating characteristics at rated output										With DOL starting		Pullout Torque to Rated Torque Ratio	Rotor GD ² B3 constr. kgm ²	Net Weight B3 constr. kg
KW	HP				Rated Speed RPM	Rated Current Amps.	Rated Torque kg-m	Power Factor			% Efficiency			Starting Current to Rated Current Ratio	Starting Torque to rated torque ratio				
						FL	3/4L	1/2L	FL	3/4L	1/2L								
*0.37	0.5	80	MJ80	MD0804A3	1415	0.97	0.255	0.76	0.7	0.58	70	68	64	4.5	2.4	2.6	0.0061	31	
0.55	0.75	80	MJ80	MD080413	1405	1.28	0.381	0.81	0.70	0.56	74.0	71.0	67.0	4.0	2.4	2.6	0.0061	31	
0.75	1	80	MJ80	MD080433	1405	1.74	0.520	0.78	0.70	0.58	77.0	76.0	72.0	4.5	2.8	3.0	0.0072	32	
*1.1	1.5	90L	MJ90	MD09S433	1410	2.45	0.760	0.80	0.73	0.61	78.0	77.0	72.0	4.2	2.3	2.7	0.0120	48	
1.5	2	90L	MJ90	MD09L453	1410	3.26	1.04	0.80	0.72	0.58	80.0	79.0	75.0	5.0	2.5	3.0	0.0160	50	
2.2	3	100L	MJ100	MD10L433	1420	4.55	1.51	0.82	0.69	0.53	82.0	80.0	76.0	5.5	2.5	3.0	0.0210	60	
3.7	5	112M	MJ112	MD11M433	1430	7.3	2.52	0.83	0.76	0.65	85.0	85.0	82.0	6.0	2.6	3.0	0.0530	70	
*5.5	7.5	132M	MJ132	MD13M433	1445	10.5	3.71	0.85	0.80	0.68	86.0	85.0	83.0	6.0	2.2	3.0	0.113	105	
7.5	10	132M	MJ132	MD13M473	1445	14.4	5.06	0.83	0.78	0.68	87.0	86.0	84.0	6.0	2.5	3.0	0.134	113	
9.3	12.5	160M	MJ160	MD16M4A3	1450	17.4	6.25	0.84	0.80	0.72	88.5	88.0	87.0	6.0	2.0	2.5	0.141	136	
11	15	160M	MJ160	MD16M4C3	1450	20.5	7.39	0.84	0.81	0.76	89.0	89.0	86.0	6.0	2.1	2.5	0.177	143	
15	20	160L	MJ160	MD16L4K3	1450	27.5	10.1	0.84	0.83	0.79	90.2	90.5	90.0	6.0	2.1	2.5	0.235	156	
*18.5	25	180L	MJ180	MD18L433	1460	33.2	12.3	0.85	0.82	0.72	91.2	91.2	90.0	6.0	2.4	2.5	0.460	215	
22	30	180L	MJ180	MD18L473	1460	39.2	14.7	0.85	0.82	0.72	91.8	91.5	90.0	6.0	2.4	2.5	0.540	230	
30	40	200L	MJ200	MD20L433	1465	51.6	19.9	0.88	0.84	0.77	92.0	92.0	90.0	6.0	2.6	2.5	0.860	305	
37	50	225S	MJ225	MD22S413	1470	63.6	24.5	0.87	0.83	0.75	93.0	93.0	91.0	6.0	2.5	2.5	1.32	380	
45	60	225M	MJ225	MD22M433	1470	76.3	29.8	0.88	0.84	0.75	93.2	93.2	91.0	6.0	2.5	2.5	1.60	430	
55	75	250M	MJ250	MD25M413	1475	93.8	36.3	0.87	0.85	0.78	93.8	93.3	91.5	6.0	2.5	2.6	2.83	570	
75	100	280S	MJ280	MD28S413	1480	126	49.4	0.88	0.87	0.81	94.2	94.0	93.0	6.0	2.1	2.5	5.00	705	
90	120	280M	MJ280	MD28M433	1480	150	59.2	0.88	0.87	0.81	94.7	94.3	93.2	6.0	2.1	2.5	6.00	725	

All performance values are subject to tolerance as per IS 325

* These ratings are offered in higher frame size

**This rating is suitable for 40° C ambient temperature

STANDARD FLAME PROOF MOTORS

Performance table for standard Flame Proof (Ex d) 6 Pole motors TEFC 3 Phase Squirrel Cage Induction Motors - Frame size 80 to 315L

Voltage : 415V ± 10%
Frequency : 50Hz ± 5%
Combined Variation : ± 10%

Ambient : 45°C
Duty : S1(Continuous)
1000 rpm (6-Pole)

Ins. Class : F
Temp. Rise : B
Protection : IP55

Rated Output		Frame size IEC	Frame size BBL	Type ref. B3 construction	Rated Speed RPM	Rated Current Amps.	Rated Torque kg-m	Operating characteristics at rated output				With DOL starting		Pullout Torque to Rated Torque Ratio	Rotor G'D kgm ²	Net Weight B3 constr. kg		
KW	HP							Power Factor		% Efficiency		Starting Current to Rated Current Ratio	Starting Torque to rated torque ratio					
								FL	3/4L	1/2L	FL	3/4L	1/2L					
0.37	0.5	80	MJ80	MD080613	910	1.08	0.396	0.70	0.60	0.48	68.0	66.0	61.0	2.1	3.0	2.3	0.0060	31
0.55	0.75	80	MJ80	MD080633	915	1.56	0.585	0.71	0.62	0.48	69.0	70.0	64.0	2.2	4.0	2.5	0.0084	32
*0.75	1	90L	MJ90	MD091633	925	1.99	0.790	0.72	0.61	0.50	73.0	70.0	69.0	2.0	3.4	2.5	0.0122	48
1.1	1.5	90L	MJ90	MD091653	930	2.8	1.15	0.72	0.61	0.50	76.0	74.0	72.0	2.1	4.0	2.6	0.0160	50
1.5	2	100L	MJ100	MD101633	935	3.72	1.56	0.72	0.64	0.52	78.0	75.0	72.0	2.0	5.0	2.5	0.0250	60
2.2	3	112M	MJ112	MD111M633	935	4.97	2.29	0.77	0.68	0.55	80.0	80.0	74.0	2.0	5.0	2.5	0.0500	67
*3.7	5	132S	MJ132	MD13M633	950	8.16	3.79	0.76	0.63	0.49	83.0	82.0	80.0	2.0	5.5	2.5	0.130	108
5.5	7.5	132M	MJ132	MD13M673	960	11.5	5.58	0.78	0.71	0.59	85.0	83.0	78.0	2.2	5.5	2.5	0.183	113
7.5	10	160M	MJ160	MD16M633	960	14.8	7.61	0.80	0.74	0.64	88.0	88.0	86.0	2.0	5.4	2.5	0.276	149
9.3	12.5	160L	MJ160	MD161663	960	18.4	9.44	0.80	0.74	0.64	88.0	88.0	87.0	2.1	5.5	2.5	0.340	160
11	15	160L	MJ160	MD161673	965	21.6	11.1	0.80	0.77	0.70	88.5	88.0	87.0	2.0	6.0	2.5	0.400	169
15	20	180L	MJ180	MD181613	965	29	15.1	0.80	0.75	0.62	90.0	90.0	87.0	2.6	5.5	2.3	0.680	210
18.5	25	200L	MJ200	MD201613	975	34	18.5	0.83	0.78	0.70	91.1	91.0	88.0	2.6	5.8	2.3	1.00	275
22	30	200L	MJ200	MD201633	975	40.3	22.0	0.83	0.77	0.68	91.5	91.0	88.0	2.6	5.8	2.3	1.20	290
30	40	225M	MJ225	MD22M623	975	52.1	30.0	0.87	0.84	0.76	92.0	91.0	88.0	2.3	6.0	2.2	2.10	430
37	50	250M	MJ250	MD25M603	975	63.2	37.0	0.88	0.85	0.82	92.5	92.5	91.0	2.5	6.0	2.3	3.51	560
45	60	280S	MJ280	MD28S613	980	81.1	44.7	0.83	0.80	0.70	93.0	92.5	92.0	2.5	6.0	2.3	5.11	615
55	75	280M	MJ280	MD28M633	980	96.3	54.7	0.85	0.81	0.72	93.5	93.0	92.0	2.3	6.0	2.3	6.16	665

All performance values are subject to tolerance as per IS 325
* These ratings are offered in higher frame size

STANDARD FLAME PROOF MOTORS

Performance table for standard Flame Proof (Ex d) 8 Pole motors TEFC 3 Phase Squirrel Cage Induction Motors - Frame size 80 to 315L

Voltage : 415V ± 10%
Frequency : 50Hz ± 5%
Combined Variation : ± 10%

Ambient : 45° C
Duty : S1(Continuous)
750 rpm (8-Pole)

Ins. Class : F
Temp. Rise : B
Protection : IP55

Rated Output		Frame size IEC	Frame size BBL	Type ref. B3 construction	Operating characteristics at rated output						With DOL starting		Pullout Torque to Rated Torque Ratio	Rotor GD ² kgm ²	Net Weight B3 constr. kg			
kW	HP				Rated Speed RPM	Rated Current Amps.	Rated Torque kg-m	Power Factor			% Efficiency	Starting Current to Rated Current Ratio				Starting Torque to rated torque ratio		
		FL	3/4L	1/2L	FL	3/4L	1/2L	FL	3/4L	1/2L								
*0.37	0.5	90L	MJ90	MD09L813	700	1.32	0.515	0.63	0.52	0.41	62.0	55.0	48.0	2.7	1.8	2.1	0.0110	46
0.55	0.75	90L	MJ90	MD09L853	690	1.81	0.776	0.63	0.55	0.43	67.0	62.0	58.0	2.9	2.0	2.4	0.0140	48
0.75	1	100L	MJ100	MD10L813	685	2.04	1.07	0.73	0.63	0.50	70.0	70.0	64.0	3.0	1.6	1.8	0.0230	55
1.1	1.5	100L	MJ100	MD10L833	690	2.91	1.55	0.71	0.62	0.48	74.0	73.0	71.0	3.3	1.9	2.3	0.0270	59
1.5	2	112M	MJ112	MD11M813	705	3.87	2.07	0.70	0.62	0.50	77.0	77.0	75.0	3.8	1.7	2.2	0.0510	65
*2.2	3	132M	MJ132	MD13M813	705	5.03	3.04	0.78	0.74	0.62	78.0	78.0	75.0	3.5	1.8	2.0	0.0990	100
3.7	5	160M	MJ160	MD16M813	720	8.05	5.01	0.78	0.74	0.65	82.0	82.0	78.0	4.4	1.8	2.0	0.217	137
5.5	7.5	160M	MJ160	MD16M833	715	11.6	7.49	0.78	0.74	0.65	84.5	84.5	82.0	4.8	1.9	2.2	0.299	151
7.5	10	160L	MJ160	MD16L873	710	15.6	10.3	0.78	0.74	0.65	86.0	84.0	82.0	5.5	2.1	2.2	0.400	167
*9.3	12.5	180L	MJ180	MD18L813	715	18.9	12.7	0.79	0.74	0.64	86.5	86.5	85.0	4.5	2.1	2.2	0.620	205
11	15	180L	MJ180	MD18L833	720	22.1	14.9	0.79	0.74	0.64	87.5	87.5	86.0	4.5	2.1	2.2	0.720	215
15	20	200L	MJ200	MD20L833	720	28.8	20.3	0.82	0.79	0.71	88.5	88.5	87.0	5.5	2.5	2.3	1.32	330
18.5	25	225M	MJ225	MD22M813	725	36.6	24.9	0.79	0.77	0.69	89.0	88.0	87.0	5.3	2.1	2.2	1.95	400
22	30	225M	MJ225	MD22M833	725	43	29.6	0.79	0.77	0.69	90.0	89.0	87.0	5.3	2.1	2.2	2.41	430
30	40	250M	MJ250	MD25M813	730	55.9	40.0	0.82	0.78	0.68	91.0	90.5	89.0	5.5	2.5	2.2	3.72	575
37	50	280S	MJ280	MD28S823	730	70.8	49.4	0.79	0.75	0.65	92.0	92.0	90.0	5.5	2.2	2.2	5.83	650
45	60	280M	MJ280	MD28M853	730	86.1	60.0	0.79	0.75	0.65	92.0	92.0	91.0	5.5	2.2	2.2	6.86	710

All performance values are subject to tolerance as per IS 325

* These ratings are offered in higher frame size

STANDARD FLAME PROOF MOTORS

Dimensional Details: Flame Proof Motors Flange Mounted (B5) TEFC Frame 80-280M

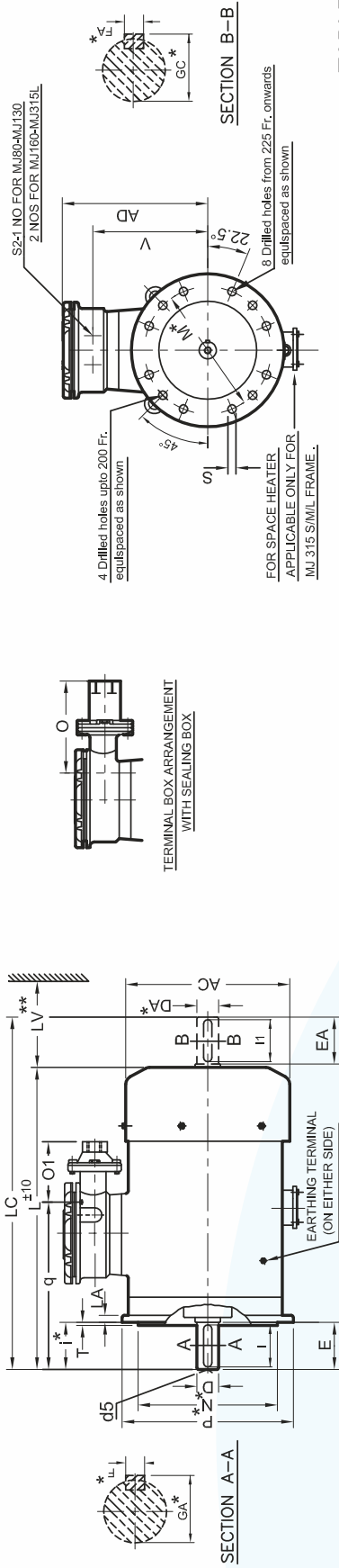


TABLE A

IEC Fr. size	Pole	GENERAL										TERMINAL BOX					SHAFT							
		P	N	M	i	S	T	LA	AC	L	LC	AD	LV	O	O1	q	S2	D, DA	E	F	GA	I	d5	
80	2, 4 & 6	200	130	165	40	12	3.5	11	164	330	386	216	30	156	214	135	168	M20X1.5P	19	40	6	21.5	35	M6
90L	2, 4, 6 & 8	200	130	165	50	12	3.5	11	174	382	463	246	35	179	217	141	195	M25X1.5P	24	50	8	27	45	M8
100L	2, 4, 6 & 8	250	180	215	60	15	4	12	195	435	520	258	40	191	207	131	225	M25X1.5P	28	60	8	31	55	M10
112M	2, 4, 6 & 8	250	180	215	60	15	4	12	220	456	539	262	45	204	200	124	233	M25X1.5P	28	60	8	31	55	M10
132M	2, 4, 6 & 8	300	230	265	80	15	4	13	260	551	660	290	50	223	175	100	282	M25X1.5P	38	80	10	41	70	M12
160M/L	2	350	250	300	110	19	5	13	314	704	839	312	60	244	252	151	365	M32X1.5P	42	110	12	45	105	M16
	4, 6 & 8	350	250	300	110	19	5	16	354	745	867	335	70	267	270	166	395	M40X1.5P	48	110	14	51.5	100	M16
200L	2	400	300	350	110	19	5	15	394	826	948	356	80	288	237	133	416	M40X1.5P	55	110	16	59	100	M20
	4, 6 & 8	450	350	400	110	19	5	16	444	799	948	426	90	339	308	264	414	M50X1.5P	55	110	16	59	100	M20
250M	2	550	450	500	140	19	5	18	489	915	1065	438	100	351	287	242	474	M50X1.5P	60	140	18	64	130	M20
	4, 6 & 8	550	450	500	140	19	5	18	544	1010	1157	475	115	388	252	207	517	M50X1.5P	65	140	18	69	130	M20
280S/M	2	660	550	600	140	24	6	22	610	1133	1293	535	130	443	276	225	584	M63X1.5P	65	140	18	69	130	M20
	4, 6 & 8	660	550	600	170	24	6	22	1163	1353	1518	535	145	443	276	225	614	M63X1.5P	80	170	22	85	160	M20
315L	2	660	550	600	140	24	6	22	610	1298	1458	535	145	443	276	225	666	M63X1.5P	65	140	18	69	130	M20
	4, 6 & 8	660	550	600	170	24	6	22	1328	1518	1718	535	145	443	276	225	696	M63X1.5P	80	170	22	85	160	M20

Tolerance on Dimensions with *

Dimension	Tolerance		Specification	
	±	mm	Dimension	Specification
N	±j6	UPTO 450	D, DA	IS : 1231
	±j6	OVER 450		
	±k6	OVER 450		
M	±0.3	UPTO 265	GA, GC, F, FA	IS : 2048
	±0.5	OVER 265		
	±1	UPTO 85		
i	±1.5	UPTO 85	d5 (centring)	IS : 2540
	±1.5	OVER 85		

- Separate sp. heater T. Box will be provided as a std. feature in case of MJ 315 S/M/L frames.
- Double shaft extension can be provided with shaft dimension identical to D.E. shaft
- 8 Nos. Fixing Holes from 225 S/M frame onwards.
- Key / key way fit : h9 / N9
- ** Minimum distance for efficient cooling of motor to be maintained by user

High Efficiency IE2 Flame Proof Induction Motors

Extending IE class performance to motors used in hazardous area

BBL will continue the practice of extending the advantage of higher efficiency series in hazardous area also, e.g.

- Ex d - Flame Proof
- Ex n – non sparking

Non sparking motors will be offered in frame sizes as per IS 12615-2011. However for flameproof motors, the frame size may not be the same as per IS 12615-2011 owing to the limitation of accommodating higher core lengths due to enclosure certification.

Highlights

- Efficiency values of different manufacturers are comparable only if they are measured by the same method as per IS 15999 (Part 2/sec 1):2011/ IEC 60034-2-1:2007.
- IE Class efficiencies are subject to tolerance as per IS/IEC 60034-1
- For conditions of limitations on grid supply (e.g. limiting starting current, high tolerances of voltage and/or frequency), it may not be possible to achieve the same IE efficiency class
- Energy efficient cage-induction motors are typically built with more active material to achieve higher efficiency and hence the starting performance of these motors differs somewhat from motors with a lower efficiency. The locked rotor current increases approximately by 10 to 15 percent for increase in each level of efficiency for the same output power. For replacing existing motors, this should be checked by the user with manufacturer for proper sizing of the protective devices.

Old efficiency levels were Eff2 and Eff1 (as per CEMEP). For calculation of these efficiencies, fixed stray load losses (0.5% of motor input) were assumed and not measured. Hence efficiency values were with high uncertainty. Now IS 12615:2011 refers to IS 15999 (Part 2/sec 1):2011 / IEC 60034-2-1:2007 for calculation of efficiency. This calculation is based on the new methods of stray load loss measurement specified in the standard. The effect is in reduction of efficiency value than the earlier values.

High efficiency IE2 flameproof Induction Motors

Bharat Bijlee has introduced flame proof IE2 High efficiency motors as per the efficiency values specified in IS 12615:2011.

PRODUCT RANGE

Type	Frame Size	kW range
IE2 High efficiency-2J	80 TO 315L	0.37 TO 200

BBL Flame Proof IE2 Motors are readily suitable for inverter duty-

- All motors with dual coat winding wires
- Special Impregnation to suit inverter duty

Note: For more details on IE2 efficiency class, please refer to page no.6, 7, 8, 9, 10, 11 of Industrial Motors Technical Information section.



IE2 FLAME PROOF MOTORS

Performance table for Flame Proof (Ex d) 2 Pole motors TEFC 3 Phase Squirrel Cage Induction Motors - Frame size 80 to 315L

Applicable standard for testing & efficiency determination: IS 15999

Voltage : 415V ± 10%

Frequency : 50Hz ± 5%

Combined Variation : ± 10%

Ambient : 45° C

Duty : S1(Continuous)

3000 rpm (2-Pole)

Ins. Class : F

Temp. Rise : B

Protection : IP55



Rated Output		Frame size IEC	Frame size BBL	Type Ref. B3 Construction	Rated Speed RPM	Rated Current Amps.	Rated Torque Kg.m	Operating Characteristics at Rated output				With DOL Starting		Pullout	Rotor	Net Weight		
kW	HP							Power Factor			% Efficiency		Starting Current to Rated Current Ratio	Starting Torque to Rated Torque Ratio	to Rated Torque Ratio	GD ² kgm ²	B3 Constn. kg	
								FL	3/4L	1/2L	FL	3/4L						1/2L
*0.37	0.5	80	MJ80	2I0802A3	2880	0.84	0.125	0.85	0.78	0.70	72.20	69.0	64.0	6.0	2.7	3.0	0.0037	31
*0.55	0.75	80	MJ80	2I0802B3	2860	1.25	0.187	0.82	0.74	0.62	74.8	72.5	67.0	6.0	2.7	3.0	0.0037	31
0.75	1	80	MJ80	2I0802I3	2830	1.64	0.258	0.82	0.74	0.62	77.4	76.5	73.5	6.0	2.5	2.8	0.0037	31
1.1	1.5	80	MJ80	2I080233	2830	2.34	0.379	0.82	0.75	0.63	79.6	79.6	75.5	6.0	2.7	3.0	0.0051	32
*1.5	2	90L	MJ90	2I0912A3	2840	3.13	0.514	0.82	0.78	0.68	81.3	81.3	78.0	6.5	3.3	3.5	0.0091	50
*2.2	3	100L	MJ100	2I1012I3	2890	4.28	0.741	0.86	0.83	0.76	83.2	83.0	80.0	7.0	2.8	3.0	0.0188	62
*3.7	5	112M	MJ112	2I11M233	2890	7	1.25	0.86	0.83	0.76	85.5	85.0	83.0	7.0	3.0	3.3	0.0530	70
*5.5	7.5	132M	MJ132	2I13M253	2935	9.88	1.83	0.89	0.85	0.77	87.0	86.5	81.8	7.0	2.5	3.0	0.0820	114
*7.5	10	132M	MJ132	2I13M293	2935	13.3	2.49	0.89	0.85	0.77	88.1	87.6	82.5	7.0	2.5	3.0	0.0980	120
9.3	12.5	160M	MJ160	2I16M233	2935	16.4	3.09	0.89	0.86	0.82	88.8	88.6	85.0	6.5	2.0	2.5	0.150	150
11	15	160M	MJ160	2I16M253	2935	19.2	3.65	0.89	0.84	0.76	89.4	89.4	87.0	6.5	2.3	3.0	0.171	154
15	20	160M	MJ160	2I16M263	2930	26	4.99	0.89	0.88	0.82	90.3	90.0	88.0	6.5	2.0	2.5	0.203	160
18.5	25	160L	MJ160	2I16L293	2930	31.5	6.15	0.90	0.89	0.86	90.9	90.7	89.0	6.5	2.0	2.5	0.268	177
*22	30	180L	MJ180	2I18L233	2935	37.7	7.30	0.89	0.87	0.82	91.3	91.0	88.8	7.0	2.4	2.7	0.340	231
30	40	200L	MJ200	2I20L2A3	2955	51	9.89	0.89	0.86	0.80	92.0	92.0	90.0	7.0	2.6	3.0	0.610	320
37	50	200L	MJ200	2I20L253	2945	62.5	12.2	0.89	0.86	0.80	92.5	92.0	90.0	7.0	2.4	2.5	0.610	320
45	60	225M	MJ225	2I22M253	2965	76.6	14.8	0.88	0.85	0.78	92.9	92.7	91.0	7.0	2.5	2.5	1.13	449
55	75	280S	MJ280	2I28S2I3	2965	90.2	18.1	0.91	0.89	0.85	93.2	93.0	91.0	7.0	2.3	2.7	2.63	690
*75	100	280M	MJ280	2I28M233	2970	124	24.6	0.90	0.88	0.83	93.8	93.6	92.0	7.0	2.2	2.8	3.01	740
90	120	280M	MJ280	2I28M253	2970	146	29.5	0.91	0.89	0.87	94.1	93.9	90.9	7.0	2.2	2.8	3.42	765
110	150	315S	MJ315	2I31S233	2982	180	35.9	0.90	0.86	0.78	94.3	94.1	91.5	7.0	2.0	2.5	5.00	1050
125	170	315M	MJ315	2I31M2A3	2982	207	40.8	0.89	0.85	0.76	94.5	93.5	91.5	7.0	2.2	2.6	5.00	1050
132	180	315M	MJ315	2I31M233	2982	216	43.1	0.90	0.86	0.78	94.6	93.6	91.3	7.0	2.0	2.5	5.00	1050
150	200	315L	MJ315	2I31L2A3	2982	248	49.0	0.89	0.84	0.76	94.7	93.7	92.2	7.0	2.0	2.5	6.20	1240
160	215	315L	MJ315	2I31L253	2982	261	52.3	0.90	0.85	0.77	94.8	94.1	93.0	7.0	2.0	2.5	6.20	1240
180	240	315L	MJ315	2I31L2B3	2982	300	58.8	0.88	0.82	0.75	94.9	94.1	93.0	7.0	2.0	2.5	7.70	1500
**200	270	315L	MJ315	2I31L273	2982	325	65.3	0.90	0.85	0.77	95	94.5	93.3	7.0	2.0	2.5	7.70	1500

Note : Efficiency class 'IE2' will be punched on the nameplates as per IS : 12615-2011 for ratings from 0.37kw to 375kw.

All performance values are subject to tolerance as per IS/IEC 60034-1

* These ratings are offered in higher frame size with IE2 efficiency level

**-. These ratings are suitable for ambient temperature 40°C

Applicable standard for testing & efficiency determination: IS 15999

IE2 FLAME PROOF MOTORS

Performance table for Flame Proof (Ex d) 4 Pole motors TEFC 3 Phase Squirrel Cage Induction Motors - Frame size 80 to 315L

Applicable standard for testing & efficiency determination: IS 15999

Voltage : 415V ± 10%
Frequency : 50Hz ± 5%
Combined Variation : ± 10%

Ambient : 45° C
Duty : S1(Continuous)
1500 rpm (4-Pole)

Ins. Class : F
Temp. Rise : B
Protection : IP55



Rated Output		Frame size IEC	Frame size BBL	Type Ref. B3 Construction	Operating Characteristics at Rated output				% Efficiency			With DOL Starting		Rotor GD ² kgm ²	Net Weight B3 Constn. kg			
kW	HP				Rated Speed RPM	Rated Current Amps.	Rated Torque Kg.m	Power Factor			FL	3/4L	1/2L			Starting Current to Rated Current Ratio	Starting Torque to Rated Torque Ratio	Pullout Torque to Rated Torque Ratio
*0.37	0.5	80	MJ80	2J080413	1415	0.99	0.255	0.74	0.68	0.55	70.1	67.0	61.0	5.0	2.4	2.6	0.0061	31
0.55	0.75	80	MJ80	2J080433	1420	1.38	0.377	0.74	0.64	0.50	75.1	75.1	68.0	5.0	2.8	3.0	0.0072	32
0.75	1	80	MJ80	2J080453	1410	1.75	0.518	0.75	0.66	0.53	79.6	79.6	74.0	5.0	2.8	3.0	0.0082	33
*1.1	1.5	90L	MJ90	2J09L423	1430	2.44	0.749	0.77	0.70	0.57	81.4	81.4	77.5	6.0	2.4	2.8	0.015	50
*1.5	2	100L	MJ100	2J10L453	1430	3.15	1.02	0.80	0.74	0.60	82.8	82.5	79.0	6.5	2.6	3.0	0.026	63
*2.2	3	112M	MJ112	2J11M433	1435	4.43	1.49	0.82	0.74	0.60	84.3	84.0	81.5	6.5	2.6	3.0	0.030	70
*3.7	5	132M	MJ132	2J13M433	1445	7.27	2.49	0.82	0.78	0.63	86.3	86.0	83.5	6.5	2.7	3.0	0.113	105
*5.5	7.5	132M	MJ132	2J13M473	1455	10.3	3.68	0.85	0.80	0.71	87.7	87.5	85.5	7.0	2.6	3.0	0.134	113
*7.5	10	160M	MJ160	2J16M4A3	1455	14	5.02	0.84	0.82	0.73	88.7	88.5	86.0	7.0	2.5	2.8	0.141	142
9.3	12.5	160M	MJ160	2J16M4C3	1460	17.7	6.20	0.82	0.76	0.68	89.3	89.3	87.0	6.5	2.5	2.8	0.177	146
11	15	160M	MJ160	2J16M4K3	1465	20.3	7.31	0.84	0.80	0.70	89.8	89.8	88.0	6.5	2.5	2.8	0.229	158
15	20	160L	MJ160	2J16L4T3	1465	27.1	9.97	0.85	0.82	0.72	90.6	90.6	89.5	6.5	2.5	2.7	0.300	215
18.5	25	180L	MJ180	2J18L473	1465	33.2	12.3	0.85	0.82	0.76	91.2	91.2	89.5	7.0	2.7	2.9	0.540	230
*22	30	200L	MJ200	2J20L433	1470	39.3	14.6	0.85	0.80	0.72	91.6	91.4	89.5	7.0	2.6	3.0	0.860	305
30	40	200L	MJ200	2J20L453	1470	52.6	19.9	0.86	0.82	0.72	92.3	92.0	90.0	7.0	2.6	2.6	0.930	319
37	50	225M	MJ225	2J22M433	1470	63.8	24.5	0.87	0.85	0.77	92.7	92.5	90.5	7.0	2.6	2.6	1.60	430
*45	60	250M	MJ250	2J25M413	1470	76.4	29.8	0.88	0.86	0.78	93.1	92.8	90.8	7.0	2.6	2.6	2.83	530
*55	75	280S	MJ280	2J28S413	1475	94.1	36.3	0.87	0.85	0.78	93.5	93.2	91.2	7.0	2.2	2.5	5.00	705
75	100	280S	MJ280	2J28S423	1480	126	49.4	0.88	0.86	0.80	94.0	93.5	92.0	7.0	2.2	2.5	5.53	710
90	120	280M	MJ280	2J28M453	1480	151	59.2	0.88	0.86	0.80	94.2	94.0	92.0	7.0	2.2	2.5	6.36	730
110	150	315S	MJ315	2J31S413	1485	188	72.1	0.86	0.83	0.76	94.5	94.3	92.3	6.5	2.5	3.0	9.97	980
125	170	315M	MJ315	2J31M4A3	1486	216	81.9	0.85	0.81	0.74	94.6	94.3	92.7	6.5	2.5	3.0	11.7	1045
132	180	315M	MJ315	2J31M433	1487	225	86.5	0.86	0.83	0.76	94.7	94.5	93.0	6.5	2.5	3.0	11.7	1045
150	200	315L	MJ315	2J31L4A3	1488	262	98.2	0.86	0.80	0.72	94.7	94.4	92.8	6.5	2.5	3.0	14.0	1230
160	215	315L	MJ315	2J31L453	1488	273	104.7	0.86	0.83	0.76	94.9	94.6	93.1	6.5	2.5	3.0	14.0	1230
180	240	315L	MJ315	2J31L463	1488	307	117.8	0.86	0.83	0.76	95.0	94.7	93.2	6.5	2.5	3.0	15.6	1303
200	270	315L	MJ315	2J31L473	1488	340	130.9	0.86	0.83	0.76	95.1	94.8	93.3	6.5	2.5	3.0	17.8	1385

Note : Efficiency class 'IE2' will be punched on the nameplates as per IS : 12615-2011 for ratings from 0.37kw to 375kw.

All performance values are subject to tolerance as per IS/IEC 60034-1

* These ratings are offered in higher frame size with IE2 efficiency level

**_. These ratings are suitable for ambient temperature 40°C

IE2 FLAME PROOF MOTORS

Performance table for Flame Proof (Ex d) 6 Pole motors TEFC 3 Phase Squirrel Cage Induction Motors - Frame size 80 to 315L

Applicable standard for testing & efficiency determination: IS 15999

Voltage : 415V ± 10%

Frequency : 50Hz ± 5%

Combined Variation : ± 10%

Ambient : 45° C

Duty : S1(Continuous)

1000 rpm (6-Pole)

Ins. Class : F

Temp. Rise : B

Protection : IP55



Rated Output		Frame size IEC	Frame size BBL	Type Ref. B3 Construction	Operating Characteristics at Rated output				With DOL Starting			Pullout Torque to Rated Torque Ratio	Rotor GD ² kgm ²	Net Weight B3 Constn. kg	
KW	HP				Rated Speed RPM	Rated Current Amps.	Rated Torque Kg.m	Power Factor			Starting Current to Rated Current Ratio				Starting Torque to Rated Torque Ratio
					FL	3/4L	1/2L	FL	3/4L	1/2L	% Efficiency				
0.37	0.5	80	MJ80	2J080613	910	1.07	0.396	0.70	0.60	0.48	69.0	67.0	2.1	2.3	31
0.55	0.75	80	MJ80	2J080633	915	1.48	0.585	0.71	0.62	0.48	72.9	68.5	4.0	2.2	32
*0.75	1	90L	MJ90	2J09L633	925	1.91	0.790	0.72	0.61	0.50	75.9	72.3	4.0	2.0	48
1.1	1.5	90L	MJ90	2J09L653	930	2.72	1.15	0.72	0.61	0.50	78.1	74.0	4.0	2.0	50
1.5	2	100L	MJ100	2J10L633	935	3.63	1.56	0.72	0.60	0.52	79.8	75.0	4.5	2.0	60
2.2	3	112M	MJ112	2J11M653	940	4.99	2.28	0.75	0.65	0.58	81.8	79.8	5.0	2.1	71
*3.7	5	132M	MJ132	2J13M633	955	8.03	3.77	0.76	0.65	0.57	84.3	83.0	5.5	2.0	108
5.5	7.5	132M	MJ132	2J13M693	960	11.4	5.58	0.78	0.68	0.60	86.0	84.5	6.0	2.5	115
7.5	10	160M	MJ160	2J16M633	960	15	7.61	0.80	0.74	0.64	87.2	85.2	5.5	2.0	149
9.3	12.5	160L	MJ160	2J16L663	960	18.4	9.44	0.80	0.74	0.64	88.0	86.7	5.5	2.1	160
11	15	160L	MJ160	2J16L673	965	21.6	11.1	0.80	0.77	0.66	88.7	87.0	6.0	2.0	169
15	20	180L	MJ180	2J18L633	965	29.1	15.1	0.80	0.75	0.62	89.7	87.2	5.5	2.6	214
18.5	25	200L	MJ200	2J20L633	975	34.7	18.5	0.82	0.77	0.69	90.4	88.3	5.5	2.6	290
22	30	200L	MJ200	2J20L653	975	41.1	22.0	0.82	0.77	0.69	90.9	88.8	6.0	2.6	300
30	40	225M	MJ225	2J22M643	975	52.9	30.0	0.86	0.84	0.76	91.7	88.7	7.0	2.5	444
37	50	250M	MJ250	2J25M633	980	63.4	36.8	0.88	0.85	0.80	92.2	91.0	6.0	2.5	573
45	60	280S	MJ280	2J28S613	980	81.4	44.7	0.83	0.80	0.70	92.7	91.2	6.0	2.5	615
55	75	280M	MJ280	2J28M633	980	96.7	54.7	0.85	0.83	0.73	93.1	91.0	6.0	2.4	665
75	100	315S	MJ315	2J31S613	985	131	74.2	0.85	0.82	0.75	93.7	92.5	6.0	2.4	940
90	120	315M	MJ315	2J31M633	987	159	88.8	0.84	0.81	0.72	94.0	92.5	6.0	2.3	1005
110	150	315M	MJ315	2J31M653	988	191	108.4	0.85	0.82	0.73	94.3	93.3	6.0	2.5	1110
125	170	315L	MJ315	2J31L6A3	988	219	123.2	0.84	0.80	0.71	94.4	93.0	6.0	2.3	1295
132	180	315L	MJ315	2J31L673	988	228	130.1	0.85	0.82	0.73	94.6	94.3	6.0	2.3	1295
150	200	315L	MJ315	2J31L6B3	988	265	147.9	0.83	0.80	0.70	94.7	94.4	6.0	2.3	1425
160	215	315L	MJ315	2J31L693	988	276	157.7	0.85	0.82	0.73	94.8	94.6	6.0	2.3	1425

Note : Efficiency class 'IE2' will be punched on the nameplates as per IS : 12615-2011 for ratings from 0.37kw to 375kw.

All performance values are subject to tolerance as per IS/IEC 60034-1

* These ratings are offered in higher frame size with IE2 efficiency level

8 - POLE HIGH EFFICIENCY FLAME PROOF MOTORS

Performance table for Flame Proof (Ex d) 8 Pole motors TEFC 3 Phase Squirrel Cage Induction Motors - Frame size 80 to 315L

HIGH EFFICIENCY MOTORS - TYPE MJ

Applicable standard for testing: IS 4029
Applicable standard for efficiency determination: IS 4889

Voltage : 415V ± 10%
Frequency : 50Hz ± 5%
Combined Variation : ± 10%

Ambient : 45° C
Duty : S1(Continuous)
750 rpm (8-Pole)

Ins. Class : F
Temp. Rise : B
Protection : IP55

Rated Output		Frame size IEC	Frame size BBL	Type Ref. B3 Construction	Rated Speed RPM	Rated Current Amps.	Rated Torque Kg.m	Operating Characteristics at Rated output				With DOL Starting		Pullout Torque to Rated? Torque Ratio	Rotor GD ² kgm ²	Net Weight B3 Consth. kg		
KW	HP							FL	3/4L	1/2L	FL	3/4L	1/2L				FL	% Efficiency
0.37	0.5	90S	MJ90	MJ09L833	700	1.22	0.515	0.63	0.52	0.41	66.8	60.0	52.0	2.7	1.8	2.1	0.0110	46
0.55	0.75	90L	MJ90	MJ09L853	690	1.71	0.776	0.63	0.53	0.43	71.1	67.0	62.0	2.9	2.0	2.4	0.0140	48
0.75	1	100L	MJ100	MJ10L813	685	1.94	1.07	0.73	0.63	0.50	73.8	73.8	67.0	3.0	1.7	2.0	0.0230	55
1.1	1.5	100L	MJ100	MJ10L833	690	2.83	1.55	0.71	0.62	0.48	76.2	76.2	73.0	3.3	1.9	2.3	0.0270	59
1.5	2	112M	MJ112	MJ11M813	705	3.83	2.07	0.70	0.62	0.50	77.9	77.9	75.0	3.8	1.7	2.2	0.0510	65
2.2	3	132S	MJ132	MJ13M813	710	5.36	3.02	0.71	0.60	0.46	80.5	80.5	78.0	3.7	1.6	2.2	0.0990	100
3.7	5	160M	MJ160	MJ16M813	720	7.95	5.01	0.78	0.74	0.65	83.0	83.0	78.0	4.4	1.8	2.0	0.217	137
5.5	7.5	160M	MJ160	MJ16M833	720	11.5	7.44	0.78	0.74	0.65	85.1	85.1	82.0	4.8	1.9	2.2	0.299	151
7.5	10	160L	MJ160	MJ16L873	715	15.5	10.2	0.78	0.74	0.65	86.4	86.4	84.0	5.5	2.1	2.2	0.400	167
9.3	12.5	180M	MJ180	MJ18L813	720	18.8	12.6	0.79	0.74	0.64	87.3	87.3	85.0	5.0	2.1	2.2	0.620	205
11	15	180L	MJ180	MJ18L833	720	22	14.9	0.79	0.74	0.64	88.1	88.1	87.0	5.0	2.1	2.2	0.720	215
15	20	200L	MJ200	MJ20L833	720	28.6	20.3	0.82	0.79	0.71	89.0	89.0	88.0	6.0	2.5	2.3	1.32	330
18.5	25	225M	MJ225	MJ22M823	725	36.3	24.9	0.79	0.77	0.69	89.8	89.8	88.0	5.5	2.1	2.2	2.10	419
22	30	225M	MJ225	MJ22M833	725	43	29.6	0.79	0.77	0.69	90.2	90.2	88.0	5.5	2.1	2.2	2.41	430
30	40	250M	MJ250	MJ25M813	730	55.6	40.0	0.82	0.78	0.68	91.5	91.5	89.0	6.0	2.5	2.2	3.72	575
37	50	280S	MJ280	MJ28S823	730	70.8	49.4	0.79	0.75	0.65	92.0	92.0	90.0	5.5	2.2	2.2	5.83	650
45	60	280M	MJ280	MJ28M853	730	85.8	60.0	0.79	0.75	0.65	92.4	92.4	90.0	5.5	2.2	2.2	6.86	710
55	75	315S	MJ315	MJ31S813	740	105	72.4	0.78	0.73	0.64	93.0	92.5	90.5	5.5	2.1	2.4	10.7	945
75	100	315M	MJ315	MJ31M833	740	143	98.7	0.78	0.73	0.64	93.5	93.5	92.0	5.5	2.1	2.4	12.4	1010
90	120	315M	MJ315	MJ31M853	740	171	118.5	0.78	0.73	0.65	94.0	94.0	93.0	5.5	2.1	2.4	15.5	1120
110	150	315L	MJ315	MJ31L873	740	208	144.8	0.78	0.73	0.64	94.3	94.0	93.0	5.5	2.1	2.4	18.0	1300
125	170	315L	MJ315	MJ31L8A3	740	236	164.5	0.78	0.73	0.64	94.6	94.4	93.6	5.5	2.1	2.4	21.5	1425
132	180	315L	MJ315	MJ31L893	740	248	173.7	0.78	0.73	0.64	94.8	94.7	94.0	5.5	2.1	2.4	21.5	1425

Note :

All performance values are subject to tolerance as per IS: 325.

Efficiency measurements are without seals.

* These ratings are offered in higher frame size

IE2 FLAME PROOF MOTORS

Dimensional Details: Flame Proof Motors Type 2/J/M/J Flange Mounted (B5) TEFC (IE2) series Frame 80-315L

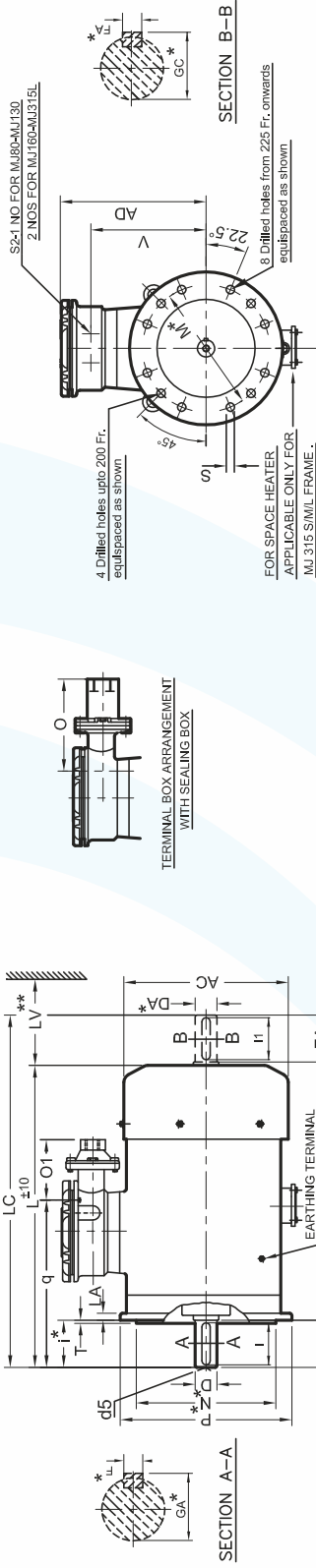


TABLE A

IEC Fr. size	Pole	FIXING										GENERAL										TERMINAL BOX										SHAFT									
		N	M	*	M	*	i	S	T	LA	AC	L	LC	AD	LV	**	V	O	O1	q	S2	D, DA	EA	E	F	GA*	GC*	I	d5	L	LC										
80	2, 4 & 6	130	165	40	12	3.5	11	164	330	386	216	30	156	214	135	168	M20X1.5P	19	40	6	21.5	35	M6	—	—	—	—	—	—	—	—	—	—								
90L	2, 4, 6 & 8	130	165	50	12	3.5	11	174	382	463	246	35	179	217	141	195	M25X1.5P	24	50	8	27	45	M8	—	—	—	—	—	—	—	—	—	—								
100L	2, 4, 6 & 8	180	215	60	15	4	12	195	435	520	258	40	191	207	131	225	M25X1.5P	28	60	8	31	55	M10	—	—	—	—	—	—	—	—	—	—	—							
112M	2, 4, 6 & 8	180	215	60	15	4	12	220	456	539	262	45	204	200	124	233	M25X1.5P	28	60	8	31	55	M10	—	—	—	—	—	—	—	—	—	—	—							
132M	2, 4, 6 & 8	230	265	80	15	4	13	260	551	660	290	50	223	175	100	282	M25X1.5P	38	80	10	41	70	M12	—	—	—	—	—	—	—	—	—	—	—	—						
160M/L	2, 4, 6 & 8	250	300	110	19	5	13	314	704	839	312	60	244	252	151	365	M32X1.5P	42	110	12	45	105	M16	—	—	—	—	—	—	—	—	—	—	—	—						
180L	2, 4, 6 & 8	250	300	110	19	5	16	354	745	867	335	70	267	270	166	395	M40X1.5P	48	110	14	51.5	100	M16	—	—	—	—	—	—	—	—	—	—	—	—	—					
200L	2, 4, 6 & 8	300	350	110	19	5	15	394	792	914	356	80	288	237	133	416	M40X1.5P	55	110	16	59	100	M20	—	—	—	—	—	—	—	—	—	—	—	—	—					
225S/M	2, 4, 6 & 8	350	400	110	19	5	16	444	799	948	426	90	339	308	264	414	M50X1.5P	60	140	18	64	130	M20	—	—	—	—	—	—	—	—	—	—	—	—	—	—				
250M	2, 4, 6 & 8	450	500	140	19	5	18	489	915	1065	438	100	351	287	242	474	M50X1.5P	60	140	18	64	130	M20	—	—	—	—	—	—	—	—	—	—	—	—	—	—				
280S/M	2, 4, 6 & 8	450	500	140	19	5	18	544	1010	1157	475	115	388	252	207	517	M50X1.5P	65	140	18	69	130	M20	—	—	—	—	—	—	—	—	—	—	—	—	—	—				
315S/M	2, 4, 6 & 8	550	600	170	24	6	22	610	1133	1293	535	130	443	276	225	584	M63X1.5P	65	170	22	85	160	M20	—	—	—	—	—	—	—	—	—	—	—	—	—					
315L	2, 4, 6 & 8	550	600	170	24	6	22	610	1298	1458	535	145	443	276	225	666	M63X1.5P	80	170	22	85	160	M20	—	—	—	—	—	—	—	—	—	—	—	—	—					

Tolerance on Dimensions with *

Dimension	Tolerance	Specification	Dimension	Tolerance	Specification
N	j6	UPTO 450	D, DA	j6	19, 24, 28Ø
	js6	OVER 450		k6	38, 42, 48Ø
M	±0.3	UPTO 265		m6	55, 60, 65, 75, 80Ø
	±0.5	OVER 265	GA, GC, F, FA		IS : 2048
i	±1	UPTO 85	d5 (centering)		IS : 2540
	±1.5	OVER 85			

- Separate sp. heater T. Box will be provided as a std. feature in case of MJ 315 S/M/L frames.
- Double shaft extension can be provided with shaft dimension identical to D.E. shaft
- 8 Nos. Fixing Holes from 225 S/M frame onwards.
- Key / key way fit : h9 / N9
- ** Minimum distance for efficient cooling of motor to be maintained by user

All Dimensions are in mm unless otherwise specified. CAT-D-8031-5-1

Standard and Energy Efficient IE2 Non-Sparking Motors Ex (nA)

Bharat Bijlee has introduced complete range of standard non-sparking motors for use in hazardous area -Zone 2 (flammable gases and vapors atmosphere).

Motors are conforming to IS/IEC 60079-15:2005 and IS/IEC 60079-0:2004 as regards to all safety aspects.

Type	Series	Frame Size	kW range	Poles
Standard motor	MN	63 to 355L	0.12 to 355	2P, 4P, 6P, 8P
High Efficiency IE2 Series Motors	2S	71 to 355L	0.37 to 355	2P, 4P, 6P
High Efficiency Motors	MS	90 to 450L	0.37 to 200	8P

Reference Standards

Motors comply with following Indian & International standards as applicable.

IS/IEC 60079 - 0:2004	Electrical apparatus for Explosive gas atmosphere – Part 0 General Requirements
IS/IEC 60079-15: 2005	Electrical apparatus for Explosive gas atmosphere – Part 15 Construction test and marking of type of protection ‘n’ electrical apparatus
IS 5572:2009	Classification of Hazardous areas (other than mining) having flammable gases and vapors for electrical installations.
IS 5571:2009	Guide for selection and installation of electrical equipment for hazardous areas (other than mines)
IEC 60079-14	Explosive atmospheres – Part 14: Electrical installations design, selection and erection

Electrical features, operational features of Non sparking motors are same as that of safe area motor. Different constructional features than standard safe area motors are mentioned below.

Special Features

Non sparking motors provide protection against auto ignition of surrounding gases which may be released under abnormal operating condition.

Limiting Temperature

These motor are designed such that the limiting temperatures of all parts in continuous operation does not exceed 200°C i.e. Temperature Class T3, as per IS / IEC 60079-15.

Standard operation Conditions

Supply conditions (Voltage & Frequency)

Voltage	:	415 V ± 10%
Frequency	:	50Hz ± 5%
Combined variation	:	± 10%

(Absolute sum with max frequency variation 5%)

Ambient

Motors are designed for ambient temperature as mentioned in the performance tables. Higher ambient temperature motors can be offered on request.

Altitude

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

Re-rating Factors

The re-rating applicable under different conditions of variations in supply voltage, frequency, ambient & altitude are obtained by multiplying following factors.

Variation in Supply Voltage & Frequency

Voltage Variation (%)	Frequency Variation (%)	Combined Voltage & Frequency Variation (%)	Permissible output as % of rated value
± 10	± 5	± 10	100
± 12.5	± 5	± 12.5	95
± 15	± 5	± 15	90

Variation in Ambient & Altitude for all Motors

For motors with Ambient 40° C		For motors with Ambient 50° C	
Amb. Temp. (°C)	Permissible output as % of rated value	Amb. Temp. (°C)	Permissible output as % of rated value
20	107	30	107
21-35	103	30-45	103
40	100	50	100
45	95	55	96
50	91	60	92

Altitude above sea level (m)	Permissible output as % of rated value
1000	100
1500	97
2000	94
2500	90
3000	86
3500	82
4000	77

Terminal and Connection

External connection of Client's power cable to the motor terminals in the terminals box must be rigidly gripped and secured against loosening and twisting. This is achieved with specially designed terminal plate in Terminals Box. Terminal plate design is as per the requirements of IS/IEC 60079-15:2005.

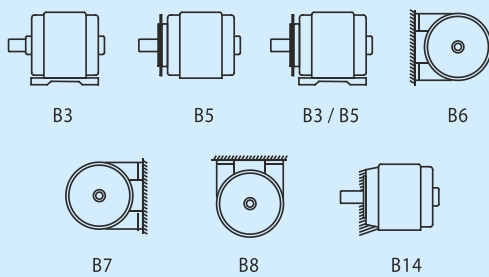
Enclosure and Degree of Protection

All Non-sparking motors are with totally enclosed fan cooled (TEFC) construction with degree of protection IP55 as per IS/IEC 60034-5 as a standards features. In addition, all flange mounted motors (B5 and B14) have oil tight Shaft (OTS) protection. Motor with V1, V5 and V18 Mounting are provided with a canopy fitted on the top of the fan cover.

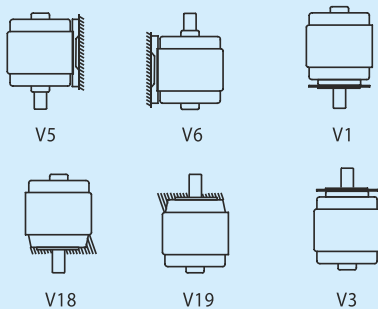
Note: For more details, refer to annexure II on page no. 121.

Mounting

Horizontal Mounting



Vertical Mounting



Cooling

All motors are totally Enclosed Fan cooled (TEFC). The cooling is effected by self-driven, bi-directional cast iron or fabricated centrifugal fan protected by fan cover. The type of cooling is IC 411 as per IS 6362/IEC 60034-6.

Minimum cooling distance as indicated in GA drawing has to be provided for effective cooling of the motor.

Note: For more details, refer to annexure I on page no. 120.

Terminal Box and Bearing Details

Please refer Terminals box and bearing details and alternate Terminals Box location as specified in the table 1.

Winding and Rotor Cage

The Stator winding and rotor cage are so designed that limiting temperature specified in IS/IEC 60079-15 is not exceeded. Gel coat is applied on winding overhang as an additional protection against ingress of moisture.

Air Gap

Radial air gap of the motor is such that the minimum air gap values specified in IS / IEC 60079-15 are complied with.

Paint

All internal & external surfaces are coated with epoxy polyimide base acid/alkali resistant paint of Dark Admiralty Grey, Shade No. 632 (as per IS: 5)

Name Plate

Stainless steel name plate is provided each motor. Special data such as efficiency class, temperature class and statutory approval reference are also provided on the nameplate along with the usual name plate details.

Certification

Non-sparking motors are approved by Petroleum Explosive and Safety Origination (PESO), Nagpur. A declaration to this effect is incorporation on the nameplate.

Starting current measurement of BBL motors:

Induction motor starting current is generally 6.0 to 7.0 times the full load current of the motor. This is a characteristic feature of the motor and though undesirable, it is inevitable in the design of the motor. Measurement of this starting current at rated voltage becomes difficult since it demands higher capacity of the supply system as well as use of appropriate CTs in the circuit of meters. Generally a fraction of rated starting current is passed in the motor due to capacity constraints. This current is extrapolated to rated voltage. If this measurement is done at higher voltage then the estimated starting current is more accurate. In BBL, starting current measurement is done as per below table

kW Range	Measurement at % of voltage to rated voltage
0.12 kW to 90 kW	70%
90 kW to 200 kW	60%
200 kW to 355 kW	35%
355 kW to 560kW	25%
560kW and above (with rated voltage 690V or higher)	25%

Bearing and Terminal Box Details for Ex(nA) motors

Frame Size	Bearing Nos. C3 clearance		Terminal Box Type/ Location	Terminal		No. & size of Cable entries	Max cond. Cross Sec. area mm ²
	DE	NDE		No.	Size		
63	6201 2Z	6201 2Z	gk130/TOP	3	M4	2 X M20X1.5P	4
71	6202 2Z	6202 2Z					
80	6004 2Z	6004 2Z					
90S, 90L	6205 2Z	6205 2Z	gk130/RHS	3*	M4	2 X M25X1.5P	10
100L	6206 2Z	6205 2Z	gk230/ RHS	3*			
112M	6206 2Z	6205 2Z					
132S, 132M	6208 2Z	6208 2Z	gk330/RHS	6	M5	2 X M25X1.5P	16
160M, 160L	6309 2Z	6209 2Z	gk330/RHS				
180M, 180L(IE2 4 P)	6310 2Z	6309 2Z	gk430/RHS	6	M6	2 X M32X1.5P	50
180M, 180L (Standard 2P, 4P, 6P, 8P & IE2 2P,6P)	6310 2Z	6210 2Z					
200L	6312 2Z	6212 2Z	TB225/RHS	6	M8	2 X M40X1.5P	70
225S, 225M	6313	6213					
250M	6315	6215					
280 S/M	2P	6316	6316	6	M10	2 X M50X1.5P	150
	4,6 & 8P	6317					
315S/M		6319	6319	6	M12	2 X M50X1.5P	185
315L		6319					
355L		6322	6322	6	M16	2 X M75X1.5P	300
355L/K	2P	6319					
	4P	6322	6322	TB400/ RHS			
	6P						
	8P						
400M/L	2P	6324	6322	6	M20	2 X M75X1.5P	400
	4P						
	6P						
	8P						
450M/L	4P	6326	6326	6	M20	2 X M75X1.5P	400
	6P						
	8P						

Table 1

*3 Terminals upto and including 1.5kW & 6 terminals for higher outputs, except IE2 motors.

Note: L10 bearing life is 50,000 hours for directly coupled loads through flexible couplings only.

** IN 315L frame for star delta connection, higher size T box of 355 frame will be provided.

Effect of Converter (VFD) supply voltage on motor performance

Note: Please refer to page 6, 7, 8, 9, 10 and 11 of Industrial Motors, technical information section.

Non sparking induction motors fed with converter supply (statutory requirement)

Combined Testing of non sparking motor and converter:

Bharat Bijlee motors have been tested and approved by statutory authorities for given temperature class with sinusoidal supply. Since VFD supply contains more harmonics, temperature rise of motor increases on VFD supply. This leads to increase in surface temperature. Also, with the VFD, motor speed is varied. When motor speed is reduced, it leads to poor cooling and higher temperature rise. So the new temperature class needs to be verified by statutory authority.

IS 5571 (Guide for selection and installation of electrical equipment for hazardous areas - other than mines) or IEC 60079-14 (Explosive atmospheres - Part 14: Electrical installations design, selection and erection) is the selection & installation guide for the user.

The statutory testing authorities insist that the motors intended for use in hazardous area, which are to be supplied with varying voltage and frequency by converter, shall be tested, certified and approved in association with the converter to determine the temperature class / maximum surface temperature. The authorities give reference to IS 5571:2009 clause 14.4.2 (a) for this testing.

This is also mentioned in the international standard IEC 60079-14:2007 (Explosive atmospheres - Part 14: Electrical installations design, selection and erection), clause 14.4.2 (a).

IS/IEC 60079-15:2005 clause 17.8.2.2 also states that the motor shall be tested with the converter to prove that the temperature class limits are not exceeded.

Note:

1. Additional factors may also need to be taken into account, which include provision by the user of additional output filters or reactors and the length of cable between converter and motor. Both these affect motor input voltage and cause additional motor heating.
2. High frequency switching in converters can lead to rapid rise time voltage stress in the windings and cable circuits and therefore a further potential source of ignition. It is necessary to consider the effects of this stress according to the type of protection. It will be necessary to add an additional output filter after the converter.
3. Bearing currents require special consideration. Possible solutions include the use of insulated bearings, either alone, or in accordance with a filter that reduces common mode voltages and / or dv/dt.

Cable length between motor and converter:

Whenever non sparking motor is fed through converter supply, normally converter is placed in safe area and motor is working in hazardous area. Hence the cable length between converter and motor is generally high, i.e. 500 to 800 meters long. For effective and trouble free operation of motor, use of filters (preferably sine wave filter) at converter output terminals is a must, when using such high cable length. The customer and / or his system integrator has to ensure that the voltage appearing at motor terminals is $\leq 1.56\text{kV}$.

Warranty clause of motor is applicable only if sine wave filter is provided at converter output terminals by the motor user in case of use of high cable length.

Use of thermal protective devices

Use of thermistors / thermostats is recommended to monitor the temperature rise of stator winding of motor.

STANDARD NON SPARKING MOTORS

PERFORMANCE TABLE FOR NON SPARKING MOTORS Ex(nA)

Performance table for 2 Pole motors

TEFC 3 Phase Squirrel Cage Induction Motors - Frame size 63 to 355L

Applicable standard for testing: IS 4029

Applicable standard for efficiency determination: IS 4889

Voltage : 415V±10%

Frequency : 50Hz±5%

Combined Variation : ±10%

Ambient : 50° C

Duty : S1(Continuous)

Temp. Class : T3

3000 rpm (2-Pole)

Ins. Class : F
Temp. Rise : B
Protection : IP55

Rated Output		Frame size IEC	Type ref. B3 construction	Rated Speed RPM	Rated Current Amps.	Rated Torque kg-m	Operating characteristics at rated output						With DOL starting		Pullout Torque to Rated Torque Ratio	Rotor GD ² kgm ²	Net Weight B3 constr. kg
kW	HP						Power Factor			% Efficiency			Starting Current to Rated Current Ratio	Starting Torque to rated torque ratio			
		FL	3/4L	1/2L	FL	3/4L	1/2L	FL	3/4L	1/2L							
0.18	0.25	63	MN063213	2720	0.57	0.064	0.76	0.66	0.52	58.0	57.0	52.0	3.2	2.7	3.0	0.00085	5
0.25	0.35	63	MN063233	2720	0.65	0.090	0.82	0.75	0.63	65.0	60.0	54.0	3.5	2.4	2.6	0.00099	5
0.37	0.5	71	MN071213	2790	0.91	0.129	0.80	0.72	0.60	71.0	68.0	62.0	4.0	2.3	2.8	0.0015	6
0.55	0.75	71	MN071233	2805	1.31	0.191	0.79	0.72	0.58	74.0	74.0	71.0	5.0	2.7	3.0	0.0019	7
0.75	1	80	MN080213	2830	1.65	0.258	0.82	0.74	0.62	77.0	76.0	72.0	5.0	2.5	2.8	0.0037	10
1.1	1.5	80	MN080233	2840	2.36	0.377	0.82	0.75	0.63	79.0	79.0	76.0	5.9	2.7	3.0	0.0051	11
1.5	2	90S	MN09S233	2825	3.01	0.517	0.86	0.83	0.76	80.6	80.6	74.0	5.5	2.7	3.0	0.0071	15
2.2	3	90L	MN09L253	2830	4.36	0.757	0.85	0.82	0.74	82.5	80.0	76.0	6.0	3.0	3.0	0.0093	18
3.7	5	100L	MN10L213	2900	7.12	1.24	0.85	0.80	0.70	85.0	83.0	78.0	6.5	2.8	3.0	0.0188	24
5.5	7.5	132S	MN13S2B3	2920	10.1	1.83	0.88	0.85	0.77	85.7	85.0	80.0	6.5	2.3	3.0	0.0630	52
7.5	10	132S	MN13S2E3	2920	13.6	2.50	0.88	0.84	0.76	87.0	86.0	82.0	6.5	2.3	3.0	0.0760	55
9.3	12.5	132M	MN13M2N3	2920	16.5	3.10	0.89	0.85	0.76	88.0	86.0	83.0	6.5	2.4	2.9	0.0980	67
11	15	160M	MN16M213	2920	19.3	3.67	0.89	0.87	0.83	89.0	88.0	86.0	5.8	2.0	3.0	0.134	95
15	20	160M	MN16M253	2920	26.2	5.00	0.89	0.88	0.82	89.5	89.0	87.0	6.0	2.0	3.0	0.171	112
18.5	25	160L	MN16L273	2920	31.6	6.17	0.90	0.88	0.86	90.5	90.0	88.0	6.5	2.0	3.0	0.225	123
22	30	180M	MN18M213	2930	37.6	7.31	0.89	0.87	0.80	91.5	90.5	88.0	6.5	2.2	2.7	0.30	168
30	40	200L	MN20L233	2950	51.2	9.91	0.88	0.85	0.79	92.6	92.0	89.5	6.5	2.5	2.5	0.52	253
37	50	200L	MN20L253	2945	62.9	12.2	0.88	0.85	0.79	93.0	92.5	91.0	6.5	2.5	2.5	0.61	274
45	60	225M	MN22M233	2960	74.4	14.8	0.90	0.87	0.83	93.5	93.0	91.0	6.0	2.5	2.5	1.04	348
55	75	250M	MN25M213	2960	89.1	18.1	0.92	0.91	0.86	93.3	92.8	91.5	6.0	2.1	2.6	2.11	523
75	100	280S	MN28S213	2970	122	24.6	0.91	0.89	0.84	93.7	92.5	90.0	6.0	1.8	2.7	2.63	626
90	120	280M	MN28M233	2970	146	29.5	0.91	0.89	0.84	94.0	93.0	91.0	6.0	1.8	2.7	3.01	669
110	150	315S	MN31S233	2982	180	35.9	0.90	0.86	0.78	94.5	94.0	91.5	7.0	2.0	2.5	5.0	898
125	170	315M	MN31M2A3	2982	206	40.8	0.89	0.85	0.76	94.7	93.5	91.5	7.0	2.2	2.6	5.0	940
132	180	315M	MN31M233	2982	215	43.1	0.90	0.86	0.78	95.0	94.0	92.0	7.0	2.0	2.5	5.0	940
150	200	315L	MN31L2A3	2982	247	49.0	0.89	0.84	0.76	95.1	94.2	92.2	7.0	2.0	2.5	6.2	1100
160	215	315L	MN31L253	2982	260	52.3	0.90	0.85	0.77	95.2	94.6	92.7	7.0	2.0	2.5	6.2	1100
180	240	315L	MN31L2B3	2982	299	58.8	0.88	0.82	0.75	95.3	94.7	92.7	7.0	2.0	2.5	7.7	1390
*200	270	315L	MN31L273	2982	324	65.3	0.90	0.85	0.77	95.5	95.0	93.0	7.0	2.0	2.5	7.7	1390
*250	335	355L	MN35L213	2985	404	81.6	0.90	0.88	0.84	95.7	95.2	93.7	7.0	1.6	2.4	12.0	1680
*315	425	355L	MN35L233	2985	508	102.8	0.90	0.88	0.84	95.8	95.3	93.8	7.0	1.6	2.4	14.7	1870

Notes:

*All performance values are subject to tolerance as per IS 325.

* For ratings above 0.37kW & up to 355kW, motors are available with efficiency class IE2. For details, please refer the section of IE2 series motors in this catalogue.

*. These ratings are suitable for ambient temperature 45° C

Efficiency measurements are without seals.

STANDARD NON SPARKING MOTORS

PERFORMANCE TABLE FOR NON SPARKING MOTORS Ex(nA) Performance table for 4 Pole motors

TEFC 3 Phase Squirrel Cage Induction Motors - Frame size 63 to 355L

Applicable standard for testing: IS 4029
Applicable standard for efficiency determination: IS 4889

Voltage : 415V ± 10%
Frequency : 50Hz ± 5%
Combined Variation : ± 10%

Ambient : 50°C
Duty : S1 (Continuous)
Temp. Class : T3
1500 rpm (4-Pole)

Ins. Class : F
Temp. Rise : B
Protection : IP55

Rated Output		Frame size IEC	Type ref. B3 construction	Rated Speed RPM	Rated Current Amps.	Rated Torque kg-m	Operating characteristics at rated output						With DOL starting		Pullout Torque to Rated Torque Ratio	Rotor GD ² kgm ²	Net Weight B3 constr. kg
kW	HP						Power Factor			% Efficiency			Starting Current to Rated Current Ratio	Starting Torque to Rated Torque Ratio			
		FL	3/4L	1/2L	FL	3/4L	1/2L	3/4L	1/2L								
0.12	0.16	63	MN063413	1330	0.41	0.088	0.75	0.65	0.50	54.0	48.0	40.0	2.4	1.9	2.3	0.00140	5
0.18	0.25	63	MN063433	1350	0.56	0.130	0.75	0.65	0.50	60.0	56.0	50.0	3.0	2.0	2.3	0.00160	5
0.25	0.35	71	MN071413	1370	0.68	0.178	0.76	0.63	0.51	67.0	64.0	58.0	3.0	2.0	2.5	0.0024	6
0.37	0.5	71	MN071433	1360	1.02	0.265	0.71	0.62	0.50	71.0	70.0	64.0	3.4	2.3	2.5	0.0033	7
0.55	0.75	80	MN080413	1405	1.28	0.381	0.81	0.70	0.56	74.0	71.0	67.0	4.0	2.4	2.6	0.0061	10
0.75	1	80	MN080433	1405	1.74	0.520	0.78	0.70	0.58	77.0	76.0	72.0	4.5	2.8	3.0	0.0072	11
1.1	1.5	90S	MN09S433	1410	2.45	0.760	0.80	0.73	0.61	78.0	77.0	72.0	4.2	2.3	2.7	0.0120	14
1.5	2	90L	MN09L453	1410	3.26	1.04	0.80	0.72	0.58	80.0	79.0	75.0	5.0	2.5	3.0	0.0160	17
2.2	3	100L	MN10L433	1420	4.55	1.51	0.82	0.69	0.53	82.0	80.0	76.0	5.5	2.5	3.0	0.0210	22
3.7	5	112M	MN11M433	1430	7.3	2.52	0.83	0.76	0.65	85.0	85.0	82.0	6.0	2.6	3.0	0.0530	32
5.5	7.5	132S	MN13S4B3	1450	10.3	3.69	0.86	0.81	0.70	86.5	86.0	84.0	6.0	2.4	3.0	0.1040	50
7.5	10	132M	MN13M4K3	1450	13.7	5.04	0.87	0.82	0.72	87.5	87.0	85.0	6.0	2.3	3.0	0.1260	64
9.3	12.5	160M	MN16M4A3	1450	17.4	6.25	0.84	0.80	0.72	88.5	88.0	87.0	6.0	2.0	2.5	0.141	93
11	15	160M	MN16M4C3	1450	20.5	7.39	0.84	0.81	0.76	89.0	89.0	86.0	6.0	2.1	2.5	0.177	97
15	20	160L	MN16L4K3	1450	27.5	10.1	0.84	0.83	0.79	90.2	90.0	90.0	6.0	2.1	2.5	0.235	113
18.5	25	180M	MN18M433	1460	33.2	12.3	0.85	0.82	0.72	91.2	91.2	90.0	6.0	2.4	2.5	0.460	160
22	30	180L	MN18L473	1460	39.2	14.7	0.85	0.82	0.72	91.8	91.5	90.0	6.0	2.4	2.5	0.540	188
30	40	200L	MN20L433	1465	51.6	19.9	0.88	0.84	0.77	92.0	92.0	90.0	6.0	2.6	2.5	0.860	270
37	50	225S	MN22S413	1470	63.6	24.5	0.87	0.83	0.75	93.0	93.0	91.0	6.0	2.5	2.5	1.32	328
45	60	225M	MN22M433	1470	76.3	29.8	0.88	0.84	0.75	93.2	93.2	91.0	6.0	2.5	2.5	1.60	362
55	75	250M	MN25M413	1475	93.8	36.3	0.87	0.85	0.78	93.2	93.2	91.5	6.0	2.5	2.6	2.83	475
75	100	280S	MN28S413	1480	126	49.4	0.88	0.87	0.81	94.2	94.0	93.0	6.0	2.1	2.5	5.00	653
90	120	280M	MN28M433	1480	150	59.2	0.88	0.87	0.81	94.7	94.3	93.2	6.0	2.1	2.5	6.00	713
110	150	315S	MN31S413	1485	188	72.1	0.8	0.83	0.76	94.7	94.5	93.2	6.5	2.5	3.0	9.97	862
125	170	315M	MN31M4A3	1486	216	81.9	0.85	0.81	0.74	94.8	94.5	93.3	6.5	2.5	3.0	11.7	965
132	180	315M	MN31M433	1487	225	86.5	0.86	0.83	0.76	95.0	94.8	93.8	6.5	2.5	3.0	11.7	965
150	200	315L	MN31L4A3	1488	261	98.2	0.84	0.80	0.72	95.2	95.0	93.9	6.5	2.5	3.0	14.0	1145
160	215	315L	MN31L453	1488	271	104.7	0.86	0.83	0.76	95.4	95.2	94.0	6.5	2.5	3.0	14.0	1145
180	240	315L	MN31L463	1488	305	117.8	0.86	0.83	0.76	95.5	95.3	94.0	6.5	2.5	3.0	15.6	1225
200	270	315L	MN31L473	1488	338	130.9	0.86	0.83	0.76	95.6	95.4	94.0	6.5	2.5	3.0	17.8	1290
250	335	355L	MN35L413	1488	413	163.6	0.88	0.85	0.75	95.8	95.5	94.0	6.5	2.2	2.5	23.3	1680
315	422	355L	MN35L433	1488	519	206.2	0.88	0.85	0.75	96.0	95.6	94.2	6.5	2.2	2.5	32.7	1855
355	475	355L	MN35L453	1488	585	232.4	0.88	0.85	0.75	96.0	95.6	94.2	6.5	2.2	2.5	37.9	2025

Notes:

• All performance values are subject to tolerance as per IS 325.

* - These ratings are suitable for ambient temperature 45°C

Efficiency measurements are without seals.

STANDARD NON SPARKING MOTORS

PERFORMANCE TABLE FOR NON SPARKING MOTORS Ex(nA) Performance table for 6 Pole motors

TEFC 3 Phase Squirrel Cage Induction Motors - Frame size 71 to 355L

Applicable standard for testing: IS 4029
Applicable standard for efficiency determination: IS 4889

Voltage : 415V ± 10%
Frequency : 50Hz ± 5%
Combined Variation : ± 10%

Ambient : 50°C
Duty : S1(Continuous)
Temp. Class : T3
1000 rpm (6-Pole)

Ins. Class : F
Temp. Rise : B
Protection : IP55

Rated Output		Frame size IEC	Type ref. B3 construction	Rated Speed RPM	Rated Current Amps.	Rated Torque kg-m	Operating characteristics at rated output						With DOL starting		Pullout Torque to Rated Torque Ratio	Rotor GD ² kgm ²	Net Weight B3 constr. kg	
kW	HP						Power Factor			% Efficiency			Starting Current to Rated Current Ratio	Starting Torque to Rated Torque Ratio				
					FL	3/4L	1/2L	FL	3/4L	1/2L	FL	3/4L	1/2L					
0.25	0.35	71	MN071633	875	0.8	0.278	0.70	0.60	0.48	55.0	62.0	62.0	55.0	2.6	2.0	2.3	0.00380	7
0.37	0.5	80	MN080613	910	1.08	0.396	0.70	0.60	0.48	61.0	68.0	66.0	61.0	3.0	2.1	2.3	0.00600	10
0.55	0.75	80	MN080633	915	1.56	0.585	0.71	0.62	0.48	64.0	69.0	70.0	64.0	4.0	2.2	2.5	0.0084	11
0.75	1	90S	MN09S633	925	1.99	0.790	0.72	0.61	0.50	69.0	73.0	70.0	69.0	3.4	2.0	2.5	0.0122	14
1.1	1.5	90L	MN09L653	930	2.8	1.15	0.72	0.61	0.50	72.0	76.0	74.0	72.0	4.0	2.1	2.6	0.0160	17
1.5	2	100L	MN10L633	935	3.72	1.56	0.72	0.64	0.52	72.0	78.0	75.0	72.0	4.0	2.0	2.5	0.0250	22
2.2	3	112M	MN11M633	935	4.97	2.29	0.77	0.68	0.55	80.0	80.0	80.0	74.0	5.0	2.0	2.5	0.0500	29
3.7	5	132S	MN13S6B3	950	8.05	3.79	0.77	0.72	0.60	83.0	83.0	83.0	82.0	5.0	2.2	2.8	0.118	50
5.5	7.5	132M	MN13M6N3	950	11.6	5.64	0.78	0.74	0.64	84.5	84.5	84.5	83.0	5.5	2.5	3.0	0.172	66
7.5	10	160M	MN16M633	960	14.8	7.61	0.80	0.74	0.64	88.0	88.0	88.0	86.0	5.4	2.0	2.5	0.276	103
9.3	12.5	160L	MN16L663	960	18.4	9.44	0.80	0.74	0.64	88.0	88.0	88.0	87.0	5.5	2.1	2.5	0.340	113
11	15	160L	MN16L673	965	21.6	11.1	0.80	0.77	0.70	88.5	88.5	88.0	87.0	6.0	2.0	2.5	0.400	123
15	20	180L	MN18L613	965	29	15.1	0.80	0.75	0.62	90.0	90.0	90.0	87.0	5.5	2.6	2.3	0.680	175
18.5	25	200L	MN20L613	975	34	18.5	0.83	0.78	0.70	91.1	91.1	91.0	88.0	5.8	2.6	2.3	1.00	241
22	30	200L	MN20L633	975	40.3	22.0	0.83	0.77	0.68	91.5	91.5	91.0	88.0	5.8	2.6	2.3	1.20	254
30	40	225M	MN22M623	975	52.1	30.0	0.87	0.84	0.76	92.0	92.0	91.0	88.0	6.0	2.3	2.2	2.10	336
37	50	250M	MN25M603	975	63.2	37.0	0.88	0.85	0.82	92.5	92.5	92.5	91.0	6.0	2.5	2.3	3.51	458
45	60	280S	MN28S613	980	81.1	44.7	0.83	0.80	0.70	93.0	93.0	92.5	92.0	6.0	2.5	2.3	5.11	573
55	75	280M	MN28M633	980	96.3	54.7	0.85	0.81	0.72	93.5	93.5	93.0	92.0	6.0	2.3	2.3	6.16	620
75	100	315S	MN31S613	985	131	74.2	0.85	0.82	0.75	94.0	94.0	94.0	92.2	6.0	2.4	2.5	10.7	830
90	120	315M	MN31M633	987	158	88.8	0.84	0.81	0.72	94.2	94.2	94.2	92.5	6.0	2.3	2.5	12.4	912
110	150	315M	MN31M653	988	191	108.4	0.85	0.82	0.73	94.5	94.5	94.5	92.5	6.0	2.3	2.5	15.5	1010
125	170	315L	MN31L6A3	988	219	123.2	0.84	0.80	0.71	94.7	94.7	94.6	92.6	6.0	2.3	2.5	18.0	1175
132	180	315L	MN31L673	988	227	130.1	0.85	0.82	0.73	95.0	95.0	94.9	93.0	6.0	2.3	2.5	18.0	1175
150	200	315L	MN31L6B3	988	265	147.9	0.83	0.80	0.70	95.0	95.0	94.3	92.8	6.0	2.3	2.5	21.5	1231
160	215	315L	MN31L693	988	276	157.7	0.85	0.82	0.73	95.0	95.0	94.5	93.0	6.0	2.3	2.5	21.5	1231
180	240	355L	MN35L6A3	990	321	177.1	0.82	0.77	0.65	95.1	95.1	94.6	93.0	6.0	2.0	2.5	28.7	1670
200	270	355L	MN35L613	990	348	196.8	0.84	0.80	0.7	95.2	95.2	95	93.3	6.0	2.0	2.5	28.7	1670
250	335	355L	MN35L633	990	434	246.0	0.84	0.80	0.7	95.5	95.5	95	93.5	6.0	2.0	2.5	35.5	1780

Notes:

- All performance values are subject to tolerance as per IS 325.
- For ratings above 0.37kW & up to 355kW, motors are available with efficiency class IE2. For details, please refer the section of IE2 series motors in this catalogue.
- Efficiency measurements are without seals.

STANDARD NON SPARKING MOTORS

PERFORMANCE TABLE FOR NON SPARKING MOTORS Ex(nA) Performance table for 8 Pole motors

TEFC 3 Phase Squirrel Cage Induction Motors - Frame size 90S to 355L

Applicable standard for testing: IS 4029
Applicable standard for efficiency determination: IS 4889

Voltage : 415V ± 10%
Frequency : 50Hz ± 5%
Combined Variation : ± 10%

Ambient : 50°C
Duty : S1(Continuous)
Temp. Class : T3
750 rpm (8-Pole)

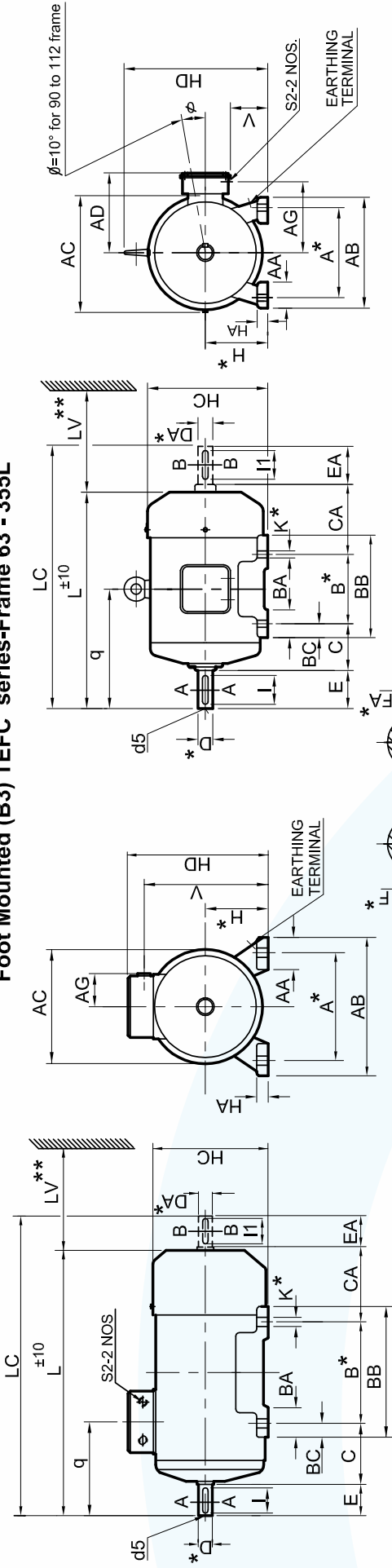
Ins. Class : F
Temp. Rise : B
Protection : IP55

Rated Output		Frame size IEC	Type ref. B3 construction	Operating characteristics at rated output										With DOL starting		Pulout Torque to Rated Torque Ratio	Rotor GD ² kgm ²	Net Weight B3 constr. kg	
kW	HP			Rated Speed RPM	Rated Current	Rated Torque kg-m	Power Factor			% Efficiency			Starting Current to Rated Current Ratio	Starting Torque to Rated Torque Ratio					
					FL	3/4L	1/2L	FL	3/4L	1/2L	FL	3/4L	1/2L						
0.37	0.5	90S	MN09S813	700	1.32	0.63	0.52	0.41	62.0	55.0	48.0	62.0	55.0	48.0	2.7	1.8	2.1	0.01100	11
0.55	0.75	90L	MN09L853	690	1.81	0.776	0.55	0.43	67.0	62.0	58.0	67.0	62.0	58.0	2.9	2.0	2.4	0.01400	14
0.75	1	100L	MN10L813	685	2.04	1.07	0.63	0.50	70.0	70.0	64.0	70.0	70.0	64.0	3.0	1.6	1.8	0.0230	18
1.1	1.5	100L	MN10L833	690	2.91	1.55	0.71	0.48	74.0	73.0	71.0	74.0	73.0	71.0	3.3	1.9	2.3	0.0270	21
1.5	2	112M	MN11M813	705	3.87	2.07	0.62	0.50	77.0	77.0	75.0	77.0	77.0	75.0	3.8	1.7	2.2	0.0510	25
2.2	3	132S	MN13S853	705	5.03	3.04	0.74	0.64	78.0	78.0	75.0	78.0	78.0	75.0	3.5	1.8	2.3	0.0990	44
3.7	5	160M	MN16M813	720	8.05	5.01	0.74	0.65	82.0	82.0	78.0	82.0	82.0	78.0	4.4	1.8	2.0	0.217	88
5.5	7.5	160M	MN16M833	715	11.6	7.49	0.78	0.74	84.5	84.5	82.0	84.5	84.5	82.0	4.8	1.9	2.2	0.299	101
7.5	10	160L	MN16L873	710	15.6	10.3	0.78	0.74	86.0	84.0	82.0	86.0	84.0	82.0	5.5	2.1	2.2	0.400	119
9.3	12.5	180M	MN18M813	715	18.9	12.7	0.79	0.74	86.5	86.5	85.0	86.5	86.5	85.0	4.5	2.1	2.2	0.620	177
11	15	180L	MN18L833	720	22.1	14.9	0.79	0.74	87.5	87.5	86.0	87.5	87.5	86.0	4.5	2.1	2.2	0.720	182
15	20	200L	MN20L833	720	28.8	20.3	0.82	0.79	88.5	88.5	87.0	88.5	88.5	87.0	5.5	2.5	2.3	1.32	282
18.5	25	225S	MN22S813	725	36.6	24.9	0.79	0.77	89.0	89.0	87.0	89.0	89.0	87.0	5.3	2.1	2.2	1.950	329
22	30	225M	MN22M833	725	43	29.6	0.79	0.77	90.0	89.0	87.0	90.0	89.0	87.0	5.3	2.1	2.2	2.410	369
30	40	250M	MN25M813	730	55.9	40.0	0.82	0.78	91.0	91.0	89.0	91.0	90.5	89.0	5.5	2.5	2.2	3.720	472
37	50	280S	MN28S823	730	70.8	49.4	0.79	0.75	92.0	92.0	90.0	92.0	92.0	90.0	5.5	2.2	2.2	5.83	615
45	60	280M	MN28M853	730	86.1	60.0	0.79	0.75	92.0	92.0	91.0	92.0	92.0	91.0	5.5	2.2	2.2	6.86	665
55	75	315S	MN31S813	740	105	72.4	0.78	0.73	93.0	93.0	90.5	93.0	92.5	90.5	5.5	2.1	2.4	10.7	833
75	100	315M	MN31M833	740	143	98.7	0.78	0.73	93.5	93.0	92.0	93.5	93.0	92.0	5.5	2.1	2.4	12.4	912
90	120	315M	MN31M853	740	171	118.5	0.78	0.73	94.0	93.5	92.5	94.0	93.5	92.5	5.5	2.1	2.4	15.5	1010
110	150	315L	MN31L873	740	208	144.8	0.78	0.73	94.2	93.7	92.5	94.2	93.7	92.5	5.5	2.1	2.4	18.0	1170
125	170	315L	MN31L8A3	740	236	164.5	0.78	0.73	94.3	93.7	92.5	94.3	93.7	92.5	5.5	2.1	2.4	21.5	1340
132	180	315L	MN31L893	740	249	173.7	0.78	0.73	94.5	94.0	92.8	94.5	94.0	92.8	5.5	2.1	2.4	21.5	1340
150	200	355L	MN35L8A3	740	283	197.4	0.78	0.70	94.6	94.0	92.5	94.6	94.0	92.5	5.5	1.8	2.2	28.7	1670
160	215	355L	MN35L813	740	300	210.6	0.78	0.70	95.0	94.5	92.5	95.0	94.5	92.5	5.5	1.8	2.2	28.7	1670
180	240	355L	MN35L8B3	740	338	236.9	0.78	0.70	95.0	94.3	92.3	95.0	94.3	92.3	5.5	1.8	2.2	35.5	1780
200	270	355L	MN35L833	740	376	263.2	0.78	0.70	95.0	94.5	92.5	95.0	94.5	92.5	5.5	1.8	2.2	35.5	1780

- All performance values are subject to tolerance as per IS 325.
- Ratings above 355kW up to 630kW are available in 355, 400 & 450 frames with Dual Circuit Cooling Arrangement (DCCA). Efficiency measurements are without seals.

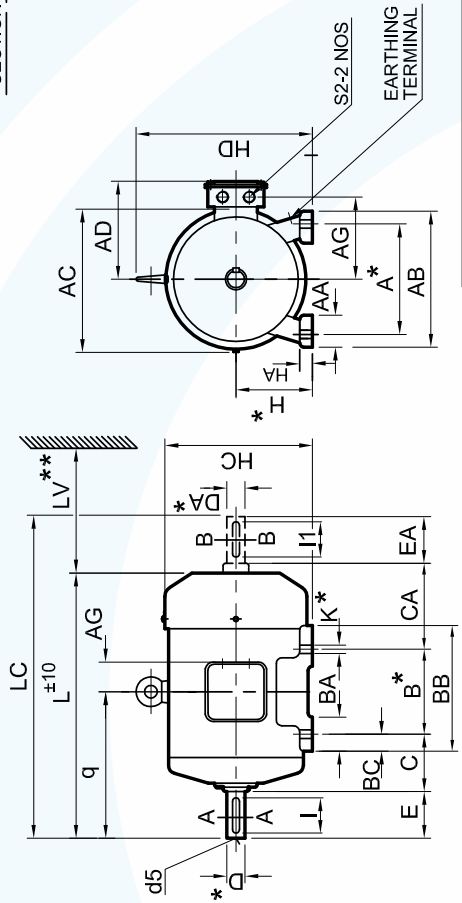
Dimensional Drawing: Increased Safety Motors (Type ME) and Non-Sparking Motors (Type MN)

Foot Mounted (B3) TEFC series-Frame 63 - 355L

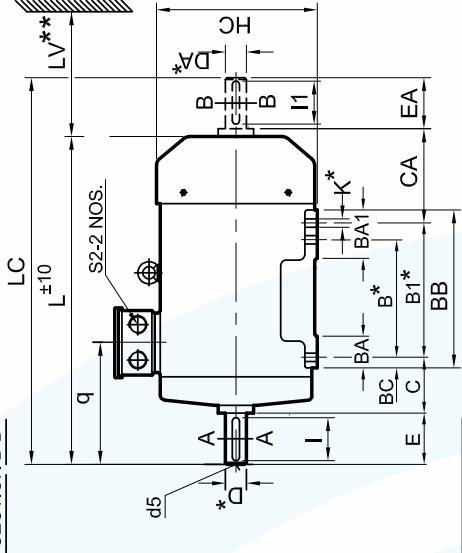


FRAME SIZE 63 TO 80

FRAME SIZE 90S TO 160L



FRAME SIZE 180M TO 225M



FRAME SIZE 250M TO 355L

* Refer TABLE A for tolerances

STANDARD NON SPARKING MOTORS

Dimensional Details: Increased Safety Motors (Type ME) and Non-Sparking Motors (Type MN)

Foot Mounted (B3) TEFC series-Frame 63-355L

IEC Ft. size	FIXING										GENERAL										TERMINAL BOX				SHAFT										
	A	B	* B1	C	* H	* K	AB	BB	AA	BA	BA1	BC	HA	HC	HD	AD	L	LC	CA	AC	LV**	V	q	AG	S2	D,DA	* * DA	E	F	* GA*	I	d5			
63	2 & 4	100	80	—	40	63	7	126	100	28	30	—	13	7	125	190	—	206	241	75	124	30	159	104	52	M20X1.5P	11	23	4	12.5	18	M4			
71	2,4 & 6	112	90	—	45	71	7	135	110	31	30	—	13	7	141	206	—	234	278	83	140	30	175	102	52	M20X1.5P	14	30	5	16	25	M5			
80	2,4 & 6	125	100	—	50	80	10	150	124	31	35	—	15	9	159	225	—	267	324	94	157	30	194	112	52	M20X1.5P	19	40	6	21.5	35	M6			
90S	2,4,6 & 8	140	100	—	56	90	10	180	130	50	43	—	18	13	177	① 141	—	302	374	143	174	35	156	110	M20X1.5P	24	50	8	27	45	M8				
90L	2,4,6 & 8	140	125	—	—	—	—	—	155	—	—	—	—	—	—	—	—	327	399	—	—	169	—	—	—	—	—	—	—	—	—	—	—		
100L	2,4,6 & 8	160	140	—	63	100	12	200	176	54	50	—	21	14	198	235	179	366	448	125	195	40	66	193	138	M25X1.5P	28	60	8	31	55	M10			
112M	4,6 & 8	190	140	—	70	112	12	230	176	62	51	—	21	15	222	260	191	388	471	141	220	45	80	200	151	M25X1.5P	28	60	8	31	55	M10			
132S	2	—	140	—	—	—	—	—	—	—	—	—	—	—	—	—	—	475	578	189	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
4,6 & 8	2	216	—	—	89	132	12	256	—	64	—	—	23	17	262	308	206	459	561	172	260	50	99	—	167	M25X1.5P	38	80	10	41	70	M12			
132M	2	—	178	—	—	—	—	—	218	—	—	—	—	—	—	—	—	513	616	189	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
4,6	4,6	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	497	599	172	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
160M	2,4	—	210	—	—	—	—	—	—	—	—	—	—	—	—	—	—	605	741	203	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
6 & 8	6 & 8	254	—	—	108	160	15	310	—	58	70	—	23	20	318	366	226	585	721	183	316	60	98	—	186	M25X1.5P	42	110	12	45	105	M16			
160L	2	—	254	—	—	—	—	—	294	—	—	—	—	—	—	—	—	629	765	183	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
180M	2,4,6 & 8	241	—	—	121	180	15	344	281	65	70	—	23	26	357	412	265	679	799	217	354	70	83	352	216	M32X1.5P	48	110	14	51.5	100	M16			
180L	2,4,6 & 8	279	—	—	—	—	—	—	319	—	—	—	—	—	—	—	—	717	838	218	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
200L	2	318	305	—	133	200	19	398	355	85	85	—	28	32	397	462	319	795	920	262	394	80	—	396	249	M40X1.5P	55	110	16	59	100	M20			
4,6 & 8	4,6 & 8	—	286	—	—	—	—	—	336	—	—	—	—	—	—	—	—	842	976	251	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
225M	2	356	311	—	149	225	19	436	361	85	85	—	28	34	450	509	344	837	956	276	450	90	—	415	273	M40X1.5P	55	110	16	59	100	M20			
4,6 & 8	4,6 & 8	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	857	1001	251	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
250M	2	406	349	—	168	250	24	506	425	100	115	—	49	42	495	665	—	983	1134	337	489	100	578	352	243	M50X1.5P	65	140	18	64	130	M20			
4,6 & 8	4,6 & 8	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	914	1065	268	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
280S/M	2	457	368	419	190	280	24	540	490	100	110	149	40	42	552	725	—	1010	1160	271	544	115	638	360	243	M50X1.5P	75	140	20	79.5	130	M20			
4,6 & 8	4,6 & 8	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1137	1293	340	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
315S/M	2	406	457	—	—	—	—	—	540	120	120	155	—	—	—	—	—	1167	1353	340	600	130	728	386	278	M50X1.5P	80	170	22	85	160	M20			
4,6 & 8	4,6 & 8	—	—	—	216	315	28	625	—	—	—	—	46	45	615	830	—	1302	1458	454	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
315L	2	508	—	—	—	—	—	—	593	120	120	120	—	—	—	—	—	1332	1518	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
4,6 & 8	4,6 & 8	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1461	1622	458	685	145	850	434	403	M75X1.5P	75	140	20	79.5	130	M24			
355L	2	610	630	—	254	355	28	710	770	110	170	—	73	45	693	939	—	1491	1682	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
4,6 & 8	4,6 & 8	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

TABLE A

Dimension	Tolerance	Specification			
		Dimension	Specification		
A,B	±0.75	6	11, 14, 19, 24, 28Ø		
H	-0.5	k6	38, 42, 48Ø		
K	-1	m6	55, 60, 65, 75, 80, 95Ø		
D,DA	OVER 280	IS : 1231	IS : 1231		
				GA, GC, F, FA	IS : 2048
				d5(centring)	IS : 2540

*Refer TABLE A for tolerances

** Minimum distance for efficient cooling of motor to be maintained by user.
 □ In 315L FR. For star delta connection Higher size T.Box will be provided

□ Double shaft extension can be provided with shaft dimension identical to DE shaft. ① Without Eye bolt

□ Also suitable for B6, B7, B8, V5 & V6 mounting as per IS 2253.

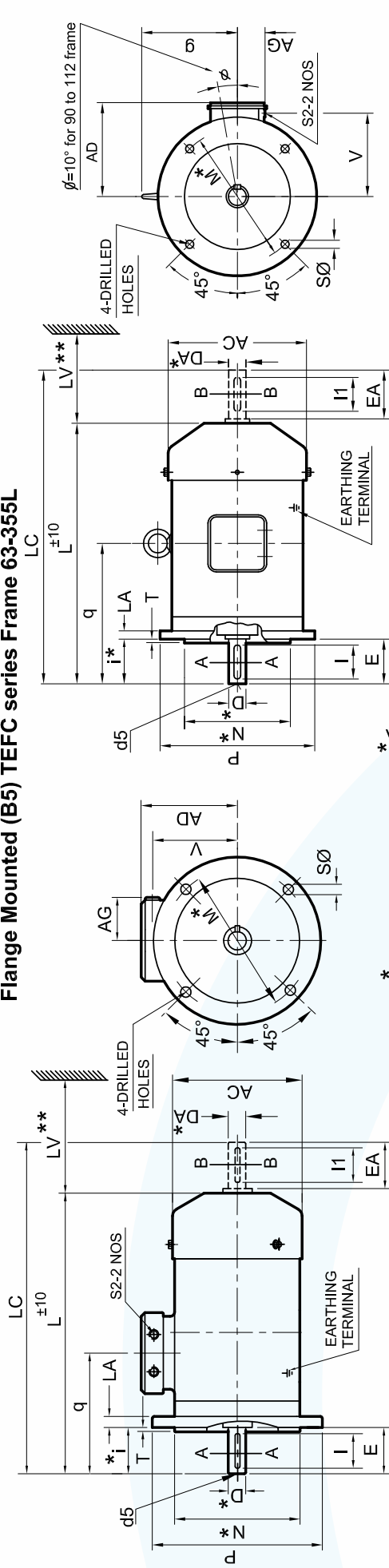
□ Key / key way fit : h9 / N9

All Dimensions are in mm unless otherwise specified.

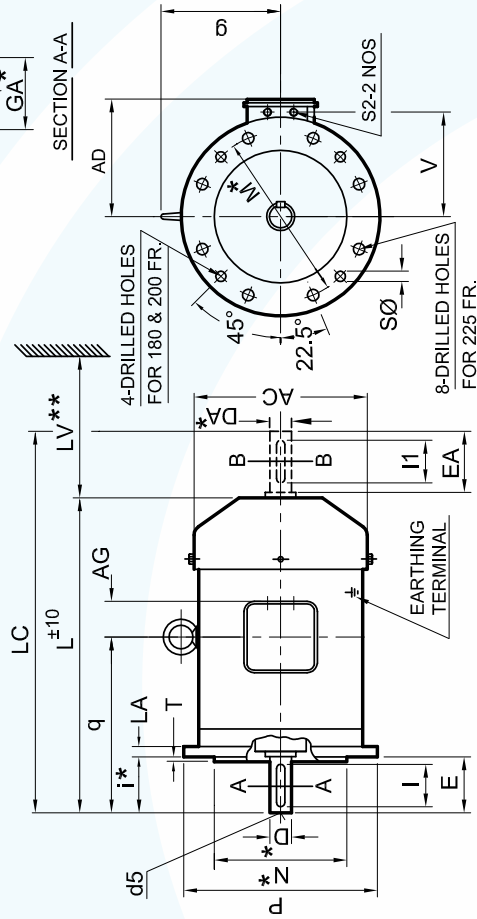
CAT-A-6335-3-2

Dimensional Drawing: Increased Safety Motors (Type ME) and Non-Sparking Motors (Type MN)

Flange Mounted (B5) TEFC series Frame 63-355L

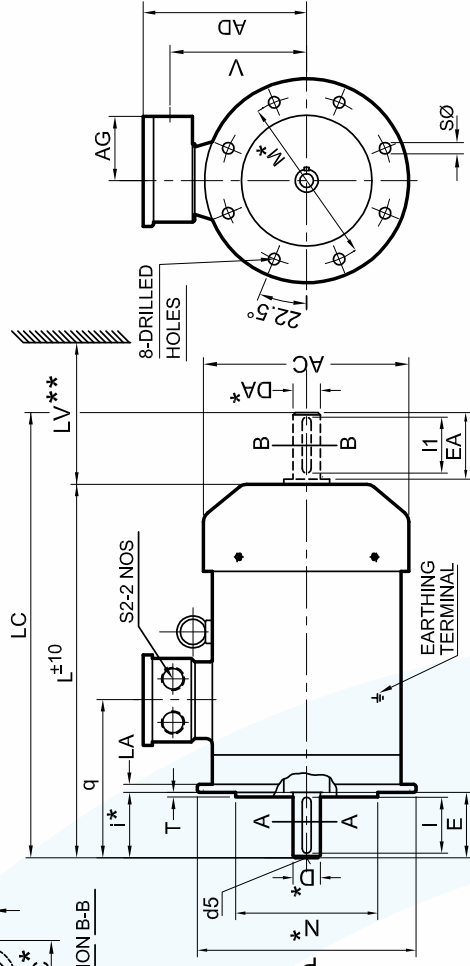


FRAME SIZE 63 TO 80



FRAME SIZE 180M TO 225M

FRAME SIZE 90S TO 160L



FRAME SIZE 250M TO 355L

* Refer TABLE A for tolerances

STANDARD NON SPARKING MOTORS

Dimensional Details: Increased Safety Motors (Type ME) and Non-Sparking Motors (Type MN)

Flange Mounted (B5) TEFC series-Frame 63-355L

IEC Fr. size	Pole	FIXING				GENERAL						TERMINAL BOX				SHAFT								
		* N	* M	* i	S	T	LA	AD	AC	L	LC	LV**	g	V	q	AG	S2	* D,DA	E EA	F* FA	GA* GC*	I I1	d5	
63	2 & 4	140	95	115	23	10	3	9	127	124	225	260	30	—	96	109	52	M20X1.5P	11	23	4	12.5	18	M4
71	2,4 & 6	160	110	130	30	10	3.5	9	135	140	261	305	30	—	104	127	52	M20X1.5P	14	30	5	16	25	M5
80	2,4 & 6	200	130	165	40	12	3.5	10	145	157	267	324	30	—	114	112	52	M20X1.5P	19	40	6	21.5	35	M6
90S	2,4,6 & 8	200	130	165	50	12	3.5	10	141	174	302	374	35	①	110	156	53	M20X1.5P	24	50	8	27	45	M8
90L	2,4,6 & 8	200	130	165	50	12	3.5	10	141	174	302	374	35	①	110	156	53	M20X1.5P	24	50	8	27	45	M8
100L	2,4,6 & 8	250	180	215	60	15	4	11	179	195	366	448	40	—	135	138	56	M25X1.5P	28	60	8	31	55	M10
112M	2,4,6 & 8	250	180	215	60	15	4	11	191	220	388	471	45	—	148	151	56	M25X1.5P	28	60	8	31	55	M10
132S	2	300	230	265	80	15	4	12	206	260	475	578	50	—	176	167	63	M25X1.5P	38	80	10	41	70	M12
132M	2	300	230	265	80	15	4	12	206	260	475	578	50	—	176	167	63	M25X1.5P	38	80	10	41	70	M12
160M	4,6 & 8	350	250	300	110	19	5	13	226	316	513	616	60	—	206	186	63	M25X1.5P	42	110	12	45	105	M16
160L	2	350	250	300	110	19	5	13	226	316	513	616	60	—	206	186	63	M25X1.5P	42	110	12	45	105	M16
180M	2,4,6 & 8	350	250	300	110	19	5	13	265	354	679	799	70	—	352	216	97	M32X1.5P	48	110	14	51.5	100	M16
180L	2,4,6 & 8	350	250	300	110	19	5	13	265	354	679	799	70	—	352	216	97	M32X1.5P	48	110	14	51.5	100	M16
200L	4,6 & 8	400	300	350	110	19	5	15	319	394	795	920	80	—	262	249	172	M40X1.5P	55	110	16	59	100	M20
225S	4,6 & 8	450	350	400	140	19	5	16	344	450	842	976	90	—	284	273	172	M40X1.5P	60	140	18	64	130	M20
225M	2	450	350	400	110	19	5	16	344	450	837	956	90	—	284	273	172	M40X1.5P	55	110	16	59	100	M20
250M	4,6 & 8	550	450	500	140	19	5	18	415	489	857	1001	100	—	328	352	243	M50X1.5P	60	140	18	64	130	M20
280S/M	2	550	450	500	140	19	5	18	445	544	983	1134	115	—	358	360	243	M50X1.5P	65	140	18	69	130	M20
315S/M	2	660	550	600	170	24	6	22	515	615	1137	1293	—	—	386	360	278	M50X1.5P	80	170	22	85	160	M20
315L	2	660	550	600	140	24	6	22	515	615	1167	1353	—	—	386	413	278	M50X1.5P	80	170	22	85	160	M20
355L	2	800	680	740	170	24	6	25	584	690	1302	1458	—	—	416	413	403	M63X1.5P	80	170	22	85	160	M20
	4,6 & 8	800	680	740	140	24	6	25	584	690	1461	1622	—	—	434	495	403	M75X1.5P	75	140	20	79.5	130	M24
	4,6 & 8	800	680	740	170	24	6	25	584	690	1491	1682	—	—	445	495	464	M75X1.5P	95	170	25	100	160	M24

TABLE A

Dimension	Tolerance		Specification	
	Dimension	Tolerance	Dimension	Specification
N	j6	11, 14, 19, 24, 29	D,DA	IS : 1231
	js6	38, 42, 48		
	m6	55, 60, 65, 75, 80, 95		
M	±0.3	OVER 265	GA,GC,FA d5(centering)	IS : 2048
	±0.5	OVER 265		
	±1	OVER 85		
i	±1.5	OVER 85		IS : 2540

① Without Eye bolt

** Minimum distance for efficient cooling of motor to be maintained by user.
 □ In 315L FR. For star delta connection Higher size T.Box will be provided

***Refer TABLE A for tolerances**

All Dimensions are in mm unless otherwise specified.

□ Key / key way fit : h9 / N9

□ 8 Nos. Fixing Holes from 225S/M frame onwards

□ Double shaft extension can be provided with shaft dimension identical to D.E shaft

□ Also suitable for V1 & V3 mounting as per IS 2253

CAT-A-6335-5-2

IE2 SERIES NON SPARKING MOTORS

HIGH EFFICIENCY IE2 SERIES NON SPARKING MOTORS - TYPE 2S PERFORMANCE TABLE FOR NON SPARKING MOTORS Ex(nA) 2 POLE

Applicable standard for testing & efficiency determination: IS 15999

Voltage : 415V ± 10%
Frequency : 50Hz ± 5%
Combined Variation : ± 10%

Ambient : 50°C
Duty : S1(Continuous)
Temp. Class : T3

Ins. Class : F
Temp. Rise : B
Protection : IP55



3000 rpm (2-Pole)

Rated Output		Frame size IEC	Type Ref. B3 Construction	Operating Characteristics at Rated output						With DOL Starting		Pullout Torque to Rated Torque Ratio	Rotor GD ² kgm ²	Net Weight B3 Consn. kg			
				Rated Speed RPM	Rated Current Amps.	Rated Torque kg.m	Power Factor			% Efficiency					Starting Current to Rated Current Ratio	Starting Torque to Rated Torque Ratio	
kW	HP			FL	3/4L	1/2L	FL	3/4L	1/2L								
0.37	0.5	71	2S0712A3	2800	0.96	0.129	0.74	0.68	0.60	72.2	72.2	66.0	5.0	2.6	3.0	0.0019	7
0.55	0.75	71	2S0712B3	2805	1.29	0.191	0.79	0.72	0.58	74.8	74.8	70.0	5.0	2.7	3.0	0.0019	7
0.75	1	80	2S080213	2830	1.64	0.258	0.82	0.74	0.62	77.4	77.4	73.5	5.0	2.5	2.8	0.0037	10
1.1	1.5	80	2S080233	2830	2.34	0.379	0.82	0.75	0.63	79.6	79.6	75.5	6.0	2.7	3.0	0.0051	11
1.5	2	90S	2S09S243	2840	3.13	0.514	0.82	0.78	0.68	81.3	81.3	78.0	6.5	3.3	3.5	0.0091	17
2.2	3	90L	2S09L273	2840	4.49	0.755	0.82	0.78	0.68	83.2	83.2	81.7	6.5	3.3	3.5	0.0113	20
3.7	5	100L	2S10L233	2890	6.92	1.25	0.87	0.83	0.75	85.5	85.5	84.0	6.5	3.0	3.3	0.0212	26
5.5	7.5	132S	2S13S2G3	2935	9.9	1.83	0.90	0.88	0.83	87.0	87.0	82.0	7.0	2.6	3.0	0.0820	55
7.5	10	132S	2S13S2N3	2935	13.2	2.49	0.90	0.87	0.82	88.1	88.1	85.0	7.0	2.6	3.0	0.0980	67
9.3	12.5	160M	2S16M233	2935	16.4	3.09	0.89	0.86	0.82	88.8	88.8	85.0	6.5	2.0	2.5	0.1500	105
11	15	160M	2S16M253	2935	19.2	3.65	0.89	0.84	0.76	89.4	89.4	87.0	6.5	2.3	3.0	0.171	112
15	20	160M	2S16M263	2930	26	4.99	0.89	0.88	0.82	90.3	90.3	88.0	6.5	2.0	2.5	0.203	120
18.5	25	160L	2S16L293	2930	31.5	6.15	0.90	0.89	0.86	90.9	90.9	89.0	6.5	2.0	2.5	0.268	137
22	30	180M	2S18M233	2935	37.7	7.30	0.89	0.87	0.82	91.3	91.3	88.8	7.0	2.4	2.7	0.34	117
30	40	200L	2S20L2A3	2955	51	9.89	0.89	0.86	0.80	92.0	92.0	90.0	7.0	2.6	3.0	0.61	274
37	50	200L	2S20L253	2945	62.5	12.2	0.89	0.86	0.80	92.5	92.5	90.0	7.0	2.4	2.5	0.61	274
45	60	225M	2S22M253	2965	76.6	14.8	0.88	0.85	0.78	92.9	92.9	91.0	7.0	2.5	2.5	1.13	353
55	75	250M	2S25M233	2965	89.2	18.1	0.92	0.91	0.86	93.2	93.2	90.0	7.0	2.3	2.7	2.60	550
75	100	280S	2S28S233	2970	124	24.6	0.90	0.88	0.83	93.8	93.8	92.0	7.0	2.2	2.8	3.01	669
90	120	280M	2S28M253	2970	146	29.5	0.91	0.89	0.87	94.1	94.1	90.9	7.0	2.2	2.8	3.42	750
110	150	315S	2S31S233	2982	180	35.9	0.90	0.86	0.78	94.3	94.3	91.5	7.0	2.0	2.5	5.0	898
125	170	315M	2S31M2A3	2982	207	40.8	0.89	0.85	0.76	94.5	94.5	91.5	7.0	2.2	2.6	5.0	940
132	180	315M	2S31M233	2982	216	43.1	0.90	0.86	0.78	94.6	94.6	91.3	7.0	2.0	2.5	5.0	940
150	200	315L	2S31L2A3	2982	248	49.0	0.89	0.84	0.76	94.7	94.7	92.2	7.0	2.0	2.5	6.2	1100
160	215	315L	2S31L253	2982	261	52.3	0.90	0.85	0.77	94.8	94.8	93.0	7.0	2.0	2.5	6.2	1100
180	240	315L	2S31L2B3	2982	300	58.8	0.88	0.82	0.75	94.9	94.9	93.0	7.0	2.0	2.5	7.7	1390
*200	270	315L	2S31L273	2982	325	65.3	0.90	0.85	0.77	95	95	93.3	7.0	2.0	2.5	7.7	1390
*250	335	355L	2S35L213	2985	407	81.6	0.90	0.88	0.84	95.0	95.0	92.8	7.0	1.6	2.4	12.0	1680
*315	425	355L	2S35L233	2985	512	102.8	0.90	0.88	0.84	95	95	93.0	7.0	1.6	2.4	14.7	1870

Note : Efficiency class 'IE2' will be punched on the nameplates as per IS : 12615-2011 for ratings from 0.37kw to 375kw.

All performance values are subject to tolerance as per IS/IEC 60034-1

Efficiency measurements are without seals.

* - These ratings are suitable for ambient temperature 45°C

IE2 SERIES NON SPARKING MOTORS

HIGH EFFICIENCY IE2 SERIES NON SPARKING MOTORS - TYPE 2S PERFORMANCE TABLE FOR NON SPARKING MOTORS Ex(nA) 4 POLE

TEFC 3 Phase Squirrel Cage Induction Motors - Frame size 71 to 355L

Applicable standard for testing & efficiency determination: IS 15999

Voltage : 415V ± 10%
Frequency : 50Hz ± 5%
Combined Variation : ± 10%

Ambient : 50°C

Duty : S1(Continuous)

Temp. Class : T3

1500 rpm (4-Pole)

Ins. Class : F

Temp. Rise : B

Protection : IP55



Rated Output		Frame size IEC	Type Ref. B3 Construction	Operating Characteristics at Rated output										With DOL Starting		Pullout Torque to Rated Torque Ratio	Rotor GD ² kgm ²	Net Weight B3 Constn. kg
				Rated Speed RPM	Rated Current Amps.	Rated Torque kg.m	Power Factor			% Efficiency			Starting Current to Rated Current Ratio	Starting Torque to Rated Torque Ratio				
kW	HP			FL	3/4L	1/2L	FL	3/4L	1/2L	FL	3/4L	1/2L	FL	3/4L	1/2L			
0.37	0.5	71	2S071433	1380	1.03	0.26	0.71	0.62	0.50	70.1	70.1	65.0	3.4	2.3	2.5	0.0033	7	
0.55	0.75	80	2S080433	1420	1.38	0.38	0.74	0.64	0.50	75.1	75.1	68.0	5.0	2.8	3.0	0.0072	11	
0.75	1	80	2S080453	1410	1.75	0.52	0.75	0.66	0.53	79.6	79.6	74.0	5.0	2.8	3.0	0.0082	12	
1.1	1.5	90S	2S09S423	1430	2.44	0.75	0.77	0.70	0.57	81.4	81.4	77.5	6.0	2.4	2.8	0.015	15	
1.5	2	90L	2S09L473	1435	3.23	1.02	0.78	0.70	0.57	82.8	82.8	80.0	5.5	2.7	3.0	0.019	19	
2.2	3	100L	2S10L473	1435	4.48	1.49	0.81	0.74	0.60	84.3	84.3	82.0	6.0	2.6	3.0	0.028	26	
3.7	5	112M	2S11M473	1450	7.46	2.49	0.80	0.76	0.62	86.3	86.3	84.0	6.5	2.7	3.0	0.066	36	
5.5	7.5	132S	2S13S4K3	1450	10.2	3.69	0.85	0.82	0.74	87.7	87.7	86.0	6.5	2.2	2.8	0.126	64	
7.5	10	132M	2S13M4T3	1450	13.8	5.04	0.85	0.82	0.74	88.7	88.7	87.0	6.5	2.2	2.8	0.163	74	
9.3	12.5	160M	2S16M4C3	1460	17.7	6.20	0.82	0.76	0.68	89.3	89.3	87.0	6.5	2.5	2.8	0.177	105	
11	15	160M	2S16M4K3	1465	20.3	7.31	0.84	0.80	0.70	89.8	89.8	88.0	6.5	2.5	2.8	0.229	115	
15	20	160L	2S16L4T3	1465	27.1	9.97	0.85	0.82	0.72	90.6	90.6	89.5	6.5	2.5	2.7	0.300	128	
18.5	25	180M	2S18M473	1465	33.2	12.3	0.85	0.82	0.76	91.2	91.2	89.5	7.0	2.7	2.9	0.540	188	
22	30	180L	2S18L483	1470	39.5	14.6	0.84	0.78	0.70	91.6	91.6	89.8	7.0	2.8	3.0	0.61	200	
30	40	200L	2S20L453	1470	52.6	19.9	0.86	0.82	0.72	92.3	92.3	90.0	7.0	2.6	2.6	0.93	275	
37	50	225S	2S22S433	1470	63.8	24.5	0.87	0.85	0.77	92.7	92.7	90.5	7.0	2.6	2.6	1.60	362	
45	60	225M	2S22M453	1470	77.3	29.7	0.87	0.85	0.77	93.1	93.1	91.0	7.0	2.6	2.6	1.85	377	
55	75	250M	2S25M433	1480	95.2	36.2	0.86	0.84	0.76	93.5	93.5	91.0	7.0	2.5	2.6	3.06	500	
75	100	280S	2S28S423	1480	126	49.4	0.88	0.86	0.80	94.0	94.0	92.0	7.0	2.2	2.5	5.53	670	
90	120	280M	2S28M453	1480	151	59.2	0.88	0.86	0.80	94.2	94.2	92.0	7.0	2.2	2.5	6.36	735	
110	150	315S	2S31S413	1485	188	72.1	0.86	0.83	0.76	94.5	94.5	92.3	6.5	2.5	3.0	9.97	862	
125	170	315M	2S31M4A3	1486	216	81.9	0.85	0.81	0.74	94.6	94.6	92.7	6.5	2.5	3.0	11.7	965	
132	180	315M	2S31M433	1487	225	86.5	0.86	0.83	0.76	94.7	94.7	93.0	6.5	2.5	3.0	11.7	965	
150	200	315L	2S31L4A3	1488	262	98.2	0.84	0.80	0.72	94.7	94.7	92.8	6.5	2.5	3.0	14.0	1145	
160	215	315L	2S31L453	1488	273	104.7	0.86	0.83	0.76	94.9	94.9	93.1	6.5	2.5	3.0	14.0	1145	
180	240	315L	2S31L463	1488	307	117.8	0.86	0.83	0.76	95.0	94.7	93.2	6.5	2.5	3.0	15.6	1225	
200	270	315L	2S31L473	1488	340	130.9	0.86	0.83	0.76	95.1	94.8	93.3	6.5	2.5	3.0	17.8	1290	
250	335	355L	2S35L413	1488	416	163.6	0.88	0.85	0.75	95.1	94.9	93.5	6.5	2.2	2.5	23.3	1680	
315	422	355L	2S35L433	1488	524	206.2	0.88	0.85	0.75	95.1	94.8	93.5	6.5	2.2	2.5	32.7	1855	
355	475	355L	2S35L453	1488	590	232.4	0.88	0.85	0.75	95.1	94.9	93.5	6.5	2.2	2.5	37.9	2025	

Note : Efficiency class 'IE2' will be punched on the nameplates as per IS : 12615-2011 for ratings from 0.37kw to 375kw.

All performance values are subject to tolerance as per IS/IEC 60034-1

Efficiency measurements are without seals.

(*) This rating is suitable ambient temperature 45°C

IE2 SERIES NON SPARKING MOTORS

HIGH EFFICIENCY IE2 SERIES NON SPARKING MOTORS - TYPE 2S PERFORMANCE TABLE FOR NON SPARKING MOTORS Ex(nA) 6 POLE

TEFC 3 Phase Squirrel Cage Induction Motors - Frame size 80 to 355L

Applicable standard for testing & efficiency determination: IS 15999

Voltage : 415V ± 10%
Frequency : 50Hz ± 5%
Combined Variation : ± 10%

Ambient : 50° C
Duty Class : S₁(Continuous)
1000 rpm (6-Pole)

Ins. Class : F
Temp. Rise : B
Protection : IP55



Rated Output		Frame size IEC	Type Ref. B3 Construction	Operating Characteristics at Rated output										With DOL Starting		Rotor GD ² kgm ²	Net Weight B3 Constn. kg	
kW	HP			Rated Speed RPM	Rated Current Amps.	Rated Torque kg.m	Power Factor			% Efficiency			Starting Current to Rated Current Ratio	Starting Torque to Rated Torque Ratio	Pullout Torque to Rated Torque Ratio			
					FL	3/4L	1/2L	FL	3/4L	1/2L	FL	3/4L	1/2L					
0.37	0.5	80	2S080613	910	1.07	0.396	0.70	0.60	0.48	0.48	69.0	69.0	67.0	3.0	2.1	2.3	0.0060	10
0.55	0.75	80	2S080633	915	1.48	0.585	0.71	0.62	0.48	0.48	72.9	72.9	68.5	4.0	2.2	2.5	0.0084	11
0.75	1	90S	2S09S633	925	1.91	0.790	0.72	0.61	0.50	0.50	75.9	75.9	72.3	4.0	2.0	2.5	0.0122	14
1.1	1.5	90L	2S09L653	930	2.72	1.15	0.72	0.61	0.50	0.50	78.1	78.1	74.0	4.0	2.0	2.6	0.0160	17
1.5	2	100L	2S10L633	935	3.63	1.56	0.72	0.60	0.52	0.52	79.8	79.6	75.0	4.5	2.0	2.5	0.0250	22
2.2	3	112M	2S11M653	940	4.99	2.28	0.75	0.65	0.58	0.58	81.8	81.8	79.8	5.0	2.1	2.5	0.065	33
3.7	5	132S	2S13S6G3	960	8	3.75	0.74	0.70	0.60	0.60	84.3	83.5	82.0	5.5	2.0	2.5	0.130	52
5.5	7.5	132M	2S13M6T3	960	11.4	5.58	0.74	0.70	0.60	0.60	86.0	84.5	82.0	6.0	2.0	2.5	0.193	71
7.5	10	160M	2S16M633	960	15	7.61	0.80	0.74	0.64	0.64	87.2	87.2	85.2	5.5	2.0	2.5	0.276	103
9.3	12.5	160L	2S16L663	960	18.4	9.44	0.80	0.74	0.64	0.64	88.0	88.0	86.7	5.5	2.1	2.5	0.34	113
11	15	160L	2S16L673	965	21.6	11.1	0.80	0.77	0.66	0.66	88.7	88.7	87.0	6.0	2.0	2.5	0.40	123
15	20	180L	2S18L633	965	29.1	15.1	0.80	0.75	0.62	0.62	89.7	89.7	87.2	5.5	2.6	2.3	0.82	200
18.5	25	200L	2S20L633	975	34.7	18.5	0.82	0.77	0.69	0.69	90.4	90.4	88.3	5.5	2.6	2.3	1.20	254
22	30	200L	2S20L653	975	41.1	22.0	0.82	0.77	0.69	0.69	90.9	90.9	88.8	6.0	2.6	2.3	1.37	270
30	40	225M	2S22M643	975	52.9	30.0	0.86	0.84	0.76	0.76	91.7	91.2	88.7	7.0	2.5	2.2	2.41	358
37	50	250M	2S25M633	980	63.4	36.8	0.88	0.85	0.82	0.82	92.2	92.2	91.0	6.0	2.5	2.3	3.72	528
45	60	280S	2S28S613	980	81.4	44.7	0.83	0.80	0.70	0.70	92.7	92.7	91.2	6.0	2.5	2.4	5.11	573
55	75	280M	2S28M633	980	96.7	54.7	0.85	0.83	0.73	0.73	93.1	93.1	91.0	6.0	2.4	2.4	6.16	620
75	100	315S	2S31S613	985	131	74.2	0.85	0.82	0.75	0.75	93.7	93.7	92.5	6.0	2.4	2.5	10.7	830
90	120	315M	2S31M633	987	159	88.8	0.84	0.81	0.72	0.72	94.0	93.9	92.5	6.0	2.3	2.5	12.4	912
110	150	315M	2S31M653	988	191	108.4	0.85	0.82	0.74	0.74	94.3	94.3	93.3	6.0	2.3	2.5	15.5	1010
125	170	315L	2S31L6A3	988	219	123.2	0.84	0.80	0.71	0.71	94.4	94.4	93.0	6.0	2.3	2.5	18.0	1175
132	180	315L	2S31L673	988	228	130.1	0.85	0.82	0.73	0.73	94.6	94.3	92.8	6.0	2.3	2.5	18.0	1175
150	200	315L	2S31L6B3	988	265	147.9	0.83	0.80	0.70	0.70	94.7	94.4	92.8	6.0	2.3	2.5	21.5	1231
160	215	315L	2S31L693	988	276	157.7	0.85	0.82	0.73	0.73	94.8	94.6	93.0	6.0	2.3	2.5	21.5	1231
180	240	355L	2S35L6A3	990	322	177.1	0.82	0.77	0.65	0.65	94.9	94.6	93.3	6.0	2.0	2.5	28.7	1670
200	270	355L	2S35L613	990	349	196.8	0.84	0.80	0.7	0.7	95.0	94.7	93.5	6.0	2.0	2.5	28.7	1670
250	335	355L	2S35L633	990	436	246.0	0.84	0.80	0.7	0.7	95.0	94.7	93.4	6.0	2.0	2.5	35.5	1780

Note : Efficiency class 'IE2' will be punched on the nameplates as per IS : 12615-2011 for ratings from 0.37kw to 375kw.

All performance values are subject to tolerance as per IS/IEC 60034-1

Efficiency measurements are without seals.

HIGH EFFICIENCY NON SPARKING MOTORS

HIGH EFFICIENCY NON SPARKING MOTORS - TYPE MS PERFORMANCE TABLE FOR NON SPARKING MOTORS Ex(nA) 8 POLE

Standard TEFC 3 Phase Squirrel Cage Induction Motors - Frame size 90s to 355L

Applicable standard for testing: IS 4029

Applicable standard for efficiency determination: IS 4889

Voltage : 415V ± 10%

Frequency : 50Hz ± 5%

Combined Variation : ± 10%

Ambient : 45° C

Duty Class : S1(Continuous)

Ins. Class : F

Temp. Rise : B

Protection : IP55

Ins. Class : F
Temp. Rise : B
Protection : IP55

750 rpm (8-Pole)

Rated Output	Frame size	Type ref	Rated Speed RPM	Rated Current Amps	Rated Torque kg.m	Operating Characteristics at Rated output				With DOL Starting			Rotor GD ² kgm ²	Net Weight kg		
						Power Factor		% Efficiency		Starting Current to Rated Current Ratio	Starting Torque to Rated Torque Ratio	Pullout Torque to Rated Torque Ratio				
						FL	3/4L	1/2L	FL						3/4L	1/2L
0.37	90S	MS09S813	700	1.22	0.515	0.63	0.52	0.41	66.8	60.0	52.0	2.7	1.8	2.1	0.0110	11
0.55	90L	MS09L853	690	1.71	0.776	0.63	0.53	0.43	71.1	67.0	62.0	2.9	2.0	2.4	0.0140	14
0.75	1	MS10L813	685	1.94	1.07	0.73	0.63	0.50	73.8	73.8	67.0	3.0	1.7	2.0	0.0230	18
1.1	100L	MS10L833	690	2.83	1.55	0.71	0.62	0.48	76.2	76.2	73.0	3.3	1.9	2.3	0.0270	21
1.5	2	MS11M813	705	3.83	2.07	0.70	0.62	0.50	77.9	77.9	75.0	3.8	1.7	2.2	0.0510	25
2.2	3	MS13S8B3	705	4.87	3.04	0.78	0.74	0.64	80.5	80.0	76.0	3.5	1.8	2.3	0.0990	44
3.7	5	MS16M813	720	7.95	5.01	0.78	0.74	0.65	83.0	83.0	78.0	4.4	1.8	2.0	0.217	88
5.5	7.5	MS16M833	720	11.5	7.44	0.78	0.74	0.65	85.1	85.1	82.0	4.8	1.9	2.2	0.299	101
7.5	10	MS16L873	715	15.5	10.2	0.78	0.74	0.65	86.4	86.4	84.0	5.5	2.1	2.2	0.400	119
9.3	12.5	MS18M813	720	18.8	12.6	0.79	0.74	0.64	87.3	87.3	85.0	5.0	2.1	2.2	0.620	177
11	15	MS18L833	720	22	14.9	0.79	0.74	0.64	88.1	88.1	87.0	5.0	2.1	2.2	0.720	182
15	20	MS20L833	720	28.6	20.3	0.82	0.79	0.71	89.0	89.0	88.0	6.0	2.5	2.3	1.32	282
18.5	25	MS22S823	725	36.3	24.9	0.79	0.77	0.69	89.8	89.8	88.0	5.5	2.1	2.2	2.10	334
22	30	MS22M833	725	43	29.6	0.79	0.77	0.69	90.2	90.2	88.0	5.5	2.1	2.2	2.41	369
30	40	MS25M813	730	55.6	40.0	0.82	0.78	0.68	91.5	91.5	89.0	6.0	2.5	2.2	3.72	472
37	50	MS28S823	730	70.8	49.4	0.79	0.75	0.65	92.0	92.0	90.0	5.5	2.2	2.2	5.83	615
45	60	MS28M853	730	85.8	60.0	0.79	0.75	0.65	92.4	92.4	90.0	5.5	2.2	2.2	6.86	665
55	75	MS31S813	740	105	72.4	0.78	0.73	0.64	93.0	92.5	90.5	5.5	2.1	2.4	10.7	833
75	100	MS31M833	740	143	98.7	0.78	0.73	0.64	93.5	93.5	92.0	5.5	2.1	2.4	12.4	912
90	120	MS31M853	740	171	118.5	0.78	0.73	0.65	94.0	94.0	93.0	5.5	2.1	2.4	15.5	1010
110	150	MS31L873	740	208	144.8	0.78	0.73	0.64	94.3	94.0	93.0	5.5	2.1	2.4	18.0	1170
125	170	MS31L8A3	740	236	164.5	0.78	0.73	0.64	94.6	94.4	93.6	5.5	2.1	2.4	21.5	1340
132	180	MS31L893	740	248	173.7	0.78	0.73	0.64	94.8	94.7	94.0	5.5	2.1	2.4	21.5	1340
150	200	MS35L8A3	740	282	197.4	0.78	0.70	0.60	95.0	95.0	93.0	5.5	1.8	2.2	28.7	1670
160	215	MS35L813	740	300	210.6	0.78	0.70	0.60	95.0	95.0	93.0	5.5	1.8	2.2	28.7	1670
180	240	MS35L8B3	740	337	236.9	0.78	0.70	0.60	95.2	95.2	93.2	5.5	1.8	2.2	35.5	1780
200	270	MS35L833	740	374	263.2	0.78	0.70	0.60	95.3	95.3	93.3	5.5	1.8	2.2	35.5	1780

Note :

All performance values are subject to tolerance as per IS: 325.

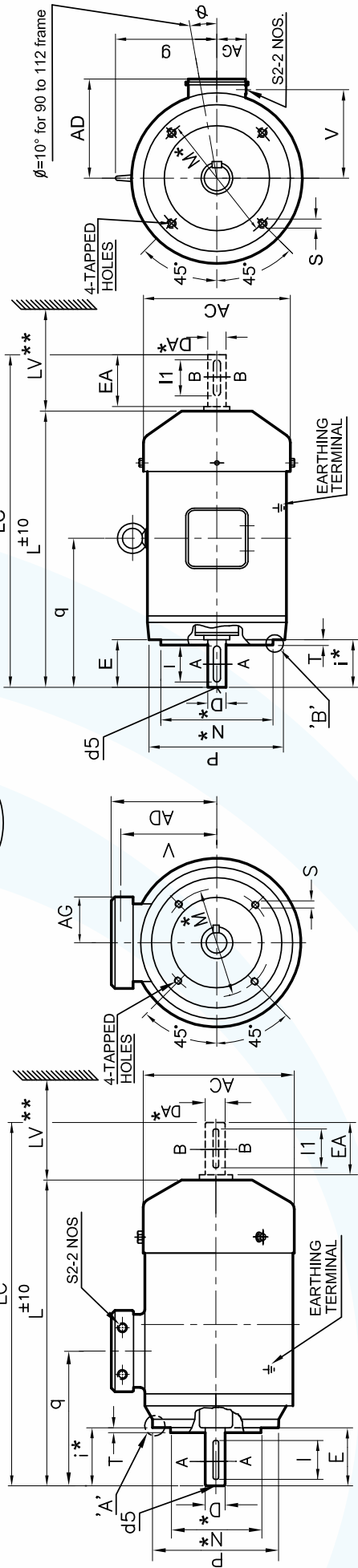
Efficiency measurements are without seals.

Ratings above 200kW/8P upto 630kW/8P are available in Frame 400 & 450. For details contact our sales office.

IE2 SERIES NON SPARKING MOTORS

Dimensional Drawing: Non Sparking Motors (Type 2S/MS)

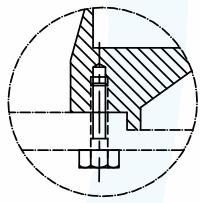
Face Mounted (B14) TEFC IE2 series-Frame 63-132



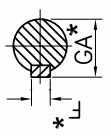
FRAME SIZE 90S TO 132M

FRAME SIZE 63 TO 80

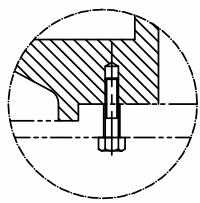
IEC Fr. size	FIXING			GENERAL					TERMINAL BOX				SHAFT															
	Pole	N	M	* i	S	T	AD	AC	L	LC	g	LV	**	V	q	AG	S2	D*	DA	E	EA	F*	FA	GA*	GC	I	d5	
63	2 & 4	90	60	75	23	M5X10	2.5	127	124	206	241	—	30	96	104	52	M20X1.5P	11	23	4	12.5	18	M4					
71	2, 4 & 6	105	70	85	30	M6X10	2.5	135	140	234	278	—	30	104	102	52	M20X1.5P	14	30	5	16	25	M5					
80	2, 4 & 6	120	80	100	40	M6X13	3	145	157	267	324	—	30	104	112	52	M20X1.5P	19	40	6	21.5	35	M6					
90S	6 & 8	140	95	115	50	M8X12	3	141	174	302	374	①	35	110	156	53	M20X1.5P	24	50	8	27	45	M8					
90L	6 & 8	140	95	115	50	M8X12	3	141	174	327	399	—	35	110	169	53	M20X1.5P	24	50	8	27	45	M8					
100L	6 & 8	160	110	130	60	M8X12	3.5	179	195	366	448	135	40	138	193	56	M25X1.5P	28	60	8	31	55	M10					
112M	6 & 8	160	110	130	60	M8X12	3.5	191	220	388	471	148	45	151	200	56	M25X1.5P	28	60	8	31	55	M10					
132S	6 & 8	—	—	—	—	—	—	—	—	459	561	—	—	—	239	—	—	—	—	—	—	—	—	—	—	—	—	
132M	6	250	180	215	80	M12X20	4	206	260	497	599	176	50	167	258	63	M25X1.5P	38	80	10	41	70	M12					



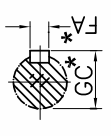
ENLARGEMENT OF CIRCLE 'A'



SECTION A—A



ENLARGEMENT OF CIRCLE 'B'



SECTION B—B

TABLE A

Dimension	Tolerance	Specification
N	j6	IS : 2223
M	±0.3	
i	±1.0	

① Without Eye bolt

□ Also suitable for V19 & V18 mounting as per IS 2253

□ Key / key way fit : h9 / N9

TABLE B

Dimension	Tolerance	Specification
D, DA	j6	IS : 1231
	k6	
GA, GC, FFA d5(centring)		IS : 2048
		IS : 2540

** Minimum distance for efficient cooling of motor to be maintained by user.

□ Double shaft extension can be provided with shaft dimension identical to D.I.E. shaft

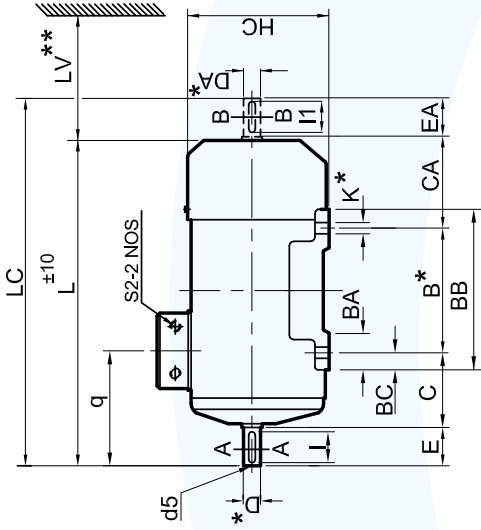
*Refer TABLE A for tolerances

All Dimensions are in mm unless otherwise specified.
CAT-E-6313-4-1

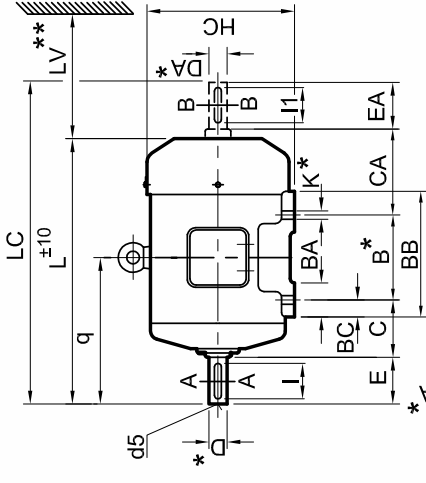
IE2 SERIES NON SPARKING MOTORS

Dimensional Drawing: Non Sparking Motors (Type 2S/MS)

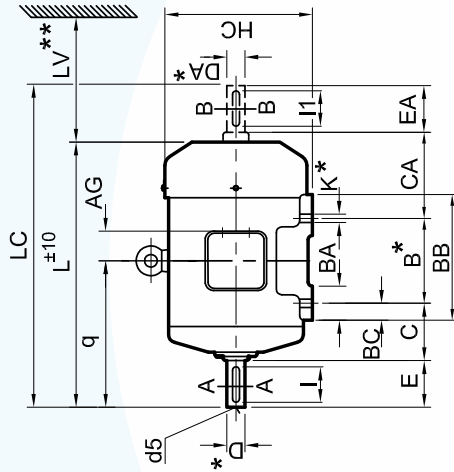
Foot Mounted (B3) TEFC (IE2) series-Frame 63-355L



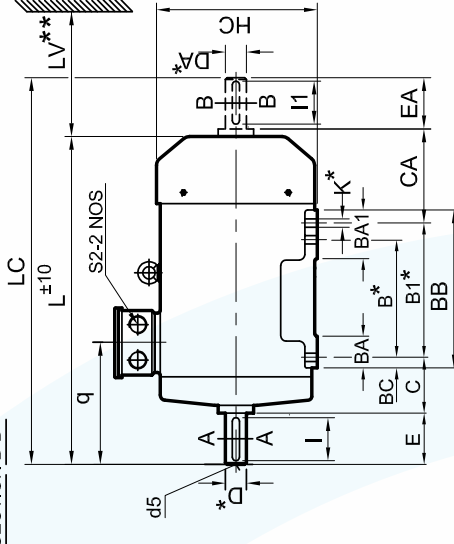
FRAME SIZE 63 TO 80



FRAME SIZE 90S TO 160L



FRAME SIZE 180M TO 225M



FRAME SIZE 250M TO 355L

* Refer TABLE A for tolerances

IE2 SERIES NON SPARKING MOTORS

Dimensional Details: Non Sparking Motors (Type 2S/MS) Foot Mounted (B3) TEFC (IE2) series-Frame 63-355L

IEC Fr. size	FIXING					GENERAL														TERMINAL BOX					SHAFT					TABLE B						
	Pole	A	B	* B1	* K	C	H	* K	AB	BB	AA	BA	BC	HA	HC	HD	AD	L	LC	CA	AC	LV	** V	q	AG	S2	* D, DA	E	F*	GA*	I	d5	L	LC	CA	
63	2 & 4	100	80	—	40	63	7	126	100	28	30	—	13	7	125	190	—	206	241	75	124	30	159	104	52	M20X1,5P	11	23	4	12.5	18	M4	—	—	—	—
71	2,4 & 6	112	90	—	45	71	7	135	110	31	30	—	13	7	141	206	—	234	278	83	140	30	175	102	52	M20X1,5P	14	30	5	16	25	M5	—	—	—	—
80	2,4 & 6	125	100	—	50	80	10	150	124	31	35	—	15	9	159	225	—	267	324	94	157	30	194	112	52	M20X1,5P	19	40	6	21.5	35	M6	—	—	—	—
90S	6 & 8	140	100	—	56	90	10	180	130	50	43	—	18	13	177	⊕	141	302	374	143	174	35	57	169	110	M20X1,5P	24	50	8	27	45	M8	2 & 4	336	408	152
90L	6 & 8	125	100	—	56	90	10	180	155	50	43	—	18	13	177	⊕	141	327	399	143	174	35	57	169	110	M20X1,5P	24	50	8	27	45	M8	2 & 4	361	433	152
100L	6 & 8	160	140	—	63	100	12	200	176	54	50	—	21	14	198	235	179	366	448	125	195	40	66	193	138	M25X1,5P	28	60	8	31	55	M10	2 & 4	387	469	146
112M	6 & 8	190	140	—	70	112	12	230	176	62	51	—	21	15	222	260	191	388	471	141	220	45	80	200	151	M25X1,5P	28	60	8	31	55	M10	4	419	502	172
132S	6 & 8	140	100	—	89	132	12	256	180	64	50	—	23	17	262	308	206	459	561	172	260	50	99	258	167	M25X1,5P	38	80	10	41	70	M12	2 & 4	518	617	228
132M	6	178	140	—	89	132	12	256	218	64	54	—	23	17	262	308	206	497	599	172	260	50	99	258	167	M25X1,5P	38	80	10	41	70	M12	—	—	—	—
160M	2,4	210	160	—	108	160	15	310	250	85	70	—	23	20	318	366	226	605	741	203	316	60	98	323	186	M25X1,5P	42	110	12	45	105	M16	2 & 4	635	771	233
160L	6 & 8	254	160	—	108	160	15	310	294	85	70	—	23	20	318	366	226	629	765	183	316	60	98	345	186	M25X1,5P	42	110	12	45	105	M16	—	—	—	—
180M	2,6 & 8	241	180	—	121	180	15	344	281	85	70	—	23	26	357	412	265	679	799	217	354	70	83	352	216	M32X1,5P	48	110	14	51.5	100	M16	—	—	—	—
180L	6 & 8	279	180	—	121	180	15	344	319	85	70	—	23	26	357	412	265	717	838	218	354	70	83	371	216	M32X1,5P	48	110	14	51.5	100	M16	—	—	—	—
200L	2	318	200	—	133	200	19	398	355	85	85	—	28	32	397	462	319	795	920	262	394	80	—	396	249	M40X1,5P	55	110	16	59	100	M20	—	—	—	—
225S	4	286	200	—	149	225	19	436	336	85	85	—	28	34	450	509	344	877	1026	281	394	80	—	432.5	249	M40X1,5P	55	110	16	59	100	M20	—	—	—	—
225M	2	356	200	—	149	225	19	436	361	85	85	—	28	34	450	509	344	837	956	276	450	90	—	445	273	M40X1,5P	55	110	16	59	100	M20	—	—	—	—
250M	2	406	250	—	168	250	24	506	425	100	115	—	49	42	495	665	—	857	1001	251	450	90	—	445	273	M40X1,5P	55	110	16	59	100	M20	—	—	—	—
250M	4,6 & 8	406	349	—	168	250	24	506	425	100	115	—	49	42	495	665	—	983	1134	337	489	100	578	352	243	M50X1,5P	65	140	18	64	130	M20	—	—	—	—
280S/M	2	457	368	—	190	280	24	540	490	100	110	—	49	42	552	725	—	914	1065	268	544	115	638	360	243	M50X1,5P	65	140	18	64	130	M20	—	—	—	—
280S/M	4,6 & 8	457	368	—	190	280	24	540	490	100	110	—	49	42	552	725	—	1010	1160	271	544	115	638	360	243	M50X1,5P	65	140	18	64	130	M20	—	—	—	—
315S/M	2	406	457	—	216	315	28	625	540	120	120	—	46	45	615	830	—	1137	1293	340	600	130	728	386	278	M50X1,5P	65	140	18	64	130	M20	—	—	—	—
315L	2	508	315	—	216	315	28	625	593	120	120	—	46	45	615	830	—	1167	1353	340	600	130	728	386	278	M50X1,5P	65	140	18	64	130	M20	—	—	—	—
355L	2	610	630	—	254	355	28	710	770	110	170	—	73	45	693	939	—	1332	1518	454	685	145	850	416	278	M63X1,5P	80	170	22	85	160	M24	—	—	—	—
355L	4,6 & 8	610	630	—	254	355	28	710	770	110	170	—	73	45	693	939	—	1461	1622	458	685	145	850	434	403	M75X1,5P	95	170	25	100	160	M24	—	—	—	—

***Refer TABLE A for tolerances**

Special Remarks
15kW/2P & 11kW/4P in 160M will have dimensions "L", "LC" & "CA" as indicated in table "B"

** Minimum distance for efficient cooling of motor to be maintained by user.
 In 315L FR. For star delta connection Higher size T.Box will be provided
 Key / key way fit: h9 / N9

TABLE A

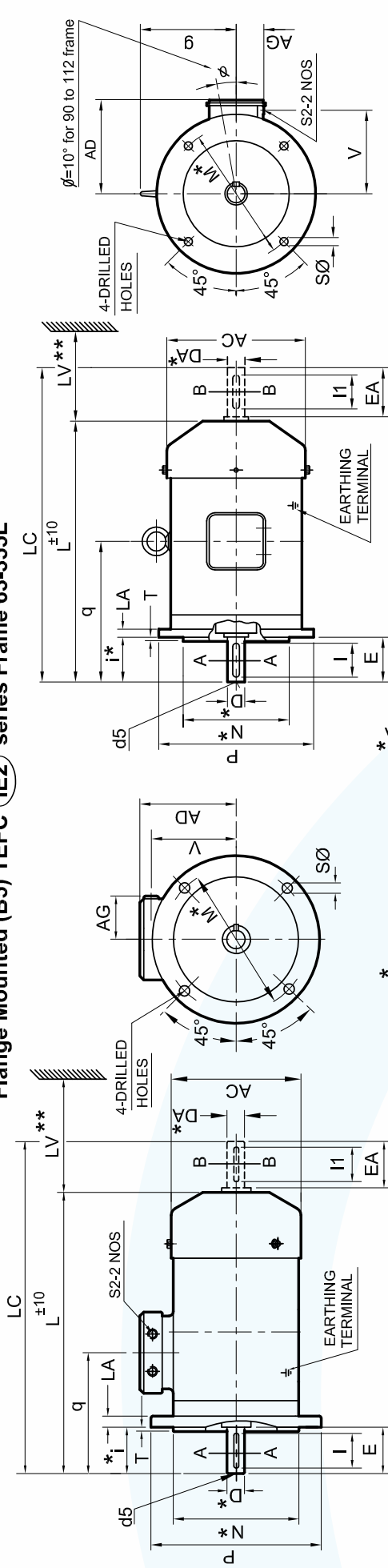
Dimension	Tolerance	Specification
A,B	+0.75	
	-0.5	UP TO 280
	-1	OVER 280
H	+0.360	IS : 1231
	+0.430	
K	+0.520	IS : 2540
	+0.520	
	+0.520	

Dimension	Tolerance	Specification
D, DA	16	IS : 1231
	k6	
	m6	
GA, GC, FFA	55, 60, 65, 75, 80, 95, 100	IS : 2048
d5 (centering)		IS : 2540

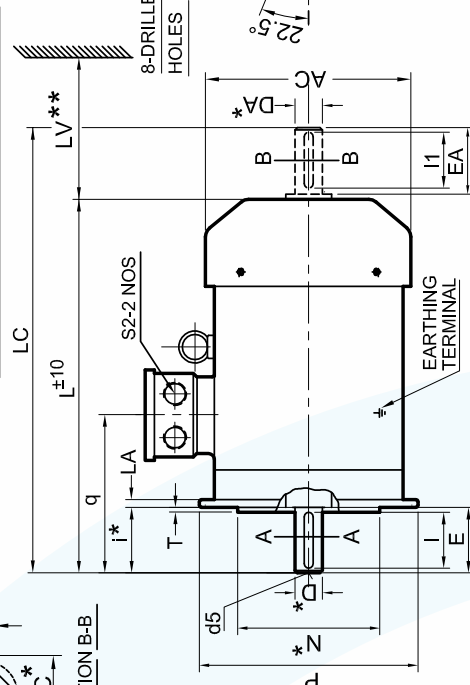
Double shaft extension can be provided with shaft dimension identical to DE shaft.
 Also suitable for B6, B7, B8, V5 & V6 mounting as per IS 2253.

Dimensional Drawing: Non Sparking Motors (Type 2S/MS)

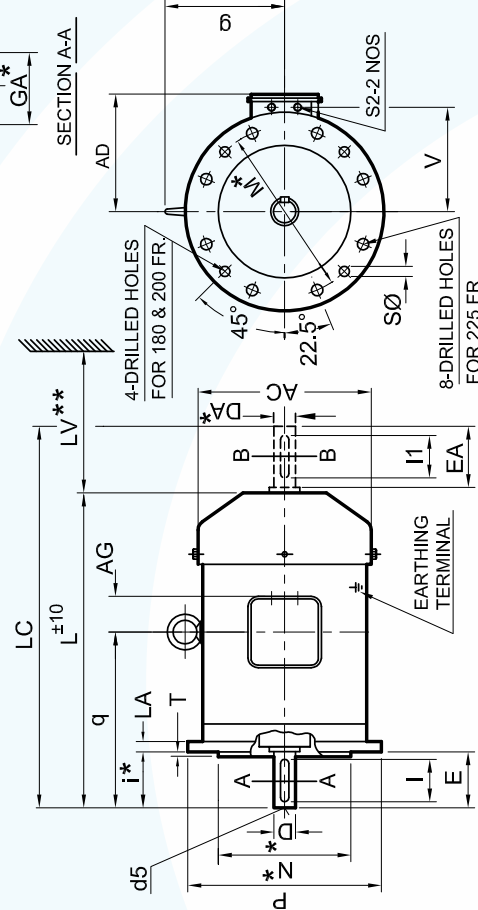
Flange Mounted (B5) TEFC (IE2) series Frame 63-355L



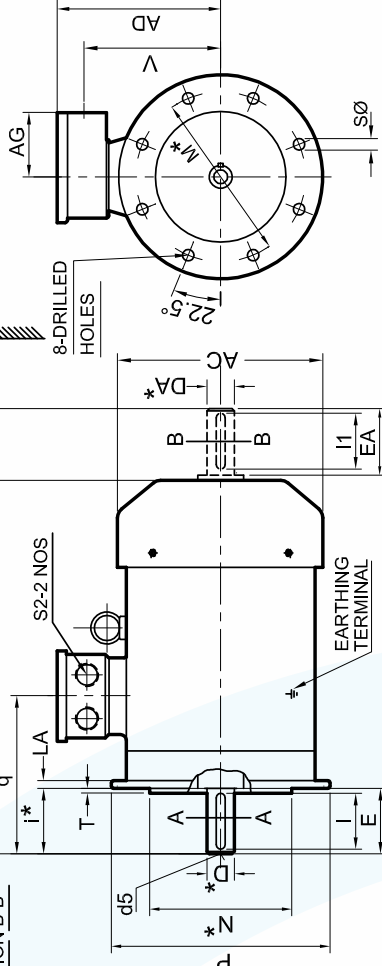
FRAME SIZE 90S TO 160L



FRAME SIZE 180M TO 225M



FRAME SIZE 250M TO 355L



* Refer TABLE A for tolerances

IE2 SERIES NON SPARKING MOTORS

Dimensional Details: Non Sparking Motors (Type 2S/MS)

Flange Mounted (B5) TEFC (IE2) series-Frame 63-355L

IEC Fr. size	Pole	FIXING			GENERAL						TERMINAL BOX				SHAFT				Pole	LC				
		P	N	M	* i	S	T	LA	AD	AC	L	LC	g	** LV	V	q	AG	S2			* * D,DA	E EA	F * FA	* GA * GC * I
63	2 & 4	140	95	115	23	10	3	9	127	124	225	260	—	30	96	109	52	M20X1.5P	11	23	4	12.5	18	M4
71	2,4 & 6	160	110	130	30	10	3.5	9	135	140	261	305	—	30	104	127	52	M20X1.5P	14	30	5	16	25	M5
80	2,4 & 6	200	130	165	40	12	3.5	10	145	157	267	324	—	30	114	112	52	M20X1.5P	19	40	6	21.5	35	M6
90S	6 & 8	200	130	165	50	12	3.5	10	141	174	302	374	⊕	35	110	156	53	M20X1.5P	24	50	8	27	45	M8
90L	6 & 8	200	130	165	50	12	3.5	10	141	174	327	399	—	35	110	169	53	M20X1.5P	24	50	8	27	45	M8
100L	6 & 8	250	180	215	60	15	4	11	179	195	366	448	135	40	138	193	56	M25X1.5P	28	60	8	31	55	M10
112M	6 & 8	250	180	215	60	15	4	11	191	220	388	471	148	45	151	200	56	M25X1.5P	28	60	8	31	55	M10
132S	6 & 8	300	230	265	80	15	4	12	206	260	459	561	176	50	167	239	63	M25X1.5P	38	80	10	41	70	M12
132M	6	300	230	265	80	15	4	12	206	260	497	599	206	60	186	258	63	M25X1.5P	42	110	12	45	105	M16
160M	2,4	350	250	300	110	19	5	13	226	316	605	741	206	60	186	323	63	M25X1.5P	42	110	12	45	105	M16
160L	6 & 8	350	250	300	110	19	5	13	226	316	585	721	206	60	186	345	63	M25X1.5P	42	110	12	45	105	M16
180M	2,6 & 8	350	250	300	110	19	5	13	265	354	679	799	232	70	216	352	97	M32X1.5P	48	110	14	51.5	100	M16
180L	6 & 8	350	250	300	110	19	5	13	265	354	717	838	232	70	216	371	97	M32X1.5P	48	110	14	51.5	100	M16
200L	2	400	300	350	110	19	5	15	319	394	795	920	262	80	249	396	172	M40X1.5P	55	110	16	59	100	M20
200L	6 & 8	400	300	350	110	19	5	15	319	394	772	897	262	80	249	396	172	M40X1.5P	55	110	16	59	100	M20
225S	4	450	350	400	140	19	5	16	344	450	877	1026	284	90	273	415	172	M40X1.5P	60	140	18	64	130	M20
225M	2	450	350	400	140	19	5	16	344	450	837	956	284	90	273	415	172	M40X1.5P	60	140	18	64	130	M20
225M	6 & 8	450	350	400	140	19	5	16	344	450	857	1001	284	90	273	415	172	M40X1.5P	60	140	18	64	130	M20
250M	2	550	450	500	140	19	5	18	415	489	983	1134	—	100	328	352	243	M50X1.5P	60	140	18	64	130	M20
250M	4,6 & 8	550	450	500	140	19	5	18	415	489	914	1065	—	100	328	352	243	M50X1.5P	60	140	18	64	130	M20
280S/M	2	550	450	500	140	19	5	18	445	544	1010	1160	—	115	358	360	243	M50X1.5P	65	140	18	69	130	M20
280S/M	4,6 & 8	550	450	500	140	19	5	18	445	544	1010	1160	—	115	358	360	243	M50X1.5P	65	140	18	69	130	M20
315S/M	2	660	550	600	170	24	6	22	515	615	1137	1293	—	130	413	386	278	M50X1.5P	80	170	22	85	160	M20
315L	4,6 & 8	660	550	600	170	24	6	22	515	615	1167	1353	—	130	413	386	278	M50X1.5P	80	170	22	85	160	M20
315L	2	660	550	600	170	24	6	22	515	615	1302	1458	—	130	413	386	278	M63X1.5P	80	170	22	85	160	M20
315L	4,6 & 8	660	550	600	170	24	6	22	515	615	1332	1518	—	130	413	386	278	M63X1.5P	80	170	22	85	160	M20
355L	2	800	680	740	140	24	6	25	584	690	1461	1622	—	145	495	434	403	M75X1.5P	95	170	25	100	160	M24
355L	4,6 & 8	800	680	740	170	24	6	25	584	690	1491	1682	—	145	495	464	403	M75X1.5P	95	170	25	100	160	M24

TABLE B

TABLE A

Dimension	Tolerance	Specification	Dimension	Tolerance	Specification
N	±0.1	UPTO 450	D,DA	±0.1	IS : 1231
M	±0.3	OVER 450	GA,GC,F,FA	±0.1	IS : 2048
i	±1.5	OVER 85	d5(centering)	±0.05	IS : 2540

***Refer TABLE A for tolerances**

Special Remarks
 15kW/2P & 11kW/4P in 160M will have dimensions "L" & "LC" as Indicated in table "B"

⊕ Without Eye bolt
 * * Minimum distance for efficient cooling of motor to be maintained by user.
 □ In 315L FR, For star delta connection Higher size T.Box will be provided
 □ 8 Nos. Fixing Holes from 225S/M frame onwards
 All Dimensions are in mm unless otherwise specified. CAT-A-6335-5-2

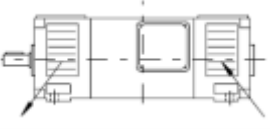
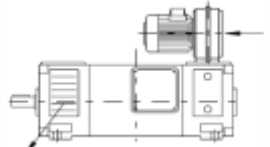
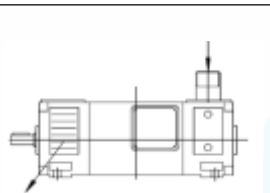
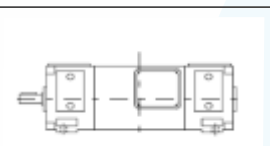
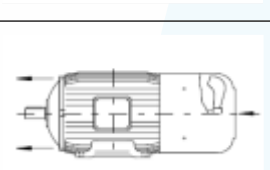
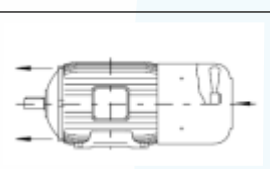
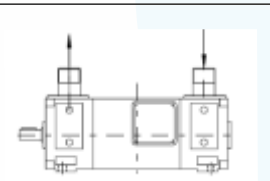
ANNEXURE - I

Methods of Cooling

Designation system concerning methods of cooling refers to standard IEC 60034-6.

Explanation of the product code

International Cooling	Circuit arrangement	Primary coolant	Method of movement of primary coolant	Secondary coolant	Method of movement of secondary coolant
(IC)	4	(A)	1	(A)	6
	1	2	3	4	5
Position 1			Position 4		
0 :	Free circulation (open circuit)		A:	For air (omitted for simplified designation)	
4 :	Frame surface cooled		W:	For water	
Position 2			Position 5		
A:	For air (omitted for simplified designation)		0	Free convection	
Position 3			1	Self-circulation	
0 :	Free convection		6	Machine-mounted independent component	
1 :	Self-circulation		8	Relative displacement	
6 :	Machine-mounted independent component				

IC 01		Enclosure IP 21 - IP 23 (type G...) Self-ventilated with integral fan cooling (DP) Cooling air is blown through the motor by a fan mounted on the shaft.
IC 06		Enclosure IP 21 - IP 23 (type G...I) Separate ventilation with radial fitted fan unit (FV) Cooling air is blown through the motor by a separately excited fan motor. The inlet side may be equipped with an air filter.
IC 17		Enclosure IP 21 - IP 23 (type G...) Single pipe ventilated (FV) Cooling air is blown across the motor through the pipe connection with a separate customer provided external blower fan and discharges on the other side to open space.
IC 410		Enclosure IP 44 - IP 55 (type G..Z) Totally-enclosed non ventilated (TENV) Cooling without using a fan, only by nature ventilation and radiation on the totally enclosed motor surface.
IC 411		Enclosure IP 44 - IP 55 (type G..ZE) Totally-enclosed fan-cooled (TEFC) Cooling air is blown over the totally enclosed motor surface by a fan mounted on the shaft.
IC 416		Enclosure IP 44 - IP 55 (type G..ZO) External surface cooling (TEFV) Cooling air is blown over the totally enclosed motor surface by a separately excited fan motor.
IC 37		Enclosure IP 44 - IP 55 (type G..Z) Double pipe ventilated (TEPV) Cooling air is blown across the motor through a pipe connecting by means of a separate customer provided external blower fan and discharges on the other side's pipe connecting.

Degree of Protection

Degree of protection for rotating machines are indicated according to IS/IEC 60034-5 using the characteristic letters 'IP' followed by two characteristic numerals for the degree of protection.

The first numeral indicates protection against contact and ingress of foreign bodies.

The second numeral indicates protection against ingress of water.

First characteristic numeral

IP2X Protected against solid objects greater than 12mm

IP5X Dust protected motors, Ingress of dust is not fully protected, but dust can not enter in an amount sufficient to interface with satisfactory operations of the motor.




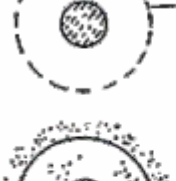
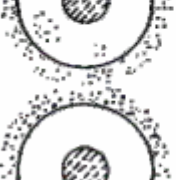
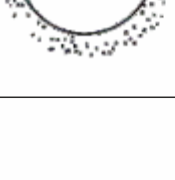

Second characteristic numeral






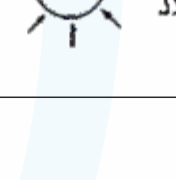

IPX3 Protected against spraying water, sprayed up to angle of 60° from vertical shall have no harmful effect.

IPX5 Protected against water, jets by a nozzle from any direction shall have no harmful effect.

IPX6 Protected against heavy seas, powerful jets from all direction shall have no harmful effect.

Degree of protection Schematic

1 st Numeric	
	0 No protection
	1 Protected against solid objects greater than 50mm (e.g. hand)
	2 Protected against solid objects greater than 12mm (e.g. fingers)
	3 Protected against solid objects greater than 2.5mm (e.g. tools, wires)
	4 Protected against solid objects greater than 1mm (e.g. wire or strips)
	5 Ingress of dust is not totally protected, but does not enter in sufficient quantities to harm equipment
	6 No ingress of dust

2 nd Numeric	
	0 No protection
	1 Dripping water shall have no harmful effect.
	2 Protected against dripping water when enclosure is tilted 15°
	3 Protected against spraying water up to 60°
	4 Water splashed from any direction shall have no harmful effect
	5 Water hosed against the enclosure shall have no harmful effect (water jets)
	6 Water from powerful jets of heavy seas shall have no harmful effects

ANNEXURE - III

Tolerances (Reference IS/IEC 60034-1)

Unless stated otherwise, tolerances on declared values are applicable as given in the table below:

Schedule of tolerances on values of quantities

Quantity	Tolerance
Efficiency η -Machines up to and including 150 kW (or kVA) -Machines above 150 kW (or kVA)	-15 % of $(1 - \eta)$ -10 % of $(1 - \eta)$
Power-factor, $\cos\Phi$, for induction machines	-1/6 $(1 - \cos\Phi)$ Minimum absolute value 0.02 Maximum absolute value 0.07
Slip of induction motors (at full load and at working temperature) $PN < 1$ kW $PN \geq 1$ kW	± 30 % of the slip ± 20 % of the slip
Locked rotor current of cage induction motors with any specified starting apparatus	+20 % of the current
Locked rotor torque of cage induction motors	+25 -15 % of the torque. (+25 % may be exceeded by agreement)
Breakdown torque of induction motors	-10% of the torque except that after allowing for this tolerance the torque shall be not less than 1.6 or 1.5 times the rated torque

Note: When tolerance is stated in only direction, the value is not limited in the other direction.

Limiting Mean Sound Power Level Lw in dB(A) for Airborne Noise Emitted by Rotating Electrical Machines

IS: 12065 - 1987

Protective Enclosure	IP22	IP44	IP22	IP44	IP22	IP44	IP22	IP44	IP22	IP44	IP22	IP44	IP22	IP44
	Rated Speed (rpm)													
Rating kV(or kVA)	960 and below		961 to 1320		1321 to 1900		1901 to 2360		2361 to 3150		3151 to 3750			
Above	Sound Power Level dB(A)													
-	-	76	-	79	-	80	-	83	-	84	-	88	-	88
1.1	-	79	-	80	-	83	-	87	-	89	-	91	-	91
2.2	-	82	-	84	-	87	-	92	-	93	-	95	-	95
5.5	82	85	85	88	88	91	91	96	94	97	94	97	97	100
11	86	89	89	93	92	96	94	98	97	101	97	100	100	103
22	89	91	92	95	94	97	96	100	99	103	99	102	102	105
37	90	92	94	97	97	99	99	103	101	105	101	104	104	107
55	94	96	97	101	100	104	102	105	104	107	104	106	106	109
110	98	100	100	104	103	106	105	108	107	110	107	108	108	112
220	100	102	104	106	106	109	107	111	108	112	108	110	110	114
660	102	104	106	107	107	111	108	111	108	112	108	110	110	114
1100	105	107	109	110	109	113	109	113	109	113	109	110	110	114
2500	106	108	110	112	111	115	111	115	111	115	111	111	111	115
6300	108	110	111	113	113	116	113	116	113	116	113	113	113	116

Note 1: IP22 corresponds generally to drip-proof, ventilated and similar enclosures.

IP44 corresponds generally to totally enclosed fan-cooled, closed air circuit air-cooled, and similar enclosures (See IS: 4691-1985*).

Note 2: No positive tolerance is allowed on the above sound power levels.

Storage and Handling Instructions for Motors

Introduction

The purpose of this write-up is to offer some short, easy to follow recommendations to our customers, users and dealers for the proper care of electric motors in storage.

For practical purposes, such equipment is considered to be in storage not only when it is in the store room but also when:

It has been delivered to the jobsite and is awaiting installation;

or, It has been installed but regular operation is delayed / pending completion of plant construction;

or, there are 3 months or more, idle periods between operating cycles;

or, the plant or department is shut down.

The recommendations given here apply to conditions commonly found in indoor storage. Personnel responsible for care of the equipment should use good discretion in adapting these recommendations to the particular situation. Common sense and sound safety rules need to be followed.

SAFETY PROCEDURE

WARNING

Dangerous voltages are present in the motor components which can cause serious injury, electrocution and equipment damage. To avoid serious injury and/or equipment damage before any adjustments, servicing, wiring, parts replacement or any other act requiring physical contact with the electrical or mechanical working components of this equipment is performed, all equipment must be de-energized, disconnected and isolated to prevent accidental contact with live or rotating parts.

The success and safe operation of motors is dependent upon proper handling, installation, operation and maintenance, as well as upon proper design and manufacture. Failure to follow certain fundamental installation and maintenance requirements may lead to personal injury and the failure and loss of the motor as well as damage to other property.

Only qualified personnel should be involved in the inspection, maintenance and repair procedure and all plant safety procedures must be observed.

A qualified person is one who is familiar with the installation, construction and operation of the equipment, and the hazards involved. In addition, he has the following qualifications:

- Is trained and authorized to energize, de-energize, clear, ground, and tag circuits and equipment in accordance with established safety practices.

- Is trained in the proper care and use of protective equipment such as rubber gloves, hard hat, safety glasses or face shields, flash clothing etc. in accordance with established safety practices.

- Is trained in rendering first aid.

Motor should be installed and grounded as per local and national codes.

Storage Instructions For Motors

Indoor storage

Wholly controlled atmosphere or partially controlled atmosphere

- Storage room must be clean, dust free and dry
- Maintain temperature in the range 20 deg to 50 deg in the storage room
- Maintain uniform temperature throughout the room
- Relative humidity to be 50% or less
- Ensure absence of harmful fumes
- Vibration free area
- Space heater must be energized if temperature falls below 10 deg.C or humidity is more than 50% to prevent harmful effects of moisture condensation.
- Ensure that no water drips on motor and no water accumulates under the motor.
- Ensure that all plugs originally provided are in place. (e.g. cable entry hole plugs, drain plugs and plug in fan cowl for greasing. If plugs are missing, all the openings to be covered with an adhesive plastic cloth.
- The enclosing structure should be designed to protect the motor from flying debris or other damage from high winds.

Cover the motor completely in a strong, transparent plastic bag to exclude dirt, dust, moisture, and other foreign materials. Before sealing this bag, small bags of silica-gel desiccant should be put inside the bag, around the motor.

Rodents and other animals like to house inside motors in search of warm surroundings or food. Some of them attack the insulating materials. Their access to the motor should be restricted.

Outdoor storage

Dry climate (Conditions usually found) - Dust, sand, heat from the sun, and occasional rain or snow.

Humid climate (Conditions usually found) - Dust, rain and snow, organic (fungus) growth

Salty and industrial atmospheres (Conditions usually found) - Moisture impregnated with salts or other acidic / alkaline chemicals, salty dust, sand, rain or snow, fungus growth, fumes, coal and chemical dust soot. All precautions indicated in indoor storage to be taken.

In addition, after the unit is covered as explained in these instructions, a shed should be erected to protect it from direct rain, snow, and excessive direct sun heat. At a bare minimum, a heavy water-proofed cover should be slipped over it.

Bearings:

Special precautions need to be taken when the machine is idle for a period of 3 months or more to avoid corrosion of the bearings and loss of grease. It is advisable to rotate the shaft periodically (once in a week @ 30 rpm for minimum 15 sec.) as the grease tends to settle at the bottom of the housings. Before a machine is started after a long idle period, the bearing covers should be removed and grease in the housing pressed with thumbs between the races of the bearing. If any deterioration of grease is apparent, the old grease should be removed and new grease pressed in the bearing housings.

If the machine is idle for four months or more, change the grease completely.

Shaft extensions, machines surfaces or flanges:

The machined parts have a protective coat of anti-rust preservative which should not be taken off during normal storage periods. In case of long storage, periodic examination should be carried out and fresh preservation should be applied, if required, after any rust or moisture has been removed. Preservation can be easily taken off by using paraffin or other petroleum solvents.

Complete motor:

When storage may last over one year, repaint all surfaces previously painted, before putting motor into service.

Handling instructions for motors

- For lifting the motor, only the lifting hook provided with motor, are to be used.
- Use all lifting hooks that are provided simultaneously. (If motor is provided with two hooks, use both hooks and not one)
- Do not use any other part of the motor for lifting.
- Do not use shaft projections for dragging the motor.
- Do not roll or drag the motor on the floor.
- Motors must not be kept in vertical position with external fan cowls as base.
- Jerks and jolts must be avoided to increase the bearing life.
- In vertical lifting, uncontrolled rotation of the motor must be prevented.
- Do not lift other equipments with motor lifting points only.

Recommended Maintenance Schedule

1. DAILY MAINTENANCE

- 1.1 Examine visually earth connections. Check motor leads and cable connections are fully tight and not loose.
- 1.2 Check motor windings for overheating (the permissible maximum temperature is above that which can be comfortably felt by hand).
- 1.3 Examine control equipments.
- 1.4 Check body and bearing temperature
- 1.5 Check voltage and current in all three phases. Check voltage variation and unbalance.
- 1.6 Check vibrations at bearings.
- 1.7 Check if motor rotation is free and measure speed.
- 1.8 Check for any abnormal noise.

Note: In order to avoid opening up motors, a good indication is to observe the shell temperature under normal working conditions. Any increase not accounted for, for example by seasonal increase in ambient temperature, should be suspected.

2. WEEKLY MAINTENANCE

- 2.1 Check belt tension. In cases where this is excessive, it should immediately be reduced. Check motor pulley seat location. Pulley has to rest on shaft shoulder.
- 2.2 Check coupling condition.
- 2.3 Blow out windings of protected type motors situated in dusty locations. Check for any accumulation of dirt, sand or fine dust.
- 2.4 Examine starting equipment for burnt contacts where motor is started and stopped frequently.
- 2.5 For outdoor motors, check if canopy is at proper place.

3. MONTHLY MAINTENANCE

- 3.1 Overhaul Controllers.
- 3.2 Inspect and clean oil circuit breakers.
- 3.3 Wipe brush holders and check bedding of brushes of slip-ring motors.

4. HALF YEARLY MAINTENANCE

- 4.1 Clean windings of motors subjected to corrosive or other elements; also bake and varnish, if necessary.
- 4.2 In the case of slip-ring motors, check sliprings for grooving or unusual wear.
- 4.3 Check grease in ball and roller bearings and make it up where necessary taking care to avoid overfilling.

5. ANNUAL MAINTENANCE

- 5.1 Check all high speed bearings and renew, if necessary.
- 5.2 Blow out all motor winding thoroughly with clean dry air. Make sure that the pressure is not so high as to damage the insulation.
- 5.3 Clean and varnish dirty and oily windings.
- 5.4 Overhaul motors which have been subjected to severe operating conditions.
- 5.5 Renew switch and fuse contacts, if damaged. Check oil.
- 5.6 There can be cement dust / saw dust / rock dust / coal dust / grain dust on motor body. Blow out compressed air over motor body to clean this accumulated dust at the time of monthly maintenance. See to it that all ventilation paths are absolutely free.
- 5.7 Paint the motor if required.
- 5.8 Check insulation resistance to earth and between phases of motor winding, control gear and wiring.
- 5.9 Check resistance of earth connections.
- 5.10 Check air gaps.
- 5.11 Test the motor overload relays and breakers.

6. RECORDS

- 6.1 Maintain a register giving one or more pages for each motor and record therein all important inspection and maintenance works carried out from time to time. These records should show past performance, normal insulation resistance level, air gap measurements, nature of repairs and time between previous repairs and other important information which would be of help for good performance and maintenance. Sample format is attached.

ANNEXURE - VI

Trouble Shooting Chart

TROUBLE	CAUSE	WHAT TO DO
Motor fails to start	Blown fuses	Replace fuses with proper type and rating.
	Overload trips	Check and reset overload in starter
	Improper power supply	Check to see that power supply agrees with Motor name plate and load factor
	Improper line connection	Check connections with diagram supplied with motor
	Open circuit in winding or control switch	Indicated by humming sound when switch is closed. Check for loose wiring connections. Also, ensure that all control contacts are closing
	Mechanical failure	Check to see if motor and drive turn freely. Check bearings and lubrication
	Short circuited stator	Indicated by blown fuses. Motor must be rewound
	Poor stator coil connection	Remove end shields, locate with test lamps
	Rotor defective	Look for broken bar sand/or end rings
	Motors may be over loaded	Reduce Load
Motor stalls	One phase may be open	Check lines for open phase
	Wrong application	Change type or size. Consult manufacturer
	Over Load	Reduce Load
	Low Voltage	Ensure the name plate voltage is maintained. Check connection
	Open circuit	Fuses blown, check overload relay, stator and push buttons
Motor runs and then dies down	Power failure	Check for loose connections to line, fuses and control
Motor does not come up to speed	Voltage too low at motor terminals because of line drop	Use higher voltage or transformer terminals or reduce load. Check connections. Check conductors for proper size
	Starting load too high	Check load motor is supposed to carry at start
	Broken rotor bars or loose rotor	Look for cracks near the rings. A new rotor may be required, as repairs are usually temporary
	Open primary circuit	Locate fault with testing device and repair

ANNEXURE - VI

Motor takes too long to accelerate and/or draws high amp	Excessive load	Reduce load
	Low voltage during start	Check for high resistance. Adequate wire size
	Defective squirrel cage rotor	Replace with new rotor
	Applied voltage too low	Increase power tap
Wrong rotation	Wrong sequence of phases	Reverse connections at motor or at switchboard
Motor overheats while running under load	Overload	Reduce Load
	Frame vents may be clogged with dirt and prevent proper ventilation of motor	Open vent holes and check for a continuous stream of air from the motor
	Motor may have one phase open	Check to make sure that all leads are well connected
	Grounded coil	Locate and repair
	Unbalanced terminal voltage	Check for faulty leads, connections and transformers
Motor vibrates	Motor misaligned	Realign
	Weak support	Strengthen base
	Coupling out of balance	Balance coupling
	Driven equipment unbalanced	Rebalance driven equipment
	Defective bearings	Replace bearings
	Bearings not in line	Line up properly
	Balancing weights shifted	Rebalance motor.
	Contradiction between balancing of rotor and coupling (half key - full key)	Rebalance coupling or motor
	Polyphase motor running single phase	Check for open circuit
Excessive end play	Adjust bearing or add shim	
Scraping noise	Fan rubbing fan cover	Remove interference
	Fan striking insulation	Clear fan
	Loose on bed plate	Tighten holding bolts

ANNEXURE - VI

Noisy operation	Rotor unbalance	Rebalance
Hot bearings general	Bent or sprung shaft	Straighten shaft
	Excessive belt pull	Decrease belt tension.
	Pulleys too far away	Move pulley closer to motor bearing
	Pulley diameter too small	Use larger pulleys
	Misalignment	Correct by realignment of drive
Hot bearings ball	Insufficient grease	Maintain proper quality of grease in bearing
	Deterioration of grease of lubricant contaminated	Remove old grease, wash bearings thoroughly in kerosene and replace with new grease
	Excess lubricant	Reduce quantity of grease, bearing should not be more than 1/2 filled
	Overload bearing	Check alignment, side and end thrust.
	Broken ball or rough races	Replace bearing, first clean housing thoroughly

ANNEXURE - VII

MOTOR SERVICE RECORD

Serial No. _____ kW _____ Type _____
 Speed _____ Volts _____ Amperes _____ Phase _____ Frequency _____
 Insulation Class _____ Temperature Rise _____ °C Frame Size _____
 Connection Diagram-Rotor _____ Stator _____
 Owner Order No. _____ Item No. _____ Date Purchased _____

MACHINE TYPE		WEATHER PROTECTED						LUBRICATION				
- Horizontal - Vertical - Totally-Enclosed - Explosion-Proof		Bearings - Ball - Roller -Sleeve		Size : Drive End _____ Non Drive End _____				Shaft Extension Length _____				
								Date Installed		Location		Application
Date Repaired or Replaced		Repairs or Parts Replaced				Fault		Repaired by		Total Cost		
Name of Part		No. Per Machine	Manufacturer's No.	Date	Qty. Repl.	Cost	Date	Qty. Repl.	Cost	Date	Qty. Repl.	Cost
Rotor												
Stator Coils												
Bearing, DE												
NDE												
Cooling fan												
Others												
INSPECTION												
Date												
Bearings												
Lubrication												
Excess Heat												
Excess Noise												
Speed												
Voltage in 3 ph												
Voltage Variation												
Voltage Unbalance												
Current in 3 ph												
Current Variation												
Current Unbalance												
Insulation Resistance												
Clean & clear air passages												
Alignment												
Vibration												
Body Temp.												
Abnormal noise												

Table 1 Derived Values of Limits of Vibration Severity in Rotating Electrical Machines measured in State of Free suspension (Velocity Mode)

IS 12075 : 2008

Sl.No	Shaft Height mm	56 < H ≤ 132		132 < H ≤ 225		225 < H ≤ 400		H > 400	
		500 to 1500	> 1500 and up to 3000	500 to 1500	> 1500 and up to 3000	500 to 1500	> 1500 and up to 3000	500 to 1500	> 1500 and up to 3000
rms value of vibration velocity in mm/s for the shaft height H in mm									
ii	N(Normal)	1.8	18	1.8	2.8	2.8	4.5	2.8	4.5
iii	R(Reduced)	0.71	0.71	0.71	1.12	1.8	2.8	-----	-----
iv	S(Special)	0.45	0.45	0.45	0.71	1.12	1.8	-----	-----

Table 2 Derived Values of Limits of Vibration Severity in Rotating Electrical Machines measured in State of Free suspension (Displacement Mode)

Shaft Height Speed, rpm	56 < H ≤ 132					132 < H ≤ 225					225 < H ≤ 400					H > 400									
	500	600	750	1000	1500	3000	500	600	750	1000	1500	3000	500	600	750	1000	1500	3000	500	600	750	1000	1500	3000	
Vibration limit in maximum displacement amplitude, in μm																									
N(Normal)	96	80	64	48	32	16	96	80	64	48	32	25	150	125	100	75	50	42	150	125	100	75	50	40	40
R(Reduced)	36	30	24	18	12	6	36	30	24	18	12	10	96	80	64	48	32	26	---	---	---	---	---	---	---
S(Special)	24	20	16	12	8	4	24	20	16	12	8	6	50	60	40	30	20	17	---	---	---	---	---	---	---

Note: For the purpose of Table 2 f is assumed as frequency corresponding to rotor rpm. But for evaluation the dominant frequency should be determined by spectrum analysis and only that frequency should be used for calculation.

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