

Motors for General Application

Catalogue for IE2 Motor Series



Introduction / Background

Global warming is a reality and world over people are working towards reduction in carbon foot print.

Electric motor applications, in Indian industry, consume about seventy percent of the generated electrical energy. Improving efficiency of the motor is therefore a major concern in energy-efficiency efforts.

Electric motors with improved efficiency, in combination with frequency converters can save about 7% of the total worldwide electrical energy. Roughly one quarter to one third of these savings come from the improved efficiency of the motor.

A need was felt amongst users, consultants and manufacturers in India to revise existing BIS standard IS 12615:2004 to harmonize with the international standards. This will lead us to be in line with international code of standards and practices. This will also result into having uniform test procedures to facilitate the end user to compare the performance and energy efficiency of motors.

Motors from 0.37kW to 375kW make up the vast majority (approximately 90%) of installed motor population and are covered by the standard IS 12615:2011. This fulfils the need of the manufacturers to design motor for a global market. This standard defines four efficiency classes for nominal frequency 50Hz.

Salient features of BIS standard IS 12615:2011 (second revision)

This standard is primarily based on IEC 60034-30:2008 issued by the International Electrotechnical Commission except that additional performance parameters other than efficiency values have also been included.

The efficiency levels in IS 12615:2011 are based on test methods specified in IS 15999 (Part 2/sec 1):2011 / IEC 60034-2-1:2007. The standard specifies methods used to determine losses and efficiency, with the objective to calculate efficiency values more accurately.

New IE efficiency classes are as given below

Efficiency Class	Description	
IE1	Standard efficiency	Comparable to eff2
IE2	High efficiency	Comparable to eff1
IE3	Premium	Premium
IE4	Super premium	Super premium

As per the standard, efficiency class of IE4 is under consideration & would be incorporated later. The standard IS 12615:2011 covers low voltage, AC three phase squirrel cage, single speed induction motors for

- Rated voltage $\leq 1000V$
- Rated frequency 50Hz
- Rated output between 0.37kW to 375kW
- 2Pole, 4Pole & 6Pole
- Rated on the basis of continuous duty (S1) or intermittent periodic duty (S3) with 80% or higher cyclic duration factor
- Capable of operating direct on line
- Rated for ambient temperature of 40 deg centigrade & altitude not exceeding 1000m
- Degree of protection IP44 or superior
- Method of cooling IC411
- Fixing dimensions as per IS 1231 & IS 2223
- Determination of total losses with PLL determination from residual losses

This standard does not cover

- 8 Pole motors
- Pole changing motors (multispeed motors)
- Motors made exclusively for converter duty application
- Motors completely integrated into the machine. (for example, pumps, compressors that cannot be tested separately from the machine)
- Crane & hoist duty motors

Hilights

- 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 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 differ 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 output) were assumed. 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 the reduction of efficiency as compared to the earlier values.

Energy Efficient Induction Motors

(Three phase squirrel cage induction motors)

Presently Bharat Bijlee has introduced a complete range of IE2 High efficiency motors

Product Range

Type	Frame Size	kW range
2H - IE2 High efficiency	71 TO 355L	0.37 TO 355*

Standards

All motors comply with following Indian & International standards

National/International Standards

IS : 325	Three Phase Induction motors specifications.
IS/IEC 60034-1	Rotating electric machines: Part 1 Rating and Performance
IS : 900	Code of practice for installation & maintenance of induction motors.
IS : 1231	Dimensions of foot mounted A.C Induction motors
IS : 2223	Dimensions of Flange mounted A.C Induction motors
IS 15999 part 2 section 1 /IEC 60034-2-1	Rotating Electrical Machines - Standard Methods for determining losses and efficiency from tests
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 methods of cooling for Rotating Electrical Machines
IS : 12065 / IEC 60034-14	Permissible Limits of noise level for Rotating Electrical Machines
IS : 12075	Mechanical Vibration of Rotating Electrical Machines
IS : 12615:2011	Energy Efficient Induction Motors Three phase Squirrel Cage.
IEC 60072	Dimension & Output rating of Rotating Electrical machines.

***Note : Motor above 355kW & up to 1250kW are available in frame size 355, 400 & 450 with double ventilated cooling system. Please Contact our Sales.**

CE MARK

All motors have **CE mark** on the nameplate

ELECTRICAL FEATURES

Standard Operating condition

Supply Conditions (Voltage & Frequency)

Voltage	:	415 V $\pm$ 10%
Frequency	:	50Hz $\pm$ 5%
Combined variation	:	$\pm$ 10%

Ambient

Motors are designed for ambient temperature of 50° C

Altitude

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

Re-rating factors

The re-rating applicable under different conditions of 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
$\pm$ 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
<30	107	1000	100
30-45	103	1500	97
50	100	2000	94
55	96	2500	90
60	92	3000	86
		3500	82
		4000	77

Method of starting

BBL motors are suitable for following method of starting

kW rating	Method of starting	No. of leads
Upto & including 1.5 kW	DOL 415V - Star 240V - Delta	6
Above 1.5 kW	DOL or Star / Delta	6

All BBL motors are suitable for inverter duty application.
(Refer page 5)

Starting Time and duty Cycle

Motors are designed for continuous (S1) Duty. Other type of duty (S2 to S9) can be offered on request. The motors can safely withstand 3 consecutive starts from cold condition & 2 consecutive starts from hot conditions. In applications where more severe starting conditions are encountered, a special enquiry should be made 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.

- GD² and relevant speed of driven equipment
- Duty cycle/sequence of operation/no. starts/hours
- Speed-Torque diagram of driven equipment
- Method of braking (Electrical or Mechanical)

Insulation and Endurance

The Motors are provided with class F insulation scheme with temperature rise limited to class B. These motors can be used either at ambient temperature of 55° C or overloaded continuously by 10% (service factor = 1.1). The temperature rise will be still within limits of class F.

The slot insulation consists of Nomex-polyester-Nomex (NPN). All insulation materials used are adequately resistant to the action of microbes and fungi.

Winding & Insulation for inverter duty motors

- The stators are wound with polyesterimide coated with polyamide-imide top coat, (dual coated) wires as per IS 13730 : part 13, grade -II thermal class 200 copper wires.
- Vacuum Pressure Impregnation (VPI) is provided to windings.

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 customer's demand, insulated bearings are offered from frame size 132 and onwards on the NDE side of the motor.

Options

Motors with class 'H' insulation can be offered on request.

Thermal Protection (For Winding & Bearing)

PTC Thermistors / thermostats. RTD etc. can be embedded in stator winding on request. In case of frame sizes 250M & above Bearing Temperature Detectors (BTD) can be supplied on request.

Earthing Terminals

Two earthing terminals are provided on the body and one terminal is provided in the terminal box.

Anti-condensation Method

In order to avoid condensation of water inside the motors, they can be heated up by connecting a voltage 4 to 10% of rated voltage to the motor terminals. Adequate heating is obtained with current equal to 20-25% of rated motor current. Alternatively any of the methods indicated in IS : 900 for heating stator winding could be adopted.

Motors can also be offered with built in space heaters in frame size 90 and above.

MECHANICAL FEATURES

Enclosures: (Material & Terminal box location)

Motors are offered with following enclosure

Frame Size	Enclosure Materials	Terminals Box Location	
		Standards	Option Available
63-80	Aluminum	TOP	----
90S-112M	Aluminum	TOP	----
	Cast Iron	RHS	TOP & LHS
132S & 132M	Aluminum	TOP	-
132S-225M	Cast Iron	RHS	TOP & LHS
250M-355L	Cast Iron	TOP	RHS & LHS

All foot mounted motors are with integral feet construction. All motors up to 280 frame are with integral bearing covers and motors in frame 315 and above are with separate bearing covers.

Cooling

All motors are totally enclosed Fan Cooled (TEFC) The cooling is effected by self driven, bi-directional centrifugal fan protected by fan cover. The Type of cooling is as per IS 6362 / IEC 60034-6. Forced cooling arrangement can be provided for frame 132S and above.

Table 2

Cooling Type	Cooling Code	
TEFC	IC 411	Standard
TENV	IC 410	On Demand
FORCED COOLED	IC 416	On Demand

Degree Protection

All motors have IP55 degree of protection as per IS/IEC60034-5 Higher degree of protection such as IP56 , IP66 can be provided on request. All flanged motors are additionally provided with oil tight shaft protection on driving end side.

Bearing & Terminals Box Details

Frame Size	Bearing nos. C3 Clearance		Terminals Box Type / Location	Terminals		No. & size of cable entries	Max. Cond. Cross Sec. area mm
	DE	NDE		No.	Size		
63	6201 2Z	6201 2Z	gk030/ Top	6	M4	1×3/4"	4
71	6202 2Z	6202 2Z					
80	6004 2Z	6004 2Z					
90S,90L	6205 2Z	6205 2Z	gk130/Top	6	M5	2×1"	10
100L	6206 2Z	6205 2Z	gk230/ Top	6			
112M	6206 2Z	6205 2Z	gk330/Top	6			
132S,132M	6208 2Z	6208 2Z	gk330/RHS	6	M6	2× 1-1/2"	16
160M,160L	6309 2Z	6209 2Z	gk430/ RHS	6			
180M,180L	6310 2Z	6210 2Z	TB	6	M8	2 × 2"	50
200L	6312	6212	225/RHS	6			
225S, 225	6313	6213	TB280/ Top	6	M10	2 × 2"	70
250M	6315	6215					
280 S/M	2P 4, 6 & 8P	6316					
		6317					150
315 S/M			TB315/ Top	6	M12	2 × 2"	240
	6319	6319					
315L	6319	6319				2 × 2 1/2"	
355L	6322	6322	TB355/Top	6	M16	2 × 3"	300

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

Roller Bearing and insulated Bearing

Alternatively motors with insulated bearing on NDE side can be offered from frame size 132S & above on request at extra price.

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

Grease

Sealed for life bearing (2Z) are filled with grease Unirex N3-of ESSO. Others are filled with LGMT3 of SKF make. Special high temperature grease can be provided on request.

On line re-greasing

On line re-greasing arrangement is provided in frame sizes 225S and above. For frame size 180M, 180L and 200L it can be provided on request.

Rotor

Entire range of motors is 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 any special shaft extension and /or special shaft material e.g. EN24 or stainless steel grades are also provided on request.

Balancing & Vibration

Rotors are dynamically balanced with a half key in the shaft extension. Vibration grade is 'reduced grade' conforming to IS: 12075. Other grades as per IS 12075 or IEC 60034-14 can be provided on request.

Noise Level

Motors are designed for noise level well below the limits specified in IS: 12065

Paint

All motors are painted with acrylic paint in Blue colour, RAL shade No. 5000. Motors used in corrosive atmosphere are painted with Epoxy base paint. Any other shade or material (e.g. polyurethane paint) can be offered on request.

Packing

Motors up to 132M frame are packed in thermacol / corrugated boxes. Wooden packing boxes are provided for higher frame size. Export worthy packing is also available on request.



Bharat Bijlee IE2 motors suitable to run with VFDs

BBL offers the entire range of motors suitable to run with VFDs.

Motors are suitable for :

- Constant torque application like crane, hoist, reciprocating compressor etc.
- Variable torque application like centrifugal pump, fan, blowers etc.
- Constant power application like metal cutting lathes, wire winding machines etc. and are custom built to suit customer's requirements.

Motors for constant torque application suitable for speed range of 1:10, 1:5, 1:2 etc can be provided. Depending on the speed range, motors can be offered with forced cooling (IC416) or in higher frame sizes 132S and above. **Please check with our sales office, for motors to be operated above 1.5 times the synchronous speed.**

PWM, IGBT devices operate at very high frequencies (2 kHz to 15 kHz) and have very short rises times leading to high dv/dt. Longer cable lengths also contribute to higher voltages at the motors terminals due to standing wave phenomenon. These stress the insulation of the motors. BBL motors are provided with special impregnation system /vacuum pressure impregnation and dual coated winding wire to take care of these stresses. This insulation conforms to the requirements given in IEC 60034-18-41. For voltage higher than 500 V, refer to our Sales Office.

All the motors are provided with six terminals in the terminal box. Shaft induced voltage occurs due to the use of VFD. This causes flow of currents through bearing which can lead to premature bearing failure. Insulated bearings can be provided in frames from 132S onwards on request.

In closed loop system operations, speed feedback is obtained through encoder mounted on the shaft of the motors . We provide encoder mounting arrangements on Non Drive End side shaft of the motors on request.

For further details and technical offer, please refer to our Sales office in your area.



Payback calculations:

Effect of additional stray load losses for efficiency determination as per IS 12615-2011

The new standard follows IS 15999 / IEC 60034-2-1 for arriving at the stray load losses. These losses can vary from 2.5% in small motors to 0.5% in higher ratings up to 1MW. The earlier standard IS 12615-2004 used for eff1 motors assumed stray losses as 0.5% of output. Hence the efficiency values tested by the earlier standard would be 0.5% to 1.5% higher than the new standard for the same motor.

Example is as given below

Rating 4 Pole	Eff1 specified in IS 12615-2004 (%)	IE2 specified in IS 12615-2011 (%)	Reduction in efficiency from eff1 Due to additional stray losses (%)
11kW	91.0	89.8	1.2
55kW	94.2	93.5	0.7

When comparing eff1 motor & IE2 motor, it is necessary to note the difference in testing methods. The standard has reduced the efficiency value to take care of this. At first glance a customer would feel that an IE2 motor is inferior to an Eff1 motor though both might be identical.

Hence for any comparison, it is necessary to use the same method of loss calculation. The worked out example shown below gives the energy savings per year (for 8000 hours running) of a BBL IE2 motor (normalized for 0.5% stray loss) over a BBL standard IS 325 motor

Rating kW	BBL IS325 Catalogue (eff%)	IE2 Catalogue (eff%)	Input Power (kW)	Additional Stray losses (kW)	Normalized IE2 Eff with 0.5% Stray losses assumed	IS 325 losses (kW)	IE2 losses (kW)	Saving (kW)	Saving in kW/Year @8000 Hrs running
11	89.0	89.8	12.249	0.187(0.2424-0.0550)	91.2	1.360	1.062	0.298	2380
55	93.8	93.5	58.824	0.684 (0.959-0.275)	94.6	3.636	3.140	0.496	3968



Energy Saving Calculations:

Table shown below gives the energy savings per year (for 8000 hours running) of a BBL IE2 motor
(normalized for 0.5% stray loss) over a BBL standard IS 325 motor

	2 Pole				4 Pole				6 Pole			
Rating kW	BBL IS325 Catalogue (Eff%)	IE2 Catalogue (Eff%)	Normalized IE2 Eff with 0.5% Stray losses	Saving in kW/Year @8000 Hrs running	BBL IS325 Catalogue (Eff%)	IE2 Catalogue (Eff%)	Normalized IE2 Eff with 0.5% Stray losses	Saving in kW/Year @8000 Hrs running	BBL IS325 Catalogue (Eff%)	IE2 Catalogue (Eff%)	Normalized IE2 Eff with 0.5% Stray losses	Saving in kW/Year @8000 Hrs running
0.37	71	72.2	73.8	157	71	70.1	71.6	37	68	69	70.0	122
0.55	74	74.8	76.4	188	74	75.1	76.7	212	69	72.9	74.0	429
0.75	77	77.4	79.0	201	77	79.6	81.3	413	73	75.9	77.1	434
1.1	79	79.6	81.2	303	78	81.4	83.1	695	76	78.1	79.8	550
1.5	80.6	81.3	82.9	412	80	82.8	84.5	797	77	79.8	81.4	850
2.2	82.5	83.2	84.8	570	82	84.3	85.9	984	80	81.8	83.4	895
3.7	85	85.5	87.0	805	85	86.3	87.9	1137	85	84.3	85.8	334
5.5	86	87	88.5	1426	86	87.7	89.2	1840	85	86	87.5	1462
7.5	87	88.1	89.5	1944	87	88.7	90.2	2417	88	87.2	88.6	473
9.3	88	88.8	90.2	2056	88	89.3	90.7	2538	88	88	89.4	1307
11	89	89.4	90.8	1927	89	89.8	91.2	2380	88.5	88.7	90.1	1726
15	89.5	90.3	91.6	3101	90.2	90.6	91.9	2520	90	89.7	91.0	1489
18.5	90.5	90.9	92.2	2989	91.2	91.2	92.5	2289	91	90.4	91.7	1206
22	91.5	91.3	92.6	2190	91.8	91.6	92.9	2215	91.2	90.9	92.1	1989
30	92.6	92	93.2	1655	92	92.3	93.5	4228	91.8	91.7	92.9	3080
37	93	92.5	93.7	2243	93	92.7	93.9	2969	92.5	92.2	93.4	2940
45	93.5	92.9	94.0	2143	93.2	93.1	94.2	4256	93.5	92.7	93.8	1320
55	93.3	93.2	94.3	4923	93.8	93.5	94.6	3968	93.5	93.1	94.2	3423
75	94	93.8	94.8	5549	94.2	94	95.0	5618				
90	94	94.1	95.1	8756	94.7	94.2	95.2	4004				

Performance Table For 2- Pole Motors

TEFC 3 Phase Squirrel Cage Induction Motors - Frame size 71 to 355L															
Voltage : 415V+/-10%				Ins. Class : F											
Frequency : 50Hz+/-5%				Ambient: : 50 °C											
Combined Variation : +/-10%				Duty : S1(Continuous)											
				Temp. Rise : B											
				Protection : IP55											
3000 rpm (2-Pole)															
Rated Output		Frame size	Type Ref.	Operating Characteristics at Rated output								Pullout Torque to Rated Torque Ratio	Rotor GD²	Net Weight B3 Constn. Kg	
				Rated Speed	Current	Rated Torque	Power Factor			% Efficiency					Starting Current to Rated Current Ratio
KW	HP	IEC	B3 Construction	RPM	Amps.	Kg.m	FL	3/4L	1/2L	FL	3/4L	1/2L			
0.37	0.50	71	2H0712A3	2800	0.96	0.130	0.74	0.68	0.60	72.2	72.2	66.0	5.0	2.6	3.0
0.55	0.75	71	2H071233	2805	1.29	0.190	0.79	0.72	0.58	74.8	74.0	70.0	5.0	2.7	3.0
0.75	1.0	80	2H080213	2830	1.64	0.256	0.82	0.74	0.62	77.4	76.5	73.5	5.0	2.5	2.8
1.1	1.5	80	2H080233	2830	2.34	0.380	0.82	0.75	0.63	79.6	79.6	75.5	6.0	2.7	3.0
1.5	2.0	90S	2H09S243	2840	3.13	0.514	0.82	0.78	0.68	81.3	81.3	78.0	6.5	3.3	3.0
2.2	3.0	90L	2H09L273	2840	4.49	0.755	0.82	0.78	0.68	83.2	83.2	81.7	6.5	3.3	3.0
3.7	5.0	100L	2H10L233	2890	7.00	1.24	0.86	0.84	0.76	85.5	85.5	83.5	7.0	3.0	3.0
5.5	7.5	132S	2H13S2G3	2930	9.9	1.83	0.89	0.85	0.77	87.0	86.0	82.0	7.0	2.5	3.0
7.5	10.0	132S	2H13S2N3	2930	13.3	2.49	0.89	0.85	0.77	88.1	87.0	83.0	7.0	2.5	3.0
9.3	12.5	160M	2H16M233	2930	16.4	3.09	0.89	0.86	0.82	88.8	88.6	84.5	7.0	2.3	2.8
11	15.0	160M	2H16M253	2930	19.2	3.66	0.89	0.86	0.82	89.4	89.4	86.5	7.0	2.3	3.0
15	20.0	160M	2H16M263	2930	26.0	4.99	0.89	0.88	0.82	90.3	90.2	87.0	7.0	2.3	2.8
18.5	25.0	160L	2H16L293	2930	31.5	6.15	0.90	0.89	0.86	90.9	90.7	88.8	7.0	2.4	3.0
22	30.0	180M	2H18M233	2935	37.7	7.30	0.89	0.87	0.83	91.3	91.0	88.8	7.0	2.4	2.7
30	40.0	200L	2H20L2A3	2950	51.0	9.89	0.89	0.86	0.80	92.0	92.0	89.5	7.0	2.5	2.6
37	50.0	200L	2H20L253	2950	62.5	12.2	0.89	0.86	0.80	92.5	92.0	90.0	7.0	2.4	2.5
45	60.0	225M	2H22M253	2965	76.6	14.8	0.88	0.85	0.78	92.9	92.7	91.0	7.0	2.5	2.5
55	75.0	250M	2H25M233	2965	89.2	18.1	0.92	0.91	0.86	93.2	92.7	90.0	7.0	2.3	2.7
75	100	280S	2H28S233	2970	124	24.6	0.90	0.88	0.83	93.8	93.6	92.0	7.0	2.2	2.8
90	120	280M	2H28M253	2970	146	29.5	0.91	0.89	0.87	94.1	93.9	90.9	7.0	2.2	2.8
110	150	315S	2H31S233	2982	180	35.9	0.90	0.86	0.78	94.3	94.1	91.5	7.0	2.0	2.5
125	170	315M	2H31M2A3	2982	207	40.8	0.89	0.85	0.76	94.5	93.5	91.5	7.0	2.2	2.6
132	180	315M	2H31M233	2982	216	43.1	0.90	0.86	0.78	94.6	93.6	91.3	7.0	2.0	2.5
150	200	315L	2H31L2A3	2982	248	49.0	0.89	0.84	0.76	94.7	93.7	92.2	7.0	2.0	2.5
160	215	315L	2H31L253	2982	261	52.3	0.90	0.85	0.77	94.8	94.1	93.0	7.0	2.0	2.5
180	240	315L	2H31L283	2982	300	58.80	0.88	0.82	0.75	94.9	94.1	93.0	7.0	2.0	2.5
*200	270	315L	2H31L273	2982	325	65.30	0.90	0.85	0.77	95	94.5	93.3	7.0	2.0	2.5
*250	335	355L	2H35L213	2985	407	81.60	0.90	0.88	0.84	95.0	94.5	92.8	7.0	1.6	2.4
*315	425	355L	2H35L233	2985	513	102.80	0.90	0.88	0.84	95	94.5	93.0	7.0	1.6	2.4

Note :
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

Performance Table For 4- Pole Motors

TEFC 3 Phase Squirrel Cage Induction Motors - Frame size 71 to 355L																		
Voltage : 415V+/-10% Ambient: : 50 °C Ins. Class : F																		
Frequency : 50Hz+/-5% Duty : S1(Continuous) Temp. Rise : B																		
Combined Variation : +/-10% Protection : IP55																		
Rated Output				Operating Characteristics at Rated output										With DOL Starting			Rotor Gp ²	Net Weight B3 Constn. Kg
KW	HP	Frame Size	Type Ref.	Rated Speed	Current	Rated Torque	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	0.50	71	2H071433	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	2H080433	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	11	
0.75	1.0	80	2H080453	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	12	
1.1	1.5	90S	2H09S423	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	2.0	90L	2H09L473	1430	3.27	1.02	0.77	0.70	0.57	82.8	82.8	78.8	6.0	2.7	3.0	0.019	19	
2.2	3.0	100L	2H10L473	1435	4.48	1.49	0.81	0.73	0.59	84.3	84.3	81.5	6.0	2.6	3.0	0.028	26	
3.7	5.0	112M	2H11M473	1445	7.27	2.49	0.82	0.78	0.63	86.3	86.3	83.8	6.5	2.7	3.0	0.066	36	
5.5	7.5	132S	2H13S4K3	1455	10.2	3.68	0.85	0.80	0.70	87.7	87.4	86.0	7.0	2.6	3.0	0.126	50	
7.5	10	132M	2H13M473	1455	13.8	5.02	0.86	0.83	0.76	88.7	88.4	86.8	7.0	2.6	3.2	0.163	56	
9.3	12.5	160M	2H16M4C3	1460	17.2	6.20	0.84	0.82	0.73	89.3	89.3	86.5	7.0	2.5	2.8	0.177	105	
11	15.0	160M	2H16M4K3	1460	20.0	7.34	0.85	0.82	0.76	89.8	89.8	87.5	7.0	2.7	2.9	0.229	115	
15	20.0	160L	2H16L473	1465	27.1	9.97	0.85	0.80	0.70	90.6	90.6	89.4	7.0	2.4	2.7	0.300	128	
18.5	25.0	180M	2H18M473	1470	33.2	12.25	0.85	0.82	0.76	91.2	91.2	89.5	7.0	2.7	2.9	0.540	188	
22	30	180L	2H18L483	1470	39.3	14.60	0.85	0.80	0.72	91.6	91.6	89.8	7.0	2.6	3.0	0.61	200	
30	40	200L	2H20L453	1470	52.6	19.88	0.86	0.82	0.78	92.3	92.0	90.0	7.0	2.6	2.6	0.93	275	
37	50	225S	2H25S433	1470	63.8	24.50	0.87	0.85	0.77	92.7	92.5	90.5	7.0	2.6	2.6	1.60	362	
45	60	225M	2H22M453	1470	77.3	29.82	0.87	0.85	0.77	93.1	92.8	90.8	7.0	2.6	2.6	1.85	377	
55	75	250M	2H25M433	1480	95.2	36.20	0.86	0.84	0.76	93.5	93.0	91.0	7.0	2.5	2.6	3.06	500	
75	100	280S	2H28S423	1480	126	49.40	0.88	0.86	0.80	94.0	93.5	92.0	7.0	2.2	2.5	5.53	670	
90	120	280M	2H28M453	1480	151	59.20	0.88	0.86	0.80	94.2	94.0	92.0	7.0	2.2	2.5	6.36	735	
110	150	315S	2H31S413	1485	188	72.10	0.86	0.83	0.77	94.5	94.3	92.3	7.0	2.1	2.5	8.70	902	
125	170	315M	2H31M4A3	1486	214	81.90	0.86	0.83	0.77	94.6	94.3	92.7	7.0	2.2	2.5	10.20	1010	
132	180	315M	2H31M433	1486	223	86.50	0.87	0.85	0.78	94.7	94.5	93.0	7.0	2.1	2.5	10.20	1010	
150	200	315L	2H31L4A3	1487	256	98.30	0.86	0.83	0.77	94.7	94.4	92.8	7.0	2.2	2.5	12.20	1185	
160	215	315L	2H31L453	1486	270	104.8	0.87	0.86	0.78	94.9	94.6	93.1	7.0	2.1	2.5	12.20	1185	
180	240	315L	2H31L463	1487	303	117.9	0.87	0.86	0.78	95.0	94.7	93.2	7.0	2.1	2.5	13.40	1262	
*200	270	315L	2H31L473	1487	336	131.0	0.87	0.86	0.78	95.1	94.8	93.3	7.0	2.2	2.5	14.60	1305	
*250	335	355L	2H35L413	1488	416	163.6	0.88	0.85	0.75	95.1	94.9	93.5	7.0	2.2	2.5	23.30	1680	
*315	422	355L	2H35L433	1488	524	206.2	0.88	0.85	0.75	95.1	94.8	93.5	7.0	2.2	2.5	32.70	1855	
**355	475	355L	2H35L453	1488	590	232.4	0.88	0.85	0.75	95.1	94.9	93.5	7.0	2.2	2.5	37.90	2025	

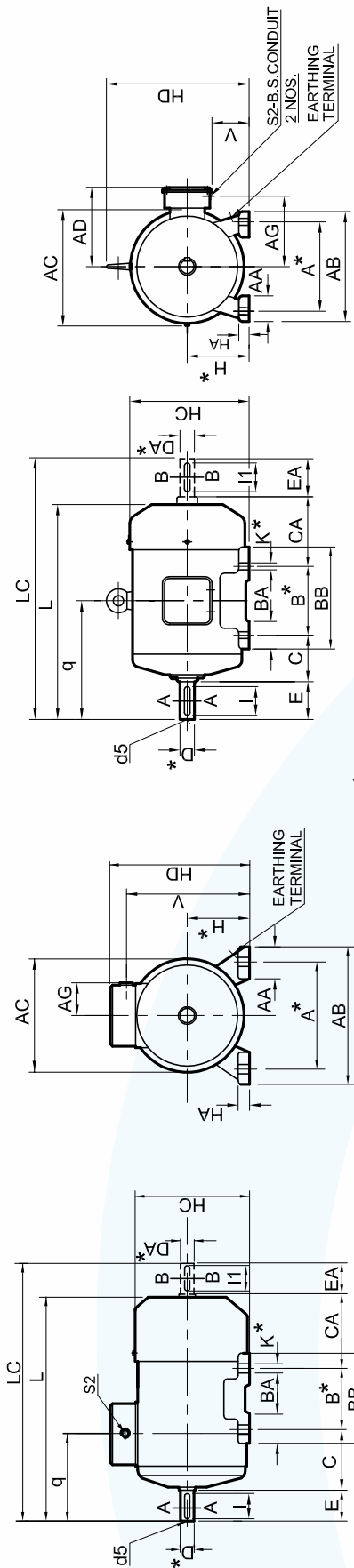
Note :
All performance values are subject to tolerance as per IS/IEC 60034-1
Efficiency measurements are without seals.
*- These ratings are suitable for ambient temperature 45°C
**- These ratings are suitable for ambient temperature 40°C

Performance Table For 6- Pole Motors

TEFC 3 Phase Squirrel Cage Induction Motors - Frame size 80 to 355L													Ins. Class : F Temp. Rise : B Protection : IP55			
Voltage : 415V+/-10% Frequency : 50Hz+/-5% Combined Variation : +/-10%													Ambient : 50 °C Duty : S1(Continuous)			
1000 rpm (6-Pole)													IE2			
Rated Output		Frame size	Type Ref.	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	Current	Rated Torque	Power Factor			% Efficiency			Starting Current to Rated Current Ratio	Starting Torque to Rated Torque Ratio		
KW	HP	IEC	B3 Construction	RPM	Amps.	Kg.m	FL	3/4L	1/2L	FL	3/4L	1/2L	FL	3/4L	1/2L	
0.37	0.5	80	2H080613	910	1.07	0.396	0.70	0.60	0.48	69.0	69.0	67.0	69.0	69.0	67.0	10
0.55	0.75	80	2H080633	915	1.48	0.59	0.71	0.62	0.48	72.9	72.9	68.5	72.9	72.9	68.5	11
0.75	1.0	90S	2H09S633	925	1.91	0.79	0.72	0.61	0.50	75.9	75.9	72.3	75.9	75.9	72.3	14
1.1	1.5	90L	2H09L653	930	2.72	1.15	0.72	0.61	0.50	78.1	78.1	74.0	78.1	78.1	74.0	17
1.5	2.0	100L	2H10L633	935	3.63	1.56	0.72	0.60	0.52	79.8	79.8	75.0	79.8	79.8	75.0	22
2.2	3.0	112M	2H11M653	940	4.99	2.28	0.75	0.65	0.58	81.8	81.8	79.8	81.8	81.8	79.8	33
3.7	5.0	132S	2H13S6G3	960	8.00	3.75	0.76	0.65	0.57	84.3	83.0	81.5	84.3	83.0	81.5	48
5.5	7.5	132M	2H13M6T3	960	11.4	5.58	0.78	0.68	0.60	86.0	84.5	82.0	86.0	84.5	82.0	55
7.5	10	160M	2H16M633	960	15.0	7.61	0.80	0.74	0.64	87.2	87.2	85.2	87.2	87.2	85.2	103
9.3	12.5	160L	2H16L663	960	18.4	9.44	0.80	0.74	0.64	88.0	88.0	86.7	88.0	88.0	86.7	113
11	15	160L	2H16L673	965	21.6	11.1	0.80	0.77	0.66	88.7	88.7	87.0	88.7	88.7	87.0	123
15	20	180L	2H18L633	965	29.1	15.1	0.80	0.75	0.62	89.7	89.7	87.2	89.7	89.7	87.2	200
18.5	25	200L	2H20L633	975	34.7	18.5	0.82	0.77	0.69	90.4	90.4	88.3	90.4	90.4	88.3	254
22	30	200L	2H20L653	975	41.1	22.0	0.82	0.77	0.69	90.9	90.9	88.8	90.9	90.9	88.8	270
30	40	225M	2H22M643	975	52.9	30.0	0.86	0.84	0.76	91.7	91.2	88.7	91.7	91.2	88.7	358
37	50	250M	2H25M633	980	63.4	36.8	0.88	0.85	0.82	92.2	92.2	91.0	92.2	92.2	91.0	528
45	60	280S	2H28S613	980	81.4	44.7	0.83	0.80	0.70	92.7	92.7	91.2	92.7	92.7	91.2	573
55	75	280M	2H28M633	980	96.7	54.7	0.85	0.83	0.73	93.1	93.1	91.0	93.1	93.1	91.0	620
75	100	315S	2H31S613	985	131	74.1	0.85	0.82	0.75	93.7	93.7	92.5	93.7	93.7	92.5	830
90	120	315M	2H31M633	987	159	88.8	0.84	0.81	0.72	94.0	93.9	92.5	94.0	93.9	92.5	912
110	150	315M	2H31M653	988	191	108.4	0.85	0.82	0.73	94.3	94.3	93.3	94.3	94.3	93.3	1010
125	170	315L	2H31L6A3	988	219	123.2	0.84	0.80	0.71	94.4	94.4	93.0	94.4	94.4	93.0	1175
132	180	315L	2H31L673	988	228	130.0	0.85	0.82	0.73	94.6	94.3	92.8	94.6	94.3	92.8	1175
150	200	315L	2H31L6B3	988	265	147.8	0.83	0.80	0.70	94.7	94.4	92.8	94.7	94.4	92.8	1231
160	215	315L	2H31L693	988	276	158.0	0.85	0.82	0.73	94.8	94.6	93.0	94.8	94.6	93.0	1231
180	240	355L	2H35L6A3	990	322	177.0	0.82	0.77	0.65	94.9	94.6	93.3	94.9	94.6	93.3	1670
200	270	355L	2H35L613	990	349	196.7	0.84	0.80	0.7	95.0	94.7	93.5	95.0	94.7	93.5	1670
250	335	355L	2H35L633	990	436	246	0.84	0.80	0.7	95.0	94.7	93.4	95.0	94.7	93.4	1780

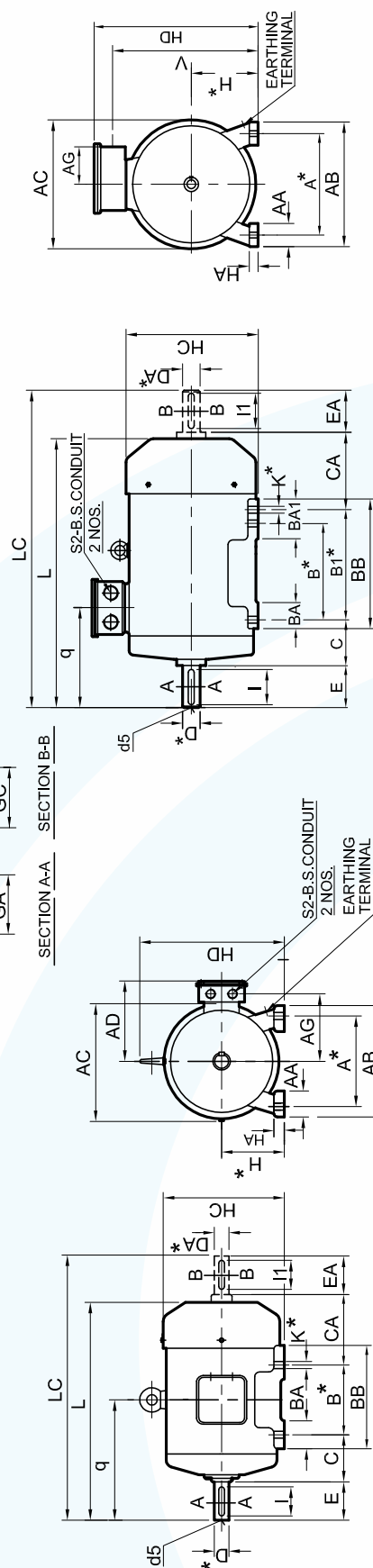
Note :
All performance values are subject to tolerance as per IS/IEC 60034-1
Efficiency measurements are without seals.

Dimensional Drawing: Industrial Motors Type 2H Foot Mounted (B3) TEFC (IE2) series Frame 63-355L



FRAME SIZE 63 TO 80

FRAME SIZE 160M TO 180L



FRAME SIZE 200L TO 225M

* Refer TABLE A for tolerances

FRAME SIZE 90S TO 132M

FRAME SIZE 250M TO 355L

IEC Fr. size	FIXING										GENERAL										TERMINAL BOX1					SHAFT					TABLE B		
	Pole	*A	*B	*B1	*C	*H	*K	AB	BB	AA	BA	BA1	HA	HC	HD	AD	L	LC	CA	AC	V	q	AG	S2 B.S.C.	*D,DA	*E	*F	*GA*	I	d5			
63	2 & 4	100	80	—	40	63	7	126	100	28	30	—	7	125	179	—	206	241	75	124	149	104	40	3/4"	11	23	4	12.5	18	M4			
71	2,4 & 6	112	90	—	45	71	7	135	110	31	30	—	7	141	195	—	234	278	83	140	166	102	40	3/4"	14	30	5	16	25	M5			
80	2,4 & 6	125	100	—	50	80	10	150	124	31	35	—	9	159	214	—	267	324	94	157	185	112	40	3/4"	19	40	6	21.5	35	M6			
90S	6 & 8	100	100	—	56	90	10	168	125	34	31.5	—	12	177	230	-	302	374	118	174	199	139	52	3/4"	24	50	8	27	45	M8			
90L	6 & 8	125	125	—	—	—	—	180	150	—	—	—	—	—	—	—	327	399	—	—	—	153	—	—	—	—	—	—	—	—			
100L	6 & 8	160	140	—	63	100	12	190	174	43.5	36	—	12	198	257	-	366	448	125	192	225	152	56	1"	28	60	8	31	55	M10			
112M	6 & 8	190	140	—	70	112	12	220	174	47	36	—	12	222	282	-	388	471	141	220	249	157	56	1"	28	60	8	31	55	M10			
132S	6 & 8	140	140	—	—	—	—	180	—	—	50	—	—	—	—	—	450	552	163	—	—	196	—	—	—	—	—	—	—	—			
132M	6	216	178	—	89	132	12	256	—	64	—	—	17	262	338	-	488	590	163	260	299	63	1"	38	80	10	41	70	M12				
160M	2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—			
160L	4,6 & 8	254	254	—	108	160	15	310	—	58	70	—	20	318	366	226	585	721	183	316	98	186	1"	42	110	12	45	105	M16				
180M	2,6 & 8	241	241	—	121	180	15	344	281	65	70	—	26	357	412	265	679	799	217	354	83	352	216	1 1/2"	48	110	14	51.5	100	M16			
180L	6 & 8	279	279	—	—	—	—	319	—	—	—	—	—	—	—	—	717	838	218	—	—	371	—	—	—	—	—	—	—	—			
200L	2	—	—	—	133	200	19	398	355	85	85	—	32	397	462	312	795	920	262	394	—	396	249	2"	55	110	16	59	100	M20			
225S	6 & 8	286	286	—	—	—	—	336	—	—	—	—	—	—	—	—	827	966	251	—	—	432.5	—	—	60	140	18	64	130	—			
225M	6 & 8	311	311	—	149	225	19	436	361	85	85	—	34	450	509	337	837	956	276	450	—	415	273	2"	55	110	16	59	100	M20			
250M	2	—	—	—	168	250	24	506	425	100	115	—	42	495	665	—	842	991	251	—	—	445	—	—	60	140	18	64					

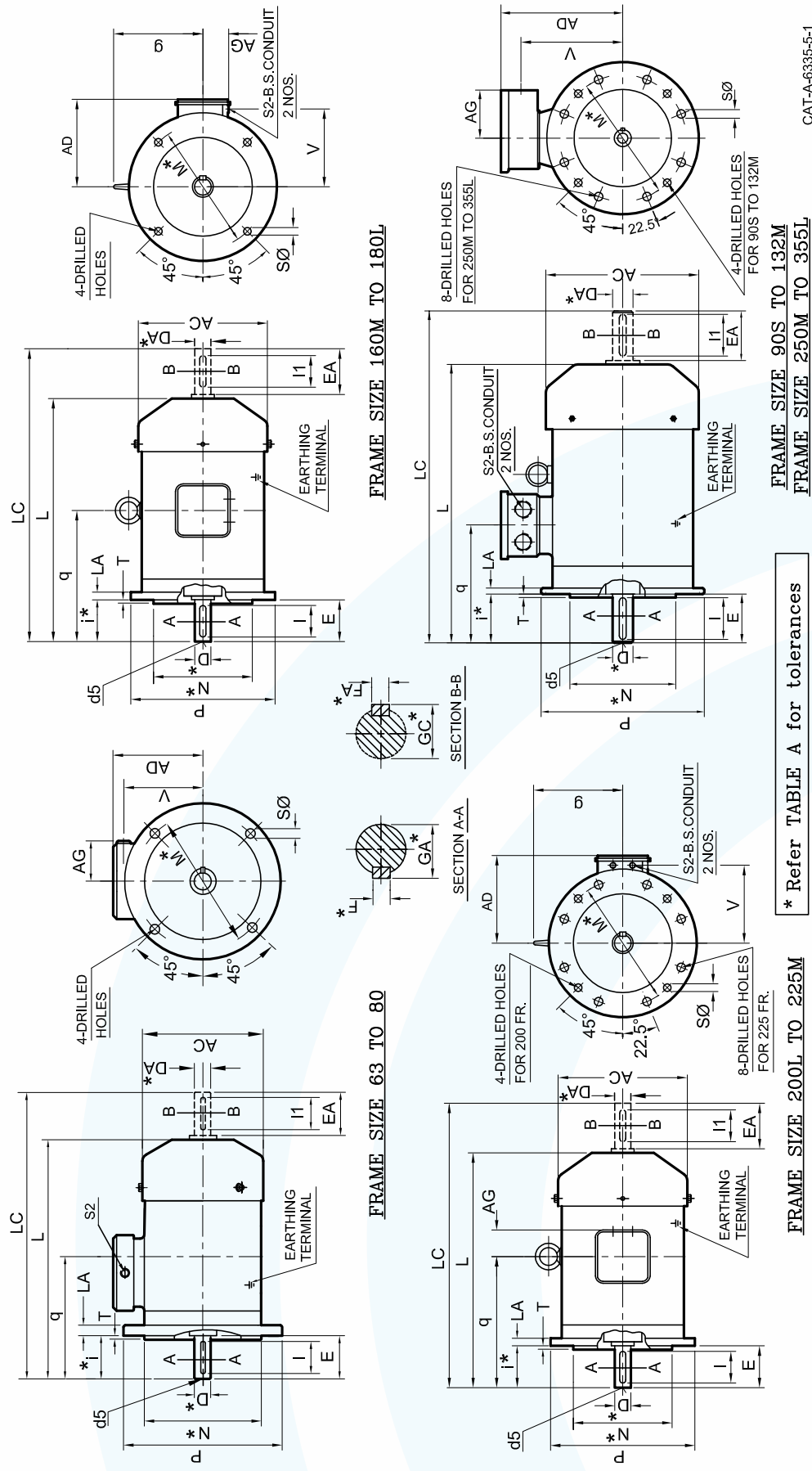
TABLE A				Special Remarks		
Dimension	Tolerance	Specification	Dimension	Tolerance	Specification	
A, B	±0.75		D DA	j6	11, 14, 19, 24, 280	
H	-0.5	UPTO 280		k6	38, 42, 480	IS : 1231
	-1	OVER 280		m6	55, 60, 65, 75, 80, 950	
K	+0.360	7.100	GA, GC, F, FA		IS : 2048	
	+0.430	12.150			IS : 2540	
	+0.520	19.24, 290		d5(centering)		

- ☐ 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.

*Refer TABLE A for tolerances

CAT-A-6335-3-2

Dimensional Drawing: Industrial Motors Type 2H Flange Mounted (B5) TEFC (IE2) series Frame 63-355L



Dimensional Details: Industrial Motors Type 2H Flange Mounted (B5) TEFC (IE2) series Frame 63-355L

TABLE B																								
FIXING										GENERAL					TERMINAL BOX					SHAFT				
IEC Fr. size	Pole	P	N	M	i	S	T	LA	AD	AC	L	LC	g	V	q	AG	S2 B.S.C.	* D.A	E EA	F* FA	G* GC	I I1	d5	
63	2 & 4	140	95	115	23	10	3	9	116	124	225	260	—	86	109	40	3/4"	11	23	4	12.5	18	M4	
71	2,4 & 6	160	110	130	30	10	3.5	9	124	140	261	305	—	95	127	40	3/4"	14	30	5	16	25	M5	
80	2,4 & 6	200	130	165	40	12	3.5	10	134	157	267	324	—	105	112	40	3/4"	19	40	6	21.5	35	M6	
90S	6 & 8	200	130	165	50	12	3.5	10	140	174	302	374	①	109	139	52	3/4"	24	50	8	27	45	M8	
90L	6 & 8	200	130	165	50	12	3.5	10	140	174	327	399	—	109	153	52	3/4"	24	50	8	27	45	M8	
100L	6 & 8	250	180	215	60	15	4	11	157	195	366	448	-	125	152	56	1"	28	60	8	31	55	M10	
112M	6 & 8	250	180	215	60	15	4	11	170	220	388	471	-	137	157	56	1"	28	60	8	31	55	M10	
132S	6 & 8	300	230	265	80	15	4	12	206	260	450	552	-	167	196	63	1"	38	80	10	41	70	M12	
132M	6	300	230	265	80	15	4	12	206	260	488	590	-	167	215	63	1"	38	80	10	41	70	M12	
160M	2	350	250	300	110	19	5	13	226	316	605	741	—	206	323	63	1"	42	110	12	45	105	M16	
160L	4,6 & 8	350	250	300	110	19	5	13	226	316	585	721	—	206	345	63	1"	42	110	12	45	105	M16	
160L	6 & 8	350	250	300	110	19	5	13	226	316	629	765	—	206	345	63	1"	42	110	12	45	105	M16	
180M	2,6 & 8	350	250	300	110	19	5	13	265	354	679	799	—	232	352	97	1 1/2"	48	110	14	51.5	100	M16	
180L	6 & 8	350	250	300	110	19	5	13	265	354	717	838	—	232	371	97	1 1/2"	48	110	14	51.5	100	M16	
200L	2	400	300	350	110	19	5	15	312	394	795	920	—	262	249	396	172	55	110	16	59	100	M20	
200L	6 & 8	400	300	350	110	19	5	15	312	394	772	897	—	262	249	396	172	55	110	16	59	100	M20	
225S	6 & 8	450	350	400	140	19	5	16	337	450	827	966	—	284	432.5	172	2"	60	140	18	64	130	M20	
225M	2	450	350	400	140	19	5	16	337	450	837	956	—	284	415	172	2"	55	110	16	59	100	M20	
225M	6 & 8	450	350	400	140	19	5	16	337	450	842	991	—	284	445	172	2"	60	140	18	64	130	M20	
250M	2	550	450	500	140	19	5	18	415	489	983	1134	—	328	352	205	2"	60	140	18	64	130	M20	
250M	4,6 & 8	550	450	500	140	19	5	18	415	489	914	1065	—	328	352	205	2"	65	140	18	69	130	M20	
280S/M	2	550	450	500	140	19	5	18	445	544	1010	1160	—	358	360	205	2"	65	140	18	69	130	M20	
280S/M	4,6 & 8	550	450	500	140	19	5	18	445	544	1010	1160	—	358	360	205	2"	75	140	20	79.5	130	M20	
315S/M	2	660	550	600	170	24	6	22	515	610	1137	1293	—	386	386	205	2"	65	140	18	69	130	M20	
315S/M	4,6 & 8	660	550	600	170	24	6	22	515	610	1167	1353	—	413	416	218	2"	80	170	22	85	160	M20	
315L	2	660	550	600	170	24	6	22	515	610	1302	1458	—	413	386	218	2"	65	140	18	69	130	M20	
315L	4,6 & 8	660	550	600	170	24	6	22	515	610	1332	1518	—	413	416	218	2 1/2"	80	170	22	85	160	M20	
355L	2	800	680	740	140	24	6	25	584	690	1461	1622	—	495	434	305	3"	75	140	20	79.5	130	M24	
355L	4,6 & 8	800	680	740	170	24	6	25	584	690	1491	1682	—	495	464	305	3"	95	170	25	100	160	M24	

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

*Refer TABLE A for tolerances

All Dimensions are in mm unless otherwise specified.
CAT-A-6335-5-2

TABLE A				Without Eye bolt			
Dimension	Tolerance	Specification	Dimension	Tolerance	Specification	Dimension	Specification
N	j6 UPTO 450	IS : 2223	D,DA	j6 k8 m6	IS : 1231	GA,GC,F,FA	IS : 2048
M	±0.3 OVER 450	IS : 2223	D,DA	±0.3 OVER 450	IS : 1231	d5(centring)	IS : 2540
i	±0.5 OVER 265	IS : 2223	D,DA	±0.5 OVER 265	IS : 1231	d5(centring)	IS : 2540
i	±1.5 OVER 85	IS : 2223	D,DA	±1.5 OVER 85	IS : 1231	d5(centring)	IS : 2540

□ Double shaft extension can be provided with shaft dimension identical to D.E shaft □ Key / key way fit : h9 / N9
□ Also suitable for V1 & V3 mounting as per IS 2253 □ 8 Nos. Fixing Holes from 225S/M frame onwards

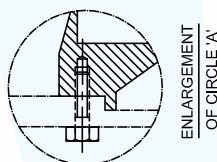
Technical drawings of a 1000A 11kV SF6 circuit breaker in closed position, showing front, side, and top views with dimensions.

Front View (Top): Shows the circular front face with four 45° tapered holes. Dimensions include: AD (outer diameter), V (inner diameter), AG (flange thickness), S (flange width), 45° (hole angle), M (mounting hole), 4 -TAPPED HOLES, $S2$ -CONDUIT 2 NOS., and AC (total width).

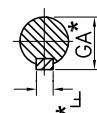
Side View (Middle): Shows the side profile of the breaker. Dimensions include: LC (total length), L (main body length), EA (earthing terminal offset), q (conduit offset), E (base height), $d5$ (base diameter), A (base width), I (base height), N (base width), Z (base width), A' (base width), B (base width), B' (base width), T (base height), i (base height), i^* (base height), $EARTHING TERMINAL$, and $S2$ -B.S. CONDUIT 2 NOS.

Top View (Bottom): Shows the top of the breaker. Dimensions include: AD (outer diameter), V (inner diameter), AG (flange thickness), S (flange width), 45° (hole angle), M (mounting hole), 4 -TAPPED HOLES, $S2$ -CONDUIT 2 NOS., and AC (total width).

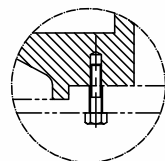
FRAME SIZE 63 TO 80

[illegible]

**ENLARGEMENT
OF CIRCLE 'A'**



SECTION A-A



**ENLARGEMENT
OF CIRCLE 'B'**



SECTION B-B

① Without Eye bolt

- ☐ Also suitable for V19 & V18 mounting as per IS 2253
- ☐ Key / key way fit : h9 / N9
- ☐ Double shaft extension can be provided with shaft dimension identical to D.E. shaft

Dimension		Tolerance	Specification
N	j6		
M	± 0.3		IS : 2223
i	± 1		

*Refer TABLE A for tolerances

All Dimensions are in mm unless otherwise specified.

This image shows a blank sheet of white paper with horizontal grey ruling lines. On the left side, there are two light blue curved decorative elements that resemble stylized waves or swooshes. The paper is otherwise empty of any text or markings.

This image shows a blank sheet of white paper with horizontal ruling lines. The lines are evenly spaced and extend across the width of the page. On the right side, there is a large, light blue curved shape that resembles a stylized wave or a partial circle, adding a decorative touch to the otherwise plain background.

Special Design features offered

Electrical

Non standard Voltage	42 TO 700V
Non standard Frequency	50/ 60 Hz with efficiency class as per IEC 60034-30
Motor for wide variation*	
Voltage variation	>10%
Frequency Variation	>5%
Motors with higher ambient temperatures	>50 °C
Polarities higher than 8 pole	10pole, 12pole etc
Dual Voltage motors	In ratio 1:√3. 1:2
Multi Speed motors	2 / 3 speeds
Class H Insulation Scheme	
Motors with Thermal protection	PTC Thermistors, Thermostat, RTD, BTD etc.
Space heaters	90 Frame onwards
Motors with starting current Limitations	e.g. <600% inclusive of tolerance
Motors with intermittent duties	
Motors with flying leads	

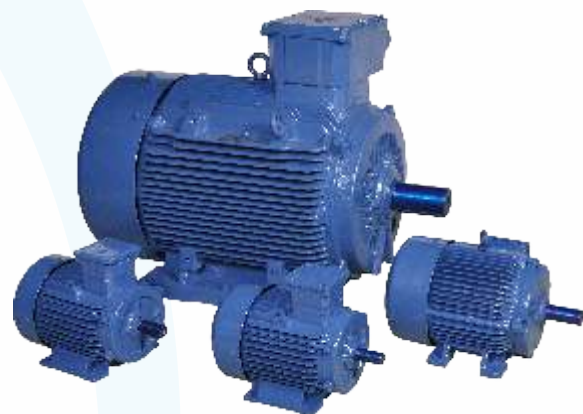
* Motor performance may vary from the catalogue performance.
Please ask for data sheet for non standard motor.

Product Range

Motor used in Hazardous area	
Flame proof motors- Ex'd' (IS/IEC:60079-1)	Frame 80 to 315L (MD)
Increased Safety –Ex'e' (IS/IEC 60079-7)	Frame 63 to 355L (ME)
Non sparking-Ex'n' (IS/IEC 60079-15)	Frame 63 to 355L (MN)
Brake Motors	Frame 71 to 132L (MB)
Slip ring Motors	Frame 100 to 160L (MP)
Roller table motors	As per Requirement
Crane Duty Motors	Frame 63 to 355L (MC)
Railway motors (Auxiliary drives)	Frame 180M TO 225M
Cane unloader motors	Frame 160L TO 225M
Marine duty motors	Frame 63 to 355L

Mechanical

Special Mounting	Non Standard mounting dimensions
Cable entries	Metric equivalent
Non Standards shaft materials	e.g. EN 24
Non Standards shaft extension dimension	
Non standards cable entries	
Cable spreader box	180 Frame onwards
Motors with cable glands	Single/Double compression
Motors with separate T.Box for space heater,thermister	200L frame and above
Low vibration motors	Reduced or special class as per IS : 12075 or vibration grade B as per IEC 60037-14
Non standards paint type	
Paint shade	e.g. Shade no. 632 RAL 7030 etc
Forced cooling arrangement (IC416)	(132 frame onwards)
Surface cooled motors (IC410)	
Motors for brake fitment	
Motors with clean flow cowl arrangement	
Motors with C.I Fan up to 225 Frame	
56 Frame motors in B5 AND B14 Mounting construction	



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