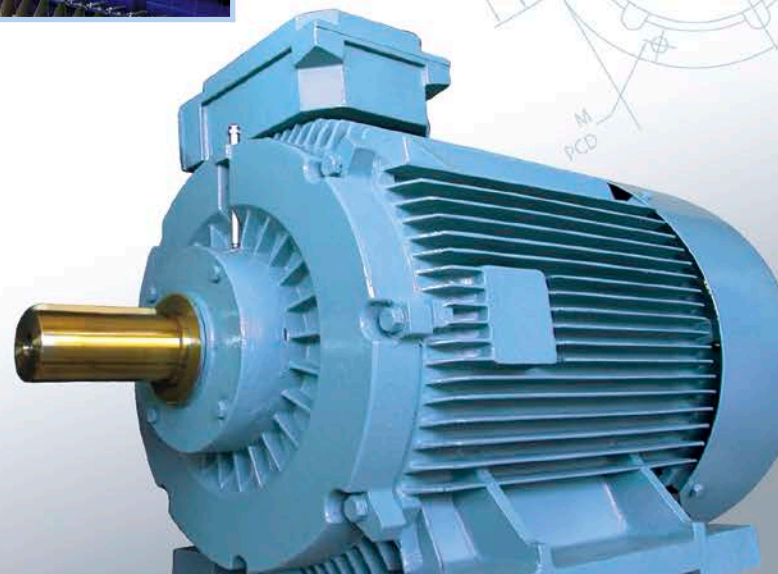
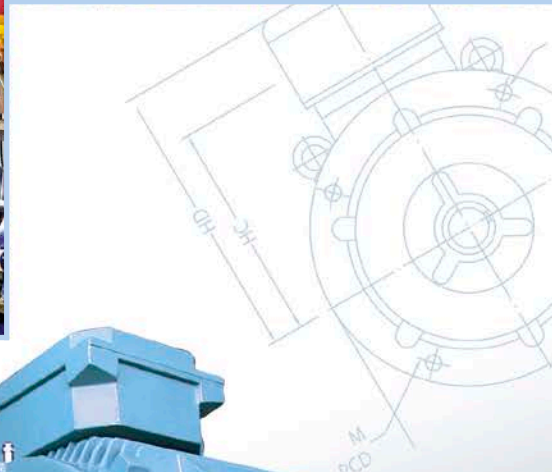




TECHNICAL  
SPECIFICATIONS



motoring the wheels of success

**hindustan**  
ELECTRIC MOTORS

## India's Foremost Manufacturer of Motors

Establishing strengthening and sustaining the development of a strong company not only means deploying resources, expertise and knowhow but also great determination and confidence in the future. Through all these years of intensive activity and quick expansions, the action towards common goal to stand out as a strong consistent group, constantly striving for improvement have driven HINDUSTAN ELECTRIC MOTOR attain and achieve a leading position in the Indian Motor industry.

Hindustan Electric Motor, an ISO 9001: 2015 company is the leading Electric Motor Manufacturer in India with a proven track record of over four decades.

From a modest beginning with an electric motor unit in Mumbai, Hindustan Electric Motor has set up state of art manufacturing facilities at Daman & Vapi. The last four decades have seen the core business develop along with different product lines; Flameproof motors, Crane duty motors, Cooling tower motors, Textile motors, Inverter duty motors, Brake motors & other motors for customer specific application. In the manufacture of motor, a competitive edge lies in providing consistent quality, high reliability with innovative products. Our expansion in Daman & Vapi was to address these key market determinants. The manufacturing set up is sourced out from the world renowned machinery and technology suppliers with constant up-gradations and expansions.

### Our primary focus .....Customer Satisfaction

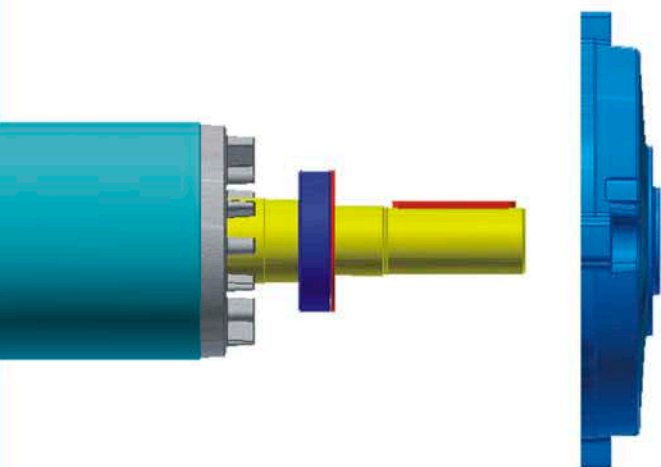
Hindustan Electric Motor derives its strength from its customers. The growth of the latter is the prerequisite to the growth of the company and hence customers' satisfaction is its prime objective. In an ongoing process to improve customer satisfaction, Hindustan Electric Motor offers a variety of Services:

- Competitive prices
- Consistent quality
- Timely delivery
- Product development for a changing Market
- A targeted stocking policy
- Technical support for applications / projects

Hindustan Electric Motor has highly experienced qualified and dedicated professionals with strong adherence to the quality management system. Hindustan Electric Motor has offices all over the country and also has a wide network of authorised distributors, dealers and service centers to cater to all the customer segments in India and abroad.

Hindustan Electric Motor has earned the trust and reputation in India and abroad by winning the customers' confidence. Millions of motors have been manufactured and are in operation in India & abroad.

Hindustan brand motors are preferred choice in OEM, end users, heavy industries, cooling tower application and various diverse application and industries. The titans of Indian industry & consultants / specifiers are now referring Hindustan Electric Motor for most critical and specific applications.



# PRODUCT RANGE

## IE2 High Efficiency Motors

Frames : 63 to 355LX  
 Rating (kW) : 0.12 to 315.0  
 Poles : 2, 4, 6, 8  
 Mountings : B3, B5, B14 & combinations  
 Protection : IP55  
 Enclosure : TEFC



## Cooling Tower Motors

Frames : 71 to 315LX  
 Rating (kW) : 0.37 to 45.0  
 Poles : 4, 6, 8, 10, 12 & others  
 Mountings : B3 or B5  
 Protection : IP55  
 Enclosure : TE, TEFC



## IE3 Premium Efficiency Motors

Frames : 63 to 355LX  
 Rating (kW) : 0.12 to 315.0  
 Poles : 2, 4, 6, 8  
 Mountings : B3, B5, B14 & combinations  
 Protection : IP55  
 Enclosure : TEFC



## Torque Motors

Frames : 63 to 160L  
 Rating (kW) : 0.037 to 5.5  
 Poles : 4, 6, 8  
 Mountings : B3, B5, B14 or special  
 Protection : IP55  
 Enclosure : TE or Force Cooled



## Multi Speed Motors

Frames : 71 to 355LX  
 Rating (kW) : 0.12 to 150.0  
 Poles : 4/2, 8/4, 6/4, 8/6 & others  
 Mountings : B3, B5, B14 & combinations  
 Protection : IP55  
 Enclosure : TEFC



## Brake Motors

Frames : 63 to 250MX  
 Rating (kW) : 0.18 to 55.0  
 Poles : 2, 4, 6, 8  
 Mountings : B3, B5, B14 & combinations  
 Protection : IP54  
 Enclosure : TEFC



## Standard Flameproof Motors

Frames : 63 to 315LX  
 Rating (kW) : 0.12 to 200.0  
 Poles : 2, 4, 6, 8  
 Mountings : B3, B5, B14 & combinations  
 Protection : IP55  
 Enclosure : TEFC



## Inverter Duty Motors

Frames : 90S to 355LX  
 Rating (kW) : 0.37 to 315.0  
 Poles : 2, 4, 6, 8  
 Mountings : B3, B5, B14 & combinations  
 Protection : IP55  
 Enclosure : Force Cooled



## IE2 High Efficiency Flameproof Motors

Frames : 63 to 315LX  
 Rating (kW) : 0.12 to 200.0  
 Poles : 2, 4, 6, 8  
 Mountings : B3, B5, B14 & combinations  
 Protection : IP55  
 Enclosure : TEFC



## Roller Table Motors

Frames : 112M to 160L  
 Rating (kW) : 0.75 to 7.5  
 Poles : 4, 6, 8  
 Mountings : B5  
 Protection : IP55  
 Enclosure : TE, TEFC



## IE3 Premium Efficiency Flameproof Motors

Frames : 63 to 315LX  
 Rating (kW) : 0.12 to 200.0  
 Poles : 2, 4, 6, 8  
 Mountings : B3, B5, B14 & combinations  
 Protection : IP55  
 Enclosure : TEFC



## Crane Duty Motors

Frames : 71 to 315LX  
 Rating (kW) : 0.18 to 200.0  
 Poles : 4, 6, 8  
 Mountings : B3, B5, B14 & combinations  
 Protection : IP55  
 Enclosure : TEFC



## Multi Speed Flameproof Motors

Frames : 71 to 315LX  
 Rating (kW) : 0.12 to 120.0  
 Poles : 4/2, 8/4, 6/4, 8/6 & others  
 Mountings : B3, B5, B14 & combinations  
 Protection : IP55  
 Enclosure : TEFC



## Textile Motors

Frames : 100L to 180L  
 Rating (kW) : 0.55 to 15.0  
 Poles : 4, 6, 8  
 Mountings : B3, B5, B14 & Pad  
 Protection : IP55  
 Enclosure : TENV, TEFC with clean flow



Special Application Motors : Dual Voltage / Dual Frequency motors • Low Vibration motors for machine tools • Motors for Extreme Climatic Conditions • Motor for Import Substitute

## STANDARDS & REFERENCES

HINDUSTAN motors are manufactured according to Indian & International standards.

Description	IS
3 phase induction motors - Efficiency & Performance specification	IS 12615
Code of practice for installation & maintenance of induction motor	IS 900
Dimensions & output series for rotating electrical machines	IS 1231, IS 2223, IS 8223
Symbols of construction & mounting arrangement	IS 2253
Guide for testing 3 ph induction motor (For standard TEFC motors)	IS 4029
Classification of degrees of protection	IS/IEC 60034-5
Terminal marking & direction of rotation	IS/IEC 60034-8
Methods of determination of efficiency of rotating electrical machines (For standard TEFC motors)	IS 15999-2-1
Methods of cooling	IS 6362
Permissible limits of noise levels for rotating electrical machines	IS 12065
Mechanical vibration of rotating electrical machines	IS 12075

### Additional standards for hazardous area motors

Electrical apparatus for explosive atmospheres - General requirements	IS/IEC 60079-0
Electrical apparatus for explosive atmospheres - Equipment protection by flameproof enclosures "d"	IS/IEC 60079-1
Classification of hazardous areas (other than mines) having flammable gases & vapours for electrical installation	IS 5572
Guide for selection & installation of electrical equipment in hazardous areas (other than mines)	IS 5571

Other Specifications: Inter plant standard for steel industries: IPSS-1-03-007



All the motors are manufactured in Quality Assurance System compliant with ISO 9000.

The motors covered by the present catalogue comply with the regulations & standards consistent with IS & IEC standards.

Glossary:

**IS** - Indian standards published by Bureau of Indian Standard (BIS)

## RATING PLATE

		3~Ind. Motor		IE3	CE	IS 12615	
Amb.	50 °C	Duty	S1	Encl.	TEFC	CM/L-78XXXXXXXX	
Type	2HE3 096-0403-A00001			Wt.	25	kg	
Brg	6205ZZ/6205ZZ			In.Cl.	F		
Fr	90L/B3						
SN	1119 M	12345678		IP	55		
Hz	±5%	V	±10%	kW/HP	A	RPM	%Eff PF
50		240D		1.5/2.0	5.4	1435	85.3 0.79
50		415Y		1.5/2.0	3.1	1435	85.3 0.79
MADE IN INDIA							

## AMBIENT TEMPERATURE

HMM Motors are designed for 50°C ambient temperature.

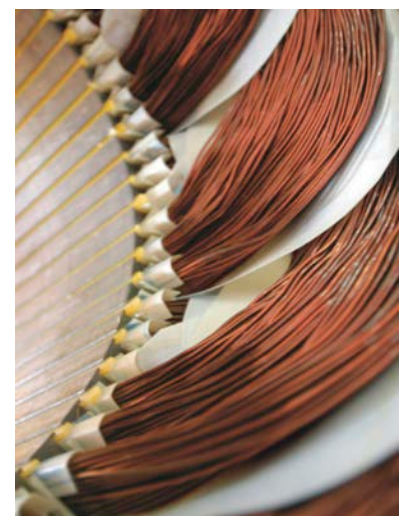
### Permitted output (% of rated output)

≤ 30° C	107 %
30° C - 45° C	103 %
50° C	100 %
55° C	96 %
60° C	92 %

# TOLERANCE ON PERFORMANCE PARAMETERS & DIMENSIONS

Performance Parameter	Tolerances
1 Efficiency ( $\eta$ ) – motors up to and including 150 kW – motors above 150 kW	- 15 % of (1 - $\eta$ ) - 10 % of (1 - $\eta$ )
2 Total losses (applicable to motors with ratings >150 kW)	+10 % of the total losses
3 Power factor ( $\cos \phi$ )	- 1/6 of (1 - $\cos \phi$ ); min 0.02, max 0.07
4 Slip at full load and at working temperature – For motors having output < 1 kW – For motors having output $\geq$ 1 kW	$\pm$ 30 % of the slip $\pm$ 20 % of the slip
5 Locked rotor current ( $I_{ST}$ ) with any specified starting apparatus	+ 20 % of the current
6 Locked rotor torque ( $T_{ST}$ )	- 15 % to + 25 % of the torque (+25 % may be exceeded by agreement between manufacturer & purchaser)
7 Pull out torque ( $T_{PO}$ )	- 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
8 Moment of inertia	$\pm$ 10 % of the value

Dimension	Tolerances
Frame Size $H \leq 250$ .....	0, - 0.5 mm
$\geq 250$ .....	0, - 1.0mm
Diameter D of shaft extension:	
• 11 to 28 mm .....	j6
• 32 to 48 mm .....	k6
• 55mm and above .....	m6
Diameter N of flange spigot:	
Up to F 500 B .....	j6
Above F 500 B .....	js6
Key width .....	h9
Width of drive shaft keyway (normal keying) .....	P9
Key depth:	
• Square section .....	h9
• Rectangular section .....	h11
Runout of shaft in flanged motors (normal class):	
D $\leq$ 10 mm .....	0.030 mm
10 mm < D $\leq$ 18 mm .....	0.035 mm
18 mm < D $\leq$ 30 mm .....	0.040 mm
30 mm < D $\leq$ 50 mm .....	0.050 mm
50 mm < D $\leq$ 80 mm .....	0.060 mm
80 mm < D $\leq$ 120 mm .....	0.070 mm
Concentricity of spigot diameter and perpendicularity of mating surface of flange to shaft (normal class)	
Flange:	
F65 to F 115 .....	0.080 mm
F130 to F 265 .....	0.100 mm
F300 to F 500 .....	0.125 mm
F600 to F740 .....	0.160 mm



## TERMINAL BOX DATA

Frame Size	Cable Entry size		Max. Cable Size DOL starting	Max. Cable Size Star-Delta starting	Terminal Stud size
	Safe Area	Hazardous Area			
63-90	1 x 3/4" BSC	1 x M20x1.5P	3C x 4mm <sup>2</sup>	-	M4
100-132	2 x 1" BSC	2 x M25x1.5P	3C x 10mm <sup>2</sup>	2 x 3C x 10mm <sup>2</sup>	M5
160-180	2 x 1" BSC	2 x M25x1.5P	3C x 35mm <sup>2</sup>	2 x 3C x 25mm <sup>2</sup>	M6
200	2 x 2" BSC	2 x M40x1.5P	3C x 120mm <sup>2</sup>	2 x 3C x 70mm <sup>2</sup>	M8
225-250		2 x M50x1.5P			
280-315	2 x 2 1/2" BSC	2 x M63x1.5P	3C x 240mm <sup>2</sup>	2 x 3C x 150mm <sup>2</sup>	M12
355	2 x 3" BSC	-	3C x 400mm <sup>2</sup>	2 x 3C x 300mm <sup>2</sup>	M16

Equivalent metric & Pg threadings can also be provided on request.

## EFFECT OF VARIATION OF VOLTAGE & FREQUENCY ON MOTOR PERFORMANCE

Characteristics		Voltage		Frequency	
		110%	90%	105%	95%
<b>Torque</b>	Starting & Maximum	Increase 21%	Decrease 19%	Decrease 10%	Increase 11%
<b>Speed</b>	Synchronous	No Change	No Change	Increase 5%	Decrease 5%
	Full Load	Increase 1%	Decrease 1.5%	Increase 5%	Decrease 5%
<b>Current</b>	No Load	Increase 10-15%	Decrease 10-12%	Decrease 5-6%	Increase 5-6%
	Starting	Increase 10-12%	Decrease 10-12%	Decrease 5-6%	Increase 5-6%
	Full Load	Decrease 7%	Increase 11%	Slight Decrease	Slight Increase
	Temp. Rise	Decrease 3-4°C	Increase 6-7°C	Slight Decrease	Slight Decrease
	Overload	Increase 21%	Decrease 19%	Slight Decrease	Slight Decrease
	Magnetic Noise	Slight Increase	Slight Decrease	Slight Decrease	Slight Increase
<b>Efficiency</b>	Full Load	Increase 0.5-1.0%	Decrease 2%	Slight Increase	Slight Decrease
<b>Power Factor</b>	Full Load	Decrease 3%	Increase 1%	Slight Increase	Slight Decrease

## BEARING ARRANGEMENT

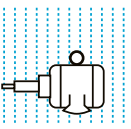
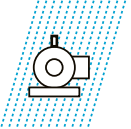
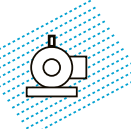
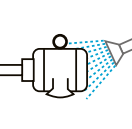
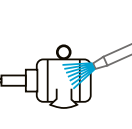
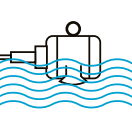
Frames upto 180 have sealed bearings which are lubricated for life. Frames 200 & above have regreasing arrangement as a standard feature.

Frame Size	Safe Area Motors		Hazardous Area Motors		Regreasing Time (Hrs.)	
	DE side	NDE side	DE side	NDE side	2 pole	4, 6, 8 pole
63	6201ZZ	6201ZZ	6201ZZ	6201ZZ	-	-
71	6202ZZ	6202ZZ	6202ZZ	6202ZZ	-	-
80	6204ZZ	6204ZZ	6204ZZ	6204ZZ	-	-
90S/L	6205ZZ	6205ZZ	6205ZZ	6205ZZ	-	-
100L	6206ZZ	6206ZZ	6206ZZ	6206ZZ	-	-
112M	6206ZZ	6206ZZ	6306ZZ	6206ZZ	-	-
132S/M	6208ZZ	6208ZZ	6308ZZ	6208ZZ	-	-
160M/L	6309ZZ	6209ZZ	6309ZZ	6309ZZ	-	-
180M/L	6310ZZ	6210ZZ	6310ZZ	6310ZZ	-	-
200L	6312 #	6312 #	6312ZZ	6312ZZ	# 3,500	# 8,000
225S/M	6313	6313	6313	6313	3,500	8,000
250M	6315	6315	6315	6315	2,500	6,000
280S/M - 2P	6315	6315	6317	6317	2,000	-
280S/M - 4-8P	6317	6317			-	5,000
315S/M/L - 2P	6316	6316	6319	6319	2,000	-
315S/M/L - 4-8P	6319	6319			-	4,000
355S/M/L - 2P	6317	6317	-	-	2,000	-
355S/M/L - 4-8P	6322	6322	-	-	-	3,000

The regreasing time mentioned is for horizontal mounted motors. For vertical mounted motors, it should be reduced by half.

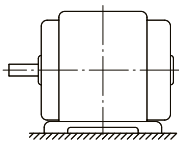
# DEGREE OF PROTECTION

The degree of protection as classified in IS/IEC 60034-5 is given below. It is denoted by 2 digits. The first digit denotes protection against solid bodies or particles and the second digit denotes protection against liquid. All our standard TEFC motors are having IP55 degree of protection, unless otherwise specified.

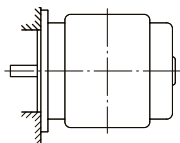
Second Characteristic Numeral							
First Characteristic Numeral	No Protection	Dripping water from top shall not harm	Dripping water up to 15° from vertical shall not harm	Dripping water up to 60° from vertical shall not harm	Water splashes shall not harm	Water projected by nozzle shall not harm	Water from heavy seas shall not harm
	0	1	2	3	4	5	6
0	No Protection						
1	Machine protected against bodies > 50mm dia						
2	Machine protected against bodies > 12mm dia		IP 21	IP 22	IP 23		
3	Machine protected against bodies > 2.5mm dia						
4	Machine protected against bodies > 1mm dia				IP 44		
5	Dust-protected machine				IP 54	IP 55	IP 56
6	No ingress of dust					IP 65	

## MOUNTING POSITIONS

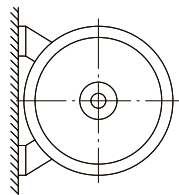
### HORIZONTAL MOUNTING



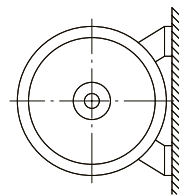
IM B3



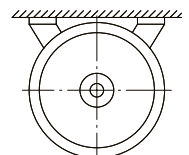
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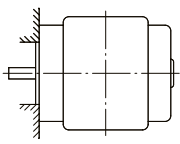
IM B6



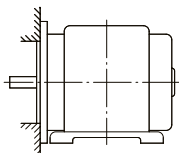
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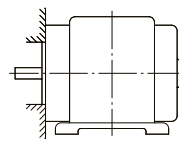
IM B8



IM B14

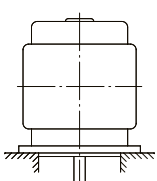


IM B35

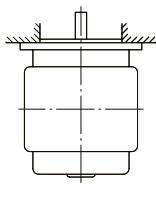


IM B34

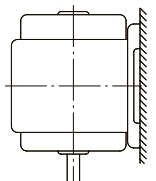
### VERTICAL MOUNTING



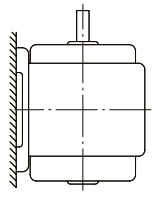
IM V1



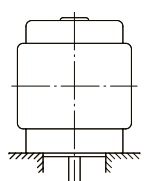
IM V3



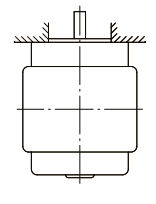
IM V5



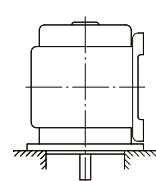
IM V6



IM V18



IM V19



IM V15

## DUTY CLASSES

The various operating cycles of driven machines can be classified into nine basic duties, ranging from S1 to S9 separately indicated below. Suitable motors can be offered to match the duty cycles of the driven machines.

### CLASSES OF DUTY

The following are the duty types:

Duty	Type	Description	Application
S1	Continuous duty	Operation at constant load maintained for sufficient time to allow the machine to reach thermal equilibrium. These are our standard motors.	Pumps, Blowers, Fan Compressors
S2	Short time duty	Operation at constant load for a given time, less than that required to reach thermal equilibrium, followed by a time de-energized and at rest of sufficient duration to re-establish machine temperatures within 2K of the coolant temperature.  The recommended values for the short-time duty are 10, 30, 60 and 90 minutes.	Operation of gates of dams, siren, Capstan, Valve Actuators, Mixers etc.
S3	Intermittent periodic duty	A sequence of identical duty cycles, each including a time of operation at constant load and a time de-energized and at rest. In this duty, the cycle is such that the starting current does not significantly affect the temperature rise. Unless otherwise specified, the duration of the cycle is 10 minutes.  The recommended values for the load factor are 15, 25, 40 and 60 percent.  These motors also come in crane duty applications and the duty cycle is designated as S3-40%, S3-60%. The no. of starts are also less; either 45 or 60 st/hr.	Valve actuators, Wire drawing machines
S4	Intermittent periodic duty with starting	A sequence of identical duty cycles each consisting of a period of starting, a period of operation at constant load and a rest period, the operating, rest & de-energized being too short to attain thermal equilibrium during one duty cycle.  In this duty the stopping of the motor is obtained either by natural deceleration after disconnection of the electricity supply or by means of braking such as mechanical brake which does not cause additional heating of the windings.  These are generally suitable for crane duty / lift duty applications.  The duty is mentioned as S4-60% CDF, 150 st/hr etc.	Hoists, cranes, lifts
S5	Intermittent periodic duty with starting and braking	A sequence identical duty cycles each consisting of a period of starting, a period of operation at constant load, a period of braking and a rest period. The operating and de-energized periods being too short to attain thermal equilibrium.  In this duty braking is rapid and is carried out electrically through electromagnetic DC brakes or by injection of DC voltage in the rotor. Since the braking is done electrically, the braking losses are also added to the starting losses, thus making this duty most stringent and heavy.  The duty is mentioned as S5-60% CDF, 300 st/hr etc.	Hoists, Cranes, Rolling Mills
S6	Continuous duty with intermittent periodic loading	A sequence of identical duty cycles each consisting of a period of operation at constant load & a period of operation at no-load, The operation and no-load periods are too short to attain thermal equilibrium during one duty cycle.  Unless otherwise specified the duration of the duty cycle is 10 minutes.  The recommended values of CDF are 15, 25, 40 and 60 percent. This duty is different from S2 duty, as in S2 Duty there is a period of rest after the load operation.  Normal S1 duty motors are suitable to operate on S6 duty provided the load Inertia is maximum equal to motor inertia.	Conveyors, Machine Tools
S7	Continuous duty with starting and braking	A sequence of identical duty cycles each consisting of a period of starting, a period of operation at constant load & a period of electrical braking. There is no rest and de-energized period.  This is also a very stringent duty application similar to S5 duty, except in this case there is no rest period.	Machine Tools, Balancing machines, Tapping machines
S8	Continuous duty with periodic speed changes	A sequence of identical duty cycles each consisting of a period of operation at constant load corresponding to a determined speed of rotation, followed immediately by a period of operation at another load corresponding to a different speed of rotation (carried out, for example, by means of change of the number of poles in the case of induction motors), the operating periods being too short to attain equilibrium during one duty cycle. There is no rest and de-energized period.  These motors are always Multi-speed Motors for e.g. 4P/2P, 8P/4P, 6P/4P etc.  Here the Speed change is done by Pole Changing method. This is achieved by connecting the motor terminals in two different ways to achieve 2 different speeds.	Special applications where the motor is required to run at different speeds and different loads



Duty	Type	Description	Application
S9	Duty with non periodic load and speed variations	A duty in which generally load and speed are varying non-periodically within the permissible operating range. This duty includes frequently applied overloads that may greatly exceed the full loads. For this duty type, suitable load values should be taken as the basis of the overload concept.	Special applications where the motor is required to run at different speeds and different loads

## DESIGNATION

A duty type is designated by means of the abbreviation given below. For the duty type S2 the abbreviation is followed an indication of the duration of the duty. For duty type S3 and S6 the abbreviations are followed by an indication of the cyclic duration factor.

**Examples:** S2 60 minutes • S3 25 percent • S6 40 percent

For the duty types S4 and S5 the abbreviation are followed by the indication of the cyclic duration factor, the number of starts per hour (st/hr) and the factor of inertia (FI)

**Examples:** S4-25%, 120 st/hr, load factor = 2 (load factor = load inertia/motor inertia)

For the duty type S7 the abbreviation is followed by the indication of the number of cycles per hour and the factor of inertia.

**Examples:** S7-500 st/hr, load factor = 2

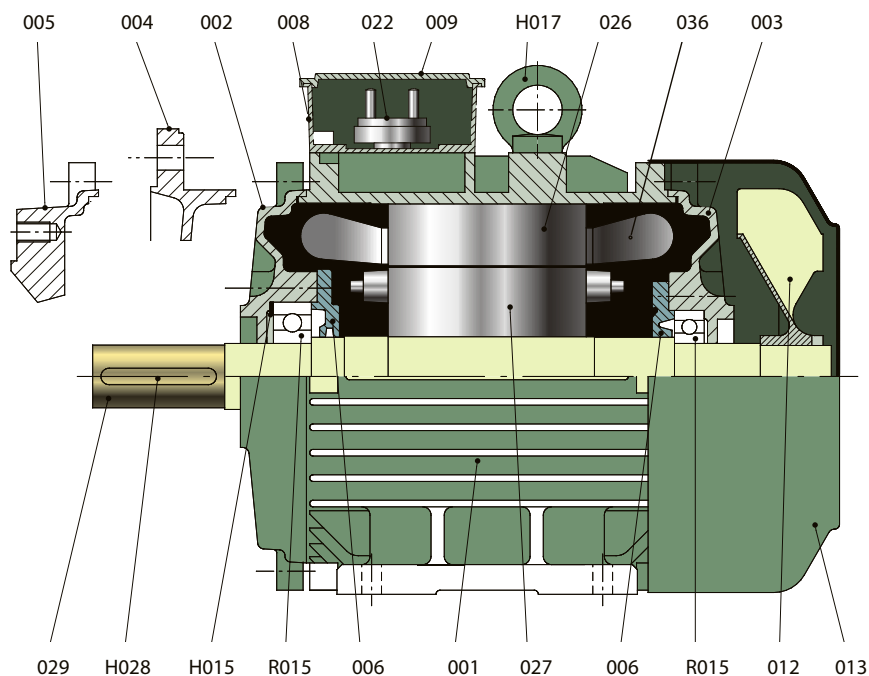
For the duty type S8 and S9 the abbreviation is followed by the indication of the number of duty cycles per hour and the factor of inertia together with the load. In addition, the cyclic duration factor should be indicated for each speed.

**Examples:** S8 or S9 30 st/hr, load factor = 3

## S2/S3 RATED MOTOR OUTPUTS

Standard motors can be used for S2 and S3 duties with increased outputs. However, the starting torque and pullout torque as percentage of full load torque would be reduced. The ratings indicated in the table are with minimum 200% pull out torque.

## SPARES



**Table of Components**

005 - Endshield DE B14	H017 - Eye bolt	H015 - Wavy washer	R015 - Bearing NDE
004 - Endshield DE B5	026 - Stator packet	R015 - Bearing DE	012 - Fan
002 - Endshield DE B3	036 - Stator winding	006 - Bearing cover DE	013 - Fan cover
008 - Terminal box	003 - Endshield NDE	001 - Stator body	
022 - Terminal block	029 - Shaft	027 - Rotor packet	
009 - Terminal box cover	H028 - Shaft key	006 - Bearing cover NDE	

## MECHANICAL VIBRATION

Limits of vibration of rotating electrical machines is defined in IS: 12075. This is applicable for machines with shaft height 56mm and higher having a nominal speed from 500 rpm up to and including 3000 rpm.

The measurements are carried out under no load, uncoupled condition in a state of free suspension (suspension by resilient means such as rope, V-belt, spring or freely placed on test bed) or Rigid mounting (for motors with shaft height greater than 400mm).

The measurements are to be carried out with half key in its shaft extension keyway.

Shaft Height (mm)	56 < H ≤ 132		132 < H ≤ 225		225 < H ≤ 400		H > 400	
	500 -1500	> 1500 & up to 3000	500 -1500	> 1500 & up to 3000	500 -1500	> 1500 & up to 3000	500 -1500	> 1500 & up to 3000
rms values of vibration velocity in mm/s for the shaft height H								
N (normal)	1.8	1.8	1.8	2.8	2.8	4.5	2.8	4.5
R (reduced)	0.71	0.71	0.71	1.12	1.8	2.8	-	-
S (special)	0.45	0.45	0.45	0.71	1.12	1.8	-	-

## NOISE LEVEL

Permissible limits of noise levels for rotating electrical machines are defined in IS: 12065. Machines are to run at no load, uncoupled condition. Measurements are carried out at a distance of 1m in the horizontal and vertical planes of the machine.

LIMITING MEAN SOUND POWER LEVEL L <sub>w</sub> IN dB (A) FOR AIRBORNE NOISE EMITTED BY ROTATING ELECTRICAL MACHINES													
Protective Enclosure		IP 22	IP 44	IP 22	IP 44	IP 22	IP 44	IP 22	IP 44	IP 22	IP 44	IP 22	IP 44
Rating kW (or kVA)		Rated Speed (rpm)											
		960 and below		961 to 1320		1321 to 1900		1901 to 2360		2361 to 3150		3151 to 3750	
Above	Up to	Sound Power Level dB(A)											
	1.1	-	76	-	79	-	80	-	83	-	84	-	88
1.1	2.2	-	79	-	80	-	83	-	87	-	89	-	91
2.2	5.5	-	82	-	84	-	87	-	92	-	93	-	95
5.5	11	82	85	85	88	88	91	91	96	94	97	97	100
11	22	86	89	89	93	92	96	94	98	97	101	100	103
22	37	89	91	92	95	94	97	96	100	99	103	102	105
37	55	90	92	94	97	97	99	99	103	101	105	104	107
55	110	94	96	97	101	100	104	102	105	104	107	106	109
110	220	98	100	100	104	103	106	105	108	107	110	108	112
220	630	100	102	104	106	106	109	107	111	108	112	110	114
630	1100	102	104	106	107	107	111	108	111	108	112	110	114
1100	2500	105	107	109	110	109	113	109	113	109	113	110	114
2500	6300	106	108	110	112	111	115	111	115	111	115	111	115
6300	16000	108	110	111	113	113	116	113	116	113	116	113	116

# INVERTER DUTY MOTORS

## Introduction:

These motors are fed with variable voltage & variable frequency from inverter supply to achieve speed variation required by the process / application & also to gain energy savings related with speeds. Typical VFDs have a very high switching frequencies which results in generating very high  $dV/dt$  (up to  $1.2kV/\mu s$ ). Such high pulses impress severe stresses on the windings. If the motors with standard insulation systems are fed from inverters, the repeated pulses of such surge waves reduces the insulation strength & the life of the motor unpredictably. "HINDUSTAN" Inverter duty motors are wound with special insulation system viz. dual coated class H wires, special vacuum pressure impregnation (VPI).

Unless specified, following details are assumed for motors with drives;

- Rated Voltage - 415V
- Rated Frequency - 50Hz
- Ratio V/f - 8.3
- V/f - Constant for frequency in the range 0-50Hz
- V - Constant for frequency > 50Hz

## Separate Cooling:

When the motor is run from 5Hz to 50Hz & expected to deliver the rated torque, the motor will draw the rated current. The heating due to the rated current will be equal to the rated heating. At lower speeds, the cooling of the motor is reduced significantly resulting in increased temperature rise. To control this, inverter duty motors are fitted with separate cooling fans. This ensures that the rated cooling is maintained even at reduced speeds.

## Insulated Bearing:

It is also suggested to protect motors of 315 frame & above with insulated bearing preferably at non-drive end due to high shaft currents induced, which are detrimental to bearing life. In smaller motors, shaft currents are less which are taken care of by grease film in the bearing.

## Operation at higher speeds:

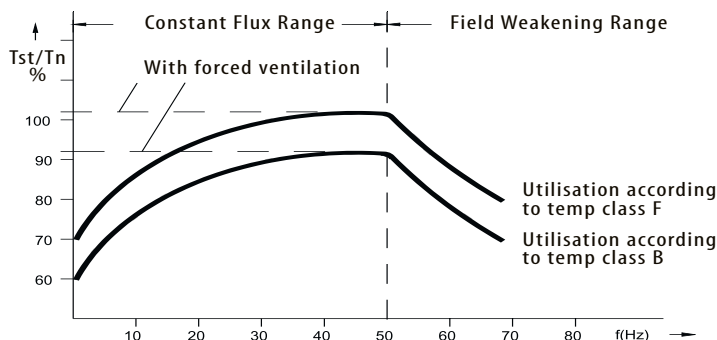
At frequencies above 50Hz, voltage is maintained constant & only the frequency is increased. This results in reduced V/f ratio resulting in weakened magnetic flux in the motor. Following care should be taken in this operation mode;

1. The mechanical speed of the motor should never exceed as below.

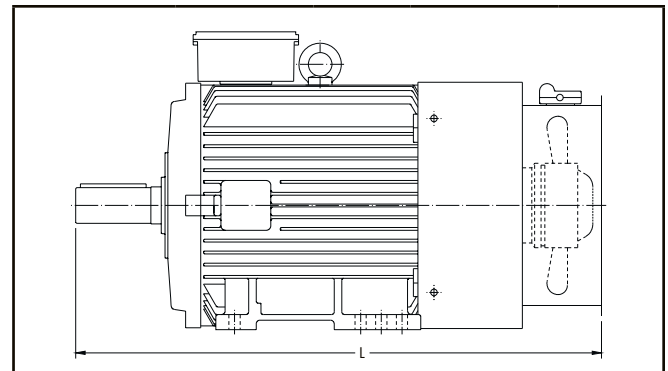
Safe Maximum Speed for Motors				
Frame Size	2P	4P	6P	8P
≤100	5200	3600	2400	1800
112	5200	3600	2400	1800
132	4500	2700	2400	1800
160	4500	2700	2400	1800
180	4500	2700	2400	1800
200	4500	2300	1800	1500
225	3600	2300	1800	1500
250	3600	2300	1800	1500
280	3600	2300	1800	1500
315	3600	2300	1800	1500
355	3600	2300	1800	1500

2. The output torque reduces greatly with increase in frequency. This results in constant power output.

3. The maximum speed & the maximum operating torque possible at any speed should be chosen ensuring the above.



## Mechanical Dimensions:



Frame Size	IE2		IE3	
	No. of Poles	L	No. of Poles	L
90S	2,4,6,8	424	2,4,6,8	449
90L	2,8	449	2,4,6,8	480
	4,6	480		
100L	2	523	2,4	523
	4,6,8	489	6,8	489
112M	4,6,8	503	8	503
			4,6	545
132S	2	606	2,6	606
	4,6,8	568	4,8	568
132M	4,6	606	4	606
			6	646
160M	2,4,6,8	704	2,4,6 <sup>3)</sup>	783
160L		748		
180M	2,4,8	770	2,4,8	770
180L	4,6,8	808	4,6,8	808
200L	2	915	2	932
	4,6,8		4,6(22kW)	
			6,8	915
225M	2	1005	2	1005
225SX/MX	4,6,8	1035	4,6,8	1035
250M	2	1085	2	1085
250MX	4,6,8		4,6,8	
280S/M	2	1195	2	1195
280SX/MX	4,6,8		4,6,8	
315S/M	2	1310	2	1310
315L		1473		1473
315SX/MX	4,6,8	1340	4,6,8	1340
315LX		1503		1503
355S/M/L	2	1647	2	1647
355SX/MX/LX	4,6,8	1717	4,6,8	1717

Note:

- 1) Suffix "X" denotes motors other than 2 pole motors.
- 2) For other dimensions, refer to page nos. 23 & 25.
- 3) For frame 160/8P, refer to dimension of IE2 motors.

# FLAMEPROOF MOTORS

Hazardous areas are defined as those locations where explosive gas – air mixture may occur in dangerous concentrations and are defined in accordance to Indian Standard IS 5572. The general classification is as highlighted in the following table:

Zone	Classification of Area as per IS 5572	Use of Electrical Equipment
Zone "0"	Area in which hazardous atmosphere is continuously present	Use of Motors is to be avoided as far as possible or use Intrinsically safe or pressurized electrical equipment.
Zone "1"	Area in which hazardous atmosphere is likely to be present at any time under normal operating conditions	Flame Proof Motors with Type Ex'd' as specified in IS /IEC 60079-1
Zone "2"	Area in which hazardous atmosphere is likely to be present only under abnormal operating conditions & for a short period	Motors with all electrical contacts to be enclosed in flame proof enclosure and conform to IS 6381 and designated as Type "e" or IS 9628 and designated as Type "n"

Customers are to select the motor type depending on the type of area of operation of the motors and should generally follow the guidelines given above in conjunction with the relevant Indian Standards specified above.

## Classification of hazardous gases:

Hazardous gases have been classified in IS/IEC 60079-0 and IS 5572 are associated with only Flame Proof Motors as listed below:

Note: FLP Motors are offered suitable for Gas Groups IIA and IIB only. Any other gas not specified in the below table, one has to refer relevant IS for the motor selection.

### GROUP OF ENCLOSURES SUITABLE FOR PARTICULAR FLAMMABLE GAS OR VAPOUR AS PER IS: IS/IEC 60079-0

Group of Enclosure	Gas or Vapour			
I	Methane (firedamp)			
IIA	Ammonia Industrial methane* Blast furnace gas Carbon monoxide Propane Butane Pentane	Hexane Heptane Iso octane Decane Benzene Xylene Cyclohexene	Acetone Ethyl methyl ketone Methyl acetate Ethyl acetate n-Propyl acetate n-Butyl acetate Amyl acetate	Chloroethylene Methanol Ethanol Iso-butanol n-Butanol Amyl alcohol Ethyl nitrate
IIB	1,3-Butadiene, Ethelene	Diethyl ether	Ethylene oxide	Town gas**
IIC	Hydrogen			

\* Industrial methane includes methane mixed with not more than 10% by volume of hydrogen.

\*\* Town gas may contain not more than 57% by volume of hydrogen & not more than 16% by volume of carbon monoxide. The remainder being the mixture of paraffin hydrocarbons & inert gas.

**Paint & Finish:** All motors are given special treatment of primer & paint to internal as well as external surfaces. All external surfaces are coated with epoxy polyimide base acid/alkali resistant paint of RAL shade 7046.

**Terminal Box Location:** Flame proof motors have terminal box on the top as standard.

## Maintaining the type of Protection during operation:

Each motor must be provided with a protective circuit breaker or an equally effective device. In particular, the following should be noted.

1. The joint faces must not be remachined 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 points where there were originally none is not permitted.
2. 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.
3. Care should be taken to see that all screws, bolts, nuts etc. used for fixing the parts of flameproof enclosures are provided with spring washers wherever originally supplied to prevent them from getting loose due to shocks and vibration during operation.







# ELECTRICAL PERFORMANCE - IE2 MOTOR

## 2 POLE MOTOR

### 2 POLE MOTOR

Safe Area Motors										Flameproof (Ex'd') Motors										
Output KW	HP	Frame Size	Type Designation	Speed (rpm)	Current (A)	Torque (kgm)	Efficiency %			Power Factor			I <sub>st</sub> /I <sub>N</sub>	T <sub>st</sub> /T <sub>N</sub>	T <sub>90</sub> /T <sub>N</sub>	GD <sup>2</sup> (kgm <sup>2</sup> )	Wt. (kg)	Frame Size	Type Designation	Wt. (kg)
							FL	3/4L	1/2L	FL	3/4L	1/2L								
0.18	0.25	63	2HE2 060-02	2900	0.53	0.06	60.4	60.4	56.0	0.78	0.72	0.59	5.0	2.0	2.3	0.0009	8	63 FLP	2FE2 060-02	18
0.25	0.33	63	2HE2 063-02	2900	0.67	0.08	64.8	64.8	59.0	0.80	0.73	0.62	5.0	2.0	2.3	0.0009	9	63 FLP	2FE2 063-02	19
0.37	0.50	71	2HE2 070-02	2810	0.89	0.13	69.5	69.5	64.0	0.83	0.78	0.70	5.0	2.0	2.6	0.0010	10	71 FLP	2FE2 070-02	21
0.55	0.75	71	2HE2 073-02	2840	1.25	0.19	74.1	74.1	71.0	0.83	0.78	0.70	5.5	2.4	2.7	0.0014	11	71 FLP	2FE2 073-02	22
0.75	1.0	80	2HE2 080-02	2845	1.7	0.26	77.4	77.4	75.0	0.79	0.76	0.72	6.5	2.4	2.7	0.0038	14	80 FLP	2FE2 080-02	27
1.1	1.5	80	2HE2 083-02	2845	2.4	0.38	79.6	79.6	76.0	0.80	0.77	0.73	6.5	2.4	2.7	0.0049	16	80 FLP	2FE2 083-02	29
1.5	2.0	90S	2HE2 090-02	2870	3.2	0.51	81.3	81.3	77.0	0.80	0.77	0.73	6.5	2.4	2.8	0.0072	24	90S FLP	2FE2 090-02	40
2.2	3.0	90L	2HE2 096-02	2870	4.5	0.75	83.2	83.2	80.0	0.82	0.78	0.74	7.0	2.4	2.8	0.0093	26	90L FLP	2FE2 096-02	41
3.7	5.0	100L	2HE2 106-02	2900	7.2	1.24	85.5	85.5	82.0	0.84	0.81	0.77	7.0	2.4	2.8	0.0130	35	100L FLP	2FE2 106-02	51
5.5	7.5	132S	2HE2 130-02	2925	10.0	1.83	87.0	87.0	84.0	0.88	0.85	0.80	7.0	2.2	2.7	0.0583	61	132S FLP	2FE2 130-02	80
7.5	10.0	132S	2HE2 131-02	2925	13.3	2.50	88.1	88.1	85.0	0.89	0.86	0.82	7.0	2.2	2.5	0.0583	65	132S FLP	2FE2 131-02	84
9.3	12.5	160M	2HE2 163-02	2930	16.5	3.09	88.9	88.9	85.5	0.88	0.85	0.80	7.0	2.3	2.8	0.1301	100	160M FLP	2FE2 163-02	135
11.0	15.0	160M	2HE2 164-02	2935	19.5	3.65	89.4	89.4	86.0	0.88	0.85	0.80	7.0	2.3	2.8	0.1301	122	160M FLP	2FE2 164-02	153
15.0	20.0	160M	2HE2 165-02	2940	26.4	4.97	90.3	90.3	86.5	0.88	0.85	0.80	7.0	2.3	2.8	0.1705	128	160M FLP	2FE2 165-02	157
18.5	25.0	160L	2HE2 166-02	2940	32.0	6.13	90.9	90.9	87.0	0.88	0.85	0.80	7.0	2.3	2.8	0.1974	151	160L FLP	2FE2 166-02	176
22.0	30.0	180M	2HE2 183-02	2950	39.0	7.26	91.3	91.3	88.0	0.86	0.85	0.80	7.0	2.3	2.7	0.1972	179	180M FLP	2FE2 183-02	200
30.0	40.0	200L	2HE2 206-02	2955	51.0	9.89	92.0	92.0	89.0	0.89	0.86	0.81	7.0	2.3	2.7	0.4468	284	200L FLP	2FE2 206-02	310
37.0	50.0	200L	2HE2 207-02	2955	62.8	12.20	92.5	92.5	89.5	0.89	0.86	0.81	7.0	2.3	2.7	0.5257	300	200L FLP	2FE2 207-02	325
45.0	60.0	225M	2HE2 223-02	2965	76.0	14.78	92.9	92.9	90.0	0.89	0.86	0.81	7.0	2.4	2.7	0.6722	368	225M FLP	2FE2 223-02	401
55.0	75.0	250M	2HE2 253-02	2965	91.0	18.07	93.2	93.2	90.5	0.90	0.87	0.83	7.0	2.3	2.7	1.0690	501	250M FLP	2FE2 253-02	537
75.0	100.0	280S	2HE2 280-02	2975	124.0	24.55	93.8	93.8	91.0	0.90	0.87	0.83	7.0	2.3	2.7	2.2591	770	280S FLP	2FE2 280-02	815
90.0	120.0	280M	2HE2 283-02	2975	148.0	29.47	94.1	94.1	91.5	0.90	0.87	0.83	7.0	2.3	2.7	2.4850	810	280M FLP	2FE2 283-02	855
110.0	150.0	315S	2HE2 310-02	2980	180.0	35.95	94.3	94.3	91.8	0.90	0.87	0.83	7.0	2.2	2.6	3.3595	1030	315S FLP	2FE2 310-02	1110
132.0	180.0	315M	2HE2 314-02	2980	216.0	43.14	94.6	94.6	92.0	0.90	0.87	0.83	7.0	2.2	2.6	3.9994	1070	315M FLP	2FE2 314-02	1150
160.0	215.0	315L	2HE2 316-02	2985	260.0	52.21	94.8	94.8	92.5	0.90	0.87	0.83	7.0	2.2	2.6	4.6393	1160	315L FLP	2FE2 316-02	1220
200.0	270.0	315L	2HE2 317-02	2985	326.0	65.26	95.0	95.0	93.0	0.90	0.87	0.83	7.0	2.2	2.6	4.1594	1200	315L FLP	2FE2 317-02	1260
250.0	335.0	355M	2HE2 353-02	2985	407.0	81.57	95.0	95.0	93.0	0.90	0.87	0.83	7.0	2.0	2.4	8.9735	1710			
315.0	425.0	355L	2HE2 357-02	2985	512.0	102.78	95.0	95.0	93.0	0.90	0.87	0.83	7.0	2.0	2.4	10.0292	1900			

Note: Motors upto 1.5kW are star (Y) connected suitable for D0L starting. Motors above 1.5kW are delta (Δ) connected suitable for D0L / Y/Δ starting.

# ELECTRICAL PERFORMANCE - IE2 MOTOR

## 4 POLE MOTOR

### 4 POLE MOTOR

Safe Area Motors							Flameproof (Ex'd') Motors													
Output KW	HP	Frame Size	Type Designation	Speed (rpm)	Current (A)	Torque (kgm)	Efficiency %			Power Factor			I <sub>st</sub> /I <sub>N</sub>	T <sub>st</sub> /T <sub>N</sub>	T <sub>po</sub> /T <sub>N</sub>	GD <sup>2</sup> (kgm <sup>2</sup> )	Wt. (kg)	Frame Size	Type Designation	Wt. (kg)
							FL	3/4L	1/2L	FL	3/4L	1/2L								
0.12	0.16	63	2HE2 060-04	1380	0.52	0.08	59.1	59.1	55.0	0.40	0.48	0.54	4.8	1.8	2.0	0.0010	8	63 FLP	2FE2 060-04	18
0.18	0.25	63	2HE2 063-04	1380	0.57	0.13	64.7	64.7	61.0	0.54	0.64	0.68	5.0	1.8	2.0	0.0010	8	63 FLP	2FE2 063-04	18
0.25	0.33	71	2HE2 070-04	1390	0.75	0.18	68.5	68.5	64.0	0.54	0.64	0.68	5.5	1.8	2.2	0.0022	10	71 FLP	2FE2 070-04	21
0.37	0.50	71	2HE2 073-04	1390	1.0	0.26	72.7	72.7	65.0	0.58	0.67	0.71	6.0	1.9	2.3	0.0024	11	71 FLP	2FE2 073-04	22
0.55	0.75	80	2HE2 080-04	1420	1.4	0.38	77.1	77.1	71.0	0.58	0.67	0.71	6.0	1.9	2.3	0.0038	15	80 FLP	2FE2 080-04	28
0.75	1.0	80	2HE2 083-04	1415	1.7	0.52	79.6	79.6	75.0	0.63	0.70	0.77	6.0	2.5	3.0	0.0062	18	80 FLP	2FE2 083-04	31
1.1	1.5	90S	2HE2 090-04	1430	2.4	0.75	81.4	81.4	80.0	0.65	0.73	0.78	6.0	2.5	3.0	0.0093	23	90S FLP	2FE2 090-04	40
1.5	2.0	90L	2HE2 096-04	1430	3.2	1.02	82.8	82.8	81.0	0.65	0.74	0.79	6.0	2.4	2.8	0.0134	29	90L FLP	2FE2 096-04	44
2.2	3.0	100L	2HE2 106-04	1440	4.4	1.49	84.3	84.3	82.5	0.65	0.76	0.83	6.5	2.4	2.8	0.0182	33	100L FLP	2FE2 106-04	52
3.7	5.0	112M	2HE2 123-04	1445	7.1	2.49	86.3	86.3	85.0	0.68	0.80	0.84	7.0	2.4	2.8	0.0404	45	112M FLP	2FE2 123-04	65
5.5	7.5	132S	2HE2 130-04	1450	10.5	3.69	87.7	87.7	86.0	0.72	0.79	0.83	7.0	2.4	2.8	0.0676	59	132S FLP	2FE2 130-04	84
7.5	10.0	132M	2HE2 133-04	1450	14.1	5.04	88.7	88.7	87.0	0.72	0.79	0.83	7.0	2.2	2.6	0.1013	76	132M FLP	2FE2 133-04	95
9.3	12.5	160M	2HE2 163-04	1455	17.5	6.23	89.3	89.3	87.5	0.72	0.80	0.83	7.0	2.2	2.6	0.1696	124	160M FLP	2FE2 163-04	161
11.0	15.0	160M	2HE2 164-04	1455	20.5	7.36	89.8	89.8	88.0	0.72	0.80	0.83	7.0	2.2	2.6	0.1871	132	160M FLP	2FE2 164-04	167
15.0	20.0	160L	2HE2 166-04	1455	27.5	10.04	90.6	90.6	89.0	0.73	0.80	0.84	7.0	2.2	2.6	0.2573	156	160L FLP	2FE2 166-04	181
18.5	25.0	180M	2HE2 183-04	1460	33.5	12.34	91.2	91.2	90.5	0.74	0.80	0.84	7.0	2.3	2.6	0.3222	182	180M FLP	2FE2 183-04	207
22.0	30.0	180L	2HE2 186-04	1460	40.0	14.68	91.6	91.6	90.5	0.74	0.80	0.84	7.0	2.3	2.6	0.3790	210	180L FLP	2FE2 186-04	232
30.0	40.0	200L	2HE2 206-04	1465	54.0	19.95	92.3	92.3	91.0	0.74	0.80	0.84	7.0	2.3	2.6	0.7298	347	200L FLP	2FE2 206-04	373
37.0	50.0	225SX	2HE2 220-04	1470	65.0	24.52	92.7	92.7	91.5	0.77	0.83	0.85	7.0	2.3	2.6	1.1642	365	225SX FLP	2FE2 220-04	404
45.0	60.0	225MX	2HE2 223-04	1475	78.0	29.72	93.1	93.1	92.0	0.77	0.83	0.86	7.0	2.3	2.6	1.3970	390	225MX FLP	2FE2 223-04	425
55.0	75.0	250MX	2HE2 253-04	1480	94.0	36.20	93.5	93.5	93.0	0.79	0.84	0.87	7.0	2.3	2.6	1.9856	529	250MX FLP	2FE2 253-04	565
75.0	100.0	280SX	2HE2 280-04	1482	128.0	49.29	94.0	94.0	93.5	0.79	0.84	0.87	7.0	2.2	2.5	3.5195	716	280SX FLP	2FE2 280-04	761
90.0	120.0	280MX	2HE2 283-04	1482	152.0	59.15	94.2	94.2	93.5	0.80	0.84	0.87	7.0	2.2	2.5	4.1594	755	280MX FLP	2FE2 283-04	800
110.0	150.0	315SX	2HE2 310-04	1485	187.0	72.15	94.5	94.5	93.7	0.80	0.84	0.87	7.0	2.2	2.5	7.7057	1020	315SX FLP	2FE2 310-04	1105
132.0	180.0	315MX	2HE2 314-04	1485	226.0	86.58	94.7	94.7	94.0	0.80	0.84	0.86	7.0	2.2	2.5	8.8912	1060	315MX FLP	2FE2 314-04	1135
160.0	215.0	315LX	2HE2 316-04	1485	272.0	104.94	94.9	94.9	94.2	0.80	0.84	0.86	7.0	2.2	2.5	10.3731	1210	315LX FLP	2FE2 316-04	1270
200.0	270.0	315LX	2HE2 317-04	1485	336.0	131.18	95.1	95.1	94.6	0.80	0.84	0.87	7.0	2.2	2.5	13.0404	1250	315LX FLP	2FE2 317-04	1310
250.0	335.0	355MX	2HE2 353-04	1488	420.0	163.64	95.1	95.1	94.6	0.78	0.84	0.87	7.0	2.0	2.4	15.9163	1720			
315.0	425.0	355LX	2HE2 357-04	1488	527.0	206.19	95.1	95.1	94.6	0.78	0.84	0.87	7.0	2.0	2.4	19.9879	1900			

Note: Motors upto 1.5kw are star (Y) connected suitable for DOL starting. Motors above 1.5kw are delta (Δ) connected suitable for DOL / Y/Δ starting.



# ELECTRICAL PERFORMANCE - IE2 MOTOR

6 POLE MOTOR

6 POLE MOTOR

Output		Safe Area Motors										Flameproof (Ex'd') Motors										
		Frame Size	Type Designation	Speed (rpm)	Current (A)	Torque (kgm)	Efficiency %			Power Factor			I <sub>st</sub> /I <sub>N</sub>	T <sub>st</sub> /T <sub>N</sub>	T <sub>90</sub> /T <sub>N</sub>	GD <sup>2</sup> (kgm <sup>2</sup> )	Wt. (kg)	Frame Size	Type Designation	Wt. (kg)		
KW	HP						FL	3/4L	1/2L	FL	3/4L	1/2L	FL	3/4L	1/2L							
0.18	0.25	71	2HE2 073-06	915	0.65	0.19	56.6	56.6	53.0	0.68	0.59	0.48	4.5	1.8	2.0	0.0033	11	71 FLP	2FE2 073-06	22		
0.25	0.33	71	2HE2 074-06	915	0.80	0.27	61.6	61.6	55.0	0.71	0.61	0.50	4.5	1.8	2.0	0.0033	11	71 FLP	2FE2 074-06	22		
0.37	0.50	80	2HE2 080-06	925	1.0	0.39	67.6	67.6	64.0	0.76	0.65	0.54	4.5	1.9	2.2	0.0049	16	80 FLP	2FE2 080-06	29		
0.55	0.75	80	2HE2 083-06	930	1.5	0.58	73.1	73.1	67.0	0.70	0.63	0.52	4.5	2.2	2.6	0.0063	17	80 FLP	2FE2 083-06	30		
0.75	1.0	90S	2HE2 090-06	935	2.0	0.78	75.9	75.9	73.0	0.69	0.63	0.52	5.0	2.1	2.5	0.0122	24	90S FLP	2FE2 090-06	41		
1.1	1.5	90L	2HE2 096-06	935	2.7	1.15	78.1	78.1	74.0	0.73	0.68	0.54	5.0	2.1	2.5	0.0176	28	90L FLP	2FE2 096-06	43		
1.5	2.0	100L	2HE2 106-06	945	3.4	1.55	79.8	79.8	77.0	0.77	0.70	0.56	5.5	2.1	2.5	0.0269	32	100L FLP	2FE2 106-06	51		
2.2	3.0	112M	2HE2 123-06	950	4.8	2.26	81.8	81.8	78.5	0.78	0.71	0.58	6.0	2.1	2.5	0.0467	41	112M FLP	2FE2 123-06	61		
3.7	5.0	132S	2HE2 130-06	950	7.6	3.79	84.3	84.3	80.0	0.80	0.74	0.62	6.0	2.2	2.6	0.0991	61	132S FLP	2FE2 130-06	86		
5.5	7.5	132M	2HE2 133-06	955	11.0	5.61	86.0	86.0	83.0	0.81	0.76	0.62	6.5	2.2	2.6	0.1321	77	132M FLP	2FE2 133-06	96		
7.5	10.0	160M	2HE2 163-06	970	14.6	7.53	87.2	87.2	84.0	0.82	0.77	0.65	7.0	2.2	2.6	0.2625	125	160M FLP	2FE2 163-06	162		
9.3	12.5	160L	2HE2 166-06	970	18.0	9.34	88.1	88.1	85.0	0.82	0.77	0.65	7.0	2.1	2.5	0.3440	149	160L FLP	2FE2 166-06	184		
11.0	15.0	160L	2HE2 167-06	970	21.0	11.05	88.7	88.7	86.0	0.82	0.77	0.65	7.0	2.1	2.5	0.4164	160	160L FLP	2FE2 167-06	190		
15.0	20.0	180L	2HE2 186-06	970	29.0	15.06	89.7	89.7	86.5	0.80	0.75	0.65	7.0	2.1	2.5	0.5949	197	180L FLP	2FE2 186-06	219		
18.5	25.0	200L	2HE2 206-06	975	35.6	18.48	90.4	90.4	87.0	0.80	0.75	0.65	7.0	2.1	2.5	0.8605	304	200L FLP	2FE2 206-06	330		
22.0	30.0	200L	2HE2 207-06	975	42.0	21.98	90.9	90.9	87.5	0.80	0.75	0.65	7.0	2.1	2.5	1.1642	308	200L FLP	2FE2 207-06	335		
30.0	40.0	225MX	2HE2 223-06	975	56.0	29.97	91.7	91.7	88.0	0.81	0.77	0.66	7.0	2.1	2.4	1.4702	370	225MX FLP	2FE2 223-06	405		
37.0	50.0	250MX	2HE2 253-06	980	68.0	36.77	92.2	92.2	89.0	0.82	0.79	0.70	7.0	2.1	2.4	2.0474	520	250MX FLP	2FE2 253-06	556		
45.0	60.0	280SX	2HE2 280-06	983	80.0	44.59	92.7	92.7	89.4	0.84	0.81	0.73	7.0	2.2	2.4	3.8890	694	280SX FLP	2FE2 280-06	739		
55.0	75.0	280MX	2HE2 283-06	983	98.0	54.50	93.1	93.1	89.7	0.84	0.81	0.73	7.0	2.2	2.4	4.8613	750	280MX FLP	2FE2 283-06	795		
75.0	100.0	315SX	2HE2 310-06	986	133.0	74.09	93.7	93.7	90.0	0.84	0.81	0.73	7.0	2.1	2.4	7.2611	1010	315SX FLP	2FE2 310-06	1095		
90.0	120.0	315MX	2HE2 313-06	986	159.0	88.90	94.0	94.0	92.0	0.84	0.81	0.74	7.0	2.1	2.4	8.5948	1050	315MX FLP	2FE2 313-06	1125		
110.0	150.0	315MX	2HE2 314-06	986	192.0	108.66	94.3	94.3	92.0	0.85	0.82	0.75	7.0	2.1	2.4	10.3731	1100	315MX FLP	2FE2 314-06	1175		
132.0	180.0	315LX	2HE2 317-06	987	227.0	130.26	94.6	94.6	93.0	0.86	0.83	0.76	7.0	2.1	2.4	10.3731	1200	315LX FLP	2FE2 317-06	1260		
160.0	215.0	355SX	2HE2 350-06	988	280.0	157.73	94.8	94.8	94.0	0.84	0.82	0.75	7.0	2.1	2.4	19.1900	1680					
200.0	270.0	355MX	2HE2 353-06	988	345.0	197.17	95.0	95.0	94.5	0.85	0.82	0.75	7.0	2.1	2.4	21.0176	1830					
250.0	335.0	355LX	2HE2 357-06	988	433.0	246.46	95.0	95.0	94.5	0.85	0.82	0.75	7.0	2.1	2.4	23.7590	2000					

Note: Motors upto 1.5kW are star (Y) connected suitable for DOL starting. Motors above 1.5kW are delta (Δ) connected suitable for DOL / Y/Δ starting.

# ELECTRICAL PERFORMANCE - IE2 MOTOR

## 8 POLE MOTOR

### 8 POLE MOTOR

Output		Safe Area Motors										Flameproof (Ex'd') Motors								
		Frame Size	Type Designation	Speed (rpm)	Current (A)	Torque (kgm)	Efficiency %		Power Factor		I <sub>st</sub> /I <sub>N</sub>	T <sub>st</sub> /T <sub>N</sub>	T <sub>po</sub> /T <sub>N</sub>	GD <sup>2</sup> (kgm <sup>2</sup> )	Wt. (kg)	Frame Size	Type Designation	Wt. (kg)		
KW	HP						FL	3/4L	1/2L	FL	3/4L	1/2L	FL	3/4L	1/2L					
0.12	0.16	71	2HE2 073-08	680	0.75	0.17	39.8	39.8	35.0	0.56	0.50	0.42	3.5	1.6	2.0	0.0033	11	71 FLP	2FE2 073-08	22
0.18	0.25	80	2HE2 080-08	685	0.85	0.26	45.9	45.9	40.0	0.64	0.50	0.42	4.0	1.7	2.0	0.0049	16	80 FLP	2FE2 080-08	29
0.25	0.33	80	2HE2 083-08	690	1.0	0.35	50.6	50.6	45.0	0.69	0.52	0.42	4.0	1.8	2.1	0.0063	18	80 FLP	2FE2 083-08	31
0.37	0.50	90S	2HE2 090-08	695	1.4	0.52	56.1	56.1	49.0	0.66	0.53	0.42	4.0	1.7	2.0	0.0095	24	90S FLP	2FE2 090-08	41
0.55	0.75	90L	2HE2 096-08	700	2.0	0.77	61.7	61.7	56.0	0.62	0.54	0.42	4.5	1.8	2.0	0.0122	28	90L FLP	2FE2 096-08	43
0.75	1.0	100L	2HE2 106-08	705	2.2	1.04	66.2	66.2	62.0	0.72	0.60	0.48	5.0	1.9	2.1	0.0228	34	100L FLP	2FE2 106-08	53
1.1	1.5	100L	2HE2 107-08	700	3.0	1.53	70.8	70.8	65.0	0.72	0.62	0.48	5.0	1.9	2.1	0.0296	36	100L FLP	2FE2 107-08	55
1.5	2.0	112M	2HE2 123-08	710	3.9	2.06	77.0	74.1	73.0	0.69	0.63	0.51	5.5	1.8	2.3	0.0467	45	112M FLP	2FE2 123-08	65
2.2	3.0	132S	2HE2 130-08	715	5.3	3.00	77.6	77.6	75.0	0.74	0.66	0.53	5.0	2.2	2.4	0.0826	59	132S FLP	2FE2 130-08	84
3.7	5.0	160M	2HE2 163-08	722	8.2	4.99	81.4	81.4	79.5	0.77	0.71	0.59	6.0	2.2	2.4	0.2625	106	160M FLP	2FE2 163-08	143
5.5	7.5	160M	2HE2 164-08	720	11.8	7.44	83.8	83.8	82.0	0.77	0.72	0.60	6.0	2.0	2.2	0.2625	115	160M FLP	2FE2 164-08	150
7.5	10.0	160L	2HE2 166-08	723	15.8	10.10	85.3	85.3	83.0	0.77	0.72	0.60	6.0	2.0	2.2	0.3440	148	160L FLP	2FE2 166-08	178
9.3	12.5	180M	2HE2 183-08	725	19.5	12.49	86.3	86.3	83.5	0.77	0.72	0.60	6.0	2.1	2.3	0.5057	181	180M FLP	2FE2 183-08	209
11.0	15.0	180L	2HE2 186-08	727	23.0	14.74	86.9	86.9	84.0	0.77	0.68	0.55	6.0	2.2	2.4	0.5949	195	180L FLP	2FE2 186-08	217
15.0	20.0	200L	2HE2 206-08	730	31.0	20.01	88.0	88.0	85.0	0.76	0.68	0.56	6.0	2.0	2.2	1.1136	306	200L FLP	2FE2 206-08	332
18.5	25.0	225SX	2HE2 220-08	732	37.5	24.62	88.6	88.6	86.0	0.77	0.70	0.61	6.0	2.0	2.2	1.5437	366	225SX FLP	2FE2 220-08	406
22.0	30.0	225MX	2HE2 223-08	733	44.8	29.23	89.1	89.1	87.0	0.77	0.70	0.58	6.0	2.2	2.4	1.8378	380	225MX FLP	2FE2 223-08	415
30.0	40.0	250MX	2HE2 253-08	733	60.7	39.86	89.8	89.8	88.0	0.77	0.71	0.61	6.0	2.1	2.3	2.5127	523	250MX FLP	2FE2 253-08	559
37.0	50.0	280SX	2HE2 280-08	735	72.0	49.03	90.3	90.3	89.0	0.79	0.74	0.64	6.0	2.2	2.5	3.8890	698	280SX FLP	2FE2 280-08	743
45.0	60.0	280MX	2HE2 283-08	735	87.0	59.63	90.7	90.7	89.3	0.79	0.75	0.67	6.0	2.2	2.4	4.8613	735	280MX FLP	2FE2 283-08	780
55.0	75.0	315SX	2HE2 310-08	737	108.4	72.69	91.0	91.0	90.0	0.78	0.72	0.60	6.0	2.1	2.3	7.2611	1010	315SX FLP	2FE2 310-08	1095
75.0	100.0	315MX	2HE2 313-08	737	146.0	99.12	91.6	91.6	90.5	0.78	0.73	0.64	6.0	2.1	2.3	8.5948	1050	315MX FLP	2FE2 313-08	1125
90.0	120.0	315LX	2HE2 316-08	737	175.0	118.94	91.9	91.9	90.7	0.78	0.74	0.65	6.0	2.0	2.2	10.3731	1180	315LX FLP	2FE2 316-08	1240
110.0	150.0	315LX	2HE2 317-08	737	213.0	145.37	92.3	92.3	91.0	0.78	0.74	0.64	6.0	2.0	2.3	11.8549	1200	315LX FLP	2FE2 317-08	1260
132.0	180.0	355SX	2HE2 350-08	739	255.8	173.98	92.6	92.6	91.5	0.78	0.72	0.60	6.0	2.0	2.2	19.1900	1680			
160.0	215.0	355MX	2HE2 353-08	739	315.0	210.88	93.0	93.0	91.7	0.76	0.68	0.56	6.0	2.0	2.4	23.7590	1830			
200.0	270.0	355LX	2HE2 356-08	739	390.0	263.60	93.5	93.5	92.5	0.76	0.70	0.60	6.0	2.0	2.4	28.3281	1920			
225.0	300.0	355LX	2HE2 357-08	739	431.0	296.55	93.5	93.5	93.0	0.78	0.71	0.63	6.0	2.0	2.2	28.3281	1930			

Note: Motors upto 1.5kW are star (Y) connected suitable for DOL starting. Motors above 1.5kW are delta (Δ) connected suitable for DOL / Y/Δ starting.

# ELECTRICAL PERFORMANCE - IE3 MOTOR

## 2 POLE MOTOR

### 2 POLE MOTOR

Safe Area Motors										Flameproof (Ex'd') Motors										
Output KW	Output HP	Frame Size	Type Designation	Speed (rpm)	Current (A)	Torque (kgm)	Efficiency %			Power Factor			$I_{ST}/I_N$	$T_{ST}/T_N$	$T_{PO}/T_N$	GD <sup>2</sup> (kgm <sup>2</sup> )	Wt. (kg)	Frame Size	Type Designation	Wt. (kg)
							FL	3/4L	1/2L	FL	3/4L	1/2L								
0.18	0.25	63	2HE3 060-02	2800	0.53	0.06	65.9	65.9	60.5	0.72	0.64	0.52	6.5	2.0	2.3	0.0010	8	63 FLP	2FE3 060-02	18
0.25	0.33	63	2HE3 063-02	2800	0.66	0.09	69.7	69.7	67.0	0.76	0.66	0.54	6.5	2.0	2.3	0.0010	9	63 FLP	2FE3 063-02	19
0.37	0.50	71	2HE3 070-02	2810	0.90	0.13	73.8	73.8	70.5	0.77	0.69	0.57	6.5	2.1	2.5	0.0010	12	71 FLP	2FE3 070-02	23
0.55	0.75	71	2HE3 073-02	2840	1.25	0.19	77.8	77.8	74.5	0.79	0.74	0.60	7.0	2.2	2.6	0.0014	13	71 FLP	2FE3 073-02	24
0.75	1.0	80	2HE3 080-02	2850	1.6	0.26	80.7	80.7	78.0	0.81	0.76	0.63	7.0	2.5	2.5	0.0049	16	80 FLP	2FE3 080-02	29
1.1	1.5	80	2HE3 083-02	2850	2.2	0.38	82.7	82.7	80.0	0.84	0.80	0.72	7.0	2.6	2.5	0.0062	18	80 FLP	2FE3 083-02	31
1.5	2.0	90S	2HE3 090-02	2870	3.0	0.51	84.2	84.2	82.5	0.83	0.81	0.75	7.0	2.5	3.0	0.0052	27	90S FLP	2FE3 090-02	43
2.2	3.0	90L	2HE3 096-02	2870	4.3	0.75	85.9	85.9	84.5	0.83	0.81	0.75	7.7	2.5	3.0	0.0066	29	90L FLP	2FE3 096-02	44
3.7	5.0	100L	2HE3 106-02	2890	6.8	1.25	87.8	87.8	85.0	0.86	0.83	0.77	7.7	2.5	3.0	0.0168	39	100L FLP	2FE3 106-02	53
5.5	7.5	132S	2HE3 130-02	2945	9.8	1.82	89.2	89.2	87.0	0.88	0.86	0.82	7.7	2.5	3.0	0.0583	63	132S FLP	2FE3 130-02	82
7.5	10.0	132S	2HE3 131-02	2945	13.0	2.48	90.1	90.1	89.5	0.89	0.87	0.84	7.7	2.5	3.0	0.0716	71	132S FLP	2FE3 131-02	90
9.3	12.5	160M	2HE3 163-02	2940	16.0	3.08	90.7	90.7	89.0	0.89	0.86	0.81	7.0	2.3	2.8	0.1700	112	160M FLP	2FE3 163-02	152
11.0	15.0	160M	2HE3 164-02	2940	19.0	3.64	91.2	91.2	90.0	0.88	0.86	0.79	7.0	2.3	2.8	0.1700	137	160M FLP	2FE3 164-02	168
15.0	20.0	160M	2HE3 165-02	2935	25.3	4.98	91.9	91.9	90.9	0.90	0.88	0.82	7.0	2.5	2.9	0.2040	142	160M FLP	2FE3 165-02	170
18.5	25.0	160L	2HE3 166-02	2930	31.0	6.15	92.4	92.4	91.4	0.90	0.88	0.81	7.0	2.3	2.8	0.2312	164	160L FLP	2FE3 166-02	189
22.0	30.0	180M	2HE3 183-02	2935	37.0	7.30	92.7	92.7	91.5	0.89	0.87	0.81	7.0	2.2	2.7	0.2585	185	180M FLP	2FE3 183-02	206
30.0	40.0	200L	2HE3 206-02	2955	49.0	9.89	93.3	93.3	92.2	0.91	0.89	0.85	7.0	2.0	2.5	0.5257	300	200L FLP	2FE3 206-02	326
37.0	50.0	200L	2HE3 207-02	2955	60.5	12.20	93.7	93.7	92.5	0.91	0.90	0.85	7.0	2.0	2.5	0.5257	320	200L FLP	2FE3 207-02	345
45.0	60.0	225M	2HE3 223-02	2960	73.0	14.81	94.0	94.0	93.0	0.91	0.90	0.86	7.0	2.3	2.5	0.8450	386	225M FLP	2FE3 223-02	419
55.0	75.0	250M	2HE3 253-02	2960	89.0	18.10	94.3	94.3	93.0	0.91	0.90	0.86	7.0	2.0	2.5	1.0690	510	250M FLP	2FE3 253-02	546
75.0	100.0	280S	2HE3 280-02	2970	121.5	24.60	94.7	94.7	93.5	0.91	0.90	0.86	7.0	2.0	2.8	2.9368	800	280S FLP	2FE3 280-02	845
90.0	120.0	280M	2HE3 283-02	2970	145.0	29.52	95.0	95.0	94.0	0.91	0.89	0.84	7.0	2.0	2.8	2.9368	845	280M FLP	2FE3 283-02	890
110.0	150.0	315S	2HE3 310-02	2980	177.0	35.95	95.2	95.2	94.0	0.91	0.90	0.86	7.0	1.9	2.6	4.6393	1090	315S FLP	2FE3 310-02	1170
132.0	180.0	315M	2HE3 314-02	2980	212.0	43.14	95.4	95.4	94.2	0.91	0.90	0.87	7.5	1.9	2.6	4.6393	1140	315M FLP	2FE3 314-02	1220
160.0	215.0	315L	2HE3 316-02	2980	257.0	52.30	95.6	95.6	94.0	0.91	0.90	0.88	7.5	1.9	2.6	5.4392	1220	315L FLP	2FE3 316-02	1280
200.0	270.0	315L	2HE3 317-02	2980	320.0	65.37	95.8	95.8	94.5	0.91	0.90	0.87	7.5	2.0	2.6	5.5991	1260	315L FLP	2FE3 317-02	1320
250.0	335.0	355M	2HE3 353-02	2980	403.0	81.71	95.8	95.8	94.0	0.90	0.88	0.84	7.5	1.9	2.6	8.9735	1740			
315.0	425.0	355L	2HE3 357-02	2980	506.0	102.96	95.8	95.8	94.0	0.90	0.88	0.84	7.5	2.0	2.6	10.0292	1900			

Note: Motors upto 1.5kW are star (Y) connected suitable for DOL starting. Motors above 1.5kW are delta (Δ) connected suitable for DOL / Y/Δ starting.

# ELECTRICAL PERFORMANCE - IE3 MOTOR

## 4 POLE MOTOR

### 4 POLE MOTOR

Safe Area Motors										Flameproof (Ex'd') Motors										
Output KW	Output HP	Frame Size	Type Designation	Speed (rpm)	Current (A)	Torque (kgm)	Efficiency %			Power Factor			$I_{st}/I_N$	$T_{st}/T_N$	$T_{Po}/T_N$	GD <sup>2</sup> (kgm <sup>2</sup> )	Wt. (kg)	Frame Size	Type Designation	Wt. (kg)
							FL	3/4L	1/2L	FL	3/4L	1/2L								
0.12	0.16	63	2HE3 060-04	1400	0.51	0.08	64.8	64.8	58.0	0.51	0.46	0.38	5.0	2.0	2.4	0.0010	8	63 FLP	2FE3 060-04	18
0.18	0.25	63	2HE3 063-04	1400	0.57	0.13	69.9	69.9	64.0	0.63	0.57	0.48	5.0	2.0	2.4	0.0010	9	63 FLP	2FE3 063-04	19
0.25	0.33	71	2HE3 070-04	1415	0.75	0.17	73.5	73.5	68.0	0.63	0.58	0.48	5.0	2.1	2.5	0.0022	11	71 FLP	2FE3 070-04	22
0.37	0.50	71	2HE3 073-04	1420	1.0	0.25	77.3	77.3	72.0	0.67	0.63	0.50	5.0	2.2	2.6	0.0028	12	71 FLP	2FE3 073-04	23
0.55	0.75	80	2HE3 080-04	1430	1.3	0.37	80.8	80.8	74.0	0.73	0.66	0.53	6.0	2.2	2.6	0.0049	16	80 FLP	2FE3 080-04	29
0.75	1.0	80	2HE3 083-04	1430	1.6	0.51	82.5	82.5	78.0	0.79	0.75	0.64	6.5	2.6	3.0	0.0062	18	80 FLP	2FE3 083-04	31
1.1	1.5	90S	2HE3 090-04	1430	2.3	0.75	84.1	84.1	81.5	0.79	0.75	0.64	6.5	2.5	3.0	0.0093	24	90S FLP	2FE3 090-04	41
1.5	2.0	90L	2HE3 096-04	1435	3.1	1.02	85.3	85.3	83.0	0.79	0.75	0.64	6.5	2.5	3.0	0.0134	29	90L FLP	2FE3 096-04	44
2.2	3.0	100L	2HE3 106-04	1440	4.3	1.49	86.7	86.7	84.0	0.82	0.78	0.67	7.0	2.5	3.0	0.0237	38	100L FLP	2FE3 106-04	55
3.7	5.0	112M	2HE3 123-04	1450	7.5	2.49	88.4	88.4	85.5	0.78	0.69	0.60	7.0	2.5	3.0	0.0497	53	112M FLP	2FE3 123-04	69
5.5	7.5	132S	2HE3 130-04	1455	10.5	3.68	89.6	89.6	87.0	0.81	0.76	0.65	7.0	2.5	3.0	0.0811	60	132M FLP	2FE3 130-04	85
7.5	10.0	132M	2HE3 133-04	1455	14.2	5.02	90.4	90.4	88.0	0.81	0.76	0.66	7.0	2.5	3.0	0.1081	77	132M FLP	2FE3 133-04	96
9.3	12.5	160M	2HE3 163-04	1465	16.5	6.18	91.0	91.0	90.0	0.86	0.82	0.73	7.0	2.5	2.8	0.2369	150	160M FLP	2FE3 163-04	187
11.0	15.0	160M	2HE3 164-04	1460	19.8	7.34	91.4	91.4	90.2	0.85	0.80	0.72	7.0	2.3	2.6	0.2369	162	160M FLP	2FE3 164-04	192
15.0	20.0	160L	2HE3 166-04	1470	26.2	9.94	92.1	92.1	91.4	0.86	0.83	0.74	7.0	2.4	2.7	0.3032	186	160L FLP	2FE3 166-04	211
18.5	25.0	180M	2HE3 183-04	1470	32.8	12.26	92.6	92.6	91.6	0.85	0.81	0.73	7.0	2.4	2.7	0.3790	195	180M FLP	2FE3 183-04	220
22.0	30.0	180L	2HE3 186-04	1470	38.8	14.58	93.0	93.0	92.0	0.85	0.81	0.73	7.0	2.3	2.6	0.4359	224	180L FLP	2FE3 186-04	246
30.0	40.0	200L	2HE3 206-04	1475	52.5	19.81	93.6	93.6	92.5	0.85	0.81	0.73	7.5	2.3	2.6	0.9987	367	200L FLP	2FE3 206-04	393
37.0	50.0	225SX	2HE3 220-04	1475	63.5	24.43	93.9	93.9	93.0	0.86	0.83	0.76	7.5	2.3	2.6	1.3970	387	225SX FLP	2FE3 220-04	426
45.0	60.0	225MX	2HE3 223-04	1475	77.8	29.72	94.2	94.2	93.2	0.85	0.82	0.74	7.5	2.5	2.8	1.6299	413	225MX FLP	2FE3 223-04	448
55.0	75.0	250MX	2HE3 253-04	1482	92.0	36.15	94.6	94.6	94.0	0.88	0.86	0.80	7.5	2.5	2.8	2.3466	557	250MX FLP	2FE3 253-04	593
75.0	100.0	280SX	2HE3 280-04	1482	125.0	49.29	95.0	95.0	94.2	0.88	0.85	0.77	7.5	2.2	2.5	4.1594	746	280SX FLP	2FE3 280-04	791
90.0	120.0	280MX	2HE3 283-04	1482	150.0	59.15	95.2	95.2	94.0	0.88	0.85	0.77	7.5	2.2	2.5	5.1192	790	280MX FLP	2FE3 283-04	835
110.0	150.0	315SX	2HE3 310-04	1485	183.0	72.15	95.4	95.4	94.4	0.88	0.85	0.77	7.7	2.0	2.4	10.3731	1110	315SX FLP	2FE3 310-04	1195
132.0	180.0	315MX	2HE3 314-04	1485	216.0	86.58	95.6	95.6	94.5	0.89	0.87	0.82	7.7	2.2	2.5	11.8549	1110	315MX FLP	2FE3 314-04	1195
160.0	215.0	315LX	2HE3 316-04	1485	260.0	104.94	95.8	95.8	94.5	0.89	0.87	0.81	7.7	2.2	2.5	13.0404	1270	315LX FLP	2FE3 316-04	1330
200.0	270.0	315LX	2HE3 317-04	1485	326.0	131.18	96.0	96.0	95.0	0.89	0.87	0.81	7.7	2.2	2.5	15.4114	1310	315LX FLP	2FE3 317-04	1370
250.0	335.0	355MX	2HE3 353-04	1485	412.0	163.97	96.0	96.0	95.0	0.88	0.85	0.77	7.7	2.0	2.5	15.9163	1735			
315.0	425.0	355LX	2HE3 357-04	1486	519.0	206.47	96.0	96.0	95.0	0.88	0.85	0.77	7.7	2.0	2.5	19.9879	1950			

Note: Motors upto 1.5kW are star (Y) connected suitable for DOL starting. Motors above 1.5kW are delta (Δ) connected suitable for DOL / Y/Δ starting.

# ELECTRICAL PERFORMANCE - IE3 MOTOR

6 POLE MOTOR

6 POLE MOTOR

Output		Safe Area Motors										Flameproof (Ex'd') Motors								
KW	HP	Frame Size	Type Designation	Speed (rpm)	Current (A)	Torque (kgm)	Efficiency %			Power Factor			I <sub>st</sub> /I <sub>N</sub>	T <sub>st</sub> /T <sub>N</sub>	T <sub>po</sub> /T <sub>N</sub>	GD <sup>2</sup> (kgm <sup>2</sup> )	Wt. (kg)	Frame Size	Type Designation	Wt. (kg)
							FL	3/4L	1/2L	FL	3/4L	1/2L								
0.18	0.25	71	2HE3 073-06	915	0.64	0.19	63.9	63.9	59.0	0.61	0.51	0.42	5.0	1.8	2.3	0.0033	12	71 FLP	2FE3 073-06	23
0.25	0.33	71	2HE3 074-06	915	0.80	0.27	68.6	68.6	64.0	0.63	0.57	0.46	5.0	1.8	2.3	0.0041	14	71 FLP	2FE3 074-06	25
0.37	0.50	80	2HE3 080-06	925	1.05	0.39	73.5	73.5	69.0	0.67	0.63	0.50	5.0	1.8	2.3	0.0049	18	80 FLP	2FE3 080-06	31
0.55	0.75	80	2HE3 083-06	925	1.45	0.58	77.2	77.2	72.0	0.68	0.62	0.50	5.0	2.0	2.4	0.0080	21	80 FLP	2FE3 083-06	34
0.75	1.0	90S	2HE3 090-06	930	1.9	0.79	78.9	78.9	74.0	0.70	0.62	0.50	5.0	2.2	2.6	0.0135	26	90S FLP	2FE3 090-06	43
1.1	1.5	90L	2HE3 096-06	940	2.7	1.14	81.0	81.0	76.0	0.70	0.62	0.50	5.5	2.2	2.6	0.0190	30	90L FLP	2FE3 096-06	45
1.5	2.0	100L	2HE3 106-06	945	3.3	1.55	82.5	82.5	80.0	0.77	0.71	0.60	5.5	2.2	2.6	0.0336	35	100L FLP	2FE3 106-06	53
2.2	3.0	112M	2HE3 123-06	955	4.7	2.24	84.3	84.3	82.0	0.77	0.71	0.60	6.0	2.2	2.6	0.0630	45	112M FLP	2FE3 123-06	65
3.7	5.0	132S	2HE3 130-06	960	7.5	3.75	86.5	86.5	84.0	0.79	0.72	0.63	6.5	2.4	2.8	0.1321	71	132S FLP	2FE3 130-06	96
5.5	7.5	132M	2HE3 133-06	960	11.0	5.58	88.0	88.0	86.0	0.79	0.72	0.63	7.5	2.6	3.0	0.1487	79	132M FLP	2FE3 133-06	98
7.5	10.0	160M	2HE3 163-06	970	14.0	7.53	89.1	89.1	88.0	0.84	0.79	0.69	7.0	2.2	2.5	0.3718	140	160M FLP	2FE3 163-06	177
9.3	12.5	160L	2HE3 166-06	965	17.0	9.39	89.8	89.8	88.5	0.85	0.80	0.70	7.0	2.2	2.5	0.4759	153	160L FLP	2FE3 166-06	188
11.0	15.0	160L	2HE3 167-06	965	20.0	11.10	90.3	90.3	88.5	0.85	0.80	0.70	7.0	2.2	2.5	0.5503	169	160L FLP	2FE3 167-06	190
15.0	20.0	180L	2HE3 186-06	970	27.5	15.06	91.2	91.2	90.0	0.83	0.80	0.71	7.5	2.3	2.6	0.7437	212	180L FLP	2FE3 186-06	234
18.5	25.0	200L	2HE3 206-06	978	34.0	18.42	91.7	91.7	90.3	0.83	0.78	0.70	7.0	2.2	2.5	1.1642	306	200L FLP	2FE3 206-06	332
22.0	30.0	200L	2HE3 207-06	978	40.0	21.91	92.2	92.2	90.7	0.83	0.78	0.69	7.0	2.2	2.5	1.3667	320	200L FLP	2FE3 207-06	347
30.0	40.0	225MX	2HE3 223-06	980	55.0	29.82	92.9	92.9	91.5	0.82	0.77	0.67	7.0	2.2	2.5	1.8378	388	225MX FLP	2FE3 223-06	423
37.0	50.0	250MX	2HE3 253-06	982	66.0	36.70	93.3	93.3	92.0	0.84	0.81	0.72	7.0	2.2	2.5	2.6988	542	250MX FLP	2FE3 253-06	576
45.0	60.0	280SX	2HE3 280-06	984	79.0	44.54	93.7	93.7	92.5	0.85	0.82	0.75	7.0	2.3	2.5	4.8613	740	280SX FLP	2FE3 280-06	785
55.0	75.0	280MX	2HE3 283-06	984	95.0	54.44	94.1	94.1	93.2	0.86	0.84	0.77	7.0	2.3	2.5	5.8335	780	280MX FLP	2FE3 283-06	825
75.0	100.0	315SX	2HE3 310-06	986	131.0	74.09	94.6	94.6	93.5	0.84	0.81	0.73	7.0	2.3	2.4	8.5948	1045	315SX FLP	2FE3 310-06	1130
90.0	120.0	315MX	2HE3 313-06	986	156.0	88.90	94.9	94.9	94.0	0.85	0.81	0.73	7.0	2.3	2.4	10.3731	1090	315MX FLP	2FE3 313-06	1265
110.0	150.0	315MX	2HE3 314-06	987	194.0	108.55	95.1	95.1	94.0	0.83	0.79	0.69	7.5	2.5	2.5	11.8549	1130	315LX FLP	2FE3 314-06	1205
132.0	180.0	315LX	2HE3 317-06	988	228.0	130.13	95.4	95.4	94.5	0.84	0.81	0.72	7.5	2.5	2.5	14.2259	1240	315LX FLP	2FE3 317-06	1300
160.0	215.0	355SX	2HE3 350-06	990	276.0	157.41	95.6	95.6	95.0	0.84	0.81	0.72	7.5	2.0	2.4	23.7590	1800			
200.0	270.0	355MX	2HE3 353-06	990	347.0	196.77	95.8	95.8	95.0	0.84	0.80	0.71	7.5	2.2	2.4	23.7590	1810			
250.0	335.0	355LX	2HE3 357-06	989	430.0	246.21	95.8	95.8	95.0	0.84	0.81	0.73	7.5	2.0	2.4	26.5005	2000			

Note: Motors upto 1.5kW are star (Y) connected suitable for DOL starting. Motors above 1.5kW are delta (Δ) connected suitable for DOL / Y/Δ starting.

# ELECTRICAL PERFORMANCE - IE3 MOTOR

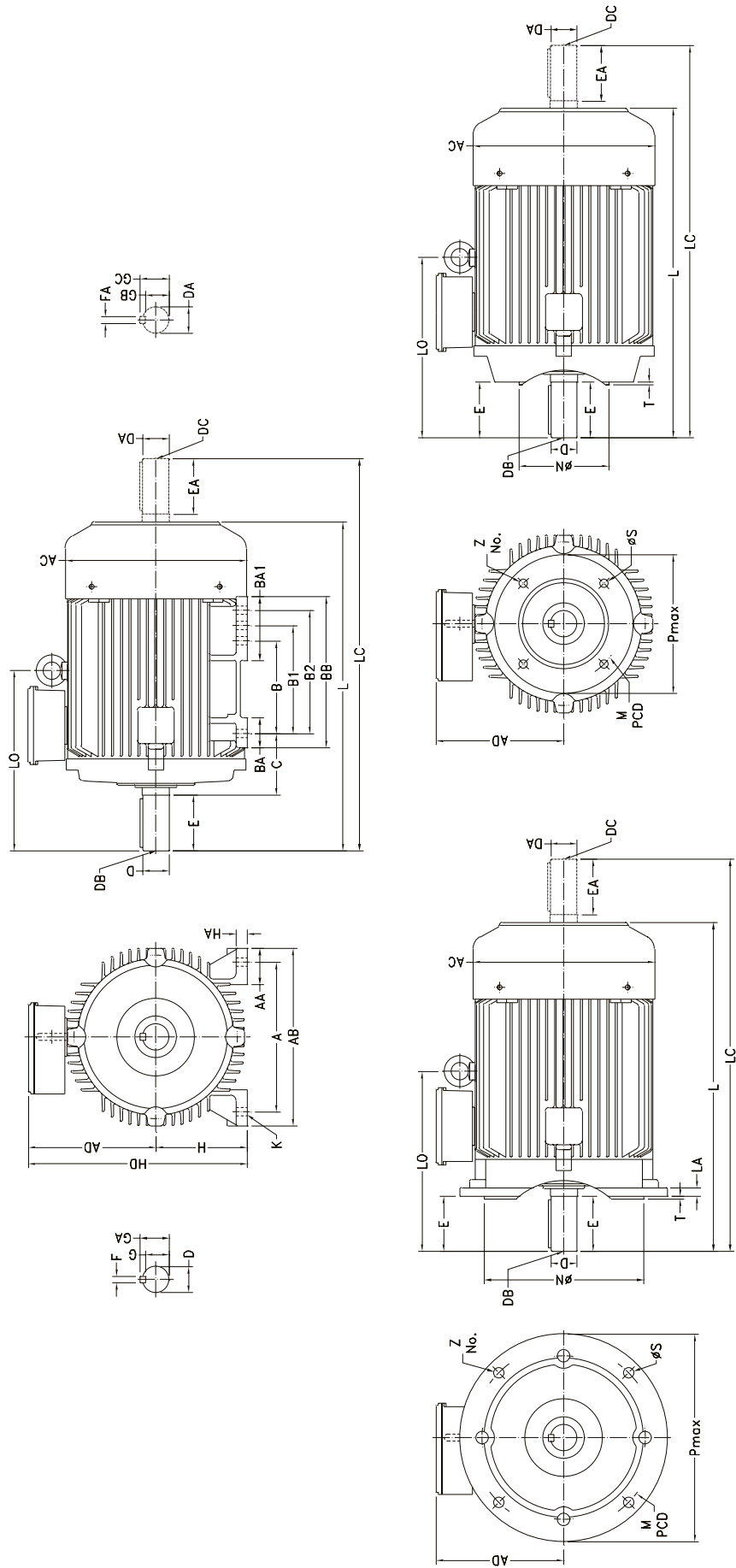
8 POLE MOTOR

**8 POLE MOTOR**

Safe Area Motors										Flameproof (Ex'd') Motors										
Output KW	HP	Frame Size	Type Designation	Speed (rpm)	Current (A)	Torque (kgm)	Efficiency %			Power Factor			I <sub>ST</sub> /I <sub>N</sub>	T <sub>ST</sub> /T <sub>N</sub>	T <sub>PO</sub> /T <sub>N</sub>	GD <sup>2</sup> (kgm <sup>2</sup> )	Wt. (kg)	Frame Size	Type Designation	Wt. (kg)
							FL	3/4L	1/2L	FL	3/4L	1/2L								
0.12	0.16	71	2HE3 073-08	685	0.66	0.17	50.7	48.0	42.0	0.50	0.45	0.38	3.5	1.6	2.0	0.0033	11	71 FLP	2FE3 073-08	22
0.18	0.25	80	2HE3 080-08	690	0.75	0.25	58.7	56.0	49.0	0.57	0.50	0.40	4.0	1.8	2.1	0.0049	17	80 FLP	2FE3 080-08	30
0.25	0.33	80	2HE3 083-08	695	0.92	0.35	64.1	63.0	57.0	0.59	0.51	0.42	4.5	1.8	2.1	0.0080	20	80 FLP	2FE3 083-08	33
0.37	0.50	90S	2HE3 090-08	700	1.3	0.51	69.3	69.3	60.0	0.57	0.48	0.40	4.5	2.0	2.2	0.0122	27	90S FLP	2FE3 090-08	44
0.55	0.75	90L	2HE3 096-08	700	1.7	0.77	73.0	73.0	66.0	0.62	0.54	0.42	4.5	1.8	2.0	0.0176	30	90L FLP	2FE3 096-08	45
0.75	1.0	100L	2HE3 106-08	700	2.1	1.04	75.0	75.0	71.0	0.66	0.58	0.48	5.0	2.0	2.2	0.0228	35	100L FLP	2FE3 106-08	54
1.1	1.5	100L	2HE3 107-08	700	2.9	1.53	77.7	77.7	73.0	0.68	0.61	0.51	5.0	2.0	2.2	0.0336	38	100L FLP	2FE3 107-08	57
1.5	2.0	112M	2HE3 123-08	710	3.7	2.06	79.7	79.7	75.0	0.71	0.65	0.55	5.5	2.0	2.2	0.0584	48	112M FLP	2FE3 123-08	68
2.2	3.0	132S	2HE3 130-08	715	5.1	3.00	81.9	81.9	77.0	0.73	0.67	0.56	6.0	2.2	2.4	0.0991	62	132S FLP	2FE3 130-08	87
3.7	5.0	160M	2HE3 163-08	723	7.9	4.98	84.5	84.5	82.0	0.77	0.73	0.61	7.0	2.2	2.4	0.2625	110	160M FLP	2FE3 163-08	147
5.5	7.5	160M	2HE3 164-08	724	11.5	7.40	86.2	86.2	82.5	0.77	0.73	0.60	7.0	2.2	2.4	0.2625	118	160M FLP	2FE3 164-08	153
7.5	10.0	160L	2HE3 166-08	725	15.4	10.08	87.3	87.3	83.5	0.78	0.73	0.60	7.0	2.2	2.4	0.3440	152	160L FLP	2FE3 166-08	181
9.3	12.5	180M	2HE3 183-08	725	19.4	12.49	88.1	88.1	84.0	0.76	0.70	0.58	7.0	2.2	2.4	0.5057	184	180M FLP	2FE3 183-08	212
11.0	15.0	180L	2HE3 186-08	727	23.0	14.74	88.6	88.6	85.0	0.75	0.67	0.54	7.0	2.3	2.5	0.5949	198	180L FLP	2FE3 186-08	220
15.0	20.0	200L	2HE3 206-08	730	31.0	20.01	89.6	89.6	86.0	0.75	0.68	0.56	7.0	2.1	2.3	1.1136	310	200L FLP	2FE3 206-08	336
18.5	25.0	225SX	2HE3 220-08	732	37.0	24.62	90.1	90.1	87.0	0.77	0.71	0.60	7.0	2.0	2.2	1.5437	370	225SX FLP	2FE3 220-08	410
22.0	30.0	225MX	2HE3 223-08	733	44.5	29.23	90.6	90.6	87.5	0.76	0.69	0.58	7.0	2.2	2.4	1.8378	385	225MX FLP	2FE3 223-08	420
30.0	40.0	250MX	2HE3 253-08	733	60.0	39.86	91.3	91.3	88.5	0.76	0.70	0.60	7.0	2.2	2.4	2.5127	530	250MX FLP	2FE3 253-08	566
37.0	50.0	280SX	2HE3 280-08	735	71.0	49.03	91.8	91.8	89.5	0.79	0.75	0.65	7.0	2.2	2.4	4.8613	720	280SX FLP	2FE3 280-08	765
45.0	60.0	280MX	2HE3 283-08	735	86.0	59.63	92.2	92.2	90.0	0.79	0.76	0.67	7.0	2.2	2.4	5.8335	750	280MX FLP	2FE3 283-08	795
55.0	75.0	315SX	2HE3 310-08	737	108.1	72.69	92.5	92.5	90.5	0.77	0.71	0.60	7.0	2.2	2.4	7.2611	1020	315SX FLP	2FE3 310-08	1105
75.0	100.0	315MX	2HE3 313-08	737	145.5	99.12	93.1	93.1	90.8	0.77	0.73	0.64	7.0	2.1	2.3	8.5948	1060	315MX FLP	2FE3 313-08	1135
90.0	120.0	315LX	2HE3 316-08	737	172.8	118.94	93.4	93.4	91.0	0.78	0.74	0.65	7.0	2.0	2.2	10.3731	1190	315LX FLP	2FE3 316-08	1250
110.0	150.0	315LX	2HE3 317-08	737	210.7	145.37	93.7	93.7	91.4	0.78	0.74	0.64	7.0	2.1	2.3	11.8549	1220	315LX FLP	2FE3 317-08	1280
132.0	180.0	355SX	2HE3 350-08	739	255.3	173.98	94.0	94.0	91.8	0.77	0.71	0.60	7.0	2.1	2.3	19.1900	1700			
160.0	215.0	355MX	2HE3 353-08	739	315.0	210.88	94.3	94.3	92.0	0.75	0.68	0.56	7.0	2.1	2.4	23.7590	1850			
200.0	270.0	355LX	2HE3 356-08	739	389.0	263.60	94.6	94.6	93.0	0.76	0.70	0.60	7.0	2.1	2.4	28.3281	1950			
225.0	300.0	355LX	2HE3 357-08	739	430.0	296.55	94.6	94.6	93.5	0.77	0.71	0.63	7.0	2.0	2.2	28.3281	1970			

Note: Motors upto 1.5kW are star (Y) connected suitable for DOL starting. Motors above 1.5kW are delta (Δ) connected suitable for DOL / Y/Δ starting.

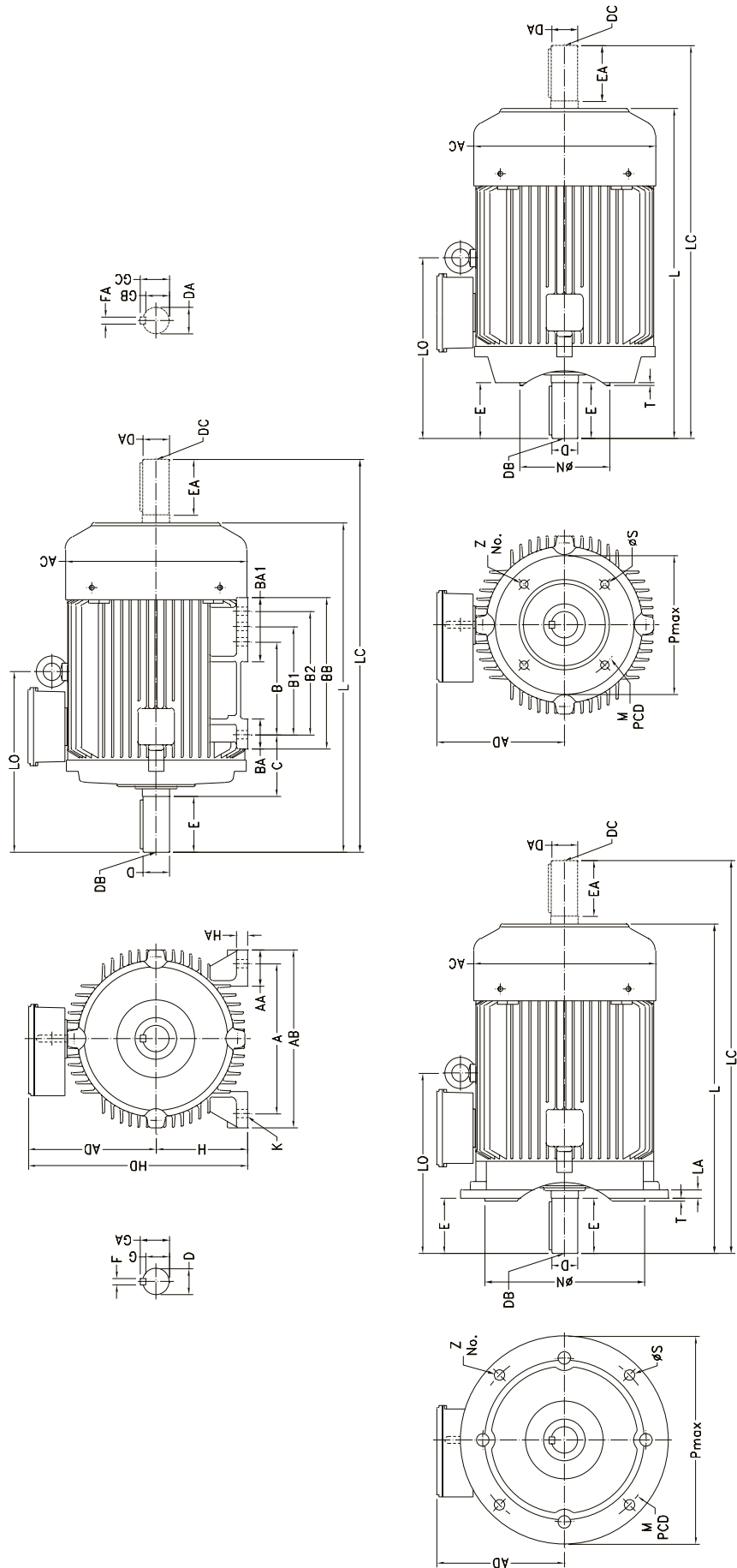
# MECHANICAL DIMENSIONS - IE2 MOTORS





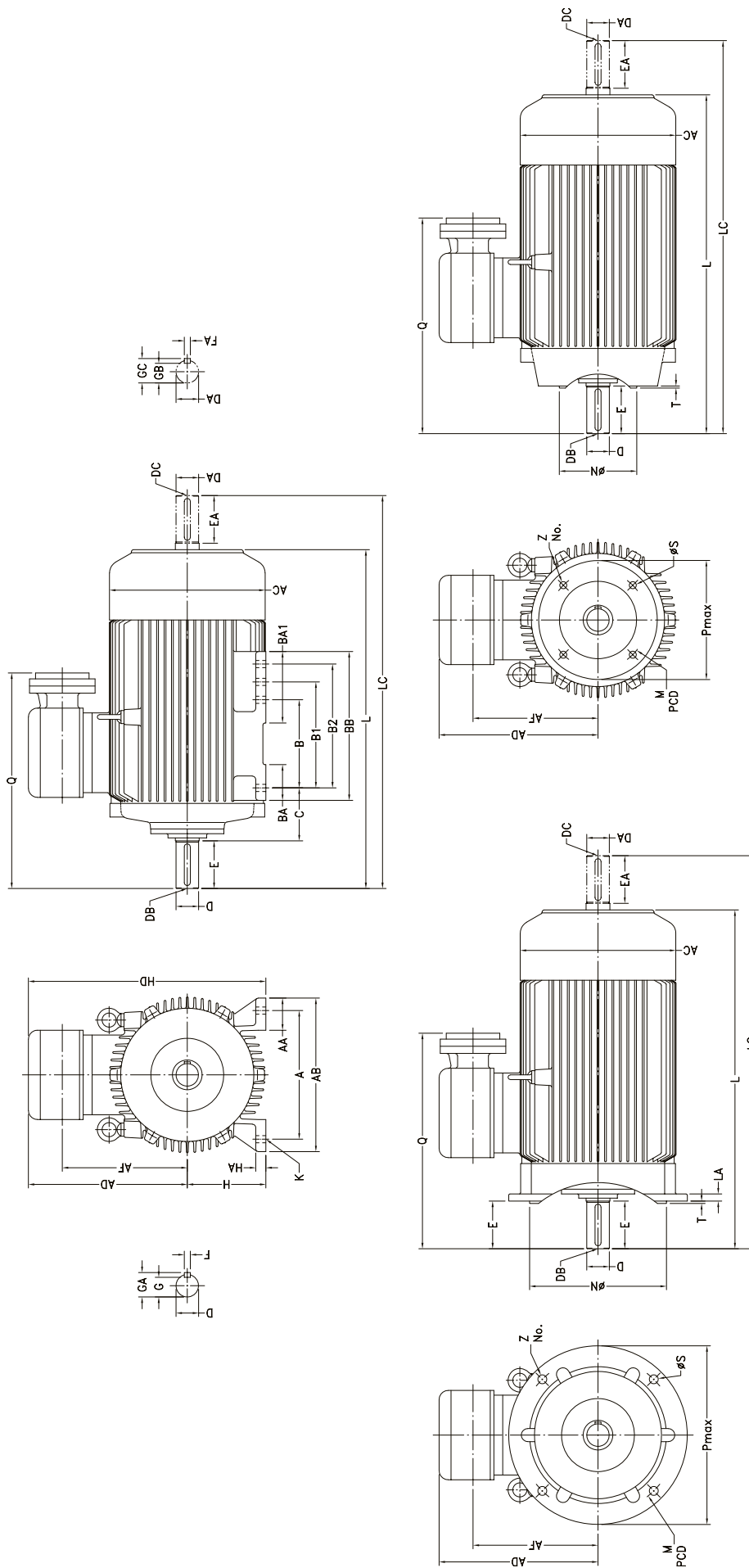


# MECHANICAL DIMENSIONS - IE3 MOTORS





# MECHANICAL DIMENSIONS - FLAMEPROOF MOTORS





# TESTING

The standard test programmes are divided into three parts; routine tests, type tests & optional tests. The routine tests are done to every machine & are included in the price of the machine. Type tests are performed in addition to routine tests normally to one of the machines of a series of similar machine or by request of the customer. Optional tests are additional tests subject to mutual agreement between purchaser & manufacturer.

## Contents of test programmes:

Routing tests	Type tests
<ol style="list-style-type: none"> <li>1. Insulation resistance test</li> <li>2. Measurement of stator resistance</li> <li>3. No load test</li> <li>4. Locked rotor test</li> <li>5. Reduced voltage running up test (up to 37kW)</li> <li>6. High voltage test</li> </ol>	<ol style="list-style-type: none"> <li>1. Dimensions</li> <li>2. Measurement of stator resistance</li> <li>3. No load test</li> <li>4. Reduced voltage running up test (up to 37kW)</li> <li>5. Locked rotor test</li> <li>6. Full load test</li> <li>7. Temperature rise test</li> <li>8. Momentary overload test</li> <li>9. Insulation resistance test</li> <li>10. High voltage test</li> </ol>
Optional tests	
<ol style="list-style-type: none"> <li>1. Vibration severity test</li> <li>2. Noise level measurement</li> <li>3. Degree of protection test</li> <li>4. Overspeed test</li> <li>5. Temp. rise test at limiting values of voltage and frequency variation</li> </ol>	

## SPECIAL CUSTOMISED DESIGNS

Frames	63	71	80	90	100	112	132	160	180	200	225	250	280	315	355
<b>Electrical</b>															
Non std voltage &/or frequency	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Gelcoat on winding overhang	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Vacuum pressure impregnation	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Insulation class H	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Two speed motors	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
High torque motors	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Special performance requirements	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
<b>Mechanical</b>															
Second std shaft end	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Non std shaft end	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
B6, B7, B8, V5, V6 mtg.	□	□	□	□	□	□	□	□	□	□	□	□	N	N	N
V1 mtg.	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
B5, V3 mtg.	■	■	■	■	■	■	■	■	■	■	■	■	■	■	N
B35, V15 mtg.	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
B14, V18, V19 mtg.	■	■	■	■	■	■	■	■	-	-	-	-	-	-	-
B34 mtg.	■	■	■	■	■	■	■	■	-	-	-	-	-	-	-
Non std flange	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Spl. vibration level	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Epoxy paint	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Thermistors, RTD	N	N	■	■	■	■	■	■	■	■	■	■	■	■	■
Anti condensation heater	N	N	N	■	■	■	■	■	■	■	■	■	■	■	■
Regreasing arrangement	N	N	N	N	N	N	N	N	N	□	□	□	□	□	□
Colours other than RAL 6011	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Special shaft material	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Cast iron cooling fan	■	■	■	■	■	■	■	■	■	■	■	■	■	■	□
IP 56 protection	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Special bearings	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Encoder mounting arrangement	N	N	N	■	■	■	■	■	■	■	■	■	■	■	■
Force cooling arrangement	N	N	N	■	■	■	■	■	■	■	■	■	■	■	■
Larger terminal box	■	■	■	■	■	■	■	■	■	■	■	■	■	■	N
Cast iron terminal box	■	■	■	■	■	■	■	■	■	■	■	■	□	□	□
Motors with service factor	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Extremely high & low ambient temp.	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■

N Cannot be supplied      □ No extra cost      ■ Extra cost