

# REVVO SERIES

# ELECTRIC MOTORS



## rotomotive

*looks good. performs better.*





Rotomotive Powerdrives India Ltd is an Italian joint venture company operating in India since 2006. It has access to European technology and know-how from Motive srl, one of the joint venture partners and sources parts and components from Indian suppliers. We have a modern manufacturing facility in Gujarat, India. Rotomotive has the capacity to design, prototype and manufacture custom motors for various applications.

Our modern manufacturing plant has advanced machinery for automatic winding, trickle and vacuum pressure impregnation, precise balancing, conveyORIZED assembly, enclosed painting lines, automatic testing facilities with all components bar coded for traceability, consistent quality and low production time.

We also have an advanced testing facility for type testing motors and gearboxes which enables us to plot accurate speed torque curves and carry out temperature rise tests and other type tests as per IEC 60034/IS:12615.

Our Manufacturing facility in India



Lean Assembly Line



Surge Impedance Test



Precise Balancing



Motor Type Testing



Brake Motor Testing



CMM for mechanical inspection



Our Manufacturing facility in Italy

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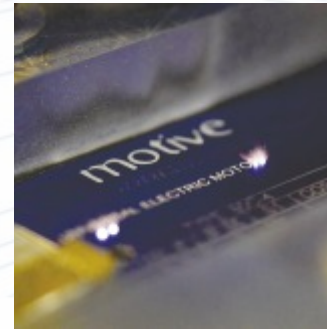
A



B



C



D



## TECHNICAL CHARACTERISTICS

Rotomotive asynchronous three phase Revvo series motors are built with dimensional conformance to Indian Standard IS:1231, IS: 2223 & International standard IEC 72-1.

The mounting positions as per IS : 2253 and IEC 34-7 are B3, B5, B14 and B35.

Rotomotive motors are totally enclosed, and fan cooled. Non-standard versions in TENV construction are also available on request.

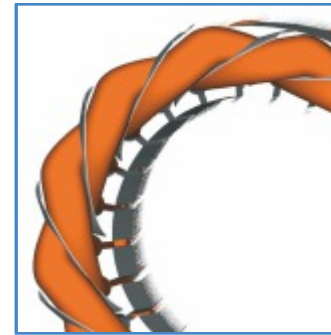
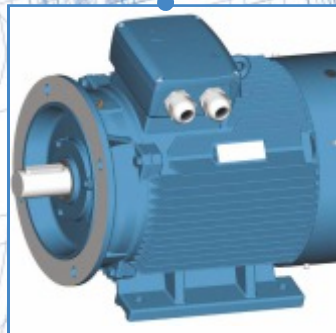
The frame sizes upto 132 are made from light weight die cast aluminium alloy and from size 160 up to 355 the frame and end-covers are made from cast iron.

All motors are  
multiple voltage  
multi-frequency 50/60Hz,  
F class insulation, (H class on request)  
S1 continuous duty service,  
IP55 protection, (IP66 on request)  
IE2 or IE3 efficiency class (IEC 60034-30)  
tropicalized winding

IE 2

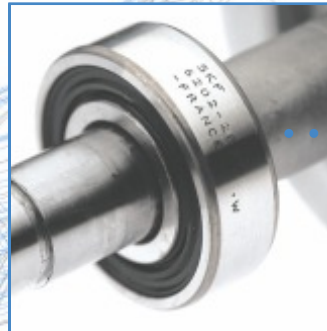
IE 3

IE 4 (PMSM)

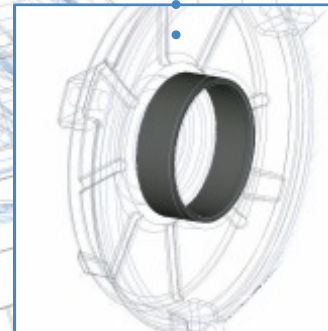
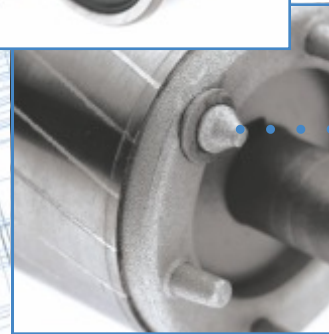


The windings are vacuum impregnated under pressure with F class insulating enamel to ensure high resistance to electrical, thermal and mechanical stresses.

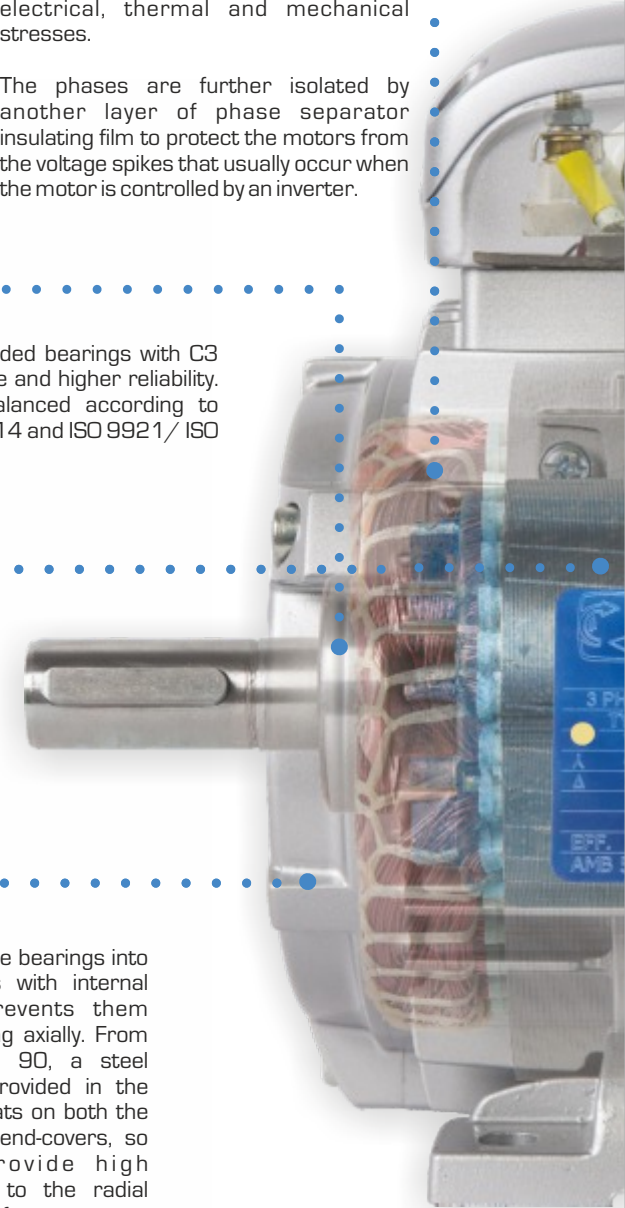
The phases are further isolated by another layer of phase separator insulating film to protect the motors from the voltage spikes that usually occur when the motor is controlled by an inverter.



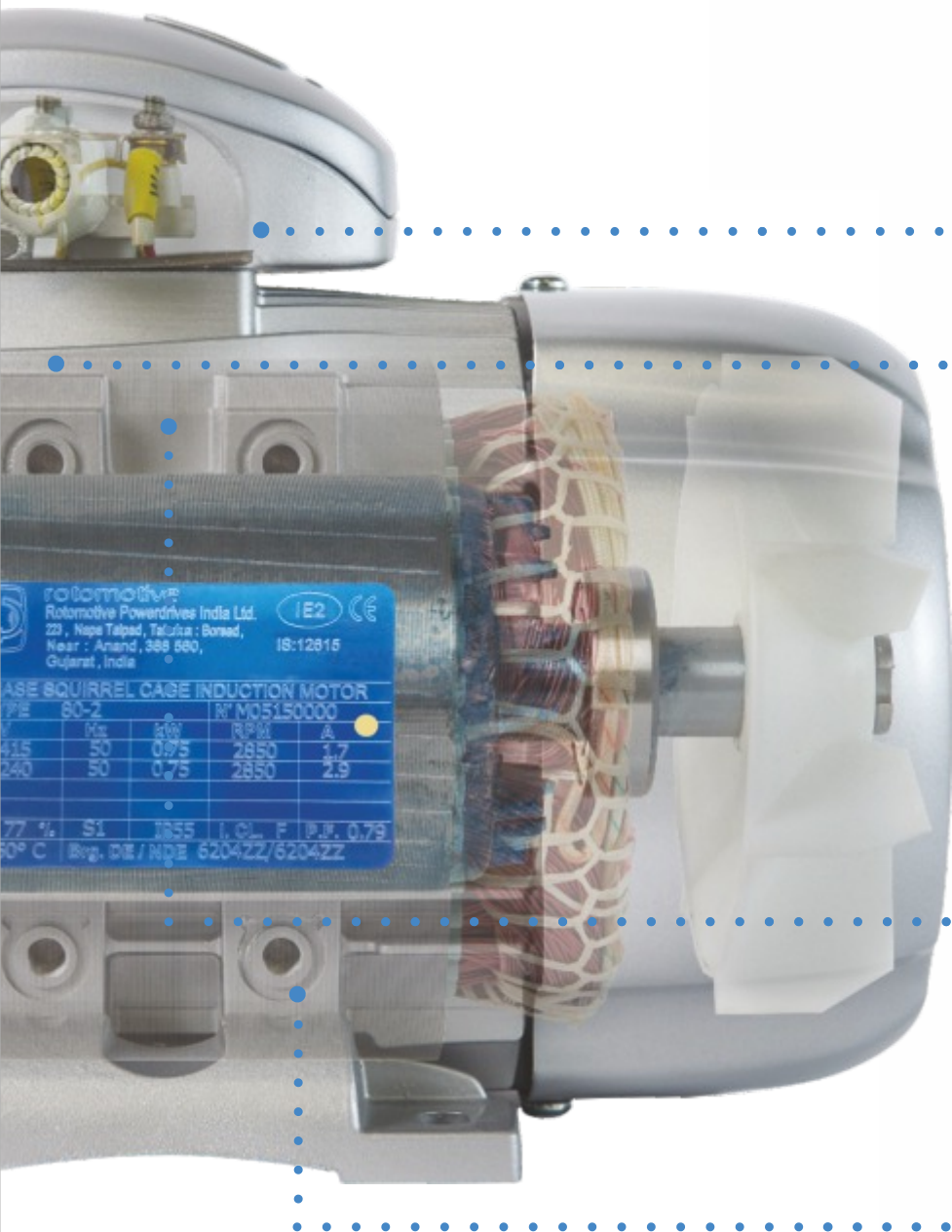
Rotomotive motors use shielded bearings with C3 clearance to ensure low noise and higher reliability. The rotor is dynamically balanced according to IS : 12075 as well as IEC 34-14 and ISO 9921/ ISO 8821 norms.



Securing the bearings into their seats with internal circlips prevents them from moving axially. From frame size 90, a steel insert is provided in the bearing seats on both the aluminium end-covers, so as to provide high resistance to the radial mechanical forces



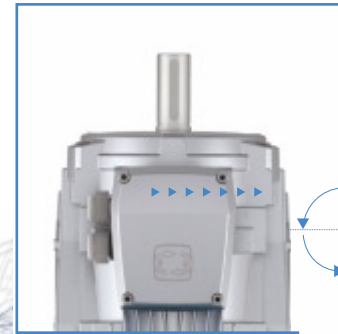
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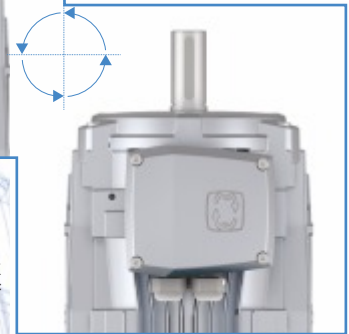
rotomotive  
 Rotomotive Powerdrives India Ltd.  
 223, Napsa Talpad, Taluina : Borwad,  
 Near : Anand, 388 660,  
 Gujarat, India  
 IE2 CE  
 IS-12815  
 BASE SQUIRREL CAGE INDUCTION MOTOR  

SIZE	FR	EFF	RPM	A
415	50	0.95	2850	1.7
240	50	0.75	2850	2.9

  
 77 % S1 1855 I.C.L.F.P.F. 0.79  
 50° C / Brg. DE / NDE 6204ZZ/6204ZZ



Cable gland can be easily moved on both the sides of the terminal box, and other end can be sealed using screwed cap.

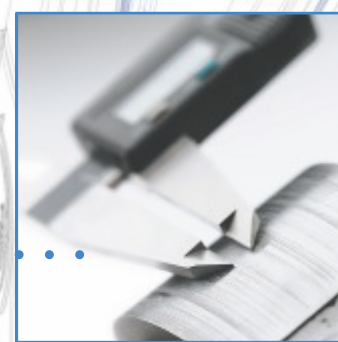


The terminal box can be rotated of 360° in steps of 90°



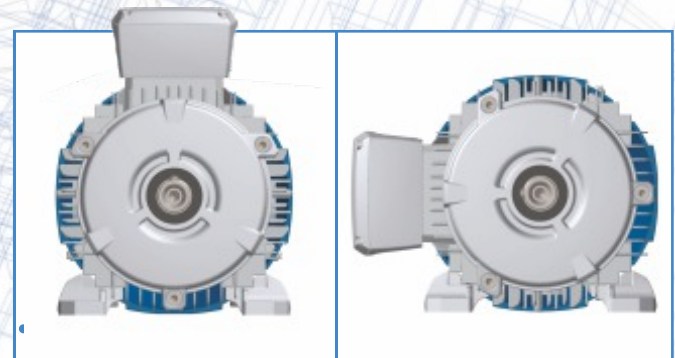
To protect against corrosion and rusting, Rotomotive motors are painted with RAL9006 silver colour upto 132 frame and from frame size 160 onwards, motors are painted with RAL 5007 blue colour.

From size 160 and up, due to the high torque, the motors are fixed with feet that are die-casted with the iron frame



Superior efficiency and performance is achieved through use of low loss CRNO magnetic laminations instead of the usual Semi Processed/Decarb material. CRNO laminations enable higher efficiency, lower heating, promote energy saving, age slower and reduce thermal stresses on insulation materials.

From frame size 56 to 132, Feet and the terminal box can be moved to the right or left



## EFFICIENCY

Limited energy resource and high interest cost of addition of new generation capacity is leading to an increase in the cost of electrical energy in India. The Bureau of Indian standards, with an aim to promote energy conservation has specified efficiency levels for motors termed as 'Energy Efficient motors' in its standard **IS: 12615**. These are categorized as IE2 & IE3.

Rotomotive motors are designed and manufactured to meet all the requirements of the standard IS: 12615 as well as the European agreement issued by the European commission and CEMEP (European Committee of Manufacturers of Electrical Machines and Power Electronics). The prime benefits of using Energy Efficient motors are:

### IMMEDIATE SAVING IN POWER COST:

Though actual savings may depend on type of use and duration, generally, IE3 level motors reduce the power cost by about 20%. For instance, a 15 KW motor for an operation period of 6,000 hours per year can save about 2 MWhr or more, resulting in a **direct saving of about Rupees 8000 per year.**

### HIGHER DURABILITY:

Higher efficiency motors heat less slowing down the aging of the insulating materials and thereby prolonging their reliability and life. Considering an average operation of 2500 hours/ year for motors up to 15KW and 4000 hours / year for motors rated higher than 15KW, the expected life is approximately 12 years.

### ENVIRONMENT FRIENDLY:

Efficiency IE3 motors guarantee great energy and cost savings, and consequently reduce the use of resources which generate CO<sub>2</sub> emissions. This eventually improves the quality of our environment.

### HOW TO MAKE A MORE EFFICIENT MOTOR?:

High efficiency can be seen in many ways: like the relation between output power and input power or like a measure of the losses that occur when converting the electric power into mechanical energy. From another perspective, energy efficient motors consume less energy to produce the same torque at the shaft.

An energy efficient motor is the result of use of low loss materials, precise construction, lower frictional losses, dynamically balanced rotor, and lesser air-gap between rotor and stator. **The main design factors are based on the choice of the type of lamination and windings with a higher conductor diameter.** Among all materials that compose a motor, quality of laminations have the highest influence on performance.

### SILICON MAGNETIC LAMINATIONS

Rotomotive motors are made with **CRNO** magnetic lamination sheets, rather than the usual **Semi Processed/Decarb** lamination sheets.

Apart from the choice of material, the thickness of laminations has a significant impact on performance.

In fact, thinner is the sheet higher is the performance.

The lamination sheets **Semi Processed/Decarb** can reach up to 1mm thickness.

**CRNO** magnetic lamination sheets have a 0.5mm maximum thickness

Material composition and thickness of magnetic laminations result in a very low Watts loss/kg.

**Lower specific losses mean less magnetising current for the same Power and torque (thus lesser heating)**

EURO NDRM	Watts loss/Kg at 1T	Watts loss/Kg at 1.5T
106-84	1.70	4.00

data at 400V 50Hz

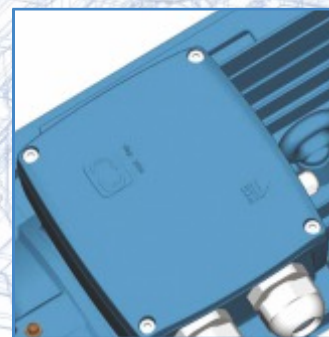
Instead, no standard prescribes a maximum watts loss factor for **Semi processed/Decarb** lamination sheets although it is considered to be generally double of **CRNO** lamination sheet.

There is ofcourse a wide variation even in these values.

Amongst all the raw materials that are used in an asynchronous electric motor, laminations have the greatest contribution in determining the performance.

The main advantages of use of silicon steel laminations are:

- Higher Efficiency
- Better guarantees on the quality consistency, and assurance of achievement of efficiency tolerances specified in International norms.



## PROTECTION TYPE

The protection against accidental human contact, ingress of dust or the entry of water is specified in IS: 4691 by an acronym of 2 letters followed by 2 numbers.

Scheme of IP index for Protection

1<sup>st</sup> Digit. Protection against harmful ingress of solid matter and dust.

2<sup>nd</sup> Digit. Protection against harmful entry of water

Rotomotive motors are with IP55 protection

	1 <sup>st</sup> number	2 <sup>st</sup> number
<b>0</b>	no protection	no protection
<b>1</b>	Protection against solid objects larger than 50mm	Protection against vertical water drops (condensation)
<b>2</b>	Protection against solid objects larger than 12mm	Protection against water drops fall upto <b>15</b> from the vertical
<b>3</b>	Protection against solid objects larger than 2.5mm	Protection against water drops upto <b>60</b> from the vertical
<b>4</b>	Protection against solid objects larger than 1mm	Protection against water splashes from all directions
<b>5</b>	Protection against dust (no deposits of harmful material)	Protection against water jet from a nozzle of 6.3mm D with a water capacity 12.5 lt/min at a distance of maximum 3m for 3 min
<b>6*</b>	Complete protection against ingress of dust.	Protection against jets of water comparable to heavy seas.

\*OPTIONAL

## WORKING CONDITIONS

### HUMIDITY:

Rotomotive motors are suitable for operating in conditions of relative humidity between 30% and 95% (without condensation). Damaging effects of occasional condensation must be avoided by adequate equipment design or if necessary by additional measures (for example built in heating or air conditioning equipment, drain holes).

### ALTITUDE AND TEMPERATURE:

The ratings indicated are at altitudes upto 1000mt above sea level and room temperature between +5°C and +50°C for motors having a rated power below 0.6KW or between -15°C and +50°C for motors having a rated power equal to or greater than 0.6KW (as per IS:12615/IEC 34-1).

Power output decreases by 10% for every 10°C increase in ambient temperature and 8% for each 1000mt increase in altitude.

It is not necessary to reduce the rated power if at an altitude higher than 1000mt and lower than 2000mt there is a max ambient temperature of 30°C or in altitudes from 2000mt to 3000mt there is a max ambient temperature of 19°C. This also holds true when the motors are operated at higher ambients, upto 50°C but at lower altitude.

### VOLTAGE AND FREQUENCY VARIATION:

The maximum permissible variation in the supply voltage is +,-10%. Frequency variation of +,-5% is permissible and overall cumulative variation i.e the sum of variation of voltage and frequency +,-10% is allowed.

### INSULATION:

The windings are vacuum impregnated under pressure with a layer of F class insulating enamel to ensure high resistance to electrical, thermal and mechanical stresses.

Slot insulation comprising of N.P.N insulating paper warps entirely around the coil side insulating the conductor from the body.

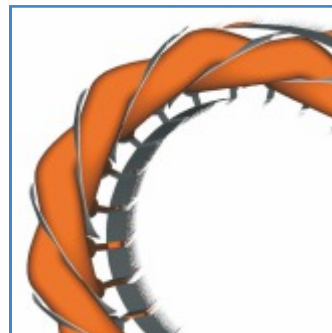
The phases are further isolated from each other by another layer of N.P.N phase separator paper to protect the motors from voltage peaks that usually occur when the motor is controlled by an inverter.

Maximum operating temperatures permitted for stator windings for each insulation class indicated on the motor name-plate.

Class	$\Delta T$ (°C)	T max (°C)
A	60+5 <sup>0</sup>	105
E	75+5 <sup>0</sup>	120
B	80+5 <sup>0</sup>	130
F	105+5 <sup>0</sup>	155
H	125	180

Rotomotive motors are designed to ensure that maximum temperature of the windings do not surpass the permissible temperature of their class even under S1 continuous duty service.

Almost all ratings of Rotomotive motors having class F insulation have the maximum temperature rise limited to the values permitted in Class B over an ambient of 50°C. Motors are suitable for 1.1 service factor with Class F temperature rise.



## ROTOMOTIVE MOTORS PROTECTION

Protections for the motors must be chosen based on the specific running condition according to the standard EN 60204-1

- Protection for motors with a shaft power greater than or equal to 0.5 KW with continuous S1 duty. This protection may be achieved by means of a thermal cut out relay, which can automatically cut off the supply.
- Protection against peak currents by magnetic relay that controls a contactor or by fuses. These must be set to the locked rotor current.
- If the application requires protection against excessive speed of the electric motor in situations where the mechanical load may drive the electric motor itself and thereby create a hazardous situation.
- If special conditions or synchronized operation with other machines or parts of machines require it, protection against power failures or dips by means of a minimum voltage relay that controls a contactor.

The electrical protections on the motor power line may not be sufficient to protect against overloads. If the ambient temperature increases, the motor overheats but the electrical conditions do not change which inhibits line protections. Installing built-in thermal protections on the windings solves this problem.

### ● PTO bimetallic device:

This is a normally closed electromechanical device that opens electrically. When the threshold temperature is reached it automatically resets when the temperature falls below the threshold level. Bimetallic devices are available with various temperature ratings and without automatic reset as per EN 60204-1

### ● PTC thermistor device:

This device promptly changes its resistance once the threshold temperature is reached. ROTOMOTIVE motors from frame size 180 to 355L are equipped with 3 PTC thermistors in the winding with cut-off temperature of 150°C in Class F motors (standard) or 180°C in H Class motors.

### ● PT100 device:

This is a device that continuously changes its resistance according to the temperature. It is useful for continuous measurement of the winding temperatures using electronic equipment.



## WIRING DIAGRAMS

Rotomotive three phase motors can be connected "Star" or "Delta".



### STAR CONNECTION:

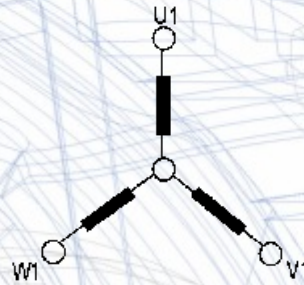
Star connection is obtained by connecting together the terminals W2, U2, V2 and supplying the terminals U1, V1, W1

The phases current and voltage are respectively

$$I_{ph} = I_n$$

$$V_{ph} = V_n / \sqrt{3}$$

Where  $I_n$  is the supply line current and  $V_n$  is the supply line voltage of star connection



The following voltages and frequencies are possible by connection the three phase Rotomotive motors having S1 duty cycle in either Star OR Delta. Typical tolerances for motors of 415V, 50Hz rating are shown.

KW	Hz	Volts			
				Tolerance	
Up to 2.2 KW	50 ± 5 %		230	400	+ 14 / - 7 %
			220	380	+ 15 / - 2 %
			240	415	+ 10 / -10 %
	60 ± 5 %		260	440	+ 15 / - 6 %
			265	460	+ 10 / -10 %
			280	480	+ 5 / -14 %
Above 2.2 KW	50 ± 5 %		400	690	+ 14 / - 7 %
			380	660	+ 15 / - 2 %
			415	720	+ 10 / -10 %
	60 ± 5 %		440	760	+ 15 / - 6 %
			460	795	+ 10 / -10 %
			480	830	+ 5 / -14 %

Voltages or tolerance other than these available on request

### DELTA CONNECTION:

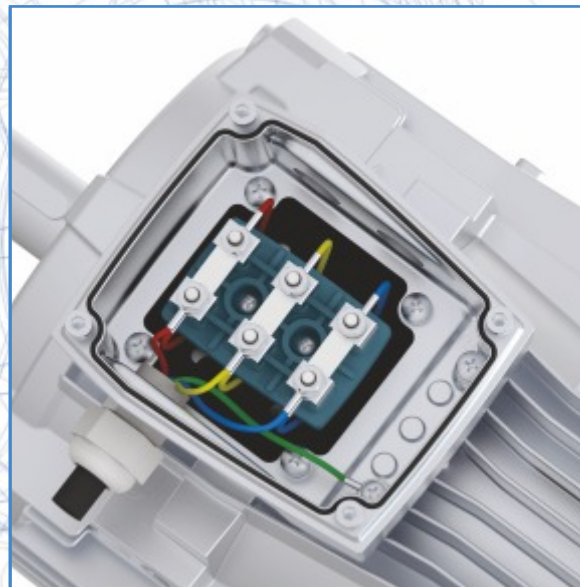
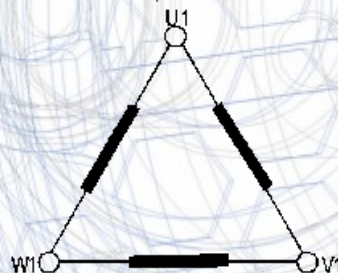
Delta connection is obtained by connecting the end of a phase with the beginning of the following one.

The phase current  $I_{ph}$  and the phase voltage  $V_{ph}$  are respectively:

$$I_{ph} = I_n / \sqrt{3}$$

$$V_{ph} = V_n$$

Where  $I_n$  and  $V_n$  are referred to Delta connection.



The general electrical specifications are listed in the performance charts that follow. To understand their contents, the following general definitions are provided.

**Rated Power:**  
It is the Electrical equivalent of mechanical power measured at the shaft and expressed according to the terminology of International Standards Committees, in Watts or Kilowatts. However it is still common to refer to power in terms of Horsepower (HP).

**Rated Voltage:**  
The voltage to be applied to the motor terminals in accordance with the specifications listed in the following tables

**Frequency:**  
All electrical data in this catalogue refer to three phase induction motors at 50 Hz. These may be connected to 60 Hz taking into account the multiplier coefficients in the table below

**Rated Current:**  
"In" is the rated current expressed in Amperes, drawn by the motor when supplied at rated voltage and delivering the rated power. In the following tables the rated currents are referred to a Voltage supply of 415V. For other voltage ratings, the absorbed rated current can be considered inversely proportional to the voltage supply. EX:

Volt	240	400	415	440	690
In	1.74	1.04	1.0	0.94	0.60

**Over Load Current:**  
Rotomotive motors can also withstand temporary overloads, with current increases of 1.5 times the rated current for 2 minutes.

rated voltage at 50Hz	Volt at 60Hz	rated power W	rpm	In	Ia In	Ca Cn	Cmax Cn
240	240	1.1	1.2	1.15	0.9	0.9	0.9
240	260	1.2	1.2	1	1	1	1
415	415	1	1.2	1.2	0.8	0.8	0.8
415	440	1.06	1.2	1.1	0.87	0.87	0.87
415	460	1.2	1.2	1	1	1	1
415	480	1.25	1.2	1	1.1	1.1	1.1

for further information, see chapter "wiring diagrams" at page 9

**Starting current (or locked rotor current):**  
In the performance charts the starting current "Is" is indicated as a multiple value of the rated current (Is/In)

**Synchronous Speed:**  
Synchronous Speed (Ns) is expressed in rpm and it is obtained by the formula  

$$N_s = (120 \times f) / P$$
 f= supply frequency Hz  
 P= number of poles pairs

**Rated Torque:**  
Cn is expressed in Nm and it corresponds to the rated power and rated rpm. It is given by the multiplication of the force for the arm (distance) and it is measured in Nm because the force is expressed in Newton and the distance in meters The rated torque value is obtained by the formula  

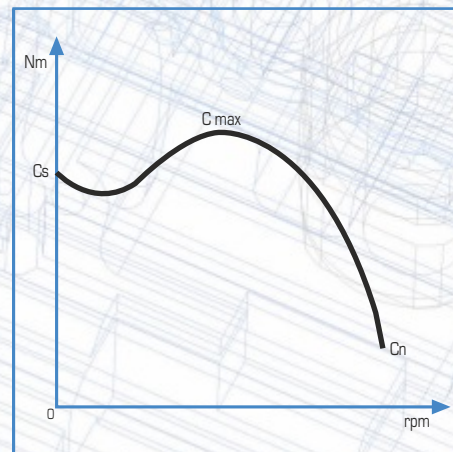
$$C_n \text{ (Nm)} = 9550 \times (P_n / n)$$

$$P_n = \text{Rated Power in KW}$$

$$N = \text{Rated rotation speed in rpm}$$

**Starting torque (or locked rotor torque):**  
Cs is the torque that the motor can develop with the rotor at a standstill and the rated power supply.

**Maximum torque (Pull out Torque):**  
Cmax is the maximum torque developed by the motor at the rated power supply at a certain speed.



It represents also the value of the stall torque/pull out torque after which the motor stops.  
In the following performance charts, it is indicated the relation between maximum torque and rated torque and maximum torque (Cmax / Cn)

**Efficiency:**  
η is expressed in % and it is given by the relation between the output power and the addition of output Power and the electric losses of the motor, that is the input power consumed by the motor. The electric motors losses are mainly of two kinds: copper losses and iron losses. These losses are lost in form of heat. Higher efficiency means energy savings, lower heating, longer life of insulating materials.

**Power factor or cos Ø:**  
It represents the cosine of the voltage and current gap angle

**Noise:**  
The noise is expressed in dB (A). The measurement must be taken in accordance with the standard IS: 12065/ ISO 1680-2, in order to find the Sound Power level LwA measured at a distance of 1m from the machine. This standard describes the acoustic Power limits to be followed, indicating the maximum sound power level LwA. The noise values indicated in the performance charts that follow are for the motors operating in no-load condition, supplied at 50Hz and with a tolerance of +3 dB (A)

The moment of inertia can be calculated in this way:  

$$J = [1/2] \times M \times R^2$$
 Where M [Kg] is the mass which is rotated, while R (m) is the radius of the rotor/ rotating mass.

### TOLERANCES

The data of each motor are specified in this catalogue like requested by the norm IS: 325. This describes in particular the following tolerance:

Characteristic	Tolerance
Efficiency (Output Power input Power)	-15% di [1- n]
Power factor	1/ 6 of [1- cos Ø] min. 0.02 max 0.07
Locked rotor torque	-15% of the guaranteed torque +25% of the guaranteed torque
Maximum torque	-10% of the guaranteed torque, if torque is not less than 1.5- 1.6 the rated torque
Noise	+3dB(A)





# PERFORMANCE CHART

2 Poles asynchronous speed 3000 rpm

Power KW	Power HP	Type	Frame	rpm	Current In (A)	Current Is/In	Torque Cn (Nm)	Torque Cs/Cn	Torque Cmax/Cn	Efficiency 100%	Efficiency 75%	Power Factor 100%	Power Factor 75%	Noise Level (dB)	J Kgm <sup>2</sup>	Kgs
Standard efficiency																
0.09	0.12	56A-2	56	2740	0.3	4.5	0.31	2.2	2.3	62.0	61.0	0.77	0.71	65	0.00010	3.5
IE 2 high efficiency																
0.12	0.18	56B-2	56	2740	0.3	4.5	0.42	2.2	2.3	64.0	63.0	0.78	0.72	65	0.00020	3.6
0.18	0.25	63A-2	63	2740	0.5	4.5	0.63	2.4	2.4	66.0	66.0	0.80	0.74	68	0.00031	4.5
0.25	0.35	63B-2	63	2750	0.6	4.5	0.87	2.5	2.6	70.0	69.0	0.81	0.75	68	0.00040	4.7
0.37	0.5	71A-2	71	2810	0.9	5.5	1.26	2.6	3.5	72.2	71.5	0.79	0.73	70	0.00050	6
0.55	0.75	71B-2	71	2780	1.3	5.5	1.89	3.0	3.0	74.8	73.6	0.79	0.73	70	0.00060	6.30
0.75	1	80A-2	80	2850	1.7	5.5	2.51	2.8	3.0	78.0	77.0	0.79	0.74	73	0.00075	10
1.1	1.5	80B-2	80	2850	2.4	5.5	3.70	2.6	2.9	80.0	79.0	0.80	0.75	73	0.00090	11
1.5	2	90S-2	90S	2850	3.2	5.5	5.03	2.8	3.0	81.3	81.0	0.80	0.75	75	0.00120	13
2.2	3	90L-2	90L	2840	4.3	5.5	7.40	2.3	2.6	83.2	82.5	0.85	0.80	75	0.00140	14
3.7	5	100L-2	100L	2880	7.1	6.0	12.28	2.3	2.6	85.9	85.0	0.85	0.81	76	0.00400	27
5.5	7.5	132SA-2	132S	2900	10.2	6.0	18.12	1.8	2.6	87.2	86.6	0.86	0.81	80	0.01190	40
7.5	10	132SB-2	132S	2900	13.3	6.5	24.70	1.8	2.8	88.2	87.7	0.89	0.87	80	0.01260	45
11	15	160MA-2	160M	2910	19.4	6.5	36.10	2.3	2.5	89.5	89.0	0.88	0.83	86	0.04990	120
15	20	160MB-2	160M	2910	26.5	6.5	49.22	2.3	2.5	90.4	90.1	0.87	0.86	86	0.05500	135
18.5	25	160L-2	160L	2910	31.7	6.5	60.71	2.3	2.5	91.1	90.7	0.89	0.86	86	0.06600	155
22	30	180M-2	180M	2940	37.6	7.0	71.50	2.0	2.3	91.4	90.4	0.89	0.86	89	0.07500	165
30	40	200LA-2	200L	2950	53.3	7.0	97.17	2.0	2.3	92.2	91.1	0.85	0.83	92	0.12400	217
37	50	200LB-2	200L	2950	66.2	7.0	119.84	2.0	2.3	92.5	91.3	0.84	0.83	92	0.13900	243
45	60	225M-2	225M	2970	75.6	7.0	144.77	2.0	2.3	93.0	91.4	0.89	0.85	92	0.23300	320
55	75	250M-2	250M	2970	95.4	7.0	176.93	2.0	2.3	93.3	92.5	0.86	0.84	93	0.31200	390
75	100	280S-2	280S	2970	129.2	7.0	241.27	2.0	2.3	93.9	93.3	0.86	0.84	94	0.57900	540
90	120	280M-2	280M	2970	147.7	7.0	289.52	2.0	2.3	94.2	93.6	0.90	0.85	94	0.67500	590
110	150	315S-2	315S	2975	178.1	7.0	353.26	1.8	2.2	94.4	93.8	0.91	0.86	96	1.18000	880
132	180	315MA-2	315M	2975	213.1	7.0	423.91	1.8	2.2	94.7	93.9	0.91	0.86	96	1.82000	1000
160	220	315LA-2	315M	2975	255.0	7.0	513.84	1.8	2.2	94.9	94.1	0.92	0.87	99	2.08000	1055
200	270	315LB-2	315M	2975	318.0	7.0	642.30	1.8	2.2	95.1	94.5	0.92	0.87	99	2.38000	1110
250	340	355M-2	355M	2975	397.5	7.0	802.87	1.8	2.2	95.1	94.6	0.92	0.88	103	3.00000	1900
315	430	355L-2	355L	2975	500.9	7.0	1011.61	1.8	2.2	95.1	94.6	0.92	0.88	103	3.50000	2300

• Efficiency is without seals. • All these performance values are declared at rated voltage 415 V frequency 50 Hz and are subjected to tolerances as per IS: 12615.



# PERFORMANCE CHART

4 Poles asynchronous speed 1500 rpm

Power KW	Power HP	Type	Frame	rpm	Current In [A]	Current Is/In	Torque Cn [Nm]	Torque Cs/Cn	Torque Cmax/Cn	Efficiency 100%	Efficiency 75%	Power Factor 100%	Power Factor 75%	Noise Level (dB)	J Kgm <sup>2</sup>	Kgs
Standard efficiency																
0.06	0.09	56A-4	56	1325	0.2	4.0	0.43	2.0	2.1	56.0	55.5	0.69	0.61	52	0.00015	3.5
0.09	0.12	56B-4	56	1325	0.3	4.0	0.65	2.0	2.1	58.0	57.5	0.70	0.61	52	0.00015	3.6
IE-2 high efficiency																
0.12	0.18	63A-4	63	1350	0.4	4.0	0.85	2.2	2.2	60.0	60.0	0.70	0.64	52	0.00030	4.5
0.18	0.25	63B-4	63	1380	0.5	4.0	1.25	2.4	2.4	67.0	66.0	0.70	0.64	52	0.00040	4.7
0.25	0.35	71A-4	71	1350	0.7	4.0	1.77	2.3	2.3	68.5	67.0	0.70	0.62	60	0.00050	6.0
0.37	0.5	71B-4	71	1350	1.0	4.5	2.62	2.3	2.3	72.7	71.8	0.72	0.66	60	0.00080	6.30
0.55	0.75	80A-4	80	1380	1.4	4.5	3.81	2.5	3.0	77.1	76.4	0.72	0.65	65	0.00180	10
0.75	1	80B-4	80	1390	1.8	4.5	5.15	2.5	3.0	79.6	79.1	0.72	0.64	65	0.00220	12.5
1.1	1.5	90S-4	90S	1410	2.5	5.0	7.45	2.1	2.2	81.4	80.6	0.75	0.7	61	0.00270	14
1.5	2	90L-4	90L	1410	3.4	5.0	10.16	2.8	3.0	82.9	82.5	0.74	0.7	72	0.00410	16
2.2	3	100L-4	100L	1440	4.5	5.0	14.60	2.8	2.9	84.4	84.4	0.80	0.74	64	0.00670	27
3.7	5	112M-4	112M	1425	7.6	5.0	24.79	2.1	2.2	86.6	86.3	0.78	0.73	65	0.01500	35
5.5	7.5	132S-4	132S	1445	11.2	5.5	36.37	1.9	2.2	87.8	87.4	0.78	0.72	71	0.02140	45
7.5	10	132M-4	132M	1455	14.7	5.5	49.25	2.0	2.2	88.7	88.5	0.80	0.74	71	0.02960	55
11	15	160M-4	160M	1460	20.0	6.0	71.99	2.2	2.3	89.8	89.0	0.85	0.80	75	0.07470	118
15	20	160L-4	160L	1470	27.0	6.0	97.50	2.2	2.3	90.8	89.8	0.85	0.80	75	0.09180	132
18.5	25	180M-4	180M	1470	31.7	6.5	120.25	2.2	2.3	91.2	90.7	0.89	0.84	76	0.13900	164
22	30	180L-4	180L	1470	38.0	6.5	143.00	2.2	2.3	91.6	91.0	0.88	0.83	76	0.15800	182
30	40	200L-4	200L	1470	51.4	6.5	195.00	2.2	2.3	92.3	91.8	0.88	0.84	79	0.26200	245
37	50	225S-4	225S	1480	63.8	6.5	238.90	2.2	2.3	92.8	92.3	0.87	0.83	81	0.40600	258
45	60	225M-4	225M	1480	75.4	6.5	290.50	2.2	2.3	93.3	92.8	0.89	0.84	81	0.46900	290
55	75	250M-4	250M	1480	95.1	6.5	355.05	2.2	2.3	93.6	92.5	0.86	0.84	81	0.66000	388
75	100	280S-4	280S	1480	128.9	7.0	484.16	2.2	2.3	94.1	93.3	0.86	0.84	86	1.12000	510
90	120	280M-4	280M	1480	147.5	7.0	581.00	2.2	2.3	94.3	93.6	0.90	0.85	86	1.46000	606
110	150	315S-4	315S	1480	177.8	6.5	710.11	2.1	2.2	94.6	93.8	0.91	0.86	93	3.11000	910
132	180	315M-4	315M	1480	212.9	6.5	852.13	2.1	2.2	94.8	93.9	0.91	0.86	93	3.62000	1000
160	220	315LA-4	315L	1480	254.7	6.5	1032.88	2.1	2.2	95.0	94.1	0.92	0.87	97	4.13000	1055
200	270	315LB-4	315L	1480	317.7	6.5	1291.10	2.1	2.2	95.2	94.5	0.92	0.87	97	4.73000	1125
250	340	355M-4	355M	1480	397.1	6.5	1613.88	2.1	2.2	95.2	94.6	0.92	0.88	101	6.50000	1700
315	430	355L-4	355L	1480	500.4	6.5	2033.48	2.1	2.2	95.2	94.6	0.92	0.88	101	8.20000	1900

• Efficiency is without seals. • All these performance values are declared at rated voltage 415 & frequency 50 Hz and are subjected to tolerances as per IS : 12615.



# PERFORMANCE CHART

6 Poles asynchronous speed 1000 rpm

Power KW	Power HP	Type	Frame	rpm	Current In (A)	Current Is/In	Torque Cn (Nm)	Torque Cs/Cn	Torque Cmax/Cn	Efficiency 100%	Efficiency 75%	Power Factor 100%	Power Factor 75%	Noise Level (dB)	J Kg <sup>m</sup> <sup>2</sup>	Kgs
IE-2 high efficiency																
0.18	0.25	71A-6	71	900	0.6	4.0	1.91	1.9	2.0	60.0	60.0	0.68	0.60	52	0.00110	6
0.25	0.35	71B-6	71	900	0.9	4.0	2.65	1.9	2.0	61.6	60.0	0.68	0.61	52	0.00140	6.3
0.37	0.5	80A-6	80	900	1.0	4.0	3.93	1.9	2.0	69.2	68.2	0.70	0.64	54	0.00190	10
0.55	0.75	80B-6	80	900	1.5	4.0	5.84	1.9	2.1	73.1	71.8	0.70	0.65	54	0.00290	11
0.75	1	90S-6	90S	930	1.9	4.0	7.75	2.1	2.3	76.0	75.0	0.71	0.62	57	0.00350	14
1.1	1.5	90L-6	90L	930	2.8	4.0	11.30	2.2	2.4	78.3	78.0	0.71	0.62	57	0.00390	15
1.5	2	100L-6	100L	940	3.7	4.5	15.25	2.1	2.3	79.9	79.7	0.71	0.62	61	0.00850	25
2.2	3	112M-6	112M	940	5.1	5.5	22.36	2.1	2.5	81.9	81.7	0.73	0.64	65	0.01600	28
3.7	5	132S-6	132S	950	8.3	5.0	37.21	1.9	2.1	85.0	84.0	0.73	0.65	69	0.03570	44
5.5	7.5	132M-6	132M	960	12.0	5.5	54.74	1.8	2.1	86.5	85.5	0.74	0.69	69	0.04490	55
7.5	10	160M-6	160M	965	15.9	5.5	74.26	2.0	2.1	87.3	86.8	0.75	0.69	69	0.08100	78
11	15	160L-6	160L	965	21.5	5.5	108.85	2.1	2.4	89.0	88.5	0.80	0.71	73	0.12860	99
15	20	180L-6	180L	970	28.7	6.5	147.76	2.0	2.1	89.8	89.2	0.81	0.74	73	0.20700	160
18.5	25	200LA-6	200L	970	35.1	6.5	182.23	2.0	2.1	90.6	90.0	0.81	0.75	76	0.31500	217
22	30	200LB-6	200L	970	40.5	6.5	216.71	2.0	2.1	91.1	90.6	0.83	0.75	76	0.36000	244
30	40	225M-6	225M	980	54.1	6.5	292.50	2.0	2.1	91.8	90.8	0.84	0.77	76	0.54700	295
37	50	250M-6	250M	980	65.6	6.5	360.72	2.0	2.1	92.3	92.0	0.85	0.77	78	0.84300	365
45	60	280S-6	280S	980	78.4	6.5	438.71	2.0	2.1	92.8	92.1	0.86	0.79	80	1.39000	500
55	75	280M-6	280M	980	95.5	6.5	536.20	2.0	2.1	93.2	92.4	0.86	0.80	85	1.65000	545
75	100	315S-6	315S	980	129.3	6.5	731.18	2.0	2.0	93.8	92.0	0.86	0.80	85	4.11000	810
90	120	315MA-6	315M	980	154.7	6.5	877.42	2.0	2.0	94.1	93.5	0.86	0.80	85	4.78000	900
110	150	315LA-6	315L	980	188.5	6.5	1072.40	2.0	2.0	94.4	93.7	0.86	0.80	85	5.45000	1010
132	180	315LB-4	315L	980	225.5	6.5	1286.88	2.0	2.0	94.7	93.7	0.86	0.80	85	6.12000	1140
160	220	355MA-6	355M	980	266.5	6.5	1559.86	1.9	2.0	94.9	94.2	0.88	0.80	92	9.50000	1550
200	270	355MB-6	355M	980	332.5	6.5	1949.82	1.9	2.0	95.1	94.6	0.88	0.80	92	10.40000	1600
250	340	355L-6	355L	980	415.6	6.5	2437.28	1.9	2.0	95.1	94.5	0.88	0.80	92	12.40000	1700

• Efficiency is without seals. • All these performance values are declared at rated voltage 415 & frequency 50 Hz and are subjected to tolerances as per IS :12615.



# PERFORMANCE CHART

IE2- high efficiency 8 Poles asynchronous speed 750 rpm

Power KW	Power HP	Type	Frame	rpm	Current In [A]	Current Is/In	Torque Cn [Nm]	Torque Cs/Cn	Torque Cmax/ Cn	Efficiency 100%	Efficiency 75%	Power Factor 100%	Power Factor 75%	Noise Level [dB]	J Kg <sup>m</sup> <sup>2</sup>	Kg
1.5	2	112M-8	112M	690	3.9	5.0	20.77	1.8	2.0	75.5	74.6	0.70	0.60	60	0.00245	28
2.2	3	132S-8	132S	705	5.5	6.0	29.81	1.8	2.0	78.5	77.6	0.71	0.65	64	0.03140	45
3.7	5	160MA-8	160M	720	8.6	6.0	49.10	1.9	2.0	81.9	81.1	0.73	0.66	68	0.07530	105
5.5	7.5	160MA-8	160M	720	12.3	6.0	72.98	2.0	2.0	83.8	83.0	0.74	0.67	68	0.09310	115
7.5	10	160L-8	160L	720	16.2	6.0	99.52	2.0	2.0	85.9	85.2	0.75	0.67	70	0.12600	135
11	15	180L-6	180L	730	22.9	5.5	143.97	2.0	2.0	88.0	88.3	0.76	0.68	73	0.20300	160
15	20	200L-6	200L	730	31.0	6.6	196.32	2.0	2.0	88.6	88.3	0.76	0.68	73	0.33900	235
18.5	25	225S-8	225S	730	37.8	6.6	242.13	1.9	2.0	89.5	88.7	0.76	0.68	73	0.49100	242
22	30	225M-8	225M	730	43.1	6.6	287.93	1.9	2.0	91.0	90.2	0.78	0.70	73	0.54700	285
30	40	250M-8	250M	730	57.9	6.6	392.64	1.9	2.0	91.3	90.6	0.79	0.72	75	0.84300	390
37	50	280S-8	280S	730	71.0	6.6	484.25	1.9	2.0	91.8	91.2	0.79	0.73	76	1.93000	500
45	60	280M-8	280M	735	85.7	6.6	584.95	1.8	2.0	92.5	91.9	0.79	0.73	76	2.25000	580
55	75	315S-8	315S	735	101.6	6.6	714.94	1.8	2.0	93.0	92.3	0.81	0.75	82	4.79000	790
75	100	315MA-8	315M	735	138.2	6.6	974.91	1.8	2.0	93.2	92.5	0.81	0.75	82	5.58000	970
90	120	315MB-8	315M	735	162.4	6.6	1169.89	1.8	2.0	94.0	93.4	0.82	0.76	82	6.37000	1055
110	150	315MC-8	315M	735	198.1	6.6	1429.87	1.8	2.0	94.2	93.6	0.82	0.76	82	7.23000	1118

- Efficiency is without seals.
- All these performance values are declared at rated voltage 415 & frequency 50 Hz and are subjected to tolerances as per IS : 12615.



## PERFORMANCE CHART

IE3, Premium efficiency 2 Poles asynchronous speed 3000 rpm

Power KW	Power HP	Type	Frame	rpm	Current In [A]	Current Is/In	Torque Cn [Nm]	Torque Cs/Cn	Torque Cmax/Cn	Efficiency 100%	Efficiency 75%	Power Factor 100%	Power Factor 75%	Noise Level [dB]	J Kg <sup>m</sup> <sup>2</sup>	Kgs
0.37	0.5	71A-2	71	2810	0.8	5.5	1.26	2.6	3.5	75.7	74.1	0.81	0.75	70	0.00061	7
0.55	0.75	71B-2	71	2780	1.2	5.5	1.89	3.0	3.0	78.2	77.4	0.80	0.74	70	0.00066	8
0.75	1	80A-2	80	2850	1.61	5.5	2.51	2.8	3.0	80.9	79.9	0.80	0.74	73	0.00090	11
1.1	1.5	80B-2	80	2810	2.37	5.5	3.71	2.8	3.0	82.9	81.0	0.78	0.76	75	0.00105	12.5
1.5	2	90S-2	90S	2860	3.13	5.5	5.01	2.8	3.0	84.5	84.0	0.79	0.73	75	0.00120	13
2.2	3	90L-2	90L	2860	4.24	5.5	7.35	2.3	2.6	85.9	85.0	0.84	0.80	75	0.00215	18
3.7	5	100L-2	100L	2870	7.04	6.0	12.31	2.3	2.6	88.1	87.6	0.83	0.78	76	0.00420	27
5.5	7.5	132SA-2	132S	2900	10.12	6.0	18.11	1.8	2.6	90.0	89.2	0.84	0.81	80	0.01190	40
7.5	10	132SB-2	132S	2900	13.25	6.5	24.70	1.8	2.8	90.5	90.0	0.87	0.84	80	0.01260	45
11	15	160MA-2	160M	2930	19.25	6.5	36.10	2.3	2.5	91.4	90.8	0.87	0.85	86	0.04990	120
15	20	160MB-2	160M	2930	26.38	6.5	48.89	2.3	2.5	92.0	91.5	0.86	0.84	86	0.05500	135
18.5	25	160L-2	160L	2930	31.59	6.5	60.29	2.3	2.5	92.6	92.0	0.88	0.86	86	0.06600	155
22	30	180M-2	180M	2940	37.48	7.0	71.50	2.0	2.3	92.8	91.8	0.88	0.86	89	0.07650	168
30	40	200LA-2	200L	2940	52.57	7.0	97.45	2.0	2.3	93.4	92.3	0.85	0.83	92	0.12640	221
37	50	200LB-2	200L	2950	65.33	7.0	119.84	2.0	2.3	93.8	92.6	0.84	0.83	92	0.14178	248
45	60	225M-2	225M	2970	74.75	7.0	144.77	2.0	2.3	94.1	92.5	0.89	0.85	92	0.23766	326
55	75	250M-2	250M	2970	93.2	7.0	176.93	2.0	2.3	94.4	93.5	0.87	0.85	93	0.31800	429
75	100	280S-2	280S	2970	128.0	7.0	241.27	2.0	2.3	94.8	93.9	0.86	0.83	94	0.59000	594
90	120	280M-2	280M	2970	146.3	7.0	289.52	2.0	2.3	95.1	94.5	0.90	0.85	94	0.68800	649
110	150	315S-2	315S	2975	176.5	7.0	353.26	1.8	2.2	95.3	94.6	0.91	0.85	96	1.20000	968
132	180	315MA-2	315M	2975	211.3	7.0	423.91	1.8	2.2	95.5	94.8	0.91	0.87	96	1.85000	1100
160	220	315LA-2	315L	2975	252.8	7.0	513.84	1.8	2.2	95.7	95.0	0.92	0.86	99	2.13000	1161
200	270	315LB-2	315L	2975	315.4	7.0	642.30	1.8	2.2	95.9	95.0	0.92	0.87	99	2.42700	1221
250	340	355M-2	355M	2975	394.2	7.0	802.87	1.8	2.2	95.9	95.1	0.92	0.88	103	3.06000	2090
315	430	355L-2	355L	2975	496.7	7.0	1011.61	1.8	2.2	95.9	95.1	0.92	0.88	103	3.60500	2530

• Efficiency is without seals. • All these performance values are declared at rated voltage 415 & frequency 50 Hz and are subjected to tolerances as per IS :12615.



# PERFORMANCE CHART

IE3, Premium efficiency 4 Poles asynchronous speed 1500 rpm

Power KW	Power HP	Type	Frame	rpm	Current In [A]	Current Is/In	Torque Cn [Nm]	Torque Cs/Cn	Torque Cmax/Cn	Efficiency 100%	Efficiency 75%	Power Factor 100%	Power Factor 75%	Noise Level [dB]	J Kg <sup>m</sup> <sup>2</sup>	Kgs
0.37	0.5	71B-4	71	1350	0.93	4.5	2.62	2.3	2.3	77.3	76.4	0.72	0.65	60	0.00092	7
0.55	0.75	80A-4	80	1380	1.3	4.5	3.81	2.5	3.0	80.8	80.0	0.73	0.66	65	0.00201	12
0.75	1	80-4	80	1390	1.75	4.5	5.15	2.5	3.0	82.6	82.3	0.72	0.64	65	0.00220	12.5
1.1	1.5	90S-4	90S	1420	2.42	5.0	7.40	2.1	2.2	84.2	83.6	0.75	0.70	61	0.00270	14
1.5	2	90L-4	90L	1410	3.26	5.0	10.16	2.8	3.0	85.4	84.7	0.75	0.71	72	0.00410	16
2.2	3	100L-4	100L	1440	4.36	5.0	14.59	2.8	2.9	86.7	86.4	0.81	0.74	64	0.00670	27
3.7	5	112M-4	112M	1430	7.44	5.0	24.71	2.1	2.2	88.7	88.2	0.78	0.72	65	0.01500	35
5.5	7.5	132S-4	132S	1455	10.38	5.5	36.10	1.9	2.2	89.9	89.4	0.82	0.77	71	0.02960	55
7.5	10	132M-4	132M	1460	14.08	6.0	49.05	2.6	3.0	90.4	90.0	0.82	0.77	71	0.03100	59
11	15	160M-4	160M	1460	19.91	6.5	71.95	2.2	2.3	91.5	91.0	0.84	0.80	75	0.09180	125
15	20	160L-4	160L	1470	26.63	6.5	97.44	2.2	2.3	92.2	91.5	0.85	0.83	75	0.11000	140
18.5	25	180M-4	180M	1470	31.23	6.5	120.25	2.2	2.3	92.6	92.0	0.89	0.84	76	0.14462	167
22	30	180L-4	180L	1470	38.19	6.5	143.00	2.2	2.3	93.2	92.6	0.86	0.82	76	0.16438	189
30	40	200L-4	200L	1470	51.25	6.5	195.00	2.2	2.3	93.6	92.2	0.87	0.84	79	0.27258	255
37	50	225S-4	225S	1480	63.01	6.5	238.90	2.2	2.3	93.9	93.2	0.87	0.84	81	0.42240	268
45	60	225M-4	225M	1480	74.60	6.5	290.50	2.2	2.3	94.3	92.8	0.89	0.85	81	0.48795	301
55	75	250M-4	250M	1480	92.9	6.5	355.05	2.2	2.3	94.7	94.1	0.87	0.85	81	0.69300	426.8
75	100	280S-4	280S	1480	126.1	7.0	484.16	2.2	2.3	95.1	94.5	0.87	0.85	86	1.17600	561
90	120	280M-4	280M	1480	146.0	7.0	581.00	2.2	2.3	95.3	94.6	0.90	0.86	86	1.53300	666.6
110	150	315S-4	315S	1480	176.1	6.5	710.11	2.1	2.2	95.5	94.8	0.91	0.87	93	3.26550	1001
132	180	315M-4	315M	1480	210.9	6.5	852.13	2.1	2.2	95.7	95.0	0.91	0.87	93	3.80100	1100
160	220	315LA-4	315L	1480	252.3	6.5	1032.88	2.1	2.2	95.9	95.1	0.92	0.87	97	4.33650	1160.5
200	270	315LB-4	315L	1480	314.7	6.5	1291.10	2.1	2.2	96.1	95.3	0.92	0.88	97	4.96650	1240.8
250	340	355M-4	355M	1480	393.4	6.5	1613.88	2.1	2.2	96.1	95.3	0.92	0.88	101	6.82500	1870
315	430	355L-4	355L	1480	495.7	6.5	2033.48	2.1	2.2	96.1	95.4	0.92	0.88	101	8.61000	2090

• Efficiency is without seals. • All these performance values are declared at rated voltage 415 & frequency 50 Hz and are subjected to tolerances as per IS :12615.



## PERFORMANCE CHART

IE3, Premium efficiency 6 Poles asynchronous speed 1000 rpm

Power KW	Power HP	Type	Frame	rpm	Current In [A]	Current Is/In	Torque Cn [Nm]	Torque Cs/Cn	Torque Cmax/Cn	Efficiency 100%	Efficiency 75%	Power Factor. 100%	Power Factor 75%	Noise Level [dB]	J Kgm <sup>2</sup>	Kgs
0.37	0.5	80A-6	80	900	1.02	4.0	3.93	1.9	2.0	73.5	72.6	0.69	0.64	54	0.00190	10
0.55	0.75	80B-6	80	900	1.43	4.0	5.84	1.9	2.1	77.2	76.4	0.70	0.65	54	0.00290	11
0.75	1	90S-6	90S	930	1.86	4.0	7.70	2.1	2.4	78.9	78.0	0.71	0.64	57	0.00350	14
1.1	1.5	90L-6	90L	930	2.62	4.0	11.29	2.2	2.4	81.0	79.8	0.72	0.63	57	0.00390	15
1.5	2	100L-6	100L	940	3.56	4.5	15.24	2.1	2.3	82.5	81.0	0.71	0.62	61	0.00850	25
2.2	3	112M-6	112M	940	4.97	5.5	22.35	2.1	2.5	84.3	83.3	0.73	0.64	65	0.01600	28
3.7	5	132S-6	132S	960	8.12	6.0	36.80	2.0	2.4	86.8	86.0	0.73	0.65	69	0.03920	49
5.5	7.5	132M-6	132M	965	11.75	5.5	54.43	2.3	2.5	88.0	87.0	0.74	0.69	69	0.04900	59
7.5	10	160M-6	160M	965	15.6	5.5	74.25	2.0	2.1	89.2	88.5	0.75	0.70	69	0.08503	85
11	15	160L-6	160L	965	21.2	5.5	108.91	2.1	2.4	90.4	89.8	0.80	0.75	73	0.13500	110
15	20	180L-6	180L	970	28.2	6.5	147.74	2.0	2.1	91.3	90.6	0.81	0.76	73	0.21735	176
18.5	25	200LA-6	200L	970	34.6	6.5	182.22	2.0	2.1	91.8	91.0	0.81	0.76	76	0.33075	238
22	30	200LB-6	200L	970	40.0	6.5	216.69	2.0	2.1	92.3	91.6	0.83	0.77	76	0.37800	265
30	40	225M-6	225M	980	53.4	6.5	292.47	2.0	2.1	93.0	92.6	0.84	0.77	76	0.57400	330
37	50	250M-6	250M	980	64.8	6.5	360.72	2.0	2.1	93.4	92.6	0.85	0.78	78	0.85986	401.5
45	60	280S-6	280S	980	77.6	6.5	438.71	2.0	2.1	93.8	93.1	0.86	0.79	80	1.41780	550
55	75	280M-6	280M	980	94.5	6.5	536.20	2.0	2.1	94.2	93.5	0.86	0.80	85	1.68300	599.5
75	100	315S-6	315S	980	128.0	6.5	731.18	2.0	2.0	94.8	94.0	0.86	0.80	85	4.19220	891
90	120	315MA-6	315M	980	153.3	6.5	877.42	2.0	2.0	95.0	94.2	0.86	0.80	85	4.87560	990
110	150	315LA-6	315L	980	186.9	6.5	1072.40	2.0	2.0	95.2	94.5	0.86	0.80	85	5.55900	1111
132	180	315LB-4	315L	980	223.6	6.5	1286.88	2.0	2.0	95.5	94.7	0.86	0.80	85	6.24240	1254
160	220	355MA-6	355M	980	264.3	6.5	1559.86	1.9	2.0	95.7	94.9	0.88	0.80	92	9.69000	1705
200	270	355MB-6	355M	980	329.7	6.5	1949.82	1.9	2.0	95.9	95.1	0.88	0.80	92	10.60800	1760
250	340	355L-6	355L	980	412.1	6.5	2437.28	1.9	2.0	95.9	95.1	0.88	0.80	92	12.64800	1870

● Efficiency is without seals. ● All these performance values are declared at rated voltage 415 & frequency 50 Hz and are subjected to tolerances as per IS :12615.

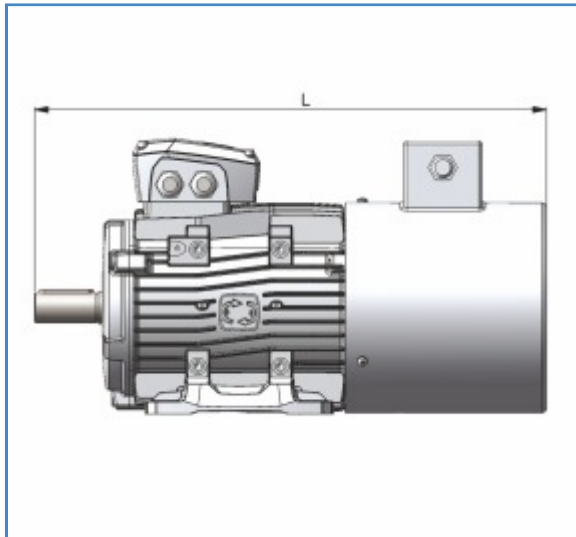
## OPTIONAL ACCESSORIES & FEATURES

### ASSISTED POWER COOLING

Three-phase 415/50, 415/60, IP 55, with separate terminal box



For applications where the motor will be operated below a frequency of 25Hz and above 60 Hz, the appropriate assisted power cooling must be mounted as there are too many variables involved to determine the various possible thermal duties, and thus the temperatures reached by the motors



TYPE	POWER W	CAPACITY m <sup>3</sup> /h	L (IE2)	L (IE3)
63	21	140	300	-
71	30	300	320	-
80	35	350	366	-
90S	50	500	400	420
90L	50	500	425	445
100	65	650	468	488
112	65	1000	450	470
132S	90	880	570	590
132M	90	880	610	630
160M	90	1100	710	710
160L	90	1100	765	765
180M	100	1200	805	805
180L	100	1200	845	845
200L	180	2500	910	910
225S	200	3800	1035	1035
225M	200	3800	1040	1040
250M	320	4200	1210	1210
280S	370	5000	1160	1160
280M	370	5000	1210	1210
315S	500	6000	1410	1410
315M	500	6000	1440	1440
315L	500	6000	1550	1550
355M	600	6500	1735	1735
355L	600	6500	1765	1765

### OPTIONAL FEATURES OFFERED IN IE2 & IE3 MOTORS.

Mechanical	
Special mounting	Non standard mounting dimensions
C.I. Body	100, 112 & 132 Frame size
Non Standard shaft material	EN24
Non Standard shaft extension	
Non Standard T. Box location	RHS/LHS or TOP
Non Standard Cable entries	
Motors with Thermal protection	PTC Thermistors, BTD Thermostat, RTD etc.
Non standard bearings	Roller bearings on driving end side
Higher Degree of protection than IP55	IP56, IP65, IP66
Low vibration motors	Precision class vibration levels(A,B or C) as per IS : 12075
Non standard paint	Epoxy paint, Poly urethane paint
Special accessories like arrow plate, Aux. name plate etc.	
Forced cooling arrangement 71 frame onwards	
Surface cooled motors (TENV)	
Motors with clean flow cowl arrangement	
Motors with flying leads	
Space heater	160 Frame onwards

Electrical	
Non standard voltage	27 to 720V
Non standard Frequency	50 to 150 Hz
Motors with wide variation in following parameters	
a. Voltage variation	>10%
b. Frequency Variation	>5%
c. Motors with higher than 8 pole	10pole,12pole etc.
d. Dual speed motors	2 / 4 Pole & 4 / 8 Pole
Class H insulation scheme	
Motors for high inertia load	
Motors with high slip	
Motors with intermittent duties	
Motors with service factor higher than 1	i.e. 1.2 service factor with Class F temperature rise of 50°C as a special construction against specific orders only for few ratings.

### ENCODER

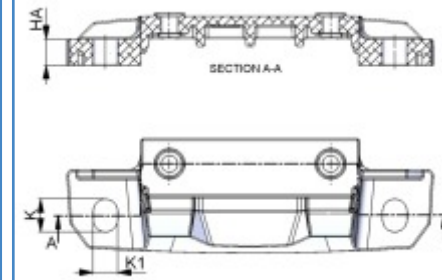
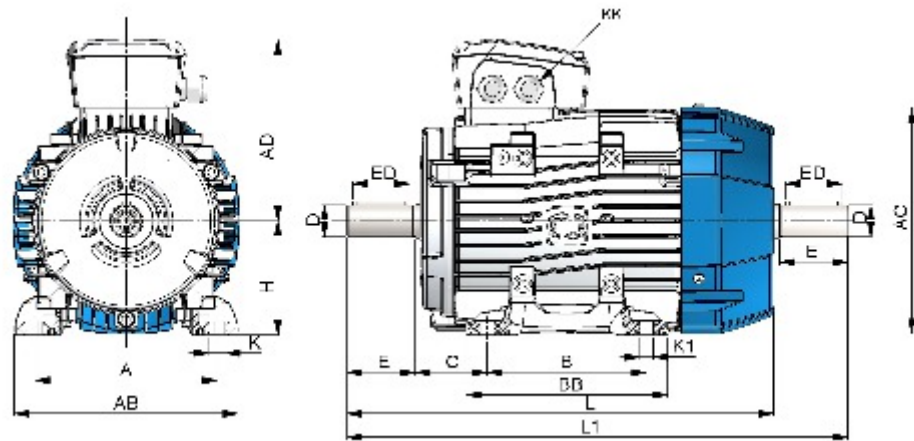
Motors with encoder or special shaft configurations for encoder mounting are available upon request. In this case assisted power cooling is also available, supported by brackets on the fan cover

## DIMENSIONS CHART

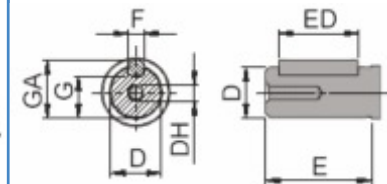


TYPE	POLES	AC	AD	H	KK	IE2	IE3	IE2	IE3	B3											B5, B3/B5							B14									
						IE4	IE4	IE4	IE4	L	L1	D	DH	E	ED	F	G	GA	A	AB	B	BB	C	HA	K	K1	M	N	P	R	S	T	LA	M	N	P	R
56	2-8	115	108	56	M16	198	-	223	-	9	M4x12	20	16	3	7.2	10.2	90	111	71	90	36	8	6	5.8	100	80	120	0	7	3	8	65	50	80	0	M5	2,5
63	2-8	122	109	63	M20	220	-	240	-	11	M4x12	23	16	4	8.5	12.5	100	124	80	105	40	8	9.5	7	115	95	140	0	10	3	10	75	60	90	0	M5	2,5
71	2-8	139	119	71	M20	244	-	281	-	14	M5X12	30	25	5	11.0	16.0	112	138	90	115	45	9	11	7	130	110	160	0	10	3.5	10	85	70	105	0	M6	2,5
80	2-8	157	131	80	M20	292	-	322	-	19	M6X16	40	30	6	15.5	21.5	125	157	100	130	50	9	14	10	165	130	200	0	12	3.5	12	100	80	120	0	M6	3,0
90S	2-8	176	145	90	M20	309	329	367	387	24	M8X19	50	40	8	20.0	27.0	140	173	100	130	56	11	14	10	165	130	200	0	12	3.5	12	115	95	140	0	M8	3,0
90L	2-8	176	145	90	M20	334	354	392	412	24	M8X19	50	40	8	20.0	27.0	140	173	125	155	56	11	14	10	165	130	200	0	12	3.5	12	115	95	140	0	M8	3,0
100L	2-8	197	159	100	M20	375	395	439	459	28	M10X22	60	50	8	24.0	31.0	160	196	140	180	63	12	16	12	215	180	250	0	15	4	13	130	110	160	0	M8	3,5
112M	2-8	221	177	112	M25	388	408	454	474	28	M10X22	60	50	8	24.0	31.0	190	227	140	185	70	12	16	12	215	180	250	0	15	4	14	130	110	160	0	M8	3,5
132S	2-8	260	197	132	M32	460	480	547	567	38	M12X28	80	65	10	33.0	41.0	216	260	140	185	89	15	16	12	265	230	300	0	15	4	14	165	130	200	0	M10	3,5
132M	2-8	260	197	132	M32	498	518	585	605	38	M12X28	80	65	10	33.0	41.0	216	260	178	225	89	15	16	12	265	230	300	0	15	4	14	165	130	200	0	M10	3,5
160M	2-8	315	255	160	2xM40	620	620	725	725	42	M16X36	110	90	12	37.0	45.0	254	320	210	260	108	20	15	15	300	250	350	0	19	5	14						
160L	2-8	315	255	160	2xM40	665	665	770	770	42	M16X36	110	90	12	37.0	45.0	254	320	254	305	108	20	15	15	300	250	350	0	19	5	14						
180M	2-8	380	280	180	2xM40	700	700	-	-	48	M16X36	110	90	14	42.5	51.5	279	355	241	300	121	24	15	15	300	250	350	0	19	5	15						
180L	2-8	380	280	180	2xM40	740	740	-	-	48	M16X36	110	90	14	42.5	51.5	279	355	279	350	121	24	15	15	300	250	350	0	19	5	15						
200L	2-8	420	305	200	2xM50	770	770	-	-	55	M20X42	110	90	16	49.0	59.0	318	395	305	370	133	24	19	19	350	300	400	0	19	5	16						
225S	4-8	470	335	225	2xM50	815	815	-	-	60	M20X42	140	110	18	53.0	64.0	356	435	286	375	149	28	19	19	400	350	450	0	19	5	22						
225M	2	470	335	225	2xM50	820	820	-	-	55	M20X42	110	90	16	49.0	59.0	356	435	311	390	149	28	19	19	400	350	450	0	19	5	22						
225M	4-8	470	335	225	2xM50	850	850	-	-	60	M20X42	140	110	18	53.0	64.0	356	435	311	390	149	28	19	19	400	350	450	0	19	5	22						
250M	2	510	370	250	2xM63	1021	1021	-	-	60	M20X42	140	110	18	53.0	64.0	406	490	349	440	168	32	24	24	500	450	550	0	19	5	25						
250M	4-8	510	370	250	2xM63	1021	1021	-	-	65	M20X42	140	110	18	58.0	69.0	406	490	349	440	168	32	24	24	500	450	550	0	19	5	25						
280S	2	580	410	280	2xM63	985	985	-	-	65	M20X42	140	110	18	58.0	69.0	457	550	368	460	190	36	24	24	500	450	550	0	19	5	28						
280S	4-8	580	410	280	2xM63	985	985	-	-	75	M20X42	140	110	20	67.5	79.5	457	550	368	460	190	36	24	24	500	450	550	0	19	5	28						
280M	2	580	410	280	2xM63	1035	1035	-	-	65	M20X42	140	110	18	58.0	69.0	457	550	419	510	190	36	24	24	500	450	550	0	19	5	28						
280M	4-8	580	410	280	2xM63	1035	1035	-	-	75	M20X42	140	110	20	67.5	79.5	457	550	419	510	190	36	24	24	500	450	550	0	19	5	28						
315S	2	615	530	315	2xM63	1160	1160	-	-	65	M20X42	140	110	18	58.0	69.0	508	635	406	500	216	42	28	28	600	550	660	0	24	6	30						
315S	4-8	615	530	315	2xM63	1270	1270	-	-	80	M20X42	170	140	22	71.0	85.0	508	635	406	500	216	42	28	28	600	550	660	0	24	6	30						
315M	2	615	530	315	2xM63	1190	1190	-	-	65	M20X42	140	110	18	58.0	69.0	508	635	457	550	216	42	28	28	600	550	660	0	24	6	30						
315M	4-8	615	530	315	2xM63	1350	1350	-	-	80	M20X42	170	140	22	71.0	85.0	508	635	457	550	216	42	28	28	600	550	660	0	24	6	30						
315L	2	615	530	315	2xM63	1190	1190	-	-	65	M20X42	140	110	18	58.0	69.0	508	635	508	600	216	42	28	28	600	550	660	0	24	6	30						
315L	4-8	615	530	315	2xM63	1350	1350	-	-	80	M20X42	170	140	22	71.0	85.0	508	635	508	600	216	42	28	28	600	550	660	0	24	6	30						
355M	2	710	655	355	2xM63	1500	1500	-	-	75	M20X42	140	110	20	67.5	79.5	610	730	560	590	254	45	28	28	740	680	800	0	24	6	32						
355M	4-8	710	655	355	2xM63	1530	1530	-	-	95	M20X42	170	140	25	86.0	100	610	730	560	590	254	45	28	28	740	680	800	0	24	6	32						
355L	2	710	655	355	2xM63	1500	1500	-	-	75	M20X42	140	110	20	67.5	79.5	610	730	630	720	254	45	28	28	740	680	800	0	24	6	32						
355L	4-8	710	655	355	2xM63	1530	1530	-	-	95	M20X42	170	140	25	86.0	100	610	730	630	720	254	45	28	28	740	680	800	0	24	6	32						

B3

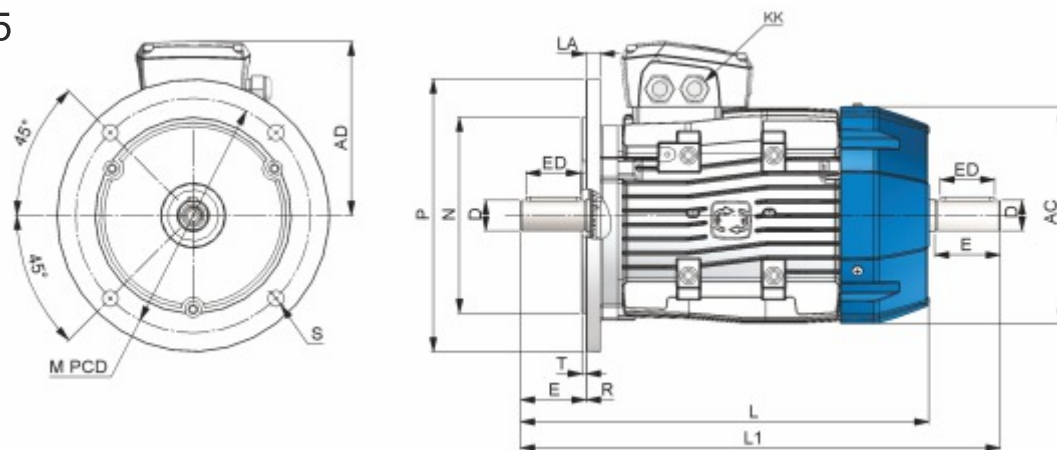


DETAILS OF FOOT



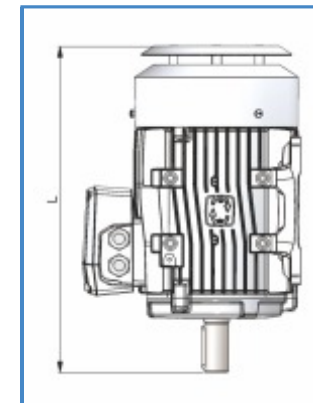
DE / NDE SIDE EXTENSION

B5 / B35



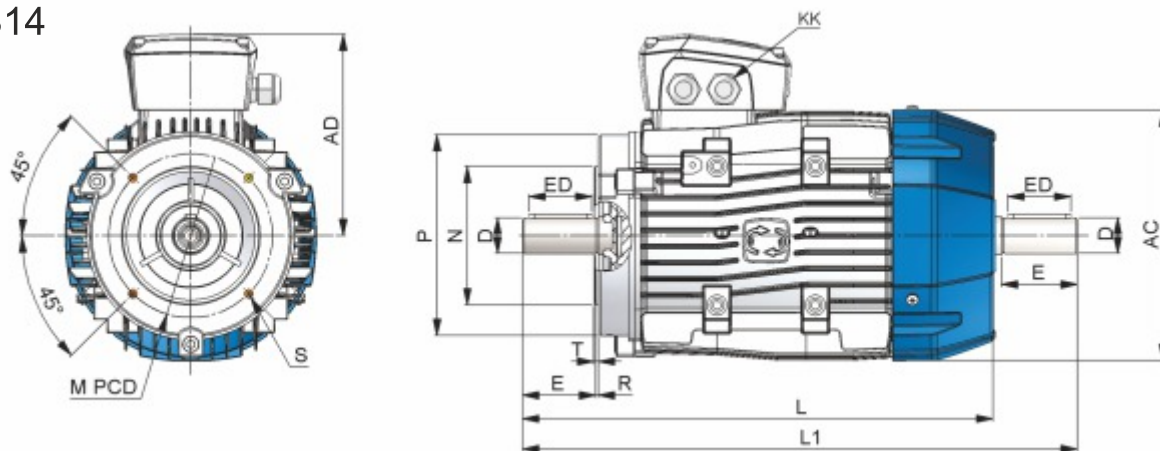
Rain Shield and Clean-flow fan cover:

For outdoor applications with V5-V18-V1-V15 installation position, we recommend the use of rain shield. This configuration may also be used in textiles processing industry having lot of fibers in the atmosphere which can clog the fan if not used with a clean flow fan cover.



TYPE	L (IE2)	L (IE3)
63	215	-
71	323	-
80	369	-
90S	403	423
90L	428	448
100	469	489
112	453	473
132S	573	593
132M	613	623
160M	770	770
160L	825	825
180M	915	915
180L	955	955
200L	1025	1025
225S	1155	1155
225M	1160	1160
250M	1320	1320
280S	1265	1265
280M	1315	1315
315S	1540	1540
315M	1570	1570
315L	1680	1680
355M	1840	1840
355L	1870	1870

B14



## REVVO ATDC / AT24

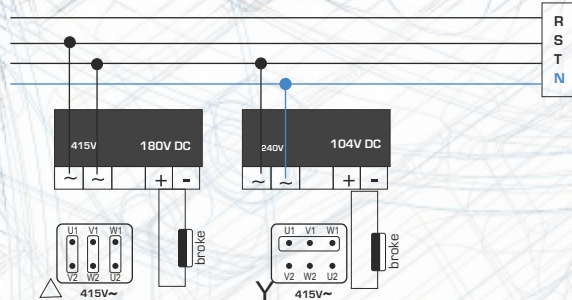
Revvo AT..... series self-braking motors use spring pressure brakes, firmly spliced on to a cast iron shield fixed on to the non-driving end of the motor.

These motors include following features as standard unlike other brands which consider these features as optional:  
**The hand release lever** : permits the release the brake, making it possible to rotate the shaft.  
**The brake can be energized by connecting** the supply to its terminals which are located inside the motor terminal box.  
**3 PTCS, one per phase**, duly connected in series, This is a standard feature from frame size 160 and onwards.

Rotomotive also offer PTO thermal protection on request.To enable automatic switching of power cooling fan the PTO can have as NO contact.

Revvo ATDC series motors use DC brakes power supplied by a rectifier installed inside the motor main terminal box. Unless there is a different request of the client, Rotomotive supplies ATDC rake motors with the rectifier already connected to the main terminal block of the motor, in order to permit to the motor switching to act as the same time on the brake.

In case that the motor is power supplied by a frequency inverter, or in case that the motor is used to move loads which can have an inertial movement, like lifted weights (such inertial movement can move the motor when the power is switched off, and the motor can act like a generator on the rectifier avoiding brake locking), disconnect the motor main terminal board from the rectifier, and connect separately the rectifier (ATDC).



Revvo AT24 series motors use DC electromagnetic brakes with 24V DC input type which can be operated through an inverter (usually having 24Vdc port.) Brake coil insulation class H & brake lining is asbestos-free.The rectifier is MOSFET type, with protection varistors at the entry and exit. All brake assemblies are protected against corrosion by painting or hot galvanizing and resin impregnated winding. The parts most subject to wear are treated in special atmospheres that provided considerable wear resistance to the parts.

The performance of all brakes, in terms of Watt, Nm and time in Sec are shown in table given below

EC Type	ATDC					AT24				ATDC AT24 Extra Kg on Std
	Static max braking torque [Nm]	Braking time no-load [Sec]	Input voltage on rectifier [Vac]	Output voltage to brake [Vdc]	Brake power W	Static max braking torque [Nm]	Static min braking torque [Nm]	Braking time no-load [Sec]	Brake power W	
AT..63	4,5	0,15	240	104	22	7,0	4,5	0,06	20	+4
AT..71	8,0	0,15	240	104	28	7,0	4,5	0,06	20	+5
AT..80	12,5	0,20	240	104	30	14,0	9,5	0,09	25	+5,5
AT..90	25,0	0,25	240	104	45	24,0	12,0	0,11	30	+6
AT..100	38,0	0,30	240	104	60	60,0	28,0	0,14	45	+7
AT..112	70,0	0,35	415	180	65	80,0	60,0	0,15	65	+10
AT..132	140,0	0,40	415	180	88	120,0	110,0	0,16	85	+12
AT..160	210,0	0,50	415	180	110	160,0	130,0	0,21	105	+22

## REVVO ATAC

Revvo ATAC series self-braking motors use brake similar in working with DC electromagnetic type but operated on AC power supply. As these brakes are operated on AC supply, no need of rectifier.

The torque value offered for ATAC series motors are as under.

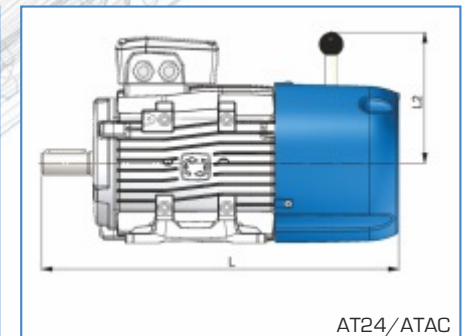
Type	Static Braking Torque Nm	Input Power W	Input Voltage to brake Vac	extra Kg on std.
ATAC63	4,5	40	415	4,2
ATAC71	8	70	415	5,2
ATAC80	12	85	415	5,8
ATAC90	16	120	415	6,3
ATAC100	45	160	415	7,4
ATAC112	70	300	415	10,6
ATAC132	140	500	415	13

## Dimensions ATDC / AT24 / ATAC

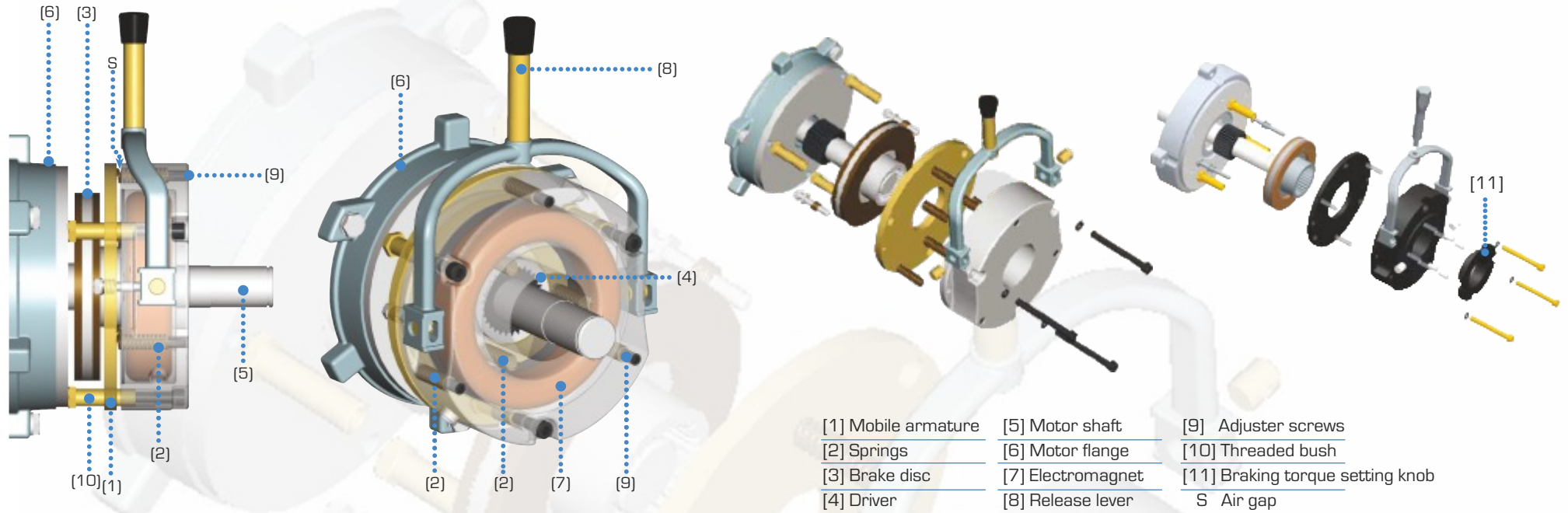
Type	ATDC/AT24			ATAC		
	L (IE2)	L (IE3)	L2	L (IE2)	L (IE3)	L2
63	275	-	120	300	-	105
71	300	-	130	334	-	115
80	340	-	140	360	-	140
90S	385	405	140	387	407	163
90L	410	430	140	412	432	163
100L	445	465	165	474	494	194
112M	472	492	174	494	514	203
132S	550	570	214	577	597	230
132M	590	610	214	615	635	230
160M	715	735	220	-	-	-
160L	760	780	220	-	-	-



ATDC



AT24/ATAC



- [1] Mobile armature
- [2] Springs
- [3] Brake disc
- [4] Driver
- [5] Motor shaft
- [6] Motor flange
- [7] Electromagnet
- [8] Release lever
- [9] Adjuster screws
- [10] Threaded bush
- [11] Braking torque setting knob
- S Air gap

**BRAKE DESCRIPTION**

The brakes used in Revo ATDC, AT24 and ATAC series are of electromagnetic type and normally OFF i.e. the braking action occurs in the absence of power supply. The brake insulation class is F. The brake lining is asbestos free as per most recent EEC Directives pertaining to Workplace Hygiene and Safety. All brake assemblies are protected against corrosion by painting or heat galvanizing and resined winding. The parts most subjected to wear are specially treated to ensure they become wear resistance.

**BRAKE OPERATION**

When the power supply is interrupted the excitation coil [7] is no longer powered and therefore doesn't exert the magnetic force necessary to restrain the mobile armature [1] which, pushed by the pressure springs [2] compresses the brake disc [3] against the motor flange [6] on one side and the armature itself on the other thereby creating a braking action.

**ADJUSTMENT**

Two different types of adjustment are possible.  
**S air gap adjustment**  
 For proper operation the air gap S between electromagnet [7] and the mobile armature [1] must be between the following indicated limits.

MOTOR TYPE [ATDC/AT24]	S AIR GAP [mm]	MOTOR TYPE [ATAC]	S AIR GAP [mm]
63 -71	0.40-0.50	63 -90	0.2
80 -160	0.50-0.60	100-132	0.3

The adjustment is made by using the threaded bushes [10] and using a thickness gauge to ensure that the required air gap is maintained.

**Braking Torque Adjustment**  
 The braking torque is set to its maximum value by Rotomotive. But it can be decreased by acting on the adjuster screws [9] [ATDC/ ATAC motor] or on the knob [11] [AT24 motor]

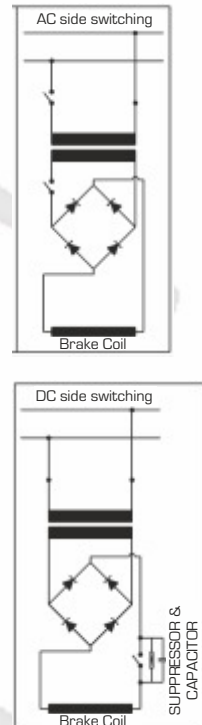
**SWITCHING (ATDC)**

Two type of switching possible for brake coils operated with DC voltage, one is AC side switching and another is DC side switching.

Generally when braking time is not critical AC side switching is done. AC side switching is often used with brake motors, where brake is connected with motor's main terminal block. Due to the inductance of the brake coil, engagement time can be 3 to 6 times longer than with DC switching. Therefore this arrangement is not suitable for hoist applications.

DC side switching is necessary when there is motor subjected to inertial movement, like lifted weights such as hoist, lifts and cranes, a brake motor regenerate the supply upto some extent and hold off the brake. DC side switching requires provision of universal spark suppressor and capacitor to protect the coil and switches against inductive voltage.

Rotomotive supply rectifier of Mosfet type, with protection varistors at the entry and the exit.



## REVVO ATIN (Intorq Brake)

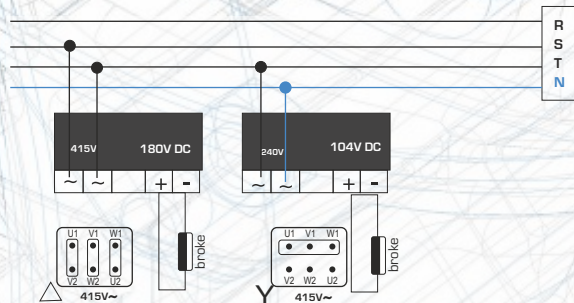
These brake motors feature brakes from Kendrion INTORQ GmbH.

These motors include following features as standard unlike other brands which consider these features as optional: The hand release lever : permits the release the brake, making it possible to rotate the shaft. The brake can be energized by connecting the supply to its terminals which are located inside the motor terminal box.

Rotomotive also offer PTO thermal protection on request. To enable automatic switching of power cooling fan the PTO can have as NO contact.

Revvo ATIN series motors use DC brakes power supplied by a rectifier installed inside the motor main terminal box. Unless there is a different request of the client, Rotomotive supplies ATIN brake motors with the rectifier already connected to the main terminal block of the motor, in order to permit to the motor switching to act as the same time on the brake.

In case that the motor is power supplied by a frequency inverter, or in case that the motor is used to move loads which can have an inertial movement, like lifted weights (such inertial movement can move the motor when the power is switched off, and the motor can act like a generator on the rectifier avoiding brake locking), disconnect the motor main terminal board from the rectifier, and connect separately the rectifier (ATIN).



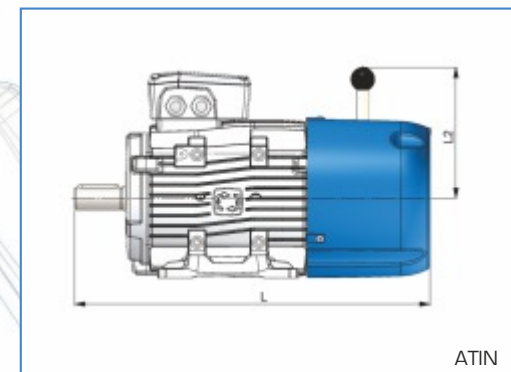
Brake coil insulation class F & brake lining is asbestos-free.

The rectifier is MOSFET type, with protection varistors at the entry and exit. All brake assemblies are protected against corrosion by painting or hot galvanizing and resin impregnated winding. The parts most subject to wear are treated in special atmospheres that provided considerable wear resistance to the parts.

EC Type	Brake Type / Size	Static Braking Torque Nm	Braking time no-load (ms)	Input voltage to brake (Vdc)	Input Power W	Extra Kg on Std
63	BFK458-06	4.5	13	104	20	1.6
71	BFK458-06	4.5	13	104	20	1.6
80	BFK458-08	8	16	104	25	2.0
90	BFK458-10	16	19	104	30	3.2
100	BFK458-12	40	25	104	40	4.5
112	BFK458-14	60	25	180	50	5.8

## DIMENSION

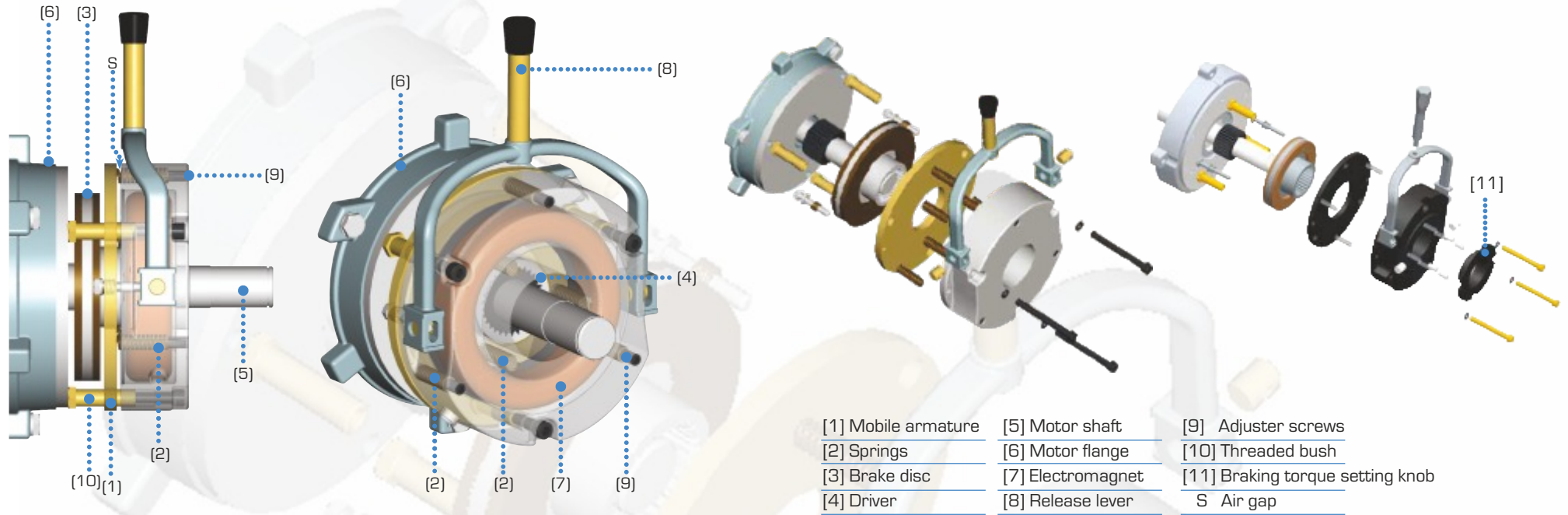
Frame	L (IE2)	L (Ie3)	L 2
63	285	-	107
71	310	-	107
80	340	350	116
90S	390	410	132
90L	415	435	132
100L	450	470	161
112M	480	500	195



ATIN



ATIN



BRAKE DESCRIPTION

The brakes used in Rewo ATIN series are of electromagnetic type and normally OFF i.e. the braking action occurs in the absence of power supply. The brake insulation class is F. The brake lining is asbestos free as per most recent EEC Directives pertaining to Workplace Hygiene and Safety.

All brake assemblies are protected against corrosion by painting or heat galvanizing and resined winding. The parts most subjected to wear are specially treated to ensure they become wear resistance.

BRAKE OPERATION

When the power supply is interrupted the excitation coil (7) is no longer powered and therefore doesn't exert the magnetic force necessary to restrain the mobile armature (1) which, pushed by the pressure springs (2) compresses the brake disk (3) against the brake flange (6) on one side and the armature itself on the other thereby creating a braking action.

BRAKE ADJUSTMENT

Two different types of adjustment are possible.

**S air gap adjustment**

For proper operation the air gap S between electromagnet (7) and the mobile armature (1) must be between the following indicated limits.

MOTOR TYPE	S AIR GAP (mm)
63 -90	0.2
100-132	0.3
160	0.4

The adjustment is made by using the threaded bushes (10) and using a thickness gauge to ensure that the required air gap is maintained.

**Braking Torque Adjustment**

The braking torque is set to its maximum value by Rotomotive. But it can be decreased by acting on the adjuster screws (9) or on the knob (11)

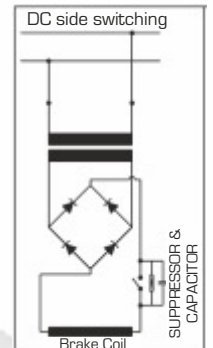
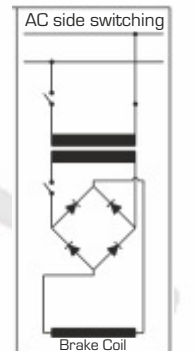
SWITCHING (ATIN)

Two type of switching possible for brake coils operated with DC voltage, one is AC side switching and another is DC side switching.

Generally when braking time is not critical AC side switching is done. AC side switching is often used with brake motors, where brake is connected with motor's main terminal block. Due to the inductance of the brake coil, engagement time can be 3 to 6 times longer than with DC switching. Therefore this arrangement is not suitable for hoist applications.

DC side switching is necessary when there is motor subjected to inertial movement, like lifted weights such as hoist, lifts and cranes, a brake motor regenerate the supply upto some extent and hold off the brake. DC side switching requires provision of universal spark suppressor and capacitor to protect the coil and switches against inductive voltage.

Rotomotive supply rectifier of Mosfet type, with protection varistors at the entry and the exit.



**Revo CR series motors** are compact asynchronous squirrel cage induction motors specially designed for use in cranes and hoists. They can also be used for other applications like material handling, weirs and sluices and lifts of all types. These motors can serve as auxiliary motors in rolling mills or wherever intermittent drives are required.



These motors are typically in one frame size lower than S1 duty motors and are of S3/S4/S5 duty, developing high starting torque with low starting current. The Motors are suitable for frequent starts/stops and reversals and conform to IS:325 for three phase induction motors and IS:4722 for rotating electrical Machines as well as IEC-34.1. These motors are available in frame sizes from 71 to 160 in 4 or 6 poles.

**Enclosures, Cooling, Mounting and Supply conditions :**

The enclosures, cooling, mounting and voltage supply conditions and tolerances are similar to Revo Series IE2/IE3 motors.

**Types of Intermittent Duty Ratings :**

The basis of these ratings is that of thermal capability, taking into account:

- i) Frequency of starting (starting class).
- ii) Percentage of time during each operating cycle the motor is energized, (CDF- Cyclic duration factor).
- iii) The number and type of operating cycles per hour, (duty class).
- iv) And the inertia of the motor and the load.

**Motors with Integral Brakes:**

These motors can be supplied with integral fail safe D.C. Brakes, with built in rectifiers. Brakes of 24 Volts for direct use with VFD drives are also available.

For braking torque values, refer to the section on Brake motors.

**Definitions :**  
The terms used frequently in intermittent duty drive and hoisting are as bellow:

**1. Cyclic duration factor : (CDF)**

The ratio between the period of loading including starting and electric braking and the total duration of the duty-cycle expressed as a percentage.

**2. Jogging or inching :**

This is an incomplete start during which the motor does not attain more than 25% of the rated speed.

**3. Electric braking :**

A system in which a braking action is applied to an electric motor by causing it to act as a generator

**4. D.C. Injection braking :**

A form of braking of an induction motor in which a separate dc supply is used to magnetize the motor.

**5. Plug braking :**

A form of electric braking of an induction motor obtained by reversing the phase sequence of its any two lines.

**6. Regenerative braking :**

A system of electric braking in which energy is returned to the supply system.

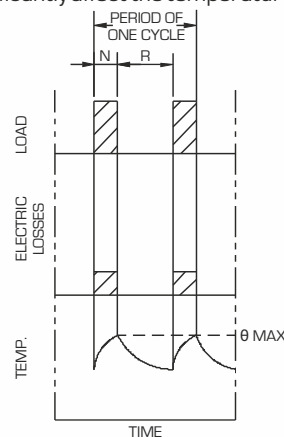
**Duty type :**

Crane duty applications can be classified into duty types S3 to S5

**Intermittent periodic duty**

**Duty type S3 :**

A sequence of identical duty cycle, each including a period of operation at constant load and a rest and de-energized period. These periods being too short to attain thermal equilibrium during one duty cycle. In this duty type, the starting current does not significantly affect the temperature rise.



$\theta_{MAX.}$  = MAX. TEMP. ATTAINED DURING DUTY CYCLE

N = OPERATION AT CONSTANT LOAD

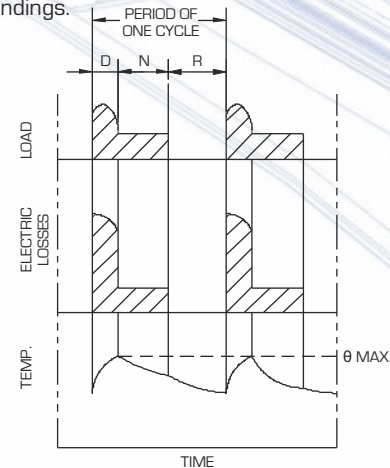
R = AT REST & DE - ENERGISED

$$\text{CYCLIC DURATION FACTOR} = \frac{N}{N+R} \times 100\%$$

**Intermittent periodic duty with starting**  
**Duty type S4 :**

A sequence of identical duty cycles, each cycle including a significant period of starting. A period of operation at constant load and a rest de-energized period. These period being too short to attain thermal equilibrium during one duty cycle.

In this duty, the stopping of the motor is obtained either by natural de-acceleration after disconnection of the supply or by means of braking such as a mechanical brake which does not cause additional heating of the windings.



$\theta_{MAX.}$  = MAX. TEMP. ATTAINED DURING DUTY CYCLE

N = OPERATION AT CONSTANT LOAD

R = AT REST & DE - ENERGISED

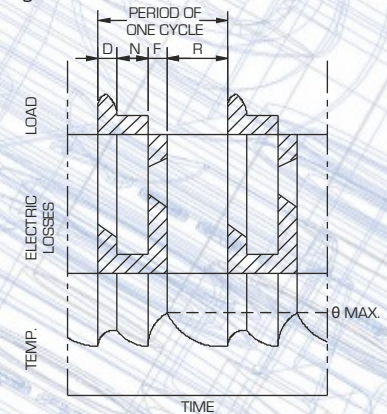
D = STARTING TIME

$$\text{CYCLIC DURATION FACTOR} = \frac{D+N}{D+N+R} \times 100\%$$

**Intermittent periodic duty with starting and braking**  
**Duty type : S5**

A sequence of identical duty cycles, each cycle consisting of a period of starting, a period of operation at constant load, a period of rapid electric braking and rest and de-energized period. The operating and rest and de-energized periods being too short, to attain thermal equilibrium during one duty cycle.

**Note :** In all above type of duties, the loading period and rest period of the cycle are so short that the steady state temperature is not reached. While working on these identical cycles continuously, the motor temperature rise must not exceed the permissible values for a given class of insulation.



$\theta_{MAX.}$  = MAX. TEMP. ATTAINED DURING DUTY CYCLE

N = OPERATING AT CONSTANT LOAD

R = AT REST & DE - ENERGISED

D = STARTING TIME

F = ELECTRIC BRAKING

$$\text{CYCLIC DURATION FACTOR} = \frac{D+N+F}{D+N+F+R} \times 100\%$$

The common cyclic duration factors (CDF) for the duties S3, S4 and S5 are 25%,40%,and 60%. Motors with CDFs other than these values can also be supplied on request.

**How to select motors for hoisting and similar duties.**

The formula to establish the rated Pn in Kw

$$P_n > \frac{FXV}{102 X Eff} Kw$$

Where F = Maximum load in Kg.

V = Hoisting speed in mtr/ sec

Eff. = Overall mechanical efficiency of the driving unit.

For Horizontal motion ensure that the rated output Pn of the motor is greater than the power necessary to move the equipment given by:

$$P_n > \frac{M \times n}{974 \times Eff} Kw$$

Where M = Torque reqd. for movement in Kg.m

n = Motor RPM



# PERFORMANCE CHART

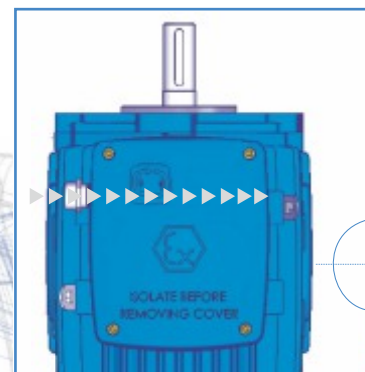
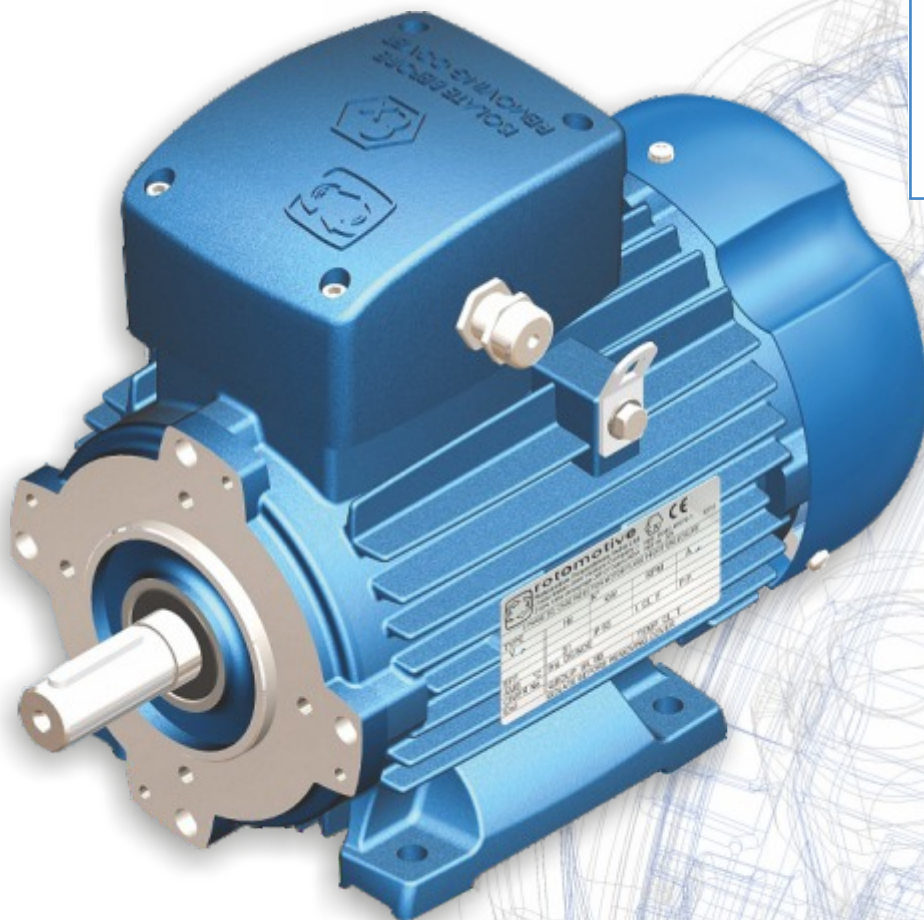
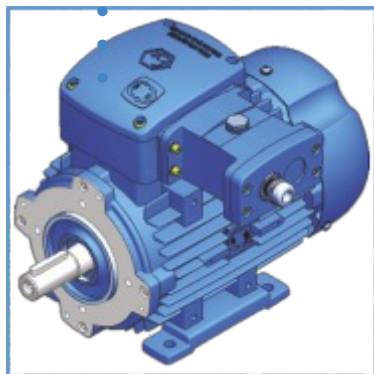
4 Pole asynchronous speed 1500 rpm						S3 Duty				S4 & S5 Duty							
						60 Starts				150 Starts				300 Starts			
Type	Rated RPM	Current [ls/ln]	Torque Cn(Nm)	Torque Cs/Cn	Torque Cmax/Cn	25% OR 40% CDF		60% CDF		25% OR 40% CDF		60% CDF		25% OR 40% CDF		60% CDF	
						Rated		Rated		Rated		Rated		Rated		Rated	
						KW	Amp	KW	Amp	KW	Amp	KW	Amp	KW	Amp	KW	Amp
71	1315	3.7	4.00	2.3	2.8	0.55	1.55	0.55	1.55	0.55	1.55	0.55	1.55	0.55	1.55	0.55	1.55
80	1385	4.5	5.20	2.3	2.8	0.75	1.9	0.75	1.9	0.75	1.9	0.75	1.9	0.75	1.9	0.75	1.9
80	1385	4.5	7.60	2.8	3.0	1.1	2.8	1.1	2.8	1.1	2.8	1.1	2.8	1.1	2.8	1.1	2.8
90S	1400	4.7	10.20	2.3	2.8	1.5	3.7	1.5	3.7	1.5	3.7	1.5	3.7	1.5	3.7	1.5	3.7
90L	1380	5.2	15.30	2.7	3.2	2.2	4.95	2.2	4.95	2.2	4.95	2.2	4.95	2.2	4.95	2.2	4.95
100L	1380	6.0	25.60	2.7	3.2	3.7	8.0	3.7	8.0	3.7	8.0	3.7	8.0	3.7	8.0	3.7	8.0
112M	1425	6.0	36.90	2.6	3.0	5.5	11.6	5.5	11.6	5.5	11.6	5.5	11.6	5.5	11.6	5.5	11.6
132S	1410	6.0	50.80	2.5	3.0	7.5	15.5	7.5	15.5	7.5	15.5	7.5	15.5	7.5	15.5	7.5	15.5
132M	1440	6.5	61.60	2.7	3.0	9.3	18.0	9.3	18.0	9.3	18.0	9.3	18.0	9.3	18.0	9.3	18.0
160M	1450	6.0	72.44	2.25	2.7	11	22.0	11	22.0	11	22.0	11	22.0	11	22.0	11	22.0
160M	1430	6.0	100.17	2.3	2.7	15	30.5	15	30.5	15	30.5	15	30.5	15	30.5	15	30.5
160L	1440	6.5	122.68	2.5	3.0	18.5	36.0	18.5	36.0	18.5	36.0	18.5	36.0	18.5	36.0	18.5	36.0

6 Pole asynchronous speed 1000 rpm						S3 Duty				S4 & S5 Duty							
						60 Starts				150 Starts				300 Starts			
Type	Rated RPM	Current [ls/ln]	Torque Cn(Nm)	Torque Cs/Cn	Torque Cmax/Cn	25% OR 40% CDF		60% CDF		25% OR 40% CDF		60% CDF		25% OR 40% CDF		60% CDF	
						Rated		Rated		Rated		Rated		Rated		Rated	
						KW	Amp	KW	Amp	KW	Amp	KW	Amp	KW	Amp	KW	Amp
71	870	3.0	4.00	2.3	2.6	0.37	1.4	0.37	1.4	0.37	1.4	0.37	1.4	0.37	1.4	0.37	1.4
80	900	4.0	5.84	2.3	2.6	0.55	1.55	0.55	1.55	0.55	1.55	0.55	1.55	0.55	1.55	0.55	1.55
80	885	4.0	8.10	2.3	2.6	0.75	2.4	0.75	2.4	0.75	2.4	0.75	2.4	0.75	2.4	0.75	2.4
90S	910	4.0	11.55	2.3	2.6	1.1	2.9	1.1	2.9	1.1	2.9	1.1	2.9	1.1	2.9	1.1	2.9
90L	895	4.5	16.00	2.3	2.8	1.5	4.2	1.5	4.2	1.5	4.2	1.5	4.2	1.5	4.2	1.5	4.2
100L	925	4.5	22.70	2.3	2.8	2.2	6.4	2.2	6.4	2.2	6.4	2.2	6.4	2.2	6.4	2.2	6.4
112M	925	4.6	38.20	2.3	2.8	3.7	8.9	3.7	8.9	3.7	8.9	3.7	8.9	3.7	8.9	3.7	8.9
132S	930	6.0	56.50	2.3	2.8	5.5	14.2	5.5	14.2	5.5	14.2	5.5	14.2	5.5	14.2	5.5	14.2
132M	930	6.0	77.00	2.3	2.8	7.5	18.0	7.5	18.0	7.5	18.0	7.5	18.0	7.5	18.0	7.5	18.0
160M	950	6.0	93.48	2.3	2.7	9.3	20.0	9.3	20.0	9.3	20.0	9.3	20.0	9.3	20.0	9.3	20.0
160L	960	6.0	109.42	2.3	2.7	11	24.0	11	24.0	11	24.0	11	24.0	11	24.0	11	24.0
160L	950	6.5	150.78	2.3	2.6	15	33.0	15	33.0	15	33.0	15	33.0	15	33.0	15	33.0

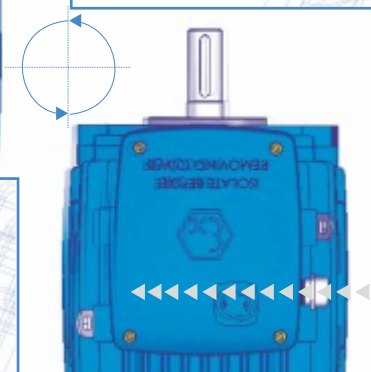
• All performance are declared at rated voltage 415 & Frequency 50Hz and are subjected to tolerances as per IS:12615. For dimensions refer chart on page no: 18 - 19

IE 1

IE 2



The terminal box can be rotated at every 180° steps.



Epoxy paint



Upto 132 frame convertibility from B3 construction to B35 or B34 without dismantling the drive end cover.

The use of electrical motors in potentially explosive atmospheres is quite frequent these days. These motors must be constructed in a manner to contain the spark within the enclosure in event of any explosion within the body/enclosure of the motor. An Explosion occurs when the following situations occur:

- i) Presence of potentially explosive atmosphere
- ii) Existence of a source of ignition
- iii) Possibility of transmission of the explosion

**Revvo Exd series** asynchronous 3 Phase squirrel cage induction motors are manufactured as per IS/IEC 60079-1:2007 for operation in hazardous locations classified as zone 1 and zone 2 areas as per IS:5572. These motors are available in frame sizes of 80 to 160 in 2, 4, 6 and 8 pole ratings. For specifications and performance parameters, refer to tables on page 10-13. The motor enclosure has been designed in a way to prevent the transmission of internal explosion to the explosive atmosphere surrounding the machine. The enclosure is designed to with stand, without damage, any pressure levels caused by an internal explosion. Care has been taken to ensure the shape, length and gap of assembly joints, at shaft opening, cable entries, etc are suitable for throttling and cooling of hot gases before they escape outside.

**Classification of Hazardous Environment :** According to IS: 5572, Hazardous area are classified in the following ways depending on the probability of the presence of hazardous atmosphere.

**Zone :** Criteria presence of gas  
 Zone 1 Present in normal operations  
 Zone 2 Unlikely, but if present, only for a short time

**Application Groups :** Depending on the intended use, explosion-proof electrical operating equipment is divided into two major groups:

- Group I Equipment for coal mines (Only specially designed motors for mines can be use)
- Group II Electrical equipment for use other than mines (surface industry)

Group II Motors with flameproof enclosures are further divided into gas groups :

- II A Propane
- II B Ethylene

**Temperature Classes :** Combustible gas of Vapour and explosion-protected electrical equipments are divided into temperature of the gas T4 to T6 with regard to the ignition temperature of the gas or vapour and the maximum surface temperature of the component. Revvo Exd series motors are suitable for Temperature class T4, T5 and T6.

Temperature class	Maximum permitted surface Temperature of electrical equipment °C
T4	135
T5	100
T6	85

**Zone 2**

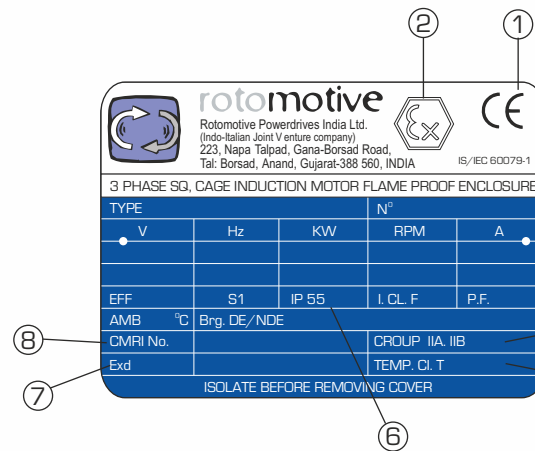
Abnormal Conditions

Presence of explosive atmosphere only by accident, but not during normal duty (< 10 H per year)

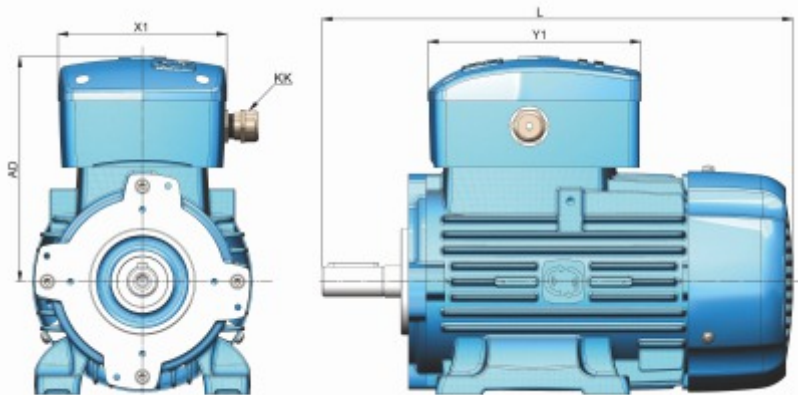
**Zone 1**

Occasionally Incidental Presence of explosive atmosphere during normal duty (10-1000 H per year)

**Description of the marking on motor Nameplate :**



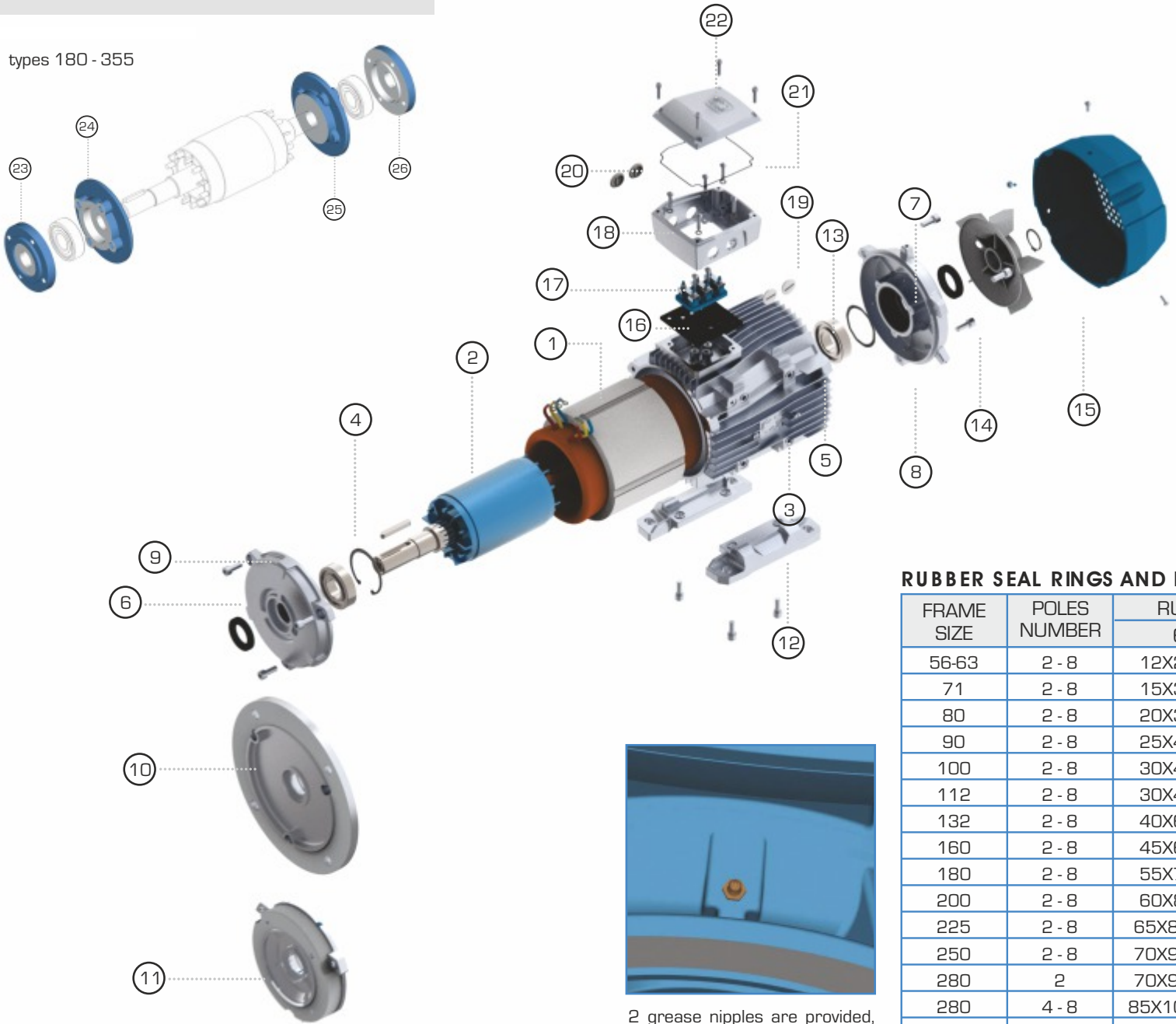
1. Marking of conformity in compliance with the European Directives.
2. Specific marking of explosion protection.
3. Motor Serial No.
4. Group [surface plants different from mines]
5. Temperature class of the motor (GAS).
6. IP protection degree.
7. Type of protection for explosive atmosphere for the presence of flammable gas.
8. Type Certificate Number.



FRAME	L	AD	X1	Y1	KK
Ex80	315	160	100	138	M20
Ex90	380	180	133	170	M20
Ex100	410	195	133	170	M20
Ex112	430	216	158	190	M25
Ex132M	495	236	158	190	M32
Ex160M	605	310	185	208	M40
Ex160L	650	310	185	208	M40

# COMPONENTS LIST

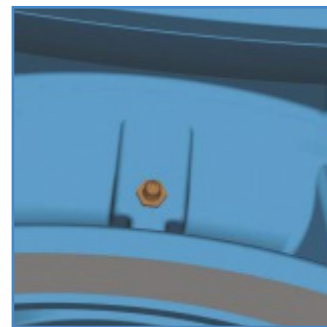
types 180 - 355



Sr. No.	Description
1	Wound stator with motor body
2	Diecast rotor with shaft
3	Name plate
4	Bearing (DE side)
5	Bearing (NDE side)
6	Oil seal
7	V seal
8	NDE cover
9	DE cover
10	B5 flange
11	B14 flange
12	Foot
13	Wave washer
14	Fan
15	Fan cover (cowl)
16	Rubber gasket
17	Terminal block
18	Terminal box
19	Cable gland
20	Plug
21	O ring
22	Terminal box cover
23	Outside bearing cover (DE side)
24	Inside bearing cover (DE side)
25	Inside bearing cover (NDE side)
26	Outside bearing cover (NDE side)

## RUBBER SEAL RINGS AND BEARINGS

FRAME SIZE	POLES NUMBER	RUBBER SEAL RING		BEARINGS	
		6	7	4	5
56-63	2 - 8	12X25X7	12X25X7	6201 ZZ	6201 ZZ
71	2 - 8	15X30X7	15X30X7	6202 ZZ	6202 ZZ
80	2 - 8	20X35X7	20X35X7	6204 ZZ	6204 ZZ
90	2 - 8	25X40X7	25X40X7	6205 ZZ	6205 ZZ
100	2 - 8	30X47X7	30X47X7	6206 ZZ	6206 ZZ
112	2 - 8	30X47X7	30X47X7	6206 ZZ	6206 ZZ
132	2 - 8	40X62X7	40X62X7	6208 ZZ	6208 ZZ
160	2 - 8	45X62X8	45X62X8	6309 ZZ	6309 ZZ
180	2 - 8	55X72X8	55X72X8	6311-C3	6311-C3
200	2 - 8	60X80X8	60X80X8	6312-C3	6312-C3
225	2 - 8	65X80X10	65X80X10	6313-C3	6313-C3
250	2 - 8	70X90X10	70X90X10	6314-C3	6314-C3
280	2	70X90X10	70X90X10	6314-C3	6314-C3
280	4 - 8	85X100X12	85X100X12	6317-C3	6317-C3
315	2	85X110X12	85X110X12	6317-C3	6317-C3
315	4 - 8	95X120X12	95X120X12	NU319-C3	6319-C3
355	2	95X120X12	95X120X12	6319-C3	6319-C3
355	4 - 8	110X130X12	110X130X12	NU322-C3	6322-C3



2 grease nipples are provided, one on each end-cover from frame size 180 and up. Other motors till frame size 160 have shielded bearings, pre-lubricated for life.

We recommend the use of SKF shielded bearings with LHT23 grease suitable for -40°C to +140°C.

**Introduction of Permanent magnet synchronous motor**

The Permanent Magnet Synchronous Motor (PMSM) is an AC synchronous motor whose field excitation is provided by permanent magnets, and has a sinusoidal back EMF waveform. The PMSM is a cross between an induction motor and brushless DC motor. Like a brushless DC motor, it has a permanent magnet rotor and windings on the stator. However, the stator structure with windings constructed to produce a sinusoidal flux density in the air gap of the machine resembles that of an induction motor. Its power density is higher than induction motors with the same ratings since there is no stator power dedicated to magnetic field production. With permanent magnets the PMSM can generate torque at zero speed, it requires digitally controlled inverter for operations. PMSM are typically used for high-performance and high-efficiency (IE4) motor drives. High-performance motor control is characterized by smooth rotation over the entire speed range of the motor, full torque control at zero speed, and fast acceleration and deceleration

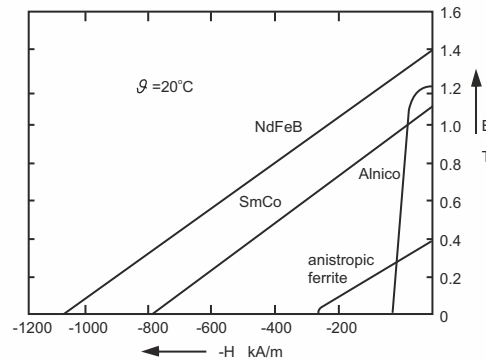
**Properties of permanent magnets**

There are three classes of PMs currently used for electric motors:

- Alnicos (Al, Ni, Co, Fe);
- Ceramics (ferrites), e.g., barium ferrite  $BaO \times 6Fe_2O_3$  and strontium ferrite  $SrO \times 6Fe_2O_3$
- Rare-earth materials, i.e., samarium-cobalt  $SmCo$  and neodymium-iron-boro  $NdFeB$ .

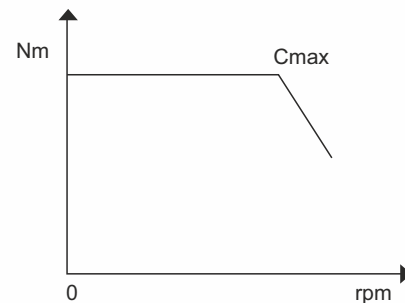
Demagnetization curves of the above PM materials are given in Figure 1.

The latest grades of  $NdFeB$  have a higher remanent magnetic flux density and better thermal stability. Metallic or resin coating is employed to improve resistance to corrosion.



**Pull out Torque**

$C_{max}$  is the maximum torque developed by the motor at the Rated power supply at a certain speed represents also the value of the stall torque/pull out torque after which the motor stops. In the following performance charts, it is indicated the relation between maximum torque and rated torque and maximum torque [ $C_{max}/C_n$ ]



**Connection**

PMSM motors are connected in STAR only. For connection details please refer page 8 - Star connection

**Interior-type PM motors**

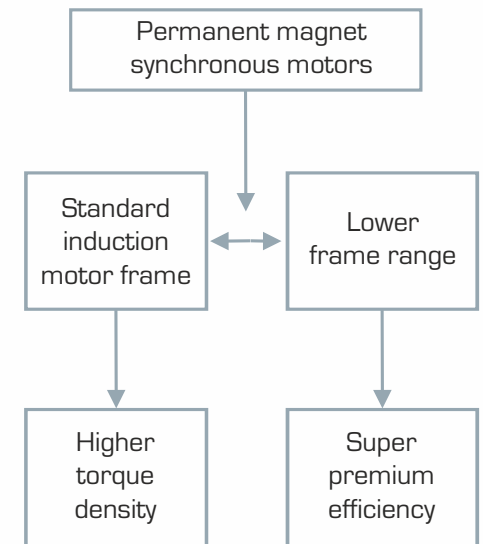
The interior-magnet rotor has radially magnetized and alternately poled magnets. Because the magnet pole area is smaller than the pole area at the rotor surface, the air gap flux density on open circuit is less than the flux density in the magnet. The synchronous reactance in d-axis is smaller than that in q-axis since the q-axis magnetic flux can pass through the steel pole pieces without crossing the PMs. The magnet is very well protected against centrifugal forces. Such a design is recommended for high frequency high speed motors.

**Advantages of Permanent magnet synchronous motor on Induction motor**

- High air gap flux density
- High power-to-weight ratio
- Large torque-to-inertia ratio Smooth torque operation (also at low speeds)
- Accurate torque control at zero speed

**Permanent magnet synchronous motors must operate with a drive**

AC induction motors can be used without a VFD to drive a pump or fan, but are often installed with variable frequency drives (VFD) in pump systems or fan systems in an effort to improve system efficiency. Permanent magnet synchronous motors require a drive to operate. PMSMs cannot run without a drive. A VFD is required to precisely control the speed of the PMSM to meet the application requirements for pressure, flow, volume, etc. Some new VFDs already come with permanent magnet motor control options as a standard feature, allowing operators to control the permanent magnet motor to drive the fan and/or pump more efficiently. We recommended Fuji-ace and Yaskawa A-1000 drives for PMSM for our motor



For performance chart refer page 28-29

For dimensions chart refer page 18-19

## IE4, Super premium efficiency

## 4 Pole Permanent magnet synchronous motor (Induction motor standard frame)

Power kW	Power HP	Type	Frame	Speed (rpm)	Current (A)	Torque Cn (Nm)	Torque Cmax/Cn	Efficiency (%)	Power Factor
0.55	0.75	80A-4	80	1500	1.1	3.5	2.0	83.9	0.96
0.75	1	80B-4	80	1500	1.5	4.78	2.0	85.7	0.96
1.1	1.5	90S-4	90S	1500	2.2	7.01	2.0	87.2	0.96
1.5	2	90L-4	90L	1500	2.9	9.55	2.0	88.2	0.96
2.2	3	100L-4	100L	1500	4.2	14.01	2.0	89.5	0.96
3.7	5	112M-4	112M	1500	7.0	23.57	2.0	90.9	0.96
5.5	7.5	132S-4	132S	1500	10.3	35.03	2.0	91.9	0.96
7.5	10	132M-4	132M	1500	13.9	47.77	2.0	92.6	0.96
11	15	160M-4	160M	1500	20.3	70.06	2.0	93.3	0.96
15	20	160L-4	160L	1500	27.4	95.54	2.0	93.9	0.96
18.5	25	180M-4	180M	1500	33.7	117.83	2.0	94.2	0.96
22	30	180L-4	180L	1500	40.0	140.13	2.0	94.5	0.96
30	41	200L-4	200L	1500	54.3	191.08	2.0	94.9	0.96
37	50	225S-4	225S	1500	66.8	235.67	2.0	95.2	0.96
45	60	225M-4	225M	1500	81.1	286.62	2.0	95.4	0.96
55	75	250M-4	250M	1500	98.8	350.32	2.0	95.7	0.96
75	100	280S-4	280S	1500	134.2	477.71	2.0	96	0.96
90	120	280M-4	280M	1500	160.9	573.25	2.0	96.1	0.96

## IE4, Super premium efficiency

## 4 Pole Permanent magnet synchronous motor (Lower frame)

1.1	1.5	80A-4	80	1500	2.2	7.01	2.0	87.2	0.96
1.5	2	80B-4	80	1500	2.9	9.55	2.0	88.2	0.96
2.2	3	90L-4	90L	1500	4.2	14.01	2.0	89.5	0.96
3.7	5	100LA-4	100	1500	7.0	23.57	2.0	90.9	0.96
5.5	7.5	112M-4	112M	1500	10.3	35.03	2.0	91.9	0.96
7.5	10	112M-4	112M	1500	13.9	47.77	2.0	92.6	0.96
11	15	132S-4	132S	1500	20.3	70.06	2.0	93.3	0.96
15	20	132M-4	132M	1500	27.4	95.54	2.0	93.9	0.96
18.5	25	160M-4	160M	1500	33.7	117.83	2.0	94.2	0.96
22	30	160L-4	160L	1500	40.0	140.13	2.0	94.5	0.96
30	41	180L-4	180L	1500	54.3	191.08	2.0	94.9	0.96
37	50	200L-4	200S	1500	66.8	235.67	2.0	95.2	0.96
45	60	200M-4	200M	1500	81.1	286.62	2.0	95.4	0.96
55	75	225-4	225M	1500	98.8	350.32	2.0	95.7	0.96
75	100	250S-4	250S	1500	134.2	477.71	2.0	96	0.96
90	120	250M-4	250M	1500	160.9	573.25	2.0	96.1	0.96

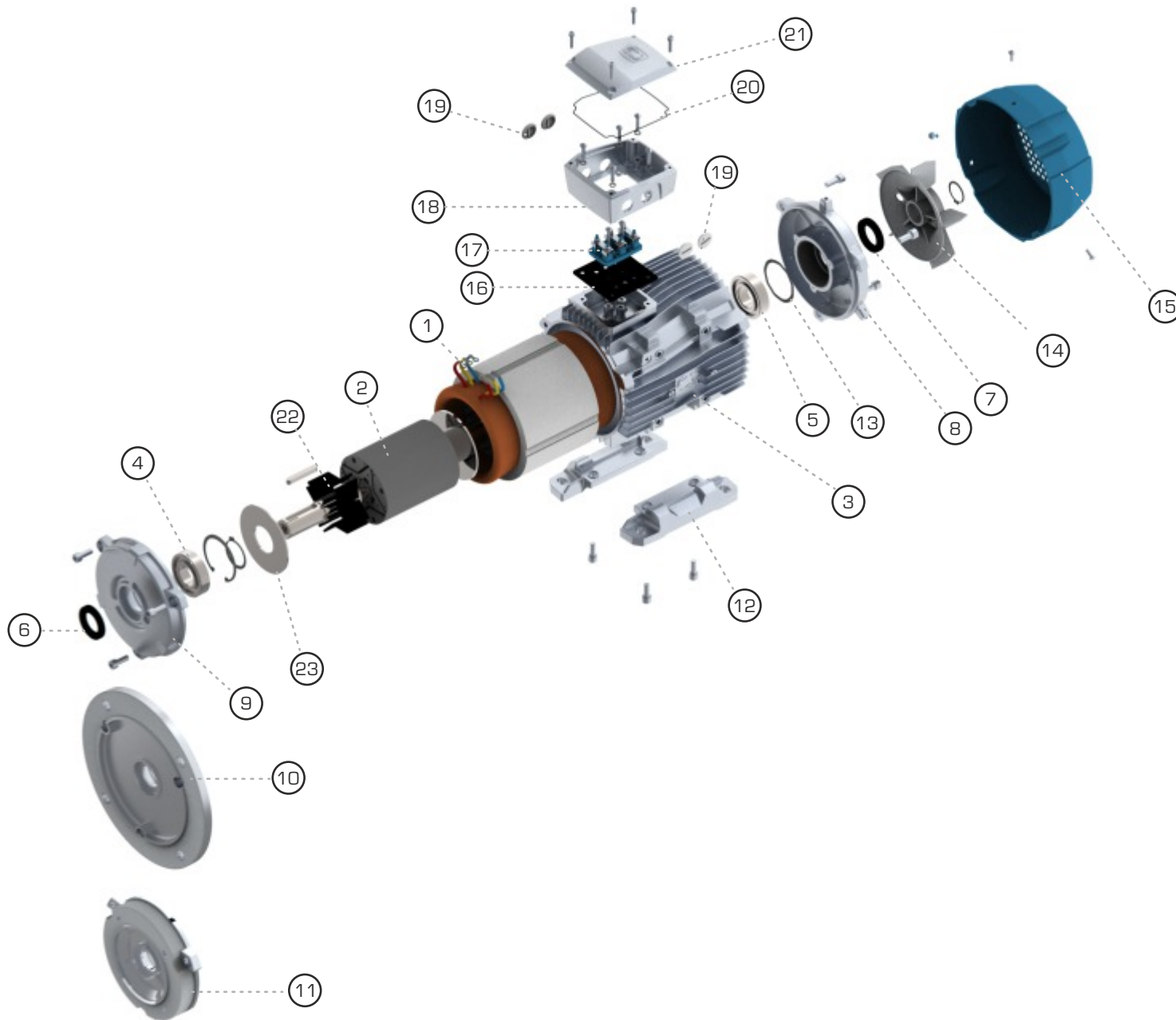
• Efficiency is without seals. • All these performance values are declared at frequency 50 Hz

Power kW	Power HP	Type	Frame	Speed (rpm)	Current (A)	Torque Cn (Nm)	Torque Cmax/Cn	Efficiency (%)	Power Factor
0.37	0.5	80A-6	80	1000	0.82	3.54	2.0	78	0.96
0.55	0.75	80B-6	80	1000	1.17	5.25	2.0	80.9	0.96
0.75	1	90S-6	90S	1000	1.56	7.17	2.0	82.7	0.96
1.1	1.5	90L-6	90L	1000	2.24	10.51	2.0	84.5	0.96
1.5	2	100L-6	100L	1000	3.00	14.33	2.0	85.9	0.96
2.2	3	112M-6	112M	1000	4.33	21.02	2.0	87.4	0.96
3.7	5	132S-6	132S	1000	7.12	35.35	2.0	89.3	0.96
5.5	7.5	132M-6	132M	1000	10.44	52.55	2.0	90.5	0.96
7.5	10	160M-6	160M	1000	14.12	71.66	2.0	91.3	0.96
11	15	160LB-6	160L	1000	20.48	105.1	2.0	92.3	0.96
15	20	180L-6	180L	1000	27.75	143.31	2.0	92.9	0.96
18.5	25	200LA-6	200L	1000	34.04	176.75	2.0	93.4	0.96
22	30	200LB-6	200L	1000	40.35	210.19	2.0	93.7	0.96
30	40	225M-6	225M	1000	54.72	286.62	2.0	94.2	0.96

- Efficiency is without seals.
- All these performance values are declared at frequency 50 Hz

-

## PERMANENT MAGNET SYNCHRONOUS MOTOR



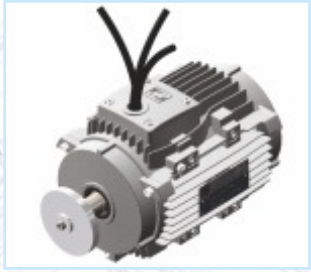
Sr no.	Description
1	Wound stator
2	Interior magnet rotor with shaft
3	Motor body
4	Bearing (DE side)
5	Bearing (NDE side)
6	Oil seal
7	V seal
8	NDE cover
9	DE cover
10	B5 flange
11	B14 flange
12	Foot
13	Wavewasher
14	Fan
15	Fan cover (cowl)
16	Rubber gasket
17	Terminal block
18	Terminal box
19	Plug
20	O ring
21	Terminal box cover
22	Magnet
23	End plate

## CUSTOM BUILT MOTOR

Rotomotive Design Engineers are well versed in the art & science of product / process design. They use tools like CAD/CAM extensively in their work. The analysis is complete well before the prototype is built. Manufacturing lines are well equipped & flexible. With the aid of a highly responsive Supply Chain team, lead times are significantly crashed while ensuring high quality & reliability.

Rotomotive offers motors for various applications in industries like wind energy, hydraulic power packs, electric transportation, construction, mining, HVAC blowers, cooling units and smoke evacuation system.

### Low Voltage Motors



Material Handling System Motor



Hybrid Vehicles Motor



Tower Crane Hoist Motor



Overhead Crane Motor

### Crane Duty Motors

## HYDRAULIC PUMP MOTOR

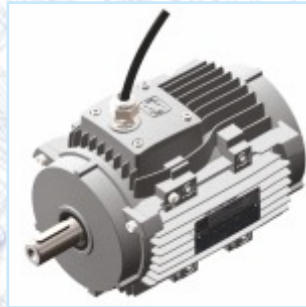
Rotomotive has developed a whole range of hollow shaft motors, particularly for hydraulic pump application. This approach has significantly reduced the cost while at the same time improved efficiency. Final product is lighter & has reduced overall length.

### Salient Features :

- Eliminate the need for shaft coupling.
- Compact design
- Low moment of inertia.
- High efficiency
- Plug & Play
- Option of high pressure oil seals.



## SMOKE & HEAT EXHAUST VENTILATION MOTOR



Delfire series of motors are designed to be a part of smoke and heat control ventilation systems. These systems create a smoke free layer above the floor by removing the smoke. Thus, they improve conditions for safe escape/rescue of people, animals and the protection of property. They also permit the fighting of fire while still in its early stage.

They are also used with jet fans to convey smoke, NOx, carbon monoxide and other gases from tunnels, car parks, basement areas and the likes. In many cases they operate in the hazard prevention mode. In case of fire outbreak, the temperature rises rapidly. Delfire motor work for a guaranteed period of 1 or 2 hours at a continuous temperature of 300, 250 & 200° Celsius, depending upon requirement. These can be single or two speed motors and are governed by the harmonized European standard EN12101.

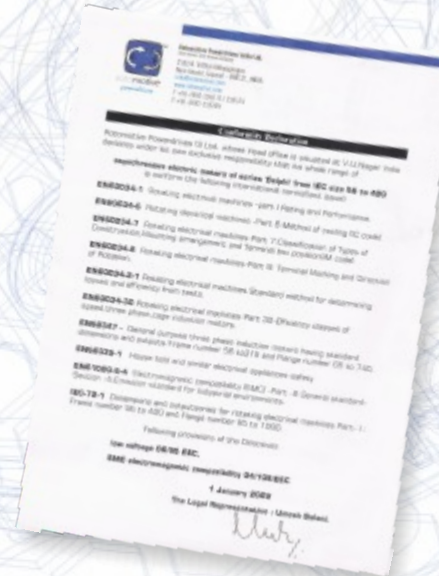
## CE MARKING

CE marking is referred to:

- Community Low Voltage Directive (LVD) 73/23 EEC, modified by the Community Directive regarding marking 93/68 EEC
- Community Electromagnetic Compatibility Directive (EMC) 89/EEC and its modifications 91/263 336 EEC, 92/31 EEC e 93/68 EEC
- Community Machinery Directive (MD) 89/392 EEC and its modifications 91/368 EEC, 93/44 EEC e 93/68

CE marking is put by Rotomotive as a visible sign of the product compliance with the requirements of above mentioned directives. In order to reach this conformity, Rotomotive products respect the following product standards:

- EN 60034-1 (last issue). Rotating electrical machines. Part 1: rating and performance
- EN 60034-5 (last issue). Rotating electrical machines. Part 5: classification of degrees of protection
- EN 60034-6 (last issue). Rotating electrical machines. Part 6: methods of cooling (IC code)
- EN 60034-9 (last issue). Rotating electrical machines. Part 9: noise limits
- EN 50081-1 (last issue). Electromagnetic compatibility - Generic emission standard - Part 1: residential and light industry environment
- EN 50082-1 (last issue). Electromagnetic compatibility- Generic immunity standard- Part 1: residential and light industry environment
- EN 50081-2 (last issue). Electromagnetic compatibility- Generic emission standard- Part 2: Industrial environment
- EN 50082-2 (last issue). Electromagnetic compatibility- Generic immunity standard- Part 2: Industrial environment



All information and data presented in this catalogue have been checked with greatest care. We however do not assume responsible for any unintended errors and omissions. Our designs are being continuously improved, so please reconfirm specifications and dimensions prior to ordering.

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