



ESC SERIES MOTORS

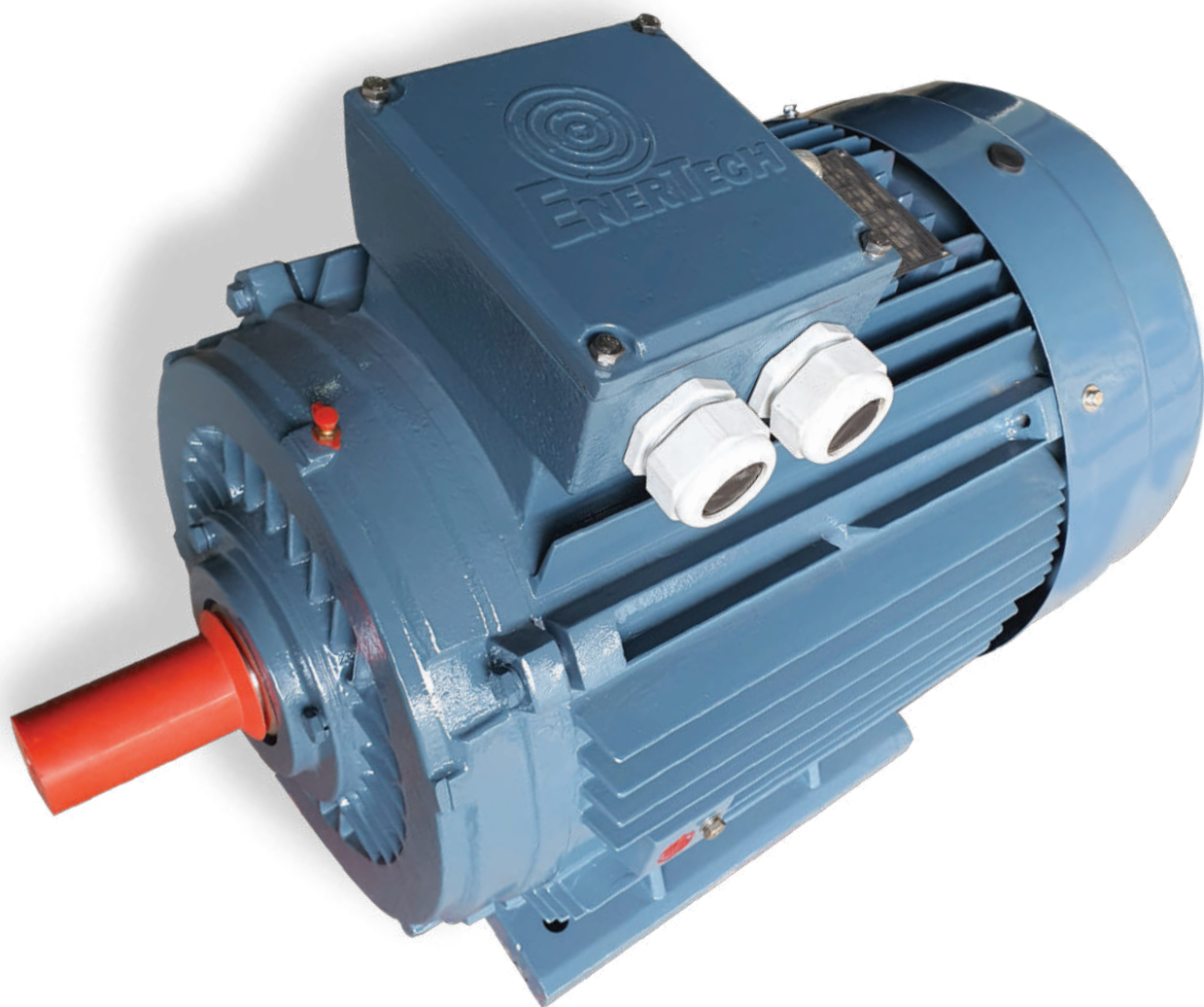


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General Specification

INTRODUCTION

ESC Eco motors are suitable for driving various kinds of machines or equipments. The output ratings are from 0.18kW to 500kW. The frame sizes are from 80 to 400.

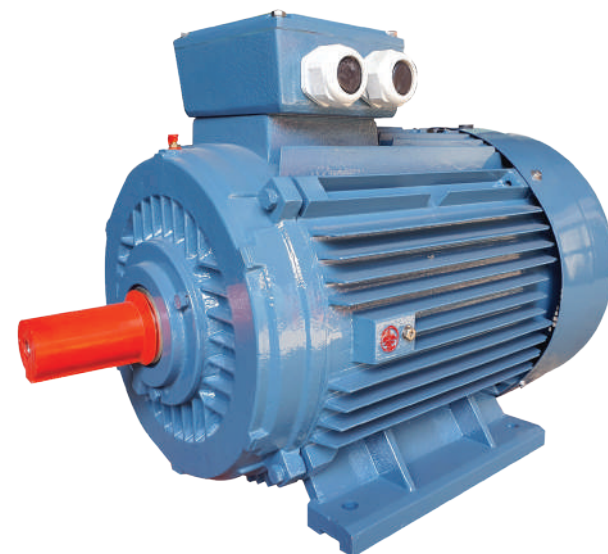
The ESC Eco motors have cast iron stator frames, endshields and terminal boxes. The feet integrally cast into the stator frame.

The location of the terminal box in standard design is on the top, on the right or on the left are possible. The position of the entry opening can be adjusted to suit the existing connection facilities by turning through 90°.

All motors comply with the requirements of European CE marking.

All motors are designed for high efficiency and low temperature giving a long economical service life.

Motors from frame size 63 to 160 with aluminium stator frames, terminal boxes and cast iron endshields are also available.



Cooling and ventilation

The standard cooling method is Totally Enclosed Fan-Cooled (TEFC) in accordance with code IC411 of IEC 60034-6. Standard motors in sizes 80-315 are equipped with radial-flow plastic fans. Standard motors in size 355 are equipped with radial-flow aluminium fans.

Enclosure

The standard degree of protection is IP55. The IP55 enclosure means complete hoseproof and dustproof protection. A higher degree of protection is available.

Voltage and frequency

Standard voltage is 400V/50Hz but can be manufactured for any single voltage in the range 200-600V at a frequency 50 or 60 Hz. The motors will operate satisfactorily with voltage variations of $\pm 10\%$ from the rated voltage.

Connection

Direct on line starting can be used on all frame sizes. Motors up to and including 3kW are star connected and cannot be started with Star/Delta started. Motors 4kW and above can be started with Star/Delta started.

Noise

The permitted noise levels of electrical machines are fixed in IEC60034-9 (EN60034-9). The noise level of ESC Eco motors is well below these limit value. For details, please refer to the performance data tables.

Vibration

Standard motors are designed for vibration class N (normal). Vibration class R (reduced) and vibration class S (special) are available on request.

Quality assurance

Stringent quality procedures are observed from first design to finished products in accordance with ISO9001 documented quality systems. Our factories have been assessed to meet these requirements, a further assurance that only the highest possible standards of quality are accepted.



GENERAL SPECIFICATION

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Against solar radiation

High solar radiation will result in undue temperature rise. In these circumstances, motors should be screened from solar radiation by placement of adequate sunshades which do not inhibit air flow.

Degree of protection

Standard levels of enclosure protection for all ESC frame sizes for both motor and the terminal box is IP55, with IP56, IP65 and IP66 available on request. Enclosure designations comply with IEC60529 or AS60529. The enclosure protection required will depend upon the environmental and operational conditions within which the motor is to operate.

IP standards explanation

I P	5	5	International protection rating prefix (IEC 60034 - 5)
	1	2	

First numeral

- First characteristic numeral
- Degree of protection of persons against approach to live parts or contact with live or moving parts (other than smooth rotating shafts and the like) inside the enclosure, and degree of protection of equipment within the enclosure against the ingress of solid foreign bodies.
- 4. Protected against solid object greater than 1.0 mm: Wires or strips of thickness greater than 1.0 mm, solid objects exceeding 1.0 mm.
 - 5. Dust protected: Ingress of dust is not totally prevented but it does not enter in sufficient quantity to interfere with satisfactory operation of the equipment.
 - 6. Dust tight: No ingress of dust.

Second numeral

- Second characteristic numeral
- 4. Protected against splashing water: Water splashed against the enclosure from any direction shall have no harmful effect.
 - 5. Protected against water jets: Water projected by a nozzle against the enclosure from any direction shall have no harmful effect.
 - 6. Protected against heavy seas: Water from heavy seas or water projected in powerful jets (larger nozzle and higher pressure than second numeral 5) shall not enter the enclosure in harmful quantities.

Shaft

ESC Eco motors have standard shaft extension lengths which provided with standard key, drilled and tapped hole. Non standard shaft extensions are available upon special order, with shaft design outlined on a detailed drawing. Shaft extension run out, concentricity and perpendicularity to face of standard flange mount motors, comply with normal grade tolerance as specified in IEC 60072-1 and AS1359. Precision grade tolerance is available upon special order.

Finish

Standard ESC Eco motor color is RAL 5008. Other colors are also available. All castings and steel parts are provided with a prime coat of rust-resistant paint. The finishing coat of enamel paint is sufficient for normal conditions, however special paint systems can be provided to accommodate stringent requirements for motors in corrosive environments. Special coatings are needed to resist such substances as acid, salt water and extreme climatic conditions.

Electrical design

- As standard, ESC Eco motors have the following design and operating parameters. Performance data is based on this standard. Any deviation should be examined and performance values altered in accordance with the information provided in this section.
- Three phase, 380-415V/50Hz, 440-480V/60Hz
 - Ambient cooling air temperature, 40°C
 - Altitude 1000m
 - Duty cycle S1 (continuous)
 - Rotation Clockwise viewed from drive end
 - Connection 230 volt Delta/400 volt Star (3kW and below)
400 volt Delta/690 volt Star (4kW and above)



Standards and regulations

ESC Eco motors are built to comply with the requirements of the following international standards and regulation:

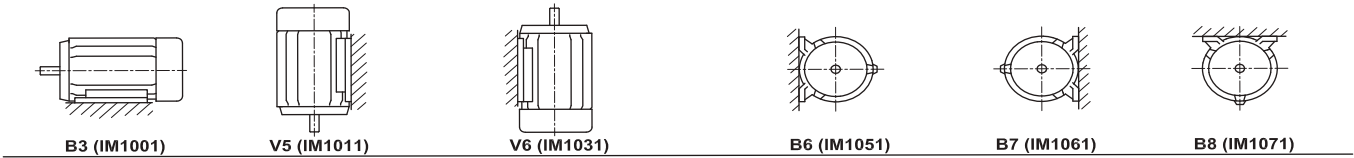
- 1. International Electrotechnical Commission - IEC 60034 and IEC 60072.
- 2. British Standards - BS5000 and BS 4999.
- 3. Australian Standards - AS 1359.
- 4. The requirements of European CE marking. Low voltage Directive 73/23 (1973), modified by Directive 93/68 (1993) and the EMC - Directive 89/336. These ESC motors are designed to use with other machinery, and they should only be used if the complete machinery is in conformity with the provisions of the Directive of safety of machinery (89/93/EEC).
- 5. CEMEP agreement - All motors with standard rating include in this catalog comply with efficiency class IE1, IE2 & IE3 and bear the corresponding label on the rating plate. For efficiency data at 50%, 75% and full load, please refer to the performance data tables.

Standards	IEC	CENELEC	BS
General requirements for electrical machines	60034-1	EN 60034-1	4999-1 4999-69
Methods of determining losses and efficiency	60034-2	HD 53 2	4999-34
Degrees of protection	60034-5	EN60034-5	4999-20
Methods of cooling	60034-6	EN60034-6	4999-21
Mounting arrangements	60034-7	EN60034-7	4999-22
Terminal markings and direction of rotation	60034-8	HD 53 8S4	4999-3
Noise limits	60034-9	EN60034-9	4999-51
Starting performance	60034-12	EN60034-12	4999-112
Mechanical vibration	60034-14	EN60034-14	4999-50
Standard voltages	60038	HD 472 S1	---
Dimensions and output ratings	60072	---	---
Mounting dimensions and relationship framesizes-output ratings	60072	HD 231	4999-10 51-110
Shaft dimensions	60072	HD 231	4999-10
Classification of environmental conditions	600721-2-1	---	---
Insulation material	60085	---	---

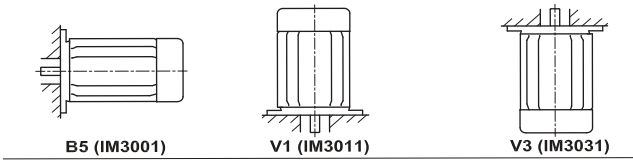
*The ESC Eco motor range corresponds to the new international standard IEC 60034-30

Standards mounting arrangements

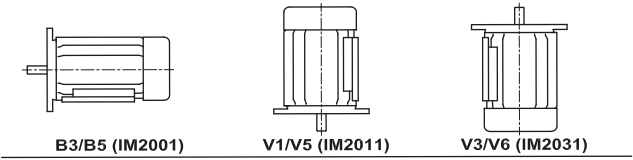
Foot mounting



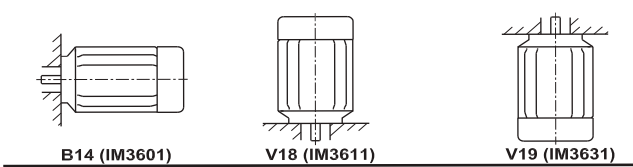
Large flange



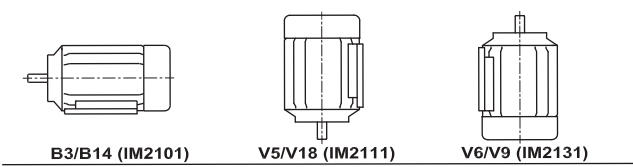
Large flange and feet



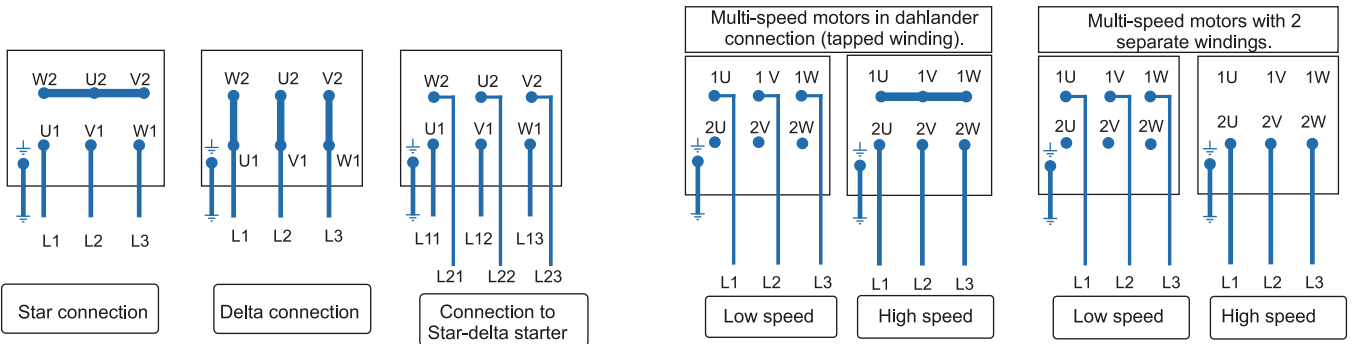
Small flange (face)



Small flange (face) and feet



Connection diagrams three phase motors with cage rotor



Rating plates

Frame size from 80 to 112

		ENERTECH ELECTRIC MOTORS (AUSTRALIA)							
3 PHASE ASYNCHRONOUS MOTOR									
TYPE					S/N				
☐	INS.CL.		IP		CODE			☐	
	AMB.TEMP		°C		DUTY				
BEARING DE			NDE			WEIGHT		KG	
VOLTS	CONN.	Hz	kW	RPM	AMP	Cos φ	EFF.%		

Frame size 132 to 355

 ENERTECH ENERTECH ELECTRIC MOTORS (AUSTRALIA) 3 PHASE ASYNCHRONOUS MOTOR										 IE	
TYPE					S/N						
INS.CL.			IP		CODE						
AMB.TEMP					°C		DUTY				
BEARING DE				NDE			WEIGHT		KG		
VOLTS		CONN.	Hz	kW	RPM	AMP	Cos φ	EFF.%			

Electrical Design

Voltage and frequency

Standard ESC Eco motors are designed for a power supply of three phase 400V, 50Hz. Motors can be manufactured for any supply between 100V and 1100V and frequencies other than 50Hz. Standard ESC motors wound for a certain voltage at 50Hz can also operate at other voltages at 50Hz and 60Hz without modification, subject to the changes in their data.

Motor wound for 50Hz at rated voltage	Connected to	Data in percentage of values at 50Hz and rated voltage						
		Output	r/min	I _N	I _L /I _N	T _N	T _L /T _N	T _B /T _N
380V	400V 50Hz	100	100	95	110	100	110	110
	380V 60Hz	100	120	98	83	83	70	85
	400V 60Hz	105	120	98	90	87	80	90
	415V 60Hz	110	120	98	95	91	85	93
	440V 60Hz	115	120	100	100	96	95	98
	460V 60Hz	120	120	100	105	100	100	103
400V	380V 50Hz	100	100	105	91	100	90	90
	415V 50Hz	100	100	96	108	100	108	108
	400V 60Hz	100	120	98	83	83	70	85
	415V 60Hz	104	120	98	89	86	75	88
	440V 60Hz	110	120	98	95	91	85	93
	460V 60Hz	115	120	100	100	96	93	98
415V	480V 60Hz	120	120	100	105	100	100	103
	380V 50Hz*	100	100	109	84	100	84	84
	400V 50Hz	100	100	104	93	100	93	93
	440V 50Hz	100	100	94	112	100	112	112
	415V 60Hz	100	120	98	83	83	70	85
	440V 60Hz	105	120	98	90	87	80	90
525V	460V 60Hz	110	120	98	95	91	85	94
	480V 60Hz	115	120	100	100	96	95	98
	550V 50Hz	100	100	95	110	100	110	110
	525V 60Hz	100	120	98	83	83	70	85
	550V 60Hz	105	120	98	90	87	80	90
	575V 60Hz	110	120	98	95	91	85	94
	600V 60Hz	115	120	100	100	96	95	98

* Not applicable for motors with F class temperature rise.

- 1) I_N=Full load current T_N=Full load torque
I_L/I_N=Locked rotor current/ full load current
T_L/T_N=Locked rotor torque/ full load torque
T_B/T_N=Breakdown torque/full load torque

Standard torque values for alternative supplies are obtainable only with special windings. For these purpose-built motors the performance data is the same as for 400V motors except for the currents which are calculated with the accompanying formula:

Where:

$$I_x = \frac{400 \times I_N}{U_x}$$

I_x = Current

I_N = Full load current at 400 volt

U_x = Design voltage

Temperature and altitude

Rated power specified in the performance data tables apply for standard ambient conditions of 40°C at 1000m above sea level. Where temperature or altitude differ from the standard, multiplication factors in the table below should be used.

Ambient temperature	Temperature factor	Altitude above sea level	Altitude factor
30°C	1.06	1000m	1.00
35°C	1.03	1500m	0.98
40°C	1.00	2000m	0.94
45°C	0.97	2500m	0.91
50°C	0.93	3000m	0.87
55°C	0.88	3500m	0.82
60°C	0.82	4000m	0.77

$$\text{Effective Power} = \frac{\text{Rated Power}}{\text{Temperature Factor}} \times \text{Altitude Factor}$$

Example 1:

Effective Power required = 15 kW

Air temperature =50°C (factor 0.93)

Altitude = 2500 metres (factor 0.91)

$$\text{Rated power required} = \frac{15}{0.93 \times 0.91} = 17.7\text{kW}$$

The appropriate motor is one with a rated power above the required, being 18.5 kW.

Example 2:

Rated power = 11 kW

Air temperature = 50°C (factor 0.93)

Altitude = 1500 metres (factor 0.98)

$$\text{Effective Power} = 11 \times 0.93 \times 0.98 = 10.0 \text{ kW}$$

Rotation

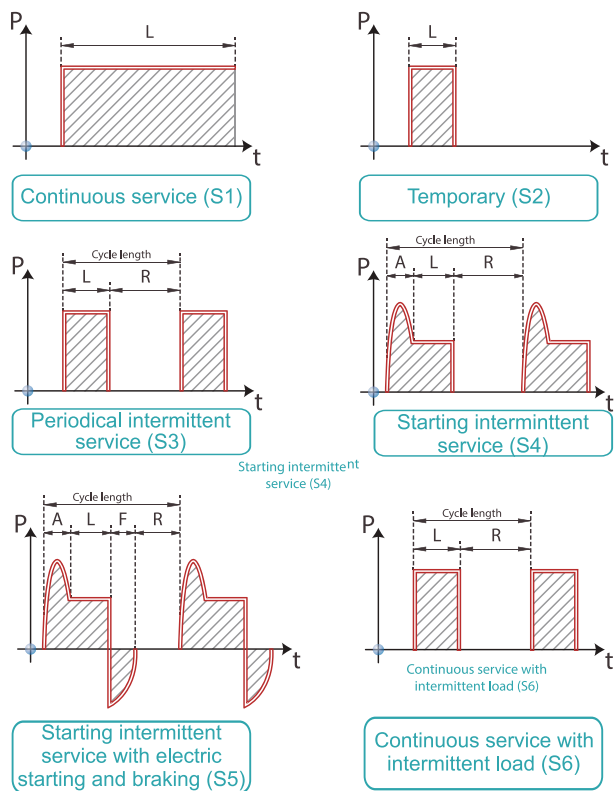
For clockwise rotation, viewed from drive end, standard three phase ESC Eco motor terminal markings coincide with the sequence of the phase line conductors. For counter clockwise rotation, viewed from drive end, two of the line conductors have to be reversed. This is made clear in the table of connection diagrams three phase motors with cage rotor (page 9).

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Duty

ESC Eco motors are supplied suitable for S1 operation (continuous operation under rated load). When the motor is operated under any other type of duty the following information should be supplied to determine the correct motor size:

- Type and frequency of switching cycles as per duty factors S3 to S7 and duty cycle factor.
- Load torque variation during motor acceleration and braking (in graphical form).
- Moment of inertia of the bad on the motor shaft.
- Type of braking (eg mechanical electrical through phase reversal or DC injection)



Explanation

D = Cycle length

L = Load time R= Resting time

A = Startingtime F = Braking time

Intermittent ratio calculation in percentage

S3 = L/(D)*100 S4 = (A+L)/(D)*100

S5 = (A+L+F)/D*100 S6 = L/(D)*100

Permissible output

Apply the factors of the expanding table to the output rating for motors with duty cycles that are not continuous. For other duties (S4, S5, S8 and S7) contact us for appropriate duty cycle factors.

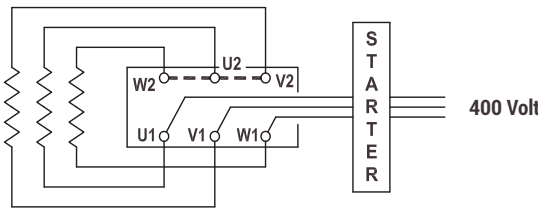
Poles		Duty cycle factor		
		For frames 80 to 132	For frames 160 to 250	For frames 280 to 355
Short-time duty, S2				
30 min	2	1.05	1.20	1.20
	4 to 8	1.10	1.20	1.20
60 min	2 to 8	1.00	1.10	1.10
Intermittent duty, S3				
15%	2	1.15	1.45	1.40
	4 to 8	1.40	1.40	1.40
25%	2	1.10	1.30	1.30
	4 to 8	1.30	1.25	1.30
40%	2	1.10	1.10	1.20
	4 to 8	1.20	1.08	1.20
60%	2	1.05	1.07	1.10
	4 to 8	1.10	1.05	1.10

Connection

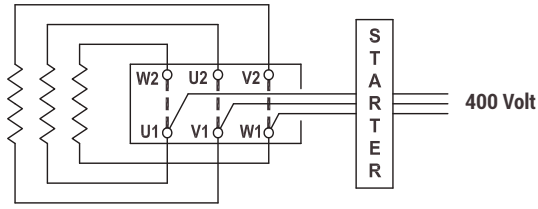
A motor's rated voltage must agree with the power supply line-to-line voltage. It is carefully to ensure the correct connection to the motor terminals.

Internal connections, voltages and VF drive selection

Standard terminal connections for motors 3kW and below is 230V delta / 400V star. These motors are designed for 400V Direct On Line (D.O.L.) starting, when connected in the star configuration. They are also suitable for operation with 230V three phase variable frequency drives. when connected in the delta configuration. Standard terminal connections for motors 4kW and above is 400V delta / 690V star. These motors are designed for 400V Direct On Line (D.O.L.) starting, when connected in the delta configuration. They are also suitable for operation with 400V three phase variable frequency drives . Alternativelythey can be operated D.O.L. in the star configuration from a 690V supply or with a 690V variable frequency drive. In this case the drive must be supplied with an output reactor to protect the winding insulation. These size motors are also suitable for 400V star-delta starting as described below. Motor connected for D.O.L. starting with bridges in place for star connection (3kW and below).



Motor connected for D.O.L. starting with bridges in place for delta connection (4kW and above).



Starting

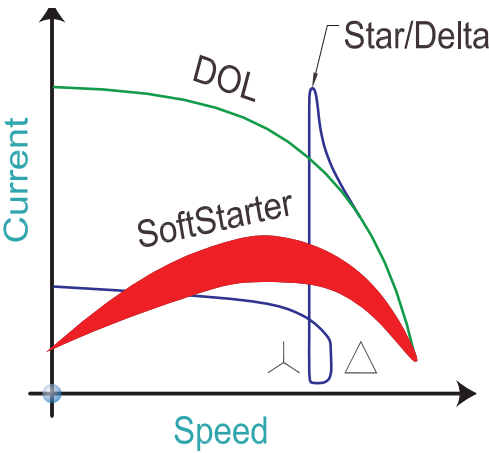
All of the following starter options are available and are the best supplied together with the motor.

D.O.L Starters

When an electric motor is started by direct connection to the power supply (D.O.L.), it draws a high current, called the starting current, which is approximately equal in magnitude to the locked rotor current I_L . As listed in the performance data, locked rotor current can be up to 8 times the rated current I_n of the motor. In circumstances where the motor starts under no load or where high starting torque is not required, it is preferable to reduce the starting current by one of the following means.

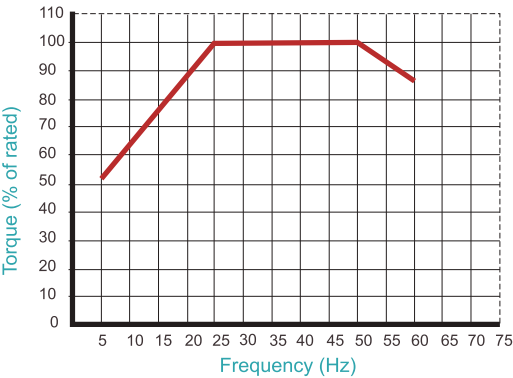
Star - Delta starting

The motors 4kW and above are suitable for the star-delta starting method. Through the use of a star-delta starter, the motor terminals are connected in the star configuration during starting, and reconnected to the delta configuration when running. The benefits of this starting method are a significantly lower starting current, to a value about 1/3 of the D.O.L. starting current, and a corresponding starting torque also reduced to about 1/3 of its D.O.L. value. It should be noted that a second current surge occurs on change over to the delta connection. The level of this surge will depend on the speed the motor has reached at the moment of change over.



VVVF Drives

Variable Voltage Variable Frequency drives are primarily recognized for their ability to manipulate power from a constant 3 phase 50/60Hz supply converting it to variable voltage and variable frequency power. This enables the speed of the motor to be matched to its load in a flexible and energy efficient manner. The only way of producing starting torque equal to full load torque with kill load current is by using VVVF drives. The functionally flexible VVVF drive is also commonly used to reduce energy consumption on fans, pumps and compressors and offers a simple and repeatable method of changing speeds or flow rates.



EDM Concerns

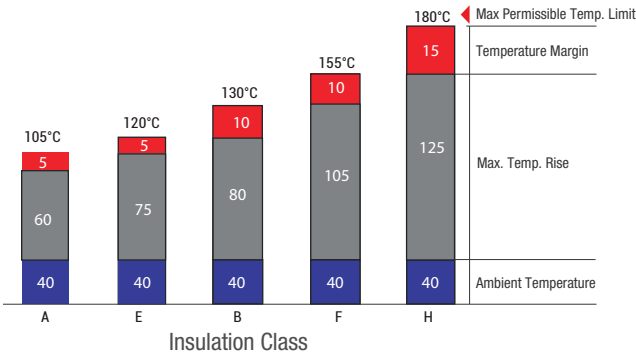
Capacitive voltages in the rotor can be generated due to an effect caused by harmonics in the waveform causing voltage discharge to earth through the beatings. This discharge results in etching of the bearing running surfaces. This effect is known as Electrical Discharge Machining (EDM). It can be control with the fitment of appropriate filters to the drive.To further reduce the of EDM, an insulated non drivebearing can be used.ESC Eco recommends the use of insulated bearings for all motors 315 frame and above.

Insulation

Our standard motors have insulation class F while the temperature rise is for Class B ensuring longer service life.

Upon the customer’s request, H class insulation motors are manufactured.

Under specified measuring conditions in accordance with IEC 60034-1 standard, insulation class F for an electric motor means that at ambient temperature of 40°C the temperature rise of its windings may be max. 105°C with the additional temperature margin of 10°C.

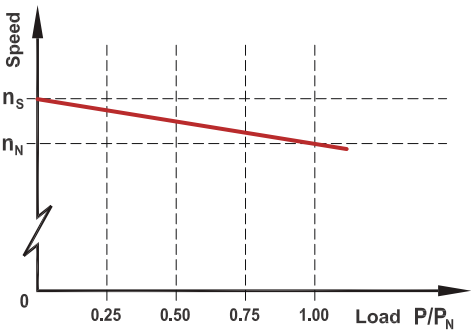


Thermal protection

Motors can be protected against excessive temperature rise by inserting, at various positions within the windings, thermal probes which can either give a warning signal or cut off the supply to the motor in the event of a temperature abnormality. The units fitted to ESC Eco motors, frame sizes 160 and above, are PTC thermistors. These thermovisible resistors, with positive temperature co-efficient, are fitted one per phase, series connected and are terminated in a terminal strip located in the terminal box. Trip temperature is 155°C (180°C for motor class H). Additional 130°C thermistors can be fitted as an option for alarm connection.

Speed at partial loads

The relationship between motor speed and degree of loading on an ESC Eco motor is approximately linear up to the rated load. This is expressed graphically in the accompanying drawing.



Where:
n_N = full load speed
n_s = asynchronous speed
P/P_N = partial load factor

Current at partial loads

Current at partial loads can be calculated using the following formula:

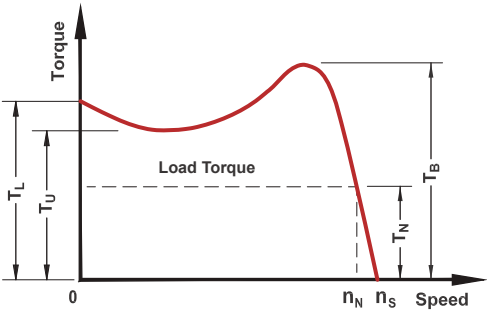
$$I_x = \frac{P_{out_x}}{\sqrt{3} \times U_N \times \cos \phi_x \times \eta_x} \times 10^5$$

Where:

- I_x = partial load current (amps)
- P_{out_x} = partial load (kW)
- U_N = rated voltage
- cos φ_x = partial load power factor
- η_x = partial load efficiency (%)

Torque characteristics

Typical characteristics of torque behaviour relative to speed are shown in the torque speed curve example below .



Where:

- T_N = full load torque
- T_L = locked rotor torque
- T_u = pull-up torque
- T_B = break down torque
- n_N = full load speed
- n_s = asynchronous speed

ESC Eco motors all exceed the minimum starting torque requirements for Design N (Normal torque) as specified in IEC60034-12, and in most cases meet the requirements of Design H (High torque). Rated torque can be calculated with the following formula:

$$T_N = \frac{9550 \times P_N}{n_N}$$

Where:

- T_N = full load torque (Nm)
- P_N = full load output power (kW)
- n_N = full load speed (r/min)



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Design features

Permissible radial loads on the shaft with standard bearings

The values of radial load calculated considering:
- Frequency: 50Hz.
- Temperature not exceeding 90°C.
- 30,000 hours of life for 2-pole motors;
- 60,000 hours of life for 4,6,8-pole motors.

For operation at 60Hz, the values have to be reduced by 6% in order to achieve the same useful life. For double speed motors, consider always the higher speed.
*The distance to the point of action of force F_R from the shoulder of the shaft must not exceed the length of the shaft end.

Forces of belt drive on the shaft tight side when the belt tensioners is calculated by the following formula:

$$F_R = 2 \sigma_0 F \sin \frac{\alpha_1}{2} z \text{ (N)}$$

Where:

- σ_0 : The initial tension. (N) (trapezoid belt, flatbelt)
- F : The cross-sectional area of the belt (cm²)
- α_1 : Arc of contact small (belt) pulley
 - + $\alpha_1 = 180^\circ - (d_2 - d_1) \frac{57^\circ}{a}$ ($\alpha_1 > 120^\circ$)
 - + d_1 : Diameter of small (belt) pulley
 - + d_2 : Diameter of large (belt) pulley
 - + a : Center distance of 2(belt) pulley
- z : Number of belt

Type of belt scales	The cross-sectional area F(cm²)
A	0.81
B	1.38
C	2.3
D	4.76
E	6.92

Deflection Amount T (mm)

$$T = \frac{a}{64}$$

Example: there is 1 trapezoid belt drive

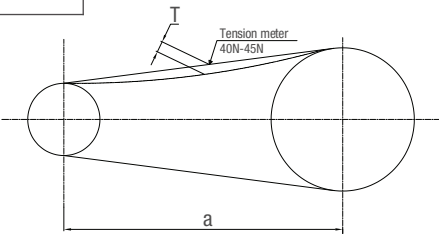
- $d_1 = 310\text{mm}$
- $d_2 = 460\text{mm}$
- a = 1300mm
- z = 8

The angle of the wheel hug small belt

$$\alpha_1 = 180^\circ - (d_2 - d_1) \frac{57}{a}$$
$$= 180^\circ - (460 - 310) \times 57 / 1300 = 173.4^\circ$$

Forces of belt drive on the shaft tight side when the belt tensioners accordance stretch panel

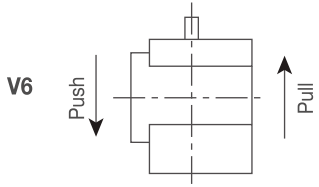
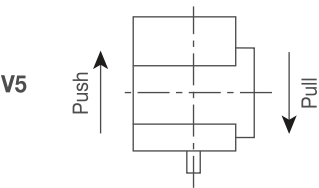
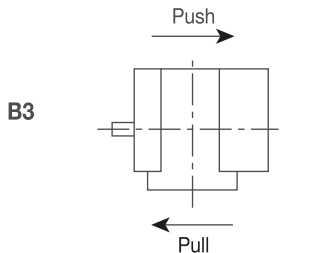
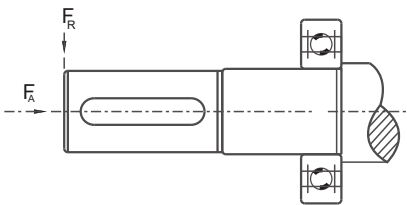
$$F_R = 2 \sigma_0 F \sin \frac{\alpha_1}{2} z \text{ (N)}$$
$$= 2 \times 150 \times 2.3 \times 0.998 \times 8 = 5\,509 \text{ N}$$



Permissible axial loads on the shaft with standard bearings

If the shaft end is loaded at $X_{\max}$ with the permissible radial load F_R , an additional axial load is allowed.

If the permissible radial load is not fully utilized, higher loads are possible in axial direction (Values on request).



Frame size	Pole number	Limit axial load with F_R at $X_{\max} = F_A$ [N]			
		Ball bearings		Roller bearings	
		B3 push/pull	V5/V6 push/pull	B3 push/pull	V5/V6 push/pull
63	2	120	110	---	---
	4	120	110	---	---
	6	140	130	---	---
	8	160	150	---	---
71	2	140	130	---	---
	4	140	120	---	---
	6	170	150	---	---
	8	190	170	---	---
80	2	190	170	---	---
	4	190	160	---	---
	6	220	190	---	---
	8	250	220	---	---
90	2	200	170	---	---
	4	200	160	---	---
	6	240	190	---	---
	8	270	220	---	---
100	2	280	230	---	---
	4	280	220	---	---
	6	330	260	---	---
	8	370	300	---	---
112	2	410	330	---	---
	4	410	320	---	---
	6	480	370	---	---
	8	540	430	---	---
132	2	590	430	---	---
	4	590	380	---	---
	6	690	470	---	---
	8	780	560	---	---
160	2	750	490	1000	700
	4	750	450	1200	840
	6	880	520	1300	910
	8	1000	640	1400	980
180	2	880	950	1000	700
	4	880	1150	1250	875
	6	1030	1350	1350	945
	8	1160	1550	1550	1085
200	2	1160	1100	1100	770
	4	1160	1200	1200	840
	6	1360	1400	1400	980
	8	1520	1600	1600	1120
225	2	1300	1250	1250	875
	4	1300	1350	1350	945
	6	1520	1600	1600	1120
	8	1710	1850	1850	1295
250	2	1460	1300	1300	910
	4	1460	1400	1400	980
	6	1710	1600	1600	1120
	8	1920	1920	1900	1330
280	2	5500	3850	3700	2590
	4	5500	3850	3700	2590
	6	6500	4550	4000	2800
	8	7400	5180	4500	3150
315 S-M	2	5500	3850	3700	2590
	4	5800	4060	3500	2450
	6	6800	4760	4000	2800
	8	7650	5355	4500	3150
315 L	2	2200	1540	3850	2695
	4	2200	1540	3800	2660
	6	2500	1750	4600	3220
	8	3000	2100	5500	3850
355L	2	2000	3690	---	---
	4	6000	1880	---	---
	6	7000	300	---	---
	8	8000	300	---	---

Performance Data

Efficiency Classification (%)

Output (kW)	2P	4P	6P	8P
0.75	75.0	73.0	69.0	71.0
1.1	76.2	76.2	72.0	73.0
1.5	78.5	78.5	76.0	75.0
2.2	81.0	81.0	79.0	78.0
3	82.6	82.6	81.0	79.0
4	84.2	84.2	82.0	81.0
5.5	85.7	85.7	84.0	83.0
7.5	87.0	87.0	86.0	85.5
11	88.4	88.4	87.5	87.5
15	89.4	89.4	89.0	88.0
18.5	90.0	90.0	90.0	90.0
22	90.5	90.5	90.0	90.5
30	91.4	91.4	91.5	91.0
37	92.0	92.0	92.0	91.5
45	92.5	92.5	92.5	92.0
55	93.0	93.0	92.8	92.8
75	93.0	93.6	93.5	93.0
90	93.6	93.9	93.8	93.8
110	94.0	94.5	94.0	94.0
132	94.5	94.8	94.2	93.7
160	94.6	94.9	94.5	94.2
200	94.8	94.9	94.5	94.5
250	95.2	95.2	94.5	94.5
315	95.4	95.2	94.5	-

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2 Poles - 3000 rpm asynchronous speed 50Hz

Output (kW)	Frame Size	Full load speed (rpm)	Current			Locked rotor I _L /I _N	Efficiency % at % full load 100	Power factor , cos φ at % full load 100	Torque			Moment of inertia J=½GD² (kg x m²)	Noise level at 1 meter dB(A)	Net weight (kg)
			Full load I _N , 50Hz						Full load T _N (Nm)	Locked rotor T _L /T _N	Break down T _B /T _N			
			380V	400V	415V									
			(A)	(A)	(A)									
0.75	80M1	2840	1.83	1.74	1.68	6.8	75.0	0.83	2.5	2.3	2.3	0.001	62	15
1.1	80M2	2840	2.61	2.48	2.39	7.1	76.2	0.84	3.7	2.3	2.3	0.002	62	18
1.5	90S	2850	3.45	3.29	3.17	7.3	78.5	0.84	5.0	2.3	2.3	0.002	67	24
2.2	90L	2850	4.85	4.61	4.44	7.6	81.0	0.85	7.3	2.3	2.3	0.003	67	28
3	100L	2880	6.34	6.02	5.81	7.8	82.6	0.87	9.9	2.2	2.3	0.005	74	38
4	112M1	2880	8.20	7.79	7.51	8.1	84.2	0.88	13.2	2.2	2.3	0.008	77	42
5.5	132S1	2900	11.08	10.53	10.15	8.2	85.7	0.88	18.1	2.2	2.3	0.014	79	70
7.5	132S2	2900	14.88	14.14	13.63	7.8	87	0.89	24.7	2.2	2.3	0.018	79	68
11	160M1	2930	21.2	20.1	19.4	7.9	88.4	0.89	35.7	2.2	2.3	0.051	81	108
15	160M2	2930	28.6	27.2	26.2	7.9	89.4	0.89	48.7	2.2	2.3	0.064	81	122
18.5	160L	2930	34.7	33.0	31.8	8.0	90.0	0.90	60.1	2.2	2.3	0.076	81	136
22	180M	2940	41.0	39.0	37.5	8.1	90.5	0.90	71.1	2.2	2.3	0.105	83	172
30	200L1	2950	55.4	52.6	50.7	7.5	91.4	0.90	96.6	2.0	2.3	0.179	84	234
37	200L2	2950	67.8	64.5	62.2	7.5	92.0	0.90	119.2	2.0	2.3	0.201	84	242
45	225M	2970	82.1	78.0	75.2	7.5	92.5	0.90	144.7	2.2	2.3	0.305	86	315
55	250M1	2970	99.8	94.8	91.4	7.6	93.0	0.90	176.6	2.2	2.3	0.414	89	394
75	280S	2970	136.1	129.3	124.6	6.9	93.0	0.90	240.8	1.8	2.3	0.695	91	520
90	280M1	2970	162.3	154.2	148.6	6.9	93.6	0.90	288.9	1.8	2.3	0.852	91	596
110	315S	2980	195.4	185.6	179.9	7.0	94.0	0.91	352.5	1.8	2.2	1.753	92	890
132	315M	2980	233.2	221.5	213.5	7.0	94.5	0.91	423.0	1.8	2.2	1.874	92	970
160	315L1	2980	279.3	265.3	255.7	7.1	94.6	0.92	512.8	1.8	2.2	2.296	92	1070
200	315L2	2980	348.4	331.0	319.0	7.1	94.8	0.92	640.9	1.8	2.2	2.478	92	1040
250	355M	2980	433.7	412.0	397.1	7.1	95.2	0.92	801.2	1.6	2.2	3.800	100	1638
315	355L	2980	545.3	518.0	499.3	7.2	95.4	0.92	1009.5	1.6	2.2	4.800	100	1834

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4 Poles - 1500 rpm asynchronous speed 50Hz

Output (kW)	Frame Size	Full load speed (rpm)	Current			Locked rotor I _L /I _N	Efficiency % at % full load 100	Power factor , cos φ at % full load 100	Full load T _N (Nm)	Torque		Moment of inertia J=¼GD² (kg x m²)	Noise level at 1 meter dB(A)	Net weight (kg)
										Locked rotor T _L /T _N	Break down T _B /T _N			
			Full load I _N , 50Hz											
			380V (A)	400V (A)	415V (A)									
0.75	80M2	1390	2.05	1.95	1.88	6.4	73.0	0.76	5.1	2.3	2.3	0.003	56	16
1.1	90S	1400	2.84	2.70	2.60	6.6	76.2	0.77	7.4	2.3	2.3	0.004	59	21
1.5	90L	1400	3.67	3.49	3.36	6.7	78.5	0.79	10.1	2.3	2.3	0.006	59	26
2.2	100L1	1420	5.10	4.84	4.66	7.3	81.0	0.81	14.6	2.3	2.3	0.010	64	32
3	100L2	1420	6.72	6.38	6.15	7.5	82.6	0.82	19.9	2.3	2.3	0.013	64	34
4	112M	1440	8.80	8.36	8.06	7.5	84.2	0.82	26.3	2.3	2.3	0.019	65	46
5.5	132S	1440	11.74	11.15	10.75	7.5	85.7	0.82	36.1	2.0	2.3	0.036	71	68
7.5	132M1	1440	15.59	14.82	14.28	7.3	87.0	0.83	49.8	2.0	2.3	0.047	71	77
11	160M	1460	22.5	21.4	20.6	7.4	88.4	0.84	71.7	2.0	2.3	0.103	73	118
15	160L	1460	29.9	28.4	27.4	7.5	89.4	0.84	97.8	2.0	2.3	0.131	73	134
18.5	180M	1470	36.3	34.5	33.2	7.6	90.0	0.86	120.2	2.0	2.3	0.183	76	183
22	180L	1470	42.9	40.8	39.3	7.7	90.5	0.86	142.4	2.1	2.3	0.219	76	215
30	200L	1470	57.9	55.0	53.0	7.1	91.4	0.86	194.2	2.1	2.3	0.297	76	265
37	225S	1480	70.2	66.7	64.3	7.3	92.0	0.87	238.8	2.1	2.3	0.578	78	296
45	225M	1480	84.9	80.7	77.7	7.3	92.5	0.87	290.4	2.2	2.3	0.659	78	328
55	250M1	1480	103.3	98.0	94.5	7.3	93.0	0.87	354.9	2.2	2.3	0.818	79	420
75	280S	1480	139.9	132.9	128.1	6.8	93.6	0.87	482.3	2.2	2.3	1.571	80	540
90	280M1	1480	167.3	158.9	153.2	6.9	93.9	0.87	578.8	2.2	2.3	1.964	80	622
110	315S	1480	200.9	190.9	184.0	6.9	94.5	0.88	707.4	2.1	2.2	3.247	88	860
132	315M	1480	240.4	228.4	220.1	6.9	94.8	0.88	848.9	2.1	2.2	3.527	88	942
160	315L1	1480	287.8	273.4	263.5	6.9	94.9	0.89	1029.0	2.1	2.2	4.087	88	1018
200	315L2	1480	359.7	341.7	329.4	6.9	94.9	0.89	1286.2	2.1	2.2	5.374	88	1158
250	355M	1490	443.3	421.1	405.9	6.9	95.2	0.90	1602.3	2.0	2.2	8.400	95	1660
315	355L	1490	558.6	530.7	511.5	6.9	95.2	0.90	2019.0	2.0	2.2	9.900	95	1804

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6 Poles -1000 rpm asynchronous speed 50Hz

Output (kW)	Frame Size	Full load speed (rpm)	Current			Locked rotor I_L/I_N	Efficiency % at % full load 100	Power factor , cos ϕ at % full load 100	Full load T_N (Nm)	Torque		Moment of inertia $J=\frac{1}{2}GD^2$ (kg x m ²)	Noise level at 1 meter dB(A)	Net weight (kg)
			Full load I_N , 50Hz							Locked rotor T_L/T_N	Break down T_B/T_N			
			380V	400V	415V									
			(A)	(A)	(A)									
0.75	90S	910	2.30	2.19	2.11	5.8	69.0	0.72	7.7	2.0	2.1	0.005	57	24
1.1	90L	910	3.20	3.04	2.93	5.9	72.0	0.73	11.2	2.0	2.1	0.008	57	26
1.5	100L	920	4.00	3.80	3.66	5.9	76.0	0.75	15.2	2.0	2.1	0.013	61	31
2.2	112M	940	5.60	5.32	5.13	6.2	79.0	0.76	22.1	2.0	2.1	0.020	65	40
3	132S	960	7.40	7.03	6.78	6.4	81.0	0.76	29.8	2.0	2.1	0.038	69	62
4	132M1	960	9.80	9.31	8.97	6.6	82.0	0.76	39.8	2.0	2.1	0.050	69	66
5.5	132M2	960	12.90	12.26	11.81	6.8	84.0	0.77	54.7	2.0	2.1	0.066	69	76
7.5	160M	970	17.20	16.34	15.75	6.8	86.0	0.77	73.8	2.0	2.1	0.121	73	112
11	160L	970	24.5	23.3	22.4	6.9	87.5	0.78	108.3	2.0	2.1	0.161	73	134
15	180L	970	31.6	30.0	28.9	7.3	89.0	0.81	146.9	2.0	2.1	0.264	73	182
18.5	200L1	970	38.6	36.7	35.3	7.2	90.0	0.81	181.2	2.0	2.1	0.407	73	230
22	200L2	970	44.7	42.5	40.9	7.3	90.0	0.83	215.5	2.0	2.1	0.459	73	240
30	225M	980	59.3	56.3	54.3	6.8	91.5	0.84	290.9	2.0	2.1	0.648	74	292
37	250M	980	71.1	67.5	65.1	7.0	92.0	0.86	358.7	2.0	2.1	0.979	76	388
45	280S	980	85.9	81.6	78.7	7.2	92.5	0.86	436.3	2.0	2.0	1.790	78	490
55	280M1	980	104.7	99.5	95.9	7.2	92.8	0.86	533.2	2.0	2.0	2.164	78	560
75	315S	990	141.7	134.6	129.7	6.5	93.5	0.86	723.5	2.0	2.0	4.279	83	800
90	315M	990	169.5	161.0	155.2	6.6	93.8	0.86	868.2	2.0	2.0	5.017	83	920
110	315L1	990	206.7	196.4	189.3	6.6	94.0	0.86	1061.1	2.0	2.0	5.607	83	1020
132	315L2	990	244.7	232.5	224.1	6.6	94.2	0.87	1273.3	2.0	2.0	6.640	83	1110
160	355M1	990	292.3	277.7	267.6	6.7	94.5	0.88	1543.4	2.0	2.2	9.600	85	1554
200	355M2	990	365.4	347.1	334.6	6.8	94.5	0.88	1929.3	2.0	2.2	11.900	85	1768
250	355L	990	456.8	434.0	418.3	6.8	94.5	0.88	2411.6	2.0	2.2	13.400	85	1810
315	355L2	990	585.8	554.1	534.1	6.8	95.0	0.88	3038.6	2.0	2.2	14.300	91	2350

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8 Poles -750 rpm asynchronous speed 50Hz

Output (kW)	Frame Size	Full load speed (rpm)	Current			Locked rotor I_L/I_N	Efficiency % at % full load 100	Power factor , $\cos \phi$ at % full load 100	Full load T_N (Nm)	Torque			Moment of inertia $J=\frac{1}{2}GD^2$ (kg x m ²)	Noise level at 1 meter dB(A)	Net weight (kg)
			Full load I_N , 50Hz							Locked rotor T_L/T_N	Break down T_B/T_N				
			380V (A)	400V (A)	415V (A)										
0.75	100L1	690	2.40	2.28	2.20	6.1	71.0	0.67	10.4	1.8	2.0	0.008	59	30	
1.1	100L2	690	3.30	3.14	3.02	6.1	73.0	0.69	15.2	1.8	2.0	0.010	59	35	
1.5	112M1	690	4.40	4.28	4.03	6.4	75.0	0.69	20.8	1.8	2.0	0.017	61	40	
2.2	132S	710	6.00	5.70	5.49	6.4	78.0	0.71	29.6	1.8	2.0	0.031	64	55	
3	132M1	710	7.90	7.51	7.23	6.8	79.0	0.73	40.4	1.8	2.0	0.040	64	65	
4	160M1	720	10.30	9.79	9.43	6.8	81.0	0.73	53.1	1.9	2.0	0.075	68	95	
5.5	160M2	720	13.60	12.92	12.45	6.7	83.0	0.74	73.0	1.9	2.0	0.093	68	115	
7.5	160L	720	17.80	16.91	16.30	6.4	85.5	0.75	99.5	1.9	2.0	0.126	68	125	
11	180L	730	25.1	23.8	23.0	6.5	87.5	0.76	143.9	2.0	2.0	0.203	70	180	
15	200L	730	34.1	32.4	31.2	6.6	88.0	0.76	196.2	2.0	2.0	0.339	73	220	
18.5	225S	730	41.1	39.0	37.6	6.6	90.0	0.76	242.0	1.9	2.0	0.491	73	260	
22	225M	740	47.4	45.0	43.4	6.6	90.0	0.78	283.9	1.9	2.0	0.547	73	290	
30	250M	740	63.4	60.2	58.1	6.5	91.0	0.79	387.2	1.9	2.0	0.830	75	380	
37	280S	740	77.8	73.9	71.2	7	91.5	0.79	477.5	1.9	2.0	1.390	76	490	
45	280M1	740	94.1	89.4	86.2	6.5	92.0	0.79	580.7	1.9	2.0	1.650	76	530	
55	315S	740	111.2	105.6	101.8	6.6	92.8	0.81	709.8	1.8	2.0	4.790	82	770	
75	315M	740	151.3	143.7	138.5	6.1	93.0	0.81	967.9	1.8	2.0	5.580	82	900	
90	315L1	740	177.8	168.9	162.8	6.2	93.8	0.82	1161.5	1.8	2.0	6.370	82	960	
110	315L2	740	216.8	206.0	198.5	6.3	94.0	0.82	1419.6	1.8	2.0	7.230	82	1060	
132	355M1	740	261.0	248.0	239.0	6.3	93.7	0.82	1704.0	1.8	2.0	7.600	89	1556	
160	355M2	740	314.7	299.0	288.2	6.3	94.2	0.82	2066.0	1.8	2.0	11.700	89	1680	
200	355L	740	387.4	368.0	354.7	6.4	94.5	0.83	2582.0	1.8	2.0	12.900	89	1850	
250	355L2	740	495.5	471.3	454.3	6.4	94.5	0.83	3226.0	1.8	2.0	14.200	89	2380	

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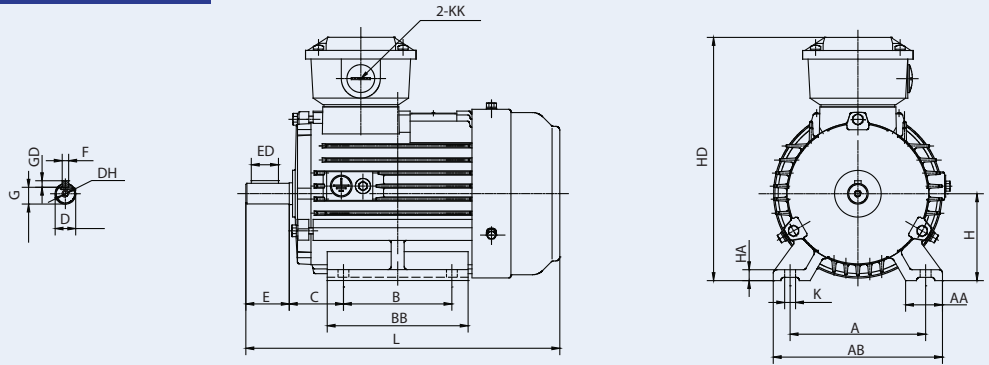


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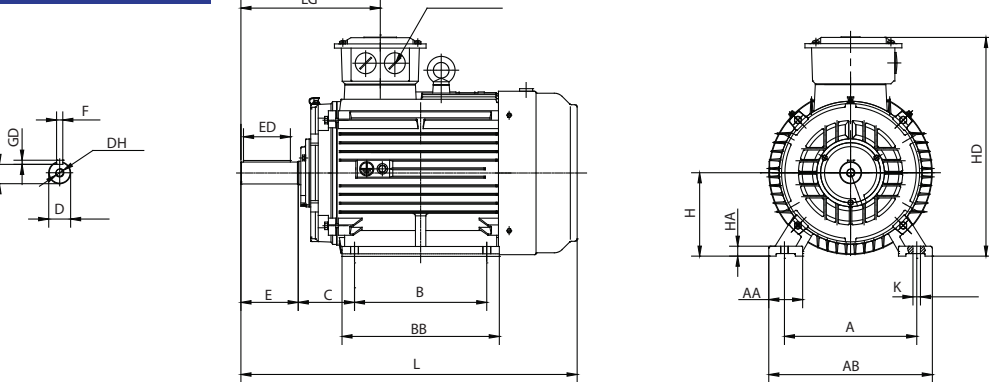
Dimensions



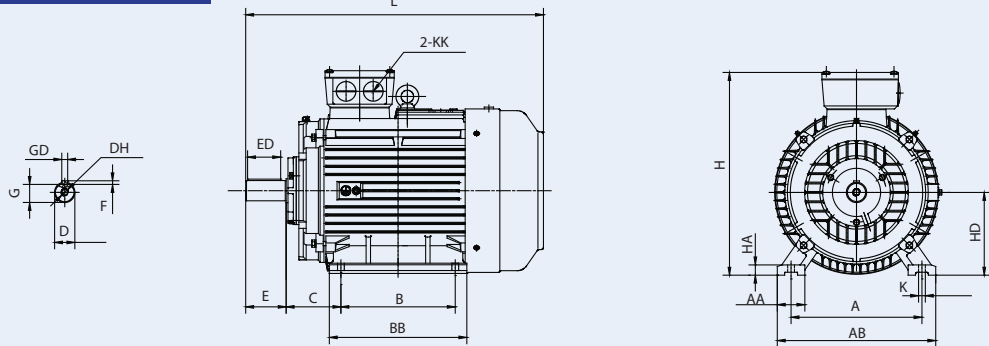
Frame size from 80 to 132



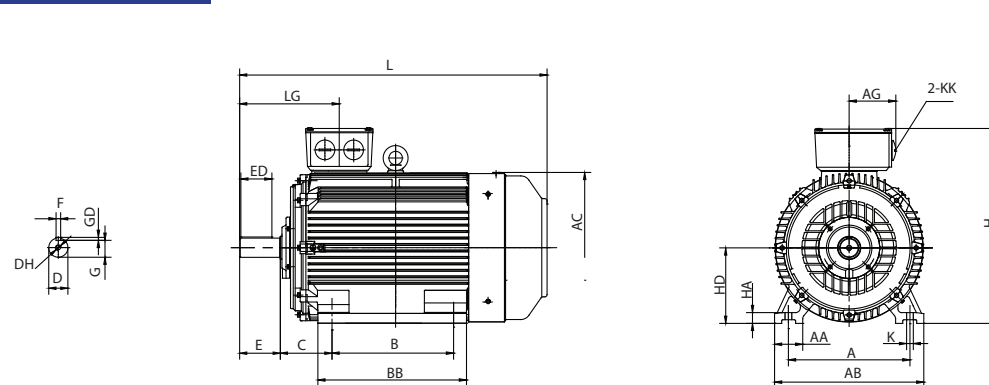
Frame size from 160 to 200



Frame size from 225 to 280



Frame size from 315 to 355

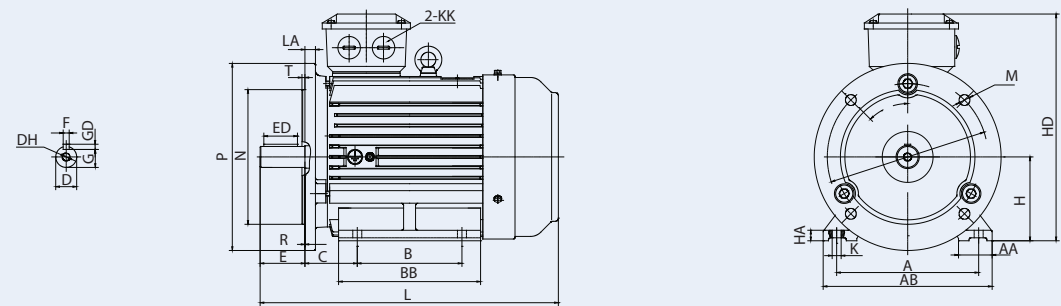


Dimension foot mount B3

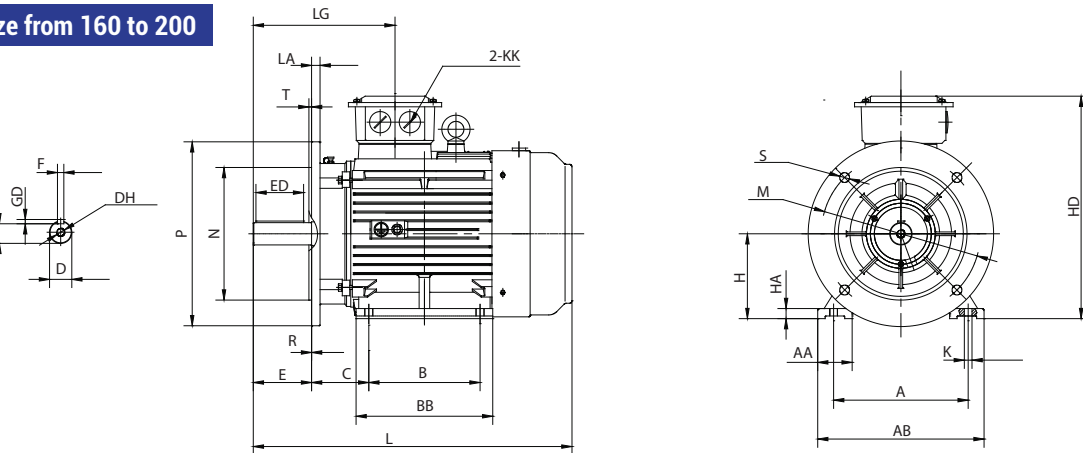
Frame Size	A	AA	AB	AC	AG	B	BB	C	D	E	ED	F	G	GD	H	HA	HD	K	KK	L	LG	DH
80	125	34	160	175	51	100	130	50	19	40	25	6	15.5	6	80	10	230	10	M24X1.5	295	106	*M6x16
90S	140	36	180	190	60	100	135	56	24	50	40	8	20	7	90	12.5	255	10	M24X1.5	320	126	*M8x19
90L	140	36	180	190	60	125	160	56	24	50	40	8	20	7	90	12.5	255	10	M24X1.5	345	126	*M8x19
100L	160	40	200	215	60	140	182	63	28	60	45	8	24	7	100	14	270	12	M24X1.5	385	142	*M10x22
112M	190	45	230	236	75	140	195	70	28	60	45	8	24	7	112	14	307	12	M30X2	415	141	M10x22
132S	216	52	265	275	75	140	205	89	38	80	63	10	33	8	132	16	347	12	M30X2	490	169	M12x28
132M	216	52	265	275	75	178	245	89	38	80	63	10	33	8	132	16	347	12	M30X2	520	169	M12x28
160M	254	67	320	330	95	210	260	108	42	110	90	12	37	8	160	19	425	14.5	M36X2	610	270	M16x36
160L	254	67	320	330	95	254	305	108	42	110	90	12	37	8	160	19	425	14.5	M36X2	655	270	M16x36
180M	279	74	350	380	95	241	297	121	48	110	90	14	42.5	9	180	22	460	14.5	M36X2	680	377	M16x36
180L	279	74	350	380	95	279	335	121	48	110	90	14	42.5	9	180	22	460	14.5	M36X2	720	277	M16x36
200L	318	75	395	420	120	305	370	133	55	110	90	16	49	10	200	25	515	18.5	M48X2	760	298	M20x42
225S(4-6P)	356	80	436	465	120	286	355	149	60	140	110	18	53	11	225	28	560	18.5	M48X2	825	340	M20x42
225M(2P)	356	80	436	465	120	311	380	149	55	110	90	16	49	10	225	28	560	18.5	M48X2	820	310	M20x42
225M(4-6P)	356	80	436	465	120	311	380	149	60	140	110	18	53	11	225	28	560	18.5	M48X2	850	340	M20x42
250M(2P)	406	88	495	520	160	349	440	168	60	140	110	18	53	11	250	33	620	24	M64X2	925	360	M20x42
250M(4-6P)	406	88	495	520	160	349	440	168	65	140	110	18	58	11	250	33	620	24	M64X2	925	360	M20x42
280S(2P)	457	100	550	570	160	368	495	190	65	140	110	18	58	11	280	35	685	24	M64X2	1000	350	M20x42
280S(4-6P)	457	100	550	570	160	368	495	190	75	140	110	20	67.5	12	280	35	685	24	M64X2	1010	350	M20x42
280M(2P)	457	100	550	570	160	419	535	190	65	140	110	18	58	11	280	35	685	24	M64X2	1000	350	M20x42
280M(4-6P)	457	100	550	570	160	419	535	190	75	140	110	20	67.5	12	280	35	685	24	M64X2	1010	350	M20x42
315S(2P)	508	120	635	650	195	406	515	216	65	140	110	18	58	11	315	45	820	28	M64X2	1160	387	M20x42
315M(2P)	508	120	635	650	195	457	625	216	65	170	140	18	58	11	315	45	820	28	M64X2	1190	387	M20x42
315L(2P)	508	120	635	650	195	508	625	216	65	140	110	18	58	11	315	45	820	28	M64X2	1270	387	M20x42
315S(4-6P)	508	120	635	650	195	406	515	216	80	170	140	22	71	14	315	45	820	28	M64X2	1300	417	M20x42
315M(4-6P)	508	120	635	650	195	457	625	216	80	140	110	22	71	14	315	45	820	28	M64X2	1270	417	M20x42
315L(4-6P)	508	120	635	650	195	508	625	216	80	170	140	22	71	14	315	45	820	28	M64X2	1300	417	M20x42
355M(2P)	610	125	735	735	260	560	775	254	75	140	110	20	67.5	12	355	49	1000	28	M72X2	1500	415	M24x50
355L(2P)	610	125	735	735	260	630	775	254	75	170	140	20	67.5	12	355	49	1000	28	M72X2	1530	415	M24x50
355M(4-6P)	610	125	735	735	260	560	775	254	95	140	110	25	86	14	355	49	1000	28	M72X2	1500	415	M24x50
355L(4-6P)	610	125	735	735	260	560	775	254	95	170	140	25	86	14	355	49	1000	28	M72X2	1530	415	M24x50

*' Means that the cable gland is only one.
The "R" dimension is zero.

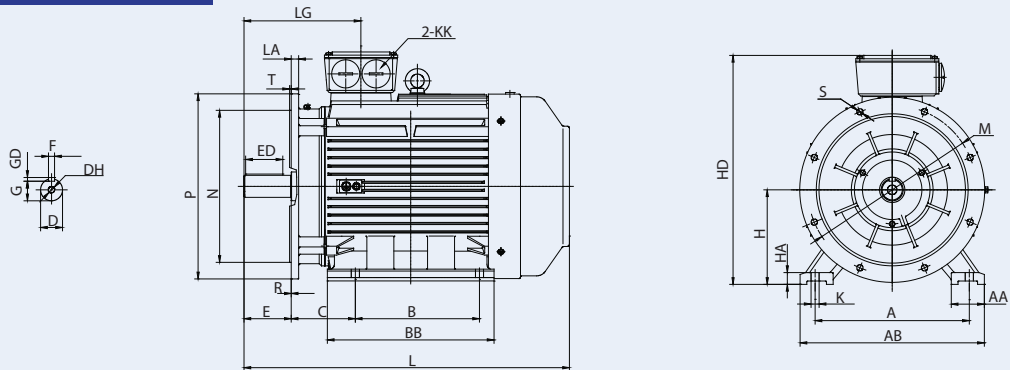
Frame size from 80 to 132



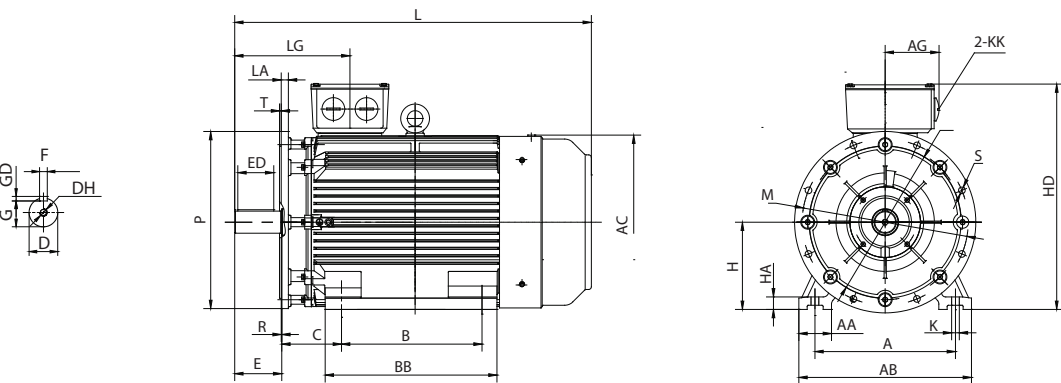
Frame size from 160 to 200



Frame size from 225 to 280



Frame size from 315 to 355



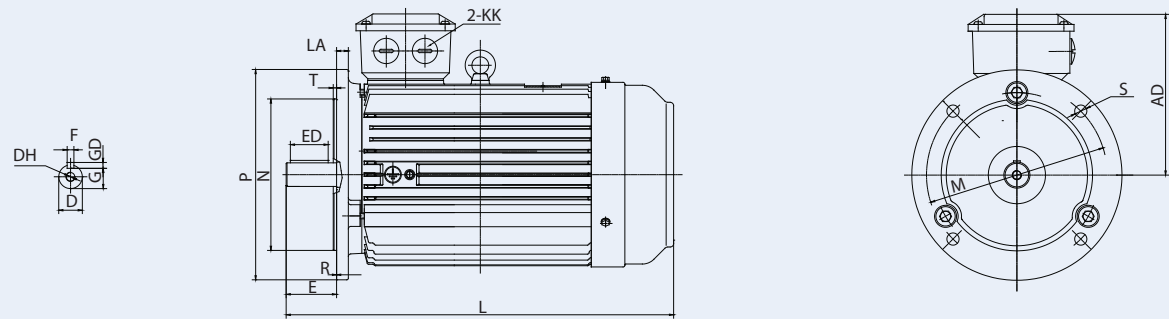
Dimension foot mount B35

Frame Size	A	AA	AB	AC	AG	B	BB	C	D	E	ED	F	G	GD	H	HA	HD	K	L	LA	LG	M	N	P	S	T	KK	DH
80	125	34	160	175	51	100	130	50	19	40	25	6	15.5	6	80	10	230	10	295	12	106	165	130	200	12	3.5	M24X1.5	*M6x16
90S	140	36	180	190	60	100	135	56	24	50	40	8	20	7	90	12.5	255	10	320	12	126	165	130	200	12	3.5	M24X1.5	*M8x19
90L	140	36	180	190	60	125	160	56	24	50	40	8	20	7	90	12.5	255	10	345	12	126	165	130	200	12	3.5	M24X1.5	*M8x19
100L	160	40	200	215	60	140	182	63	28	60	45	8	24	7	100	14	270	12	385	14	142	215	180	250	14.5	4	M24X1.5	*M10x22
112M	190	45	230	236	75	140	195	70	28	60	45	8	24	7	112	14	307	12	415	14	141	215	180	250	14.5	4	M30X2	M10x22
132S	216	52	265	275	75	140	205	89	38	80	63	10	33	8	132	16	347	12	490	14	169	265	230	300	14.5	4	M30X2	M12x28
132M	216	52	265	275	75	178	245	89	38	80	63	10	33	8	132	16	347	12	520	14	169	265	230	300	14.5	4	M36X2	M12x28
160M	254	67	320	330	95	210	260	108	42	110	90	12	37	8	160	19	425	14.5	610	15	270	300	250	350	18.5	5	M36X2	M16x36
160L	254	67	320	330	95	254	305	108	42	110	90	12	37	8	160	19	425	14.5	655	15	270	300	250	350	18.5	5	M36X2	M16x36
180M	279	74	350	380	95	241	297	121	48	110	90	14	42.5	9	180	22	460	14.5	680	15	277	300	250	350	18.5	5	M36X2	M16x36
180L	279	74	350	380	95	279	335	121	48	110	90	14	42.5	9	180	22	460	14.5	720	15	277	300	250	350	18.5	5	M48X2	M16x36
200L	318	75	395	420	120	305	370	133	55	110	90	16	49	10	200	25	515	18.5	760	17	298	350	300	400	18.5	5	M48X2	M20x42
225S(4-6P)	356	80	436	465	120	286	355	149	60	140	110	18	53	11	225	28	560	18.5	825	19	340	400	350	450	18.5	5	M48X2	M20x42
225M(2P)	356	80	436	465	120	311	380	149	55	110	90	16	49	10	225	28	560	18.5	820	19	310	400	350	450	18.5	5	M48X2	M20x42
225M(4-6P)	356	80	436	465	120	311	380	149	60	140	110	18	53	11	225	28	560	18.5	850	19	340	400	350	450	18.5	5	M48X2	M20x42
250M(2P)	406	88	495	520	160	349	440	168	60	140	110	18	53	11	250	33	620	24	925	20	360	500	450	550	18.5	5	M64X2	M20x42
250M(4-6P)	406	88	495	520	160	349	440	168	65	140	110	18	58	11	250	33	620	24	925	20	360	500	450	550	18.5	5	M64X2	M20x42
280S(2P)	457	100	550	570	160	368	495	190	65	140	110	18	58	11	280	35	685	24	1000	22	350	500	450	550	18.5	5	M64X2	M20x42
280S(4-6P)	457	100	550	570	160	368	495	190	75	140	110	20	67.5	12	280	35	685	24	1010	22	350	500	450	550	18.5	5	M64X2	M20x42
280M(2P)	457	100	550	570	160	419	535	190	65	140	110	18	58	11	280	35	685	24	1000	22	350	500	450	550	18.5	5	M64X2	M20x42
280M(4-6P)	457	100	550	570	160	419	535	190	75	140	110	20	67.5	12	280	35	685	24	1010	22	350	500	450	550	18.5	5	M64X2	M20x42
315S(2P)	508	120	635	650	190	406	515	216	65	140	110	18	58	11	315	45	820	28	1160	24	387	600	550	660	24	6	M64X2	M20x42
315M(2P)	508	120	635	650	190	457	625	216	65	170	140	18	58	11	315	45	820	28	1190	24	387	600	550	660	24	6	M64X2	M20x42
315L(2P)	508	120	635	650	190	508	625	216	65	140	110	18	58	11	315	45	820	28	1270	24	387	600	550	660	24	6	M64X2	M20x42
315S(4-6P)	508	120	635	650	190	406	515	216	80	170	140	22	71	14	315	45	820	28	1300	24	417	600	550	660	24	6	M64X2	M20x42
315M(4-6P)	508	120	635	650	190	457	625	216	80	140	110	22	71	14	315	45	820	28	1270	24	417	600	550	660	24	6	M64X2	M20x42
315L(4-6P)	508	120	635	650	190	508	625	216	80	170	140	22	71	14	315	45	820	28	1300	24	417	600	550	660	24	6	M64X2	M20x42
355M(2P)	610	125	735	735	260	560	775	254	75	140	110	20	67.5	12	355	49	1000	28	1500	25	415	740	680	800	24	6	M72X2	M24x50
355L(2P)	610	125	735	735	260	630	775	254	75	170	140	20	67.5	12	355	49	1000	28	1530	25	415	740	680	800	24	6	M72X2	M24x50
355M(4-6P)	610	125	735	735	260	560	775	254	95	140	110	25	86	14	355	49	1000	28	1500	25	445	740	680	800	24	6	M72X2	M24x50
355L(4-6P)	610	125	735	735	260	630	775	254	95	170	140	25	86	14	355	49	1000	28	1530	25	445	740	680	800	24	6	M72X2	M24x50

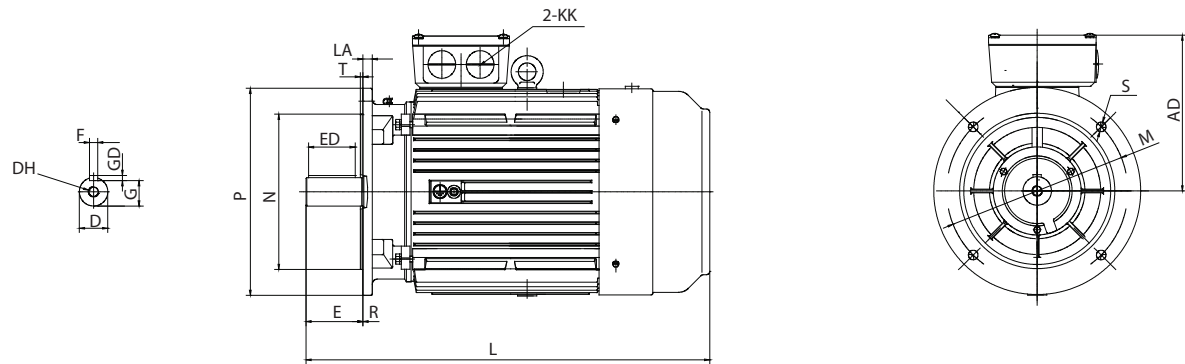
'*' Means that the cable gland is only one.

The "R" dimension is zero.

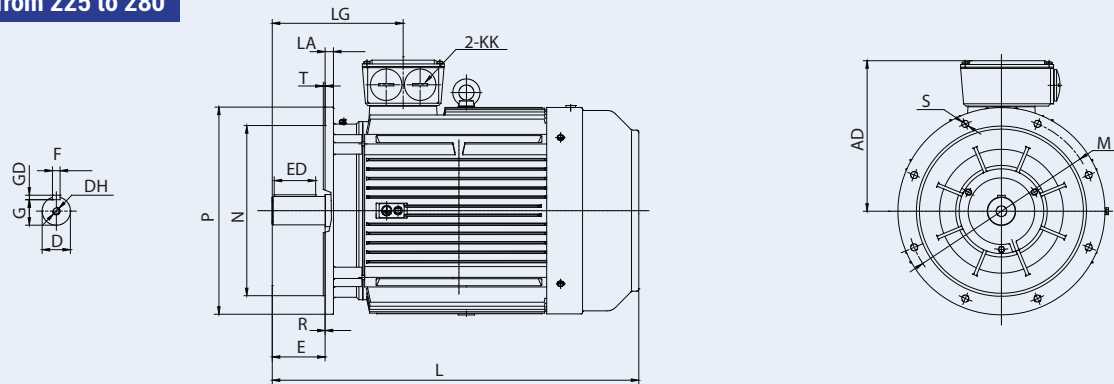
Frame size from 80 to 132



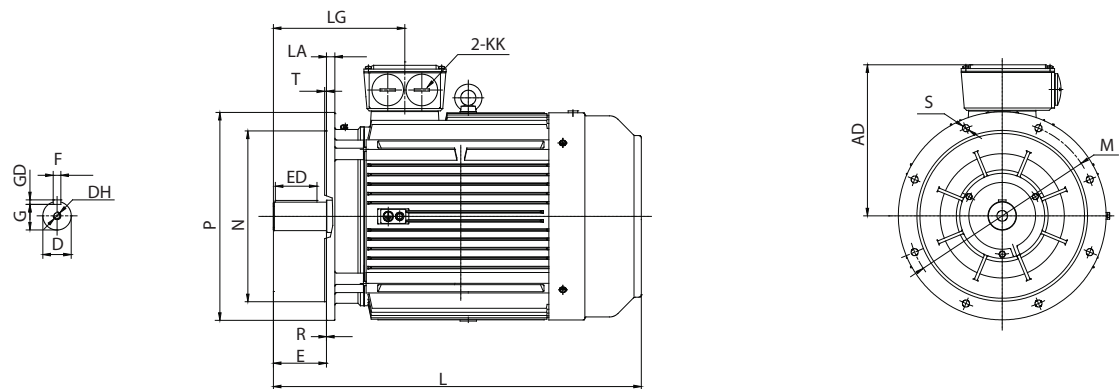
Frame size from 160 to 200



Frame size from 225 to 280



Frame size from 315 to 355



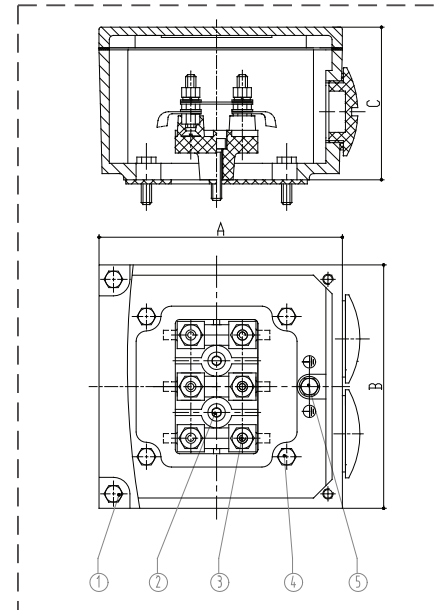
Dimension foot mount B5

Frame Size	AC	D	AD	AG	E	ED	F	G	GD	LA	LG	M	N	P	S	T	KK	L	LM	DH
80	175	19	150	51	40	25	6	15.5	6	12	106	165	130	200	12	3.5	M24X1.5	295	-	*M6x16
90S	190	24	165	60	50	40	8	20	7	12	126	165	130	200	12	3.5	M24X1.5	320	-	*M8x19
90L	190	24	165	60	50	40	8	20	7	12	126	165	130	200	12	3.5	M25X1.5	345	-	*M8x19
100L	215	28	170	60	60	45	8	24	7	14	142	215	180	250	14.5	4.0	M25X1.5	385	-	*M10x22
112M	236	28	195	75	60	45	8	24	7	14	144	215	180	250	14.5	4.0	M30X2	415	-	M10x22
132S	275	38	215	75	80	63	10	33	8	14	169	265	230	300	14.5	4.0	M30X2	490	-	M12x28
132M	275	38	215	75	80	63	10	33	8	14	169	265	230	300	14.5	4.0	M36X2	520	-	M12x28
160M	330	42	265	95	110	90	12	37	8	15	270	300	250	350	14.5	5.0	M36X2	610	659	M16x36
160L	330	42	265	95	110	90	12	37	8	15	270	300	250	350	18.5	5.0	M36X2	655	703	M16x36
180M	380	48	280	95	110	90	14	42.5	9	15	277	300	250	350	18.5	5.0	M36X2	680	728	M16x36
180L	380	48	280	95	110	90	14	42.5	9	15	277	300	250	350	18.5	5.0	M36X2	720	766	M16x36
200L	420	55	315	120	110	90	16	49	10	17	298	350	300	400	18.5	5.0	M48X2	760	856	M20x42
225S(4-6P)	465	60	335	120	140	110	18	53	11	19	340	400	350	450	18.5	5.0	M48X2	825	906	M20x42
225M(2P)	465	55	335	120	110	90	16	49	10	19	310	400	350	450	18.5	5.0	M48X2	820	896	M20x42
225M(4-6P)	465	60	335	120	140	110	18	53	11	19	340	400	350	450	18.5	5.0	M48X2	850	931	M20x42
250M(2P)	520	60	375	160	140	110	18	53	11	20	360	500	450	550	18.5	5.0	M64X2	925	1010	M20x42
250M(4-6P)	520	65	375	160	140	110	18	58	11	20	360	500	450	550	18.5	5.0	M64X2	925	1016	M20x42
280S(2P)	570	65	395	160	140	110	18	58	11	22	350	500	450	550	18.5	5.0	M64X2	1000	1050	M20x42
280S(4-6P)	570	75	395	160	140	110	20	67.5	12	22	350	500	450	550	18.5	5.0	M64X2	1010	1054	M20x42
280M(2P)	570	65	395	160	140	110	18	58	11	22	350	500	450	550	18.5	5.0	M64X2	1000	1090	M20x42
280M(4-6P)	570	75	395	160	140	110	20	67.5	12	22	350	500	450	550	18.5	5.0	M64X2	1010	1094	M20x42
315S(2P)	650	65	500	195	140	110	18	58	11	24	387	600	550	660	24	6.0	M64X2	1160	1230	M20x42
315M(2P)	650	65	500	195	170	140	18	58	11	24	387	600	550	660	24	6.0	M64X2	1190	1340	M20x42
315L(2P)	650	65	500	195	140	110	18	58	11	24	387	600	550	660	24	6.0	M64X2	1270	1340	M20x42
315S(4-6P)	650	80	500	195	170	140	22	71	14	24	417	600	550	660	24	6.0	M64X2	1300	1281	M20x42
315M(4-6P)	650	80	500	195	140	110	22	71	14	24	417	600	550	660	24	6.0	M64X2	1270	1391	M20x42
315L(4-6P)	650	80	500	195	170	140	22	71	14	24	417	600	550	660	24	6.0	M64X2	1300	1391	M20x42
355M(2P)	735	75	645	260	140	110	20	67.5	12	25	415	740	680	800	24	6.0	M72X2	1500	1590	M24x50
355L(2P)	735	75	645	260	170	140	20	67.5	12	25	415	740	680	800	24	6.0	M72X2	1530	1590	M24x50
355M(4-6P)	735	95	645	260	140	110	25	86	14	25	445	740	680	800	24	6.0	M72X2	1500	1620	M24x50
355L(4-6P)	735	95	645	260	170	140	25	86	14	25	445	740	680	800	24	6.0	M72X2	1530	1620	M24x50

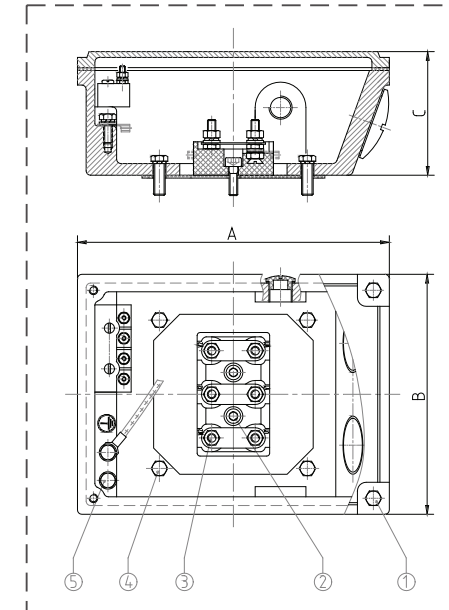
'*' Means that the cable gland is only one.
The "R" dimension is zero.

Terminal box

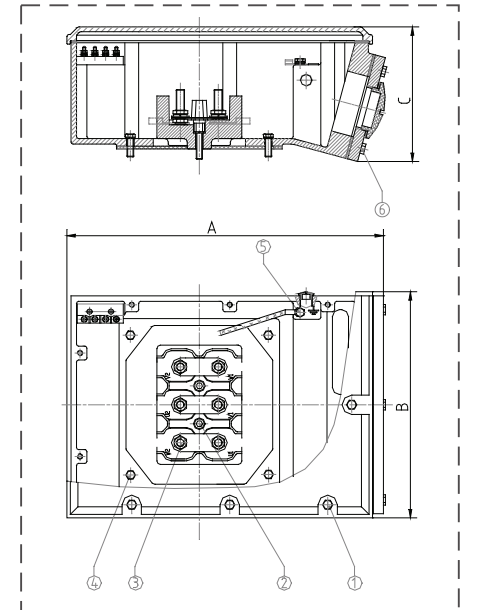
Frame size from 80 to 132



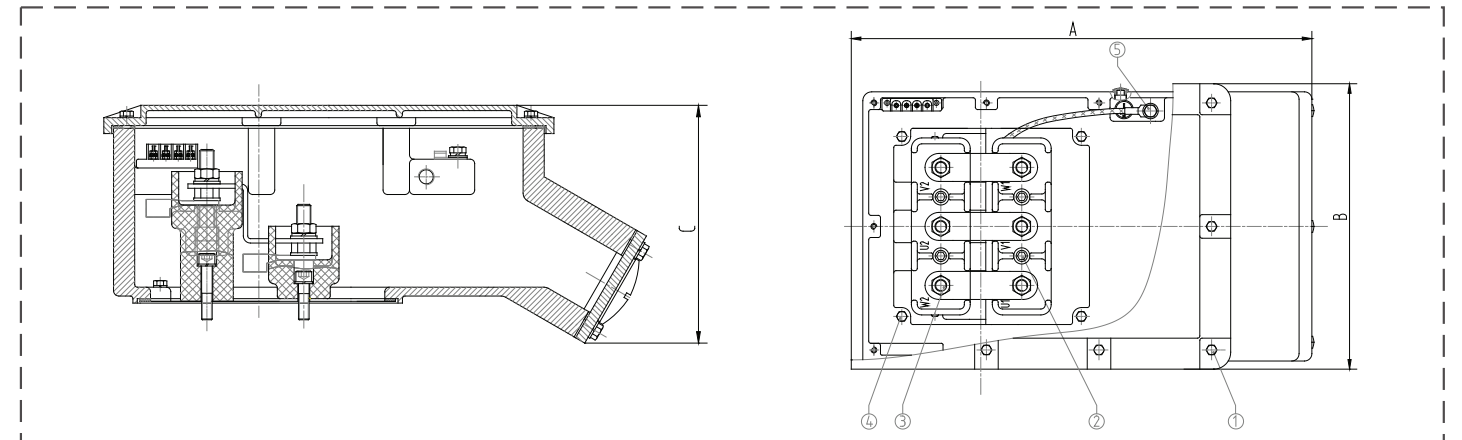
Frame size from 160 to 280



Frame size 315



Frame size 355



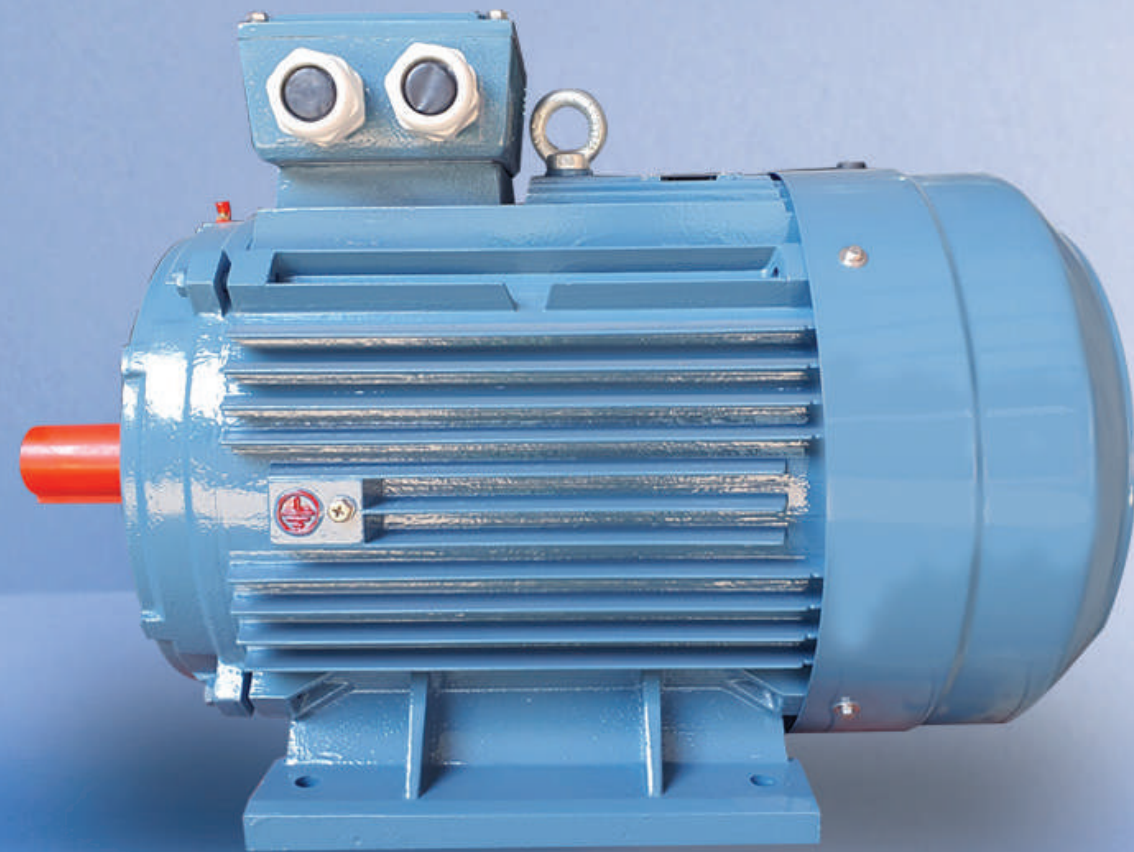
ENERTECHMOTORS.COM.AU



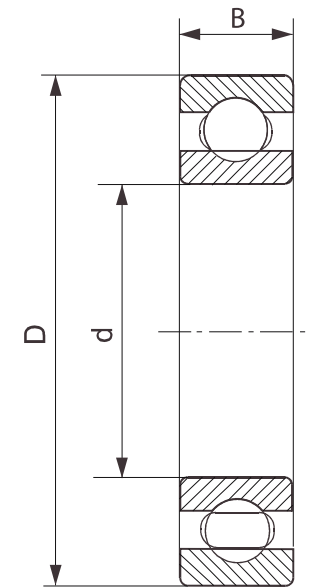
Frame size	A	B	C	1	2	3	4	5	6	Metric Gland Sizes	PG Gland Sizes
80-100	118	118	61	M5×16	M5×20	M4	M5×16	M5×12	-	2×M25×1.5	2×PG16
112-132	118	118	77	M5×16	M5×25	M5	M5×20	M5×12	-	2×M32×1.5	2×PG21
160-180	183	185	85	M6×20	M6×20	M6	M6×25	M6×16	-	2×M40×1.5	2×PG29
200-225	249	210	102	M6×16	M8×25	M8	M8×25	M8×16	-	2×M50×1.5	2×PG36
250-280	275	238	110	M6×20	M10×30	M10	M8×25	M10×20	-	2×M63×1.5	2×PG42
315	460	317	190	M8×25	M10×55	M12	M12×30	M10×25	M8×30	2×M63×1.5	2×PG42
355	620	390	275	M8×30	M12×60	M16	M12×40	M10×20	M10×40	2×M63×1.5	2×PG42

Bearing and oil seal

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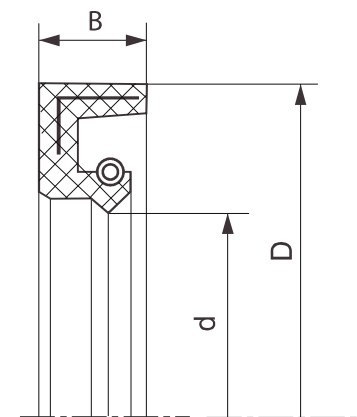


Bearing data



Frame size	DE	NDE	d	D	B
80	6204 ZZ C3	6204 ZZ C3	20	47	14
90	6205 ZZ C3	6205 ZZ C3	25	52	15
100	6206 ZZ C3	6206 ZZ C3	30	62	16
112	6306 ZZ C3	6306 ZZ C3	30	72	19
132	6308 ZZ C3	6308 ZZ C3	40	90	23
160	6309 C3	6309 C3	45	100	25
180	6311 C3	6311 C3	55	120	29
200	6312 C3	6312 C3	60	130	31
225	6313 C3	6313 C3	65	140	33
250	6314 C3	6314 C3	70	150	35
280 2P	6314 C3	6314 C3	70	150	35
280 4-8P	6317 C3	6317 C3	85	180	39
315 2P (Horizontal)	6317 C3	6317 C3	80	170	39
315 2P (Vertical)	6317 C3 / 7316	7317 / 6317 C3	80	170	39
315 4-8P (Horizontal)	NU319 C3	6319 C3	95	200	39
315 4-8P (Vertical)	6319 C3 / 7319	7319 / 6319 C3	95	200	45
355 2P (Horizontal)	6319 C3	6319 C3	95	200	45
355 2P (Vertical)	6319 C3 / 7319	7319 / 6319 C3	95	200	45
355 4-8P (Horizontal)	NU322 C3	6322 C3	110	240	50
355 4-8P (Vertical)	6322 C3 / 7322	7322 / 6322 C3	110	240	50

Oil seal data (Option)



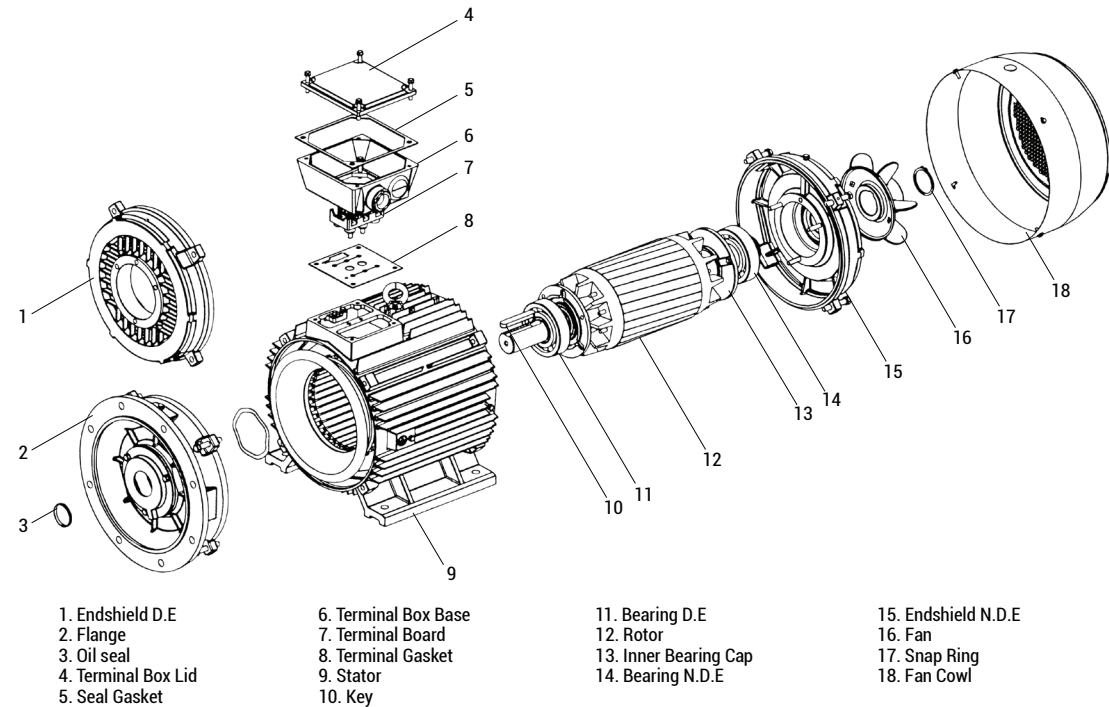
Frame size	DE			NDE		
	d	D	B	d	D	B
80	20	35	5	20	35	5
90	25	45	5	25	45	5
100	30	55	7	30	55	7
112	30	55	7	30	55	7
132	40	65	5	40	65	5
160	45	70	8	45	70	8
180	55	80	8	55	80	8
200	60	90	8	60	90	8
225	65	90	10	65	90	10
250	70	100	10	70	100	10
280 2P	70	100	10	70	100	10
280 4-8P	85	115	10	85	115	10
315 2P	80	100	10	80	100	10
315 4-8P	95	120	12	95	120	12
355 2P	95	120	12	95	120	12
355 4-8P	110	140	12	110	140	12

Bearing lubrication

It should be noted that for motor fitted with Ball and Roller bearing, the lubrication intervals for both bearings should be based on the roller bearing data. The lubrication intervals recommend are calculated on the basis of normal working conditions (operating temperatures up to 70°C). ESC motors are equipped with bearings from excellent manufactures. We recommend using SKF, FAG or NSK Brand. In general the bearings have C3 clearances. The motor of frame size 80-132 are fitted with life-lubricated bearings. The motor of frame size 160-355 are fitted with open bearings and regreasing device. Depending on the useful life of grease, open bearings must be regreased in good time so that the scheduled bearing service life is reached. We recommend using Shell Gadus S3 V220C-2 or SKF. Angular contact thrust ball bearings should be used for vertical mounting motor.

Frame size	Drive end bearing	Non-drive end bearing	Maximum regreasing period hours for operating temperatures up to 70°C			Quantity of grease in bearing chamber grams
			rpm<3600	rpm<1800	rpm<1200	
160	6309 C3	6309 C3	6000	12000	18000	13
180	6311 C3	6311 C3	4000	11000	16000	17
200	6312 C3	6312 C3	3500	8500	13000	20
225	6313 C3	6313 C3	3000	6000	9000	23
250	6314 C3	6314 C3	2000	5000	8000	30
280*	6314 C3	6314 C3	1200	-	-	30
280	6317 C3	6317 C3	-	4000	6000	35
315*	6317 C3	6317 C3	1200	-	-	35
315	NU319 C3	6319 C3	-	2000	3000	45
355*	6319 C3	6319 C3	1200	-	-	45
355	NU322 C3	6322 C3	-	1400	2200	60

Notes:
* 2 Pole motors only
1. Vertical motors should be greased twice as often as horizontal motors.
2. Regreasing time should be reduced if bearing operating temperature is in excess of 70°C



1. Endshield D.E

2. Flange

3. Oil seal

4. Terminal Box Lid

5. Seal Gasket
6. Terminal Box Base

7. Terminal Board

8. Terminal Gasket

9. Stator

10. Key
11. Bearing D.E

12. Rotor

13. Inner Bearing Cap

14. Bearing N.D.E
15. Endshield N.D.E

16. Fan

17. Snap Ring

18. Fan Cowl

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Operation and Maintenance

OPERATION

- Before running the motor make sure that the terminal box lid is closed and secured with appropriate clearance to live parts.
 - Make sure that appropriate earthing is done.
 - Make sure that the coupling and/or transmission is adequately guarded for safety.
 - Check the mounting bolts and/or flanges are firmly secured.
 - Make sure of no loose objects around that may be sucked by the cooling fan on the motor.
 - Make sure that the load applied is within the nameplate specification.
 - Make sure that the ambient temperature is inside 40°C or nameplate specification, record the figures in the log book for future reference.
- Note that the current imbalance can be higher, typically 10 times the voltage imbalance if there is an imbalance in supply voltage.

VIBRATION, BALANCING AND NOISE

Vibration severity limit Level

Motor frame size	Maximum RMS vibration velocity [mm/s]
71	1.6
80	1.6
90	1.6
100	1.6
112	1.6
132	1.6
160	2.2
180	2.2
200	2.2
225	2.2
250	2.2
280	2.2
315	2.8
355	2.8

Vibration

ESC motor fall within the limits of vibration severity set out in standard IEC 60034-14 which are listed below. As specified in the standard, these values relate to rotating machinery measured in soft suspension.

Balancing

Rotors have been dynamically balanced with a shaft key. Pulleys or couplings used with motors must also be appropriate.

Noise

Noise levels for ESC motor comply with limits set by IEC 60034.9 and AS1359.109. ESC sound pressure levels at 1 meter (Data relate to motor tested at no load) are set out in the table (above).

MAINTENANCE SCHEDULE FOR MOTORS

Description	Comments	Maintenance frequency
Motor use/sequencing	Turn off or sequence unnecessary motors.	Weekly
Overall visual inspection	Verify equipment is operating and safety systems are in place.	Weekly
Check bearings and drive belts	Inspect for wear, and adjust, repair, or replace as necessary.	Weekly
Motor alignment	Look for rubber or steel savings under couplings, or listen for odd noises, as these may indicate a problem).	Weekly
Motor condition	Check condition by analyzing temperature or vibration, and compare to baseline values.	Quarterly (or as needed on weekly inspections)
Cleaning	Remove dust and dirt to facilitate cooling.	Quarterly
Check lubrication	Ensure bearings are lubricated as recommended by manufacturer.	Annually (or based on run hours)
Check mountings	Secure any loose mountings.	Annually
Check terminal tightness	Tighten any loose connections.	Annually
Check for balanced three-phase power	Troubleshoot unbalanced motor circuit and fix problems if the voltage imbalance exceeds 1%.	Annually
Check for over- or undervoltage conditions	Troubleshoot motor circuit and fix problems if the supply voltage differs significantly from rated voltages.	Annually

Sound pressure level

Output [kW]	Sound pressure level dB(A) at 1 metre			
	3000 r/min	1500 r/min	1000 r/min	700 r/min
0.37	-	61	57	-
0.55	-	61	57	-
0.75	65	61	59	-
1.1	65	61	60	56
1.5	69	61	60	56
2.2	69	63	60	56
3	72	63	64	59
4	72	67	64	59
5.5	76	68	68	65
7.5	76	71	68	65
11	80	72	70	65
15	80	74	70	67
18.5	80	74	70	67
22	85	74	70	68
30	87	76	73	70
37	87	76	73	70
45	89	76	76	70
55	89	78	76	74
75	91	81	78	76
90	91	81	78	76
110	92	84	79	76
132	92	86	80	77
160	92	87	85	82
200	92	89	85	82
220	95	92	88	-
250	95	92	88	-
280	95	92	88	-
315	95	92	-	-

ESC Motor Modification Options

The ESC series can be modified to incorporate one or more of the following options, please contact to Enertech Electric Motors (Australia) branch for more details.

- Socket head cap screws, Grades 8.8, 10.9 or 12.9 to replace all external bolts and/or screws.
- Anti-condensation heater.
- Stainless steel shafts.
- Alternative shaft diameters and/or shaft length.
- Double shaft extensions.
- Alternative conduit entry dimensions.
- Alternative bearing arrangements (ball, roller, angular contact or four point contact types).
- Force ventilation for frame size 200 and above.
- Low noise fan and cowl in steel or cowl only in stainless steel.
- Rain canopy for vertical mount (V1) in steel or stainless steel.
- Class H winding insulation.
- Nonstandard paint color in RAL standard.
- Two pack epoxy paint finish.
- Class H winding insulation for 180°C working environment.
- PTC and condensate heater.
- Grease nipple both DE and NDE bearing for frame size 100L, 112M and 132 if required. IQF Spiral Freezer & Cooler.
- Special design for IQF tunnel freezer condition.
- Working temperature -50°C max.
- IP 66 (optional).
- Double shaft extension.
- Anodizing of aluminium or enhanced performance cast iron units.
- Stainless steel external shaft.
- Air Blast Freezer.
- Stainless steel external in grades AISI 316L. Working in temperature from -18°C to 22°C.
- Smoke spill application motors are designed to withstand the extreme environmental conditions associated with a building fire. Ventilation systems within public buildings are required to continue providing smoke extraction for 2 hours at smokespill air temperature of 350°C.

OUR PRODUCTS



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