ESC SERIES MOTORS

Three phase asynchronous

Enhanced performance cast iron units

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IE1-IE2-IE3

Three phase asynchronous

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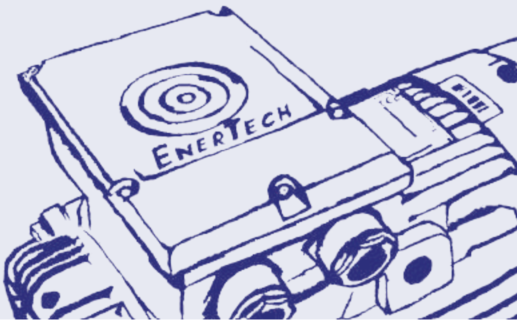
Enhanced performance cast iron units



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INTRODUCTION

ESC 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 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.

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CERTIFICATE OF COMPLIANCE

Certificado de Conformidade - Сертификат соответствия - Konformitätserklärung

1) APPLICANT:
Enertech Electric Motors (Australia)
5 Kintyre Court, Greenvale 3059, Victoria, Australia.

2) CERTIFICATE NO.:
IT041253ET170119

TEST REPORT(S) NO:
SCC(17)-70012A-01-LVD
SCC(17)-70012A-01-EMC
CEPREI (Sichuan) Laboratory.

3) WITH REFERENCE TO EC DIRECTIVE APPLIED:
Low Voltage Directive 2014/35/EU
Electromagnetic Compatibility 2014/30/EU

HARMONIZED STANDARDS APPLIED:
EN 60034-1:2010+AC:2010; EN 61000-6-1:2007
EN 61000-6-3:2007/A1:2011/AC:2012
EN 61000-3-2:2014, EN 61000-3-3:2013

4) CERTIFICATION ISET MARK:
ISTITUTO SERVIZI EUROPEI TECNOLOGICI

5) PRODUCT CHARACTERISTICS: ESC Series Three-phase Asynchronous Motor

MODEL(S): See the following annex I

REMARK: ***This verification has been carried out on voluntary application of the manufacturer based only on the documents prepared and provided by the manufacturer itself. The product(s) satisfies the requirements of the Certification Mark of ISET according to the ISET regulations. The manufacturer is responsible to mantain the internal production control to ensure the compliance of the products. ISET declines any liability with reference to any onther noncompliance of documents, product or test report that have been submitted to evaluation. However, marking and EC declaration are duties of the manufacturer before putting into service of its product(s) on market. The manufacturer is liable to take all the necessary actions required by the applicable directives & producers.***

CE

6) DATE OF ISSUE: 19/01/2017 ***DATE OF EXPIRE:*** 18/01/2022

CERTIFICATION MANAGER:

ISTITUTO SERVIZI EUROPEI TECNOLOGICI ISET S.R.L

General Specification

Cooling and ventilation

The standard cooling method is Totally Enclosed Fan-Cooled (TEFC) in accordance with code IC411 of I EC 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 anysingle voltage in the range 200-600V at a frequency 50 or 60 Hz. Themotors will operate satisfactorily with voltage variations of ±5% 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/Delt 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 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 IS09001 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.

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
	1	2

International protection rating prefix
(IEC 60034 - 5)

First numeral

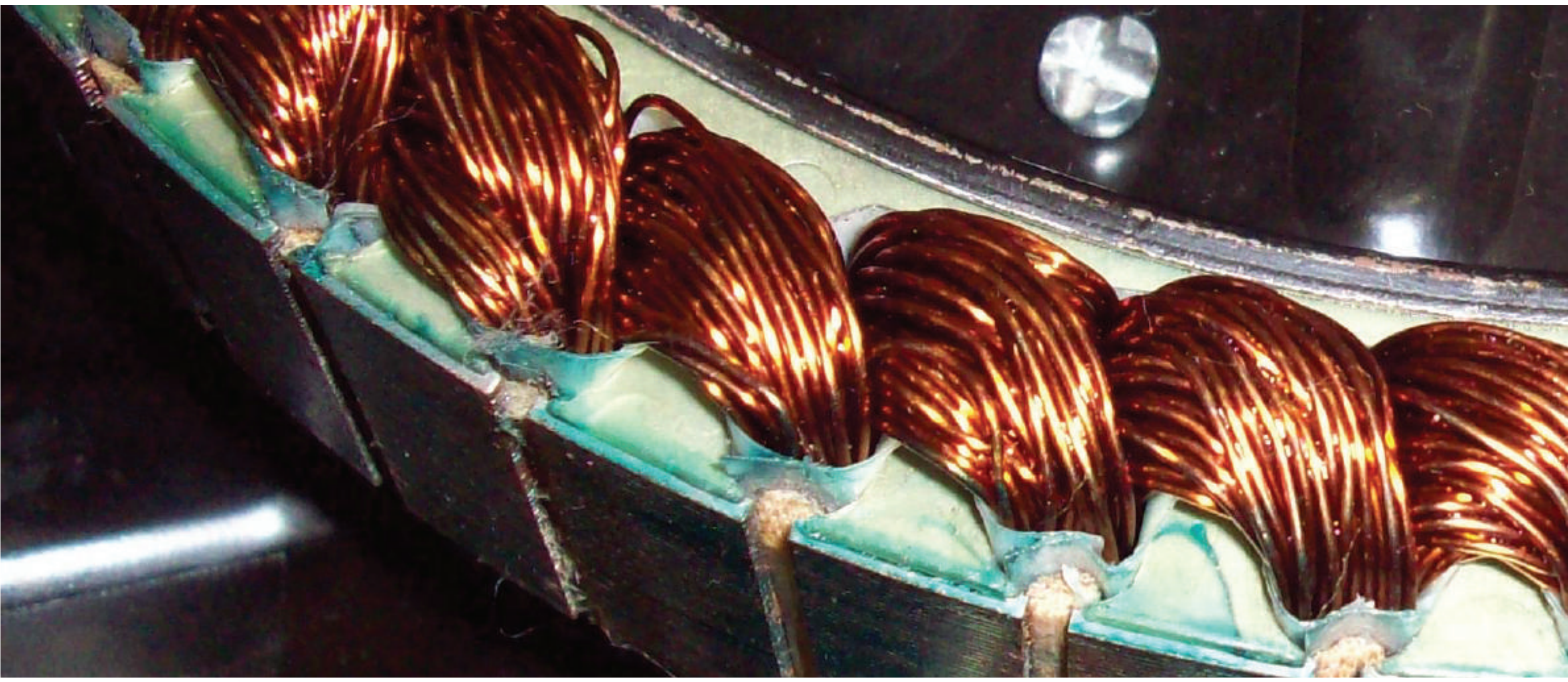
First characteristic numeral
Degree of protection of persons against approach to live parts or contact with live or moving parts (other than smooth rotating shafts and the like) inside the enclosure, and degree of protection of equipment within the enclosure against the ingress of solid foreign bodies.

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 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 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.

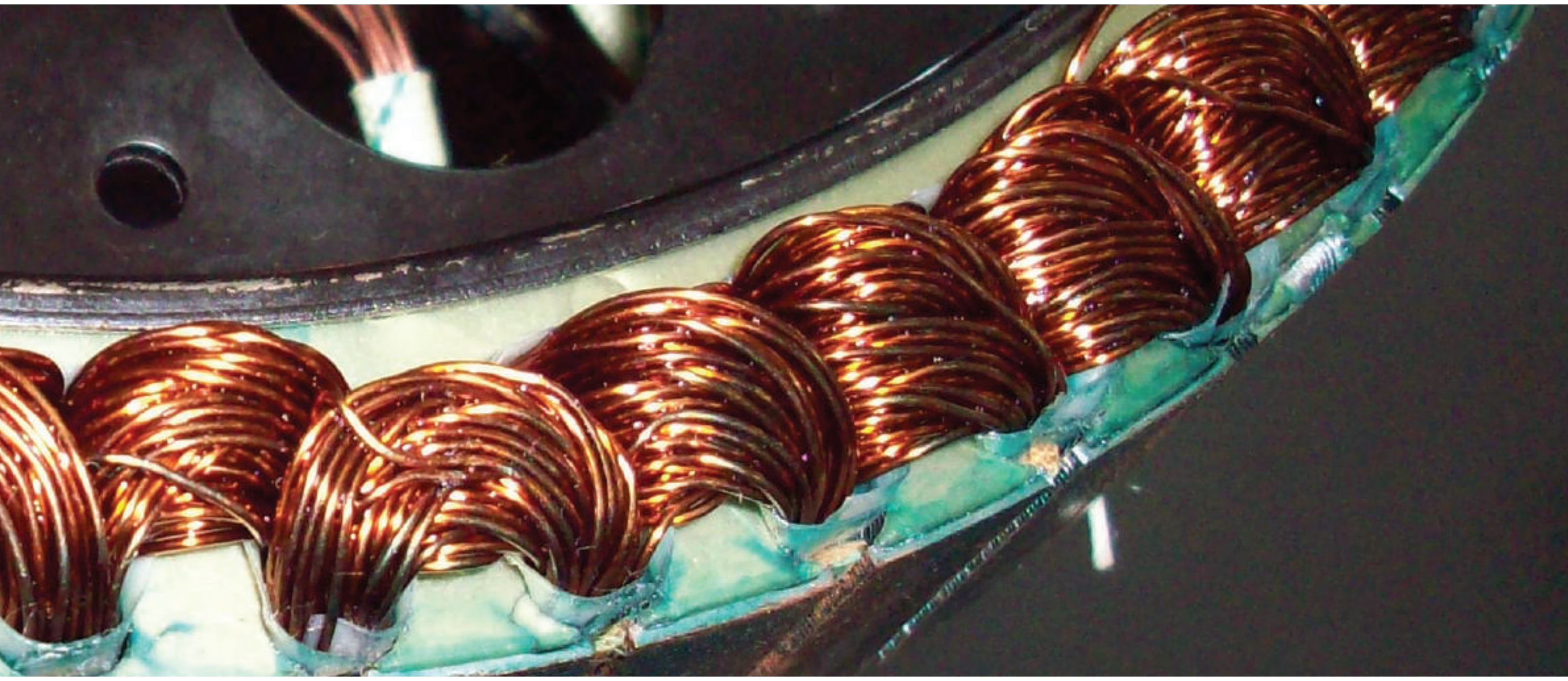
Electrical design

As standard, ESC 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)



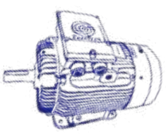
Standards and regulations

ESC 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.

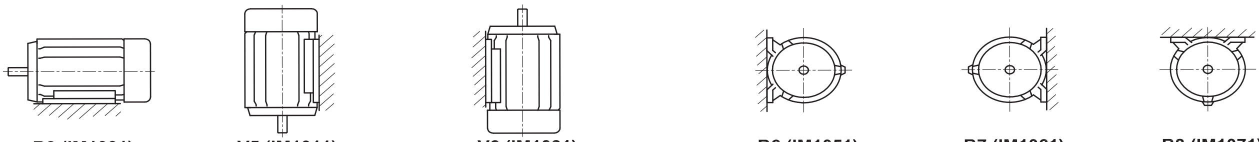
Standards	IEC	CENELEC	BS
General requirements for electrical machines	60034-1	EN 60034-1	4999-1 4999-69
Methods of determining losses and efficiency	60034-2	HD 53 2	4999-34
Degrees of protection	60034-5	EN60034-5	4999-20
Methods of cooling	60034-6	EN60034-6	4999-21
Mounting arrangements	60034-7	EN60034-7	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 motor range corresponds to the new international standard IEC 60034-30



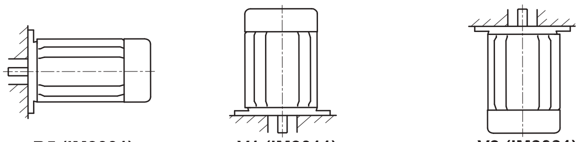
Standards mounting arrangements

Foot mounting



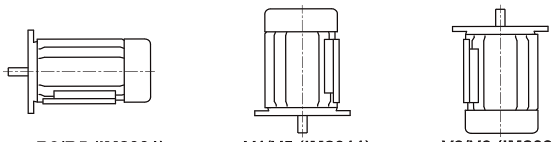
B3 (IM1001) | V5 (IM1011) | V6 (IM1031) | B6 (IM1051) | B7 (IM1061) | B8 (IM1071)

Large flange



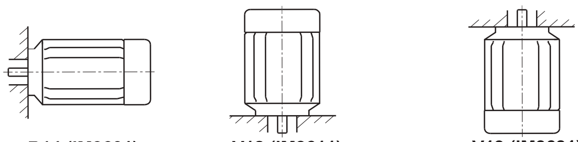
B5 (IM3001) | V1 (IM3011) | V3 (IM3031)

Large flange and feet



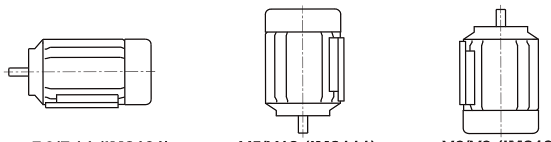
B3/B5 (IM2001) | V1/V5 (IM2011) | V3/V6 (IM2031)

Small flange (face)



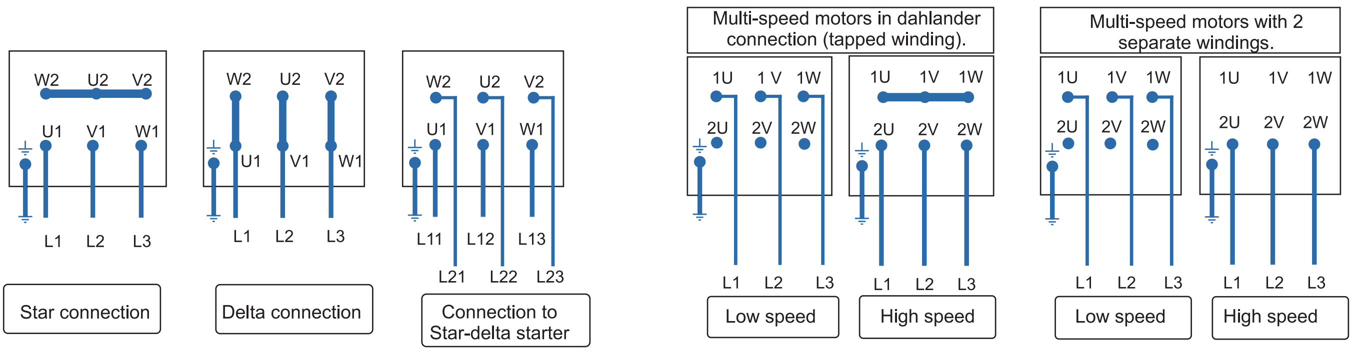
B14 (IM3601) | V18 (IM3611) | V19 (IM3631)

Small flange (face) and feet



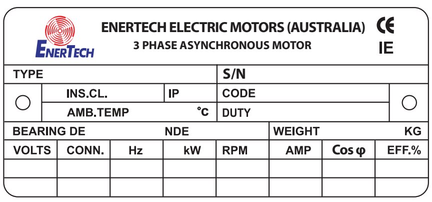
B3/B14 (IM2101) | V5/V18 (IM2111) | V6/V9 (IM2131)

Connection diagrams three phase motors with cage rotor

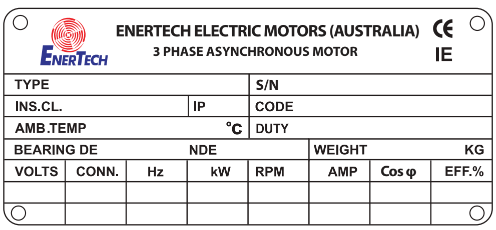


Rating plates

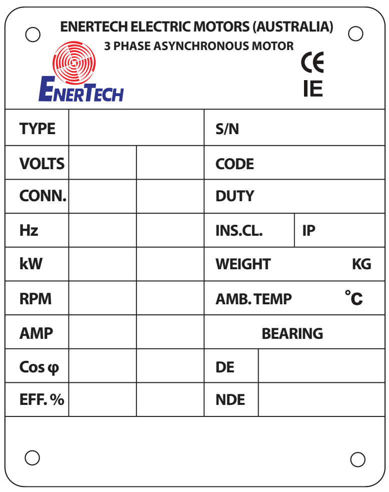
Frame size from 80 to 132 (except for IE1)



Frame size 132 (IE1)



Frame size from 160 to 355



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Electrical Design

Voltage and frequency

Standard ESC 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
	480V 60Hz	120	120	100	105	100	100	103
415V	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
	460V 60Hz	110	120	98	95	91	85	94
	480V 60Hz	115	120	100	100	96	95	98
525V	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
30°C	1.06
35°C	1.03
40°C	1.00
45°C	0.97
50°C	0.93
55°C	0.88
60°C	0.82

Altitude above sea level	Altitude factor
1000m	1.00
1500m	0.98
2000m	0.94
2500m	0.91
3000m	0.87
3500m	0.82
4000m	0.77

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

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)

Effective Power = 11 x 0.93 x 0.98 = 10.0 kW

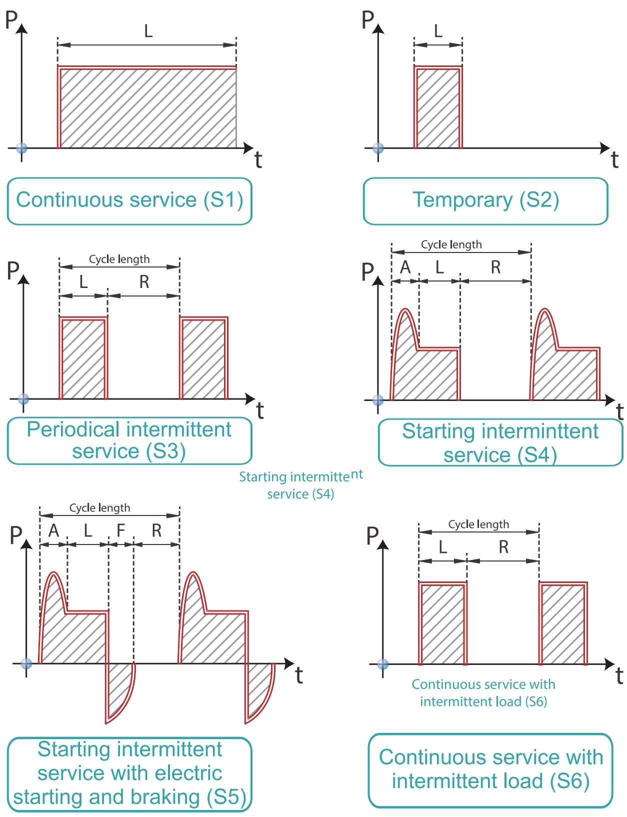
Rotation

For clockwise rotation, viewed from drive end, standard three phase ESC 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).

Duty

ESC 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 = Starting time 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.

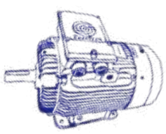
	Poles	Duty cycle factor		
		For frames 80 to 132	For frames 160 to 250	For frames 280 to 355
Short-time duty, S2				
30 min	2	1.05	1.20	1.20
	4 to 8	1.10	1.20	1.20
60 min	2 to 8	1.00	1.10	1.10
Intermittent duty, S3				
15%	2	1.15	1.45	1.40
	4 to 8	1.40	1.40	1.40
25%	2	1.10	1.30	1.30
	4 to 8	1.30	1.25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

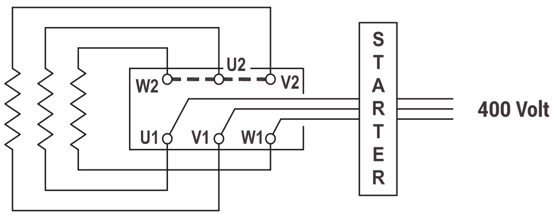
Connection

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.

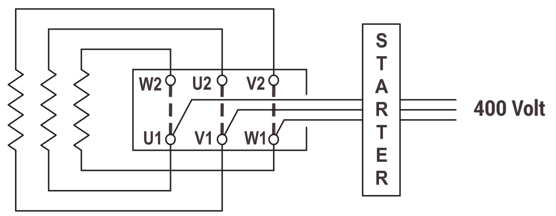
Internal connections, voltages and VF drive selection

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 . Alternatively they 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

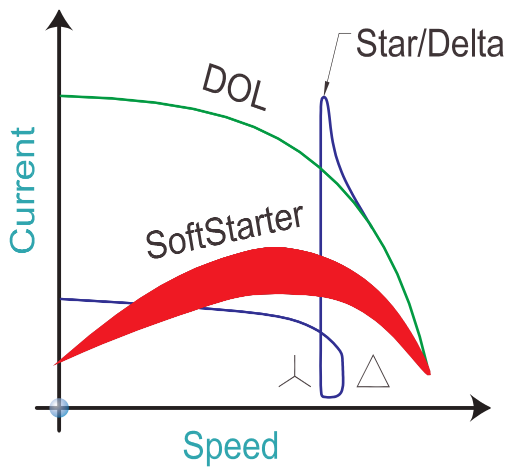
All of the following starter options are available and are the best supplied together with the motor.

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.

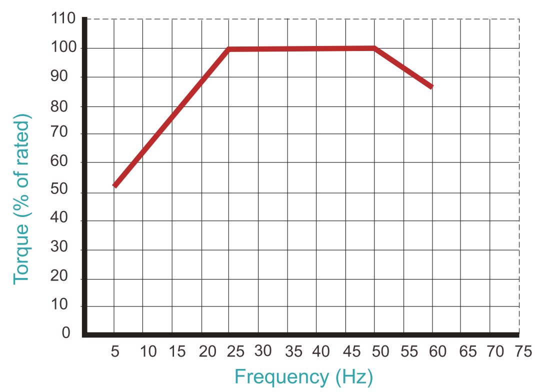
Star - Delta starting

The ESC 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

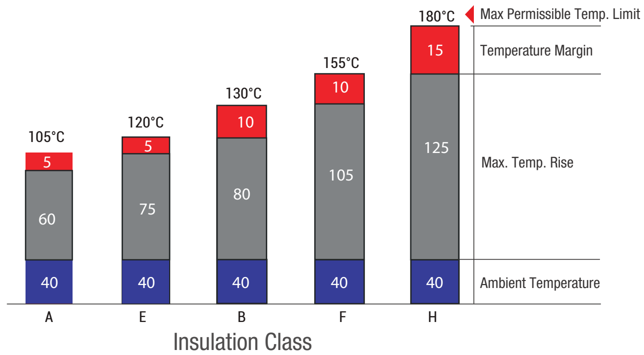
Capacitive voltages in the rotor can be generated due to an effect caused by harmonics in the waveform causing voltage discharge to earth through the beatings. This discharge results in etching of the bearing running surfaces. This effect is known as Electrical Discharge Machining (EDM). It can be control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

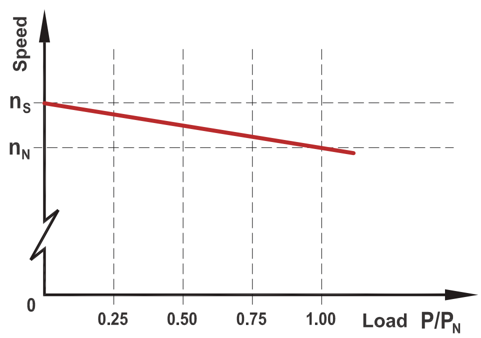


Thermal protection

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 motors, frame sizes 160 and above, are PTC thermistors. These thermovariable 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 ESC 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 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:

$$I_x = \frac{Pout_x}{\sqrt{3} \times U_N \times \cos\varphi_x \times \eta_x} \times 10^5$$

Where:

I_x = partial load current (amps)

$Pout_x$ = partial load (kW)

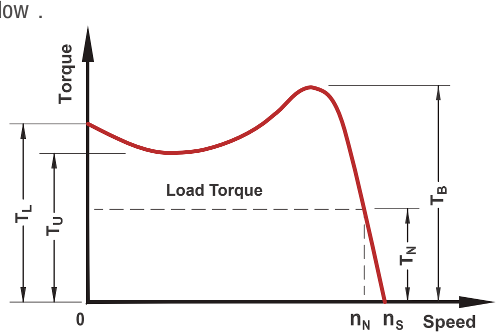
U_N = rated voltage

$\cos\varphi_x$ = 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 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:

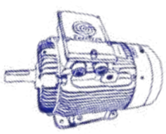
$$T_N = \frac{9550 \times P_N}{n_N}$$

Where:

T_N = full load torque (Nm)

P_N = full load output power (kW)

n_N = full load speed (r/min)



EnerTech

Design features

Permissible radial loads on the shaft with standard bearings

The values of radial load calculated considering:
- Frequency: 50Hz.
- Temperature not exceeding 90ºC.
- 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 fo the point of action of force F_R from the shoulder of ther shaft must not exceed the length of the shaft end.

Forces of belt drive on the shaft tight side when the belt tensionners 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 (cm^2)

α_1 : Arc of contact small (belt) pulley

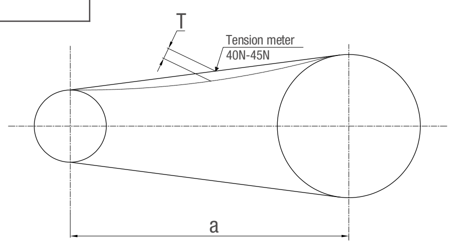
+ $\alpha_1 = 180^o - (d_2 - d_1)\frac{57^o}{a}$ ($\alpha_1 > 120^o$)
+ d_1 : Diameter of small (belt) pulley
+ d_2 : Diameter of large (belt) pulley
+ a : Center distance of 2(belt) pulley

z : Number of belt

Type of belt scales	The cross-sectional area F(cm^2)
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 = 310mm
d_2 = 460mm
a = 1300mm
z = 8

The angle of the wheel hug small belt

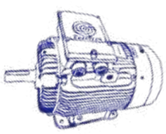
$$\alpha_1 = 180^o - (d_2 - d_1)\frac{57}{a}$$
$$= 180^o - (460 - 310) \times 57/1300 = 173.4^o$$

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

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

$$= 2 \times 150 \times 2.3 \times 0.998 \times 8 = 5\,509 \text{ N}$$

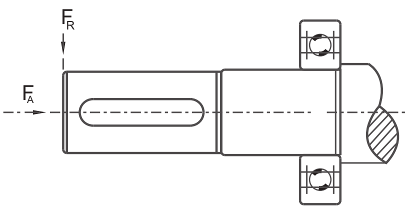
Frame size	Pole number	Permissible radial load F_R [N]	
		Ball bearings	Roller bearings
63	2	365	---
	4	365	---
	6	410	---
	8	455	---
71	2	455	---
	4	450	---
	6	515	---
	8	565	---
80	2	590	---
	4	590	---
	6	670	---
	8	735	---
90	2	670	---
	4	660	---
	6	750	---
	8	830	---
100	2	1850	---
	4	915	---
	6	1045	---
	8	1150	---
112	2	1360	---
	4	1350	---
	6	1545	---
	8	1700	---
132	2	1955	---
	4	1930	---
	6	2210	---
	8	2240	---
160	2	2500	5460
	4	2480	5617
	6	2820	5722
	8	3115	5775
180	2	3275	6195
	4	3175	6720
	6	3600	7035
	8	4000	7140
200	2	4250	9240
	4	4325	9975
	6	5150	10290
	8	5275	10447
225	2	5075	11340
	4	4925	12180
	6	5575	12600
	8	6050	12810
250	2	5025	13230
	4	5475	15225
	6	5595	15750
	8	5970	15907
280	2	5000	14700
	4	5150	15225
	6	6300	15750
	8	7200	17325
315 S-M	2	5000	13650
	4	5700	26775
	6	6700	27825
	8	7600	28350
315 L	2	6200	13020
	4	6450	23625
	6	7300	26250
	8	8200	29400
355L	2	3250	---
	4	8400	---
	6	8900	---
	8	8900	---



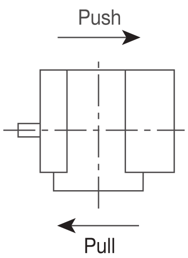
Permissible axial loads on the shaft with standard bearings

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

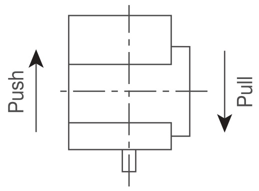
If the permissible radial load is not fully utilized, higher loads are possible in axial direction (Values on request).



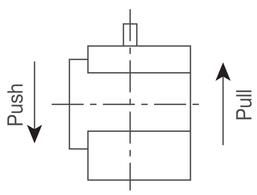
B3



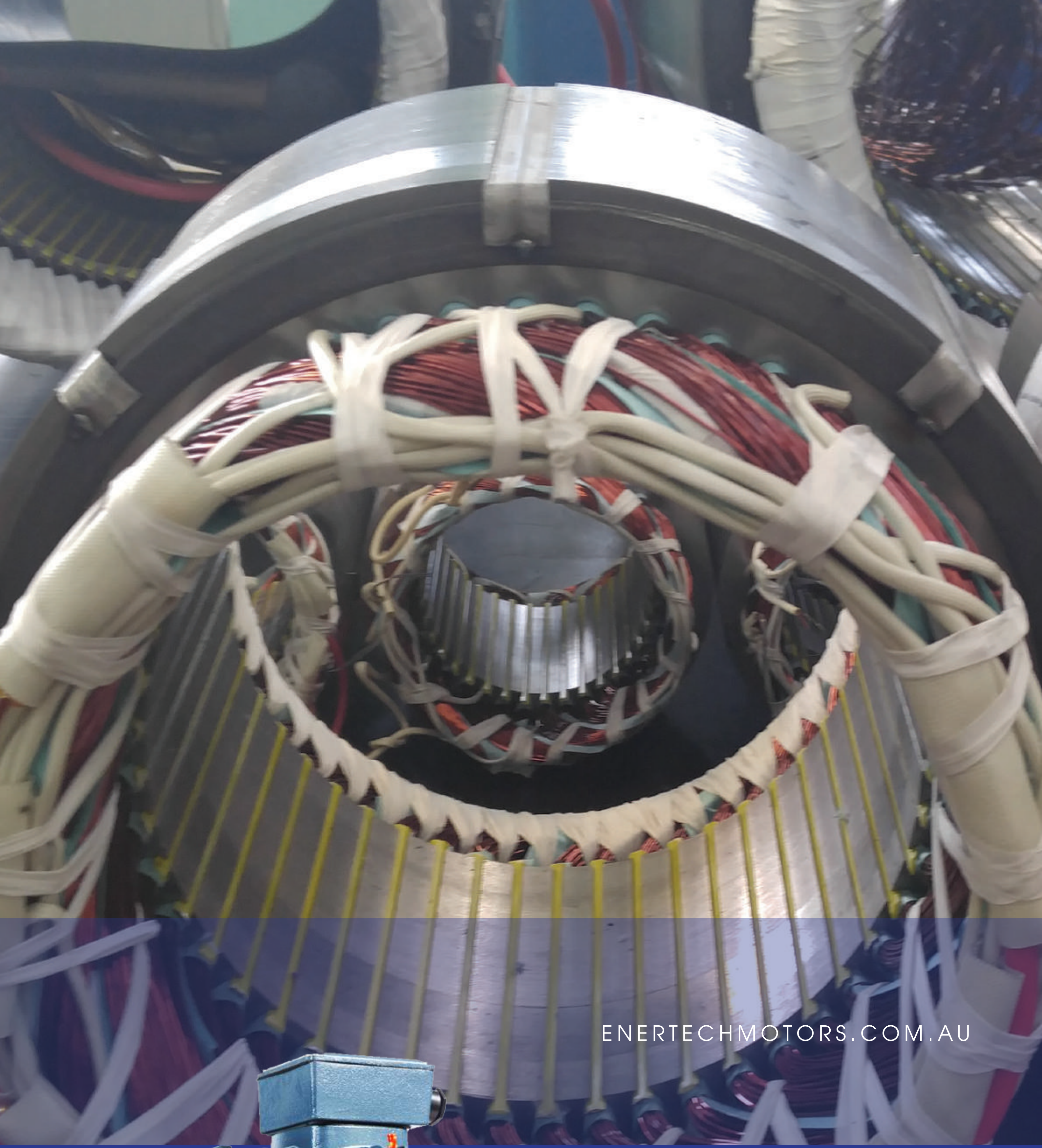
V5



V6



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	---	---



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Performance Data

Efficiency Classification (%)

Output (kW)	IE1				IE2				IE3			
	2P	4P	6P	8P	2P	4P	6P	8P	2P	4P	6P	8P
0.18	-	-	-	38.0	-	-	-	-	-	-	-	-
0.25	-	-	-	43.4	-	-	-	-	-	-	-	-
0.37	-	-	67.7	49.7	-	-	-	-	-	-	-	-
0.55	-	71.0	73.0	56.1	-	-	-	-	-	-	-	-
0.75	75.0	73.0	73.3	61.2	77.4	79.6	75.9	66.2	80.7	82.5	78.9	75.0
1.1	77.0	75.0	75.2	66.5	79.6	81.4	78.1	70.8	82.7	84.1	81.0	77.7
1.5	79.0	78.0	79.9	70.2	81.3	82.8	79.8	74.1	84.2	85.3	82.5	79.7
2.2	81.0	80.0	81.8	74.2	83.2	84.3	81.8	77.6	85.9	86.7	84.3	81.9
3	83.0	82.0	84.5	77.0	84.6	85.5	83.3	80.0	87.1	87.7	85.6	83.5
4	85.0	84.0	85.8	79.2	85.8	86.6	84.6	81.9	88.1	88.6	86.8	84.8
5.5	86.0	85.0	87.2	81.4	87.0	87.7	86.0	83.8	89.2	89.6	88.0	86.2
7.5	87.0	87.0	84.6	83.1	88.1	88.7	87.9	85.3	90.1	90.4	89.1	87.3
11	87.6	87.6	86.3	85.0	89.4	89.8	88.7	86.9	91.2	91.4	90.3	88.6
15	88.7	88.7	87.6	86.2	90.3	90.6	89.7	88.0	91.9	92.1	91.2	89.6
18.5	89.3	89.3	88.2	86.9	90.9	91.2	90.4	88.6	92.4	92.6	91.7	90.1
22	89.9	89.9	88.9	87.4	91.3	91.6	90.9	89.1	92.7	93.0	92.2	90.6
30	90.7	90.7	90.1	88.3	92.0	92.3	91.7	89.8	93.3	93.6	92.9	91.3
37	91.2	91.2	90.7	88.8	92.5	92.7	92.2	90.3	93.7	93.9	93.3	91.8
45	91.7	91.7	91.3	89.2	92.9	93.1	92.6	90.7	94.0	94.2	93.7	92.2
55	92.1	92.1	91.8	89.7	93.3	93.4	93.1	91.0	94.3	94.6	94.2	92.5
75	92.7	92.7	92.3	90.3	93.8	94.0	93.7	91.6	94.8	95.1	94.8	93.1
90	93.0	93.0	92.6	90.7	94.1	94.2	94.0	91.9	95.2	95.3	95.1	93.4
110	93.3	93.3	92.5	91.1	94.4	94.4	94.2	92.3	95.5	95.5	95.3	93.7
132	93.5	93.5	93.1	91.5	94.6	94.7	94.3	92.6	95.7	95.8	95.5	94.0
160	93.8	93.8	93.1	91.9	94.9	94.9	94.6	93.0	95.9	96.0	95.8	94.3
200	94.0	94.0	93.6	92.3	95.1	95.1	94.8	93.4	96.1	96.2	95.9	94.6
250	94.0	94.0	93.5	-	95.1	95.1	94.8	-	96.1	96.2	95.9	-
315	94.0	94.0	-	-	95.1	95.1	-	-	96.1	96.2	-	-

PERFORMANCE DATA IE1

2 Pole - 3000 rpm asynchronous speed 50Hz

IE1

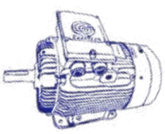
Output (kW)	Frame Size	Full lock speed (rpm)	Current Full load I_N, 50Hz 380V (A)	400V (A)	415V (A)	Locked rotor I_L/I_N	Efficiency % at % full load 100	75	50	power factor, cos φ at % full load 100	75	50	Torque Full load T_N (Nm)	Locked rotor T_L/T_N	Break down T_B/T_N	Moment of inertia J=¼GD² (kg x m²)	Noise level at 1 meter dB(A)	Net weight (kg)
0.75	80M1	2830	1.8	1.7	1.7	6.1	75.0	75.6	72.2	0.83	0.84	0.75	2.5	2.2	2.3	0.001	67	14
1.1	80M2	2830	2.6	2.5	2.4	7.0	77.0	79.8	77.7	0.84	0.87	0.78	3.7	2.2	2.3	0.001	67	16
1.5	90S	2840	3.4	3.3	3.1	7.0	79.0	81.2	78.9	0.84	0.86	0.79	5.0	2.2	2.3	0.002	72	19
2.2	90L1	2840	4.9	4.6	4.4	7.0	81.0	83.4	81.4	0.85	0.88	0.81	7.4	2.2	2.3	0.002	72	22
3	100L	2870	6.3	6.0	5.8	7.5	83.0	84.5	83.0	0.87	0.89	0.83	10.0	2.2	2.3	0.004	76	32
4	112M1	2890	8.1	7.7	7.4	7.5	85.0	87.0	86.8	0.88	0.92	0.86	13.2	2.2	2.3	0.016	77	41
5.5	132S1	2900	11.0	10.5	10.1	7.5	86.0	87.4	86.5	0.88	0.91	0.84	18.1	2.2	2.3	0.011	80	58
7.5	132S2	2900	14.9	14.1	13.6	7.5	87.0	88.8	88.3	0.88	0.92	0.87	24.7	2.2	2.3	0.015	80	62
11	160M1	2930	21.7	20.6	19.9	7.3	87.6	87.5	86.5	0.88	0.86	0.82	35.9	2.3	2.6	0.039	83	96
15	160M2	2930	29.2	27.7	26.7	7.2	88.7	88.2	86.4	0.88	0.86	0.82	48.9	2.3	2.6	0.044	83	110
18.5	160L	2935	35.8	34.0	32.8	7.3	89.3	89.2	87.6	0.88	0.86	0.82	60.2	2.2	2.7	0.057	84	126
22	180M	2940	42.3	40.1	38.7	7.0	89.9	89.8	87.9	0.88	0.86	0.82	71.5	2.4	3.0	0.077	84	156
30	200L1	2950	57.1	54.3	52.3	5.9	90.7	90.6	88.7	0.88	0.86	0.82	97.1	1.9	3.0	0.125	86	206
37	200L2	2955	70.0	66.5	64.1	6.5	91.2	91.0	89.8	0.88	0.86	0.82	119.6	2.3	3.3	0.140	88	235
45	225M	2960	84.7	80.5	77.6	7.1	91.7	91.4	90.0	0.88	0.86	0.83	145.2	2.4	3.3	0.230	90	292
55	250M1	2965	101.9	96.9	93.4	8.0	92.1	92.0	90.2	0.89	0.87	0.83	177.2	2.7	3.1	0.320	90	358
75	280S	2965	138.1	131.2	126.5	6.8	92.7	92.5	90.5	0.89	0.87	0.83	241.6	2.2	3.2	0.595	90	480
90	280M1	2970	165.2	157.0	151.3	7.2	93.0	92.6	91.0	0.89	0.88	0.83	289.4	2.2	3.0	0.678	90	540
110	315S	2975	199.0	189.1	182.3	6.1	93.3	93.1	91.7	0.90	0.89	0.84	353.1	2.3	2.6	1.170	90	803
132	315M	2980	238.3	226.4	218.2	7.1	93.5	93.3	91.8	0.90	0.89	0.84	423.0	2.3	2.8	1.550	90	860
160	315L1	2980	284.8	270.6	260.8	7.4	93.8	93.6	91.8	0.91	0.89	0.85	512.8	2.5	2.7	1.750	91	891
200	315L2	2980	355.2	337.5	325.3	7.3	94.0	93.7	92.0	0.91	0.89	0.87	640.9	2.7	3.0	2.050	91	985
250	355M	2985	444.1	421.9	406.6	7.1	94.0	93.8	92.2	0.91	0.90	0.87	799.8	1.8	2.6	3.560	93	1482
315	355L	2985	559.5	531.5	512.3	6.3	94.0	93.8	92.3	0.91	0.90	0.88	1007.8	1.7	2.9	4.120	94	1706

High Output Design*

5.5	112M2	2880	11.1	10.5	10.1	7.6	85.7	86.5	86.2	0.88	0.90	0.84	18.2	2.2	3.3	0.008	79	52
11	132M	2915	21.7	20.6	19.9	7.2	87.6	87.5	84.4	0.88	0.85	0.81	36.0	2.4	3.3	0.028	83	87
75	250M2	2960	138.1	131.2	126.5	6.8	92.7	92.5	90.2	0.89	0.87	0.83	242.0	2.2	3.2	0.412	90	438
110	280M2	2970	199.0	189.1	182.3	6.8	93.3	93.0	91.6	0.90	0.89	0.83	353.7	2.6	3.1	0.860	88	605

* The motor is increased output (kW) in a reduced frame size electric motor

This data is provided for guidance only. Results are guaranteed only when confirmed by test results.



4 Pole - 1500 rpm asynchronous speed 50Hz

IE1

Output (kW)	Frame Size	Full lock speed (rpm)	Current: Full load I_N, 50Hz 380V (A)	400V (A)	415V (A)	Locked rotor I_L/I_N	Efficiency % at % full load: 100	75	50	power factor, cos φ at % full load: 100	75	50	Torque: Full load T_N (Nm)	Locked rotor T_L/T_N	Break down T_B/T_N	Moment of inertia $J=¼GD^2$ (kg x m²)	Noise level at 1 meter dB(A)	Net weight (kg)
0.55	80M1	1390	1.6	1.5	1.4	5.2	71.0	70.5	65.5	0.75	0.73	0.60	3.8	2.4	2.3	0.001	58	14
0.75	80M2	1390	2.1	2.0	1.9	6.0	73.0	76.0	73.9	0.76	0.66	0.53	5.2	2.3	2.3	0.002	58	15
1.1	90S	1400	2.9	2.7	2.6	6.0	75.0	76.7	74.4	0.77	0.78	0.66	7.5	2.3	2.3	0.002	61	18
1.5	90L	1400	3.7	3.5	3.4	6.0	78.0	80.2	78.0	0.79	0.79	0.67	10.2	2.3	2.3	0.003	61	23
2.2	100L1	1430	5.2	4.9	4.7	7.0	80.0	83.3	82.3	0.81	0.81	0.70	14.7	2.3	2.3	0.007	64	32
3	100L2	1430	6.8	6.4	6.2	7.0	82.0	84.8	83.8	0.82	0.82	0.73	20.0	2.3	2.3	0.009	64	35
4	112M	1440	8.8	8.4	8.1	7.0	84.0	86.0	85.4	0.82	0.82	0.72	26.5	2.3	2.3	0.013	65	44
5.5	132S	1440	11.8	11.3	10.8	7.0	85.0	87.8	87.7	0.83	0.85	0.75	36.5	2.3	2.3	0.027	71	61
7.5	132M1	1440	15.6	14.8	14.3	7.0	87.0	88.8	88.5	0.84	0.86	0.79	49.7	2.3	2.3	0.037	71	76
11	160M	1460	23.0	21.8	21.0	6.8	87.6	87.5	85.1	0.83	0.80	0.73	72.0	2.3	2.8	0.075	70	105
15	160L	1460	30.6	29.1	28.0	7.4	88.7	88.2	86.2	0.84	0.80	0.73	98.1	2.6	3.4	0.093	73	125
18.5	180M	1465	37.0	35.2	33.9	7.0	89.3	89.2	86.8	0.85	0.81	0.74	120.6	2.1	3.2	0.140	75	153
22	180L	1470	43.7	41.6	40.1	6.8	89.9	89.7	87.9	0.85	0.82	0.76	142.9	2.1	3.0	0.159	75	170
30	200L	1475	58.4	55.5	53.5	6.5	90.7	90.5	88.2	0.86	0.84	0.78	194.2	2.2	3.0	0.265	78	221
37	225S	1475	71.7	68.1	65.6	7.0	91.2	91.1	89.6	0.86	0.84	0.78	239.6	2.1	3.2	0.404	80	283
45	225M	1475	86.7	82.4	79.4	6.6	91.7	91.4	90.0	0.86	0.84	0.78	291.4	2.2	2.8	0.470	80	340
55	250M1	1480	105.5	100.2	96.6	6.3	92.1	92.0	91.0	0.86	0.84	0.79	354.9	2.2	2.7	0.670	82	375
75	280S	1480	139.7	132.7	127.9	6.3	92.7	92.6	91.8	0.88	0.85	0.81	484.0	2.3	2.8	1.120	84	506
90	280M1	1485	167.1	158.7	153.0	7.1	93.0	92.7	92.0	0.88	0.85	0.81	578.8	2.6	3.0	1.460	84	590
110	315S	1485	203.6	193.4	186.4	5.8	93.3	93.0	92.2	0.88	0.85	0.81	707.4	2.1	2.8	3.100	88	842
132	315M	1485	243.8	231.6	223.2	6.3	93.5	93.2	92.5	0.88	0.85	0.82	848.9	2.2	2.6	3.300	88	908
160	315L1	1490	291.2	276.6	266.6	5.7	93.8	93.5	92.8	0.89	0.86	0.82	1025.5	2.0	2.6	3.790	90	992
200	315L2	1490	363.2	345.1	332.6	6.2	94.0	93.9	93.0	0.89	0.86	0.82	1281.9	2.3	2.7	4.500	90	1122
250	355M	1490	449.0	426.5	411.1	6.5	94.0	93.8	93.2	0.90	0.87	0.84	1602.3	2.1	3.1	5.670	90	1490
315	355L	1490	565.7	537.4	518.0	6.0	94.0	93.8	93.3	0.90	0.87	0.84	2019.0	2.1	3.3	6.660	90	1650

High Output Design*

11	132M2	1450	23.3	22.1	21.3	6.2	87.6	87.2	84.6	0.82	0.80	0.72	72.4	2.2	2.8	0.063	69	88
75	250M2	1475	141.3	134.2	129.4	6.3	92.7	92.6	91.4	0.87	0.84	0.80	485.6	2.2	3.2	0.880	82	455
110	280M2	1480	203.6	193.4	186.4	6.2	93.3	93.1	92.5	0.88	0.85	0.81	709.8	2.4	2.8	2.680	85	670

* The motor is increased output (kW) in a reduced frame size electric motor

This data is provided for guidance only. Results are guaranteed only when confirmed by test results.

6 Pole - 1000 rpm asynchronous speed 50Hz

IE1

Output (kW)	Frame Size	Full lock speed (rpm)	Current Full load I_N, 50Hz 380V (A)	400V (A)	415V (A)	Locked rotor I_L/I_N	Efficiency % at % full load 100	75	50	power factor, cos φ at % full load 100	75	50	Torque Full load T_N (Nm)	Locked rotor T_L/T_N	Break down T_B/T_N	Moment of inertia J=¼GD² (kg x m²)	Noise level at 1 meter dB(A)	Net weight (kg)
0.37	80M1	890	1.3	1.2	1.2	4.7	62.0	67.7	62.2	0.70	0.66	0.53	4.0	1.9	2.0	0.002	54	14
0.55	80M2	890	1.8	1.7	1.6	4.7	65.0	73.0	69.3	0.72	0.68	0.54	5.9	1.9	2.1	0.003	54	15
0.75	90S	910	2.3	2.2	2.1	5.5	69.0	73.3	70.0	0.72	0.69	0.55	7.9	2.0	2.1	0.003	57	19
1.1	90L	910	3.2	3.0	2.9	5.5	72.0	75.2	72.9	0.73	0.70	0.57	11.5	2.0	2.1	0.005	57	22
1.5	100L	940	4.0	3.8	3.7	5.5	76.0	79.9	78.2	0.75	0.74	0.62	15.2	2.0	2.1	0.008	61	30
2.2	112M	940	5.6	5.3	5.1	6.5	79.0	81.8	81.7	0.76	0.74	0.62	22.4	2.0	2.1	0.014	65	38
3	132S	960	7.4	7.0	6.8	6.5	81.0	84.5	84.3	0.76	0.75	0.62	29.8	2.1	2.1	0.029	69	50
4	132M1	960	9.8	9.3	8.9	6.5	82.0	85.8	84.4	0.76	0.75	0.63	39.8	2.1	2.1	0.036	69	59
5.5	132M2	960	12.9	12.3	11.8	6.5	84.0	87.2	86.8	0.77	0.76	0.63	54.7	2.1	2.1	0.049	69	65
7.5	160M	965	17.5	16.6	16.0	5.4	84.7	84.6	83.6	0.77	0.72	0.63	74.2	2.0	2.3	0.088	71	96
11	160L	970	25.1	23.9	23.0	5.5	86.4	86.3	85.5	0.77	0.73	0.65	108.3	2.0	2.3	0.115	72	124
15	180L	970	33.3	31.7	30.5	6.2	87.7	87.6	86.4	0.78	0.74	0.66	147.7	2.1	2.5	0.207	72	161
18.5	200L1	975	39.2	37.2	35.9	6.2	88.6	88.2	87.3	0.81	0.78	0.68	181.2	2.0	2.8	0.315	73	193
22	200L2	975	46.3	44.0	42.4	5.9	89.2	88.9	87.8	0.81	0.78	0.70	215.5	2.0	2.5	0.360	73	211
30	225M	980	61.6	58.5	56.4	6.4	90.2	90.1	88.5	0.82	0.80	0.71	292.3	2.0	2.5	0.545	73	296
37	250M	980	73.7	70.0	67.5	6.7	90.8	90.7	89.7	0.84	0.81	0.72	360.6	2.3	2.6	0.834	76	347
45	280S	980	88.0	83.6	80.6	6.7	91.4	91.3	90.5	0.85	0.82	0.75	438.5	2.1	3.0	1.390	76	444
55	280M1	980	107.0	101.6	98.0	6.3	91.9	91.8	90.8	0.85	0.83	0.78	536.0	2.1	2.5	1.650	76	492
75	315S	985	144.8	137.5	132.6	7.0	92.6	92.3	91.5	0.85	0.83	0.80	727.2	2.0	2.7	4.100	80	795
90	315M	985	173.2	164.5	158.6	6.2	92.9	92.6	91.7	0.85	0.84	0.80	872.6	2.0	2.4	4.300	80	884
110	315L1	990	211.2	200.6	193.4	6.7	93.1	92.5	92.2	0.85	0.84	0.80	1061.1	2.4	2.8	5.450	82	946
132	315L2	990	250.2	237.7	229.1	6.8	93.2	93.1	92.3	0.86	0.85	0.81	1273.3	2.3	2.9	6.120	82	1071
160	355M1	990	298.9	283.9	273.6	6.5	93.5	93.1	92.7	0.87	0.86	0.82	1543.4	1.9	2.5	8.850	85	1426
200	355M2	990	372.8	354.1	341.3	6.3	93.7	93.6	93.0	0.87	0.86	0.82	1929.3	2.0	2.5	9.550	85	1585
250	355L	990	466.0	442.7	426.7	6.0	93.7	93.5	93.2	0.87	0.86	0.83	2411.6	1.9	2.4	10.400	87	1690

High Output Design*

75	280M2	980	144.8	137.5	132.6	6.8	92.6	92.5	91.2	0.85	0.83	0.79	730.9	2.8	2.9	3.210	79	610

* The motor is increased output (kW) in a reduced frame size electric motor

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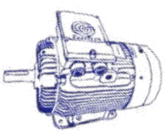

8 Pole - 750 rpm asynchronous speed 50Hz

IE1

Output (kW)	Frame Size	Full lock speed (rpm)	Current Full load I_N, 50Hz 380V (A)	400V (A)	415V (A)	Locked rotor I_L/I_N	Efficiency % at % full load 100	75	50	power factor, cos φ at % full load 100	75	50	Torque Full load T_N (Nm)	Locked rotor T_L/T_N	Break down T_B/T_N	Moment of inertia $J=\frac{1}{4}GD^2$ (kg x m²)	Noise level at 1 meter dB(A)	Net weight (kg)
0.18	80M1	680	1.2	1.1	1.1	3.2	38.0	36.9	33.0	0.61	0.55	0.42	2.5	2.1	2.4	0.002	50	17
0.25	80M2	690	1.4	1.4	1.3	3.3	43.4	42.7	39.6	0.61	0.55	0.44	3.5	2.0	2.2	0.003	50	19
0.37	90S	700	1.9	1.8	1.7	3.6	49.7	49.6	45.5	0.61	0.56	0.46	5.0	1.9	2.5	0.004	53	23
0.55	90L	700	2.4	2.3	2.2	3.5	56.1	56.0	52.2	0.61	0.56	0.46	7.5	1.9	2.3	0.004	54	25
0.75	100L1	700	2.8	2.6	2.5	4.0	61.2	61.1	56.6	0.67	0.57	0.46	10.2	2.1	2.4	0.008	56	33
1.1	100L2	700	3.5	3.3	3.2	3.7	66.5	66.2	60.8	0.72	0.59	0.47	15.0	2.2	2.4	0.010	59	38
1.5	112M1	700	4.5	4.3	4.1	4.2	70.2	69.9	65.6	0.72	0.60	0.50	20.5	2.2	2.7	0.017	61	50
2.2	132S	705	6.3	5.9	5.7	4.7	74.2	73.4	71.4	0.72	0.63	0.51	29.8	2.1	2.5	0.030	65	58
3	132M1	705	8.1	7.7	7.4	4.6	77.0	76.5	73.9	0.73	0.67	0.55	40.6	2.1	2.6	0.040	65	68
4	160M1	710	10.5	10.0	9.6	4.5	79.2	78.8	76.8	0.73	0.67	0.56	53.8	2.1	2.7	0.075	67	76
5.5	160M2	715	13.9	13.2	12.7	5.0	81.4	81.2	78.6	0.74	0.67	0.56	73.5	2.3	2.8	0.093	68	92
7.5	160L	720	18.0	17.1	16.5	6.0	83.1	82.4	79.3	0.76	0.69	0.56	99.5	2.2	2.6	0.125	68	117
11	180L	730	25.5	24.3	23.4	5.5	85.0	84.7	82.4	0.77	0.69	0.56	143.9	2.2	2.5	0.202	70	154
15	200L	730	33.9	32.2	31.0	5.8	86.2	85.6	83.5	0.78	0.72	0.58	196.2	2.1	2.8	0.338	71	202
18.5	225S	730	41.5	39.4	38.0	6.3	86.9	86.2	83.9	0.78	0.73	0.61	242.0	2.1	2.5	0.490	73	251
22	225M	735	48.4	46.0	44.3	6.2	87.4	87.3	84.2	0.79	0.74	0.63	285.9	2.2	2.5	0.550	73	295
30	250M	735	64.5	61.3	59.1	5.9	88.3	87.9	86.0	0.80	0.76	0.64	389.8	2.3	3.0	0.830	74	358
37	280S	735	78.2	74.2	71.6	6.3	88.8	88.5	86.5	0.81	0.76	0.65	480.7	2.1	2.8	1.390	75	472
45	280M1	740	94.6	89.9	86.6	6.4	89.2	88.7	87.3	0.81	0.76	0.65	580.7	1.9	2.5	1.650	76	528
55	315S	740	112.2	106.6	102.8	6.8	89.7	89.5	88.2	0.83	0.78	0.69	709.8	1.9	2.7	4.790	78	729
75	315M	740	152.0	144.4	139.2	7.0	90.3	90.0	88.6	0.83	0.78	0.70	967.9	2.0	2.4	5.580	78	902
90	315L1	740	179.5	170.5	164.3	6.7	90.7	90.5	89.0	0.84	0.78	0.70	1161.5	2.4	2.8	6.370	80	969
110	315L2	740	218.4	207.5	200.0	6.4	91.1	90.9	89.5	0.84	0.80	0.72	1419.6	2.4	2.5	7.230	81	1112
132	355M1	740	260.9	247.9	238.9	5.8	91.5	91.1	90.0	0.84	0.81	0.72	1703.5	1.7	2.3	10.540	82	1475
160	355M2	743	311.2	295.6	285.0	5.5	91.9	91.8	90.0	0.85	0.82	0.75	2056.5	1.5	2.3	11.720	86	1528
200	355L	743	387.3	368.0	354.7	6.0	92.3	92.0	90.2	0.85	0.82	0.75	2570.7	1.3	3.3	12.850	87	1730

High Output Design*

2.2	112M2	720	6.3	6.0	5.8	3.9	74.9	80.0	79.3	0.71	0.71	0.59	29.2	2.1	2.5	0.018	64	41
4	132M2	730	10.4	9.9	9.5	4.4	80.0	82.8	81.5	0.73	0.72	0.60	52.3	2.1	2.5	0.052	68	68
55	280M2	735	112.2	106.6	102.8	6.9	89.7	88.7	87.9	0.83	0.77	0.67	714.6	2.3	2.9	3.650	77	613

* The motor is increased output (kW) in a reduced frame size electric motor

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2 Pole - 3000 rpm asynchronous speed 50Hz

IE2

Output (kW)	Frame Size	Full lock speed (rpm)	Current – Full load I_N, 50Hz – 380V (A)	Current – Full load I_N, 50Hz – 400V (A)	Current – Full load I_N, 50Hz – 415V (A)	Locked rotor I_L/I_N	Efficiency % at % full load – 100	Efficiency % at % full load – 75	Efficiency % at % full load – 50	power factor, cos φ at % full load – 100	power factor, cos φ at % full load – 75	power factor, cos φ at % full load – 50	Torque – Full load T_N (Nm)	Torque – Locked rotor T_L/T_N	Torque – Break down T_B/T_N	Moment of inertia $J=\frac{1}{4}GD^2$ (kg x m²)	Noise level at 1 meter dB(A)	Net weight (kg)
0.75	80M1	2848	2.0	1.9	1.8	6.0	77.4	77.5	73.8	0.75	0.80	0.67	2.5	2.3	2.9	0.001	67	16
1.1	80M2	2846	2.7	2.5	2.4	6.7	79.6	80.5	78.6	0.79	0.83	0.70	3.7	2.3	2.7	0.001	67	18
1.5	90S	2852	3.3	3.2	3.1	6.1	81.3	81.9	81.0	0.84	0.82	0.71	5.0	2.4	2.7	0.001	70	20
2.2	90L1	2845	4.8	4.5	4.4	7.0	83.2	83.6	82.5	0.84	0.82	0.69	7.4	2.4	2.9	0.002	72	24
3	100L	2851	6.1	5.8	5.5	7.6	84.6	85.5	84.0	0.89	0.85	0.76	10.0	2.4	2.8	0.003	76	34
4	112M1	2910	8.0	7.6	7.3	7.8	85.8	85.3	82.7	0.89	0.89	0.81	13.1	2.5	3.0	0.006	77	43
5.5	132S1	2905	10.8	10.3	9.9	7.8	87.0	88.1	86.0	0.89	0.89	0.81	18.1	2.3	2.8	0.012	80	60
7.5	132S2	2910	14.7	14.0	13.5	7.9	88.1	89.0	87.3	0.88	0.90	0.83	24.6	2.3	2.7	0.015	80	65
11	160M1	2940	21.5	20.4	19.7	7.9	89.4	88.8	86.8	0.87	0.84	0.80	35.7	2.2	2.3	0.062	80	110
15	160M2	2940	29.0	27.6	26.6	8.0	90.3	90.0	87.5	0.87	0.85	0.81	48.7	2.2	2.3	0.067	81	121
18.5	160L	2940	35.5	33.8	32.5	8.1	90.9	90.8	88.3	0.87	0.85	0.82	60.1	2.2	2.3	0.081	81	140
22	180M	2945	42.1	40.0	38.5	8.2	91.3	90.9	88.9	0.87	0.85	0.82	71.3	2.2	2.3	0.100	83	170
30	200L1	2960	56.9	54.1	52.1	7.5	92.0	91.7	89.6	0.87	0.85	0.82	96.8	2.2	2.3	0.189	84	236
37	200L2	2960	69.9	66.4	64.0	7.5	92.5	92.3	90.7	0.87	0.85	0.82	119.4	2.2	2.3	0.197	84	253
45	225M	2970	84.6	80.4	77.5	7.6	92.9	92.6	91.4	0.87	0.85	0.83	144.7	2.2	2.3	0.362	86	337
55	250M1	2975	101.8	96.7	93.2	7.6	93.3	92.8	91.5	0.88	0.86	0.83	176.6	2.2	2.3	0.439	89	439
75	280S	2980	138.0	131.1	126.3	6.9	93.8	93.3	92.3	0.88	0.85	0.83	240.4	2.0	2.3	0.808	91	554
90	280M1	2980	165.1	156.9	151.2	7.0	94.1	93.7	92.5	0.88	0.86	0.83	288.4	2.0	2.3	0.921	91	627
110	315S	2980	198.9	189.0	182.2	7.1	94.4	93.8	92.7	0.89	0.86	0.83	352.5	2.0	2.2	1.693	91	871
132	315M	2980	238.2	226.3	218.1	7.1	94.6	94.2	93.1	0.89	0.87	0.83	423.0	2.0	2.2	1.875	91	936
160	315L1	2980	284.7	270.5	260.7	7.1	94.9	94.3	93.2	0.90	0.87	0.83	512.8	2.0	2.2	2.214	92	983
200	315L2	2980	355.1	337.4	325.2	7.1	95.1	94.6	93.5	0.90	0.87	0.83	640.9	2.0	2.2	2.517	92	1093
250	355M	2985	444.0	421.8	406.5	7.1	95.1	94.7	93.6	0.90	0.87	0.84	799.8	2.0	2.2	3.827	100	1482
315	355L	2985	559.4	531.4	512.2	7.1	95.1	94.7	93.7	0.90	0.88	0.85	1007.8	2.0	2.2	4.552	100	1706

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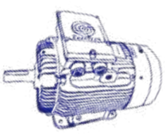

4 Pole - 1500 rpm asynchronous speed 50Hz

IE2

Output	Frame Size	Full lock speed	Current Full load I_N, 50Hz			Locked rotor	Efficiency % at % full load			power factor, cos φ at % full load			Torque			Moment of inertia	Noise level	Net weight
			380V	400V	415V		100	75	50	100	75	50	Full load T_N	Locked rotor T_L/T_N	Break down T_B/T_N	$J=¼GD^2$	at 1 meter	
(kW)		(rpm)	(A)	(A)	(A)	I_L/I_N							(Nm)			(kg x m²)	dB(A)	(kg)
0.75	80M2	1420	1.9	1.8	1.7	5.4	79.6	79.8	77.5	0.76	0.68	0.55	5.0	2.3	2.9	0.002	58	16
1.1	90S	1425	2.6	2.5	2.4	5.9	81.4	81.9	79.1	0.78	0.69	0.56	7.4	2.3	2.7	0.003	61	19
1.5	90L	1420	3.5	3.3	3.2	6.4	82.8	83.4	80.4	0.79	0.72	0.58	10.1	2.4	2.7	0.004	61	24
2.2	100L1	1430	4.8	4.6	4.4	6.6	84.3	85.5	83.6	0.82	0.76	0.63	14.7	2.4	2.9	0.007	64	34
3	100L2	1430	6.7	6.3	6.1	6.9	85.5	85.7	83.9	0.80	0.76	0.63	20.0	2.4	2.8	0.009	64	37
4	112M	1435	8.9	8.4	8.1	7.9	86.6	87.2	85.5	0.79	0.78	0.65	26.6	2.5	3.0	0.013	65	46
5.5	132S	1430	11.6	11.0	10.6	7.1	87.7	89.2	87.1	0.82	0.83	0.72	36.7	2.3	2.8	0.028	71	63
7.5	132M1	1430	15.5	14.7	14.2	7.8	88.7	89.8	87.5	0.83	0.84	0.75	50.1	2.3	2.7	0.036	71	78
11	160M	1465	22.4	21.3	20.5	7.5	89.8	89.6	86.3	0.83	0.78	0.70	71.7	2.2	2.3	0.108	70	129
15	160L	1465	30.3	28.8	27.8	7.5	90.6	90.4	87.0	0.83	0.79	0.73	97.8	2.2	2.3	0.139	73	155
18.5	180M	1470	36.7	34.9	33.6	7.7	91.2	90.9	88.2	0.84	0.80	0.74	120.2	2.2	2.3	0.191	75	191
22	180L	1475	43.4	41.3	39.8	7.8	91.6	91.5	88.6	0.84	0.82	0.74	142.4	2.2	2.3	0.219	75	214
30	200L	1475	58.1	55.2	53.2	7.2	92.3	92.2	89.7	0.85	0.82	0.75	194.2	2.2	2.3	0.319	76	248
37	225S	1480	71.3	67.8	65.3	7.3	92.7	92.6	90.2	0.85	0.83	0.75	238.8	2.2	2.3	0.646	78	328
45	225M	1480	86.4	82.1	79.1	7.4	93.1	92.9	91.0	0.85	0.83	0.75	290.4	2.2	2.3	0.755	78	385
55	250M1	1480	105.3	100.0	96.4	7.4	93.4	93.3	91.6	0.85	0.83	0.76	354.9	2.2	2.3	0.934	79	446
75	280S	1485	139.3	132.4	127.6	6.7	94.0	93.8	92.4	0.87	0.85	0.77	482.3	2.2	2.3	1.787	80	655
90	280M1	1485	166.9	158.6	152.9	6.9	94.2	94.0	93.1	0.87	0.85	0.77	578.8	2.2	2.3	2.123	80	704
110	315S	1485	203.5	193.3	186.3	6.9	94.4	94.2	93.2	0.87	0.85	0.78	707.4	2.2	2.2	3.819	85	885
132	315M	1485	243.6	231.4	223.0	6.9	94.7	94.6	93.8	0.87	0.85	0.80	848.9	2.2	2.2	3.831	85	953
160	315L1	1490	291.1	276.5	266.5	6.9	94.9	94.8	94.2	0.88	0.87	0.81	1025.5	2.2	2.2	4.673	88	1076
200	315L2	1490	363.1	345.0	332.5	6.9	95.1	94.9	94.2	0.88	0.87	0.81	1281.9	2.2	2.2	5.346	88	1237
250	355M	1490	448.8	426.3	410.9	6.9	95.1	95.0	94.3	0.89	0.87	0.82	1602.3	2.2	2.2	8.219	95	1686
315	355L	1490	565.5	537.2	517.8	6.9	95.1	95.0	94.3	0.89	0.87	0.82	2019.0	2.2	2.2	10.515	95	1830

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6 Pole - 1000 rpm asynchronous speed 50Hz

IE2

Output (kW)	Frame Size	Full lock speed (rpm)	Current Full load I_N, 50Hz 380V (A)	400V (A)	415V (A)	Locked rotor I_L/I_N	Efficiency % at % full load 100	75	50	power factor, cos φ at % full load 100	75	50	Torque Full load T_N (Nm)	Locked rotor T_L/T_N	Break down T_B/T_N	Moment of inertia J=¼GD² (kg x m²)	Noise level at 1 meter dB(A)	Net weight (kg)
0.75	90S	935	2.0	1.9	1.8	6.2	75.9	76.4	73.8	0.76	0.66	0.51	7.7	2.2	2.7	0.003	59	20
1.1	90L	935	2.7	2.5	2.4	6.0	78.1	78.6	77.6	0.80	0.67	0.53	11.2	2.3	2.6	0.005	59	23
1.5	100L	940	3.5	3.3	3.2	5.8	79.8	80.2	78.3	0.82	0.70	0.56	15.2	2.3	2.7	0.010	61	31
2.2	112M	940	5.1	4.9	4.7	6.4	81.8	82.5	79.0	0.80	0.70	0.56	22.4	2.3	2.9	0.017	64	40
3	132S	940	6.6	6.3	6.0	6.3	83.3	84.0	82.2	0.83	0.71	0.57	30.5	2.4	2.8	0.030	64	51
4	132M1	945	8.6	8.1	7.8	6.2	84.6	85.1	83.5	0.84	0.71	0.59	40.4	2.5	2.8	0.040	68	61
5.5	132M2	945	11.9	11.3	10.9	6.8	86.0	86.8	85.4	0.82	0.74	0.60	55.6	2.3	2.8	0.053	68	67
7.5	160M	970	17.3	16.4	15.8	6.7	87.9	87.1	84.7	0.75	0.71	0.64	73.8	2.1	2.1	0.125	71	117
11	160L	970	24.8	23.6	22.7	6.9	88.7	88.6	86.0	0.76	0.72	0.65	108.3	2.1	2.1	0.180	72	151
15	180L	975	33.0	31.3	30.2	7.2	89.7	89.6	87.5	0.77	0.74	0.67	146.9	2.0	2.1	0.342	72	219
18.5	200L1	980	38.9	36.9	35.6	7.2	90.4	90.3	88.5	0.80	0.75	0.69	180.3	2.1	2.1	0.489	73	235
22	200L2	980	46.0	43.7	42.1	7.3	90.9	90.8	89.5	0.80	0.75	0.70	214.4	2.1	2.1	0.552	73	265
30	225M	985	61.4	58.3	56.2	7.1	91.7	91.6	90.7	0.81	0.75	0.71	290.9	2.0	2.1	0.706	74	328
37	250M	985	73.5	69.8	67.3	7.1	92.2	92.1	91.2	0.83	0.76	0.73	358.7	2.1	2.1	1.119	75	408
45	280S	985	87.9	83.5	80.5	7.2	92.6	92.5	91.8	0.84	0.80	0.74	436.3	2.1	2.0	2.165	78	524
55	280M1	985	106.9	101.5	97.8	7.2	93.1	93.0	92.6	0.84	0.80	0.75	533.2	2.1	2.0	2.669	78	601
75	315S	990	144.6	137.4	132.4	6.7	93.7	93.6	92.8	0.84	0.81	0.75	723.5	2.0	2.0	4.110	82	852
90	315M	990	173.0	164.3	158.4	6.7	94.0	93.9	93.2	0.84	0.82	0.76	868.2	2.0	2.0	4.875	82	955
110	315L1	990	211.0	200.4	193.2	6.7	94.2	94.0	93.5	0.84	0.82	0.76	1061.1	2.0	2.0	5.913	83	1067
132	315L2	990	249.9	237.4	228.8	6.7	94.3	94.2	93.6	0.85	0.82	0.77	1273.3	2.0	2.0	6.950	83	1214
160	355M1	990	298.5	283.5	273.3	6.7	94.6	94.5	94.2	0.86	0.82	0.78	1543.4	2.0	2.0	9.999	85	1515
200	355M2	990	372.7	354.1	341.3	6.7	94.8	94.7	94.2	0.86	0.83	0.80	1929.3	2.0	2.0	11.190	85	1709
250	355L	990	465.9	442.6	426.6	6.7	94.8	94.7	94.2	0.86	0.83	0.80	2411.6	2.0	2.0	14.061	85	1877

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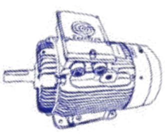

8 Pole - 750 rpm asynchronous speed 50Hz

IE2

Output (kW)	Frame Size	Full lock speed (rpm)	Current Full load I_N, 50Hz 380V (A)	400V (A)	415V (A)	Locked rotor I_L/I_N	Efficiency % at % full load 100	75	50	power factor, cos φ at % full load 100	75	50	Torque Full load T_N (Nm)	Locked rotor T_L/T_N	Break down T_B/T_N	Moment of inertia $J=¼GD^2$ (kg x m²)	Noise level at 1 meter dB(A)	Net weight (kg)
0.75	100L1	695	2.6	2.4	2.4	4.6	66.2	65.9	61.6	0.67	0.55	0.46	10.3	2.1	2.4	0.011	55	36
1.1	100L2	695	3.4	3.3	3.1	4.6	70.8	70.5	65.7	0.69	0.58	0.47	15.1	2.2	2.4	0.013	56	42
1.5	112M1	700	4.3	4.1	4.0	4.7	74.1	74.0	69.8	0.71	0.61	0.51	20.5	2.2	2.7	0.020	60	55
2.2	132S	705	6.0	5.7	5.5	4.7	77.6	77.5	72.4	0.72	0.61	0.52	29.8	2.1	2.5	0.059	63	64
3	132M1	705	7.9	7.5	7.2	4.6	80.0	79.8	74.8	0.72	0.63	0.54	40.6	2.1	2.6	0.074	64	75
4	160M1	715	10.2	9.7	9.3	4.5	81.9	81.8	76.3	0.73	0.65	0.54	53.4	2.2	2.7	0.082	65	84
5.5	160M2	715	13.5	12.8	12.3	5.5	83.8	83.6	78.6	0.74	0.65	0.55	73.5	2.3	2.8	0.116	68	102
7.5	160L	725	17.6	16.7	16.1	6.2	85.3	85.1	80.6	0.76	0.67	0.55	98.8	2.2	2.6	0.132	68	128
11	180L	730	25.3	24.0	23.2	5.5	86.9	86.8	83.3	0.76	0.67	0.56	143.9	2.2	2.5	0.262	70	170
15	200L	730	33.6	32.0	30.8	5.8	88.0	87.9	84.2	0.77	0.72	0.58	196.2	2.1	2.8	0.398	70	222
18.5	225S	730	41.2	39.1	37.7	6.2	88.6	88.4	84.7	0.77	0.72	0.61	242.0	2.1	2.5	0.578	70	276
22	225M	735	48.1	45.7	44.0	6.2	89.1	89.0	85.3	0.78	0.73	0.62	285.9	2.2	2.5	0.623	73	325
30	250M	735	64.3	61.0	58.8	5.8	89.8	89.7	86.9	0.79	0.74	0.63	389.8	2.3	2.4	1.056	74	394
37	280S	740	77.8	73.9	71.3	6.4	90.3	90.1	87.2	0.80	0.75	0.65	477.5	2.1	2.2	2.015	75	520
45	280M1	740	94.2	89.5	86.3	6.4	90.7	90.6	87.6	0.80	0.75	0.65	580.7	1.9	2.5	2.568	75	580
55	315S	740	112.0	106.4	102.5	6.8	91.0	90.8	88.2	0.82	0.76	0.68	709.8	1.9	2.2	5.362	78	802
75	315M	740	151.7	144.1	138.9	6.9	91.6	91.2	89.0	0.82	0.78	0.70	967.9	2.0	2.4	5.960	78	992
90	315L1	745	179.3	170.3	164.2	6.7	91.9	91.5	89.6	0.83	0.78	0.70	1153.7	1.8	2.2	6.775	80	1066
110	315L2	745	218.2	207.3	199.8	6.4	92.3	92.2	90.1	0.83	0.79	0.71	1410.1	1.8	2.5	7.965	81	1223
132	355M1	745	260.8	247.8	238.8	6.2	92.6	92.3	90.7	0.83	0.80	0.72	1692.1	1.7	2.3	12.560	82	1622
160	355M2	745	311.0	295.5	284.8	6.2	93.0	92.7	91.5	0.84	0.82	0.74	2051.0	1.6	2.3	14.320	82	1680
200	355L	745	387.2	367.8	354.5	6.3	93.4	93.2	92.2	0.84	0.82	0.74	2563.8	1.6	2.4	15.930	85	1903

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2 Pole - 3000 rpm asynchronous speed 50Hz

IE3

Output (kW)	Frame Size	Full lock speed (rpm)	Current Full load I_N, 50Hz 380V (A)	400V (A)	415V (A)	Locked rotor I_L/I_N	Efficiency % at % full load 100	75	50	power factor, cos φ at % full load 100	75	50	Torque Full load T_N (Nm)	Locked rotor T_L/T_N	Break down T_B/T_N	Moment of inertia $J=¼GD^2$ (kg x m²)	Noise level at 1 meter dB(A)	Net weight (kg)
0.75	80M1	2880	1.7	1.6	1.6	5.5	80.7	80.3	77.2	0.83	0.82	0.71	2.5	1.8	3.5	0.001	67	17
1.1	80M2	2880	2.4	2.3	2.2	7.5	82.7	82.5	79.9	0.83	0.84	0.73	3.6	2.6	3.5	0.001	67	19
1.5	90S	2895	3.3	3.1	3.0	7.1	84.2	83.8	81.4	0.83	0.85	0.75	4.9	2.6	3.5	0.002	72	22
2.2	90L1	2895	4.6	4.3	4.2	7.0	85.9	86.1	84.7	0.85	0.87	0.79	7.3	2.0	3.0	0.003	72	25
3	100L	2895	5.9	5.6	5.4	8.6	87.1	87.5	86.3	0.88	0.89	0.81	9.9	2.0	3.2	0.005	76	35
4	112M1	2905	7.8	7.4	7.2	8.0	88.1	88.2	87.0	0.88	0.90	0.83	13.1	1.8	2.9	0.008	77	45
5.5	132S1	2930	10.6	10.1	9.7	7.5	89.2	89.4	88.2	0.88	0.89	0.83	17.9	2.1	2.5	0.015	80	62
7.5	132S2	2930	14.4	13.7	13.2	7.3	90.1	90.2	89.1	0.88	0.91	0.85	24.4	2.0	3.5	0.019	80	67
11	160M1	2940	21.3	20.2	19.5	7.9	91.2	90.7	88.4	0.86	0.83	0.79	35.7	2.2	2.3	0.063	80	115
15	160M2	2940	28.8	27.4	26.4	8.0	91.9	91.8	88.5	0.86	0.84	0.80	48.7	2.2	2.5	0.070	81	125
18.5	160L	2940	35.4	33.6	32.4	8.1	92.4	92.2	89.8	0.86	0.84	0.84	60.1	2.2	2.3	0.087	81	147
22	180M	2945	41.9	39.8	38.4	8.2	92.7	92.4	90.2	0.86	0.84	0.81	71.3	2.2	2.3	0.107	83	178
30	200L1	2960	56.8	54.0	52.0	7.5	93.3	93.1	90.4	0.86	0.84	0.81	96.8	2.2	2.4	0.196	84	248
37	200L2	2960	69.7	66.3	63.9	7.5	93.7	93.6	91.2	0.86	0.84	0.81	119.4	2.2	2.3	0.201	84	258
45	225M	2970	84.5	80.3	77.4	7.6	94.0	93.8	91.8	0.86	0.84	0.82	144.7	2.2	2.4	0.393	86	353
55	250M1	2975	101.7	96.7	93.2	7.6	94.3	94.2	92.5	0.87	0.84	0.82	176.6	2.2	2.3	0.488	89	460
75	280S	2980	137.9	131.0	126.3	7.1	94.8	94.6	92.9	0.87	0.84	0.82	240.4	2.0	2.3	0.879	91	580
90	280M1	2980	165.0	156.7	151.1	7.0	95.2	94.9	93.2	0.87	0.85	0.82	288.4	2.0	2.3	1.088	91	658
110	315S	2980	198.8	188.8	182.0	7.1	95.5	95.1	93.5	0.88	0.85	0.82	352.5	2.0	2.2	1.898	91	960
132	315M	2980	238.1	226.2	218.0	7.1	95.7	95.2	93.9	0.88	0.86	0.82	423.0	2.0	2.2	1.998	91	982
160	315L1	2980	284.5	270.3	260.5	7.1	95.9	95.5	94.2	0.89	0.86	0.82	512.8	2.0	2.3	2.286	92	1030
200	315L2	2980	355.0	337.2	325.0	7.1	96.1	95.6	94.5	0.89	0.86	0.82	640.9	2.0	2.2	2.988	92	1145
250	355M	2985	443.9	421.7	406.4	7.1	96.1	95.7	94.7	0.89	0.86	0.83	799.8	2.0	2.2	3.988	100	1555
315	355L	2985	559.3	531.4	512.2	7.1	96.1	95.7	94.7	0.89	0.87	0.83	1007.8	2.0	2.2	4.781	100	1790

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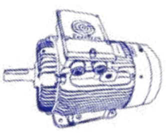

4 Pole - 1500 rpm asynchronous speed 50Hz

IE3

Output (kW)	Frame Size	Full lock speed (rpm)	Current Full load I_N, 50Hz 380V (A)	400V (A)	415V (A)	Locked rotor I_L/I_N	Efficiency % at % full load 100	75	50	power factor, cos φ at % full load 100	75	50	Torque Full load T_N (Nm)	Locked rotor T_L/T_N	Break down T_B/T_N	Moment of inertia J=¼GD² (kg x m²)	Noise level at 1 meter dB(A)	Net weight (kg)
0.75	80M2	1420	1.9	1.8	1.7	6.0	82.5	82.5	80.1	0.74	0.77	0.66	5.0	2.9	3.6	0.002	58	18
1.1	90S	1445	2.7	2.6	2.5	6.5	84.1	84.2	82.9	0.74	0.76	0.65	7.3	2.7	3.8	0.004	61	22
1.5	90L	1445	3.6	3.4	3.3	6.8	85.3	85.5	84.1	0.74	0.77	0.66	9.9	3.0	3.6	0.005	61	26
2.2	100L1	1435	4.9	4.7	4.5	7.2	86.7	87.1	86.2	0.78	0.80	0.69	14.6	2.5	3.5	0.009	64	36
3	100L2	1435	6.7	6.3	6.1	7.2	87.7	88.0	86.9	0.78	0.82	0.72	20.0	2.6	3.5	0.011	64	41
4	112M	1440	8.6	8.1	7.9	7.0	88.6	88.8	88.2	0.80	0.80	0.71	26.5	2.3	3.2	0.015	65	48
5.5	132S	1460	11.7	11.1	10.7	7.1	89.6	89.8	89.4	0.80	0.83	0.74	36.0	2.7	3.5	0.034	71	65
7.5	132M1	1460	15.4	14.6	14.1	7.2	90.4	90.9	90.3	0.82	0.85	0.77	49.1	2.7	3.8	0.044	72	80
11	160M	1465	22.3	21.2	20.4	7.5	91.4	91.3	88.5	0.82	0.77	0.69	71.7	2.2	2.3	0.110	70	135
15	160L	1465	30.2	28.7	27.6	7.5	92.1	92.0	89.3	0.82	0.78	0.72	97.8	2.0	2.3	0.578	73	162
18.5	180M	1470	36.6	34.7	33.5	7.7	92.6	92.5	90.5	0.83	0.79	0.73	120.2	2.1	2.3	0.209	75	196
22	180L	1475	43.3	41.1	39.7	7.8	93.0	92.7	91.0	0.83	0.79	0.74	142.4	2.2	2.3	0.258	75	224
30	200L	1475	58.0	55.1	53.1	7.2	93.6	93.5	91.5	0.84	0.81	0.74	194.2	2.1	2.3	0.369	76	260
37	225S	1480	71.3	67.7	65.3	7.3	93.9	93.6	91.8	0.84	0.82	0.75	238.8	2.2	2.4	0.667	78	345
45	225M	1480	86.2	81.9	78.9	7.4	94.2	94.0	92.0	0.84	0.82	0.75	290.4	2.2	2.4	0.790	78	403
55	250M1	1480	105.2	99.9	96.3	7.4	94.6	94.5	92.8	0.84	0.82	0.75	354.9	2.2	2.4	1.005	79	468
75	280S	1485	139.2	132.2	127.4	6.7	95.1	94.8	93.0	0.86	0.83	0.76	482.3	2.0	2.3	1.898	80	685
90	280M1	1485	166.8	158.5	152.8	6.9	95.3	95.0	93.4	0.86	0.84	0.77	578.8	2.1	2.3	2.565	80	739
110	315S	1485	203.3	193.1	186.1	6.9	95.5	95.1	93.8	0.86	0.84	0.77	707.4	2.1	2.2	3.863	85	930
132	315M	1485	243.4	231.3	222.9	6.9	95.8	95.4	94.0	0.86	0.84	0.79	848.9	2.1	2.2	4.125	85	1000
160	315L1	1490	290.9	276.3	266.4	6.9	96.0	95.7	94.2	0.87	0.85	0.80	1025.5	2.1	2.2	4.932	88	1130
200	315L2	1490	363.0	344.8	332.3	6.9	96.2	95.9	94.5	0.87	0.85	0.81	1281.9	2.1	2.2	5.855	88	1298
250	355M	1490	448.7	426.3	410.9	6.9	96.2	95.9	94.7	0.88	0.85	0.81	1602.3	2.1	2.3	8.456	95	1770
315	355L	1490	565.4	537.1	517.7	6.9	96.2	96.0	94.7	0.88	0.86	0.81	2019.0	2.2	2.3	10.745	95	1920

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6 Pole - 1000 rpm asynchronous speed 50Hz

IE3

Output (kW)	Frame Size	Full lock speed (rpm)	Current Full load I_N, 50Hz 380V (A)	400V (A)	415V (A)	Locked rotor I_L/I_N	Efficiency % at % full load 100	75	50	power factor, cos φ at % full load 100	75	50	Torque Full load T_N (Nm)	Locked rotor T_L/T_N	Break down T_B/T_N	Moment of inertia $J=¼GD^2$ (kg x m²)	Noise level at 1 meter dB(A)	Net weight (kg)
0.75	90S	935	2.4	2.2	2.2	4.5	78.9	80.1	78.1	0.61	0.68	0.55	7.7	2.5	3.3	0.004	59	22
1.1	90L	945	3.0	2.8	2.7	4.5	81.0	81.1	78.4	0.69	0.70	0.57	11.1	1.7	3.3	0.005	59	24
1.5	100L	949	4.0	3.8	3.7	4.2	82.5	83.0	81.8	0.69	0.74	0.62	15.1	2.3	3.0	0.009	61	33
2.2	112M	955	5.6	5.3	5.1	4.5	84.3	84.5	83.2	0.71	0.73	0.61	22.0	2.6	3.0	0.018	64	42
3	132S	968	7.5	7.1	6.9	4.5	85.6	86.0	85.1	0.71	0.73	0.61	29.6	2.0	3.1	0.034	65	53
4	132M1	968	9.9	9.4	9.0	5.0	86.8	87.1	86.2	0.71	0.73	0.61	39.5	2.1	2.6	0.044	68	64
5.5	132M2	968	12.7	12.0	11.6	5.4	88.0	88.3	87.1	0.75	0.75	0.63	54.3	1.7	2.6	0.054	68	69
7.5	160M	970	17.1	16.2	15.6	6.7	89.1	89.0	85.7	0.75	0.71	0.64	73.8	2.1	2.3	0.144	71	123
11	160L	970	24.7	23.4	22.6	6.9	90.3	90.2	87.2	0.75	0.71	0.64	108.3	2.1	2.3	0.205	72	159
15	180L	975	32.9	31.2	30.1	7.1	91.2	91.1	88.5	0.76	0.73	0.66	146.9	2.0	2.2	0.356	72	230
18.5	200L1	980	38.8	36.9	35.5	7.2	91.7	91.6	89.6	0.79	0.74	0.68	180.3	2.1	2.3	0.502	73	246
22	200L2	980	45.9	43.6	42.0	7.2	92.2	92.1	90.7	0.79	0.74	0.69	214.4	2.1	2.3	0.574	73	278
30	225M	985	61.3	58.3	56.2	7.1	92.9	92.8	91.3	0.80	0.74	0.70	290.9	2.0	2.2	0.726	74	344
37	250M	985	73.4	69.7	67.2	7.1	93.3	93.2	91.8	0.82	0.75	0.71	358.7	2.1	2.3	1.135	75	428
45	280S	985	87.8	83.4	80.4	7.1	93.7	93.6	92.1	0.83	0.79	0.72	436.3	2.1	2.2	2.204	78	550
55	280M1	985	106.8	101.4	97.7	7.1	94.2	94.0	92.6	0.83	0.79	0.73	533.2	2.1	2.2	2.689	78	630
75	315S	990	144.5	137.3	132.3	6.7	94.8	94.5	93.2	0.83	0.80	0.73	723.5	2.0	2.3	4.145	82	895
90	315M	990	172.9	164.2	158.3	6.7	95.1	94.8	93.7	0.83	0.80	0.75	868.2	2.0	2.3	4.985	82	1002
110	315L1	990	210.9	200.3	193.1	6.7	95.3	95.0	94.0	0.83	0.81	0.75	1061.1	2.0	2.3	6.136	83	1120
132	315L2	990	249.8	237.4	228.8	6.7	95.5	95.3	94.2	0.84	0.81	0.76	1273.3	2.0	2.3	7.082	83	1275
160	355M1	990	298.2	283.3	273.1	6.7	95.8	95.5	94.7	0.85	0.81	0.76	1543.4	2.0	2.3	10.544	85	1590
200	355M2	990	372.6	354.0	341.2	6.7	95.9	95.7	94.8	0.85	0.81	0.78	1929.3	2.0	2.3	11.856	85	1795
250	355L	990	465.8	442.5	426.5	6.7	95.9	95.8	95.0	0.85	0.81	0.78	2411.6	2.0	2.3	14.965	85	1970

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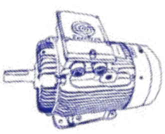

8 Pole - 750 rpm asynchronous speed 50Hz

IE3

Output (kW)	Frame Size	Full lock speed (rpm)	Current Full load I_N, 50Hz 380V (A)	400V (A)	415V (A)	Locked rotor I_L/I_N	Efficiency % at % full load 100	75	50	power factor, cos φ at % full load 100	75	50	Torque Full load T_N (Nm)	Locked rotor T_L/T_N	Break down T_B/T_N	Moment of inertia $J=\frac{1}{4}GD^2$ (kg x m²)	Noise level at 1 meter dB(A)	Net weight (kg)
0.75	100L1	695	2.3	2.2	2.1	4.6	75.0	74.6	69.8	0.67	0.55	0.45	10.3	2.1	2.4	0.011	55	40
1.1	100L2	695	3.2	3.0	2.9	4.6	77.7	77.5	72.5	0.68	0.57	0.46	15.1	2.2	2.4	0.013	56	46
1.5	112M1	700	4.1	3.9	3.7	4.7	79.7	79.5	75.2	0.70	0.60	0.50	20.5	2.2	2.7	0.021	60	60
2.2	132S	705	5.7	5.5	5.3	4.7	81.9	81.8	77.6	0.71	0.60	0.52	29.8	2.1	2.5	0.061	63	70
3	132M1	705	7.7	7.3	7.0	4.6	83.5	83.3	79.5	0.71	0.62	0.54	40.6	2.1	2.6	0.081	64	80
4	160M1	715	10.0	9.5	9.1	4.5	84.8	84.6	80.9	0.72	0.63	0.54	53.4	2.2	2.7	0.092	65	89
5.5	160M2	715	13.3	12.6	12.2	5.5	86.2	86.1	82.5	0.73	0.64	0.54	73.5	2.3	2.7	0.123	68	107
7.5	160L	725	17.4	16.5	15.9	6.2	87.3	87.2	83.8	0.75	0.66	0.55	98.8	2.2	2.6	0.138	68	135
11	180L	730	25.2	23.9	23.0	5.5	88.6	88.5	84.9	0.75	0.66	0.56	143.9	2.2	2.5	0.278	70	179
15	200L	730	33.5	31.8	30.6	5.8	89.6	89.5	86.0	0.76	0.71	0.57	196.2	2.1	2.6	0.403	70	233
18.5	225S	730	41.0	39.0	37.6	6.2	90.1	90.0	86.7	0.76	0.71	0.61	242.0	2.1	2.5	0.598	70	290
22	225M	735	47.9	45.5	43.9	6.2	90.6	90.5	87.8	0.77	0.72	0.62	285.9	2.2	2.5	0.668	73	340
30	250M	735	64.0	60.8	58.6	6.2	91.3	91.2	88.3	0.78	0.73	0.63	389.8	2.3	2.4	1.156	74	413
37	280S	740	77.5	73.6	71.0	6.4	91.8	91.6	88.9	0.79	0.74	0.64	477.5	2.1	2.2	2.206	75	546
45	280M1	740	93.9	89.2	86.0	6.4	92.2	92.0	89.5	0.79	0.74	0.65	580.7	1.9	2.5	2.870	75	610
55	315S	740	111.5	106.0	102.1	6.7	92.5	92.4	90.6	0.81	0.75	0.67	709.8	1.9	2.2	5.867	78	842
75	315M	740	151.1	143.6	138.4	6.7	93.1	93.0	91.5	0.81	0.77	0.69	967.9	2.0	2.4	6.233	78	1042
90	315L1	745	178.5	169.6	163.5	6.7	93.4	93.3	92.0	0.82	0.77	0.69	1153.7	1.8	2.2	6.988	80	1120
110	315L2	745	217.5	206.6	199.2	6.4	93.7	93.5	92.5	0.82	0.78	0.70	1410.1	1.8	2.5	8.152	81	1285
132	355M1	745	260.2	247.2	238.3	6.2	94.0	93.9	92.8	0.82	0.79	0.72	1692.1	1.7	2.3	13.135	82	1703
160	355M2	745	310.6	295.1	284.4	6.2	94.3	94.1	93.0	0.83	0.81	0.73	2051.0	1.6	2.3	14.895	82	1765
200	355L	745	387.0	367.7	354.4	6.3	94.6	94.5	93.5	0.83	0.81	0.74	2563.8	1.6	2.4	16.213	85	1998

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ENERTECH ELECTRIC MOTORS (AUSTALIA)


ENERTECHMOTORS.COM.AU

PERFORMANCE DATA FOR DUAL SPEED MOTORS

ESC Dual-speed motors are a cost-saving solution for applications requiring only two speeds that moreover reduces the risk of failure. Typically, these motors are designed for an operating speed and a slower speed to facilitate startup. ESC Dual speed motors can propel fans, pumps, hoists, and other machines at two different speeds without a frequency inverter.
ESC motors Dual Speed motors series utilize special winding technology to achieve flexible capabilities, reliable operation and professional appearance.

Common Applications:

- Industrial Fans
- Blowers
- Machine Tools
- Hoists
- Conveyors belts
- Pumps
- General 2-speed drive applications

2/4 POLES - 3000/1500 RPM - SINGLE WINDINGS

High speed (kw)	Low speed (kw)	Frame	High speed (rpm)	High speed (A)	Low speed (rpm)	Low speed (A)
0.8	0.16	802	2730	1.9	1375	0.4
1.2	0.24	90S	2825	2.6	1425	0.57
1.7	0.34	90L	2870	3.5	1430	0.8
2.4	0.48	100L	2900	4.9	1450	1.4
3.3	0.66	112M	2925	6.9	1475	2.3
4.4	0.88	132S1	2940	8.7	1465	2.5
6.1	1.2	132S2	2940	11.5	1465	2.9
8.3	1	160M1	2955	15.7	1480	4.0
12	2.4	160M2	2945	21.2	1470	5.2
17	3.4	160L	2940	30.0	1460	7.3
20	4	180M	2930	35.3	1470	8.6
24	4.8	200L1	2935	42.4	1475	10.3
33	6.6	200L2	2940	58.0	1475	14.2
41	8.2	225M	2940	72.0	1475	17.6
50	10	250M	2950	88.0	1480	21.5
61	12	280S	2950	108	1480	25.8
83	17	280M	2955	147	1480	36.5
99	20	315S	2955	175	1480	42.9
121	24	315M	2955	214	1480	52.0
145	29	315L1	2960	256	1485	62.0
176	35	315L2	2960	311	1485	75.0

4/8 POLES - 1500/750 RPM - SINGLE WINDINGS

High speed (kw)	Low speed (kw)	Frame	High speed (rpm)	High speed (A)	Low speed (rpm)	Low speed (A)
0.6	0.12	802	1410	1.7	670	0.57
0.8	0.16	90S	1430	2.0	700	0.7
1.2	0.24	90L	1430	2.9	700	1.0
1.7	0.34	100L1	1435	3.7	715	1.4
2.4	0.48	100L2	1430	5.0	720	1.8
3.3	0.7	112M	1435	6.5	720	2.2
4.4	0.9	132S	1455	8.6	730	2.8
6.1	1.2	132M	1460	11.9	730	4.0
8.3	1.7	160M	1450	15.0	730	4.2
12	2.4	160L	1455	21.2	735	5.7
17	3.4	180M	1475	31.0	740	9.1
20	4	180L	1475	37.0	740	11.3
24	5	200L	1475	41.1	740	11.8
33	6.6	225S	1480	56.5	740	15.3
41	8.2	225M	1480	72.6	740	20.4
50	10	250M	1480	84.8	740	23.5
61	12	280S	1485	105	745	27.3
83	17	280M	1485	143	740	38.7
99	20	315S	1485	170	740	45.5
121	24	315M	1485	208	740	55.0
145	29	315L1	1485	250	740	66.0
176	35	315L2	1485	303	740	80.0

4/6 POLES - 1500/1000 RPM - SEPARATE WINDINGS

High speed (kw)	Low speed (kw)	Frame	High speed (rpm)	High speed (A)	Low speed (rpm)	Low speed (A)
0.55	0.18	802	1410	1.5	945	0.8
0.75	0.25	90S	1420	1.8	950	1.0
1.1	0.36	90L	1420	2.5	950	1.4
1.5	0.5	100L1	1430	3.5	960	1.7
2.2	0.75	100L2	1440	4.7	960	2.3
3	1	112M	1440	6.3	965	3.0
4	1.3	132S	1460	8.2	980	3.7
5.5	1.8	132M	1465	11.0	980	4.7
7.5	2.5	160M	1470	14.2	980	5.8
11	3.5	160L	1470	20.9	980	8.3
15	5	180L	1470	27.2	985	10.5
18.5	6.1	200L1	1475	33.5	985	12.0
22	7.3	200L2	1480	39.5	985	14.5
33	11	225M	1485	59.0	990	20.9
45	15	250M	1485	77.0	990	26.7
55	18	280M	1480	94.0	990	32.2
75	25	315S	1480	128.0	990	44.7
90	30	315M	1480	154.0	990	54.0
110	36	315L1	1480	188.0	990	64.0
132	44	315L2	1480	226.0	990	79.0

6/8 POLES - 1000/750 RPM - SEPARATE WINDINGS

High speed (kw)	Low speed (kw)	Frame	High speed (rpm)	High speed (A)	Low speed (rpm)	Low speed (A)
0.55	0.24	90S	945	1.5	700	0.94
0.75	0.32	90L	945	2.1	710	1.6
1.1	0.47	100L	950	2.7	710	1.6
1.5	0.65	112M	960	3.6	710	1.9
2.2	0.95	132S	975	5.6	730	3.1
3	1.3	132M1	975	7.2	730	4.1
4	1.7	132M2	975	9.3	730	5.1
5.5	2.4	160M	980	11.4	735	6.4
7.5	3.2	160L	980	15.1	735	8.4
11	4.7	180L	985	25.7	735	11.0
13	5.5	200L	985	24.9	735	11.5
15	6.5	225S	985	29.5	735	13.1
21	9	225M	985	38.4	735	17.7
26	11	250M	990	47.0	740	21.3
30	13	280S	990	56.0	740	25.8
37	16	280M	992	73.0	742	31.0
53	23	315S	990	105	740	44.6
65	28	315M	990	128	740	54.0
80	34	315L1	990	158	740	66.0
92	40	315L2	990	182	740	78.0

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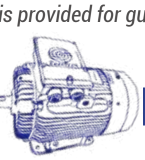
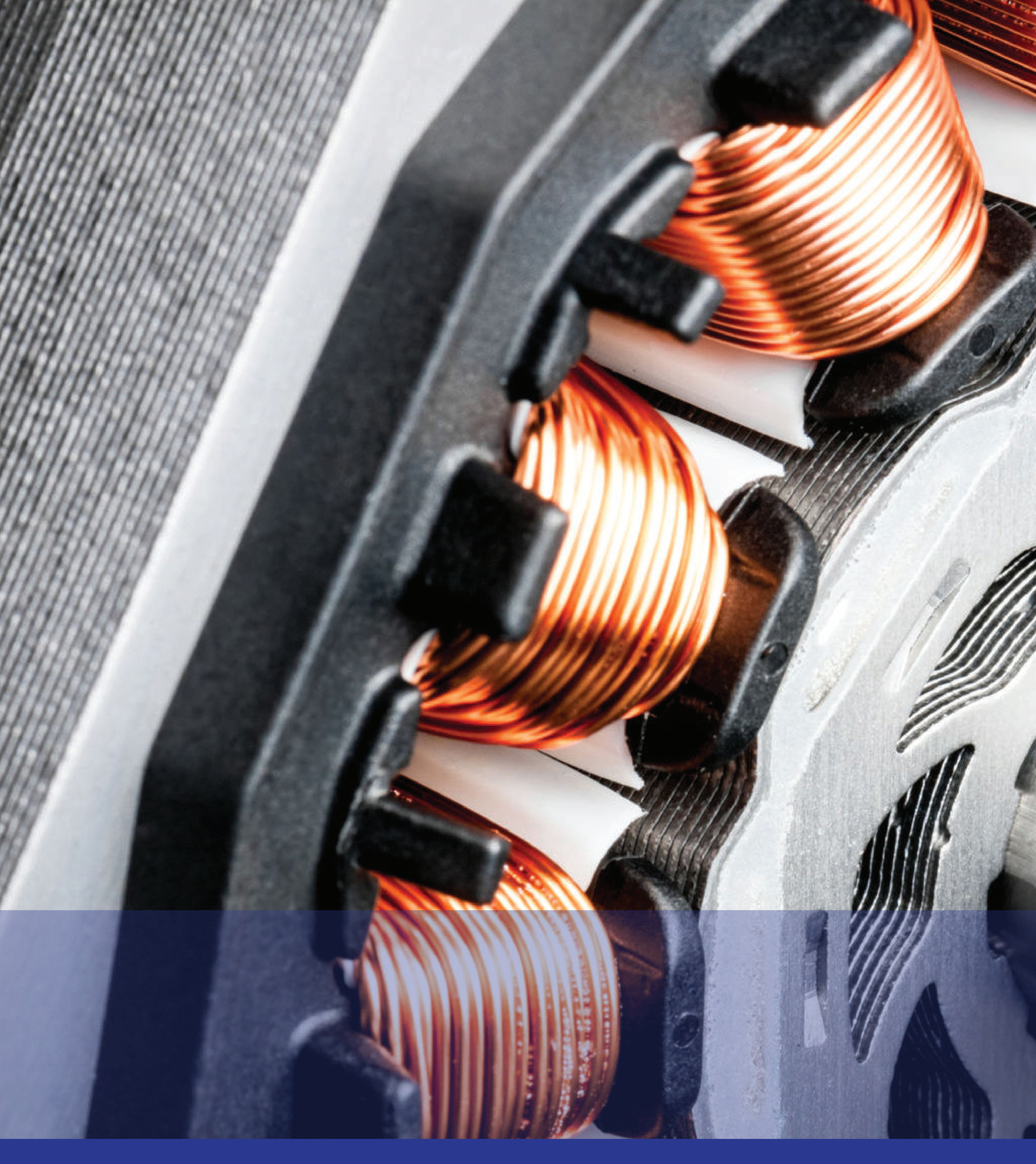


ESC Motor Modification Options

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 200°C or for 30 minutes at 300°C.

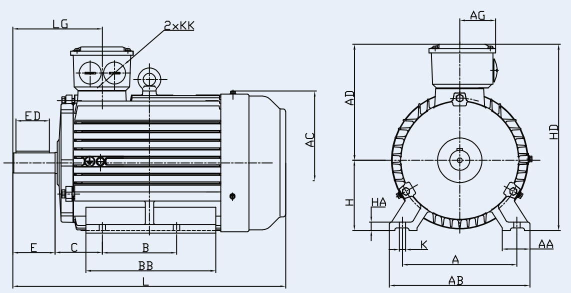


Dimensions IE1-IE2-IE3

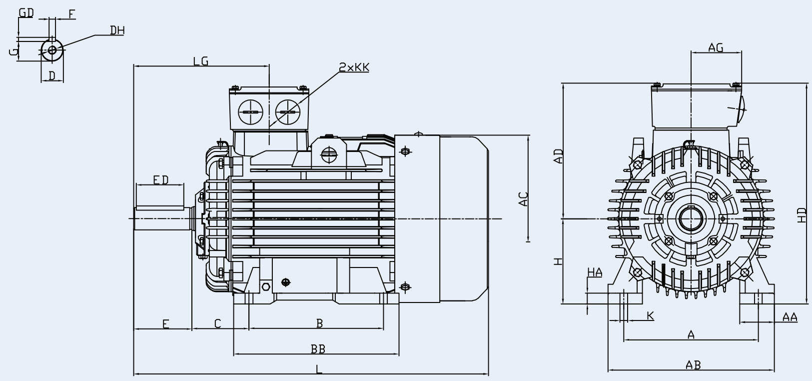
ENERTECH

DIMENSIONS

IMB3

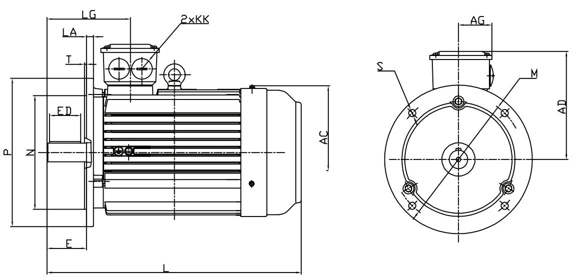


Frame size from 80 to 132

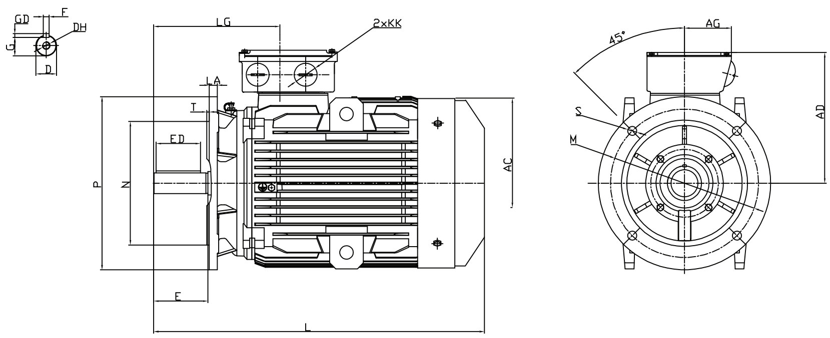


Frame size from 160 to 315

IMB5

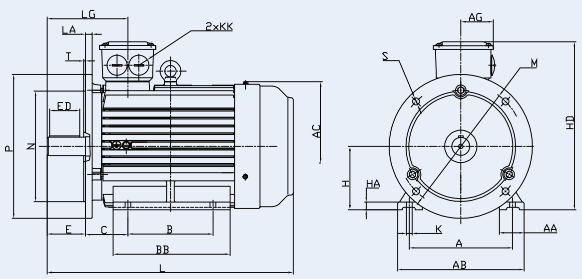


Frame size from 80 to 132

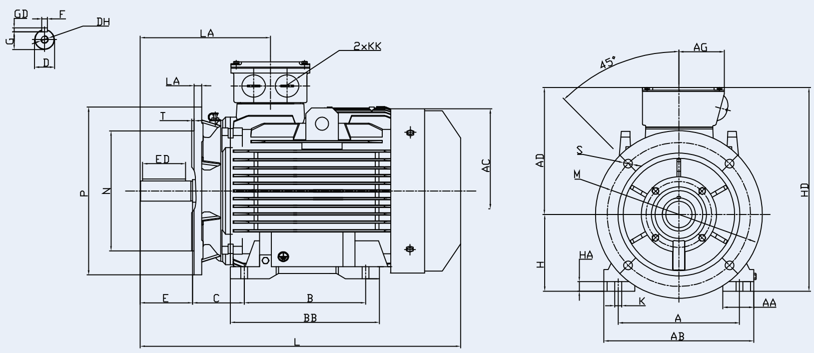


Frame size from 160 to 315

IMB35

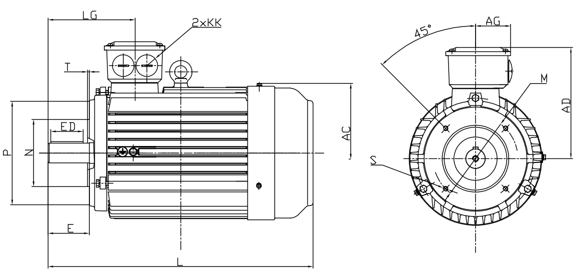


Frame size from 80 to 132

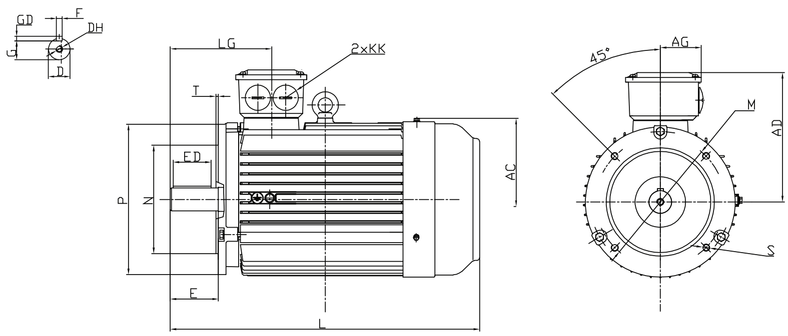


Frame size from 160 to 315

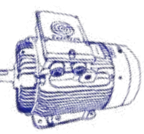
IMB14



Frame size from 80 to 160 B14A



Frame size from 80 to 112 B14B



Frame size	General								Feet									
	B3 B5 B35 B14								B3 B35									
	AC(2)	L(2)	AC	L	AD	AG	KK	LG	A	AB	AA	B	BB	C	H	HA	HD	K
80	175	310	175	295	150	51	M25X1.5	106	125	160	34	100	130	50	80	10	230	10
90S	195	355	190	320	155	60	M25X1.5	124	140	180	36	100	135	56	90	12.5	260	10
90L	195	380	190	345	155	60	M25X1.5	124	140	180	36	125	160	56	90	12.5	260	10
100L	215	440	215	385	170	60	M32X1.5	140	160	200	40	140	182	63	100	14	275	12
112M	220	400	236	415	198	75	M32X1.5	145	190	230	45	140	195	70	112	14	310	12
132S	260	470	275	480	218	75	M32X1.5	169	216	265	52	140	205	89	132	16	350	12
132M	260	510	275	520	218	75	M32X1.5	169	216	265	52	178	245	89	132	16	350	12
160M	314	620	330	625	255	95	M40X1.5	269	254	314	65	210	268	108	160	20	415	14.5
160L	314	665	330	670	255	95	M40X1.5	269	254	314	65	254	312	108	160	20	415	14.5
180M	355	700	380	700	270	95	M40X1.5	274	279	349	70	241	296	121	180	22	450	14.5
180L	355	740	380	740	270	95	M40X1.5	274	279	349	70	279	335	121	180	22	450	14.5
200L	405	790	420	780	310	166	M50X1.5	296	318	380	72	305	366	133	200	23	510	18.5
225S	460	830	470	820	325	166	M50X1.5	329	356	431	75	286	380	149	225	28	550	18.5
225M(1)	460	830	470	820	325	166	M50X1.5	299	356	431	75	311	405	149	225	28	550	18.5
225M	460	860	470	850	325	166	M50X1.5	329	356	431	75	311	405	149	225	28	550	18.5
250M(1)	500	945	510	945	370	185	M63X1.5	355	406	480	110	349	440	168	250	38	620	24
250M	500	945	510	945	370	185	M63X1.5	355	406	480	110	349	440	168	250	38	620	24
280S(1)	560	1020	580	1020	390	185	M63X1.5	359	457	542	130	368	458	190	280	33	670	24
280S	560	1020	580	1020	390	185	M63X1.5	359	457	542	130	368	458	190	280	33	670	24
280M(1)	560	1070	580	1070	390	185	M63X1.5	359	457	542	130	419	509	190	280	33	670	24
280M	560	1070	580	1070	390	185	M63X1.5	359	457	542	130	419	509	190	280	33	670	24
315S(1)	625	1215	645	1200	525	275	M63X1.5	415	508	628	140	406	595	216	315	43	840	28
315M(1)	625	1360	645	1310	525	275	M63X1.5	415	508	628	140	457	645	216	315	43	840	28
315L(1)	625	1330	645	1310	525	275	M63X1.5	415	508	628	140	508	645	216	315	43	840	28
315S	625	1245	645	1230	525	275	M63X1.5	445	508	628	140	406	595	216	315	43	840	28
315M	625	1360	645	1340	525	275	M63X1.5	445	508	628	140	457	645	216	315	43	840	28
315L	625	1360	645	1340	525	275	M63X1.5	445	508	628	140	508	645	216	315	43	840	28
355M(1)	698	1595	720	1650	705	447	M63X1.5	419	610	740	150	560	805	254	355	55	1060	28
355L(1)	698	1595	720	1650	705	447	M63x1.5	419	610	740	150	630	805	254	355	55	1060	28
355M	698	1625	720	1680	705	447	M63X1.5	449	610	740	150	560	805	254	355	55	1060	28
355L	698	1625	720	1680	705	447	M63X1.5	449	610	740	150	630	805	254	355	55	1060	28

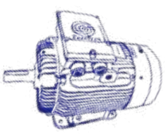
(1) 2 Pole motors only

(2) IE2 and IE3 motors

Frame size	Shaft							Flange dimension														
	B3 B5 B35 B14							B5 B35					B14A					B14B				
	D	DH	E	ED	F	G	GD	M	N	P	S	T	M	N	P	S	T	M	N	P	S	T
80	19	*M6X16	40	25	6	15.5	6	165	130	200	12	3.5	100	80	120	M6	3	130	110	160	M8	3.5
90S	24	*M8X19	50	40	8	20	7	165	130	200	12	3.5	115	95	140	M8	3	130	110	160	M8	3.5
90L	24	*M8X19	50	40	8	20	7	165	130	200	12	3.5	115	95	140	M8	3	130	110	160	M8	3.5
100L	28	*M10X22	60	45	8	24	7	215	180	250	14.5	4	130	110	160	M8	3.5	165	130	200	M10	3.5
112M	28	M10X22	60	45	8	24	7	215	180	250	14.5	4	130	110	160	M8	3.5	165	130	200	M10	3.5
132S	38	M12X28	80	63	10	33	8	265	230	300	14.5	4	165	130	200	M10	3.5	215	180	250	M12	4
132M	38	M12X28	80	63	10	33	8	265	230	300	14.5	4	165	130	200	M10	3.5	215	180	250	M12	4
160M	42	M16X36	110	90	12	37	8	300	250	350	18.5	5	215	180	250	M12	4	265	230	300	M12	4
160L	42	M16X36	110	90	12	37	8	300	250	350	18.5	5	215	180	250	M12	4	265	230	300	M12	4
180M	48	M16X36	110	90	14	42.5	9	300	250	350	18.5	5	-	-	-	-	-	-	-	-	-	-
180L	48	M16X36	110	90	14	42.5	9	300	250	350	18.5	5	-	-	-	-	-	-	-	-	-	-
200L	55	M20X42	110	90	16	49	10	350	300	400	18.5	5	-	-	-	-	-	-	-	-	-	-
225S	60	M20X42	140	110	18	53	10	400	350	450	18.5	5	-	-	-	-	-	-	-	-	-	-
225M (1)	55	M20X42	110	90	16	49	10	400	350	450	18.5	5	-	-	-	-	-	-	-	-	-	-
225M	60	M20X42	140	110	18	53	11	400	350	450	18.5	5	-	-	-	-	-	-	-	-	-	-
250M (1)	60	M20X42	140	110	18	53	11	500	450	550	18.5	5	-	-	-	-	-	-	-	-	-	-
250M	65	M20X42	140	110	18	58	11	500	450	550	18.5	5	-	-	-	-	-	-	-	-	-	-
280S (1)	65	M20X42	140	110	18	58	11	500	450	550	18.5	5	-	-	-	-	-	-	-	-	-	-
280S	75	M20X42	140	110	20	67.5	12	500	450	550	18.5	5	-	-	-	-	-	-	-	-	-	-
280M (1)	65	M20X42	140	110	18	58	11	500	450	550	18.5	5	-	-	-	-	-	-	-	-	-	-
280M	75	M20X42	140	110	20	67.5	12	500	450	550	18.5	5	-	-	-	-	-	-	-	-	-	-
315S (1)	65	M20X42	140	110	18	58	11	600	550	660	24	6	-	-	-	-	-	-	-	-	-	-
315M (1)	65	M20X42	140	110	18	58	11	600	550	660	24	6	-	-	-	-	-	-	-	-	-	-
315L (1)	65	M20X42	140	110	18	58	11	600	550	660	24	6	-	-	-	-	-	-	-	-	-	-
315S	80	M20X42	170	140	22	71	14	650	550	660	24	6	-	-	-	-	-	-	-	-	-	-
315M	80	M20X42	170	140	22	71	14	600	550	660	24	6	-	-	-	-	-	-	-	-	-	-
315L	80	M20X42	170	140	22	71	14	600	550	660	24	6	-	-	-	-	-	-	-	-	-	-
355M (1)	75	M24X50	140	110	20	67.5	12	740	680	800	24	6	-	-	-	-	-	-	-	-	-	-
355L (1)	75	M24X50	140	110	20	67.5	12	740	680	800	24	6	-	-	-	-	-	-	-	-	-	-
355M	95	M24X50	170	140	25	86	14	740	680	800	24	6	-	-	-	-	-	-	-	-	-	-
355L	95	M24X50	170	140	25	86	14	740	680	800	24	6	-	-	-	-	-	-	-	-	-	-

(1) 2 Pole motors only

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



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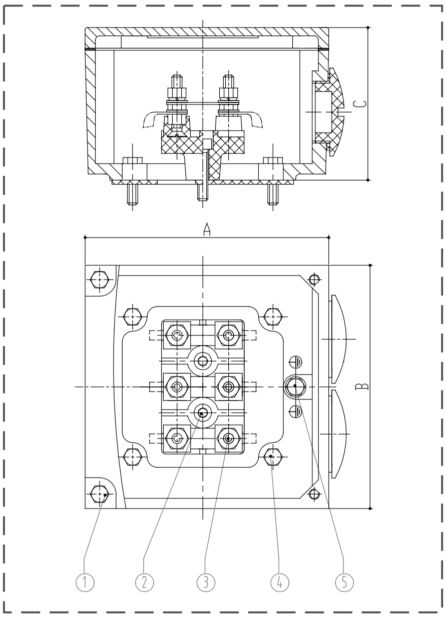
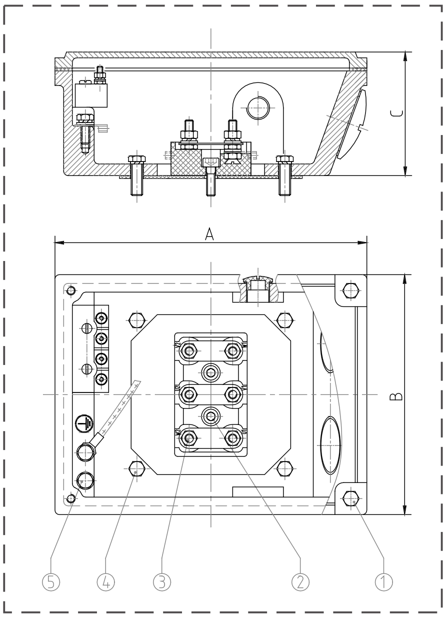
Terminal box

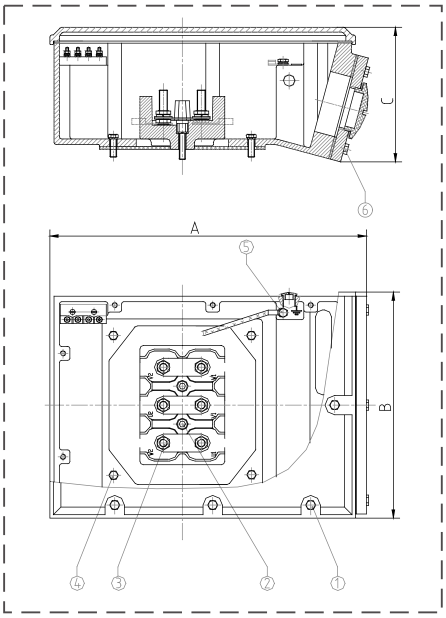
Frame size from 80 to 132



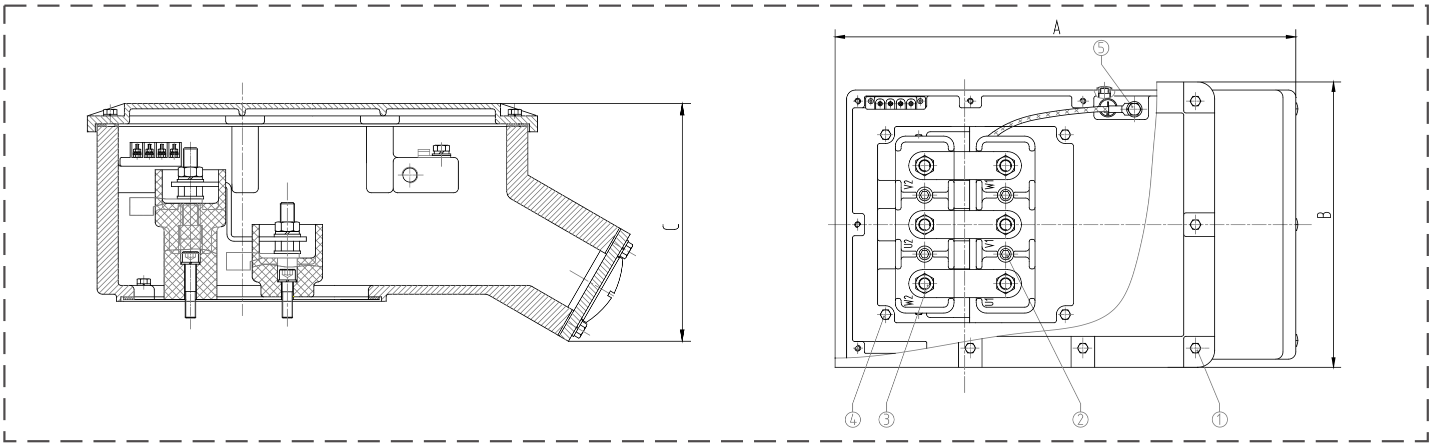
Frame size from 160 to 280



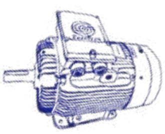
Frame size 315



Frame size 355



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



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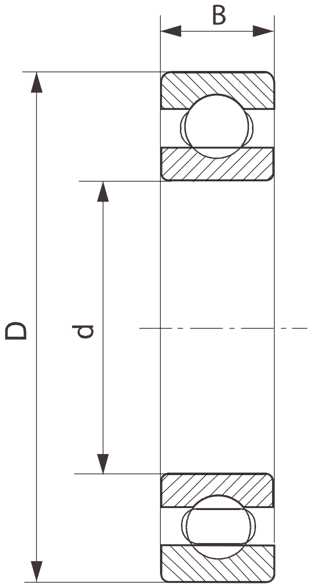
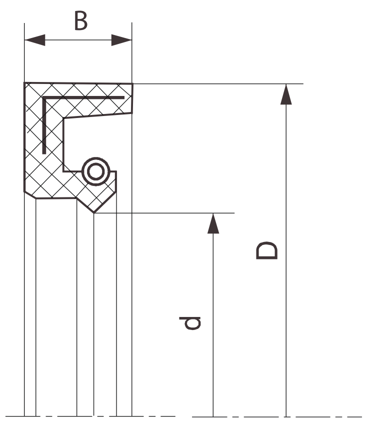
Bearing and oil seal

Bearing data

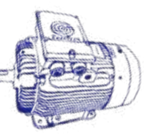


Frame size		DE	NDE	d	D	B
80		6204 ZZ C3	6204 ZZ C3	20	47	14
90		6205 ZZ C3	6205 ZZ C3	25	52	15
100		6206 ZZ C3	6206 ZZ C3	30	62	16
112		6306 ZZ C3	6306 ZZ C3	30	72	19
132		6308 ZZ C3	6308 ZZ C3	40	90	23
160		6309 C3	6309 C3	45	100	25
180		6311 C3	6311 C3	55	120	29
200		6312 C3	6312 C3	60	130	31
225		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



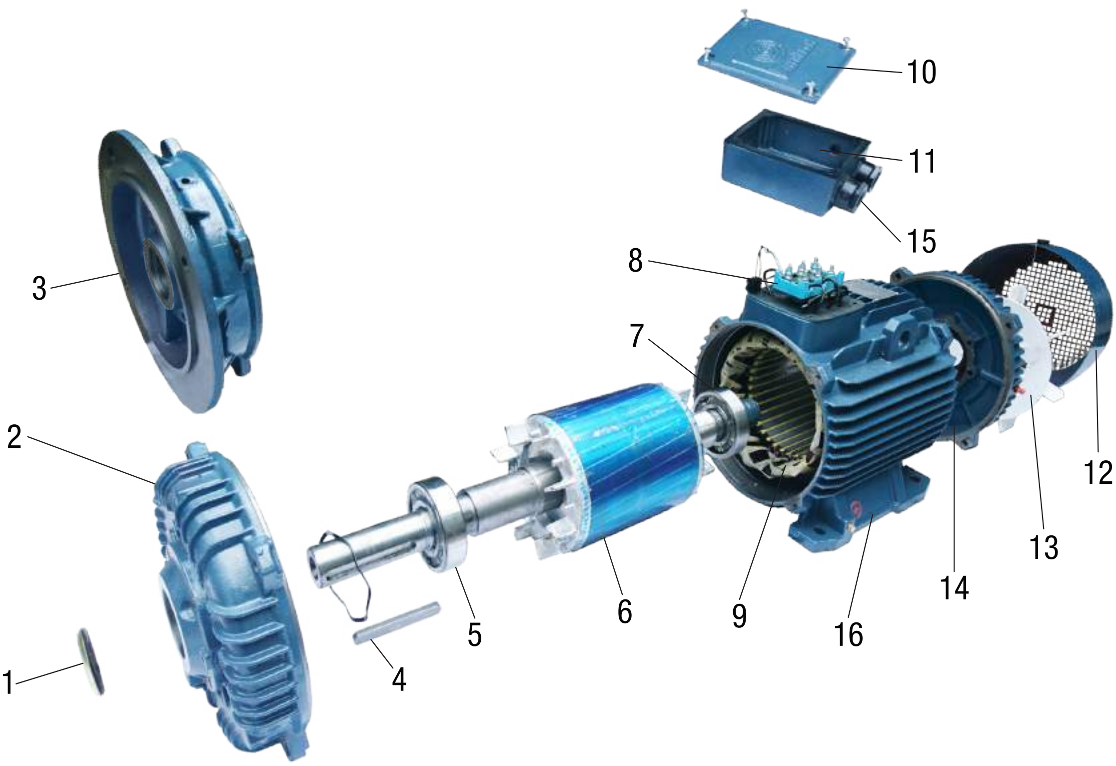
Bearing lubrication

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 and BP Energrease LS2. 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	15
200	6312 C3	6312 C3	3500	8500	13000	20
225	6313 C3	6313 C3	3000	6000	9000	22
250	6314 C3	6314 C3	2000	5000	8000	23
280*	6314 C3	6314 C3	1200	-	-	30
280	6317 C3	6317 C3	-	4000	6000	30
315*	6317 C3	6317 C3	1200	-	-	30
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. Oil seal
2. Front Endshield
3. Flange B5
4. Key
5. Bearing
6. Rotor
7. Bearing N.D.E
8. Terminal Board
9. Stator
10. Terminal Box Lid
11. Terminal Box Base
12. Fan Cowl
13. Fan
14. Rear Endshield
15. Cable gland
16. Feet



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

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 ralate to rotating machinery measured in soft suspension

Balancing

Rotors have been dynamically balance 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.

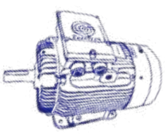
VIBRATION, BALANCING AND NOISE

Vibration severity limit Level

Motor frame size	Maximum RMS vibrition 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

MAINTENANCE SCHEDULE FOR MOTORS

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



OUR
PRODUCTS

EDITION 23.01

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V.23.01

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