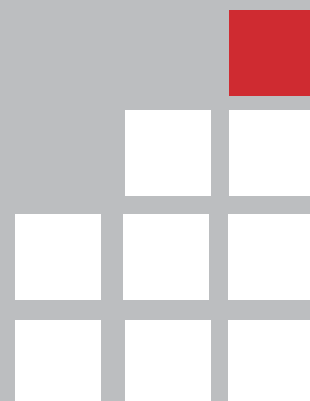


IE1

ESC Three Phase IEC Low Voltage

Three phase asynchronous

ESC Series Motors Enhanced performance cast iron units



General specification

Introduction

ESC motors are suitable for driving various kinds of machines or equipments. The output ratings are from 0.18kW to 355kW. The frame sizes are from 80 to 355.

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 sizes 63 to 160 with aluminium stator frames, terminal boxes and cast iron endshields are also available.



Specification

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 voltages are 380V/50Hz or 425V/50Hz, but can be wound 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/Delt started. Motors 4kW and above can be started with Star/Delt 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 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.

Standards and regulations

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

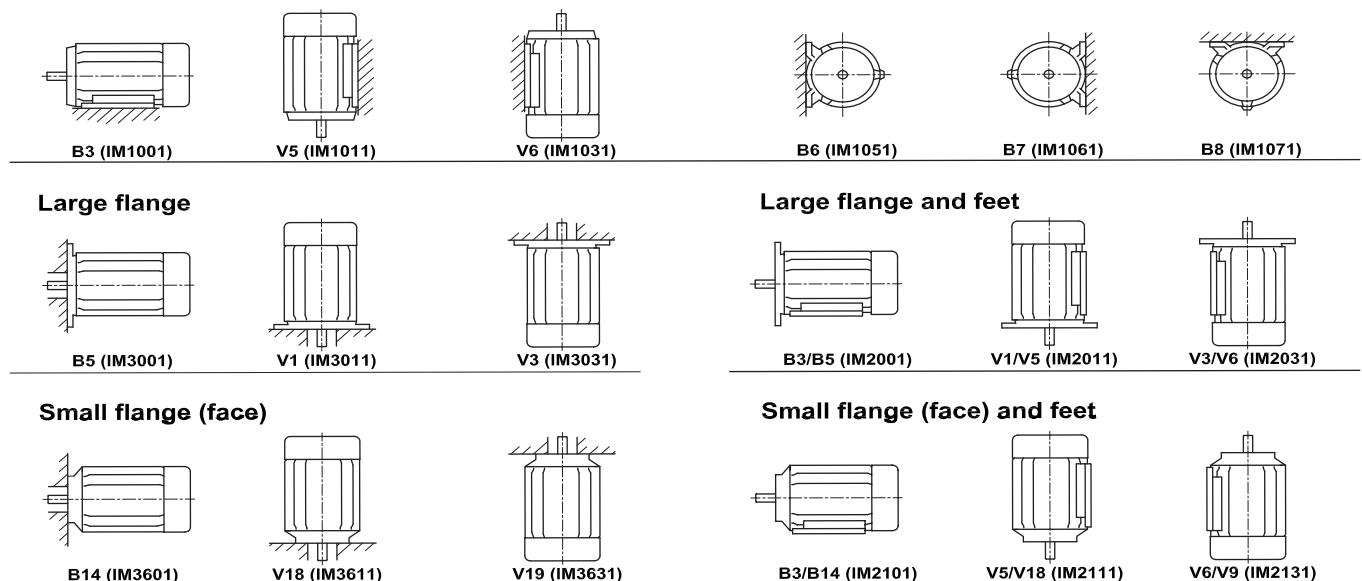
1. International Electrotechnical commission - IEC 60034 and IEC 60072.
2. British Standards - BS5000 and BS 4999.
3. Australian Standards - AS 1359.
4. The requirements of European EC marking. Low voltage Directive 73/23 (1973), modified by Directive 93/68 (1993) and the EMC - Directive 89/336. These 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 included in this catalogue comply with IE1 efficiency (class EFF2)* 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. Motors comply with IE2 efficiency (class EFF1) are available on request.

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		

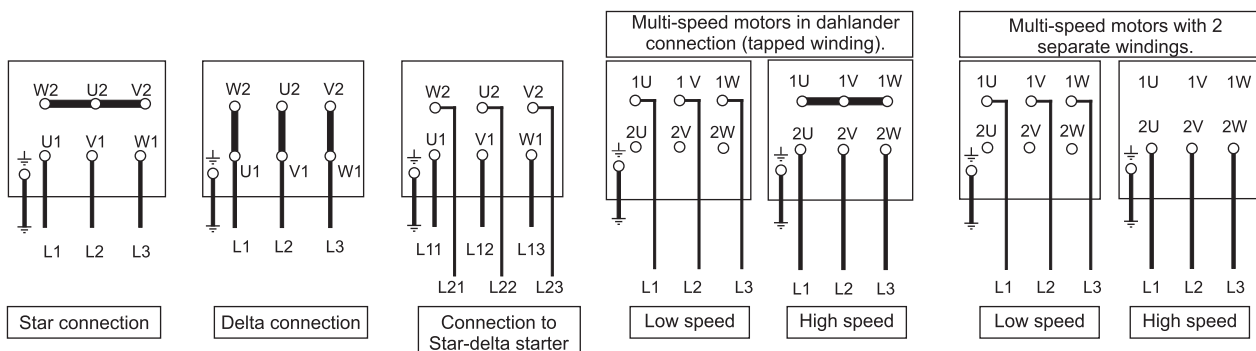
* The ESC motor range corresponds to the new international standard IEC 00034-30

Standards and regulations

Foot mounting



Connection diagrams three phase motors with cage rotor



Rating plates

Frame size from 315 to 355			
ENERTECH ELECTRIC MOTORS (AUSTRALIA)		IE1	
3 PHASE ASYNCHRONOUS MOTOR			
TYPE	SERIAL NUMBER		
VOLTS		DUTY	
CONN.		INS.CL. IP	
Hz		WEIGHT KG	
kW		AMB.TEMP °C	
RPM		BEARING	
AMP		DE	
Cosφ		NDE	
EFF.%			
CE PRODUCT CODE:			

Frame size from 180 to 280			
ENERTECH ELECTRIC MOTORS(AUSTRALIA)		CE	
3 PHASE ASYNCHRONOUS MOTOR		IE1	
TYPE	SERIAL NUMBER		
VOLTS	CONN.	Hz	kW
RPM	AMP	Cosφ	EFF.%
BEARING DE		NDE	DUTY
AMB.TEMP °C	IP	INS.CL.	WEIGHT KG
PRODUCT CODE:			

Frame size from 80 to 160			
ENERTECH ELECTRIC MOTORS(AUSTRALIA)		CE	
3 PHASE ASYNCHRONOUS MOTOR		IE1	
TYPE	SERIAL NUMBER		
INS.CL.	IP	PRODUCT CODE:	
AMB.TEMP °C	DUTY		
BEARING DE	NDE	WEIGHT	KG
VOLTS	CONN.	Hz	kW
RPM	AMP	Cosφ	EFF.%

General specification

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 terminal box is IP55, with IP56, IP65 and IP66 available on request. Enclosure designations comply with IEC 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 7044. 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, 380V, 50Hz

Ambient cooling air temperature, 40°C

Altitude - 1000m Duty cycle S1 (continuous)

Rotatio - Clockwise viewed from drive end

Connection - 230 volt Delta/380 volt Star (3kW and below)

- 380 volt Delta/660 volt Star (4kW and above)

Voltage and frequency

Standard ESC motors are designed for a power supply of three phase 380V, 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 .

General specification

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 _N	I _L	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
	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
	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
	600V 60Hz	115	120	100	100	96	95	98

* Not applicable for motors with F class temperature rise.

* Note: This table is not applicable for hazardous area motors

- 1) 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 380V motors except for the currents which are calculated with the accompanying formula:

Where:

$$I_x = \frac{380 \times I_N}{U_x}$$

I_x = Current

I_N = Full load current at 380 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

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

Example 1

Effective Power required = 15kW

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 18.5kW.

Example 2

Rated power = 11kW

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 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 3).

General specification

Duty

ESC motors are supplied suitable for S1 operation (continuous operation under rated load). When the motor is operate 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 load on the motor shaft.
- Type of braking (eg mechanical, electrical through phase reversal or DC injection).

Symbol	Design data	
	Type	Preferred value
S1	Operating time	Continuous
S2	Operating time	0.5; 1; 3; 5; 10; 30; 60; 90 mins
S3	Period of one cycle	10 mins
S4	Switching rate	60, 90, 120, 240, 600 c/h
S5	Relative on period	15%; 25%; 40%, 60%
S6	moment of inertia factor F1	1.2; 1.6; 2.5; 4
S7		
S8		

Permissible output

Apply the factors in the accompanying table to the output rating for motors with duty cycles that are not continuous. For other duties (S4, S5, S6 and S7) contact us for appropriate duty cycle factors.

		Duty cycle factor		
		For frames 80 to 132	For frames 160 to 250	For frames 280 to 355
Poles				
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

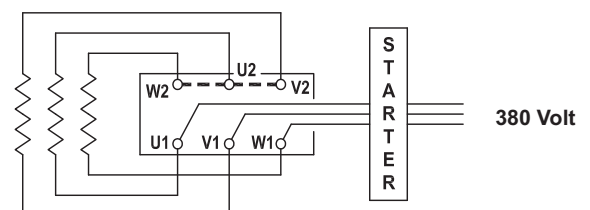
Connection

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

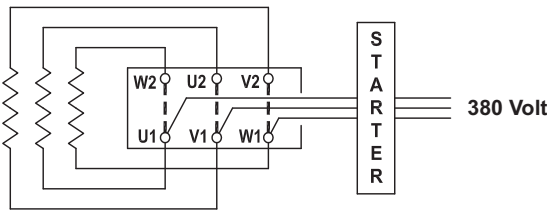
Standard terminal connections for motors 3kW and below is 220V delta / 380V star. These motors are designed for 380V Direct On Line (D.O.L.) starting, when connected in the star configuration. They are also suitable for operation with 220V three phase variable frequency drives. when connected in the delta configuration. Standard terminal connections for motors 4kW and above is 380V delta / 660V star. These motors are designed for 380V Direct On Line (D.O.L.) starting, when connected in the delta configuration. They are also suitable for operation with 380V three phase variable frequency drives. Alternatively they can be operated D.O.L. in the star configuration from a 660V supply or with a 660V 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 380V tar-delta starting as described below. Motor connected for D.O.L. starting with bridges in place for star connection (3kW and below)



General specification

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.

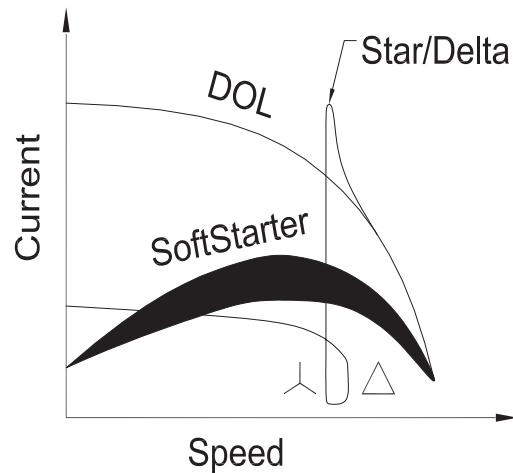
D.O.L Starters

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

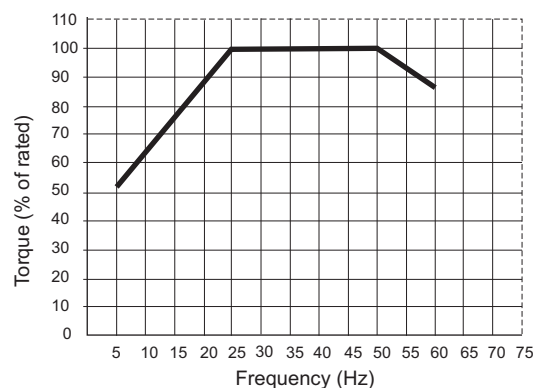
The ESC motors 4kW and above are suitable for the star-delta starting method. Through the use of a star-delta starter, the motor terminals are connected in the star configuration during starting, and reconnected to the delta configuration when running.

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 changeover 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 full 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 bearings. 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.

General specification

Insulation

The insulation system is Class F (150K) and the motors are designed to operate with Class B (80K).

This ensures long life and reliability with the ability to withstand ambient temperatures as high as 54°C or up to 15% overload in adverse electrical supply situations.

Non-Standard ESC will provide a safety margin of 45K and can be safely operated at elevated ambient temperatures. Due to their conservative design many sizes in the ESC range of motors have temperature rises considerably less than 80K and therefore provide even greater safety margins.

	Insulation class		
	B	F	H
Max. permissible winding temp. (°C)	130	155	180
Less ambient temp. (°C)	-40	-40	-40
Less hotspot allowance (K)	-10	-10	-15
Equals max. permissible temp. rise (K)	80	150	125
Less max. design temp. rise (K)	-80	-80	-80
Equals min. safety margin (K)	-	25	45

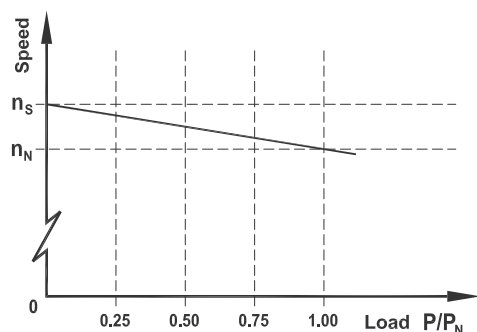
Thermal protection

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 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 160°C (180°C for EHC series). 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:

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

Where:

I_x = partial load current (amps)

P_{out_x} = partial load (kW)

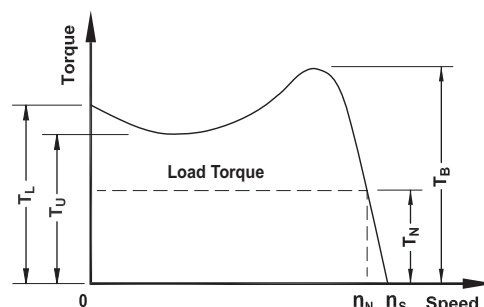
U_N = rated voltage

$\cos\phi_x$ = 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:

$$T_N = \frac{9950 \times P_N}{n_N}$$

Where:

T_N = full load torque (Nm)

P_N = full load output power (kW)

n_N = full load speed (r/min)

Performance data

2 Pole - 3000 rpm asynchronous speed 50Hz

Output (kW)	Frame Size	Full lock speed (rpm)	Current			Locked rotor I _L /I _N	Efficiency %			power factor, cos φ			Torque				Moment of inertia J=1/4 GD ² (kgxm ²)	Nosie level at 1 meter dB(A)	Net weight (kg)
			Full load I _N , 50Hz				at % full load			at % full load			Full load T _N (Nm)	Locked rotor T _L /T _N	Pull up T _U /T _N	Break down T _B /T _N			
			380V (A)	400V (A)	415V (A)		100	75	50	100	75	50							
3000r/min = 2 poles																			
0.75	80M1	2840	1.80	1.70	1.67	5.5	75.5	74.8	72.3	0.83	0.79	0.66	2.5	2.3	1.9	2.6	0.0008	67	13
1.1	80M2	2840	2.60	2.50	2.40	5.6	76.1	75.8	73.1	0.84	0.81	0.68	3.7	2.3	2.0	2.6	0.0009	67	15
1.5	90S	2850	3.40	3.20	3.10	6.1	79.5	78.8	76.7	0.85	0.81	0.70	5.0	2.5	2.1	2.9	0.0012	72	20
2.2	90L	2850	4.80	4.60	4.40	6.1	81.7	80.3	78.6	0.85	0.81	0.71	7.4	2.7	2.3	2.9	0.0014	72	23
3	100L	2880	6.30	6.00	5.80	6.5	83.1	82.6	81.3	0.87	0.83	0.73	10.0	2.7	2.5	2.9	0.0039	76	30
4	112M1	2880	8.30	7.90	7.60	6.5	83.5	84.1	83.3	0.88	0.84	0.78	13.3	2.6	2.2	2.9	0.0055	77	40
5.5	132S1	2900	11.1	10.5	10.2	6.9	85.9	85.7	84.4	0.88	0.85	0.78	18.1	2.3	2.0	2.6	0.0109	80	54
7.5	132S2	2900	14.9	14.2	13.5	6.9	87.2	86.9	84.7	0.88	0.84	0.79	24.5	2.5	2.3	2.8	0.013	80	60
11	160M1	2930	21.1	20.1	19.4	6.7	88.7	87.2	86.1	0.89	0.85	0.81	35.8	2.6	2.2	2.9	0.038	86	99
15	160M2	2930	28.6	27.2	26.2	6.7	89.5	89.5	88.6	0.89	0.80	0.83	48.8	2.6	2.1	2.9	0.045	86	110
18.5	160L	2930	34.6	32.9	31.8	6.8	90.2	89.3	88.4	0.90	0.87	0.82	60.4	2.5	2.0	2.8	0.055	89	127
22	180M	2940	41.0	38.9	37.6	6.6	90.6	90.1	88.1	0.90	0.87	0.82	71.4	2.6	1.8	2.8	0.076	89	167
30	200L1	2950	55.4	52.6	50.7	6.5	91.5	90.1	87.0	0.90	0.89	0.84	97.2	2.5	2.1	2.7	0.124	92	220
37	200L2	2950	67.9	64.5	62.2	6.5	92.0	91.6	89.4	0.90	0.87	0.83	119.8	2.4	1.9	2.6	0.139	92	242
45	225M	2970	82.1	78.0	75.3	6.8	92.5	90.9	88.4	0.90	0.89	0.85	145	2.4	2.2	2.6	0.233	92	281
55	250M1	2970	99.6	94.6	91.3	6.8	93.2	92.9	90.1	0.90	0.90	0.81	177	2.5	2.0	2.8	0.312	93	373
75	280S	2970	134.8	128.1	123.5	6.7	93.9	93.2	91.2	0.90	0.87	0.82	241	2.4	1.9	2.7	0.597	94	477
90	280M1	2970	159.5	151.5	146.1	6.7	94.2	93.9	92.5	0.91	0.89	0.86	290	2.4	2.2	2.7	0.675	94	516
110	315S	2980	194.6	184.9	178.2	6.6	94.4	93.7	92.3	0.91	0.88	0.83	353	2.0	1.7	2.5	1.18	96	792
132	315M	2980	233	221.4	213.4	6.6	94.6	94.4	93.0	0.91	0.89	0.86	423	2.1	1.9	2.5	1.55	96	828
160	315L1	2980	282.1	270	258.4	6.7	94.7	94.2	93.0	0.91	0.90	0.87	513	1.9	1.7	2.4	1.76	99	932
200	315L2	2980	347.7	330.1	318.4	6.7	95.0	94.5	93.6	0.92	0.91	0.89	641	1.9	1.7	2.4	2.02	99	1044
220	355M1	2980	379	361	349	5.42	95.5	95	94.1	0.92	0.91	0.89	705	1.48	1.31	2.34	3.21	103	1490
250	355M2	2980	429	408	393	5.74	95.6	94.9	93.0	0.92	0.91	0.88	802	1.65	1.40	2.44	3.56	103	1638
280	355L1	2980	478	457	437	6.69	95.6	94.9	93.0	0.92	0.91	0.88	897	2.01	1.6	2.76	3.91	103	1798
315	355L2	2980	537	510	491	5.46	95.7	95.1	94.0	0.93	0.93	0.90	1010	1.61	1.5	2.29	4.1	103	1834

High Output Design*

5.5	112M2	2880	11.1	10.5	10.2	7.7	85.7	85.4	84.6	0.88	0.87	0.81	13.3	2.7	2.4	3.2	0.007	78	42
11	132M	2910	21.4	20.4	19.7	6.2	88.4	88.0	83.8	0.88	0.87	0.79	36.2	2.2	2.1	2.4	0.028	83	72
75	250M2	2970	135.1	128.4	123.8	6.5	93.7	93.4	51.9	0.90	0.88	0.83	241	2.3	2.0	3.2	0.412	94	440
110	280M2	2980	194.7	185	178.3	6.5	94.3	93.9	92.9	0.91	0.92	0.90	354	2	1.8	2.5	0.86	96	546

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

Performance data

4 Pole - 1500 rpm asynchronous speed 50Hz

Output (kW)	Frame Size	Full lock speed (rpm)	Current			Locked rotor I _L /I _N	Efficiency %			power factor, cos φ			Torque				Moment of inertia J=1/4 GD ² (kgxm ³)	Nosie level at 1 meter dB(A)	Net weight (kg)
			Full load I _N , 50Hz				at % full load			at % full load			Full load T _N (Nm)	Locked rotor T _L /T _N	Pull up T _U /T _N	Break down T _B /T _N			
			380V (A)	400V (A)	415V (A)		100	75	50	100	75	50							
1500r/min = 4 poles																			
0.55	80M1	1390	1.60	1.50	1.40	5.5	71.4	70.9	68.9	0.75	0.67	0.55	3.8	2.2	2.0	2.4	0.002	58	13
0.75	80M2	1390	2.10	2.00	1.90	5.6	73.5	73.2	71.4	0.76	0.66	0.55	5.2	2.2	1.9	2.4	0.002	58	15
1.1	90S	1400	2.90	2.80	2.70	5.4	76.2	75.9	74.6	0.77	0.66	0.52	7.5	2.2	2.0	2.5	0.002	61	20
1.5	90L	1400	3.80	3.60	3.50	5.2	78.7	78.3	76.6	0.78	0.70	0.58	10.2	2.4	2.1	2.6	0.003	61	24
2.2	100L1	1420	5.10	4.80	4.70	6.0	81.0	80.7	79.6	0.81	0.71	0.58	14.8	2.3	2.0	2.6	0.007	64	29
3	100L2	1420	6.80	6.50	6.20	6.1	82.7	82.3	80.9	0.82	0.76	0.64	20.2	2.3	2.1	2.7	0.007	64	32
4	112M	1440	8.80	8.40	8.10	6.5	84.5	84.0	81.9	0.82	0.75	0.66	26.5	2.3	1.9	2.8	0.0095	65	42
5.5	132S	1440	11.7	11.1	10.7	6.8	85.7	85.2	83.9	0.83	0.77	0.68	36.5	2.3	2.0	2.9	0.0214	71	57
7.5	132M1	1440	15.6	14.8	14.3	6.5	87.1	86.5	84.5	0.84	0.79	0.70	49.8	2.4	2.1	3.0	0.0296	71	69
11	160M	1460	22.5	21.4	20.6	6.9	88.6	87.6	86.5	0.84	0.82	0.76	72.0	2.3	1.9	2.9	0.0075	75	107
15	160L	1460	30.3	28.8	27.7	6.8	89.5	88.5	87.2	0.85	0.82	0.75	98.2	2.3	2.1	2.9	0.0092	75	129
18.5	180M	1470	36.2	34.4	33.1	6.4	90.2	89.6	88.1	0.86	0.82	0.72	120.2	2.3	2.0	2.9	0.139	76	162
22	180L	1470	42.9	40.8	39.3	6.9	90.7	90.2	88.0	0.86	0.83	0.74	143	2.3	1.9	2.9	0.158	76	172
30	200L	1470	57.5	54.6	52.7	6.8	92.1	91.5	88.8	0.86	0.83	0.78	195	2.4	1.8	2.9	0.262	79	224
37	225S	1480	69.7	66.2	63.8	6.5	92.7	92.1	90.3	0.87	0.85	0.76	238.9	2.2	1.6	2.7	0.406	81	277
45	225M	1480	84.5	80.3	77.4	6.3	93.0	92.4	90.3	0.87	0.84	0.78	290.5	2.3	1.8	2.5	0.469	81	302
55	250M1	1480	103	97.9	94.3	6.4	93.3	92.6	90.4	0.87	0.84	0.78	355.1	2.2	1.9	2.5	0.66	83	383
75	280S	1480	138.1	131.2	126.5	6.8	93.8	93.3	91.6	0.88	0.87	0.83	483.9	2.1	1.8	2.8	1.12	86	527
90	280M1	1480	165	156.8	151.1	6.9	94.1	93.8	91.6	0.88	0.87	0.81	580.7	2.2	1.7	2.7	1.46	86	548
110	315S	1480	200.5	190.5	183.6	6.5	94.7	93.9	91.9	0.88	0.88	0.86	709.8	1.9	1.8	2.7	3.11	93	850
132	315M	1480	240	228	219.8	6.8	95.0	94.3	93.0	0.88	0.88	0.83	851.8	2.3	1.7	3.2	3.29	90	918
160	315L1	1480	287	272.7	262.8	6.6	95.2	94.4	93.3	0.89	0.86	0.81	1032	2.6	1.6	3.0	3.79	97	1018
200	315L2	1480	358	340.1	327.8	6.4	95.4	94.6	93.6	0.89	0.87	0.78	1290	2.2	1.8	2.8	4.49	97	1122
220	355M1	1490	388	372	356	6.18	95.6	94.8	93.8	0.90	0.86	0.79	1410	1.94	1.7	2.41	5.28	101	1592
250	355M2	1490	440	420	403	6.05	95.6	94.8	93.3	0.90	0.89	0.87	1603	1.93	1.8	2.33	5.67	101	1650
280	355L1	1490	492	471	450	6.17	95.7	95.6	94.4	0.90	0.87	0.85	1795	2.01	1.6	2.35	6.17	101	1758
315	355L2	1490	554	521	506	6.44	95.7	95.6	94.4	0.90	0.87	0.85	2020	2.17	1.6	2.42	6.66	101	1804
355	355L3	1490	620	592	567	6.21	95.8	95.7	94.6	0.91	0.88	0.86	2275	2.1	1.8	2.32	7.9	101	2083
High Output Design*																			
11	132M2	1440	22.6	21.5	20.7	6.8	88.4	87.9	86.5	0.84	0.79	0.71	73	2.2	1.8	2.7	0.057	75	75
75	250M2	1480	138.4	131.5	126.7	6.2	93.6	93.4	91.4	0.88	0.87	0.82	483.9	2.3	1.9	2.6	0.88	86	427
110	280M2	1480	201	191	184	6.5	94.5	94.0	91.9	0.89	0.87	0.82	709.8	2.1	1.8	2.3	2.68	93	830

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

Performance data

6 Pole - 1000 rpm asynchronous speed 50Hz

Output (kW)	Frame Size	Full lock speed (rpm)	Current			Locked rotor I _L /I _N	Efficiency %			power factor, cos φ			Torque				Moment of inertia J=1/4 GD ² (kgxm ²)	Nosie level at 1 meter dB(A)	Net weight (kg)
			Full load I _N , 50Hz				at % full load			at % full load			Full load T _N (Nm)	Locked rotor T _L /T _N	Pull up T _U /T _N	Break down T _B /T _N			
			380V (A)	400V (A)	415V (A)		100	75	50	100	75	50							
1000 r/min = 6 poles																			
0.37	80M1	890	1.30	1.20	1.20	4.4	62.5	61.4	55.2	0.70	0.63	0.50	4.0	1.9	1.7	2.3	0.002	54	15
0.55	80M2	890	1.80	1.70	1.60	4.5	65.0	64.7	63.0	0.72	0.62	0.53	5.9	2.1	1.8	2.4	0.003	54	16
0.75	90S	910	2.3	2.20	2.10	4.1	69.1	68.7	65.6	0.72	0.65	0.56	7.9	2.3	1.8	2.7	0.003	57	21
1.1	90L	910	3.20	3.00	2.90	4.6	72.0	71.6	69.5	0.73	0.66	0.52	11.5	2.3	1.7	2.7	0.004	57	23
1.5	100L	920	4.10	3.90	3.80	5.0	76.0	76.6	73.1	0.75	0.67	0.56	15.6	2.4	1.9	2.8	0.007	61	29
2.2	112M	940	5.60	5.30	5.10	5.2	79.1	78.6	76.5	0.76	0.73	0.59	22.4	2.1	1.8	2.5	0.014	65	37
3	132S	960	7.20	7.00	6.80	5.6	81.3	80.8	77.8	0.76	0.67	0.54	29.9	1.9	1.6	2.5	0.029	69	52
4	132M1	960	9.70	9.20	8.90	6.2	82.3	81.9	79.5	0.76	0.67	0.56	39.8	2.1	1.9	2.7	0.036	69	59
5.5	132M2	960	12.8	12.2	11.7	6.5	84.7	84.3	82.0	0.77	0.68	0.55	54.7	2.3	1.7	2.8	0.045	69	72
7.5	160M	970	17.1	16.2	15.7	5.6	86.6	86.1	83.6	0.77	0.74	0.68	73.9	2.0	1.8	2.6	0.088	73	98
11	160L	970	24.5	23.3	22.4	5.8	87.6	87.1	85.2	0.78	0.76	0.67	108	2.1	1.7	2.4	0.116	73	121
15	180L	970	31.6	30.0	28.9	5.7	89.0	88.4	86.3	0.81	0.77	0.63	148	2.0	1.6	2.4	0.207	73	164
18.5	200L1	970	38.5	36.6	35.3	6.7	90.2	90.0	87.4	0.81	0.78	0.69	182	2.2	1.8	2.8	0.315	76	208
22	200L2	970	44.7	42.5	40.9	6.6	90.2	89.8	87.6	0.83	0.80	0.71	217	2.3	1.7	2.9	0.36	76	217
30	225M	980	59.3	56.3	54.3	6.8	91.5	91.0	88.1	0.84	0.82	0.76	293	2.2	1.6	2.7	0.547	76	287
37	250M	980	70.1	66.6	64.2	6.2	92.2	91.9	89.3	0.86	0.81	0.75	361	2.0	1.9	2.5	0.834	78	355
45	280S	980	86.0	81.7	78.7	6.1	92.5	92.2	89.4	0.86	0.83	0.76	438	1.9	1.6	2.5	1.39	80	456
55	280M1	985	105	99.8	96.1	6.7	92.9	92.5	90.4	0.86	0.86	0.81	536	2.1	1.8	2.7	1.65	80	502
75	315S	990	142	134.9	130	6.5	94.4	93.6	91.7	0.86	0.84	0.80	724	2.0	1.8	2.7	4.11	85	786
90	315M	990	170	161.5	155.7	6.2	93.9	93.5	91.6	0.86	0.84	0.77	869	2.0	1.7	2.6	4.28	85	884
110	315L1	990	206	195.7	188.6	6.0	94.5	94.2	92.3	0.86	0.85	0.82	1062	1.9	1.4	2.7	5.45	85	964
132	315L2	990	244	231.8	223.4	5.8	94.6	94.3	92.3	0.87	0.87	0.81	1274	2.0	1.5	2.7	6.12	85	1060
160	355M1	990	291	275	267	7.13	95.4	95.0	93.1	0.87	0.87	0.83	1544	2.28	1.4	2.95	8.85	92	1554
185	355M2	990	335	317	306	6.94	95.4	95.0	93.1	0.88	0.88	0.84	1785	2.24	1.4	2.84	9.13	92	1620
200	355M3	990	361	342	330	7.09	95.5	96.2	94.1	0.88	0.85	0.81	1930	2.3	1.6	2.89	9.55	92	1768
220	355L1	990	395	376	365	5.90	95.5	95.0	92.8	0.88	0.85	0.81	2122	1.84	1.6	2.73	10.05	92	1796
250	355L2	990	448	425	409	6.59	95.6	95.1	92.9	0.89	0.86	0.82	2413	2.16	1.6	2.64	10.3	92	1902
280	355L3	990	501	477	460	6.32	95.6	95.1	92.9	0.89	0.86	0.82	2701	2.08	1.6	2.52	10.8	92	1962
High Output Design*																			
75	280M2	990	140	133	128.2	5.8	93.6	93.0	91.6	0.87	0.83	0.77	727	2.1	1.7	2.3	3.21	82	630

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

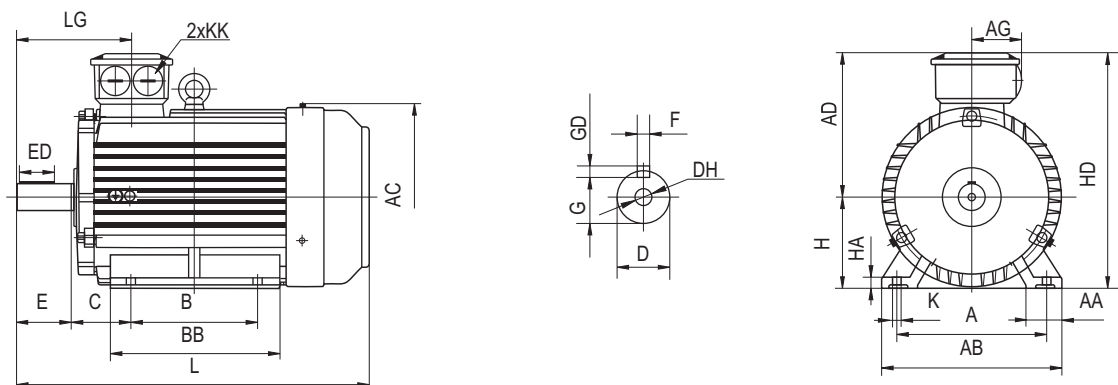
Performance data

8 Pole - 750 rpm asynchronous speed 50Hz

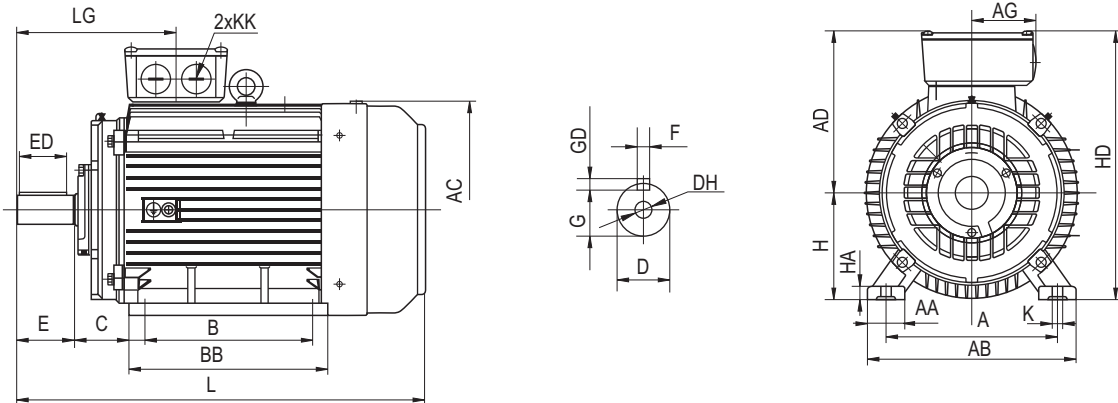
Output (kW)	Frame Size	Full lock speed (rpm)	Current			Locked rotor I _L /I _N	Efficiency %			power factor, cos φ			Torque				Moment of inertia J=1/4 GD ² (kgxm ²)	Nosie level at 1 meter dB(A)	Net weight (kg)
			Full load I _N , 50Hz				at % full load			at % full load			Full load T _N (Nm)	Locked rotor T _L /T _N	Pull up T _U /T _N	Break down T _B /T _N			
			380V (A)	400V (A)	415V (A)		100	75	50	100	75	50							
750 r/min = 8 poles																			
0.18	80M1	630	0.88	0.84	0.81	2.9	51.2	46.5	38.9	0.61	0.56	0.47	2.8	2.0	1.7	2.2	0.002	52	15
0.25	80M2	640	1.15	1.09	1.05	3.0	54.2	49.2	39.3	0.61	0.55	0.47	3.7	2.1	1.7	2.4	0.003	52	17
0.37	90S	660	1.48	1.41	1.36	3.4	62.21	61.3	54.6	0.61	0.54	0.45	5.4	2.0	1.8	2.2	0.004	56	21
0.55	90L	660	2.16	2.05	1.98	3.5	63.1	62.5	55.8	0.61	0.53	0.43	8.0	2.1	1.6	2.3	0.004	56	24
0.75	100L1	690	2.41	2.29	2.21	3.5	70.5	70.0	63.6	0.67	0.53	0.44	10.4	2.0	1.8	2.2	0.008	59	28
1.1	100L2	690	3.35	3.18	3.07	3.6	72.4	71.9	69.5	0.69	0.57	0.46	15.2	2.2	1.7	2.4	0.01	59	33
1.5	112M1	690	4.4	4.20	4.00	3.9	74.5	74.0	72.0	0.70	0.62	0.49	20.8	2.4	2.0	2.6	0.017	61	45
2.2	132S2	710	5.90	5.60	5.40	4.3	79.3	78.7	77.6	0.71	0.64	0.53	29.6	2.3	2.0	2.5	0.031	64	51
3	132M1	710	7.80	7.40	7.10	4.4	80.1	79.8	78.1	0.73	0.64	0.52	40.4	2.2	1.8	2.4	0.04	64	61
4	160M1	720	10.2	9.70	9.30	4.4	81.6	81.1	79.7	0.73	0.66	0.57	53.1	2.2	1.9	2.5	0.075	68	89
5.5	160M2	720	13.6	12.9	12.5	5.0	83.3	82.9	81.7	0.74	0.66	0.55	73.0	2.2	1.9	2.4	0.093	68	107
7.5	160L	720	17.7	16.8	16.2	5.7	85.9	85.6	83.7	0.75	0.68	0.55	99.5	2.1	1.7	2.3	0.126	68	120
11	180L	730	25.4	24.1	23.3	5.6	87.8	87.4	85.5	0.75	0.69	0.58	144	2.3	1.9	2.5	0.203	70	158
15	200L	730	34.0	32.3	31.1	5.5	88.3	88.0	86.3	0.76	0.72	0.62	196.3	2.1	1.8	2.4	0.339	73	228
18.5	225S	730	41.0	39.0	37.5	5.6	90.2	89.8	87.8	0.76	0.72	0.65	242.1	2.2	1.7	2.6	0.491	73	258
22	225M	740	47.2	44.8	43.2	5.4	90.8	90.4	88.3	0.78	0.75	0.66	284	2.1	1.8	2.4	0.547	73	282
30	250M	740	63.3	60.1	58.0	5.3	91.2	90.9	88.9	0.79	0.76	0.68	387.3	2.2	1.8	2.5	0.83	75	367
37	280S	740	77.5	73.6	71.0	5.6	91.8	91.3	88.8	0.79	0.75	0.66	477.7	2.3	1.8	2.7	1.39	76	468
45	280M1	740	94.1	89.4	86.2	5.2	92.0	91.5	89.4	0.79	0.74	0.65	581	2.1	1.9	2.8	1.65	76	515
55	315S	740	110.8	105.3	101.5	5.7	93.1	92.9	91.3	0.81	0.77	0.70	710.1	1.9	1.7	2.5	4.79	82	752
75	315M	740	150.1	142.6	137.4	5.9	93.7	93.4	91.9	0.81	0.78	0.70	968.3	2.1	1.6	2.8	5.58	82	870
90	315L1	740	177.4	168.5	162.4	6.2	94.0	93.6	92.1	0.82	0.76	0.70	1162	2.3	1.8	2.9	6.37	82	976
110	315L2	740	216.4	205.6	198.1	6.0	94.2	93.8	92.4	0.82	0.80	0.71	1420	2.2	1.7	2.8	7.23	82	1096
132	355M1	740	259	246	240	5.03	94.6	94.5	91.9	0.82	0.79	0.71	1704	1.86	1.8	2.22	7.55	90	1556
160	355M2	740	315	298	292	5.28	94.7	94.5	92.2	0.81	0.78	0.72	2066	2.03	1.6	2.3	11.73	90	1704
185	355L1	740	363	342	334	5.29	94.8	94.6	92.3	0.82	0.79	0.73	2388	2.04	1.6	2.29	12.48	90	1876
200	355L2	740	393	370	361	5.42	94.8	94.6	92.3	0.82	0.81	0.75	2582	2.12	1.6	2.33	12.86	90	1989
220	355L3	740	425	410	390	4.76	94.8	94.6	92.3	0.83	0.82	0.76	2839	1.8	1.6	2.04	13.05	91	2049

Dimensions foot mount B3

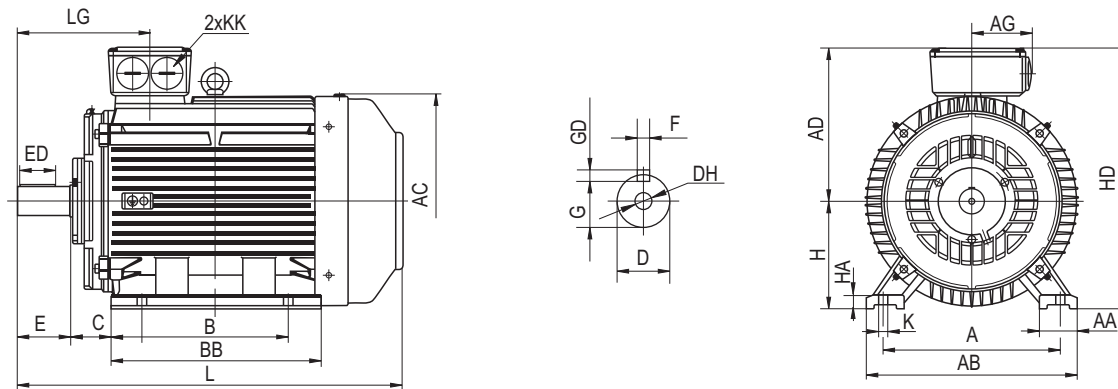
Frame size from 80 to 132



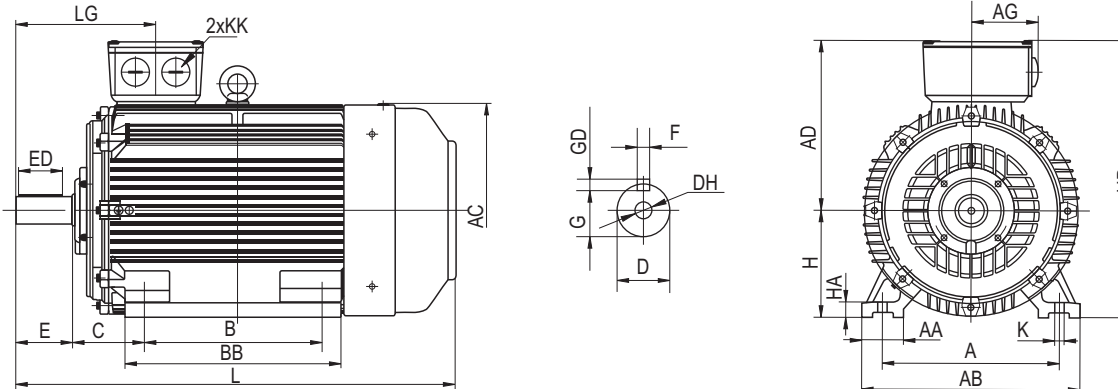
Frame size from 160 to 200



Frame size from 225 to 280



Frame size from 315 to 355



Dimensions foot mount B3

Frame size	A	AA	AB	AC	AD	AG	B	BB	C	D	DH	E	ED	F	G	GD	H	HA	HD	K	KK	L	LG
80	125	34	160	175	140	51	100	130	50	19	*M6X16	40	22	6	15.5	6	80	10	230	10	M24X1.5	295	140
90S	140	36	180	190	150	60	100	135	56	24	*M8X19	50	32	8	20	7	90	12.5	260	10	M24X1.5	320	156
90L	140	36	180	190	150	60	125	160	56	24	*M8X19	50	32	8	20	7	90	12.5	260	10	M24X1.5	345	168.5
100L	160	40	200	215	160	60	140	182	63	28	*M10X22	60	40	8	24	7	100	14	275	12	M24X1.5	385	193
112M	190	45	230	236	185	75	140	195	70	28	M10X22	60	40	8	24	7	112	14	310	12	M30X2	410	200
132S	216	52	265	275	205	75	140	205	89	38	M12X28	80	56	10	33	8	132	16	350	12	M30X2	480	239
132M	216	52	265	275	205	75	178	245	89	38	M12X28	80	56	10	33	8	132	16	350	12	M30X2	520	258
160M	254	67	320	330	250	95	210	260	108	42	M16X36	110	80	12	37	8	160	19	425	14.5	M36X2	610	270
160L	254	67	320	330	250	95	254	305	108	42	M16X36	110	80	12	37	8	160	19	425	14.5	M36X2	655	270
180M	279	74	350	380	270	95	241	297	121	48	M16X36	110	80	14	42.5	9	180	22	460	14.5	M36X2	680	270
180L	279	74	350	380	270	95	279	335	121	48	M16X36	110	80	14	42.5	9	180	22	460	14.5	M36X2	720	277
200L	318	75	395	420	325	120	305	370	133	55	M20X42	110	90	16	49	10	200	25	515	18.5	M48X2	760	298
225S	356	80	436	465	335	120	286	355	149	60	M20X42	140	100	18	53	11	225	28	560	18.5	M48X2	825	338
225M ¹⁾	356	80	436	465	335	120	311	380	149	55	M20X42	110	80	16	49	10	225	28	560	18.5	M48X2	820	338
225M	356	80	436	465	335	120	311	380	149	60	M20X42	140	100	18	53	11	225	28	560	18.5	M48X2	850	338
250M ¹⁾	406	88	495	520	370	160	349	440	168	60	M20X42	140	100	18	53	11	250	33	620	24	M64X2	925	360
250M	406	88	495	520	370	160	349	440	168	65	M20X42	140	100	18	58	11	250	33	620	24	M64X2	925	360
280S ¹⁾	457	90	550	570	395	160	368	494	190	65	M20X42	140	100	18	58	11	280	35	685	24	M64X2	960	344
280S	457	90	550	570	395	160	368	494	190	75	M20X42	140	100	20	67.5	12	280	35	685	24	M64X2	975	344
280M ¹⁾	457	90	550	570	395	160	419	535	190	65	M20X42	140	100	18	58	11	280	35	685	24	M64X2	1000	344
280M	457	90	550	570	395	160	419	535	190	75	M20X42	140	100	20	67.5	12	280	35	685	24	M64X25	1015	344
315S ¹⁾	508	120	635	650	495	195	406	515	216	65	M20X42	140	100	18	58	11	315	45	820	28	M64X2	1160	417
315M ¹⁾	508	120	635	650	495	195	457	625	216	75	M20X42	140	100	18	58	11	315	45	820	28	M64X2	1270	417
315L ¹⁾	508	120	635	650	495	195	508	625	216	65	M20X42	140	100	18	58	11	315	45	820	28	M64X2	1270	417
315S	508	120	635	650	495	195	406	515	216	80	M20X42	170	130	22	71	14	315	45	820	28	M64X2	1190	417
315M	508	120	635	650	495	195	457	625	216	80	M20X42	170	130	22	71	14	315	45	820	28	M64X2	1300	417
315L	508	120	635	650	495	195	508	625	216	80	M20X42	170	130	22	71	14	315	45	820	28	M64X2	1300	417
355M ¹⁾	610	125	735	735	640	330	560	775	254	75	M24X50	140	110	20	67.5	12	355	49	1000	28	M64X2	1500	420
355L ¹⁾	610	125	735	735	640	330	630	775	254	75	M24X50	140	110	20	67.5	12	355	49	1000	28	M64X2	1500	420
355M	610	125	735	735	640	330	560	675	254	95	M24X50	170	140	25	86	14	355	49	1000	28	M64X2	1530	450
355M ²⁾	610	125	735	735	640	330	560	775	254	100	M24X50	210	160	28	90	16	355	49	1000	28	M64X2	1570	490
355L	610	125	735	735	640	330	630	775	254	95	M24X50	170	140	25	86	14	355	49	1000	28	M64X2	1530	450
355L ²⁾	610	125	735	735	640	330	630	775	254	100	M24X50	210	160	28	90	16	355	49	1000	28	M64X2	1570	490

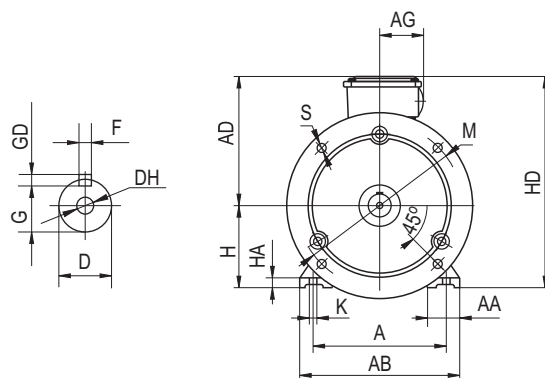
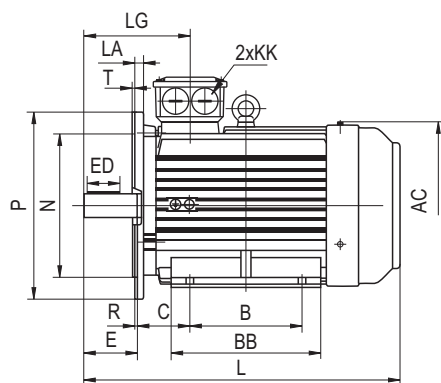
1) 2 Pole motors only.

2) These motor can also be supplied. Please state the dimensions of the shaft extension on order.

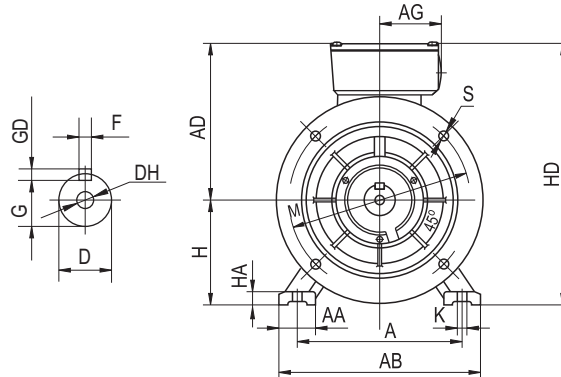
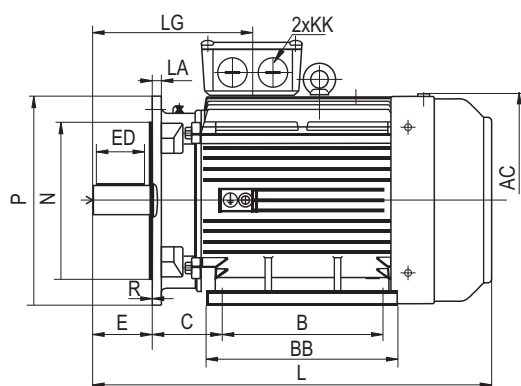
** Means that the cable gland is only one.
The "R" dimension is zero.

Dimensions foot-flange mount B35

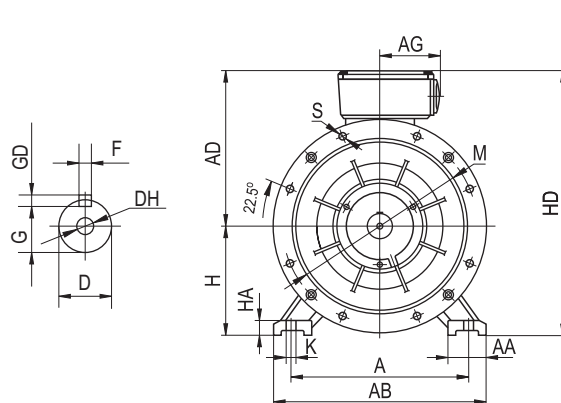
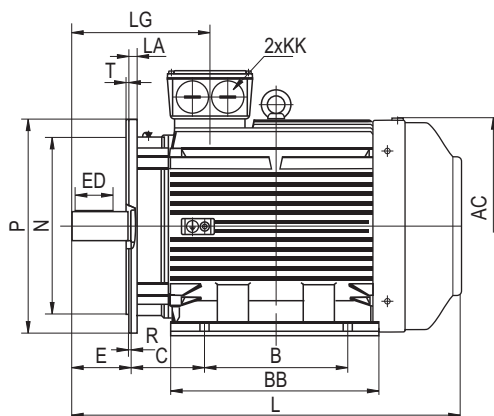
Frame size from 80 to 132



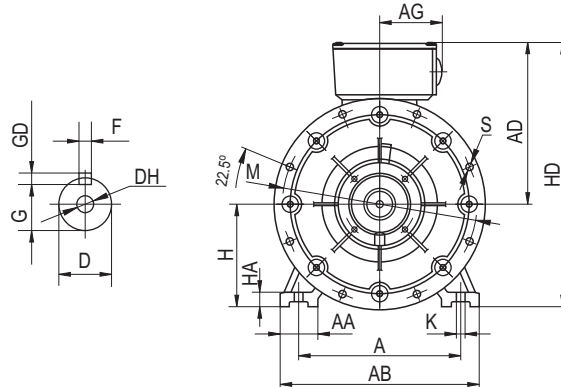
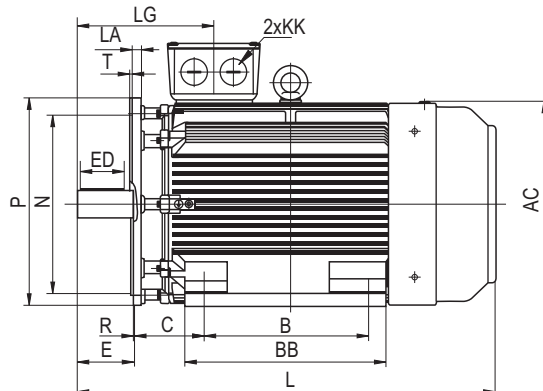
Frame size from 160 to 200



Frame size from 225 to 280



Frame size from 315 to 355



Dimensions foot-flange mount B35

Frame size	A	AA	AB	AC	AD	AG	B	BB	C	D	DH	E	ED	F	G	GD	H	HA	HD	K	KK	L	LA	LG	M	N	P	S	T
80	125	34	160	175	140	51	100	130	50	19	*M6X16	40	22	6	15.5	6	80	10	230	10	M24X1.5	295	12	140	165	130	200	12	3.5
90S	140	36	180	190	150	60	100	135	56	24	*M8X19	50	32	8	20	7	90	12.5	260	10	M24X1.5	320	12	156	165	130	200	12	3.5
90L	140	36	180	190	150	60	125	160	56	24	*M8X19	50	32	8	20	7	90	12.5	260	10	M24X1.5	345	12	168.5	165	130	200	12	3.5
100L	160	40	200	215	160	60	140	182	63	28	*M10X22	60	40	8	24	7	100	14	275	12	M24X1.5	385	14	193	215	180	250	14.5	4
112M	190	45	230	236	185	75	140	195	70	28	M10X22	60	40	8	24	7	112	14	310	12	M30X2	410	14	200	215	180	250	14.5	4
132S	216	52	265	275	205	75	140	205	89	38	M12X28	80	56	10	33	8	132	16	350	12	M30X2	480	14	239	265	230	300	14.5	4
132M	216	52	265	275	205	75	178	245	89	38	M12X28	80	56	10	33	8	132	16	350	12	M30X2	520	14	258	265	230	300	14.5	4
160M	254	67	320	330	250	95	210	260	108	42	M16X36	110	80	12	37	8	160	19	425	14.5	M36X2	610	15	270	300	250	350	18.5	5
160L	254	67	320	330	250	95	254	305	108	42	M16X36	110	90	12	37	8	160	19	425	14.5	M36X2	655	15	270	300	250	350	18.5	5
180M	279	74	350	380	270	95	241	297	121	48	M16X36	110	80	14	42.5	9	180	22	460	14.5	M36X2	680	15	277	300	250	350	18.5	5
180L	279	74	350	380	270	95	279	335	121	48	M16X36	110	80	14	42.5	9	180	22	460	14.5	M36X25	720	15	277	300	250	350	18.5	5
200L	318	80	395	420	325	120	305	370	133	55	M20X42	110	90	16	49	10	200	25	515	18.5	M48X2	760	17	298	350	300	400	18.5	5
225S	356	80	436	465	335	120	286	355	149	60	M20X42	140	100	18	53	11	225	28	560	18.5	M48X2	825	19	338	400	350	450	18.5	5
225M ¹⁾	356	80	436	465	335	120	311	380	149	55	M20X42	110	80	16	49	10	225	28	560	18.5	M48X2	850	19	338	400	350	450	18.5	5
225M	356	80	436	465	335	120	311	380	149	60	M20X42	140	100	18	53	11	225	28	560	18.5	M48X2	850	19	338	400	350	450	18.5	5
250M ¹⁾	406	88	495	520	370	160	349	440	168	60	M20X42	140	100	18	53	11	250	33	620	24	M64X2	925	20	360	500	450	550	18.5	5
250M	406	88	495	520	370	160	349	440	168	65	M20X42	140	100	18	58	11	250	33	620	24	M64X2	925	20	360	500	450	550	18.5	5
280S ¹⁾	457	90	550	570	395	160	368	494	190	65	M20X42	140	100	18	58	11	280	35	685	24	M64X2	960	22	344	500	450	550	18.5	5
280S	457	90	550	570	395	160	368	494	190	75	M20X42	140	100	20	67.5	12	280	35	685	24	M64X2	975	22	344	500	450	550	18.5	5
280M ¹⁾	457	90	550	570	395	160	419	535	190	65	M20X42	140	100	18	58	11	280	35	685	24	M64X2	1000	22	344	500	450	550	18.5	5
280M	457	90	550	570	395	160	419	535	190	75	M20X42	140	100	20	67.5	12	280	35	685	24	M64X2	1015	22	344	500	450	550	18.5	5
315S ¹⁾	508	120	635	650	495	195	406	515	216	65	M20X42	140	100	18	58	11	315	45	820	28	M64X2	1160	24	417	600	550	660	24	5
315M ¹⁾	508	120	635	650	495	195	457	625	216	65	M20X42	140	100	18	58	11	315	45	820	28	M64X2	1270	24	417	650	550	660	24	5
315L ¹⁾	508	120	635	650	495	195	508	625	216	65	M20X42	140	100	18	58	11	315	45	820	28	M64X2	1270	24	417	600	450	550	24	5
315S	508	120	635	650	495	195	406	515	216	80	M20X42	170	130	22	71	14	315	45	820	28	M64X2	1190	24	417	600	550	660	24	6
315M	508	120	635	650	495	195	457	625	216	80	M20X42	170	130	22	71	14	315	45	820	28	M64X2	1300	24	417	600	550	660	24	6
315L	508	120	635	650	495	195	508	625	216	80	M20X42	170	130	22	71	14	315	45	820	28	M64X2	1300	24	417	600	550	660	24	6
355M ¹⁾	610	125	735	735	640	330	560	775	254	75	M20X50	140	110	20	67.5	12	355	49	1000	28	M64X2	1500	25	420	740	680	800	24	6
355L ¹⁾	610	125	735	735	640	330	630	775	254	75	M20X50	140	110	20	67.5	12	355	49	1000	28	M64x2	1500	25	420	740	680	800	24	6
355M	610	125	735	735	640	330	560	675	254	95	M24X50	170	140	25	86	14	355	49	1000	28	M64X2	1530	25	450	740	680	800	24	6
355M ²⁾	610	125	735	735	640	330	560	775	254	100	M24X50	210	160	28	90	16	355	49	1000	28	M64X2	1570	25	490	740	680	800	24	6
355L	610	125	735	735	640	330	630	775	254	95	M24X50	170	140	25	86	14	355	49	1000	28	M64X2	1530	25	450	740	680	800	24	6
355L ²⁾	610	125	735	735	640	330	560	775	254	100	M24X50	210	160	28	90	16	355	49	1000	28	M64X2	1570	25	490	740	680	800	24	6

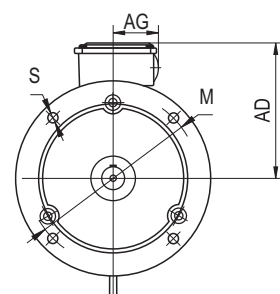
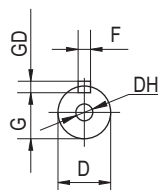
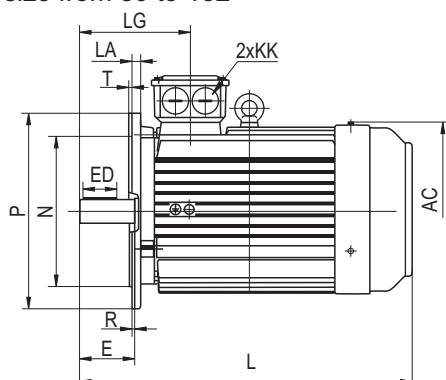
1) 2 Pole motors only.

2) These motor can also be supplied. Please state the dimensions of the shaft extension on order.

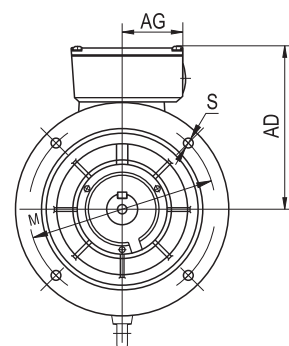
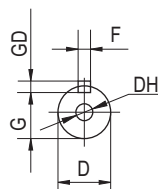
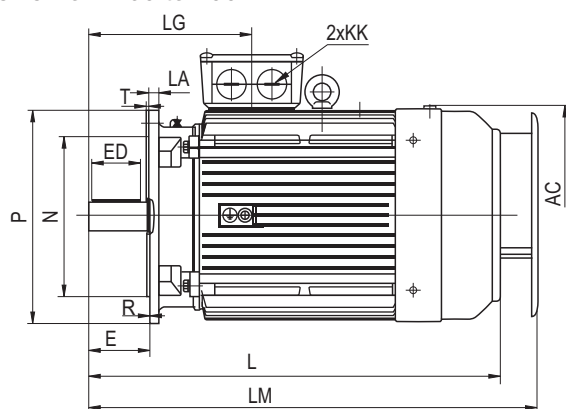
** Means that the cable gland is only one.
The "R" dimension is zero.

Dimensions flange mount B5 and V1

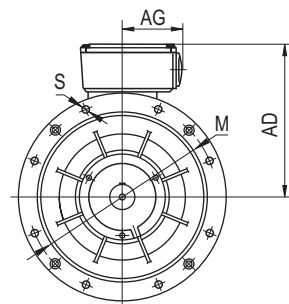
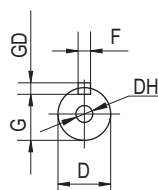
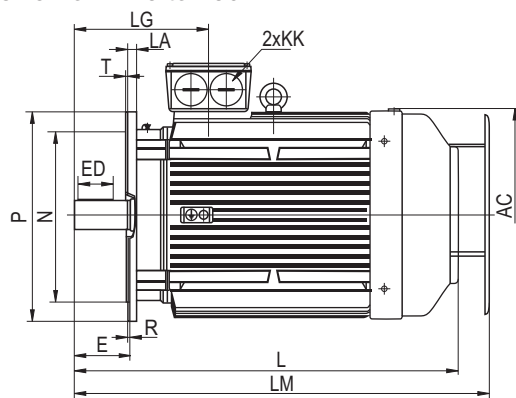
Frame size from 80 to 132



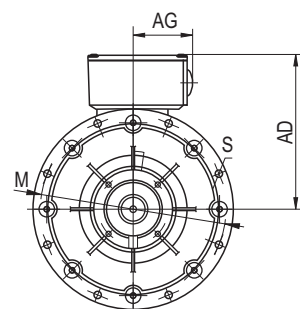
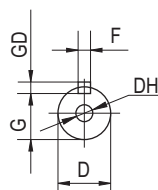
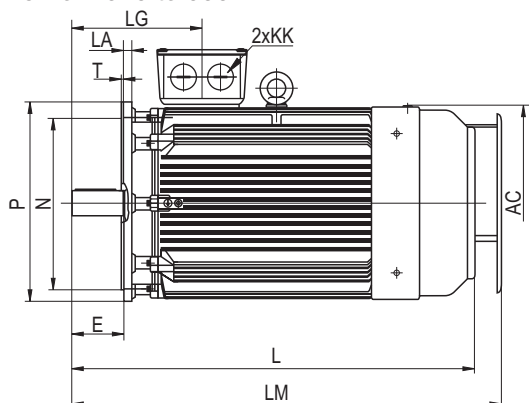
Frame size from 160 to 200



Frame size from 225 to 280



Frame size from 315 to 355



Dimensions flange mount B5 and V1

Frame size	AC	AD	AG	D	DH	E	ED	F	G	GD	KK	L	LA	LG	LM	M	N	P	S	T
80	175	140	51	19	M6X16	40	22	6	15.5	6	*M24X1.5	295	12	140	-	165	130	200	12	3.5
90S	190	150	60	24	M8X19	50	32	8	20	7	*M24X1.5	320	12	156	-	165	130	200	12	3.5
90L	190	150	60	24	M8X19	50	32	8	20	7	*M24X1.5	345	12	168.5	-	165	130	200	12	3.5
100L	215	160	60	28	M10X22	60	40	8	24	7	*M24X1.5	385	14	193	-	215	180	250	14.5	4
112M	236	185	75	28	M10X22	60	40	8	24	7	M30X2	410	14	200	-	215	180	250	14.5	4
132S	275	205	75	38	M12X28	80	56	10	33	8	M30X2	480	14	239	-	265	230	300	14.5	4
132M	275	205	75	38	M12X28	80	56	10	33	8	M30X2	520	14	258	-	265	230	300	14.5	4
160M	330	250	95	42	M16X36	110	80	12	37	8	M36X2	610	15	270	665	300	250	350	18.5	5
160L	330	250	95	42	M16X36	110	80	12	37	8	M36X2	655	15	270	720	300	250	350	18.5	5
180M	380	270	95	48	M16X36	110	80	14	42.5	9	M36X2	685	15	277	755	300	250	350	18.5	5
180L	380	270	95	48	M16X36	110	80	14	42.5	9	M36X2	720	15	277	795	300	250	350	18.5	5
200L	420	325	120	55	M20X42	110	90	16	49	10	M48X2	760	17	298	845	350	300	400	18.5	5
225S	465	335	120	60	M20X42	140	100	18	53	11	M48X2	825	19	338	894	400	350	450	18.5	5
225M ¹⁾	465	335	120	55	M20X42	110	80	16	49	10	M48X2	820	19	338	889	400	350	450	18.5	5
225M	465	335	120	60	M20X42	140	100	18	53	11	M48X2	850	19	338	919	400	350	450	18.5	5
250M ¹⁾	520	370	160	60	M20X42	140	100	18	53	11	M64X2	925	20	360	1051	500	450	550	18.5	5
250M	520	370	160	65	M20X42	140	100	18	58	11	M64X2	925	20	360	1051	500	450	550	18.5	5
280S ¹⁾	570	400	160	65	M20X42	140	100	18	58	11	M64X2	960	22	344	1090	500	450	550	18.5	5
280S	570	400	160	75	M20X42	140	100	20	67.5	12	M64X2	975	22	344	1090	500	450	550	18.5	5
280M ¹⁾	570	400	160	65	M20X42	140	100	18	58	11	M64X2	1000	22	344	1090	500	450	550	18.5	5
280M	570	400	160	75	M20X42	140	100	20	67.5	12	M64X2	1015	22	344	1090	500	450	550	18.5	5
315S ¹⁾	650	495	195	65	M20X42	140	100	18	58	11	M64X2	1160	24	417	1258	600	550	660	24	6
315M ¹⁾	650	495	195	65	M20X42	140	100	18	58	11	M64X2	1270	24	417	1368	600	550	660	24	6
315L ¹⁾	650	495	195	65	M20X42	140	100	18	58	11	M64X2	1270	24	417	1368	600	550	660	24	6
315S	650	495	195	80	M20X42	170	130	22	71	14	M64X2	1190	24	417	1288	600	550	660	24	6
315M	650	495	195	80	M20X42	170	130	22	71	14	M64X2	1300	24	417	1398	600	550	660	24	6
315L	650	495	195	80	M20X42	170	130	22	71	14	M64X2	1300	24	417	1398	600	550	660	24	6
355M(V1) ¹⁾	735	645	330	75	M24X50	140	110	20	67.5	12	M64X2	1500	25	420	1600	740	680	800	24	6
355L(V1) ¹⁾	735	645	330	75	M24X50	140	110	20	67.5	12	M64X2	1500	25	420	1600	740	680	800	24	6
355M(V1)	735	645	330	95	M24X50	170	140	25	86	14	M64X2	1530	25	450	1630	740	680	800	24	6
355M(V1) ²⁾	735	645	330	100	M24X50	210	160	28	90	16	M64X2	1570	25	490	1670	740	680	800	24	6
355L(V1)	735	645	330	95	M24X50	170	140	25	86	14	M64X2	1530	25	450	1630	740	680	800	24	6
355L(V1) ²⁾	735	645	330	100	M24X50	210	160	28	90	16	M64X2	1570	25	490	1670	740	680	800	24	6

1) 2 Pole motors only.

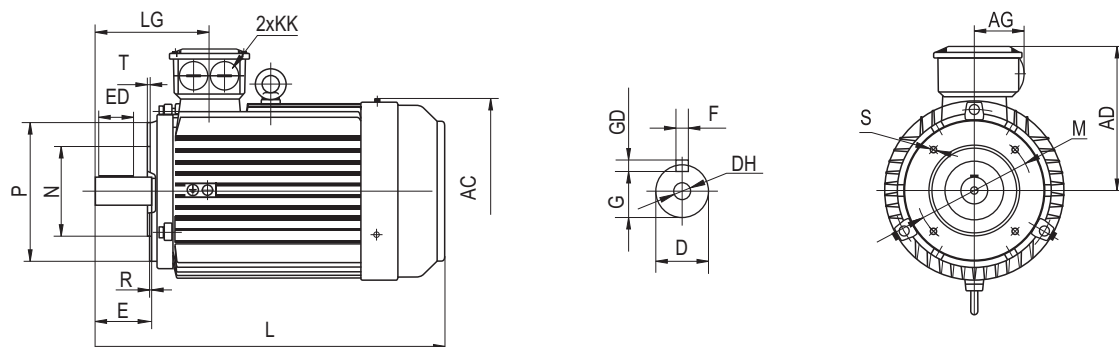
2) These motor can also be supplied. Please state the dimensions of the shaft extension on order.

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

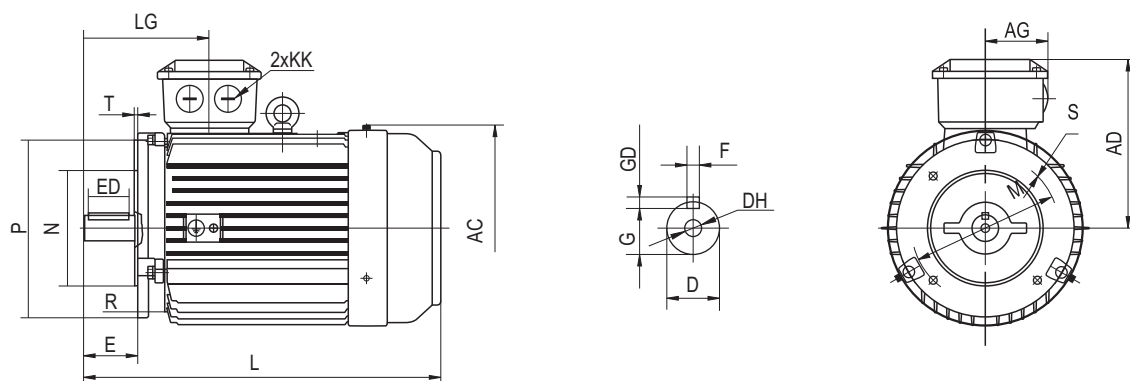
The "R" dimension is zero.

Dimensions face-flange mount B14A and B14B

Frame size from 80 to 160 B14A



Frame size from 80 to 112 B14B

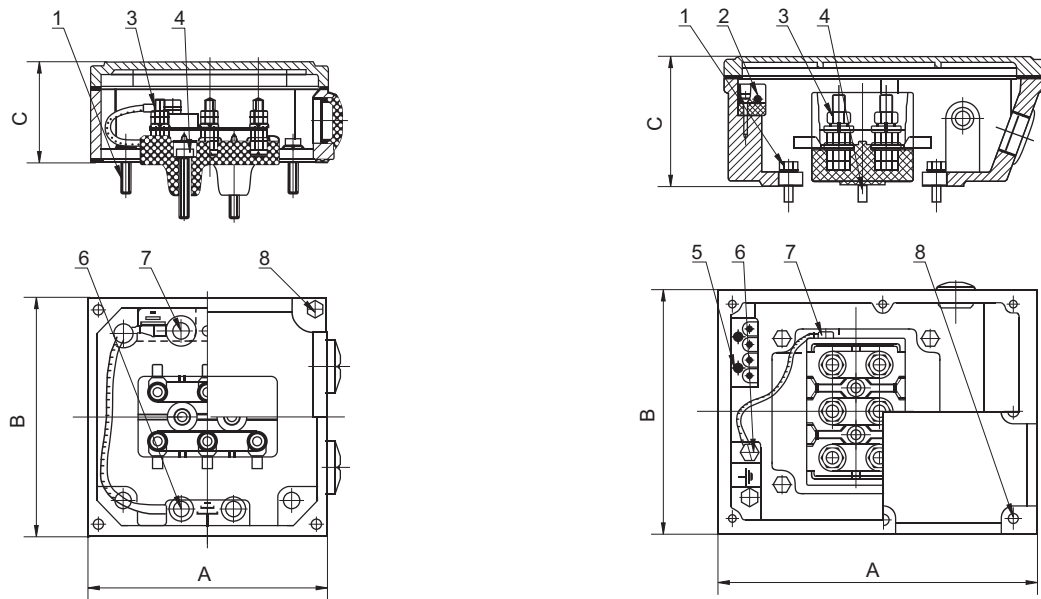


Frame size	B14A													B14B				
	AC	AD	AG	D	DH	E	ED	F	G	GD	KK	L	LG	M	N	P	S	T
80	175	150	51	19	M6X16	40	22	6	15.5	6	*M24X1.5	295	140	100	80	120	M6	3
90S	190	165	60	24	M8X19	50	32	8	20	7	*M24X1.5	320	156	115	95	140	M8	3
90L	190	165	60	24	M8X19	50	32	8	20	7	*M24X1.5	345	168.5	115	95	140	M8	3
100L	215	170	60	28	M10X22	60	40	8	24	7	*M24X1.5	385	193	130	110	160	M8	3.5
112M	236	195	75	28	M10X22	60	40	8	24	7	M30X2	410	200	130	110	160	M8	3.5
132S	275	215	75	38	M12X28	80	56	10	33	8	M30X2	480	239	165	130	200	M10	3.5
132M	275	215	75	38	M12X28	80	56	10	33	8	M30X2	520	258	165	130	200	M10	3.5
160M	330	265	95	42	M16X36	110	80	12	37	8	M36X2	610	270	215	180	250	M12	4
160L	330	265	95	42	M16X36	110	80	12	37	8	M36X2	655	270	215	180	250	M12	4

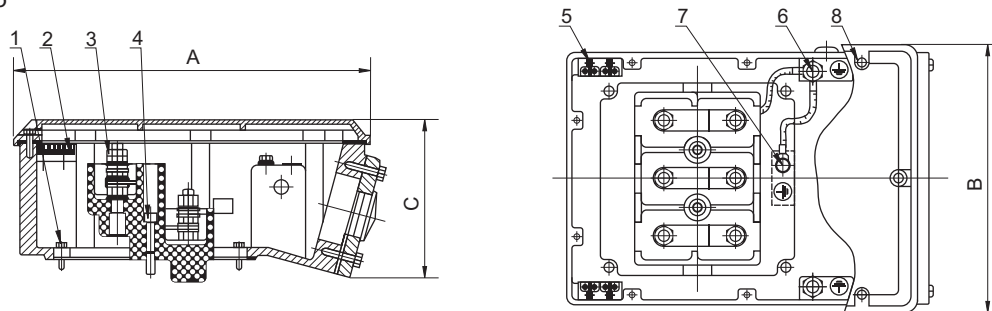
“*” Means that the cable gland is only one.
The “R” dimension is zero.

Terminal box

Frame size from 160 to 315



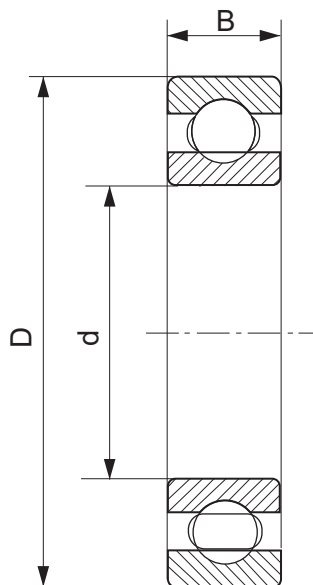
Frame size 355



Frame size	A	B	C	1	2	3	4	5	6	7	8	Metric Gland Sizes	PG Gland Sizes
80~90	104	104	48	M6X16	-	M4	M6X25	-	M6X12	M6X12	M5X16	2XM25X1.5	2XPG16
100~132	118	181	62	M6X16	-	M5	M6X25	-	M6X12	M6X12	M5X16	2XM32X1.5	2XPG21
160~180	200	164	83	M6X20	M3	M8	M8X30	M4X25	M8X16	M8X16	M5X16	2XM40X1.5	2XPG29
200~225	285	190	109	M8X30	M3	M10	M8X30	M4X25	M8X16	M8X16	M6X20	2XM50X1.5	2XPG36
250~280	284	218	119	M8X30	M3	M10	M10X30	M4X25	M10X20	M10X20	M6X25	2XM63X1.5	2XPG42
315	441	326	195	M8X30	M3	M12	M10X50	M4X25	M10X16	M10X20	M8X30	2XM63X1.5	2XPG48
315	490	365	220	M8X30	M3	M16	M10X25	M4X25	M10X25	M10X25	M8X30	2XM63X1.5	2XPG48

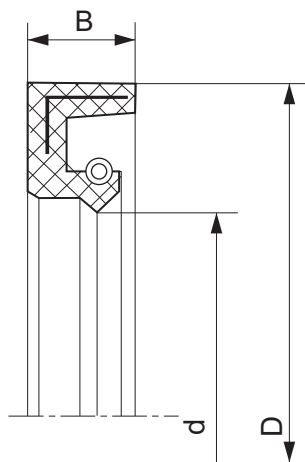
Bearing and oil seal

Bearing data



	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)	6316 C3	6316 C3	80	170	39
315 2P (Vertical)	6316 C3	7316	80	170	39
315 4-8P (Horizontal)	NU319 C3	6319 C3	95	200	45
315 4-8P (Vertical)	NU319 C3	7319	95	200	45
355 2P (Horizontal)	6319 C3	6319 C3	95	200	45
355 2P (Vertical)	6319 C3	7319	95	200	45
355 4-8P (Horizontal)	NU322 C3	6322 C3	110	240	50
355 4-8P (Vertical)	NU322 C3	7322	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	40	5	25	40	5
100	30	52	7	30	52	7
112	30	52	7	30	52	7
132	40	62	5	40	62	5
160	45	65	8	45	65	8
180	55	75	8	55	75	8
200	60	80	8	60	80	8
225	65	90	10	65	90	10
250	70	95	10	70	95	10
280 2P	70	95	10	70	95	10
280 4-8P	85	120	10	85	120	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

- ESC motors are equipped with bearings from excellent manufacturers.
- In general the bearings have C3 clearances.
- Motors of frame sizes 80–132 are fitted with life-lubricated bearings.
- Motors of frame sizes 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.

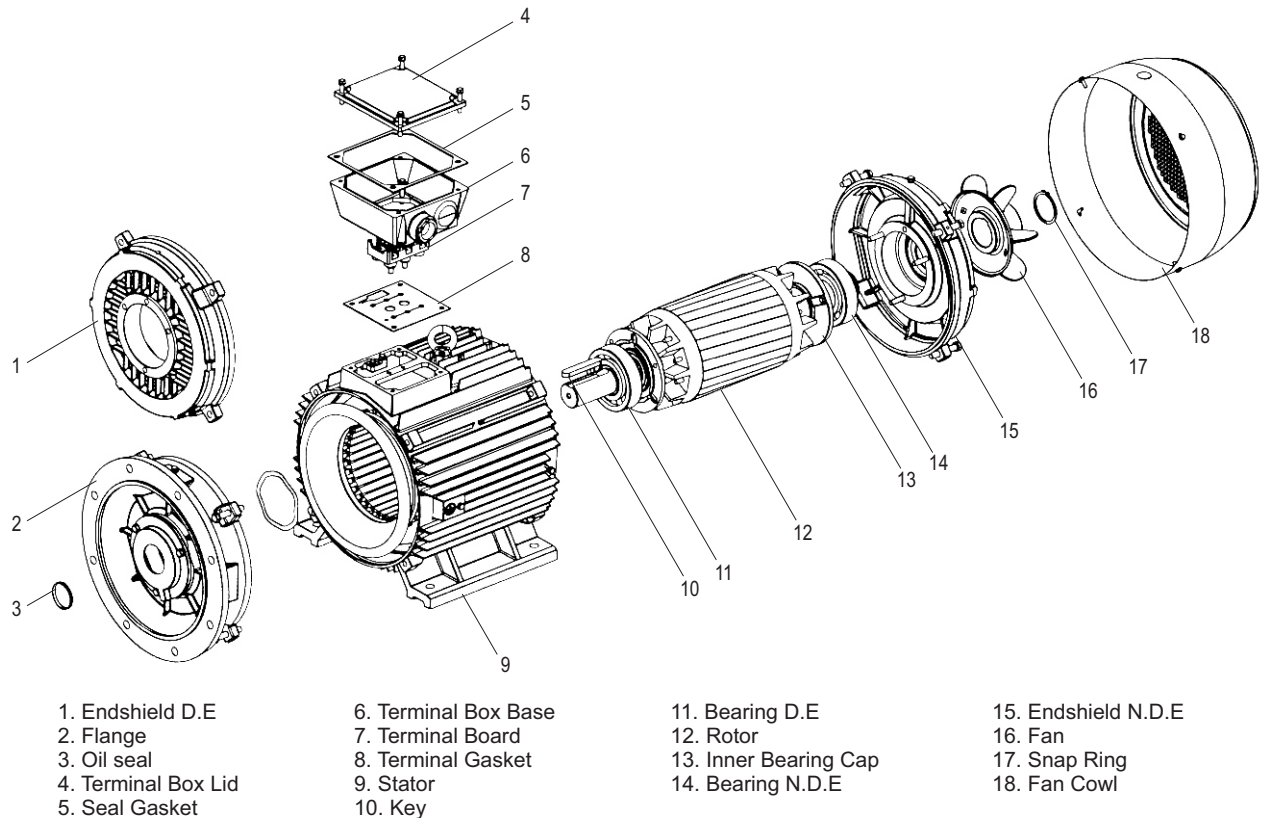
Frame size	Drive end bearing	Non-drive end bearing	Regreasing period hours for operating temperatures up to 70°C			Quantity of grease in bearing chamber grams
			rpm<3600	rpm<1800	rpm<1200	
160	6309 C3	6309 C3	6000	12000	18000	13
180	6311 C3	6311 C3	4000	11000	16000	15
200	6312 C3	6312 C3	3500	8500	13000	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	6316 C3	6316 C3	–	4000	6000	30
315*	6316 C3	6316 C3	1200	–	–	30
315	NU319 C3	6319 C3	–	2000	3000	45
355*	6319 C3	6319 C3	1200	–	–	30
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.



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