ENERTECH

ESI SERIES CATALOGUE

www.enertechmotors.com.au

ADVANTAGE & INTRODUCTION

NEMA and IEC Stainless Steel motors are designed and manufactured to operate in extreme conditions with high ambient temperatures, high humidity, water, steam, etc. These motors are IP67 as standard and can operate under water! The motors have a specially designed construction which avoids the use of through bolts or end shield bolts. The outer surfaces of the motors are completely smooth to make it easier to clean and wash away any dirt, food scraps or debris that might collect on them.

The motors can be manufactured in 302, 304, or 316 Grades of Stainless Steel. Standard motors are produced in SS304 Food Grade - for a long service life with no corrosion. The shafts are made from SS420 as standard.

Commonly Electric Motors (Normally Cast Iron or Aluminium Frame) are usually painted and it is not uncommon for flakes of paint to break free, when the motor starts to corrode, and contaminate food being processed. This is another advantage of stainless steel motors - The Stainless Steel Construction requires no surface treatments and introduces no possible contaminants to the process.

The standard motors are fitted with SKF or equivalent bearings, which are suitable for a very wide range of temperatures with very low friction losses. The drive end is sealed with 2 oil seals and the shaft is induction hardened to ensure a long service life. Special bearings can also be fitted as per customer requirement.

All motors are supplied with 1 metre of Cable and are tested under water as part of the standard routine testing of these motors.

Stainless Steel motors have a higher Capital Cost than commonly used Cast Iron or Aluminium framed motors, but using a Stainless Steel Electric Motor instead of a standard motor can result in significant savings over the life of the motor. Commonly used Cast Iron or Aluminium framed motors do not last very long when subjected to Steam, Hot Water or Chemical Cleaning every day. When the motors fail, the cost of the downtime and the loss of production can often be much more than the extra cost of purchasing a Stainless Steel motor. Stainless Steel Electric Motors have a long service life provided they operate under normal conditions and are subject to a suitable maintenance regime and are expected to operate reliably for many years, while a Commonly used Cast Iron or Aluminium framed motor might only last 6 months in a similar application.

GENERAL SPECIFICATION

Stainless Steel motors are required by the following industries

> Food Processing and Production
> Marine
> Beverage
> Pharmaceutical
> And anywhere that requires a very clean sanitised environment. These motors are designed to work in applications where the motors are Steam or Chemically Cleaned at regular intervals.

Type

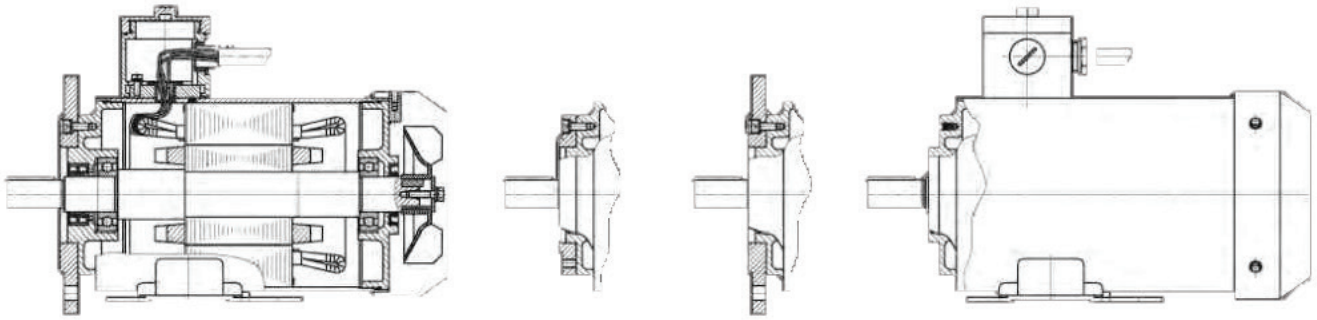
The motors can be supplied in TENV (Totally Enclosed Non Ventilated) Construction with no Fan or Fan Cowl - or - TEFC (Totally Enclosed Fan Cooled) Construction with a Fan and Stainless Steel Fan Cowl. The TENV motors are generally more popular as they are easier to clean. (It is not easy to completely clean motors with a Fan and Fan Cowl, if the Fan Cowl is not removed).

Efficiency

These motors can be supplied at IE1, IE2, IE3 and Premium Efficiency levels (CSA Approval C*-PUS) and have been tested according to the requirements of IEC60034.2.1:2007 Method A. All the motors are suitable for operation with Inverters or Reduced Voltage Starting and can be manufactured with special Inverter duty wire - if requested. All motors are supplied with 150 Deg.C. Thermistors in the windings.

Mounting

The motors are available in standard IEC frames from 63 to 160 in B3, B5, B35, and B14 configurations. Ail Motors 132 Frame and below have a modular construction and are able to be easily modified to suit different Mounting requirements. The standard Foot mount B3 motor can be easily modified to B3/B5 or B3/B14 by installing a separate flange disk. In the same way, a B5 motor can be quickly and easily modified to be B14.
The motors can also be supplied with non-standard mounting configurations and can be fitted to special OEM gearboxes like SEW and Flender Products.



GENERAL SPECIFICATION

Motor wound for 50Hz at rated voltage	Connected to	Data in percentage of values at 50Hz and rated voltage						
		Output	r/min	$I/_{NN}I$	I_L	T_N	$T/_{LN}T$	$T/_{BN}T$
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.
*Note: This table is not applicable for hazardousarea motors.

1) N = Full load current T_N= Full load torque motors

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/fullload 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:

$$I_X = \frac{380x \quad I_N}{U_X}$$

I_X = Current
I_N = Full load current at 380 volt
U_X = Design voltage

Temperature and altitude

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:

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

Effective Power = Rated Power x Temperature Factor x Altitude Factor

Example 1
Effective Power required = 2.2 kW
Air temperature = 50°C (factor 0.93)
Altitude = 2500 metres (factor 0.91)

$$\text{Rated power required} = \frac{2.2}{0.93 \times 0.91} = 2.6\ \text{kW}$$

The appropriate motor is one with a rated power above the required, being 3 kW.

Example 2
Rated power = 7.5 kW
Air temperature = 50°C (factor 0.93)
Altitude = 1500 metres (factor 0.98)

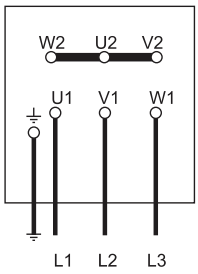
Effective Power 7.5 x 0.93 x 0.98 = 6.84 kW

Rotation

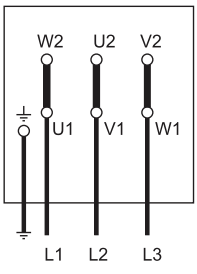
For clockwise rotation, viewed from drive end, standard three phase ESCS and ESI motor terminal markings coincide with the sequence of the phase line conductors.

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 8).

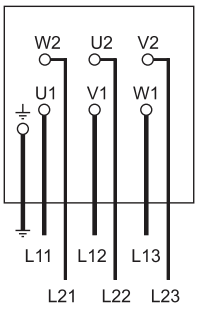
Connection Diagrams



Star connection

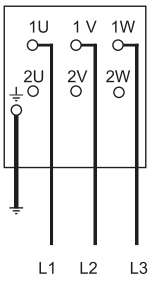


Delta connection

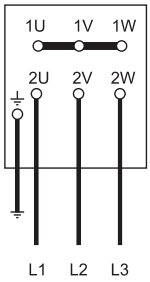


Connection to Star-delta starter

Multi-speed motors in dahlander connection (tapped winding).

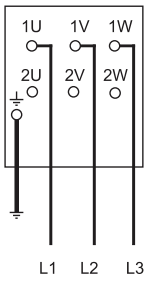


Low speed

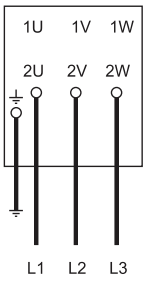


High speed

Multi-speed motors with 2 separate windings.



Low speed



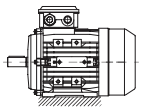
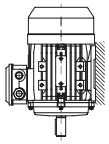
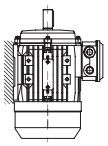
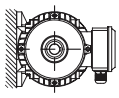
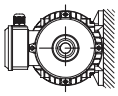
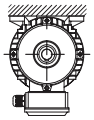
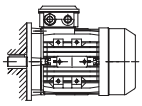
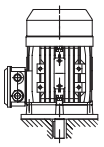
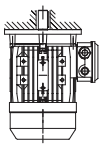
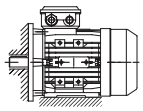
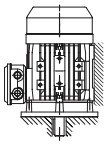
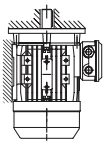
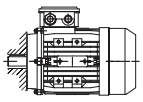
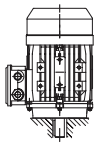
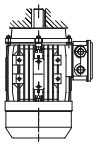
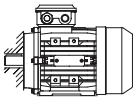
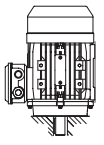
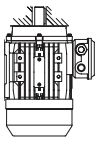
High speed

Rating Plate

Frame size from 56 to 160

ENERTECH ELECTRIC MOTORS(AUSTRALIA) 3 PHASE ASYNCHRONOUS MOTOR							
TYPE				SERIAL NUMBER			
VOLTSC	ONN.	Hz	kW	RPM	AMP	Cos Ø	EFF.%
BEARINGD		E		NDE		DUTY	
AMB.TEMP		IP		INS.CL.		WEIGHT	
PRODUCT CODE:				STAINLESS STEEL			

Mounting

Foot mount  B3 (IM1001)*	 V5 (IM1011)	 V6 (IM1031)
 B6 (IM1051)	 B7 (IM1061)	 B8 (IM1071)
Large flange mount  B5 (IM3001)*	 V1 (IM3011)*	 V3 (IM3031)
Large flange and feet  B3/B5 (IM2001)*	 V1/V5 (IM2011)	 V3/V6 (IM2031)
Small flange mount  B14 (IM3601)	 V18 (IM3611)	 V19 (IM3631)
Small flange and feet  B3/B14 (IM2101)	 V5/V18 (IM2111)	 V6/V19 (IM2131)

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 standard explaination

IP	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

ESI 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.

Electrical design

As standard, ESI 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 51 (continuous)
Rotatio - Clockwise viewed from drive end
Connection - 220 volt Delta/380 volt Star (3kW and below)
- 380 volt Delta/660 volt Star (4kW and above)

Voltage and frequency

Standard ESI motors are designed for a power supply of three phase 380V, 50Hz. Motors can be manufactured for any supply between 100V and 600 V and frequencies other than 50Hz.
Standard ESCS and ESI 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 .

Duty

Enertech motors are 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 motorsize:

1. Continuousduty S1: The motor works at a constant load for enough time to reach temperature equilibrium.

2. Short time duty S2: The motor works at a constant load, but not long enough to reach temperature equilibrium, and the rest periods are long enough for the motor to reachambient temperature.

3. Intermittent periodic duty S3: Sequential, identical run and rest cycles with constant load. Temperature equilibrium is never reached. Starting current has little effect on temperature rise.

4. Intermittent periodic duty with starting S4: Sequential identical start, run and rest cycles with constant load. Temperature equilibrium is not reached,but starting current affects temperature rise.

5. Intermittent periodic duty with electric braking S5: Sequential, identical cycles of starting, running at constant load, electric braking and rest. Temperature equilibrium is not reached.

6. Continuous operation with intermittent load S6: Sequential, identical cycles of running with constant load and running with no load. No rest periods.

7. Continuousoperationwith electric braking S7: Sequential, identical cycles of starting, running at constant load and electric braking. No rest periods.

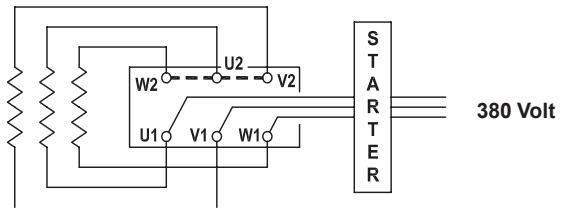
8. Continuous operation with periodic changes in load and speed S8: Sequential, identical, duty cycles of start, running at constant load and given speed, then run at other constant loadsand speeds. No rest periods.

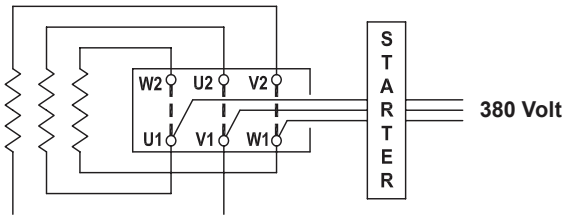
Connection

A motor's rated voltage must agree with the power supply line-to-line voltage. It is careful 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 connection 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 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.

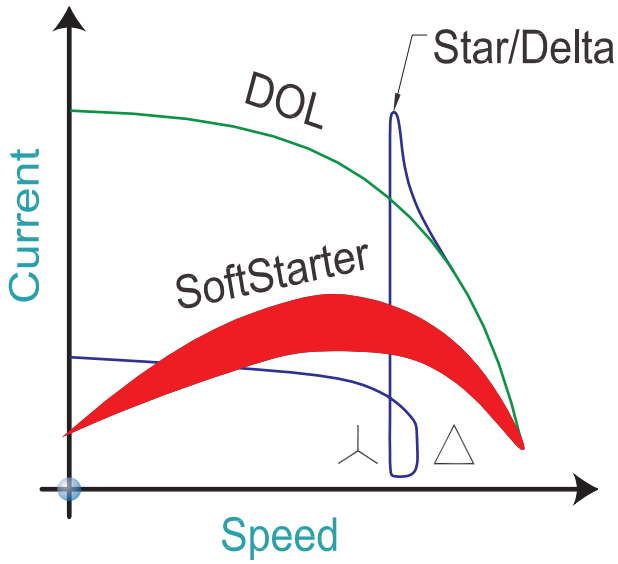
D.O.L Starter

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

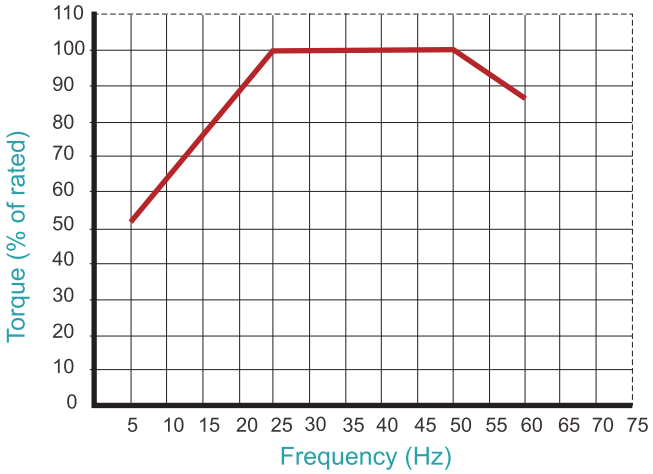
The ESI motors 4kW and above are suitable for the star-delta starting method. Through the use of a star-delta starter, the motor terminals are connected in the star configuration during starting, and reconnected to the delta configuration when running.

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

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.



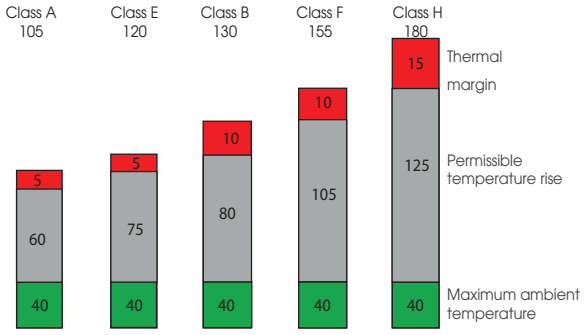
EDM Concerns

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 controlled with the fitment of appropriate filters to the drive. To futher reduce the effect of EDM, an insulated non drive bearing can be used.

GENERAL SPECIFICATION

Insulation

The insulation system is Class F (155°C) and the motors are designed to operate with Class B (80°C).
This ensures long life and reliability with the ability to withstand ambient temperatures as high as 54°C or up to 10% overload in adverse electrical supply situations.

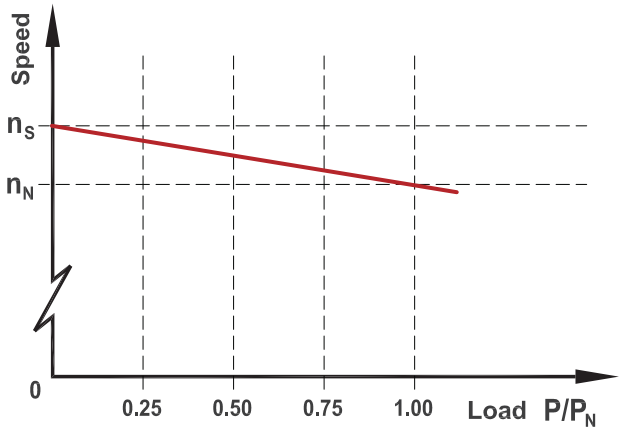


Temperxature Limits According to IEC 85

Speed at partial loads

The relationship between the motor speed and the degree of loading on an ESI 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 facto



Current at partial loads

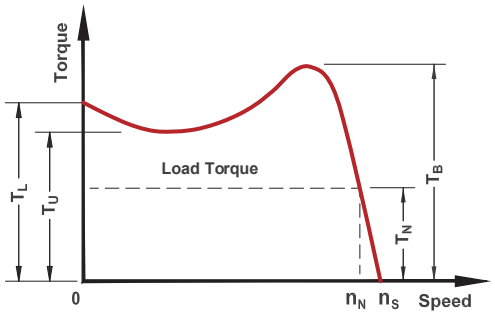
Current at partial loads can be calculated using the following formula.

$$\text{Where: } I_x = \frac{Pout_x}{\sqrt{3} \times U_{NX} \times \cos\varphi_X \times \eta} \times 10^5$$

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.



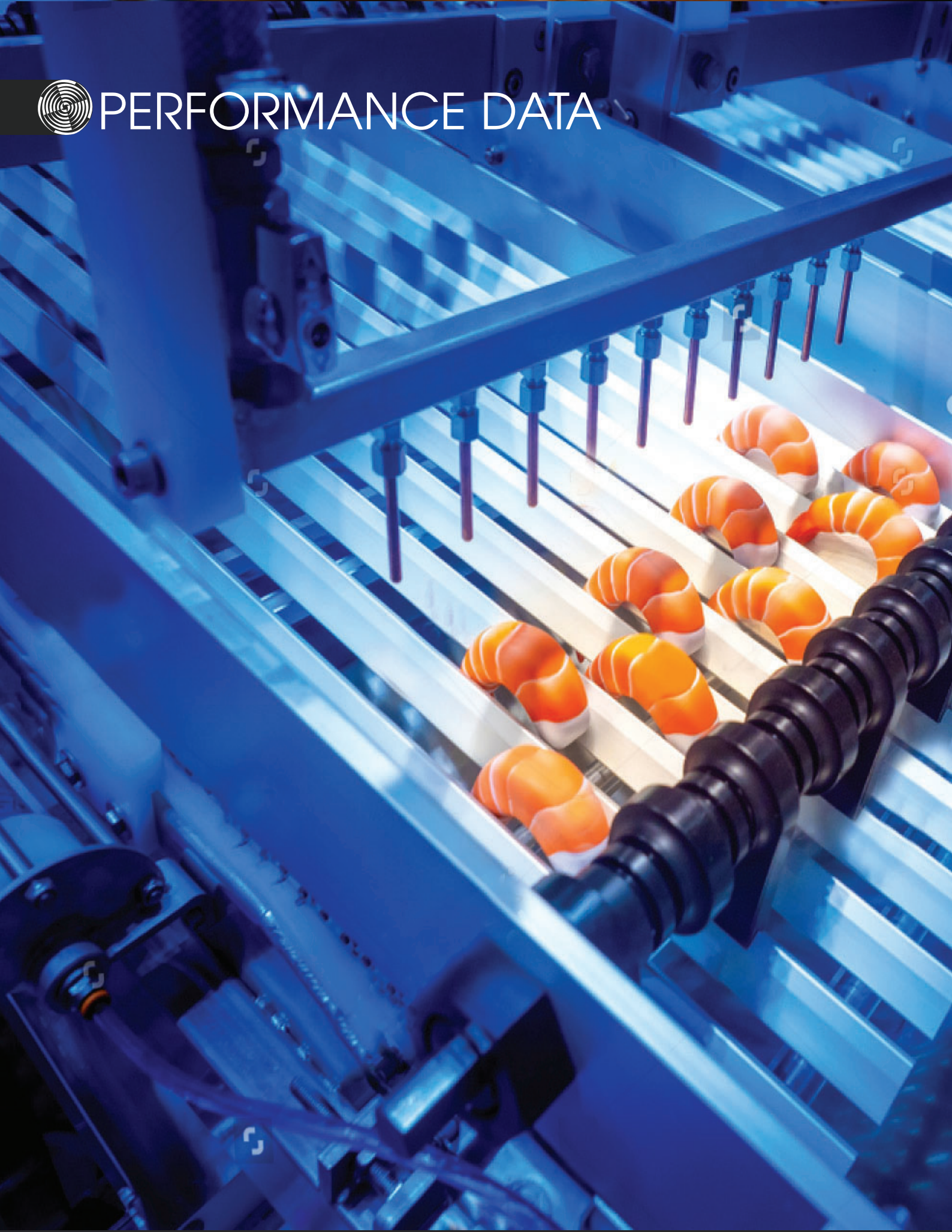
Where:

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
ESI 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:

$$\text{Where: } T_N = \frac{9950 \times p_N}{n_N}$$

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

PERFORMANCE DATA



ESI SERIES

2 poles - 3000 rpm Stainless Steel speed 50Hz - IE3

Frame size	Output (kW)	Full load speed (RPM)	Current full load I_N 50 Hz 380V (A)	Current full load I_N 50 Hz 400V (A)	Current full load I_N 50 Hz 415V (A)	Efficiency at 100% full load	Power factor cos φ at 100% full load	Locked rotor I_L/I_N	Torque Full load torque T_N (Nm)	Torque Locked rotor torque T_L/T_N	Torque Break down torque T_B/T_N	Noise level at 1m dB (A)	Net weight (kg)
80M1	0.75	2840	1.7	1.6	1.6	80.7	0.82	7.0	2,5	2.3	2.3	62	17.71
80M2	1.1	2825	2.4	2.3	2.2	82.7	0.83	7.3	3,7	2.2	2.3	62	19.25
90S	1.5	2855	3.2	3.1	3.0	84.2	0.84	7.6	5,0	2.2	2.3	67	22.22
90L	2.2	2855	4.6	4.3	4.2	85.9	0.85	7.6	7,4	2.2	2.3	67	29.59
100L	3	2895	6.0	5.7	5.5	87.1	0.87	7.8	9,9	2.2	2.3	74	37.68
112M	4	2895	7.8	7.4	7.2	88.1	0.88	8.3	13,2	2.2	2.3	77	45.76
132S1	5.5	2920	10.6	10.1	9.7	89.2	0.88	8.3	18,0	2.0	2.3	79	68.42
132S2	7.5	2920	14.4	13.7	13.2	90.1	0.88	7.9	24,5	2.0	2.3	79	76.23
160M1	11	2960	20.6	19.6	18.9	91.2	0.89	8.1	35,5	2.0	2.3	81	118.80
160M2	15	2955	27.9	26.5	25.5	91.9	0.89	8.1	48,5	2.0	2.3	81	138.60
160L	18.5	2955	34.2	32.5	31.3	92.4	0.89	8.2	59,8	2.0	2.3	81	184.80
180M	22	2960	40.5	38.5	37.1	92.7	0.89	8.2	71,0	2.0	2.3	83	204.60

4 poles - 1500 rpm Stainless Steel speed 50Hz - IE3

Frame size	Output (kW)	Full load speed (RPM)	Current full load I_N 50 Hz 380V (A)	Current full load I_N 50 Hz 400V (A)	Current full load I_N 50 Hz 415V (A)	Efficiency at 100% full load	Power factor cos φ at 100% full load	Locked rotor I_L/I_N	Torque Full load torque T_N (Nm)	Torque Locked rotor torque T_L/T_N	Torque Break down torque T_B/T_N	Noise level at 1m dB (A)	Net weight (kg)
80M1	0.55	1425	1.4	1.3	1.3	80.6	0.75	6.5	3,7	2.3	2.3	56	16.61
80M2	0.75	1425	1.8	1.7	1.7	82.5	0.75	6.6	5,0	2.3	2.3	56	17.93
90S	1.1	1420	2.6	2.5	2.4	84.1	0.76	6.8	7,4	2.3	2.3	59	21.34
90L	1.5	1420	3.5	3.3	3.2	85.3	0.77	7.0	10,1	2.3	2.3	59	24.20
100L1	2.2	1445	4.8	4.5	4.4	86.7	0.81	7.6	14,5	2.3	2.3	64	42.90
100L2	3	1440	6.3	6.0	5.8	87.7	0.82	7.6	19,9	2.3	2.3	64	44.55
112M	4	1460	8.4	7.9	7.7	88.6	0.82	7.8	26,2	2.2	2.3	65	46.20
132S	5.5	1460	11.2	10.7	10.3	89.6	0.83	7.9	36,0	2.0	2.3	71	73.70
132M	7.5	1460	15.0	14.3	13.7	90.4	0.84	7.5	49,1	2.0	2.3	71	89.98
160M	11	1470	21.5	20.4	19.7	91.4	0.85	7.7	71,5	2.2	2.3	73	127.60
160L	15	1470	28.8	27.3	26.3	92.1	0.86	7.8	97,4	2.2	2.3	73	149.60
180M	18.5	1475	35.3	33.5	32.3	92.6	0.86	7.8	119,8	2.0	2.3	76	194.70
180L	22	1475	41.8	39.7	38.3	93.0	0.86	7.8	142,4	2.0	2.3	76	207.90

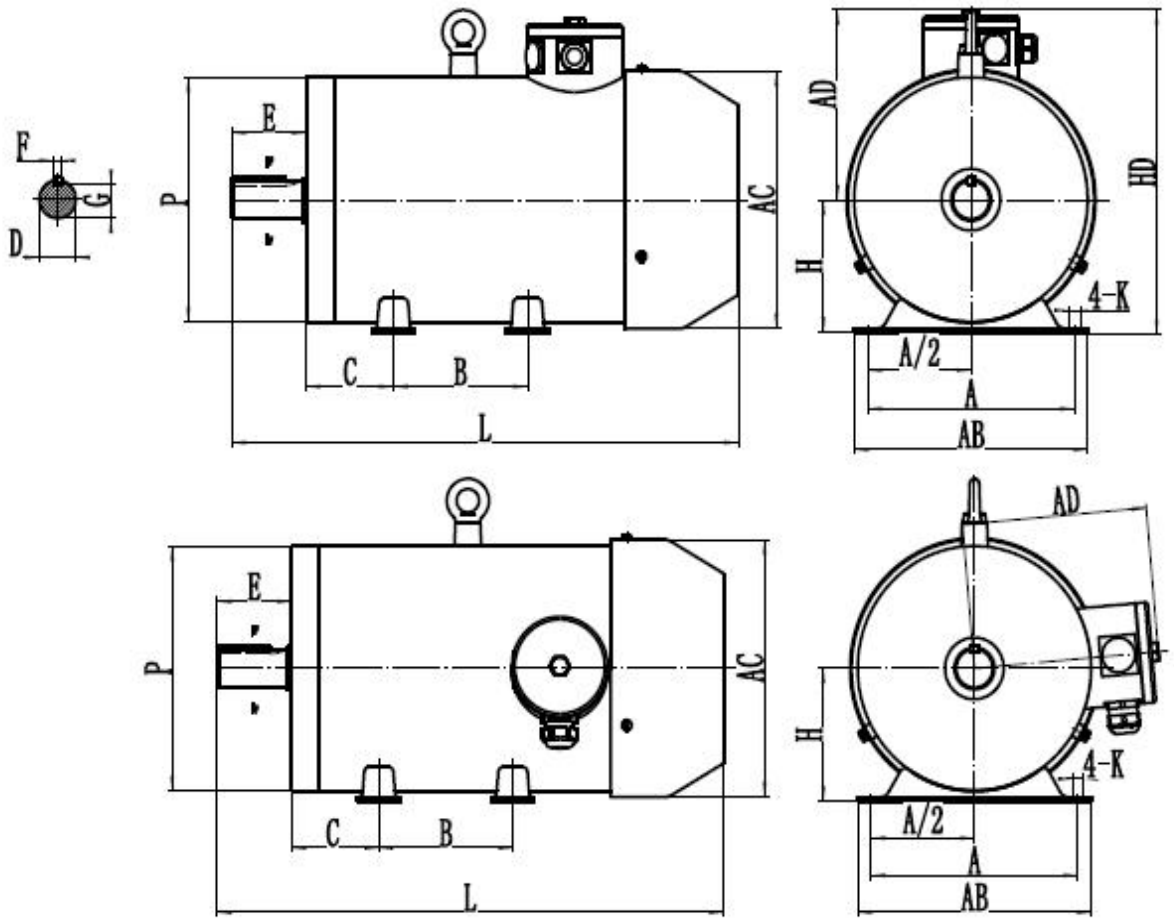
6 poles - 1000 rpm Stainless Steel speed 50Hz - IE3

Frame size	Output (kW)	Full load speed (RPM)	Current full load I_N 50 Hz 380V (A)	Current full load I_N 50 Hz 400V (A)	Current full load I_N 50 Hz 415V (A)	Efficiency at 100% full load	Power factor cos φ at 100% full load	Locked rotor I_L/I_N	Torque Full load torque T_N (Nm)	Torque Locked rotor torque T_L/T_N	Torque Break down torque T_B/T_N	Noise level at 1m dB (A)	Net weight (kg)
80M1	0.37	910	1.1	1.0	1.0	73.5	0.70	5.5	3.9	1.9	2.0	54	16.83
80M2	0.55	905	1.5	1.4	1.4	77.2	0.71	5.8	5.8	1.9	2.1	54	20.24
90S	0.75	940	2.0	1.9	1.9	78.9	0.71	6.0	7.6	2.0	2.1	57	21.78
90L	1.1	935	2.8	2.7	2.6	81.0	0.73	6.0	11.2	2.0	2.1	57	25.30
100L	1.5	955	3.8	3.6	3.5	82.5	0.73	6.5	15.0	2.0	2.1	61	41.47
112M	2.2	960	5.4	5.1	4.9	84.3	0.74	6.6	21.9	2.0	2.1	65	54.45
132S	3	975	7.2	6.8	6.6	85.6	0.74	6.8	29.4	1.9	2.1	69	59.07
132M1	4	975	9.5	9.0	8.7	86.8	0.74	6.8	39.2	1.9	2.1	69	63.69
132M2	5.5	970	12.7	12.0	11.6	88.0	0.75	7.0	54.1	2.0	2.1	69	107.80
160M	7.5	970	16.2	15.4	14.8	89.1	0.79	7.0	73.8	2.0	2.1	70	124.30
160L	11	970	23.1	22.0	21.2	90.3	0.80	7.2	108.3	2.0	2.1	70	183.70
180L	15	975	30.9	29.3	28.2	91.2	0.81	7.3	146.9	2.0	2.1	73	211.20

DIMENSIONS

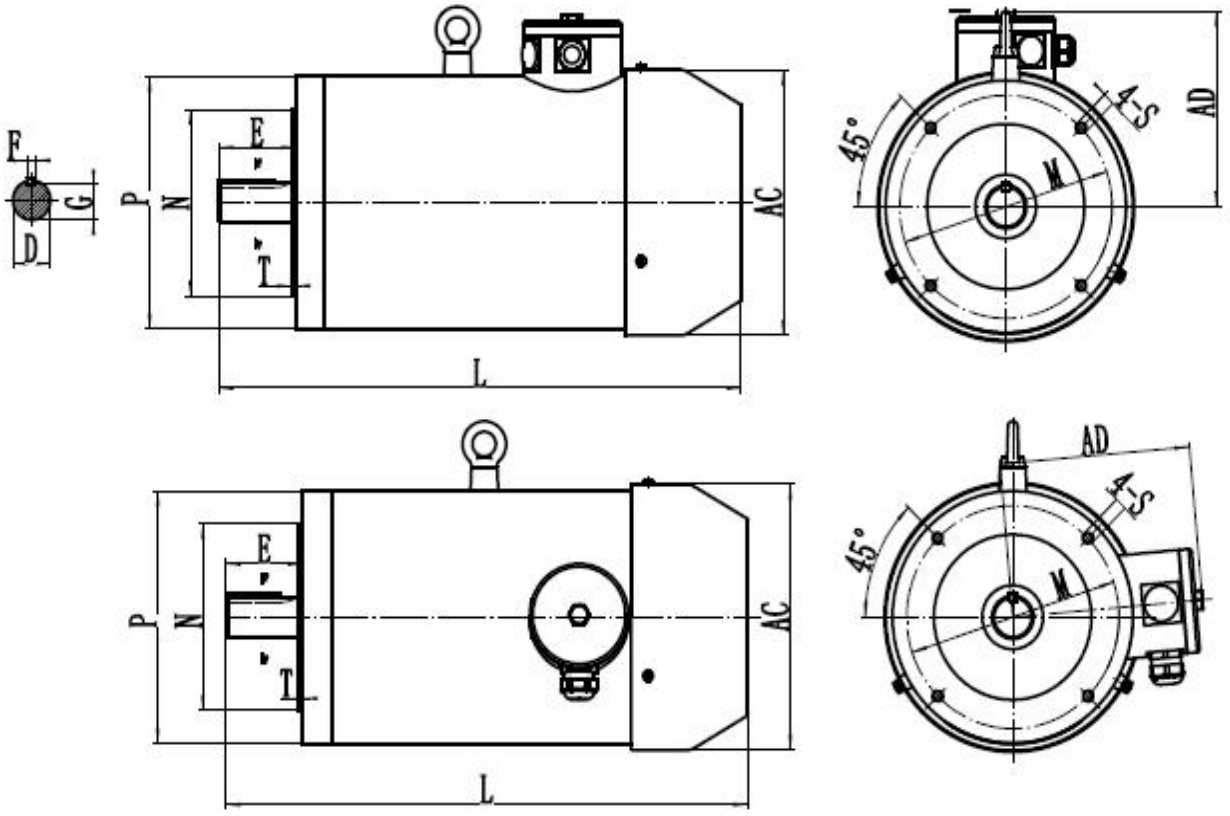
MOTORS CAN BE ORDERED WITH SIDE MOUNTED TERMINAL BOX-BUT THIS IS NON STANDARD

Dimension foot - flange mount B3
ESI frame size 80 to 180



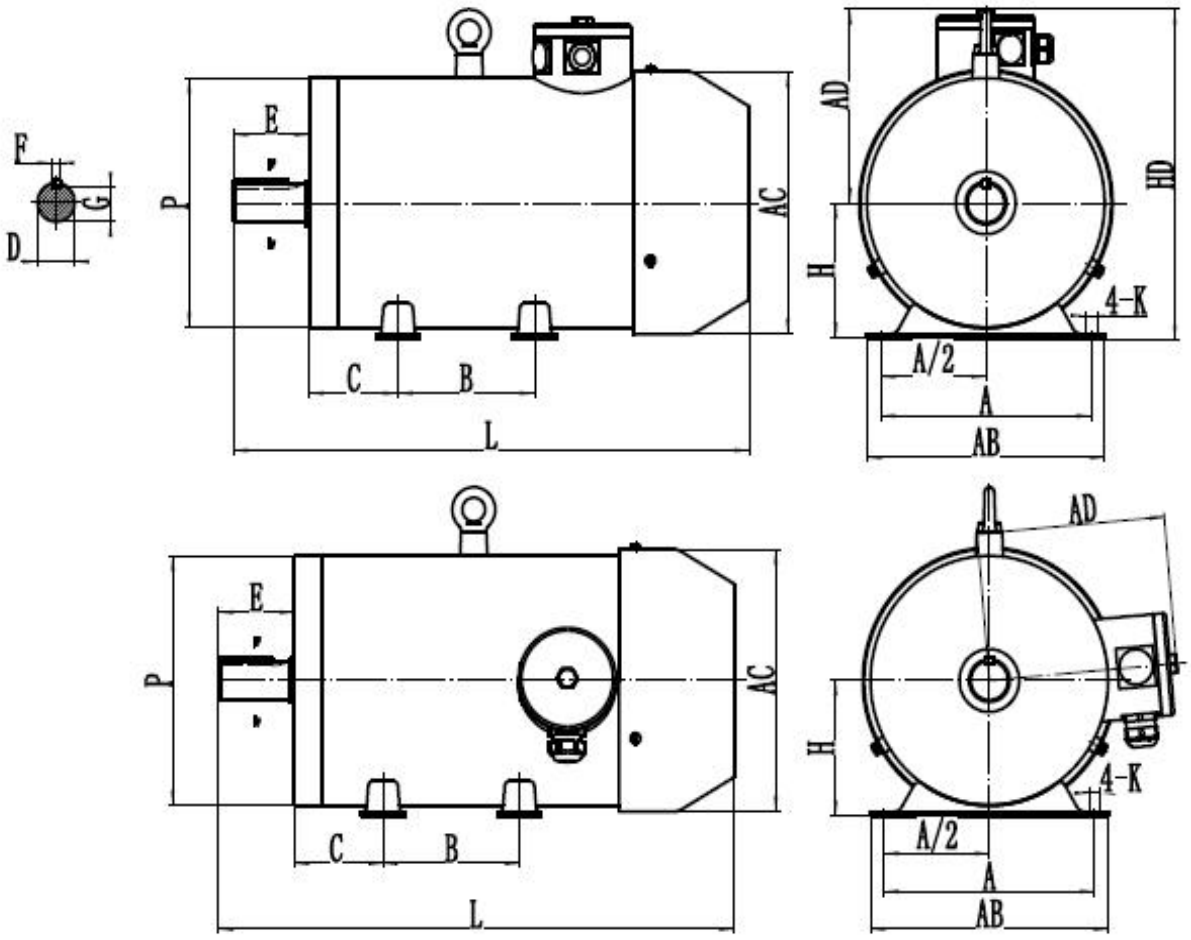
Frame Size	A	B	C	D	E	F	G	P	H	K	AB	AC	AD	HD	K
80	125	100	50	19	40	6	15.5	80	80	10	155	158	135	215	328
90S	140	100	56	24	50	8	20	164	90	10	165	178	150	240	354
90L	140	125	56	24	50	8	20	164	90	10	165	178	150	240	389
100L	160	140	63	28	60	8	24	186	100	12	190	200	150	250	385
112M	190	140	70	28	60	8	24	206	112	12	220	220	180	292	457
132S	216	140	89	38	80	10	33	244	132	12	245	260	200	332	496
132M	216	178	89	38	80	10	33	244	132	12	245	260	200	332	541
160M	254	210	108	42	110	12	37	298	160	15	300	314	240	400	604
160L	254	254	108	42	110	12	37	298	160	15	300	314	240	400	644
180M	279	241	121	48	110	14	42.5	337	180	15	340	355	260	440	709
180L	279	279	121	48	110	14	42.5	337	180	15	340	355	260	440	734

Dimension foot - flange mount B14
ESI frame size 80 to 180



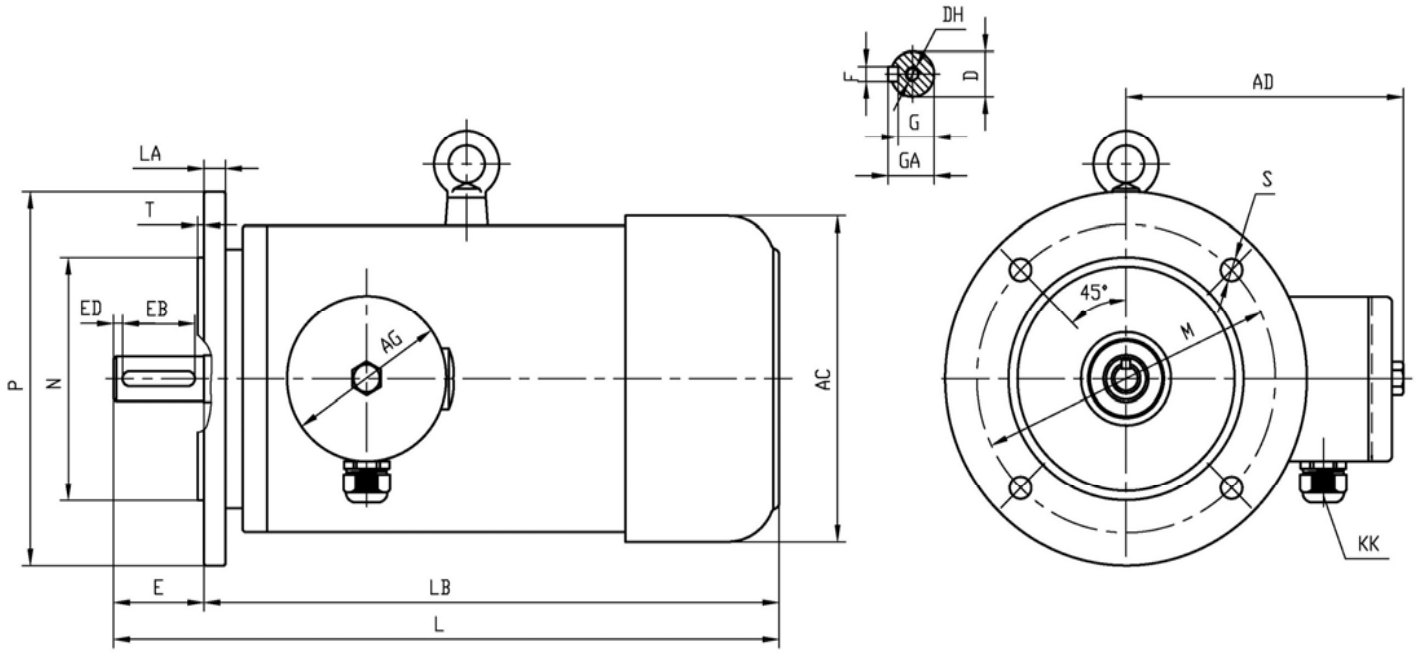
Frame Size	D	E	F	G	M	N	P	S	T	AC	AD	HF	L
80	19	40	6	15.5	100	80	144	4-M6	3	158	135	215	328
90S	24	50	8	20	115	94	164	4-M8	3	178	150	240	354
90L	24	50	8	20	115	94	164	4-M8	3	178	150	240	389
100L	28	60	8	24	130	110	186	4-M8	3.5	200	150	250	449
112M	28	60	8	24	130	110	206	4-M8	3.5	220	180	292	457
132S	38	80	10	33	165	130	244	4-M10	3.5	260	200	332	496
132M	38	80	10	33	165	130	244	4-M10	3.5	260	200	332	541
160M	42	110	12	37	265	230	298	4-M12	4	314	240	400	604
160L	42	110	12	37	265	230	298	4-M12	4	314	240	400	644
180M	48	110	14	42.5	300	250	337	4-M12	4	355	260	440	709
180L	48	110	14	42.5	300	250	337	4-M12	4	355	260	440	734

Dimension foot - flange mount B34
ESI frame size 80 to 180



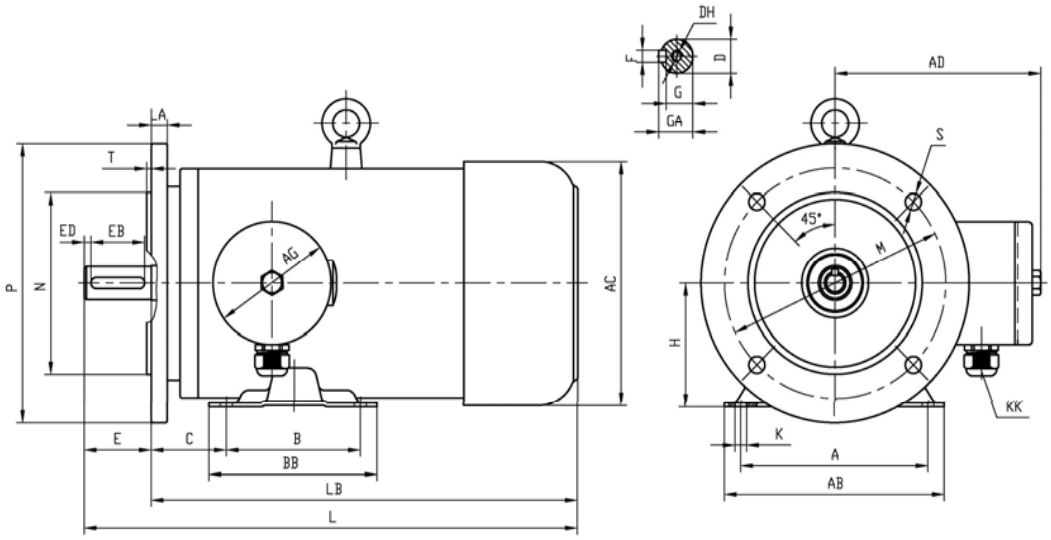
Frame Size	A	B	C	D	E	F	G	H	K	M	N	P	S	T	AB	AC	AD	HD	L
80	125	100	50	19	40	6	15.5	80	10	100	80	144	4-M6	3	155	158	135	215	328
90S	140	100	56	24	50	8	20	90	10	115	94	164	4-M8	3	165	178	150	240	354
90L	140	125	56	24	50	8	20	90	10	115	94	164	4-M8	3	165	178	150	240	389
100L	160	140	63	28	60	8	24	100	12	130	110	186	4-M8	3.5	190	200	160	260	449
112M	190	140	70	28	60	8	24	112	12	130	110	206	4-M8	3.5	220	220	180	292	457
132S	216	140	89	38	80	10	33	132	12	165	130	244	4-M10	3.5	245	260	200	332	496
132M	216	178	89	38	80	10	33	132	12	165	130	244	4-M10	3.5	245	260	200	332	541
160M	254	210	108	42	110	12	37	160	15	265	230	298	4-M12	4	300	314	240	400	604
160L	254	254	108	42	110	12	37	160	15	265	230	298	4-M12	4	300	314	240	400	644
180M	279	241	121	48	110	14	42.5	180	15	300	250	337	4-M12	4	340	355	260	440	709
180L	279	279	121	48	110	14	42.5	180	15	300	250	337	4-M12	4	340	355	260	440	734

Dimension foot - flange mount B5
ESI frame size 80 to 160



Frame size	AC	AD	AG	D	DH	E	EB	ED	F	G	GA	KK	L	LA	LB	M	N	P	S	T
80	150	140	88	19	M6X16	40	30	5	6	15.5	21.5	2-M20X1.5	360	10	320	165	130	200	12	3.5
90S	180	155	88	24	M8X19	50	40	5	8	20	27	2-M20X1.5	370	10	320	165	130	200	12	3.5
90L	180	155	88	24	M8X19	50	40	5	8	20	27	2-M20X1.5	415	10	365	165	130	200	12	3.5
100L	202	170	88	28	M10X22	60	50	5	8	24	31	2-M25X1.5	455	12	395	215	180	250	14.5	4
112M	227	180	98	28	M10X22	60	50	5	8	24	31	2-M25X1.5	455	12	395	215	180	250	14.5	4
132S	267	210	98	38	M12X28	80	65	7.5	10	33	41	2-M25X1.5	530	13	450	265	230	300	14.5	4
132M	267	210	98	38	M12X28	80	65	7.5	10	33	41	2-M25X1.5	550	13	470	265	230	300	14.5	4
160M	326	230	136	42	M16X36	110	90	10	12	37	45	2-M32X1.5	620	15	510	300	250	350	18.5	5
160L	326	230	136	42	M16X36	110	90	10	12	37	45	2-M32X1.5	660	15	550	300	250	350	18.5	5

Dimension foot - flange mount B35
ESI frame size 80 to 160



Frame size	A	AB	AC	AD	AG	B	BB	C	D	DH	E	EB	ED	F	G	GA	H	K	KK	L	LA	LB	M	N	P	S	T
80	125	150	150	140	88	100	125	50	19	M6X16	40	30	5	6	16	22	80	10	2-M20X1.5	360	10	320	165	130	200	12	4
90S	140	165	180	155	88	100	150	56	24	M8X19	50	40	5	8	20	27	90	10	2-M20X1.5	370	10	320	165	130	200	12	4
90L	140	165	180	155	88	125	150	56	24	M8X19	50	40	5	8	20	27	90	10	2-M20X1.5	415	10	365	165	130	200	12	4
100L	160	190	202	170	88	140	170	63	28	M10X22	60	50	5	8	24	31	100	12	2-M25X1.5	455	12	395	215	180	250	15	4
112M	190	225	227	180	98	140	165	70	28	M10X22	60	50	5	8	24	31	112	12	2-M25X1.5	455	12	395	215	180	250	15	4
132S	216	246	267	210	98	140	206	89	38	M12X28	80	65	7.5	10	33	41	132	12	2-M25X1.5	530	13	450	265	230	300	15	4
132M	216	246	267	210	98	178	206	89	38	M12X28	80	65	7.5	10	33	41	132	12	2-M25X1.5	550	13	470	265	230	300	15	4
160M	254	285	326	230	136	210	240	108	42	M16X36	110	90	10	12	37	45	160	14.5	2-M32X1.5	620	15	510	300	250	350	19	5
160L	254	285	326	230	136	254	284	108	42	M16X36	110	90	10	12	37	45	160	14.5	2-M32X1.5	660	15	550	300	250	350	19	5

MOTOR MODIFICATION OPTION

The ESI series can be modified to incorporate one or more of the Kiln timber following options, please contact your nearest. Please contact to Enertech Electric motor (Australia) branch for more details.

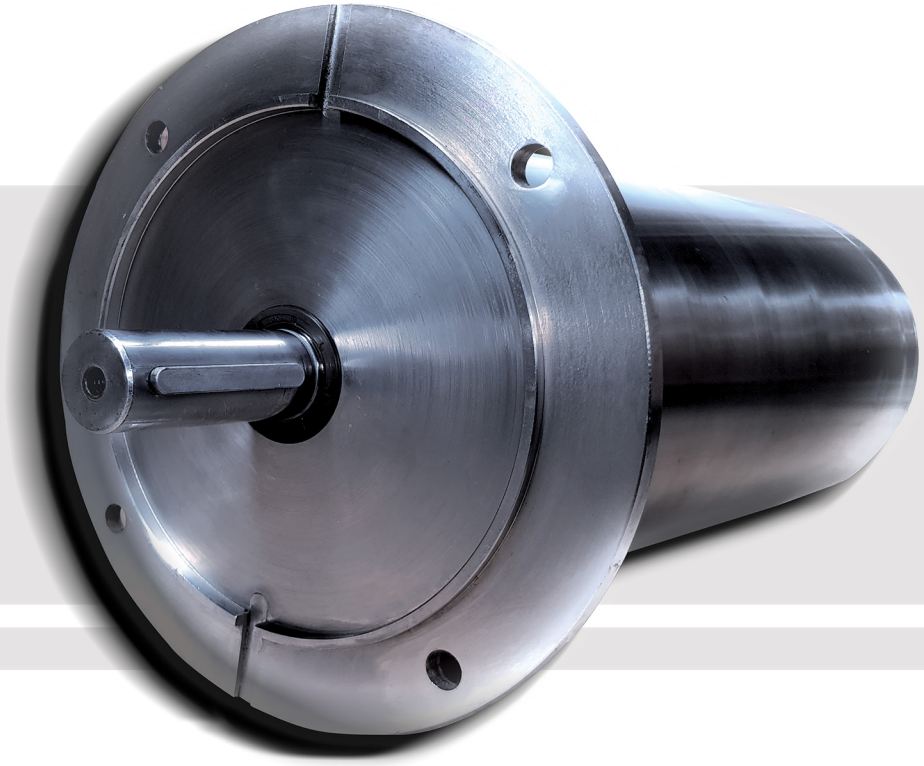
- Anti-condensation heater terminated in the main terminal box.
- Stainless steel shafts.
- Alternative shaft diameters and/or shaft length.
- Double shaft extensions.
- Alternative conduit entry dimensions.
- Alternative bearing arrangements (ball, roller, angular contact or four point contact types).
- 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 for 180°C working environment.
- PTC and condensate heater (optional).
- Grease nipple both DE and NDE bearing for frame size 100L, 112M and 132) if required.
- Especial design for IQF tunner freezer condition.
- Working temperature -49°C max.
- IPSS with Anti-condensation heater terminated in main terminal box.
- IP 66 (optional).
- Air Blast Freezer

STAINLESS STEEL CASTING FOR FREEZER AIR COOLER

DIRECTIVE AND REFERENCE STANDARD

Electric motors are in compliance with the following Directives and specific Standards

2006/95/CE EC	Low Voltage Directive
2011/65/EC EC	RoHS Directive regarding the Restriction of Hazardous Substances in electrical and electronic equipments
2009/125/CE EC	ErP Directive regarding the ecodesign requirements for Energy related Products
640/2009/CE EC	Regulation regarding the ecodesign requirements for electric motors
IEC 60034-1:2011	Rating and Performance
IEC 60034-5:2001	Degrees of Protection
IEC 60034-6:1993	Methods of cooling
IEC 60034-7:1993	Types of construction, mounting arrangements
IEC 60034-8:2008	Terminal marking and direction of rotation
IEC 60034-9:2006	Noise limits
IEC 60034-12:2003	Starting performances
IEC 60034-14:2004	Mechanical vibrations
IEC 600038:2011	European standard voltage
IEC 60072-1:1991	Output dimensions and tolerances
IEC 60034-30:2011	Efficiency classes
IEC 60034-2-1:2011	Efficiency measurement methods

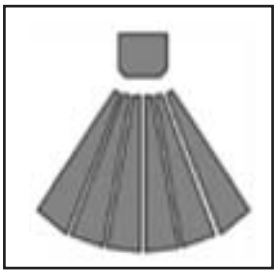


GENERAL TECHNICAL DATA

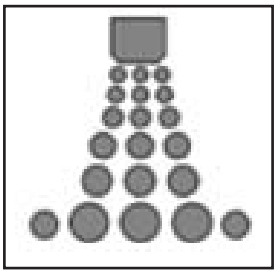
TESTS EXUCUTED

Corrosion, dipping tests have been executed, using the most common cleansing and sanitizing agents on the industrial cleaning market. A particular attention has been paid to the food industry, being the most rigorous application sector requiring frequent rinsing cycles.

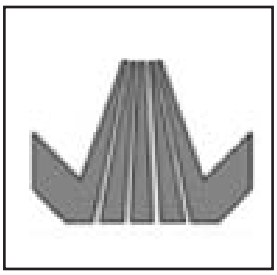
Example of cleansing schedule



Rinsing with cold water from -40 - 50 °C
Rinsing with low pressure from top to bottom in the direction of the drains.
Cleaning of the drains.



Foaming from bottom to top / alkaline: P3-topax 19 2÷5% daily / acid: P3-topax 56 2% on demand / temperature: cold up to -40°C
Contact time: 15 minutes recommended



Washdown with high pressure water 40 - 50°C
Spray disinfection P3-topax 91 1÷2%, 20÷30minutes

APPLICATION FILEDS

Industrial sectors:

- Air Blast Freezer
- Poultry, meat
- Seafood
- Dairy Processing
- Bakery
- Bottling / Beverage
- Pharmaceutical Industry / Cosmetics
- Chemical manufacture
- Tobacco

ESI series for IQF Spiral Freezer & Cooler

- Δ/Y 230/400V-50Hz
- I.Cl.F – IP68 - IC410
- Duty S1
- Stainless steel AISI 304 or AISI 316L construction
- Efficiency IE2 or IE3 (IEC60034-30, IEC60034-2-1 Pn ≥ 0,75kW)

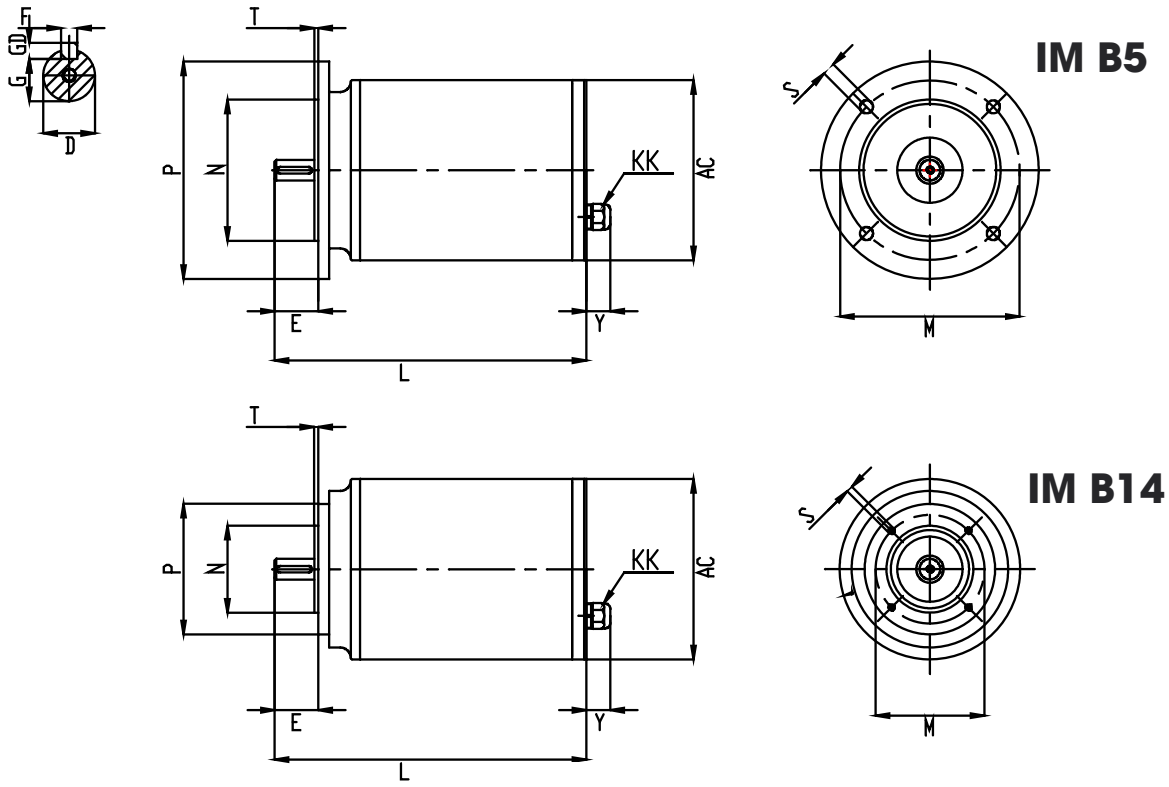
Performance Data

4 Pole - 1500 rpm asynchronous speed 50Hz

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 100 % full load	Torque Full load T_N (Nm)	Locked rotor T_L/T_N	Break down T_B/T_N	Moment of inertia J=1/4 GD ^{2} (kg×m^2)	Net weight (kg)
1500r/min = 4 poles															
0.12	63A	1430	0.44	0.42	0.4	3.5	75	---	---	0.57	0.8	4.5	0.4	0.001 1	10
0.18	63B	1430	0.59	0.56	0.54	3.5	75	---	---	0.62	1.2	4.5	0.54	0.0015	12
0.25	71A	1430	0.74	0.7	0.67	4	80	77	77	0.64	1.7	5	0.67	0.0018	13
0.37	71B	1435	1.16	1.1	1.06	4	80	79	79	0.64	2.5	5	1.06	0.0023	16
0.55	80A	1440	1.47	1.4	1.34	4.5	80	81	81	0.7	3.6	5.4	1.34	0.0041	22
0.75	80B	1440	2.1	2	1.92	6.5	90	80.9	78	0.7	5	5.6	2.6	0.0053	25
1.1	90A	1450	2.94	2.8	2.69	6.6	90	81.8	81	0.7	7.2	6	2.5	0.0075	32
1.5	90B	1450	3.78	3.6	3.46	6.9	95	83.7	83	0.71	9.9	6	2.7	0.0100	40
4	112M	1450	8.5	8.1	7.8	7.7	86.6	86	84	0.82	26.5	2.3	2.7	0.009	46
5.5	132S	1450	11.4	10.8	10.4	7.5	88.1	87.1	86	0.83	36.5	2.2	2.4	0.0223	47
7.5	132M	1455	15.4	14.6	14.1	7.4	88.1	87.1	86	0.84	49.6	2.3	2.5	0.0308	61.5
9.2	132L1	1455	18.5	17.5	16.9	7.5	89.8	88.8	87.5	0.85	61.4	2.2	2.6	0.0410	67
11	132L2	1455	22.2	21.1	20.4	7.5	89.8	88.8	87.5	0.84	72.0	2.2	2.6	0.0780	67
11	160M	1465	22.2	21	20.3	7.5	89.8	88.8	87.5	0.84	72.0	2.2	2.6	0.0780	115
15	160L	1465	29.6	28.1	27.1	7.5	90.6	90.1	87.9	0.85	98.1	2.2	2.4	0.0952	132

TECHNICAL DATA - DIMENSIONS

Stainless Steel casting for Freezer Air Coolers



Size	Bearings		Cable Glands	IMB5						IMB14					
	DE	NDE	KK	M	N	P	R	n x S	T	M	N	P	R	n x S	T
63	6202 2RZ	6202 2RZ	M16X1.5	115	95 j6	140	≤0	4x 10	3	75	60 j6	90	≤0	4x M5	2,5
71	6202 2RZ	6202 2RZ	M20X1.5	130	110 j6	160	≤0	4x 10	3,5	85	70 j6	105	≤0	4x M6	2,5
80	6205 2RZ	6203 2RZ	M20X1.5	165	130 j6	200	≤0	4x 12	3,5	100	80 j6	120	≤0	4x M6	3
90S/L	6205 2RZ	6203 2RZ	M25X1.5	165	130 j6	200	≤0	4x 12	3,5	115	95 j6	140	≤0	4x M8	3
112	6308 2RS C3	6308 2RS C3	M25X1.5	215	180	250	≤0	4 x 14.5	4			------			
132	6308 2RS C3	6308 2RS C3	M25X1.5	265	230	300	≤0	4 x 14.5	4			------			
160	6309 2RS C3	6309 2RS C3	M40X1.5	300	250	350	≤0	4 x 18.5	5			------			

TECHNICAL DATA - DIMENSIONS

Size	Shaft					General		
	D	E	F	G	GD	AC	Y	L
63A	11@M4	23	4	8,5	4	131	22	228
63B								243
71A	14@M5	30	5	11	5	131	25	265
71B								285
80A	19@M6	40	6	15,5	6	166	25	268
80B								288
90S	24@M8	50	8	20	7	166	30	333
90L								373
112	28@M10	60	8	24	7	218	15	437
132S	38@M12	80	10	33	8	218	15	457
132M								495
160	42@M16	110	12	37	8	282	------	610

ESCS - ESI SERIES

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