Three-Phase Asynchronous Motors

Product Catalogue

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AEMOT® ELECTRIC MOTORS

ENG

Three-Phase Asynchronous
Electric Motors

AEMOT®
ELECTRIC
MOTORS


The Performance Transforming Energy In To Power

CORPORATE

AEMOT is one of Turkey's most important manufacturers of electric motors, which has become a specialist in the field of electric motors. The production of the company is in Aksaray on 28,000 m2 closed area, Electric motors from type 63 to 315 body size, between 0.12 kW - 200 kW power ratings, 2-4-6-8-10-12 pole AC three-phase electric motors are manufactured.

In line with customer demands, special electric motors with mechanical and electrical measurements as well as a wide range of standard product types are manufactured.

Having TS EN 60034-1, CE, ISO 9001: 2009 Quality System Certificate and certified by the TSE AEMOT motors are used in various industries in the country. They are used in all industrial products, custom manufactured milling machines, cranes, CNC machines, air and water pumps, gearbox, burners, air conditioning systems and compressors which need action and thus address many important manufacturing and industrial sectors such as mining, marble, feed mill, textile, ventilation, wood, food packaging, heating and cooling, construction and so on.

Looking back, established in 1983, started the production process through patent agreement made with Siemens company, its potential to manufacture products of high quality formed a significant ground for the company to create and expand a portfolio for AEMOT brand at home and abroad.

Today, incorporating AEMOT Motors, Altuntaş Group continues its activities with the AEMOT brand in full capacity. AEMOT Motors has a policy of existence in the industry policy under three main headings;

* Excellent quality of product and service with trained and experienced staff
* Integration with technology and innovation
* Timely and accurate delivery

With these features, AEMOT products are domestically within the reach of many points through authorized dealers and are exported in significant numbers to mainly in Germany, Austria, the Netherlands and other European countries as well as the Middle East and African countries.

AEMOT conducts production and services focused strictly on the principle of "quality and customer satisfaction" in all stages. AEMOT's principle is to be an enterprise with the qualification of "responsible industrialist". Investment in human, flexible and dynamic structure raises customer satisfaction through outstanding products and service.

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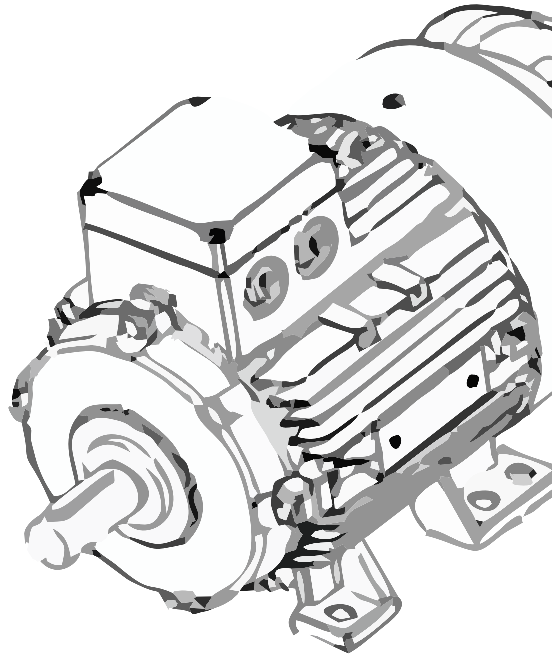


DESCRIPTION OF TYPE CODES

X1	X2	X3	X4	X5	X6
AB	H	112	M	4	A

CODE		DESCRIPTION
X1		Motor body types
	AA	Aluminium frame
	AB	Iron Cast frame
	ABN	Aluminum old type frame
X2		Efficiency class
		IE1 Standard Efficiency
	H	IE2 High Efficiency
	P	IE3 Premium efficiency
X3		Frame Size
	63-315	Shaft axis Height above ground
X4		Frame length
	S	Short
	M	Medium
	L	Long
X5		Number of poles [Rotation Speed]
	2	2 pole, 3000 rpm
	4	4 pole, 1500 rpm
	6	6 pole, 1000 rpm
	8	8 pole, 750 rpm
	2/4	2/4 pole, 3000/1500 rpm
	4/8	4/8 pole, 1500/750 rpm
	6/8	6/8 pole, 1000/750 rpm
X6		Stack length
	A	Short
	B	Medium
	C	Long

AEMOT ELECTRIC MOTORS

Seri No:
3~MOT
IEC/EN 60034
42 kg
MADE IN TURKEY

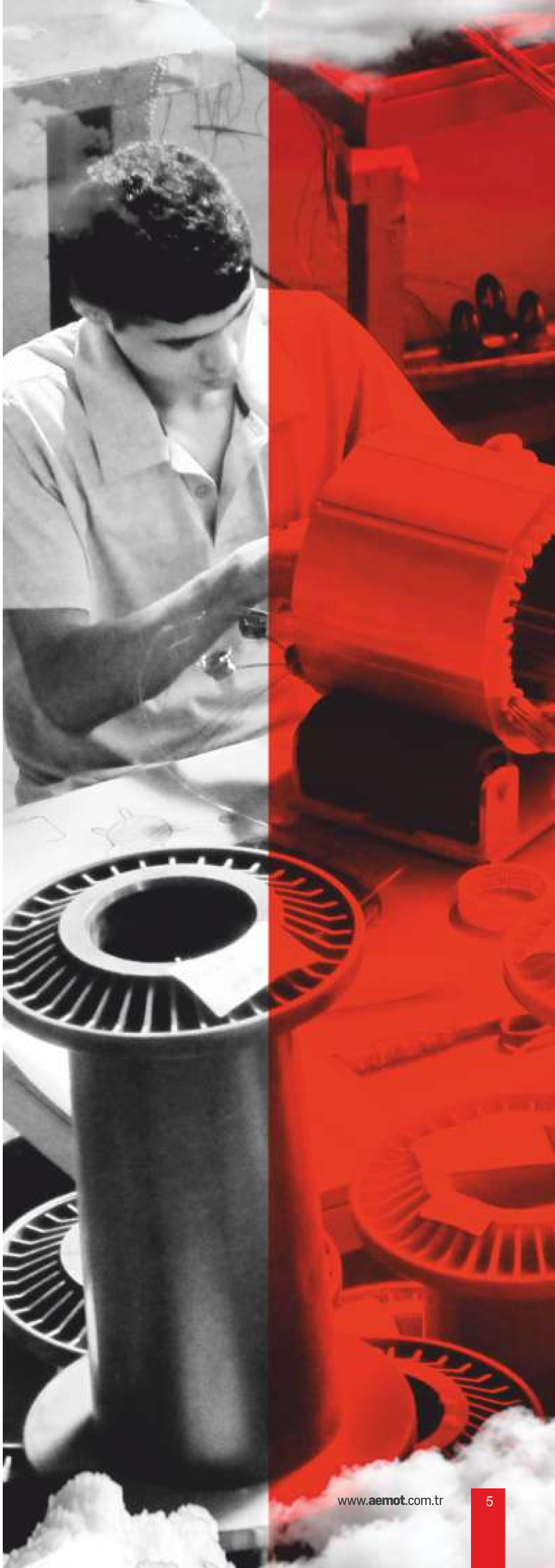
TSE IE2 CE

Tip: AAH 200 L4A
Bearing
DE :6208 ZZ
NE :6208 ZZ

IP55
Izo.F
S1

V	Hz	A	kW	cos	d/dak	IE-CL	Verim 1/2 yük	3/4 yük	1/1 yük
400 △	50	11.3	5.5	0.80	1465	IE2	91.4	91.4	91.6
690 ⅄	50	6.6	5.5	0.80	1465	IE2	91.4	91.4	91.6
460 △	60	10.9	5.5	0.81	1465	IE2	91.4	91.4	91.6
460 ⅄	60	9.9	5.5	0.78	1770	IE2	91.4	91.4	91.6

ABN112M4A	Motor Type Code
3 ~	3-phase Electric Motor
S1	Duty Type
TSE	Turkish Standards Conformity Mark
IE2	Iec Efficiency Class
IEC/EN 60034	Related Standards
Bearing	Bearing Type
Serial No	Motor Serial Number
IP55	Protection Class
İzo.KL	Insulation Class
Kg	Motor Weight
BG	Rated Power (hp)
kW	Rated Power [kw]
Cosφ	Rated Power Factor
50 Hz – 60 Hz	Utility Frequency
rpm	Rotation Speed Of The Motor At Nominal Pow. And Freq.
Δ / ⅄	The Connection Types Of Motor Terminals
V	Rated Operating Voltage
I	Rated Operating Current



GENERAL TECHNICAL INFORMATION

This catalogue has been prepared with the aim of giving information for mechanical and electrical values of 3-phase, cage rotor, completely closed, 63-315 build size asynchronous motors manufactured for public use needed by the industry, in accordance with the "TS" standards of the Turkish Standards Institute and "IEC" standards of the International Electrotechnical Commission. AEMOT motors are manufactured in accordance with national and international standards.

STANDARDS ADHERED TO IN DESIGN

TS	IEC	DIN/EN	DESCRIPTION
TS EN 60034-1	60 034-1	EN 60 034-1	Performance and classification
TS EN 60034-2-2	60 034-2	EN 60 034-2	Losses and efficiency value and calculation methods in rotating electrical machines
TS EN 50 347	60 072-1	EN 50347	Dimensions and nominal power of foot-mounting and flange 3-phase electrical machinery
TS 3209 EN 60034-5/A1	60034-5-AMD1	DIN EN 60 034-5	Protection classes [against foreign objects and dust]
TS 3210 EN 60034-6	60 034-6	EN 60 034-6	Cooling methods
TS 3211 EN 60034-7	60 034-7	EN 60 034-7	Construction types, mounting and terminal box position
TS EN 60034-8/A1	60 034-8	EN 60 034-8	Marking of terminals and direction of rotation
TS EN 60034-9/A1	60 034-9	EN 60 034-9	Noise limit values
TS EN 60 034-11	60 034-11	EN 60 034-11	Thermal protection rules
TS 6848 EN 60 034-12/A1	60 034-12	EN 60 034-12	Starting characteristics
TS EN 60 034-14/A1	60 034-14	EN 60 034-14	Mechanical vibration levels
TS EN 60038	60 038	EN 60 038	Standard voltage
TS EN 60085	60 038	EN 60 085	Classification of insulating material
TS EN 50 347	60 072-1	DIN EN 50347	Cylindrical shaft ends
		DIN 42925	Terminal box cable entries

MECHANICAL FEATURES

HOUSING, END SHIELDS AND FLANGES

Materials of frames, covers and flanges used in AEMOT electric motors are summarized in the following table.

Frame Size	Housings	Covers	Flanges		
			B5	B14 ST.	B14 Special
63	Aluminum	Aluminum	Aluminum	Aluminum	Cast Iron
71					
80					
90					
100					
112					
132	Aluminium or cast Iron	Aluminium or cast Iron	Aluminium or cast Iron	Aluminium or cast Iron	Cast Iron
160			Cast Iron		-
180	Cast Iron	Cast Iron			-
200				-	-
225				-	-
250				-	-
280				-	-
315					

The motor is manufactured with the feet connected to the frame.

2 lifting rings are cast as fixed to the fame in 112 - 160 aluminium frames.

On All cast iron motors of size of between 132-315 are threaded to attach lifting eye in accordance with DIN 580.

MOTOR PROTECTION CLASSES

Motors are classified with the IP code according to their degree of protection. This classification is expressed by initials of "Ingress Protection" and two characteristic digits in accordance with TS 3209 EN 60034-5/AI.

It is a classification that determines the degree to which foreign objects and water penetrating into the motor can access to parts of motor which may cause danger for electric or moving parts of the motor. The first digit specifies the degree of protection against solid matters and the second number specifies the degree of protection against water.

Amount	First Digit Protection Against Solids	Second Digit Protection Against Liquids
	Unprotected	Unprotected
1	Protection against objects larger than 50 mm	Protection against water from vertical
2	Protection against objects larger than 12 mm	Protection against water spray up to an angle of 15 degrees from vertical
3	Protection against objects larger than 2.5 mm	Protection against water spray up to an angle of 60 degrees from vertical
4	Protection against objects larger than 1 mm	Protected against sprayed water from any direction.
5	Protection against dust Complete protection against random contact with voltage in the motor or moving parts inside the body. The amount dust entering the machine would not be sufficient to cause damage to the machine's operation although its influence cannot be prevented completely.	Protection against damaging low-pressure water spray from any direction
6	Fully protected against the ingress of dust	Protection against heavy sea and weather conditions or strong water spray from all directions
7		Protection against immersion for 30 minutes at depths between 15cm and 1m
8		Protection against long-term water immersion at depth of 1-3 m

AEMOT motors are produced in accordance with IP 55 protection rating as standard to operate in dusty and humid environments. Motors can operate in a closed area, without direct sunlight, under mild atmospheric conditions without any additional measures.
It is necessary to take the necessary protective measures, to use a special paint, to select protection class IP56, to use a special lacquer at winding head against excessive humidity, etc. for motors to be used in extremely harsh climate conditions such as high humidity, outdoor conditions, corrosive chemicals or coastal areas.
While ordering, it is necessary to select the appropriate motor, specifying the non-standard environmental conditions.
Upgraded protection class motors are manufactured upon customer demand.

DRAINAGE HOLE FOR CONDENSED WATER AND HEATER TO PREVENT CONDENSATION

In motors to operate in extreme temperature differences or climatic conditions, the drain hole is drilled on the lowest point of the motor in order to drain the condensed water. Drain holes are sealed with plastic blind stopper. If blind stopper is opened, the protection class would be IP44.
If there is the possibility of a dangerous condensation in the winding, water condensation is prevented by placing 1 heater in the total power given in the table below due to special climatic conditions changing in wide temperature ranges or being in a humid environment for a long time. Heaters should be supplied from an independent source and deactivated before motor is started.

Size of Structure	Heater	
	Voltage (V)	Total power (W)
63-71-80-90-100	220	26
112-132	220	42
160-180	220	65
200	220	85
225	220	90
250-280-315	220	100

Another solution to avoid condensation is to use an auto-transformer. A value between 5-10% of the rated voltage and 20-30% of the rated current is applied between UI-VI.

COOLING

Standard AEMOT motor is cooled from the outer surface (TS 3210 EN 60034-6- IC411), with propeller made of Polyamide. Propeller is mounted on motor shaft from the rear and motor rotation direction does not prevent the function of the fan. The propeller is protected by the housing manufactured from perforated sheet allowing sufficient air flow to the rear surface and in size to prevent fingers to enter the holes.
Motor should be mounted, leaving enough space so that the motor's cooling fan is not blocked.
Optionally, motor, cooled by free spread without propeller is produced in accordance with IC410.

TERMINAL BOX

It is on top in the middle for structure size 63-71-80-90-112-132-160; on top on the shaft side for types 100-180-200-225-250-280-315.
Optionally, it can be on the right or left when viewed from the shaft for types 100-112-132-160-180-200-225-250.
Connection box is manufactured in accordance with IP 65 protection class. In addition to 6 cable terminals, there is a grounding screw in the box directly in contact with the body. Connection box is made from the same material as the body material.

CABLE ACCESS

Cable entries to the terminal box are made using standard couplings in holes drilled in accordance with DIN 42 925. Optionally, IP68 waterproof fittings are used.

Size of Structure	Connection box type	Number of terminals	Connector nut	Maximum conductor cross-section	The largest cable outer diameter	Cable Glands
63	KK 63-90	6	M4	1.5	11	M20x1,5k
71	KK 63-90	6	M4	2.5	16	M20x1,5k
80	080 KKK	6	M4	2.5	16	M20x1,5k
90	080 KKK	6	M4	2.5	16	M20x1,5k
100	132 KKK	6	M5	2.5	16	2xM20x1,5
112	132 KKK	6	M5	2.5	16	2xM20x1,5
132	132 KKK	6	M5	6	21	2xM25x1,5
160	160 YENİ KK	6	M6	16	29	2xM32x1,5
180	KK 160-180	6	M6	16	29	2xM32x1,5
200	KK 200-225	6	M8	50	36	2xM40x1,5 M12x1,5
225	KK 200-225	6	M8	50	36	2xM40x1,5 M12x1,5
250	KK 250	6	M10	120	42	2xM50x1,5 M12x1,5
280	KK 280	6	M10	120	42	2xM63x1.5 M12x1,5
315	KK 315	6	M12	240	48	2xM63x1.5 M12x1,5

BEARINGS

ROW BALL BEARING

AEMOT motors have high-quality, smooth-running bearings with fixed balls in conformity with DIN 625-1 and cylindrical roller bearings in conformity with DIN 5412-1. As standard, single-row bearings are used in the drive (front) and fan (back) side, specified in the following table.
Cylindrical roller bearings indicated in the table on page 7 are used when radial force greater than the values in the radial forces table on page 9 are needed. Please contact Aemot for information and ordering if you need motors to operate in great force other than radial forces defined in the table.

ROW BALL BEARING

Motor Type	Number of	* DE Bearing	** NDE Bearing	Figure No
63 M	2-4	6002 ZZC3	6002 ZZC3	Fig. 1 and Fig. 2
71 M	2-4-6-8	6202 ZZC3	6202 ZZC3	
80 M	2-4-6-8	6004 ZZC3	6004 ZZC3	
90 S/L	2-4-6-8	6205 ZZC3	6004 ZZC3	
100 L	2-4-6-8	6206 ZZC3	6205 ZZC3	
112 M	2-4-6-8	6206 ZZC3	6205 ZZC3	
132 S/M	2-4-6-8	6208 ZZC3	6208 ZZC3	
160 M/L	2-4-6-8	6309 ZZC3	6209 ZZC3	Fig.2
180 M/L	2-4-6-8	6310 ZZC3	6210 ZZC3	
200 L	2-4-6-8	6312 ZZC3	6212 ZZC3	
225 S/M	2-4-6	6313 ZZC3	6213 ZZC3	
250 M	2-4-6	6315 ZZC3	6215 ZZC3	
280 S/M	2	6316 ZZC3	6315 ZZC3	
	4-6	6317 ZZC3	6316 ZZC3	
315 S/M/L	2	6217 C3	6217 C3	Fig.3
	4	6319 C3	6318 C3	
	6	6319 C3	6319 C3	

CYLINDRICAL ROLLER BEARING

Please consult us, as cylindrical roller design is needed when you need greater radial power with belt/pulley drive applications. Bearing selection table is for planning and selection purposes. Please consult us for precise knowledge of what types of bearings should be used with motors produced with greater power. Sound and vibration values of NU motors are given on demand. Motors are shipped horizontally, and can be shipped vertically upon request.

Cylindrical Roller Bearings Used in Enhanced Motors

Motor Type	Number of	* DE Bearing	** NDE Bearing	Figure No
180 M/L	2-4-6-8	NU 310 E	6210 ZZC3	Fig.3
200 L	2-4-6-8	NU 312 E	6212 ZZC3	Fig.3
225 S/M	2-4-6	NU 313 E	6213 ZZC3	Fig.3
250 M	2-4-6	NU 315 E	6215 ZZC3	Fig.3
280 S/M	2	NU 316 E	6315 ZZC3	Fig.3
280 S/M	4-6	NU 317 E	6316 ZZC3	Fig.3
315 S/M	2	NU 217 E	6217 C3	Fig.3
315 S/M	4	NU 319 E	6318 C3	Fig.3
315 S/M	6	NU 319 E	6319 C3	Fig.3

Fixed bearing is standard for the shafts of motors with 160 size and over on non-drive end shield. If motors in sizes 180-315, it is manufactured as in Figure 3 with reinforced design, cylindrical roller bearing and lubrication lid. Permissible radial forces and axial forces can be found on page 12 on page 13, respectively.

*** DE: Drive End** **** NDE: Non-Drive End**

BEARING INSTALLATION SCHEMES

Fig. 1 DE Bearing NDE Bearing

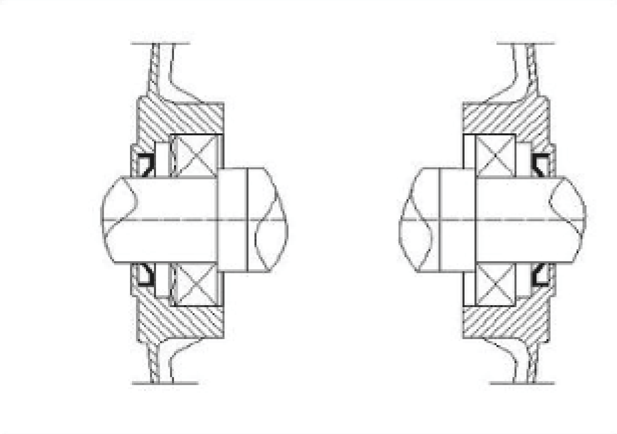


Fig. 2 DE Bearing NDE Bearing

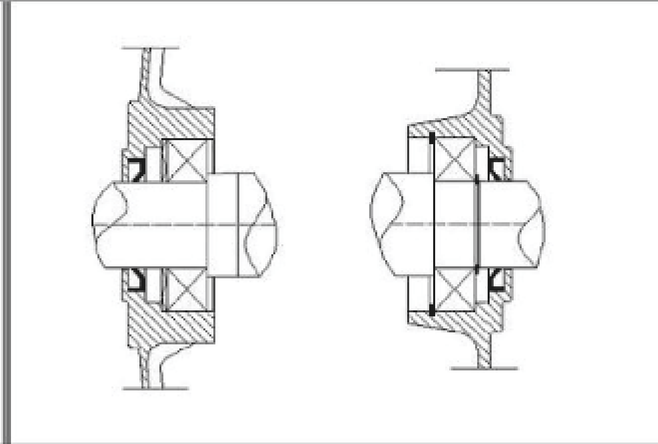


Fig. 3 DE Bearing NDE Bearing

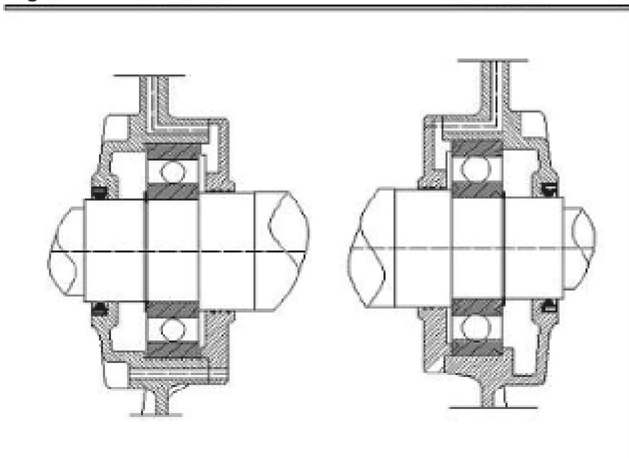
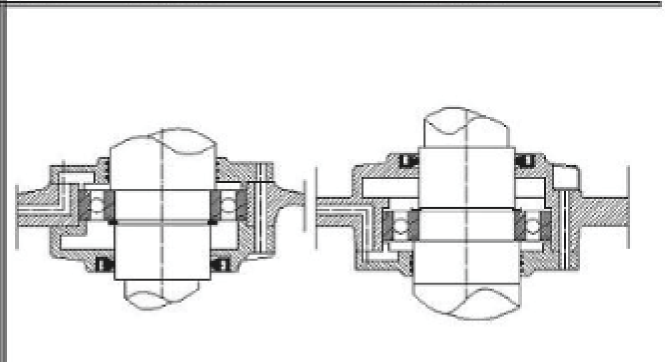


Fig. 4 DE Bearing NDE Bearing



MAINTENANCE OF BEARINGS

A carrier layer of lubricant on the bearings raceway provides the following benefits.
It reduces friction and rolling force,
Reduce wear and rust,
It reduces bearing's operation sound to a minimum level,
It helps to reduce the heat generated by the bearing.
Mineral oil based, lithium-based grease is used in closed type bearings used in motors, with resisting temperature from -30C up to + 180C. Proper grease should be selected according to the conditions if the motor will operate at temperatures higher than 40Co, which is indicated in the catalogue. Open type bearings should be filled with grease up to 1/3 of internal space volume of bearing. Bearings should be lubricated as specified in the maintenance manual. Bearings operating in harsh conditions must be lubricated with a maximum interval of 3 years or less.
Bearing life varies according to horizontal and axial forces on the shaft. If there are no horizontal and axial force on the shaft, bearing life is approximately 40,000 hours. Permissible horizontal and axial forces are prepared in accordance with 20,000 hours of operation life and 50hz network frequency.

PERMISSIBLE MECHANICAL FORCES

The force unit is taken as Newton in the table of permissible radial and axial forces. If mechanical forces on the bearing is more than the values specified in tables, the structural size of the motor, operation type, operating speed, form, board layout, load application point, of the characteristics of the load [variable, direction, size], the type of machine to be driven, motor and machine connection type [pulleys, couplings etc.] should be specified at order stage and the design should be appropriate.

PERMISSIBLE RADIAL FORCES

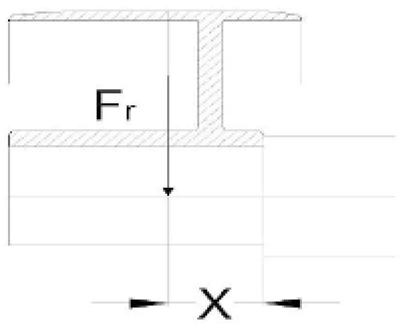


Fig. 6

To calculate the extra radial forces on the shaft, centre of the pulley is considered the axis of force, the force perpendicular to the shaft is called "Fr", the distance of the force of the shaft bill is called "x";

Radial force; $$F_r = 2.10^7.\frac{P.k}{n.D} \quad (N)$$

Fr = radial force,
X = distance between the shoulder of shaft and force application point [mm], the largest value of X is the length of shaft. The axis of the pulley must not exceed the maximum value of x.
P = motor power [kW] n = Speed at full load [rpm]
D=diameter of pulley [mm]
k = belt tension factor [about] will be k = 2, [if it is flat belt and loose pulley and if it is V belt between k = 2 and 2.5; if the flat and multiple V-belt is without pulley, it should be between k = 2.5 and = 3.]

Fixed Bearing Standard Design [Axial Force Fa = 0]

Structural size	3000 rpm		1500 rpm		1000 rpm		750 rpm	
	x_0 (N)	x_{mak} (N)	x_0 (N)	x_{mak} (N)	x_0 (N)	x_{mak} (N)	x_0 (N)	x_{mak} (N)
63	265	235	345	300	-	-	-	-
71	410	350	520	440	620	520	670	570
80	480	400	625	515	730	600	810	670
90	730	610	925	770	1080	900	1210	1000
100	1035	835	1315	1055	1525	1230	1690	1370
112	1030	840	1290	1045	1510	1240	1690	1380
132	1500	1200	1940	1530	2250	1780	2490	1990
160	2800	2230	3340	2610	3740	2890	3740	2890
180	3240	2240	3530	2810	4040	3210	4480	3550
200	4295	3550	5440	4500	6230	5150	6910	5690
225	4770	3970	6025	4800	6890	5510	7640	6110
250	5805	4725	7335	6010	8410	6860	-	-
280	5775	4790	7855	6605	9030	7590	-	-
315	6000	5090	8750	7260	9900	8210	-	-

Cylindrical Roller Bearing Special Design [Axial Force Fa = 0]

Structural size	3000 rpm		1500 rpm		1000 rpm		750 rpm	
	x_0 (N)	x_{mak} (N)	x_0 (N)	x_{mak} (N)	x_0 (N)	x_{mak} (N)	x_0 (N)	x_{mak} (N)
180	7725	6265	9545	7750	10810	8800	11790	9570
200	10580	8720	13050	10750	14660	12160	16070	13270
225	12610	10510	15590	12390	17590	13090	19280	15380
250	16690	13690	20680	16880	23420	19120	-	-
280	16780	14180	22080	16580	24970	20980	-	-
315	18050	15550	29000	23750	32650	26850	-	-

PERMISSIBLE AXIAL EXTERNAL FORCES

Hard Ball Bearing Standard Design																
Str. Size	HORIZONTAL SHAFT				VERTICAL SHAFT											
	Pull	Push			Shaft Down						Shaft Up					
					Force Down			Force Up			Force Down			Force Up		
		Maks.Fr			Maks.Fr			Maks.Fr			Maks.Fr			Maks.Fr		
	Fr=0	Xo	Xm	Fr=0	Xo	Xm	Fr=0	Xo	Xm	Fr=0	Xo	Xm	Fr=0	Xo	Xm	Fr=0
	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
2 pole [3000 rpm]																
63	80	170	150	220	70	70	70	180	150	230	160	140	210	90	90	90
71	100	190	160	240	90	90	90	200	170	250	170	140	230	110	110	110
80	150	330	280	420	130	130	130	350	290	440	310	260	410	170	170	170
90	170	360	300	440	140	140	140	380	330	480	320	260	420	200	200	200
100	230	500	410	600	180	180	180	530	450	660	440	350	570	280	280	280
112	230	500	420	600	170	170	170	540	460	670	430	350	560	290	290	290
132	370	730	600	840	220	220	220	840	710	1020	550	420	720	520	520	520
160	1670	1110	860	1250	1230	970	1490	1290	1030	1550	810	550	1070	1710	1450	1970
180	1840	1210	940	1320	1270	1000	1570	1480	1210	1780	760	480	1050	2000	1730	2290
200	2610	1930	1610	2110	1850	1510	2250	2290	1960	2690	1350	1010	1750	2790	2460	3190
225	2850	2100	1760	2290	1950	1590	2420	2540	2180	3000	1390	1030	1860	3100	2740	3560
250	3150	2440	1980	2610	2020	1540	2560	3030	2550	3570	1480	1010	2020	3560	3090	4110
280	5230	4450	4070	4700	3740	3310	4450	5280	4840	5980	3210	2770	3910	5810	5380	6520
315	5120	4810	5080	5120	2740	2320	2440	7140	6720	7840	2740	2320	3440	7140	6720	7840
4-pole [1500 rpm]																
63	80	270	240	330	70	70	70	270	240	350	260	230	330	90	90	90
71	100	290	250	360	90	90	90	300	260	370	270	230	340	110	110	110
80	150	500	430	620	130	130	130	520	450	650	470	400	600	170	170	170
90	170	550	470	660	130	130	130	580	500	710	500	420	630	210	210	210
100	230	750	640	890	160	160	160	800	690	980	670	550	840	300	300	300
112	230	760	650	880	140	140	140	820	710	990	650	540	820	320	320	320
132	370	1110	940	1260	200	200	200	1230	1060	1470	900	730	1140	540	540	540
160	2130	1530	1200	1710	1560	1220	1900	1760	1420	2110	1140	800	1480	2180	1840	2530
180	2360	1680	1330	1840	1650	1280	2040	2010	1640	2400	1130	760	1520	2530	2160	2920
200	3390	2630	2200	2890	2460	2010	2990	3040	2590	3580	1960	1510	2490	3540	3090	4080
225	3680	2890	2330	3120	2510	1930	3130	3440	2870	4060	1950	1370	2570	4000	3430	4620
250	4090	3320	2710	3550	2640	2010	3370	4040	3410	4770	2110	1480	2830	4580	3950	5300
280	7090	6750	6270	7090	4930	4320	5940	8000	7390	9010	4930	4320	5940	8000	7390	9010
315	7870	7470	7420	7870	4650	3900	5780	10230	9450	11330	4650	3900	5780	10230	9450	11330
6 pole [1000 rpm]																
71	100	360	320	450	80	80	80	380	330	470	340	300	430	120	120	120
80	140	630	550	770	110	110	110	660	570	810	590	500	740	170	170	170
90	170	690	590	820	120	120	120	720	620	880	630	530	780	220	220	220
100	230	950	810	1110	150	150	150	1010	860	1210	850	710	1060	310	310	310
112	230	950	820	1100	130	130	130	1020	890	1230	820	690	1020	330	330	330
132	360	1380	1180	1570	160	160	160	1530	1320	1810	1140	930	1420	560	560	560
160	2490	1860	1470	2060	1800	1390	2210	2140	1740	2550	1380	970	1790	2560	2160	2970
180	2750	2030	1610	2230	1930	1500	2400	2380	1950	2850	1420	980	1880	2900	2470	3360
200	3940	3150	2640	3440	2830	2310	3470	3630	3100	4260	2330	1810	2970	4130	3600	4760
225	4260	3470	2820	3700	2830	2140	3560	4180	3490	4910	2270	1580	3000	4740	4050	5470
250	4780	3970	3250	4240	3090	2350	3950	4810	4060	5660	2560	1810	3420	5340	4600	6200
280	8370	7980	7370	8370	5930	5210	7120	9310	8590	10530	5930	5210	7120	9310	8590	10530
315	9200	8730	8820	9200	5290	4410	6630	12230	11330	13530	5290	4410	6630	12230	11330	13530
8 pole [750 rpm]																
71	100	420	370	520	80	80	80	440	390	540	400	350	500	120	120	120
80	140	730	630	880	110	110	110	750	650	920	680	590	860	170	170	170
90	170	810	700	960	120	120	120	840	730	1020	750	630	930	220	220	220
100	230	1110	950	1310	150	150	150	1170	1010	1410	1010	850	1250	310	310	310
112	230	1110	950	1280	130	130	130	1180	1030	1410	980	820	1210	330	330	330
132	360	1620	1390	1860	190	190	190	1750	1510	2080	1400	1170	1730	530	530	530
160	2780	2110	1660	2360	2040	1590	2500	2380	1930	2840	1620	1170	2080	2800	2350	3260
180	3060	2310	1840	2540	2150	1660	2670	2700	2210	3220	1630	1150	2150	3220	2730	3740
200	4430	3570	2990	3930	3250	2650	3960	4040	3450	4750	2750	2150	3460	4540	3950	5250
225	4800	3890	3150	4240	3340	2570	4160	4530	3770	5360	2780	2010	3600	5090	4330	5920
250	5320	4470	3670	4780	3460	2630	4420	5370	4530	6330	2930	2090	3890	5910	5070	6870
280	9510	9020	8260	9510	6960	6150	8310	10230	9420	11630	6960	6150	8310	10230	9430	11630
315	10430	9910	9820	10430	6380	5390	7890	13330	12330	14830	6380	5390	7890	13330	12330	14830

Cylindrical Roller Bearing Standard Design

Str. Size	HORIZONTAL SHAFT				VERTICAL SHAFT											
					Shaft Down						Shaft Up					
	Pull	Push			Force Down			Force Up			Force Down			Force Up		
		Maks.Fr			Maks.Fr			Maks.Fr			Maks.Fr			Maks.Fr		
	Fr=0	Xo	Xm	Fr=0	Xo	Xm	Fr=0	Xo	Xm	Fr=0	Xo	Xm	Fr=0	Xo	Xm	Fr=0
	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
2 pole [3000 rpm]																
180	2840	2420	1800	2840	1770	1350	2570	2700	2070	3300	1970	1350	2570	2700	2070	3300
200	3730	3180	2400	3730	2590	1810	3370	3540	2750	4310	2590	1810	3370	3540	2750	4310
225	4180	3510	2620	4180	2800	1900	3750	3950	3050	4900	2800	1900	3750	3950	3050	4900
250	5030	4180	2910	5030	3230	1950	4440	4780	3490	5990	3230	1950	4440	4780	3490	5990
280	5210	4110	2980	4680	3260	2120	4360	4970	3820	6070	2730	1580	3830	5500	4360	6600
315	5210	5040	3940	5210	2800	1680	3820	6450	5330	7460	2800	1680	3820	6450	5330	7460
4-pole [1500 rpm]																
180	3780	3220	2410	3780	2670	1850	3460	3550	2730	4330	2670	1850	3460	3550	2730	4330
200	4970	4220	3200	4970	3550	2520	4570	4630	3600	5650	3550	2520	4570	4630	3600	5650
225	5550	4680	3280	5550	3740	2330	4990	5240	3830	6490	3740	2330	4990	5240	3830	6490
250	6670	5570	3910	6670	4370	2690	5960	6300	4630	7890	4370	2690	5960	6300	4630	7890
280	7130	6230	4660	7130	4470	3160	6070	7300	5990	8900	4470	3160	6070	7300	5990	8900
315	7870	7370	5250	7870	3940	1800	5780	9490	7350	11330	3940	1800	5780	9490	7350	11330
6 pole [1000 rpm]																
180	4480	3810	2870	4480	3200	2250	4120	4170	3210	5090	3200	2250	4120	4170	3210	5090
200	5840	4980	3800	5840	4170	2970	5360	5470	4270	6660	4170	2970	5360	5470	4270	6660
225	6530	5560	3930	6530	4360	2710	5830	6270	4620	7740	4360	2710	5830	6270	4620	7740
250	7890	6610	4670	7890	5200	3240	7060	7450	5490	9310	5200	3240	7060	7450	5490	9310
280	8420	7350	5490	8420	5400	3520	7260	8520	6640	10430	5400	3520	7260	8520	6640	10430
315	9200	8770	6300	9200	4470	1950	6630	11330	8860	13530	4470	1950	6630	11330	8860	13530
8 pole [750 rpm]																
180	5030	4290	3230	5030	3610	2550	4640	4680	3610	5710	3610	2550	4640	4680	3610	5710
200	6600	5610	4280	6600	4790	3450	6130	6090	4750	7430	4790	3450	6130	6090	4750	7430
225	7390	6210	4400	7390	5110	3270	6750	6860	5020	8510	5110	3270	6750	6860	5020	8510
250	8830	7400	5250	8830	5860	3690	7940	8300	6130	10430	5860	3690	7940	8300	6130	10430
280	9540	8240	6170	9540	6340	4240	8430	9370	7270	11530	6340	4240	8430	9370	7270	11530
315	10430	9790	7030	10430	5470	2660	7890	12330	9570	14830	5470	2660	7890	12330	9570	14830

Shaft End

Standard motors have only one cylindrical shaft end and they comply with the standard EN 50347 [IEC 60072-1]. Key seat in sizes specified in the standard is gained on motor shaft and shipped as key installed. Shaft end is threaded compatible with DIN 332-2. The second shaft end can be provided with additional costs.
Shaft end runout, the concentricity of the flange face and steepness of surface are in compliance with EN 50347 [IEC 60 072-I]. Increased accuracy - tolerance R [reduced] can be provided, if requested.
Aemot Motors has the capability to manufacture all kinds of special motors on request.

Vibration

All rotors are dynamically balanced with a half key compatible with DIN EN 60034-14/A1. Therefore, any balance of the drive element to be mounted to the shaft [pulleys, gears, couplings, etc..] should be taken with a flat mandrel without pin.
Motors are supplied in vibration class "N" [normal] and vibration class "R" [reduced] and vibration Class "S" [special] can be available upon request.
Brake motors can not be delivered in vibration class "S" [special].

Active Vibration Severity Limits in mm/sec with Shaft Height H [mm]				
Adjustment	Speed range rpm	Limit values for the vibration speeds for the following structural sizes at		
		63<H<132	132<H<225	250<H<400
N [normal]	600-3600	1.8	2.8	3.5
R [reduced]	600-1800	0.71	1.12	1.8
	1801-3600	1.12	1.8	2.8
S [special]	600-1800	0.45	0.71	1.12
	1801-3600	0.71	1.12	1.8

* There may be ± 10% difference between the calculated and the actual values.

SOUND [NOISE] LEVELS

Noise measurement of standard AEMOT motors is carried out in a sound proof room as specified in the standard TS EN 60034-9/A1. There are three factors causing noise: magnetic forces, bearings and cooling fan.

Magnetic forces: It is caused by vibration of the stator.
Bearings: Noises that occur in balls and rollers.
Cooling fan: Noise caused by the air flow.

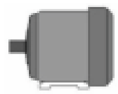
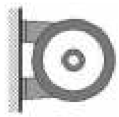
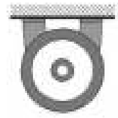
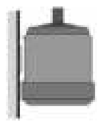
The most active of the three main sources of noise the noise from cooling fan.
The values indicated in the table below are the values specified in the 50 Hz mains frequency. About 4 dB [A] should be added to these values to find the values for 60 Hz.

Surface - Sound pressure level LPA				
Size of Structure	2-pole dB [A]	4-pole dB [A]	6-pole dB [A]	8-pole dB [A]
63	51	43	-	-
71	58	46	43	43
80	60	50	46	44
90	63	52	52	50
100	65	55	54	53
112	66	57	55	54
132	70	61	59	57
160	74	65	63	62
180	75	67	65	63
200	75	67	65	63
225	77	69	67	65
250	79	71	69	67
315	82	76	73	-

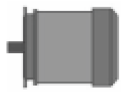
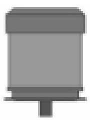
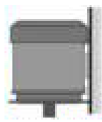
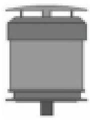
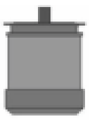
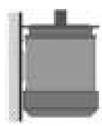
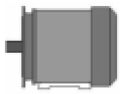
All the data recorded for the LpA may vary ± 3 dB [A].

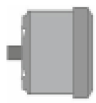
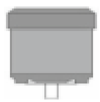
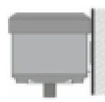
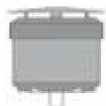
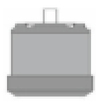
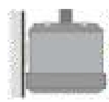
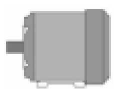
CONSTRUCTION TYPES AND MOUNTING ARRANGEMENTS [TS 3211 EN 60034-7]

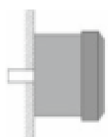
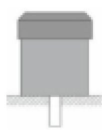
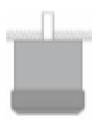
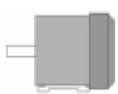
No Flange

Symbol	Connection Type	Description	Construction Size
IM B3 / IM 1001		Floor Mounted	All
IM B6 / IM 1051, IM B7 / IM 1061, IM B8 / IM 1071	 Wall Mounted  Wall Mounted  Ceiling Mounted		All
IM V5 / IM 1051		Wall Mounted, shaft end facing downward	All
IM V6 / IM 1031		Wall Mounted, shaft end facing upward	All
IM V5 / IM 1031 With rain protection		shaft end facing downward	All

Flang e (B5)

Symbol	Connection Type	Description	Construction Size
IM B5 / IM 3001		Flange Mounted	All
IM V1 / IM 3011 IM V15 / IM 2011 No Rain Protection	 Flange Mounted  Wall Mounted	Wall Mounted, shaft end facing downward	All
IM V1 / IM 3011 With rain protection		Flange Mounted, shaft end facing	All
IM V3 / IM 3031	 Flange Mounted  Wall Mounted	Wall Mounted, shaft end facing upward	All
IM B35 / IM 2001		Floor Mounted. Flange connected	All

Symbol	Connection Type	Standard Flange (B14) Description		Construction Size
IM B14 / IM 3601		Flange Mounted		All
IM V18 / IM 3611 IM V58 / IM 2111 No Rain Protection	 Flange Mounted	 Wall Mounted	Flange. Shaft end facing downward	All
IM V18 / IM 3611 With rain protection		Flange Mounted, shaft end facing		All
IM V19 / IM 3631 IM V69 / IM 2131	 Flange Mounted	 Wall Mounted	Shaft end facing upward	All
IM B34 / IM 2101		Floor Mounted. Flange connected		All

Symbol	Connection Type	Standart Flanşlı (B14) Description	Construction Size
IM B9 / IM 9101		Front Mounted	All
IM V8 / IM 9111		No feet, no cap, mounted by front of the frame Shaft end facing downward	All
IM V9 / IM 9131		No feet, no cap, mounted by front of the frame Shaft end facing upward	All
IM B15 / IM 1201		No front cap, foot mounted	All

VOLTAGE AND FREQUENCY

As a standard practice, motors are designed according to 400V voltage and 50Hz frequency. In line with customer requirements, they can be produced in the range of 42-690 V voltage range and 50-60 Hz frequency range. No change in the power of the motor is observed during ± 5% variation in the voltage and ± 2% variation in the frequency.
Temperature of motors operating continuously in the upper and lower voltage values can exceed 10K over the maximum permissible temperature rise depending on the winding insulation class [B:80K, F:100K H:125K].
When motors designed for 50 Hz frequency is operated at 60 Hz network, to detect electrical values □□they should be multiplied with the following coefficients.

50 Hz	60 Hz								
Rated Voltage V	Network Voltage V	Full Load Operating Specifications							
		Power	Speed	In	Io	Ia/In	Mn	Ma/Mn	Mk/Mn
230	230	1	1.2	1	0.73	0.87	0.83	0.75	0.85
	250	1.1	1.2	1	0.85	0.96	0.91	0.83	0.94
	264	1.15	1.2	1	0.93	1	0.96	0.93	1
	278	1.2	1.2	1	0.98	1.03	1	0.96	1.03
400	400	1	1.2	1	0.73	0.87	0.83	0.75	0.85
	440	1.1	1.2	1	0.85	0.96	0.91	0.83	0.94
	460	1.15	1.2	1	0.93	1	0.96	0.93	1
	480	1.2	1.2	1	0.98	1.03	1	0.98	1.03
500	500	1	1.2	1	0.73	0.87	0.83	0.75	0.85
	550	1.1	1.2	1	0.85	0.96	0.91	0.83	0.94
	575	1.15	1.2	1	0.93	1	0.96	0.93	1
	600	1.2	1.2	1	0.98	1.03	1	0.98	1.03

Up to 20% increase in power can be observed at motors designed as 60 Hz.

Standard Power [kW] 50 Hz	Standard Power [kW] 60 Hz	Standard Power [kW] 50 Hz	Standard Power [kW] 60 Hz	Standard Power [kW] 50 Hz	Standard Power [kW]
0.09	0.108	2.2	2.64	30	36.0
0.12	0.144	3	3.40	37	44.4
0.18	0.216	4	4.8	45	54
0.25	0.30	5.5	6.6	55	66
0.37	0.444	7.5	9.0	75	90
0.55	0.66	11	13.2	90	108
0.75	0.90	15	18.0	110	132
1.1	1.32	18.5	22.2	132	158
1.5	1.80	22	26.4	160	192

RATED POWER

The rated power of the motor is referred to as mechanical power obtained from the motor shaft at nominal current and voltage values printed on the label of the motor.
Electrical power (Pe); is the power drawn from the mains and is greater than the mechanical power obtained from the motor shaft due to losses.

$$P_e = \sqrt{3}.U.I.\cos\varphi$$

The efficiency of the motors (η) refers to the ratio of the mechanical power obtained from the motor shaft with electrical power drawn from the mains. Efficiency rates printed in the motor catalogue are calculated by the method specified in TSI EN 60034-2-2.
Electrical values specified in motor catalogue are valid at ambient temperature of 25 ºC, altitude up to 1000 and continuous operation (S1) and does not include the special operation conditions. In applications where temperature and altitude values are not met power obtained from motor shaft varies as indicated in the tables.

Temperature [Pn] effect;

Ambient Temperature	ºC	≤30	40	45	50	55	60
P_N	%	110	100	95	90	85	80

Temperature [Pn] effect;

Height	m	1000	2000	3000	4000
(P_N)	%	100	95	90	80

Under circumstances where both altitude and ambient temperature change at the same time, new nominal power coefficient will be obtained by multiplying corresponding coefficients.
When the ambient temperature is in the range of 30-40 oC in motors operating at altitudes over 1000 m, the power obtained from the motor shaft will not change if a reduction of 1 º C in temperature for insulation class F and 1.25 º C for insulation class H at increases of height every 100m.

OVERLOAD

If 1.5 times of the rated current passes through the coils for a period of maximum 2 minutes with intervals of 15 minutes while a standard AEMOT is running in a regime temperature, the temperature rise at a level that will damage the winding will not occur. In addition, the motor is manufactured to withstand 1.6 times excessive torque of the nominal torque for 15 seconds when running at nominal voltage and frequency.
Outside this periods of time, the load of motor depends upon factors such as overcurrent and excessive torque values applied, the operating conditions of the motor, the application duration, frequency of the load or current , motor's being at regime temperature.

RATED TORQUE

The torque in Nm [Newton-meters] from motor shaft is expressed as follows:

$$M = \frac{9{,}55.P_N.1000}{n}$$

P_N: Nominal output power in kW
N: the nominal speed in terms of rpm
1 kgfm = 9.81 Nm ≈ 10 Nm

INSULATION CLASS

We produce standard motors with class F insulation.
As defined in the standards, permissible temperature rise limit for Class F is 105K. We produce motors to operate within limits of Class B [80K] to improve both the performance and lifetime. In such a motor designed in this way, the maximum level in the ambience temperature is elevated and the power factor is drawn upwards.
For example, operating ambient temperature of a motor produced as Class F and designed at class F temperature rise limit must be 40 ºC at a maximum. Operating ambient temperature of a motor produced as Class F and designed at class B temperature may rise up to -40 ºC at a maximum. Similarly, AEMOT motors produced as class F and and designed at class B temperature rise limit can exceed the nominal power 10% - 15% and show a better performance against network fluctuations.
Enamelled copper wire used as a standard is supplied in class H [180 ºC].
To maximize the thermal conductivity of motor windings and to prevent the vibration of the motor windings, it is used with synthetic and water based varnish in class H, and then oven-dried.

OPERATION DUTY

Operation duties are as described in TS EN 60034-1. Modes of operation are expressed by abbreviations through S1-S10. The operating regime in operational type S4, S5 and S7 is an operating program that includes the application periods and orders of loads applied to the motor as well as start and stop periods of motor without load.
Electric motors are produced according to a wide range of operating conditions. Standard operation duty is described in IEC 60034 -1.

Symbol	Description	Example
S1	**Continuous Operation** Operating of the motor under constant load until it reaches a thermal equilibrium.Short-Time Duty	S1
S2	**Short-Time Duty** Operating of motor at constant load for a shorter period of time which is less than the time required to reach thermal equilibrium in sufficient time so as a period of no energy and rest follow in order to be able to keep the motor's temperature within coolant temperature of 2 K.	S2 - 60 dak
S3	**Periodic Intermittent Duty** A sequence of identical cycles without a thermal steady state being reached. Each cycle is composed of a time with constant loading and a pause. In this duty, the starting current should have practically no effect on the increase in temperature.	S3 - %25
S4	**Periodic Intermittent Duty with influence of the start-up process** It can be defined as a sequence of identical cycles without a thermal steady state being reached. Each cycle is composed of a noticeable starting time, a time with constant loading and a pause. S4 is followed by cyclic period factor and moment of inertia of the motor and moment of inertia of the load [J_ext], both of which belong to motor shaft.	S4 - %25 $J_M = 0{,}15\ (kgxm^2]$ $J_{ext} = 0{,}7\ (kgxm^2)$
S5	**Periodic Intermittent Duty with Electrical Braking** It can be defined as a sequence of identical cycles without a thermal steady state being reached. Each cycle is composed of a noticeable starting time, a time with constant loading, electrical breaking period, resting and a pause. S5 is followed by cyclic period factor and moment of inertia of the motor [J_m] and moment of inertia of the load [J_ext], both of which belong to motor shaft.	S5 - %25 $J_M = 0{,}15\ kgxm^2$ $J_{ext} = 0{,}7\ kgxm^2$
S6	**Continuous Periodic Operation** It can be defined as a sequence of identical cycles without a thermal steady state being reached. Each cycle is composed of a starting time, a time with constant loading and a no-load operating time. There is no pause in this mode	S6 - %40
S7	**Uninterrupted Periodic Duty with Electrical Braking** A sequence of identical cycles. Each cycle is composed of a starting time, a time with constant loading and a time with electrical braking. There is no pause in this mode of operation.	S7 $J_M = 0{,}4\ kgxm^2$ $J_{ext} = 7{,}5\ kgxm^2$
S8	**Uninterrupted Periodic Duty With Load/Speed Changes** A sequence of identical cycles following each other [different speeds such as double speed motors]. Each cycle is composed of a time with constant loading and a particular speed and one ore more times with other loadings at different speeds. There is no pause in this mode of operation. The figure S8 is followed by cyclic period factor and moment of inertia of the motor [J_m] and moment of inertia of the load [J_ext], both of which belong to motor shaft and load, speed and cyclic period factor at every speed condition.	S7 $J_M = 0{,}5\ kgxm^2$ $J_{ext} = 6\ kgxm^2$ 16 kW 740 $enaz^{-1}$ %30 40 kW 1460 $enaz^{-1}$ %30 25 kW 980 $enaz^{-1}$ %40
S9	**Non-Periodic Duty With Load/Speed Changes** Loading and speed change non-periodically within the permissible operating range. Motor operates above nominal power can occur. Overloading can occur. Load and inertia moment coefficiencies at various speeds should be provided.	S9
S10	**Duty With Discrete Constant Loads** Operating mode that does not include more than 4 particular load values, wherein every value is kept for a period sufficient for the motor to reach thermal equilibrium.	S10

N: Operating under nominal conditions	F: Electrical braking	V: Idling	L: operating with variable load
D: Starting	R: Stop	S: Operating overload	Cp: Full load

Relative period of duty It is defined as the proportion of duty with load to total period of duty. Start-up and electrical breaking periods are included in the period of duty.

Inertia moment coefficient = $\frac{J_M / J_Z}{J_M}$

J_M Inertia moment of motor (kgm^2)

J_Z Total inertia moment of heavy equipment such as pump, fan vb. and fittings like couplings as compared to motor shaft (kgm^2)

Type of braking, whether mechanical or electrical, should be noted

The value of duty provided in the catalogue belongs to continuous operation [S1]. Motors we produce as standard SI can operate in other modes of operation not to exceed the maximum temperature values.

FREQUENCY OF START-UP

When asynchronous motors start-up too often, the incoming heat from start-up limits the number of start-ups. Frequency of permissible no-load start-ups in an hour is indicated in the following table. The number of start-ups which an asynchronous motor can make an hour depends on the operating conditions and calculated by the following formula

$$Z = \frac{J_M}{J_M + J_Z} . \frac{M_M - M_L}{M_M} . [1 - (\frac{P}{P_N})^2] Z_0$$

Z : Starting frequency per hour of operating conditions
Z_0 :Starting frequency per hour of no-load operating conditions
J_M :Inertia moment of motor (kgm2]
J_Z : inertia of components such as heavy equipment as compared to the motor shaft
M_M : The motor's torque during acceleration [Nm]
M_L : The heavy equipment's torque during acceleration [Nm]
N : Motor rated power [kW]
P : Power required by the heavy equipment [kW]

If the asynchronous motor frequently starts and stops in operating conditions the motor power needed to be selected should be calculated according to the following formula, as the needed motor power [P] and the nominal motor power PN

$$P = P_N \sqrt{1 - \frac{Z}{Z_0} . \frac{J_M + J_Z}{J_M} . \frac{M_M}{M_M - M_L}}$$

For AEMOT electric motors M can be taken as 2 times the nominal torque in the calculation.
Change of electrical direction can cause the motor 3-4 times more warming as compared to start up. Therefore, the frequency of the permissible cyclic shifts per hour is to be calculated as the 1/4 of start frequency. Load torque [ML] should be taken into account with calculation of changes in direction.
Permissible starting frequency at idling Z0 is available in the table below.

Permissible starting frequency per hour at no-load operation [ZO]					
Building Size		Motor speed (rpm)			
		3000	1500	1000	750
63	M	30000	48000		
71	M	14700	20700	31000	34000
80	M	9300	18000	28500	32500
90	S	9000	17100	26200	31600
	L	8800	16500	24200	31700
100	L	6400	11000	13800	18800
112	M	3300	9200	12800	12800
132	S	2000	4900	9800	12100
	M	-	4750	7850	10350
160	M	950	2950	4050	-
	L	900	2850	3550	8950
180	M	600	2100	-	-
	L	-	2000	3400	6600
200	L	470	1950	3100	3800
225	S	-	1850	-	-
	M	420	1770	2200	3300
250	M	330	980	1820	2320
280	S	220	720	1420	1820
	M	200	680	1130	1680
315	S	110	400	650	750
	M	90	350	560	670
	L	70	300	450	550

Start Duration

All values of torque of asynchronous motor for a secure start, from start until it reaches the nominal speed, must be greater enough than the load torque of the machine.
Starting torque of the motor must be greater than the load torque of the machine in the state of being at rest. Motors of particularly high starting torque can be produced.
Starting time is an important parameter of the electrical motor. Motors become warmer because they draw more current than normal during start-up. It is necessary to limit the duration and frequency of start-up to prevent damage to motors. Starting time is calculated according to the formula below.

$$t_a = \frac{(J_M + J_Z).n}{9{,}55.(M_M - M_L)}$$

t_a : Starting time [s]
J_M : Inertia moment of motor [kgm2]
J_Z : inertia of components such as heavy equipment as compared to the motor shaft
M_M : The motor's torque during acceleration [Nm]
M_L : The heavy equipment's torque during acceleration [Nm]
n : Nominal motor speed [rpm]

Start-up times calculated from this formula must be smaller than the start-up times in the table. Permissible starting times vary depending on whether the motor is cold and at thermal equilibrium. Motors can start three consecutive times when cold and twice when at the operating temperature. The motor should adequately cool down for the next start. This period is approximately 30 minutes.

Structure Size	3000 rpm		1500 rpm		1000 rpm		750 rpm	
	Cold	Business	Cold	Business	Cold	Business	Cold	Business
63	70	28	100	45				
71	50	20	75	30	140	55	140	55
80	40	15	60	25	90	35	90	35
90	35	13	50	20	65	25	65	25
100	32	12	40	17	50	20	50	20
112	30	11	35	14	40	16	40	16
132	28	10	30	12	32	13	32	13
160	26	9	27	10	28	10	28	10
180	24	8	25	9	25	9	25	9
200	22	8	23	8	23	9	23	9
225	20	7	21	8	22	8	22	8
250	19	7	20	7	21	8	21	8
280	18	6	19	7	20	7	20	7
315	18	6	18	6	19	7	19	7

Periods in Δ/Y start should be multiplied by about 3.

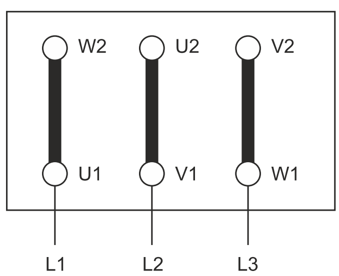
TERMINAL CONNECTION AND STARTING METHODS

For standard productions, 400 V Δ connection is made for 2 and 4 pole at power values □□4kW and over; 400 V Δ for 6 pole at power values □□3 kW and and over and 400 V Δ for 8 pole at power values □□of 3kW and over. For power values less than these 400 VY connection is made.

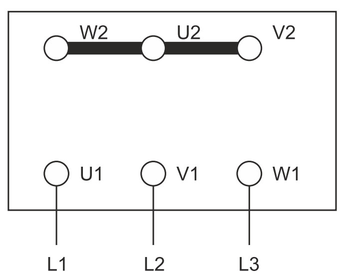
Number of Poles	230/400 V Δ/Y	400/690 V Δ/Y
2 ve 4	≤ 3 kW	≥ 4 k W
6	≤ 2.2 kW	≥ 3 k W
8	≤ 1,5 kW	≥ 2.2 k W
Starting 'Methods	Direct	Direct [not recommended] Y/ Δ or other

U-V-W ▪ Motor Phases
L1-L2-L3 ▪ Phases of Energy

Δ CONNECTION



Y CONNECTION



DIRECT STARTING

The easiest and cheapest way for a squirrel cage asynchronous motor is to connect directly to mains voltage. This method has the advantage of being low operating costs compared to other methods. However, it has the disadvantages of drawing more current from the mains and causing more consumption and windings are forced because of starting currents.

INDIRECT STARTING

In cases where starting current of motors exceed limit values of network, star-delta starting may be used to limit the current. Starting a motor designed as 400 V ∆ by triangle connection, starting current and starting torque are reduced. Because phase-neutral voltage instead of phase-to-phase voltage is supplied to the motor terminals, voltage decreases√3 times, the current and torque decrease 3 times.
Among the advantages are a solution simple, small in size, low in power and inexpensive, low starting current as compared to direct starting?
It has the disadvantages of starting characteristics which cannot be adjusted, long time of starting because the moment decreases, sudden passes of moment and current while passing from delta to star, open circuit, non-inclusion of motor protection parameters and having 6 cable connections to the motor.
In star-delta starting, star-delta times should be calculated well. Transition from star to delta should occur when 95% of the nominal motor speed is reached.

SOFT STARTING

Soft starters are the most advanced starting mode in the starters lowering the voltage. In addition to advanced motor protection and operator interface specifications, they can control current and torque in an excellent way.
The main advantages that soft starters provide are as follows;

1- During the start-up, current and the torque are controlled in a flexible and simple way,
2- Voltage and current can be supplied continuously and without exposure to sudden changes,
3- It is appropriate for frequent starting,
4- Works for variable start-ups conditions,

Electrical Protection of Motors

Winding temperature in the motor must be observed to avoid winding temperatures to exceed the specified values by insulation class used in motors. Insulation class must be selected taking into account the operating conditions.
Generally, motors are tried to be protected by connecting the overload relays and delayed overcurrent protection breakers. Such protection protects the motor at only start up. However, during runtime, the winding temperature increases due to load, voltage and frequency changes and windings are unprotected. Thermal protector and a thermistor must be applied in order to monitor temperature increases occurring in the windings and to deactivate the motor at the maximum value the motor winding insulation allows. This is the most reliable method. Fuses built into the system do not mean anything in terms of motor protection and protects only the system.

PERFORMANCE VALUES

3 PHASE,
VOLTAGE : 400 V.
FREQUENCY : 50 Hz.
PROTECTION CLASS : IP 55
INSULATION CLASS : F
MODE OF OPERATION : S1

Aluminium body - Synchronous Speed 750 rpm [8-pole]

Δ 230 / Y 400 V

TYPE AB	Rated Power		Nom. Speed rpm	Rated Current 400 V A	Nominal Moment Nm	Starting Values				Overturning Moment Nom - Mom	Efficiency %	Power Factor	Moment of Inertia	Footed Motor Weight
						Current		Moment						
	kW	HP				I_A / I_N λ	I_A / I_N Δ	M_A / M_N λ	M_A / M_N Δ	M_K / M_N	η	Cosφ	kgm²	kg.
80 M8A	0.18	1/4	675	0.79	2.5	2.3	–	1.8	–	1.8	50	0.60	0.0015	8
80 M8B	0.25	1/3	670	1.00	3.5	3.0	-	1.9	-	1.9	55	0.60	0.0018	9
90 S8A	0.37	1/2	665	1.30	5.3	3.3	-	1.6	-	1.6	59	0.70	0.0028	12
90 L8A	0.55	3/4	665	1.74	7.9	3.2	-	1.6	-	1.6	56	0.70	0.0035	14.3
100 L8A	0.75	1	670	2.28	11	3.9	-	1.5	-	1.7	65	0.65	0.0063	18.5
100 L8B	1.1	1.5	660	3.40	16	4.1	-	1.7	-	1.8	65	0.65	0.011	20
112 M8A	1.5	2	690	4.45	21	4.5	-	1.5	-	1.7	65	0.62	0.020	23

Aluminum body - Synchronous Speed 750 rpm [8-pole]

Δ 400 / Y 690 V

TYPE AB	Rated Power		Nom. Speed rpm	Rated Current 400 V A	Nominal Moment Nm	Starting Values				Overturning Moment Nom - Mom	Efficiency %	Power Factor	Moment of Inertia	Footed Motor Weight
						Current		Moment						
	kW	HP				I_A / I_N λ	I_A / I_N Δ	M_A / M_N λ	M_A / M_N Δ	M_K / M_N	η	Cosφ	kgm²	kg.
132 S8A	2.2	3	700	6.2	30	1.1	3.3	–	1.6	1.9	70	0.66	0.028	33
132 M8A	3	4	695	8.1	41	1.2	3.5	-	1.8	1.9	75	0.70	0.035	36
160 M8A	4	5.5	700	10.4	55	1.2	3.7	-	1.6	1.9	75	0.65	0.052	65
160 M8B	5.5	7.5	710	14.3	74	1.3	3.8	-	1.7	2.0	77	0.65	0.055	74
160 L8A	7.5	10	705	18.6	102	1.3	3.8	-	1.7	1.9	77	0.70	0.080	94

Cast body - Synchronous Speed 750 rpm [8-pole]

Δ 400 / Y 690 V

TYPE AB	Rated Power		Nom. Speed rpm	Rated Current 400 V A	Nominal Moment Nm	Starting Values				Overturning Moment Nom - Mom	Efficiency %	Power Factor	Moment of Inertia	Footed Motor Weight
						Current		Moment						
	kW	HP				I_A / I_N λ	I_A / I_N Δ	M_A / M_N λ	M_A / M_N Δ	M_K / M_N	η	Cosφ	kgm²	kg.
132 S8A	2.2	3	700	6.2	30	1.1	3.3	–	1.6	1.9	70	0.66	0.028	44
132 M8A	3	4	695	8.1	41	1.2	3.5	-	1.8	1.9	75	0.70	0.035	52
160 M8A	4	5.5	700	10.4	55	1.2	3.7	-	1.6	1.9	75	0.65	0.052	80
160 M8B	5.5	7.5	710	14.3	74	1.3	3.8	-	1.7	2.0	77	0.65	0.055	89
160 L8A	7.5	10	705	18.6	102	1.3	3.8	-	1.7	1.9	77	0.70	0.080	114
180 L8A	11	15	720	24.1	145	1.7	5.0	-	2.0	2.2	81	0.80	0.25	172
200 L8A	15	20	730	34	196	1.8	5.8	-	2.0	2.6	89	0.77	0.24	260
225 M8A	22	30	730	46.5	290	1.9	5.9	-	2.0	2.6	89.5	0.80	0.78	340
250 M8A	30	40	736	67	390	1.7	5.2	-	2.3	2.1	91	0.70	0.90	410

HIGH EFFICIENCY MOTORS

High Efficiency ↕ Low Efficiency	CEMEP	IEC
		IE3 Premium efficiency
	EFF1 High Efficiency	IE2 High Efficiency
	EFF2 Improved Efficiency	IE1 Standard Efficiency
	EFF3 Low Efficiency	

		IEC 6034-30
Power range	1,1-90 kW	0,75-375 kW
Pole	2-4	2-4-6

Another difference between CEMEP and IEC 60034-30:2008 is the calculation method of the motor efficiency. IEC 60034-2:1996 standard is replaced by IEC 60034-2-1:2007 standard.

The new standard, which is used calculate the additional losses, uses more precise measurement and calculation methods to determine losses and efficiency of the electric motors. The measurement methods specified in both standards are as follows:

Old Testing Standard IEC 60034-2-1:1996	New Testing Standard IEC 60034-2-1:2007
Direct measurement method	Direct measurement method
Indirect measurement method Additional losses [PLL] are taken into account as 0.5% of the input power at full load.	Indirect measurement method Additional losses [PLL] are determined according to the results of the tests carried out in different load values. Additional losses [PLL] are taken into account at rates ranging from 1% to 2.5% of the input power for motors from 1 kW up to 1000 kW. Additional losses [PLL] are based on mathematical calculations.
Stator and rotor winding losses are determined by a temperature of 95 ºC.	Stator and rotor winding losses are determined according to [25 ºC + measured temperature increase value].

The lower limit values of 50 and 60 Hz new IE1, IE2 and IE3 efficiency classes are as indicated in the following table.

50 Hz Efficiency Values

P_N (kW)	IE1			IE2			IE3		
	Number of poles								
	2	4	6	2	4	6	2	4	6
0.75	72.1	72.1	70.0	77.4	79.6	75.9	80.7	82.5	78.9
1.1	75.0	75.0	72.9	79.6	81.4	78.1	82.7	84.1	81.0
5.1	77.2	77.2	75.2	81.3	82.8	79.8	84.2	85.3	82.5
2.2	79.7	79.7	77.7	83.2	84.3	81.8	85.9	86.7	84.3
3	81.5	81.5	79.7	84.6	85.5	83.3	87.1	87.7	85.6
4	83.1	83.1	81.4	85.8	86.6	84.6	88.1	88.6	86.8
5.5	84.7	84.7	83.1	87.0	87.7	86.0	89.2	89.6	88.0
7.5	86.0	86.0	84.7	88.1	88.7	87.2	90.1	90.4	89.1
11	87.6	87.6	86.4	89.4	89.8	88.7	91.2	91.4	90.3
15	88.7	88.7	87.7	90.3	90.6	89.7	91.9	92.1	91.2
18.5	89.3	89.3	88.6	90.9	91.2	90.4	92.4	92.6	91.7
22	89.9	89.9	89.2	91.3	91.6	90.9	92.7	93.0	92.2
30	90.7	90.7	90.2	92.0	92.3	91.7	93.3	93.6	92.9
37	91.2	91.2	90.8	92.5	92.7	92.2	93.7	93.9	93.3
45	91.7	91.7	91.4	92.9	93.1	92.7	94.0	94.2	93.7
55	92.1	92.1	91.9	93.2	93.5	93.1	94.3	94.6	94.1
75	92.7	92.7	92.6	93.8	94.0	93.7	94.7	95.0	94.6
90	93.0	93.0	92.9	94.1	94.2	94.0	95.0	95.2	94.9
110	93.3	93.3	93.3	94.3	94.5	94.3	95.2	95.4	95.1
132	93.5	93.5	93.5	94.6	94.7	94.6	95.4	95.6	95.4
160	93.8	93.8	93.8	94.8	94.9	94.8	95.6	95.8	95.6
200 – 375	94.0	94.0	94.0	95.0	95.1	95.0	95.8	96.0	95.8

60 Hz Efficieny Values

P_N (kW)	IE1			IE2			IE3		
	Number of poles								
	2	4	6	2	4	6	2	4	6
0.75	77.0	78.0	73.0	75.5	82.5	80.0	77.0	85.5	82.5
1.1	78.5	79.0	75.0	82.5	84.0	85.5	84.0	86.5	87.5
1.5	81.0	81.5	77.0	84.0	84.0	86.5	85.5	86.5	88.5
2.2	81.5	83.0	78.5	85.5	87.5	87.5	86.5	89.5	89.5
3	84.5	85.0	83.5	87.5	87.5	87.5	88.5	89.5	89.5
4	86.0	87.0	85.0	88.5	89.5	89.5	89.5	91.7	91.0
5.5	87.5	87.5	86.0	89.5	89.5	89.5	90.2	91.7	91.0
7.5	87.5	88.5	89.0	90.2	91.0	90.2	91.0	92.4	91.7
11	88.5	89.5	89.5	90.2	91.0	90.2	91.0	93.0	91.7
15	89.5	90.5	90.2	91.0	92.4	91.7	91.7	93.6	93.0
18.5	89.5	91.0	91.0	91.0	92.4	91.7	91.7	93.6	93.0
22	90.2	91.7	91.7	91.7	93.0	93.0	92.4	94.1	94.1
30	91.5	92.4	91.7	92.4	93.0	93.0	93.0	94.5	94.1
37	91.7	93.0	91.7	93.0	93.6	93.6	93.6	95.0	94.5
45	92.4	93.0	92.1	93.0	94.1	93.6	93.6	95.4	94.5
55	93.0	93.2	93.0	93.6	94.5	94.1	94.1	95.4	95.0
75	93.0	93.2	93.0	94.5	94.5	94.1	95.0	95.4	95.0
90	93.0	93.5	94.1	94.5	95.0	95.0	95.0	95.8	95.8
110	94.1	94.5	94.1	95.0	95.0	95.0	95.4	96.2	95.8
132	94.1	94.5	94.1	95.4	95.4	95.0	95.8	96.2	95.8
160	77.0	78.0	73.0	75.5	82.5	80.0	77.0	85.5	82.5
200 – 375	78.5	79.0	75.0	82.5	84.0	85.5	84.0	86.5	87.5

The efficiency value has a tolerance up to [[100 - efficiency] x 0.15]. So, if the efficiency value obtained as a result of actual engine test results is lower than the specified IE limit as this tolerance, ten it is accepted in the specified efficiency class.
High efficiency motors have the same mechanical properties as standard engines. They are also in compliance with the same standards and the norms. AEMOT motors are painted with RAL 5023 [DIN1843] light blue protective paint.

CALCULATION OF ENERGY SAVINGS FOR HIGH EFFICIENCY MOTORS

In general terms, energy efficiency is directing energy to the expected work and reducing energy losses.
Electric motor efficiency = power received from the motor shaft/ power drawn from the mains Power drawn from the mains = power obtained from motor shaft + Losses
Losses occurring in high-efficiency motors [the stator and rotor winding losses, iron losses, losses of friction and ventilation] are lower compared to the standard motors. Therefore, they provide energy savings as long as they work since the power they draw from the mains is lower as compared to low efficiency motors. The following information is needed to calculate energy savings required when analysing preferability of high-efficiency motors to low efficiency motors;

- Rated power and speed of the existing motor [It may be obtained from the label information]
- The efficiency of the existing motor [Please contact us]
- The load percentage of the motor [would be considered 80% if not known.]
- The total annual operating hours of the motors. In light of this information, the total savings is calculated as;

$$K = t.P_N.x.k.\frac{1}{(\eta - \eta_{IE})}$$

K	:	Total annual savings	TL
t	:	The total annual working hours	H
P_N	:	Rated power of the motor	kW
x	:	Load ratio of motor [to be taken into account as x = 0.80 if 80%]	-
k	:	The unit price of electricity	TL/kWh
η	:	Efficiency ratio of motor [to be taken into account as n = 0.87 if 87%]	-
η_{IE}	:	Efficiency value of high-efficiency motor [to be taken into account as n 0.89 if efficiency rate is 89%.]	-

After calculating total savings by this formula, how the initial investment costs will depreciate can be calculated. For example;
For a 4 kW, 1500 rpm pump running 7 days 24 hours the unit price of power is 15 cent/kWh, annual energy savings IE2 electric motor will provide compared to IE1 motors can be calculated as follows:
• IE2 electric motor draws 4/ 0.866 = 4.619 kW power from the power supply and consumes 4,619x24 = 110.86 kWh energy per day
• Elelectric motor draws 4 / 0.842 = 4.751 kW power from the mains and consumes 4,751x24 = 114.02 kWh energy per day.
Under these conditions, the IE2 electric motor compared with IE1 motor, saves;
• 3.16 kWh of energy,
• 3,16x0,15 = 0.474 USD
• The annual savings would be $ 173.
Considering an internationally recognized 4 kW 4-pole IE1 motor's list price of $ 414 and the list price of IE2 motor of the same power of $ 482, investment costs of the IE2 motor is expected to pay for itself within a period of time shorter than one year.

IE2

3 PHASE,
VOLTAGE : 400 V.
FREQUENCY : 50 Hz.
PROTECTION CLASS : IP 55
INSULATION CLASS : F
MODE OF OPERATION : S1

Sync Speed 3000 rpm

Δ 230 / Y 400 V

TYPE AAH / ABH	Rated Power kW	Rated Power HP	Nom. Speed rpm	Rated Current 400 V A	Nominal Moment Nm	Starting Values Current I_A/I_N λ	Starting Values Current I_A/I_N Δ	Starting Values Moment M_A/M_N λ	Starting Values Moment M_A/M_N Δ	Overturning Moment Nom - Mom M_K/M_N	Efficiency % η	Power Factor Cosφ	Moment of Inertia kgm^2	Footed Motor Weight kg.
63 M2A	0.18	1/4	2740	0.5	0.62	4	-	2.3	-	2.3	64	0.81	0.00016	4
63 M2B	0.25	1/3	2765	0.68	0.86	4.3	-	2.3	-	2.3	74	0.81	0.00020	4.5
71 M2A	0.37	1/2	2765	1.02	1.3	4.3	-	2.3	-	2.3	74	0.79	0.00035	5.5
71 M2B	0.55	3/4	2800	1.44	1.9	4.9	-	2.3	-	2.3	74	0.81	0.00045	6.4
80M2A	0.75	1	2890	1.66	2.48	6	-	2.4	-	2.3	77.4	0.74	0.0011	8.5
80M2B	1.1	1.5	2880	2.4	3.65	6.1	-	2.4	-	2.3	79.6	0.81	0.0011	13
90S2A	1.5	2	2910	3.2	4.92	6.2	-	2.5	-	2.5	81.3	0.80	0.0020	15.5
90L2A	2.2	3	2900	4.7	7.24	6.8	-	2.8	-	2.8	83.2	0.80	0.0020	16.
100L2A	3	4	2910	5.95	9.85	7.2	-	2.4	-	2.6	84.6	0.85	0.0046	23
100L2B	4	5.5	2840	8.2	13	2.1	6.3	-	3	3.1	85.8	0.84	0.0050	23.5

Sync Speed 3000 rpm

Δ 400 / Y 690 V

TYPE AAH / ABH	Rated Power kW	Rated Power HP	Nom. Speed rpm	Rated Current 400 V A	Nominal Moment Nm	Starting Values Current I_A/I_N λ	Starting Values Current I_A/I_N Δ	Starting Values Moment M_A/M_N λ	Starting Values Moment M_A/M_N Δ	Overturning Moment Nom - Mom M_K/M_N	Efficiency % η	Power Factor Cosφ	Moment of Inertia kgm^2	Footed Motor Weight kg.
112M2A	4	5.5	2920	8.1	13	2.5	7.6	-	2.4	2.8	85.8	0.82	0.0059	29
112M2B	5.5	7.5	2910	11.8	18	2.1	6.4	-	2.4	2.5	87	0.79	0.0070	30
132S2A	5.5	7.5	2930	10.7	18	2.3	7	-	2.2	2.8	87	0.82	0.019	42
132S2B	7.5	10	2948	13.9	24.3	2.6	7.7	-	2.5	3	88.1	0.88	0.022	54
132 M2A	9	12.2	2935	18.4	29	2.3	7.0	-	2.6	3.6	86	0.84	0.022	53
132 M2B	11	15	2900	24.4	35	2.3	6.8	-	2.7	2.9	87.6	0.83	0.025	54
160M2A	11	15	2945	19.9	35.7	2.1	6.5	-	2.1	2.6	89.4	0.88	0.040	65.5
160M2B	15	20	2945	27.5	48.64	2.3	7.1	-	2.3	2.8	90.3	0.87	0.50	85
160L2A	18.5	25	2950	33	60	2.5	7.6	-	2.5	2.9	90.9	0.89	0.50	130
180M2A	22	30	2950	38.6	71.2	2.2	7	-	2.4	3.1	91.3	0.90	0.0868	153
200L2A	30	40	2965	52	96.6	-	6.8	-	2.3	2.7	92	0.90	0.16	225
200L2B	37	50	2965	64	119.2	-	6.9	-	2.3	2.7	92.5	0.90	0.16	250
225M2A	45	60	2965	78.5	145	-	6.9	-	2.3	2.7	92.9	0.89	0.24	341
250M2A	55	75	2970	91.1	176.9	-	6.9	-	2.4	2.5	93.2	0.90	0.45	440
280S2A	75	100	2975	127	240	-	7.5	-	2	2.3	93.8	0.91	0.53	516
280M2A	90	120	2975	153	289	-	7.5	-	2	2.3	94.1	0.90	0.65	520
315S2A	110	150	2977	190	355	-	6.7	-	2	2.4	94.3	0.87	0.73	900
315M2A	132	175	2979	230	425	-	6.4	-	1.8	2.3	94.6	0.86	0.78	900
315M2B	160	210	2975	278	511	-	6.4	-	1.8	2.2	94.8	0.86	0.79	905
315L2A	185	250	2970	310	595	-	5.5	-	2.3	2.6	95.6	0.88	0.82	930
315L2B	200	270	2960	335	645	-	5.5	-	2.2	2.3	95	0.87	0.9	1015

IE2

3 PHASE,	
VOLTAGE	: 400 V.
FREQUENCY	: 50 Hz.
PROTECTION CLASS	: IP 55
INSULATION CLASS	: F
MODE OF OPERATION	: S1

Synchronous Speed 1500 rpm

Δ 230 / Y 400 V

TYPE AAH / ABH	Rated Power		Nom. Speed rpm	Rated Current 400 V A	Nominal Moment Nm	Starting Values				Overturning Moment Nom - Mom	Efficiency %	Power Factor	Moment of Inertia	Footed Motor Weight
						Current		Moment						
	kW	HP				I_A/I_N λ	I_A/I_N Δ	M_A/M_N λ	M_A/M_N Δ	M_K/M_N	η	Cosφ	kgm²	kg.
63 M4A	0.12	1/6	1315	0.42	0.88	3.0	-	1.9	-	2.0	62	0.77	0.0003	4
63 M4B	0.18	1/4	1320	0.58	1.30	3.0	-	1.9	-	2.0	59	0.76	0.0004	4.5
63 M4C	0.25	1/3	1335	0.85	1.73	3.0	-	2.6	-	2.7	62.5	0.68	0.0004	4.7
71 M4A	0.25	1/3	1325	0.79	1.8	3.2	-	1.7	-	1.7	63	0.78	0.0006	5
71 M4B	0.37	1/2	1375	1.12	2.5	3.7	-	2.0	-	2.0	67	0.76	0.0008	6.1
71 M4C	0.5	0.7	1345	1.50	3.3	3.2	-	2.2	-	2.3	67.6	0.74	0.0008	6.2
80 M4A	0.55	3/4	1400	1.47	3.7	4.7	-	2.3	-	2.4	75	0.80	0.0015	8.1
80M4B	0.75	1	1410	1.85	5.1	5	-	2.5	-	3.2	79.6	0.74	0.0018	10.4
80 M4C	1.1	1.5	1400	2.65	7.6	3.77	-	2.58	-	2.6	75.0	0.80	0.0018	9.7
90S4A	1.1	1.5	1435	2.50	7.32	6.6	-	2.9	-	3.6	81.4	0.77	0.0035	16
90L4A	1.5	2	1430	3.40	10	6.5	-	3.2	-	3.5	82.8	0.76	0.0048	17
90 L4B	2.2	3	1382	5.73	15.2	3.36	-	1.86	-	2.1	78	0.74	0.0035	16.7
100L4A	2.2	3	1435	4.88	14.65	6.5	-	3.2	-	3.7	82.8	0.77	0.0058	22
100L4B	3	4	1435	6.5	19.97	6.2	-	2.7	-	3	83	0.78	0.0063	24.5

Synchronous Speed 1500 rpm

Δ 400 / Y 690 V

TYPE AAH / ABH	Rated Power		Nom. Speed rpm	Rated Current 400 V A	Nominal Moment Nm	Starting Values				Overturning Moment Nom - Mom	Efficiency %	Power Factor	Moment of Inertia	Footed Motor Weight
						Current		Moment						
	kW	HP				I_A/I_N λ	I_A/I_N Δ	M_A/M_N λ	M_A/M_N Δ	M_K/M_N	η	Cosφ	kgm²	kg.
112M4A	4	5.5	1445	8.3	26.43	-	7	-	2.9	3	86.6	0.80	0.018	33
112 M4B	5.5	7.5	1400	12.4	38	-	4.8	-	2.4	2.9	84.9	0.85	0.018	31
132S4A	5.5	7.5	1465	11.4	35.85	-	7.8	-	3	3.4	87.7	0.85	0.028	48
132M4A	7.5	10	1455	15.6	49.23	-	7.7	-	3.2	3.3	88.7	0.78	0.030	55.5
132M4C	11	15	1409	24.3	75	-	5.9	-	2.6	2.4	87.6	0.80	0.16	54
160M4A	11	15	1460	21.6	71.95	-	7.1	-	2.6	3.3	89.8	0.81	0.05	72
160L4A	15	20	1460	29.8	98	-	7.1	-	2.5	3.2	90.6	0.80	0.07	87
180M4A	18.5	25	1470	35.5	120.2	-	7.2	-	2.7	3.2	91.2	0.82	0.170	160
180L4A	22	30	1470	41.7	143	-	6.5	-	2.8	3	91.6	0.83	0.183	180
200L4A	30	40	1470	55	195	-	7.4	-	3.1	3.2	92.3	0.84	0.24	235
225S4A	37	50	1475	67	240	-	7.7	-	3	3	92.7	0.84	0.44	347
225M4A	45	60	1475	79.5	291.3	-	7.1	-	3	3	93.1	0.87	0.51	350
250M4	55	75	1480	96.5	355	-	7	-	2.6	2.9	93.5	0.87	0.795	430
280S4A	75	100	1484	137	483	-	6.8	-	2.2	2.8	94	0.87	0.90	527
280M4A	90	120	1482	158	580	-	7.1	-	2.6	2.9	94.2	0.87	1.03	596
315S4A	110	150	1489	208	705	-	6.9	-	2.1	3.3	94.5	0.79	1.30	860
315M4A	132	175	1488	235	850	-	5.8	-	2.1	3.2	94.7	0.87	1.50	940
315M4B	160	210	1489	335	1027	-	5.3	-	2.2	3.4	94.9	0.72	1.60	947
315L4A	185	250	1480	320	1193	-	5.2	-	2.3	3.2	96	0.87	1.83	990
315L4B	200	270	1480	320	1290	-	5.2	-	2	3.1	95.1	0.87	1.90	1070

IE2

3 PHASE,
VOLTAGE : 400 V.
FREQUENCY : 50 Hz.
PROTECTION CLASS : IP 55
INSULATION CLASS : F
MODE OF OPERATION : S1

Synchronous Speed 1000 rpm

Δ 230 / Y 400 V

TYPE AAH / ABH	Rated Power		Nom. Speed rpm	Rated Current 400 V A	Nominal Moment Nm	Starting Values				Overturning Moment Nom - Mom	Efficiency %	Power Factor	Moment of Inertia	Footed Motor Weight
						Current		Moment						
	kW	HP				I_A / I_N λ	I_A / I_N Δ	M_A / M_N λ	M_A / M_N Δ	M_K / M_N	η	Cosφ	kgm^2	kg.
71 M6A	0.18	1/4	835	0.75	2.0	2.3	-	2.0	-	2.0	54	0.69	0.0006	5.4
71 M6B	0.25	1/3	860	0.80	2.7	3.0	-	2.0	-	2.0	60	0.72	0.009	6.3
80 M6A	0.37	1/2	905	1.28	3.9	3.3	-	1.9	-	2.0	69	0.72	0.0015	7.8
80 M6B	0.55	3/4	900	1.90	5.8	3.2	-	2.0	-	2.1	72	0.72	0.0018	9
90S6A	0.75	1	940	2.15	7.62	4.5	-	2.3	-	2.8	75.9	0.66	0.0036	15.4
90L6A	1.1	1.5	935	3	11.25	4.5	-	2.3	-	2.6	78.1	0.68	0.0040	16.2
100L6A	1.5	2	940	3.70	15.25	4.5	-	2.1	-	2.5	79.8	0.72	0.0090	22
112M6A	2.2	3	945	5.5	22.2	5.0	-	2.0	-	2.7	81.8	0.70	0.013	26.5

Synchronous Speed 1000 rpm

Δ 400 / Y 690 V

TYPE AAH / ABH	Rated Power		Nom. Speed rpm	Rated Current 400 V A	Nominal Moment Nm	Starting Values				Overturning Moment Nom - Mom	Efficiency %	Power Factor	Moment of Inertia	Footed Motor Weight
						Current		Moment						
	kW	HP				I_A / I_N λ	I_A / I_N Δ	M_A / M_N λ	M_A / M_N Δ	M_K / M_N	η	Cosφ	kgm^2	kg.
132S6A	3	4	960	7.1	29.8	-	5.5	-	2.1	2.4	83.3	0.73	0.028	40
132M6A	4	5.5	965	9.05	39.6	-	5.2	-	2.2	2.6	84.6	0.75	0.035	49
132M6B	5.5	7.5	965	12.3	54.4	-	5	-	2.1	2.7	86	0.75	0.040	52
160M6A	7.5	10	970	17	73.8	-	6	-	2	3	87.2	0.73	0.080	88
160L6A	11	15	965	24.8	108.8	-	6	-	2.2	3	88.7	0.72	0.10	91.5
180L6A	15	20	975	30.6	147	-	6	-	2.5	2.7	89.7	0.79	0.22	165
200L6A	18.5	25	975	36.4	181	-	6.5	-	2.5	2.9	90.4	0.81	0.24	240
200L6B	22	30	975	42.5	215.5	-	7	-	2.5	3	90.9	0.83	0.30	248
225M6A	30	40	980	57.5	292.4	-	6	-	2	2.6	91.7	0.82	0.64	346
250M6A	37	50	980	69.5	360.5	-	6	-	2.6	2.1	92.2	0.83	0.95	430
280S6A	45	60	990	93.1	434	-	6.9	-	2.5	2.9	92.7	0.84	1.50	488
280M6A	55	75	990	100	530	-	7	-	2.1	2	93.1	0.85	1.75	530
315S6A	75	100	990	140	724	-	5	-	1.8	2.3	94	0.82	2	840
315M6A	90	120	989	163	874	-	5.6	-	1.9	2.4	94	0.84	2.3	882
315M6B	110	150	991	236	1060	-	5.4	-	2.1	2.9	94.3	0.71	2.4	892
315L6A	132	175	985	237	1285	-	5	-	1.85	2.5	94.5	0.84	2.55	902
315L6B	160	210	985	275	1545	-	5	-	1.90	2.5	94.9	0.85	2.75	1010

MULTI-SPEED MOTORS

"Multi speed motor" is the motor from which different speed and power are obtained from the same body with more than two different windings. They are usually produced as double speed because of the difficulty of efficiency and production.

Double speed asynchronous motors are the same as single-speed asynchronous motors in terms of construction and operation.
Dual-speed motors are manufactured in two forms, according to the type of winding: Dahlander and two separate windings;

Dahlander Connection Motors

They are motors where two different speeds at only 1/2 ratio can be obtained from a single winding placed in the Stator. Motors with 4/2 and 8/4 pole in the performance figures table are Dahlander winding motors.

Motors with Two Separate Winding Connection

They are the motors where two different speeds can be obtained from two separate windings placed in the stator. Motors with 6/4 and 8/6 pole in the performance figures table are two separate winding motors.
Dual-speed motors are designed according to two different applications including Variable Torque and Constant Torque;

Constant Moment, Double Speed Motors

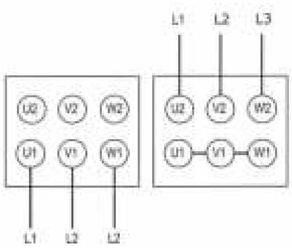
Constant torque motors are used in applications that require high torque at start-up and constant torque in low speed. Compressors, machine tools, cranes, etc use such motors. The power and current of the motor changes in both speeds. High-speed power is great. According to moment formula [M = 975*P/n] moment must be constant and the power at low speed must be low. The power at high speed must be higher. High torque at low speed required in this type of motors can be obtained by keeping the output power as high as possible.
For Constant Moment applications, D/YY connection is made in Dahlander winding motors and Y/Y connection is made in two winding motors.

Variable Moment, Double Speed Motors

Variable torque motors are used in applications that do not require high torque at start-up and in applications that require decreasing in square of of the speed in low speed. Torque and power are high at high-speed and they are low at low-speed.
For Variable Moment applications, Y/YY connection is made in Dahlander winding motors and Y/Y connection is made in two winding motors.

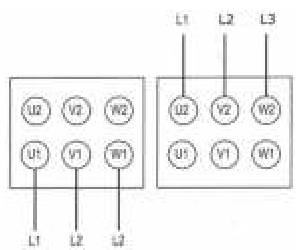
3-Phase, double-speed motor terminal connections

Dahlander Winding



Low Speed High Speed

Two Separate Windings



Low Speed High Speed

3 PHASE,
VOLTAGE : 400 V.
FREQUENCY : 50 Hz.
PROTECTION CLASS : IP 55
INSULATION CLASS : F
MODE OF OPERATION : S1

Sync Speed 1500/3000 RPM [4/2 pole]

TYPE	Rated Power		Rated speed		Nominal Momentum		Efficiency		Rated Current		Startup Values				Overturning Moment		B3
											CURRENT		CURRENT				Motor Weight
AB			d/d		Nm				A (400 V)		I_A/I_N	I_A/I_N	M_A/M_N	M_A/M_N	M_K/M_N	M_K/M_N	
	4k	2k	4k	2k	4k	2k	4k	2k	4k	2k	4k	2k	4k	2k	4k	2k	kg
71M4/2A	0.21	0.28	1340	2685	1.5	1	58.5	54.9	0.7	0.9	3	3.1	1.6	1.6	1.8	1.8	5
71M4/2B	0.3	0.43	1375	2765	2.1	1.5	65.2	61.4	0.9	1.23	3.7	3.8	1.8	1.8	2	2	6
80M4/2A	0.5	0.6	1380	2775	3.5	2.1	73	65.6	1.28	1.69	3.9	4	1.7	1.7	2	2	8
80M4/2B	0.7	0.85	1395	2840	4.8	2.8	73	65.4	1.637	2.03	4.3	4.3	1.8	1.8	2.1	2.1	10
90S4/2A	1.1	1.4	1385	2820	7.6	4.7	71.4	71.1	2.71	3.58	4.2	4.3	1.6	1.6	1.9	2	12
90L4/2A	1.5	1.9	1370	2830	10.5	6.4	73.5	74.5	3.62	4.4	4.9	5.3	1.9	1.9	2	2.1	15
100L4/2A	2	2.4	1400	2855	13.6	8.1	80	80	4.7	5.81	5	5	1.8	1.8	2.1	2.1	20
100L4/2B	2.6	3.1	1405	2875	17.7	10.3	79.2	77.3	5.82	7.48	5.6	5.6	2.3	2.4	2.4	2.4	22
112M4/2A	3.7	4.4	1405	2865	25.1	47.7	77	70.3	8.37	11.4	5.6	5.6	2	2.2	2.3	2.3	28
132S4/2A	4.9	5.9	1450	2905	32.3	19.4	80.1	73.8	10.8	13	6.3	6.3	1.7	1.6	2.2	2.2	38
132M4/2A	6.85	8	1430	2990	45.4	26.4	79	76.9	15	17	6.9	6.9	2	2.1	2.6	2.6	48
160M4/2A	9.5	11	1455	2920	62.4	36	85.3	82.3	19.9	22.1	6.7	6.7	2	1.8	2.4	2.4	71
160L4/2A	12	14.5	1455	2930	78.8	47.3	86.3	85.7	25	28.5	7.6	7.6	2.4	2.2	2.9	2.9	106
180M4/2A	15	18	1460	2940	98.1	58.5	84.9	81.5	31	37	6.7	6.7	2.1	2.2	3.2	3.2	163
180L4/2A	18	21.5	1460	2940	117.7	59.8	85.2	82.3	35	45	6.4	6.4	2	2.2	31	3.1	184

3 PHASE,
VOLTAGE : 400 V.
FREQUENCY : 50 Hz.
PROTECTION CLASS : IP 55
INSULATION CLASS : F
MODE OF OPERATION : S1

Sync Speed 750 /1500 rpm [8/4/ pole]

DAHLENDER CONNECTION [Δ/YY]

TYPE AB	Rated Power		Rated speed d/d		Nominal Momentum Nm		Efficiency		Rated Current A (400 V)		Startup Values CURRENT		Startup Values CURRENT		Overturning Moment		B3 Motor Weight kg
											I_A/I_N	I_A/I_N	M_A/M_N	M_A/M_N	M_K/M_N	M_K/M_N	
	8k	4k	8k	4k	8k	4k	8k	4k	8k	4k	8k	4k	8k	4k	8k	4k	
80M8/4A	0.18	0.32	670	1355	2.6	2.3	46.1	54.6	0.87	0.77	2.5	2.4	1.3	1.3	1.6	1.6	8
80m8/4B	0.25	0.4	670	1380	3.6	2.8	49	66	1.12	1.00	2.8	3.5	1.3	1.3	1.6	1.6	9
90S8/4A	0.35	0.5	675	1405	4.9	3.4	56.7	76.7	1.40	1.10	2.5	3.2	1.3	1.3	1.6	1.6	12
90L8/4A	0.5	0.7	640	1370	7.5	4.9	61.3	77	1.80	1.58	3.0	3.5	1.4	1.5	1.7	1.8	15
100L8/4A	0.7	1.1	675	1380	9.9	7.6	78	78	2.50	2.52	3.3	3.5	1.7	1.6	2	1.9	20
100L8/4B	0.9	1.5	700	1400	12.3	10.2	67.2	81.8	3.00	3.30	3.5	3.6	1.8	1.6	2	1.9	22
112M8/4A	1.4	2.2	710	1415	18.8	14.9	67.6	68.1	4.95	5.40	3.6	4.4	1.4	1.5	1.7	1.8	28
132S8/4A	1.8	3.	715	1415	24.1	20.3	72	81.3	6.0	6.3	4.3	5.4	2.0	1	2.3	1.8	33
132M8/4A	2.2	3.3	705	1420	29.8	22.2	73.8	79.9	6.5	7.0	4.2	5.2	2.0	1.3	2.3	1.8	40
132M8/4B	2.8	4.7	715	1430	37.4	31.4	73.4	81.3	9.2	10.0	4.3	5.4	2.0	1.3	2.3	1.8	50
160M8/4A	4.	6.5	710	1415	53.8	43.9	72.7	81.2	12.6	13.3	4.0	5.4	2.0	1.4	2.3	1.8	68
160L8/4A	5.1	10	730	1450	66.7	65.9	77.8	86	16.7	20.1	4.2	5.9	2.2	1.7	2.4	2	110
180L8/4A	10	16	730	1460	130.8	104.7	82.1	86	26.8	33.9	5.2	6.2	1.9	2	2.2	2.2	169
200L8/4A	15	19	740	1470	193.6	123.4	85.2	89	37	41	4.2	5.9	2.2	1.7	2.4	2	240
200L8/4B	16	24	745	1475	205.1	155.4	85.1	89.2	40	47	5.2	6.2	1.9	2	2.2	2.2	260

3 PHASE,
VOLTAGE : 400 V.
FREQUENCY : 50 Hz.
PROTECTION CLASS : IP 55
INSULATION CLASS : F
MODE OF OPERATION : S1

Sync Speed 1000/1500 rpm (6/4 pole)

DAHLEND CONNECTION [Δ/YY]

TYPE AB	Rated Power 6k	Rated Power 4k	Rated speed d/d 6k	Rated speed d/d 4k	Nominal Momentum Nm 6k	Nominal Momentum Nm 4k	Efficiency 6k	Efficiency 4k	Rated Current A (400 V) 6k	Rated Current A (400 V) 4k	Startup Values CURRENT I_A/I_N 6k	Startup Values CURRENT I_A/I_N 4k	Startup Values CURRENT M_A/M_N 6k	Startup Values CURRENT M_A/M_N 4k	Overturning Moment M_K/M_N 6k	Overturning Moment M_K/M_N 4k	B3 Motor Weight kg
71M6/4A	0.12	0.18	940	1430	1.2	1.2	43.2	66.6	0.7	0.66	1.9	2.3	1.5	1.6	1.6	1.7	5
71M6/4B	0.18	0.22	890	1415	1.9	1.4	44.5	59.3	0.9	0.78	2	2.5	1.6	1.6	1.7	1.8	6
80M6/4A	0.22	32	956	1455	2.2	2.1	66.6	72.7	0.82	0.95	2.3	2.9	1.8	1.6	1.9	1.7	7
80M6/4B	0.26	0.4	930	1440	2.7	2.6	61.9	71.4	0.96	1.18	2.4	3	1.9	1.3	2	1.9	9
90S6/4A	0.38	65	905	1430	4	4.3	61.3	71.4	1.08	1.71	3	4.3	1.6	1.9	1.8	2.2	12
90L6/4A	0.55	0.9	905	1435	5.8	5.9	65.4	72	1.57	2.38	3.2	4.9	1.9	1.9	2	2.3	15
100L6/4A	0.9	1.3	920	1430	9.3	8.7	67.7	74.7	2.43	3.07	3.5	4.9	1.7	1.8	1.8	2.3	20
100L6/4B	1.1	1.7	930	1430	11.3	11.4	68.8	75.2	2.96	4.08	3.9	5	1.7	1.6	1.8	2	22
112M6/4A	1.5	2.3	960	1445	14.9	15.2	71.7	76.9	4.5	5.92	4.2	5	1.8	2	2.2	2.3	24
132S6/4A	2	3.1	955	1435	20	20.6	71.7	74.5	5.6	8	4.3	4.8	1.7	1.7	1.9	2	33
132M6/4A	2.8	4.3	945	1420	28.3	28.9	76.7	79.8	5.85	9.5	4.4	4.7	1.7	1.7	1.9	1.9	40
160M6/4A	4.3	6.6	960	1445	42.7	43.7	80.3	82.9	10.1	13.8	4.7	5.2	1.6	1.6	2	2.1	68
160L6/4A	5.7	8.7	960	1440	56.7	57.7	81.3	84	13.8	18	4.5	5	1.6	1.6	2.1	2	110
180L6/4A	9.5	15	985	1475	92.4	96.9	84.3	80	22	35.6	4.5	5	1.6	1.6	2	2	165

3 PHASE,

VOLTAGE	: 400 V.
FREQUENCY	: 50 Hz.
PROTECTION CLASS	: IP 55
INSULATION CLASS	: F
MODE OF OPERATION	: S1

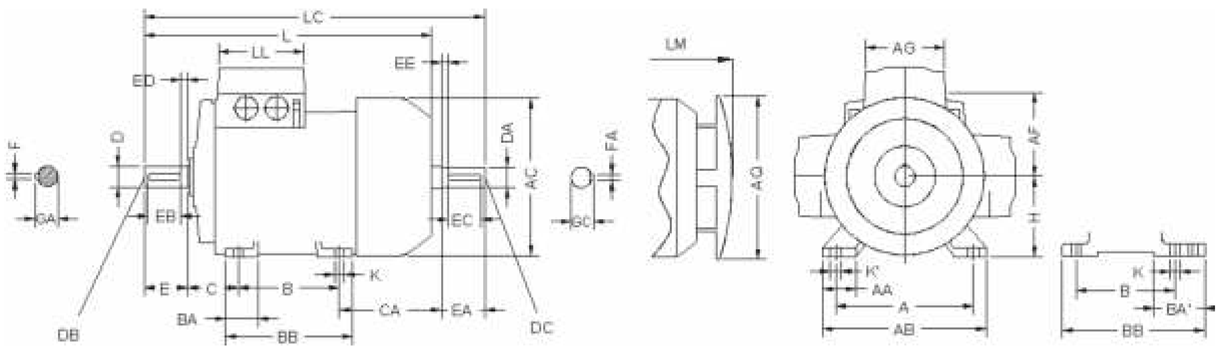
Sync Speed 1000/1500 rpm (8/6 pole)

DAHLEND CONNECTION [Δ/YY]

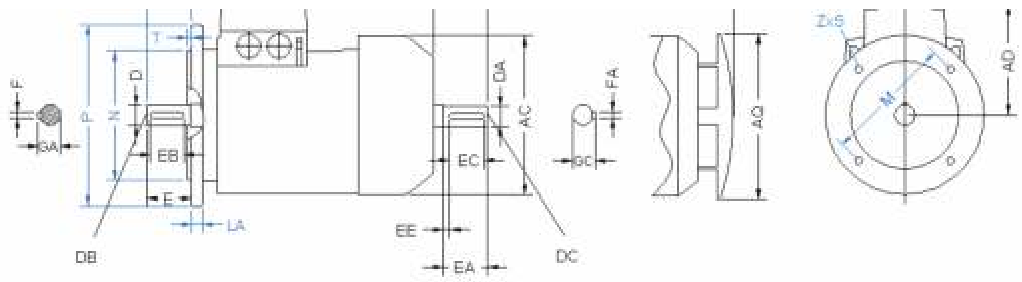
TYPE AB	Rated Power		Rated speed d/d		Nominal Momentum Nm		Efficiency		Rated Current A (400 V)		Startup Values				Overturning Moment		B3 Motor Weight kg
											CURRENT		CURRENT				
											I_A/I_N	I_A/I_N	M_A/M_N	M_A/M_N	M_K/M_N	M_K/M_N	
	8k	6k	8k	6k	8k	6k	8k	6k	8k	6k	8k	6k	8k	6k	8k	6k	
80M8/6A	0.12	0.18	695	940	1.6	1.8	35.2	51.4	0.78	0.82	2.1	2.8	1.6	1.7	1.8	1.8	7
80m8/6B	0.18	0.28	670	945	2.6	2.5	47.4	61	0.85	95	2.1	2.8	1.6	1.7	1.8	1.8	9
90S8/6A	0.3	0.4	675	930	4.2	4.1	52.6	62.5	1.1	1.25	2.4	3.1	1.5	1.7	1.6	1.9	12
90L8/6A	0.4	55	680	925	5.6	5.7	54.8	62.5	160	1.7	2.5	3	1.7	1.6	1.8	1.8	15
100L8/6A	0.6	0.85	695	950	8.2	8.5	58.3	65.9	2.2	2.6	2.9	3.6	1.5	1.6	1.7	1.8	20
100L8/6B	0.8	1.1	680	935	11.1	11.1	603.1	66.2	2.9	3.3	2.9	3.4	1.5	1.6	1.8	1.8	22
112M8/6A	1.2	1.8	710	960	16.1	17.9	65.5	72	4.2	5.5	3.5	4.3	1.8	1.9	2	2.1	24
132S8/6A	1.5	2.2	715	955	20	22	62.6	72.6	5.5	6.2	3.3	3.8	1.6	1.6	1.9	1.8	33
132M8/6A	1.8	2.4	715	965	24	23.7	70.6	78.7	5.6	6.4	3.7	4.6	1.7	1.6	2	2.1	38
132M8/6B	2.3	3.3	710	950	30.9	33.2	71.7	77.5	6.8	8.3	3.7	4.2	1.7	1.6	1.9	1.9	40
160M8/6A	4	5.3	720	970	531	52.2	76.7	80.6	10.9	13.5	4.2	5	1.7	1.6	2	2	68
160L8/6A	5.4	7.2	725	965	71.1	71.3	79.6	81.4	14.7	16.4	5.1	5.1	2.1	1.7	2.5	2.2	110
180L8/6A	7.8	10.5	730	980	102	102.3	79.6	81.7	20.5	24.7	5.6	5.8	2.1	1.7	2.2	2.2	184

ALUMINUM SERIES

IM B3



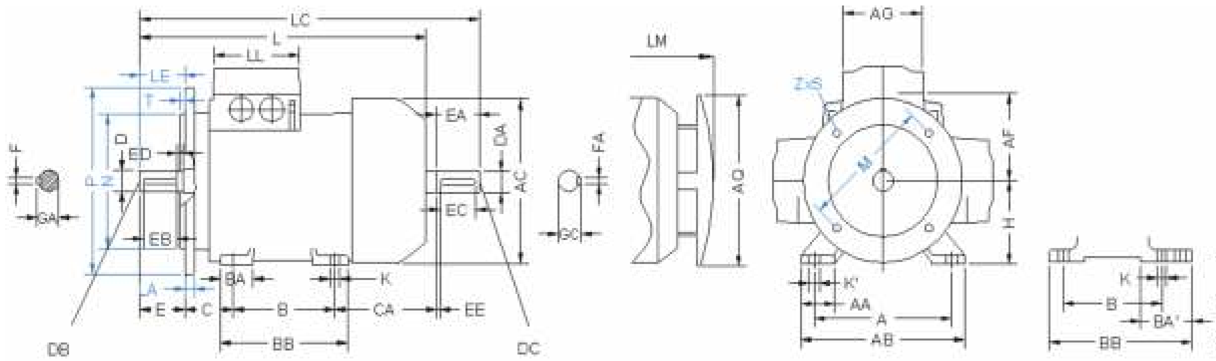
IM B5 and VI
See page 43 for flange dimensions



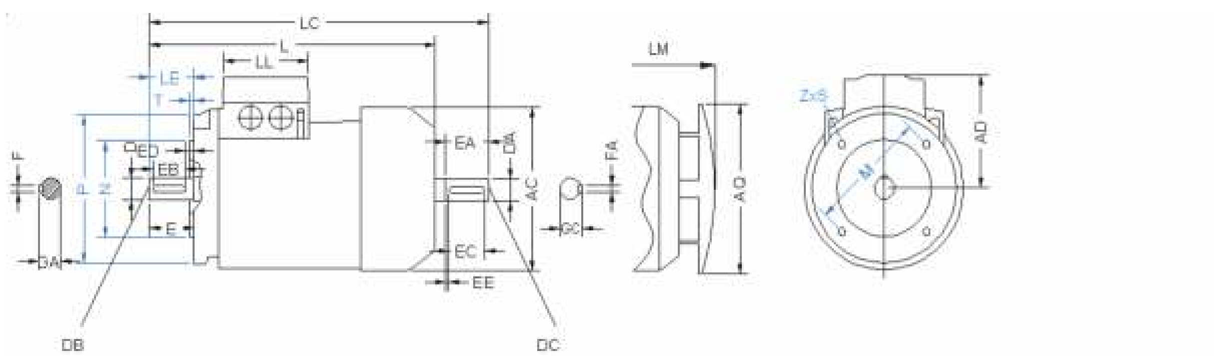
Structure Size	Number of poles	A	AA	AB	AC	AD	AF	AG	AQ	B	BA	BA'	BB	C	CA	H	K	K'
63 M	2-4	100	28.5	123	125	108.5	87.5	60	--	80	30	30	100	40	78	63	7	10
71 M	2-8	112	31	135	138.5	117	74	83	125	90	29	29	110	45	84.5	71	7	10
80 M	2-8	125	34	153	156	118	78.5	83	125	100	35	35	124	50	105.5	80	9.5	13.5
90 S 90 L	2-8	140	323.5	168	174	130	87.5	83	160	100 125	34.5	59.5	149	56	118	90	10	14
100 L	2-8	160	40	198	195	138	82	112	160	140	44	44	174	63	125	100	12	16
IE2 100 L4	2-8	160	40	198	195	138	82	112	160	140	44	44	174	63	152	100	12	16
112 M	2-8	190	46	226	219.5	152	97	112	180	140	45	45	176	70	145	112	12	16
132 S 132 M	2-8	216	50	256	259	195	135	112	220	140 178	50	50 88	180 218	89	162.5	132	14	16
IE2 132 S2	2	216	50	256	259	195	135	112	220	178	50	50 88	218	89	162.5	132	14	16
160 M 160 L	2-8	254	60	300	313.5	222	140	162	250	210 254	70	70 114	256 300	108	183	160	17	19

ALUMINUM SERIES

IM B35



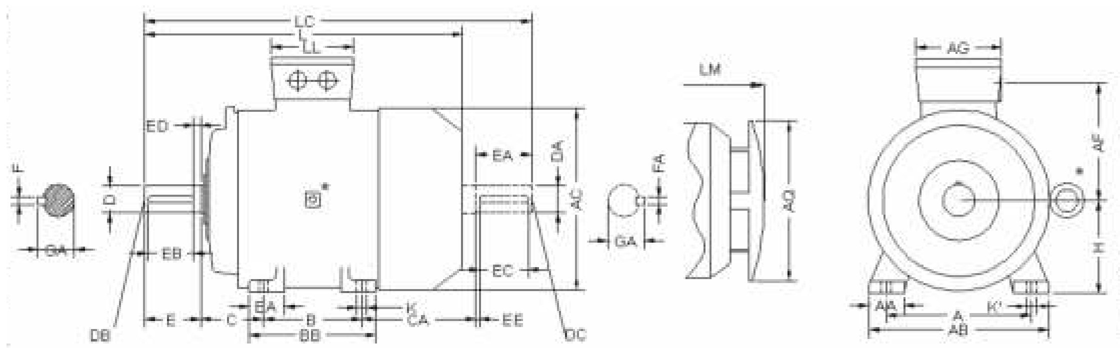
IM B14



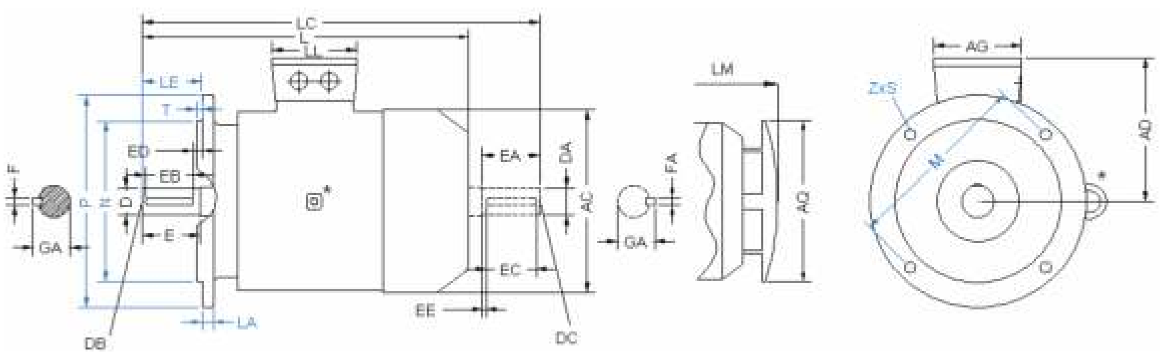
Structure Size	Number of poles	L	LC	LL	LM	D	DB	E	EB	ED	F	GA	DA	DC	EA	EC	EE	FA	GC
63 M	2-4	212.5	242.5	90	--	11	M4	23	16	3.5	4	12.5	11	M4	23	16	3.5	4	12.5
71 M	2-8	241.5	279.5	83	270.5	14	M5	30	22	4	5	16	14	M5	30	22	4	5	16
80 M	2-8	284	334	83	310	19	M6	40	32	4	6	21.5	19	M6	40	32	4	6	21.5
90 S 90 L	2-8	331	389	83	365	24	M8	50	40	5	8	27	19	M8	40	32	4	6	21.5
100 L	2-8	372	438	120	406	28	M10	60	50	5	8	31	24	M8	50	40	5	8	27
IE2 100 L4	2-8	399	465	120	406	28	M10	60	50	5	8	31	24	M8	50	40	5	8	27
112 M	2-8	397	465	120	438	28	M10	60	50	5	8	31	24	M8	50	40	5	8	27
132 S 132 M	2-8	452.5 490.5	551.5 589.5	120	498.5 536.5	38	M12	80	70	5	10	41	38	M12	80	70	5	10	41
IE2 132 S2	2	490.5	589.5	120	536.5	38	M12	80	70	5	10	41	38	M12	80	70	5	10	41
160 M 160 L	2-8	588 632	721 765	162	638 682	42	M16	110	90	10	12	45	42	M16	110	90	10	12	45

CAST SERIES

IM B3



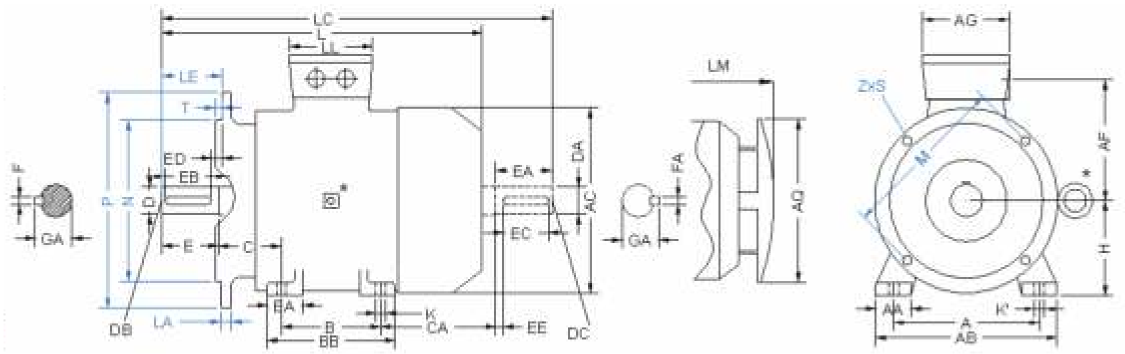
IM B5 and VI
See page 43 for flange dimensions



Structure Size	Number of poles	A	AA	AB	AC	AD	AF	AG	AQ	B	BA	BA'	BB	C	CA	H	K	K'
132 S 132 M	2-8	216	50	256	259	195	166	122	220	140 178	50	--	180 218	89	162.5	132	14	16
IE2 132 S2	2	216	50	256	259	195	135	112	220	178	50	--	218	89	162.5	132	14	16
160 M 160 L	2-8	254	60	300	313.5	222	193	152	250	210 254	70	--	256 300	108	183	160	17	19

CAST SERIES

IM B35



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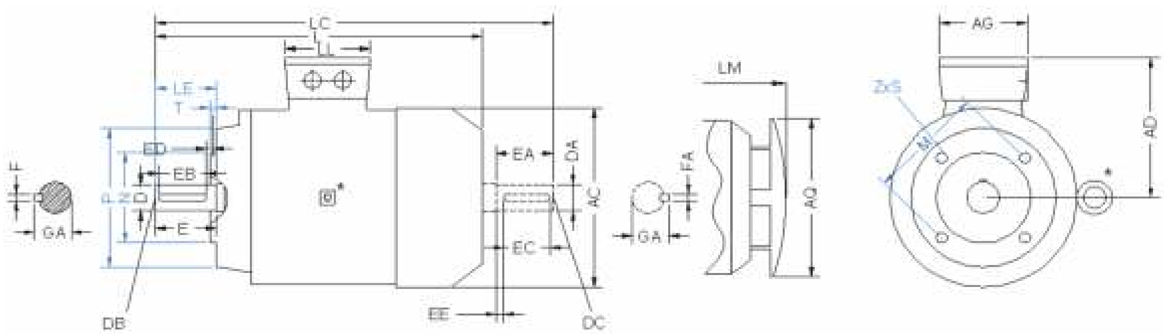
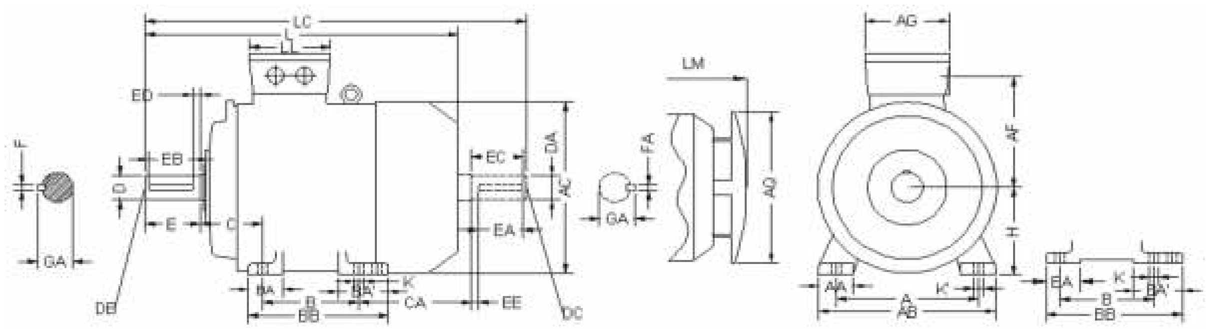


Structure Size	Number of poles	L	LC	LL	LM	D	DB	E	EB	ED	F	GA	DA	DC	EA	EC	EE	FA	GC
132 S 132 M	2-8	452.5 490.5	551.5 589.5	117	498.5 536.5	38	M12	80	70	5	10	41	38	M12	80	70	5	10	41
IE2 132 S2	2	490.5	589.5	120	536.5	38	M12	80	70	5	10	41	38	M12	80	70	5	10	41
160 M 160 L	2-8	588 632	721 765	132	638 682	42	M16	110	90	10	12	45	42	M16	110	90	10	12	45

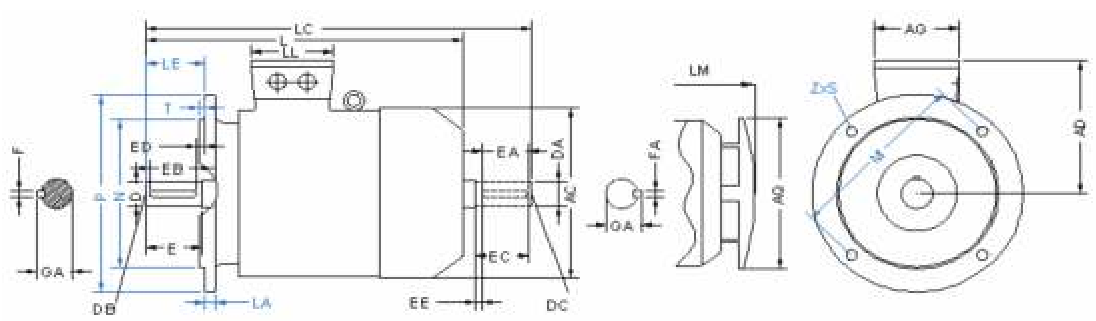
CAST IRON SERIES

IM B3



IM B5 ve V1

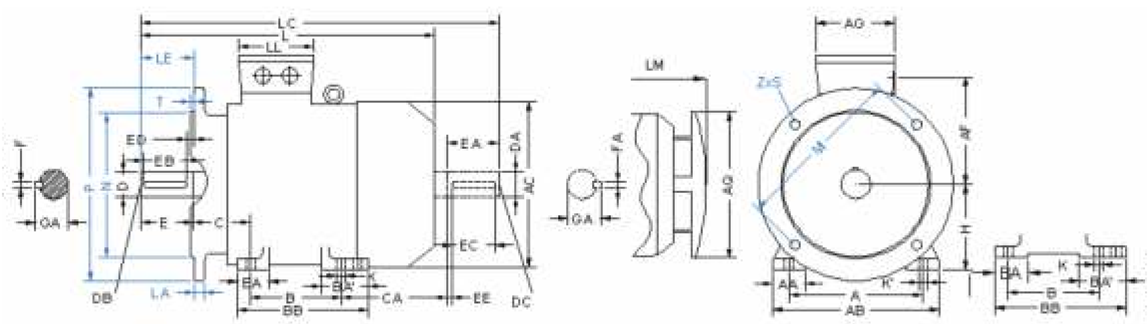
See page 43 for flange dimensions



Structure Size	Number of poles	A	AA	AB	AC	AD	AF	AG	AQ	B	BA	BA'	BB	C	CA	H	K	K'
180 M 180 L	2-8	279	65	344	346.5	250.5	210.5	152	300	241 279	64	105	281 319	121	149	180	17	19
200 L	2-8	318	72	390	386.5	290	249	185	--	305	75	75	355	133	183	200	19	23
225 S 225 M	4-6 2 4-6	356	80 80	436 436	432.5 432.5	319 319	266 266	185 185	-- --	286 311	80 80	106 106	370 370	149 149	255 230	225 225	20 20	23 23
250 M	2 4-8	406	90	486	480	363	293	250	--	349	90	90	410	168	206.5	250	20	24
280 S	2 4-6	457	95	536	547.5	386	323	278.5	--	368	100	151	490	190	279.5	280	23	25
280 M	2 4-6	457	95	536	547.5	386	323	278.5	--	419	100	151	490	190	228.5	280	23	25
315 S	2 4-6	508	120	630	627	505	407.5	370	--	406	125	180	550	216	373	315	25	27
315 M	2 4-6	508	120	630	627	505	407.5	370	--	457	125	180	550	216	322	315	25	27
315 L	2 4-6	508	120	630	627	505	407.5	370	--	508	125	180	600	216	271	315	25	27

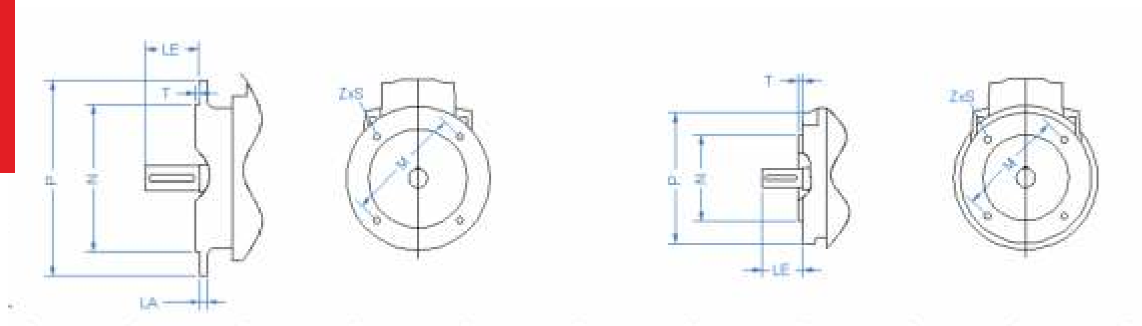
CAST IRON SERIES

IM B35



Structure Size	Number of poles	L	LC	LL	LM	D	DB	E	EB	ED	F	GA	DA	DC	EA	EC	EE	FA	GC
180 M 180 L	2-8	616 656	731 771	132	668 708	48	M16	110	90	5	14	51.5	42	M16	110	90	10	10	41
200 L	2-8	750.5	865.5	155	--	55	M20	110	90	5	16	59	55	M20	110	90	5	16	59
225 S 225 M	4-6 2 4-6	825 795 825	940 910 940	155	--	60 55 60	M20 M20 M20	140 110 140	125 100 125	10 5 10	18 16 18	64 59 64	55 55 55	M20 M20 M20	110 110 110	100 100 100	5 5 5	16 16 16	59 59 59
250 M	2 4-6	858.5	973.5	185	--	60 65	M20 M20	140 140	125 125	10 10	18 18	64 69	55 60	M20 M20	110 140	100 125	5 10	16 18	59 64
280 S	2 4-6	972.5	1117.5	240	--	65 75	M20 M20	140 140	125 125	10 10	18 20	69 79.5	60 65	M20 M20	140 140	125 125	10 10	18 18	64 69
280 M	2 4-6	972.5	1117.5	240	--	65 75	M20 M20	140 140	125 125	10 10	18 20	69 79.5	60 65	M20 M20	140 140	125 125	10 10	18 18	64 69
315 S	2 4-6	1130 1160	1275 1305	300	--	65 85	M20 M20	140 170	125 140	10 25	18 22	69 90	60 70	M20 M20	140 140	125 125	10 10	18 20	64 74.5
315 M	2 4-6	1130 1160	1275 1305	300	--	65 85	M20 M20	140 170	125 140	10 25	18 22	69 90	60 70	M20 M20	140 140	125 125	10 10	18 20	64 74.5
315 L	2 4-6	1200 1230	1348 1377	300	--	65 85	M20 M20	140 170	125 140	10 25	18 22	69 90	60 70	M20 M20	140 140	125 125	10 10	18 20	64 74.5

FLANGE DIMENSIONS



Building Size	Construction Type	Flange Type	DIN 42948	LA	LE	M	N	P	S	T	Z
63 M	IM B14-IMB34-V18-V19	Standart Flange	C 90	--	23	75	60	90	M5	2.5	4
	IM B14-IMB34-V18-V19	Special Flange	C 120	--	23	100	80	120	M6	3	4
	IM B14-IMB34-V18-V19	Special Flange	C140	8	23	115	95	140	10	3	4
71 M	IM B5-IM B35-V1-V3	Standart Flange	A 160	9	30	130	110	160	10	3.5	4
	IM B14-IMB34-V18-V19	Standart Flange	C 105	--	30	85	70	105	M6	2.5	4
	IM B14-IMB34-V18-V19	Special Flange	C120	--	30	100	80	120	M6	3	4
	IM B14-IMB34-V18-V19	Special Flange	C 140	--	30	115	95	140	M8	3	4
80 M	IM B5-IM B35-V1-V3	Standart Flange	A 200	10	40	165	130	200	12	3.5	4
	IM B14-IMB34-V18-V19	Standart Flange	C 120	--	40	100	80	120	M6	3	4
	IM B14-IMB34-V18-V19	Special Flange	C 140	--	40	115	95	140	M8	3	4
	IM B14-IMB34-V18-V19	Special Flange	C 160	--	40	130	110	160	M8	3.5	4
90 S-90 L	IM B5-IM B35-V1-V3	Standart Flange	A 200	10	50	165	130	200	12	3.5	4
	IM B14-IMB34-V18-V19	Standart Flange	C 140	--	50	115	95	140	M8	3	4
	IM B14-IMB34-V18-V19	Special Flange	C 160	--	50	130	110	160	M8	3.5	4
100 L	IM B5-IM B35-V1-V3	Standart Flange	A 250	11	60	215	180	250	15	4	4
	IM B14-IMB34-V18-V19	Standart Flange	C 160	--	60	130	110	160	M8	3.5	4
	IM B14-IMB34-V18-V19	Special Flange	C 120	--	60	100	80	120	M6	3	4
	IM B14-IMB34-V18-V19	Special Flange	C140	--	60	115	95	140	M8	3	4
	IM B14-IMB34-V18-V19	Special Flange	C 200	--	60	165	130	200	M10	3.5	4
112 M	IM B5-IM B35-V1-V3	Standart Flange	A 250	11	60	215	180	250	15	4	4
	IM B14-IMB34-V18-V19	Standart Flange	C 160	--	60	130	110	160	M8	3.5	4
	IM B14-IMB34-V18-V19	Special Flange	C140	--	60	115	95	140	M8	3	4
	IM B14-IMB34-V18-V19	Special Flange	C 200	--	60	165	130	200	M10	3.5	4
132 S-132 M	IM B5-IM B35-V1-V3	Standart Flange	A 300	12	80	265	230	300	15	4	4
	IM B14-IMB34-V18-V19	Standart Flange	C 200	--	80	165	130	200	M10	3.5	4
	IM B5-IM B35-V1-V3	Special Flange	A 250	13	80	215	180	250	15	4	4
	IM B14-IMB34-V18-V19	Special Flange	C 160	--	80	130	110	160	M8	3.5	4
	IM B14-IMB34-V18-V19	Special Flange	C 250	--	80	215	180	250	M12	4	4
160 M-160 L	IM B5-IM B35-V1-V3	Standart Flange	A 350	13	110	300	250	350	19	5	4
	IM B14-IMB34-V18-V19	Standart Flange	C 200	--	110	165	130	200	M10	3.5	4
180 M-180 L	IM B5-IM B35-V1-V3	Standart Flange	A 350	13	110	300	250	350	19	5	4
	IM B14-IMB34-V18-V19	Special Flange	C 250	--	110	215	180	250	M12	4	4
200 L	IM B5-IM B35-V1-V3	Standart Flange	A 400	15	110	350	300	400	19	5	4
225 S-225 M 2 Pole 4.6 Pole	IM B5-IM B35-V1-V3	Standart Flange	A 450	16	110 140	400	350	450	19	5	8
250 M	IM B5-IM B35-V1-V3	Standart Flange	A 550	18	140	500	450	550	19	5	8
280 S-280 M	IM B5-IM B35-V1-V3	Standart Flange	A 550	18	140	500	450	550	19	5	8
315 S- M 315 L 2 .4.6 Pole	IM B5-IM B35-V1-V3	Standart Flange	A 660	22	140 170	600	550	660	24	6	8

MARINE MOTORS

Marine motors produced for marine industry practice are specially produced to operate under marine conditions. Standard electric motors are designed to operate in the marine environment and produced at a proportion of properties as described below.

- All bolts and fasteners are from corrosion free material
- Body cover, flanges, terminal box and cover are from cast material
- Fittings are optionally made of brass or bronze
- Standard thermistor is [PTC] applied
- Varnish used in winding is from high temperature-resistant material
- Stump [no fan and unshielded fan] for the purpose of impermeability
- Standard protection class is IP 56 class that allows high water resistance
- Paints are epoxy polyester primer and finish is painted
- If desired, in a form encoder can be connected to the motors
- If necessary, they are produced as heater placed in the motor windings.

SPECIAL WINDING MOTORS

Power and operating values of 3-phase asynchronous electric motors produced by AEMOT are valid under conditions of continuous operation [SI] and a rated voltage of 400 V + - 5%, 50 Hz FREQUENCY, ambient temperature of maximum 40 ºC and elevation from the sea level up to 1000 m.

At a frequency of 50 Hz, motors are compatible with Δ230V/Y400V connection at power 3 kW and lower and Δ400V / Y690V connection at power 4 kW and over. Standard motors can be designed so as to operate at 50 Hz, 400V and 60 Hz, 480V or at requested voltage [24V, 48V, 500V, etc.] or frequency [17 Hz, 87 Hz, and so on] for non-standard applications by experienced specialized staff.

BRAKE MOTORS

EN 60034-1 compliant 63-315 body brake motors;

General Applications

- Automation Systems
- Gearboxes
- Fans
- Crushers
- Conveyor Belts[conveyor]
- Centrifuge Machines
- Presses
- Lift Applications
- Crane Applications
- Packaging Machinery
- Automatic Sliding Systems
- Stone crushing, screening machines and so on.

Standard Features

- Brake Voltage: 24 or 220 V DC
- Braking trocar Range: 3-2800 Nm
- 3-phase Squirrel Cage Induction Motors
- Output Power: 0,12 – 250 kW
- Protection Class IP55
- Frame Size 63-315
- Voltage & Frequency: 230 /400- 400 / 690 [50 Hz]
- Insulation class: F [AT=80 K]
- Mode of Operation: S1
- Operating Temperature: Maximum 40 ºC [up to 1000m above sea level]
- Squirrel-cage rotor, Aluminum Injection
- Double lip seals on both sides
- Stainless steel nameplate
- IEC-72 Compliant Construction Sizes
- Performance Characteristics According to IEC34
- Cable Access Threaded in Terminal Box In Compliance with Metric Values
- Colour: RAL 7030 or 5023
- IEC-411 Compliant Cooling
- Fixed Foot

Special Applications

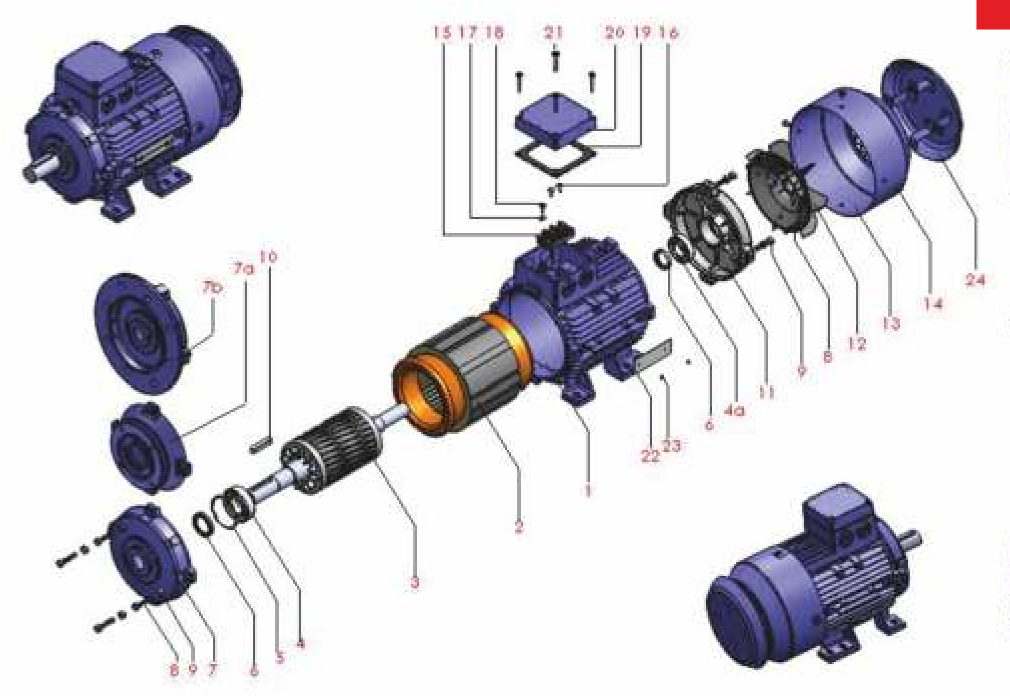
- Protection Class: IP56-IP65-IP66
- Special bearings
- Special Seals
- Thermal Protection
  - Thermal
  - PT100
- H Insulation
- Special winding [Special Voltage & Frequency]

Please consult regarding different applications as needed.

CINICI MOTORS

Pressure water pump motors with construction sizes IEC112, 132, 160 and power of 1500 rpm and 4,00-5,50-7,50-11,00-15,00 kW are especially used in washing machines. Drive side of the shaft of these motors has hollow shaft and have specially designed bearing and cover.

SPARE PARTS

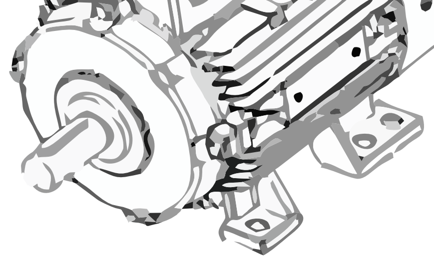


NO	Number of poles
01	Frame
02	Completewinding stator [varnished]
03	Rotor shaft [balanced]
04	DE Bearing
04a	NDE Bearing
05	Bearing tension spring
06	Wiper
07	DE Shield
07a	B14 Flange
07b	B5 Flange
08	Connection bolt
09	Connection bolt nut
10	Shaft end wedge
11	NDE Shield
12	propeller
13	Propeller protection cup
14	Propeller protection cup bolt
15	Terminals [terminals, bridges, nuts and washers included]
16	Terminal connection bolt
17	Earth connection
18	Earth connection bolt
19	Gasket
20	The terminal box cover
21	The terminal box cover mounting bolt
22	Label
23	Label connection bolt
24	Canopy [rain protection]

DE:Drive end NDE: Non Drive End

AEMOT®
ELECTRIC
MOTORS

The Performance Transforming Energy In To Power



Note

AEMOT®
ELECTRIC
MOTORS

www.**aemot**.com.tr
info@**aemot**.com.tr

T: +90 382 288 02 00 (4 Hat)
F: +90 382 266 21 30

Taşpınar Kasabası Yavuzselim Mah. Sümrü Küme Evleri
No: 61 - 68100 MERKEZ /AKSARAY/TÜRKİYE