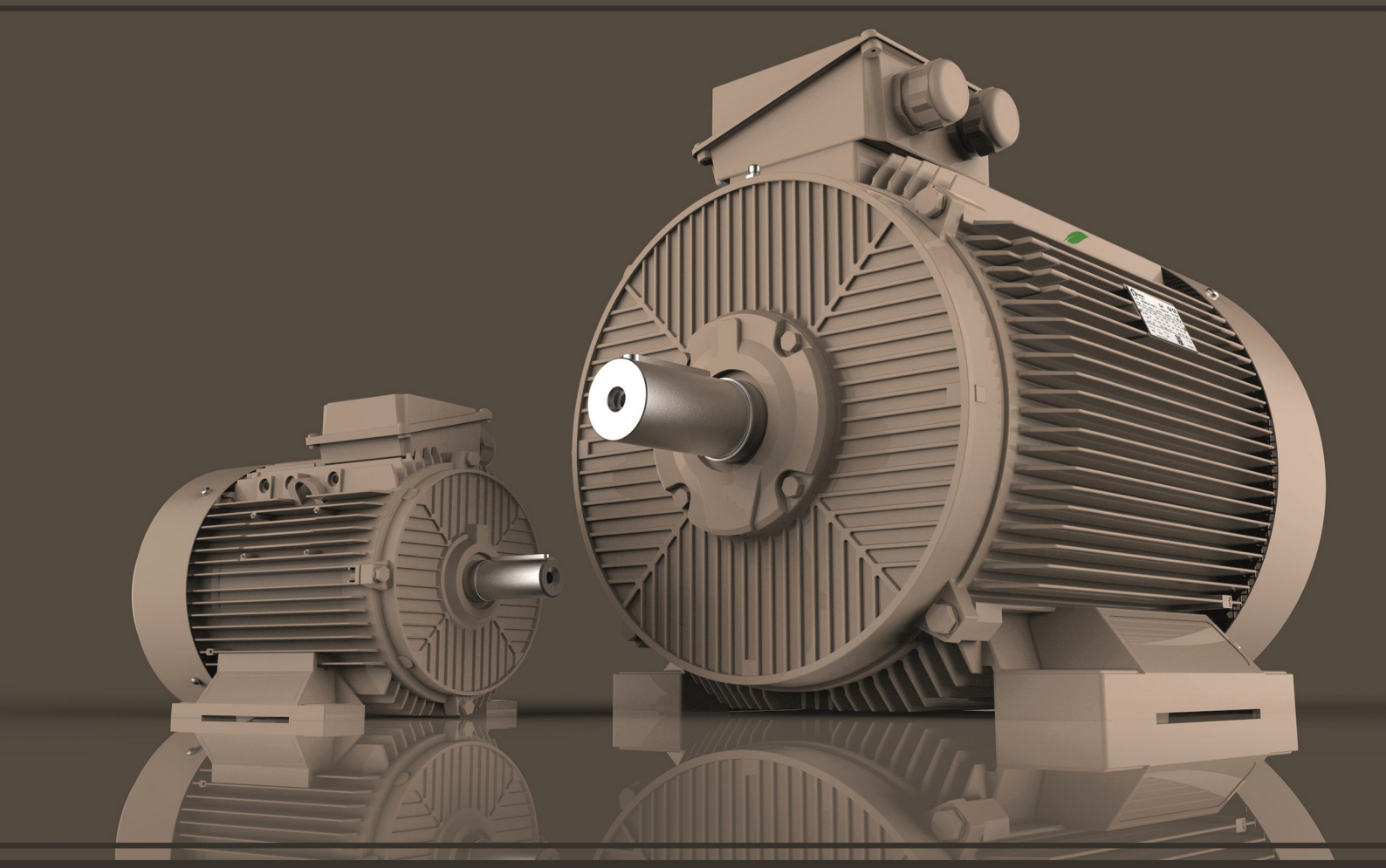
OMEGA MOTOR



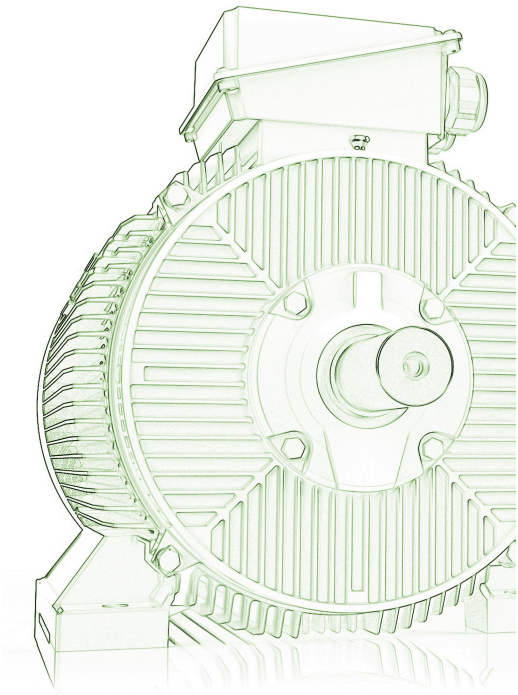
LOW VOLTAGE INDUCTION MOTORS

IEC FRAME SIZES: 71 to 355
OUTPUT POWER: 0.18 to 500kW

IE3 - IE4

LOW VOLTAGE INDUCTION MOTORS
IEC Frame Sizes: 71 to 355

CONTENTS



1. STANDARDS

Omega Motor low voltage induction motors are designed, produced and tested in accordance with the given international electrical and mechanical standards.

STANDARDS	TITLE
IEC 60034-1	Rating and performance
IEC 60034-2-1	Standard methods for determining losses and efficiency from tests
IEC 60034-5	Degrees of protection provided by the integral design of rotating electrical machines (IP Code)
IEC 60034-6	Methods of cooling (IC Code)
IEC 60034-7	Classification of types of construction, mounting arrangements and terminal box position (IM Code)
IEC 60034-8	Terminal markings and direction of rotation
IEC 60034-9	Noise limits
IEC 60034-11	Thermal protection
IEC 60034-12	Starting performance of single-speed three-phase cage induction motors
IEC 60034-14	Measurement, evaluation and limits of vibration severity
IEC 60034-26	Effects of unbalanced voltages on the performance of three-phase cage induction motors
IEC 60034-30-1	Efficiency classes of line operated AC motors (IE Code)
IEC 60034-31	Selection of energy-efficient motors including variable speed applications - Application guide
IEC 60038	Standard voltages
IEC 60072-1	Dimensions and output series for rotating electrical machines - Frame numbers 56 to 400 and flange numbers 55 to 1080
IEC 60085	Electrical insulation - Thermal evaluation and designation
IEC 60947-8	Control units for built-in thermal protection (PTC) for rotating electrical machines
EN ISO 1680	Test code for the measurement of airborne noise emitted by rotating electrical machines

2. EFFICIENCY

In 1998 the European Committee of Manufacturers of Electrical Machines and Power Systems (CEMEP) issued a voluntary agreement of motor manufacturers on efficiency classification with three efficiency classes namely Eff1, Eff2, and Eff3, which can be treated as the first concrete approach towards efficiency in the European region. The lack of regularity authority behind the agreement have limited the success of this formation and helped to convert as low as 1% of Eff3 low-efficiency motors to Eff1 high-efficiency motors in about 10 years.

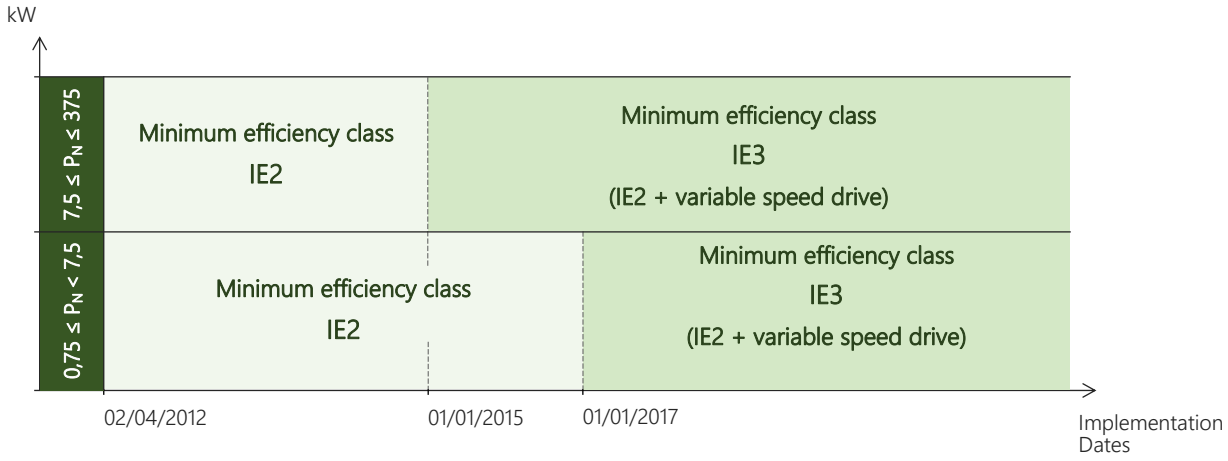
International Electrotechnical Commission (IEC) conducted a comprehensive study within this period of time and came up with two efficiency standards of which latest versions are 60034-30-1:2014 where IE codes are defined and 60034-2-1:2014 where test methods are specified.

IEC is an organization that defines efficiencies, test procedures by publishing standards but it is not a body that is controlling the application of these standards. They are rather controlled via MEPS (Minimum Energy Performance Standards) which are made mandatory by government energy efficiency bodies in the relevant countries. In the European Union, Eu regulation 640/2009 and the supplement 04/2014 is a force to regulate energy efficiency of industrial motors in the industrial environment. In Turkey, it is regulated by communique 28197 (SGM-2012/2) dated 07/02/2012 on ecodesign requirements for electric motors and the supplement 29294 (SGM-2015-2015/15 dated 13/03/2015.

The aim of these legislative regulations in the European Union and Turkey is to maintain usage of motors not less than IE3 efficiency level as from 1 January 2015 (motors between 7,5kW – 375kW) and 1 January 2017 (motors between 0,75 – 7,5 kW) hence reduce Co2 emissions worldwide.

The table below lists the scope of the international standard IEC 60034-30-1 and of Regulation 640/2009

Timeline as per EU Regulation



SCOPE	DIRECTIVES: 640/2009 and 04/2014	STANDARD: IEC 60034-30-1:2014
Pole Number	2, 4 and 6 pole	2, 4, 6 and 8 pole
Motor Output Power	0,75kW < P_N < 375kW	0,12kW < P_N < 1000kW
Nominal Voltage	0 < U_N < 1000V	50V < U_N < 1000V
Frequency	50Hz or 50/60Hz	50Hz or 60Hz
Altitude	0 < altitude < 4000m	0 < altitude < 4000m
Ambient Temperature*	-30°C < t < 60°C	-20°C < t < 60°C
Maximum Operating Temperature	400°C	400°C**

* Minimum ambient temperature should be 0°C for water cooled motors.

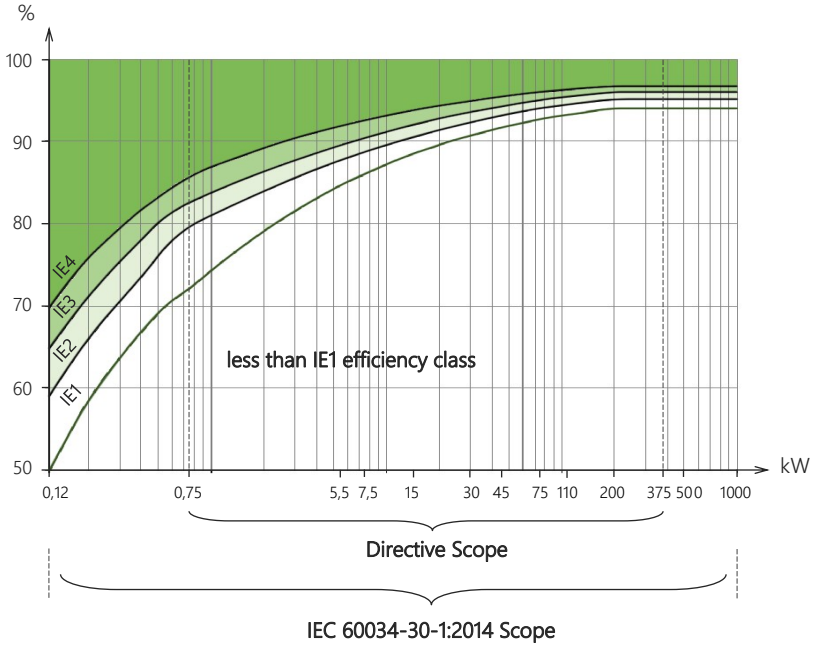
** Smoke extraction motors

2.1. IEC 60034-30-1:2014

IEC 60034-30-1: 2014 specifies the latest efficiency classes for single-speed electric motors that are rated according to IEC 60034-1 and operating on a sinusoidal voltage supply.

The motors listed below are excluded from this standard:

- Single-speed motors with 10 or more poles or multi speed motors.
- Motors completely integrated into a machine (for example pump, fan and compressor) that cannot be tested separately from the driven machine.
- Motors with integrated frequency converter (compact drives) when the motor cannot be tested separately from the converter.
- Brake motors when the brake is an integral part of the inner motor construction and cannot be dismantled or separately fed.
- Submersible motors specially designed to operate wholly immersed in a liquid.



Efficiency levels for 4 pole motors (IEC 60034-30-1:2014)

2.2. IEC 60034-2-1:2014

IEC defines three different preferred testing methods in the latest IEC 60034-2-1:2014/06 standard, in order to determine the efficiencies of rotating electrical machines.

Omega Motor uses test **Method 2-1-1B** with low uncertainty. This is an indirect method and determines the efficiency by summation of losses with additional load losses from residual losses. The respective loss components are iron losses, windage and friction losses, stator and rotor losses and additional load losses. These losses are calculated by parameters measured and derived during the test of the motor, hence by their summation, the motor efficiency is determined precisely.

There are two other test methods in the standards which can be preferred depending on the type or rating of the machine under test.

- **Method 2-1-1A:** Direct measurement of input and output
- **Method 2-1-1C:** Summation of losses with additional load losses from assigned allowance.

Nominal efficiency values (%) for 50Hz are specified in IEC 60034-30-1:2014 and given below:

Efficiency value determination based on the test methods specified in IEC 60034-2-1:2014

Output Power	IE1 Standard Efficiency Motors				IE2 High Efficiency Motors				IE3 Premium Efficiency Motors				IE4 Super Premium Efficiency Motors			
kW	2 pole	4 pole	6 pole	8 pole	2 pole	4 pole	6 pole	8 pole	2 pole	4 pole	6 pole	8 pole	2 pole	4 pole	6 pole	8 pole
0,12	45,0	50,0	38,3	31,0	53,6	59,1	50,6	39,8	60,8	64,8	57,7	50,7	66,5	69,8	64,9	62,3
0,18	52,8	57,0	45,5	38,0	60,4	64,7	56,6	45,9	65,9	69,9	63,9	58,7	70,8	74,7	70,1	67,2
0,20	54,6	58,5	47,6	39,7	61,9	65,9	58,2	47,4	67,2	71,1	65,4	60,6	71,9	75,8	71,4	68,4
0,25	58,2	61,5	52,1	43,4	64,8	68,5	61,6	50,6	69,7	73,5	68,6	64,1	74,3	77,9	74,1	70,8
0,37	63,9	66,0	59,7	49,7	69,5	72,7	67,6	56,1	73,8	77,3	73,5	69,3	78,1	81,1	78,0	74,3
0,40	64,9	66,8	61,1	50,9	70,4	73,5	68,8	57,2	74,6	78,0	74,4	70,1	78,9	81,7	78,7	74,9
0,55	69,0	70,0	65,8	56,1	74,1	77,1	73,1	61,7	77,8	80,8	77,2	73,0	81,5	83,9	80,9	77,0
0,75	72,1	72,1	70,0	61,2	77,4	79,6	75,9	66,2	80,7	82,5	78,9	75,0	83,5	85,7	82,7	78,4
1,1	75,0	75,0	72,9	66,5	79,6	81,4	78,1	70,8	82,7	84,1	81,0	77,7	85,2	87,2	84,5	80,2
1,5	77,2	77,2	75,2	70,2	81,3	82,8	79,8	74,1	84,2	85,3	82,5	79,7	86,5	88,2	85,9	82,6
2,2	79,7	79,7	77,7	74,2	83,2	84,3	81,8	77,6	85,9	86,7	84,3	81,9	88,0	89,5	87,4	84,5
3	81,5	81,5	79,7	77,0	84,6	85,5	83,3	80,0	87,1	87,7	85,6	83,5	89,1	90,4	88,6	85,9
4	83,1	83,1	81,4	79,2	85,8	86,6	84,6	81,9	88,1	88,6	86,8	84,8	90,0	91,1	89,5	87,1
5,5	84,7	84,7	83,1	81,4	87,0	87,7	86,0	83,8	89,2	89,6	88,0	86,2	90,9	91,9	90,5	88,3
7,5	86,0	86,0	84,7	83,1	88,1	88,7	87,2	85,3	90,1	90,4	89,1	87,3	91,7	92,6	91,3	89,3
11	87,6	87,6	86,4	85,0	89,4	89,8	88,7	86,9	91,2	91,4	90,3	88,6	92,6	93,3	92,3	90,4
15	88,7	88,7	87,7	86,2	90,3	90,6	89,7	88,0	91,9	92,1	91,2	89,6	93,3	93,9	92,9	91,2
18,5	89,3	89,3	88,6	86,9	90,9	91,2	90,4	88,6	92,4	92,6	91,7	90,1	93,7	94,2	93,4	91,7
22	89,9	89,9	89,2	87,4	91,3	91,6	90,9	89,1	92,7	93,0	92,2	90,6	94,0	94,5	93,7	92,1
30	90,7	90,7	90,2	88,3	92,0	92,3	91,7	89,8	93,3	93,6	92,9	91,3	94,5	94,9	94,2	92,7
37	91,2	91,2	90,8	88,8	92,5	92,7	92,2	90,3	93,7	93,9	93,3	91,8	94,4	95,2	94,5	93,1
45	91,7	91,7	91,4	89,2	92,9	93,1	92,7	90,7	94,0	94,2	93,7	92,2	95,0	95,4	94,8	93,4
55	92,1	92,1	91,9	89,7	93,2	93,5	93,1	91,0	94,3	94,6	94,1	92,5	95,3	95,7	95,1	93,7
75	92,7	92,7	92,6	90,3	93,8	94,0	93,7	91,6	94,7	95,0	94,6	93,1	95,6	96,0	95,4	94,2
90	93,0	93,0	92,9	90,7	94,1	94,2	94,0	91,9	95,0	95,2	94,9	93,4	95,8	96,1	95,6	94,4
110	93,3	93,3	93,3	91,1	94,3	94,5	94,3	92,3	95,2	95,4	95,1	93,7	96,0	96,3	95,4	94,7
132	93,5	93,5	93,5	91,5	94,6	94,7	94,6	92,6	95,4	95,6	95,4	94,0	96,2	96,4	96,0	94,9
160	93,8	93,8	93,8	91,9	94,8	94,9	94,8	93,0	95,6	95,8	95,6	94,3	96,3	96,6	96,2	95,1
200	94,0	94,0	94,0	92,5	95,0	95,1	95,0	93,5	95,8	96,0	95,8	94,6	96,5	96,7	96,3	95,4
250	94,0	94,0	94,0	92,5	95,0	95,1	95,0	93,5	95,8	96,0	95,8	94,6	96,5	96,7	96,5	95,4
315	94,0	94,0	94,0	92,5	95,0	95,1	95,0	93,5	95,8	96,0	95,8	94,6	96,5	96,7	96,6	95,4
355	94,0	94,0	94,0	92,5	95,0	95,1	95,0	93,5	95,8	96,0	95,8	94,6	96,5	96,7	96,6	95,4
400	94,0	94,0	94,0	92,5	95,0	95,1	95,0	93,5	95,8	96,0	95,8	94,6	96,5	96,7	96,6	95,4
450	94,0	94,0	94,0	92,5	95,0	95,1	95,0	93,5	95,8	96,0	95,8	94,6	96,5	96,7	96,6	95,4
500 - 1000	94,0	94,0	94,0	92,5	95,0	95,1	95,0	93,5	95,8	96,0	95,8	94,6	96,5	96,7	96,6	95,4

3. DEGREES OF PROTECTION

IEC 60034-5 defines the degrees of protection provided by enclosures for rotating electrical machines.

EXAMPLE OF DESIGNATION

IP X X

Characteristic letters (International Protection)
First characteristic numeral
Second characteristic numeral

Motor	Degree of protection	First Numeral		Second Numeral
		Protection against contact	Protection against foreign bodies	Protection against water
Surface Ventilated	IP 55	Complete protection against contact with live or moving parts	Dust protected. Ingress of dust is not totally prevented but dust can not enter in sufficient quantity to interfere with satisfactory operation of the motors	Protected against jets. Water projected by a nozzle against the motor from any direction shall not do any harmful effect.
	IP 56			Protected against water from heavy seas.
	IP 65		Dust tight. Ingress of dust is totally prevented	Water projected by a nozzle from any direction.

4. COOLING METHOD

Brief information on the cooling methods, specified in IEC 60034-6, is given below.

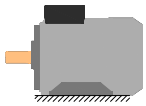
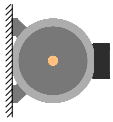
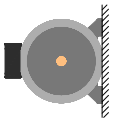
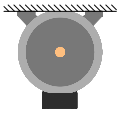
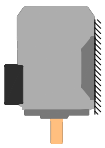
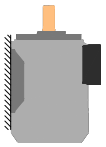
IC 4 (A)* 1 (A)* 1

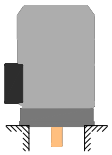
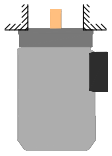
- Code letters (International Cooling)
- Cooling circuit arrangement
  - **4:** Frame surface cooled
- Movement method of primary coolant
  - **1:** Air circulation inside the motor
- Movement method of secondary coolant
  - **0:** Free convection via frame surface, without fan
  - **1:** With the fan on the motor shaft (NDE side) via frame surface
  - **6:** With an independent fan from the motor shat (Forced cooling)
  - **8:** Cooling with driven fan by the motor itself

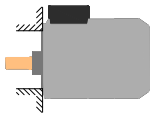
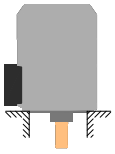
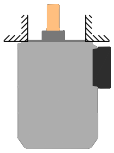
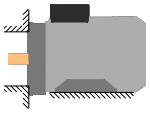
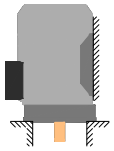
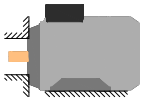
* (A): This letter indicates the surrounding medium (A for air. W for water). For air cooled motors, A is omitted for simpler designation.

5. TYPES of CONSTRUCTION

Types of construction and mounting arrangements according to IEC 60034-7.

	Foot Mounted Motors					
Example Sketch						
Mounting Arrangements	IM B3 IM 1001	IM B6 IM 1051	IM B7 IM 1061	IM B8 IM 1071	IM V5 IM 1011	IM V6 IM 1031
Frame Size	71 - 355	71 - 355	71 - 355	71 - 355	71 - 355	71 - 355
Product Code (Position 13)	A	H	J	K	L	M

	Flange Mounted Motors					
Example Sketch						
Mounting Arrangements	IM B5 IM 3001	IM V1 IM 3011	IM V3 IM 3031	IM B14 IM 3601	IM V18 IM 3611	IM V19 IM 3631
Frame Size	71 - 355	71 - 355	71 - 315	71 - 160	71 - 160	71 - 160
Product Code (Position 13)	B	D	N	S	Y	Z

	Motors without Foot and Endshield at D-End			Foot and Flange Mounted Motors		
Example Sketch						
Mounting Arrangements	IM B9 IM 9101	IM V8 IM 9111	IM V9 IM 9131	IM B35 IM 2001	IM V15 IM 2011	IM B34 IM 2101
Frame Size	71 - 355	71 - 355	71 - 315	71 - 355	71 - 355	71 - 160
Product Code (Position 13)	F	P	R	C	E	T

6. LIMITS OF VIBRATION SEVERITY

The permissible vibration severities for electric motors are specified in standard IEC 60034-14. All motors from frame size 71 to 355 already meet or remain below the limit values specified for vibration severity grade A (normal). Vibration severity grade A is the standard version and is valid up to a rated frequency of 60 Hz. Vibration severity grade B can be supplied on request (code B01). For converter operation with frequencies higher than 60 Hz, special balancing is required for compliance with the specified limit values.

IEC 60034-14 recommends the following maximum vibration magnitude limits in terms of displacement, speed and acceleration for a frame size H:

Vibration Grade	Frame Size	71 ≤ H ≤ 132			132 < H ≤ 280			H > 280		
		Displacement µm	Velocity mm/s	Acceleration m/s^2	Displacement µm	Velocity mm/s	Acceleration m/s^2	Displacement µm	Velocity mm/s	Acceleration m/s^2
A	Free suspension	25	1,6	2,5	35	2,2	3,5	45	2,8	4,4
	Rigid mounting	21	1,3	2,0	29	1,8	2,8	37	2,3	3,6
B	Free suspension	11	0,7	1,1	18	1,1	1,7	29	1,8	2,8
	Rigid mounting	-	-	-	14	0,9	1,4	24	1,5	2,4

Based on ISO 8821, the key convention "half key (H)" must be used for balancing. All rotors are balanced dynamically with an inserted half-key in place. Upon request, it is possible to perform balancing with or without a full key (order code for full key balancing is B11, and without key is B12). Shaft fitments, such as couplings, pulleys, gears and fans must also be balanced likewise to prevent undue vibration and adverse effects on bearing life. A full feather is always inserted in the keyway on delivery.

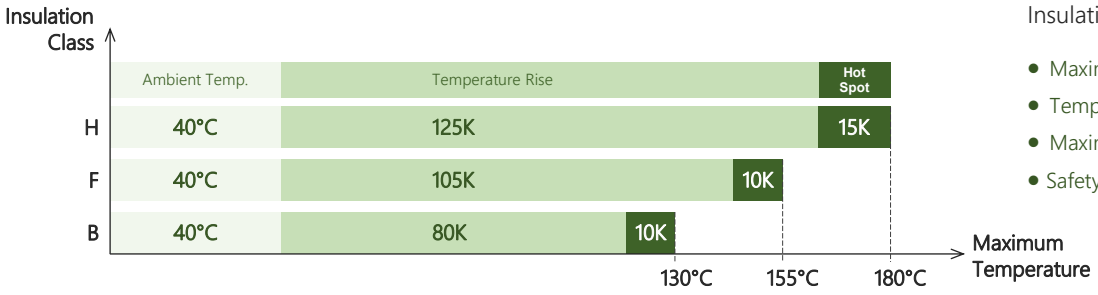
7. INSULATION SYSTEM

The insulation system applied in our motors ensures a high level of mechanical and electrical strength along with a very long motor life. The winding insulation is resistant against aggressive gasses, vapors, dust, oil and humid air. It helps the windings to withstand against vibration stress. This system accomplished by using mainly high grade enameled copper wires, insulating sheets, sleeves and solvent free impregnating epoxy resin.

All standard range motors are of class F (155˚C) insulation with class B (80K) temperature rise which gives the product a 25˚C safety margin. This reserve of temperature allows the motors to operate continuously at;

- Up to 15% above its rated outputs
- Up to 55˚C ambient temperature at rated outputs
- Up to 3000m asl altitude at rated outputs

Furthermore, this temperature reserve permits the motor to withstand against greater voltage and frequency tolerances. The insulation life of the motor will extend if the safety margin is not utilized.



Insulation system in brief;

- Maximum temperature: **155°C**
- Temperature rise: **80K**
- Maximum ambient temperature: **40°C**
- Safety margin: **35°C**

8. VARIABLE SPEED DRIVES

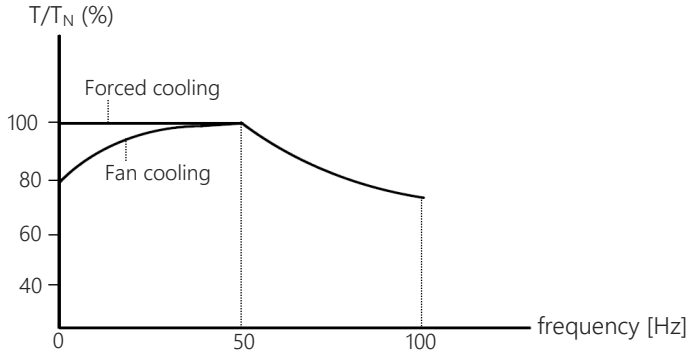
Squirrel cage induction motors used in industry and many other applications offer highly efficient, robust and reliable operation. The performance of motors having constant speed and starting DOL can be further improved when used with a frequency converter. The VSD enables to control the process accurately by adjusting the torque and speed. With a correct application of frequency converter, it is possible to increase the efficiency of the system and in some cases improve the capacity of the process by increasing the speed over nominal speeds.

With a VSD, it is possible to make smooth starting which helps to reduce significantly the stress on the motors and supply network.

Following points under related subtitles must be taken into consideration when motors are driven by frequency converter.

8.1. WINDING INSULATION

The output voltage waveform from a frequency converter is not fully sinusoidal. Further, harmonics will be produced in the inverter. This may affect the motor additional losses and increase the motor temperature rise. In this case, the motor must be correctly sized to compensate for the losses incurred. In addition to thermal dimensioning, an adequate torque margin must be maintained for stabilities which must be at least 30% higher than the load torque. However, standard production of Omega Motors which are IE3 premium and IE4 super premium efficiency motors, may be enough to maintain the torque and output requirements over the whole duty range without the need to oversize the motor as the temperature rise is considerably reduced due to the lower losses.

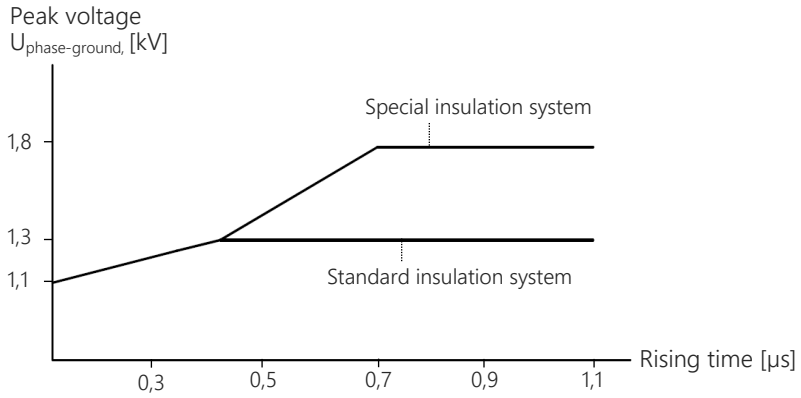


The adjacent figure gives an idea about the thermal capacity of a motor. Mechanical speed limits should be taken into consideration during the operation above nominal speeds.

Standard design induction motors of Omega Motor are capable of working with frequency converters up to 500V supply voltage without any special design. However, limit values for peak voltages and voltage rising time must be taken into consideration. Limit values for standard design motors are:

- Peak voltage $U_{phase\text{-}ground} \leq 1100$ V
- Voltage rising time $t_s > 0.1$ µs

The voltage peaks at the motor terminals are mainly caused by converter switching frequency and cabling between the converter and motor. It is recommended not to exceed 5kHz switching frequency in order to protect the insulation system of the motor. In case the maximum allowed phase-to-ground (U phase-ground) voltage peaks in motor terminals as a function of pulse rise time (ts) shown in the figure below are exceeded, a special insulation system with Y02 Code must be inquired. However, if this condition can not be satisfied, filters must be used.



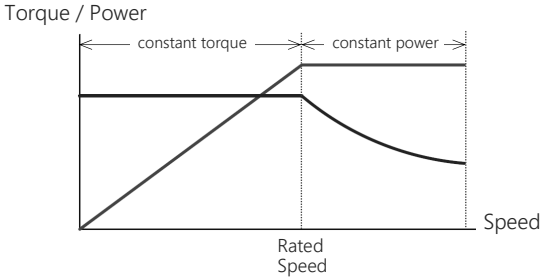
Maximum peak voltage (phase-ground) as a function of rising time.

8.2. COOLING

When the motor is operated at low speeds, the cooling capacity of the fan fitted on its shaft will decrease in a proportion, with the speed.

In variable torque loads, when the torque is reduced with decreasing speed, such as with centrifugal pumps and fans, this reduction in cooling air often stays in balance with the reduction in motor losses as the load is reduced with speed. In constant torque loads, the motor's temperature rise limits will likely to be exceeded if the low-efficiency motor is being used in which case a forced ventilation must be considered. However, IE3 premium efficiency and IE4 super premium efficiency motors generate less heat which means they have a higher thermal reserve and may not need forced ventilation but of course this depends on the extent of the speed reduction.

In high speed applications due to magnetic field weakening , the motor torque will reduce and can only supply constant power. The output of the motor will remain constant to a certain extent depending on the breakdown torque and then will start to reduce as illustrated in below figures.



When the motor is operated in high speed (higher than 60Hz operation) standard fan will generate more noise and friction&windage losses will increase. In such cases forced ventilation is strongly recommended to prevent additional friction&windage losses and noise problem.

When placing the order, operating conditions must be stipulated.

8.3. BEARING LIFE - LUBRICATION

Bearing temperature varies as a function of motor load and speed, in variable speed applications. The ideal way to determine the bearing life expectancy of permanently lubricated bearings of frame sizes 71 to 225 and lubrication intervals for the re-greaseable bearing of frame sizes 250 to 355 is best done by measuring the bearing temperature during motor operation. Please note that the lubrication periods and grease amount will be different for variable speed applications than that given in the technical catalog and motor label.

Bearing temperature of motors that are operated above their nominal speed will be higher due to friction and the lifetime of permanently lubricated bearings and lubrication period of re-greaseable bearings will become shorter.

8.4. MECHANICAL SPEED LIMITS

The permissible mechanical speed limits of OMEGA Motors are given at the following table. The speed limits of the bearings, critical rotor speeds and rigidity of the rotating parts determines the maximum mechanical speeds. Please note that operation at speeds higher than nominal speed may cause higher mechanical vibrations.

Frame Sizes	2 Pole	4 Pole	6 Pole	8 Pole	Frame Sizes	2 Pole	4 Pole	6 Pole	8 Pole
71	4500	4500	4500	-	180	4500	4500	4500	4500
80	4500	4500	4500	-	200	4500	4500	4500	4500
90	4500	4500	4500	-	225	3600	3600	3600	3600
100	4500	4500	4500	-	250	3600	3600	3600	3600
112	4500	4500	4500	-	280	3600	3600	3600	3600
132	4500	4500	4500	4500	315	3600	2300	2300	2300
160	4500	4500	4500	4500	355	3600	2300	2300	2300

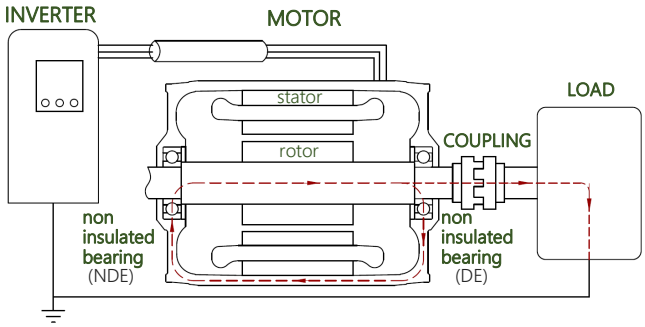
8.5. BEARING CURRENTS

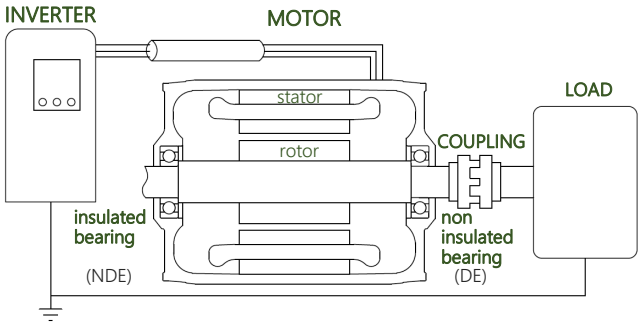
The rapid switching in modern AC frequency converters may generate high-frequency current pulses which tend to complete their path through the motor bearings. If the energy of these pulses is high enough, this can lead to a damage on the bearings. The induced voltage on the shaft will overcome the dielectric of the lubricant in the bearing and hence cause bearing discharges known as Electrical Discharging Machining EDM effect that causes distructive pitting and damage on the bearing raceway. Beside the rise time, the cable length is a predominant factor influencing the voltage peaks occurrence at the inverter fed motor terminals. Therefore, shortening the cable length between the motor and the drive and/or using a symmetrical shielded cable will help to reduce the radiated emission through the motor cables in the Radio Frequency range (RF).

For motors lower than 100kW, the effects are usually minimal, and no additional provision needed to be made. However, for motors with an output higher than 100kW the effects become more noticeable and following additional provisions need to be made in order to eliminate the harms of bearing currents:

- Using an insulated bearing at Non-drive end side.
- Insulating the Non-drive end shield and components contacting the bearing.
- Using Drive-end grounding brush.

Using common-mode filters at the output of the inverter will avoid bearing currents. When placing the order, please specify if the motor is to be driven by a frequency converter.





9. TOLERANCES

According to IEC 60034-1, the following tolerances are permissible:

Parameters	Tolerances
Efficiency (η) (when determined indirectly)	
-Motors $P_N \leq 150kW$	- 0,15 x (1-η)
-Motors $P_N > 150kW$	- 0,1 x (1-η)
Power factor (cosφ)	1/6 (1 - cosφ) minimum absolute value: 0,02 maximum absolute value: 0,07
Total losses (applicable for machines with rated outputs > 150kW)	+10% of the total losses
Slip (s)	
Motors $P_N < 1kW$	±30% of the slip
Motors $P_N \geq 1kW$	±20% of the slip
Locked rotor current (I_A)	+20% (without lower limit)
Locked rotor torque (T_A)	+25%* of the torque -15% of the torque
Breakdown torque (T_K)	-10% (M_K/M_N still at least 1.6 after application of this tolerance)
Moment of inertia (J)	± 10%
Noise level (sound pressure level at measuring surface)	+ 3 dB (A)

These tolerances are applicable to the warranted values for three-phase asynchronous motors, taking into account necessary manufacturing tolerances and possible deviations in the raw materials used.

* + 25% may be exceeded by agreement

10. MECHANICAL DESIGN

10.1. FRAME, ENDSHIELDS AND FLANGES

Frame Size	71	80	90	100	112	132	160	180	200	225	250	280	315	355
Frame	Aluminium						Aluminium or Cast Iron				Cast Iron			
End shields (DE/NDE Sides)	Aluminium						Aluminium or Cast Iron		Cast Iron					
Flange (B5)	Aluminium						Cast Iron							
Flange (B14)	Aluminium					Cast Iron		—						
Flange (B14-2)	Aluminium					Cast Iron		—						

10.1.1. ALUMINIUM FRAME

The motor frames are made of pressure die cast aluminium alloy from frame size 71 to 225. Frame sizes 71 to 112 have both integral and removable feet construction where terminal box is located on top in both versions. Frame sizes 132 to 225 are multi mount frames having removable/bolt-on feet and allows the motor to be left, right or top terminal box mounting position. All removable feet are made of pressure die cast aluminium alloy. Multi mount frame motors are available on top terminal box position as standard. Please inquire if left or right terminal box position is required.

10.1.2. CAST IRON FRAME

The motor frames are made of cast iron from frame size 160 to 355. All cast iron frames are available as with feet and without feet. Frame with feet has a solid and integrated cast feet which provide greater strength. The terminal box is always located on top as standard.

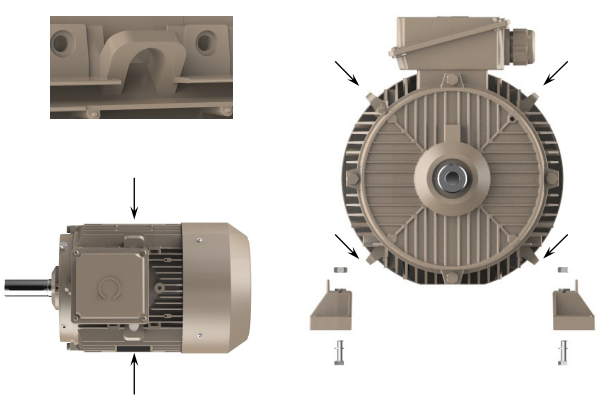
The cast iron frame produced of GG20 is capable to withstand against high mechanical impacts and strengths and reduce mechanical vibrations. Its unique fin design provide maximum heat dissipation and ensures excellent thermal performance of the motor.

10.2. LIFTING LUGS

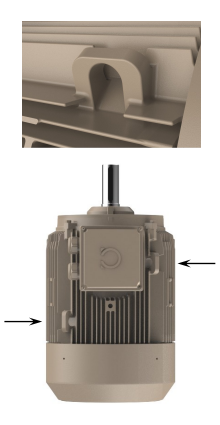
Eye bolts, lifting lugs or lifting openings, if provided, are intended only for lifting the motor. These lifting provisions should never be used when lifting or handling the motor and driven ancillary equipment together. Please refer to “Motor Installation and Maintenance Guide” for further information.

To facilitate lifting to the different mounting positions, the motors have multiple points where lifting lugs are available or eyebolts can be fitted.

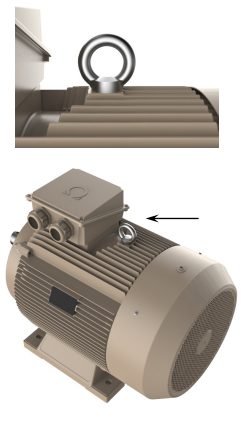
No lifting facility is provided in frame size 71 to 112 motors. Four lifting lugs integral with aluminium frame are available in frame size 132 to 225 motors. Once feet are bolt on the frame, two lifting lugs opposite to each other can be used to lift the horizontal motor no matter if the terminal box is on top, right or left position. Furthermore, two optional points are available for fitting DIN580 eyebolts in aluminium frame motors from frame size 160 to 225 which has to be inquired with an option code of X06.



Aluminium Frames
132 to 225



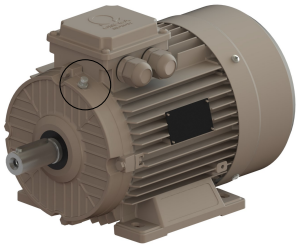
Cast Iron Frames
160 to 225

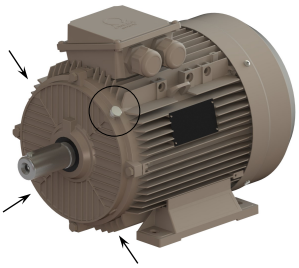


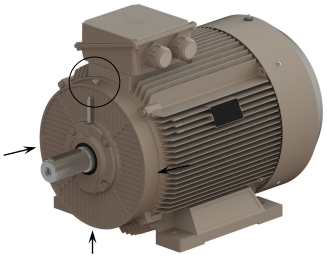
Cast Iron Frames
250 to 355

10.3. VIBRATION MEASURING POINTS AND NIPPLES

There is one flat area on the drive and non drive end of the motors from frame size 71 to 112, for better placement of accelerometer or vibration tester. Motors of frame size 132 to 355 have four of these flat areas on both ends. Measuring nipples for SPM shock pulse measurement are optionally possible to check the bearings.







10.4. EXTERNAL FINISH

Omega Motors are protected with a range of surface finishes as shown below.

Surface	Parts	Treatment
Cast Iron	End shields, Housing	Shot blasting + Primer
Steel	Fan Cover	Zinc galvanized
Aluminium alloy	Housing, End shields, Terminal boxes, Bearing caps	Shot blasting
Polymer	Ventilation fans	None

Standard paint system of Omega Motor

Motors	Atmosphere	Applications	Corrosivity Category Acc. to ISO 12944-2
71 to 112 Aluminium Frame	Non-harsh and not very harsh (indoors, industrial)	Solvent-based acrylic paint	C3
132 to 225 Aluminium Frame	Moderately corrosive, humid and outdoors (temperate climate)	2 pack (water based) Epoxy top coat 50µm	C3
160 to 355 Cast Iron			

Omega motor standard paint color reference: RAL 1019

10.5. COOLING

All standard motors are totally enclosed and fan cooled (TEFC)-IC411 as per IEC 60034-6. Motors frame size 71 to 355 have radial flow fan, fitted on the non-drive end shaft of the motor and operate regardless of the direction of rotation. The air flows from the non-drive end (NDE) to drive end (DE) direction. Totally enclosed non-ventilated (TENV) – IC410, totally enclosed air over (TEAO) – IC418 and totally enclosed forced ventilated (TEFV) – IC416 versions are also available on request.

The standard fan impeller is made out of plastic. Where necessary, metal fan impeller can also be supplied on request. The fan covers of all motors are made of sheet metal by drawing to its final shape.

For motors having vertical shaft extension pointing upwards, the end user must prevent, ingress of fluid along the shaft. Downwards, a protective cover (canopy) is recommended. When the motors are installed outdoors, over a long period of time, they must be protected with a sort of cover against direct intensive solar radiation, rain, snow, ice or dust.

When the motor is mounted to a place where the air intake is restricted, it must be ensured that minimum clearance is maintained between the fan cover and the restricted element. This restriction may be caused either by a wall or any adjacent part fitted on the non-drive end shaft of the motor like flywheels or large hand wheels. Recommended minimum clearance between the wall and fan cover;

Frame Size	71	80	90	100	112	132	160	180	200	225	250	280	315	355
Clearance [mm]	25			30			45		60		90		110	

10.6. SHAFT EXTENSION

All standard design motors are produced with one shaft extension and fitted with a proper shaft key in accordance with ZEC 60072-1. Motors with second standard shaft extension can be delivered upon request with special order code M 30. The shaft ends have a 60° center hole to DIN 332, Port 2 with M5 to M24 tapped hole depending on the shaft diameter.

10.7. ANTI-CONDENSATION HEATING ELEMENTS

Heating elements are used to protect the windings of the motor against condensation. The use of anti-condensation heaters are recommended for motors installed in highly humid environments and left idle for long periods or for motors that are subjected to widely fluctuating temperatures.

Anti-condensation heaters must be energized when the motor is switched off and de-energized when the motor is switched on.

An additional M16 cable gland is provided for the connecting cable in the terminal box.

The supply voltage for anti-condensation heaters must be defined by the customer. It can be either 115V or 230V.

The power rating and number of anti-condensation heaters corresponding to the frame sizes are indicated in the below table:

Frame Sizes	71	80	90	100	112	132	160	180	200	225	250	280	315	355
No. of Heaters x Output Power	2 x 8W	2 x 20W			2 x 30W				2 x 40W				2 x 60W	

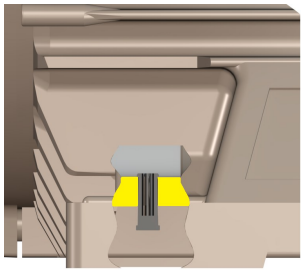
Instead of anti-condensation heaters, another alternative is to apply a low voltage that is approximately 5 to 10% of motor rated voltage to stator terminals U1 and V1 by means of auto-transformer. After the motor is de-energized 20% to 30% of the motor rated current will be enough to heat the motor.

10.8. DRAIN HOLES

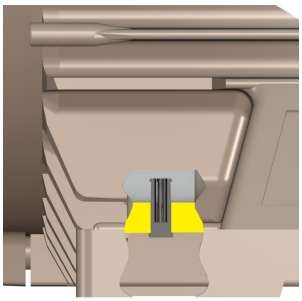
There are drain holes at both ends of the frame for drainage of water that may condense inside of the enclosure.

These drain holes are situated underneath of the frame as standard for horizontal mounting arrangement where the terminal box is on top. Condensation drain holes can also be implemented in motors designed for vertical operation (shaft up or down), feet located on side or top provided that it is inquired with the order. Motors with a protection degree of IP 55 are delivered with plugs closed. It is advisable to periodically open the drain plugs in order to ensure that the condensed water drains out. When opened , the enclosure degree of protection will reduce to IP 44.

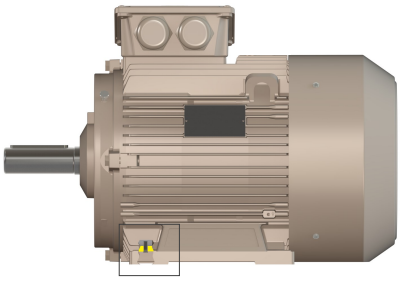
The open and closed positions of drain plugs are illustrated below.



Drain hole open position



Drain hole is close position



- Location of drain hole depends on motor's mounting arrangement and frame material. These pictures are given for IM B3, aluminium frame motors.

10.9. TERMINAL BOX

The terminal box of all frame sizes is made of high pressure die-cast aluminium alloy and positioned towards the drive end of the motor. This arrangement improves the air flow over the cooling fins, and reduces the motor operating temperature.

From frame size 132 to 355, it is diagonally split for easier access and handling of leads and connections. It allows cable entry from both sides simply by rotating the terminal box 180°.

From frame size 71 to 112, terminal box is integrally cast with the aluminium motor frame. Cable entry is maintained by means of readily fit snap-in cable gland. It also permits cable entry from opposite side by removing the aluminium knockout.

All motors from frame size 71 to 355 are provided with earth terminal on the frame inside the terminal box.

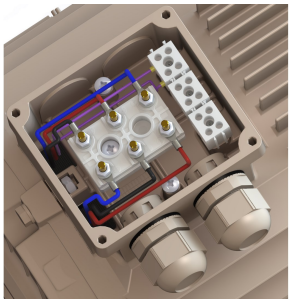
Accessory terminals are assembled on connectors whenever the motor is supplied with thermistors, thermostats, PT100 monitoring sensors or anti-condensation heaters. A M16 cable gland is fitted for the incoming connection leads.

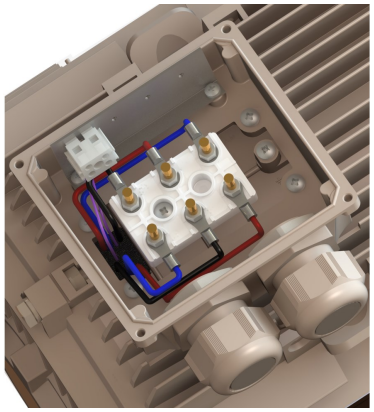
The motor terminal block is made from thermoplastic material duly reinforced with fiber glass. It has six terminals with sizes given below:

Frame size	71	80	90	100	112	132	160	180	200	225	250	280	315	355
Terminal size	M4 x 12					M5 x 15	M6 x 24		M8 x 28		M10 x 24		M12	M16

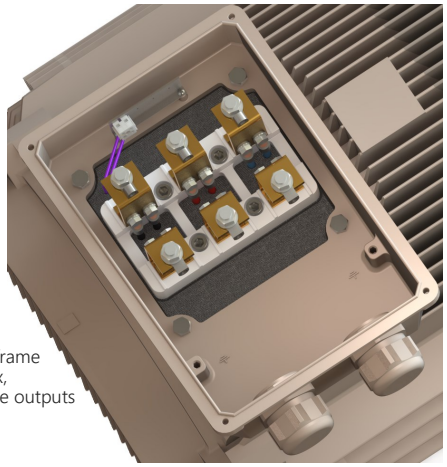
*External earth terminal is standard for frame size 250 to 315 motors. It is located on the foot.

For **71 to 112** frame sizes terminal box, terminal and cable outputs are

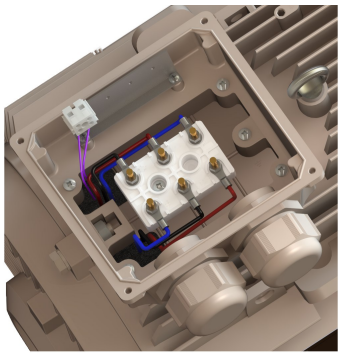




For **132** frame size terminal box, terminal and cable outputs are shown above.



For **315** and **355** frame sizes terminal box, terminal and cable outputs are shown above.



For **160** to **280** frame sizes terminal box, terminal and cable outputs are shown above.

10.10. CABLE GLAND

Cable entry to the terminal box is maintained by means of polyamide cable glands produced according to DIN EN 62444 and sealed with IP 68 protection degree. Motors from frame size 71 to 90 have one and motors of frame sizes 100 and 112 have two snap-in glands and are fitted on right when viewed from drive end shaft extension. Motors from frame size 132 to 355 have two glands with thread and are flited on right when viewed from drive end shaft extension.

Frame Size	71	80	90	100	112	132	160	180	200	225	250	280	315	355
Cable Glands	1 x M25			2 x M25		2 x M32	2 x M40		2 x M50		2 x M63			2 x M80
Max. Cable Outer Diameter [mm]	Ø18			Ø18		Ø25	Ø32		Ø39		Ø46			Ø60
Min. Cable Outer Diameter [mm]	Ø10			Ø10		Ø12	Ø18		Ø27		Ø33			Ø46

10.11. BEARINGS

The standard bearing configuration of Omega Motor is single row deep groove ball bearings. The maximum permissible radial and axial forces are given at pages 20 to 23. Reinforced design with cylindrical roller bearing at DE should be considered in applications where high radial load is available and exceeding the values given for standard design at page 20. Roller bearings are suitable for belt and pulley applications. When ordering a motor with an angular contact ball bearing, specify also the method of mounting and the direction and magnitude of axial force.

Frame Size	Number of Poles	Standard design Deep groove ball bearing			Reinforced design for high radial forces NU bearing at DE			Reinforced design for high axial forces Angular contact ball bearing at DE		
		Drive end (DE) bearing	Non-drive end (NDE) bearing	Fig. No.	Drive end (DE) bearing	Non-drive end (NDE) bearing	Fig. No.	Drive end (DE) bearing	Non-drive end (NDE) bearing	Fig. No.
71	2 to 8	6202 ZZ CM		1	-		-	-		-
80	2 to 8	6204 ZZ CM			-			-		
90	2 to 8	6205 ZZ CM			-			-		
100	2 to 8	6206 ZZ CM			-			-		
112	2 to 8	6206 ZZ CM			-			-		
132	2 to 8	6208 ZZ C3		2	-			-		
160	2 to 8	6309 ZZ C3	6209 ZZ C3		NU 309 E / CN	6309 C3	5	6309 C3	7309 B	6
180	2 to 8	6310 ZZ C3	6210 ZZ C3		NU 310 E / CN	6310 C3		6310 C3	7310 B	
200	2 to 8	6312 ZZ C3	6212 ZZ C3		NU 312 E / CN	6312 C3		6312 C3	7312 B	
225	2 to 8	6313 ZZ C3	6213 ZZ C3		NU 313 E / CN	6313 C3		6313 C3	7313 B	
250	2 to 8	6315 C3		3	NU 315 E / CN	6315 C3		6315 C3	7315 B	
280	2 to 8	6316 C3			NU 316 E / CN	6316 C3		6316 C3	7316 B	
315	2									
315	4 to 8	6319 C3		4	NU 319 E / CN	6319 C3		6319 C3	7319 B	
355	2									
355	4 to 8	6322 C3			NU 322 E / CN	6322 C3		6322 C3	7322 B	

Standard design with deep groove ball bearings

From frame size 71 to 225, the motors are fitted with double shielded (ZZ) deep groove ball bearings which are factory grease packed for life. Motors of frame size 250 to 355 have open type single row deep groove ball bearings and are equipped with greasing nipples for re-lubrication during operation.

Motors from frame size 71 to 112 have floating bearings at both drive end and non-drive end (see Fig.1). On request, axially-secured located bearing can be supplied on the drive end (DE) complete with a retaining ring to avoid the play of the shaft.

The non-drive end bearings of motors from frame size 132 to 225 are axially located with a retaining ring (see Fig.2). From frame size 250 upwards, the located bearing is axially secured at drive end with a bearing cap (see Fig.3 and Fig.4).

Motors from frame size 160 to 225 can be supplied with NDE bearing upgraded to the size of DE bearing on request with the configuration of Fig.2.

In frame sizes 160 to 225, if required, the drive end (DE) bearing can be located with a retaining ring. A located bearing at the drive end (DE) is recommended when gearing is installed or pumps and fans are mounted directly on the motor shaft.

To compensate for any axial movement of the shaft, the motors are fitted with pre-load washers up to frame size 225 at DE and frame sizes 250 and 280 at NDE. Motors of frame size 315 and 355 have pre-load springs located at NDE (see Fig.4).

Reinforced design with NU cylindrical roller bearing

Reinforced design with NU cylindrical roller bearing is recommended for belt and pulley application in cases where the permissible radial force values given for standard deep groove ball bearing design at page 20 is not enough.

Motors from frame size 160 upwards can be supplied with cylindrical roller bearings. The non-drive end (NDE) bearing is located and the axial movement is compensated by the axial play of the drive end (DE) roller bearing. (see Fig.5)

For NU cylindrical roller bearings, in contrast to ball bearings, a minimum radial force is required to ensure proper operation. Cylindrical roller bearings are not suitable for coupling arrangement and high speed operation.

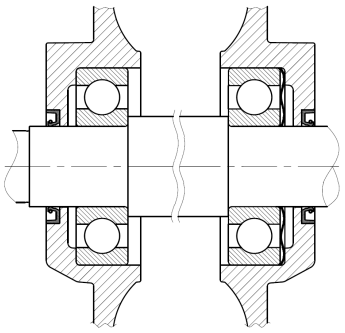
Reinforced design with angular contact ball bearing

Reinforced design with angular contact ball bearing is recommended for applications where the permissible axial force values given at pages 21, 22 and 23 is not enough. When ordering a motor with an angular contact ball bearing, specify also the method of mounting, direction and magnitude of axial force.

Motors from frame size 160 upwards can be supplied with angular contact ball bearings. The non-drive end (NDE) bearing is located and the axial movement is compensated by the pre-load washers/springs at drive end (DE). (see Fig.6)

Motors with roller bearings or angular-contact ball bearings are fitted with a transport lock before dispatch to prevent damage to bearings during transport. The transport lock must be removed before operation.

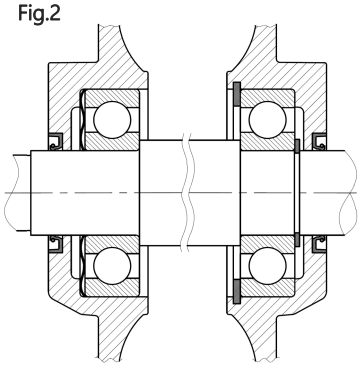
Fig.1



DE Floating bearing

NDE Floating bearing, Pre load washer

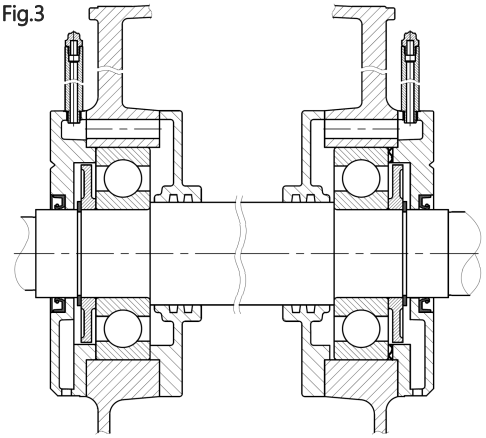
Fig.2



DE Floating bearing, Pre load washer

NDE Locked bearing

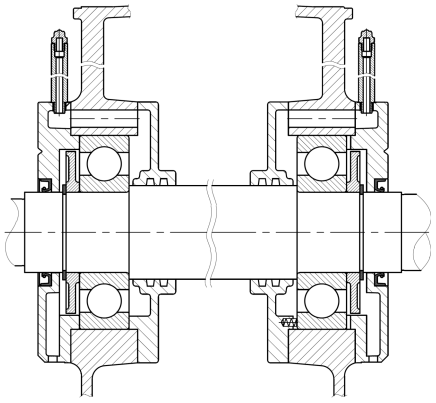
Fig.3



DE Locked bearing

NDE Floating bearing, Pre load washer

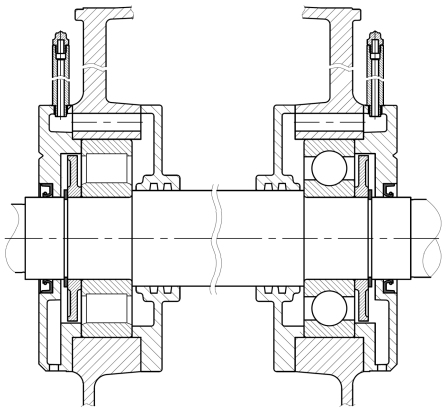
Fig.4



DE Locked bearing

NDE Floating bearing, Pre load spring

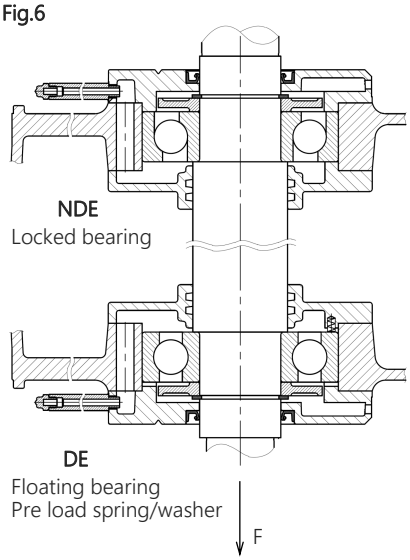
Fig.5



DE Floating bearing

NDE Locked bearing

Fig.6



DE Floating bearing, Pre load spring/washer

10.11.1. BEARING LIFETIME AND LUBRICATION

The standard bearing configuration of Omega Motor is single row deep groove ball bearings. The maximum permissible radial and axial forces are given at pages 20 to 23. Reinforced design with cylindrical roller bearing at DE should be considered in applications where high radial load is available and exceeding the values given for standard design at page 20. Roller bearings are suitable for belt and pulley applications. When high axial loads greater than the values given for standard design at pages 21, 22 and 23 are available, then angular contact ball bearing should be used. When ordering a motor with an angular contact ball bearing, specify also the method of mounting and the direction and magnitude of axial force.

The lifetime of a bearing is expressed as the number of revolutions or the number of operating hours at a given speed that the bearing can accomplish before the first sign of metal fatigue (spalling) begins to appear on a raceway of the inner or outer ring or a rolling element.

The nominal bearing lifetime L10h as defined in ISO 281 is the life that 90% of a sufficiently large group of apparently identical bearings can be expected to reach or exceed when operating under conventional conditions, i.e. after a stated amount of time 90% of a group of identical bearings will not yet have developed metal fatigue. The majority of bearings last much longer than the nominal lifetime; the average lifetime achieved or exceeded by 50% of bearings is around 5 times longer than the nominal lifetime.

Generally, the lifetime of the bearing is dependent on its type and size, the radial and axial mechanical loads it is submitted to, operating conditions (environment, temperature, mounting orientation), rotational speed and grease life. Therefore, bearing lifetime is closely related to its correct use, maintenance and lubrication. A bearing lifetime calculation is possible on request.

The approximate bearing life of four-pole motors at 50 Hz operation with horizontal mounting is about 40000 hours if there is no additional axial or radial forces when direct coupled to the load and 20000 hours when utilized according to the maximum admissible loads given in pages 20 to 23. The nominal bearing lifetime is reduced for converter operation at higher frequencies.

10.11.1.1. Motors with bearings greased for life

Motors in frame size 71 to 225, are fitted with double shielded (ZZ) deep groove ball bearings which are factory grease packed for life. The bearing grease lifetime is matched to the bearing lifetime. This can, however, only be achieved if the motor is operated in accordance with the catalog specifications.

10.11.1.2. Motors with relubrication nipples

Motors in frame size 250 to 355 have open type single row deep groove ball bearings and are equipped with greasing nipples for re-lubrication during operation. On request, motors in frame size 160 to 225 can be equipped with greasing nipples. In aluminium frame motors, both DE and NDE end shields will be cast iron if regreasing facility is requested.

Bearings are lubricated with high quality grease containing lithium soap (thickener) and mineral oil (base).

The quantity of grease and lubrication intervals are stamped in the motor nameplate. The lubrication intervals are shown in table below. It must be emphasized that excessive lubrication, i.e. a quantity of grease greater than that recommended in below table and on the motor nameplate, can result in the increase of bearing temperatures leading to reduced operating hours. Respecting the quantity of grease and lubrication intervals allows bearings to reach the lifetime given.

High speeds that exceed the rated speed with converter operation and the resulting increased vibrations alter the mechanical running smoothness and the bearings are subjected to increased mechanical stress. This reduces the grease lifetime and the bearing lifetime.

Lubrication intervals for deep groove ball bearing

Frame Sizes	Grease Amount		Lubrication Intervals (hour)			
	Drive end (DE) Bearing	Non-drive end (NDE) Bearing	2 Pole 3000 rpm	4 Pole 1500 rpm	6 Pole 1000 rpm	8 Pole 750 rpm
	g	g	hour	hour	hour	hour
160	12	12	8500	16000	20000	22000
180	15	15	7500	15000	19000	21000
200	20	20	6000	13000	17000	20000
225	23	23	5000	12000	16500	19000
250	30	30	4000	11000	15000	18000
280	33	33	3500	10000	14500	17000
315	33	33	2500	-	-	-
315	45	45	-	8500	13000	16000
355	45	45	2000	-	-	-
355	60	60	-	6500	11000	14000

Lubrication intervals are given above for both standard design housing and alternative design housing against over axial forces.

Lubrication intervals for roller bearing

Frame Sizes	Grease Amount		Lubrication Intervals (hour)			
	Drive end (DE) Bearing	Non-drive end (NDE) Bearing	2 Pole 3000 rpm	4 Pole 1500 rpm	6 Pole 1000 rpm	8 Pole 750 rpm
	g	g	hour	hour	hour	hour
160	12	12	3000	8000	11000	13000
180	15	15	2500	7500	10000	12000
200	20	20	1900	6000	9000	11000
225	23	23	1600	5500	9000	11000
250	30	30	1100	4500	7500	10000
280	33	33	900	4000	7000	9000
315	33	33	500	-	-	-
315	45	45	-	3300	6000	8000
355	45	45	300	-	-	-
355	60	60	-	2300	4500	6500

10.11.2. PERMISSIBLE RADIAL FORCES

In pulley and belt couplings, the drive shaft carrying the pulley is subjected to a radial force Fr applied at a distance X (mm) from the shoulder of the shaft extension (length E). The line of force (i.e. the centerline of the pulley) of the radial force must lie within the free shaft extension (dimension x).

The radial force Fr expressed in N applied to the drive shaft is found by the formula.

$$F_R = 1{,}9 \cdot \frac{P \cdot k}{D \cdot n} \cdot 10^7$$

F_R = Radial force in N
n = rated motor speed in rpm
P = Rated motor power (transmitted power) in kW
D = Pulley diameter in mm
k = Belt tension factor, dependent on belt type and type of duty

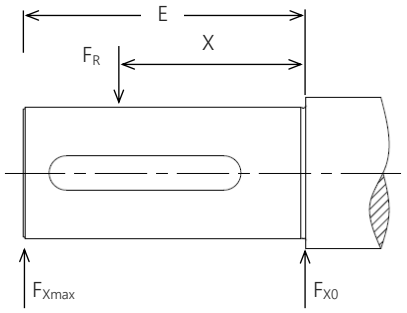
The belt tension factor k is a value gained from experience from the belt manufacturer. The following approximate value can be assumed:

- k = 1 to 1.5 for toothed belts
- k = 2 to 2.5 for V-belts
- k = 2.5 to 3 for flat belts with tensioner
- k = 3 to 4 for flat belts without tensioner

If the radial force is applied between points X_0 and X_{max}, the permissible force Fr can be calculated with the following formula:

$$F_R = F_{X0} - \frac{X}{E}(F_{X0} - F_{Xmax})$$

Where E stands for length of the shaft extension in the standard version



The following table shows permissible radial forces on the shaft in Newton, assuming zero axial force (Fa=0), 20 000 hours bearing life and 50 Hz operation. Please consult for values at 60 Hz. operation.

Standard design with deep groove ball bearing (F_A = 0)

Pole Number	2 Pole			4 Pole			6 Pole			8 Pole		
Frame Size	F_{X0}	F_{Xmax}	Shaft Extension E	F_{X0}	F_{Xmax}	Shaft Extension E	F_{X0}	F_{Xmax}	Shaft Extension E	F_{X0}	F_{Xmax}	Shaft Extension E
	N	N	mm	N	N	mm	N	N	mm	N	N	mm
71	427	358	30	540	453	30	619	519	30	-	-	-
80	710	588	40	893	739	40	1025	848	40	-	-	-
90	792	648	50	996	816	50	1145	937	50	-	-	-
100	1095	877	60	1375	1101	60	1580	1266	60	-	-	-
112	1094	887	60	1376	1115	60	1580	1280	60	-	-	-
132	1610	1275	80	2000	1580	80	2300	1820	80	2530	2000	80
160	3000	2400	110	3750	3000	110	4300	3440	110	4730	3785	110
180	3500	2840	110	4370	3540	110	5045	4090	110	5570	4515	110
200	4580	3820	110	5700	4750	110	6600	5500	110	7280	6070	110
225	5095	4270	110	6400	5145	140	7430	5970	140	8230	6610	140
250	6175	5060	140	7760	6365	140	9035	7410	140	9995	8195	140
280	6570	5525	140	8130	6835	140	9545	8025	140	10580	8895	140
315	5879	5063	140	8361	7165	170	9759	8364	170	10982	9412	170
355	6650	5700	170	12000	10000	210	14000	11500	210	15700	12300	210

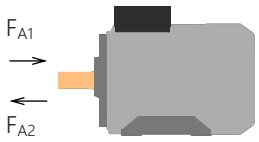
Reinforced design with NU cylindrical roller bearing (F_A = 0)

Pole Number	2 Pole			4 Pole			6 Pole			8 Pole		
Frame Size	F_{X0}	F_{Xmax}	Shaft Extension E	F_{X0}	F_{Xmax}	Shaft Extension E	F_{X0}	F_{Xmax}	Shaft Extension E	F_{X0}	F_{Xmax}	Shaft Extension E
	N	N	mm	N	N	mm	N	N	mm	N	N	mm
160	7505	6000	110	9200	7360	110	10400	8315	110	11330	9060	110
180	8430	6830	110	10330	8370	110	11700	9485	110	12775	10350	110
200	11490	9580	110	14070	11730	110	15955	13300	110	17410	14515	110
225	13637	11437	110	16765	13470	140	19025	15280	140	20780	16700	140
250	18075	14820	140	22220	18220	140	25230	20685	140	27545	22585	140
280	19340	16265	140	23645	19880	140	26920	22640	140	29410	24734	140
315	18202	15676	140	29668	25427	170	33660	28847	170	36910	31630	170
355	24100	20700	170	38600	31800	210	43700	36000	210	47900	39500	210

10.11.3. PERMISSIBLE AXIAL FORCES

The following table shows permissible axial forces on the shaft in Newton, assuming 20 000 hours bearing life and 50 Hz operation. Please consult for values at 60 Hz. operation.

10.11.3.1. HORIZANTAL MOUNTING



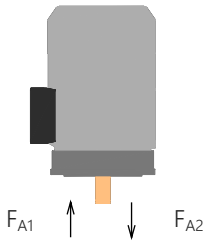
Standard design with deep groove ball bearing

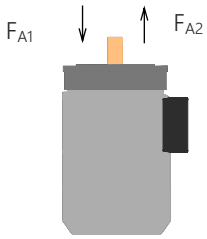
Pole Number	2 Pole				4 Pole				6 Pole				8 Pole			
Frame Size	F_{A1}			F_{A2}	F_{A1}			F_{A2}	F_{A1}			F_{A2}	F_{A1}			F_{A2}
	F_R= 0	F_R = max		F_R = 0	F_R= 0	F_R = max		F_R = 0	F_R= 0	F_R = max		F_R = 0	F_R= 0	F_R = max		F_R = 0
		F_{X0}	F_{Xmax}			F_{X0}	F_{Xmax}			F_{X0}	F_{Xmax}			F_{X0}	F_{Xmax}	
	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
71	247	212,5	182,5	91,5	367	315,5	271,5	91,5	449	394,5	342,5	91,5	-	-	-	-
80	390	343	289	150	573	505	431	150	712	636	541	150	-	-	-	-
90	429	385	320	160	626	562	477	160	782	706	597	160	-	-	-	-
100	583	525	421	220	846	764	639	220	1061	955	797	220	-	-	-	-
112	580	525	426	220	843	764	645	220	1056	955	804	220	-	-	-	-
132	1050	970	840	1650	1475	1365	1190	2075	1814	1685	1465	2415	2060	1920	1690	2660
160	1155	1045	800	1655	1585	1435	1135	2085	1935	1740	1375	2435	2200	2000	1575	2700
180	1380	1260	990	1900	1880	1710	1380	2400	2300	2090	1650	2820	2625	2410	1930	3145
200	2065	1895	1595	2565	2760	2545	2175	3255	3340	3075	2615	3840	3825	3515	2980	4325
225	2345	2140	1815	2905	3160	2910	2420	3720	3835	3520	2915	4395	4405	4035	3325	4965
250	5305	2805	2805	4765	6890	3625	3625	6350	8150	4220	4220	7610	9210	4720	4720	8670
280	5495	2930	2930	5000	7125	3805	3805	6625	8445	4430	4430	7945	9525	4945	4945	9025
315	5290	2928	2929	4730	7869	4430	4430	7270	9252	5147	5147	8652	10466	5745	5745	9865
355	6000	3400	3400	5400	10300	5630	5630	9700	1250	6600	6600	11500	13700	6750	6750	13100

Reinforced design with NU cylindrical roller bearing

Pole Number	2 Pole				4 Pole				6 Pole				8 Pole			
Frame Size	F_{A1}			F_{A2}	F_{A1}			F_{A2}	F_{A1}			F_{A2}	F_{A1}			F_{A2}
	F_R= 0	F_R = max		F_R = 0	F_R= 0	F_R = max		F_R = 0	F_R= 0	F_R = max		F_R = 0	F_R= 0	F_R = max		F_R = 0
		F_{X0}	F_{Xmax}			F_{X0}	F_{Xmax}			F_{X0}	F_{Xmax}			F_{X0}	F_{Xmax}	
	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
160	2445	2165	1570	2445	3210	2835	2105	3210	3825	3355	2790	3825	4275	3805	2805	4275
180	2830	2520	1900	2830	3710	3310	2540	3710	4420	3930	3015	4420	4980	4455	3400	4980
200	3690	3270	2535	2690	4815	4295	3380	4815	5735	5095	4015	5735	6490	5765	4525	6490
225	4160	3625	2795	4160	5460	4810	3505	5460	6505	5710	4215	6505	7380	6470	4755	7380
250	5050	4290	3110	5050	6630	5715	4135	6630	7895	6780	4985	7895	8955	7660	5640	8955
280	5260	4600	3495	5260	6890	6090	4595	6890	8215	7235	5550	8215	9295	8165	6290	9295
315	4878	3994	3108	5378	7638	6357	4770	7638	9025	7610	5700	9025	10243	8615	6530	10243
355	5700	5000	4000	5700	10100	9330	7380	10100	11940	10800	7800	11940	13400	12300	8900	13400

10.11.3.2. VERTICAL MOUNTING





Standard design with deep groove ball bearings

Frame Size	Pole Number	Shaft Down						Shaft Up					
		F_{A1}			F_{A2}			F_{A1}			F_{A2}		
		F_R= max		F_R= 0	F_R= max		F_R= 0	F_R= max		F_R= 0	F_R= max		F_R= 0
		F_{X0}	F_{Xmax}		F_{X0}	F_{Xmax}		F_{X0}	F_{Xmax}		F_{X0}	F_{Xmax}	
		N	N	N	N	N	N	N	N	N	N	N	N
71	2	232	202	266	81,5	81,5	81,5	201	171	235	101,5	101,5	101,5
	4	336	292	387	81,5	81,5	81,5	305	261	356	101,5	101,5	101,5
	6	414	363	469	81,5	81,5	81,5	383	332	438	101,5	101,5	101,5
80	2	369	316	416	135	135	135	324	271	371	165	165	165
	4	541	467	609	125	125	125	479	405	547	170	170	170
	6	677	581	752	125	125	125	613	517	688	175	175	175
90	2	426	362	470	135	135	135	355	291	399	180	180	180
	4	618	532	683	125	125	125	522	436	587	190	190	190
	6	769	659	843	125	125	125	669	559	743	195	195	195
100	2	591	489	649	190	190	190	481	379	539	255	255	255
	4	850	724	933	165	165	165	703	577	786	265	265	265
	6	1052	892	1159	165	165	165	898	738	1005	275	275	275
112	2	607	509	662	175	175	175	471	373	526	265	265	265
	4	877	756	957	150	150	150	693	572	773	290	290	290
	6	1074	921	1177	150	150	150	884	731	987	290	290	290
132	2	1120	990	1200	1450	1325	1530	850	720	930	1720	1590	1800
	4	1580	1405	1695	1760	1585	1870	1160	980	1270	1580	1405	2295
	6	1895	1670	2015	2080	1860	2205	1480	1260	1605	2495	2270	2615
	8	2180	1960	2320	2285	2070	2420	1685	1465	1820	2780	2560	2920
160	2	1325	1085	1440	1280	1040	1390	780	540	890	1825	1585	1940
	4	1840	1535	1995	1555	1250	1710	1055	750	1210	2340	2035	2495
	6	2160	1785	2355	1830	1455	2025	1330	955	1525	2660	2285	2855
	8	2470	2040	2660	2040	1610	2235	1540	1115	1735	2970	2540	3160
180	2	1700	1430	1825	1430	1160	1550	910	640	1030	2220	1950	2350
	4	2310	1970	2485	1725	1390	1900	1205	865	1380	2830	2490	3005
	6	2740	2320	2960	2110	1690	2330	1590	1170	1810	3260	2840	3480
	8	3070	2595	3285	2400	1925	2620	1880	1405	2100	3590	3115	3810
200	2	2525	2210	2680	1895	1585	2050	1395	1080	1550	3025	2710	3180
	4	3460	3080	3675	2285	1900	2500	1785	1405	2000	3960	3580	4175
	6	3960	3490	4235	2840	2365	3115	2340	1870	2615	4460	3990	4735
	8	4445	3885	4720	3260	2705	3535	2760	2200	3035	4945	4385	5220
225	2	3055	2715	3240	1930	1600	2115	1370	1035	1555	3615	3275	3800
	4	4010	3505	4265	2475	1975	2730	1915	1410	2170	4570	4065	4825
	6	4755	4125	5080	3135	3510	3460	2575	1950	2900	5315	4685	5640
	8	5300	4560	5630	3660	2925	3990	3100	2360	3430	5860	5120	6190
250	2	3900	3900	6465	1245	1250	3810	1785	1785	4350	3360	3360	5925
	4	5050	5050	8410	1750	1755	5110	2290	2290	5650	4510	4510	7870
	6	5645	5645	9700	2410	2420	6470	2950	2950	7010	5105	5105	9160
	8	6150	6150	10795	2875	2875	7520	3415	3415	8060	5610	5610	10255

Standard design with deep groove ball bearings

Frame Size	Pole Number	Shaft Down						Shaft Up					
		F_{A1}			F_{A2}			F_{A1}			F_{A2}		
		F_R= max		F_R= 0	F_R= max		F_R= 0	F_R= max		F_R= 0	F_R= max		F_R= 0
		F_{X0}	F_{Xmax}		F_{X0}	F_{Xmax}		F_{X0}	F_{Xmax}		F_{X0}	F_{Xmax}	
		N	N	N	N	N	N	N	N	N	N	N	N
280	2	4395	4395	7045	1095	1095	3745	1595	1595	4245	3895	3895	6545
	4	5790	5790	9220	1340	1340	4770	1840	1840	5270	5290	5290	8720
	6	6290	6290	10450	2100	2100	6265	2600	2600	6765	5790	5790	9950
	8	6860	6860	11615	2575	2575	7330	3075	3075	7830	6360	6360	11115
315	2	5127	5127	7585			2890	2890	930	3390	4627	4627	7087
	4	7700	7700	11290	-	-	3423	432	432	4023	7100	7100	10690
	6	8422	8422	12730	325	325	4625	920	920	5225	7822	7822	12130
	8	9040	9040	14007	935	935	5905	1535	1535	6505	8440	8440	13407
355	2	6300	6300	9000	-	-	2430	320	320	3300	5700	5700	8400
	4	9265	9265	14150	740	740	5630	1340	1340	6200	8665	8665	13500
	6	10200	10200	16000	1253	1253	7043	1853	1853	7600	9660	9660	15400
	8	11000	11000	17650	2015	2015	8634	2600	2600	9200	10400	10400	17000

Reinforced design with NU cylindrical roller bearing

Frame Size	Pole Number	Shaft Down						Shaft Up					
		F_{A1}			F_{A2}			F_{A1}			F_{A2}		
		F_R= max		F_R= 0	F_R= max		F_R= 0	F_R= max		F_R= 0	F_R= max		F_R= 0
		F_{X0}	F_{Xmax}		F_{X0}	F_{Xmax}		F_{X0}	F_{Xmax}		F_{X0}	F_{Xmax}	
		N	N	N	N	N	N	N	N	N	N	N	N
160	2	2445	1850	2725	1900	1310	2185	1900	1310	2185	2445	1850	2725
	4	3240	2515	3625	2450	1730	2835	2450	1730	2835	3240	2515	3625
	6	3775	2895	4240	2940	2065	3410	2940	2065	3410	3775	2895	4240
	8	4275	3265	4735	3350	2340	3810	3350	2340	3810	4275	3265	4735
180	2	2970	2335	3270	2180	1545	2480	2180	1545	2480	2970	2335	3270
	4	3905	3135	4310	2800	2030	3205	2800	2030	3205	3905	3135	4310
	6	4575	3645	5080	3430	2495	3930	3430	2495	3930	4575	3645	5080
	8	5135	4055	5635	2870	3950	4450	2870	3950	4450	5135	4055	5635
200	2	3895	3145	4305	2760	2015	3175	2760	2015	3175	3895	3145	4305
	4	5205	4295	5735	3530	2625	4060	3530	2625	4060	5205	4295	5735
	6	5975	4880	6630	4355	3260	5005	4355	3260	5005	5975	4880	6630
	8	6690	5420	7390	5000	3730	5700	5000	3730	5700	6690	5420	7390
225	2	4535	3680	5055	2850	2000	3370	2850	2000	3370	4535	3680	5055
	4	5905	4605	6565	3805	2505	4470	3805	2505	4470	5905	4605	6565
	6	6930	5410	7750	4755	3235	5570	4755	3235	5570	6930	5410	7750
	8	7720	5970	8610	5520	3770	6410	5520	3770	6410	7720	5970	8610
250	2	5430	4220	6195	3310	2105	4080	3310	2105	4080	5430	4220	6195
	4	7210	5625	8140	4450	2870	5380	4450	2870	5380	7210	5625	8140
	6	8295	6495	9430	5605	3810	6740	5605	3810	6740	8295	6495	9430
	8	9205	7150	10525	6470	4420	7790	6470	4420	7790	9205	7150	10525
280	2	6110	4980	6790	3310	2180	3990	3310	2180	3990	6110	4980	6790
	4	8150	6655	8970	4195	2705	5020	4195	2705	5020	8150	6655	8970
	6	9200	7520	10200	5510	3835	6515	5510	3835	6515	9200	7520	10200
	8	10200	8285	11365	6415	4500	7580	6415	4500	7580	10200	8285	11365
315	2	6165	5248	7087	2468	1547	3390	1968	1051	2890	6665	5748	7587
	4	9765	8070	10990	2495	800	3725	2495	800	3725	9765	8070	10990
	6	10952	9055	12430	3450	1552	7926	3450	1552	4925	10952	9055	12430
	8	12000	9915	13707	4497	2482	6204	4497	2412	6204	12000	9915	13707
355	2	7900	6900	8700	1930	930	2700	1930	930	2700	7900	6900	8700
	4	13000	11000	13850	5100	3100	5900	5100	3100	5900	13000	11000	13850
	6	14600	11600	15700	6200	3200	7300	6200	3200	7300	14600	11600	16700
	8	16000	12700	17350	7600	4300	8900	7600	4300	8900	16000	12700	17350

10.12. MOTOR PROTECTION

To protect the motor, fuses, thermic relays, thermal magnetic switches and thermal protectors could be used. Fuses protect energy lines (motor, relays, switches etc.) against the short circuit but they are not enough, just themselves, in the case of overloading and over heating. Although it is possible to prevent over current on motor terminals with thermic relays and thermal magnetic switches, in the case of over heating they are not proper solution.

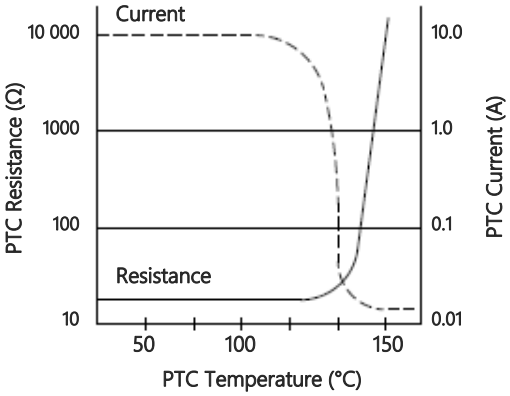
Long-term operating of motor under overload, with unbalanced or low supply voltage may be cause to current flow through stator winding that is more than nominal value, it raises winding temperature over expected and permissible values. To prevent any damaged caused by heating on stator winding thermal motor protectors should be used. They are placed in the motor windings and provide suitable motor thermal protection.

10.12.1. PTC (POSITIVE TEMPERATURE COEFFICIENT) THERMISTORS

PTC thermistors are thermal protectors consisting of semiconductor detectors and using with relays, installed in the motor winding (three in series, one per each phase winding). Their resistance rises suddenly at a certain critical temperature. This sudden resistance increment blocks the PTC current and causing to main circuit switched off.

Where thermistor protection is required to provide both alarm and trip operations, it is necessary to use two sets of thermistors (two thermistors per phase). For alarm operation the temperature should be 20K less than tripping temperature. When it reaches the critical temperature value a warning signal is sent to relay.

PTC thermistors should be chosen according to motor insulation class.



On PTC thermistor can be used on stator windings and the requests must be specified in order with their demand codes. (Demand codes are on page 42.)

10.12.2. PT100

PT100 is a temperature sensor with platinum resistance inside. It has 100Ω resistance at 0°C and the resistance value of platinum changes linearly for even small increment or decrement of temperature. Sensitive and continuous winding temperature measuring is possible through a monitoring display. PT100 can be used both for alarm and trip operations with a relay. It is important to set alarm and tripping temperature values taking into account the insulation class of motor and regular operating temperature.

On request PT100 can be used on stator windings and the requests must be specified in order with their demand codes. (Demand codes are on page 42.)

10.12.3. BIMETAL THERMAL PROTECTORS

The bimetallic thermal protectors are placed in stator windings one per each phase and series connected with the contactor coil. With the increasing motor current, winding temperature rises and when the critical temperature is reached, shape of bimetal layer inside the thermostat change and open the contactor. When their operating temperature decreases, they return to their original shape immediately, let the contactor to close again.

They can be used either as alarm or trip. To use both alarm and trip operation two sets of thermostat must be placed. Bimetallic thermal protectors should be chosen according to motor insulation class and maximum permissible operation temperature for motor windings.

On request bimetal thermal protectors can be used on stator windings and the requests must be specified in order with their demand codes. (Demand codes are on page 42.)

10.13. VOLTAGE AND FREQUENCY

Omega Motors are designed for a rated supply of 400V and frequency of 50Hz. However, motors for any standard supply from 110V to 690V at frequencies of 50Hz or 60Hz may be supplied on request. Any request different than 400V 50Hz supply should be specified in the order.

Motors will operate satisfactorily within a voltage band of ±5% of the rated voltage and ±2% of the rated frequency. In case of continuous operation at the extreme voltage limits specified above, the temperature rise limits permitted for various insulation classes may be exceeded by 10K.

When motors are operated at 60Hz, shaft speed increases by 20% compared to 50Hz operation. Based on change of speed all other motor performance values change. Variation of performance values (output power, speed, current and torque) are given at below table.

Rated Voltage at 50Hz [V]	Supply Voltage at 60Hz [V]	60Hz Performance Values							
		Output Power	Speed	Current	Torque	I_A/I_N	T_A/T_N	T_K/T_N	I_0
220	220	1	1,2	1	0,83	0,87	0,75	0,85	0,73
	220*	1,15	1,2	1,15	0,96	0,98	0,93	1	1,12
	240	1,1	1,2	1	0,91	0,96	0,83	0,94	0,85
	255	1,15	1,2	1	0,96	1	0,93	1	0,93
400	400	1	1,2	1	0,83	0,87	0,75	0,85	0,73
	400*	1,15	1,2	1,15	0,96	0,98	0,93	1	1,12
	440	1,1	1,2	1	0,92	0,98	0,90	0,96	0,87
	460	1,15	1,2	1	0,96	1	0,93	1	0,93
	480	1,2	1,2	1	1	1,03	0,98	1,03	0,98
500	500	1	1,2	1	0,83	0,87	0,75	0,85	0,73
	500*	1,15	1,2	1,15	0,96	0,98	0,93	1	1,12
	550	1,1	1,2	1	0,92	0,98	0,90	0,96	0,87
	575	1,15	1,2	1	0,96	0,98	0,93	1	0,93
	600	1,2	1,2	1	1	1,03	0,98	1,03	0,98

* Special winding for 60Hz.

I_N : Nominal current
T_N : Nominal torque
I_A : Locked rotor current
T_A : Locked rotor torque
T_K : Breakdown torque
I_0 : No-load current

Any request different than 400V 50Hz supply should be specified in the order.

10.14. PRODUCT CODE

Sample Product Code	3	M	0	S	A	4	E	-	22	M	A	4	0	C	T	0	-	A	0	1
Positions	1	2	3	4	5	6	7	-	8	9	10	11	12	13	14	15	-	16	17	18

3 Phase, Totally enclosed, Fan cooled, Induction motor — 3 M 0 S — **Demand Codes** — X 0 0

Frame Material

Aluminium	A
Cast Iron	G
Steel	S

Generation Code

0	0, 1, 2, 3,
...	4, 5, 6,
9	7, 8, 9

Efficiency Class (One Speed Motors)

3E: IE3 efficiency class	3 E
4E: IE4 efficiency class	4 E

Winding Type (Pole-Changing Motors)

1S: Two speed, Dahlander, Constant torque	1 S
1D: Two speed, Dahlander, Variable torque	1 D
2S: Two speed, Constant torque	2 S
2D: Two speed, Variable torque	2 D
3S: Three speed, Constant torque	3 S
3D: Three speed, Variable torque	3 D

Terminal Box Position (Viewed from DE side)

L	Left Hand Side
R	Right Hand Side
T	Top
B	Bottom

Mounting Arrangements

A	IM B3
B	IM B5
.	**C:** IM B35 **D:** IM V1 **E:** IM V15
.	**F:** IM B9 **G:** IM B15 **H:** IM B6
.	**J:** IM B7 **K:** IM B8 **L:** IM V5
.	**M:** IM V6 **N:** IM V3 **P:** IM V8
.	**R:** IM V9 **S:** IM B14 **T:** IM B34
.	**Y:** IM V18 **Z:** IM V19
.	**Q:** IM B14-2 **U:** IM V18-2
Z	**V:** IM V19-2 **W:** IM B34-2

Frame Size

71	07
80	08
90	09
100	10
112	11
132	13
160	16
180	18
200	20
225	22
250	25
280	28
315	31
355	35

Frame Length

L	L
M	M
S	S

Core Length

A, B, C, D, E	A ... E

Pole Number

2: 2pole, **4:** 4pole, **6:** 6pole, **8:** 8pole	2 A D
A: 10pole, **B:** 12pole, **C:** 16pole	
D: 4/2, **E:** 8/4, **F:** 6/4	

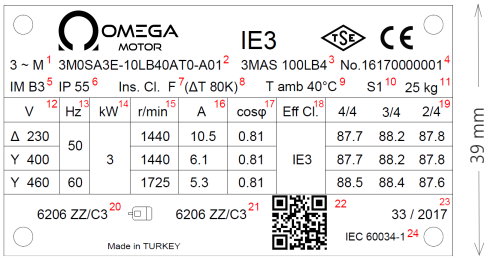
Voltage Connection Frequency

0	400/690V - Δ/Y, 50Hz	One Speed Motors
1	230/400V - Δ/Y, 50Hz	
2	380/660V - Δ/Y, 50Hz	
3	220/380V - Δ/Y, 50Hz	
4	240/415V - Δ/Y, 50Hz	
5	500V - Δ, 50Hz	
6	500V - Y, 50Hz	
7	550V - Δ, 50Hz	
8	550V - Y, 50Hz	
A	400/690V - Δ/Y, 60Hz	
B	230/400V - Δ/Y, 60Hz	
C	380/660V - Δ/Y, 60Hz	
D	220/380V - Δ/Y, 60Hz	
E	400V, 50 Hz	
F	500V, 50 Hz	Pole-Changing Motors
H	230V, 50 Hz	
Z	Special Requests	

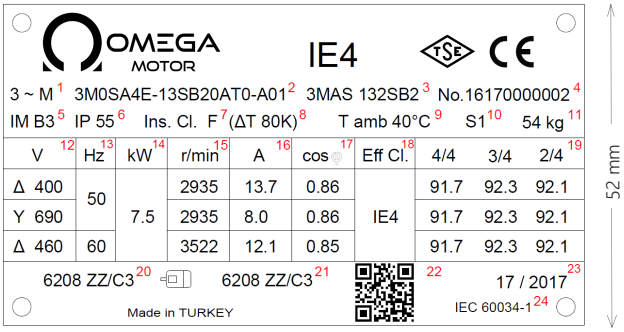
ORDERING EXAMPLE		Product Code
Motor Type	3 Phase, Totally enclosed induction motor	3M0SA4E - 22MA40CT0 - A01
Frame Material	Aluminium	3M0SA4E - 22MA40CT0 - A01
Efficiency Class	IE4 efficiency class	3M0SA4E - 22MA40CT0 - A01
Frame Size - Pole Number/Speed	225 M - 4 pole/1500 rpm	3M0SA4E - 22MA40CT0 - A01
Motor Output Power	45 kW	
Voltage - Connection - Frequency	400/690V - Δ/Y - 50Hz	3M0SA4E - 22MA40CT0 - A01
Mounting Arrangement	IM B35 (IM 3001)	3M0SA4E - 22MA40CT0 - A01
Terminal Box Position (Viewed from DE side)	On Top	3M0SA4E - 22MA40CT0 - A01
Special Demands	Codes from pages 34 and 35	3M0SA4E - 22MA40CT0 - A01

10.15. NAME PLATE

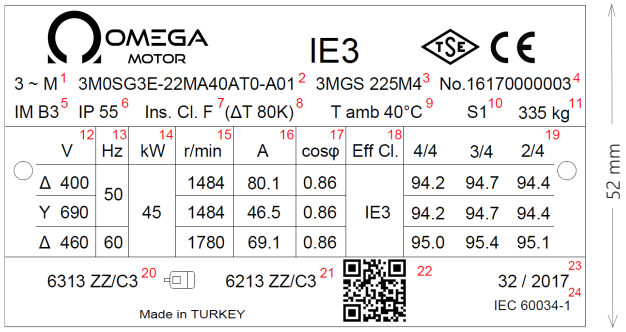
Nominal efficiency values are determined according to IEC 60034-2-1:2014 and efficiency classes are based on IEC 60034-30-1:2014. Label material is aluminium as standard and is located on right hand side (viewed from DE side). Following name plates are only samples. For different name plates and materials please see page 42



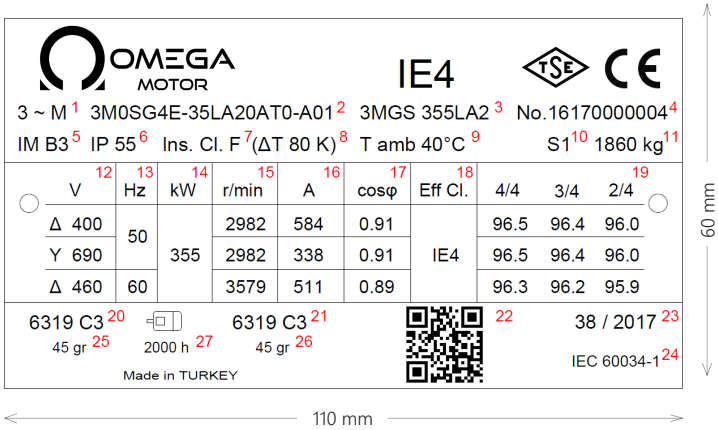
Rating plate for frame sizes 71 to 112 is given above.



Rating plate for aluminium motors, frame sizes from 132 to 225, is given above.



Rating plate for cast iron motors, frame sizes from 160 to 225, is given above.



Rating plate for frame sizes 250 to 355 is given above.

1 AC Motor phase number
2 Product code
3 Motor type
4 Product serial number
5 Mounting arrangement
6 IP Protection degree
7 Insulation class
8 Temperature rise
9 Ambient temperature
10 Duty type
11 Motor weight
12 Connection and voltage
13 Frequency
14 Nominal output power
15 Nominal speed
16 Nominal current
17 Power factor
18 Efficiency class according to IEC 60034-30-1
19 Efficiency values at 100%, 75% and 50% load
20 Bearing, DE side
21 Bearing, NDE side
22 QR Code
23 Manufacturing date (Week / Year)
24 Rating and performance standard
25 Grease amount (DE Bearing)
26 Grease amount (NDE Bearing)
27 Lubrication period

PERFORMANCE VALUES

IE3

Standard 3 phase, Squirrel Cage Induction Motors
IP 55 protection, IC 411 cooling, F class insulation, B temperature rise
IE3: Premium Efficiency Class (IEC 60034-30-1:2014)

2 Pole, 3000 rpm; 400 V 50 Hz

ALUMINIUM FRAME

STANDARD MOTORS

Output Power			Speed	Current	Torque	Power Factor	Efficiency			Starting Current Ratio	Starting Torque Ratio	Breakdown Torque Ratio	Moment of Inertia J	Weight B3
			n	I_N	T_N		4/4 Load	3/4 Load	2/4 Load					
kW	Motor Type	Product Code	rpm	A	Nm	cosφ	100%	75%	50%	I_A / I_N	T_A / T_N	T_K / T_N	kgm^2	kg
0,37	3MAS 71MA2	3M0SA3E- 07MA2 ■■■■ -...	2745	0,94	1,29	0,77	73,8	73,5	73,0	5,0	2,2	2,6	0,0005	6
0,55	3MAS 71MB2	3M0SA3E- 07MB2 ■■■■ -...	2755	1,26	1,91	0,81	77,8	78,2	78,1	5,8	2,6	3,0	0,0006	7
0,75	3MAS 80MA2	3M0SA3E- 08MA2 ■■■■ -...	2855	1,62	2,51	0,83	80,7	81,0	80,8	6,0	2,6	3,1	0,0009	9
1,1	3MAS 80MB2	3M0SA3E- 08MB2 ■■■■ -...	2855	2,28	3,67	0,84	82,7	83,2	82,9	6,5	3,0	3,4	0,0011	10
1,5	3MAS 90S2	3M0SA3E- 09SA2 ■■■■ -...	2865	2,91	4,98	0,88	84,2	84,8	84,3	6,7	2,6	3,2	0,0018	13
2,2	3MAS 90L2	3M0SA3E- 09LA2 ■■■■ -...	2870	4,20	7,40	0,89	85,9	86,3	86,0	7,3	3,0	3,5	0,0022	16
3	3MAS 100L2	3M0SA3E- 10LA2 ■■■■ -...	2890	5,52	9,91	0,90	87,1	87,4	87,0	8,0	3,0	3,8	0,0041	22
4	3MAS 112M2	3M0SA3E- 11MA2 ■■■■ -...	2900	7,21	13,18	0,91	88,1	88,0	87,8	7,3	2,7	3,6	0,0068	28
5,5	3MAS 132SA2	3M0SA3E- 13SA2 ■■■■ -...	2930	10,1	18	0,88	89,2	89,5	88,4	7,8	2,8	3,6	0,0165	43
7,5	3MAS 132SB2	3M0SA3E- 13SB2 ■■■■ -...	2930	13,4	24	0,90	90,1	90,4	89,6	8,0	3,0	3,8	0,0201	49
11	3MAS 160MA2	3M0SA3E- 16MA2 ■■■■ -...	2945	19,3	36	0,90	91,2	91,1	90,0	8,0	2,5	3,5	0,0430	81
15	3MAS 160MB2	3M0SA3E- 16MB2 ■■■■ -...	2945	26,4	49	0,89	91,9	92,0	91,1	8,2	2,7	3,5	0,0515	91
18,5	3MAS 160L2	3M0SA3E- 16LA2 ■■■■ -...	2945	31,9	60	0,91	92,4	92,4	91,6	8,3	2,8	3,6	0,0616	106
22	3MAS 180M2	3M0SA3E- 18MA2 ■■■■ -...	2955	37,7	71	0,91	92,7	92,7	91,7	7,8	2,5	3,4	0,098	132
30	3MAS 200LA2	3M0SA3E- 20LA2 ■■■■ -...	2960	52	97	0,89	93,3	93,4	92,8	7,8	2,6	3,4	0,1600	197
37	3MAS 200LB2	3M0SA3E- 20LB2 ■■■■ -...	2960	64	119	0,89	93,7	93,8	93,2	7,8	2,8	3,2	0,1770	212
45	3MAS 225M2	3M0SA3E- 22MA2 ■■■■ -...	2965	77	145	0,90	94,0	94,2	93,6	8,0	2,6	3,2	0,3440	275

COMPACT MOTORS

Output Power			Speed	Current	Torque	Power Factor	Efficiency			Starting Current Ratio	Starting Torque Ratio	Breakdown Torque Ratio	Moment of Inertia J	Weight B3
			n	I_N	T_N		4/4 Load	3/4 Load	2/4 Load					
kW	Motor Type	Product Code	rpm	A	Nm	cosφ	100%	75%	50%	I_A / I_N	T_A / T_N	T_K / T_N	kgm^2	kg
11	3MAS 132M2K	3M0SA3E- 13MK2 ■■■■ -...	2935	19,7	35,9	0,89	91,2	91,1	90,0	8,1	3,2	3,8	0,0252	57
22	3MAS 160L2K	3M0SA3E- 16LK2 ■■■■ -...	2945	38	71,2	0,90	92,7	92,5	92,3	8,4	2,7	3,6	0,0739	125
30	3MAS 180L2K	3M0SA3E- 18LK2 ■■■■ -...	2955	53	96,9	0,88	93,3	93,0	92,8	8,7	2,9	3,4	0,1174	155
45	3MAS 200L2K	3M0SA3E- 20LK2 ■■■■ -...	2955	79	145,4	0,88	94,0	94,2	93,9	8,0	2,8	3,3	0,2163	244
55	3MAS 225M2K	3M0SA3E- 22MK2 ■■■■ -...	2965	96	177	0,88	94,3	94,6	94,4	7,4	2,7	3,3	0,4066	312

Efficiency values are determined according to IEC 60034-2-1:2014. (By the summation of all separate losses, including additional load loss)

PERFORMANCE VALUES

IE3

Standard 3 phase, Squirrel Cage Induction Motors
IP 55 protection, IC 411 cooling, F class insulation, B temperature rise
IE3: Premium Efficiency Class (IEC 60034-30-1:2014)

2 Pole, 3000 rpm; 400 V 50 Hz

CAST IRON FRAME

STANDARD MOTORS

Output Power			Speed	Current	Torque	Power Factor	Efficiency			Starting Current Ratio	Starting Torque Ratio	Breakdown Torque Ratio	Moment of Inertia J	Weight B3
			n	I_N	T_N		4/4 Load	3/4 Load	2/4 Load					
kW	Motor Type	Product Code	rpm	A	Nm	cosφ	100%	75%	50%	I_A / I_N	T_A / T_N	T_K / T_N	kgm^2	kg
11	3MGS 160MA2	3M0SG3E- 16MA2 ■■■■ -...	2945	19,3	36	0,90	91,2	91,1	90,0	8,0	2,5	3,5	0,0430	104
15	3MGS 160MB2	3M0SG3E- 16MB2 ■■■■ -...	2945	26,4	49	0,89	91,9	92,0	91,1	8,2	2,7	3,5	0,0515	115
18,5	3MGS 160L2	3M0SG3E- 16LA2 ■■■■ -...	2945	31,9	60	0,91	92,4	92,4	91,6	8,3	2,8	3,6	0,0616	132
22	3MGS 180M2	3M0SG3E- 18MA2 ■■■■ -...	2955	37,7	71	0,91	92,7	92,7	91,7	7,8	2,5	3,4	0,0980	164
30	3MGS 200LA2	3M0SG3E- 20LA2 ■■■■ -...	2960	52	97	0,89	93,3	93,4	92,8	7,8	2,6	3,4	0,1600	236
37	3MGS 200LB2	3M0SG3E- 20LB2 ■■■■ -...	2960	64	119	0,89	93,7	93,8	93,2	7,8	2,8	3,2	0,1770	251
45	3MGS 225M2	3M0SG3E- 22MA2 ■■■■ -...	2965	77	145	0,90	94,0	94,2	93,6	8,0	2,6	3,2	0,3440	320
55	3MGS 250M2	3M0SG3E- 25MA2 ■■■■ -...	2975	94	177	0,90	94,3	94,5	93,8	8,0	2,5	3,4	0,5070	431
75	3MGS 280S2	3M0SG3E- 28SA2 ■■■■ -...	2978	128	241	0,89	94,7	94,8	94,2	7,6	2,1	3,0	0,8800	551
90	3MGS 280M2	3M0SG3E- 28MA2 ■■■■ -...	2978	152	289	0,90	95,0	95,1	94,6	7,8	2,2	3,1	0,9500	624
110	3MGS 315S2	3M0SG3E- 31SA2 ■■■■ -...	2981	186	352	0,90	95,2	95,4	95,1	7,4	1,9	3,0	1,75	895
132	3MGS 315MA2	3M0SG3E- 31MA2 ■■■■ -...	2983	220	423	0,91	95,4	95,6	95,3	7,5	2,1	3,1	1,94	942
160	3MGS 315MB2	3M0SG3E- 31MB2 ■■■■ -...	2982	265	512	0,91	95,6	95,8	95,5	7,7	2,1	3,0	2,13	989
200	3MGS 315MD2	3M0SG3E- 31MD2 ■■■■ -...	2980	330	641	0,91	95,8	96,0	95,6	7,4	2,1	3,0	2,25	1087
250	3MGS 355MA2	3M0SG3E- 35MA2 ■■■■ -...	2982	415	801	0,91	95,8	95,8	95,6	7,5	2,1	3,0	3,1	1270
315	3MGS 355MB2	3M0SG3E- 35MB2 ■■■■ -...	2980	525	1010	0,9	95,8	95,8	95,5	7,4	2,1	2,8	3,6	1460
355	3MGS 355MC2	3M0SG3E- 35MC2 ■■■■ -...	2983	600	1137	0,89	95,8	95,8	95,4	7,6	2,1	3,0	3,8	1524
400	3MGS 355LA2	3M0SG3E- 35LA2 ■■■■ -...	2982	665	1281	0,91	95,8	95,6	95,3	7,6	2,1	3,0	4,1	1735
450	3MGS 355LB2	3M0SG3E- 35LB2 ■■■■ -...	2982	752	1441	0,9	95,8	95,7	95,4	7,7	2,2	3,0	4,5	1940
500	3MGS 355LC2	3M0SG3E- 35LC2 ■■■■ -...	2982	835	1601	0,9	95,8	95,8	95,5	7,8	2,2	3,0	4,9	2153

COMPACT MOTORS

Output Power			Speed	Current	Torque	Power Factor	Efficiency			Starting Current Ratio	Starting Torque Ratio	Breakdown Torque Ratio	Moment of Inertia J	Weight B3
			n	I_N	T_N		4/4 Load	3/4 Load	2/4 Load					
kW	Motor Type	Product Code	rpm	A	Nm	cosφ	100%	75%	50%	I_A / I_N	T_A / T_N	T_K / T_N	kgm^2	kg
22	3MGS 160L2K	3M0SG3E- 16LK2 ■■■■ -...	2945	38	71,2	0,90	92,7	92,5	92,3	8,4	2,7	3,6	0,0739	157
30	3MGS 180L2K	3M0SG3E- 18LK2 ■■■■ -...	2955	53	96,9	0,88	93,3	93,0	92,8	8,7	2,9	3,4	0,1174	199
45	3MGS 200L2K	3M0SG3E- 20LK2 ■■■■ -...	2955	79	145,4	0,88	94,0	94,2	93,9	8,0	2,8	3,3	0,2163	288
55	3MGS 225M2K	3M0SG3E- 22MK2 ■■■■ -...	2965	96	177	0,88	94,3	94,6	94,4	7,4	2,7	3,3	0,4066	367
75	3MGS 250M2K	3M0SG3E- 25MK2 ■■■■ -...	2970	127	241,1	0,90	94,7	94,8	94,6	7,9	2,6	3,5	0,6031	485
110	3MGS 280M2K	3M0SG3E- 28MK2 ■■■■ -...	2975	190	353	0,88	95,2	95,0	94,7	7,5	2,4	3,3	1,1325	715
250	3MGS 315M2K	3M0SG3E- 31MK2 ■■■■ -...	2980	408	801	0,92	95,8	95,9	95,5	7,9	2,4	3,0	2,6300	1183

Efficiency values are determined according to IEC 60034-2-1:2014. (By the summation of all separate losses, including additional load loss)

PERFORMANCE VALUES

IE3

Standard 3 phase, Squirrel Cage Induction Motors
IP 55 protection, IC 411 cooling, F class insulation, B temperature rise
IE3: Premium Efficiency Class (IEC 60034-30-1:2014)

4 Pole, 1500 rpm; 400 V 50 Hz

ALUMINIUM FRAME

STANDARD MOTORS

Output Power			Speed	Current	Torque	Power Factor	Efficiency			Starting Current Ratio	Starting Torque Ratio	Breakdown Torque Ratio	Moment of Inertia J	Weight B3
			n	I_N	T_N		4/4 Load	3/4 Load	2/4 Load					
kW	Motor Type	Product Code	rpm	A	Nm	cosφ	100%	75%	50%	I_A / I_N	T_A / T_N	T_K / T_N	kgm^2	kg
0,25	3MAS 71MA4	3M0SA3E- 07MA4 ■■■■ -...	1395	0,67	1,7	0,73	73,5	73,5	73,0	4,5	2,5	2,8	0,0010	6
0,37	3MAS 71MB4	3M0SA3E- 07MB4 ■■■■ -...	1410	0,95	2,5	0,73	77,3	77,5	76,8	5,1	3,0	3,2	0,0011	7
0,55	3MAS 80MA4	3M0SA3E- 08MA4 ■■■■ -...	1410	1,30	3,7	0,76	80,8	81,0	79,5	5,5	2,9	3,1	0,0017	10
0,75	3MAS 80MB4	3M0SA3E- 08MB4 ■■■■ -...	1415	1,66	5,1	0,79	82,5	82,7	82,0	6,2	3,6	3,7	0,0022	12
1,1	3MAS 90S4	3M0SA3E- 09SA4 ■■■■ -...	1435	2,39	7,3	0,79	84,1	84,5	83,9	6,7	3,2	3,6	0,0035	14
1,5	3MAS 90L4	3M0SA3E- 09LA4 ■■■■ -...	1435	3,22	10,0	0,79	85,3	85,6	84,8	7,0	3,4	3,7	0,0042	17
2,2	3MAS 100LA4	3M0SA3E- 10LA4 ■■■■ -...	1440	4,47	14,6	0,82	86,7	86,9	87,3	6,8	2,7	3,3	0,0049	22
3	3MAS 100LB4	3M0SA3E- 10LB4 ■■■■ -...	1440	6,10	19,9	0,81	87,7	88,2	87,8	7,4	3,1	3,7	0,0062	25
4	3MAS 112M4	3M0SA3E- 11MA4 ■■■■ -...	1440	7,68	26,6	0,85	88,6	88,9	88,3	7,0	2,6	3,4	0,0124	31
5,5	3MAS 132S4	3M0SA3E- 13SA4 ■■■■ -...	1465	10,5	35,9	0,84	89,6	90,0	89,5	7,0	2,1	3,2	0,0324	45
7,5	3MAS 132M4	3M0SA3E- 13MA4 ■■■■ -...	1465	14,3	48,9	0,84	90,4	90,7	90,0	7,4	2,3	3,3	0,0429	58
11	3MAS 160M4	3M0SA3E- 16MA4 ■■■■ -...	1470	20,7	71,5	0,84	91,4	91,5	90,5	7,1	2,3	3,1	0,086	89
15	3MAS 160L4	3M0SA3E- 16LA4 ■■■■ -...	1470	28,0	97,4	0,84	92,1	92,5	92,2	7,5	2,5	3,3	0,113	111
18,5	3MAS 180M4	3M0SA3E- 18MA4 ■■■■ -...	1475	35,2	120	0,82	92,6	93,0	92,6	7,1	2,7	3,2	0,173	134
22	3MAS 180L4	3M0SA3E- 18LA4 ■■■■ -...	1475	41,0	142	0,83	93,0	93,5	93,4	7,2	2,6	3,2	0,203	152
30	3MAS 200L4	3M0SA3E- 20LA4 ■■■■ -...	1480	54,6	194	0,85	93,6	94,4	94,1	7,6	2,7	3,2	0,363	211
37	3MAS 225S4	3M0SA3E- 22SA4 ■■■■ -...	1480	66,1	239	0,86	93,9	94,4	94,2	7,4	2,5	3,2	0,518	260
45	3MAS 225M4	3M0SA3E- 22MA4 ■■■■ -...	1480	80,0	290	0,86	94,2	94,6	94,5	7,4	2,6	3,2	0,613	291

COMPACT MOTORS

Output Power			Speed	Current	Torque	Power Factor	Efficiency			Starting Current Ratio	Starting Torque Ratio	Breakdown Torque Ratio	Moment of Inertia J	Weight B3
			n	I_N	T_N		4/4 Load	3/4 Load	2/4 Load					
kW	Motor Type	Product Code	rpm	A	Nm	cosφ	100%	75%	50%	I_A / I_N	T_A / T_N	T_K / T_N	kgm^2	kg
9,2	3MAS 132M4K	3M0SA3E- 13MK4 ■■■■ -...	1460	18,7	60,2	0,78	91,0	91,6	91,3	6,5	2,5	3,2	0,0431	59
18,5	3MAS 160L4K	3M0SA3E- 16LK4 ■■■■ -...	1475	35	119,8	0,82	92,6	93,0	92,7	7,8	2,8	3,4	0,1330	119
37	3MAS 200L4K	3M0SA3E- 20LK4 ■■■■ -...	1480	69	238,7	0,82	93,9	94,4	94,0	7,7	2,7	3,2	0,4260	234
55	3MAS 225M4K	3M0SA3E- 22MK4 ■■■■ -...	1475	100	356,1	0,84	94,6	94,8	94,6	7,5	2,8	3,3	0,7183	325

Efficiency values are determined according to IEC 60034-2-1:2014. (By the summation of all separate losses, including additional load loss)

PERFORMANCE VALUES

IE3

Standard 3 phase, Squirrel Cage Induction Motors
IP 55 protection, IC 411 cooling, F class insulation, B temperature rise
IE3: Premium Efficiency Class (IEC 60034-30-1:2014)

4 Pole, 1500 rpm; 400 V 50 Hz

CAST IRON FRAME

STANDARD MOTORS

Output Power			Speed	Current	Torque	Power Factor	Efficiency			Starting Current Ratio	Starting Torque Ratio	Breakdown Torque Ratio	Moment of Inertia J	Weight B3
			n	I_N	T_N		4/4 Load	3/4 Load	2/4 Load					
kW	Motor Type	Product Code	rpm	A	Nm	cosφ	100%	75%	50%	I_A / I_N	T_A / T_N	T_K / T_N	kgm^2	kg
11	3MGS 160M4	3M0SG3E- 16MA4 ■■■■ -...	1470	20,7	71,5	0,84	91,4	91,5	90,5	7,1	2,3	3,1	0,086	113
15	3MGS 160L4	3M0SG3E- 16LA4 ■■■■ -...	1470	27,9	97,4	0,84	92,1	92,5	92,2	7,5	2,5	3,3	0,113	137
18,5	3MGS 180M4	3M0SG3E- 18MA4 ■■■■ -...	1475	35,2	120	0,82	92,6	93,0	92,6	7,1	2,7	3,2	0,173	166
22	3MGS 180L4	3M0SG3E- 18LA4 ■■■■ -...	1475	41,0	142	0,83	93,0	93,5	93,4	7,2	2,6	3,2	0,203	188
30	3MGS 200L4	3M0SG3E- 20LA4 ■■■■ -...	1480	54,6	194	0,85	93,6	94,4	94,1	7,6	2,7	3,2	0,363	250
37	3MGS 225S4	3M0SG3E- 22SA4 ■■■■ -...	1480	66,1	239	0,86	93,9	94,4	94,2	7,4	2,5	3,2	0,518	305
45	3MGS 225M4	3M0SG3E- 22MA4■■■■ -...	1480	80,0	290	0,86	94,2	94,6	94,5	7,4	2,6	3,2	0,613	335
55	3MGS 250M4	3M0SG3E- 25MA4■■■■ -...	1485	96,5	354	0,87	94,6	95,0	94,8	7,4	2,7	3,2	0,975	433
75	3MGS 280S4	3M0SG3E- 28SA4 ■■■■ -...	1486	133	482	0,86	95,0	95,4	95,1	7,3	2,5	3,0	1,76	548
90	3MGS 280M4	3M0SG3E- 28MA4■■■■ -...	1486	157	578	0,87	95,2	95,4	94,8	7,3	2,4	3,0	2,03	643
110	3MGS 315S4	3M0SG3E- 31SA4 ■■■■ -...	1490	191	705	0,87	95,4	95,5	95,2	7,7	2,4	3,2	3,46	864
132	3MGS 315MA4	3M0SG3E- 31MA4 ■■■■ -...	1490	231	846	0,86	95,6	95,8	95,4	7,8	2,5	3,2	3,89	920
160	3MGS 315MB4	3M0SG3E- 31MB4 ■■■■ -...	1490	274	1026	0,88	95,8	96,0	95,8	7,9	2,6	3,2	4,46	990
200	3MGS 315MD4	3M0SG3E- 31MD4 ■■■■ -...	1490	339	1282	0,89	96,0	96,4	96,2	7,7	2,6	3,0	5,21	1148
250	3MGS 355MA4	3M0SG3E- 35MA4■■■■ -...	1490	438	1602	0,86	96	96,2	95,8	7,6	2,4	2,7	6,9	1504
315	3MGS 355MB4	3M0SG3E- 35MB4■■■■ -...	1490	552	2019	0,86	96	96,1	95,8	7,5	2,3	2,6	7,9	1562
355	3MGS 355MC4	3M0SG3E- 35MC4■■■■ -...	1490	622	2275	0,86	96	96	95,6	7	2,2	2,6	8,3	1612
400	3MGS 355LA4	3M0SG3E- 35LA4 ■■■■ -...	1490	705	2564	0,85	96	95,8	95,5	7,3	2,3	2,8	8,8	1825
450	3MGS 355LB4	3M0SG3E- 35LB4 ■■■■ -...	1490	795	2884	0,85	96	96	95,6	7,5	2,3	2,7	9,2	1930
500	3MGS 355LC4	3M0SG3E- 35LC4 ■■■■ -...	1490	885	3205	0,85	96	96	95,5	7,2	2,2	2,7	9,6	2040

COMPACT MOTORS

Output Power			Speed	Current	Torque	Power Factor	Efficiency			Starting Current Ratio	Starting Torque Ratio	Breakdown Torque Ratio	Moment of Inertia J	Weight B3
			n	I_N	T_N		4/4 Load	3/4 Load	2/4 Load					
kW	Motor Type	Product Code	rpm	A	Nm	cosφ	100%	75%	50%	I_A / I_N	T_A / T_N	T_K / T_N	kgm^2	kg
18,5	3MGS 160L4K	3M0SG3E- 16LK4 ■■■■ -...	1475	35	119,8	0,82	92,6	93,0	92,7	7,8	2,8	3,4	0,1330	145
37	3MGS 200L4K	3M0SG3E- 20LK4 ■■■■ -...	1480	69	238,7	0,82	93,9	94,4	94,0	7,7	2,7	3,2	0,4260	274
55	3MGS 225M4K	3M0SG3E- 22MK4■■■■ -...	1475	100	356,1	0,84	94,6	94,8	94,6	7,5	2,8	3,3	0,7183	370
75	3MGS 250M4K	3M0SG3E- 25MK4■■■■ -...	1480	136	483,9	0,84	95,0	95,3	95,1	7,6	2,6	3,2	1,133	482
110	3MGS 280M4K	3M0SG3E- 28MK4■■■■ -...	1485	196	707,4	0,85	95,4	95,4	95,1	7,8	2,5	3,2	2,356	730
250	3MGS 315M4K	3M0SG3E- 31MK4 ■■■■ -...	1490	425	1602	0,88	96,0	96,2	96,0	8,0	2,7	3,2	6,47	1304

Efficiency values are determined according to IEC 60034-2-1:2014. (By the summation of all separate losses, including additional load loss)

PERFORMANCE VALUES

IE3

Standard 3 phase, Squirrel Cage Induction Motors
IP 55 protection, IC 411 cooling, F class insulation, B temperature rise
IE3: Premium Efficiency Class (IEC 60034-30-1:2014)

6 Pole, 1000 rpm; 400 V 50 Hz

ALUMINIUM FRAME

STANDARD MOTORS

Output Power			Speed	Current	Torque	Power Factor	Efficiency			Starting Current Ratio	Starting Torque Ratio	Breakdown Torque Ratio	Moment of Inertia J	Weight B3
			n	I_N	T_N		4/4 Load	3/4 Load	2/4 Load					
kW	Motor Type	Product Code	rpm	A	Nm	cosφ	100%	75%	50%	I_A / I_N	T_A / T_N	T_K / T_N	kgm^2	kg
0,18	3MAS 71MA6	3M0SA3E- 07MA6 ■■■■ -...	925	0,61	1,87	0,67	63,9	63,7	62,5	3,6	2,2	2,4	0,0010	6
0,25	3MAS 71MB6	3M0SA3E- 07MB6 ■■■■ -...	925	0,80	2,58	0,66	68,6	68,8	68,0	3,9	2,4	2,6	0,0013	7
0,37	3MAS 80MA6	3M0SA3E- 08MA6 ■■■■ -...	935	1,10	3,8	0,66	73,5	74,0	73,4	5,0	2,5	3,0	0,0023	9
0,55	3MAS 80MB6	3M0SA3E- 08MB6 ■■■■ -...	935	1,53	5,6	0,67	77,2	77,8	77,1	5,1	2,6	3,2	0,0028	11
0,75	3MAS 90S6	3M0SA3E- 09SA6 ■■■■ -...	940	2,02	7,6	0,68	78,9	78,9	78,5	4,6	2,2	2,5	0,0037	13
1,1	3MAS 90L6	3M0SA3E- 09LA6 ■■■■ -...	945	2,84	11,1	0,69	81,0	81,3	80,7	4,8	2,3	2,6	0,0046	18
1,5	3MAS 100L6	3M0SA3E- 10LA6 ■■■■ -...	955	3,75	15,0	0,70	82,5	83,0	82,7	5,5	2,6	2,9	0,0090	23
2,2	3MAS 112M6	3M0SA3E- 11MA6 ■■■■ -...	960	5,38	21,9	0,70	84,3	84,9	84,2	4,5	2,0	2,6	0,0177	28
3	3MAS 132S6	3M0SA3E- 13SA6 ■■■■ -...	965	6,66	29,7	0,76	85,6	85,6	84,8	5,2	1,7	2,5	0,0320	37
4	3MAS 132MA6	3M0SA3E- 13MA6 ■■■■ -...	965	8,76	39,6	0,76	86,8	86,8	86,0	5,6	1,8	2,7	0,0413	46
5,5	3MAS 132MB6	3M0SA3E- 13MB6 ■■■■ -...	965	11,7	54,4	0,77	88,0	88,2	87,4	5,6	1,8	2,7	0,0550	57
7,5	3MAS 160M6	3M0SA3E- 16MA6 ■■■■ -...	975	15,2	73,5	0,80	89,1	89,1	88,5	6,6	1,8	3,0	0,0960	77
11	3MAS 160L6	3M0SA3E- 16LA6 ■■■■ -...	975	22,0	108	0,80	90,3	90,4	89,5	6,9	2,0	3,2	0,142	103
15	3MAS 180L6	3M0SA3E- 18LA6 ■■■■ -...	975	29,3	147	0,81	91,2	92,0	91,4	6,9	2,0	3,1	0,210	131
18,5	3MAS 200LA6	3M0SA3E- 20LA6 ■■■■ -...	980	37,0	180	0,79	91,7	91,9	91,6	6,3	2,3	2,9	0,377	177
22	3MAS 200LB6	3M0SA3E- 20LB6 ■■■■ -...	980	43,0	214	0,80	92,2	92,6	92,2	6,5	2,4	2,9	0,453	199
30	3MAS 225M6	3M0SA3E- 22MA6 ■■■■ -...	985	56,2	291	0,83	92,9	93,4	93,2	6,9	2,4	2,9	0,690	263

COMPACT MOTORS

Output Power			Speed	Current	Torque	Power Factor	Efficiency			Starting Current Ratio	Starting Torque Ratio	Breakdown Torque Ratio	Moment of Inertia J	Weight B3
			n	I_N	T_N		4/4 Load	3/4 Load	2/4 Load					
kW	Motor Type	Product Code	rpm	A	Nm	cosφ	100%	75%	50%	I_A / I_N	T_A / T_N	T_K / T_N	kgm^2	kg
37	3MAS 225M6K	3M0SA3E- 22MK6 ■■■■ -...	985	72	359	0,80	93,3	93,6	93,4	7,0	2,8	3,2	0,689	276

Efficiency values are determined according to IEC 60034-2-1:2014. (By the summation of all separate losses, including additional load loss)

PERFORMANCE VALUES

IE3

Standard 3 phase, Squirrel Cage Induction Motors
IP 55 protection, IC 411 cooling, F class insulation, B temperature rise
IE3: Premium Efficiency Class (IEC 60034-30-1:2014)

6 Pole, 1000 rpm; 400 V 50 Hz

CAST IRON FRAME

STANDARD MOTORS

Output Power			Speed	Current	Torque	Power Factor	Efficiency			Starting Current Ratio	Starting Torque Ratio	Breakdown Torque Ratio	Moment of Inertia J	Weight B3
			n	I_N	T_N		4/4 Load	3/4 Load	2/4 Load					
kW	Motor Type	Product Code	rpm	A	Nm	cosφ	100%	75%	50%	I_A / I_N	T_A / T_N	T_K / T_N	kgm^2	kg
7,5	3MGS 160M6	3M0SG3E- 16MA6 ■■■■ -...	975	15,2	73,5	0,80	89,1	89,1	88,5	6,6	1,8	3,0	0,0960	101
11	3MGS 160L6	3M0SG3E- 16LA6 ■■■■ -...	975	22,0	108	0,80	90,3	90,4	89,5	6,9	2,0	3,2	0,142	129
15	3MGS 180L6	3M0SG3E- 18LA6 ■■■■ -...	975	29,3	147	0,81	91,2	92,0	91,4	6,9	2,0	3,1	0,210	167
18,5	3MGS 200LA6	3M0SG3E- 20LA6 ■■■■ -...	980	37,0	180	0,79	91,7	91,9	91,6	6,3	2,3	2,9	0,377	216
22	3MGS 200LB6	3M0SG3E- 20LB6 ■■■■ -...	980	43,0	214	0,80	92,2	92,6	92,2	6,5	2,4	2,9	0,453	238
30	3MGS 225M6	3M0SG3E- 22MA6 ■■■■ -...	985	56,2	291	0,83	92,9	93,4	93,2	6,9	2,4	2,9	0,690	308
37	3MGS 250M6	3M0SG3E- 25MA6 ■■■■ -...	987	68,0	358	0,84	93,3	93,8	93,5	6,8	2,3	2,7	1,073	403
45	3MGS 280S6	3M0SG3E- 28SA6 ■■■■ -...	988	82,5	435	0,84	93,7	94,0	94,0	6,4	2,3	2,7	1,82	478
55	3MGS 280M6	3M0SG3E- 28MA6 ■■■■ -...	988	101	532	0,84	94,1	94,2	94,0	6,6	2,3	2,7	2,18	574
75	3MGS 315S6	3M0SG3E- 31SA6 ■■■■ -...	991	135	723	0,85	94,6	94,7	94,3	6,9	2,2	2,9	3,62	789
90	3MGS 315MA6	3M0SG3E- 31MA6 ■■■■ -...	991	163	867	0,84	94,9	95,1	94,8	7,0	2,3	2,9	4,42	868
110	3MGS 315MB6	3M0SG3E- 31MB6 ■■■■ -...	991	199	1060	0,84	95,1	95,2	95,0	7,0	2,2	2,9	5,22	947
132	3MGS 315MC6	3M0SG3E- 31MC6 ■■■■ -...	991	241	1272	0,83	95,4	95,4	94,8	7,1	2,3	2,9	6,18	1106
160	3MGS 355MA6	3M0SG3E- 35MA6 ■■■■ -...	992	295	1540	0,82	95,6	95,6	95,2	6,8	2,4	2,6	8,8	1360
200	3MGS 355MB6	3M0SG3E- 35MB6 ■■■■ -...	992	371	1925	0,81	95,8	95,6	95	6,5	2,3	2,5	10,7	1520
250	3MGS 355MC6	3M0SG3E- 35MC6 ■■■■ -...	992	470	2407	0,8	95,8	95,9	95,5	6,8	2,4	2,6	12,4	1675
315	3MGS 355LA6	3M0SG3E- 35LA6 ■■■■ -...	992	592	3033	0,8	95,8	95,6	95,1	6,6	2,3	2,5	14,7	1940
355	3MGS 355LB6	3M0SG3E- 35LB6 ■■■■ -...	992	670	3418	0,8	95,8	95,8	95,2	6,7	2,3	2,6	16,9	2155
400	3MGS 355LC6	3M0SG3E- 35LC6 ■■■■ -...	992	755	3850	0,8	95,8	95,8	95,2	6,8	2,3	2,3	18,8	2500

COMPACT MOTORS

Output Power			Speed	Current	Torque	Power Factor	Efficiency			Starting Current Ratio	Starting Torque Ratio	Breakdown Torque Ratio	Moment of Inertia J	Weight B3
			n	I_N	T_N		4/4 Load	3/4 Load	2/4 Load					
kW	Motor Type	Product Code	rpm	A	Nm	cosφ	100%	75%	50%	I_A / I_N	T_A / T_N	T_K / T_N	kgm^2	kg
37	3MGS 225M6K	3M0SG3E- 22MK6 ■■■■ -...	985	72	359	0,80	93,3	93,6	93,4	7,0	2,8	3,2	0,6889	321
45	3MGS 250M6K	3M0SG3E- 25MK6 ■■■■ -...	990	86	434	0,81	93,7	94,1	93,6	7,5	2,8	3,3	1,2531	435
75	3MGS 280M6K	3M0SG3E- 28MK6 ■■■■ -...	989	136	723	0,84	94,6	94,9	94,6	7,6	2,5	3,1	2,538	635
160	3MGS 315M6K	3M0SG3E- 31MK6 ■■■■ -...	991	287	1542	0,84	95,6	95,6	95,0	7,1	2,3	3,0	7,63	1250

Efficiency values are determined according to IEC 60034-2-1:2014. (By the summation of all separate losses, including additional load loss)

PERFORMANCE VALUES

IE3

Standard 3 phase, Squirrel Cage Induction Motors
IP 55 protection, IC 411 cooling, F class insulation, B temperature rise
IE3: Premium Efficiency Class (IEC 60034-30-1:2014)

8 Pole, 750 rpm; 400 V 50 Hz

ALUMINIUM FRAME

STANDARD MOTORS

Output Power			Speed	Current	Torque	Power Factor	Efficiency			Starting Current Ratio	Starting Torque Ratio	Breakdown Torque Ratio	Moment of Inertia J	Weight B3
			n	I_N	T_N		4/4 Load	3/4 Load	2/4 Load					
kW	Motor Type	Product Code	rpm	A	Nm	cosφ	100%	75%	50%	I_A / I_N	T_A / T_N	T_K / T_N	kgm^2	kg
2,2	3MAS 132S8	3M0SA3E- 13SA8 ■■■■ -...	720	5,9	29,2	0,66	81,9	81,0	78,0	5,3	2,0	3,6	0,0460	27
3	3MAS 132M8	3M0SA3E- 13MA8 ■■■■ -...	720	7,7	39,8	0,67	83,5	83,0	81,2	5,6	2,1	3,7	0,0556	35
4	3MAS 160MA8	3M0SA3E- 16MA8 ■■■■ -...	730	9,9	52,3	0,69	84,8	85,0	84,0	5,2	2,0	2,8	0,108	58
5,5	3MAS 160MB8	3M0SA3E- 16MB8 ■■■■ -...	730	13,3	72	0,69	86,2	86,5	95,8	5,4	2,1	3,0	0,126	72
7,5	3MAS 160L8	3M0SA3E- 16LA8 ■■■■ -...	730	17,5	98	0,71	87,3	88,0	97,8	5,2	2,0	2,8	0,181	94
11	3MAS 180L8	3M0SA3E- 18LA8 ■■■■ -...	728	25,5	144	0,70	88,6	88,5	97,6	5,6	2,1	2,8	0,245	116
15	3MAS 200L8	3M0SA3E- 20LA8 ■■■■ -...	732	32,2	196	0,75	89,6	90,2	89,8	5,3	2,0	2,5	0,460	181
18,5	3MAS 225S8	3M0SA3E- 22SA8 ■■■■ -...	735	38	240	0,78	90,1	90,5	90,2	5,8	2,2	2,6	0,705	218
22	3MAS 225M8	3M0SA3E- 22MA8 ■■■■ -...	738	45	285	0,78	90,6	90,8	90,0	6,0	2,3	2,8	0,837	245

Efficiency values are determined according to IEC 60034-2-1:2014. (By the summation of all separate losses, including additional load loss)

PERFORMANCE VALUES

IE3

Standard 3 phase, Squirrel Cage Induction Motors
IP 55 protection, IC 411 cooling, F class insulation, B temperature rise
IE3: Premium Efficiency Class (IEC 60034-30-1:2014)

8 Pole, 750 rpm; 400 V 50 Hz

CAST IRON FRAME

STANDARD MOTORS

Output Power			Speed	Current	Torque	Power Factor	Efficiency			Starting Current Ratio	Starting Torque Ratio	Breakdown Torque Ratio	Moment of Inertia J	Weight B3
			n	I_N	T_N		4/4 Load	3/4 Load	2/4 Load					
kW	Motor Type	Product Code	rpm	A	Nm	cosφ	100%	75%	50%	I_A / I_N	T_A / T_N	T_K / T_N	kgm^2	kg
4	3MGS 160MA8	3M0SG3E- 16MA8 ■■■■ -...	730	9,9	52,3	0,69	84,8	85,0	84,0	5,2	2,0	2,8	0,108	82
5,5	3MGS 160MB8	3M0SG3E- 16MB8 ■■■■ -...	730	13,3	72	0,69	86,2	86,5	95,8	5,4	2,1	3,0	0,126	96
7,5	3MGS 160L8	3M0SG3E- 16LA8 ■■■■ -...	730	17,5	98	0,71	87,3	88,0	97,8	5,2	2,0	2,8	0,181	120
11	3MGS 180L8	3M0SG3E- 18LA8 ■■■■ -...	728	25,5	144	0,70	88,6	88,5	97,6	5,6	2,1	2,8	0,245	152
15	3MGS 200L8	3M0SG3E- 20LA8 ■■■■ -...	732	32,2	196	0,75	89,6	90,2	89,8	5,3	2,0	2,5	0,460	220
18,5	3MGS 225S8	3M0SG3E- 22SA8 ■■■■ -...	735	38	240	0,78	90,1	90,5	90,2	5,8	2,2	2,6	0,705	263
22	3MGS 225M8	3M0SG3E- 22MA8 ■■■■ -...	738	45	285	0,78	90,6	90,8	90,0	6,0	2,3	2,8	0,837	290
30	3MGS 250M8	3M0SG3E- 25MA8 ■■■■ -...	735	60	390	0,79	91,3	91,5	91,2	6,4	2,5	3,0	1,40	396
37	3MGS 280S8	3M0SG3E- 28SA8 ■■■■ -...	740	73	478	0,80	91,8	91,8	91,3	6,2	2,2	2,7	2,20	453
45	3MGS 280M8	3M0SG3E- 28MA8 ■■■■ -...	741	89	580	0,79	92,2	92,3	91,5	6,4	2,3	2,8	2,59	498
55	3MGS 315S8	3M0SG3E- 31SA8 ■■■■ -...	741	107	709	0,80	92,5	92,5	91,8	6,5	1,8	2,7	3,92	766
75	3MGS 315MA8	3M0SG3E- 31MA8 ■■■■ -...	740	142	968	0,82	93,1	93,0	92,2	6,3	1,7	2,6	5,34	804
90	3MGS 315MB8	3M0SG3E- 31MB8 ■■■■ -...	741	170	1160	0,82	93,4	93,5	92,5	6,8	1,9	2,7	6,32	879
110	3MGS 315MC8	3M0SG3E- 31MC8 ■■■■ -...	742	212	1416	0,80	93,7	93,7	93,0	6,7	1,9	2,6	7,30	936
132	3MGS 355MA8	3M0SG3E- 35MA8 ■■■■ -...	745	254	1692	0,8	94	94	93,3	7,2	1,4	2,5	8,5	1320
160	3MGS 355MB8	3M0SG3E- 35MB8 ■■■■ -...	745	307	2051	0,8	94,3	94,2	93,5	7,4	1,5	2,6	10,2	1590
200	3MGS 355MC8	3M0SG3E- 35MC8 ■■■■ -...	745	382	2564	0,8	94,6	94,6	94	7,2	1,4	2,5	11,6	1745
250	3MGS 355LA8	3M0SG3E- 35LA8 ■■■■ -...	745	480	3205	0,79	94,6	94,3	93,8	7,2	1,5	2,6	13,5	1900

COMPACT MOTORS

Output Power			Speed	Current	Torque	Power Factor	Efficiency			Starting Current Ratio	Starting Torque Ratio	Breakdown Torque Ratio	Moment of Inertia J	Weight B3
			n	I_N	T_N		4/4 Load	3/4 Load	2/4 Load					
kW	Motor Type	Product Code	rpm	A	Nm	cosφ	100%	75%	50%	I_A / I_N	T_A / T_N	T_K / T_N	kgm^2	kg
132	3MGS 315M8K	3M0SG3E- 31MK8 ■■■■ -...	744	253	1694	0,80	94,0	94,0	92,8	6,8	1,7	2,6	8,27	1056

Efficiency values are determined according to IEC 60034-2-1:2014. (By the summation of all separate losses, including additional load loss)

PERFORMANCE VALUES

IE4

Standard 3 phase, Squirrel Cage Induction Motors
IP 55 protection, IC 411 cooling, F class insulation, B temperature rise
IE4: Super Premium Efficiency Class (IEC 60034-30-1:2014)

2 Pole, 3000 rpm; 400 V 50 Hz

ALUMINIUM FRAME

STANDARD MOTORS

Output Power			Speed	Current	Torque	Power Factor	Efficiency			Starting Current Ratio	Starting Torque Ratio	Breakdown Torque Ratio	Moment of Inertia J	Weight B3
			n	I_N	T_N		4/4 Load	3/4 Load	2/4 Load					
kW	Motor Type	Product Code	rpm	A	Nm	cosφ	100%	75%	50%	I_A / I_N	T_A / T_N	T_K / T_N	kgm^2	kg
0,37	3MAS 71MA2	3M0SA4E- 07MA2 ■■■■ -...	2760	0,83	1,28	0,82	78,1	77,7	77,0	6,4	3,1	3,7	0,0006	7
0,55	3MAS 71MB2	3M0SA4E- 07MB2 ■■■■ -...	2760	1,17	1,90	0,83	81,5	81,3	80,8	6,9	3,5	3,8	0,0007	8
0,75	3MAS 80MA2	3M0SA4E- 08MA2 ■■■■ -...	2875	1,55	2,49	0,84	83,5	84,0	83,3	7,7	3,6	4,0	0,0010	10
1,1	3MAS 80MB2	3M0SA4E- 08MB2 ■■■■ -...	2875	2,19	3,65	0,85	85,2	85,9	85,0	8,0	3,6	4,0	0,0012	11
1,5	3MAS 90S2	3M0SA4E- 09SA2 ■■■■ -...	2885	2,98	4,97	0,84	86,5	87,0	86,7	8,2	3,8	3,8	0,0019	15
2,2	3MAS 90L2	3M0SA4E- 09LA2 ■■■■ -...	2890	4,25	7,27	0,85	88,0	88,5	88,1	9,3	3,9	4,4	0,0024	17
3	3MAS 100L2	3M0SA4E- 10LA2 ■■■■ -...	2900	5,52	9,88	0,88	89,1	89,4	88,9	9,1	3,3	4,1	0,0048	26
4	3MAS 112M2	3M0SA4E- 11MA2 ■■■■ -...	2915	7,21	13,1	0,89	90,0	90,4	90,1	9,0	3,2	4,0	0,0082	32
5,5	3MAS 132SA2	3M0SA4E- 13SA2 ■■■■ -...	2935	9,8	17,9	0,89	90,9	90,6	89,2	8,0	2,8	3,6	0,0187	47
7,5	3MAS 132SB2	3M0SA4E- 13SB2 ■■■■ -...	2935	13,2	24,4	0,89	91,7	91,6	90,6	8,0	2,9	3,7	0,0227	54
11	3MAS 160MA2	3M0SA4E- 16MA2 ■■■■ -...	2950	19,3	35,6	0,89	92,6	92,3	91,2	7,9	2,8	3,7	0,0490	88
15	3MAS 160MB2	3M0SA4E- 16MB2 ■■■■ -...	2950	25,8	48,6	0,90	93,3	93,1	92,2	7,8	2,7	3,6	0,0620	104
18,5	3MAS 160L2	3M0SA4E- 16LA2 ■■■■ -...	2950	31,6	59,9	0,90	93,7	93,3	92,7	8,0	2,8	3,7	0,0740	122
22	3MAS 180M2	3M0SA4E- 18MA2 ■■■■ -...	2960	37,5	71,0	0,90	94,0	93,8	93,5	8,0	2,6	3,5	0,127	160
30	3MAS 200LA2	3M0SA4E- 20LA2 ■■■■ -...	2965	51,5	96,6	0,89	94,5	94,2	93,4	7,8	2,6	3,6	0,190	223
37	3MAS 200LB2	3M0SA4E- 20LB2 ■■■■ -...	2970	63,3	119	0,89	94,8	94,6	93,8	8,0	2,8	3,7	0,227	254
45	3MAS 225M2	3M0SA4E- 22MA2 ■■■■ -...	2970	73,5	145	0,93	95,0	95,1	94,9	8,0	2,5	3,6	0,460	337

Efficiency values are determined according to IEC 60034-2-1:2014. (By the summation of all separate losses, including additional load loss)

PERFORMANCE VALUES

IE4

Standard 3 phase, Squirrel Cage Induction Motors
IP 55 protection, IC 411 cooling, F class insulation, B temperature rise
IE4: Super Premium Efficiency Class (IEC 60034-30-1:2014)

2 Pole, 3000 rpm; 400 V 50 Hz

CAST IRON FRAME

STANDARD MOTORS

Output Power			Speed	Current	Torque	Power Factor	Efficiency			Starting Current Ratio	Starting Torque Ratio	Breakdown Torque Ratio	Moment of Inertia J	Weight B3
			n	I_N	T_N		4/4 Load	3/4 Load	2/4 Load					
kW	Motor Type	Product Code	rpm	A	Nm	cosφ	100%	75%	50%	I_A / I_N	T_A / T_N	T_K / T_N	kgm^2	kg
11	3MGS 160MA2	3M0SG4E- 16MA2 ■■■■ -...	2950	19,3	35,6	0,89	92,6	92,3	91,2	7,9	2,8	3,7	0,0490	112
15	3MGS 160MB2	3M0SG4E- 16MB2 ■■■■ -...	2950	25,8	48,6	0,90	93,3	93,1	92,2	7,8	2,7	3,6	0,0620	127
18,5	3MGS160L2	3M0SG4E- 16LA2 ■■■■ -...	2950	31,6	59,9	0,90	93,7	93,3	92,7	8,0	2,8	3,7	0,0740	148
22	3MGS 180M2	3M0SG4E- 18MA2 ■■■■ -...	2960	37,5	71,0	0,90	94,0	93,8	93,5	8,0	2,6	3,5	0,127	191
30	3MGS 200LA2	3M0SG4E- 20LA2 ■■■■ -...	2965	51,5	96,6	0,89	94,5	94,2	93,4	7,8	2,6	3,6	0,190	262
37	3MGS 200LB2	3M0SG4E- 20LB2 ■■■■ -...	2970	63,3	119	0,89	94,8	94,6	93,8	8,0	2,8	3,7	0,227	293
45	3MGS 225M2	3M0SG4E- 22MA2 ■■■■ -...	2970	73,5	145	0,93	95,0	95,1	94,9	8,0	2,5	3,6	0,460	382
55	3MGS 250M2	3M0SG4E- 25MA2 ■■■■ -...	2980	90,5	176	0,92	95,3	95,4	95,1	8,2	2,8	3,8	0,758	546
75	3MGS 280S2	3M0SG4E- 28SA2 ■■■■ -...	2981	124	240	0,91	95,6	95,8	95,6	7,6	2,1	3,0	1,15	651
90	3MGS 280M2	3M0SG4E- 28MA2 ■■■■ -...	2981	149	288	0,91	95,8	96,0	95,7	7,8	2,3	3,1	1,26	732
110	3MGS 315S2	3M0SG4E- 31SA2 ■■■■ -...	2983	184	352	0,90	96,0	96,2	95,8	8,0	2,4	3,2	2,57	1105
132	3MGS 315MA2	3M0SG4E- 31MA2 ■■■■ -...	2983	216	423	0,92	96,2	96,3	96,0	7,9	2,4	3,1	2,88	1184
160	3MGS 315MB2	3M0SG4E- 31MB2 ■■■■ -...	2983	261	512	0,92	96,3	96,5	96,2	7,9	2,5	3,1	3,19	1326
200	3MGS 315MD2	3M0SG4E- 31MD2 ■■■■ -...	2983	325	640	0,92	96,5	96,4	96,0	8,0	2,5	3,0	3,57	1408
250	3MGS 355MA2	3M0SG4E- 35MA2 ■■■■ -...	2982	407	801	0,92	96,5	96,5	96,2	7,8	2,3	2,8	3,6	1520
315	3MGS 355MB2	3M0SG4E- 35MB2 ■■■■ -...	2982	518	1009	0,91	96,5	96,4	96,1	8	2,4	2,8	3,8	1605
355	3MGS 355MC2	3M0SG4E- 35MC2 ■■■■ -...	2982	584	1137	0,91	96,5	96,4	96	7,8	2,4	2,8	4,1	1860

Efficiency values are determined according to IEC 60034-2-1:2014. (By the summation of all separate losses, including additional load loss)

PERFORMANCE VALUES

IE4

Standard 3 phase, Squirrel Cage Induction Motors
IP 55 protection, IC 411 cooling, F class insulation, B temperature rise
IE4: Super Premium Efficiency Class (IEC 60034-30-1:2014)

4 Pole, 1500 rpm; 400 V 50 Hz

ALUMINIUM FRAME

STANDARD MOTORS

Output Power			Speed	Current	Torque	Power Factor	Efficiency			Starting Current Ratio	Starting Torque Ratio	Breakdown Torque Ratio	Moment of Inertia J	Weight B3
			n	I_N	T_N		4/4 Load	3/4 Load	2/4 Load					
kW	Motor Type	Product Code	rpm	A	Nm	cosφ	100%	75%	50%	I_A / I_N	T_A / T_N	T_K / T_N	kgm^2	kg
0,25	3MAS 71MA4	3M0SA4E- 07MA4 ■■■■ -...	1410	0,63	1,69	0,73	77,9	77,8	77,2	5,4	2,9	3,3	0,0011	7
0,37	3MAS 71MB4	3M0SA4E- 07MB4 ■■■■ -...	1420	0,89	2,49	0,74	81,1	81,0	80,3	6,0	3,5	4,0	0,0013	8
0,55	3MAS 80MA4	3M0SA4E- 08MA4 ■■■■ -...	1420	1,22	3,70	0,78	83,9	84,2	83,5	6,5	3,7	3,9	0,0019	11
0,75	3MAS 80MB4	3M0SA4E- 08MB4 ■■■■ -...	1420	1,61	5,04	0,79	85,7	86,0	85,4	7,0	4,0	4,1	0,0027	14
1,1	3MAS 90S4	3M0SA4E- 09SA4 ■■■■ -...	1440	2,25	7,29	0,81	87,2	87,5	86,8	8,1	3,9	4,3	0,0046	17
1,5	3MAS 90L4	3M0SA4E- 09LA4 ■■■■ -...	1440	2,95	9,93	0,83	88,2	88,5	87,7	8,2	3,9	4,3	0,0059	20
2,2	3MAS 100LA4	3M0SA4E- 10LA4 ■■■■ -...	1450	4,29	14,5	0,83	89,5	89,5	88,8	8,7	3,6	4,4	0,0068	26
3	3MAS 100LB4	3M0SA4E- 10LB4 ■■■■ -...	1450	5,65	19,8	0,85	90,4	90,8	90,0	8,8	3,7	4,4	0,0085	31
4	3MAS 112M4	3M0SA4E- 11MA4 ■■■■ -...	1450	7,36	26,3	0,86	91,1	91,5	90,8	8,7	3,3	4,3	0,0159	37
5,5	3MAS 132S4	3M0SA4E- 13SA4 ■■■■ -...	1470	10,3	35,7	0,84	91,9	91,7	91,0	7,6	2,3	3,5	0,0428	57
7,5	3MAS 132M4	3M0SA4E- 13MA4 ■■■■ -...	1470	13,9	48,7	0,84	92,6	92,6	92,2	7,7	2,3	3,5	0,0590	75
11	3MAS 160M4	3M0SA4E- 16MA4 ■■■■ -...	1475	20,5	71,2	0,83	93,3	93,1	92,4	7,6	2,4	3,5	0,112	109
15	3MAS 160L4	3M0SA4E- 16LA4 ■■■■ -...	1475	28,1	97,1	0,82	93,9	93,9	93,0	7,6	2,4	3,5	0,151	139
18,5	3MAS 180M4	3M0SA4E- 18AM4 ■■■■ -...	1480	33,4	119	0,85	94,2	94,4	93,9	7,5	2,4	3,5	0,229	167
22	3MAS 180L4	3M0SA4E- 18LA4 ■■■■ -...	1480	40,0	142	0,84	94,5	94,5	94,0	7,5	2,3	3,5	0,259	184
30	3MAS 200L4	3M0SA4E- 20LA4 ■■■■ -...	1485	53,0	193	0,86	94,9	95,1	94,6	7,6	2,5	3,4	0,520	275
37	3MAS 225S4	3M0SA4E- 22SA4 ■■■■ -...	1485	64,5	238	0,87	95,2	95,2	94,7	7,6	2,5	3,0	0,697	319
45	3MAS 225M4	3M0SA4E- 22MA4 ■■■■ -...	1485	80,0	289	0,85	95,4	95,4	94,8	7,9	2,7	3,2	0,844	366

Efficiency values are determined according to IEC 60034-2-1:2014. (By the summation of all separate losses, including additional load loss)

PERFORMANCE VALUES

IE4

Standard 3 phase, Squirrel Cage Induction Motors
IP 55 protection, IC 411 cooling, F class insulation, B temperature rise
IE4: Super Premium Efficiency Class (IEC 60034-30-1:2014)

4 Pole, 1500 rpm; 400 V 50 Hz

CAST IRON FRAME

STANDARD MOTORS

Output Power			Speed	Current	Torque	Power Factor	Efficiency			Starting Current Ratio	Starting Torque Ratio	Breakdown Torque Ratio	Moment of Inertia J	Weight B3
			n	I_N	T_N		4/4 Load	3/4 Load	2/4 Load					
kW	Motor Type	Product Code	rpm	A	Nm	cosφ	100%	75%	50%	I_A / I_N	T_A / T_N	T_K / T_N	kgm^2	kg
11	3MGS 160M4	3M0SG4E- 16MA4 ■■■■ -...	1475	20,5	71,2	0,83	93,3	93,1	92,4	7,6	2,4	3,5	0,112	132
15	3MGS 160L4	3M0SG4E- 16LA4 ■■■■ -...	1475	28,1	97,1	0,82	93,9	93,9	93,0	7,6	2,4	3,5	0,151	165
18,5	3MGS 180M4	3M0SG4E- 18MA4 ■■■■ -...	1480	33,4	119	0,85	94,2	94,4	93,9	7,5	2,4	3,5	0,229	198
22	3MGS 180L4	3M0SG4E- 18LA4 ■■■■ -...	1480	40,0	142	0,84	94,5	94,5	94,0	7,5	2,3	3,5	0,259	220
30	3MGS 200L4	3M0SG4E- 20LA4 ■■■■ -...	1485	53,0	193	0,86	94,9	95,1	94,6	7,6	2,5	3,4	0,520	314
37	3MGS 225S4	3M0SG4E- 22SA4 ■■■■ -...	1485	64,5	238	0,87	95,2	95,2	94,7	7,6	2,5	3,0	0,697	364
45	3MGS 225M4	3M0SG4E- 22MA4 ■■■■ -...	1485	80,0	289	0,85	95,4	95,4	94,8	7,9	2,7	3,2	0,844	411
55	3MGS 250M4	3M0SG4E- 25MA4 ■■■■ -...	1487	95,4	353	0,87	95,7	95,8	95,4	7,5	2,5	2,8	1,36	529
75	3MGS 280S4	3M0SG4E- 28SA4 ■■■■ -...	1490	128	481	0,88	96,0	96,2	95,8	7,6	2,4	3,1	2,30	647
90	3MGS 280M4	3M0SG4E- 28MA4 ■■■■ -...	1488	155	578	0,87	96,1	96,3	96,0	7,6	2,4	3,1	2,77	779
110	3MGS 315S4	3M0SG4E- 31SA4 ■■■■ -...	1491	187	705	0,88	96,3	96,5	96,1	7,9	2,5	3,3	4,46	992
132	3MGS 315MA4	3M0SG4E- 31MA4 ■■■■ -...	1491	224	845	0,88	96,4	96,6	96,2	7,9	2,6	3,3	5,21	1086
160	3MGS 315MB4	3M0SG4E- 31MB4 ■■■■ -...	1490	268	1026	0,89	96,6	96,8	96,5	7,8	2,6	3,2	6,46	1243
200	3MGS 315MD4	3M0SG4E- 31MD4 ■■■■ -...	1490	335	1282	0,89	96,7	96,8	96,6	7,8	2,7	3,2	8,1	1509
250	3MGS 355MA4	3M0SG4E- 35MA4 ■■■■ -...	1491	429	1601	0,87	96,7	96,7	96,4	7,8	2,4	3	7,9	1705
315	3MGS 355MB4	3M0SG4E- 35MB4 ■■■■ -...	1491	540	2018	0,87	96,7	96,6	96	7,5	2,6	3	8,3	1750
355	3MGS 355MC4	3M0SG4E- 35MC4 ■■■■ -...	1491	610	2274	0,87	96,7	96,6	96,2	7,8	2,5	3	8,8	1900

Efficiency values are determined according to IEC 60034-2-1:2014. (By the summation of all separate losses, including additional load loss)

PERFORMANCE VALUES

IE4

Standard 3 phase, Squirrel Cage Induction Motors
IP 55 protection, IC 411 cooling, F class insulation, B temperature rise
IE4: Super Premium Efficiency Class (IEC 60034-30-1:2014)

6 Pole, 1000 rpm; 400 V 50 Hz

ALUMINIUM FRAME

STANDARD MOTORS

Output Power			Speed	Current	Torque	Power Factor	Efficiency			Starting Current Ratio	Starting Torque Ratio	Breakdown Torque Ratio	Moment of Inertia J	Weight B3
			n	I_N	T_N		4/4 Load	3/4 Load	2/4 Load					
kW	Motor Type	Product Code	rpm	A	Nm	cosφ	100%	75%	50%	I_A / I_N	T_A / T_N	T_K / T_N	kgm^2	kg
0,18	3MAS 71MA6	3M0SA4E- 07MA6 ■■■■ -...	930	0,57	1,86	0,66	70,1	69,9	68,8	3,8	2,3	2,5	0,0013	7
0,25	3MAS 71MB6	3M0SA4E- 07MB6 ■■■■ -...	935	0,75	2,57	0,66	74,1	74,0	73,0	4,2	2,7	2,7	0,0016	9
0,37	3MAS 80MA6	3M0SA4E- 08MA6 ■■■■ -...	940	1,01	3,76	0,68	78,0	77,9	77,4	5,1	2,6	3,2	0,0029	11
0,55	3MAS 80MB6	3M0SA4E- 08MB6 ■■■■ -...	940	1,44	5,58	0,68	80,9	80,8	80,0	5,4	2,8	3,3	0,0035	13
0,75	3MAS 90S6	3M0SA4E- 09SA6 ■■■■ -...	945	1,90	7,57	0,69	82,7	82,9	82,2	4,8	2,3	2,7	0,0047	16
1,1	3MAS 90L6	3M0SA4E- 09LA6 ■■■■ -...	950	2,65	11,05	0,71	84,5	84,5	84,0	5,1	2,5	2,8	0,0057	22
1,5	3MAS 100L6	3M0SA4E- 10LA6 ■■■■ -...	960	3,47	15,0	0,73	85,9	85,8	85,2	5,8	2,8	2,9	0,0113	28
2,2	3MAS 112M6	3M0SA4E- 11MA6 ■■■■ -...	965	5,05	21,7	0,72	87,4	87,7	87,1	4,8	2,2	2,7	0,0222	34
3	3MAS 132S6	3M0SA4E- 13SA6 ■■■■ -...	970	6,52	29,5	0,75	88,6	89,0	88,2	6,0	1,8	2,6	0,038	42
4	3MAS 132MA6	3M0SA4E- 13MA6 ■■■■ -...	975	8,60	39,2	0,75	89,5	89,5	88,7	6,2	1,9	2,7	0,050	53
5,5	3MAS 132MB6	3M0SA4E- 13MB6 ■■■■ -...	975	11,7	53,9	0,75	90,5	90,4	90,0	6,4	2,0	2,8	0,067	66
7,5	3MAS 160M6	3M0SA4E- 16MA6 ■■■■ -...	980	14,6	73,1	0,81	91,3	91,3	90,8	6,6	2,4	3,0	0,129	94
11	3MAS 160L6	3M0SA4E- 16LA6 ■■■■ -...	980	21,2	107	0,81	92,3	92,0	91,4	6,8	2,5	3,0	0,198	133
15	3MAS 180L6	3M0SA4E- 18LA6 ■■■■ -...	980	28,1	146	0,83	92,9	92,8	92,3	6,7	2,4	3,0	0,285	164
18,5	3MAS 200LA6	3M0SA4E- 20LA6 ■■■■ -...	985	34,4	179	0,83	93,4	93,3	92,6	6,7	2,6	2,9	0,453	200
22	3MAS 200LB6	3M0SA4E- 20LB6 ■■■■ -...	985	41,3	213	0,82	93,7	93,6	93,2	6,7	2,5	2,9	0,576	236
30	3MAS 225M6	3M0SA4E- 22MA6 ■■■■ -...	985	54,0	291	0,85	94,2	94,0	93,6	6,6	2,3	2,8	0,910	318

Efficiency values are determined according to IEC 60034-2-1:2014. (By the summation of all separate losses, including additional load loss)

PERFORMANCE VALUES

IE4

Standard 3 phase, Squirrel Cage Induction Motors
IP 55 protection, IC 411 cooling, F class insulation, B temperature rise
IE4: Super Premium Efficiency Class (IEC 60034-30-1:2014)

6 Pole, 1000 rpm; 400 V 50 Hz

CAST IRON FRAME

STANDARD MOTORS

Output Power			Speed	Current	Torque	Power Factor	Efficiency			Starting Current Ratio	Starting Torque Ratio	Breakdown Torque Ratio	Moment of Inertia J	Weight B3
			n	I_N	T_N		4/4 Load	3/4 Load	2/4 Load					
kW	Motor Type	Product Code	rpm	A	Nm	cosφ	100%	75%	50%	I_A / I_N	T_A / T_N	T_K / T_N	kgm^2	kg
7,5	3MGS 160M6	3M0SG4E- 16MA6 ■■■■ -...	980	14,6	73,1	0,81	91,3	91,3	90,8	6,6	2,4	3,0	0,129	118
11	3MGS 160L6	3M0SG4E- 16LA6 ■■■■ -...	980	21,2	107	0,81	92,3	92,0	91,4	6,8	2,5	3,0	0,198	159
15	3MGS 180L6	3M0SG4E- 18LA6 ■■■■ -...	980	28,1	146	0,83	92,9	92,8	92,3	6,7	2,4	3,0	0,285	201
18,5	3MGS 200LA6	3M0SG4E- 20LA6 ■■■■ -...	985	34,4	179	0,83	93,4	93,3	92,6	6,7	2,6	2,9	0,453	239
22	3MGS 200LB6	3M0SG4E- 20LB6 ■■■■ -...	985	41,3	213	0,82	93,7	93,6	93,2	6,7	2,5	2,9	0,576	275
30	3MGS 225M6	3M0SG4E- 22MA6 ■■■■ -...	985	54,0	291	0,85	94,2	94,0	93,6	6,6	2,3	2,8	0,910	362
37	3MGS 250M6	3M0SG4E- 25MA6 ■■■■ -...	988	66,5	358	0,85	94,5	94,5	94,2	6,5	2,3	2,8	1,38	462
45	3MGS 280S6	3M0SG4E- 28SA6 ■■■■ -...	992	80,6	433	0,85	94,8	95,0	94,6	6,7	2,3	2,7	2,40	559
55	3MGS 280M6	3M0SG4E- 28MA6 ■■■■ -...	992	98,2	530	0,85	95,1	95,2	95,0	6,7	2,3	2,7	2,80	661
75	3MGS 315S6	3M0SG4E- 31SA6 ■■■■ -...	992	132	722	0,86	95,4	95,3	94,8	7,0	2,2	3,0	4,42	870
90	3MGS 315MA6	3M0SG4E- 31MA6 ■■■■ -...	992	160	866	0,85	95,6	95,8	95,3	7,0	2,3	3,0	5,22	948
110	3MGS 315MB6	3M0SG4E- 31MB6 ■■■■ -...	992	193	1059	0,86	95,8	95,8	95,3	6,9	2,3	2,9	6,02	1028
132	3MGS 315MC6	3M0SG4E- 31MC6 ■■■■ -...	992	236	1271	0,84	96,0	96,2	95,9	6,9	2,3	2,9	7,30	1217
160	3MGS 355MA6	3M0SG4E- 35MA6 ■■■■ -...	995	290	1536	0,83	96,2	96,1	95,6	6,8	2,2	2,6	10,7	1565
200	3MGS 355MB6	3M0SG4E- 35MB6 ■■■■ -...	995	361	1920	0,83	96,5	96,2	95,5	7	2,3	2,6	12,4	1670
250	3MGS 355MC6	3M0SG4E- 35MC6 ■■■■ -...	995	451	2399	0,83	96,6	96,4	95,8	6,8	2,2	2,6	14,7	1850
315	3MGS 355LA6	3M0SG4E- 35LA6 ■■■■ -...	995	569	3023	0,83	96,6	96,3	95,5	6,7	2,3	2,7	16,9	2115
355	3MGS 355LB6	3M0SG4E- 35LB6 ■■■■ -...	995	650	3407	0,82	96,6	96,5	96	7	2,4	2,8	18,8	2365

Efficiency values are determined according to IEC 60034-2-1:2014. (By the summation of all separate losses, including additional load loss)

DEMAND CODES

Here is all additional features listed below for our standard induction motors. All requests should be specified with their codes in order. These features are applicable to both IE3 and IE4 motors. Note that there are some features that cannot be used together.

Code		Frame Sizes													
		71	80	90	100	112	132	160	180	200	225	250	280	315	355
	Packaging														
A01	Overseas packing	o	o	o	o	o	o	o	o	o	o	o	o	o	o
A02	Overseas packing, Wooden	o	o	o	o	o	o	o	o	o	o	o	o	o	o
A03	Packing of motor in vertical mounting position	o	o	o	o	o	o	o	o	o	o	o	o	o	o
	Balancing														
B01	Vibration level Grade B according to IEC 60034-14	o	o	o	o	o	o	o	o	o	o	o	o	o	o
B11	Full-key balancing	o	o	o	o	o	o	o	o	o	o	o	o	o	o
B12	Balanced without key	o	o	o	o	o	o	o	o	o	o	o	o	o	o
	Painting														
B50	Unpainted motors (Just for aluminium frames)	o	o	o	o	o	o	o	o	o	o	x	x	x	x
B51	Primer paint only (Just for cast iron frames)	x	x	x	x	x	x	o	o	o	o	o	o	o	o
B52	Special paint colors, Standard RAL codes	o	o	o	o	o	o	o	o	o	o	o	o	o	o
	Name Plate														
E01	On right, Stainless steel material (Viewed from DE side)	o	o	o	o	o	o	o	o	o	o	o	o	o	o
E03	On left, Aluminium material (Viewed from DE side)	o	o	o	o	o	o	o	o	o	o	o	o	o	o
E02	On left, Stainless steel material (Viewed from DE side)	o	o	o	o	o	o	o	o	o	o	o	o	o	o
E08	Additional information on rating plate (max. 20 characters)	o	o	o	o	o	o	o	o	o	o	o	o	o	o
E04	2nd rating plate, Aluminium material, Affixed	o	o	o	o	o	o	o	o	o	o	o	o	o	o
E05	2nd rating plate, Stainless steel material, Affixed	o	o	o	o	o	o	o	o	o	o	o	o	o	o
E06	2nd rating plate, Aluminium material, Unmounted	o	o	o	o	o	o	o	o	o	o	o	o	o	o
E07	2nd rating plate, Stainless steel material, Unmounted	o	o	o	o	o	o	o	o	o	o	o	o	o	o
	Brake														
F01	Electromagnetic brake	o	o	o	o	o	o	o	o	o	o	o	o	o	o
	Encoder														
E50	1024 Pulse encoder	o	o	o	o	o	o	o	o	o	o	o	o	o	o
	Temperature Sensors														
T60	KTY 84 - 130 in stator winding	o	o	o	o	o	o	o	o	o	o	o	o	o	o
T02	Bimetal (Thermostat), 130°C, 3 in Stator winding	o	o	o	o	o	o	o	o	o	o	o	o	o	o
T01	Bimetal (Thermostat), 150°C, 3 in Stator winding	o	o	o	o	o	o	o	o	o	o	o	o	o	o
T03	Bimetal (Thermostat), 170°C, 3 in Stator winding	o	o	o	o	o	o	o	o	o	o	o	o	o	o
T20	PTC Thermistor, 130°C, 3 in Stator winding	o	o	o	o	o	o	o	o	o	o	o	o	o	o
T22	PTC Thermistor, 150°C, 3in Stator winding	o	o	o	o	o	o	o	o	o	o	o	o	o	o
T21	PTC Thermistor, 170°C, 3in Stator winding	o	o	o	o	o	o	o	o	o	o	o	o	o	o
T30	PTC Thermistor, 130°C - 3 and 150°C - 3 in Stator winding	o	o	o	o	o	o	o	o	o	o	o	o	o	o
T31	PTC Thermistor, 150°C - 3 and 170°C - 3 in Stator winding	o	o	o	o	o	o	o	o	o	o	o	o	o	o
T40	Pt100, 2-wire in Stator winding	o	o	o	o	o	o	o	o	o	o	o	o	o	o
T50	Pt100, 3-wire in Stator winding	o	o	o	o	o	o	o	o	o	o	o	o	o	o
	Heating Elements														
H01	Heating elements, supply voltage 100V-120V	o	o	o	o	o	o	o	o	o	o	o	o	o	o
H02	Heating elements, supply voltage 200V-240V	o	o	o	o	o	o	o	o	o	o	o	o	o	o
	Terminal Box														
K50	Brass cable glands	o	o	o	o	o	o	o	o	o	o	o	o	o	o
K51	Stainless steel cable glands	o	o	o	o	o	o	o	o	o	o	o	o	o	o

S : As standard **o** : On request **x** : Not applicable

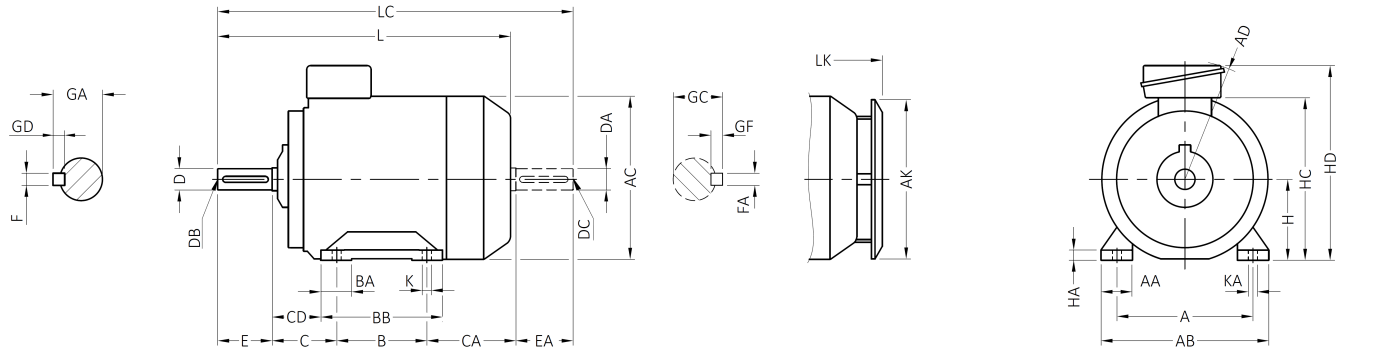
Code		Frame Sizes 71	80	90	100	112	132	160	180	200	225	250	280	315	355
	Shaft and Rotor														
M01	Shaft material stainless steel	o	o	o	o	o	o	o	o	o	o	o	o	o	o
M20	Shaft extension with open keyway	o	o	o	o	o	o	o	o	o	o	o	o	o	o
M30	Shaft extension on both sides, with dimensions as given in catalogue	o	o	o	o	o	o	o	o	o	o	o	o	o	o
M31	Special shaft extension dimensions at DE side, standard material	o	o	o	o	o	o	o	o	o	o	o	o	o	o
M32	Special shaft extension dimensions at NDE side, standard material	o	o	o	o	o	o	o	o	o	o	o	o	o	o
M33	Special shaft material according to customer specification	o	o	o	o	o	o	o	o	o	o	o	o	o	o
M21	Motor delivered with half key on its shaft	o	o	o	o	o	o	o	o	o	o	o	o	o	o
	Motor Protection														
K01	Protection degree, IP 56	o	o	o	o	o	o	o	o	o	o	o	o	o	o
K02	Protection degree, IP 65	o	o	o	o	o	o	o	o	o	o	o	o	o	o
K03	Protection degree, IP 66	o	o	o	o	o	o	o	o	o	o	o	o	o	o
K10	Radial seal, DE side	o	o	o	o	o	o	o	o	o	o	o	o	o	o
K20	Canopy	o	o	o	o	o	o	o	o	o	o	o	o	o	o
	Bearing and Lubrication														
R01	Transport locking on bearings	x	x	x	x	x	x	o	o	o	o	o	o	o	o
R02	Vibration measurement nipples suitable for SPM	o	o	o	o	o	o	o	o	o	o	o	o	o	o
R10	Lubrication nipples and relubricapable bearings	x	x	x	x	x	x	o	o	o	o	S	S	S	S
R11	Cylindrical roller bearing, DE side	x	x	x	x	x	x	o	o	o	o	o	o	o	o
R12	Angular contact ball bearing, shaft force towards bearing	x	x	x	x	x	x	o	o	o	o	o	o	o	o
R13	Angular contact ball bearing, shaft force away from bearing	x	x	x	x	x	x	o	o	o	o	o	o	o	o
R14	Same bearing both DE and NDE side	S	S	S	S	S	S	o	o	o	o	S	S	S	S
R15	Isolated bearing, NDE side	x	x	x	x	x	x	o	o	o	o	o	o	o	o
R16	Isolated endshield, NDE side	x	x	x	x	x	x	o	o	o	o	o	o	o	o
R20	DE Bearing locked	o	o	o	o	o	o	o	o	o	o	S	S	S	S
R21	NDE Bearing locked	o	o	o	o	o	S	S	S	S	S	o	o	o	o
R40	Pt100, 2-wire on bearings	x	x	x	x	x	o	o	o	o	o	o	o	o	o
R50	Pt100, 3-wire on bearings	x	x	x	x	x	o	o	o	o	o	o	o	o	o
	Cooling														
S01	IC 416 Cooling method, forced Cooling	o	o	o	o	o	o	o	o	o	o	o	o	o	o
S02	IC 410 Cooling method, without fan	o	o	o	o	o	o	o	o	o	o	o	o	o	o
S03	IC 418 Cooling method, cooling with driven fan by the motor itself	o	o	o	o	o	o	o	o	o	o	o	o	o	o
	Standardized Features														
X01	Motor designed for ambient temperature -20°C to 40°C	o	o	o	o	o	o	o	o	o	o	o	o	o	o
X02	Corrosion protected stator and rotor core	o	o	o	o	o	o	o	o	o	o	o	o	o	o
X03	Stainless steel or acid proof bolts	o	o	o	o	o	o	o	o	o	o	o	o	o	o
X04	Additional eyebolt on the top of frame, Cast iron frames	x	x	x	x	x	x	o	o	o	o	S	S	S	S
X05	Additional eyebolt on the bottom of frame, Cast iron frames	x	x	x	x	x	x	o	o	o	o	o	o	o	o
X06	Additional eyebolt on the top of frame, Aluminium frames	x	x	x	x	x	x	o	o	o	o	x	x	x	x
	Test														
T01	Type test report for one motor from specific delivery batch	o	o	o	o	o	o	o	o	o	o	o	o	o	o
T02	Torque-speed curve, type test and multi point load test report for one	o	o	o	o	o	o	o	o	o	o	o	o	o	o
T03	Overvoltage test	o	o	o	o	o	o	o	o	o	o	o	o	o	o
T04	Vibration level test	o	o	o	o	o	o	o	o	o	o	o	o	o	o
T05	Noise level test for one motor from specific delivery batch	o	o	o	o	o	o	o	o	o	o	o	o	o	o
	Earthing Bolts														
C01	Additional earthing bolt on motor frame, For aluminium motors	o	o	o	o	o	o	o	o	o	o	x	x	x	x
C02	Additional earthing bolt on motor frame, For cast iron motors	x	x	x	x	x	x	o	o	o	o	o	o	o	o
	Insulation System														
Y01	H Class winding insulation	o	o	o	o	o	o	o	o	o	o	o	o	o	o
Y02	Special winding insulation for frequency converter supply	o	o	o	o	o	o	o	o	o	o	o	o	o	o

S : As standard **o** : On request **x** : Not applicable

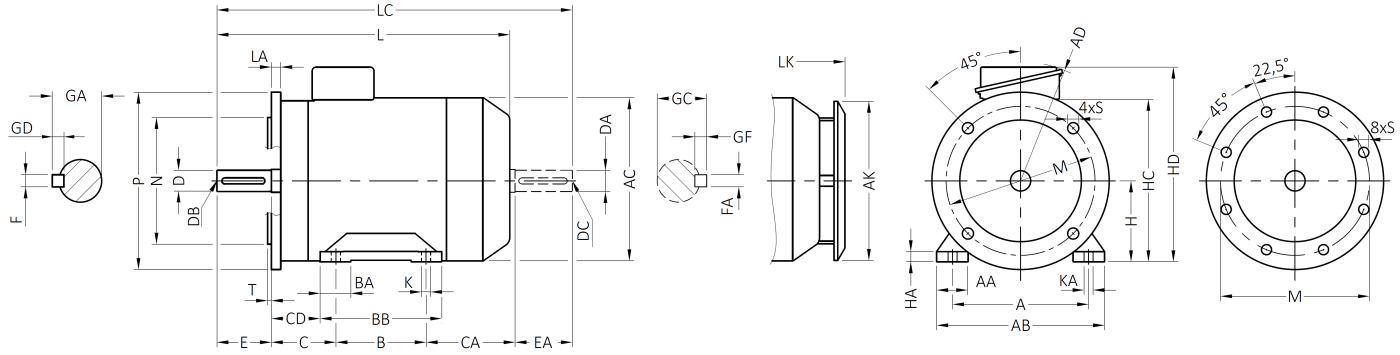
DIMENSION DRAWINGS:

71M - 225M
ALUMINIUM FRAME

IM B3 (IM 1001), IM B6 (IM 1051), IM B7 (1061), IM B8 (1071), IM V5 (IM 1011), IM V6 (IM 1031)



IM B35 (IM 2001), V15 (IM 2011)



71 to 200
Frame Sizes

225
Frame Size

TOLERANCES

D, DA	ISO j6	71M - 112M
	ISO k6	132S - 180L
	ISO m6	225M
N	ISO j6	71M - 180L
	ISO h6	200L - 225M
H	-0.5	
F, FA	ISO h6	

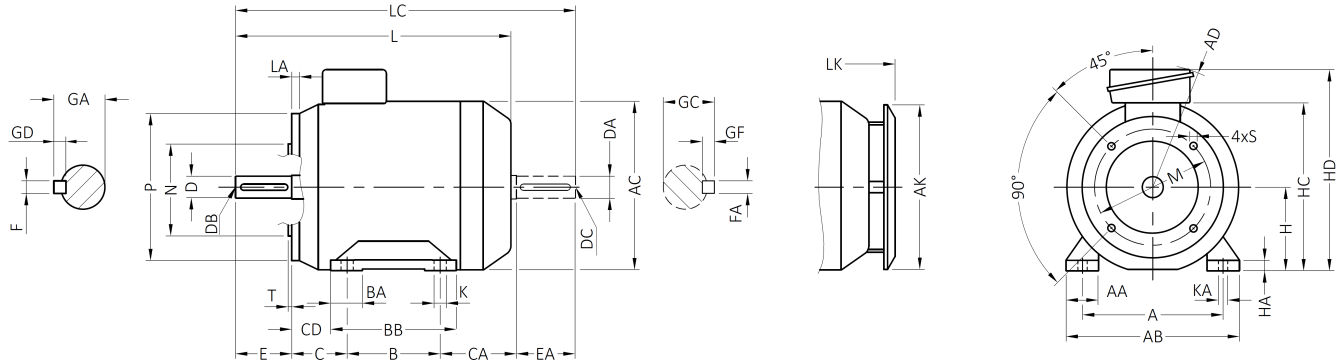
- Shoulder of shaft extension and contact surface of flange are in the same plane.
- The unit for all dimensions is mm.

Frame Sizes	Pole Number	A	AA	AB	AC	AD	B	BA	BB	C	CA	CD ~	D DA	DB DC	E EA	F x GD FA x GF	GA GC	H	HA	HC	HD
71 M	2-4-6	112	35	150	146	112	90	27,5	109	45	82	35,5	14	M5	30	5 x 5	16	71	9	144	165
80 M	2-4-6	125	36	164	160	121	100	32	124	50	104	38	19	M6	40	6 x 6	21,5	80	12	174	194,5
90 S	2-4-6	140	40	184	180	130	100	32	124	56	112	44	24	M8	50	8 x 7	27	90	12	194,5	215
90 L	2-4-6	140	40	184	180	130	125	32	149	56	112	44	24	M8	50	8 x 7	27	90	12	194,5	215
100 L	2-4-6	160	45	208	204	141	140	42	174	63	117	46	28	M10	60	8 x 7	31	100	13	215,5	236
112 M	2-4-6	190	45	232	228	153	140	42	174	70	124,5	53	28	M10	60	8 x 7	31	112	13	239,5	260
132 S	2-4-6-8	216	50	274	270	195	140	46	174	89	128	71,5	38	M12	80	10 x 8	41	132	15	267	317,5
132 M	2-4-6-8	216	50	274	270	195	178	46	213	89	130	71,5	38	M12	80	10 x 8	41	132	15	267	317,5
160 M	2-4-6-8	254	62	332	328	252	210	60,5	255	108	189,5	85,5	42	M16	110	12 x 8	45	160	22	324	400
160 L	2-4-6-8	254	62	332	328	252	254	60,5	299	108	190,5	85,5	42	M16	110	12 x 8	45	160	22	324	400
180 M	2-4-6-8	279	64	364	358	264	241	65	286	121	237	98,5	48	M16	110	14 x 9	51,5	180	22	359	433
180 L	2-4-6-8	279	64	364	358	264	279	65	324	121	199	98,5	48	M16	110	14 x 9	51,5	180	22	359	433
200 L	2-4-6-8	318	69	408	408	300	305	67,5	355	133	243	108	55	M20	110	16 x 10	59	200	27	404	485
225 S	4-6-8	356	84	470	460	323	286	75	336	149	275,5	124	60	M20	140	18 x 11	64	225	30	455	534
225 M	2	356	84	470	460	323	311	75	361	149	250,5	124	55	M20	110	16 x 10	59	225	30	455	534
225 M	4-6-8	356	84	470	460	323	311	75	361	149	250,5	124	60	M20	140	18 x 11	64	225	30	455	534

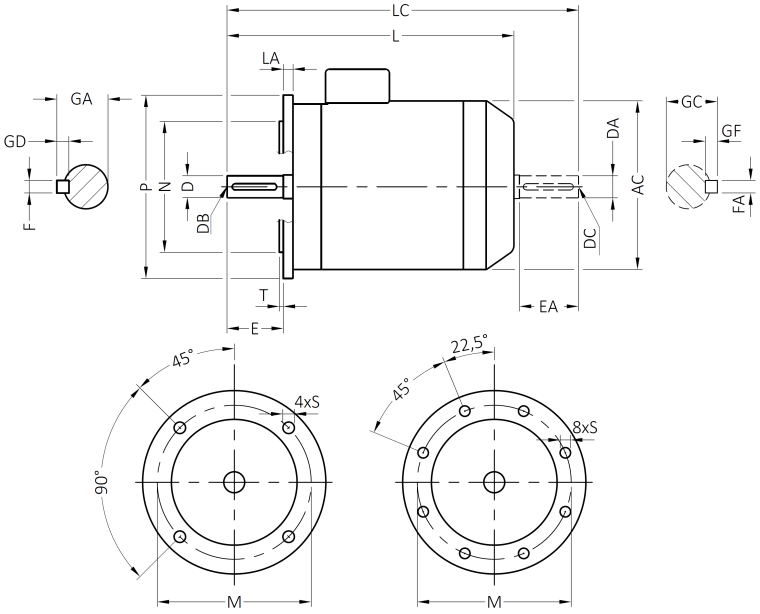
DIMENSION DRAWINGS:

71M - 225M
ALUMINIUM FRAME

IM B34 (IM 2101)



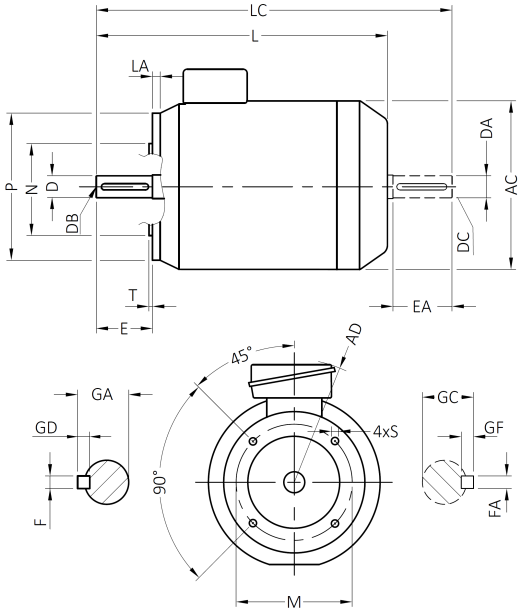
IM B5 (3601), IM V1 (3011), IM V3 (3031)



71 to 200
Frame Sizes

225
Frame Size

IM B14 (IM 3601), IM V18 (IM 3611), IM V19 (IM 3631)



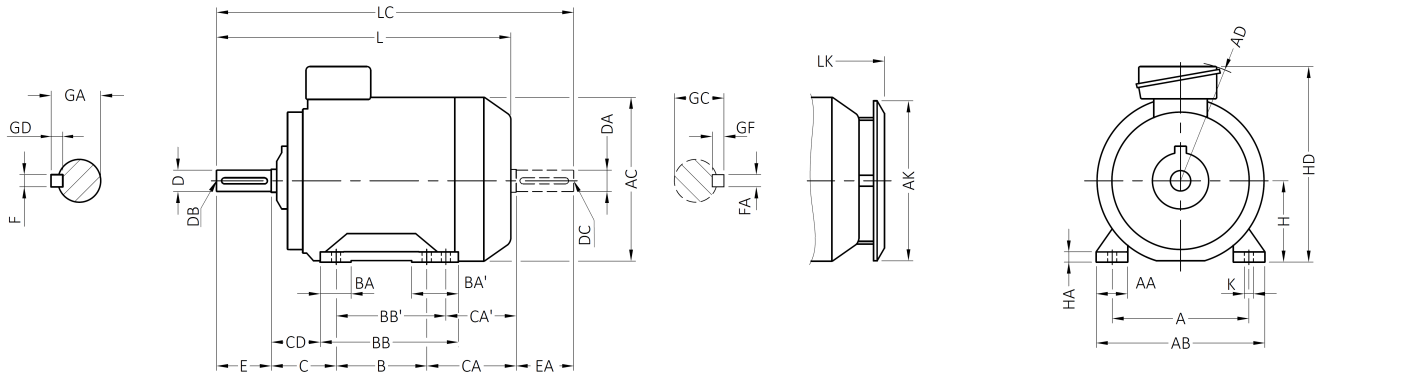
- Shoulder of shaft extension and contact surface of flange are in the same plane.
- The unit for all dimensions is mm.

						Canopy		B5 Flange Dimensions							B14 Flange Dimensions											
Frame Sizes	Pole Number	K	KA	L ~	LC	AK	LK	Flange No.	LA	M	N	P	S	T	Flange No.	M	N	P	S	T	Flange No.	M	N	P	S	T
71 M	2-4-6	7	11	242	277	140	279	FF130	10	130	110	160	10	4	FT85	85	70	105	M6	2,5	FT115	115	95	140	M8	3
80 M	2-4-6	10	15	289	334	152	326	FF165	12	165	130	200	12	3,5	FT100	100	80	120	M6	3	FT130	130	110	160	M8	3,5
90 S	2-4-6	10	15	313	368	174	350	FF165	12	165	130	200	12	3,5	FT115	115	95	140	M8	3	FT130	130	110	160	M8	3,5
90 L	2-4-6	10	15	338	393	174	375	FF165	12	165	130	200	12	3,5	FT115	115	95	140	M8	3	FT130	130	110	160	M8	3,5
100 L	2-4-6	12	18	375	440	196	412	FF215	15	215	180	250	14,5	4	FT130	130	110	160	M8	3,5	FT165	165	130	200	M10	3,5
112 M	2-4-6	12	18	389,5	454,5	218	426,5	FF215	15	215	180	250	14,5	4	FT130	130	110	160	M8	3,5	FT165	165	130	200	M10	3,5
132 S	2-4-6-8	12	18	429	517	258	466	FF265	15	265	230	300	14,5	4	FT165	165	130	200	M10	3,5	FT215	215	180	250	M12	4
132 M	2-4-6-8	12	18	469	557	258	506	FF265	15	265	230	300	14,5	4	FT165	165	130	200	M10	3,5	FT215	215	180	250	M12	4
160 M	2-4-6-8	15	19	609,5	727,5	314	665,5	FF300	18	300	250	350	18,5	5	FT215	215	180	250	M12	4	-	-	-	-	-	-
160 L	2-4	15	19	654,5	772,5	314	710,5	FF300	18	300	250	350	18,5	5	FT215	215	180	250	M12	4	-	-	-	-	-	-
180 M	2-4-6-8	15	19	701	819	350	757	FF300	18	300	250	350	18,5	5	-	-	-	-	-	-	-	-	-	-	-	-
180 L	2-4-6-8	15	19	701	819	350	757	FF300	18	300	250	350	18,5	5	-	-	-	-	-	-	-	-	-	-	-	-
200 L	2-4-6-8	19	24	781	901	390	837	FF350	22	350	300	400	18,5	5	-	-	-	-	-	-	-	-	-	-	-	-
225 S	4-6-8	19	24	840,5	960,5	440	896,5	FF400	22	400	350	450	18,5	5	-	-	-	-	-	-	-	-	-	-	-	-
225 M	2	19	24	810,5	930,5	440	866,5	FF400	22	400	350	450	18,5	5	-	-	-	-	-	-	-	-	-	-	-	-
225 M	4-6-8	19	24	840,5	990,5	440	896,5	FF400	22	400	350	450	18,5	5	-	-	-	-	-	-	-	-	-	-	-	-

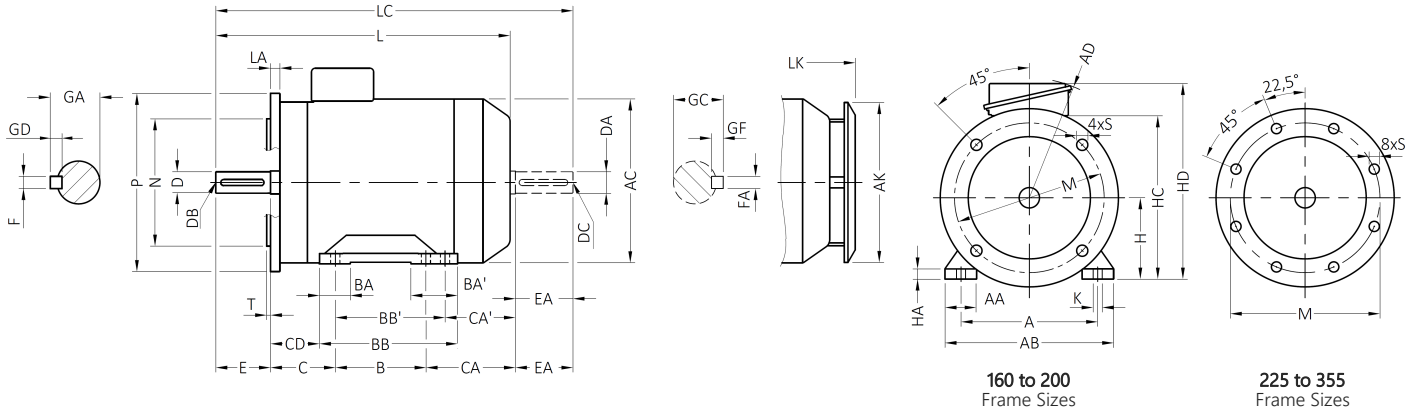
DIMENSION DRAWINGS:

160M - 355L
CAST IRON FRAME

IM B3 (IM 1001), IM B6 (IM 1051), IM B7 (1061), IM B8 (1071), IM V5 (IM 1011), IM V6 (IM 1031)



IM B35 (IM 2001), V15 (IM 2011)



160 to 200
Frame Sizes

225 to 355
Frame Sizes

TOLERANCES

D, DA	ISO k6	160M - 180L
	ISO m6	200L - 355L
N	ISO j6	160S-180L
	ISO h6	200L - 355L
H	-0.5	160M - 250M
	-1	280M - 355L
F, FA	ISO h6	

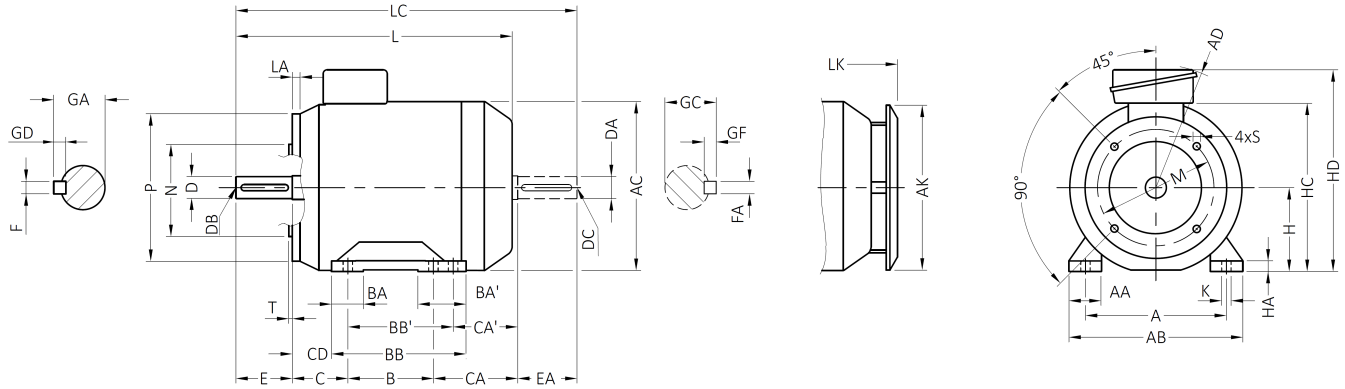
- Shoulder of shaft extension and contact surface of flange are in the same plane.
- The unit for all dimensions is mm.

Frame Sizes	Pole Number	A	AA	AB	AC	AD	B	B'	BA	BA'	BB	C	CA	CA'	CD ~	D DA	DB DC	E EA	F x GD FA x GF	GA GC	H	HA	HD
160 M	2-4-6-8	254	62	332	328	252	210	-	60	-	255	108	189,5	-	85	42	M16	110	12 x 8	45	160	22	400
160 L	4-6	254	62	332	328	252	254	-	60	-	300	108	190,5	-	85	42	M16	110	12 x 8	45	160	22	400
180 M	2-4-6-8	279	64	364	358	264	241	-	65	-	287	121	202	-	98	48	M16	110	14 x 9	51,5	180	22	433
180 L	2-4	279	64	364	358	264	279	-	65	-	325	121	199	-	98	48	M16	110	14 x 9	51,5	180	22	433
200 L	2-4-6-8	318	80	410	408	300	305	-	71	-	354	133	243	-	108,5	55	M20	110	16 x 10	59	200	25	485
225 S	4-8	356	90	466	460	323	286	311	75	95	368	149	275,5	250,5	120,5	60	M20	140	18 x 11	64	225	30	534
225 M	2	356	90	466	460	323	286	311	75	95	368	149	275,5	250,5	120,5	55	M20	110	16 x 10	59	225	30	534
225 M	4-6-8	356	90	466	460	323	286	311	75	95	368	149	275,5	250,5	120,5	60	M20	140	18 x 11	64	225	30	534
250 M	2	406	100	516	513	377	349	-	100	-	421	168	259,5	-	132	60	M20	140	18 x 11	64	250	36	612
250 M	4-6-8	406	100	516	513	377	349	-	100	-	421	168	259,5	-	132	65	M20	140	18 x 11	69	250	36	612
280 S	2	457	110	606	600	413	368	-	100	-	440	190	268,5	-	154	65	M20	140	18 x 11	69	280	44	679
280 S	4-6-8	457	110	606	600	413	368	-	100	-	440	190	268,5	-	154	75	M20	140	20 x 12	79.5	280	44	679
280 M	2	457	110	606	600	413	419	-	100	-	491	190	272,5	-	154	65	M20	140	18 x 11	69	280	44	679
280 M	4-6-8	457	110	606	600	413	419	-	100	-	491	190	272,5	-	154	75	M20	140	20 x 12	79,5	280	44	679
315 S	2	508	135	680	675	557	406	457	120	170	540	216	373,5	322,5	174	65	M20	140	18 x 11	69	315	47	809
315 S	4-6-8	508	135	680	675	557	406	457	120	170	540	216	373,5	322,5	174	85	M20	170	22 x 14	90	315	47	809
315 M	2	508	135	680	675	525	406	457	120	170	540	216	373,5	322,5	-	65	M20	140	18 x 11	69	315	47	805
315 M	4-6-8	508	135	680	675	525	406	457	120	170	540	216	373,5	322,5	-	85	M20	170	22 x 14	90	315	47	805
355 M	2	610	160	770	760	570	630	-	140		730	254	345	-	-	80	M20	170	22 x 14	85	355	50	860
355 M	4-6-8	610	160	770	760	570	630	-	140		730	254	345	-	-	100	M24	210	28 x 16	106	355	50	860
355 L	2	610	160	770	760	570	800	-	140		895	254	345	-	-	80	M20	170	22 x 14	85	355	50	860
355 L	4-6-8	610	160	770	760	570	800	-	140		895	254	345	-	-	100	M24	210	28 x 16	106	355	50	860

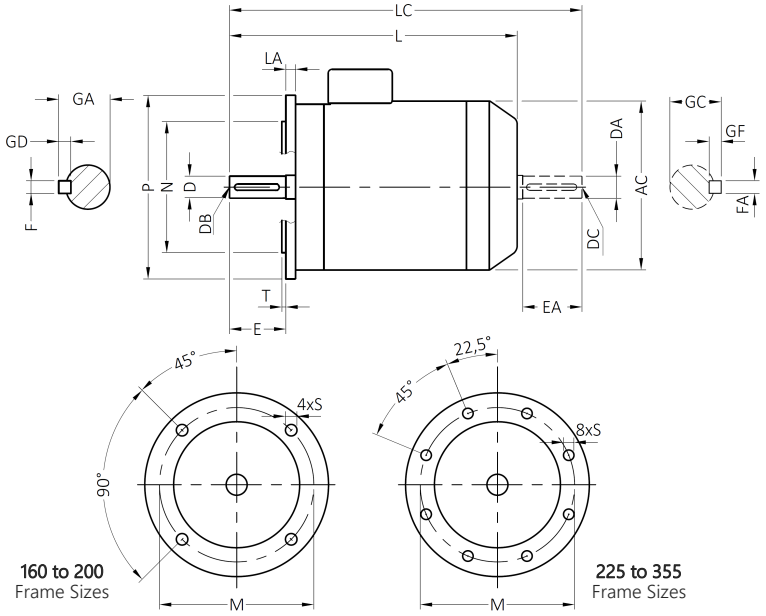
DIMENSION DRAWINGS:

160M - 355L
CAST IRON FRAME

IM B34 (IM 2101)



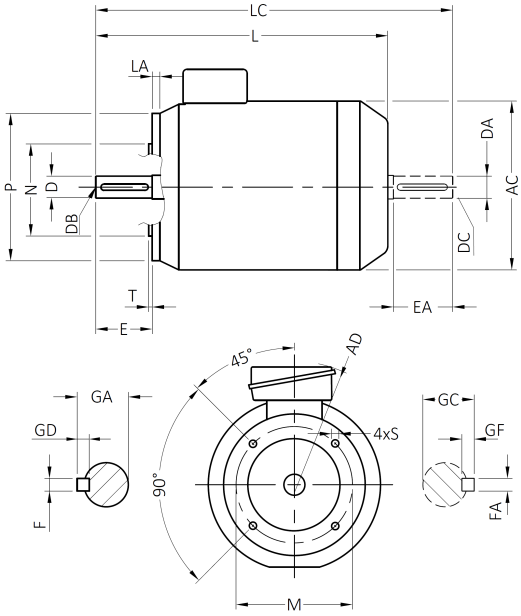
IM B5 (3601), IM V1 (3011), IM V3 (3031)



160 to 200 Frame Sizes

225 to 355 Frame Sizes

IM B14 (IM 3601), IM V18 (IM 3611), IM V19 (IM 3631)



- Shoulder of shaft extension and contact surface of flange are in the same plane.
- The unit for all dimensions is mm.

					Canopy		B5 Flange Dimensions							B14 Flange Dimensions					
Frame Sizes	Pole Number	K	L	LC	AK	LK	Flange No.	LA	M	N	P	S	T	Flange No.	M	N	P	S	T
160 M	2-4-6-8	15	609,5	727,5	314	665,5	FF300	18	300	250	350	18,5	5	FT215	215	180	250	M12	4
160 L	4-6	15	654,5	772,5	314	710,5	FF300	18	300	250	350	18,5	5	FT215	215	180	250	M12	4
180 M	2-4-6-8	15	666	784	350	722	FF300	18	300	250	350	18,5	5	-	-	-	-	-	-
180 L	2-4	15	701	819	350	757	FF300	18	300	250	350	18,5	5	-	-	-	-	-	-
200 L	2-4-6-8	19	781	901	390	837	FF350	22	350	300	400	18,5	5	-	-	-	-	-	-
225 S	4-8	19	840,5	990,5	440	896,5	FF400	22	400	350	450	18,5	5	-	-	-	-	-	-
225 M	2	19	810,5	930,5	440	866,5	FF400	22	400	350	450	18,5	5	-	-	-	-	-	-
225 M	4-6-8	19	840,5	990,5	440	896,5	FF400	22	400	350	450	18,5	5	-	-	-	-	-	-
250 M	2	24	906,5	1056,5	490	962,5	FF500	26	500	450	550	18,5	5	-	-	-	-	-	-
250 M	4-6-8	24	906,5	1056,5	490	962,5	FF500	26	500	450	550	18,5	5	-	-	-	-	-	-
280 S	2	24	956,5	1106,5	550	1012,5	FF500	26	500	450	550	18,5	5	-	-	-	-	-	-
280 S	4-6-8	24	956,5	1106,5	550	1012,5	FF500	26	500	450	550	18,5	5	-	-	-	-	-	-
280 M	2	24	1011,5	1161,5	550	1067,5	FF500	26	500	450	550	18,5	5	-	-	-	-	-	-
280 M	4-6-8	24	1011,5	1161,5	550	1067,5	FF500	26	500	450	550	18,5	5	-	-	-	-	-	-
315 S	2	28	1125,5	1275,5	620	1356	FF600	26	600	550	660	24	6	-	-	-	-	-	-
315 S	4-6-8	28	1155,5	1335,5	620	1416	FF600	26	600	550	660	24	6	-	-	-	-	-	-
315 M	2	28	1126	1276	620	1356	FF600	26	600	550	660	24	6	-	-	-	-	-	-
315 M	4-6-8	28	1156	1336	620	1416	FF600	26	600	550	660	24	6	-	-	-	-	-	-
355 M	2	28	1410	1595	700	1610	FF740	35	740	680	800	24	6	-	-	-	-	-	-
355 M	4-6-8	28	1450	1675	700	1650	FF740	35	740	680	800	24	6	-	-	-	-	-	-
355 L	2	28	1600	1785	700	1800	FF740	35	740	680	800	24	6	-	-	-	-	-	-
355 L	4-6-8	28	1640	1865	700	1840	FF740	35	740	680	800	24	6	-	-	-	-	-	-

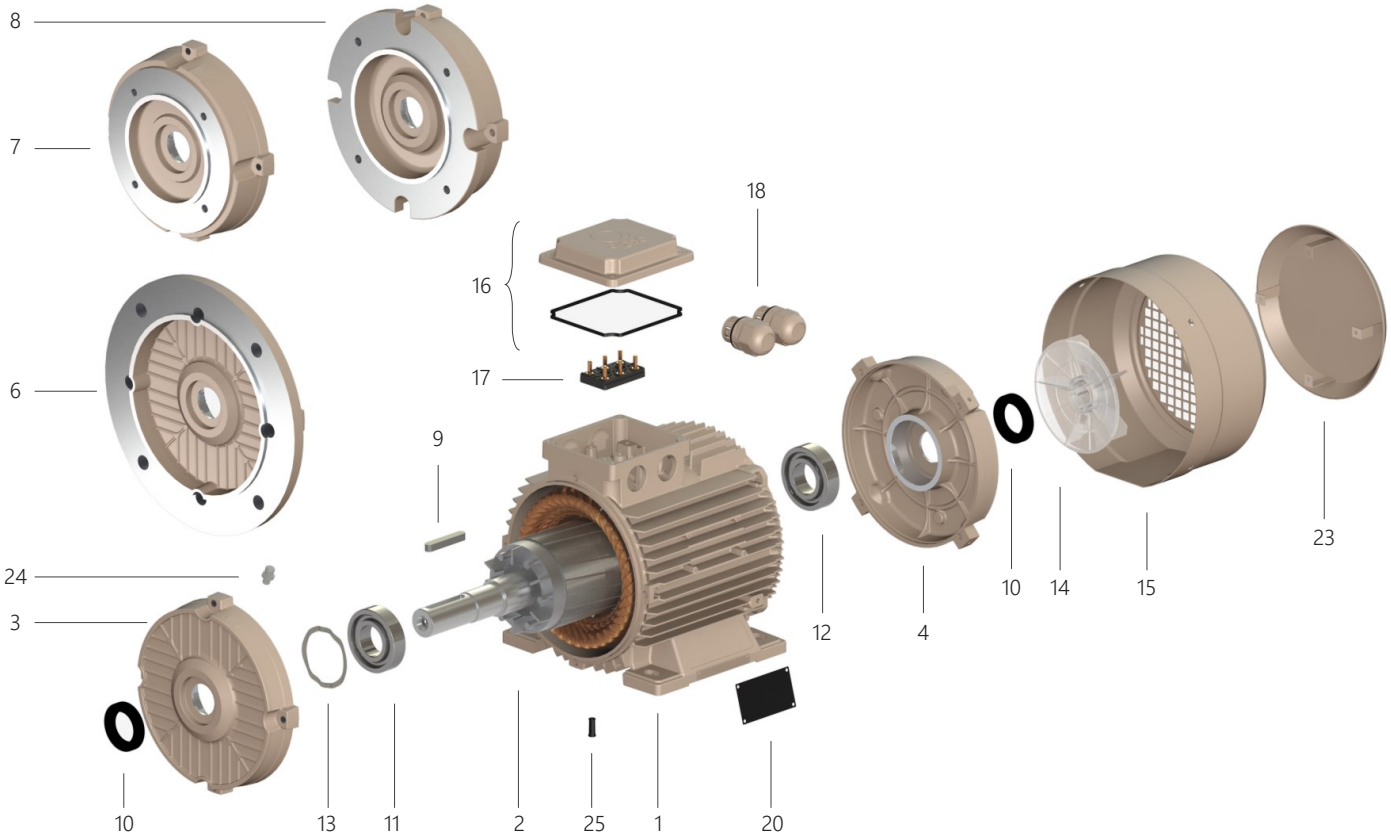
MOTORS IN BRIEF: IE3 & IE4 MOTORS

71 - 112
ALUMINIUM FRAME

Frame Sizes		71	80	90	100	112
Frame		Pressure die-cast aluminium alloy				
End shields	Material	Pressure die-cast aluminium alloy				
Flange (B5)	Material	Pressure die-cast aluminium alloy				
Flange (B14)	Material	Pressure die-cast aluminium alloy				
Flange (B14-2)	Material	Cast iron GG 20				
Feet		Feet bolted to the frame, pressure die-cast aluminium				
Painting	Material	Solvent-based acrylic paint, RAL 1019				
	Corrosion Class	C3; ISO 12944-2:2007				
Bearings	Locking	Floating Bearing				
	Spring	DE Side				
	DE Side	6202 ZZ	6204 ZZ	6205 ZZ	6206 ZZ	
	NDE Side	6202 ZZ	6204 ZZ	6205 ZZ	6206 ZZ	
	Seal	Radial Seal				
Lubrication	Grease	Permanently lubricated shielded bearings.				
Vibration Measurement Nipples	On Request	SPM				
Terminal Box	Material	Pressure die-cast aluminium alloy				
	Position	Top as standard. Changeable to LHS and RHS positions by simply bolting the feet accordingly				
Cable Connections	Cable Glands	1 x M25			2 x M25	
	Terminal	6 terminals for connection with cable lugs (lugs not included)				
Stator Winding	Material	Enameled copper wire				
	Insulation	Insulation class F, Temperature rise B				
	Winding Protection	On Request				
Heating Elements	On Request	2 x 8W	2 x 20W			2 x 30W
Rotor Winding	Material	Medium pressure die-cast, pure aluminium				
Shaft	Material	AISI 1040				
	Screw Hole	M5	M6	M8	M10	
Vibration		Grade A				
Balance		Half key method				
Shaft Key		Closed keyway				
Rating Plate	Material	Aluminium plate; 0,5 mm				
Earthing		One inside the terminal box and one on the frame next to the foot.				
Protection Degree		IP 55 as standard, Higher protection on request.				
Cooling Method		Totally enclosed, fan cooled - IC 411				
Fan	Material	Polypropylene				
Fan Cover	Material	Steel				
Drain Holes	Material	PA 6				

COMPONENTS:

71 - 112
ALUMINIUM FRAME



STANDARD DESIGN MOTORS
71 to 112 Frame Sizes

1	Frame and complete stator
2	Rotor with shaft
3	End shield, DE side
4	End shield, NDE side
6	B5 Flange
7	B14 Flange
8	B14 2nd
9	Shaft key
10	Radial seal
11	Bearing, DE side
12	Bearing, NDE side
13	Wave spring
14	Fan
15	Fan cover
16.1	Terminal box cover
17	Terminal
18	Cable glands
20	Rating plate
23	Canopy
24	Vibration measurement nipple
25	Plug for drain hole

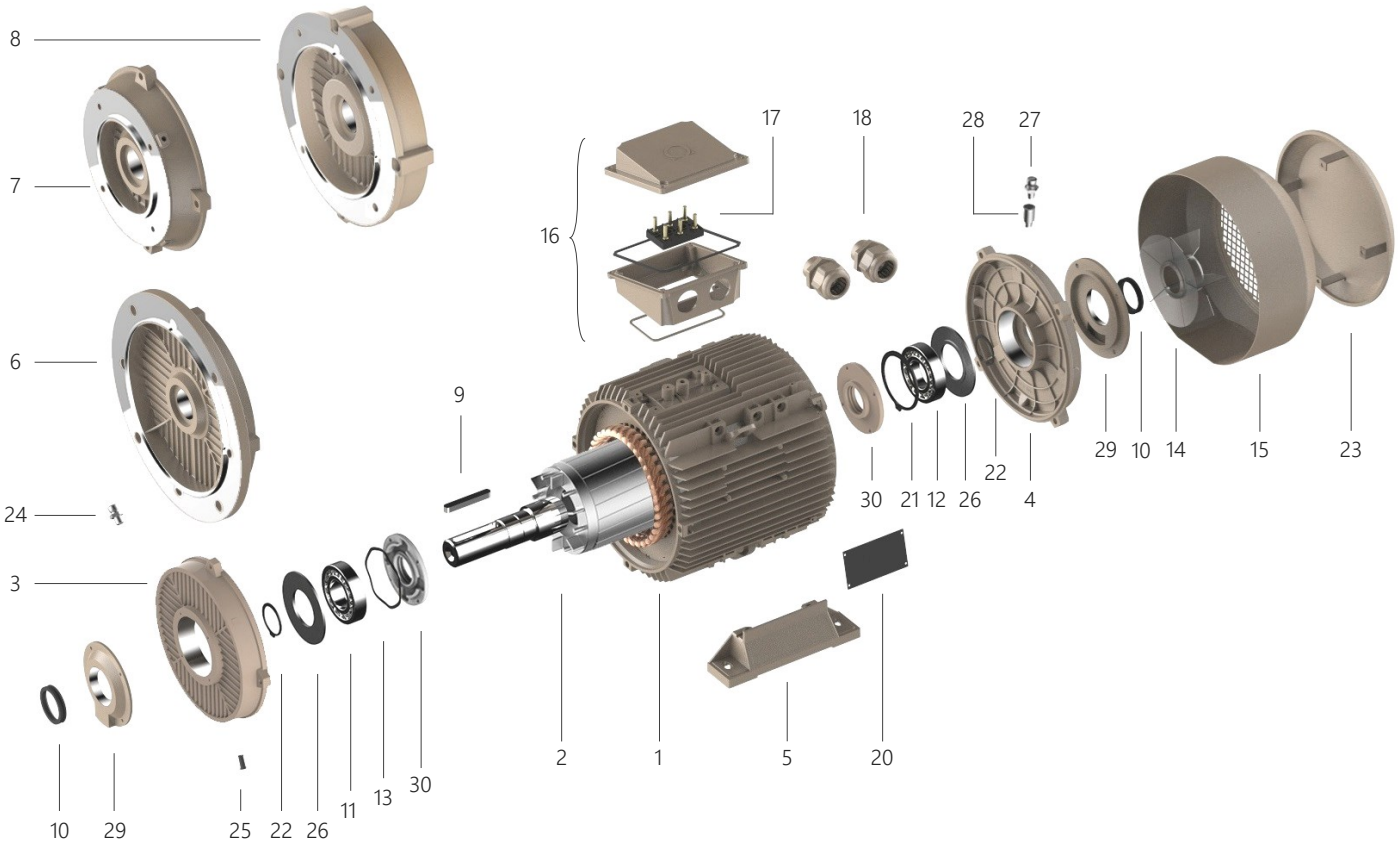
MOTORS IN BRIEF: IE3 & IE4 MOTORS

132 - 225 ALUMINIUM FRAME

Frame Size		132	160	180	200	225
Frame		Pressure die-cast aluminium alloy				
End shields	Material	Pressure die-cast aluminium alloy			Cast iron GG 20	
Flange (B5)	Material	Pressure die-cast aluminium alloy	Cast iron GG 20			
Flange (B14)	Material	Cast iron GG 20		—		
Flange (B14-2)	Material	Cast iron GG 20	—			
Feet		Feet bolted to the frame, pressure die-cast aluminium				
Painting	Material	Water based, RAL 1019				
	Corrosion Class	C3; ISO 12944-2:2007				
Bearings	Locking	Locked at NDE with circlip				
	Spring	DE Side				
	DE Side	6208 ZZ/C3	6309 ZZ/C3	6310 ZZ/C3	6312 ZZ/C3	6313 ZZ/C3
	NDE Side	6208 ZZ/C3	6209 ZZ/C3	6210 ZZ/C3	6212 ZZ/C3	6213 ZZ/C3
	Seal	Radial Seal				
Lubrication	Grease	Permanently lubricated shielded bearings.				
	Relubrication	-	M8x1 greasing nipples on request			
Vibration Measurement Nipples	On Request	SPM				
Terminal Box	Material	Pressure die-cast aluminium alloy				
	Position	Top as standard. Changeable to LHS and RHS positions by simply bolting the feet accordingly				
Cable Connections	Cable Glands	2 x M32	2 x M40		2 x M50	
	Terminal	6 terminals for connection with cable lugs (lugs not included)				
Stator Winding	Material	Enameled copper wire				
	Insulation	Insulation class F, Temperature rise B				
	Winding Protection	On Request				
Heating Elements	On Request	2 x 30W			2 x 40W	
Rotor Winding	Material	Medium pressure die-cast, pure aluminium				
Shaft	Material	AISI 1040				
	Screw Hole	M12	M16		M20	
Vibration		Grade A				
Balance		Half key method				
Shaft Key		Closed keyway				
Rating Plate	Material	Aluminium plate; 0,5 mm				
Earthing		One inside the terminal box and one on the frame next to the foot.				
Protection Degree		IP 55 as standard, Higher protection on request.				
Cooling Method		Totally enclosed, fan cooled - IC 411				
Fan	Material	Polypropylene				
Fan Cover	Material	Steel				
Drain Holes	Material	PA 6				

COMPONENTS:

132 - 225
ALUMINIUM FRAME



STANDARD DESIGN MOTORS
132 - 225 Frame Sizes

1 Frame and complete stator
2 Rotor with shaft
3 End shield, DE side
4 End shield, NDE side
5 Feet
6 B5 Flange
7 B14 Flange (for frame sizes 132 and 160)
8 B14 2nd Flange (for frame size 132)
9 Shaft key
10 Radial seal
11 Bearing, DE side
12 Bearing, NDE side
13 Wave spring
14 Fan
15 Fan cover
16 Terminal box
17 Terminal
18 Cable glands
20 Rating plate
21 Internal circlip (NDE side)
22 External circlip
23 Canopy
24 Vibration measurement nipple
25 Plug for drain hole

MOTORS with GREASING NIPPLES
160 - 225 Frame Sizes

1 Frame and complete stator
2 Rotor with shaft
3 End shield, DE side
4 End shield, NDE side
5 Feet
6 B5 Flange
7 B14 Flange (for frame size 160)
9 Shaft key
10 Radial seal
11 Bearing, DE side
12 Bearing, NDE side
13 Wave spring
14 Fan
15 Fan cover
16 Terminal box
17 Terminal
18 Cable glands
20 Rating plate
22 External circlip
23 Canopy
24 Vibration measurement nipple
25 Plug for drain hole
26 Grease retaining disc
27 Grease nipple
28 Extension part for greasing nipple
29 Outer bearing cover
30 Inner bearing cover

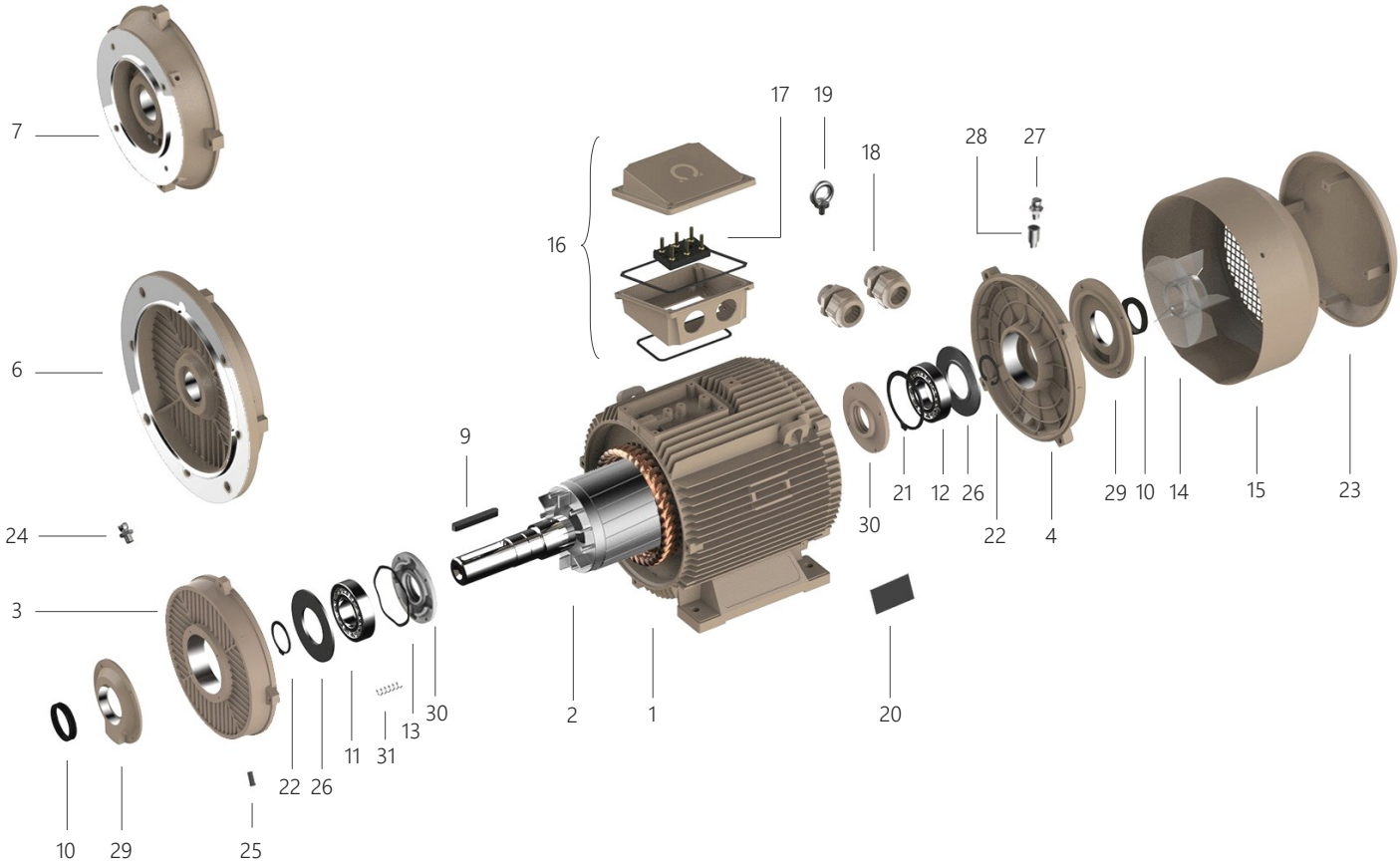
MOTORS IN BRIEF: IE3 & IE4 MOTORS

160 - 355
CAST IRON FRAME

Frame Size			160	180	200	225	250	280	315	355
Frame			Cast iron GG 20							
End shields	Material		Cast iron GG 20							
Flange (B5)	Material		Cast iron GG 20							
Flange (B14)	Material		Cast iron GG 20	—						
Feet			Integrated cast iron feet							
Painting	Material		Water based, RAL 1019							
	Corrosion Class		C3, ISO 12944-2:2007							
Bearings	Locking		Locked at NDE with circlip				Locked at DE with bearing cover			
	Spring		DE Side				NDE Side			
	DE Side	2 pole	6309 ZZ/C3	6310 ZZ/C3	6312 ZZ/C3	6313 ZZ/C3	6315 C3	6316 C3	6316 C3	6319 C3
		4-6 pole							6319 C3	6322 C3
	NDE Side	2 pole	6209 ZZ/C3	6210 ZZ/C3	6212 ZZ/C3	6213 ZZ/C3	6315 C3	6316 C3	6316 C3	6319 C3
		4-6 pole							6319 C3	6322 C3
	Seal		Radial seals on both DE and NDE sides							
Lubrication	Grease		Permanently lubricated shielded bearings				Shell Alvania Rt3			
	Relubrication		M8x1 greasing nipples on request				M8x1 greasing nipples as standard			
Vibration Measurement Nipples	On Request		SPM							
Terminal Box	Material		Pressure die-cast aluminium alloy							
	Position		Top as standard							
Cable Connections	Cable Glands		2 x M40		2 x M50		2 x M63			2 x M80
	Terminal		6 terminals for connection with cable lugs (lugs not included)							
Stator Winding	Material		Enameled copper wire							
	Insulation		Insulation class F, Temperature rise B							
	Winding Protection		PTC thermistor as standard							
Heating Elements	On Request		2 x 30W			2 x 40W			2 x 60W	
Rotor Winding	Material		Medium pressure die-cast, pure aluminium							
Shaft	Material		AISI 1040				AISI 1050			
	Screw Hole	2 pole	M16		M20					M20
		4-6 pole								M24
Vibration			Grade A							
Balance			Half key method							
Shaft			Closed keyway							
Rating Label	Material		Aluminium plate; 0,5 mm							
Earthing			One inside the terminal box and one on the frame next to the foot.							
Protection Degree			IP 55 as standard, Higher protection on request.							
Cooling Method			Totally enclosed, fan cooled - IC 411							
Fan	Material		Polypropylene							
Fan Cover	Material		Steel							
Drain Holes	Material		PA 6							

COMPONENTS:

160 - 355
CAST IRON FRAME



STANDARD DESIGN MOTORS
160 - 225 Frame Sizes

1 Frame and complete stator
2 Rotor with shaft
3 End shield, DE side
4 End shield, NDE side
6 B5 Flange
7 B14 Flange (for frame size 160)
9 Shaft key
10 Radial seal
11 Bearing, DE side
12 Bearing, NDE side
13 Wave spring
14 Fan
15 Fan cover
16 Terminal box
17 Terminal
18 Cable glands
19 Eyebolt
20 Rating plate
21 Internal circlip (NDE side)
22 External circlip
23 Canopy
24 Vibration measurement nipple
25 Plug for drain hole

MOTORS with GREASING NIPPLES
160 - 355 Frame Sizes

1 Frame and complete stator
2 Rotor with shaft
3 End shield, DE side
4 End shield, NDE side
6 B5 Flange
7 B14 Flange (for frame size 160)
9 Shaft key
10 Radial seal
11 Bearing, DE side
12 Bearing, NDE side
13 Wave spring
14 Fan
15 Fan cover
16 Terminal box
17 Terminal
18 Cable glands
19 Eyebolt
20 Rating plate
22 External circlip
23 Canopy
24 Vibration measurement nipple
25 Plug for drain hole
26 Grease retaining disc
27 Grease nipple
28 Extension part for greasing nipple
29 Outer bearing cover
30 Inner bearing cover
31 Helical spring (for frame sizes 315 and 355)

NOTES

NOTES

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