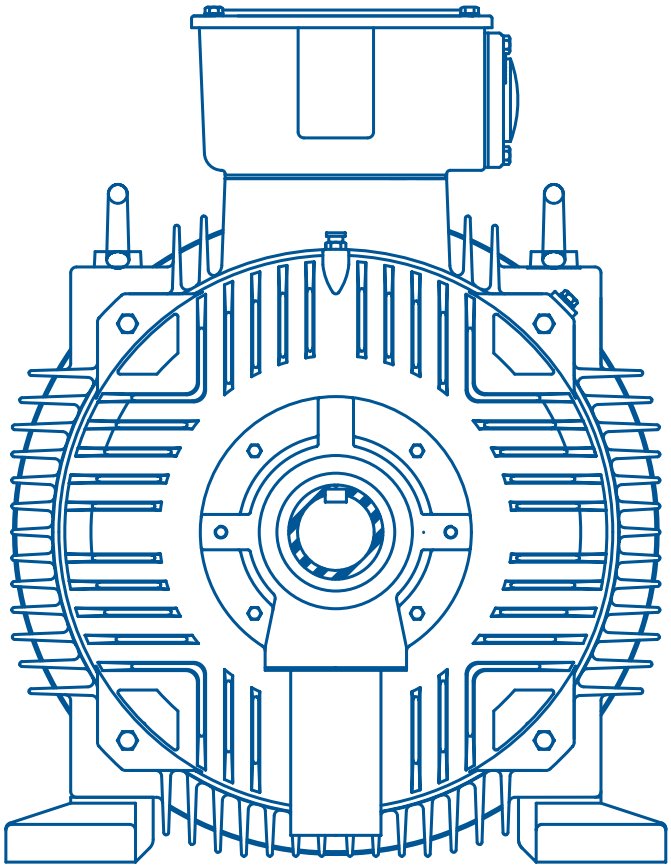
M SERIES

LVED
Low voltage European Design
IE3 from 0,37 to 400 kW



TECO

distributed by

MOTOVARIO®
HEART OF MOTION
a TECO Group company

AESV3E
AESU3E

Table of Contents

TECO History

1956 Company foundation and start of production in the first TECO factory in San-Chung, TAIWAN

1965 Production capacity increased by opening new factory in Shin-Chuan, TAIWAN

1966 Start of close technical co-operation with Hitachi, Yaskawa and Taiyo

1979 Increased production capacity by opening factory in Chung Li, TAIWAN Plant I (Heavy Motor Plant)

1987 Opened Chung Li Plant II for serial motor production (Small Motor Plant), TAIWAN

1987 Started Joint Venture with Westinghouse Motor Company, USA, one of the leading motor manufacturers in North America

1991 Founded TECO Perai, Penang Provence, MALAYSIA, low voltage motors for local market

1993 Established TECO Electric Europe in Manchester, UNITED KINGDOM to start presence in Europe

1995 100% take over of Westinghouse motor business by TECO. Established TECO-Westinghouse Motor Company, USA

2000 Opened TECO factory for low voltage motors in Suzhou, Jiangsu Provence, CHINA

2003 Opened TECO factory for low and medium voltage motors in Wuxi, CHINA

2005 Opened third TECO factory in Nanchang, Jiangxi Provence, CHINA

2006 Opened factory in Huyen Long Thanh, Tinh Dong Nai Provence, VIETNAM

2008 Opened TECO repair plant in Dammam, KINGDOM OF SAUDI ARABIA, on joint venture basis

2009 Established TECO Fuan in Fujian Provence, CHINA

2010 Starting the production of aluminium motors and semi finished aluminium parts at TECO Fuan factory in Fujian Provence, CHINA

2012 Established India branch office

2013 Established Turkey branch office

2014 Founding of " HunanTeco Wind Power Co.,Ltd"

2015 Acquisition of major Italian gear reducers manufacturer Motovario S.p.A., inroads into power transmission system

2016 Inauguration of the lamination center in Wuxi green plant

2017 Inauguration of "automated production center of motor stator" at the Chungli plant

2018 Ground breaking on Vietnamese motor plant, making Vietnam a major production base of TECO Group in Southeast Asia

Inking of memorandum of cooperation with Mitsubishi Heavy Industries for production of offshore wind-power systems

2019 Join hands with Taiwan Sugar in forging Taiwan's first smart green-energy residential park

Inauguration of IE3 small-motor plant in Becamex industrial park III in Vietnam's Binh Duong Province

TECO General

TECO operates in 45 countries worldwide and affiliates gained a turnover of 1.9 Billion EURO, with approximately 20.000 employees worldwide. More than 50% of the turnover was generated by the Electric Motor business. TECO is listed in the stock exchange in Taipei, TAIWAN. Detailed financial data can be downloaded from the TECO website http://www.teco.com.tw/en_version, under "Investor Relations".

TECO is mainly focused on
- Sustainable development with new competitive advantages
- Enhancing service quality
- Development and education of experienced employees
- Creating outstanding products

TECO has
- Significant Experience in the Motor Industry
- Experienced Engineering and Manufacturing Staff
- State of the art factories in the most important manufacturing markets
- State of the art Testing Facilities for the full power and voltage range of its motors

In Europe, along with well-known TECO-Westinghouse Medium Voltage Motors, TECO manufactures full range Low Voltage Stock Motors to IE3 standard, with cast iron and aluminium cases. With the recently released 510 Series, TECO offers high performance and cost effective wide range of Variable Speed Drives that fit virtually all applications. So whatever your motor and drive requirement our experienced engineering team can help and advise on the correct products to suit your applications.

References in this catalogue:
- TECO Manual "INSTALLATION, OPERATION and MAINTENANCE INSTRUCTIONS FOR TECO LOW VOLTAGE MOTORS Type AESV3E and AESU3E"
- TECO short form safety instructions

TECO Scope of Supply:

Low Voltage 0,12 to 1000 kW	Three Phase Asynchronous Motors	Cast Iron
		Aluminium
		Open Drip Proo
	High Efficiency Motors	IE3 Cast Iron
		IE2 Aluminium
		IE3 Aluminium
		NEMA Premium Efficiency
	Single Phase Motors	Capacitor-Start
		Capacitor-Start, Capacitor Run
		Split Phase Start
	Explosion Proof Motors	Non Sparking
		Flameproof
		Increased Safety
		Dust Ignition Proof
	Vertical Motors	Solid Shaft High Thrust
		Hollow Shaft High Thrust
	Special Purpose Motors	Inverter Duty
		Pole Changing
		Smoke Extraction
		Brake Motor
		Marine Duty
		Extended Shaft End
		Double Shaft End
		Hollow Shaft
		Crusher Duty
		Submersible
		Crane Duty
		Wind Generator
		Cooling Fan Design
		Pump jack (Oil Well) Design
	3 Phase Drives	0.4–1000kW
		200, 400, 690V
		Constant/Variable Torque models
		IP00, IP20, IP54, IP65
		V/F and Flux Vector
	Single Phase Drives	0.18–2.2kW
		IP20 and IP65
		V/F and Flux Vector
High Voltage 0,315 to 45 MW	3 Phase Motors	Asynchronous
		Synchronous
		Slip ring
	Explosion Proof Motors	Non Sparking
		Flameproof
		Increased Safety
		Dust Ignition Proof
	Vertical Motors	Solid Shaft High Thrust
		Hollow Shaft High Thrust
	Special Purpose	Inverter Duty
		Pole Changing
		Marine Duty
		Extended Shaft End
		Double Shaft End
		Crusher Duty
		Wind Generator
Special Design	Wound Rotor Induction Motors	
	Permanent Magnet Motors	
	DC Motors	Series Type
		Shunt Type
		Compound Type

1 General

1.1 Standards and regulations

There are different international standards for electrical machines, e.g.
• the international "IEC" standard or
• the North American "NEMA"-standard and others.
The motors covered by this catalogue are designed and manufactured according to the latest IEC standards. Furthermore they fulfil the relevant regulations of the European Community ("EC Regulations").

List of national and international standards and regulations applied:

Title	International IEC	Europe EN/Directive	Germany DIN/VDE
Rotating electrical machines – Part 1: Rating and performance	60034-1	60034-1	DIN EN 60034-1 VDE 0530 Part 1
Rotating electrical machines – Part 2-1: Standard methods for determining losses and efficiency from tests	60034-2-1	60034-2-1	DIN EN 60 034-2 VDE 0530 Part 2
Rotating electrical machines – Part 5: Degrees of protection provided by the integral design of rotating electrical machines (IP code) – Classification	60034-5	60034-5	DIN EN 60 034-5 VDE 0530 Part 5
Rotating electrical machines – Part 6: Methods of cooling (IC Code	60034-6	60034-6	DIN EN 60034-6 VDE 0530 Part 6
Rotating electrical machines – Part 7: Classification of types of construction, mounting arrangements and terminal box position (IM Code	60034-7	60034-7	DIN EN 60034-7 VDE 0530 Part 7
Rotating electrical machines – Part 8: Terminal markings and direction of rotation	60034-8	60034-8	DIN EN 60034-8 VDE 0530 Part 8
Rotating electrical machines – Part 9: Noise limits	60034-9	60034-9	DIN EN 60034-9 VDE 0530 Part 9
Rotating electrical machines – Part 11: Thermal protection	60034-11	60034-11	
Thermistors, PTC	-	-	DIN 44081:1980-6
Rotating electrical machines – Part 12: Starting performance of single-speed three-phase cage induction motors	60034-12	60034-12	DIN EN 60034-12 VDE 0530 Part 12
Rotating electrical machines – Part 14: Mechanical vibration of certain machines with shaft heights 56 mm and higher – Measurement, evaluation and limits of vibration severity	60034-14	60034-14	DIN EN 60034-14 VDE 0530 Part 14
Cage induction motors when fed from converters-Application guide	TS 60034-17	-	-
Mechanical vibration; balancing shaft and fitment key convention	-	-	DIN ISO 8821
Mechanical vibration – Balance quality requirements for rotors in a constant (rigid) state – Part 1: Specification and verification of balance tolerances	-	-	DIN ISO 1940-1: 2004-04

Title	International IEC	Europe EN/Directive	Germany DIN/VDE
Rotating electrical machines – Part 30: Efficiency classes of single-speed, three-phase, cage-induction motors (IE-code	60034-30	-	-
IEC standard voltages	60038	-	DIN IEC 60038
Dimensions and output series for rotating electrical machines – Part 1: Frame numbers 56 to 400 and flange numbers 55 to 1080	60072-1 [1)]	50347	DIN EN 50347 [2)]
Electrical insulation – Thermal evaluation and designation	60085	-	DIN IEC 60085
Safety of electrical Machines – Electrical equipment of Machines Part 1: Common Requirements	60204-1	60204-1	DIN EN 60204-1 VDE 0113-1
Electro technical graphical symbols	60617-2	60617-2	DIN EN 60617-2
Drive Type Fastenings without Taper Action; Parallel Keys, Keyways, Deep Pattern			DIN 6885-1
Hexagonal screws	-	-	DIN EN ISO 4014
Hexagonal nuts	-	-	DIN EN ISO 4032
Lubricating nipples; button head	-	-	DIN 3404
Protection of steel structures from corrosion by organic and metallic coatings	-	-	DIN 55928

Table 1-1: Standards and regulations applied

Conformity with Community Directives

The standard electric motors are in conformity with the following Directives:
- Low Voltage Directive 2014/35/UE;
- Directive EMC 2014/30/UE regarding intrinsic characteristics in relation to emissions and levels of immunity;
- Directive RoHS 2015/863/UE relating to the prohibition or limitation of use of noxious substances in electrical and electronic equipment;
- ErP Directive 2009/125 / EC regarding eco-compatible design and its implementing regulation n ° 640/2009.

The manufacturer of the machine is exclusively responsible for the conformity with the Machinery Directive and EMC Directive of a complete installation. Electric motors may not be commissioned until the machines to which they are coupled have themselves been declared conforming with the Machinery Directive (Certificate of Incorporation – Directive 2006/42/CE).

Remarkable latest innovations in above mentioned standards are:

• IEC 60034-2-1 (standard methods for determining losses and efficiency from tests) and
• IEC 60034-30 (efficiency classes of single-speed, three-phase cage-induction motors; IE-code).

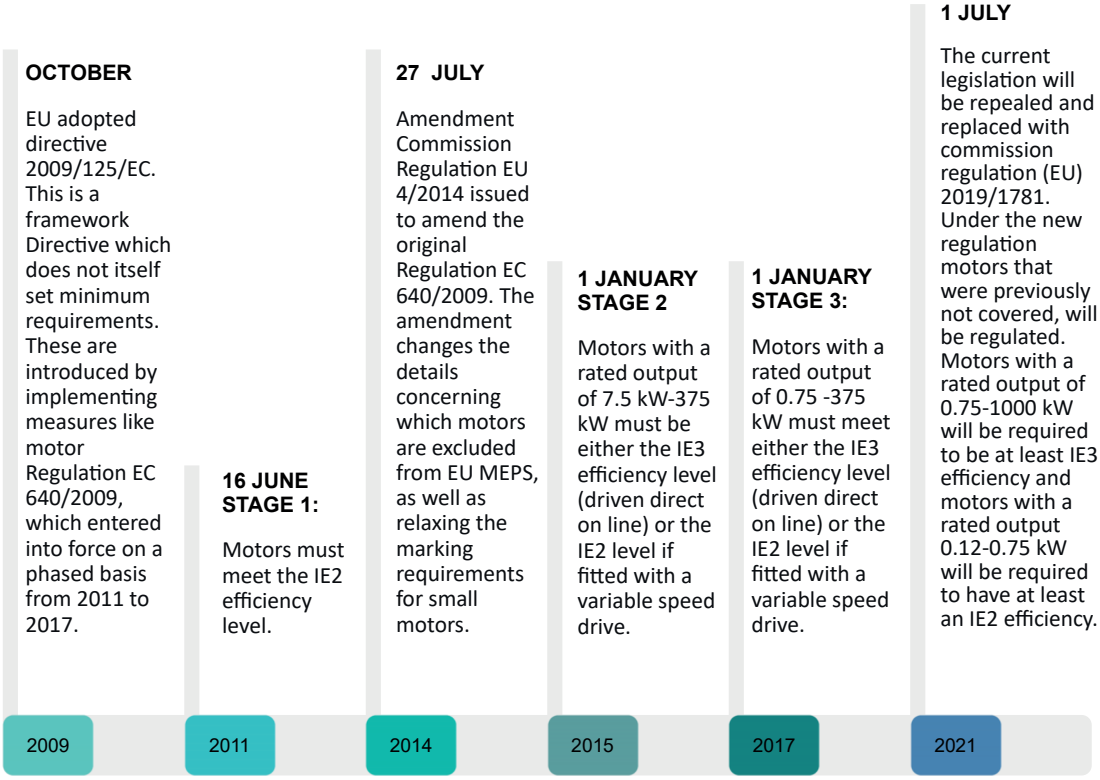
By IEC 60034-2-1 an improved procedure for testing of the efficiency is described. In general the nominal efficiency evaluated by this method is slightly lower than the value based on the formerly used procedure. IEC 60034-30 defines classes of efficiency for standard motors ("International Efficiency"):
"IE1" (Standard Efficiency),
"IE2" (High Efficiency),
"IE3" (Premium Efficiency) and
"IE4" (Super Premium efficiency).

These efficiency class definitions demand a minimum efficiency value depending on power rating and pole number of the motor. (This classification replaces the formerly used efficiency class definitions like e.g. "eff1".) The motors in this catalogue (IE3) fulfil or override these minimum levels.

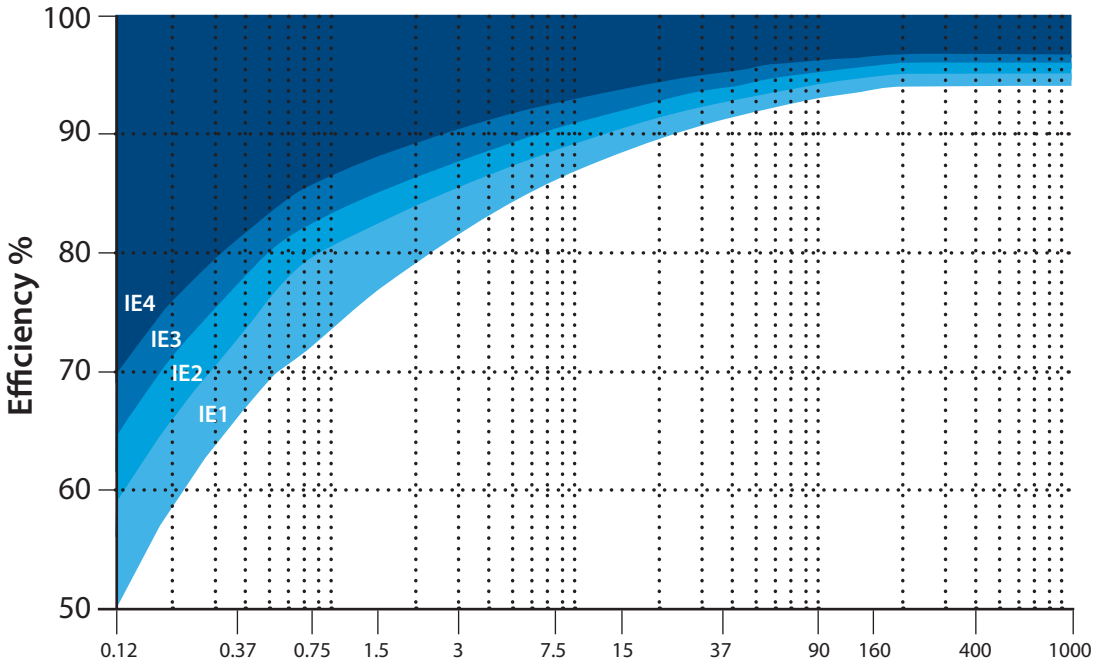
The European Union published on 25 October 2019 the result of the revision of the Commission Regulation (EC) 640/2009 for electric motors. The new Commission Regulation (EU) 2019/1781 will require minimum requirements for a wider scope of motors (0.12 kW - 1000 kW), will also include 8-pole motors and will abolish the former requirement of an IE2 motor plus a converter instead of IE3. Also, maximum losses for converters between 0.12 kW and 1000 kW at IE2 are requested. From 2023, IE4 will be required for motors between 75 kW and 200 kW.

• **01/01 2017:** efficiency class IE3 for all motors from 0,75 kW up to 375 kW (or IE2 if inverter operated).
• **01/07/2021:** efficiency class IE3 for all motors from 0,75 kW up to 1000 kW
• **01/07/2021:** efficiency class IE2 for all motors from 0,12 kW up to 0,55 kW
• **01/07/2023:** efficiency class IE4 for all motors from 75 kW up to 200 kW in 2,4,6 pole

Timeline of Changes



A sample for efficiency requirements is showed in the figure below



1 Efficiency (IE) classes for single speed electric motors according to IEC 60034-30-1

1.2 Basics, terms and definitions

Induction machines are the commonly most used motor type for general drive applications. They are extremely durable and robust and provide an economic drive solution, even under severe environmental conditions. They can be used for direct line operation (fixed speed) or in combination with a frequency inverter (variable speed drive system). They are available in a lot of varieties. Some typical characteristics are listed below:

1.2.1 Power rating

The power rating of electrical motors refers to the mechanical shaft output power (in opposite: for electrical generators the rating refers to the electrical power at the terminals). Within the IEC standard range (up to 315 kW) standardized values for the rating are defined (e.g. 37 kW, 45 kW etc.).

1.2.2 Frame size

The frame size is defined as the distance [mm] between the mounting level and the centre of the shaft (in case of floor mounted arrangement; accordingly a definition is stated for flange mounted arrangement). Standard values for the frame sizes are defined for the IEC standard range (e.g. frame size 200, 225 etc.). In addition a fixed coordination between power rating and frame size is defined in IEC 60072-1. Within a defined frame size several types can be designed with different lengths.

1.2.3 Mounting arrangement

Rotating electrical machines can be delivered in a large variety of possible physical arrangements. In IEC 60034-7 the construction and arrangement is classified, (IM code as e.g. "IM B3"). Mechanical interface dimensions and their tolerances are standardized for each frame size. Table of some typical arrangements:

Mounting	Code acc. IEC 60034-7		Description	
Diagram	Code I	Code II	Feet	Flange
Horizontal use:				
	IM B3	IM 1001	with feet	—
	IM B5	IM 3001	—	with flange (clearance fixing holes)
	IM B14	IM 3601	—	with flange (tapped fixing holes)
	IM B34	IM 2101	with feet	with flange (tapped fixing holes)
	IM B35	IM 2001	with feet	with flange (clearance fixing holes)
Vertical use:				
	IM V1	IM 3011	—	with flange (clearance fixing holes) shaft up

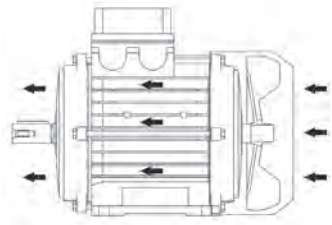
Table 1-2: Relevant IM arrangements (selection)

1.2.4 Construction and construction material

The relevant components are:
- Stator housing with active stator parts inside (magnetic core, stator winding),
- End shields with bearings,
- Shaft with active rotor parts (magnetic core, squirrel cage),
- Cooling system,
- Terminal box.

1.2.5 Cooling

Cooling can be carried out either with ambient air or with cooling water with a large variety of detailed constructions. Principle arrangements of the cooling are defined in IEC 60034-6 (IC code). In the range of IEC standard motors as presented in this catalogue the cooling system in general is "IC 411": Totally Enclosed Surface Fan cooled ("TEFC") as shown in the sample picture below.

IC411	

Note: Contact our technical service for other cooling systems

Option: As option is possible to provide IC416 and IC410 cooling system.

1.2.6 Degrees of protection

The level of protection against environmental conditions like water, dust, etc. is defined in 60034-5 (IP code as e.g. "IP55"). The user has to choose a sufficient degree of protection according to his environmental conditions. It does not account for protection against mechanical damage or special conditions, including humidity (for example, as caused by condensation), corrosive vapours, mould, insects or explosive atmospheres. The code indicating the protection rating is composed of the letters IP followed by two characteristic digits which indicate conformity with the conditions indicated in the table. The TECO electric motors in standard operation have an IP55 degree of protection; optionals include executions with IP56, IP65 and IP66 degrees of protection.

	The first digit indicates the degree of protection against ingress of solid matter and approach to or contact with live components
0	no protection
1	protection against ingress of solid bodies of diameter greater than 50mm. (e.g. involuntary contact with the hands)
2	protection against ingress of solid bodies of diameter greater than 12mm. (e.g. finger)
3	protection against ingress of solid bodies of diameter greater than 2.5mm
4	protection against ingress of solid bodies of diameter greater than 1mm
5	protection against ingress of dust; penetration by dust is not completely eliminated, but it may not enter in amounts sufficient to compromise the operation of the motor
6	total protection against ingress of dust

	The second digit indicates the degree of protection against ingress of water
0	no protection
1	drops of water falling vertically may not cause damage (e.g. condensation)
2	drops of water falling vertically may not cause damage when the machine is inclined at any angle up to 15° from its normal position
3	water fall- ing at an angle to the vertical of up to 60° may not cause damage
4	water sprayed onto the machine from any direction may not cause damage
5	water sprayed onto the machine with a nozzle from any direction may not cause damage
6	waves or jets of water may not penetrate into the machine in amounts sufficient to cause damage
7	water may not penetrate into the machine in amounts sufficient to cause damage when it is submerged in given conditions of pressure and duration
8	the motor may remain submerged perma- nently in water in the conditions indicated by the manufacturer

1.2.7 Performance characteristics: Speed, torque

(Only induction motors with a rotor in "squirrel cage" design regarded here; no "wound rotor" types). If operated at a grid with fixed voltage and frequency the nominal speed ("full load speed") is near to the "no-load speed" (also called "synchronous speed"): this is defined by the grid frequency and the "pole number" of the motor (also called "2p" with "p" as the number of pole pairs):

Motor design	**2-pole**	**4-pole**	**6-pole**	**8-pole**
No load speed at 50 Hz grid	3000 rpm	1500 rpm	1000 rpm	750 rpm
No load speed at 60 Hz grid	3600 rpm	1800 rpm	1200 rpm	900 rpm

Table 1-3: No load speed

The starting performance is standardized by IEC 60034-12 ("Starting performance of single-speed three-phase cage induction motors"). The motors covered by this catalogue comply with "IEC 60034-12, Design N". The typical characteristic of the torque versus speed is shown in the diagram below:

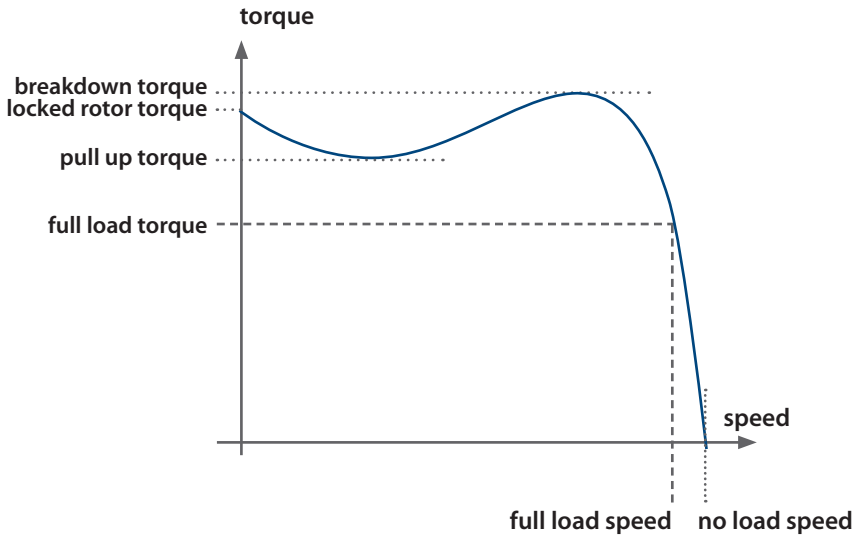


Figure 1-2: Typical characteristic for induction motors: Torque versus speed

Characteristic points which are content of the type data:

- Full load speed ("nominal speed")
- Full load torque ("nominal torque")
- Locked rotor torque ("starting torque"); as a multiple of nominal
- Pull up torque; as a multiple of nominal
- Breakdown torque; as a multiple of nominal.

1.2.8 Electrical performance characteristics

According to 1.2.7 Performance characteristics: Speed, torque the typical characteristic of current and power factor is shown in the diagram below:

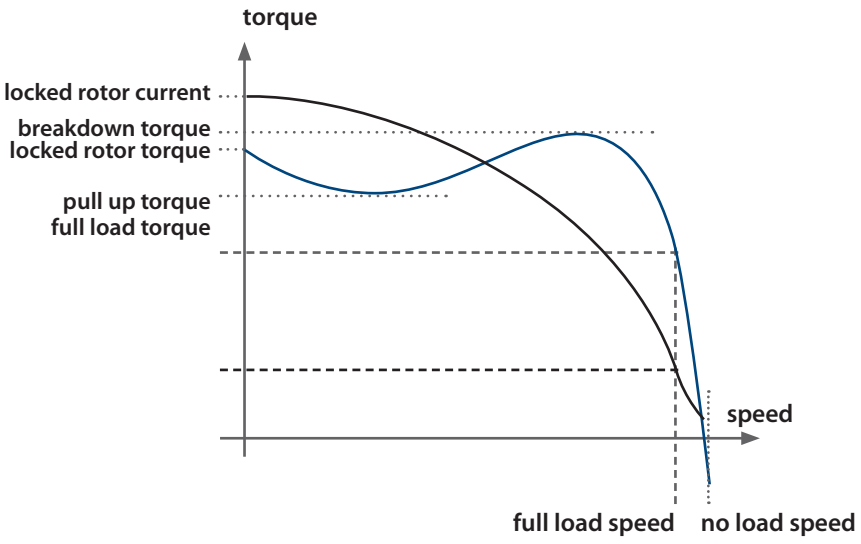


Figure 1-3: Typical characteristic for induction motors: Torque and current versus speed

Characteristic points which are content of the type data (see 6 Technical data, starting page 58):

- Full load current ("nominal current")
- Full load power factor
- Locked rotor current; as a multiple of nominal.

At different load points (partial load, overload) the values for current, power factor and efficiency are varying; a typical characteristic is shown in diagram below. The values of power factor and efficiency for each motor type are listed in section 6 for the load points 1/4; 2/4 and 3/4 partial load.

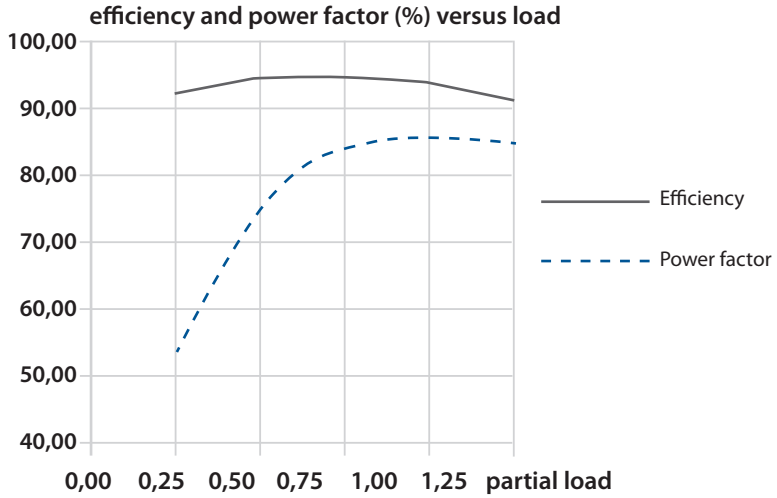


Figure 1-4: Typical characteristics for a TECO motor (30 kW): power factor and efficiency at partial load

2 AC Motors, European Design

2.1 Range of motors covered by this catalogue; variety of characteristics

Common characteristics	Three phase low voltage motors according to IEC standard, single speed, totally enclosed, for Standard Safe Area
Power rating	0,18 kW – 400 kW (50 Hz) or 0,21 kW- 460kW (60 Hz)
Frame size	80M–355C
Pole number	2-poles; 4-poles; 6-poles; 8-poles
Line Frequency	50 Hz; 60 Hz
Type of mounting	Feet version, flange version and combinations
Construction material	Cast Iron
Efficiency class acc. IEC	IE3
Accessories	Standard or with options (see options page)
Standards	IEC standards, *European directives (CE marking)+UL CSA EAC (Russian, Belarussian and Kazakh market)

Table 2-1: Motors covered by this catalogue

* As standard, every motor has the CE and UL CSA marking except for the following: 132 kW-4p, 1,1kW-6p, 1,5kW-6p and 2,2kW-6p which have only CE marking

2.2 TECO type code ("Motor Identification Code")

The type code covers the overall range of TECO induction motors. When placing an order, please state the following minimum data in the order as in the example

AESV (foot mounted) - Cast Iron Motors								
Series	**Frame**	**Poles**	**Power [kW]**	**Voltage [V]**	**Frequency [Hz]**	**Mounting Pos.**	**Design**	**Other Options**
AESV3E	80M	2	0,37	230/400	50	B3	NDF	**
	÷	4	÷	400/690	60	B34		
	355C	6	400			B35		
		8						
AESU (flange mounted) - Cast Iron Motors								
Series	**Frame**	**Poles**	**Power [kW]**	**Voltage [V]**	**Frequency [Hz]**	**Mounting Pos.**	**Design**	**Other Options**
AESU3E	80M	2	0,37	230/400	50	B5	NDF	**
	÷	4	÷	400/690	60	B14		
	355C	6	400			V1		
		8						

Table 2-2: TECO type code

** See other options page

A low voltage 3 phase AC motor; frame size 80; 4-pole, power 0.75kW; voltage 230/400,frequency 50Hz, mounting B3, design NDF and no other option, the type code is:

AESV3E 80M4 0,75 230/400-50 B3 NDF

3 Mechanical design

3.1 Housing, mounting arrangement

All construction components are shown for a sample motor in the figure below:

01 Shaft cover
02 Oil Seal
03 Outer bearing cover
04 Grease drain cover
05 End shield DE
06 Grease nipple
07 Bearing
08 Bearing stop ring
09 Inner bearing cover
10 Shaft
11 Key
12 Rotor
13 Stator
14 Frame
15 Feet
16 Washer
17 Eye bolt
18 Name plate carrier
19 Name plate
20 Terminal box plate
21 Blind plug
22 Terminal box housing
23 Fixed seat
24 Power connecting assy
25 Internal Earth terminal assy
26 Power terminals
27 Hex nut
28 Star-Delta jumpers
29 Terminal box gasket
30 Terminal box cover
31 External Earth terminal assy
32 Inner bearing cover
33 Bearing stop ring
34 Bearing
35 Pre-load spring
36 End shield NDE
37 Grease nipple
38 Grease drain cover
39 Outer bearing cover
40 Oil seal
41 External fan
42 Fan cowl
43 Detachable gland plate Gasket
44 Detachable gland plate

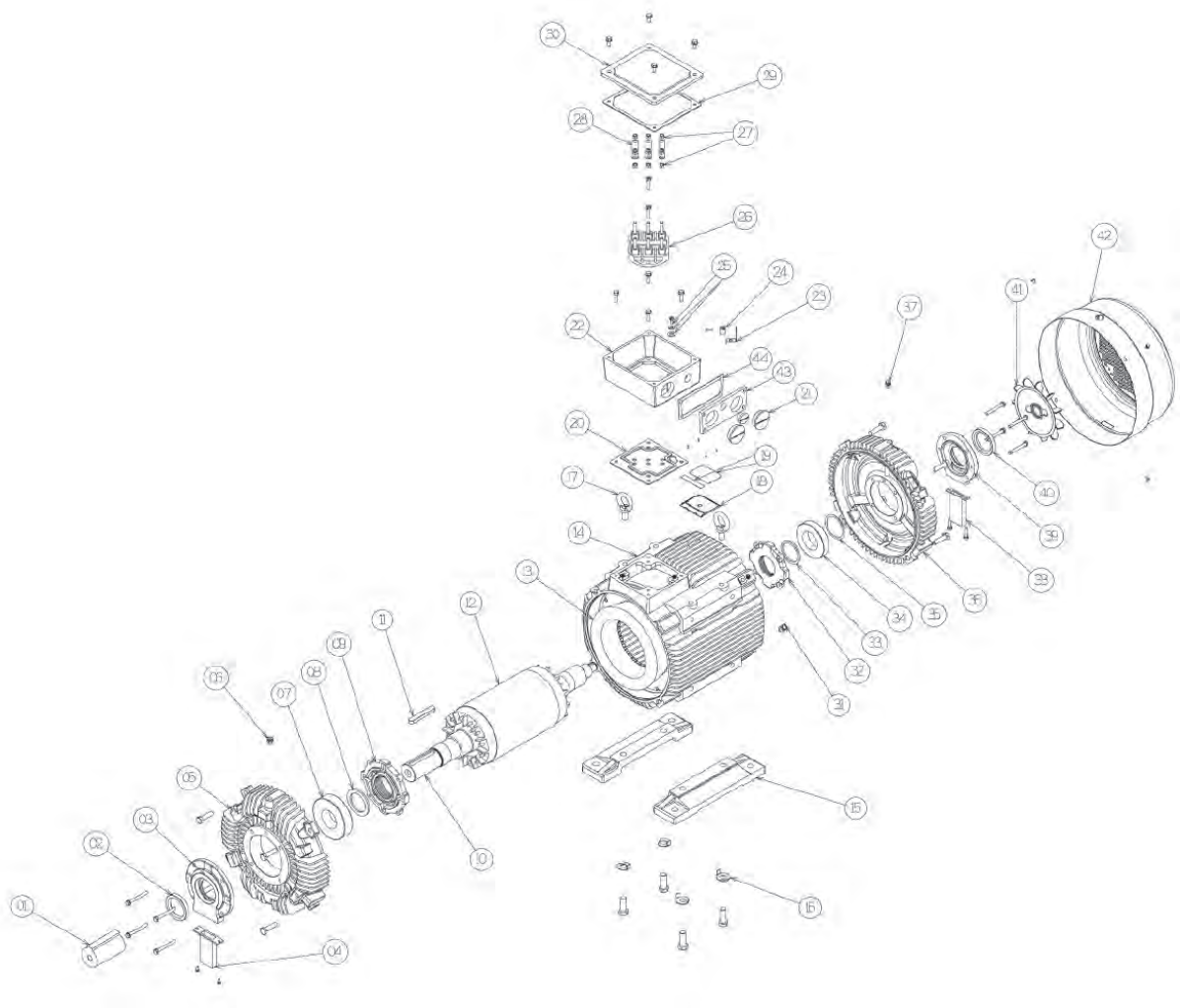


Figure 3-1: "Exploded" drawing of a sample TECO motor

The motors can be delivered for many types of mounting:

- Feet version (IM code B3); with top mounted terminal box (standard configuration)
- Flange version with clearance fixing holes (IM code B5, suitable for arrangements V1) or
- Flange version with tapped fixing holes (IM code B14)
- Version with feet and flange with clearance fixing holes (IM code B35)
- Version with feet and flange with tapped fixing holes (IM code B34).

To be regarded only for motors with frame size 315; 2-pole: Vertical use (V-mountings) is only admissible in a special design; this has to be defined in the order.

Figure 3-2: Sample of a TECO motor (feet version)

Figure 3-3: Sample of a TECO motor (flange version)

Figure 3-4: Multi-mount design (in axial direction); terminal box "Non drive end"

Dimensions:

The dimensions and tolerances for the mechanical interface (e.g.positions of feet holes) are defined by IEC 600721.

Multi-mount symmetric design – Axial direction:

The motor housing is designed to allow for a large variety of mounting arrangements. It is symmetric in axial direction (DE – NDE), except of the asymmetric position of the terminal box. Therefore the user can change the axial position of the terminal box according to the individual spatial conditions at his construction (front or back) by changing the position of the rotor including DE and NDE end shield. Due to a special design of the DE end shield this modification can be carried out without dismantling the NDE assembly. (To be regarded when carrying out this modification: the rotational direction of the motor is no longer acc. to IEC 60034-8 then. Precautions shall be made to prevent disturbances. Modification of mounting arrangement shall only be carried out by qualified personnel; regard the guidelines in the TECO manual "INSTALLATION, OPERATION and MAINTENANCE INSTRUCTIONS. ... ")

Figure 3-4: Multi-mount design (in axial direction); terminal box "Drive End"

3.2 Terminal box and cable entry

As a standard the motors are delivered with a top mounted terminal box; located at the drive end, with cable entry to the right hand side. As described in 3.1 Housing, mounting arrangement, the position of the terminal box can easily be varied (left, right, front or back). Furthermore the terminal box itself is able to be rotated by steps of 90° to every direction to enable power cable entry from 4 directions (front, rear, left, right). (Guidelines for proper modification of the terminal box position: see TECO manual "INSTALLATION, OPERATION and MAINTENANCE INSTRUCTIONS. .... ").

Figure 3-9: Cable entry front

Figure 3-10: Cable entry back

Figure 3-11: Cable entry left

Figure 3-12: Cable entry right

There are two cable entry holes for the power supply cable(s) and one entry hole for the cable for auxiliary devices, e. g. for thermistor connection. They are drilled, tapped and properly sealed; with threads according to table below. (The applicable cable outer diameter is dependent on the customer's cable gland type.)
All six winding lead ends from the windings are brought out and connected to a terminal block with metric threaded bolts for smaller motors or to metric duct connection bolts for bigger motors. Screws and nuts are hexagonal with metric thread and with ISO wrench sizes acc. to DIN EN ISO 4014 (screws) and DIN EN ISO 4032 (nuts).Three jumpers are attached to enable the customer a simple star or delta connection (see 4 Electrical design).
The lead ends of the standard thermistors (as well as optional accessories like space heaters) are connected to terminals (luster terminals or spring loaded serial terminals, see table below).

<table>
<tr><th rowspan="2">Frame size</th><th colspan="2">Power Supply</th><th colspan="2">Thermistor</th></tr>
<tr><th>Threads</th><th>Power connector bolts</th><th>Threads</th><th>Type of Connector</th></tr>
<tr><td>80</td><td rowspan="2">2 x M25 x 1.5</td><td rowspan="4">U-clamp</td><td rowspan="11">M20 x 1.5</td><td rowspan="4">Luster terminal</td></tr>
<tr><td>90</td></tr>
<tr><td>100
112
132</td><td rowspan="2">2 x M32 x 1.5</td></tr>
<tr><td>160</td><td rowspan="2">2 x M40 x 1.5</td><td rowspan="7">Bolts</td><td rowspan="7">Serial terminal</td></tr>
<tr><td>180</td></tr>
<tr><td>200
225</td><td rowspan="2">2 x M50 x 1.5</td></tr>
<tr><td>250</td><td rowspan="3">2 x M63 x 1.5</td></tr>
<tr><td>280
315</td></tr>
<tr><td>355</td><td>2 x M72 x 1.5</td></tr>
</table>

Table 3-4: Cable entries and connectors

Detailed mechanical dimensions depending on motor type: see 7 Outline drawings, starting page 82.

Options, on request:

From frame size 160 to 250 an optional attachment of one and from frame size 280 to 400 of two separate accessory terminal boxes is available (e.g.: different terminal boxes for different voltage levels may be demanded by customer specifications).
The motors can also be delivered without a terminal box on request. In this case we provide a blind plate with bushing for direct entry of customer specified cable(s).

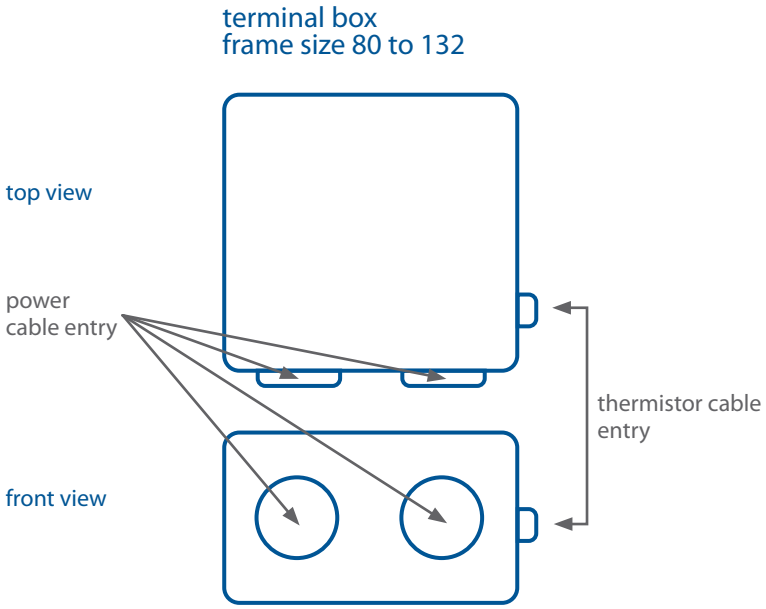


Figure 3-13: Position of cable entries (up to frame size 132)

Frame size 160 and above are equipped with a detachable steel plate on one side of the terminal box (cable entry plate). This is to enable customers an easy power supply connection and simple replacement of the motors with bulky cables as well as for later flexibility if customer asks for special amount of cable entry holes with special threads (special cable size or number of cables).

In these cases TECO can manufacture customized entry plates or blank plates on demand. Customer's cable glands: Insure the cable glands used are rated to an equal or better protection class than the motor.

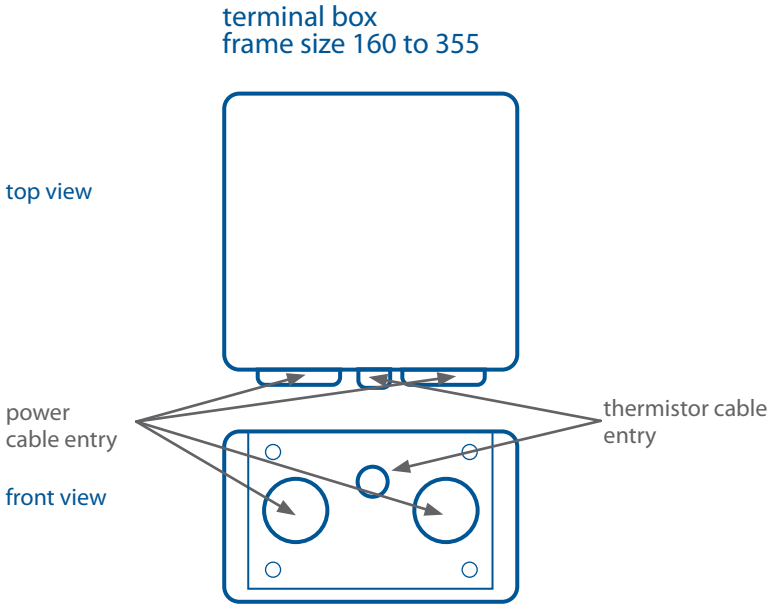


Figure 3-14: Position of cable entries

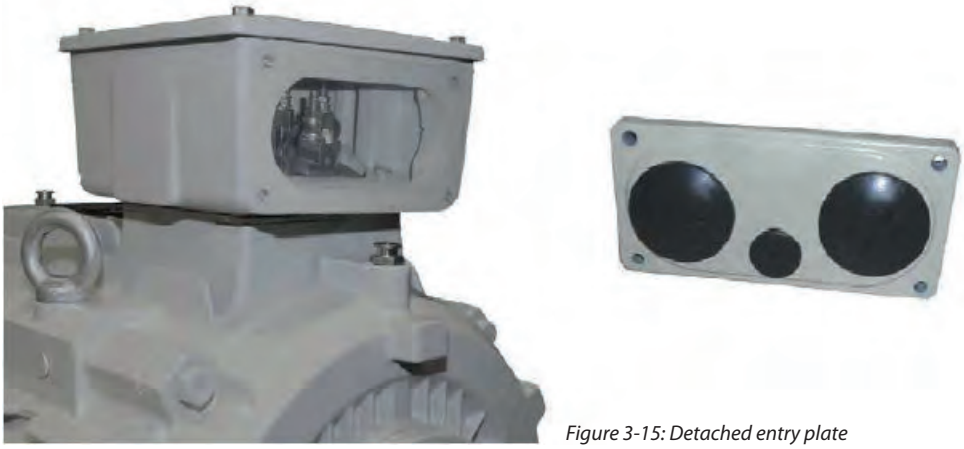


Figure 3-15: Detached entry plate

3.3 Cooling

As a standard the motors covered by this catalogue are "Totally Enclosed Surface Fan Cooled" ("TEFC") acc. to the IEC code "IC 411". This design provides cooling fins on the surface of the motor housing and a fan (and fan cowl) at NDE to generate a cooling air flow over these fins from NDE to DE. Even though acoustic noise is optimized, the fan is suitable for application in both directions of rotation ("bidirectional design"). The fan cowl is manufactured in steel sheet.

Figure 3-16: Cooling principle ("TEFC")

In accordance with IEC standards the degree of protection for the cooling system is IP20 (even though the motor is classified in a much higher degree of protection, in this case IP55).The cooling system allows operation in any mounting position in principle. When mounted in a "shaft down position" precautions are required to prevent foreign bodies or excessive amount of water falling into the openings of fan. An accessory kit "Protection cover for shaft down motors" is available on request; it can be added easily in site. The user has to take care that the air flow is not hindered or a high back pressure is generated when integrating the motor into his machine. As a general rule e.g. the distance between air inlet of motor and obstruction should be at least ¼ of the air inlet diameter of the fan cowl.

Options:

• For special applications the motors can be delivered without ventilation. Power rating and duty type then have to be calculated by TECO acc. to customer's request.

• In the case of applications of the variable speed motor, it may be necessary to resort to forced ventilation (cooling method IC416), obtained by means of an axial flow servo-fan whose air flow rate is independent of the speed of rotation of the drive shaft. Forced ventilation could be necessary in case of frequent starting torques, as this condition entails a high heating and a low heat dissipation by the fan fitted on motor shaft. The speed limit which determines the need for forced ventilation depends on the load conditions to which the electric motor is subjected, in relation to the speed and duty type.

3.4 Rotor assembly (active part, shaft, bearings)

3.4.1 General

The active rotor part of a squirrel cage motor is a rugged arrangement only consisting of the magnetic lamination and the short circuit "winding" made of cast aluminium. It is mounted on the shaft manufactured from high tensile strength carbon steel. The bearings (including sealing) are supported in the end shields.

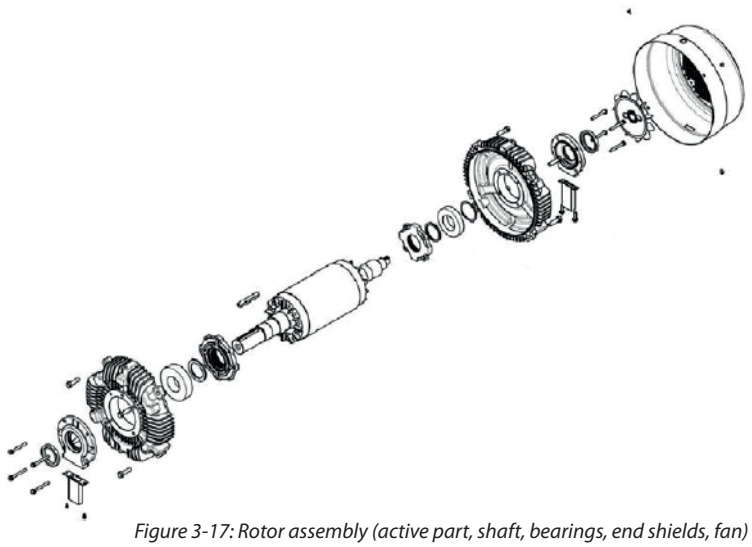


Figure 3-17: Rotor assembly (active part, shaft, bearings, end shields, fan)

The rotor is dynamically balanced with half key. The balance quality meets DIN ISO 1940, Q2,5. The mechanical vibrations of the motors meet level A according to EN 60034-14 at synchronous speed. Mechanical vibrations; permissible axial and radial forces at DE and maximum mechanical speed: See 5.3 Mechanical performance.

3.4.2 Shaft

The dimensions of the DE shaft end (including the keyway) and their tolerances are standardized by IEC 60027-1 (DIN EN 50347). The DE shaft face has a threaded centre hole for mounting of customer's shaft fitments. The key is press fit into key way. The NDE shaft end is carrying the fan; on larger machines (see dimensional diagrams. Depending on frame size its face is equipped with a threaded centre hole for later mounting of accessories (like speed sensor, etc.). The fan is manufactured from conductive polypropylene (non-sparking material).

3.4.3 Bearings

As a standard both DE bearing and NDE bearing are ball bearings, suitable both for horizontal and vertical mounting of the motor (except for frame size 315, 2-pole; where a special bearing is provided for operation at vertical mounting, see tables below). As an option reinforced bearing types can be provided according to customer's load specifications. The DE bearing is fixed; it absorbs axial and radial forces transmitted from the driven machine. The floating bearing is installed at the non drive end (NDE) to allow thermal expansion of the shaft and to absorb radial forces. The bearings are preloaded in axial direction by an undular washer at NDE. Even though the DE bearing is fixed due to a special design of the DE end shield it is easy to fit a flange end shield without removing the rotor. Disassembling of the rotor (e.g. for changing the terminal box position) can be carried out without disassembling the NDE).
Motors up to frame size 160 are equipped with double shielded bearings (suffix "zz" on bearing type). Those motors bearings are lubricated for life. They are maintenance-free and cannot be regreased.
Motors from frame size 180 up to frame size 315 are equipped with grease nipples both at DE and NDE for manual regreasing. These motors are already greased during manufacture. Grease nipples are of "flat button head" design according to DIN 3404 with thread M10 x 1. DE and NDE nipple are easily accessible (NDE nipple outside of the fan cowl).
A shaft lock is fitted on from frame size 280 to 315 to prevent bearing damage during transportation.

Tables with the types of standard bearings and reinforced bearings (optional):

From frame size 160 to 250 an optional attachment of one and from frame size 280 to 400 of two separate accessory terminal boxes is available (e.g.: different terminal boxes for different voltage levels may be demanded by customer specifications).

The motors can also be delivered without a terminal box on request. In this case we provide a blind plate with bushing for direct entry of customer specified cable(s).

Frame size	Poles	Drive end				Non drive end	
		Sealed	Regreasable			Sealed	Regreasable
		Standard	Standard	Standard	Reinforced	Standard	Standard
		All mountings	B-mountings (horizontal mounting)	V-mountings (vertical mounting)	All mountings	All mountings	All mountings
80	2	6204 ZZC3	nA			6204 ZZC3	nA
	4						
	6, 8						
90	2	6205 ZZC3				6205 ZZC3	
	4						
	6, 8						
100	2	6206 ZZC3				6206 ZZC3	
	4						
	6, 8						

Note: nA (Not Available)

Frame size	Poles	Drive end				Non drive end	
		Sealed	Regreasable			Sealed	Regreasable
		Standard	Standard	Standard	Reinforced	Standard	Standard
		All mountings	B-mountings (horizontal mounting)	V-mountings (vertical mounting)	All mountings	All mountings	All mountings
112	2	6306 ZZC3	nA			6306 ZZC3	nA
	4						
	6, 8						
132	2	6308 ZZC3					
	4						
	6, 8						
160	2	6309 ZZC3				6307 ZZC3	
	4						
	6, 8						

Note: nA (Not Available)

Table 3-6: Standard bearings used in cast iron motors frame size up to 160

Frame size	Poles	Drive end				Non drive end	
		Sealed	Regreasable			Sealed	Regreasable
		Standard	Standard	Standard	Reinforced	Standard	Standard
		All mountings	B-mountings (horizontal mounting)	V-mountings (vertical mounting)	All mountings	All mountings	All mountings
180	2	nA	6311C3	6311C3	NU311	nA	6310C3
	4						
	6, 8						
200	2		6312 C3	6312 C3	NU312		6212 C3
	4						
	6, 8						
225	2		6313 C3	6313 C3	NU313		6213 C3
	4						
	6, 8						
250	2		6315 C3	6315 C3	NU315		6313 C3
	4						
	6, 8						
280	2		6316 C3	6316 C3	NU316		6314 C3
	4		6318 C3	6318 C3	NU318		6316 C3
	6, 8						
315	2		6316 C3	7316 C3	-		6314 C3
	4		6320 C3	6320 C3	NU320		6316 C3
	6, 8						
315D	2		6316 C3	7316 C3	-		
	4		6322 C3	6322 C3	NU322		6322 C3
	6, 8						
355C	2		6318 C3	7318 C3	-		6318 C3
	4		6322 C3	6322 C3	NU322		6322 C3
	6, 8						

Note: nA (Not Available)

Table 3-7: Bearings used in cast iron motors , frame size 180 up to 355

Bearing lifetime:

The calculated operating lifetime L10 of the bearings is at least 20000 hours, provided:

- operation in horizontal position
- operation at nominal max temperature and nominal speed
- radial and axial forces are within the limits stated in the catalogue, refer to 5.3 "Mechanical performance".

In case of operation with a coupling (no additional axial or radial forces from the driven machine) a lifetime of 50000 h is calculated. Lifetime is reduced when operated at increased ambient temperature higher speed than nominal or under severe vibration conditions.

Table how the calculated operating lifetime:

Frame size	Lifetime at nominal operational conditions			
	2-pole	4-pole	6-pole	8-pole
	[h]	[h]	[h]	[h]
80	20000	40000	40000	40000
90				
100				
112				
132				
160				

Table 3-8: Calculated lifetime for sealed standard bearings (operating life L10)

Sealing:

The sealing of DE and NDE bearing is provided by a radial seal ring with dust protection lip to fulfil the requirements of degree of protection "IP55". IP56 or IP65 protection options (dust tight; protection against powerful water jets) can be realized by reinforced sealing (see 3.4.3 Bearings). For applications with direct gearbox mounting an option "Oil Sealed Design" is available.

Bearing insulation:

If the motor is line operated (sinusoidal voltage supply) motors covered by this catalogue usually do not need a bearing insulation, because the shaft voltage (caused by small magnetic unbalance within the machine) does not exceed the level of 500 mV. This level is agreed as a save limit in the standard IEC 60034-17.

If the motor is inverter operated, increased bearing stress by high frequent bearing currents might occur. As an option TECO recommends using insulated bearing on NDE for frame size 280 and above in this case (see 5.5 Motor performance inverter duty).

3.4.4 Regreasing

(relevant for cast iron motors, frame size 160–315)

Baugröße/ Frame Size/ Hauteur d'Arbre/ Grandezza Motore/ Carcasa/ Размер двигателя	Polzahl Poles Polos Poli Polos полюсов	Lagergröße Bearing Size Type de Roulement Grandezza Cuscinetti Tamaño Rodamiento Размер подшипника		Nachschmierfrist [h] Lubrication interval [h] Intervalle de Lubrification [h] Intervallo Lubrificazione [h] Intervalo Lubricación [h] Периодичность замены смазки в подшипниках [ч]		Fettmenge [g] Grease Quantity [g] Quantité de Graisse [g] Quantità di Grasso [g] Cantidad de Grasa [g] Количество смазки [г]	
160	Standard	DE	NDE	DE	NDE	DE	NDE
	2	6309 C3	6307 C3	3500	4200	25	13
	4	6309 C3	6307 C3	8500	10500	25	13
	6	6309 C3	6307 C3	14000	16000	25	13
	8	6309 C3	6307 C3	17500	21000	25	13
	Verstärkt/ Reinforced/ Renforcé/ Rinforzati/ Reforzado/ Усиленный						
	4	NU309C3	6307 C3	3300	10500	25	13
	6	NU309C3	6307 C3	5100	16000	25	13
	8	NU309C3	6307 C3	7100	21000	25	13
	DE = Antriebsseitig/ Drive End/ Coté Arbre/ Anteriore/ Lado Acoplamiento/ Приводная сторона двигателя						
	NDE = Lüfterseitig/ Non Drive End/ Coté Opposé à l'Arbre/ Posteriore/ Lado Op. Acoplamiento/ Неприводная сторона двигателя						32045A0100005

Baugröße/ Frame Size/ Hauteur d'Arbre/ Grandezza Motore/ Carcasa/ Размер двигателя	Polzahl Poles Polos Poli Polos полюсов	Lagergröße Bearing Size Type de Roulement Grandezza Cuscinetti Tamaño Rodamiento Размер подшипника		Nachschmierfrist [h] Lubrication interval [h] Intervalle de Lubrification [h] Intervallo Lubrificazione [h] Intervalo Lubricación [h] Периодичность замены смазки в подшипниках [ч]		Fettmenge [g] Grease Quantity [g] Quantité de Graisse [g] Quantità di Grasso [g] Cantidad de Grasa [g] Количество смазки [г]	
180	Standard	DE	NDE	DE	NDE	DE	NDE
	2	6311 C3	6310 C3	2600	3100	40	30
	4	6311 C3	6310 C3	7000	8000	40	30
	6	6311 C3	6310 C3	10500	12000	40	30
	8	6311 C3	6310 C3	14500	17000	40	30
	Verstärkt/ Reinforced/ Renforcé/ Rinforzati/ Reforzado/ Усиленный						
	4	NU311C3	6310 C3	3200	8000	40	30
	6	NU311C3	6310 C3	5000	12000	40	30
	8	NU311C3	6310 C3	7000	17000	40	30
	DE = Antriebsseitig/ Drive End/ Coté Arbre/ Anteriore/ Lado Acoplamiento/ Приводная сторона двигателя						
	NDE = Lüfterseitig/ Non Drive End/ Coté Opposé à l'Arbre/ Posteriore/ Lado Op. Acoplamiento/ Неприводная сторона двигателя						32045A0110001

Baugröße/ Frame Size/ Hauteur d'Arbre/ Grandezza Motore/ Carcasa/ Размер двигателя 200

Polzahl / Poles / Poles / Poli / Polos / полюсов	Lagergröße / Bearing Size / Type de Roulement / Grandezza Cuscinetti / Tamaño Rodamiento / Размер подшипника		Nachschmierfrist [h] / Lubrication Interval [h] / Intervalle de Lubrification [h] / Intervallo Lubrificazione [h] / Intervalo Lubricación [h] / Периодичность замены смазки в подшипниках [ч]		Fettmenge [g] / Grease Quantity [g] / Quantité de Graisse [g] / Quantità di Grasso [g] / Cantidad de Grasa [g] / Количество смазки [г]	
Standard	DE	NDE	DE	NDE	DE	NDE
2	6312 C3	6312 C3	2400	2700	50	50
4	6312 C3	6312 C3	6700	7500	50	50
6	6312 C3	6312 C3	10000	11500	50	50
8	6312 C3	6312 C3	14000	16000	50	50
Verstärkt/ Reinforced/ Renforcé/ Rinforzati/ Reforzado/ Усиленный						
4	NU312C3	6312 C3	3100	7500	50	50
6	NU312C3	6312 C3	4800	11500	50	50
8	NU312C3	6312 C3	6800	16000	50	50

DE = Antriebsseitig/ Drive End/ Coté Arbre/ Anteriore/ Lado Acoplamiento/ Приводная сторона двигателя

NDE = Lüfterseitig/ Non Drive End/ Coté Opposé à l'Arbre/ Posteriore/ Lado Op. Acoplamiento/ Неприводная сторона двигателя

32045A0120006

Baugröße/ Frame Size/ Hauteur d'Arbre/ Grandezza Motore/ Carcasa/ Размер двигателя 225

Polzahl / Poles / Poles / Poli / Polos / полюсов	Lagergröße / Bearing Size / Type de Roulement / Grandezza Cuscinetti / Tamaño Rodamiento / Размер подшипника		Nachschmierfrist [h] / Lubrication Interval [h] / Intervalle de Lubrification [h] / Intervallo Lubrificazione [h] / Intervalo Lubricación [h] / Периодичность замены смазки в подшипниках [ч]		Fettmenge [g] / Grease Quantity [g] / Quantité de Graisse [g] / Quantità di Grasso [g] / Cantidad de Grasa [g] / Количество смазки [г]	
Standard	DE	NDE	DE	NDE	DE	NDE
2	6312 C3	6212 C3	2400	2700	65	30
4	6313 C3	6213 C3	6000	7000	65	30
6	6313 C3	6213 C3	9000	11000	65	30
8	6313 C3	6213 C3	13000	15000	65	30
Verstärkt/ Reinforced/ Renforcé/ Rinforzati/ Reforzado/ Усиленный						
4	NU313C3	6213 C3	2700	7000	65	30
6	NU313C3	6213 C3	4300	11000	65	30
8	NU313C3	6213 C3	6500	15000	65	30

DE = Antriebsseitig/ Drive End/ Coté Arbre/ Anteriore/ Lado Acoplamiento/ Приводная сторона двигателя

NDE = Lüfterseitig/ Non Drive End/ Coté Opposé à l'Arbre/ Posteriore/ Lado Op. Acoplamiento/ Неприводная сторона двигателя

32045A0130001

Baugröße/ Frame Size/ Hauteur d'Arbre/ Grandezza Motore/ Carcasa/ Размер двигателя 250

Polzahl / Poles / Poles / Poli / Polos / полюсов	Lagergröße / Bearing Size / Type de Roulement / Grandezza Cuscinetti / Tamaño Rodamiento / Размер подшипника		Nachschmierfrist [h] / Lubrication Interval [h] / Intervalle de Lubrification [h] / Intervallo Lubrificazione [h] / Intervalo Lubricación [h] / Периодичность замены смазки в подшипниках [ч]		Fettmenge [g] / Grease Quantity [g] / Quantité de Graisse [g] / Quantità di Grasso [g] / Cantidad de Grasa [g] / Количество смазки [г]	
Standard	DE	NDE	DE	NDE	DE	NDE
2	6313 C3	6313 C3	2200	2200	90	65
4	6315 C3	6313 C3	4800	6000	90	65
6	6315 C3	6313 C3	8000	9000	90	65
8	6315 C3	6313 C3	11000	13000	90	65
Verstärkt/ Reinforced/ Renforcé/ Rinforzati/ Reforzado/ Усиленный						
4	NU315C3	6313 C3	2200	6000	90	65
6	NU315C3	6313 C3	3800	9000	90	65
8	NU315C3	6313 C3	6000	13000	90	65

DE = Antriebsseitig/ Drive End/ Coté Arbre/ Anteriore/ Lado Acoplamiento/ Приводная сторона двигателя

NDE = Lüfterseitig/ Non Drive End/ Coté Opposé à l'Arbre/ Posteriore/ Lado Op. Acoplamiento/ Неприводная сторона двигателя

32045A0140007

Baugröße/ Frame Size/ Hauteur d'Arbre/ Grandezza Motore/ Carcasa/ Размер двигателя

280

Polzahl / Poles / Poles / Poli / Polos / полюсов	Lagergröße / Bearing Size / Type de Roulement / Grandezza Cuscinetti / Tamaño Rodamiento / Размер подшипника		Nachschmierfrist [h] / Lubrication Interval [h] / Intervalle de Lubrification [h] / Intervallo Lubrificazione [h] / Intervalo Lubricación [h] / Периодичность замены смазки в подшипниках [ч]		Fettmenge [g] / Grease Quantity [g] / Quantité de Graisse [g] / Quantità di Grasso [g] / Cantidad de Grasa [g] / Количество смазки [г]	
Standard	DE	NDE	DE	NDE	DE	NDE
2	6316 C3	6314 C3	1400	1800	100	80
4	6318 C3	6316 C3	3800	4200	120	100
6	6318 C3	6316 C3	7000	7500	120	100
8	6318 C3	6316 C3	9500	10000	120	100
Verstärkt/ Reinforced/ Renforcé/ Rinforzati/ Reforzado/ Усиленный						
4	NU 318	6316 C3	1800	4200	120	100
6	NU 318	6316 C3	3100	7500	120	100
8	NU 318	6316 C3	4200	10000	120	100
DE = Antriebsseitig/ Drive End/ Coté Arbre/ Anteriore/ Lado Acoplamiento/ Приводная сторона двигателя						
NDE = Lüfterseitig/ Non Drive End/ Coté Opposé à l'Arbre/ Posteriore/ Lado Op. Acoplamiento/ Неприводная сторона двигателя						3W045D3440001

Baugröße/ Frame Size/ Hauteur d'Arbre/ Grandezza Motore/ Carcasa/ Размер двигателя

315-S-M-L

Polzahl / Poles / Poles / Poli / Polos / полюсов	Lagergröße / Bearing Size / Type de Roulement / Grandezza Cuscinetti / Tamaño Rodamiento / Размер подшипника		Nachschmierfrist [h] / Lubrication Interval [h] / Intervalle de Lubrification [h] / Intervallo Lubrificazione [h] / Intervalo Lubricación [h] / Периодичность замены смазки в подшипниках [ч]		Fettmenge [g] / Grease Quantity [g] / Quantité de Graisse [g] / Quantità di Grasso [g] / Cantidad de Grasa [g] / Количество смазки [г]	
Standard	DE	NDE	DE	NDE	DE	NDE
2	63(73)16 C3	6314 C3	1400	1800	100	80
4	6320 C3	6316 C3	3600	4200	160	100
6	6320 C3	6316 C3	6000	7500	160	100
8	6320 C3	6316 C3	8500	10000	160	100
Verstärkt/ Reinforced/ Renforcé/ Rinforzati/ Reforzado/ Усиленный						
4	NU 320	6316 C3	1600	4200	160	100
6	NU 320	6316 C3	2700	7500	160	100
8	NU 320	6316 C3	3700	10000	160	100
DE = Antriebsseitig/ Drive End/ Coté Arbre/ Anteriore/ Lado Acoplamiento/ Приводная сторона двигателя						
NDE = Lüfterseitig/ Non Drive End/ Coté Opposé à l'Arbre/ Posteriore/ Lado Op. Acoplamiento/ Неприводная сторона двигателя						3W045D3450006

Baugröße/ Frame Size/ Hauteur d'Arbre/ Grandezza Motore/ Carcasa/ Размер двигателя

315D

Polzahl / Poles / Poles / Poli / Polos / полюсов	Lagergröße / Bearing Size / Type de Roulement / Grandezza Cuscinetti / Tamaño Rodamiento / Размер подшипника		Nachschmierfrist [h] / Lubrication Interval [h] / Intervalle de Lubrification [h] / Intervallo Lubrificazione [h] / Intervalo Lubricación [h] / Периодичность замены смазки в подшипниках [ч]		Fettmenge [g] / Grease Quantity [g] / Quantité de Graisse [g] / Quantità di Grasso [g] / Cantidad de Grasa [g] / Количество смазки [г]	
Standard	DE	NDE	DE	NDE	DE	NDE
2	63(73)16 C3	6316 C3	1400	1400	100	100
4	6322 C3	6322 C3	2750	2750	220	220
6	6322 C3	6322 C3	5000	5000	220	220
8	6322 C3	6322 C3	8000	8000	220	220
Verstärkt/ Reinforced/ Renforcé/ Rinforzati/ Reforzado/ Усиленный						
4	NU 322	6322 C3	1300	2750	220	220
6	NU 322	6322 C3	2300	5000	220	220
8	NU 322	6322 C3	3500	8000	220	220
DE = Antriebsseitig/ Drive End/ Coté Arbre/ Anteriore/ Lado Acoplamiento/ Приводная сторона двигателя						
NDE = Lüfterseitig/ Non Drive End/ Coté Opposé à l'Arbre/ Posteriore/ Lado Op. Acoplamiento/ Неприводная сторона двигателя						3W045D3460001

Baugröße/ Frame Size/ Hauteur d'Arbre/ Grandezza Motore/ Carcasa/ Размер двигателя	Polzahl Poles Pole Poli Polos полюсов	Lagergröße Bearing Size Type de Roulement Grandezza Cuscinetti Tamaño Rodamiento Размер подшипника		Nachschmierfrist [h] Lubrication Interval [h] Intervalle de Lubrification [h] Intervallo Lubrificazione [h] Intervalo Lubricación [h] Периодичность замены смазки в подшипниках [ч]		Fettmenge [g] Grease Quantity [g] Quantité de Graisse [g] Quantità di Grasso [g] Cantidad de Grasa [g] Количество смазки [г]	
355C	Standard	DE	NDE	DE	NDE	DE	NDE
	2	63(73)18 C3	6318 C3	1100	1100	120	120
	4	6322 C3	6322 C3	2750	2750	220	220
	6	6322 C3	6322 C3	5000	5000	220	220
	8	6322 C3	6322 C3	8000	8000	220	220
	Verstärkt/ Reinforced/ Renforcé/ Rinforzati/ Reforzado/ Усиленный						
	4	NU 322	6322 C3	1300	2750	220	220
	6	NU 322	6322 C3	2300	5000	220	220
	8	NU 322	6322 C3	3500	8000	220	220
	DE = Antriebsseitig/ Drive End/ Coté Arbre/ Anteriore/ Lado Acoplamiento/ Приводная сторона двигателя						
	NDE = Lüfterseitig/ Non Drive End/ Coté Opposé à l'Arbre/ Posteriore/ Lado Op. Acoplamiento/ Неприводная сторона двигателя						

3W045D6380009

The grease must be replaced at regular intervals depending on the motor size and its usage. The used grease exits through a grease drain. Regreasing intervals and grease quantity: see figures above
Regard that greasing intervals are given for operation at rated speed, nominal operation conditions and for horizontal mounting position. In case of vertical use the intervals shall be reduced to 50 %. In case of ambient temperature higher than 40 °C or when operated with higher speed than nominal the intervals have to be reduced according table below:

Ambient temperature	+40 °C	+50 °C	+60 °C
Recommended reduction of regreasing intervals	1	0,6	0,4

Continuous speed	nominal	1,5 x nominal	2 x nominal
Recommended reduction of regreasing intervals	1	nominal	0,5

Table 3-11: Rule of thumb for reduction of regreasing intervals

Details (grease type, recommendations for greasing procedure) can be seen on additional regreasing nameplates (close to the regreasing nipples) and the TECO manual "INSTALLATION, OPERATION and MAINTENANCE INSTRUCTIONS".

3.5 Others

3.5.1 Grounding terminals

The grounding terminals are directly screwed into the motor frame and have no other function except of grounding. Screws, washers and U-clamps are made of electro-zinc plated steel. They are labelled with the ground symbol defined in DIN EN 60 617-2: One terminal is located inside of the terminal box. The stator housing provides 4 external access points for grounding to allow easy access in every possible mounting position. The assembled grounding access point shall be free of primer or paint and shall be metallic blank. Only 1 access points is finally assembled ex factory (right hand side).
Design examples for grounding terminals:
a) for motors frame size 80…250
b) for motors frame size 280 and larger

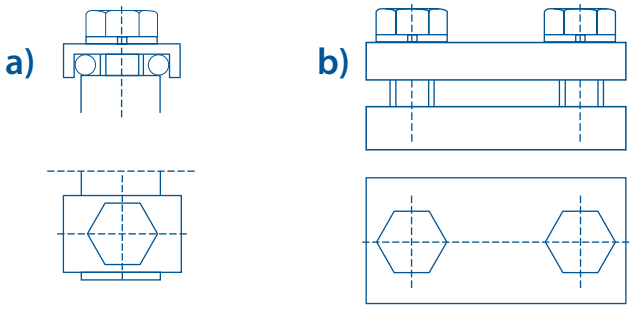


Figure 3-19: Design examples for grounding terminals

3.5.2 Lifting eyes

Using the lifting eye(s) is obligatory when transporting and lifting the motor; details see TECO manual "INSTALLATION, OPERATION and MAINTENANCE INSTRUCTIONS ..... ". The position of the lifting eye(s) can be seen in the sample figure below and in section 7 Outline drawings. In case of 2 lifting eyes (frame size 132 and larger) both of the 2 lifting eyes have to be used. They are located in a way that there is no collision with already installed power cables installed in axial direction.

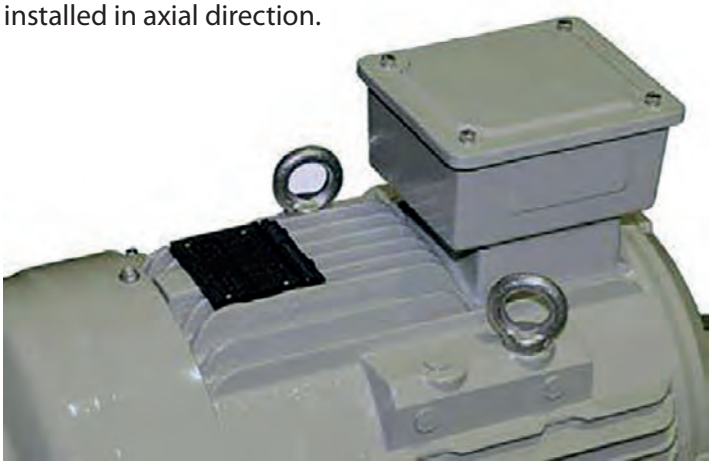


Figure 3-20: Position of lifting eyes

3.5.3 Drain holes

As a standard no drain holes are provided. Drain holes can be drilled on customer's request for frame size 132 and larger. They will be located in the brackets or flanges and not in the housing to allow later modifications of the mounting arrangement.

3.5.4 SPM provision

Throughout their lifetime, bearings generate shocks in the interface between the loaded rolling element and the raceway. As these shocks 'ring' the shock pulse transducer, it outputs electric pulses proportional to the shock magnitude. Unlike vibration transducers, the shock pulse transducer responds at its carefully tuned resonance frequency of about 32 kHz, thus allowing a calibrated measurement of the shock pulse amplitudes. Drilled, tapped and plugged holes with conical M8 thread for later shock pulse measurement nipple mounting on DE and NDE are provided (as standard) for frame size 280 and above. For the other sizes, For other sizes, contact our technical service.

3.5.5 Painting, corrosion protection

Concerning corrosion the top coat is resistant to water, steam and salt water. Concerning chemical surrounding the top coat is resistant to hydraulic liquids, cleaning agents, synthetic coolants, solvents and chemicals. The coating is appropriate for a temperature range from –40 °C to +130 °C; it stays nonabrasive, elastic, scratch resistant and impact resistant through the whole temperature range. The motors are suitable for use in paint shops and are 100 % free of paint adhesion detrimental substances as for example silicone. Layer thickness see figure below.

	Cast iron, frame size ≤ 132	Cast iron, frame size ≥ 160
Primer for cast iron parts	min. 20 µm	min. 25 µm
Primer for steel parts		
Base prior to top coat		min. 50 µm
Top coat *		min. 25 µm
Total thickness of coating	min. 60 µm	min. 100 µm

*) The inner surface of the fan cowl is treated with primer only.

Table 3-12: Layer thickness of painting

As a standard the motor frame and fan cowl colour is grey (RAL 7032, pebble grey). For later customizing of the motor it is possible to spray a second layer of top coat (same thickness as standard coating) without influence to the thermal design of the motor.
All machined and metallic blank surfaces (feet, flange, 1 external grounding surface, shaft end) are protected against corrosion. The antirust agent can stay at the parts without influence to customer assembling (coupling) or mounting the motor to machine (max. layer thickness 5 µm).

Option:
As option, the motor can be provided with a special anti-corrosion treatment for the following classes of corrosion.

Class (ISO 12944)	Example of typical Environments	
	Interior	Exterior
C3	Buildings for production with high atmospheric humidity and some air pollution such as food manufacturers, breweries, dairies and laundries.	Urban and industrial areas, moderate sulphur dioxide pollution. Coastal areas with low salt content.
C4	Chemical manufacturers, swimming baths and ship- and boatyards by the sea.	Industrial areas and coastal areas with moderate salt impact.
C5	Buildings or areas with almost permanent condensation and with high pollution.	Industrial areas with high humidity and aggressive atmosphere.

3.5.6 Rating plate and labelling

The material of the rating plate is stainless steel and the data indicated are irremovable and clearly engraved or lasered. It is irremovably fixed (riveted) at the motor frame.
Rating plate data comply with IEC 60034-1 and contain e.g. (see sample below):
• name of manufacturer
• serial number (a unique individual identification number) and year of construction
• reference to IEC standard
• efficiency level (efficiency class IE-code according to IEC 60034-30)
• CE,UL and EAC marking
• technical data according to IEC 60034-1.

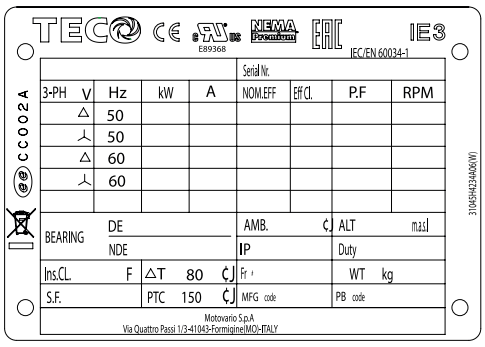


Figure 3-21: Sample of a TECO rating plate

Additional nameplates and markings:
- Connection diagram sticker with the wiring diagram, fitted on the inside of the terminal box lid
- In case of optional accessories: connection diagram sticker inside terminal box
- Grounding symbols according to DIN EN 60617-2
- In case of regreasable bearings: regreasing nameplates (close to the regreasing nipples)

4 Electrical design

Squirrel cage motors as covered by this catalogue provide electrical active parts:

• **Rotor**

The active part is a rugged arrangement only consisting of the magnetic lamination and the short circuit "winding" made of cast aluminium embedded in slots.

• **Stator**

Contains the magnetic stator lamination, the three phase winding embedded in slots; including its insulation system and integrated temperature sensors.

• **Terminals**

4.1 Stator winding

The stator winding is carried out as a wire wound winding ("random winding"). High quality enamelled wires are used. Insulating sheets provide proper performance for

• insulation phase to ground,
• insulation phase to phase and
• interturn insulation.

An appropriate phase separation and a proper bandage of the winding overhang ensure high electric and mechanical strength.The stator winding is rotating dip impregnated with varnish or resin according to "thermal class F" requirements. According to the classification EN 60085 thermal class F allows a maximum hot spot temperature of 155 °C.

TECO motors covered by this catalogue are utilized (under nominal conditions) according to class "B":

• average temperature rise (by resistance method) is 80 °K;
• maximum spot temperature is 130 °C.

This ensures a high lifetime of the insulation system. (Insulation does not suddenly fail if the maximum temperature of the thermal class is reached, but useful operating life declines rapidly. A rule of thumb is a halving of life time for every increase of 10 °C.) As an option an additional finish for tropical protection (against fungus) can be provided (option "Winding Tropicalization").

Figure 4-1: Stator core with winding

Figure 4-2: Stator core with slot liners

In case of high humidity environment, it is highly recommended the use of added winding coat in order to protect and to extend the electric motor lifetime. Select it (option "Outdoor Service") if it is necessary.

The winding features 3 phases which produce the rotating magnetic flux. All 6 winding ends are connected to the terminal box. The 3-phase line can be connected to the winding either in star connection (written as "Y") or delta connection (written as "D" or Δ), see figure below:

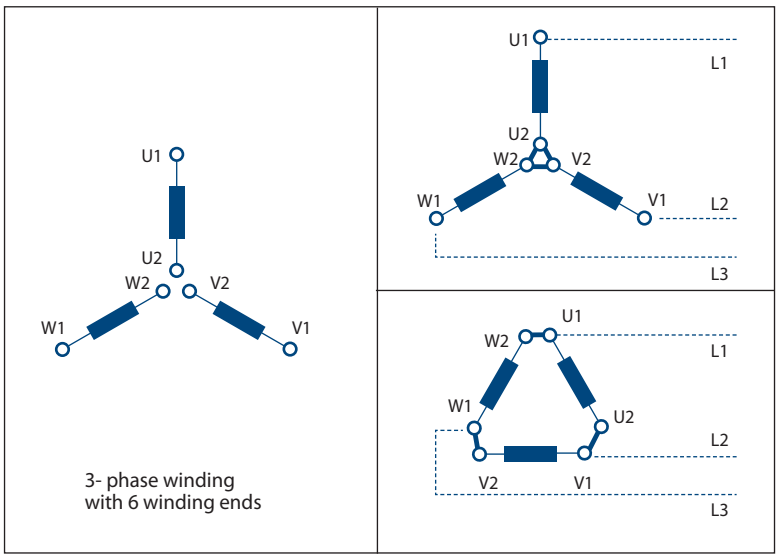


Figure 4-3: Three phase stator winding (star and delta connection)

These configurations allow operation of a certain motor at a higher line voltage level (e.g. 690 V with "star" connection) or at a lower line voltage (e.g. 400 V with "delta" connection). In case of dual rating: The rating plate is providing data for both applications (e.g.: "400 V/690 V D/Y; 129,4 A/75 A").
If the standard configuration of the motor for nominal voltage is designed as "delta" (preferred at higher power rating) the motor might be switched to "star" during starting by an external switchgear. This allows reduction of starting current (factor √3) and starting torque (factor 3).
The TECO standard configuration is shown in the table below:

Power rating [kW]	Line frequency [Hz]	Nominal voltage [V]; connection
≤ 2.2	50	230 V Δ / 400 V Y
	60	265 V Δ / 460 V Y
≥ 3.0	50	400 V Δ / 690 V Y
	60	460 V Δ

Table 4-1: TECO standard winding configuration and nominal voltage(s)

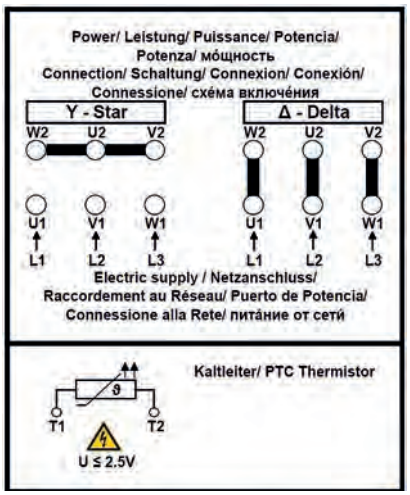


Table 4-1: TECO standard winding configuration and nominal voltage(s)

The configuration can be carried out by the user by inserting the jumpers of the terminal box; the spatial arrangement is shown in the figure on left (standard sticker inside of the terminal box):

Phase sequence:
If the terminals are connected to an electrically clockwise supply system the motor is designed for clockwise mechanical rotation (when viewing from driving shaft end; according to IEC 60034-8). For change of rotational direction a change of 2 supply line phases has to be carried out by customer.

4.2 Thermal protection

For thermal protection of the winding as a standard 3 temperature PTC thermistors are embedded in the winding; one for each phase (according to standards IEC 60034-11 and DIN 44081). Their nominal temperature level is 150 °C; when reaching this temperature their resistance suddenly escalates to a high level. They are connected in series and lead to terminals in the terminal box. A suitable monitoring device according to standard DIN 44081 shall be connected by customer and shall be used for tripping the system.
At inverter operation the use of this method of thermal protection is mandatory; protection measures based on operating current are not suitable in this case. A warning on the sticker inside the terminal box shows that no voltage higher than 2,5 V must be applied on these terminals.

5 Performance data

5.1 Duty type

The motors are designed for continuous operation at full load under nominal ambient conditions (duty type "S1" according to IEC 60034-1. Type data for differing duty types (S2...S8, periodic variation of load, influence of frequent starting stress, etc.) and S9 (non-periodic load and speed variation, e.g. at inverter operation) can be evaluated on request.

5.2 Environmental conditions, performance

All environmental conditions in site as listed in standard IEC 60721-3 (temperature, altitude, exposition to water, biological, chemical and mechanical active substances, vibrations, etc. have to be in accordance with the design of the motor (e.g. degree of protection).

5.2.1 Operation at high ambient temperature/high altitude

As a standard the motors are designed for
• ambient temperature (cooling air temperature): –20 °C up to +40 °C
• maximum altitude 1000 m above sea level
The motors can also be operated at higher ambient temperatures or at higher altitude if the continuous output power is reduced, see figures below. In this case the winding temperature rise is approximately identical to nominal operation. It has to be regarded that the bearing stress at higher temperature is increased and regreasing intervals shall be shortened accordingly then (see 3.4.3 Bearings).

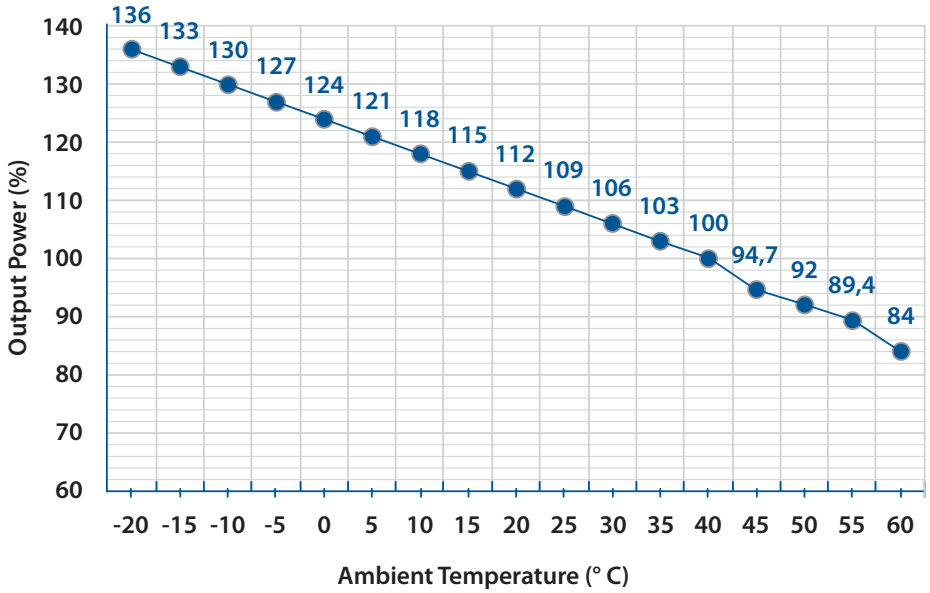


Figure 5-1: Output power versus ambient temperature

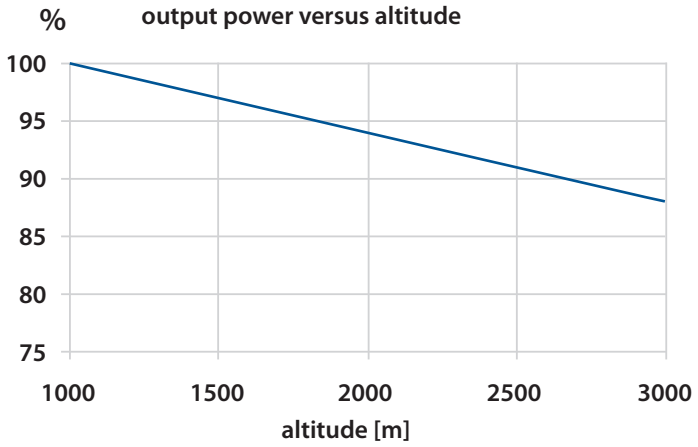


Figure 5-2: Reduction of output power versus altitude

Output with nominal power rating is permissible at high altitude, if accordingly the ambient temperature is reduced, see figure below:

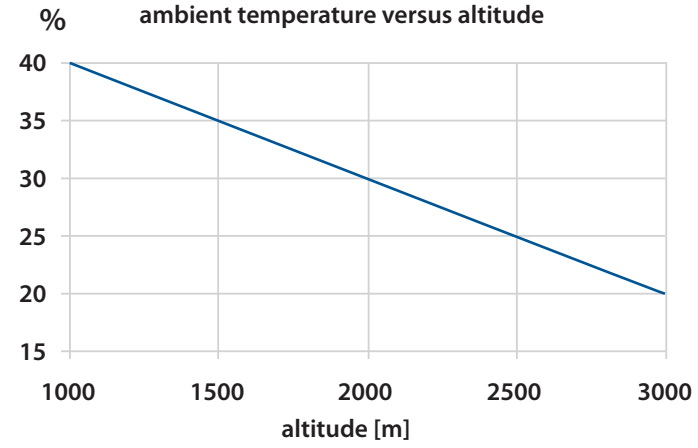


Figure 5-3: Reduction of ambient temperature versus altitude for nominal output rating

Combining effects of temperature and altitude variation, the dissipation capacity of motor output can be obtained multiplying the useful output by the multiplying factor of table below:

AMBIENT TEMPERATURE [°C] \ ALTITUDE [m]	1000	1500	2000	2500	3000	3500	4000
0	1.24	1.20	1.16	1.12	1.08	1.04	1.00
5	1.21	1.17	1.13	1.09	1.05	1.01	0.97
10	1.18	1.14	1.10	1.06	1.03	0.99	0.95
15	1.15	1.11	1.08	1.04	1.00	0.96	0.93
20	1.12	1.08	1.05	1.01	0.97	0.94	0.90
25	1.09	1.05	1.02	0.98	0.95	0.91	0.88
30	1.06	1.03	0.99	0.96	0.92	0.89	0.85
35	1.03	1.00	0.96	0.93	0.90	0.86	0.83
40	1.00	0.97	0.94	0.90	0.87	0.84	0.81
45	0.95	0.92	0.88	0.85	0.82	0.79	0.76
50	0.92	0.89	0.86	0.83	0.80	0.77	0.74
55	0.89	0.86	0.84	0.81	0.78	0.75	0.72
60	0.84	0.81	0.79	0.76	0.73	0.70	0.68

5.2.2 Operation at low temperature/high humidity

For operation at ambient temperature range –20 °C to +40 °C a heater for the motor winding is necessary at standstill. The same precaution is requested for operation in sites with normal temperature level, but high humidity (typically above 90 %) to prevent condensation inside the motor.

Heating can be carried out:

- By option "Winding Heater without Tbox"
  In this case additional terminals for the heater are provided within the terminal box. Heater terminals are marked with a voltage flash and a short note "Heater may be energized even if motor is isolated!" A special connection diagram sticker with the wiring diagram of the accessory is fitted inside terminal box lid.
  Approx. heater power see Table 5-1, page 42.

Note: PTC Thermistor and Winding heater cannot be provided together

- By heating the motor via stator winding. An auxiliary single phase AC voltage supply is to be connected to 2 power connectors. The appropriate voltage level and VA-rating depending on the motor size: On request. The safety precautions as mentioned above have to be regarded by the user.

Frame size	To prevent condensation			Regreasable		
	Heater output [W]	Heater nominal voltage single phase AC [V]		Heater output [W]	Heater nominal voltage single phase AC [V]	
		230	400		230	400
80	20	20	20	20	20	20
90	20	20	20	20	20	20
100	30	30	30	30	30	30
112	30	30	30	30	30	30
132	40	40	40	40	40	40
160	40	40	40	40	40	40
180	50	50	50	50	50	50
200	50	50	50	50	50	50
225	60	60	60	60	60	60
250	60	60	60	60	60	60
280	150	150	150	150	150	150
315	200	200	200	200	200	200
355	Check with us					

Table 5-1: Availability and output power of option "Heating via Strip Heater"

5.2.3 Operation at severe mechanical conditions

For operation at extraordinary mechanical conditions (permanent exposure to vibration and shock higher than class 3M3 acc. to IEC 60721-3) we recommend a special request.

5.3 Mechanical performance

5.3.1 Torque characteristic; starting performance

The power rating (nominal power PN) and the nominal torque (TN) of each type is listed in 6 Technical data, starting page 58. The torque can be calculated in general as:

$$T = \frac{9550 \times P}{n}$$

where T = torque [Nm]
P = power [kW] and
n = speed [rpm]

The motors are equipped with a squirrel cage rotor (cast aluminium); they are suitable for direct starting. Direction of rotation is clockwise (view onto shaft end) if a clockwise supply system is connected according to the wiring diagram. Technical data of the standard motors are valid for both directions of rotation (bidirectional design). In IEC 600034-12 the starting performance is standardized.

During starting the motor creates a torque according to its individual characteristic (locked rotor torque, pull up torque and break down torque as generally described in 1.2.7 Performance characteristics: Speed, torque, starting page 11). Depending on the type an individual value for the torques is listed in 6 Technical data, starting page 58.

A sample of a TECO type test see figure below. In steady operation at full load torque the individual nominal speed (close to no load speed) is reached. It has to be regarded that this speed is only valid for thermal equilibrium conditions.
If the motor is not heated up this speed will be significant closer to the no load speed. Limits and tolerances according to IEC standard: see
6.1 General data; tolerances (acc. to IEC 60034-1), starting page 58.
According to requirements of IEC 60034 the break down torque (including –10 % tolerance) has to be 160 % at least. The torque values are quadratic depending on a variation of line voltage. (Correspondingly the complete torque characteristic e.g. is reduced by a factor of 3 when starting the motor in star-delta).

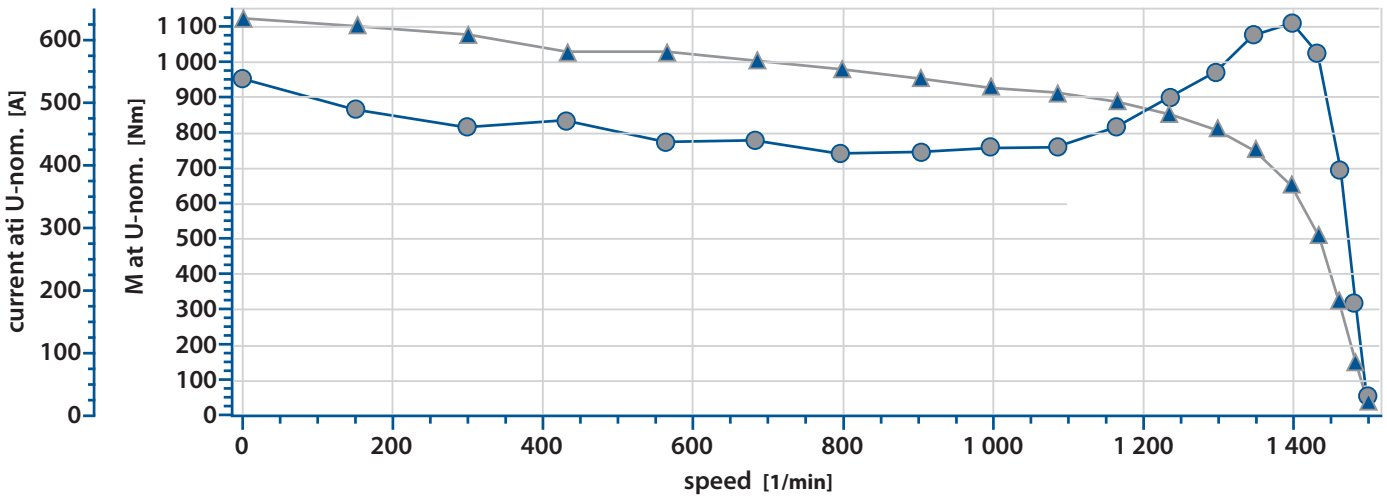


Figure 5-4: Sample of TECO type test data sheet: Torque and current vs. speed

5.3.2 Maximum operational speed

It is possible to increase the speed e.g. by feeding the motor from a frequency inverter with increased frequency. In general it shall be regarded at increased speed (also see 5.5 Motor performance (inverter operated), starting page 51):

- increase of acoustic noise level (especially contribution of fan noise)
- increase of vibration
- regreasing intervals shall be shortened accordingly then (see 3.4.3 Bearings, starting page 28)
- bearing life may be reduced
- maximal mechanically permissible operational speed limit,

see table below, following the requirements of IEC 60034-1; both for horizontal and vertical mounting:

Frame size	2-pole		4-pole		6-pole		8-pole	
	[min-1]	[Hz]	[min-1]	[Hz]	[min-1]	[Hz]	[min-1]	[Hz]
80	5200	87	3600	120	2400	120	1600	106
90	5200	87	3600	120	2400	120	1600	106
100	5200	87	3600	120	2400	120	1600	106
112	5200	87	3600	120	2400	120	1600	106
132	4500	75	2700	90	2400	120	1600	106
160	4500	75	2700	90	2400	120	1600	106
180	4500	75	2700	90	2400	120	1600	106
200	4500	75	2300	77	1800	90	1200	80
225	3600	60	2300	77	1800	90	1200	80
250	3600	60	2300	77	1800	90	1200	80
280	—	—	—	—	—	—	—	—
315	—	—	—	—	—	—	—	—

Table 5-2: Maximal permissible operational speed

5.3.3 Permissible radial shaft forces

At operation with belt drive (or caused by other influences of the driven equipment) radial forces will impact on shaft end and bearings. For belt drives a rough estimation of the radial force can be carried out:

$$Fr \cong \frac{5000 \times P}{D \times n}$$

where Fr =radial force [N]
P = power rating [kW]
D = diameter of pulley [m] and
n = speed [rpm].

The permissible radial force depends on the axial point of application of the external force, see figure below:

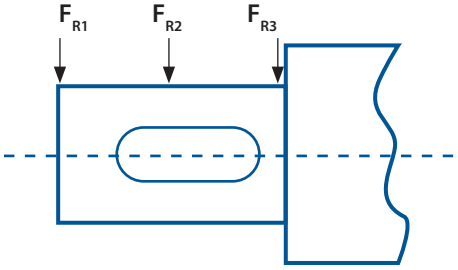


Figure 5-5: Axial point of application of the external radial force

The permissible radial thrust is given in the table below:

- for standard ball bearings and
- for optional version with cylinder roller bearings.

It has to be regarded that cylinder roller bearings demand a minimum radial force for proper operation.

Load F_R [N] for standard ball bearings										bearingsLoad F_R [N] for cylinder roller bearings					
Frame Size	Poles	Maximum F_{R1}	Maximum F_{R2}	Maximum F_{R3}	Frame Size	Poles	Maximum F_{R1}	Maximum F_{R2}	Maximum F_{R3}	Frame Size	Poles	Maximum F_{R1}	Maximum F_{R2}	Maximum F_{R3}	Minimum $F_{R3\,min}$
80	2	558	620	682	200	2	3434	3793	4152	160	2	5650	6325	7000	604
	4	699	777	855		4	4368	4825	5282		4	8000	8500	9000	539
	6	790	870	950		6	4965	5485	6004		6	8900	9550	10200	517
	8	927	1017	1051		8	5733	6278	6484		8	8684	9763	10185	505
90	2	583	659	736	225	2	4010	4401	4792	180	2	6450	7219	7888	923
	4	741	838	936		4	4731	5346	5962		4	8560	9255	9950	806
	6	849	961	1073		6	5436	6112	6788		6	9600	10450	11300	777
	8	1039	1142	1179		8	6367	7073	7345		8	11207	12364	12805	747
100	2	830	932	1034	250	2	4902	5441	5981	200	2	7350	8119	8888	1108
	4	1039	1168	1296		4	6026	6685	7343		4	9075	10024	10973	960
	6	1186	1333	1479		6	7130	7909	8688		6	10203	11271	12338	911
	8	1358	1505	1562		8	8083	8890	9196		8	12385	13563	14008	886
112	2	1157	1293	1429	280	2	5231	5685	6224	225	2	8233	9036	9839	1316
	4	15465	1637	1809		4	7482	8255	9210		4	9503	10739	11976	1131
	6	1699	1898	2098		6	8353	9210	10275		6	10817	12161	13506	1069
	8	2039	2248	2327		8	10234	11124	11455		8	14699	16398	17055	1038
132	2	1734	1970	2207	315S-M-L	2	5208	5514	5871	250	2	11585	12860	14135	1807
	4	2185	2482	2780		4	8895	9786	10894		4	14149	15695	17240	1525
	6	2530	2834	3139		6	10230	11275	12548		6	16194	17963	19732	1431
	8	2847	3194	3330		8	11398	12378	12744		8	20313	22341	23111	1384
160	2	2198	2507	2816	315D	2	4188	4405	4647	280	2	---	---	---	---
	4	2740	3125	3511	315D (D85)	4	10780	11456	12210		4	17635	19451	21692	2241
	6	3143	3541	3938		6	12691	13514	14396		6	19671	21705	24216	2082
	8	3593	4011	4168		8	12085	12842	13116		8	26617	29085	30013	1996
180	2	3141	3529	3917						315S-M-L	2	---	---	---	---
	4	3835	4316	4796							4	22106	24348	27100	2910
	6	4398	4902	5405							6	24996	27531	30640	2679
	8	5051	5573	5772							8	33259	35856	36814	2581
										315D	2	---	---	---	---
										315D (D85)	4	25347	27116	29115	3816
											6	26538	28184	30066	3462
											8	39771	42264	43166	3216
										315D (D95)	4	29204	31007	33124	3816
											6	32722	34750	37102	3462
											8	41375	43969	44907	3216

Table 5-3.1: 50HZ Permissible radial shaft forces

Load F_R [N] for standard ball bearings										bearingsLoad F_R [N] for cylinder roller bearings					
Frame Size	Poles	Maximum F_{R1}	Maximum F_{R2}	Maximum F_{R3}	Frame Size	Poles	Maximum F_{R1}	Maximum F_{R2}	Maximum F_{R3}	Frame Size	Poles	Maximum F_{R1}	Maximum F_{R2}	Maximum F_{R3}	Minimum $F_{R3\ min}$
80	2	522	580	638	200	2	3199	3534	3868	160	2	5311	5946	6580	631
	4	654	727	800		4	4072	4498	4924		4	7520	7990	8460	552
	6	700	800	900		6	4626	5110	5594		6	8360	8974	9588	517
	8	868	953	984		8	5352	5861	6053		8	8152	9165	9561	511
90	2	545	614	683	225	2	3739	4104	4468	180	2	5934	6596	7257	969
	4	693	782	871		4	4474	5030	5586		4	7875	9154	9154	829
	6	795	895	996		6	5063	5692	6322		6	8832	10396	10396	782
	8	974	1069	1103		8	5943	6602	6856		8	10515	11601	12015	758
100	2	775	871	966	250	2	4573	5076	5579	200	2	6930	7655	8379	1167
	4	971	1091	1210		4	5609	6221	6834		4	8557	9452	10347	989
	6	1107	1244	1381		6	6652	7378	8105		6	9619	10625	11631	930
	8	1270	1407	1460		8	7550	8304	8590		8	11612	12717	13134	901
112	2	1082	1209	1335	280	2	5164	5615	6154	225	2	7764	8521	9278	1391
	4	1370	1531	1691		4	7399	8036	8810		4	8958	10124	11290	1168
	6	1590	1777	1963		6	8340	9065	9927		6	10193	11460	12728	1094
	8	1909	2104	2178		8	9603	10437	10749		8	13790	15384	16000	1057
132	2	1623	1844	2065	315S-M-L	2	4958	5282	5654	250	2	10932	12136	13339	1920
	4	2045	2303	2561		4	8663	9310	10143		4	13340	14797	16254	1581
	6	2359	2655	2952		6	9672	10437	11319		6	15280	16950	18619	1468
	8	2670	2996	3123		8	10019	10801	11090		8	19060	20962	21684	1412
160	2	2055	2318	2581	315D	2	4390	4615	4870	280	2	---	---	---	---
	4	2560	2888	3217	315D (D85)	4	10094	10740	11456		4	17375	18855	20678	2336
	6	2931	3301	3672		6	11622	12328	13181		6	19472	21177	23177	2145
	8	3361	3744	3891		8	11144	11842	12095		8	25118	27447	28322	2038
180	2	2940	3303	3666						315S-M-L	2	---	---	---	---
	4	3585	4016	4447							4	21863	23569	25538	3044
	6	4104	4574	5044							6	24392	26273	28508	2773
	8	4723	5211	5397							8	31254	33694	24594	2645
										315D	2	---	---	---	---
										315D (D85)	4	22824	24509	26401	4028
											6	23706	25587	27734	3604
											8	37315	39654	40500	3300
										315D (D95)	4	26695	28371	30262	4028
											6	30164	32026	34202	3604
											8	38918	41358	42240	3300

Table 5-3.2: 60HZ Permissible radial shaft forces

5.3.4 Permissible axial shaft forces

The permissible external forces in axial direction (direction towards DE or towards NDE) is depending on the mounting position of the motor:

- horizontal shaft,
- shaft up or
- shaft down.

The figures refer to standard bearing design (reinforced version on request) and operation at nominal speed or horizontal mounting; e. g. mounting B3, B5, B14, B34, B35:

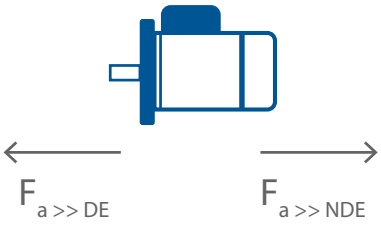


Figure 5-6: Mounting position "horizontal" and directions of axial force

Frame size	Maximal axial bearing load F_a [N]							
	2-pole		4-pole		6-pole		8-pole	
	$F_{a >> NDE}$	$F_{a >> DE}$	$F_{a >> NDE}$	$F_{a >> DE}$	$F_{a >> NDE}$	$F_{a >> DE}$	$F_{a >> NDE}$	$F_{a >> DE}$
	⟵	⟶	⟵	⟶	⟵	⟶	⟵	⟶
80	490	490	617	617			-	-
90	470	470	676	676	774	774	-	-
100	657	657	931	931	1068	1068	-	-
112	911	911	1294	1294	1490	1490	-	-
132	1401	1401	1960	1960	2254	2254	-	-
160	1793	1793	2528	2528	2881	2881	-	-
180	2470	2470	3440	3440	3920	3920	-	-
200	2734	2734	3459	3459	4449	4449	-	-
225	3165	3165	3920	3920	5018	5018	-	-
250	3900	3900	4753	4753	6233	6233	-	-
280	4106	4106	6085	6085	6860	6860	-	-
315 S/M	3775	3775	6694	6694	7577	7577	-	-
315 L	3645	3645	6713	6713	7693	7693	-	-

Table 5-4: Maximal permissible axial bearing load for mounting position "horizontal"

5.3.5 Vibration

The motors are dynamically balanced with half key and the shaft end face is marked according to standard DIN ISO 8821 (marking "H" = half key). The balance quality meets DIN ISO 1940, Q2,5.

The mechanical vibrations of the motors meet level A according to EN 60034-14 at synchronous speed; standardized limits see table below (special design like full-key-balancing, no-key-balancing or vibration grade B on request.)

Frame size		56 to 132		160 to 280		> 280	
		Displac.	Veloc.	Displac.	Veloc.	Displac.	Veloc.
	Mounting	[µm]	[mm/s] RMS	[µm]	[mm/s] RMS	[µm]	[mm/s] RMS
Vibration Grade A	Free	25	1.6	35	2.2	45	2.8
	suspension	21	1.3	29	1.8	37	2.3
Vibration Grade B	Rigid mounting	11	0.7	18	1.1	29	1.8
	Free suspension	N.A.	N.A.	14	0.9	24	1.5
Grade "A" applies to machines with no special vibration requirements; Grade "B" applies to machines with special vibration requirements.							

Table 5-5: Vibration limits according to IEC 60034-14

N.A.=not available

5.4 Motor performance (line operated)

The motors covered by this catalogue are low voltage asynchronous motors; designed for operation at a three phase AC voltage system (depending on the type; availability see 4.1 Stator winding):

- 230 V, 3 AC, 50 Hz,
- 400 V, 3 AC, 50 Hz,
- 690 V, 3 AC, 50 Hz, according to IEC 60038 and DIN IEC 60038
- 265 V, 3 AC, 60 Hz,
- 460 V, 3 AC, 60 Hz.

5.4.1 Requirements for supply voltage and frequency

Permissible tolerances of voltage and frequency at operation IEC 60034-1 defines 2 ranges of permissible variation of voltage and frequency, "Zone A" and "Zone B", see figure below:

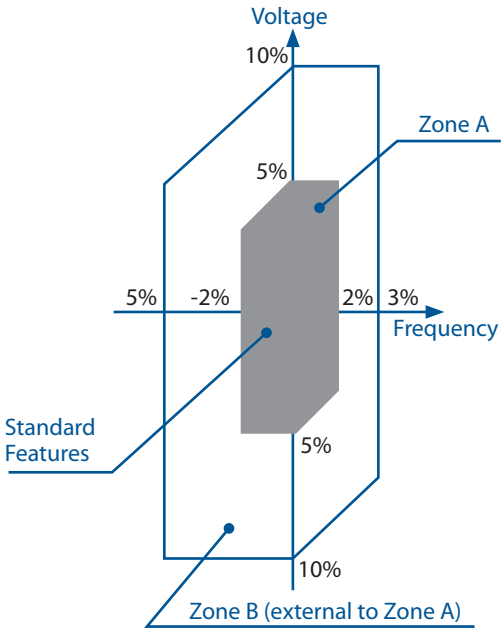


Figure 5-7: Permissible tolerance of voltage and frequency acc. to IEC 60034-1

"Zone A":
According to IEC 60034-1 the motor is suitable to perform its nominal torque continuously. The performance characteristics may have deviations from the nominal values and the temperature rise is higher than nominal.
"Zone B":
(continuous operation is explicitly not recommended by IEC 60034-1): The motor is suitable to perform its nominal torque continuously. The performance characteristics may have greater deviations from the nominal values; the temperature rise is higher than within "Zone A".
Requirements for waveform and unbalance of the supply voltage: Distortion of the sinusoidal waveform (caused by neighbouring power electronics) and unbalance of the voltage system (e.g. caused by single-phase loads) is permissible within the limits given in IEC 60034-1 section 7.2.1.1 (distortion factor HVF < 3 % and negative sequence component < 1 %).
Special requirements (voltage peaks) have to be observed at inverter operation: see 5.5 Motor performance (inverter operated), starting page 51.

5.4.2 Current, power factor and efficiency at partial load

The general characteristic is shown in section 1 (e.g. Figure 1-4, page 13). Type specific data for TECO motors:
• Values for the nominal point can be seen on the rating plate and in section 6 Technical data, starting page 58.
• Values for partial load (power factor and efficiency) can be seen in section 6 Technical data, starting page 58, columns 1/4, 2/4 and 3/4 partial load.
Overload capability according to IEC 60034-1 section 9:
• 150 % of nominal current during 2 min. at least;
• Min. 160 % of full load torque for 15 sec.

5.4.3 Start-up current, time limitations

General characteristic: see 1.2 Basics, terms and definitions, starting page 9 (sample for a TECO type test protocol: see Figure 5-4, page 43). Type specific data for TECO motors are evaluated during type test and are available on request.
Overload capability:
A minimum of overload capability is defined in IEC 60034-1 section 9:
• Min. 2 min. at 150 % of nominal current (for motors with power rating up to 315 kW);
• Min. 160 % of full load torque for 15 sec.
Locked rotor:
The motors are suitable for direct starting; however the high current during starting causes a high thermal load for the stator winding and especially for the rotor. A maximum locked rotor time has to be regarded, depending on the type. The table below shows the max. duration when starting at cold machine and at nominal operation temperature:

Nominal power [kW]	Maximum locked rotor time [s]: 50 Hz; cast iron; IE3 version							
	2-pole		4-pole		6-pole		8-pole	
	Cold	Hot	Cold	Hot	Cold	Hot	Cold	Hot
0.75	17,3	8,6	33,3	16,6	58,4	29,2		
1.1	10,7	5,3	30,4	15,2	53,5	26,8		
1.5	10,8	5,4	25,9	13,0	43,6	21,8		
2.2	10,3	5,1	25,3	12,6	27,3	13,7		
3	10,4	5,2	20,9	10,5	30,9	15,5		
4	10,0	5,0	16,7	8,3	23,3	11,7		
5.5	13,1	6,5	16,1	8,1	19,6	9,8		
7.5	10,7	5,3	12,4	6,2	27,9	14,0		
11	20,9	10,5	18,7	9,3	18,2	9,1		
15	16,3	8,1	16,5	8,3	23,6	11,8		
18.5	16,8	8,4	28,4	14,2	20,7	10,4		
22	16,4	8,2	25,6	12,8	19,2	9,6		
30	25,3	12,7	16,7	8,4	36,9	18,4		
37	19,8	9,9	21,9	10,9	38,9	19,5	N.A.	N.A.
45	20,6	10,3	18,7	9,4	16,0	13,9		
55	21,6	10,8	24,0	12,0	13,0	11,2		
75	12,3	10,7	14,3	12,4	23,5	20,4		
90	10,0	8,7	13,1	11,3	19,1	16,6		
110	20,5	17,8	14,0	12,1	21,4	18,6		
132	16,9	14,7	13,3	11,5	18,2	15,8		
160	13,2	11,4	12,2	10,6	18,1	15,7		
200	28,0	24,3	12,5	10,8	14,0	12,1		
250	26,0	22,6	13,3	11,5	13,1	11,3		
315	19,4	14,9	12	9,2	12,9	9,9		
355	14,3	11,0	13,8	10,6	15,1	11,6		
375	14,0	10,8	10,5	8,1	15,2	11,7		
400	15,7	12,1	12	9,2	N.A.	N.A.		

N.A. = not available

Nominal power [kW]	Maximum locked rotor time [s]: 60 Hz; cast iron; IE3 version							
	2-pole		4-pole		6-pole		8-pole	
	Cold	Hot	Cold	Hot	Cold	Hot	Cold	Hot
0.75	14,4	7,2	30,9	15,5	55,0	27,5	N.A.	N.A.
1.1	10,8	5,4	27,7	13,8	51,7	25,8		
1.5	10,0	5,0	23,7	11,8	35,1	17,6		
2.2	10,4	5,2	24,0	12,0	25,4	12,7		
3	10,2	5,1	19,5	9,7	26,6	13,3		
4	11,3	5,6	15,3	7,6	21,2	10,6		
5.5	17,4	8,7	13,9	6,9	18,3	9,1		
7.5	14,3	7,1	10,7	5,4	19,9	10,0		
11	18,7	9,3	16,6	8,3	16,6	8,3		
15	16,7	8,4	16,6	8,3	20,1	10,0		
18.5	16,7	8,3	24,7	12,4	17,7	8,9		
22	16,6	8,3	23,1	11,6	16,5	8,2		
30	25,5	12,7	16,6	8,3	32,1	16,0		
37	19,9	10,0	19,2	9,6	26,4	13,2		
45	18,0	9,0	16,6	8,3	20,0	17,3		
55	21,1	10,5	18,1	9,1	13,8	11,9		
75	13,8	12,0	15,6	13,5	25,0	21,7		
90	12,3	10,6	13,9	12,0	21,0	18,2		
110	21,3	18,5	15,2	13,2	22,3	19,3		
132	21,0	18,2	14,2	12,3	20,5	17,8		
160	16,0	13,9	12,8	11,1	20,4	17,7		
200	14,0	12,0	13,1	11,3	14,8	12,8		
250	29,6	25,7	14,2	12,3	13,9	12,0		
315	20,2	15,5	12,3	9,5	14,2	10,9		
355	17,6	13,5	14,3	11	18	13,8		
375	11,8	9,1	11,4	8,8	16,4	12,6		

N.A. = not available

5.5 Motor performance, inverter duty

5.5.1 General

When line operated, asynchronous motors provide an almost fixed rotational speed depending on line frequency and pole number. When feeding the motor by an electronic frequency inverter with variable frequency and voltage a "Variable Speed Drive System" is generated. It shows remarkable benefits for energy efficiency and enables a low-cost and maintenance-free solution for flexible control of processes. (Control system which only are varying the voltage are not covered here; they are only permissible for short-term use like soft starters). Technical details can be seen in IEC 60034-17 (for general purpose motors) and IEC 60034-25 (for motors especially designed for inverter operation). The motors covered by this catalogue are general purpose motors; they are suitable for operation with a frequency inverter. Several items have to be observed when the motors are inverter operated (details following sections):

General:	see section ...
additional losses due to non-sinusoidal supply voltage	5.5.3
increased winding insulation stress	5.5.4
increased acoustic noise level due to non- sinusoidal supply voltage	5.5.7
additional bearing currents	5.5.5
EMC considerations	5.5.6
Depending on operational range:	
decreased cooling of self-ventilated motors at low speed	5.5.3
increased acoustic noise level of self-ventilated motors at high speed	5.5.7
shortening of regreasing intervals when permanently operated at high speed	3.4.4
max speed due to decrease of breakdown torque in the field weakening range	6 (breakdown torque)
Maximum operational speed	5.3.2

5.5.2 Operational range; principle

At inverter operation (variable frequency and voltage) the speed-torque-characteristic curve of the motor (see Figure 1-2, page 11) can be shifted along the speed axis in any position. It allows permanent operation at any speed and torque at both directions of rotation. Depending on the design of the inverter operation in the generator range is possible as well:

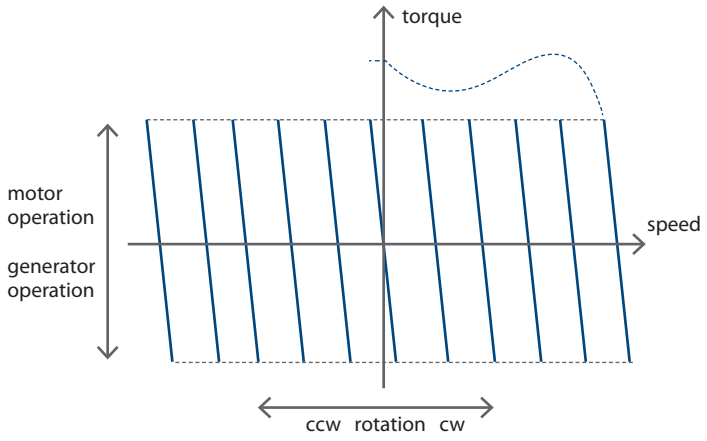


Figure 5-8: Operational range of inverter operated induction motors (range with constant flux)

In addition the frequency can also be adjusted higher than the nominal frequency while the voltage is kept constant (field weakening operation). The operational range then is defined by two sections, see figure below:

- constant flux range: frequency and voltage are almost proportional; the achievable torque is constant
- field weakening range: frequency is increased at constant voltage: the achievable power is constant.

Remark: In the field weakening range a quadratic decrease of breakdown torque has to be regarded. Thus the max speed may be restricted depending on the motor data.

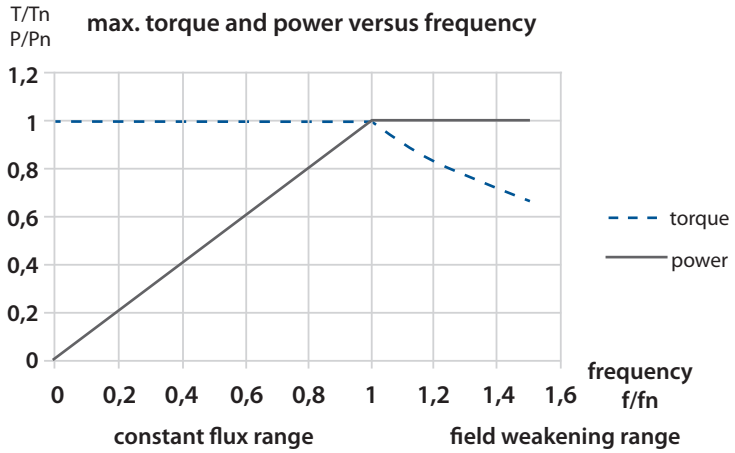


Figure 5-9: Max. torque and power versus frequency

5.5.3 Operational range for continuous operation

In general the inverter provides a non-sinusoidal supply voltage for the motor. As a consequence additional harmonic currents and additional losses are generated. The amount of additional losses is depending on the design of the inverter. In case of a PMW inverter (voltage source inverter with pulse shaped output voltage) the losses are significantly depending on the pulse frequency. As a rough figure the pulse frequency shall be 3 kHz–5 kHz at least under this aspect. Motors covered by this catalogue in general are suitable for continuous operation with nominal output under this precondition.

Configuration for 87 Hz:

If a motor is designed for 50 Hz in star connection of the winding, it can be operated up to 87 Hz in constant flux operation, if the winding connection is changed to delta connection. The theoretically achievable maximal power then is √3 of nominal at √3 of nominal speed. However, as the core losses are increased at higher frequency, the output power for continuous operation at 87 Hz is only approximately in the range of 1,5 of nominal (small motors) and 1,2 of nominal (large motors), see figure below: The exact value for a specific motor type and type of inverter can be evaluated on request. (Max. mechanical speed for the motor type has to be considered).

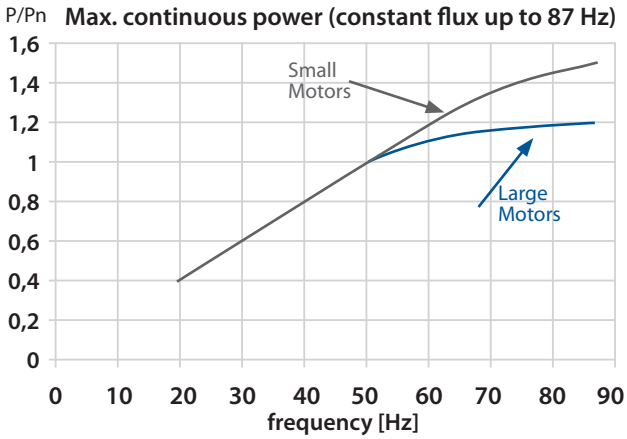


Figure 5-10: Typical characteristics for max. continuous power in "87 Hz-configuration". The motors up to frame 100 are considered "Small Motors".

Maximum permissible torque and power for continuous operation within the speed range: In 5.5.2 Operational range; principle the achievable characteristics are shown. For continuous operation it has to be regarded that the losses of the motor and (in case of self ventilated design) the heat transfer is depending on the operation point. As a consequence the typical characteristics for maximum permissible torque versus speed (and power versus speed) is given; see figures 5-11 and 5-12 below. (speed 0...1 = operation with nominal flux; speed > 1 = field weakening operation). The exact value for a concrete motor type and type of inverter can be evaluated on request.
Remark: In the field weakening range a quadratic decrease of breakdown torque has to be regarded. Thus the max speed may be restricted depending on the motor data.

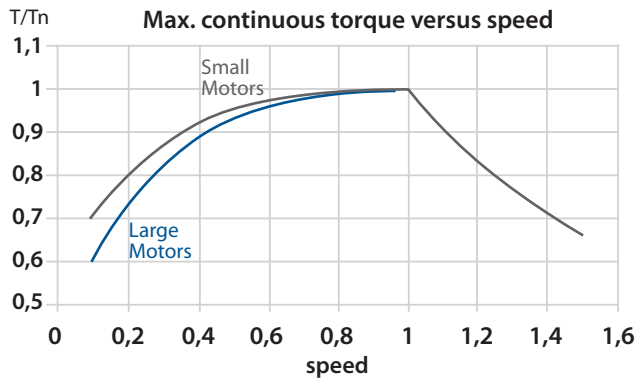


Figure 5-11: Typical max. continuous torque (self ventilated motors)

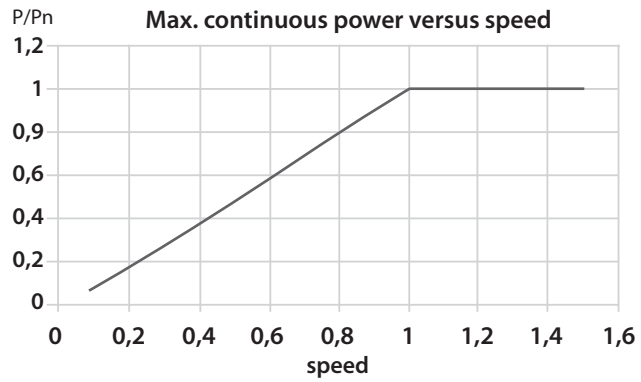


Figure 5-12: Typical max. continuous power (self ventilated motors)

For drive application with quadratic torque characteristic this restriction is not relevant. Drives with constant torque demand either a motor with accordingly higher rating or the use of forced ventilation. If forced ventilation is used (cooling method "IC 416" according to IEC 60034-6) the cooling is independent from the motor speed. Continuous operation is permissible according to figure below:

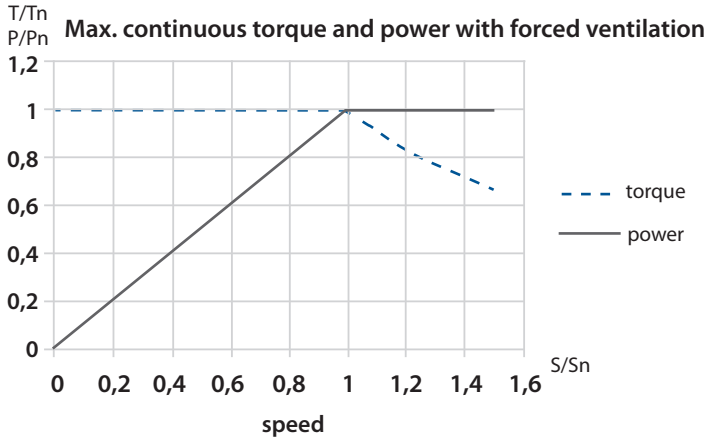


Figure 5-13: Max. continuous torque and power (motors with forced ventilation)

5.5.4 Winding insulation stress

In case of using PWM inverters a pulse shaped voltage is applied to the motor winding. The height of the voltage pulses is depending on the DC link voltage. In addition the voltage pulses show a voltage overshoot. Waveform and peak voltage are a function of both motor cable length and inverter specific pulse shape.

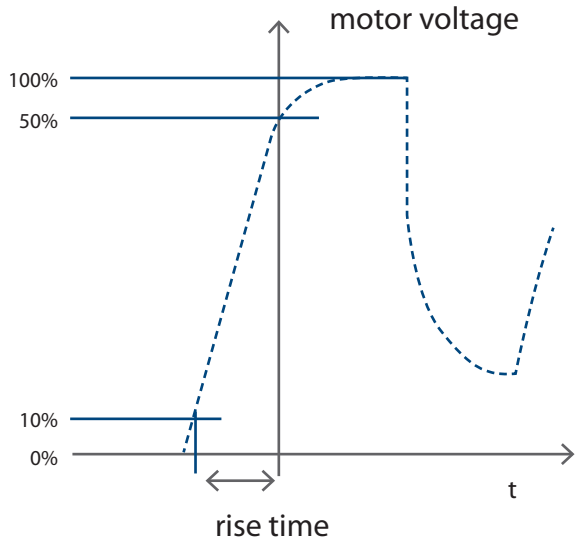


Figure 5-14: Typical pulse waveform and definition of rise time according to IEC 60034-17

Short rise time of the voltage pulses effects an unbalanced voltage contribution within the winding and therefore increases the dielectric stress. The winding stress is defined as a combination of both peak voltage and voltage rise time. A characteristic describes limits for admissible peak voltage versus voltage versus rise time. In IEC Technical Specification "60034-17" (Cage induction motors when fed from converters- Application guide; edition 2006-05) a limit curve is defined for general purpose motors. Motors covered by this catalogue comply with the curve in this standard, shown in the diagram below:

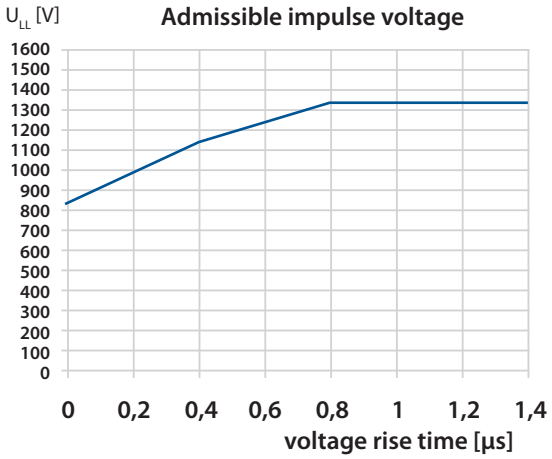


Figure 5-15: Admissible peak voltage versus rise time according to IEC TS 60034-17

At high nominal voltage level (e.g. 690 V) and especially in case of long motor cables these requirements can only be fulfilled by using "dV/dt filters" which are increasing the voltage rise time and decrease the amount of voltage overshoot. In some cases even expensive "sine wave filters" may be required.

5.5.5 Inverter caused bearing currents

PWM inverters in general are generating a high frequency "common mode voltage". There are several mechanisms which can produce harmful high frequency current through the bearings. A listing of possible counter measures can be seen below:

Counter measure	Remarks
Insulation of NDE bearing	Recommended by TECO for frame size 280 and higher
Inverter filters (dV/dt filter; common mode filter)	
Choice of a low inverter switching frequency	
Use of non-conductive coupling	
Symmetric power cabling and effective motor grounding	

As a simplified rule to avoid problems both with bearing current and winding insulation TECO recommends general precautions according table below (voltage limits according to the insulation system chosen has to be regarded):

TECO general recommendations		
Rated voltage	**Frame size < 250**	**Frame size ≥ 280**
≤ 460 V	Standard motor (Motor cable lengths < 20 m)	Standard motor + Insulated NDE bearing
≤ 600V	Standard motor + dV/dt-filter (reactor) or Reinforced insulation	Standard motor + dV/dt-filter (reactor) + Insulated NDE bearing or Reinforced insulation + Insulated NDE bearing
≤ 690V	Reinforced insulation + dV/dt-filter (reactor)	Reinforced insulation + dV/dt-filter (reactor) + Insulated NDE bearing

Table 5-6: TECO recommendations for general precautions at inverter operation

5.5.6 Electromagnetic compatibility

If induction motors are line operated, the electromagnetic emissions are regarded as negligible (see IEC 60034-1, section 13). The motors meet the limit values of Class B of EN 55011 and therefore can be used both in industrial and residential environment.

If inverter operated the EMC performance can only be considered for the complete drive system (inverter, filters, cabling, motor) as an entity, according to the relevant product standard EN 61800-3 (“Adjustable speed electrical power drive systems; EMC requirements and specific test methods...”).

For this purpose TECO motors e.g. are equipped with a metallic terminal box with cable entries suitable for the use of EMC-compliant cable glands.

5.5.7 Additional acoustic noise

Due to the non-sinusoidal motor voltage the acoustic noise level in general is increased at inverter operation. The increase is depending on the type and technical data of the inverter (at PWM inverters especially the pulse frequency and the pulse generation method) and cannot be stated generally.

Increase at nominal speed:
As a rule of thumb an increase at nominal speed can be expected when fed from inverter:
• approx. 1–3 dB(A) in case of a current source inverter or a PWM inverter with high pulse frequency
• approx. 1–10 dB(A) in case of a customary PWM inverter.

If acoustic noise is a relevant feature in the application, the cast iron version shall be preferred instead of aluminium design.

Speeds higher than nominal speed:
Self ventilated motors are generating an increased fan noise at higher speed. A rough estimation for the increase of overall sound level is shown in the table below (the increase can be minimized by using the option “Forced ventilation”).

	Increase of sound pressure level [dB(A)]			
	50 Hz	60 Hz	75 Hz	100 Hz
2-pole motor	0	4	10	16
4-pole motor	0	3	7	12
6 and 8 pole motor	0	3	6	8

Table 5-7: Acoustic sound increase to be expected at high speed (self ventilated motors)

6 Technical data

6.1 General data; tolerances (acc. to IEC 60034-1)

Rating, Performance	
Product Group, Design standard	Low Voltage Squirrel Cage Induction Motor, IEC 60034
Nominal voltages	3 AC; 230 V–690 V; tolerance see Figure 5-7, page 48
Winding configuration	Star/Delta, 6 winding ends
Winding temperature rise	Less than 80 K acc. Utilization B (by resistance method)
Method of starting	Full Voltage Direct On Line or Star/Delta starting
Nominal frequency	50 Hz or 60 Hz; tolerance according to IEC 60034-1
Inverter Operation	Suitable for inverter operation according to IEC 60034-17
Output range	0,18 kW – 400 kW (50 Hz) or 0,21 kW- 460kW (60 Hz)0,182 kW–400315 kW
Duty type	Continuous (S1); SF 1.0 (data for other duty types on request)
Efficiency	IE3 according to IEC 60034-30
Range of frame size	From 80M up to 355C
Pole numbers	2-poles; 4-poles; 6-poles and 8-poles
Rotational speed (synchronous)	750 rpm–3000 rpm (50 Hz); 900 rpm–3600 rpm (60 Hz)
Operational speed limit	See 5.3.2 Maximum operational speed, starting page 43
Rotational direction	Clockwise acc. IEC definition; suitable for bidirectional operation
Locked rotor torque	Tolerance: –15 %; +25 %
Pull up torque	Tolerance: –15 % (Minimum: 30 % of FLT)
Breakdown torque	>160 % of full load torque; tolerance – 10 % included
Slip	Tolerance: ±30 % for rating < 1 kW; ±20 % for rating ≥ 1 kW
Efficiency η	Tolerance: –0,15 (1–η) for rating < 150 kW; –0,1 (1–η) for rating ≥ 150 kW
Power factor cos φ	Tolerance: (1–cos φ)/6 (min. 0,02; max 0,07)
Locked rotor current	Tolerance: +20 %
Acoustic noise level	Tolerance +3dB(A) acc. to IEC 60034-1
Vibration Level	Level A according to IEC 60034-14

Application, Construction	
Site condition	Shadow, Non-hazardous
Ambient Temperature	–20 °C to +40 °C
Site Altitude	Less than 1000 m
Relative Humidity	Less than 90 % RH (Non-Condensation)
Enclosure	Totally Enclosed (IP55 acc. to IEC)
Cooling Method	Self Ventilated, Surface Cooled, "TEFC" (IC 411 acc. to IEC code)
Mounting	Foot Mounting (B3), Flange Mounting (B5 and B14) and derivatives
Stator Winding	Random Wound, Copper wire, Thermal class F insulation
Rotor Winding	Squirrel cage, Aluminium Conductor
Power Connectors	See section 3.2 Terminal box and cable entry, starting page 21
Bearings, Lubrication	See section 3.4 Rotor assembly (active part, shaft, bearings), starting page 27
Material (housing, end shields)	Cast Iron
Painting	Pebble Grey (RAL 7032)

General tolerances of dimensions (nomenclature acc. dimensional diagram)		
Motor mass	m	–5 %...+10 %
Rotor inertia	J	±10 %
Radial spacing of feet fixing holes	A	±1 mm
Axial spacing of feet fixing holes	B	±1 mm
Shaft height	H	frame ≤ 250: –0,5 mm; frame > 250: –1mm
Pitch circle diameter of flange	M	±0,8 mm
Shaft end diameter	D	see dimensional diagram

6.2 Type data for cast iron version

6.2.1 Cast iron; 400 V; 50 Hz; Class IE3

2-pole

OUTPUT		FULL LOAD rpm	FRAME NO.	EFFICIENCY				POWER FACTOR				CURRENT		TORQUE				ROTOR	APPROX. WEIGHT
HP	kW			FULL LOAD (%)	3/4 LOAD (%)	2/4 LOAD (%)	1/4 LOAD (%)	FULL LOAD (%)	3/4 LOAD (%)	2/4 LOAD (%)	1/4 LOAD (%)	FULL LOAD (A)	LOCKED ROTOR (A)	FULL LOAD N•m	LOCKED ROTOR %FLT	PULL UP %FLT	BREAK DOWN %FLT	J kg-m²	W kg
1	0,75	2875	80M	80,7	78,3	75,1	63,0	84,5	78,0	66,5	46,5	1,59	12	2,491	280	275	335	0,001	17,5
1,5	1,1	2870	80M	82,7	83,0	81,3	73,8	85,0	78,5	66,5	45,0	2,26	18	3,660	300	295	350	0,002	19,5
2	1,5	2850	90S	84,2	85,4	85,8	81,0	90,5	87,0	78,0	57,5	2,84	22	5,026	220	210	300	0,003	25,0
3	2,2	2860	90L	85,9	86,7	86,8	82,2	89,5	85,0	75,5	53,5	4,13	35	7,346	245	235	315	0,004	28,0
4	3	2855	100L	87,1	88,3	88,4	84,9	90,0	86,5	78,5	58,5	5,52	48	10,04	325	310	355	0,006	38,0
5,5	4	2875	112M	88,1	89,0	88,9	85,5	91,0	87,5	80,0	61,0	7,20	69	13,29	270	250	360	0,011	50,0
7,5	5,5	2930	132S	89,2	89,8	89,5	85,5	88,5	86,0	79,5	58,0	10,1	80	17,93	210	205	340	0,019	70,5
10	7,5	2920	132S	90,1	90,9	90,8	87,7	87,0	84,5	77,5	58,5	13,8	100	24,53	210	195	315	0,020	75,0
15	11	2935	160M	91,5	92,5	92,5	89,5	90,0	89,0	83,5	69,5	19,3	150	35,79	230	185	300	0,046	110
20	15	2935	160M	91,9	92,0	92,0	88,0	89,0	85,5	77,5	57,5	26,5	230	48,81	275	230	330	0,051	120
25	18,5	2930	160L	92,4	93,0	93,0	91,0	90,0	89,5	84,0	67,5	32,1	260	60,30	245	200	300	0,059	137
30	22	2940	180M	93,0	93,0	93,0	89,0	87,0	85,0	77,0	53,0	39,2	300	71,46	225	180	300	0,071	178
40	30	2950	200L	93,3	93,5	92,5	91,5	90,0	90,0	86,5	74,0	51,6	400	97,12	200	145	300	0,151	276
50	37	2955	200L	94,0	95,0	94,5	92,5	91,0	90,5	87,0	75,0	62,4	510	119,6	210	145	300	0,188	302
60	45	2960	225M	94,0	94,0	93,5	90,0	91,0	91,0	88,0	70,5	75,9	615	145,2	170	140	300	0,30	333
75	55	2970	250M	95,0	95,0	95,0	92,0	91,5	90,0	86,5	72,0	91,3	735	176,9	165	130	315	0,39	456
100	75	2965	280S	94,7	94,5	93,5	89,7	90,5	89,0	83,0	64,0	126	1000	241,6	220	190	280	0,60	585
125	90	2970	280M	95,0	94,8	94,1	90,5	90,5	89,0	83,5	65,0	151	1250	289,4	220	190	280	0,70	640
150	110	2970	315S	95,2	95,0	94,0	90,0	90,0	89,0	85,0	68,0	185	1515	353,7	220	190	250	1,00	870
175	132	2970	315M	95,4	95,2	94,4	91,4	90,5	89,5	86,5	71,5	221	1670	424,4	220	190	250	1,20	940
215	160	2975	315M	95,6	95,5	94,8	92,0	91,0	91,0	86,5	70,0	265	2140	513,6	230	200	250	1,30	980
270	200	2975	315L	95,8	95,6	95,0	92,0	91,0	91,0	88,0	73,0	331	2550	642,0	230	200	250	1,50	1.150
335	250	2975	315D	95,8	95,8	94,8	91,5	91,0	89,3	85,0	66,0	414	3050	802,5	210	180	250	2,40	1.600
420	315	2975	315D	95,8	95,5	94,7	92,4	91,0	89,5	84,5	66,5	522	3800	1011	210	180	250	2,6	1.750
475	355	2978	355C	95,8	95,5	94,7	92,4	91,5	91,0	87,0	75,5	585	4635	1138	130	110	230	5,0	2.470
503	375	2978	355C	95,8	95,6	94,8	92,5	91,5	91,0	87,0	75,5	617	5000	1203	130	110	230	5,2	2.500
536	400	2978	355C	95,8	95,6	94,8	92,5	91,6	91,2	87,5	75,8	658	5280	1283	130	110	230	5,6	2.550

Note:

- The above are typical values based on tests according to IEC 60034-2-1
- Tolerance according to IEC 60034-1
- Efficiency, power factor, speed and torque are the same for other voltages. Current values vary inversely with voltage

4-pole

OUTPUT		FULL LOAD rpm	FRAME NO.	EFFICIENCY				POWER FACTOR				CURRENT		TORQUE				RO-TOR	APPROX. WEIGHT
HP	kW			FULL LOAD (%)	3/4 LOAD (%)	2/4 LOAD (%)	1/4 LOAD (%)	FULL LOAD (%)	3/4 LOAD (%)	2/4 LOAD (%)	1/4 LOAD (%)	FULL LOAD (A)	LOCKED ROTOR (A)	FULL LOAD N•m	LOCKED ROTOR %FLT	PULL UP %FLT	BREAK DOWN %FLT	J kg-m²	W kg
0,75	0,55	1430	80M	79,0	77,9	74,7	62,8	69,0	58,5	44,5	27,5	1,46	9	3,673	300	270	320	0,002	17,5
1	0,75	1410	80M	82,5	81,8	79,7	71,6	73,5	64,0	50,0	31,5	1,79	11	5,080	315	290	335	0,003	20,5
1,5	1,1	1430	90S	84,1	84,4	83,2	76,5	79,5	71,5	57,5	36,5	2,37	17	7,346	255	205	300	0,005	26,0
2	1,5	1435	90L	85,3	84,1	82,2	74,3	75,0	65,5	51,5	31,5	3,38	26	9,983	300	235	335	0,006	28,0
3	2,2	1450	100L	86,7	87,3	86,9	80,2	81,0	73,5	60,5	37,5	4,52	33	14,49	210	160	300	0,011	38,0
4	3	1455	100L	87,7	87,7	86,2	78,9	78,0	70,5	57,5	36,5	6,33	49	19,69	250	240	335	0,013	40,5
5,5	4	1445	112M	88,6	88,4	87,9	83,0	82,0	76,5	65,5	43,5	7,95	57	26,44	245	205	300	0,021	54,0
7,5	5,5	1455	132S	89,6	90,4	90,3	86,9	85,5	81,0	70,5	49,0	10,4	77	36,10	240	200	300	0,033	74,5
10	7,5	1460	132M	90,4	90,9	90,6	87,2	84,5	79,5	69,0	46,0	14,2	110	49,06	270	225	330	0,043	85,0
15	11	1460	160M	91,4	92,0	91,5	88,0	84,0	80,0	70,0	49,0	20,7	160	71,95	230	185	300	0,091	133
20	15	1460	160L	92,1	92,5	92,5	89,0	84,5	81,0	71,0	49,0	27,8	225	98,12	250	195	300	0,115	138
25	18,5	1475	180M	92,6	94,0	93,0	90,0	81,5	77,0	69,5	46,0	35,4	270	119,8	215	160	280	0,176	183
30	22	1475	180L	93,0	93,5	93,0	90,0	81,0	77,0	71,0	46,5	42,2	315	142,4	210	145	275	0,197	199
40	30	1470	200L	94,1	95,0	95,0	93,0	86,0	84,5	77,0	56,0	53,5	445	194,9	250	205	300	0,363	266
50	37	1480	225S	94,1	95,0	94,5	92,0	85,5	82,0	73,0	50,0	66,4	505	238,8	210	175	300	0,474	333
60	45	1480	225M	94,5	95,0	94,5	92,0	84,5	79,5	70,0	47,0	81,3	600	290,4	210	175	300	0,495	368
75	55	1485	250M	95,0	95,0	94,5	91,0	87,5	84,5	77,0	55,0	95,5	750	353,7	210	185	295	0,978	492
100	75	1485	280S	95,0	95,0	94,5	92,0	88,5	86,0	79,0	58,0	129	1000	482,3	220	190	280	1,500	660
125	90	1485	280M	95,2	95,2	94,5	91,5	88,5	86,5	79,5	59,0	154	1200	578,8	220	190	280	1,700	700
150	110	1480	315S	95,4	95,4	94,8	92,4	88,5	86,5	80,0	59,5	188	1595	709,8	220	190	260	2,200	930
175	132	1485	315M	95,6	95,6	95,2	93,0	89,0	87,5	82,5	64,0	224	1815	848,9	220	190	260	2,60	1.040
215	160	1485	315M	95,8	95,8	95,5	93,5	89,0	87,5	82,5	64,0	271	2225	1029	230	200	260	2,90	1.080
270	200	1485	315L	96,0	96,0	95,6	94,5	89,5	88,5	84,5	68,5	336	2630	1286	230	200	260	3,50	1.250
335	250	1485	315D	96,0	95,8	95,2	92,6	87,0	84,0	76,0	54,5	432	3300	1608	200	170	250	6,90	1.800
420	315	1488	315D	96,0	96,0	95,5	93,5	87,0	84,0	76,0	54,5	544	4050	2022	200	170	260	7,80	2.000
475	355	1488	355C	96,0	96,0	95,5	93,5	89,5	87,8	82,3	63,5	596	4280	2278	200	170	280	9,50	2.500
503	375	1488	355C	96,0	96,0	95,5	93,5	89,5	88,0	82,5	63,8	630	4450	2407	200	170	280	10,00	2.550
536	400	1488	355C	96,0	96,0	95,5	93,5	89,6	88,0	82,5	64,0	671	4975	2567	210	180	280	10,70	2.630

Note:

- The above are typical values based on tests according to IEC 60034-2-1
- Tolerance according to IEC 60034-1
- Efficiency, power factor, speed and torque are the same for other voltages. Current values vary inversely with voltage

6-pole

OUTPUT		FULL LOAD rpm	FRAME NO.	EFFICIENCY				POWER FACTOR				CURRENT		TORQUE				ROTOR	APPROX. WEIGHT
HP	kW			FULL LOAD (%)	3/4 LOAD (%)	2/4 LOAD (%)	1/4 LOAD (%)	FULL LOAD (%)	3/4 LOAD (%)	2/4 LOAD (%)	1/4 LOAD (%)	FULL LOAD (A)	LOCKED ROTOR (A)	FULL LOAD N•m	LOCKED ROTOR %FLT	PULL UP %FLT	BREAK DOWN %FLT	J kg-m²	W kg
0,5	0,37	920	80M	70,0	69,0	64,8	49,9	65,0	54,5	41,5	27,5	1,17	5	3,841	230	210	250	0,002	18,0
0,75	0,55	905	80M	70,0	69,7	66,2	52,1	69,0	58,0	44,5	29,0	1,64	6	5,804	210	195	250	0,003	19,5
1	0,75	935	90S	78,9	80,6	79,4	72,3	71,0	62,5	49,0	30,5	1,93	9	7,660	210	190	250	0,005	27,5
1,5	1,1	930	90L	81,0	81,2	80,5	74,4	72,0	63,5	50,0	31,0	2,72	13	11,30	210	185	240	0,007	30,0
2	1,5	950	100L	82,5	82,9	81,5	73,9	72,5	65,0	52,0	33,0	3,62	18	15,08	210	175	250	0,015	41,0
3	2,2	960	112M	84,3	84,3	82,2	74,0	67,0	59,0	47,0	29,0	5,62	29	21,89	190	180	280	0,021	52,5
4	3	970	132S	85,6	86,1	85,1	79,9	79,5	73,0	60,0	38,0	6,36	41	29,54	195	170	300	0,038	74,0
5,5	4	970	132M	86,8	87,2	86,3	81,5	79,5	72,5	60,0	37,5	8,37	57	39,38	200	185	310	0,051	84,0
7,5	5,5	970	132M	88,0	88,0	86,2	79,4	73,5	65,5	52,0	31,5	12,3	88	54,15	210	205	345	0,054	87,0
10	7,5	970	160M	90,0	91,0	90,0	85,0	79,0	73,0	61,0	39,0	15,2	110	73,84	235	210	300	0,121	110
15	11	970	160L	90,3	91,0	90,5	86,0	78,0	72,0	60,5	38,0	22,5	170	108,3	295	255	300	0,157	138
20	15	970	180L	91,2	92,0	92,0	89,5	82,0	78,0	68,0	46,0	29,0	200	147,7	215	165	255	0,334	205
25	18,5	975	200L	92,0	93,0	93,0	90,0	80,5	76,0	66,5	44,0	36,1	260	181,2	220	185	265	0,457	263
30	22	975	200L	92,2	93,0	93,5	91,0	81,5	77,0	68,0	45,0	42,3	305	215,5	210	185	265	0,520	283
40	30	980	225M	93,0	94,0	94,0	91,0	83,5	80,0	76,5	53,0	55,8	335	292,3	210	160	240	0,756	343
50	37	980	250M	93,3	94,0	94,0	91,0	85,0	81,5	75,0	52,0	67,3	490	360,6	230	200	280	1,048	458
60	45	982	280S	93,7	93,7	93,0	90,0	85,5	82,0	73,5	50,5	81,1	570	437,6	220	190	280	1,800	600
75	55	980	280M	94,1	94,1	93,5	90,5	85,5	82,0	73,0	51,0	98,7	720	536,0	220	190	280	2,100	660
100	75	985	315S	94,6	94,6	94,0	91,4	85,0	81,5	72,0	48,5	135	910	727,2	220	190	250	3,20	850
125	90	985	315M	94,9	94,9	94,6	92,0	85,5	82,0	73,5	50,5	160	1200	872,6	230	200	260	3,80	1.000
150	110	985	315M	95,1	95,2	94,7	92,2	85,5	83,0	75,0	53,0	195	1500	1066	230	200	250	4,60	1.120
175	132	988	315L	95,4	95,5	95,2	93,0	85,0	82,0	73,0	51,0	235	1700	1276	230	200	250	5,10	1.200
215	160	988	315L	95,6	95,6	95,2	93,4	85,0	82,0	74,0	51,0	284	2000	1547	230	200	250	5,80	1.320
270	200	988	315D	95,8	95,8	95,5	93,0	85,0	82,5	75,5	54,5	355	2500	1933	210	180	240	9,80	1.750
335	250	988	315D	95,8	95,8	95,5	93,2	85,0	83,0	75,5	54,0	443	3100	2416	200	170	240	11,60	2.100
420	315	990	355C	95,8	95,8	95,5	93,2	84,5	80,5	71,0	47,0	562	4175	3039	200	170	280	15,70	2.700
475	355	990	355C	95,8	95,8	95,5	93,2	84,5	80,5	71,2	47,0	633	4425	3424	200	170	280	16,20	2.740
503	375	990	355C	95,8	95,8	95,5	93,3	84,5	80,5	71,2	47,2	669	4630	3617	200	170	280	16,90	2.800

Note:

- The above are typical values based on tests according to IEC 60034-2-1
- Tolerance according to IEC 60034-1
- Efficiency, power factor, speed and torque are the same for other voltages. Current values vary inversely with voltage

8-pole

OUTPUT		FULL LOAD rpm	FRAME NO.	EFFICIENCY				POWER FACTOR				CURRENT		TORQUE				RO-TOR	APPROX. WEIGHT
HP	kW			FULL LOAD (%)	3/4 LOAD (%)	2/4 LOAD (%)	1/4 LOAD (%)	FULL LOAD (%)	3/4 LOAD (%)	2/4 LOAD (%)	1/4 LOAD (%)	FULL LOAD (A)	LOCKED ROTOR (A)	FULL LOAD N•m	LOCKED ROTOR %FLT	PULL UP %FLT	BREAK DOWN %FLT	J kg-m²	W kg
0,25	0,18	705	80M	58,7	53,9	46,2	24,4	51.5	43.5	35.5	27.5	0,86	3	2,438	300	275	305	0,003	20,0
0,33	0,25	690	80M	64,1	62,0	56,5	33,6	63,8	53,8	42.5	31.0	0,88	3	3,460	225	210	230	0,004	21,0
0,5	0,37	705	90S	69,3	66,6	62,3	44,6	59.0	48.5	39.0	25.5	1,31	5	5,012	195	175	235	0,004	25,0
0,75	0,55	705	90L	73,0	71,5	68,9	52,7	63.5	53.0	42.5	27.0	1,71	7	7,450	170	150	220	0,006	29,0
1	0,75	700	100L	75,0	74,7	70,9	57,3	60.5	51.0	39.0	24.5	2,39	10	10,23	225	215	235	0,010	36,0
1,5	1,1	695	100L	77,7	78,8	76,8	66,3	66.0	57.0	44.0	27.5	3,10	13	15,12	200	190	210	0,015	44,5
2	1,5	700	112M	79,7	80,2	79,1	64,6	69.5	61.0	48.0	28.5	3,91	18	20,46	165	140	205	0,022	55,5
3	2,2	705	132S	81,9	82,2	79,8	69,0	69,0	60,0	46,5	27,0	5,62	31	29,80	230	205	265	0,034	66,0
4	3	715	132M	83,5	83,2	80,1	68,6	63.0	53.5	40.5	24.0	8,23	47	40,07	280	250	325	0,045	75,0
5,5	4	720	160M	84,8	84,7	82,5	73,5	70,5	62,0	48,5	28,8	9,66	57	53,06	190	170	250	0,086	111
7,5	5,5	720	160M	86,2	85,2	83,3	75,9	71,5	63.0	50,0	29.0	12,9	78	72,95	200	185	275	0,126	130
10	7,5	720	160L	87,3	87,3	85,8	76,4	71,0	64,5	51,0	30,0	17,5	104	99,48	225	215	295	0,168	155
15	11	720	180L	88,6	88,6	88,1	83,2	78.0	73.0	62.0	37.5	23,0	130	145,9	170	150	210	0,318	203
20	15	730	200L	89,6	88,9	87,5	80,2	78,0	72,0	60,0	38,0	31,0	187	196,2	195	170	230	0,520	299
25	18,5	735	225S	91,5	92,0	91,0	86,0	72,0	65,5	58,0	35,5	40,5	220	240,4	210	185	235	0,669	345
30	22	735	225M	92,0	92,0	92,0	88,0	74,5	69,0	63,0	39,5	46,3	240	285,9	210	170	215	0,756	367
40	30	735	250M	92,0	92,0	92,0	88,0	74,5	68,0	58,0	36,0	63,2	350	389,8	210	170	245	1,141	475
50	37	736	280S	92,2	92,3	91,5	88,2	81,0	77,0	67,5	46,0	71,5	455	480,1	150	130	270	2,100	645
60	45	736	280M	92,6	92,6	92,1	89,2	81,0	78,0	68,0	47,0	86,6	540	583,9	150	130	270	2,400	690
75	55	738	315S	93,0	93,0	92,3	89,4	79,0	75,0	63,5	42,0	108	660	711,7	200	180	250	4,00	900
100	75	738	315M	93,7	93,8	93,5	90,4	79,0	75,0	64,5	42,0	146	885	970,5	200	180	250	5,30	1.060
125	90	740	315L	94,0	94,0	93,6	90,5	80,0	76,0	65,5	44,0	173	1160	1161	200	180	250	6,10	1.180
150	110	740	315L	94,5	94,5	94,1	91,0	80,0	76,0	65,5	44,0	210	1300	1420	200	180	260	7,70	1.320
175	132	741	315D	94,6	94,6	94,1	91,0	80,2	76,3	65,0	43,0	251	1606	1701	140	120	270	8,70	1.650
215	160	741	315D	94,8	94,8	94,2	91,2	80,0	75,5	64,0	41,5	305	2035	2062	140	120	275	10,20	1.800
270	200	741	315D	95,0	95,0	94,3	91,3	80,5	76,2	66,0	42,0	377	2445	2578	140	120	270	11,80	1.950
335	250	741	355C	95,0	95,0	94,5	91,7	84,0	81,0	73,0	51,0	452	3000	3222	130	130	270	17,50	2.650
420	315	741	355C	95,2	95,2	94,6	92,0	84,0	81,0	73,0	51,0	569	3870	4060	130	130	270	20,90	2.800

Note:

- The above are typical values based on tests according to IEC 60034-2-1
- Tolerance according to IEC 60034-1
- Efficiency, power factor, speed and torque are the same for other voltages. Current values vary inversely with voltage

6.2.2 Cast iron; 460 V; 60 Hz; Class IE3

2-pole

OUTPUT		FULL LOAD rpm	FRAME NO.	EFFICIENCY				POWER FACTOR				CURRENT		TORQUE				RO-TOR	APPROX. WEIGHT
HP	kW			FULL LOAD (%)	3/4 LOAD (%)	2/4 LOAD (%)	1/4 LOAD (%)	FULL LOAD (%)	3/4 LOAD (%)	2/4 LOAD (%)	1/4 LOAD (%)	FULL LOAD (A)	LOCKED ROTOR (A)	FULL LOAD N•m	LOCKED ROTOR %FLT	PULL UP %FLT	BREAK DOWN %FLT	J kg-m²	W kg
1,15	0,86	3480	80M	81,6	80,5	76,7	65,1	84,0	78,0	67,0	48,0	1,57	14	2,360	295	285	370	0,001	17,5
1,7	1,27	3470	80M	84,0	83,9	81,6	72,9	85,5	79,5	68,0	47,0	2,22	19	3,495	320	310	365	0,002	19,5
2,32	1,73	3455	90S	85,5	86,7	86,5	81,5	90,0	86,0	77,5	58,0	2,82	23	4,782	295	210	300	0,003	25,0
3,39	2,53	3460	90L	86,5	87,4	87,0	82,3	89,5	85,5	76,5	55,0	4,10	38	6,983	320	235	315	0,004	28,0
4,62	3,45	3450	100L	88,5	89,4	89,2	84,6	90,0	87,5	80,0	51,5	5,44	47	9,550	295	285	335	0,006	38,0
6,17	4,6	3470	112M	89,5	90,2	89,9	85,7	91,5	88,5	81,5	62,5	7,05	68	12,66	255	250	325	0,011	50,0
8,49	6,33	3530	132S	89,5	89,7	88,9	84,2	87,5	85,0	78,5	60,0	10,1	79	17,13	210	205	300	0,019	70,5
11,5	8,6	3520	132S	90,2	90,7	90,2	86,8	87,5	85,5	79,0	62,0	13,7	100	23,33	210	200	300	0,020	75,0
17	12,7	3525	160M	91,0	91,0	90,1	85,0	92,0	91,0	87,5	75,0	19,0	155	34,41	215	190	300	0,046	110
23	17,3	3535	160M	91,7	92,0	91,5	87,3	91,0	89,0	84,0	66,0	26,0	225	46,74	305	255	340	0,051	120
28,5	21,3	3525	160L	91,7	92,4	92,3	89,0	93,0	90,5	86,5	72,0	31,3	265	57,71	255	210	300	0,059	137
34	25,3	3540	180M	91,7	92,0	91,3	87,7	90,5	86,0	79,0	60,0	38,3	311	68,25	250	200	300	0,071	178
46	34,5	3545	200L	93,0	92,9	92,0	87,5	91,0	90,5	88,0	78,0	51,2	400	92,94	200	160	220	0,151	276
57	42,6	3550	200L	93,6	93,8	93,6	90,2	91,0	91,0	88,0	78,0	62,8	510	114,6	205	150	255	0,188	302
69,5	52	3560	225M	93,6	93,6	92,8	88,4	93,0	93,0	92,5	80,0	75,0	620	139,5	180	175	300	0,297	333
84,5	63	3565	250M	93,6	93,9	93,3	90,8	92,5	92,0	88,5	75,5	91,3	740	168,8	210	160	300	0,386	456
115	86	3570	280S	94,5	94,5	93,8	90,8	91,0	89,5	84,5	66,5	126	1000	230,1	220	190	270	0,600	585
140	104	3570	280M	95,0	94,8	94,2	90,5	91,0	89,5	84,5	67,0	151	1250	278,2	220	190	280	0,700	640
170	127	3575	315S	95,0	94,5	93,0	88,5	90,0	89,5	86,5	71,5	186	1475	339,3	220	190	250	1,000	870
204	152	3575	315M	95,1	94,8	93,6	89,8	90,5	89,5	87,5	74,0	222	1650	406,0	220	190	250	1,200	940
247	184	3577	315M	95,8	95,4	94,4	91,0	92,0	91,0	88,0	73,5	262	2100	491,2	230	200	250	1,300	980
308	230	3575	315L	95,8	95,6	94,5	91,5	92,0	91,0	89,0	77,0	328	2500	614,4	230	200	250	1,500	1.150
385	288	3575	315D	95,8	95,5	94,4	90,8	91,5	90,5	86,5	70,0	412	3050	769,3	210	180	250	2,400	1.600
485	362	3575	315D	96,0	95,8	94,6	91,5	91,5	90,5	86,5	71,0	517	3750	967,0	210	180	250	2,60	1.750
547	408	3577	355C	96,0	95,8	94,8	92,0	91,5	91,0	87,0	76,5	583	4470	1089	110	100	220	5,00	2.470
578	431	3577	355C	96,0	95,8	94,8	92,2	91,5	91,0	87,2	77,0	616	4820	1151	110	100	220	5,20	2.500
617	460	3577	355C	96,0	95,8	94,8	92,3	91,5	91,0	87,5	77,2	657	5100	1228	110	100	220	5,60	2.550

Note:

- The above are typical values based on tests according to IEC 60034-2-1
- Tolerance according to IEC 60034-1
- Efficiency, power factor, speed and torque are the same for other voltages. Current values vary inversely with voltage

(*) Efficiency, per TECO performance standard (Not IE3)

4-pole

OUTPUT		FULL LOAD rpm	FRAME NO.	EFFICIENCY				POWER FACTOR				CURRENT		TORQUE				RO-TOR	APPROX. WEIGHT
HP	kW			FULL LOAD (%)	3/4 LOAD (%)	2/4 LOAD (%)	1/4 LOAD (%)	FULL LOAD (%)	3/4 LOAD (%)	2/4 LOAD (%)	1/4 LOAD (%)	FULL LOAD (A)	LOCKED ROTOR (A)	FULL LOAD N•m	LOCKED ROTOR %FLT	PULL UP %FLT	BREAK DOWN %FLT	J kg-m²	W kg
0,84	0,63	1725	80M	80,0	78,8	74,3	61,3	70,0	62,5	48,0	30,5	1,41	9	3,488	325	295	355	0,002	17,5
1,15	0,86	1710	80M	84,0	83,6	81,4	73,6	74,0	65,0	51,0	32,0	1,74	12	4,808	370	340	355	0,003	20,5
1,7	1,27	1730	90S	85,5 (*)	86,1	84,6	78,0	78,0	70,5	57,5	37,5	2,39	17	7,011	250	195	300	0,005	26,0
2,32	1,73	1735	90L	85,5(*)	85,7	83,9	76,9	75,5	67,0	53,0	33,0	3,36	25	9,522	280	220	330	0,006	28,0
3,39	2,53	1760	100L	88,5 (*)	88,1	86,9	79,2	74,5	65,5	52,0	32,0	4,82	41	13,73	245	195	350	0,011	38,0
4,62	3,45	1750	100L	88,5(*)	88,5	87,1	80,7	79,5	72,5	60,0	38,5	6,15	50	18,83	225	220	340	0,013	40,5
6,17	4,6	1740	112M	88,5 (*)	89,2	88,8	84,3	82,0	77,5	67,0	45,5	7,96	57	25,25	220	175	300	0,021	54,0
8,49	6,33	1755	132S	91,7	92,1	91,9	88,0	85,5	81,0	71,0	48,5	10,1	78	34,45	255	205	330	0,033	74,5
11,5	8,6	1760	132M	91,7	92,2	91,9	88,7	85,5	81,0	71,0	49,0	13,8	113	46,66	285	235	350	0,043	85,0
17	12,7	1760	160M	92,4	93,0	92,9	90,1	87,0	84,0	76,0	55,0	19,8	165	68,91	255	240	355	0,091	133
23	17,3	1755	160L	93,0 (*)	93,5	93,4	90,9	87,0	84,0	76,0	55,0	26,8	225	94,14	285	280	385	0,115	138
28,5	21,3	1770	180M	93,6	94,0	93,5	90,1	82,5	79,0	71,0	49,5	34,6	265	114,9	230	225	355	0,176	183
34	25,3	1770	180L	93,6	94,0	93,5	90,3	82,0	79,0	71,0	49,0	41,4	310	136,5	235	230	355	0,197	199
46	34,5	1770	200L	94,1	94,5	94,3	92,3	89,0	87,0	81,5	64,5	51,7	410	186,1	210	195	300	0,363	266
57	42,6	1780	225S	94,5 (*)	94,7	94,1	90,4	86,0	83,0	75,5	54,0	65,8	510	228,6	210	190	310	0,474	333
69,5	52	1775	225M	94,5 (*)	94,5	94,1	90,9	86,0	83,5	76,5	55,5	80,3	620	279,8	235	200	295	0,495	368
84,5	63	1780	250M	95,0 (*)	95,0	94,2	90,6	88,0	85,5	78,5	57,0	94,6	755	338,0	240	205	300	0,978	492
115	86	1780	280S	95,0 (*)	95,0	94,2	90,6	89,0	88,0	82,5	63,5	128	1000	461,4	220	190	270	1,500	660
140	104	1780	280M	95,4 (*)	95,4	94,5	91,5	89,5	88,5	83,0	64,0	153	1200	558,0	220	190	280	1,700	700
170	127	1785	315S	95,6 (*)	95,5	94,7	92,0	89,5	88,5	82,5	64,5	186	1565	679,5	220	190	260	2,200	930
204	152	1785	315M	95,8 (*)	95,6	95,0	92,6	89,5	88,5	84,5	68,0	223	1800	813,2	220	190	260	2,60	1.040
247	184	1785	315M	95,8 (*)	95,6	95,0	92,6	89,5	88,5	84,5	68,0	269	2200	984,4	230	200	260	2,90	1.080
308	230	1785	315L	95,8 (*)	95,8	95,5	93,6	90,0	89,5	86,0	71,5	335	2600	1231	230	200	250	3,50	1.250
385	288	1788	315D	96,0(*)	95,8	95,0	92,2	88,0	85,5	78,5	58,5	428	3240	1538	200	170	250	6,90	1.800
485	362	1788	315D	96,2	96,2	95,6	93,3	88,0	85,5	79,0	59,0	537	3980	1934	200	170	250	7,80	2.000
547	408	1788	355C	96,2	96,1	95,5	93,4	90,0	88,5	83,5	67,0	591	4240	2179	200	170	270	9,50	2.500
578	431	1788	355C	96,2	96,1	95,5	93,5	90,0	88,5	84,0	67,5	625	4390	2302	200	170	260	10,00	2.550
617	460	1788	355C	96,2	96,2	95,6	93,6	90,0	88,5	84,0	87,5	667	4940	2457	205	175	280	10,70	2.630

Note:

- The above are typical values based on tests according to IEC 60034-2-1
- Tolerance according to IEC 60034-1
- Efficiency, power factor, speed and torque are the same for other voltages. Current values vary inversely with voltage

(*) Efficiency, per TECO performance standard (Not IE3)

6-pole

OUTPUT		FULL LOAD rpm	FRAME NO.	EFFICIENCY				POWER FACTOR				CURRENT		TORQUE				ROTOR	APPROX. WEIGHT
HP	kW			FULL LOAD (%)	3/4 LOAD (%)	2/4 LOAD (%)	1/4 LOAD (%)	FULL LOAD (%)	3/4 LOAD (%)	2/4 LOAD (%)	1/4 LOAD (%)	FULL LOAD (A)	LOCKED ROTOR (A)	FULL LOAD N•m	LOCKED ROTOR %FLT	PULL UP %FLT	BREAK DOWN %FLT	J kg-m²	W kg
0,58	0,43	1120	80M	76,0	76,4	73,1	59,5	64,5	55,0	42,5	27,0	1,10	5	3,667	225	220	255	0,010	18,0
0,84	0,63	1110	80M	76,0	76,4	73,5	60,2	66,5	57,0	44,0	28,0	1,56	7	5,420	210	205	240	0,012	19,5
1,15	0,86	1140	90S	82,5(*)	83,8	82,7	73,0	70,5	62,0	48,5	30,0	1,86	10	7,204	195	170	250	0,022	27,5
1,7	1,27	1130	90L	82,5	83,3	82,6	77,3	72,0	64,0	50,5	31,5	2,68	13	10,73	185	165	235	0,026	30,0
2,32	1,73	1150	100L	84,0 (*)	84,2	82,7	75,5	73,0	65,5	53,0	34,0	3,54	18	14,37	200	155	240	0,058	41,0
3,39	2,53	1155	112M	86,5 (*)	86,5	84,7	77,5	67,5	60,0	48,0	30,0	5,44	28	20,92	165	160	270	0,083	52,5
4,62	3,45	1165	132S	89,5	89,5	88,1	82,7	77,0	70,0	57,5	37,0	6,28	41	28,28	190	165	300	0,154	74,0
6,17	4,6	1170	132M	90,2 (*)	90,4	88,9	83,8	77,5	70,5	57,5	37,0	8,26	61	37,55	210	170	300	0,205	84,0
8,49	6,33	1170	132M	90,2 (*)	90,0	88,6	82,6	74,5	67,0	53,5	33,0	11,8	87	51,67	210	185	330	0,216	87,0
11,5	8,6	1170	160M	91,0	91,5	91,0	86,4	80,0	75,0	64,5	42,5	14,8	110	70,20	235	210	300	0,483	110
17	12,7	1170	160L	91,7	92,0	91,7	87,4	81,0	76,0	65,5	42,0	21,5	171	103,7	245	220	300	0,628	138
23	17,3	1165	180L	91,7 (*)	92,3	92,6	89,7	83,5	80,5	73,0	51,0	28,4	205	141,8	225	200	280	1,337	205
28,5	21,3	1175	200L	93,0	93,4	93,3	90,0	82,0	78,0	69,5	48,0	35,1	270	173,1	255	195	260	1,829	263
34	25,3	1175	200L	93,0	93,5	93,5	90,5	82,0	79,0	71,0	49,0	41,6	320	205,6	245	190	250	2,078	283
46	34,5	1175	225M	93,0 (*)	93,7	93,7	90,6	87,0	86,0	81,0	61,0	53,5	340	280,4	175	120	210	3,023	343
57	42,8	1180	250M	94,1 (*)	94,3	94,0	90,7	87,5	86,0	80,0	59,0	64,9	500	344,8	220	195	250	4,194	458
69,5	52	1185	280S	94,5	94,5	93,5	90,5	86,0	83,5	76,0	54,5	80,3	575	419,1	220	190	270	7,200	600
84,5	63	1185	280M	94,5	94,5	93,7	91,0	86,0	83,4	75,7	53,5	97,3	720	507,7	220	190	270	8,400	660
115	86	1185	315S	95,0	95,0	94,4	91,6	86,0	84,0	77,0	56,5	132	900	693,1	220	190	250	12,80	850
140	104	1185	315M	95,2 (*)	95,2	94,5	91,7	86,0	83,0	75,5	54,0	159	1200	838,1	220	190	250	15,20	1.000
170	127	1188	315M	95,4 (*)	95,4	95,0	92,5	86,5	84,5	77,5	57,0	193	1420	1021	230	200	250	18,40	1.120
204	152	1188	315L	95,8	95,8	95,3	93,0	86,5	84,0	76,5	55,5	230	1650	1276	230	200	250	20,40	1.200
247	184	1188	315L	95,8	95,9	95,4	93,0	86,5	84,0	77,0	56,5	279	2050	1547	230	200	250	23,20	1.320
308	230	1188	315D	95,8	95,8	95,5	92,5	85,5	83,5	77,0	58,0	352	2450	1933	210	180	220	39,20	1.750
385	288	1188	315D	95,8	95,8	95,4	93,0	85,5	83,5	77,5	58,5	441	3100	2416	200	170	220	46,40	2.100
485	362	1190	355C	95,8	95,8	95,3	92,6	85,5	83,0	74,0	52,5	555	4065	3039	200	170	280	62,80	2.700
547	408	1190	355C	95,8	95,8	95,3	92,8	85,6	83,2	75,0	54,0	624	4310	3424	180	160	260	64,80	2.740
578	431	1190	355C	95,8	95,8	95,3	93,0	85,6	83,2	75,5	54,8	660	4505	3617	180	160	260	67,60	2.800

Note:

- The above are typical values based on tests according to IEC 60034-2-1
- Tolerance according to IEC 60034-1
- Efficiency, power factor, speed and torque are the same for other voltages. Current values vary inversely with voltage

8-pole

OUTPUT		FULL LOAD rpm	FRAME NO.	EFFICIENCY				POWER FACTOR				CURRENT		TORQUE				ROTOR	APPROX. WEIGHT
HP	kW			FULL LOAD (%)	3/4 LOAD (%)	2/4 LOAD (%)	1/4 LOAD (%)	FULL LOAD (%)	3/4 LOAD (%)	2/4 LOAD (%)	1/4 LOAD (%)	FULL LOAD (A)	LOCKED ROTOR (A)	FULL LOAD N•m	LOCKED ROTOR %FLT	PULL UP %FLT	BREAK DOWN %FLT	J kg-m²	W kg
0,28	0,21	860	80M	61,5	57,1	48,4	29,9	45.0	38.5	31.5	22.5	0,95	4	2,332	320	315	335	0,003	20,0
0,39	0,29	840	80M	68,0	65,6	59,3	41,2	58.0	49.5	39.0	26.0	0,92	4	3,297	210	205	220	0,004	21,0
0,58	0,43	855	90S	72,0	71,3	67,2	49,0	62.0	53.0	41.5	26.5	1,21	5	4,803	165	155	220	0,004	25,0
0,84	0,63	855	90L	74,0	74,0	71,5	54,8	65.0	56.5	44.0	27.5	1,64	7	7,037	155	145	210	0,006	29,0
1,15	0,86	855	100L	75,5	75,5	73,6	63,8	63.5	54,2	41.0	25.5	2,25	11	9,606	185	170	230	0,010	36,0
1,7	1,27	850	100L	78,5(*)	79,5	78,8	71,4	68.0	59.0	46.0	28.0	2,99	14	14,27	165	155	210	0,015	44,5
2,32	1,73	855	112M	79,6 (*)	81,4	81,1	69,1	69.0	61.0	48.0	29.0	3,95	20	19,32	150	110	220	0,022	55,5
3,39	2,53	855	132S	84,6 (*)	85,3	83,8	74,6	65.5	56.0	43.0	25.0	5,73	33	28,26	240	220	290	0,034	66,0
4,62	3,45	860	132M	85,7	86,0	84,1	74,5	62.0	52.5	39.5	23.0	8,15	50	38,31	275	250	335	0,045	75,0
6,17	4,6	870	160M	86,5	86,8	85,8	79,3	67.0	57.5	44.0	26.0	9,96	59	50,49	210	195	285	0,086	111
8,49	6,33	870	160M	86,5	87,0	86,5	81,6	69.5	61.0	47.5	28.0	13,2	75	69,48	200	190	270	0,126	130
11,5	8,6	870	160L	89,5	89,9	89,2	83,8	69.0	60.0	46.5	28.0	17,5	105	94,40	215	200	280	0,168	155
17	12,7	870	180L	89,5(*)	90,9	91,0	85,4	82.0	79.0	69.5	42.0	21,7	127	139,4	165	150	200	0,318	203
23	17,3	870	200L	88,7	90,1	90,6	83,9	80.5	76.5	66.5	40.0	30,4	182	189,9	200	180	220	0,520	299
28,5	21,3	880	225S	92,0	92,5	92,0	87,5	76,5	72,0	61,5	40,0	38,0	196	231,2	200	140	235	0,669	345
34	25,3	880	225M	92,0	92,5	92,0	88,0	78,0	75,0	66,0	45,0	44,3	208	274,6	180	150	250	0,756	367
46	34,5	885	250M	93,0	93,0	93,0	89,0	79,0	74,5	64,5	41,0	58,9	295	372,3	180	130	225	1,141	475
57	42,6	885	280S	92,8	92,8	92,0	88,0	81,5	78,5	70,0	48,0	70,7	455	459,7	125	105	240	2,100	645
69,5	52	885	280M	93,6	93,6	92,5	88,4	82,0	79,0	71,0	49,0	85,0	550	561,1	120	100	230	2,400	690
84,5	63	887	315S	93,6	93,6	92,6	89,0	81,5	79,0	71,0	50,0	104	600	678,3	130	110	220	4,00	900
115	86	886	315M	94,1	94,1	93,0	89,5	81,5	79,5	70,0	51,0	141	800	927,0	130	110	220	5,30	1.060
140	104	886	315L	94,2	94,2	93,2	90,1	81,5	79,5	72,0	51,5	170	920	1121	135	115	220	6,10	1.180
170	127	888	315L	94,5	94,5	93,6	90,8	81,5	79,5	72,0	51,5	207	1250	1366	140	120	220	7,70	1.320
204	152	888	315D	95,0	95,0	94,2	91,0	81,5	78,5	69,5	47,0	246	1540	1635	120	100	240	8,70	1.650
247	184	888	315D	95,0	95,0	94,5	91,0	81,5	78,5	70,0	46,0	298	1932	1979	100	80	250	10,20	1.800
308	230	888	315D	95,1	95,1	94,5	91,5	82,0	79,0	72,0	48,0	370	2310	2474	100	80	240	11,80	1.950
385	288	888	355C	95,1	95,1	94,6	92,0	84,5	82,2	75,0	54,5	450	3000	3097	100	100	240	17,50	2.650
485	362	888	355C	95,2	95,2	94,7	92,3	84,7	82,2	75,0	54,5	563	3800	3893	110	110	250	20,90	2.800

Note:

- The above are typical values based on tests according to IEC 60034-2-1
- Tolerance according to IEC 60034-1
- Efficiency, power factor, speed and torque are the same for other voltages. Current values vary inversely with voltage

7 Outline drawings

7.1 Cast iron design

7.1.1 Cast iron design; feet version (B3)

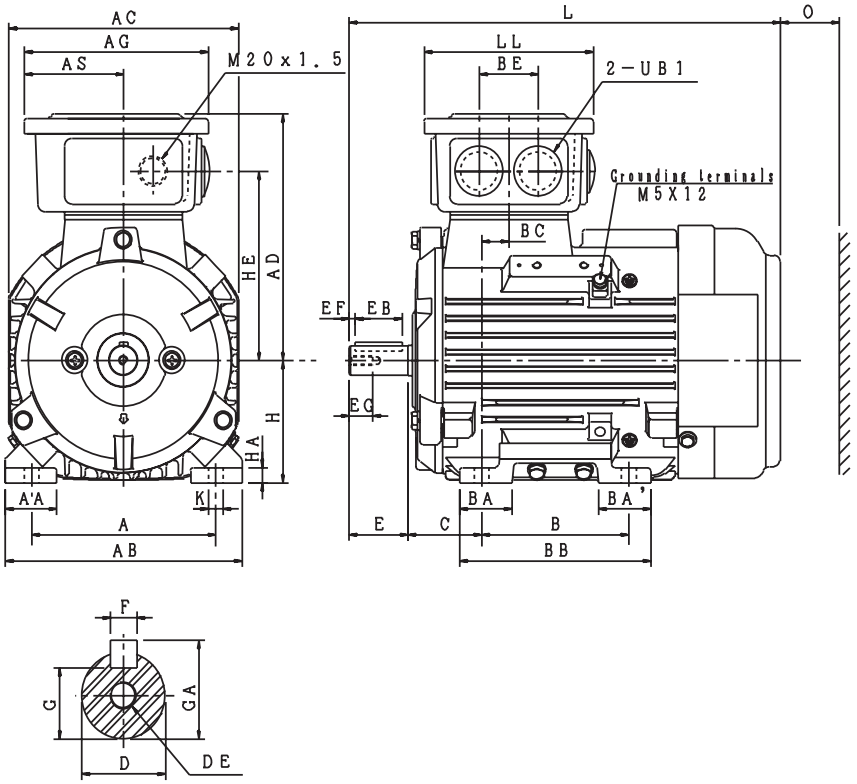


Figure 7-4: Outline drawing of cast iron design, feet version, mounting B3; frame size 80M – 112M

FRAME SIZE	Outline drawing of cast iron design, feet version, mounting B3; frame size 80M – 112M, dimensions in [mm]																	
	A	AA	AB	AC	AD	AG	AS	B	B'	BA	BA'	BB	BC	BE	C	H	HA	HE
80M	125	35	161	156	161	125	67.5	100	--	35.5	35.5	130	18.5	40	50	80	10	123.5
90S	140	40	180	176	171	125	67.5	100	--	33	33	125	36	40	56	90	10	133.5
90L	140	40	180	176	171	125	67.5	125	100	33	58	150	36	40	56	90	10	133.5
100L	160	40	200	196	191	147	78.5	140	--	43.5	43.5	176	21	50	63	100	12	157
112M	190	50	235	218	198.5	147	78.5	140	--	45.5	45.5	176	28	50	70	112	13	164.5

FRAME SIZE	K	L	LL	O	UB1	SHAFT EXTENSION									BEARING	
						D	E	EB	EF	EG	F	G	GA	DB	DRIVE END	OPPOSITE DRIVE END
80M	10	293	115	40	M25X1.5	19	40	32	4	16	6	15.5	21.5	M6	6204ZZC3	6204ZZC3
90S	10	344.5	115	40	M25X1.5	24	50	40	5	19	8	20	27	M8	6205ZZC3	6205ZZC3
90L	10	369.5	115	40	M25X1.5	24	50	40	5	19	8	20	27	M8	6205ZZC3	6205ZZC3
100L	12	392	125	50	M32X1.5	28	60	50	5	22	8	24	31	M10	6206ZZC3	6206ZZC3
112M	12	412.5	125	50	M32X1.5	28	60	50	5	22	8	24	31	M10	6306ZZC3	6306ZZC3

NOTE: 1. Tolerance of shaft end diameter D : Under ψ19 ÷ ψ28 : j6.
2. Tolerance of shaft center high H : +0, -0.5.

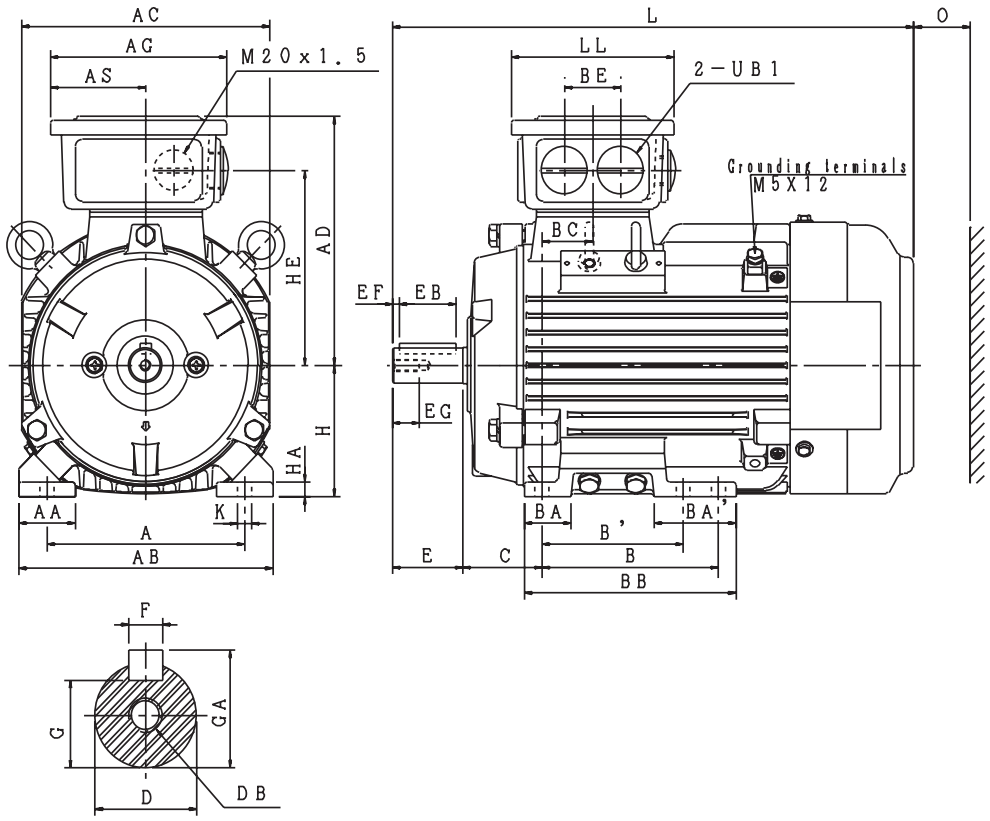


Figure 7-4: Outline drawing of cast iron design, feet version, mounting B3; frame size 80M – 112M

FRAME SIZE	Outline drawing of cast iron design, feet version, mounting B3; frame size 132, dimensions in [mm]																	
	A	AA	AB	AC	AD	AG	AS	B	B'	BA	BA'	BB	BC	BE	C	H	HA	HE
132S	216	63.5	259	258	216	147	78.5	140	--	59	59	184	6	50	89	132	16	182
132M	216	63.5	259	258	216	147	78.5	178	140	59	97	222	6	50	89	132	16	182

FRAME SIZE	utline drawing of cast iron design, feet version, mounting B3; frame size 132, dimensions in [mm]															
	K	L	LL	O	UB1	SHAFT EXTENSION									BEARING	
						D	E	EB	EF	EG	F	G	GA	DB	DRIVE END	OPPOSITE DRIVE END
132S	12	466	125	50	M32X1.5	38	80	70	5	28	10	33	41	M12	6308ZZC3	6306ZZC3
132M	12	504	125	50	M32X1.5	38	80	70	5	28	10	33	41	M12	6308ZZC3	6306ZZC3

NOTE: 1. Tolerance of shaft end diameter D : Under ψ19 ÷ ψ38 : k6.
2. Tolerance of shaft center high H : +0, -0.5.

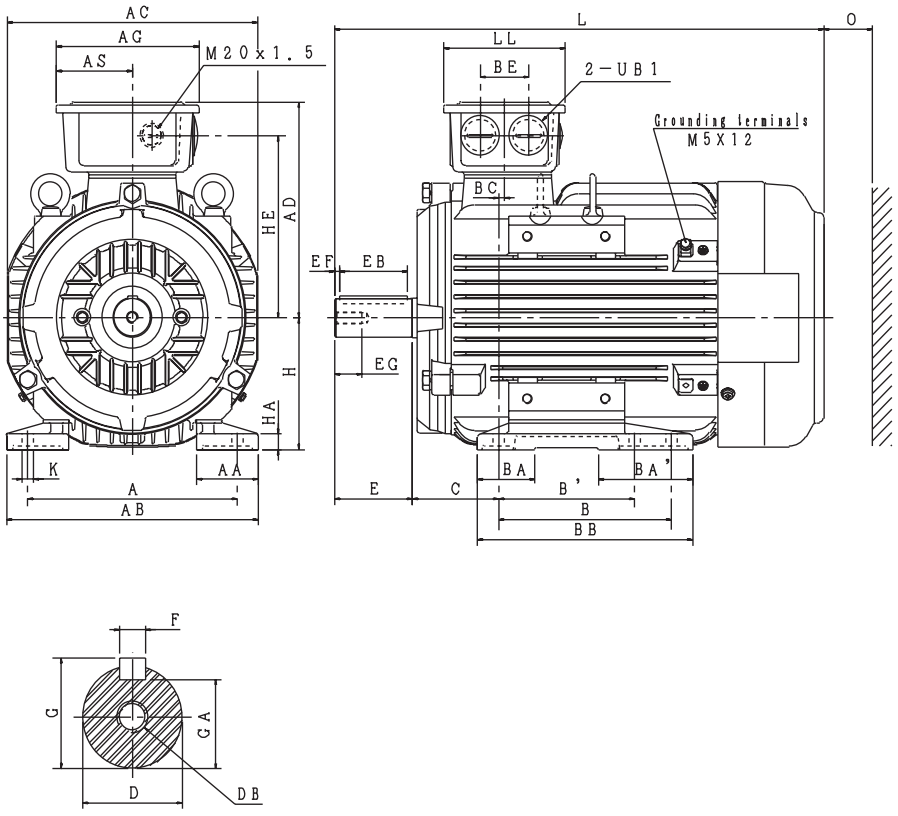


Figure 7-6: Outline drawing of cast iron design, feet version, mounting B3; frame size 160M – 180L

FRAME SIZE	Outline drawing of cast iron design, feet version, mounting B3; frame size 160M-180L, dimensions in [mm] Dimension in mm																	
	A	AA	AB	AC	AD	AG	AS	B	B'	BA	BA'	BB	BC	BE	C	H	HA	HE
160M	254	71	300	317	271	193	91.5	210	---	66	66	256	38	89	108	160	18	215
160L	254	71	300	317	271	193	91.5	254	210	66	110	300	38	89	108	160	18	215
180M	279	72	330	354	297	193	91.5	241	---	68.5	68.5	292	34	89	121	180	20	241
180L	279	72	330	354	297	193	91.5	279	241	68.5	106.5	330	34	89	121	180	20	241

FRAME SIZE	HE'	K	L	LL	O	UB	SHAFT EXTENSION									BEARING	
							D	E	EB	EF	EG	F	G	GA	DB	DRIVE END	OPPOSITE DRIVE END
160M	234.5	14.5	608	193	60	M40 x 1.5	42	110	100	5	36	12	37	45	M16	6309ZZC3	6307ZZC3
160L	234.5	14.5	652	193	60	M40 x 1.5	42	110	100	5	36	12	37	45	M16	6309ZZC3	6307ZZC3
180M	260.5	14.5	672	193	70	M40 x 1.5	48	110	100	5	36	14	42.5	51.5	M16	6311C3	6310C3
180L	260.5	14.5	710	193	70	M40 x 1.5	48	110	100	5	36	14	42.5	51.5	M16	6311C3	6310C3

NOTE: 1. Tolerance of shaft end diameter D : ψ 42÷48 :k6.
2. Tolerance of shaft center high H : +0, -0.5.

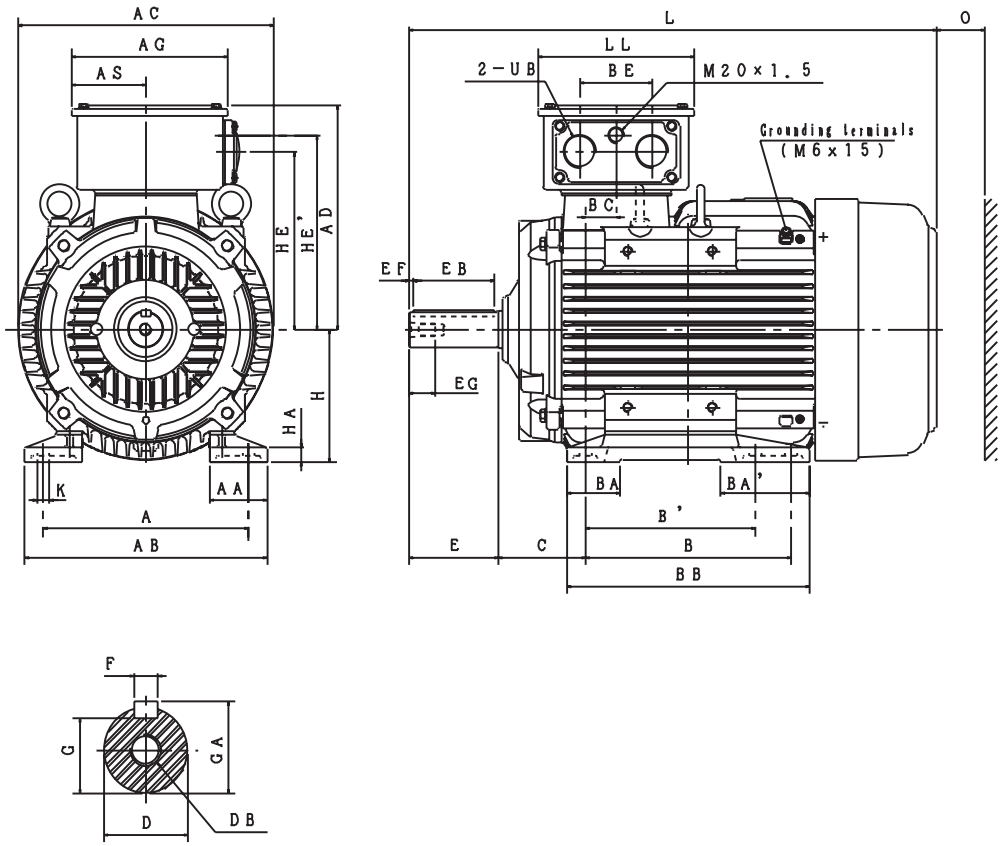


Figure 7-7: Outline drawing of cast iron design, feet version, mounting B3; frame size 200L – 250M

Outline drawing of cast iron design, feet version, mounting B3; frame size 132, dimensions in [mm]																					
Output (kW)				FRAME SIZE	A	AA	AB	AC	AD	AG	AS	B	B'	BA	BA'	BB	BC	BE	C	H	HA
2P	4P	6P	8P																		
30 37	30	18.5 22	15	200L	318	88	378	398	330	231	110.5	305	---	90	90	365	53	106	133	200	24
---	37	---	18.5	225SC	356	94	416	449	356	231	110.5	286	---	90	90	350	30.5	106	149	225	28
45	---	---	---	225MA	356	94	416	449	356	231	110.5	311	286	90	115	375	30.5	106	149	225	28
---	45	30	22	225MC	356	94	416	449	356	231	110.5	311	286	90	115	375	30.5	106	149	225	28
55	---	---	---	250MA	406	112	480	498	398	255	122.5	349	---	105	105	425	45.5	119	168	250	30
---	55	37	30	250MC	406	112	480	498	398	255	122.5	349	---	105	105	425	45.5	119	168	250	30

FRAME SIZE	HE	HE'	K	L	LL	O	UB	SHAFT EXTENSION									BEARING	
								D	E	EB	EF	EG	F	G	GA	DB	DRIVE END	OPPOSITE DRIVE END
200L	262	289	18.5	770	231	80	M50 x 1.5	55	110	100	5	42	16	49	59	M20	6312C3	6212C3
225SC	288	315	18.5	816	231	90	M50 x 1.5	60	140	125	7.5	42	18	53	64	M20	6313C3	6213C3
225MA	288	315	18.5	811	231	90	M50 x 1.5	55	110	100	5	42	16	49	59	M20	6312C3	6212C3
225MC	288	315	18.5	841	231	90	M50 x 1.5	60	140	125	7.5	42	18	53	64	M20	6313C3	6213C3
250MA	322	349	24	921	255	105	M63 x 1.5	60	140	125	7.5	42	18	53	64	M20	6313C3	6313C3
250MC	322	349	24	921	255	105	M63 x 1.5	65	140	125	7.5	42	18	58	69	M20	6315C3	6313C3

NOTE: 1. Tolerance of shaft end diameter D : ψ 55÷65 :m6
2. Tolerance of shaft center high H : +0, -0.5.

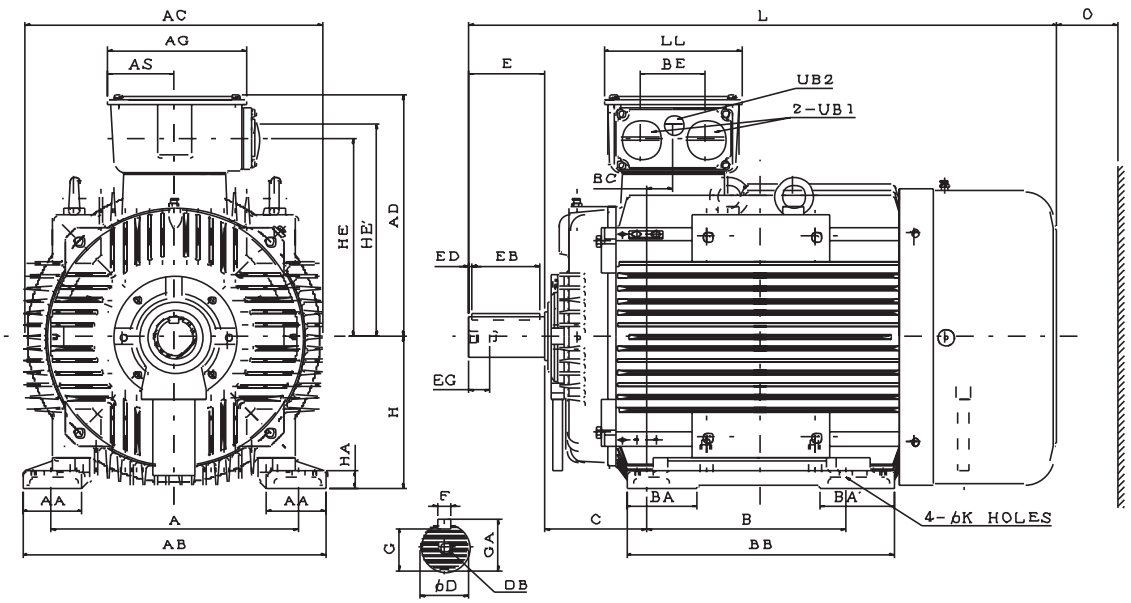


Figure 7-8: Outline drawing of cast iron design, feet version, mounting B3; frame size 280

Outline drawing of cast iron design, feet version, mounting B3; frame size 280S-280M, dimensions in [mm]																						
Output (kW)				FRAME SIZE	A	AA	AB	AC	AD	AG	AS	B	B'	BA	BA'	BB	BC	BE	C	H	HA	HE	HE'
2P	4P	6P	8P																				
75	---	---	---	280SA	457	110	560	550	446	255	122.5	368	---	130	130	445	48	119	190	280	32	367	394
---	75	45	37	280SB	457	110	560	550	446	255	122.5	368	---	130	130	445	48	119	190	280	32	367	394
---	75	45	37	280SC	457	110	560	550	446	255	122.5	368	---	130	130	445	48	119	190	280	32	367	394
90	---	---	---	280MA	457	110	560	550	446	255	122.5	419	---	130	137	495	48	119	190	280	32	367	394
---	90	55	45	280MB	457	110	560	550	446	255	122.5	419	---	130	137	495	48	119	190	280	32	367	394
---	90	55	45	280MC	457	110	560	550	446	255	122.5	419	---	130	137	495	48	119	190	280	32	367	394

FRAME SIZE	K	L	LL	O	UB1	UB2	SHAFT EXTENSION									BEARING	
							E	E	EB	EF	EG	F	G	GA	DB	DRIVE END	OPPOSITE DRIVE END
280SA	24	1037	255	140	M63X1.5	M20X1.5	65	140	125	7.5	42	18	58	69	M20	6316C3	6314C3
280SB	24	1037	255	140	M63X1.5	M20X1.5	75	140	125	7.5	42	20	67.5	79.5	M20	6318C3	6316C3
280SC	24	1037	255	140	M63X1.5	M20X1.5	75	140	125	7.5	42	20	67.5	79.5	M20	NU318	6316C3
280MA	24	1087.5	255	140	M63X1.5	M20X1.5	65	140	125	7.5	42	18	58	69	M20	6316C3	6314C3
280MB	24	1087.5	255	140	M63X1.5	M20X1.5	75	140	125	7.5	42	20	67.5	79.5	M20	6318C3	6316C3
280MC	24	1087.5	255	140	M63X1.5	M20X1.5	75	140	125	7.5	42	20	67.5	79.5	M20	NU318	6316C3

NOTE: 1.Tolerance of shaft end diameter D: ψ 65÷75 : m6
2.Tolerance of shaft center high H:+0, -1
3.Tollerance of key width F: h9

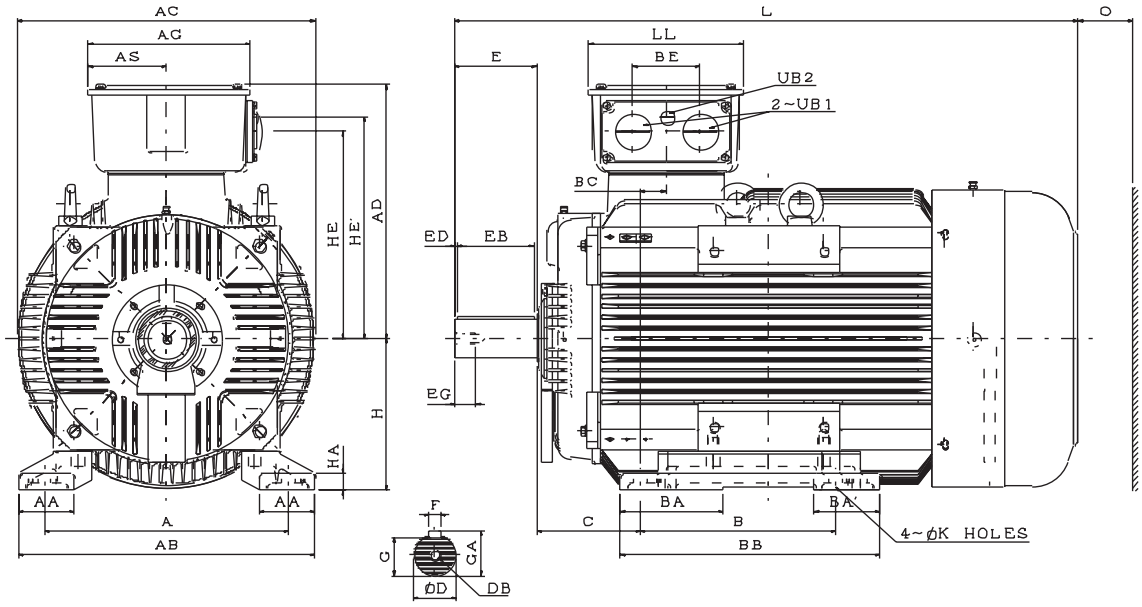


Figure 7-9: Outline drawing of cast iron design, feet version, mounting B3; frame size 315S -315M

Outline drawing of cast iron design, feet version, mounting B3; frame size 315S-315M, dimensions in [mm]																						
Output (kW)				FRAME SIZE	A	AA	AB	AC	AD	AG	AS	B	B'	BA	BA'	BB	BC	BE	C	H	HA	HE	HE'
2P	4P	6P	8P																				
110	---	---	---	315SA	508	115	615	620	527	336	163	406	---	150	150	508	53	140	216	315	35	430	460
---	110	75	55	315SB	508	115	615	620	527	336	163	406	---	150	150	508	53	140	216	315	35	430	460
---	110	75	55	315SC	508	115	615	620	527	336	163	406	---	150	150	508	53	140	216	315	35	430	460
132 160	---	---	---	315MA	508	115	615	620	527	336	163	457	---	213	137	540	53	140	216	315	35	430	460
---	132 160	90 110	75	315MB	508	115	615	620	527	336	163	457	---	213	137	540	53	140	216	315	35	430	460
---	132 160	90 110	75	315MC	508	115	615	620	527	336	163	457	---	213	137	540	53	140	216	315	35	430	460

FRAME SIZE	K	L	LL	O	UB1	UB2	SHAFT EXTENSION									BEARING	
							D	E	EB	ED	EG	F	G	GA	DB	DRIVE END	OPPOSITE DRIVE END
315SA	28	1216	322	180	M63X1.5	M20X1.5	65	140	125	7.5	42	18	58	69	M20	6316C3	6314C3
315SB	28	1246	322	180	M63X1.5	M20X1.5	80	170	160	5	42	22	71	85	M20	6320C3	6316C3
315SC	28	1246	322	180	M63X1.5	M20X1.5	80	170	160	5	42	22	71	85	M20	NU320	6316C3
315MA	28	1266	322	180	M63X1.5	M20X1.5	65	140	125	7.5	42	18	58	69	M20	6316C3	6314C3
315MB	28	1296	322	180	M63X1.5	M20X1.5	80	170	160	5	42	22	71	85	M20	6320C3	6316C3
315MC	28	1296	322	180	M63X1.5	M20X1.5	80	170	160	5	42	22	71	85	M20	NU320	6316C3

NOTE: 1.Tolerance of shaft end diameter D: ψ 65÷80 : m6
2.Tolerance of shaft center high H: +0, -1
3.Tollerance of key width F: h9

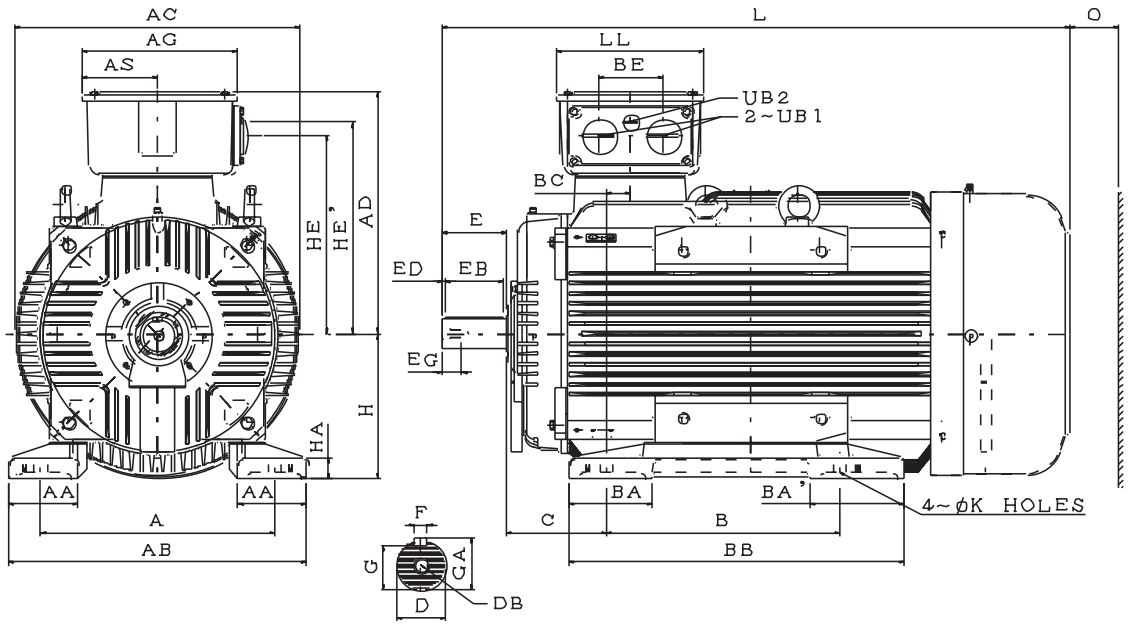


Figure 7-10: Outline drawing of cast iron design, feet version, mounting B3; frame size 315LA-315LC

Outline drawing of cast iron design, feet version, mounting B3; frame size 315S-315M, dimensions in [mm]																						
Output (kW)				FRAME SIZE	A	AA	AB	AC	AD	AG	AS	B	BA	BA'	BB	BC	BE	C	H	HA	HE	HE'	K
2P	4P	6P	8P																			
200	---	---	---	315LA	508	150	650	620	527	336	163	508	180	205	730	53	140	216	315	45	430	460	28
---	200	132 160	90 110	315LB	508	150	650	620	527	336	163	508	180	205	730	53	140	216	315	45	430	460	28
---	200	132 160	90 110	315LC	508	150	650	620	527	336	163	508	180	205	730	53	140	216	315	45	430	460	28

FRAME SIZE	L	LL	O	UB1	UB2	SHAFT EXTENSION									BEARING	
						D	E	EB	ED	EG	F	G	GA	DB	DRIVE END	OPPOSITE DRIVE END
315LA	1366	322	180	M63X1.5	M20X1.5	65	140	125	7.5	42	18	58	69	M20	6316C3	6314C3
315LB	1396	322	180	M63X1.5	M20X1.5	80	170	160	5	42	22	71	85	M20	6320C3	6316C3
315LC	1396	322	180	M63X1.5	M20X1.5	80	170	160	5	42	22	71	85	M20	NU320	6316C3

NOTE: 1.Tolerance of shaft end diameter D: ψ 65÷80 : m6
2.Tolerance of shaft center high H: +0, -1
3.Tollerance of key width F: h9

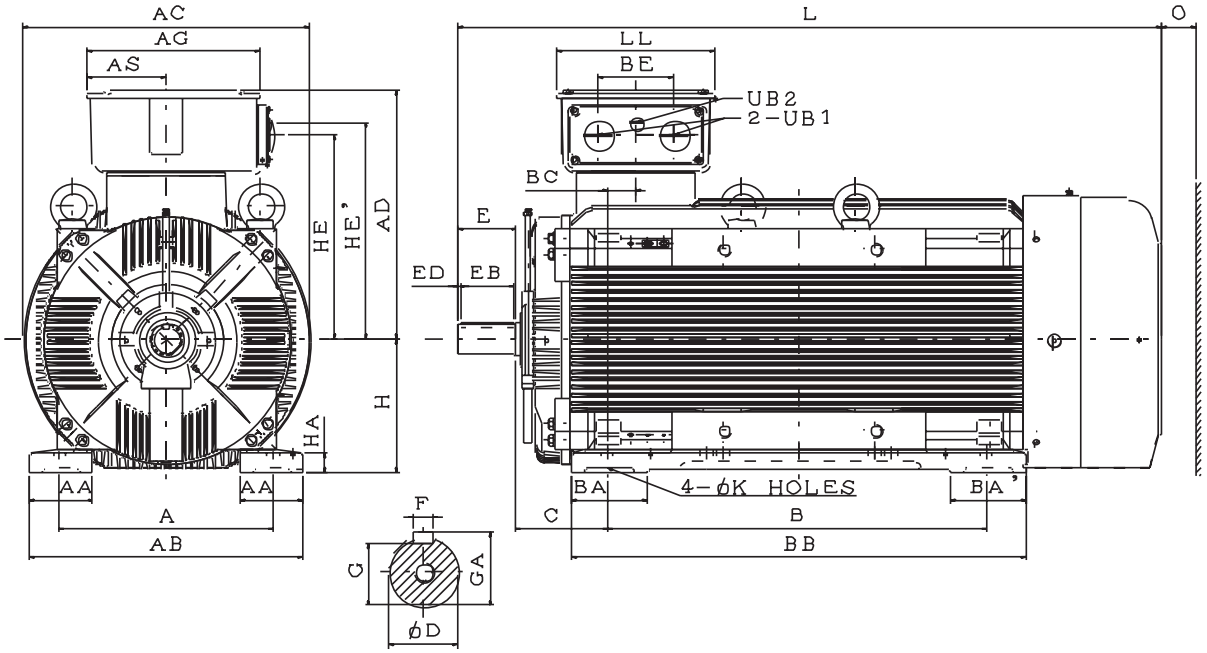


Figure 7-11: Outline drawing of cast iron design, feet version, mounting B3; frame size 315DA-315DC

Outline drawing of cast iron design, feet version, mounting B3; frame size 315S-315M, dimensions in [mm]																						
Output (kW)				FRAME SIZE	A	AA	AB	AC	AD	AG	AS	B	BA	BA'	BB	BC	BE	C	H	HA	HE	HE'	K
2P	4P	6P	8P																			
250 315	---	---	---	315DA	508	150	650	682	590	412	189	900	255	255	1080	68	180	216	315	45	485	515	28
---	250	200	132 160 200	315DB	508	150	650	682	590	412	189	900	255	255	1080	68	180	216	315	45	485	515	28
---	315	250																				
---	250	200	132 160 200	315DC	508	150	650	682	590	412	189	900	255	255	1080	68	180	216	315	45	485	515	28
---	315	250																				

FRAME SIZE	L	LL	O	UB1	UB2	SHAFT EXTENSION									BEARING	
						D	E	EB	ED	EG	F	G	GA	DB	DRIVE END	OPPOSITE DRIVE END
315DA	1674	372	200	M63X1.5	M20X1.5	65	140	125	7.5	42	18	58	69	M20	6316C3	6316C3
315DB	1704	372	200	M63X1.5	M20X1.5	85	170	160	5	42	22	76	90	M20	6322C3	6322C3
315DC	1704	372	200	M63X1.5	M20X1.5	95	170	160	5	50	25	86	100	M24	NU322	6322C3

NOTE: 1.Tolerance of shaft end diameter D: ψ 65÷80 : m6
2.Tolerance of shaft center high H: +0, -1
3.Tollerance of key width F: h9

7.1.2 Cast iron design; feet version (B5)

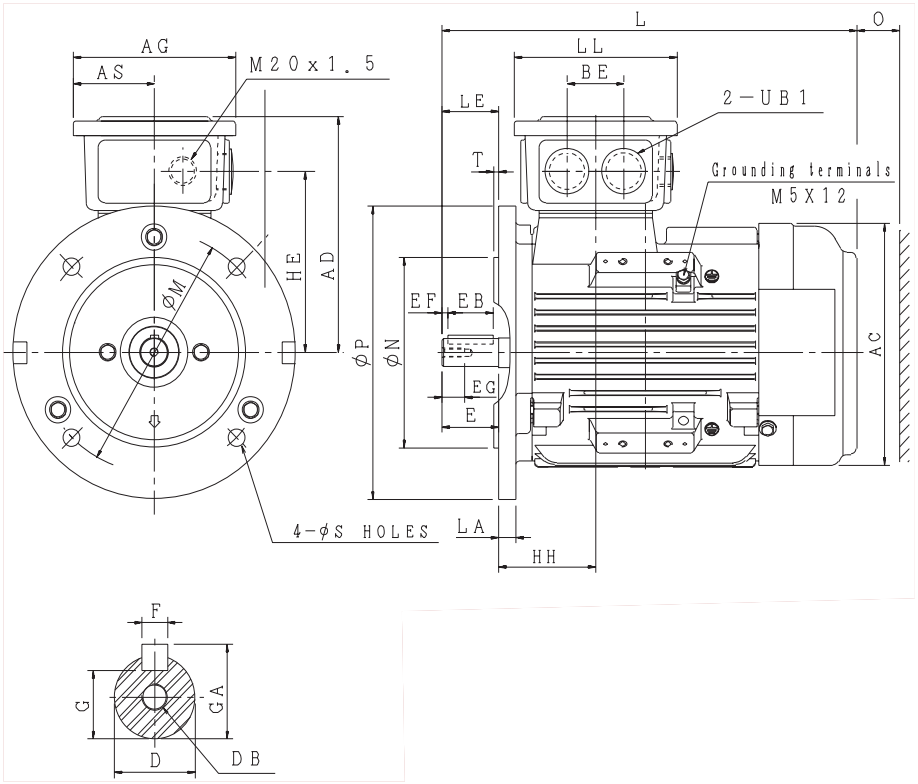
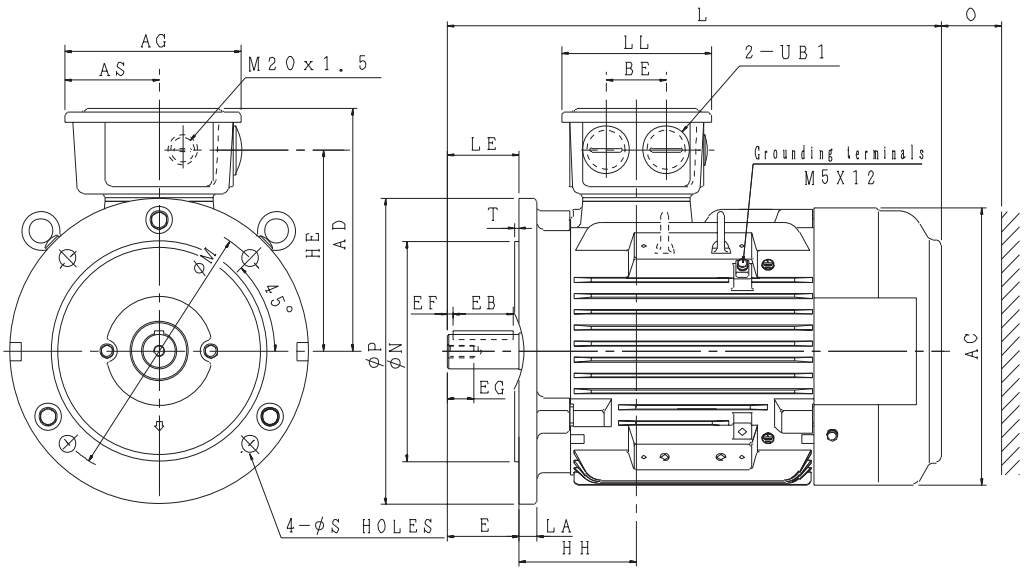


Figure 7-12: Outline drawing of cast iron design, feet version, mounting B5; frame size 80M - 90L

Output (kW)				FRAME SIZE	FLANGE DIMENSION							AC	AD	AG	AS	BE	HE	HH	L	LL	O
2P	4P	6P	8P		LA	LE	M	N	P	S	T										
0,75	0,55	0,37	0,18	80M	12	40	165	130	200	12	3,5	156	161	125	67,5	40	123,5	68,5	293	115	40
1,1	0,75	0,55	0,25																		
1,5	1,1	0,75	0,37	90S	12	50	165	130	200	12	3,5	176	171	125	67,5	40	133,5	92	344,5	115	40
2,2	1,5	1,1	0,55	90L	12	50	165	130	200	12	3,5	176	171	125	67,5	40	133,5	92	369,5	115	40

FRAME SIZE	UB1	SHAFT EXTENSION									BEARING	
		D	E	EB	EF	EG	F	G	GA	DB	DRIVE END	OPPOSITE DRIVE END
80M	M25X1.5	19	40	32	4	16	6	15,5	21,5	M6	6204ZZC3	6204ZZC3
90S	M25X1.5	24	50	40	5	19	8	20	27	M8	6205ZZC3	6205ZZC3
90L	M25X1.5	24	50	40	5	19	8	20	27	M8	6205ZZC3	6205ZZC3

NOTE: 1. Tolerance of Shaft End Diameter D: j6
2. Tolerance of N: j6



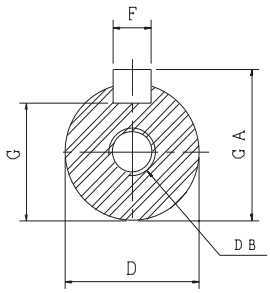


Figure 7-13: Outline drawing of cast iron design, feet version, mounting B5; frame size 132M - 100L

Output (kW)				FRAME SIZE	FLANGE DIMENSION							AC	AD	AG	AS	BE	HE	HH	L	LL	O
2P	4P	6P	8P		LA	LE	M	N	P	S	T										
3	2,2	1,5	0,75	100L	16	60	215	180	250	14,5	4	196	191	147	78,5	50	157	84	392	125	50
—	3	—	1,1																		
4	4	2,2	1,5	112M	15	60	215	180	250	14,5	4	218	198,5	147	78,5	50	164,5	98	412,5	125	50
5,5	5,5	3	2,2	132S	16	80	265	230	300	14,5	4	258	216	147	78,5	50	182	95	466	125	50
7,5	—	—	—																		
—	7,5	4	3	132M	16	80	265	230	300	14,5	4	258	216	147	78,5	50	182	95	504	125	50
—	—	5,5	—																		

FRAME SIZE	UB1	SHAFT EXTENSION									BEARING	
		D	E	EB	EF	EG	F	G	GA	DB	DRIVE END	OPPOSITE DRIVE END
100L	M32X1.5	28	60	50	5	22	8	24	31	M10	6206ZZC3	6206ZZC3
112M	M32X1.5	28	60	50	5	22	8	24	31	M10	6306ZZC3	6306ZZC3
132S	M32X1.5	38	80	70	5	28	10	33	41	M12	6308ZZC3	6306ZZC3
132M	M32X1.5	38	80	70	5	28	10	33	41	M12	6308ZZC3	6306ZZC3

NOTE: 1. Tolerance of shaft end diameter D: ψ28:j6 , ψ38:k6.
2. Tolerance of N: j6.

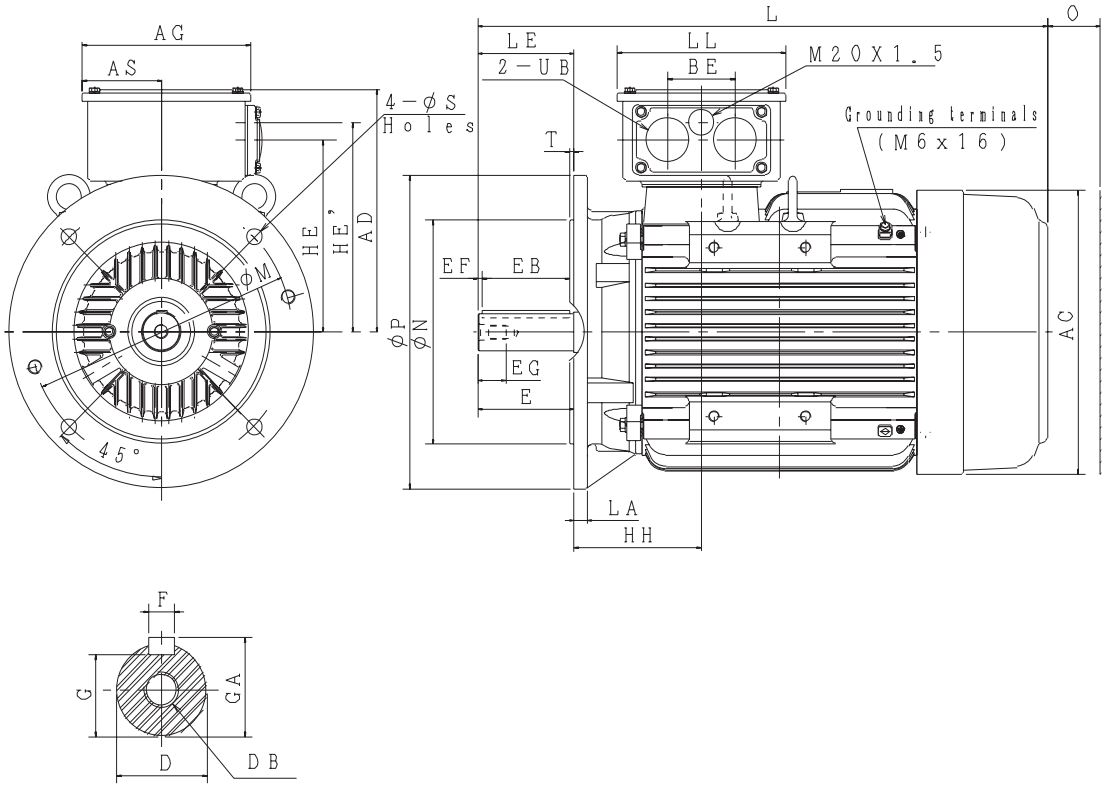


Figure 7-12: Outline drawing of cast iron design, feet version, mounting B5; frame size 160M - 180L

Output (kW)				FRAME SIZE	FLANGE DIMENSION							AC	AD	AG	AS	BE	HE	HE'	HH	L	LL	O
2P	4P	6P	8P		LA	LE	M	N	P	S	T											
11 15	11	7,5	4 5.5	160M	15	110	300	250	350	18,5	5	317	271	193	91,5	89	215	234,5	146	608	193	60
18,5	15	11	7,5	180M	15	110	300	250	350	18,5	5	317	271	193	91,5	89	215	234,5	146	652	193	60
22	18,5	---	---	180L	15	110	300	250	350	18,5	5	354	297	193	91,5	89	241	260,5	155	672	193	70
---	22	15	11	80M	15	110	300	250	350	18,5	5	354	297	193	91,5	89	241	260,5	155	710	193	70

FRAME SIZE	UB1	SHAFT EXTENSION									BEARING	
		D	E	EB	EF	EG	F	G	GA	DB	DRIVE END	OPPOSITE DRIVE END
160M	M40 x 1.5	42	110	100	5	36	12	37,0	45,0	M16	6309ZZC3	6307ZZC3
160L	M40 x 1.5	42	110	100	5	36	12	37,0	45,0	M16	6309ZZC3	6307ZZC3
180M	M40 x 1.5	48	110	100	5	36	14	42,5	51,5	M16	6311C3	6310C3
180L	M40 x 1.5	48	110	100	5	36	14	42,5	51,5	M16	6311C3	6310C3

NOTE: 1. Tolerance of shaft end diameter D: Under ψ42 ~ ψ48 : k6.
2. Tolerance of N: j6.

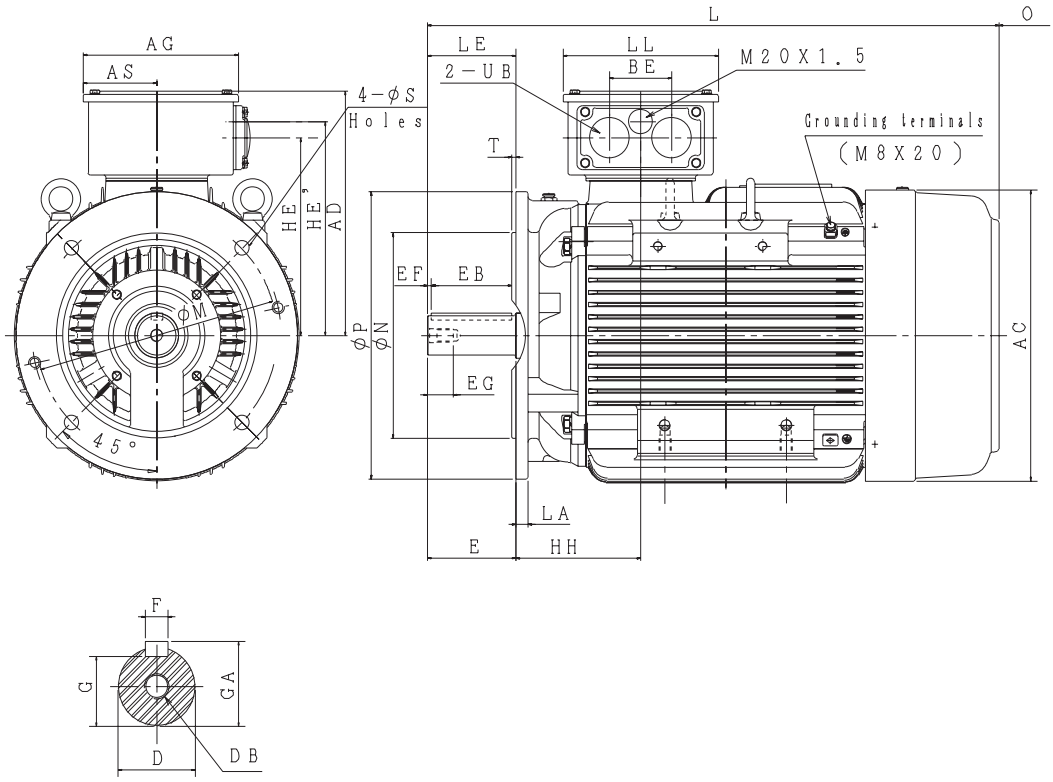


Figure 7-13: Outline drawing of cast iron design, feet version, mounting B5; frame size 250M - 200L

Output (kW)				FRAME SIZE	FLANGE DIMENSION							AC	AD	AG	AS	BE	HE	HE'	HH	L	LL	O
2P	4P	6P	8P		LA	LE	M	N	P	S	T											
30 37	30	18.5 22	15	200L	17	110	350	300	400	18,5	5	398	330	231	110,5	106	262	289	193	770	231	80
---	37	---	18,5	225SC	20	140	400	350	450	18,5	5	449	356	231	110,5	106	288	315	179,5	816	231	90
45	---	---	---	225MA	20	140	400	350	450	18,5	5	449	356	231	110,5	106	288	315	179,5	811	231	90
---	45	30	22	225MA	22	140	500	450	550	18,5	5	449	356	231	110,5	106	288	315	179,5	841	231	90
55	---	---	---	250MA	22	140	500	450	550	18,5	5	498	398	255	122,5	119	322	349	213,5	921	255	105
---	55	37	30	250MC	15	110	300	250	350	18,5	5	498	398	255	122,5	119	322	349	213,5	921	255	105

FRAME SIZE	UB1	SHAFT EXTENSION									BEARING	
		D	E	EB	EF	EG	F	G	GA	DB	DRIVE END	OPPOSITE DRIVE END
200L	M50 x 1.5	55	110	100	5,0	42	16	49	59	M20	6312C3	6212C3
225SC	M50 x 1.5	60	140	125	7,5	42	18	53	64	M20	6313C3	6213C3
225MA	M50 x 1.5	55	110	100	5,0	42	16	49	59	M20	6312C3	6212C3
225MC	M50 x 1.5	60	140	125	7,5	42	18	53	64	M20	6313C3	6213C3
250MA	M63 x 1.5	60	140	125	7,5	42	18	53	64	M20	6313C3	6313C3
250MC	M63 x 1.5	65	140	125	7,5	42	18	58	69	M20	6315C3	6313C3

NOTE: 1. Tolerance of shaft end diameter D : Under ψ55 ~ψ65 : m6.
2. Tolerance of N : j6.

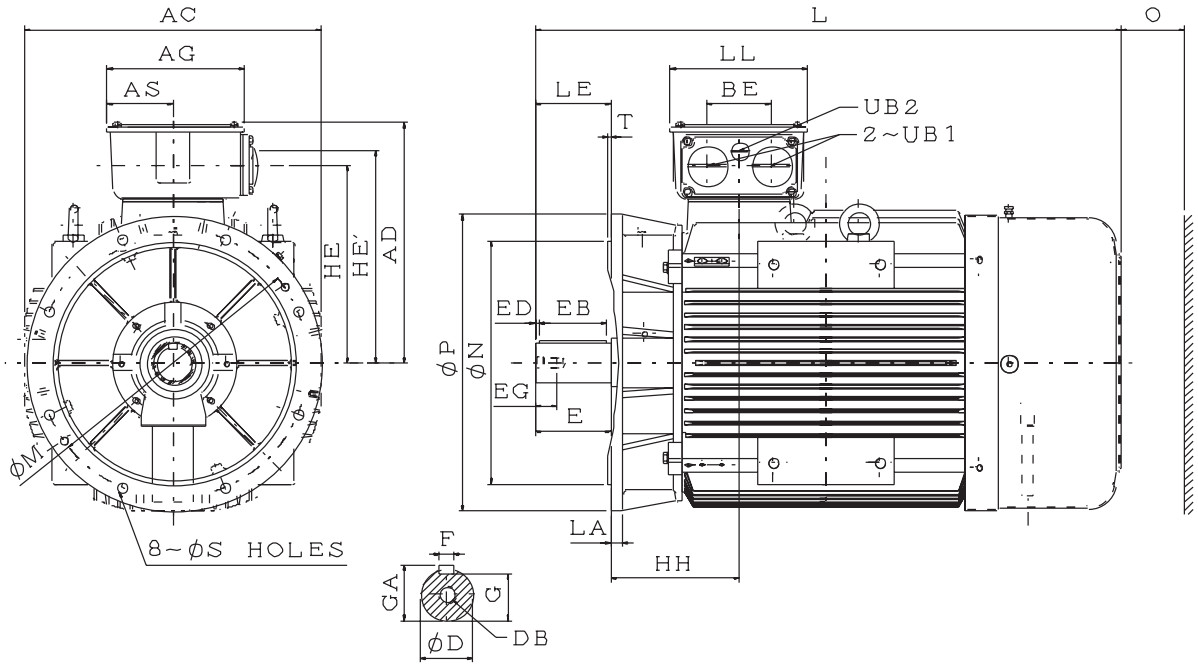


Figure 7-12: Outline drawing of cast iron design, feet version, mounting B5; frame size 280SA - 280MC

Output (kW)				FRAME SIZE	FLANGE DIMENSION							AC	AD	AG	AS	BE	HE	HE'	HH	L	LL	O
2P	4P	6P	8P		LA	LE	M	N	P	S	T											
75	---	---	---	280SA	22	140	500	450	550	18,5	5	550	446	255	122,5	119	367	394	238	1037,5	255	140
---	75	45	37	280SB	22	140	500	450	550	18,5	5	550	446	255	122,5	119	367	394	238	1037,5	255	140
---	75	45	37	280SC	22	140	500	450	550	18,5	5	550	446	255	122,5	119	367	394	238	1037,5	255	140
90	---	---	---	280MA	22	140	500	450	550	18,5	5	550	446	255	122,5	119	367	394	238	1087,5	255	140
---	90	55	45	280MB	22	140	500	450	550	18,5	5	550	446	255	122,5	119	367	394	238	1087,5	255	140
---	90	55	45	280MC	22	140	500	450	550	18,5	5	550	446	255	122,5	119	367	394	238	1087,5	255	140

FRAME SIZE	UB1	UB2	SHAFT EXTENSION									BEARING	
			D	E	EB	ED	EG	F	G	GA	DB	DRIVE END	OPPOSITE DRIVE END
280SA	M63X1.5	M20X1.5	65	140	125	7,5	42	18	58	69	M20	6316C3	6314C3
280SB	M63X1.5	M20X1.5	75	140	125	7,5	42	20	67,5	79,5	M20	6318C3	6316C3
280SC	M63X1.5	M20X1.5	75	140	125	7,5	42	20	67,5	79,5	M20	NU318	6316C3
280MA	M63X1.5	M20X1.5	65	140	125	7,5	42	18	58	69	M20	6316C3	6314C3
280MB	M63X1.5	M20X1.5	75	140	125	7,5	42	20	67,5	79,5	M20	6318C3	6316C3
280MC	M63X1.5	M20X1.5	75	140	125	7,5	42	20	67,5	79,5	M20	NU318	6316C3

NOTE: 1. Tolerance of Shaft End Diameter D : m6
2. Tolerance of Key Width F : h9

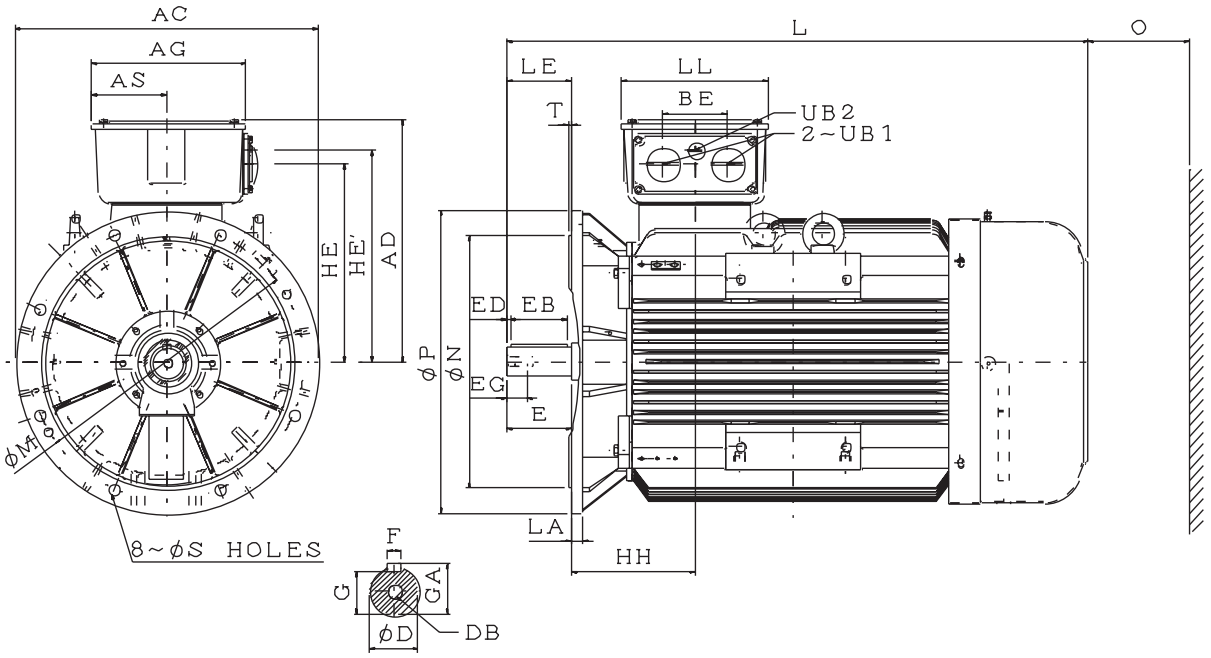


Figure 7-13: Outline drawing of cast iron design, feet version, mounting B5; frame size 315SA - 315MC

Output (kW)				FRAME SIZE	FLANGE DIMENSION							AC	AD	AG	AS	BE	HE	HE'	HH	L	LL	O
2P	4P	6P	8P		LA	LE	M	N	P	S	T											
110	---	---	---	315SA	25	140	600	550	660	24	6	660	527	336	163	140	430	460	269	1216	322	180
---	110	75	55	315SB	25	170	600	550	660	24	6	660	527	336	163	140	430	460	269	1246	322	180
---	110	75	55	315SC	25	170	600	550	660	24	6	660	527	336	163	140	430	460	269	1246	322	180
132 160	---	---	---	315MA	25	140	600	550	660	24	6	660	527	336	163	140	430	460	269	1266	322	180
---	132 160	90 110	75	315MB	25	170	600	550	660	24	6	660	527	336	163	140	430	460	269	1296	322	180
---	132 160	90 110	75	315MC	25	170	600	550	660	24	6	660	527	336	163	140	430	460	269	1296	322	180

FRAME SIZE	UB1	UB1	SHAFT EXTENSION									BEARING	
			D	E	EB	EF	EG	F	G	GA	DB	DRIVE END	OPPOSITE DRIVE END
315SA	M63X1.5	M20X1.5	65	140	125	7,5	42	18	58	69	M20	6316C3	6314C3
315SB	M63X1.5	M20X1.5	80	170	160	5	42	22	71	85	M20	6320C3	6316C3
315SC	M63X1.5	M20X1.5	80	170	160	5	42	22	71	85	M20	NU320	6316C3
315MA	M63X1.5	M20X1.5	65	140	125	7,5	42	18	58	69	M20	6316C3	6314C3
315MB	M63X1.5	M20X1.5	80	170	160	5	42	22	71	85	M20	6320C3	6316C3
315MC	M63X1.5	M20X1.5	80	170	160	5	42	22	71	85	M20	NU320	6316C3

NOTE: 1. Tolerance of Shaft End Diameter D : m6
2. Tolerance of Key Width F : h9

7.1.3 Cast iron design; feet version (B35)

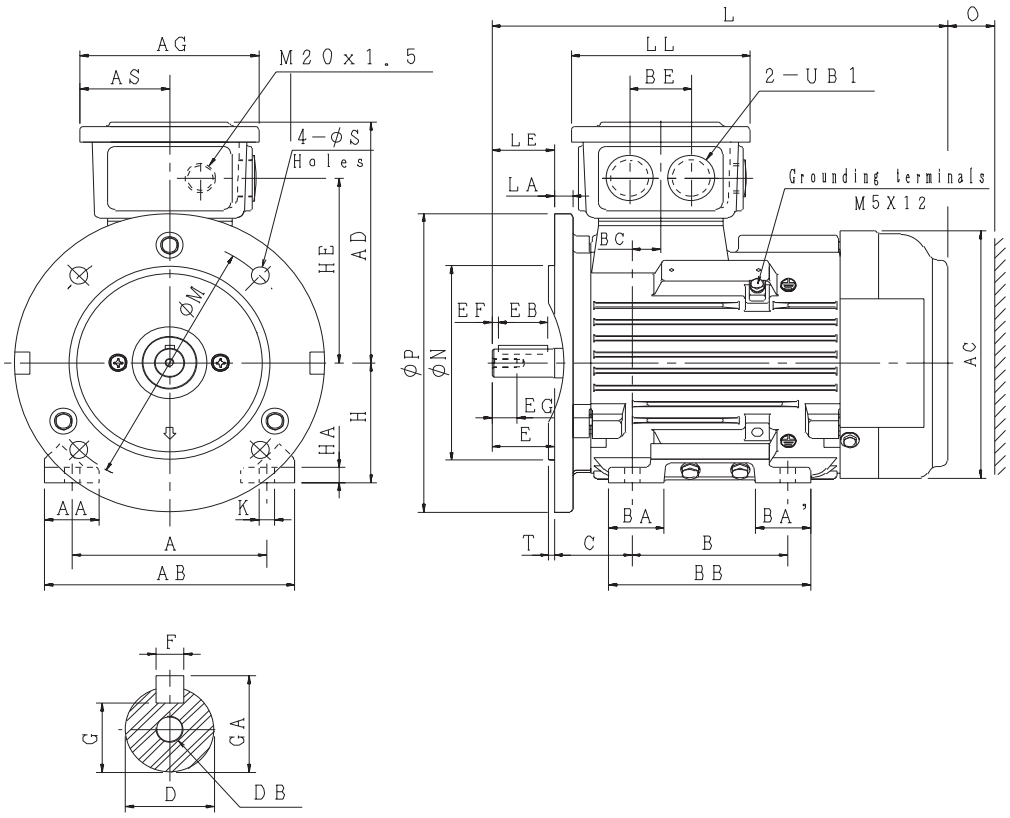


Figure 7-14: Outline drawing of cast iron design, feet version, mounting B35; frame size 80M - 90L

Output (kW)				FRAME SIZE	FLANGE DIMENSION							A	AA	AB	AC	AD	AG	AS	B	B'	BA	BA'
2P	4P	6P	8P		LA	LE	M	N	P	S	T											
0.75 1.1	0.55 0.75	0.37 0.55	0.18 0.25	80M	12	40	165	130	200	12	3,5	125	35	161	156	161	125	67,5	100	--	35,5	35,5
1,5	1,1	0,75	0,37	90S	12	50	165	130	200	12	3,5	140	40	180	176	171	125	67,5	100	--	33	33
2,2	1,5	1,1	0,55	90L	12	50	165	130	200	12	3,5	140	40	180	176	171	125	67,5	125	100	33	58

FRAME SIZE	BB	BC	BE	C	H	HA	HE	K	L	LL	O	UB1	SHAFT EXTENSION									BEARING	
													D	E	EB	EF	EG	F	G	GA	DB	DRIVE END	OPPOSITE DRIVE END
80M	130	18,5	40	50	80	10	123,5	10	293	115	40	M25X1.5	19	40	32	4	16	6	15,5	21,5	M6	6204ZZC3	6204ZZC3
90S	125	36	40	56	90	10	133,5	10	344,5	115	40	M25X1.5	24	50	40	5	19	8	20	27	M8	6205ZZC3	6205ZZC3
90L	150	36	40	56	90	10	133,5	10	369,5	115	40	M25X1.5	24	50	40	5	19	8	20	27	M8	6205ZZC3	6205ZZC3

NOTE: 1. Tolerance of shaft end diameter D : j6.
2. Tolerance of shaft center high H : +0, -0.5.
3. Tolerance of N : j6

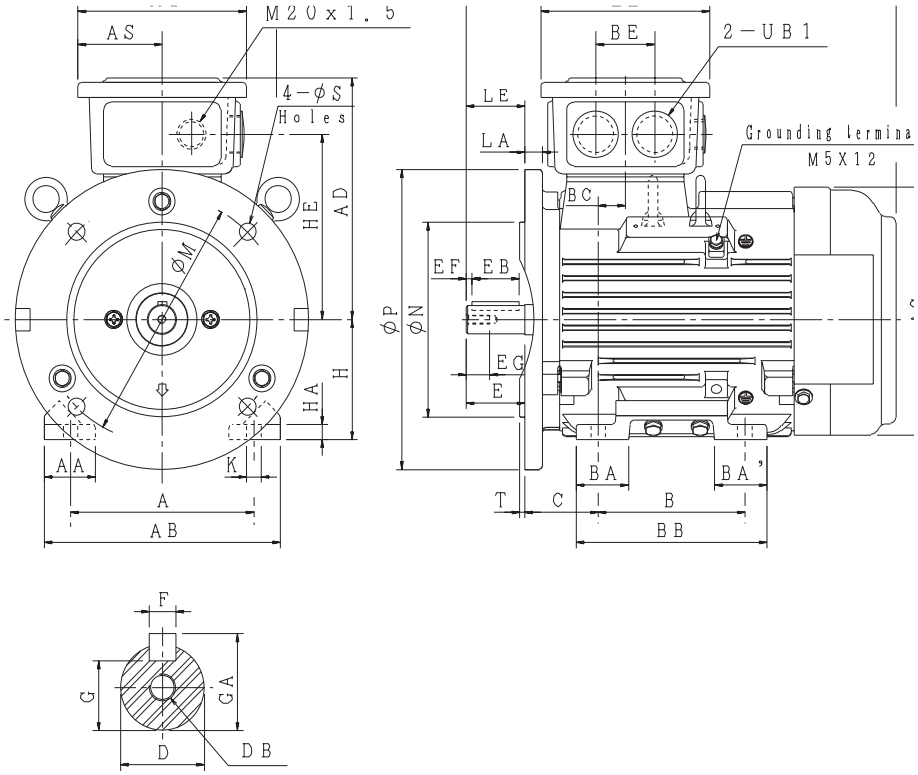


Figure 7-15: Outline drawing of cast iron design, feet version, mounting B35; frame size 132M - 100L

Output (kW)				FRAME SIZE	FLANGE DIMENSION							A	AA	AB	AC	AD	AG	AS	B	B'	BA	BA'
2P	4P	6P	8P		LA	LE	M	N	P	S	T											
3 -	2.2 3	1.5 -	0.75 1.1	100L	16	60	215	180	250	14,5	4	160	40	200	196	191	147	78,5	140	--	43,5	43,5
4	4	2,2	1,5	112M	15	60	215	180	250	14,5	4	190	50	235	218	198,5	147	78,5	140	--	45,5	45,5
5.5 7.5	5,5	3	2,2	132S	16	80	265	230	300	14,5	4	216	63,5	259	258	216	147	78,5	140	--	59	59
—	7,5	4 5.5	3	132M	16	80	265	230	300	14,5	4	216	63,5	259	258	216	147	78,5	178	140	59	97

FRAME SIZE	BB	BC	BE	C	H	HA	HE	K	L	LL	O	UB1	SHAFT EXTENSION									BEARING	
													D	E	EB	EF	EG	F	G	GA	DB	DRIVE END	OPPOSITE DRIVE END
100L	176	21	50	63	100	12	157	12	392	125	50	M32X1.5	28	60	50	5	22	8	24	31	M10	6206ZZC3	6206ZZC3
112M	176	28	50	70	112	13	164,5	12	412,5	125	50	M32X1.5	28	60	50	5	22	8	24	31	M10	6306ZZC3	6306ZZC3
132S	184	6	50	89	132	16	182	12	466	125	50	M32x1.5	38	80	70	5	28	10	33	41	M12	6308ZZC3	6306ZZC3
132M	222	6	50	89	132	16	182	12	504	125	50	M32x1.5	38	80	70	5	28	10	33	41	M12	6308ZZC3	6306ZZC3

NOTE: 1. Tolerance of shaft end diameter D : ψ28:j6 , ψ38:k6.
2. Tolerance of shaft center high H : +0, -0.5.
3. Tolerance of N : j6

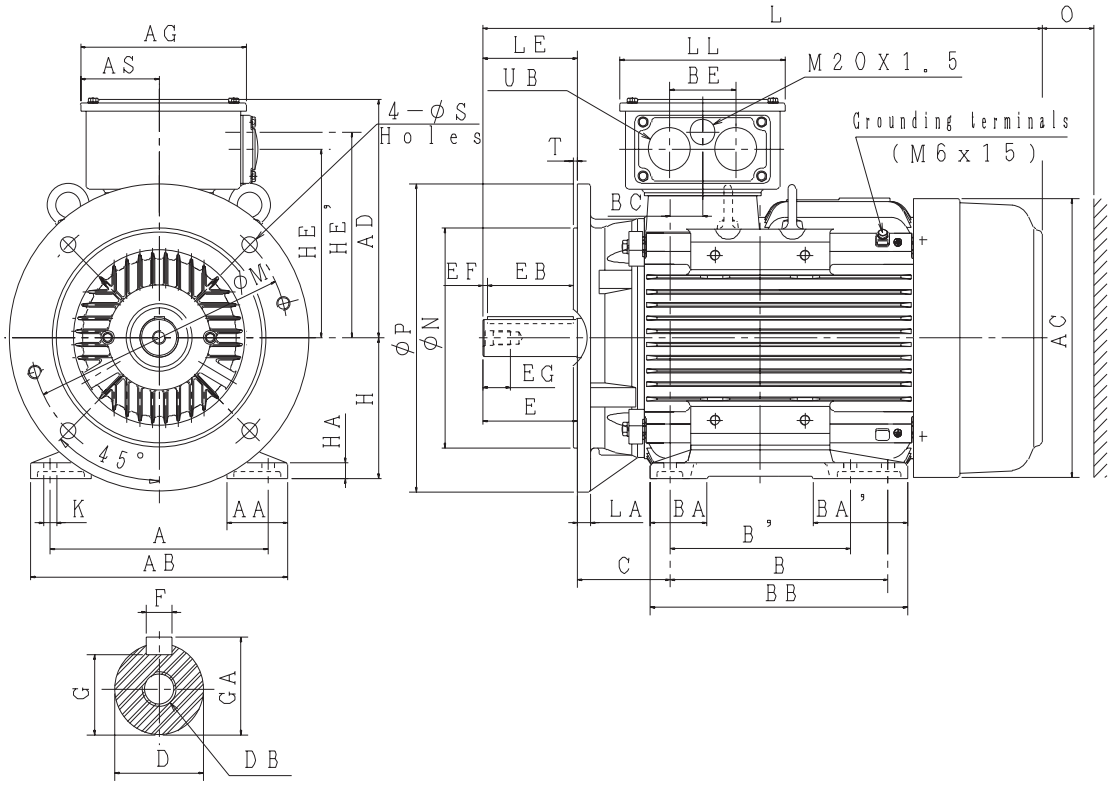


Figure 7-16: Outline drawing of cast iron design, feet version, mounting B35; frame size 160M - 180L

Output (kW)				FRAME SIZE	FLANGE DIMENSION							A	AA	AB	AC	AD	AG	AS	B	B'	BA	BA'
2P	4P	6P	8P		LA	LE	M	N	P	S	T											
11 15	11	7,5	4 5.5	160M	15	110	300	250	350	18,5	5	254	71	300	317	271	193	91,5	210	---	66	66
18,5	15	11	7,5	160L	15	110	300	250	350	18,5	5	254	71	300	317	271	193	91,5	254	210	66	110
22	18,5	---	---	180M	15	110	300	250	350	18,5	5	279	72	330	354	297	193	91,5	241	---	68,5	68,5
---	22	15	11	180L	15	110	300	250	350	18,5	5	279	72	330	354	297	193	91,5	279	241	68,5	106,5

FRAME SIZE	BB	BC	BE	C	H	HA	HE	HE'	K	L	LL	O	UB1	SHAFT EXTENSION									BEARING	
														D	E	EB	EF	EG	F	G	GA	DB	DRIVE END	OPPOSITE DRIVE END
160M	256	38	89	108	160	18	215	234,5	14,5	608	193	60	M40 x 1.5	42	110	100	5	36	12	37	45	M16	6309ZZC3	6307ZZC3
160L	300	38	89	108	160	18	215	234,5	14,5	652	193	60	M40 x 1.5	42	110	100	5	36	12	37	45	M16	6309ZZC3	6307ZZC3
180M	292	34	89	121	180	20	241	260,5	14,5	672	193	70	M40 x 1.5	48	110	100	5	36	14	42,5	51,5	M16	6311C3	6310C3
180L	330	34	89	121	180	20	241	260,5	14,5	710	193	70	M40 x 1.5	48	110	100	5	36	14	42,5	51,5	M16	6311C3	6310C3

NOTE: 1. Tolerance of shaft end diameter D : Under ψ42 ~ ψ48 : k6.
2. Tolerance of shaft center high H : +0, -0.5.
3. Tolerance of N : j6

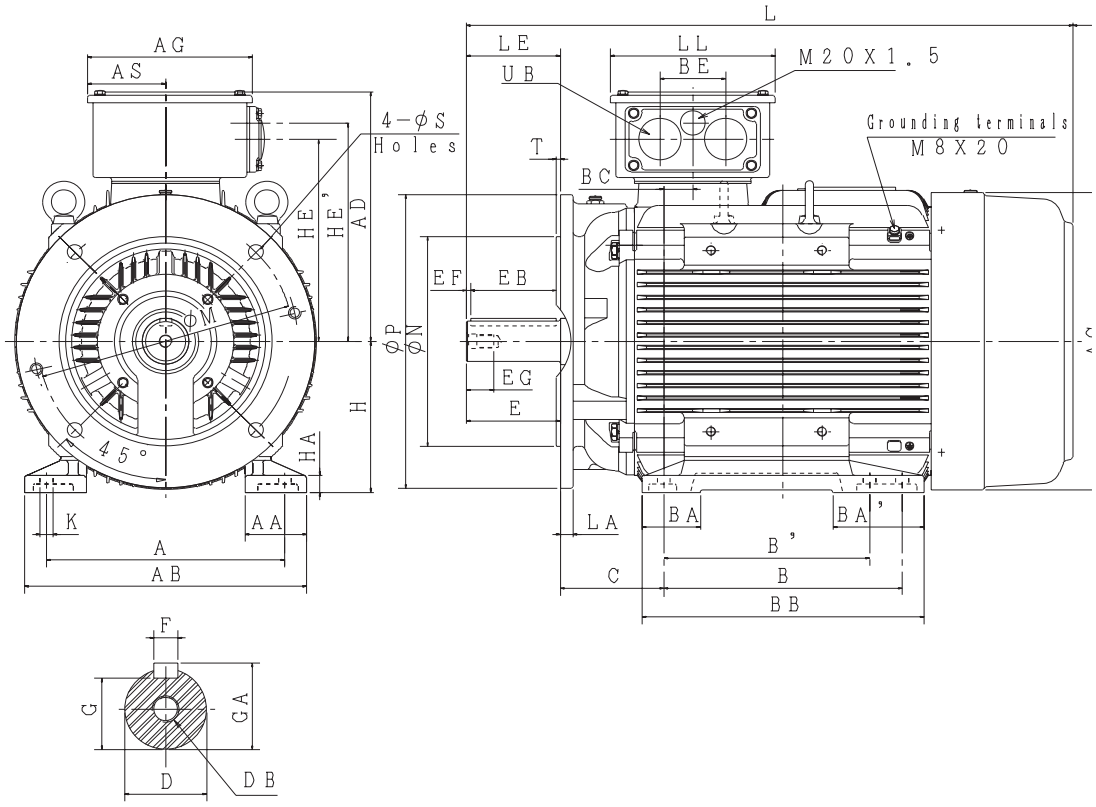


Figure 7-17: Outline drawing of cast iron design, feet version, mounting B35; frame size 200L - 250M

Output (kW)				FRAME SIZE	FLANGE DIMENSION							A	AA	AB	AC	AD	AG	AS	B	B'	BA
2P	4P	6P	8P		LA	LE	M	N	P	S	T										
30 37	30	18.5 22	15	200L	17	110	350	300	400	18,5	5	318	88	378	398	330	231	110,5	305	---	90
---	37	---	18,5	225SC	20	140	400	350	450	18,5	5	356	94	416	449	356	231	110,5	286	---	90
45	---	---	---	225MA	20	110	400	350	450	18,5	5	356	94	416	449	356	231	110,5	311	286	90
---	45	30	22	225MC	20	140	400	350	450	18,5	5	356	94	416	449	356	231	110,5	311	286	90
55	---	---	---	250MA	22	140	500	450	550	18,5	5	406	112	480	498	398	255	122,5	349	---	105
---	55	37	30	250MC	22	140	500	450	550	18,5	5	406	112	480	498	398	255	122,5	349	---	105

FRAME SIZE	BA'	BB	BC	BE	C	H	HA	HE	HE'	K	L	LL	O	UB1	SHAFT EXTENSION									BEARING	
															D	E	EB	EF	EG	F	G	GA	DB	DRIVE END	OPPOSITE DRIVE END
200L	90	365	53	106	133	200	24	262	289	18,5	770	231	80	M50 x 1.5	55	110	100	5	42	16	49	59	M20	6312C3	6212C3
225SC	90	350	30,5	106	149	225	28	288	315	18,5	816	231	90	M50 x 1.5	60	140	125	7,5	42	18	53	64	M20	6313C3	6213C3
225MA	115	375	30,5	106	149	225	28	288	315	18,5	811	231	90	M50 x 1.5	55	110	100	5	42	16	49	59	M20	6312C3	6212C3
225MC	115	375	30,5	106	149	225	28	288	315	18,5	841	231	90	M50 x 1.5	60	140	125	7,5	42	18	53	64	M20	6313C3	6213C3
250MA	105	425	45,5	119	168	250	30	322	349	24	921	255	105	M63 x 1.5	60	140	125	7,5	42	18	53	64	M20	6313C3	6313C3
250MC	105	425	45,5	119	168	250	30	322	349	24	921	255	105	M63 x 1.5	65	140	125	7,5	42	18	58	69	M20	6315C3	6313C3

NOTE: 1. Tolerance of shaft end diameter D : Under ψ55 ~ψ65 : m6.
2. Tolerance of shaft center high H : +0, -0.5.
3. Tolerance of N : j6

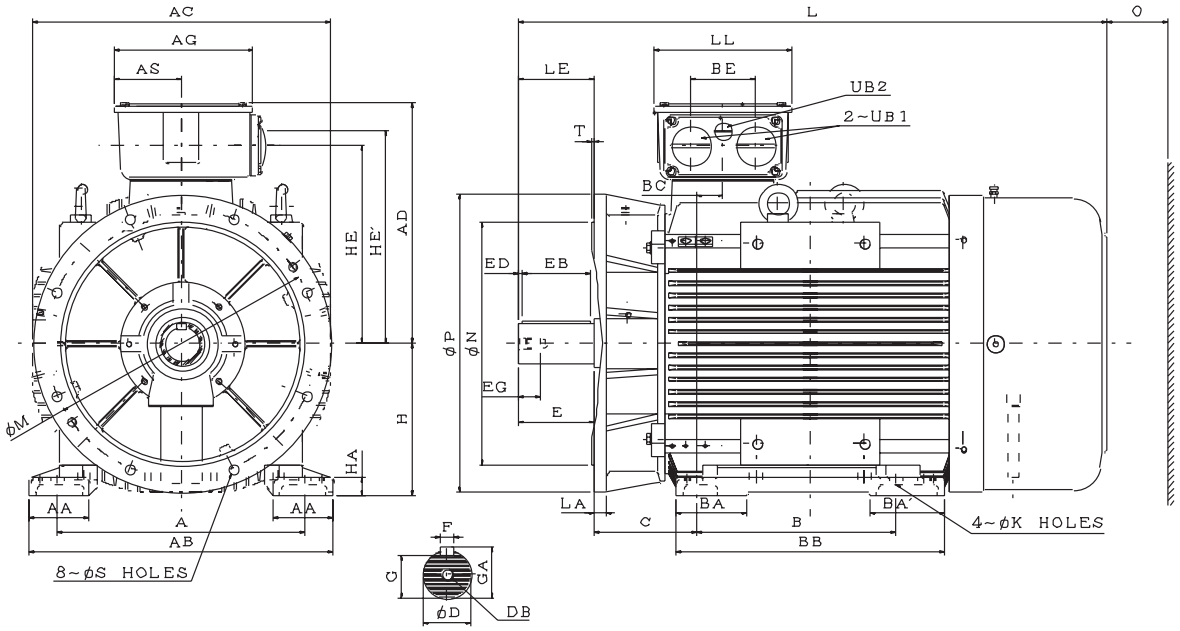


Figure 7-18: Outline drawing of cast iron design, feet version, mounting B35; frame size 280SA - 280MC

Output (kW)				FRAME SIZE	FLANGE DIMENSION							A	AA	AB	AC	AD	AG	AS	B	B'	BA	BA'	BB	BC	BE	C
2P	4P	6P	8P		LA	LE	M	N	P	S	T															
75	---	---	---	280SA	22	140	500	450	550	18,5	5	457	110	560	550	446	255	122,5	368	---	130	130	445	48	119	190
---	75	45	37	280SB	22	140	500	450	550	18,5	5	457	110	560	550	446	255	122,5	368	---	130	130	445	48	119	190
---	75	45	37	280SC	22	140	500	450	550	18,5	5	457	110	560	550	446	255	122,5	368	---	130	130	445	48	119	190
90	---	---	---	280MA	22	140	500	450	550	18,5	5	457	110	560	550	446	255	122,5	419	---	130	137	495	48	119	190
---	90	55	45	280MB	22	140	500	450	550	18,5	5	457	110	560	550	446	255	122,5	419	---	130	137	495	48	119	190
---	90	55	45	280MC	22	140	500	450	550	18,5	5	457	110	560	550	446	255	122,5	419	---	130	137	495	48	119	190

FRAME SIZE	H	HA	HE	HE'	K	L	LL	O	UB1	UB2	SHAFT EXTENSION									BEARING	
											D	E	EB	EF	EG	F	G	GA	DB	DRIVE END	OPPOSITE DRIVE END
280SA	280	32	367	394	24	1037	255	140	M63X1.5	M20X1.5	65	140	125	7,5	42	18	58,0	69,0	M20	6316C3	6314C3
280SB	280	32	367	394	24	1037	255	140	M63X1.5	M20X1.5	75	140	125	7,5	42	20	67,5	79,5	M20	6318C3	6316C3
280SC	280	32	367	394	24	1037	255	140	M63X1.5	M20X1.5	75	140	125	7,5	42	20	67,5	79,5	M20	NU318	6316C3
280MA	280	32	367	394	24	1087,5	255	140	M63X1.5	M20X1.5	65	140	125	7,5	42	18	58,0	69,0	M20	6316C3	6314C3
280MB	280	32	367	394	24	1087,5	255	140	M63X1.5	M20X1.5	75	140	125	7,5	42	20	67,5	79,5	M20	6318C3	6316C3
280MC	280	32	367	394	24	1087,5	255	140	M63X1.5	M20X1.5	75	140	125	7,5	42	20	67,5	79,5	M20	NU318	6316C3

NOTE:
1. Tolerance of Shaft End Diameter D : m6
2. Tolerance of Key Width F : h9
3. Tolerance of Shaft Center Height H : +0, -1

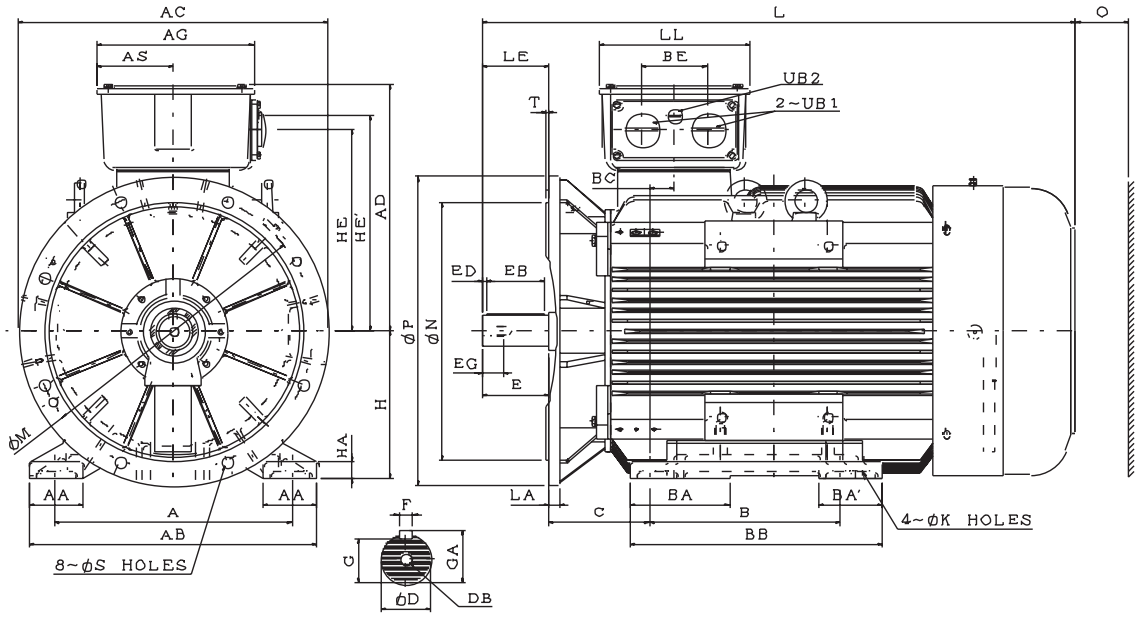


Figure 7-19: Outline drawing of cast iron design, feet version, mounting B35; frame size 315SA - 315MC

Output (kW)				FRAME SIZE	FLANGE DIMENSION							A	AA	AB	AC	AD	AG	AS	B	B'	BA	BA'	BB	BC	BE	C
2P	4P	6P	8P		LA	LE	M	N	P	S	T															
110	---	---	---	315SA	25	140	600	550	660	24	6	508	115	615	660	527	336	163	406	---	150	150	508	53	140	216
---	110	75	55	315SB	25	170	600	550	660	24	6	508	115	615	660	527	336	163	406	---	150	150	508	53	140	216
---	110	75	55	315SC	25	170	600	550	660	24	6	508	115	615	660	527	336	163	406	---	150	150	508	53	140	216
132 160	---	---	---	315MA	25	140	600	550	660	24	6	508	115	615	660	527	336	163	457	---	213	137	540	53	140	216
---	132 160	90 110	75	315MB	25	170	600	550	660	24	6	508	115	615	660	527	336	163	457	---	213	137	540	53	140	216
---	132 160	90 110	75	315MC	25	170	600	550	660	24	6	508	115	615	660	527	336	163	457	---	213	137	540	53	140	216

FRAME SIZE	H	HA	HE	HE'	K	L	LL	O	UB1	UB2	SHAFT EXTENSION									BEARING	
											D	E	EB	EF	EG	F	G	GA	DB	DRIVE END	OPPOSITE DRIVE END
315SA	315	35	430	460	28	1216	322	180	M63X1.5	M20X1.5	65	140	125	7,5	42	18	58	69	M20	6316C3	6314C3
315SB	315	35	430	460	28	1246	322	180	M63X1.5	M20X1.5	80	170	160	5,0	42	22	71	85	M20	6320C3	6316C3
315SC	315	35	430	460	28	1246	322	180	M63X1.5	M20X1.5	80	170	160	5,0	42	22	71	85	M20	NU320	6316C3
315MA	315	35	430	460	28	1266	322	180	M63X1.5	M20X1.5	65	140	125	7,5	42	18	58	69	M20	6316C3	6314C3
315MB	315	35	430	460	28	1296	322	180	M63X1.5	M20X1.5	80	170	160	5,0	42	22	71	85	M20	6320C3	6316C3
315MC	315	35	430	460	28	1296	322	180	M63X1.5	M20X1.5	80	170	160	5,0	42	22	71	85	M20	NU320	6316C3

NOTE:
1. Tolerance of Shaft End Diameter D : m6
2. Tolerance of Key Width F : h9
3. Tolerance of Shaft Center Height H : +0, -1

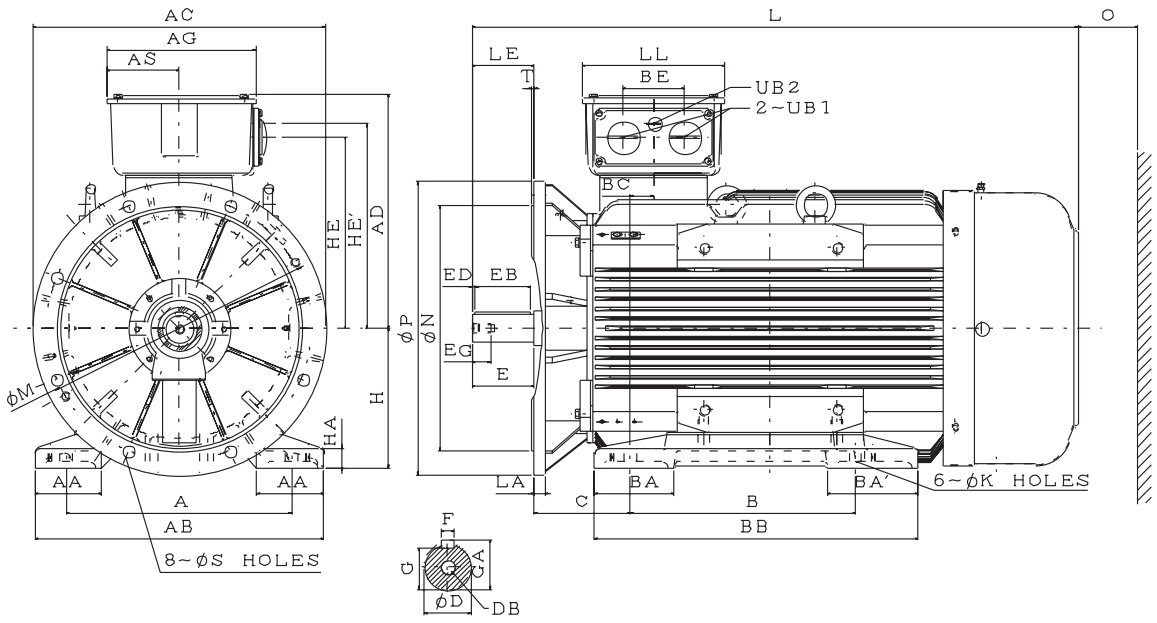


Figure 7-20: Outline drawing of cast iron design, feet version, mounting B35; frame size 315LA - 315LC

Output (kW)				FRAME SIZE	FLANGE DIMENSION							A	AA	AB	AC	AD	AG	AS	B	BA	BA'	BB	BC	BE	C	H
2P	4P	6P	8P		LA	LE	M	N	P	S	T															
200	---	---	---	315LA	25	140	600	550	660	24	6	508	150	650	660	527	336	163	508	180	205	730	53	140	216	315
---	200	132 160	90 110	315LB	25	170	600	550	660	24	6	508	150	650	660	527	336	163	508	180	205	730	53	140	216	315
---	200	132 160	90 110	315LC	25	170	600	550	660	24	6	508	150	650	660	527	336	163	508	180	205	730	53	140	216	315

FRAME SIZE	HA	HE	HE'	K	L	LL	O	UB1	UB2	SHAFT EXTENSION									BEARING	
										D	E	EB	EF	EG	F	G	GA	DB	DRIVE END	OPPOSITE DRIVE END
315LA	45	430	460	28	1366	322	180	M63X1.5	M20X1.5	65	140	125	7,5	42	18	58	69	M20	6316C3	6314C3
315LB	45	430	460	28	1396	322	180	M63X1.5	M20X1.5	80	170	160	5	42	22	71	85	M20	6320C3	6316C3
315LC	45	430	460	28	1396	322	180	M63X1.5	M20X1.5	80	170	160	5	42	22	71	85	M20	NU320	6316C3

NOTE: 1. Tolerance of Shaft End Diameter D : m6
2. Tolerance of Key Width F : h9
3. Tolerance of Shaft Center Height H : +0, -1

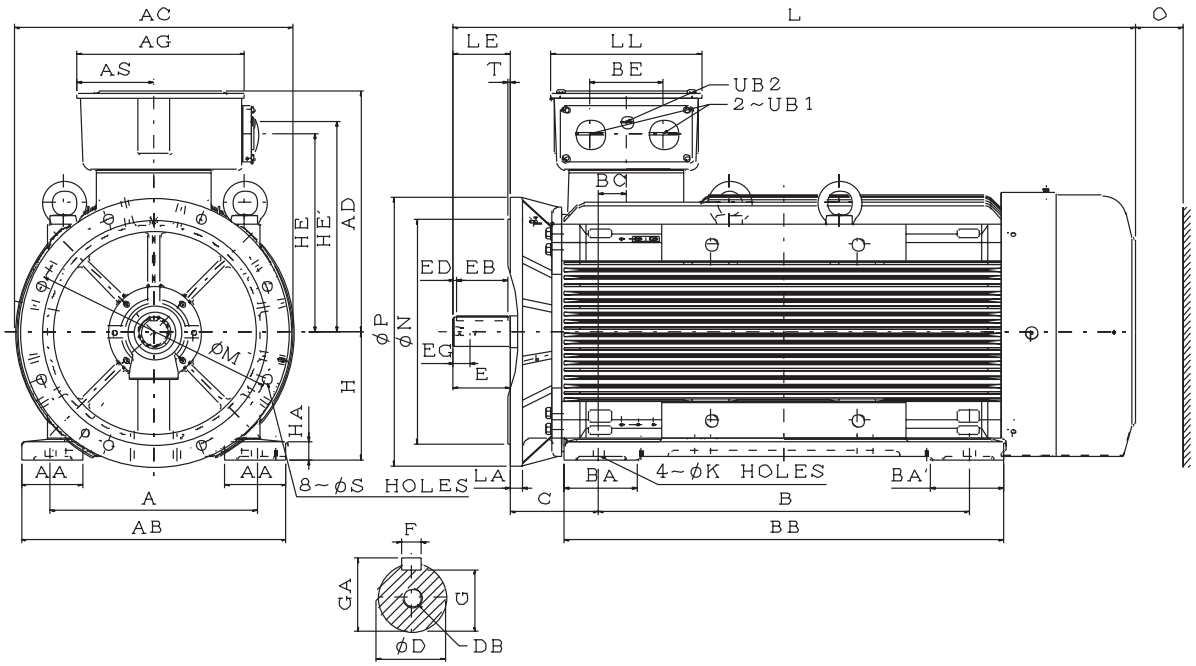


Figure 7-21: Outline drawing of cast iron design, feet version, mounting B35; frame size 315DA - 315DC

Output (kW)				FRAME SIZE	FLANGE DIMENSION							A	AA	AB	AC	AD	AG	AS	B	B'	BA	BA'	BB	BC	BE	C
2P	4P	6P	8P		LA	LE	M	N	P	S	T															
250 315	---	---	---	315DA	30	140	600	550	660	24	6	508	150	650	682	590	412	189	900	---	255	255	1080	68	180	216
---	250 315	200 250	132 160 200	315DB	30	170	600	550	660	24	6	508	150	650	682	590	412	189	900	---	255	255	1080	68	180	216
---	250 315	200 250	132 160 200	315DC	30	170	600	550	660	24	6	508	150	650	682	590	412	189	900	---	255	255	1080	68	180	216

FRAME SIZE	H	HA	HE	HE'	K	L	LL	O	UB1	UB2	SHAFT EXTENSION									BEARING	
											D	E	EB	EF	EG	F	G	GA	DB	DRIVE END	OPPOSITE DRIVE END
315DA	315	45	485	515	28	1674	372	200	M63X1.5	M20X1.5	65	140	125	7,5	42	18	58	69	M20	6316C3	6316C3
315DB	315	45	485	515	28	1704	372	200	M63X1.5	M20X1.5	85	170	160	5	42	22	76	90	M20	6322C3	6322C3
315DC	315	45	485	515	28	1704	372	200	M63X1.5	M20X1.5	95	170	160	5	50	25	86	100	M24	NU322	6322C3

NOTE: 1. Tolerance of Shaft End Diameter D : m6
2. Tolerance of Key Width F : h9
3. Tolerance of Shaft Center Height H : +0, -1

7.1.4 Cast iron design; feet version (B14)

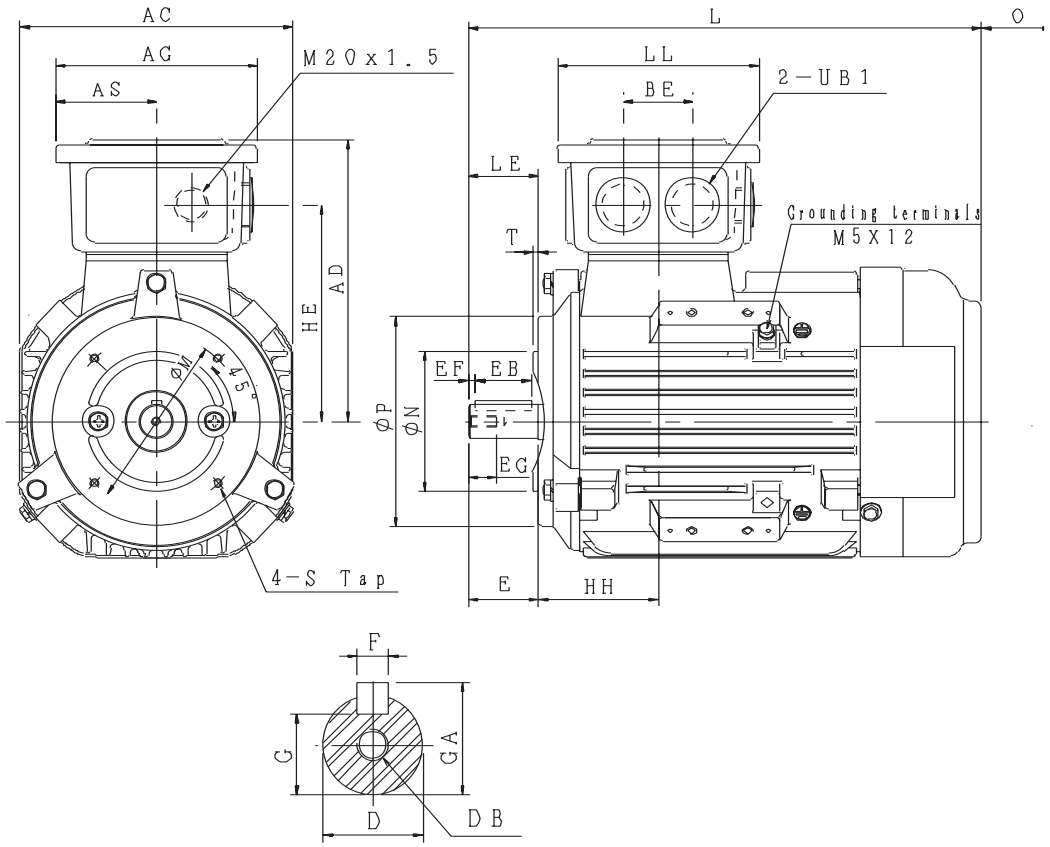


Figure 7-22: Outline drawing of cast iron design, feet version, mounting B14; frame size 80M - 112M

Output (kW)				FRAME SIZE	FLANGE DIMENSION						AC	AD	AG	AS	BE	HE	HH	L	LL	O
2P	4P	6P	8P		LE	M	N	P	S	T										
0,75	0,55	0,37	0,18	80M	40	100	80	120	M6	3	156	161	125	67,5	40	123,5	68,5	293	115	40
1,1	0,75	0,55	0,25																	
1,5	1,1	0,75	0,37	90S	50	115	95	140	M8	3	176	171	125	67,5	40	133,5	92	344,5	115	40
2,2	1,5	1,1	0,55	90L	50	115	95	140	M8	3	176	171	125	67,5	40	133,5	92	369,5	115	40
3	2,2	1,5	0,75	100L	60	130	110	160	M8	3,5	196	191	147	78,5	50	157	84	392	125	50
—	3	—	1,1																	
4	4	2,2	1,5	112M	60	130	110	160	M8	3,5	218	198,5	147	78,5	50	164,5	98	412,5	125	50

FRAME SIZE	UB1	SHAFT EXTENSION									BEARING	
		D	E	EB	EF	EG	F	G	GA	DB	DRIVE END	OPPOSITE DRIVE END
80M	M25X1.5	19	40	32	4	16	6	15,5	21,5	M6	6204ZZC3	6204ZZC3
90S	M25X1.5	24	50	40	5	19	8	20	27	M8	6205ZZC3	6205ZZC3
90L	M25X1.5	24	50	40	5	19	8	20	27	M8	6205ZZC3	6205ZZC3
100L	M32X1.5	28	60	50	5	22	8	24	31	M10	6206ZZC3	6206ZZC3
112M	M32X1.5	28	60	50	5	22	8	24	31	M10	6306ZZC3	6306ZZC3

NOTE: 1. Tolerance of Shaft End Diameter D : j6
2. Tolerance of N : j6

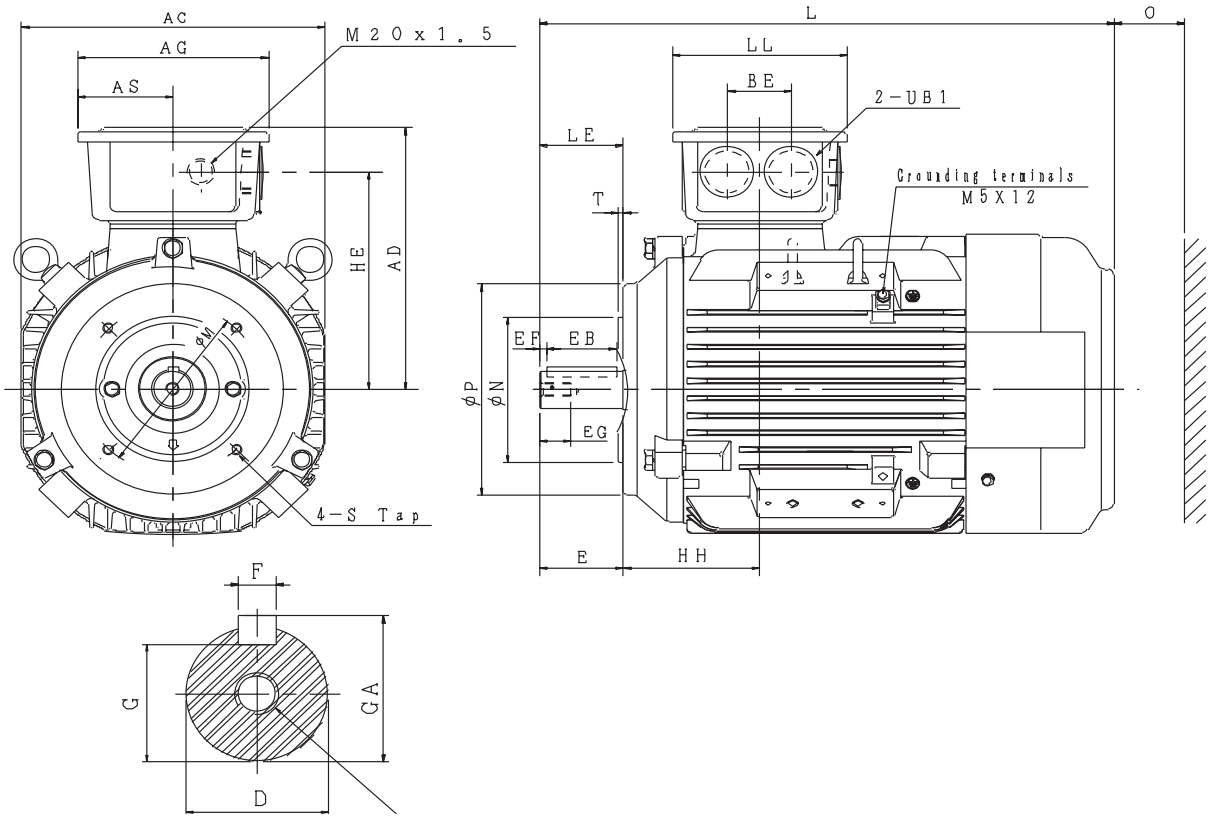


Figure 7-23: Outline drawing of cast iron design, feet version, mounting B14; frame size 132S - 160L

Output (kW)				FRAME SIZE	FLANGE DIMENSION						AC	AD	AG	AS	BE	HE	HE'	HH	L	LL	O
2P	4P	6P	8P		LE	M	N	P	S	T											
5,5	5,5	3	2,2	132S	80	165	130	200	M10	3,5	258	216	147	78,5	50	182	—	95	466	125	50
7,5	—	—	—																		
—	7,5	4	3	132M	80	165	130	200	M10	3,5	258	216	147	78,5	50	182	—	95	504	125	50
—	—	5,5	—																		
11	11	7,5	4	160M	110	215	180	250	M12	4	317	271	193	91,5	89	215	234,5	146	608	193	60
15	—	—	5,5																		
18,5	15	11	7,5	160L	110	215	180	250	M12	4	317	271	193	91,5	89	215	234,5	146	652	193	60

FRAME SIZE	UB1	UB2	SHAFT EXTENSION									BEARING	
			D	E	EB	EF	EG	F	G	GA	DB	DRIVE END	OPPOSITE DRIVE END
132S	M32X1.5	—	38	80	70	5	28	10	33	41	M12	6308ZZC3	6306ZZC3
132M	M32X1.5	—	38	80	70	5	28	10	33	41	M12	6308ZZC3	6306ZZC3
160M	M40X1.5	M20X1.5	42	110	100	5	36	12	37	45	M16	6309ZZC3	6307ZZC3
160L	M40X1.5	M20X1.5	42	110	100	5	36	12	37	45	M16	6309ZZC3	6307ZZC3

NOTE: 1. Tolerance of shaft end diameter D : k6.
2. Tolerance of N : j6.

7.1.5 Cast iron design; feet version (B34)

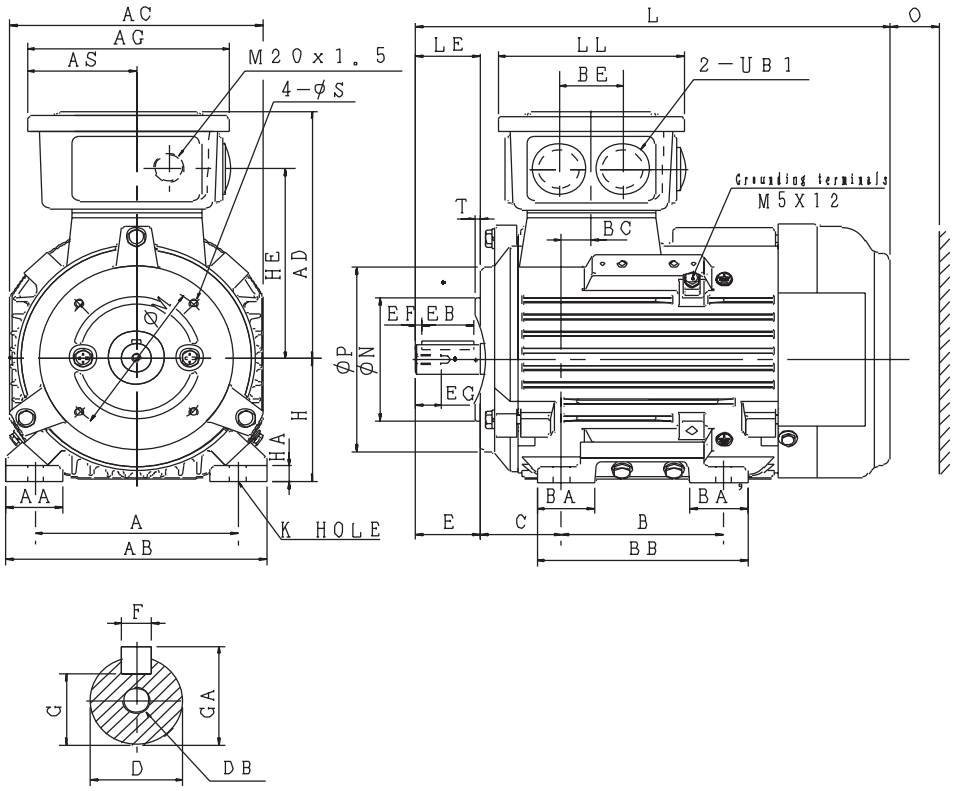


Figure 7-24: Outline drawing of cast iron design, feet version, mounting B34; frame size 80M - 112M

Output (kW)				FRAME SIZE	FLANGE DIMENSION						A	AA	AB	AC	AD	AG	AS	B	B'	BA	BA'
2P	4P	6P	8P		LE	M	N	P	S	T											
0.75 1.1	0.55 0.75	0.37 0.55	0.18 0.25	80M	40	100	80	120	M6	3	125	35	161	156	161	125	67,5	100	--	35,5	35,5
1,5	1,1	0,75	0,37	90S	50	115	95	140	M8	3	140	40	180	176	171	125	67,5	100	--	33	33
2,2	1,5	1,1	0,55	90L	50	115	95	140	M8	3	140	40	180	176	171	125	67,5	125	100	33	58
3 -	2.2 3	1.5 -	0.75 1.1	100L	60	130	110	160	M8	3,5	160	40	200	196	191	147	78,5	140	--	43,5	43,5
4	4	2,2	1,5	112M	60	130	110	160	M8	3,5	190	50	235	218	198,5	147	78,5	140	--	45,5	45,5

FRAME SIZE	BB	BC	BE	C	H	HA	HE	K	L	LL	O	UB1	SHAFT EXTENSION								BEARING	
													D	E	EB	EF	EG	F	G	GA	DB	DRIVE END	OPPOSITE DRIVE END
80M	130	18,5	40	50	80	10	123,5	10	293	115	40	M25X1.5	19	40	32	4	16	6	15,5	21,5	M6	6204ZZC3	6204ZZC3
90S	125	36	40	56	90	10	133,5	10	344,5	115	40	M25X1.5	24	50	40	5	19	8	20	27	M8	6205ZZC3	6205ZZC3
90L	150	36	40	56	90	10	133,5	10	369,5	115	40	M25X1.5	24	50	40	5	19	8	20	27	M8	6205ZZC3	6205ZZC3
100L	176	21	50	63	100	12	157	12	392	125	50	M32X1.5	28	60	50	5	22	8	24	31	M10	6206ZZC3	6206ZZC3
112M	176	28	50	70	112	13	164,5	12	412,5	125	50	M32X1.5	28	60	50	5	22	8	24	31	M10	6306ZZC3	6306ZZC3

NOTE:
1. Tolerance of shaft end diameter D : j6.
2. Tolerance of shaft center high H : +0, -0.5.
3. Tolerance of N : j6

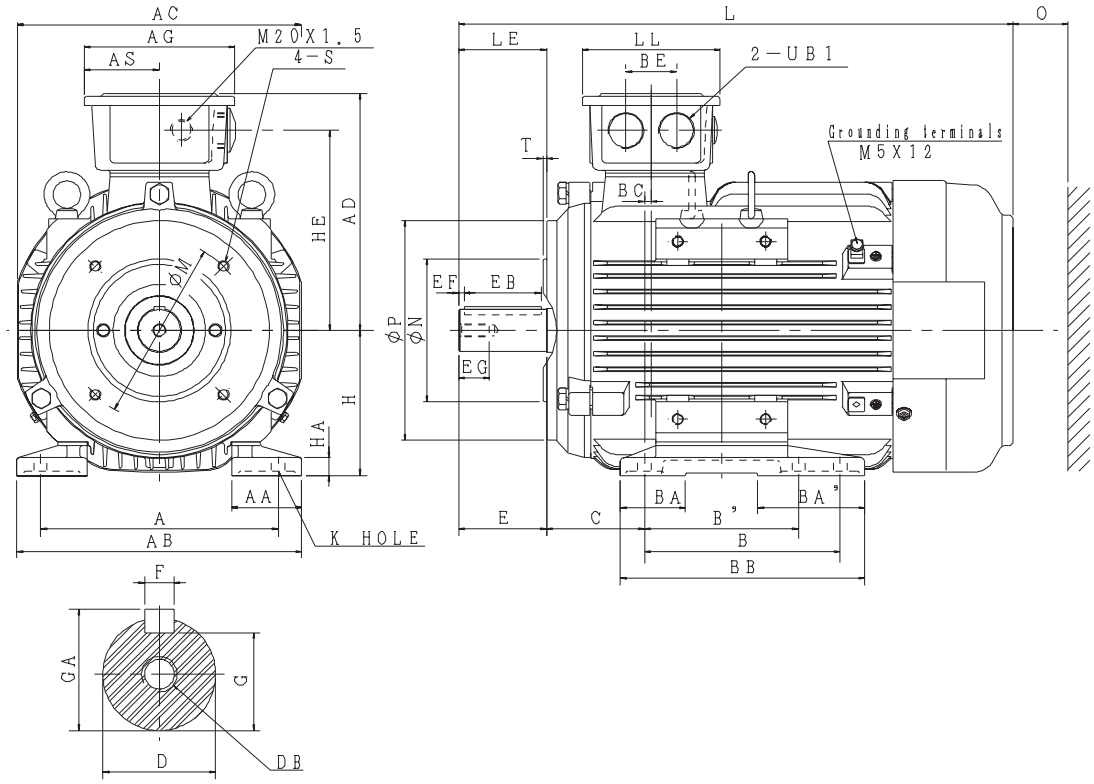


Figure 7-25: Outline drawing of cast iron design, feet version, mounting B34; frame size 132S - 160L

Output (kW)				FRAME SIZE	FLANGE DIMENSION						A	AA	AB	AC	AD	AG	AS	B	B'	BA	BA'	BB
2P	4P	6P	8P		LE	M	N	P	S	T												
5,5	5,5	3	2,2	132S	80	165	130	200	M10	3,5	216	63,5	259	258	216	147	78,5	140	--	59	59	184
7,5	—	—	—																			
—	7,5	4	3	132M	80	165	130	200	M10	3,5	216	63,5	259	258	216	147	78,5	178	140	59	97	222
—	—	5,5	—																			
11	11	7,5	4	160M	110	215	180	250	M12	4	254	71	300	317	271	193	91,5	210	--	66	66	256
15	—	—	5,5																			
18,5	15	11	7,5	160L	110	215	180	250	M12	4	254	71	300	317	271	193	91,5	254	210	66	110	300

FRAME SIZE	BC	BE	C	H	HA	HE	HE'	K	L	LL	O	UB1	UB2	SHAFT EXTENSION								BEARING	
														D	E	EB	EF	EG	F	G	GA	DB	DRIVE END	OPPOSITE DRIVE END
132S	6	50	89	132	16	182	—	12	466	125	50	M32x1.5	—	38	80	70	5	28	10	33	41	M12	6308ZZC3	6306ZZC3
132M	6	50	89	132	16	182	—	12	504	125	50	M32x1.5	—	38	80	70	5	28	10	33	41	M12	6308ZZC3	6306ZZC3
160M	38	89	108	160	18	215	234,5	14,5	608	193	60	M40x1.5	M20x1.5	42	110	100	5	36	12	37	45	M16	6309ZZC3	6307ZZC3
160L	38	89	108	160	18	215	234,5	14,5	652	193	60	M40x1.5	M20x1.5	42	110	100	5	36	12	37	45	M16	6309ZZC3	6307ZZC3

NOTE:
1. Tolerance of shaft end diameter D : k6.
2. Tolerance of shaft center high H : +0, -0.5.
3. Tolerance of N : j6

8 Options

OPTIONS	FRAME SIZE					
	80	90	100	112	132	160
	Protection					
IP56	•	•	•	•	•	•
IP65	•	•	•	•	•	•
IP66	•	•	•	•	•	•
Rain cover	•	•	•	•	•	•
	Painting					
C3 - Class of corrosion prevention	•	•	•	•	•	•
C4 - Class of corrosion prevention	•	•	•	•	•	•
C5 - Class of corrosion prevention	•	•	•	•	•	•
	Insulation System					
Insulation H class	•	•	•	•	•	•
Winding Tropicalization	•	•	•	•	•	•
	Heating Elements					
Winding Heater without Tbox	•	•	•	•	•	•
	Mechanical					
Drive End Roller bearing (NU)	-	-	-	-	-	-
Non Drive End insulated bearing	-	-	-	-	-	-

•Available as option | Included as standard | - Not Applicable

OPTIONS	FRAME SIZE						
	180	200	225	250	280	315	355
	Protection						
IP56	•	•	•	•	•	•	•
IP65	•	•	•	•	•	•	•
IP66	•	•	•	•	•	•	•
Rain cover	•	•	•	•	-	-	-
	Painting						
C3 - Class of corrosion prevention	•	•	•	•	•	•	•
C4 - Class of corrosion prevention	•	•	•	•	•	•	•
C5 - Class of corrosion prevention	•	•	•	•	•	•	•
	Insulation System						
Insulation H class	•	•	•	•	•	•	•
Winding Tropicalization	•	•	•	•	•	•	•
	Heating Elements						
Winding Heater without Tbox	•	•	•	•	•	•	•
	Mechanical						
Drive End Roller bearing (NU)	•	•	•	•	•	•	•
Non Drive End insulated bearing	-	-	-	-	•	•	•

•Available as option | Included as standard | - Not Applicable

9 Spare parts

Spare parts are available according to figures below. The schematic diagrams are only representative for a product group.

9.1 Cast iron motors

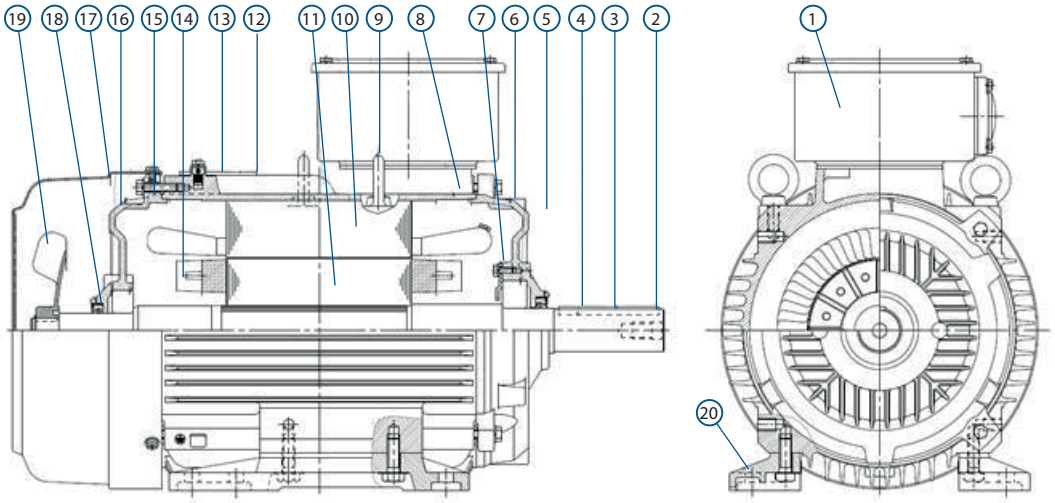


Figure 8-3: Cast iron motors; frame size ≤160 (sample)

01 Terminal box
02 Key
03 Shaft
04 Oil seal
05 Bearing
06 DE end shield
07 Inner bearing cover
08 Frame
09 Lifting eye
10 Stator
11 Rotor
12 Rating plate
13 Grounding terminal
14 Bearing
15 NDE end shield
16 Pre-load spring
17 Fan cowl
18 Oil seal
19 External fan
20 Feet

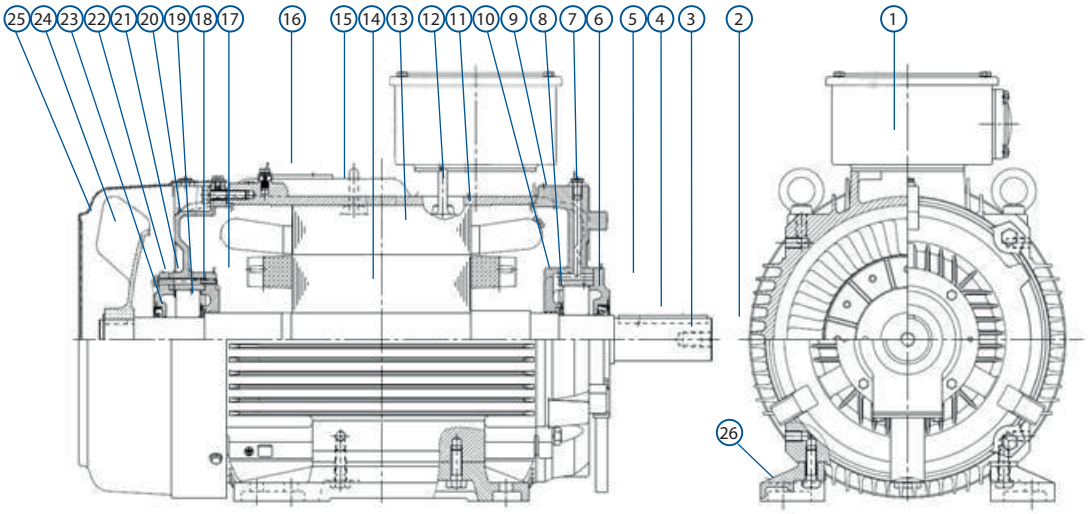


Figure 8-4: Cast iron motors; frame size 180 – 280

01 Terminal box
02 Key
03 Shaft
04 Oil seal
05 Outer bearing cover
06 Bearing
07 Grease nipple
08 Bracket
09 DE end shield
10 Inner bearing cover
11 Frame
12 Lifting eye
13 Stator
14 Rotor
15 Rating plate
16 Grounding terminal
17 Inner bearing cover
18 Bracket
19 Bearing
20 NDE end shield
21 Pre-load spring
22 Outer bearing cover
23 Oil seal
24 External fan
25 Fan cowl
26 Feet

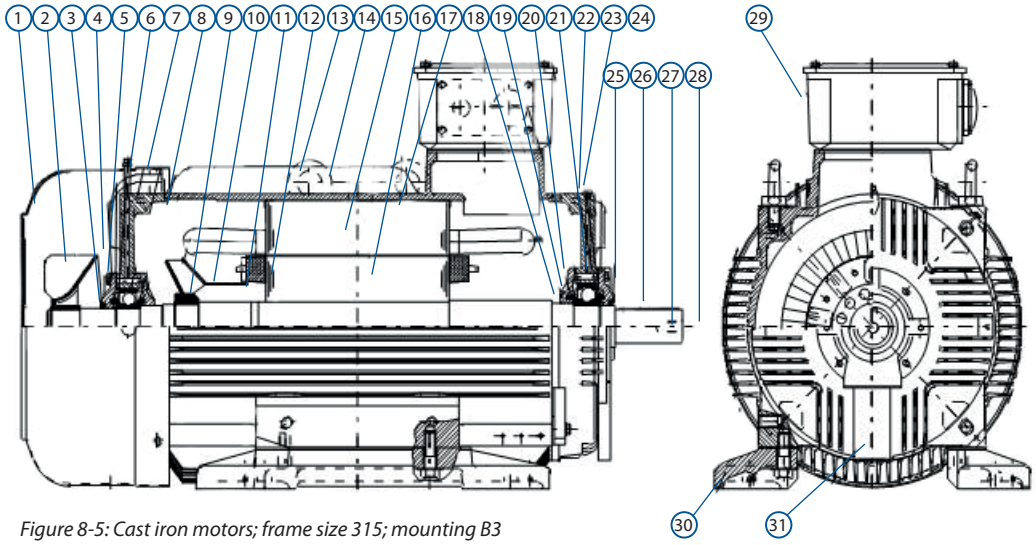


Figure 8-5: Cast iron motors; frame size 315; mounting B3

01 Fan cowl
02 External fan
03 Oil seal
04 Outer bearing cover
05 Outside retaining ring
06 Grease flinger
07 Grease nipple
08 DE end shield
09 Bearing
10 Grease flinger
11 Inner bearing cover
12 Inner fan
13 Lifting eye
14 Rating plate
15 Stator
16 Rotor
17 Frame
18 Inner bearing cover
19 Grease flinger
20 Bearing
21 NDE end shield
22 Grease flinger
23 Outside retaining ring
24 Grease nipple
25 Outer bearing cover
26 Oil seal
27 Shaft
28 Key
29 Terminal box
30 Feet
31 Oil drain cover

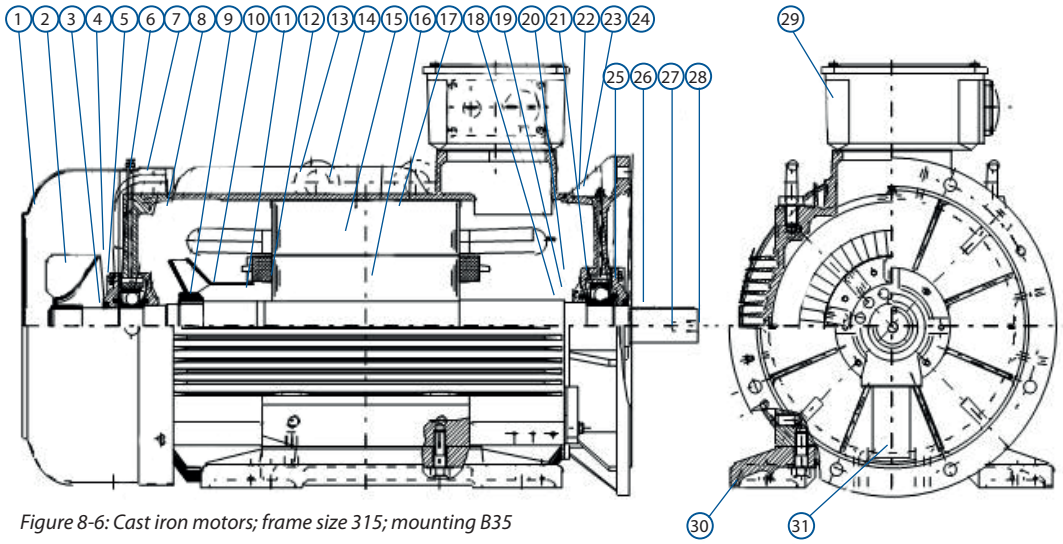


Figure 8-6: Cast iron motors; frame size 315; mounting B35

01 Fan cowl
02 External fan
03 Oil seal
04 Outer bearing cover
05 Outside retaining ring
06 Grease flinger
07 Grease nipple
08 DE end shield
09 Bearing
10 Grease flinger
11 Inner bearing cover
12 Inner fan
13 Lifting eye
14 Rating plate
15 Stator
16 Rotor
17 Frame
18 Inner bearing cover
19 Grease flinger
20 Bearing
21 NDE end shield
22 Grease flinger
23 Outside retaining ring
24 Grease nipple
25 Outer bearing cover
26 Oil seal
27 Shaft
28 Key
29 Terminal box
30 Feet
31 Oil drain cover

10 Packing, labelling

10.1 Packing design

If not otherwise specified, the motors are delivered as described below. Motors are appropriately packed for the shipping and transport method (mainly ship and truck). Within its individual cartons or crates the motors are sealed in foil to prevent spillage and mechanically fixed to avoid movement. A desiccant (like silica gel) is contained within the foil to prevent condensation.

10.1.1 Motors up to frame size 90

The motors are carton packed and placed on individually designed pallets. The motors cartons have two handling bars for carrying appropriate to withstand the motor weight. In a second function these handling bars give easy access to the nameplate of the motor. Therefore change of the brand label is possible without unpacking the motor. The cartons can be piled in 1 – 3 layers on a pallet (see table below). The pallets for carton packed motors are designed for fork lifter use with similar fork access space (max. 145 mm centre blocks) as for euro pallets. (pallet dimensions see table below).

Frame size	Single carton dimensions	Max. pallet dimensions	Max. motors per unit	Max. mass, (depending on type)
	L x W x H	L x W x H		m
	[mm]	[mm]	pieces	[kg]
80	360 x 233 x 250	1100 x 800 x 900	30	730 – 900
90	450 x 250 x 270	1100 x 800 x 970	21	660 – 900

Table 9-1: Packing data of cartons and pallets

10.1.2 Motors frame size 100 to 315

The motors are packed in pallet based crates. It is possible to pile the crates according to table below:

Frame size	Single crate dimensions	Max. layer use	Max. pallet dimensions	Max. motors per unit	Max. mass, (depending on type)
	L x W x H		L x W x H		m
	[mm]	layers	[mm]	pieces	[kg]
100	530 x 350 x 385	3	1100 x 800 x 1000	18	900 – 1150
112	530 x 350 x 385	3	1050 x 930 x 900	12	750 – 1050
132	570 x 440 x 385	3	1160 x 800 x 1020	8	750 – 1050
160	750 x 450 x 590	3	750 x 900 x 720	2	300 – 425
180	840 x 490 x 625	3	980 x 840 x 1380	4	900 – 1250
200	990 x 580 x 740	2	990 x 590 x 750	1	300 – 400
225	990 x 580 x 740	2	990 x 590 x 750	1	370 – 520
250	1090 x 630 x 800	1	1090 x 630 x 800	1	500 – 650
280	1140 x 700 x 970	1	1140 x 700 x 970	1	684 - 730
315 - 355	Check with us	1	Check with us	1	Check with us

Table 9-2: Packing data

10.2 Labelling

Each motor has an identification sticker which provides the following information encoded in clear text as well as in barcode (part of the 128 family).
The sticker is placed:
• with carton packed motors: on one side of the carton
• with crate packed motors: one sticker on side of the crate.

	Clear Text	Barcode
Article No.	X	X
Motor individual serial number	X	X
Catalogue No.	X	
Voltage	X	
Power	X	
Poles	X	
Mounting arrangement	X	

Table 9-3: Identification sticker contents

11 Quality assurance

According to the requirements of IEC 60034-1 the following tests are carried out at least:
• Type test (for a certain type of motor) and
• Routine test (carried out on each individual motor.
The contents of these tests according to IEC are listed in the table below:

Code	Test Item	Type Test	Routine Test
1	Outline dimension inspection	X	X
2	Stator winding resistance (cold)	X	X
3	Insulation resistance (before high voltage test; item 8)	X	
4	Test of rotational direction	X	X
5	Locked rotor current	X	X
6.1	No load curve (current, power)	X	
6.2	Nominal no load point (current, power)	X	X
7.1	Heat run test	X	
7.2	Winding resistance hot (after heat run test)	X	
7.3	Losses segregation (evaluation of efficiency)	X	
8	High voltage test	X	X
9	Insulation resistance (after high voltage test; item 8)	X	X
10.1	Vibration test	X	
10.2	Acoustic noise test	X	

12 Documentation

Together with each motor the following documentation is delivered:
- Barcode label (see 9.2 Labelling, page 120)
- Safety instruction: A short form safety instructions according to demands of European directive 2006/95/EG is delivered together with each single motor (attached in carton box or safely fixed on eye bolt of crate packed motors). The manual is available in the most common EU languages.

The following documentation can be provided on request:
- A detailed start up and operation manual is available in English, German, French, Italian and Spanish language; it is available for download and as a hardcopy in TECO EU offices (TECO file name: "INSTALLATION, OPERATION and MAINTENANCE INSTRUCTIONS FOR TECO LOW VOLTAGE MOTORS TYPE ALAA and ALCA").
- EC certificate of conformity (Low Voltage Directive 2014/35/UE; EMC Directive 2014/30/UE)
- EC-Declaration of Incorporation according to Machinery Directive 2006/42/EC
- Data sheet and individual dimensional diagram
- Inspection certificate according to EN 10204:2004.

Note

Note

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