



MarelliMotori

Inspired solutions



Industrial applications

Content

The company	2
Vision	3
Mission	3
Marelli Motori Group of Companies	4
Core markets	6
Our commitment to quality	8
Inspired solutions	10
No compromise on quality	11
Highest efficiency standards	11
Reliable expertise	11
Serviceability	12
Sustainable approach	12
Industrial applications	14
Motor applications	15
Services	16
Industry standards	17
Energy saving	18
Mountings and positions	20
Product code structure	21
IP Code - Degree of protection	22
IC Code - Cooling	22
Technical characteristics	23
Motor applications	32
Motor range	33
TEFC motors: A6C - B6C - A5C - B5C - B5H	34
TEAAC motors: B4W - B4WH	48
ODP motors: C3C - C4C - C3CH - C4CH - C3W - C4W - C3WH - C4WH	50
TEWAC motors: B4V - B4VH	53
TEWC motors: B4J - B5J - B4JH - B5JH	56
Testing facilities	60
Facilities	61
Routine and type test	61
Special testing	61
Services	62
Our Service team	63
Aftersales services	63



The company

Vision	3
Mission	3
Marelli Motori Group of Companies	4
Core markets	6
Our commitment to quality	8

Vision

To become the global market leader of electric rotating machines in all our core markets.

Mission

Our mission is to aid the sustainable growth of our customers' businesses.

We will provide innovative solutions inspired by relentless efforts to understand our customers' needs and their specific applications.

We will leverage our extensive technical knowledge, product performance and service to increase the competitiveness, efficiency and productivity of our partners worldwide.



Marelli Motori Group of Companies

The Marelli Motori Group is one of the world's leading designers and manufacturers of generators and electric motors. The company was founded in 1891 and nowadays enjoys worldwide brand recognition thanks to its extended sales, distribution and service networks across four continents and two manufacturing facilities, based in Italy and Malaysia, which produce technologically advanced products sold in more than 120 countries.

Our business model is based on a successful combination of four key elements that enable Marelli Motori to offer innovative and inspired solutions which create value for our customers:

- wide range of innovative products
- skilled people providing sales & support globally
- local for local approach
- continuous investment in R&D.



SOUTH AFRICA
Johannesburg

GERMANY
Elze

UNITED KINGDOM
Leicester

UAE
Dubai

USA
Harrodsburg KY

ITALY - HEADQUARTERS
Arzignano (VI)

MALAYSIA
Kuala Lumpur

SPAIN
Barcelona

Core markets

Marelli Motori operates in six key markets:



Marine

Marelli Motori manufactures electric motors and generators for all marine applications where power is required.

Our product applications include:

- propulsion, thrusters, FI-FI system, auxiliaries, dredge pumps, winch and PTO-PTI system
- shaft generators, hybrid machines, offshore, generators at variable speed and emergency.

Motors up to 10.000 kW

Generators up to 12.500 kVA



Power generation

Marelli Motori manufactures generators for all applications where energy is required.

Our product applications include:

- Prime Rated Power (PRP) and Continuous Operating Power (COP)
- stand by
- emergency
- Uninterruptible Power Supply (UPS)
- telecom.

Generators up to 12.500 kVA



Cogeneration (CHP)

Marelli Motori manufactures electric generators for combined heat and power applications.

Our product applications include:

- internal combustion (diesel and gas) engines
- steam and gas turbines.

Generators up to 12.500 kVA



Oil & Gas

Marelli Motori manufactures electric motors and generators for the oil and gas market.

Our product applications include:

- power generation, auxiliary generators and emergency
- centrifugal & reciprocating compressor motors
- heat exchangers & blowers
- pumps (pipeline, water, transfer, cooling, booster)
- extruders / expanders, conveyor system
- mixers, mills and cranes.

Motors up to 1.600 kW

Generators up to 12.500 kVA



Hydropower

Marelli Motori manufactures electric synchronous and asynchronous generators for hydro power plants which can be utilized in any turbine installation.

Our product applications include:

- Pelton turbines
- Francis turbines
- Kaplan turbines
- Turgo turbines
- Cross-Flow turbines.

Asynchronous generators up to 2.800 kW

Synchronous generators up to 9.000 kVA



Industrial

Marelli Motori manufactures electric motors for a wide variety of industrial applications.

Our product applications include:

- power
- metals
- pulp and paper
- cement
- sugar mill
- water pumping and treatments
- manufacturing processes
- mining
- chemical.

Motors up to 10.000 kW

Our commitment to quality

Quality certifications

The Marelli Motori Group uses an Integrated Management System (IMS) which monitors quality, health and safety and environment standards according to ISO 9001, ISO 14001 and OHSAS 18001.

Our quality certifications guarantee the highest standards in all areas of our operations to ensure:

- outstanding product quality allied to best-in-class service performance
- market leading customer satisfaction by ensuring compliance with all customer requirements from product reliability through to durability and ease of maintenance
- a safe place to work in
- minimal environmental impact in all our operations.

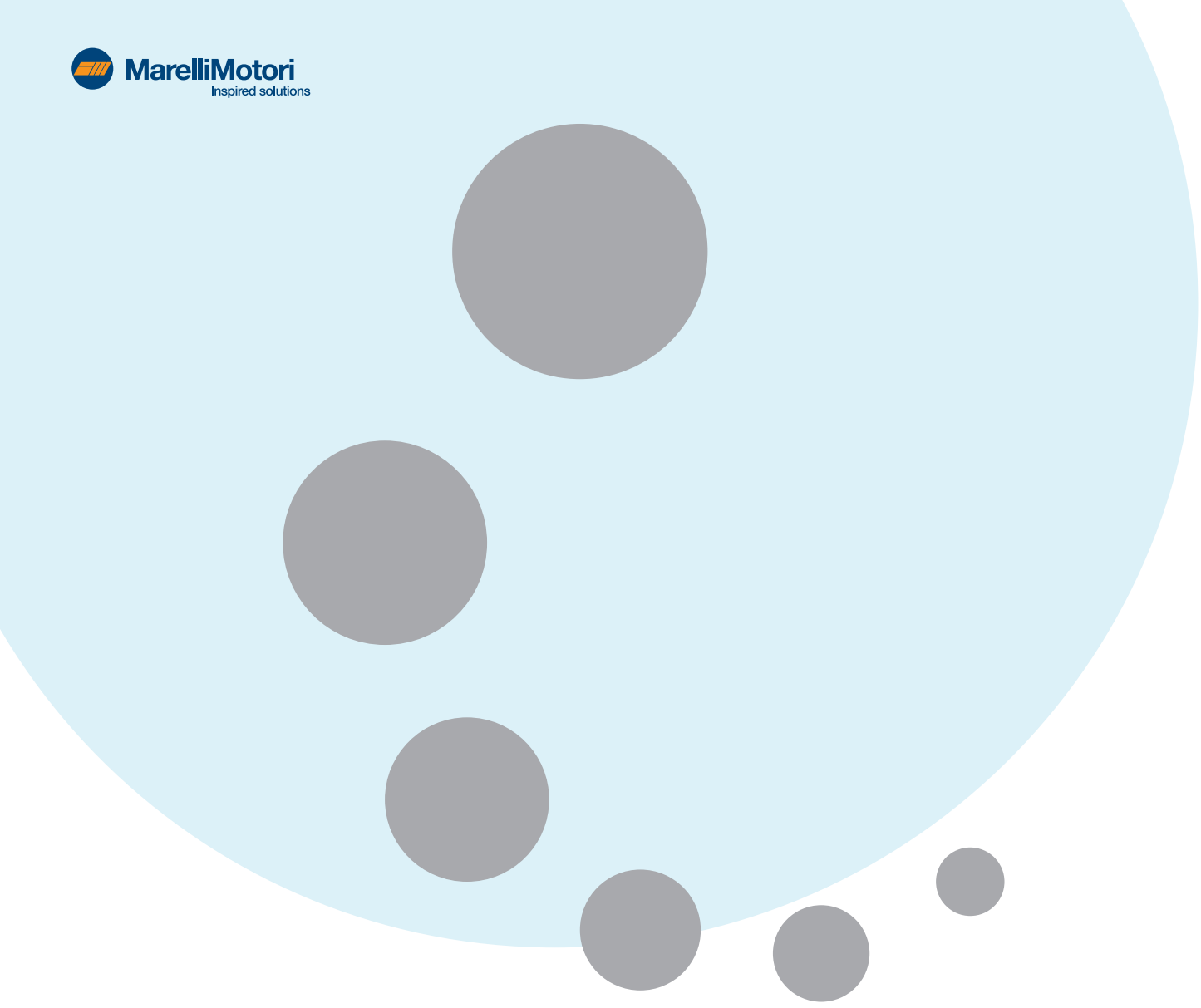


Our quality strategy

The Marelli Motori commitment to quality involves all employees from the boardroom to the shopfloor. Our aim is to help our employees to:

- develop a culture of quality, heightening awareness of quality issues, skills with appropriate and information
- ensure all employees comply with relevant quality regulations and procedures for the highest product quality, health and safety, and environmental standards
- plan and organise their activities with customer-oriented logic with customer satisfaction the ultimate goal at all times
- continuous evaluation of employee proposals for the improvement of processes defining key objectives and goals for the minimisation of environmental impact and health and safety risks of the personnel involved
- develop a culture where individual behavior leads to a safer and healthier workplace
- increase the awareness and involvement of all employees in work-related safety issues
- promote the Marelli Motori commitment to health and safety amongst the entire supply base ensuring a mutually beneficial relationship, enhancing the ability of both to create value.





Inspired solutions

No compromise on quality	11
Highest efficiency standards	11
Reliable expertise	11
Serviceability	12
Sustainable approach	12

No compromise on quality

Vertical manufacturing

Marelli Motori's manufacturing process is vertically integrated which ensures we retain control of our supply chain both upstream and downstream.

High quality materials

Our products are manufactured using the highest quality materials and components from internationally recognised brands which are regularly audited to maintain standards.

Our electrical machines are designed and engineered to ensure a long production life, using components, such as bearings, which have been developed for the most demanding customer requirements.

Special impregnation process

The durability of our electrical core components is vitally important in maintaining uptime and productivity. As a result we have developed our own VPI (Vacuum Pressure Impregnation) process in-house, which ensures that the machine windings are sealed against moisture and vibration, in turn aiding mechanical strength and reliability.

Highest efficiency standards

We specialise in offering our customers the highest levels of motor efficiency via the use of technologically advanced solutions.

Our motors are specifically designed to reach exceptionally high performance standards at any speed and during partial load operations.

Machine arrangements are suitable for variable speed applications, offering best-in-class energy efficiency levels to keep energy costs under control with no compromise on productivity.

Reliable expertise

Extensive and diverse product range

Our comprehensive range of motors have been specifically designed to match the diverse requirements of our customers, offering state-of-the-art solutions backed by outstanding application expertise.

Continuous enhancement through R&D

Our R&D focus is driven by a deep customer understanding which is then converted into product development and continuous range enhancement. We often develop projects in partnership with customers, for example developing very compact designs to suit narrow spaces.

Design flexibility

Our flexibility even reaches final assembly, a point at which customers are still able to adapt a design to meet the requirements of their specific application.

Once in the field, our products can be equipped with a range of retrofit devices enabling the continuous refinement and upgrading of machine performance.

Reliable performance

Non-stop operations can be undertaken during ancillaries replacement and mirror system devices for back-up are standard features.

All of our products are extensively tested in our in-house laboratories, with tests including the string test type, to ensure the correct evaluation of electrical and mechanical performances in any working conditions.

Serviceability

Our motors have been specifically designed for ease-of-maintenance, offering quick access to key components to facilitate MRO activities and reduce servicing costs.

All of our products have a friendly user-interface which, together with a global service network available worldwide, ensures best-in-class performance and high ROI.

Sustainable approach

Safety first

All Marelli Motori manufacturing sites comply with the International Standards for Safety OH SAS ISO18000 (Occupational Health and Safety Assessment Series).

Low carbon footprint

Marelli Motori products are designed to deliver maximum performance and high energy efficiency to achieve the lowest carbon footprint possible.

For example, the energy recovery process in place during test room activities enables us to reduce the impact on the environment and mitigate global warming.

Social responsibility

Marelli Motori's approach to social responsibility is based upon minimising our impact on the environment and preserving the world's natural resources.

A key part of this approach is engage, with all of our stakeholders, including our supply chain and customers, partnering with universities for research and development and supporting local communities with charity activities.





Industrial applications

Motor applications	15
Services	16
Industry standards	17
Energy saving	18
Mountings and positions	20
Product code structure	21
IP Code - Degree of protection	22
IC Code - Cooling	22
Technical characteristics	23

Motor applications



TEFC
A6C A5C IP 55
B6C B5C B5H IP 55
up to 2.400 kW



TEAAC
B4W B4WH IP 55
up to 5.500 kW



ODP
C3C C4C C6C C3CH C4CH IP 23
C3W C4W C6W C3WH C4WH IP 44
up to 10.000 kW



TEWAC
B4V B4VH IP 55
up to 10.000 kW



TEWC
B4J B5J IP 55
B4JH B5JH IP 55
up to 4.000 kW

Marelli Motori manufactures electric motors for a wide variety of industrial applications. Our product applications include:

- power
- metals
- pulp and paper
- cement
- sugar mill
- water pumping and treatments
- manufacturing processes
- mining
- chemical.

Key

TEFC Totally Enclosed Fan Cooled

TEAAC Totally Enclosed Air to Air Cooled

ODP Open Drip Proof

TEWAC Totally Enclosed Water to Air Cooled

TEWC Totally Enclosed Water Cooled

Services

When you partner with Marelli Motori, customers not only gain access to our outstanding portfolio of motors and generators but also world class aftersales support.



Technical support

Marelli Motori prides itself on providing outstanding technical and application support for all its products. Qualified technical support personnel are always on hand to help with design, retrofitting and revamping solutions for machines and voltage/control systems.



Field Service

Our highly trained aftersales service technicians are capable of deploying, at short notice, anywhere in the world, rapidly diagnosing faults and ensuring fast and efficient maintenance and repair.



Spare parts

Genuine Marelli Motori spare parts are available at the Marelli headquarters, branch offices and service centres located all over the world.



Repairs

When a machine fails it is vital that a repair is performed quickly to ensure a swift return to operation. Marelli Motori can perform repairs of low, medium and high voltage machines either at our manufacturing facility or at the customer premises.



Commissioning

We understand that correct machine commissioning is vital in ensuring that our generators work to the best of their ability from day one. Marelli Motori provides hands-on assistance during the commissioning phase, guaranteeing that start-up takes place safely and that correct functional parameters for each machine are applied.



Training

Training courses are available all year to users and maintenance people to ensure the correct operation and maintenance of our electrical machines.

Industry standards

Standard

Rating and Performance	IEC 60034 - 1
Standard methods for determining losses and efficiency from tests	IEC 60034 - 2 - 1
Classification of degrees of protection (IP code)	IEC 60034 - 5
Methods of cooling (IC code)	IEC 60034 - 6
Classification of type of construction and mounting arrangement and terminal box position (IM code)	IEC 60034 - 7
Terminal markings and direction of rotation	IEC 60034 - 8
Noise limits	IEC 60034 - 9
Thermal protection	IEC 60034 - 11
Starting performance of single-speed three-phase cage induction motors	IEC 60034 - 12
Mechanical vibration of certain machines with shaft heights 56 mm and higher - Measurement, evaluation and limits of vibration severity	IEC 60034 - 14
Efficiency classes of single-speed, three phase, cage-induction (IEcode)	IEC 60034 - 30 - 1
Standard voltages	IEC 60038
Dimensions and outputs series for electrical machines - Part1: Frame numbers 56 to 400 flange numbers 55 to 1080	IEC 60072 - 1

European directives

Marelli Motori motors fully comply with the following directives.

Electromagnetic Compatibility (EMC)	2014/30/UE
Low Voltage Directive (LVD)	2014/35/UE
Machinery Directive	2006/42/EC

CE mark declaration of conformity

All low voltage products described in this catalogue are marked CE and are in conformity with the requirements of the applicable Directive. With references to the Machinery Directive, above mentioned product is to considered as a component.

Energy saving

European standards for motors efficiency

The International Electrotechnical Commission (IEC), in order to harmonize the energy consumption regulations aimed to reduce the CO₂ emissions and the impact of industrial operations on the environment, has established the standard IEC 60034-30-1 which defines energy efficiency classes for single-speed, three-phase, 50 Hz and 60 Hz induction motors.

To that regard, the European Community (EC) has recently passed the regulation EU 4/2014 which amend the previous Regulation EC 640/2009. Together these Regulations are also referred to as EU MEPS (European Minimum Energy Performance Standard), and set mandatory minimum efficiency levels for electric motors introduced into the European market. Electric motors account for about 70% of the electricity consumed by industry. The potential cost saving of high efficiency systems is estimated 20% to 30% and one of the major factors in such cost-effective improvement is the use of energy efficient motors.

The IEC 60034-30-1 is part of an effort to unify motor testing standards, efficiency requirements and product labelling requirements to easily recognize worldwide high-efficiency products.

To show compliance with these new efficiency standards, motors must be tested in accordance with the new testing standard IEC 60034-2-1. The motor efficiency class and nominal motor efficiency must be stated on the motor nameplate and given in product documentation and motor catalogues.

Scope

Regulation EU 4/2014 covers single speed, three-phase, 50 Hz and 60 Hz induction motors with:

- 2, 4 or 6 pole
- rated output from 0,75 to 375 kW;
- rated voltage up to 1000 V;
- continuous duty

The following motors are excluded from EU 4/2014

- motors specified to operate wholly immersed in a liquid;
- motors completely integrated into a product (for example gear, pump, fan or compressor) of which the energy performance cannot be tested independently from the product;
- brake motors;
- motors specified to operate exclusively:
 1. at altitudes exceeding 4000 m above sea-level;
 2. where ambient air temperatures exceed 60°C or is less than -30°C;
 3. in maximum operating temperature above 400°C;
 4. where ambient air temperatures are less than -30°C for any type of motor or less than 0°C for a motor with water cooling;
 5. where water coolant temperature is less than 0°C or exceeds 32°C;
 6. in potentially EXplosive ATmospheres (ATEX) as defined in Directive 94/9/EC

Method for determining the efficiency (IEC 60034-2-1)

The method for measuring the efficiency of low-voltage three-phase asynchronous motors is regulated by with the IEC 60034-2-1 standard.

Deadlines

From January 2017, 0,75 - 375 kW motors must have IE3 efficiency level as minimum, or IE2 efficiency level only if driven by frequency converters.

Efficiency classes

The new IEC 60034-30-1 defines worldwide the following efficiency classes of single-speed three-phase, cage-induction motors in the 0,12 - 1000 kW power range.

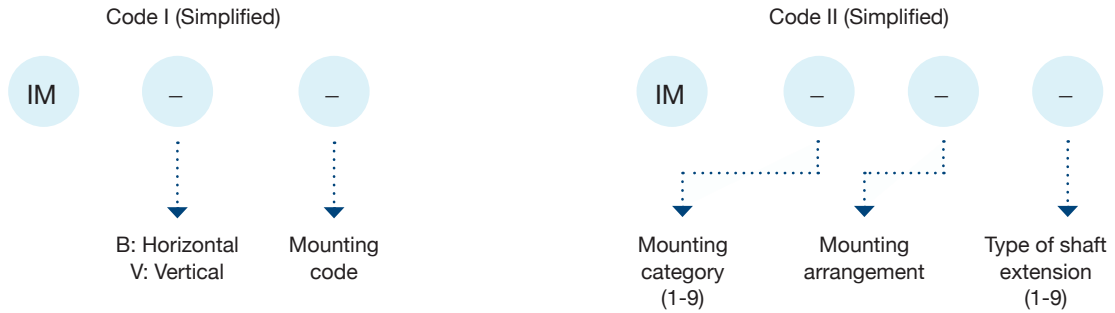
Power kW	IE1 Standard				IE2 High				IE3 Premium			
	2 pole	4 pole	6 pole	8 pole	2 pole	4 pole	6 pole	8 pole	2 pole	4 pole	6 pole	8 pole
0,12	45,0	50,0	38,3	31,0	53,6	59,1	50,6	39,8	60,8	64,8	57,7	50,7
0,18	52,8	57,0	45,5	38,0	60,4	64,7	56,6	45,9	65,9	69,9	63,9	58,7
0,20	54,6	58,5	47,6	39,7	61,9	65,9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

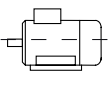
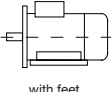
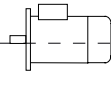




Under regulation EU 4/2014






Mountings and positions

IEC - 60034 - 7

Mounting and positions are defined by the following codes according to IEC 60034 - 7:



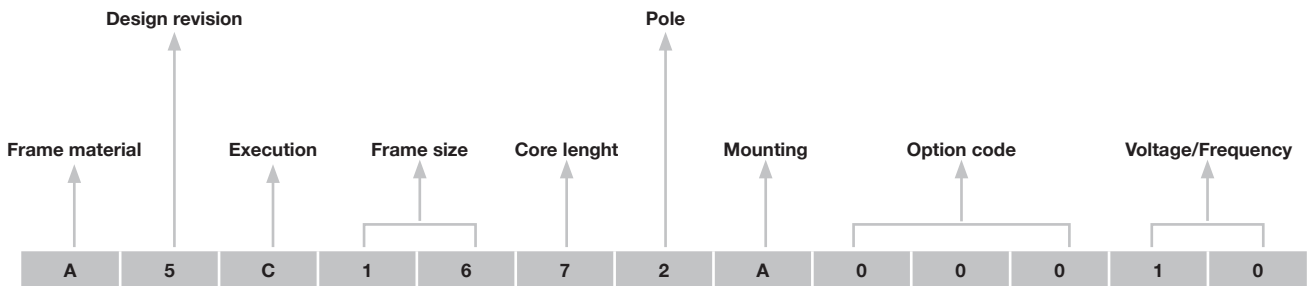
IEC 60034-7			Frame size							
Code I	Code II	Mount	71-132	160 + 250	280	315	355	400	450	500
IM B3	IM 1001	 with feet	Standard	Standard	Standard	Standard	Standard	Standard	Standard	Standard
IM B35	IM 2001	 with feet flanged motor; unthreaded through holes	Standard	Standard	Standard	Standard	Standard	Standard	Standard	Standard
IM B5	IM 3001	 flanged motor; unthreaded through holes	Standard	Standard	Contact Marelli Motori	Contact Marelli Motori	Contact Marelli Motori	Not applicable	Not applicable	Not applicable
IM B6	IM 1051	 with feet	Standard	Standard	Contact Marelli Motori	Contact Marelli Motori	Contact Marelli Motori	Not applicable	Not applicable	Not applicable
IM B7	IM 1061	 with feet	Standard	Standard	Contact Marelli Motori	Contact Marelli Motori	Contact Marelli Motori	Not applicable	Not applicable	Not applicable
IM B8	IM 1071	 with feet	Standard	Standard	Contact Marelli Motori	Contact Marelli Motori	Contact Marelli Motori	Not applicable	Not applicable	Not applicable
IM V1	IM 3011	 flanged motor; unthreaded through holes	Standard	Standard	Standard	Standard	Standard	Standard	Standard	Standard

IEC 60034-7			Frame size							
Code I	Code II	Mount	71-132	160 + 250	280	315	355	400	450	500
IM V15	IM 2011	 with feet flanged motor: unthreaded through holes	Standard	Standard	Standard	Standard	Standard	Standard	Standard	Standard
IM V3	IM 3031	 flanged motor: unthreaded through holes	Standard	Standard	Contact Marelli Motori	Contact Marelli Motori	Contact Marelli Motori	Not applicable	Not applicable	Not applicable
IM V36	IM 2031	 with feet flanged motor: unthreaded through holes	Standard	Standard	Contact Marelli Motori	Contact Marelli Motori	Contact Marelli Motori	Not applicable	Not applicable	Not applicable
IM V5	IM 1011	 with feet	Standard	Standard	Contact Marelli Motori	Contact Marelli Motori	Contact Marelli Motori	Not applicable	Not applicable	Not applicable
IM V6	IM 1031	 with feet	Standard	Standard	Contact Marelli Motori	Contact Marelli Motori	Contact Marelli Motori	Not applicable	Not applicable	Not applicable

For other mounting arrangements refer to IEC 60034-7. The motors should be installed on a rigid foundation with negligible structural vibrations.

Product code structure

Marelli Motori products are identified by a 13-digit code shown on the nameplate. The code is constructed as follow.



IP Code - Degree of protection (IEC - 60034 - 5)

First number	Second number
2 Machine protected against solid objects greater than 12 mm	2 Dripping water shall have no harmful effect from the vertical up to an angle up to 15°
3 Machine protected against solid objects greater than 2,5 mm	3 Spraying water shall have no harmful effect from the vertical up to an angle up to 60°
4 Machine protected against solid objects greater than 1 mm	4 Splashing water from any direction shall have no harmful effect
5 Machine protected against dust	5 Jets of water from any direction shall have no harmful effect
6 Machine totally protected against tight dust	6 Jets of water from heavy seas from any direction shall have no harmful effect

Example of designation - IP 44

- IP** Code IP
- 4** First number (protection against dust)
- 4** Second number (protection against liquid)

IC Code - Cooling (IEC - 60034 - 6)

Typical fluids	
A	Air
W	Water

Typical circuit arrangements	
0	Free circulation
4	Machine surface - cooled
6	Heat exchanger machine mounted (using the motor surrounding coolant)
7	Heat exchanger built in the machine (not using the motor surrounding coolant)
8	Heat exchanger machine mounted (not using the motor surrounding coolant)

Typical methods of circulation	
0	Free circulation
1	Self circulation
6	Circulation with independent device

Example of designation - IC 411

- IC** Code IC
- 4** Circuit arrangement
- A** Primary fluid
- 1** Method of circulation for primary fluid
- A** Secondary fluid
- 1** Method of circulation for secondary fluid

Technical characteristics

Continuous duty S1

The type of duty is indicated by the symbols S1...S9 as defined in standard IEC 60034-1. Duty type S1 refers to operations at a constant load maintained for sufficient time to allow the machine to reach thermal equilibrium.

Insulation class F

Class F insulation systems are utilised in Marelli Motori motors.

This is the most common requirement among the industry today. The class F insulation system allows a temperature rise of 105K, measured by the resistance variation method, and a maximum temperature value of 155°C. Insulation class H allows a temperature rise of 125K on an ambient temperature of 40°C and a maximum temperature value of 180°C. Insulation class H can be provided on request.

Temperature rise compatible with class B

Class B rise allows a maximum winding temperature rise of 80K under normal running conditions (rated voltage, frequency and load) with maximum ambient temperature of 40°C and altitude below 1000 m a.s.l.

Protective treatment

External surfaces

The standard painting process consists of epoxy vinyl-polyurethane paint: of a thickness used to ensure an optimum environmental resistance. Standard finishing paint colour is RAL 5010. Other RAL and MUNSSELL colours are available on request.

The special painting process, consisting of epoxy vinyl paint followed by poly-acrylic paint, is available on request. This process is particularly recommended for:

- environments where acids or basic liquids are present
- outdoor installations where salt is present
- marine applications
- environments where anhydride gases are present.

Corrosivity category	Process	Characteristics	Minimum Thickness
C1	Standard F96833	Base paint: epoxy vinyl paint	50 µm
C3	On request F96831	Base paint: epoxy vinyl paint Final Paint: polyacrylic paint	100 µm
C3-C4 Low	On request F96819	Base paint: epoxy vinyl paint + Final Paint: polyacrylic paint	160 µm
C4 High - C5 Industrial	On request F96826	Base paint: epoxy paint + Final Paint: polyacrylic paint	240 µm
C5 Marine	On request F96827	Base paint: epoxy paint + Final Paint: polyacrylic paint	320 µm

Internal Surfaces

All internal surfaces of motors from 280 frame size are tropicalized with an insulating enamel to prevent motor corrosion due to humidity and aggressive substances. Tropicalisation can also be applied to motors from 160 to 250 frame size on request.

Balancing and vibration grades

The motors are subjected to dynamic balancing with a half key applied to the shaft extension in accordance with standard IEC 60034-14 to vibration grade A in standard execution.

The following table indicates the limits of vibration magnitude in displacement, velocity and acceleration (r.m.s.) for shaft height H.

Large vibrations may occur on motors installed on site, due to several factors such as unsuitable foundations or reactions caused by the driven application.

In such cases checks should also be carried out on each element of the installation.

Motors can be supplied also with grade B on request.

Vibration grade	Mounting	63 < h < 132			160 < h < 280			h > 280		
		Displac. [µm]	Vel. [mm/s]	Acc. [m/s ²]	Displac. [µm]	Vel. [mm/s]	Acc. [m/s ²]	Displac. [µm]	Vel. [mm/s]	Acc. [m/s ²]
A reduced	Free	25	1.6	2.5	35	2.2	3.5	45	2.8	4.4
	Ridig	21	1.3	2.0	29	1.8	2.8	37	2.3	3.6
B special	Free	11	0.7	1.1	18	1.1	1.7	29	1.8	2.8
	Ridig	-*	-*	-*	14	0.9	1.4	24	1.5	2.4

*Rigid mounting is not considered acceptable for machines with shaft heights less than 132 mm.

The instrumentation can have a measurement tolerance of $\pm 10\%$.

the free suspension condition is achieved by suspending the machine on a spring or by mounting on a elastic support (springs, rubber, ect).

Noise

Medium values of A-sound pressure level (LpA) and A-sound power level (LwA) are measured at a one metre distance according to standard ISO R 1680.

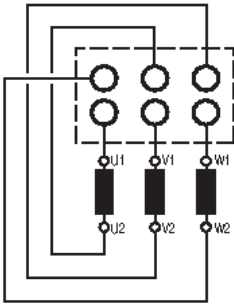
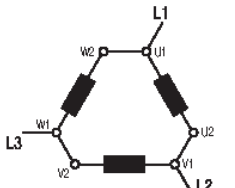
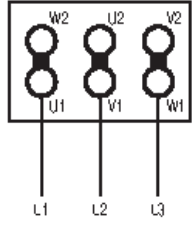
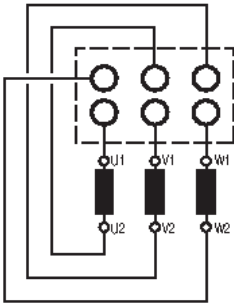
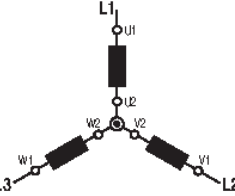
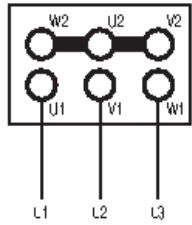
Sound levels are measured at no-load and a tolerance of 3 dB (A) shall be applied. Values of sound pressure increase by approximately a 4 dB (A) at 60 Hz.

To reduce noise levels, a special fan can be fitted to motors on request.

Ask Marelli Motori to check requested derating and admissible outputs.

Connection diagrams

The table below, show the materials used on the mechanical components for standard motors.

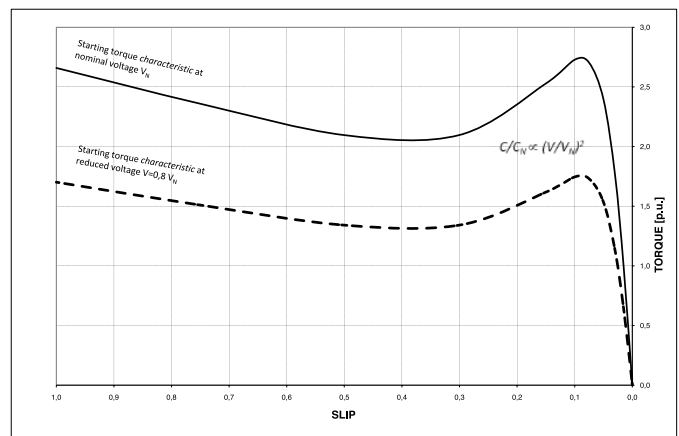
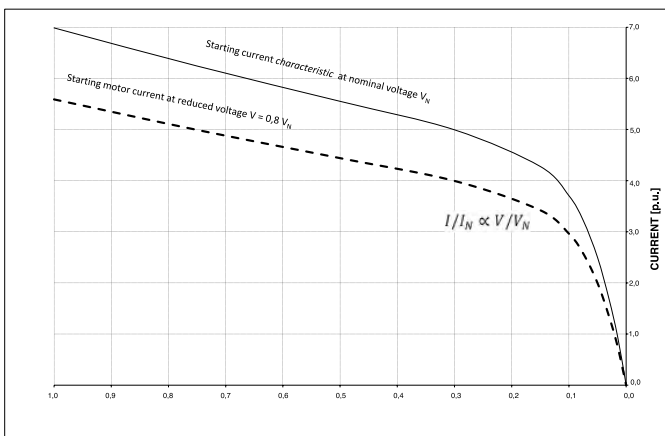
Voltages and connection	Internal connection diagrams	Outline diagrams	External connection diagrams
Single speed motors			
Voltage: U Connection Δ (at lower marked voltage) e.g. 230 V / Δ			
Voltage: U Connection Y (at lower marked voltage) e.g. 400 V / Y			

Starting

The performances of a motor in the starting phases are, in first approximation, related to the corresponding feeding voltage by the following relationships:

- The starting current is almost varying directly with the motor feeding voltage: $I/I_N \propto V/V_N$.
- The starting torque (C_s) and the maximum torque (C_M) of the motor is almost varying directly with the square of the feeding voltage: $C/C_N \propto (V/V_N)^2$.

Example of starting current and torque characteristics modification when voltage is varying from 100 % of V_N to 80 % of V_N .



Starting response

The starting current values given in p.u. detailed in the present catalogue allow to obtain the starting current rms values, and so measured after some sinusoidal periods from insertion: in the first instant it is possible to have peak currents which can be up to 2.5 times the stable values. The amplitude of the peaks depends essentially on the instantaneous value of the sinusoidal supply voltage at the moment of insertion. These peaks are rapidly damped. The starting torque peaks, having an analogue behavior, come considerably attenuated by the inertia of the motor and the coupling load, with negligible resulting stress of the shaft and coupling.

Type of starting

Knowing the torque versus speed diagram of the load driven by the motor is the first fundamental point to evaluate which type of starting method can be used in the system: the motor coupled to the load can be started positively only when the accelerating motor torque is higher than the required load torque in all the speed range of the starting process (from zero to the nominal speed).

Torque load diagrams are mainly divided in the following categories:

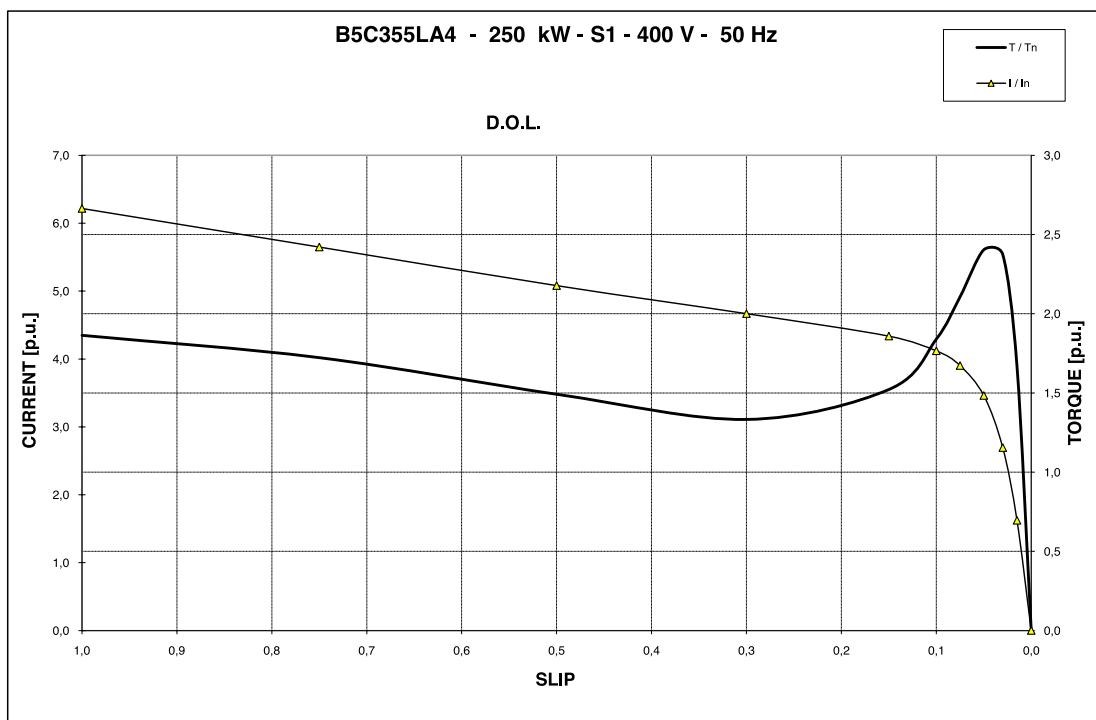
- **Machines with quadratic torque versus speed diagram:** typically these machines can be centrifugal pumps, ventilators, propellers or screw compressors
- **Machines with constant torque versus speed diagram:** typically these can be paper continuative machines, refrigeration piston compressor, or skiing cable car
- **Machines with proportional torque versus speed diagram:** typically are rolling mills or liquid ring pump.

During the starting a big attention is usually paid to the starting current that, for DOL starting can achieve very high values. Considering all these factors, an appropriate starting system can be chosen.

The most common starting methods are the following:

1. Direct-on-line starting (D.O.L.)

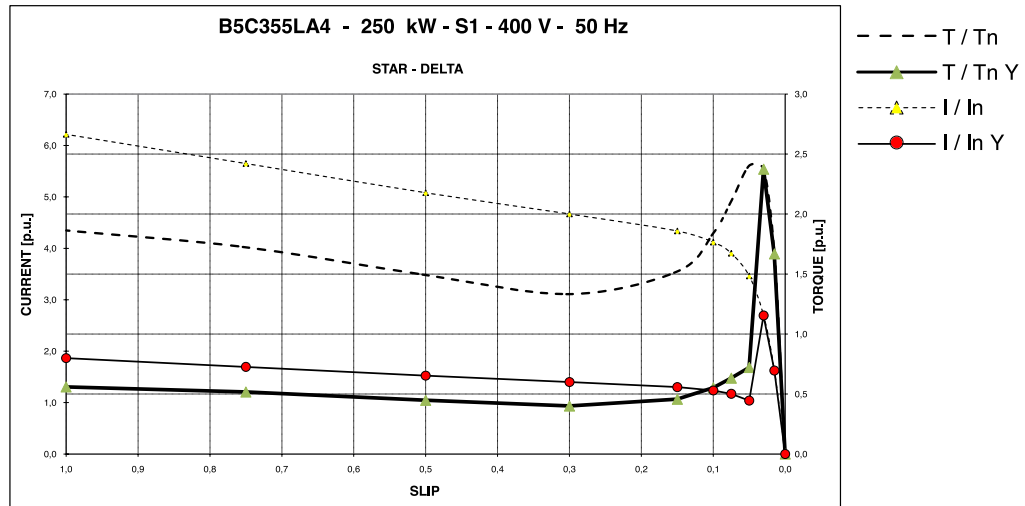
D.O.L. starting means the direct insertion of the motor at its nominal voltage and frequency values. In these conditions the starting torque and current are those given in the catalogue.



2. Star -Delta starting (Y / Δ)

With this method both the starting torque (▲) and the current (●), in the starting phase, will be reduced at a value of approx 30% of the correspondent value indicated for DOL starting (with a negligible transient at delta insertion). This starting method can be adopted in cases where the resistant torque is very low and low starting currents are also requested.

A motor that should be started with star – delta device should have all the six winding terminals in the main terminal box and the motor should be designed for delta connection when fed at nominal voltage / frequency.

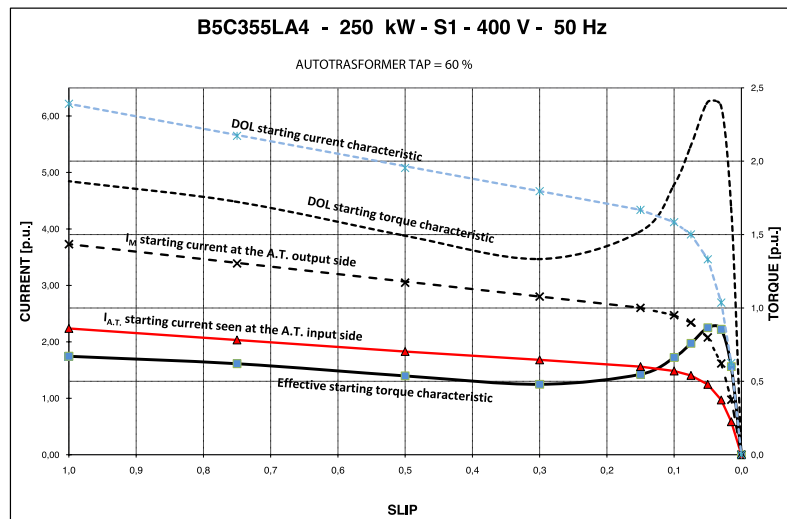


3. Autotransformer starting (A.T.)

When the starting is realized by the use of an autotransformer it should be considered the voltage ratio ($K=V_{AT}/V_N$) between the output and input of the transformer during the starting.

In this conditions the starting performances will be as in the following:

The use of an autotransformer allows a reduction of the starting current but also results in a lower motor torque characteristic. Functioning is given with the following relationships:



$$I_{A.T.} = I_N \cdot \left(\frac{V_{A.T.}}{V_N} \right)^2 = I \cdot K^2 \quad I_M = I_N \cdot \frac{V_{A.T.}}{V_N} = I_N \cdot K$$

$$C_{A.T.} = C_{D.O.L.} \cdot \left(\frac{V_{A.T.}}{V_N} \right)^2 = C_{D.O.L.} \cdot K^2$$

V_N = motor nominal voltage [V]

I_N = motor nominal current [A]

$I_{D.O.L.}$ = motor starting current at nominal voltage

$I_{A.T.}$ = reduced starting current seen by the main supply (input side of autotransformer [A])

$C_{A.T.}$ = starting motor torque at reduced voltage $V_{A.T.}$

$V_{A.T.}$ = reduced voltage at the exit of autotransformer [V]

I_M = motor starting current at voltage V_{AT} [A]

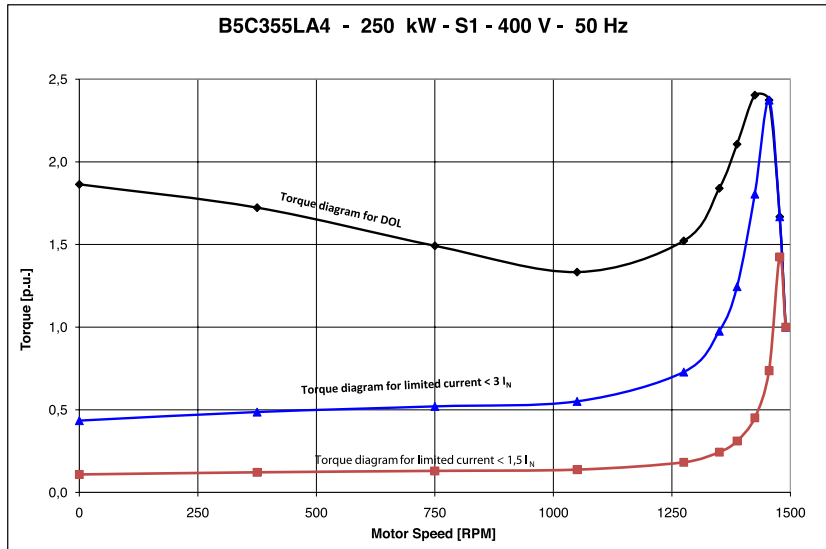
$C_{D.O.L.}$ = starting torque at nominal voltage

4. Soft starter starting

The soft starter can be seen as a device that, during the starting process, increase gradually the voltage, limiting the starting current at a fixed value (usually the limited current range is from 1,5 to 3 times the nominal current).

Being fixed the limited current during the starting, the torque diagram will be consequently reduced almost directly with the square ratio of the limited current and the correspondent D.O.L. current.

This method of starting is indicated for machines with very low torque profile at low speed.



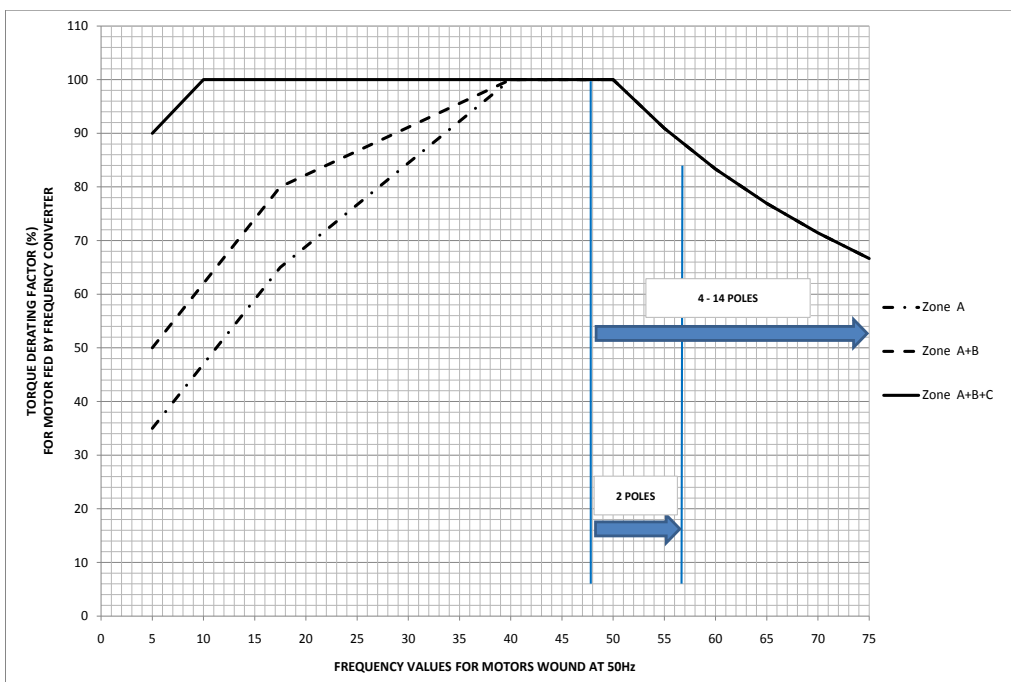
Motors for variable speed applications

A.C. motors designed for sinusoidal feeding voltage and constant feeding frequency can, under normal conditions, be used in variable speed applications by means of a frequency converter. Motors for variable speed applications are generally fed by the frequency converter by upholding the relationship U_n/f_n up to the speed correspondent to the nominal voltage and frequency and, for higher speeds, by increasing the frequency and keeping constant the nominal voltage value.

The performances of a motor fed by frequency converter depend on the cooling type: self-ventilated motors are suitable for use at loads with quadratic torque/speed shapes (typical case for pumps and fans).

When constant torque is required from low speeds, forced ventilation must be employed.

Generally the motor type can be chosen referring to the following diagram by considering: the torque diagram of the motor, the speed range, the cooling type.



In both cases the resistant torque of the driven machine must be lower than the leading torque of the motor for the total running speed range.

The speed range is set from a minimum frequency F_{MIN} (typically around 5-10 Hz depending on the converter), and a maximum frequency F_{MAX} given by the speed limits of the rotating system and/or the reduction in torque.

Cooling Method IC 411	Poles	Frame size
Zone A + B	2 - 14	≥ 355
Zone A	6 - 8	≤ 315
Zone A + B	2 - 4	≤ 315
Cooling Method IC 416	Poles	Frame size
Zone A + B + C	2 - 17	≤ 500

The use of the frequency converter requires some precautions regarding the voltage peaks and wave-fronts. The values of the peaks depend on the supply voltage of the motor feeding cable length.

According to different voltage levels, peaks values and features of the insulation are based on the following table.

Frame size	$V_n \leq 500 \text{ V}$		$V_n \leq 690 \text{ V}$	
	Peak Voltage Limits	Features	Peak Voltage Limits	Features
160 ÷ 250	$V_{pk} \leq 800 \text{ V}$ Rise Time $\geq 1 \mu\text{s}$	Standard motor	$V_{pk} \leq 800 \text{ V}$ Rise Time $\geq 1 \mu\text{s}$	Standard insulation + dU/dt filters*
280 ÷ 315	$V_{pk} \leq 1000 \text{ V}$ Rise Time $\geq 1 \mu\text{s}$	Enhanced insulation	$V_{pk} \leq 1000 \text{ V}$ Rise Time $\geq 1 \mu\text{s}$	Standard insulation + dU/dt filters*
355 ÷ 450	$V_{pk} \leq 1350 \text{ V}$ Rise Time $\geq 1 \mu\text{s}$	Enhanced insulation	$V_{pk} \leq 2150 \text{ V}$ Rise Time $\geq 0,5 \mu\text{s}$ $V_{pk} \leq 1900 \text{ V}$ Rise Time $\geq 0,2 \mu\text{s}$	Superior insulation

* The filter depends on the characteristics of the converter and therefore any inquiries should be directed to the converter manufacturer.

Motors fed by frequency converter can be subject to voltages between the D-end and N-end bearing arrangements. This is due to the effects of the feeding system. The values of the aforementioned voltages depend on the characteristic of the frequency converter and on the dimensions of the motor itself. For motors from 315 frame size or those where the shaft peak voltage exceed 500 mV, Marelli Motori suggest to insulate on of the bearing arrangements of the motor. Normally this solution is applied to the N-end of the motor.

These guidelines, coupled with the correct grounding of the operating system, motor and coupled machine, guarantee the best results.

Motors for forced ventilation

The forced ventilation is available as an optional for specific application.

80Motors for forced ventilation			Nominal data			
			400 V - 500 Hz		440 V - 60 Hz	
Frame size	Approx. Δp [kg]	Approx. Δl [mm]	P[W]	In[A]	P[W]	In[A]
160 - 180M	5,3	215	0,25	0,82	0,26	0,75
180L - 200	7,7	222	0,55	1,7	0,58	1,4
225 - 250	7,7	232	0,55	1,7	0,58	1,4
280	7,7	248	0,55	1,7	0,58	1,4
315	32	250	0,55	1,7	0,58	1,4
355	60	400	2,2	4,65	2,4	4,39
400	60	400	2,2	4,65	2,4	4,39
450	60	450	3	6,57	3,3	6,32
500	80	450	4	8,08	4,4	7,8

Tolerances for eletromechanical characteristics

Tolerances for electromechanical characteristics in accordance with standard IEC 60034-1

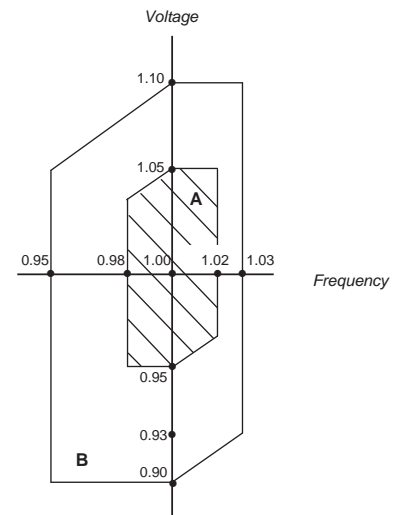
Efficiency η	-15% of $(1 - \eta)$ for $P_{nom} \leq 150$ kW -10% of $(1 - \eta)$ for $P_{nom} > 150$ kW
Power factor	-1/6 $(1 - \cos\phi)$ Minimum absolute value 0.02 Maximum absolute value 0.07
Slip	$\pm 20\%$ for $P_{nom} \geq 1$ kW $\pm 30\%$ for $P_{nom} < 1$ kW
Locked rotor current	+20% of the current
Locked rotor torque	-15% +25% of the torque
Run up torque	-15% of the value
Breakdown torque	-15% of the value
Moment of inertia	$\pm 10\%$
Noise	+3 dB (A)
Vibration	+10% of the guaranteed class

Voltage and frequency

The motors described in this catalogue have nominal ratings and performances referred to the nominal voltage mentioned in the main nameplate, according to the Standard IEC 60034-1. This Standard classifies voltage and frequency variations in two different areas A and B as shown in the following figure.

Area A – The motor shall be capable of performing its primary function continuously, but need not comply fully with its performance at rated voltage and frequency and may exhibit some deviations.

Area B – In this area the motor shall be capable of performing its primary function, but may exhibit greater deviations from its performance at rated voltage and frequency than in zone A. Extended operation at the perimeter of zone B is not recommended.



The motors can be wound for special voltage and frequency values, on request.

Installation ≤ 1000 m a.s.l.

The performance of standard motors is considered at a maximum height of 1000m above sea level (a.s.l.) with motors running in continuous duty, at nominal voltage and frequency and a maximum ambient temperature of 40°C.

Deratings

Should the environmental conditions be different from the conditions given by IEC 60034-1 §6 standards (continuous duty S1, at 50 Hz for rated voltage, 40° ambient temperature, and an altitude up to 1000 m a.s.l.), the output ratings are obtained by applying the factors as per the following table.

Altitude (m) a.l.m.	Ambient Temperature (°C)						
	30	35	40	45	50	55	60
1000	-	-	1,00	0,95	0,92	0,88	0,83
1500	-	1,00	0,97	0,92	0,90	0,85	0,82
2000	1,00	0,95	0,94	0,90	0,87	0,83	0,80
2500	0,96	0,93	0,90	0,88	0,85	0,81	0,77
3000	0,92	0,90	0,86	0,85	0,82	0,78	0,75
3500	0,90	0,88	0,82	0,81	0,80	0,76	0,73
4000	0,86	0,84	0,80	0,78	0,77	0,73	0,70
4500	0,82	0,80	0,76	0,74	0,72	0,70	0,67
5000	0,78	0,75	0,71	0,69	0,67	0,65	0,62



Motor applications

Motor range	33
TEFC motors: A6C - B6C - A5C - B5C - B5H	34
TEAAC motors: B4W - B4WH	48
ODP motors: C3C - C4C - C3CH - C4CH - C3W - C4W - C3WH - C4WH	50
TEWAC motors: B4V - B4VH	53
TEWC motors: B4J - B5J - B4JH - B5JH	56

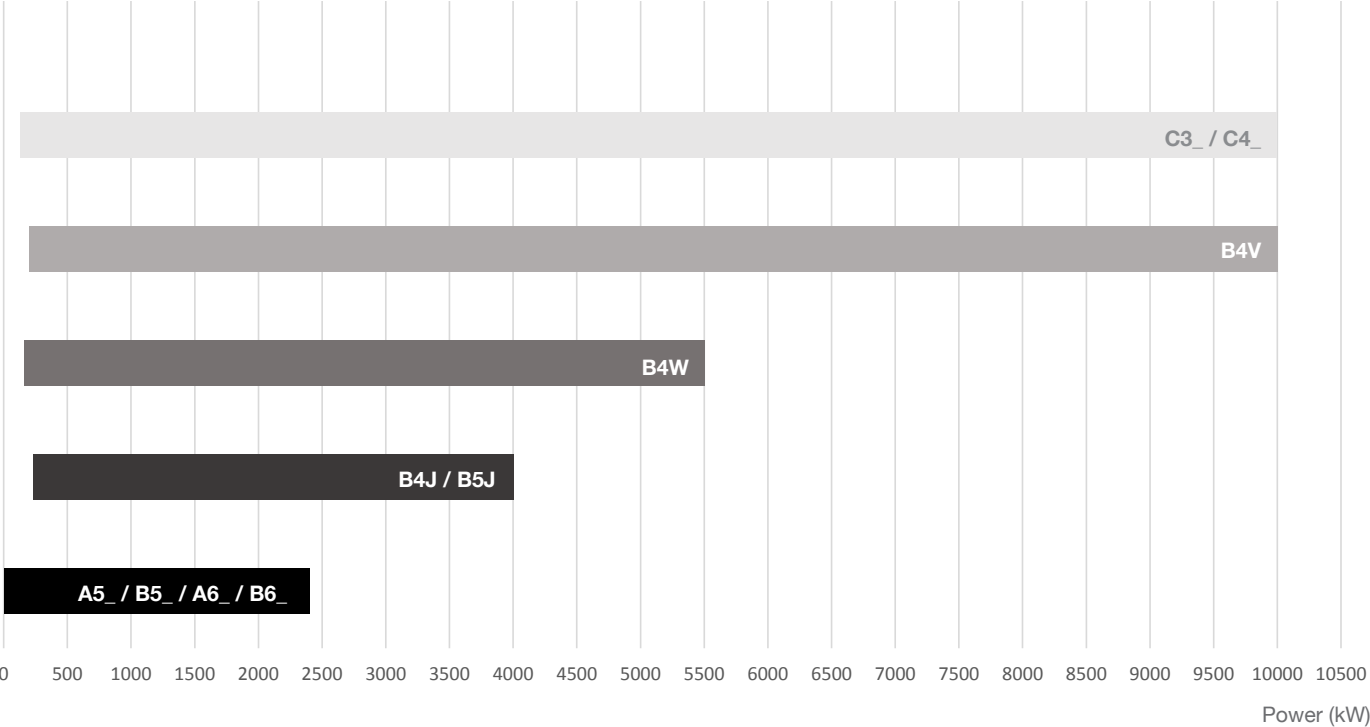
Motor range

Key

- ODP - Open Drip Proof
- ◐ TEWAC - Totally Enclosed Water to Air Cooled
- ◑ TEAAC - Totally Enclosed Air to Air Cooled
- TEWC - Totally Enclosed Water Cooled
- TEFC - Totally Enclosed Fan Cooled

Motor model

- C3C / C4C / C6C / C3CH / C4CH / C3W / C4W / C4W / C3WH / C4WH
- B4V / B4VH
- B4W / B4WH
- B4J / B5J / B4JH / B5JH
- A6C / A5C / B6C / B5C / B5H



TEFC motors



Model IP 55	LV A6C - B6C - A5C - B5C MV B5H
Power	Up to 2.400 kW
Voltages	Up to 11.000 V
Frame	71 ÷ 560
Pole	2, 4, 6, 8,10 and 12
Cooling	IC 411 (IC 416 optional)
IP optional	IP 56 or IP 65*
Main application	power, metals, pulp and paper, cement, sugar mill, water pumping and treatments, manufacturing processes, mining, chemical.

Power

	2 POLES	4 POLES	6 POLES	8 POLES	10 POLES	12 POLES
kW	1.350 (50 Hz)	2.400 (60 Hz)	2.160 (60 Hz)	1.500 (60 Hz)	1.200 (60 Hz)	1.080 (60 Hz)

* IP 65 not available for A6C.

Main components

Housing

Motors from size 71 to 132 are made in cast iron.
Motors from size 160 to 280 are made either in aluminium or in cast iron (optional).
Starting from frame 315 and up to 500 the frame is in cast iron only.
(EN 1561-GJL – 200)

Shield

Made of grey cast-iron (EN 1561 – GJL 200) up to 500 frame size motors.

Shaft

General data

Made in carbon steel (EN 10083 – 2 C40 – TN) up to 500 frame

Shaft design

Cylindrical shaft with key.

Materials

The table below, show the materials used on the mechanical components for standard motors.

Components	Frame Size 71 - 132	Frame Size 160 - 280	Frame Size 315	Frame Size 355 - 400	Frame Size 450 - 500	Frame Size 560
Frame	Cast Iron	Aluminium	Cast Iron	Cast Iron	Cast Iron	Steel
Endshields	Cast Iron	Cast Iron	Cast Iron	Cast Iron	Cast Iron	Steel
Fan cowl	Steel	Steel	Steel	Fibreglass	Fibreglass	Steel
Fan	Thermoplastic	Thermoplastic	Thermoplastic	2 poles polyamide ≥4 poles aluminium	2 poles polyamide ≥4 poles aluminium	Steel
Terminal Box ¹	Cast Iron	Steel	Steel	Cast Iron	Steel	Steel

¹ Terminal box casted with frame for 71 and 80 sizes

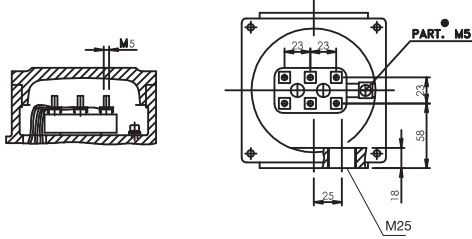
Main terminal box

Mounted on top and made of cold-rolled formable steels EN 10025 – S235JR or cast iron depending from size. Degree of protection of standard terminal box is IP 55.

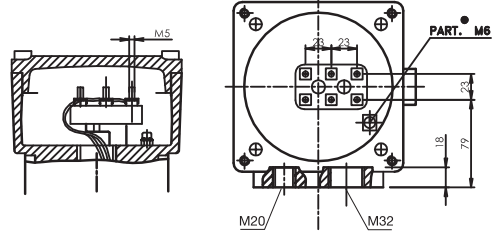
Frame size	Type of terminal	Terminal size	Maximun conductor section [mm ²]	Maximun cable diameter [mm]	Clearance holes formetric cablands	
71- 80	Threaded Terminals	M6	10	15	M25 X 1,5 + M20 X 1,5 (aux)	
90 - 132				21	M32 X 1,5 + M20 X 1,5 (aux)	
160 - 250		M8		35	38	M40 Knockout opening M50 Knockout opening
280 - 315M		M12		120	43	2 x M63 Knockout opening
315L	2 x M63					
355 - 400	Flat copper bars		2 X 300			/
450 - 500		6 X 300	/			
560		M16	8 X 300	/		

Dimensions

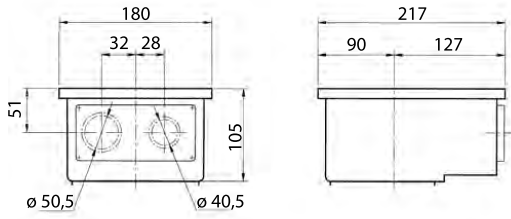
Motors in standard execution are supplied with main terminal box having the following dimensions:



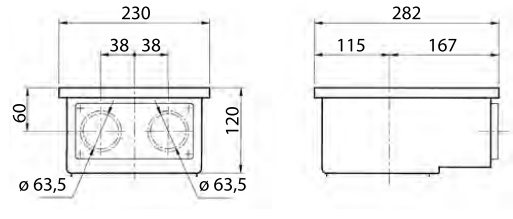
71 - 80



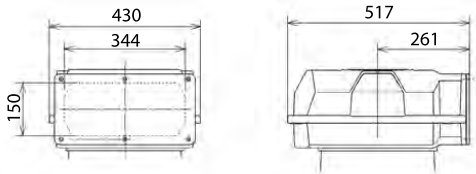
90 - 132



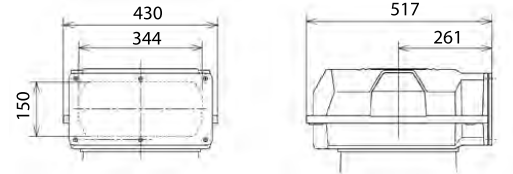
Star connection Delta connection
160 - 250



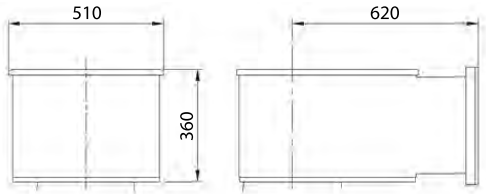
Star connection Delta connection
280 - 315 M



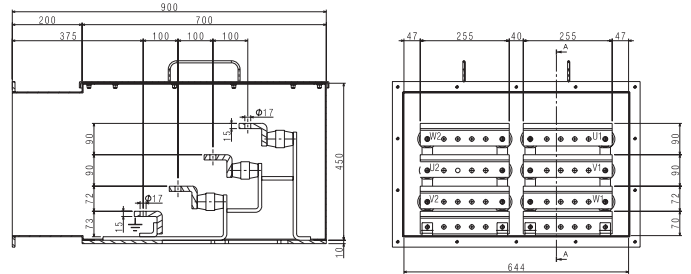
Star connection Delta connection
315 L



Delta connection Star connection
355 - 400

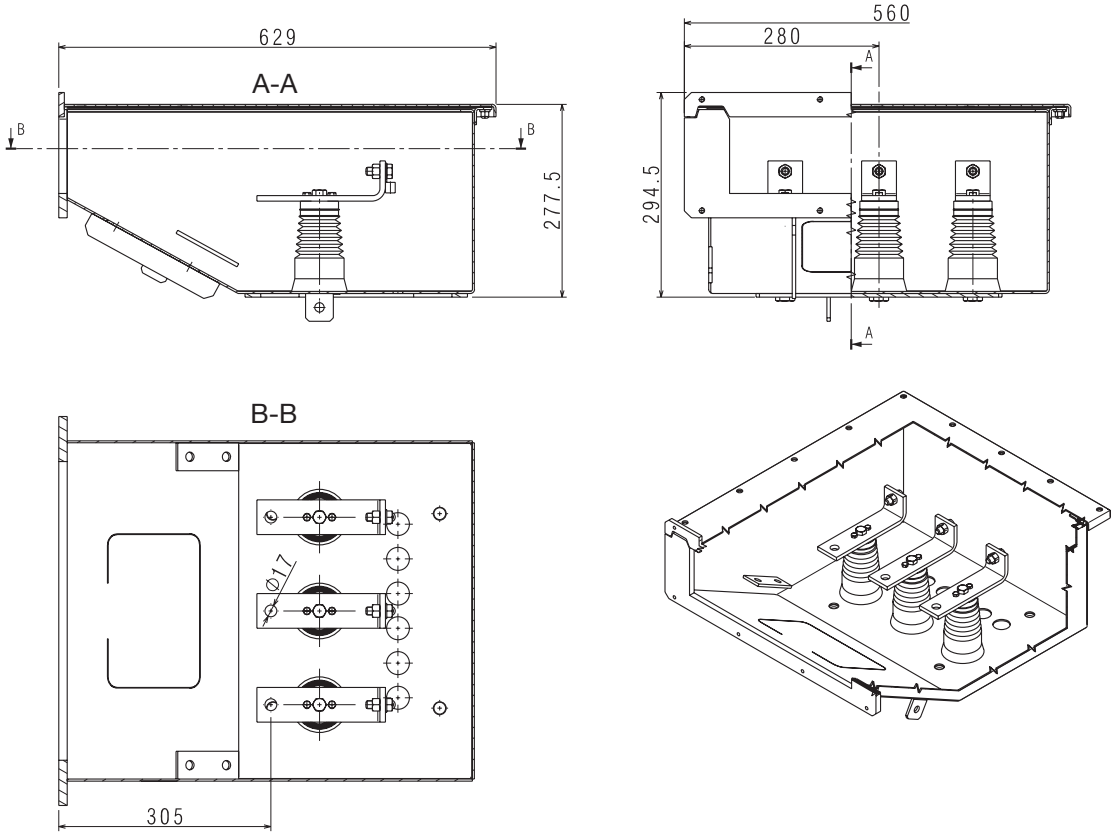


Delta connection Star connection
450 - 500 LV Low Voltage

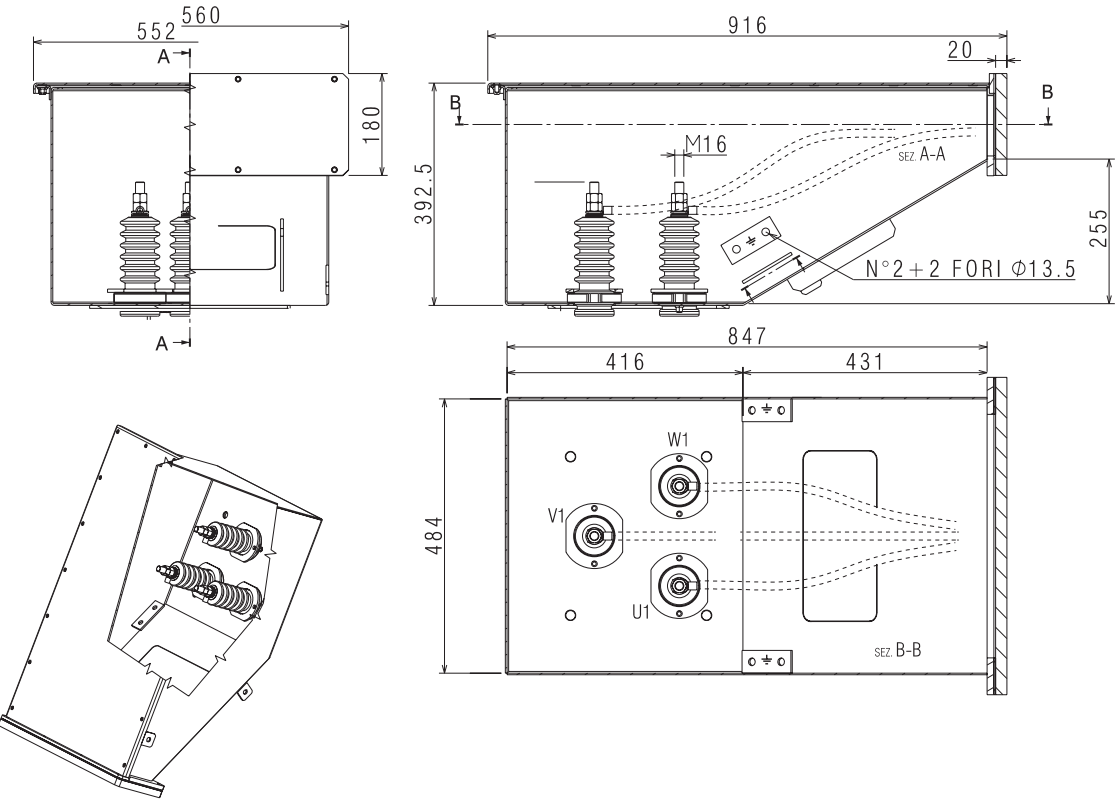


560

The medium voltage terminal box up to 6.6kV is shown below



The high voltage terminal box up to 11kV is shown below



Construction

Enclosure	TEFC MOTORS – Totally Enclosed Eater Cooled
Cooling system	<p>IC 411 as per IEC60034-6</p> <p>Totally enclosed standard motor, frame surface cooled with fan</p> <p>4: Frame surface cooled</p> <p>1: Self circulation of primary coolant</p> <p>1: Self circulation of secondary coolant</p> <p>On request for variable speed application an external ventilation unit can be supplied to get the IC 416 cooling type.</p>
Degree of protection	Motors are supplied in IP 55 as per IEC60034-5. (IP 56 or IP 65 available on request)
Mounting	See complete list at page 20.

Technical data

Stator/Rotor core	Laminated and enamel-insulated on both sides to minimise eddy-current losses. The stator winding is made of flat copper or round copper wire depending on the machine size. The completely wound stator pack with housing is thereby impregnated in an epoxy-resin VPI from 355 frame size. The subsequent heat treatment hardens the resin. Up to 315 frame size the wound stator pack is impregnated by rolling deep technology.
Rotor	<p>Short circuit rotor type.</p> <p>Depending on machine size, the rotor construction is either a solid shaft or welded ribbed shaft.</p> <p>The rotor winding can be either a pressure die cast aluminum or a copper bar construction.</p>
Bearing	<p>General data</p> <p>Antifriction bearings grease lubricated (ball or roller type) or oil lubricated sleeve bearing.</p> <p>The theoretical lifetime of bearings, L_{10h} according to ISO 281/1 standard, of standard horizontal construction motors, without external forces (radial and/or axial) is in excess of 50 000 hours. On request, the lifetime of bearings, L_{10h} can be in excess of 100.000 hours.</p> <p>Locating bearings are on the D end side and floating bearings on the ND end side. Both bearings are fitted with a regreasing system. The used grease is removed through a valve locked in the outer bearing cover. Sleeve bearings available as an option. On request special bearings are designed where high radial and axial forces are applied.</p> <p>The lifetime of bearings is determined by multiple factors and specifically by:</p> <ul style="list-style-type: none"> • the lifetime of the grease (mainly on double screen bearings), • the environmental conditions and working temperature, • the external loads and vibrations. <p>The motors \leq 132 frame size have double screen prelubricated ball bearings. The motors from 160 to 250 frame size have single screen prelubricated ball bearings (without grease nipples).</p> <p>The correspondent grease life under normal operating conditions for a motor with horizontal shaft, at 50Hz and maximum ambient temperature of 40°C is</p> <ul style="list-style-type: none"> • 10 000 hours in continuous duty for 2-pole motors, • 20 000 hours in continuous duty for 24-pole motors. <p>The motors from 280 frame size and above have regreasable bearings (with grease nipples Tecalemit UNI type) and the relative exhausted grease drainage.</p>

For initial charge of standard motor bearings a grease with mineral oil as basic oil and lithium soap as thickener, NLGI consistency grade 3, is used.

Motors for unfavourable operating conditions can be lubricated with special grease. The name plate indicates the type of grease, the quantity and the relubrication intervals. For standard motors relubrication data applies for neutral ambient conditions, at the rated speed, with almost vibration-free running, without any additional axial or radial load.

Immediately after regreasing the bearing temperature rises (10-15 °C) for a while, and then drops to normal values after the grease has been uniformly distributed and the exceeding grease displaced from the bearing.

An excessive quantity of grease causes bearing self heating.

The relubrication intervals refers to an average temperature about 70°C. With higher temperatures the lubrication interval must be shortened.

For vertical mounting (motors frame form 160 to 500) the values must be halved; for motor frame 560 see specific rows for B3 constructions.

The lubrication intervals of motors without grease nipples and the relubrication intervals of motors with grease nipples are shown in the tables below.

Motors without grease nipples

Frame size	Lubrication intervals [hours]							
	3600 min ⁻¹	3000 min ⁻¹	1800 min ⁻¹	1500 min ⁻¹	1200 min ⁻¹	1000 min ⁻¹	900 min ⁻¹	750 min ⁻¹
160 - 180	14000	15000	24000	28000	28000	36000	36000	36000
200	11000	14000	22000	24000	24000	32000	32000	32000
225	11000	14000	20000	22000	22000	32000	32000	32000
250	10000	14000	19000	22000	22000	28000	28000	28000

Motors with grease nipples

Frame size*	Relubrication intervals [hours]									
	3600 min ⁻¹	3000 min ⁻¹	1800 min ⁻¹	1500 min ⁻¹	1200 min ⁻¹	1000 min ⁻¹	900 min ⁻¹	750 min ⁻¹	600 min ⁻¹	500 min ⁻¹
280	2300	2600	4000	4800	5500	6600	2900	3400	-	-
315 M	2100	2400	3000	3600	5000	5750	2500	3000	-	-
315 L	2100	2400	3000	3600	5000	5750	-	-	-	-
355	1500	2500	4000	5500	7000	7500	8000	9000	9000	9000
400	1000	2000	3200	4500	6500	7000	7500	8000	8000	8000
450	1000	1500	2800	4000	5000	6000	7000	8000	8000	8000
500	1000	1500	2800	4000	5000	6000	7000	8000	8000	8000
560	-	-	1500	1800	2100	2400	2600	3000	3600	-

* values refer to horizontal mounting.

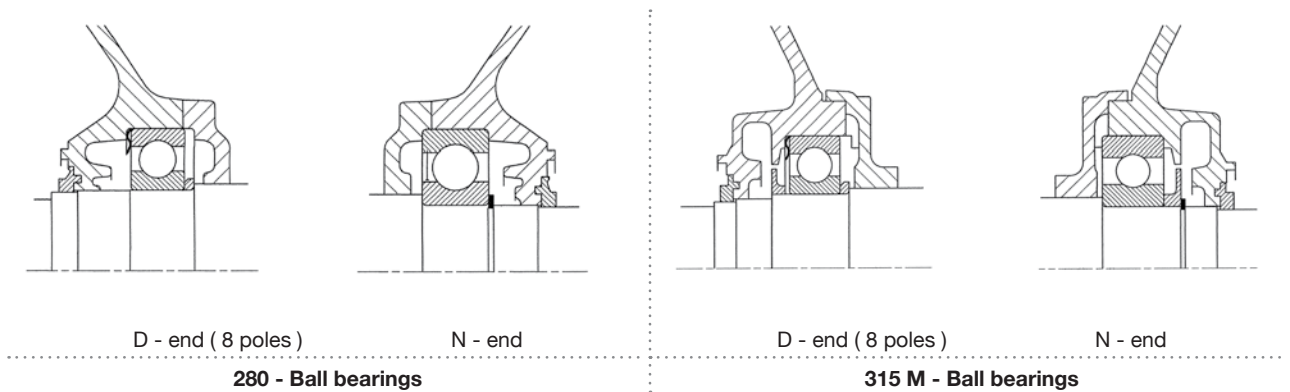
Lubrication - Grease quantity

Frame size	160	180	200	225	250	280	315	355	400	450	500	560	
Poles	2 ≥4	2 ≥4	2 ≥4	2 ≥4	2 ≥4	2 4-6 8	2 4-6 8	2 ≥4	2 ≥4	2 ≥4	2 ≥4	≥4	
Grease quantity (g)	12 12	12 12	16 16	20 20	22 22	22 30	22 30	35 30	30 48	30 48	42 66	42 76	D-end 140 N-end 70

Axial rotor position

Frame size	Horizontal arrangement	Vertical arrangement
160 - 250	Preload washer at N-end	
280	Fixed bearing at N-end	
315 - 560	Fixed bearing at D-end	Fixed bearing at N-end

On request, 8 pole motors of 280 - 315 frame can be supplied with ball bearings on both sides. In these cases the bearing are axially preloaded, as shown in the following diagrams.

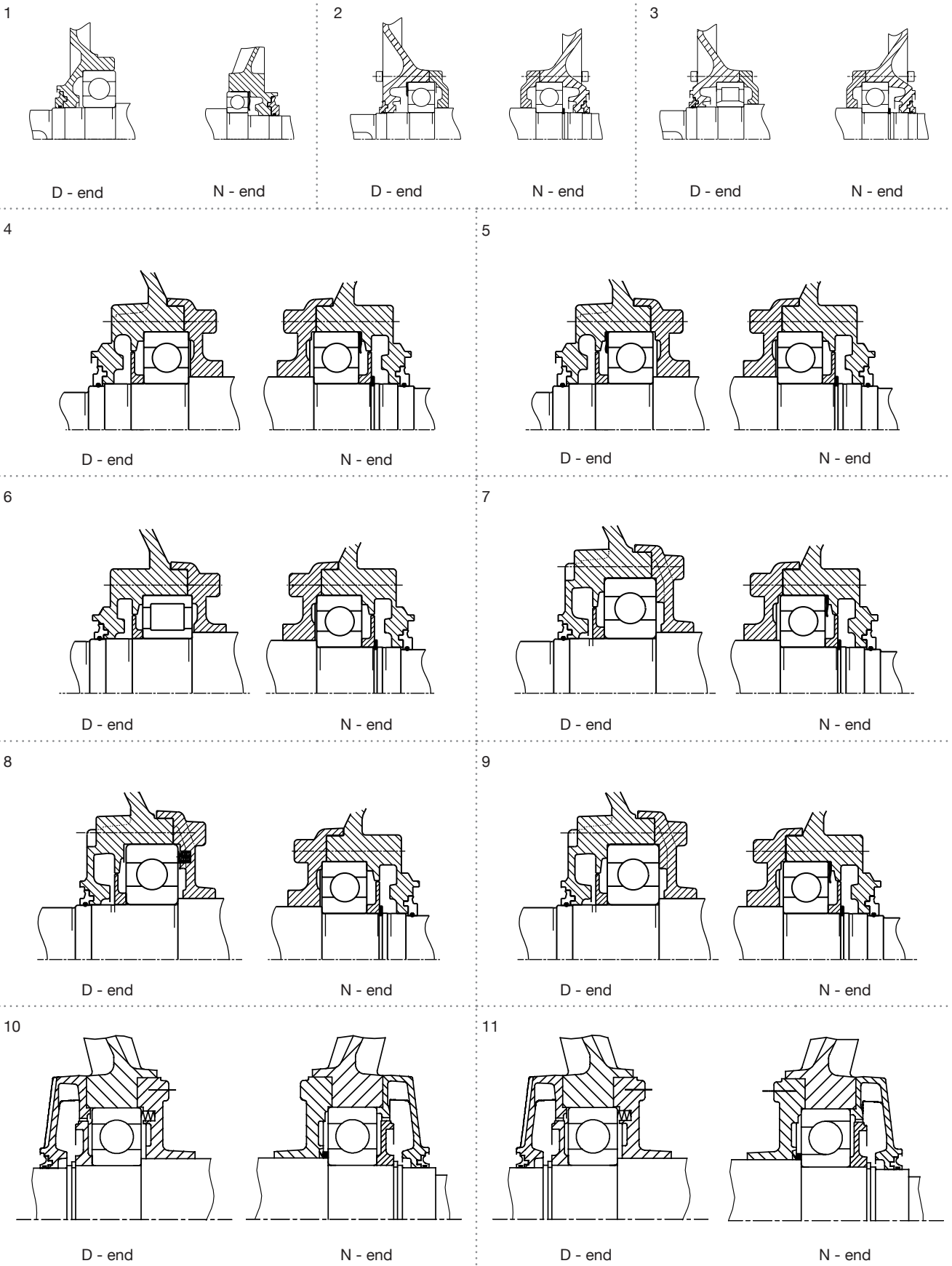


Bearings for standard motors

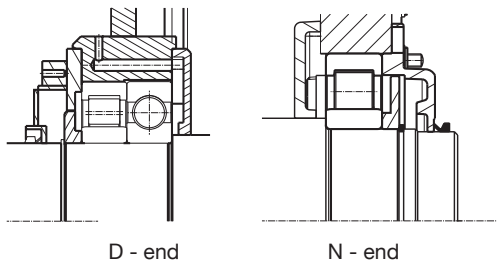
Type	Frame size	Poles	Horizontal			Vertical			
			D-end	N-end	Bearing Assembly Diagrams ID	D-end	N-end	Bearing Assembly Diagrams ID	
B5C	71	-	6202-2Z-C3		n/a	6202-2Z-C3		-	
	80	-	6204-2Z-C3		-	6204-2Z-C3		-	
	90	-	6205-2Z-C3		-	6205-2Z-C3		-	
	100	-	6206-2Z-C3		-	6206-2Z-C3		-	
	112	-	6206-2Z-C3		-	6206-2Z-C3		-	
	132	-	6308-2Z-C3		-	6308-2Z-C3		-	
A6C	160	-	6310-Z-C3	6209-Z-C3	1	6310-Z-C3	6209-Z-C3	1	
	180 M	-	6310-Z-C3	6209-Z-C3	1	6310-Z-C3	6209-Z-C3	1	
	180 L	-	6310-Z-C3	6210-Z-C3	1	6310-Z-C3	6210-Z-C3	1	
	200	-	6312-Z-C3	6210-Z-C3	1	6312-Z-C3	6210-Z-C3	1	
	225	-	6313-Z-C3	6213-Z-C3	1	6313-Z-C3	6213-Z-C3	1	
	250	-	6314-Z-C3	6213-Z-C3	1	6314-Z-C3	6213-Z-C3	1	
	280	2	6314-Z-C3	6214-Z-C3	2	6314-Z-C3	6214-Z-C3	2	
	280	4-6	6317-Z-C3	6314-Z-C3	2	6317-Z-C3	6314-Z-C3	2	
A5C	280	8	NU 2217-EC-C3	6314-Z-C3	3	NU 2217-EC-C3	6314-Z-C3	3	
B5C - B6C	315 M - L	2	6316-Z-C3	6216-Z-C3	4	6316-Z-C3	6216-Z-C3	5	
	315	4-6	6319-Z-C3	6316-Z-C3	7	6319-Z-C3	6316-Z-C3	8	
	315	8	NU 2219-EC-C3	6316-Z-C3	6	NU 2219-EC-C3	6316-Z-C3	6	
	355	2	6317-Z-C3	6317-C3	9	6317-Z-C3	7317-BE	11	
	355	≥4	6322-Z-C3	6322-C3	9	6322-Z-C3	6322-C3	10	
	400	2	6317-Z-C3	6317-C3	9	6317-Z-C3	7317-BE	11	
	400 LA - LB	≥4	6322-Z-C3	6322-C3	9	6322-Z-C3	6322-C3	10	
	400 LC - LD	≥4	6322-Z-C3	6322-C3	9	6322-Z-C3	7322-BE	11	
	450 LA - LC	2	6320-Z-C3	6320-C3	9	6320-Z-C3	7320-BE	11	
	450 LA - LC	≥4	6326-Z-C3	6326-C3	9	6326-Z-C3	7326-BC	11	
	500	2	ON REQUEST						
	500	≥4	6328-Z-C3	6328-C3	9	6328-Z-C3	7328-BC	11	
	560	≥4	NU238-EC-MC-3 + 6238-M-C3	NU234-EC-M-C3	12	6238-M-C3	6330-C3-INSULATED +2X 7330-BCBM	13	

Re-greasing systems are normally supplied for frame size 280 and 315. On request, regreasing systems are available from frame size 160 to 250.

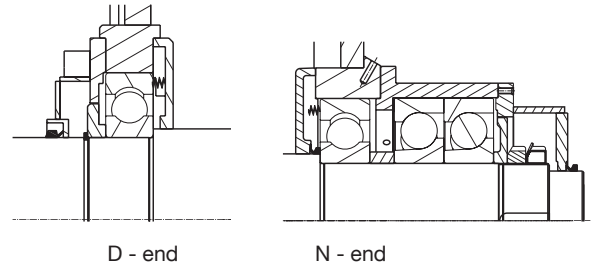
Drawings bearings for standard motors



12



13



**Axial forces:
Horizontal mounting**

The maximum allowable axial force at the shaft extension for motors having the following characteristics:

- standard construction;
- horizontal mounting (Mounting arrangement IM B3, IM B35 only;¹⁾)
- operating frequency 50Hz;
- bearing life of 20 000 hours (according to ISO 281:1990);
- bearing operating temperature between – 20 and + 70°C;
- no external radial forces;
- motor installed on a rigid foundation with negligible structural vibrations;

are shown in the following table.

Frame size	Mounting arrangement IM B3, IM B5 ¹⁾							
	maximum allowed axial force [N] →				← maximum allowed axial force [N]			
	2 poles	4 poles	6 poles	8 poles	2 poles	4 poles	6 poles	8 poles
160	1000	1200	1450	1650	2000	2500	2900	3300
180	950	1300	1500	1700	2000	2500	2900	3200
200	710	710	710	710	2650	3350	3850	4300
225	1750	2100	2500	2750	3000	3700	4300	4750
250	1700	2050	2000	2120	3400	4200	4800	5400
280	3250	2900	3900	5200	3250	2900	3900	5200
315 M	4000	2900	4050	6200	4000	2900	4050	6200
315 L	3240	2500	2600	-/-	3240	2500	2600	-/-
355	2000	6000	7000	8000	2000	6000	7000	8000
400 LA - LB	1850	6000	7100	-/6900	1850	6000	7100	-/6900
400 LC - LD	1600/-	5450/-	6250	7400	1600/-	5450/-	6250	7400
450	4200	7300	8300	4600	4200	7300	8300	4600
500	-/-	3400	6000	7000	-/-	3400	6000	7000
560	-/-	9000	11000	12600	-/-	9000	11000	12600

1) For other mounting arrangements consult Marelli Motori.

The corresponding values for motors running at 60Hz can be obtained reducing the indicated values by 7% (160-250) and by 10% (280-560). For double speed motors the higher speed should always be considered.

**Axial forces:
Vertical mounting**

The maximum allowable axial force at the shaft extension for motors having the following characteristics:

- standard construction;
- vertical mounting shaft extension downwards (Mounting arrangement IM V1, IM V15 only;¹⁾)
- operating frequency 50Hz;
- bearing life of 20 000 hours (according to ISO 281:1990);
- bearing operating temperature between – 20 and + 70°C;
- no external radial forces;
- motor installed on a rigid foundation with negligible structural vibrations;

are shown in the following table.

Frame size	Shaft extension downwards Mounting arrangement IM B3, IM B5 ¹⁾							
	maximum allowed axial force in downwards direction [N]				maximum allowed axial force in upwards direction [N]			
	2 poles	4 poles	6 poles	8 poles	2 poles	4 poles	6 poles	8 poles
160	1730	2040	2470	2930	1270	1660	1880	2020
180	1650	1990	2340	2680	1300	1820	2060	2230
200	2190	2750	3140	3660	1170	1310	1430	1350
225	2380	2760	3330	3820	2370	3040	3470	3680
250	2700	3160	3540	425	2410	3090	3260	3270
280	2130	2410	3020	3640	4370	5670	6300	6760
315 M	2170	1320	2150	2820	5830	7750	9050	9580
315 L	1350	630	490	- / -	5850	7470	9590	- / -
355 L	3690	1880	300	300	160	14100	15800	17100
400 LA - LB	7000	300	300	- / 300	2450	14400	16900	-/6900
400 LC -LD	6000	15000	18000	18000	1000 / -	5100 / -	7800	8500
450	11000	16000	18000	20000	100	7100	11100	13000
500	- / -	20000	23000	23000	- / -	8000	13000	18000
560	- / -	36500	41000	41500	- / -	- / -	- / -	- / -

1) For other mounting arrangements consult Marelli Motori

Corresponding values for motors running at 60Hz:

- Frame sizes: 160 – 315:

The indicated values have to be reduced by 7%

- Frame sizes: 355 – 560:

Maximum allowable axial force in downwards direction: The indicated values have to be reduced by 10%.

Maximum allowable axial force in upwards direction:

2 poles, frame sizes 400 e 500: The indicated values have to be reduced by 50%.

2 poles, frame sizes 355 e 450: Consult Marelli Motori

≥ 4 poles, frame sizes 355-500: The indicated values have to be reduced by 25%

Radial forces

The maximum allowable radial forces at the shaft extension (X_{max}) and at the shaft collar (X_0) for motors having the following characteristics:

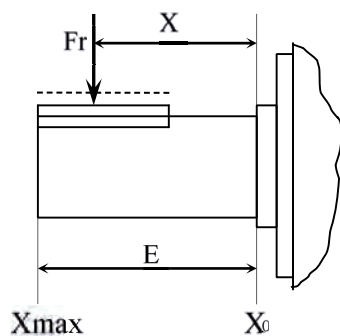
- standard construction;
- horizontal mounting (Mounting arrangement IM B3, IM B35 only¹⁾);
- operating frequency 50Hz;
- bearing life of 20 000 hours (according to ISO 281:1990);
- bearing operating temperature between -20 and $+70^{\circ}\text{C}$;
- no external axial forces;
- motor installed on a rigid foundation with negligible structural vibrations;

are shown in the following table.

Frame size	Mounting arrangement IM B3, IM B5 ¹⁾							
	2 poles		4 poles		6 poles		8 poles	
	F_{x0} [N]	F_{xMAX} [N]	F_{x0} [N]	F_{xMAX} [N]	F_{x0} [N]	F_{xMAX} [N]	F_{x0} [N]	F_{xMAX} [N]
160	3000	2400	3600	2000	4300	2000	4500	2000
180	3000	2400	3650	2500	2500	2500	4900	2500
200	1390	950	1390	950	950	950	1390	950
225	4550	3800	5400	3800	3800	3800	7000	3800
250	3260	2000	3260	2000	2000	2000	3260	2000
280	4600	3750	7500	6200	8700	7200	See construction for high load	
315 M	6100	3530	7800	6300	9100	7400	See construction for high load	
315 L	6330	4040	7800	6600	8600	7200	/	/
355	4300	2200	9000	6500	3400	3400	9800	3000
400 LA - LB	3600	2000	9000	7800	4500	4500	- / 2000	- / 1000
400 LC -LD	1000 / -	500 / -	2000 / -	1000 / -	300	300	300	300
450	3400	3100	5500	4800	3000	3000	2000	1000
500	/	/	3000	1500	300	300	300	300
560	/	/	44800	39500	49600	43700	49900	44100

1) For other mounting arrangements consult Marelli Motori

The external radial forces between the values $X_0=0$ and $X_{max}=E$ can be determined by following linear relationship.



$$F_r = F_{x0} - \frac{X}{E} * (F_{x0} - F_{xmax})$$

F_{x0} = maximum radial force on the shaft collar [N]

F_{xmax} = maximum radial force at the shaft extension [N]

E = shaft extension length [mm]

X = distance from radial force application point to the shaft collar [mm]

Construction for high radial loads

Maximum allowable external radial loads for motors 4 – 8 poles equipped with roller bearings and having the following characteristics:

- horizontal mounting (Mounting arrangement IM B3, IM B35 only;¹⁾)
- operating frequency of 50Hz;
- theoretical bearing life of 20 000 hours (in accordance with ISO 281:1990);
- bearing operating temperature between –20 and +70C°
- no external axial forces;
- motor installed on a rigid foundation with negligible structural vibrations;

In the high radial loads option, for all frame sizes, the rotor is axially positioned by N-end bearing.

Motors for high radial loads – bearings (horizontal construction)

Mounting arrangement IM B3, IM B5 ¹⁾			
Frame size	4 pole - 6 poles - 8 poles		
	D-end	N-end	
A5C/A6C 160	NU 310 - C3	6209 - Z - C3	
A5C/A6C 180	NU 310 - C3	6210 - Z - C3	
A5C/A6C 200	NU 312 - C3	6210 - Z - C3	
A5C/A6C 225	NU 313 - C3	6213 - Z - C3	
A5C/A6C 250	NU 314 - C3	6213 - Z - C3	
A6C 280	4-6 pole	NU 317 - C3	6314 - Z - C3
A5C 280	8 pole ²⁾	NU 2217 - C3	6314 - Z - C3
B6C 315	4-6 pole	NU 2219 - C3	6316 - Z - C3
B5C 315 M	8 pole ²⁾	NU 2219 - C3	6316 - Z - C3
B5C 315 L	8 pole ²⁾	NU 319 - C3	6316 - Z - C3
B5C/B6C 355		NU 322 - C3	6322 - C3
B5C 400		NU 322 - C3	6322 - C3
B5C 450		NU 326 - C3	6326 -C3
B5C 500		NU 328 - C3	6328 -C3

1) For other mounting arrangements consult Marelli Motori

2) 8 pole motors with size 280 and 315 are supplied with high load bearing construction as standard.

Impregnation system

- Up to 315 frame size: stator is impregnated with rolling deep technology.
- Starting from 355 frame size: stator is VPI treated with an unsaturated polyester amide resin which is polymerised in an oven.

Insulation system

Low voltage
 Stator: F class insulated with a synthetic enamel.
 (H class insulation available on request)

Protective treatments

Dedicated protective enamel is applied on the winding.

Grounding

Two terminals exist for grounding, one inside the terminal box and one outside.

Condensation Drainage

When installed outdoors or used for intermittent work in environments with high humidity levels, motors must be provided with holes for condensation drainage. In order to assure the correct positioning of the holes the operating position of the motors must be specified. Motors with frame sizes from 280 to 500 have holes for condensation drainage as standard.

Motors can be supplied with drainage holes on request.

Anticondensation Heaters

Motors subject to atmospheric condensation, either through standing idle in damp environments or because of wide ambient temperature variations, may be fitted with anticondensation heaters. Anticondensation heaters are normally switched on automatically when the supply to the motor is interrupted, heating the motor to avoid water condensation. They are normally mounted on D-end winding heads.

Normal feeding voltage is 220//230/240V.

Motors can be supplied with anticondensation heaters with terminals in main terminal box (Opt. 108) or, with terminals in a separate terminal box (Opt. 109).

The power values normally used are shown in the table below.

Frame size	Power [W]
90 - 112	8
132	25
160 - 180	50
200 - 250	65
280	100
315	200
355	300
400 - 450	400
500	600
560	800

Thermal Protections

Standard magnetothermal circuit breakers are sufficient to suitably protect the motor from overloading. Anyway the motors can be supplied with additional thermal protections with the characteristics described in the following table.

Type	Operating principle	Active temperature [°C]
Positive temperature coefficient thermistors PTC	At the active temperature this device quickly changes its resistance value.	155
Platinum resistance thermometer PT100	Variable linear resistance with the winding temperature, particularly suitable for a continuous winding temperature monitoring.	Set up in control panel

Motors from 315 frame size are supplied with N. 3 PTC with terminals in main terminal box, in standard execution. Frame size from 355 are supplied with terminals in separate terminal box, in standard execution.

Motors from 280 frame size can be supplied with PT100 thermal detectors on the bearings on request.

Optional features

- Dual/multiple winding configuration
- flanged shaft or special shaft end on both sides
- increase protection degree up to IP56
- encoder
- vibration sensors
- special frame design to suite the application
- special bearings (sleeve or angular contact bearings)
- reinforced winding for VFD operation
- insulated bearings design for VFD application
- shaft earth brush for VFD application
- other options available on request

TEAAC motors



Model	LV B4W
	MV B4WH
Power LV	300 ÷ 6000 kW
Power HV/MV	250 ÷ 5500 kW
Voltages	Up to 11.000 V
Frame	355 ± 800
Pole	4, 6, 8, 10 and 12
Cooling	IC 611 (or IC 616 optional)
IP	IP 55
Main application	power, metals, pulp and paper, cement, sugar mill, water pumping and treatments, manufacturing processes, mining, chemical.

Power

	4 POLES	6 POLES	8 POLES	10 POLES	12 POLES
kW (60 Hz)	1.350	2.400	2.160	1.200	1.200

General information

B4W series

B4W motor series have been expressly designed to work in the most severe environment conditions.
Rigid frame, rugged welded steel fabrication (EN 10025 - S235 JR)

Main characteristics

Enclosure

TEAAC - Totally Enclosed Air to Air Cooled

Cooling system

IC 611 as defined by IEC60034 - 6. Closed machine with mounted heat exchanger, using air as the primary and secondary coolant.
This cooling method is suitable for motors installed in locations with limited or no access to cooling water.
Shaft mounted fans are fitted both inside and outside of the casing to supply the inside and outside cooling circuits respectively. The motor is protected against dust and splashing water from any direction.

Protection degree

Up to IP 55 as defined by IEC60034-5.

Insulation system

Class F or H are available.

Protective treatment	VPI (Vacuum Pressure Impregnation). Winding are impregnated with high quality materials using the latest technologies.
Impregnation system	To withstand salty atmosphere and for sandy environment. Special treatments for corrosive ambient to meet ISO 12944 on request. Customizable terminal boxes for main and neutral connections.

Mechanical characteristics

Terminal boxes	Terminals are suitable for multiple cable connections.
Auxiliary boxes	Dedicated terminal boxes for auxiliary devices.

Technical data

Stator/Rotor core	Laminated and enamel-insulated on both sides to minimise eddy-current losses. The stator winding is made of flat copper or round copper wire depending on the machine size. The completely wound stator pack is thereby impregnated in an epoxy-resin VPI. The subsequent heat treatment hardens the resin.
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Rotor	Squirrel cage rotor type. Depending on machine size, the rotor construction is either a solid shaft or welded ribbed shaft. The rotor winding can be either a pressure die cast aluminum or a copper bar construction. Dual/multiple winding configuration
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Bearing	<p>General data</p> <p>Antifriction bearings grease lubricated (ball or roller type) or oil lubricated sleeve bearing.</p> <p>The theoretical lifetime of bearings, L10h according to ISO 281/1 standard, of standard horizontal construction motors, without external forces (radial and / or axial) is in excess of 50.000 hours. On request, the lifetime of bearings, L10h can be in excess of 100.000 hours.</p> <p>Locating bearings are on the D end side and floating bearings on the ND end side. Both bearings are fitted with a regreasing system.</p> <p>The used grease is removed through a valve locked in the outer bearing cover. Sleeve bearings available as an option.</p> <p>On request special bearings are designed where high radial and axial forces are applied.</p>
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Optional features

- flanged shaft or special shaft end on both sides
- increase protection degree up to IP 56
- encoder
- vibration sensors
- special frame design to suite the application
- special bearings (sleeve or angular contact bearings)
- reinforced winding for VFD operation
- insulated bearings design for VFD application
- shaft earth brush for VFD application
- other options available on request.

ODP motors



	IE3 C6C
Model IP 23	LV C3C - C4C
	MV C3CH - C4CH
Model IP 44	LV C3W - C4W
	MV C3WH - C4WH
Power	Up to 10.000 kW
Voltages	Up to 15.000 V
Frame	315 ÷ 1000
Pole	4, 6, 8, 10 and 12
Cooling	IC 01 (IC 06 optional)
Main application	power, metals, pulp and paper cement, sugar mill, water pumping and treatments, manufacturing processes, mining, chemical.

Power

	4 POLES	6 POLES	8 POLES	10 POLES	12 POLES
kW (at 60 Hz)	7.000	10.000	9.000	7.500	5.000

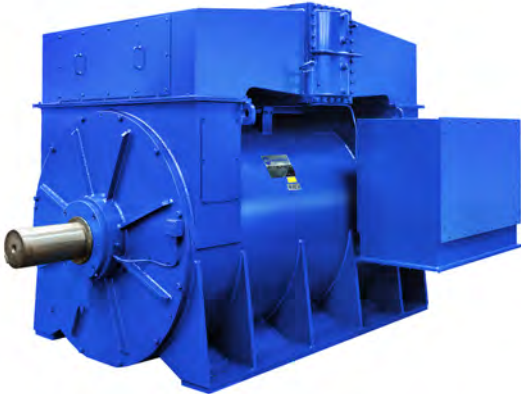
Main components

Housing	Rigid frame, rugged welded steel fabrication (EN 10025 - S235 JR). Frame is provided with side ribs to increase the strength. Marelli Motori motors for continuous duty operation are designed to meet vibration levels per IEC 60034-14, ISO 10816-1 and BS 5000-3.
Shield	Made of grey cast-iron (EN 1561 – GJL 200) up to 500 frame size motors. Made of hot-rolled structural steel (EN 10025 – S235 JR) from size 560 and above.
Shaft	<p>General data Made in carbon steel (EN 10083 – 2 C40 – TN) up to 450 frame and hot-rolled structural steel from 500 frame (EN 10025 – S355 JR).</p> <p>Shaft design Cylindrical shaft with key.</p>
Main terminal box	Mounted on top. Made of cold-rolled formable steels EN 10025 – S235JR.
Internal fan	Made of aluminum alloy up to 400 frame. Made of hot-rolled structural steel above (EN 10025 – S235 JR).
Construction	
Enclosure	ODP – Open Drip Proof Motors.
Cooling system	IC 01 as per IEC60034-6 Free circulation. Internal air is flowing by a fan mounted on the shaft of the motor at the driven side. The cooling air is taken on the ND-end, the air outlet is on the D-end. On request for variable speed application an external ventilation unit can be supplied to get the IC 06 cooling type.
Degree of protection	IP 23 as per IEC60034-5. The series can be supplied with air inlet filters to achieve the IP 44 rating. The motor series name will be C3W - C4W.
Mounting	IM B3, V1 and V10 as per IEC60034-7.

Technical data

Stator/Rotor core	Laminated and enamel-insulated on both sides to minimise eddy-current losses. The stator winding is made of flat copper or round copper wire depending on the machine size. The completely wound stator pack with housing is thereby impregnated in an epoxy-resin VPI. The subsequent heat treatment hardens the resin.
Rotor	Short circuit rotor type. Depending on machine size, the rotor construction is either a solid shaft or welded ribbed shaft. The rotor winding can be either a pressure die cast aluminum or a copper bar construction.
Bearing	<p>General data</p> <p>Antifriction bearings grease lubricated (ball or roller type) or oil lubricated sleeve bearing.</p> <p>The theoretical lifetime of bearings, L10h according to ISO 281/1 standard, of standard horizontal construction motors, without external forces (radial and / or axial) is in excess of 50.000 hours. On request, the lifetime of bearings, L10h can be in excess of 100.000 hours.</p> <p>Locating bearings are on the D end side and floating bearings on the ND end side.</p> <p>Both bearings are fitted with a regreasing system. The used grease is removed through a valve locked in the outer bearing cover. Sleeve bearings available as an option.</p> <p>On request special bearings are designed where high radial and axial forces are applied.</p>
Impregnation system	Stator and rotor are VPI treated with an unsaturated polyester amide resin which is polymerised in an oven.
Insulation system	Stator: F class insulated with a synthetic enamel. (H class insulation available on request)
Protective treatments	Dedicated protective enamel is applied on the winding.
Optional features	<ul style="list-style-type: none"> • Dual/multiple winding configuration • flanged shaft or special shaft end on both sides • increase protection degree up to IP 56 • encoder • vibration sensors • special frame design to suite the application • special bearings (sleeve or angular contact bearings) • reinforced winding for VFD operation • insulated bearings design for VFD application • shaft earth brush for VFD application • other options available on request.

TEWAC motors



Model	LV B4V MV B4VH
Power	Up to 10.000 kW
Voltages	Up to 15.000 V
Frame	355 ÷ 1.000
Pole	4, 6, 8, 10 and 12
Cooling	IC 81W (IC 86W optional)
IP	Standard IP 55 (IP 56 optional)
Main application	power, metals, pulp and paper, cement, sugar mill, water pumping and treatments, manufacturing processes, mining, chemical.

Power

	4 POLES	6 POLES	8 POLES	10 POLES	12 POLES
kW (at 60 Hz)	7.000	10.000	9.000	7.500	5.000

Main components

Housing	Rigid frame, rugged welded steel fabrication (EN 10025 - S235 JR). Frame is provided with side ribs to increase the strength. Marelli Motori motors for continuous duty operation are designed to meet vibration levels per IEC 60034-14, ISO 10816-1 and BS 5000-3.
Shield	Made of grey cast-iron (EN 1561 – GJL 200) up to 500 frame size motors. Made of hot-rolled structural steel (EN 10025 – S235 JR) from size 560 and above.
Shaft	<p>General data Made in carbon steel (EN 10083 – 2 C40 – TN) up to 450 frame and hot-rolled structural steel from 500 frame (EN 10025 – S355 JR).</p> <p>Shaft design Cylindrical shaft with key.</p>
Main terminal box	Mounted on side (right or left to be selected). Made of formable steels EN 10130.
Internal fan	Made of aluminum alloy up to 400 frame. Made of hot-rolled structural steel above (EN 10025 – S235 JR).
Heat Exchanger	<p>Construction</p> <ul style="list-style-type: none"> • mounted on top of the machine • double tube made of CuNi 90/10 • copper fins housing • equipped with water leakage detector • suitable to be treated with corrosion inhibitors, PH regulators and anti freeze as appropriate to site conditions. <p>Exchanger data</p> <ul style="list-style-type: none"> • designed pressure 6 bar • test pressure 10 bar • max glycol: 30% • type of water: fresh water or marine (salt) water • flanges: PN6 – PN10 – Special (ANSI).
Construction	
Enclosure	TEWAC – Totally Enclosed Water to Air Cooled
Cooling system	IC 81W as per IEC60034-6. Primary fluid (water) is flowing by external water system. Internal air is flowing by a fan mounted on the shaft of the generator at the driven side.
Degree of protection	Standard IP 55 as per IEC60034-5 (IP 56 optional).
Mounting	IM B3, V1 and V10 as per IEC60034-7.

Technical data

Stator/Rotor core	Laminated and enamel-insulated on both sides to minimise eddy-current losses. The stator winding is made of flat copper or round copper wire depending on the machine size. The completely wound stator pack is thereby impregnated in an epoxy-resin VPI. The subsequent heat treatment hardens the resin.
Rotor	Squirrel cage rotor type. Depending on machine size, the rotor construction is either a solid shaft or welded ribbed shaft. The rotor winding can be either a pressure die cast aluminum or a copper bar construction.
Bearing	General data Antifriction bearings grease lubricated (ball or roller type) or oil lubricated sleeve bearing. The theoretical lifetime of bearings, L10h according to ISO 281/1 standard, of standard horizontal construction motors, without external forces (radial and / or axial) is in excess of 50.000 hours. On request, the lifetime of bearings, L10h can be in excess of 100.000 hours. Locating bearings are on the D end side and floating bearings on the ND end side. Both bearings are fitted with a regreasing system. The used grease is removed through a valve locked in the outer bearing cover. Sleeve bearings available as an option. On request special bearings are designed where high radial and axial forces are applied.
Impregnation system	Stator is VPI treated with an unsaturated polyester amide resin which is polymerisation in oven.
Insulation system	Stator: F class insulated with a synthetic enamel. (H class insulation available on request)
Protective treatments	Dedicated protective enamel is applied on the winding.

Optional features

- Dual/multiple winding configuration
- flanged shaft or special shaft end on both sides
- increase protection degree up to IP 56
- encoder
- vibration sensors
- special frame design to suite the application
- special bearings (sleeve or angular contact bearings)
- reinforced winding for VFD operation
- insulated bearings design for VFD application
- shaft earth brush for VFD application
- other options available on request.

TEWC motors



Model	LV B4J - B5J
	MV B4JH - B5JH
Power	Up to 4.000 kW
Voltages	B4J - B5J Up to 690 V B4JH - B5JH Up to 6.600 V
Frame	355 ÷ 630
Pole	4, 6, 8 and 10
Cooling	IC 71W
IP	IP 55 (IP 56 optional)
Main application	power, metals, pulp and paper, cement, sugar mill, water pumping and treatments, manufacturing processes, mining, chemical.

Power

	4 POLES	6 POLES	8 POLES	10 POLES
kW (at 60 Hz)	4.000	3.500	3.000	2.500

Main components

Housing	Rigid frame, rugged welded steel fabrication (EN 10025 - S235 JR). Frame is provided with side ribs to increase the strength. Marelli Motori motors for continuous duty operation are designed to meet vibration levels per IEC 60034-14, ISO 10816-1 and BS 5000-3.
Shield	Made of grey cast-iron (EN 1561 – GJL 200) up to 500 frame size motors. Made of hot-rolled structural steel (EN 10025 – S235 JR) from size 560 and above.
Shaft	<p>General data Made in carbon steel (EN 10083 – 2 C40 – TN) up to 450 frame and hot-rolled structural steel from 500 frame (EN 10025 – S355 JR).</p> <p>Shaft design Cylindrical shaft with key</p>
Main terminal box	Mounted on top or side (with vertical mounting) and made in cast iron or cold rolled formable steels depending from size.
Internal fan	Made of aluminium alloy for 450 and 500 frame size. Made of hot-rolled structural steel from frame size 560 and above (EN 10025 – S235 JR).
Heat Exchanger	<p>General data Heat exchanger is part of the housing and built on the machine. The material of the frame is carbon steel according to the standard EN 10025-S275JR. Equipped with water leakage detector as standard.</p> <p>Exchanger data Test pressure 9 bar Max glycol : 20%</p> <p>C 7 A1 W7 (Self-circulating primary coolant with integral heat exchanger using remote fresh water). Reduces the noise level and it is ideal for constant torque, low speed, inverter applications. The cooling fluid must be clean water. Do not use: - sea water, - water with more than 120 mg/l of chloride. - water with solid content over 10 mg/l.</p> <p>Two flanged connections are provided for inlet and outlet of cooling water. On the appropriate name plate heat exchanger characteristics are indicated: flow rate, inlet/outlet temperature, min/max pressure.</p>

Frame size	Flow rate	Inlet Temp.	Outlet Temp.	Max Pressure	Min Pressure
mm	l/min	°C	°C	bar	bar
355	50	38	45	6	1
400	65	38	45	6	1
450	70	38	48	6	1
500	75	38	48	6	1
560	120	38	48	6	1

Construction

Enclosure

TEWC – Totally Enclosed Water Cooled

Cooling system

IC 71W as per IEC60034-6.

7 : Heat exchanger. The primary coolant is circulated in a closed circuit which is built as integral part of the machine.

1 : Self-circulation. The coolant is moved by a fan mechanically driven by the rotor.

W : Coolant. Cooling water must be clean water.

Degree of protection

IP 55 as per IEC60034-5 (IP 56 optional)

Mounting

IM B3, B35, V1 and V10 as per IEC60034-7

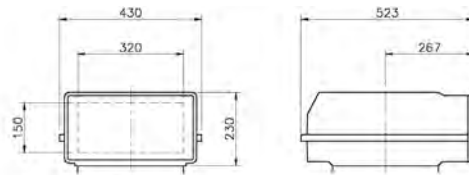
Duty

The table below shows the correction factors to calculate the outputs for S2 duty.

S2 – 30'		Frame size	S2 – 60'	
4 poles	6-8 poles		4 poles	6-8 poles
1,30	1,30	355	1,10	1,10
1,30	1,25	400	1,10	1,05
1,25	1,20	450	1,05	1,05
1,15	1,15	500	1,05	1,05
1,15	1,15	560	1,05	1,05

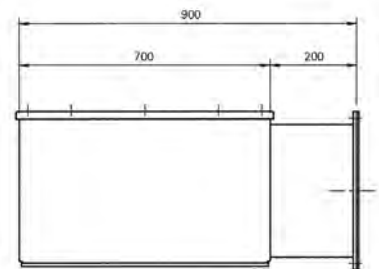
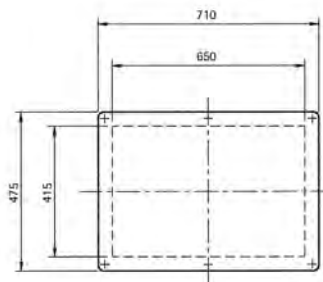
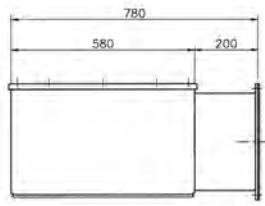
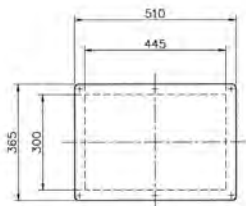
Terminal box dimensions

355-400LB



400LC-500

560



Frame size	Terminal Block	Terminals	Maximum conductor cross section	Cable entrance
355 ÷ 400 LB	Flat coppers bars	Hole for M12 bolt	2 x 300 mm ²	Undrilled gland plate
400 LC ÷ 500	Flat coppers bars	Hole for M12 bolt	4 x 300 mm ²	Undrilled gland plate
560	Flat coppers bars	Hole for M16 bolt	8 x 300 mm ²	Undrilled gland plate

Technical data

Stator/Rotor core	Laminated and enamel-insulated on both sides to minimise eddy-current losses. The stator winding is made of flat copper or round copper wire depending on the machine size. The completely wound stator pack with housing is thereby impregnated in an epoxy-resin VPI. The subsequent heat treatment hardens the resin.
Rotor	Squirrel cage rotor type. Depending on machine size, the rotor construction is either a solid shaft or welded ribbed shaft. The rotor winding can be either a pressure die cast aluminum or a copper bar construction.
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Impregnation system	Stator is VPI treated with an unsaturated polyester amide resin which is polymerised in an oven.
Insulation system	Stator: F class insulated with a synthetic enamel. (H class insulation available on request)
Protective treatments	Dedicated protective enamel is applied on the winding.

Optional features

- Dual/multiple winding configuration
- flanged shaft or special shaft end on both sides
- increase protection degree up to IP 56
- encoder
- vibration sensors
- special frame design to suite the application
- special bearings (sleeve or angular contact bearings)
- reinforced winding for VFD operation
- insulated bearings design for VFD application
- shaft earth brush for VFD application
- other options available on request.



Testing facilities

Facilities.....	61
Routine test and type test.....	61
Special testing.....	61

Facilities

Testing surface is 2.800 sqm. Load testing capacity up to 8 MW. Voltage range during test from 400 to 15.000 V. Test benches designed for testing machines up to 35 t in horizontal and vertical configuration.

Routine and type test

Routine test and type test are carried out in compliance with all major international standards (IEC60034, IEEE, UNI-EN-ISO, MIL-STD), ATEX rules, UL certification and customer specifications.

Test for motors

Standard test for motors

- Name plate check
- Phase sequence
- Winding insulation resistance test
- High voltage test
- No-load run test at nominal voltage.

Routine test for motors (standard test included)

- Winding resistance measurement at cold
- Auxiliary check.

Type test for motors (routine test included)

- Vibration
- Over speed test
- Locked rotor test
- Load run test at rated condition with current, power factor, efficiency measurement
- Heat run test

Special testing

Special tests for the measurement of mechanical and structural vibration and overspeed tests for high-voltage machines (dissipation factor and partial discharges).

We are able to test drive-motor systems in-house in order to ensure perfect compatibility to customer site conditions.

Special test for motors

- Measurement of noise level
- Measurement of dissipation factor $\tan \delta$
- Partial discharge test
- Measurement of torque curve $C=f(n)$
- Shaft voltage measurement
- Visual and dimensional check.



Services

Our Service team	63
Aftersales services	63

Our Service team

Marelli Motori offers all-around support throughout the entire operational life of a product.

Our service team is committed to providing a fast, efficient and reliable service that keeps your motors and generators working productively, minimising downtime and lowering whole life costs.

We work closely with our manufacturing facilities to provide the highest levels of aftersales service worldwide, including commissioning, repairs, spare parts supply, technical support, performance enhancements, training courses and maintenance contracts of electrical machines of all makes.

Our service team offers technical advice to help improve performance, reduce operating costs, improve energy efficiency, minimising downtime and improve reliability.

We operate worldwide and are fully in compliance with the international quality rules, utilising highly skilled technicians and precision instruments to keep your machines working.

Aftersales services

Field service

Marelli Motori service personnel are trained to react quickly to any situation anywhere in the world. We rapidly analyse the source of machine problems and prescribe solutions which can get you 'up and running' quickly, minimising downtime and production losses.

We understand that, for a plant to operate efficiently, disruption must be kept to a minimum and that, when problems do occur, corrective action must be implemented quickly and effectively.

Marelli Motori Service is the solution to electrical machine problems, offering prompt technical support and ultra-fast response no matter where in the world you are located:

- diagnostic and functional tests
- start-up of brand-new machines
- revamping of regulation systems
- on the spot repairs
- custom-made maintenance programmes
- periodical inspections.

Commissioning

The Marelli Motori Commissioning Service includes all activities required for the efficient start-up of the machine during installation, to ensure maximum operational effectiveness from the start.

Our inspection processes during commissioning guarantee that the start-up phase takes place safely and that the correct functional parameters are applied.

The full commissioning option is available to buy with every machine purchase.

Repairs

Marelli Motori Service also offers repairs and complete refurbishing of motors and generators of any make or model.

Repairs of low, medium and high voltage machines can take place at the Marelli Motori manufacturing facility or at customer premises, delivered by our constantly expanding service network.

Our high tech facilities, which include computerised machine centres, VPI plants, 3D measurement systems, digital and infrared diagnostics tools, along with our long experience in designing and manufacturing machines, offer the highest quality of repairs and absolute reliability.

All repairs and testing take place in our modern test room that can handle machines up to 5 MW and a 13.8 kV before issuing functional test certificates and detailed repair reports.

Marelli Motori Service overhauls and tests any rotating electrical machine, including third party machines.

The characteristics of the overhaul procedure are:

- manufacturer know-how
- guarantee on the reparation
- original parts used
- tests in the internal testing room
- reports and about the reparations.

In addition Marelli Motori keeps an available stock of machines with common configurations, which can be supplied to customers for temporary use whilst their own machines are overhauled.

Spare parts

Genuine Marelli Motori spare parts are available at the Marelli headquarters, branch offices, and service centres located all over the world, with specific characteristics:

- original and guaranteed parts.
- branded package.
- major equipment assemblies (complete rotors, stators).
- kits of recommended spare parts.
- spare stocks on Marelli Motori branches.

This policy covers all spare parts manufactured by Marelli Motori.

In the event that a component is out-of-production, Marelli Motori Spa will source and propose the suitable interchangeable spare parts. All spare parts are certified by Marelli Motori Spa for the operating conditions proposed.

Technical support

Marelli Motori customers can access our outstanding technical support at all times to ensure their machines are safety, reliable and productive.

Our service engineers and technicians, from headquarter or subsidiaries, are always at our customer's disposal to assist in solving technical issues by either phone or email.

Training

Training courses are available all year round to users and maintenance personnel to ensure the correct operation and maintenance of machines.

Our customised training sections are tailor-made for:

- customers
- users
- operators for the selection operation and maintenance of electrical equipment.

Training courses

Our training courses include:

- electrical generator working principle and troubleshooting
- electric generator setting and maintenance
- digital voltage regulation with MEC100
- ATEX directive for maintenance of hazardous area motors.

In addition to the training in this brochure, it is possible to specify customised training based on a customer's own requirements. Training language is either in Italian or English. At the end of each course, each participant will receive a personalised certificate, based on the result of a final test.

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