

CATALOG | DECEMBER 2019

Low voltage

IE5 Synchronous reluctance motors



With expertise, and a comprehensive portfolio of products and life-cycle services, we help value-minded industrial customers improve their energy efficiency and productivity.

Low voltage IE5 Synchronous reluctance motors

Sizes 90 to 315, 1.1 to 350 kW

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Synchronous reluctance motors

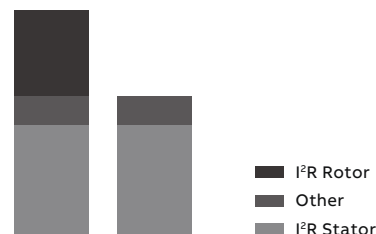
Ultimate efficiency and reliability to optimize your cost of ownership



Traditional induction motor



IE5 SynRM motor



Losses

Innovation inside

The idea is simple. Take a conventional, proven stator technology and a innovative rotor design. Then combine them with a best-in-class industrial drive loaded with new, purpose-designed software.

Magnet-free design

Synchronous reluctance technology combines the performance of the permanent magnet motor with the simplicity and service-friendliness of an induction motor. The rotor has neither magnets nor windings and suffers virtually no power losses. And because there are no magnetic forces in the rotor, maintenance is as straightforward as with induction motors.

SynRM technology	Benefit
Higher efficiency IE5	Lowest energy consumption
No rare earth metals	Environmental sustainability
Magnet-free rotor	Easy service
Lower winding and bearing temperatures	Longer life time, extended service intervals
Better controllability	Accurate speed and torque control
Lower noise level	Better working environment
Same size with IE2	Perfect for retrofits

Highest reliability to minimize the cost of not running

IE5 synchronous reluctance motors have very low winding temperatures, which increases the reliability and lifetime of the winding. More importantly, the cool synchronous reluctance rotor means significantly lower bearing temperatures – an important factor because bearing failures cause about 70 percent of unplanned motor outages.

Full motor control, down to zero speed

Many processes require accurate speed control. As the name says, SynRM is a synchronous motor that always runs at reference speed with practically no error, without an encoder. Even the best slip compensation systems in an induction motor inverter will never match the precision of SynRM.

Sometimes your application may require you to run your motor at slow speeds, for example at less than 40 rpm. If you are using SynRM and your drive cannot provide the necessary torque, it may trip. This means you may have downtime while the problem is being debugged. ABB drives provide full control and torque down to zero speed, even without speed sensors.

For all applications

This is important if you are planning on using the motor with applications other than quadratic torque applications like pumps and fans. Our drives provide full SynRM motor control for constant torque applications such as extruders, conveyors and wire drawing machines.

Perfect for retrofits

The SynRM package is a perfect solution for motor retrofits. The IE5 SynRM is the same size as an IE2 induction motor, eliminating the need for mechanical modifications. The increased efficiency will, on the other hand, reduce the payback time of the investment.

Synchronous reluctance motors

IE5 according to IEC TS 60034-30-2

New technical specification IEC TS 60034-30-2 (2016) specify the efficiency classes for variable speed drive (VSD) motors (i.e. motors which cannot be operated direct on line (DOL)). Typical standard low voltage induction motor efficiency is determined according to IEC 60034-30-1 in sinusoidal (DOL) supply.

efficiency with VSD supply are listed for comparison.

IEC TS 60034-30-2 highlights

- The IE class limit values in new IEC TS 60034-30-2 are reduced by adding the additional harmonic losses caused by the drive:
 - 15% additional losses for motors up to 90kW
 - 25% additional losses for motors above 90kW
- Limit values available also for IE5 level
- Limit values to be achieved with 90% speed, 100% torque

DOL or VSD motor – Same IE class, same efficiency performance in VSD duty

This allows direct comparison in IE class level of traditional induction motors in variable speed usage and advanced technology motors designed only for variable speed drive (like Synchronous reluctance motors). It does not matter if the IE classification is done with DOL supply according to IEC 60034-30-1 or with VSD supply according to IEC TS 60034-30-2. The given IE class still illustrates efficiency performance of both solutions in VSD operation very well. Same IE class, same efficiency performance.

Example:

110 kW 4-pole motor efficiency	
IEC 60034-30-1 (DOL)	IEC TS 60034-30-2 (VSD)
Losses 4,2 kW	Losses 4,2 kW x 1,25 = 5,25 kW
Eff. (110kW/114,2 kW) = 96,3%	Eff. (110 kW/ (110 + 5,25 kW)) = 95,4%
IE4 limit 96,3%	IE4 limit 95,0%

Same motor is IE4 according to both standards

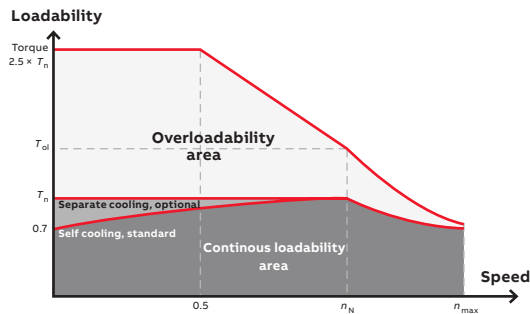
IE5 SynRM efficiency with VSD duty for same rating is 96,8 %.

In practice, IE5 motor has 20% less losses compared to an IE4 motor. In the technical tables you can see the measured SynRM motor efficiency with VSD supply. Typical values of IE3 induction motor

Synchronous reluctance motors

IE5 synchronous reluctance motors

01 Torque characteristics of SynRM motors



01

Efficiency & MEPS

International minimum efficiency performance standards (MEPS) for measuring the efficiency of VSD-only types of motors - such as synchronous reluctance motors - are under development. No local MEPS efficiency requirements for VSD-only motors have been issued by November 2019.

Service

Servicing synchronous reluctance motors is as straightforward as with induction motors. The winding technology is identical to induction motors. The rotor does not include any magnetic materials, which means that the motor can be disassembled and serviced using the same procedure as for conventional induction motors. For test runs, SynRM capable frequency converter is needed.

Package selection

The technical data section lists matching motor and drive packages for easy package selection for pump and fan applications. Refer to ABB for package selection for other speeds or applications, or use the Drive-Size software.

Insulation protection

Synchronous reluctance motors have the same stator winding insulation as other ABB low voltage motors. The insulation is approved for 500 V VSD supply. For voltages above 500 V, follow ABB's instructions regarding the correct insulation system and the output filters of the drive.

Bearing currents

Synchronous reluctance motors rated above 100 kW are equipped with one insulated bearing as standard, which together with the correct cabling is sufficient to secure trouble-free operation up

to 350 kW. Above 350 kW the drive should be equipped with a common-mode filter as an additional measure.

Cabling, grounding, and EMC

Synchronous reluctance motors are not equipped with EMC filters as standard. The variant code to order EMC cable glands is +704.

The use of a frequency converter sets higher demands on the cabling and grounding of the drive system. In other than exceptional circumstances, the motor must be cabled with shielded symmetrical cables and cable glands providing 360-degree bonding (EMC glands). For motors up to 30 kW, asymmetrical cables can be used, but shielded cables are always recommended, especially if there are sensitive components in the driven application.

For motors from frame size 280 upwards, additional potential equalization is needed between the motor frame and machinery, unless the motor and the driven machine are installed on a common steel base. When a steel base is used for potential equalization, the high frequency conductivity of the connection must be checked. For more information, see the ABB manual "Grounding and cabling of drive systems", 3AFY61201998 Rev C.

To meet EMC requirements, special EMC cables must be used in addition to the correct cable gland mounting, with additional special earthing pieces. For more information, refer to drive manuals.

Synchronous reluctance motors

Technology

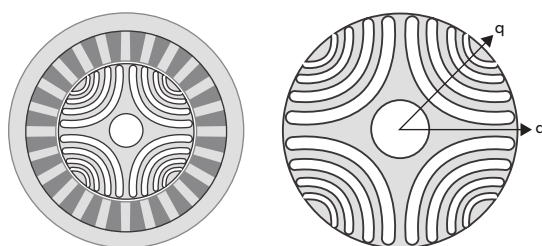
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01 Cross-sectional illustration of a four-pole synchronous reluctance motor (left), and the definition of the magnetic d- and q-axes of its rotor (right).

Introduction

The synchronous reluctance motor is a three-phase electric motor with a magnetically anisotropic rotor structure. In the four-pole version, the rotor has four high- and four low-permeance axes. High permeance means high magnetic conductivity and higher inductance, while low permeance means lower inductance.

Reluctance is the inverse of permeance and is, in practical terms, magnetic resistance; high reluctance results in low inductance. The axes with high permeance can be referred to as the direct or d-axis, while the axes with high reluctance can be referred to as the quadrature or q-axis.

The figures below show cross-sectionals of a synchronous reluctance motor. The different axes in the rotor are identified in the figure on the right.



—
01

Functional principle

When a magnetic field is produced in the air gap by applying exciting currents to the stator windings, the rotor will strive to align its most magnetically conductive axis, the d-axis, with the applied field, in order to minimize the reluctance in the magnetic circuit. In other words, torque is produced in the air gap between the stator and rotor whenever the applied field vector and the d-axis of the rotor are not aligned.

The magnitude of the vector field and the speed of its rotation can be controlled by a frequency converter. The high saliency of the rotor means that its angular position can easily be detected by a sensorless control. Expensive absolute encoders, resolvers, and other rotational sensors are therefore not required.

The sensorless control system keeps track of the rotor's angular position in relation to the stator and creates a vector field with accurate magnitude and rotational speed in accordance with the control reference signals dictated by the load. Since performance is dependent on the information about the rotor's position, the motor needs a frequency converter; it cannot be started with a direct-on-line supply. The rotor runs in synchronism with the applied vector field, striving to minimize reluctance in the magnetic circuit that is present. This functional principle has given its name to the technology – synchronous reluctance.

Synchronous reluctance motors run smoothly due to the sinusoidal air gap field distribution and operation with sinusoidal current.

Rotor design

The rotor design of a synchronous reluctance motor comprises electric steel plates stacked together to form a rotor package. The electric steel plates have punched holes as flux barriers, as illustrated in the figure 01.

The torque produced by the motor is proportional to the difference between the inductances on the d- and q-axes: the greater this difference, the greater the torque production. The synchronous reluctance motor is therefore designed with magnetically conductive material, iron, in the d-axis and magnetically insulating material, air, in the q-axis.

As the rotor has no windings and consequently no joule losses, it runs considerably cooler and with better efficiency than the rotor in an induction motor. The cool running of the rotor also means lower bearing temperatures, which in turn increase the reliability of the bearing system.

Further considerations

Eliminating rotor joule losses in the synchronous reluctance motor has led to compact construction, good efficiency levels and cooler bearing temperatures. The main disadvantage of this technology is that the motor's power factor is generally not as good as with induction motors.

Since there is always a frequency converter between the motor and the grid, the lower power factor is not apparent on the grid side and conse-

quently does not have an impact on the grid supply dimensioning. However, the lower power factor may sometimes mean that a frequency converter with a higher current rating is needed.

The stator and frame design are based on proven induction motor technology, and the rotor consists of only iron and air. The lack of windings and permanent magnets in the rotor eliminates potential faults associated with these components, resulting in robust motor technology optimized for industrial variable speed applications.

Synchronous reluctance motors with ACS880 variable speed drive



ACS880 drive highlights

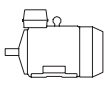
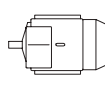
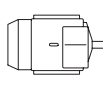
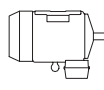
- An all-compatible drives range for numerous industries and applications: paper machines, processing lines, pumps, fans, compressors, and conveyors, among others.
- Compact design for easy installation, commissioning, and maintenance.
- Enclosure classes IP21, IP22, IP42, IP54 and IP55 for various ambient conditions.
- Integrated safety, including the safe-torque-off (STO) feature as standard.
- A memory module stores drive settings and can be installed in a new drive by anyone on the site.
- Supports various motor types: induction, permanent magnet, and synchronous reluctance motors.
- Direct torque control (DTC) – ABB's signature motor control technology provides precise speed and torque control also without any feedback devices like encoders or position sensors.

Other drives are also available. Consult ABB Drives for the latest SynRM-compatible frequency converter offering.

Mounting arrangements

Foot-mounted motor

Code I / code II

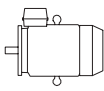
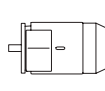
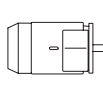
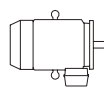
					
IM B3	IM V5	IM V6	IM B6	IM B7	IM B8
IM 1001	IM 1011	IM 1031	IM 1051	IM 1061	IM 1071

Product code pos. 12

A: foot-mounted, term. box top
R: foot-mounted, term. box RHS
L: foot-mounted, term. box LHS

Flange-mounted motor, large flange

Code I / code II

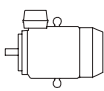
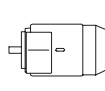
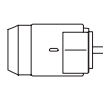
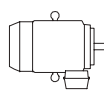
					
IM B5	IM V1	IM V3	*)	*)	*)
IM 3001	IM 3011	IM 3031	IM 3051	IM 3061	IM 3071

Product code pos. 12

B: flange mounted, large flange

Flange-mounted motor, small flange

Code I / code II

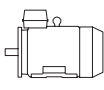
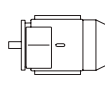
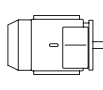
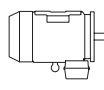
					
IM B14	IM V18	IM V19	*)	*)	*)
IM 3601	IM 3611	IM 3631	IM 3651	IM 3661	IM 3671

Product code pos. 12

C: flange mounted, small flange

Foot- and flange-mounted motor with feet, large flange

Code I / code II

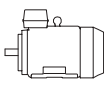
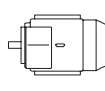
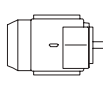
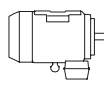
					
IM B35	IM V15	IM V35	*)	*)	*)
IM 2001	IM 2011	IM 2031	IM 2051	IM 2061	IM 2071

Product code pos. 12

H: foot/flange-mounted, term. box top
S: foot/flange-mounted, term. box RHS
T: foot/flange-mounted, term. box LHS

Foot- and flange-mounted motor with feet, small flange

Code I / code II

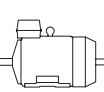
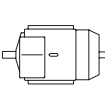
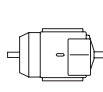
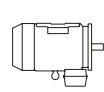
					
IM B34	IM V17	IM 2131	IM 2151	IM 2161	IM 2171

Product code pos. 12

J: foot/flange-mounted, small flange

Foot-mounted motor, shaft with free extensions

Code I / code II

					
IM 1002	IM 1012	IM 1032	IM 1052	IM 1062	IM 1072

Product code pos. 12

*) Not stated in IEC 60034-7.

Note: If the motor is mounted shaft upwards, take measures to prevent water or any other liquid from running down the shaft into the motor.

Ordering information

Explanation of the product code

Motor type	Motor size	Product code	Mounting arrangement code, Voltage and frequency code, Generation code	Variant codes
M3BL	160	MLA 3GBL 162 413	- ASC	445
		1 2 3 4 5 6 7 8 9 10 11 12 13 14		

Positions 1 to 4

3GAL Totally enclosed fan-cooled synchronous reluctance motor with cast aluminum frame, sizes 90 - 132

3GBL Totally enclosed fan-cooled synchronous reluctance motor with cast iron frame, sizes 160 - 315

Positions 5 to 6

IEC size

13: 132

16: 160

18: 180

20: 200

22: 225

25: 250

28: 280

31: 315

Position 7

Pole pairs

2: 4 poles

Positions 8 to 10

Running number

Position 11

-(dash)

Position 12

Mounting arrangement

A: Foot-mounted

B: Flange-mounted, large flange with clearance holes.

Use a variant code for ordering any other mounting arrangement

Position 13

Voltage and frequency

Position 14

Generation code

C IE5 synchronous reluctance motors

Position 15

Variant code

Rating plates

01 Main rating plate, motor sizes

02 Lubrication plate, motor sizes

The motor's main rating plate shows the motor's performance values at nominal speed. The lubrication plate specifies regreasing amount, regreasing interval in hours - depending on the mounting position and ambient temperature - and types of lubricant recommended.

		ABB Oy, Motors and Generators Strömbergin puistotie 5 A 65320 Vaasa, Finland					
		IE5		IEC60034-1			
3- SYNCHRONOUS RELUCTANCE MOTOR						2020	
M3BL 180MLA 4 IMB3/IM1001							
4507489642-10							
No. 3G1F2003648934				Ins. cl. F		IP 55	
V	Hz	kW	r/min	A	Eff.	Duty	
370	Y	100	22	3000	49.5	94.8%	S1
Product code 3GBL182417-ASC							
NETWORK VOLTAGE 400V				IE5 - IEC TS 60034-30-2			
				Nmax 4200		r/min	
6310-2Z/C3				6209-2Z/C3		160 kg	

01

		REGREASING INSTRUCTIONS			
Bearings		6316/C3 6316/C3VL0241			
Amount of grease		40 g 40 g			
Greased in factory with MOBIL UNIREX N2					
Mounting	AMB. temp.	1800 r/min	1500 r/min	1000 r/min	0-900 r/min
Hor	25	7800	9600	13900	15000
Hor	40	3900	4800	6900	7500
Vert	25	3900	4800	6900	7500
Vert	40	1900	2400	3500	3800
Regreasing interval in duty hours					
The following or similar high performance grease can be used:					
Mobil	Unirex N2 / N3	Shell	Gadus S5 V 100 2		
Total	Multis Complex S2 A	Mobil	Mobilith SHC 100		
Kluber	Klubplex BEM 41-132	FAG	Arcanol TEMP110		
Do not exceed the motor max. speed				1777138-1	
See respective "Motor manual"					

02

IE5 Synchronous reluctance motors

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Technical data

IE5 synchronous reluctance motors, 3000 and 1500 r/min

These tables present technical performance data for the currently available IE5 motor and drive packages.

			Performance at nominal speed								Suggested ACS880 SynRM package frequency convert- er for light duty (**no overload)	
Output kW	Type designation	Product code	IE class acc. to IEC TS 60034- 30-2	Motor ef- ficiency with VSD supply T _N = 100%, η _N =100%	Typical IE3 induction motor ef- ficiency with VSD supply***	Current		Torque	Inertia			Weight
						I _N / A	T _N Nm	T _{OL} /T _N Nm	J kgm ₂	kg		
3000 r/min (100 Hz)			400 V network									
5.5	M3AL 132SMA 4	3GAL132217--SC	IE5	92.8	87.8	12.1	17.51	1.5	0.0174	41	ACS880-01-14A3-3	
7.5	M3AL 132SMB 4	3GAL132227--SC	IE5	93.1	88.8	16.5	23.87	1.5	0.0174	41	ACS880-01-17A7-3	
11	M3AL 132SMC 4	3GAL132237--SC	IE5	94.0	90.0	24.5	35.01	1.5	0.0211	47	ACS880-01-25A5-3	
15	M3AL 132SMD 4	3GAL132247--SC	IE5	94.1	90.8	32.9	47.75	1.5	0.0211	47	ACS880-01-035A-3	
11	M3BL 160MLA 4	3GBL162417--SC	IE5	93.7	90.0	25.6	35.0	1.5	0.0579	133	ACS880-01-25A5-3	
15	M3BL 160MLB 4	3GBL162427--SC	IE5	95.1	90.8	34.6	48.0	1.5	0.0579	133	ACS880-01-035A-3	
18.5	M3BL 160MLC 4	3GBL162437--SC	IE5	94.6	91.4	43.3	59.0	1.5	0.0579	133	ACS880-01-043A-3	
22	M3BL 180MLA 4	3GBL182417--SC	IE5	94.8	91.7	49.5	70.0	1.5	0.0702	160	ACS880-01-050A-3	
30	M3BL 200MLA 4	3GBL202417--SC	IE4	94.6	92.4	68.3	95.0	1.5	0.207	259	ACS880-01-069A-3	
37	M3BL 200MLB 4	3GBL202427--SC	IE5	95.5	92.8	84.5	118	1.5	0.207	259	ACS880-01-085A-3	
45	M3BL 225SMA 4	3GBL222217--SC	IE5	96.0	93.2	101	143	1.5	0.242	282	ACS880-01-103A-3	
55	M3BL 225SMF 4	3GBL222267--SC	IE4	95.3	93.5	124	175	1.5	0.242	282	ACS880-01-123A-3	

			Performance at nominal speed								Suggested ACS880 SynRM package frequency convert- er for light duty (**no overload)
Output kW	Type designation	Product code	IE class acc. to IEC TS 60034- 30-2	Motor ef- ficiency with VSD supply	Typical IE3 in- duction motor efficiency with VSD supply***	Current	Torque		Inertia	Weight	
				T _N = 100%, η _N =100%		I _N / A	T _N Nm	T _{OL} /T _N Nm	J kgm ₂	kg	
1500 r/min (50 Hz)			400 V network								
5.5	M3AL 132SMA 4	3GAL132213--SC	IE5	93.7	88.2	11.7	35.0	1.5	0.0301	63	ACS880-01-14A3-3
7.5	M3AL 132SMB 4	3GAL132223--SC	IE5	93.7	89.1	15.7	47.8	1.5	0.0301	63	ACS880-01-17A7-3
11	M3AL 132SMC 4	3GAL132233--SC	IE5	94.2	90.2	23.8	70.0	1.5	0.0336	69	ACS880-01-25A5-3
11	M3BL 160MLA 4	3GBL162413--SC	IE5	94.0	90.2	24.2	70.0	1.5	0.0702	160	ACS880-01-25A5-3
15	M3BL 160MLB 4	3GBL162423--SC	IE5	94.8	91.0	32.1	95.0	1.5	0.0864	177	ACS880-01-035A-3
18.5	M3BL 180MLA 4	3GBL182413--SC	IE4	94.3	91.6	40.3	118	1.5	0.0864	177	ACS880-01-043A-3
22	M3BL 200MLF 4	3GBL202463--SC	IE5	95.7	92.0	48.1	140	1.5	0.287	304	ACS880-01-050A-3
30	M3BL 200MLA 4	3GBL202413--SC	IE5	95.3	92.7	66.1	191	1.5	0.287	304	ACS880-01-069A-3
37	M3BL 250SMF 4	3GBL252263--SC	IE5	95.5	93.0	83.0	236	1.5	0.575	428	ACS880-01-085A-3
45	M3BL 250SMG 4	3GBL252273--SC	IE4	95.6	93.4	98.9	286	1.5	0.575	428	ACS880-01-103A-3
55	M3BL 250SMA 4	3GBL252213--SC	IE4	95.6	93.8	119	350	1.5	0.633	454	ACS880-01-123A-3
75	M3BL 280SMA 4	3GBL282213--DC	IE4	96.1	94.3	166	478	2.0	1	639	ACS880-01-173A-3
90	M3BL 280SMB 4	3GBL282223--DC	IE5	96.5	94.5	199	573	2.1	1	639	ACS880-01-202A-3
110	M3BL 280SMC 4	3GBL282233--DC	IE5	96.7	94.3	241	699	2.1	1.21	697	ACS880-01-245A-3
110	M3BL 315SMA 4	3GBL312213--DC	IE5	96.8	94.3	243	702	2.0	1.64	873	ACS880-01-245A-3
132	M3BL 315SMB 4	3GBL312223--DC	IE5	96.8	94.6	290	842	2.0	1.87	925	ACS880-01-290A-3
160	M3BL 315SMC 4	3GBL312233--DC	IE5	97.1	94.8	343	1018	1.9	2.04	965	ASC880-01-343A-3
200	M3BL 315MLA 4	3GBL312413--DC	IE5	97.2	95.0	428	1272	1.9	2.45	1116	ACS880-01-427A-3
250	M3BL 315LKA 4	3GBL312813--DC	IE5	97.1	95.0	552	1591	2.0	3.04	1357	ACS880-04-585A-3*
315	M3BL 315LKC 4	3GBL312833--DC	IE5	97.2	95.0	662	2006	1.8	3.77	1533	ACS880-04-650A-3*

* ACS880-04 drive module, protection IP 21.

** Consult ABB for motor and drive dimensioning for applications with other load characteristics.

*** Additional motor losses acc. to IEC TS 60034-30-2.

Technical data

IE5 synchronous reluctance motors, 1000 r/min

This table presents technical performance data for the currently available IE5 motor and drive packages.

			Performance at nominal speed								Suggested ACS880 SynRM package frequency converter for light duty (**no overload)
Output kW	Type designation	Product code	IE class acc. to IEC TS 60034-30-2	Motor efficiency with VSD supply	Typical IE3 induction motor efficiency with VSD supply***	Current I _n / A	Torque T _N Nm	Inertia T _{OL} /T _N Nm	Weight J kgm ₂ kg		
				T _N = 100%, n _N =100%							
1000 r/min (33 Hz)			400 V network								
7.5	M3BL 160MLA 4	3GBL162412--SC	IE5	93.1	86.4	16.5	72.0	1.5	0.0702	160	ACS880-01-17A7-3
11	M3BL 160MLB 4	3GBL162422--SC	IE5	93.7	87.7	24.1	105	1.5	0.0864	177	ACS880-01-25A5-3
15	M3BL 200MLF 4	3GBL202462--SC	IE5	94.7	89.0	32.4	143	1.5	0.242	282	ACS880-01-035A-3
18.5	M3BL 200MLA 4	3GBL202412--SC	IE5	95.2	90.0	39.9	177	1.5	0.287	304	ACS880-01-043A-3
22	M3BL 200MLB 4	3GBL202422--SC	IE5	95.0	90.6	47.0	210	1.5	0.287	304	ACS880-01-050A-3
30	M3BL 250SMF 4	3GBL252262--SC	IE5	95.3	91.1	67.2	286	1.5	0.499	391	ACS880-01-069A-3
37	M3BL 250SMA 4	3GBL252212--SC	IE5	95.6	91.9	80.5	353	1.5	0.575	428	ACS880-01-085A-3
45	M3BL 280SMA 4	3GBL282212--DC	IE5	96.2	92.4	98.6	430	2.3	1	639	ACS880-01-103A-3
55	M3BL 280SMB 4	3GBL282222--DC	IE5	96.0	92.8	119	526	2.0	1	639	ACS880-01-123A-3
75	M3BL 280SMC 4	3GBL282232--DC	IE5	96.2	93.3	160	715	2.1	1.21	697	ACS880-01-173A-3
75	M3BL 315SMA 4	3GBL312212--DC	IE5	96.5	93.8	164	717	2.0	1.64	873	ACS880-01-173A-3
90	M3BL 315SMB 4	3GBL312222--DC	IE5	96.8	94.2	199	859	2.0	1.87	925	ACS880-01-202A-3
110	M3BL 315SMC 4	3GBL312232--DC	IE5	96.8	93.9	241	1051	1.9	2.04	965	ACS880-01-245A-3
132	M3BL 315MLA 4	3GBL312412--DC	IE5	97.1	94.3	278	1261	1.7	2.45	1116	ACS880-01-290A-3
160	M3BL 315LKA 4	3GBL312812--DC	IE5	97.1	94.6	341	1527	1.9	3.04	1357	ASC880-01-343A-3
200	M3BL 315LKC 4	3GBL312832--DC	IE5	97.3	94.8	416	1910	1.8	3.77	1533	ACS880-01-427A-3

* ACS880-04 drive module, protection IP 21.

** Consult ABB for motor and drive dimensioning for applications with other load characteristics.

*** Additional motor losses acc. to IEC TS 60034-30-2

Variant codes

IE5 synchronous reluctance motors

Variant codes specify additional options and features to the standard motor. The desired features are listed as three-digit variant codes in the motor order. Note also that there are variants that cannot be used together.

		Frame size							
Code/Variants		132	160	180	200	225	250	280	315
Administration									
529	Customer witnessed visual inspection of complete order line.	●	●	●	●	●	●	●	●
530	Two-year extension on standard warranty	-	●	●	●	●	●	●	●
531	Sea freight packing	-	●	●	●	●	●	●	●
533	Wooden sea freight packing	-	-	-	-	-	-	●	●
590	Mounting of customer supplied part other than coupling.	-	●	●	●	●	●	●	●
Balancing									
423	Balanced without key.	●	●	●	●	●	●	●	●
424	Full-key balancing	●	●	●	●	●	●	●	●
Bearings and Lubrication									
036	Transport lock for bearings.	●	●	●	●	●	●	●	●
037	Roller bearing at D-end.	●	●	●	●	●	●	●	●
039	Cold-resistant grease	-	-	-	-	-	-	●	●
040	Heat-resistant grease	-	-	-	-	-	-	●	●
041	Bearings regreasable via grease nipples.	●	●	●	●	○	○	○	○
043	SPM compatible nipples for vibration measurement	●	●	●	●	○	○	○	○
057	2RS bearings at both ends.	●	●	●	●	●	●	-	-
058	Angular contact bearing at D-end, shaft force away from bearing.	●	●	●	●	●	●	●	●
059	Angular contact bearing at N-end, shaft force towards bearing.	●	-	-	-	-	-	●	●
060	Angular contact bearing at D-end, shaft force towards bearing.	-	-	-	-	-	-	●	●
061	Angular contact bearing at N-end, shaft force away from bearing.	-	-	-	-	-	-	●	●
107	Pt100 2-wire in bearings.	-	●	●	●	●	●	●	●
128	Double PT100, 2-wire in bearings	-	●	●	●	●	●	●	●
129	Double PT100, 3-wire in bearings	-	●	●	●	●	●	●	●
130	Pt100 3-wire in bearings.	-	●	●	●	●	●	●	●
194	2Z bearings greased for life at both ends.	○	○	○	○	●	●	-	-
420	Bearing mounted PTC thermistors.	-	-	-	-	-	-	●	●
433	Outlet grease collector	-	-	-	-	-	-	●	●
506	Nipples for vibration measurement : SKF Marlin Quick Connect stud CMSS-2600-3	-	●	●	●	●	●	●	●
593	Bearings grease suitable for food and beverage industry.	●	-	●	●	●	●	●	●
654	Provision for vibration sensors (M8x1)	-	●	●	●	●	●	●	●
796	Grease nipples JIS B 1575 PT 1/8 Type A	-	●	●	●	●	●	●	●
797	Stainless steel SPM nipples	●	●	●	●	●	●	●	●
798	Stainless steel grease nipples	-	●	●	●	●	●	●	●
799	Grease nipples flat type DIN 3404, thread M10x1	-	●	●	●	●	●	●	●
800	Grease nipples JIS B 1575 PT 1/8" pin type	-	●	●	●	●	●	●	●
Branch standard designs									
177	Design for high ambient applications	-	●	●	●	●	●	-	-
178	Stainless steel / acid proof bolts.	●	●	●	●	●	●	●	●
204	Jacking bolts for foot mounted motors.	-	-	-	-	-	-	●	●
209	Non-standard voltage or frequency, (special winding).	●	●	●	●	●	●	●	●
217	Cast iron D-end shield (on aluminum motor).	●	-	-	-	-	-	-	-
425	Corrosion protected stator and rotor core.	-	-	-	-	-	-	●	●
Cooling system									
053	Metal fan cover.	●	○	○	○	○	○	○	○
068	Light alloy metal fan	●	●	●	●	●	●	●	●
075	Cooling method IC418 (without fan).	●	-	-	-	-	-	-	-

○ = Included as standard | • = Available as option | - = Not applicable

		Frame size							
Code/Variants		132	160	180	200	225	250	280	315
183	Separate motor cooling (fan axial, N-end).	●	●	●	●	●	●	●	●
189	Separate motor cooling, IP44, 400V, 50Hz (fan axial, N-end).	-	●	●	●	●	●	-	-
206	Steel fan	-	-	-	-	-	-	●	●
422	Separate motor cooling (on top) with integrated fan motor	-	-	-	-	-	-	●	●
514	Separate motor cooling (fan on top)	-	-	-	-	-	-	●	●
791	Stainless steel fan cover	-	-	-	-	-	-	●	●
Coupling									
035	Assembly of customer supplied coupling-half.	-	-	-	-	-	-	●	●
Documentation									
141	Binding 2D main dimension drawing.	-	●	●	●	●	●	●	●
374	Binding 2D motor detailed drawing	-	●	●	●	●	●	●	●
536	Photos of manufactured motors	●	●	●	●	●	●	●	●
722	Rotor dimension drawing (incl. torsional stiffness).	-	●	●	●	●	●	●	●
Drain holes									
065	Plugged existing drain holes.	●	●	●	●	●	●	●	●
448	Draining holes with metal plugs.	-	-	-	-	-	-	●	●
Earthing Bolt									
067	External earthing bolt.	●	○	○	○	○	○	○	○
Heating elements									
450	Heating element, 100-120 V	●	●	●	●	●	●	●	●
451	Heating element, 200 - 240 V	●	●	●	●	●	●	●	●
Insulation system									
405	Special winding insulation for frequency converter supply.	-	●	●	●	●	●	●	●
Mounting arrangements									
008	IM 2101 foot/flange mounted, IEC flange, from IM 1001 (B34 from B3).	●	-	-	-	-	-	-	-
009	IM 2001 foot/flange mounted, IEC flange, from IM 1001 (B35 from B3).	●	●	●	●	●	●	●	●
047	IM 3601 flange mounted, IEC flange, from IM 3001 (B14 from B5).	●	-	-	-	-	-	-	-
048	IM 3001 flange mounted, IEC flange, from IM 3601 (B5 from B14).	●	-	-	-	-	-	-	-
066	Modified for specified mounting position differing from IM B3 (1001), IM B5 (3001), B14 (3601), IM B35 (2001), IM B34 (2101)	●	●	●	●	●	●	●	●
200	Flange ring holder.	●	-	-	-	-	-	-	-
236	Flange FT 165.	●	-	-	-	-	-	-	-
243	Flange ring FF 215.	●	-	-	-	-	-	-	-
244	Flange ring FT 215.	●	-	-	-	-	-	-	-
253	Flange ring FF 265.	●	-	-	-	-	-	-	-
254	Flange ring FT 265.	●	-	-	-	-	-	-	-
255	Flange FF 265.	●	-	-	-	-	-	-	-
305	Additional lifting lugs.	-	●	●	●	●	●	●	●
Noise reduction									
055	Noise reduction cover for foot mounted motor	-	-	-	-	-	-	●	●
Painting									
105	Paint thickness report.	-	●	●	●	●	●	●	●
114	Special paint color, standard grade	●	●	●	●	●	●	●	●
115	Painting system C4M acc. to ISO 12944-2: 1998.	-	●	●	●	●	●	●	●
168	Primer paint only.	-	●	●	●	●	●	●	●
710	Thermally sprayed zink metallizing with acrylic top coat	-	●	●	●	●	●	●	●
754	Painting system C5M acc. to ISO 12944-2:1998	-	●	●	●	●	●	●	●
Protection									
005	Protective roof	●	●	●	●	●	●	●	●
072	Radial seal at D-end. Not possible for 2-pole , 280 and 315 frames	●	●	●	●	●	●	●	●
073	Sealed against oil at D-end.	-	●	●	●	●	●	●	●
158	Degree of protection IP65.	●	●	●	●	●	●	●	●
401	Protective roof, horizontal motor.	-	●	●	●	●	●	●	●
403	Degree of protection IP56.	●	●	●	●	●	●	●	●
404	Degree of protection IP56, without fan and fan cover.	●	●	●	●	●	●	-	-
434	Degree of protection IP56, open deck.	-	-	-	-	-	-	●	●
783	Labyrinth sealing at D-end.	-	-	-	-	-	-	●	●
784	Gamma-seal at D-end.	●	●	●	●	○	○	-	-
Rating & instruction plates									
002	Restamping voltage, frequency and output, continuous duty.	●	●	●	●	●	●	●	●

○ = Included as standard | ● = Available as option | - = Not applicable

		Frame size							
Code/Variants		132	160	180	200	225	250	280	315
004	Additional text on std rating plate (max 12 digits on free text line).	●	●	●	●	●	●	●	●
126	Tag plate	-	●	●	●	●	●	●	●
135	Mounting of additional identification plate, stainless.	●	●	●	●	●	●	●	●
138	Mounting of additional identification plate, aluminium.	●	-	-	-	-	-	-	-
139	Additional identification plate delivered loose.	●	●	●	●	●	●	●	●
159	Additional plate with text “Made in”	●	●	●	●	●	●	●	●
160	Additional rating plate affixed.	●	●	●	●	●	●	●	●
161	Additional rating plate delivered loose.	●	●	●	●	●	●	●	●
163	Frequency converter rating plate. Rating data according to quotation.	●	●	●	●	●	●	●	●
528	Rating plate sticker	-	●	●	●	●	●	●	●
Shaft & rotor									
069	Two shaft extensions according to catalog drawings.	●	●	●	●	●	●	●	●
070	Special shaft extension at D-End, standard shaft material	●	●	●	●	●	●	●	●
131	Motor delivered with half key (key not exceeding shaft diameter)	●	●	●	●	●	●	-	-
164	Shaft extension with closed keyway	○	○	○	○	○	○	●	●
165	Shaft extension with open keyway	●	●	●	●	●	●	○	○
410	Shaft material stainless steel	-	-	-	-	-	-	●	●
591	Special shaft extension according to customer specification.	●	●	●	●	●	●	●	●
600	Special shaft extension at N-end, standard shaft material.	-	●	●	●	●	●	●	●
Standards and Regulations									
208	Fulfilling Underwriters Laboratories (UL), listed requirements	-	●	●	●	●	●	●	●
823	WIMES 3.03i6 Compliant Design for VSD operation	●	●	●	●	●	●	●	●
Stator winding temperature sensors									
120	KTY 84-130 (1 per phase) in stator winding.	-	●	●	●	●	●	●	●
121	Bimetal detectors, break type (NCC), (3 in series), 130 °C, in stator winding	●	●	●	●	●	●	●	●
122	Bimetal detectors, break type (NCC), (3 in series), 150 °C, in stator winding	●	●	●	●	●	●	●	●
123	Bimetal detectors, break type (NCC), (3 in series), 170 °C, in stator winding	●	●	●	●	●	●	●	●
124	Bimetal detectors, break type (NCC), (3 in series), 140 °C, in stator winding	-	●	●	●	●	●	●	●
125	Bimetal detectors, break type (NCC), (2x3 in series), 150 °C, in stator winding	●	●	●	●	●	●	●	●
127	Bimetal detectors, break type (NCC), (3 in series, 130 °C & 3 in series, 150 °C), in stator winding	●	●	●	●	●	●	●	●
321	Bimetal detectors, closing type (NO), (3 in parallel), 130°C, in stator winding.	●	-	-	-	-	-	-	-
322	Bimetal detectors, closing type (NO), (3 in parallel), 150°C, in stator winding.	●	-	-	-	-	-	-	-
325	Bimetal detectors, closing type (NO), (2x3 in parallel), 150°C, in stator winding.	●	-	-	-	-	-	-	-
327	Bimetal detectors, closing type (NO), (3 in parallel, 130°C & 3 in parallel, 150°C), in stator winding.	●	-	-	-	-	-	-	-
435	PTC - thermistors (3 in series), 130 °C, in stator winding	●	●	●	●	●	●	●	●
436	PTC - thermistors (3 in series), 150 °C, in stator winding	●	○	○	○	○	○	○	○
437	PTC - thermistors (3 in series), 170 °C, in stator winding	●	●	●	●	●	●	●	●
438	PTC - thermistors (3 in series), 190 °C, in stator winding	-	-	-	-	-	-	●	●
439	PTC - thermistors (2x3 in series), 150 °C, in stator winding	●	●	●	●	●	●	●	●
440	PTC - thermistors (3 in series, 110°C & 3 in series, 130°C), in stator winding.	●	-	-	-	-	-	-	-
441	PTC - thermistors (3 in series, 130 °C & 3 in series, 150 °C), in stator winding	●	●	●	●	●	●	●	●
442	PTC - thermistors (3 in series, 150 °C & 3 in series, 170 °C), in stator winding	-	●	●	●	●	●	●	●
445	Pt100 2-wire in stator winding, 1 per phase	●	●	●	●	●	●	●	●
446	Pt100 2-wire in stator winding, 2 per phase	-	●	●	●	●	●	●	●
502	Pt100 3-wire in stator winding, 1 per phase	-	●	●	●	●	●	●	●
503	Pt100 3-wire in stator winding, 2 per phase	-	●	●	●	●	●	●	●
511	PTC thermistors (2 x 3 in series), 130 °C, in stator winding	-	●	●	●	●	●	●	●
Terminal box									
019	Larger than standard terminal box.	-	-	-	-	-	-	●	●
020	Detached terminal box.	-	-	-	-	-	-	●	●
021	Terminal box LHS (seen from D-end).	-	-	-	-	-	-	●	●
022	Cable entry LHS (seen from D-end).	○	●	●	●	●	●	●	●
157	Terminal box degree of protection IP65.	-	●	●	●	●	●	●	●
180	Terminal box RHS (seen from D-end).	-	-	-	-	-	-	●	●
230	Standard metal cable gland.	●	●	●	●	●	●	○	○

○ = Included as standard | ● = Available as option | - = Not applicable

		Frame size							
Code/Variants		132	160	180	200	225	250	280	315
277	Cable sealing end unit, size small for C-opening	-	-	-	-	-	-	●	-
278	Cable sealing end unit, size medium for D-opening	-	-	-	-	-	-	-	●
279	Cable sealing end unit, size large for D-opening	-	-	-	-	-	-	-	●
292	Adapter C-C	-	-	-	-	-	-	●	-
293	Adapter D-D	-	-	-	-	-	-	-	●
294	Adapter E-D	-	-	-	-	-	-	-	●
295	Adapter E-2D	-	-	-	-	-	-	-	●
375	Standard plastic cable gland	●	-	-	-	-	-	-	-
376	Two standard plastic cable glands	●	-	-	-	-	-	-	-
380	Separate terminal box for temperature detectors, std. material	-	●	●	●	●	●	●	●
413	Extended cable connection, no terminal box.	-	-	-	-	-	-	●	●
418	Separate terminal box for auxiliaries, standard material.	-	●	●	●	●	●	●	●
447	Top mounted separate terminal box for monitoring equipment.	-	-	-	-	-	-	●	●
466	Terminal box at N-end.	-	-	-	-	-	-	●	●
468	Cable entry from D-end.	-	-	-	-	-	-	●	●
469	Cable entry from N-end.	-	●	●	●	●	●	●	●
554	Cast iron flange for cable glands drilled and tapped according to order.	-	●	●	●	●	●	●	●
557	Nickel plated cable glands mounted according to order.	-	●	●	●	●	●	●	●
568	Separate terminal box for heating elements, std. material	-	●	●	●	●	●	●	●
569	Separate terminal box for brakes	-	-	-	-	-	-	●	●
730	Prepared for NPT cable glands.	-	-	-	-	-	-	●	●
731	Two standard metal cable glands.	●	●	●	●	●	●	○	○
740	Prepared for PG cable glands.	-	●	●	●	●	●	-	-
742	Protective cover for accessory terminal block in main terminal box.	-	-	-	-	-	-	●	●
743	Non-drilled cast iron flange for cable glands	-	●	●	●	●	●	●	●
744	Stainless steel non-drilled flange for cable glands.	-	-	-	-	-	-	●	●
745	Painted steel flange equipped with nickel plated brass cable glands	-	-	-	-	-	-	●	●
746	Stainless steel cable flange equipped with standard nickel plated brass cable glands	-	-	-	-	-	-	●	●
Testing									
148	Routine test report.	●	●	●	●	●	●	●	●
150	Customer witnessed testing. Specify test procedure with other codes.	-	-	-	-	-	-	●	●
760	Vibration level test	-	●	●	●	●	●	●	●
761	Vibration spectrum test for one motor from specific delivery batch.	-	-	-	-	-	-	●	●
762	Noise level test for one motor from specific delivery batch.	-	-	-	-	-	-	●	●
763	Noise spectrum test for one motor from specific delivery batch.	-	-	-	-	-	-	●	●
764	Test for one motor from specific delivery batch with ABB frequency converter available at ABB test field. ABB standard test procedure.	-	●	●	●	●	●	●	●
Variable speed drives									
182	Mounting of non-listed pulse tacho.	-	-	-	-	-	-	●	●
429	Separate motor cooling (fan top, N-end) and 1024 pulse tacho (Leine & Linde 861) mounted.	-	-	-	-	-	-	●	●
470	Prepared for hollow shaft pulse tacho (L&L equivalent).	-	●	●	●	●	●	●	●
472	1024 pulse tacho (L&L 861007455-1024).	-	●	●	●	●	●	●	●
473	2048 pulse tacho (L&L 861007455-2048).	-	●	●	●	●	●	●	●
474	Separate motor cooling (axial fan, N-end) and prepared for hollow shaft tacho (L&L equivalent)	-	●	●	●	●	●	●	●
476	Separate motor cooling (axial fan, N-end) and 1024 pulse tacho (L&L 861007455-1024)	-	●	●	●	●	●	●	●
477	Separate motor cooling (axial fan, N-end) and 2048 pulse tacho (L&L 861007455-2048)	-	●	●	●	●	●	●	●
478	Separate motor cooling (fan on top, N-end) and prepared for hollow shaft tacho (L&L equivalent)	-	-	-	-	-	-	●	●
479	Mounting of other type of pulse tacho with shaft extension, tacho not included.	-	-	-	-	-	-	●	●
486	Separate motor cooling (fan top, N-end) and prepared for DC-tacho.	-	-	-	-	-	-	●	●
510	Separate motor cooling (fan top, N-end) and 2048 pulse tacho (Leine & Linde 861) mounted.	-	-	-	-	-	-	●	●
570	Prepared for hollow shaft pulse tacho (L&L 503).	-	●	●	●	●	●	-	-
572	1024 pulse tacho (L&L 503).	-	●	●	●	●	●	-	-
573	2048 pulse tacho (L&L 503).	-	●	●	●	●	●	-	-
582	1024 pulse tacho, GHK912-GBR-1024, BEI IDEACOD	-	-	-	-	-	-	●	●
583	2048 pulse tacho, GHK912-GBR-2048, BEI IDEACOD	-	-	-	-	-	-	●	●
588	Shaft grounding device	●	●	●	●	●	●	-	-

○ = Included as standard | ● = Available as option | - = Not applicable

		Frame size							
Code/Variants		132	160	180	200	225	250	280	315
658	Special tachometer mounted, price category 1	-	-	-	-	-	-	●	●
659	Special tachometer mounted, price category 2	-	-	-	-	-	-	●	●
660	Special tachometer mounted, price category 3	-	-	-	-	-	-	●	●
661	1024 Pulse tachometer mounted, Hohner series 59, 11-30V	●	-	-	-	-	-	-	-
662	2048 Pulse tachometer mounted, Hohner series 59, 11-30V	●	-	-	-	-	-	-	-
701	Insulated bearing at N-end.	-	●	●	●	●	●	○	○
702	Insulated bearings at both ends	●	●	●	●	●	●	-	-
704	EMC cable entry.	●	●	●	●	●	●	●	●
Variable speed drives									

○ = Included as standard | • = Available as option | - = Not applicable

Mechanical design

Motor frame and drain holes

01 As standard, the motor is delivered with drain holes and closable plugs.

Motor frame

Motor size 132 have aluminum alloy stator frame with integrated aluminum feet and terminal box. Motor sizes 160 and above have cast iron frame and feet and a removable terminal box. Integrated feet provide rigid mounting and minimize vibration.

Motors can be supplied for foot mounting, flange mounting, and combinations of these.

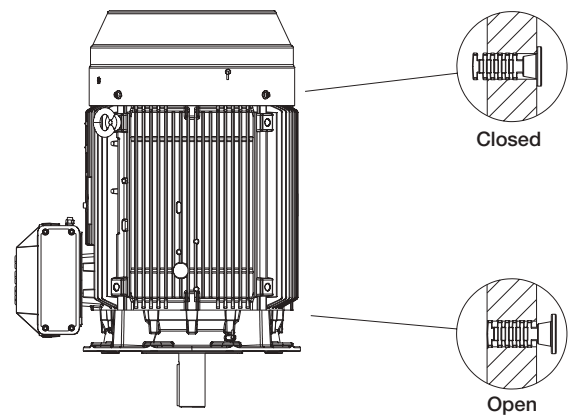
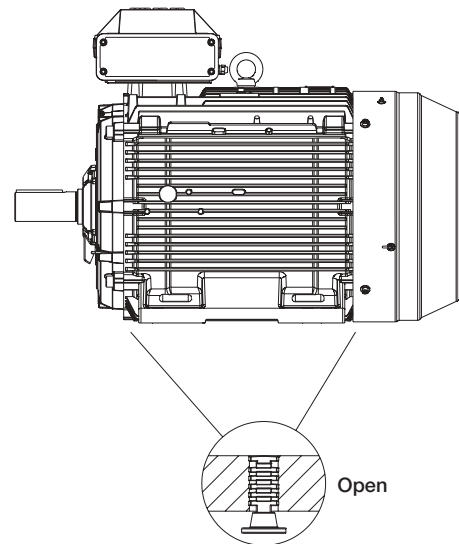
Drain holes

Motors that will be operated in very humid or wet environments, and especially under intermittent duty, should be provided with drain holes. The IM designation, such as IM 3031, determines the intended mounting arrangement for the motor.

Motors are fitted with drain holes and closable plugs. The plugs are open on delivery. When mounting the motors, ensure that the drain holes face downwards.

In case of vertical mounting, the upper plug must be hammered home completely. In very dusty environments, both plugs should be hammered home.

When mounting differs from foot-mounted IM B3 arrangement, use variant code 066 when ordering. (See variant code 065 under Drain holes and variant code 066 under Mounting arrangements in the Variant codes section.)



01

Mechanical design

Heating elements

Heating elements are installed into windings to keep them free of corrosion in humid conditions. The required power of heating elements is shown in the table. You can order heating elements with variant code 450 or 451.

Motor size	132	160	180	200	225	250	280	315
Heating element power (W)	25	25	50	50	50	50	60	2x60

Mechanical design

Bearings

Synchronous reluctance motors are normally fitted with single-row deep-groove ball bearings, as shown in the table below.

If the bearing at the D-end is replaced with a roller bearing (NU- or NJ-), higher radial forces can be handled. Roller bearings are suitable for belt-drive applications.

When there are high axial forces, angular-contact ball bearings should be used. This option is available on request. When ordering a motor with an angular-contact ball bearing, specify also the method of mounting and the direction and magnitude of axial force. See Variant codes for special bearings.

Standard motor with deep-groove ball bearings			
Motor size	n_N r/min	Deep-groove ball bearings	
		D-end	N-end
132	1500, 3000	6308-2Z/C3	6206-2Z/C3
160	1000 - 3000	6309-2Z/C3	6209-2Z/C3
180	1500 - 3000	6310-2Z/C3	6209-2Z/C3
200	1000 - 3000	6312-2Z/C3	6210-2Z/C3
225	3000	6313/C3	6210/C3
250	1000 - 1500	6315/C3	6213/C3
280	1000 - 1500	6316/C3	6316/C3*
315	1000 - 1500	6319/C3	6316/C3*

* Insulated bearing at N-end as standard.

Motor with roller bearings, variant code 037		
Motor size	n_N r/min	Roller bearings D-end
132	1500, 3000	NU 308
160	1000 - 3000	NU 309 ECP
180	1500 - 3000	NU 310 ECP
200	1000 - 3000	NU 312 ECP
225	3000	NU 313 ECP
250	1000 - 1500	NU 315 ECP
280	1000 - 1500	NU 316/C3
315	1000 - 1500	NU 319/C3

Axially locked bearings

All motors are equipped as standard with an axially locked bearing at the D-end.

Transport locking

Motors with roller bearings or an angular-contact ball bearing are fitted with a transport lock before dispatch to prevent damage to bearings during

transport. A warning sign is attached to motors larger than 250 when transport locking is used.

Locking may also be fitted in other cases if severe transport conditions are expected.

Bearing seals

These tables present the standard and alternative sizes and types of seals per motor size.

Standard designs			
Motor size	n_N r/min	Standard design Axial seal	
		D-end	N-end
132	1500, 3000	VA40	Labyrinth seal
160	1000 - 3000	RB45	RB45
180	1500 - 3000	RB50	RB45
200	1000 - 3000	RB60	RB50
225	3000	RB65	RB50
250	1000 - 1500	RB75	RB65
280	1000 - 1500	VS80	VS80
315 SM	1000 - 1500	VS95	VS80
315 LK	1000 - 1500	Labyrinth seal	VS80

Alternative designs in motor sizes 132 – 250		
Motor size	n_N r/min	Alternative design, D-end
		Radial seal (DIN 3760), variant code 072
132	1500, 3000	40x62x7
160	1000 - 3000	45x62x8
180	1500 - 3000	50x68x8
200	1000 - 3000	60x80x8
225	3000	65x85x10
250	1000 - 1500	75x95x10

Alternative designs in motor sizes 280 – 315			
Motor size	n_N r/min	Alternative design 1	
		D-end	N-end
280	1000 - 1500	Labyrinth seal	Labyrinth seal
315 SM, ML	1000 - 1500	Labyrinth seal	Labyrinth seal
315 LK	1000 - 1500	(Labyrinth seal)	Labyrinth seal

Motor size	n _N r/min	Alternative design 2	
		D-end	N-end
280	1000 - 1500	Radial seal 80×110×10	Radial seal 80×110×10
315 SM, ML	1000 - 1500	Radial seal 95×125×10	Radial seal 80×110×10
315 LK	1000 - 1500	(Labyrinth seal)	Radial seal 80×110×10

Bearing life and lubrication

Bearing life

The nominal life L_{10h} of a bearing is defined according to ISO 281 as the number of operating hours achieved or exceeded by 90 % of identical bearings in a large test series under specified conditions. 50 % of bearings achieve at least five times this lifetime.

The calculated bearing life L_{10h} for power transmission by means of coupling is for horizontally mounted motors in sizes 280 to 315 $\geq 200,000$ hours.

Lubrication

On delivery, motors in frame size 225 and above are prelubricated with high-quality grease. Before first start-up, see instructions for relubrication and recommended grease in the Manual for low voltage motors delivered together with the motor, or see the lubrication plate on the motor.

Lubrication intervals

ABB follows the L_1 principle in defining lubrication intervals. According to this principle, 99 % of motors will make the interval time. The synchronous reluctance motor sizes 250 to 315 have regreasable bearings as the standard solution. The lubrication intervals can also be calculated according to the L_{10} principle, which usually gives twice as long interval times. L_{10} values are available from ABB at request.

Motors with relubrication nipples

In frame sizes 280 – 315, the bearing system allows the use of a valve disc to ease lubrication. Motors are lubricated while running.

The grease outlet opening has closing valves at both ends. These should be opened before greasing and closed 1 – 2 hours after regreasing. This ensures that the construction is tight and bearings remain dust- and dirt-free. A grease-collection method can be used optionally.

The following tables show lubrication intervals according to the L_1 principle for various nominal speeds in 25 °C ambient temperature. These values apply to horizontally mounted motors (B3) with 80 °C bearing temperature and high-quality grease containing lithium-complex soap and mineral or PAO-oil.

Lubrication intervals in duty hours for ball bearings

Frame size	Amount of grease, g/bearing	Interval hours at		
		3000 r/min	1500 r/min	1000 r/min
Ball bearings				
132-200	greased for life			
225	50	6500	-	-
250	60	-	11 500	15 000
280	40	-	9600	14 000
315	55	-	7600	11 800

Lubrication intervals in duty hours for roller bearings

Frame size	Amount of grease, g/bearing	Interval hours at		
		3000 r/min	1500 r/min	1000 r/min
Roller bearings				
132	On request	-	-	-
160	25	6000	10 500	12 000
180	30	4500	9000	-
200	40	4000	8500	11 500
225	50	3000	-	-
250	60	-	5500	7500
280	40	-	5250	7000
315	55	-	3800	5900

Grease lifetime

Grease lifetime information is relevant for motors equipped with bearings greased for life, which means standard synchronous reluctance motors in frame sizes 160 – 200.

The standard bearing grease is high-quality grease intended for normal temperatures in dry or humid environments. The normal ambient temperature is 40 °C, in some cases even higher. Refer to the table below to see how temperature affects grease lifetime.

As an optional solution, grease nipples for regreasing can also be provided. See variant code 041.

The grease lifetime L_{10} , applicable to permanently lubricated bearings, is defined as the number of operating hours after which 90 % of bearings are still adequately lubricated. 50 % of the bearings achieve twice the lifetime L_{10} .

40 000 hours should be regarded as the definitive maximum lifetime after which bearings should be replaced. Lifetime is subject to the load conditions of the application run by the motor.

Grease lifetime L10 in deep groove ball bearings of type 2Z, horizontally mounted motors in continuous duty

		Ambient temperature and grease lifetime					
Motor size	Speed r/min	25 °C	40 °C	50 °C	60 °C	70 °C	80 °C
132	3000	40 000	31 000	20 000	12 000	6 000	3 000
132	1500	40 000	40 000	40 000	24 000	13 000	7 000
160	3000	40 000	40 000	40 000	26 000	14 000	8 000
160	1000 - 1500	40 000	40 000	40 000	40 000	40 000	37 000
180	3000	38 000	38 000	38 000	38 000	23 000	13 000
180	1500	40 000	40 000	40 000	32 000	28 000	15 000
200	3000	27 000	27 000	27 000	24 000	14 000	8 000
200	1000 - 1500	40 000	40 000	40 000	40 000	40 000	30 000

Mechanical design

Radial forces

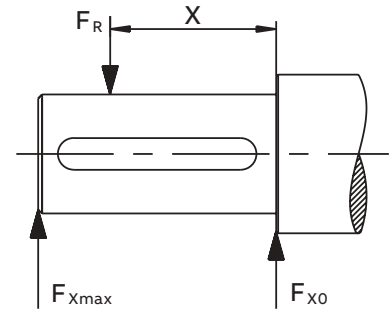
Permissible loading on the shaft

The following table shows permissible radial forces on the shaft in Newtons, assuming zero axial force, a 25 °C ambient temperature, and normal conditions. The values are given for a calculated bearing life of 20 000 and 40 000 hours per motor size.

These calculated values further assume mounting position IM B3 (foot-mounted), with force directed sideways. In some cases, the strength of the shaft affects permissible forces.

Permissible loads of simultaneous radial and axial forces can be supplied on request.

E = length of the shaft extension in the standard version.



Permissible radial forces, motor sizes 132 – 315

Motor size	Speed r/min	Length of shaft extension E (mm)	Ball bearings		Roller bearings					
			20 000 hours		40 000 hours		20 000 hours		40 000 hours	
			FX ₀ (N)	FX _{max} (N)	FX ₀ (N)	FX _{max} (N)	FX ₀ (N)	FX _{max} (N)	FX ₀ (N)	FX _{max} (N)
132	3000	80	2600	2100	2600	2100	-	-	-	-
132	1500	80	2600	2100	2600	2100	-	-	-	-
160	3000	110	5050	3900	4350	3350	6700	4300	5700	4300
160	1500	110	5400	4300	4600	3700	7550	4300	6400	4300
160	1000	110	5400	4300	4600	3700	7780	4300	6500	4300
180	3000	110	6060	4960	5280 ¹⁾	4305 ¹⁾	7600	5500	6560	5500
180	1500	110	4800	3940	4020	3300	7280	5500	6140	5500
200	3000	110	8300	6900	7200 ²⁾	6000 ²⁾	10 700	8900	9200	7650
200	1500	110	8900	7400	7600	6350	12 000	9550	10 150	8500
200	1000	110	8960	7480	7600	6340	12 480	9550	10 520	8780
225	3000	110	6100	5185	5155	4340	13 000	10 700	11 200	9455
250	3000	140	7700	6250	6500	5250	17 100	10 900	14 900	10 900
250	1500	140	8700	7000	7300	5900	19 800	13 800	17 000	13 800
250	1000	140	8900	7200	7355	5955	21 200	13 800	18 000	13 800
280	1500	140	9200	7800	7300	6200	25 100	9200	20 300	9200
280	1000	140	10 600	8900	8400	7000	28 300	9200	23 000	9200
315 SM_	1500	170	11 400	9400	9000	7450	32 500	9600	26 600	9600
315 SM_	1000	170	13 000	9600	10 300	8500	37 000	9600	30 000	9600
315 ML_	1500	170	11 500	9700	9100	7650	32 700	13 600	26 500	13 600
315 ML_	1000	170	13 200	11 100	10 400	8800	36 900	13 600	29 900	13 600
315 LK_	1500	170	11 500	10 000	9100	7850	33 100	13 300	26 800	13 300
315 LK_	1000	170	13 200	11 400	10 400	9000	37 300	13 300	30 300	13 300

¹⁾ The maximum lifetime of the grease is 38 000 h, see Grease lifetime.

²⁾ The maximum lifetime of the grease is 27 000 h, see Grease lifetime.

If the radial force is applied between points X0 and Xmax, the permissible force FR can be calculated with the following formula:

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

Mechanical design

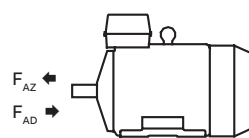
Axial forces

01 Mounting arrangement IM B3

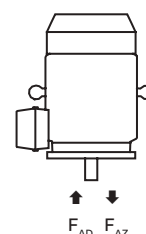
02 Mounting arrangement IM V1

The following tables present permissible axial forces on the shaft in Newton's, assuming zero radial force, a 25 °C ambient temperature, and normal conditions. The values are given for a calculated bearing life of 20 000 and 40 000 hours per motor size.

Permissible loads of simultaneous radial and axial forces can be supplied on request. For axial force F_{AD} , it is assumed that the D-bearing is locked with a locking ring.



01



02

Permissible axial forces, motor sizes 132 – 315

Motor size	Poles	Length of shaft extension E (mm)	Mounting arrangement IM B3				Mounting arrangement IM V1			
			Ball bearings				Ball bearings			
			20,000 h		40,000 h		20,000 h		40,000 h	
			$F_{AD}(N)$	$F_{AZ}(N)$	$F_{AD}(N)$	$F_{AZ}(N)$	$F_{AD}(N)$	$F_{AZ}(N)$	$F_{AD}(N)$	$F_{AZ}(N)$
132	3000	80	2220	1620	1740	1140	2435	1480	1950	995
132	1500	80	2840	2240	2205	1605	3150	2035	2515	1400
160	3000	110	4650	4650	3850	3850	4950	4350	4200	3600
160	1500	110	5000	5000	4200	4200	5450	4650	4600	3800
160	1000	110	4840	4840	4000	4000	5400	4420	4540	3560
180	3000	110	5480	5480	4600 ¹⁾	4600 ¹⁾	5920	5515	5060 ¹⁾	4255 ¹⁾
180	1500	110	4360	4360	3540	3540	5080	3860	4240	3020
200	3000	110	5000	7350	5000 ²⁾	6150 ²⁾	5000	7050	5000 ²⁾	5800 ²⁾
200	1500	110	5000	8050	5000	6700	5000	7550	5000	6200
200	1000	110	5000	8300	5000	6880	5000	7505	5000	6025
225	3000	110	4860	4860	3960	3960	5000	4245	4780	3345
250	3000	140	6000	6050	4900	4900	6000	5300	5800	4200
250	1500	140	6000	7100	5800	5800	6000	6300	6000	4900
250	1000	140	6000	7480	6000	6040	6000	6370	6000	4830
280	1500	140	7900	5900	6100	4100	10 000	4500	8200	2700
280	1000	140	9100	7100	7000	5000	11 600	5400	9500	3300
315 SM_	1500	170	9300	7300	7100	5100	12 000	5500	9900	3300
315 SM_	1000	170	10 700	8700	8200	6200	14 300	6300	11 800	3700
315 ML_	1500	170	9200	7200	7000	5000	12 400	5000	10 300	2800
315 ML_	1000	170	10 600	8600	8100	6100	14 900	5800	12 300	3200
315 LK_	1500	170	9000	7000	6900	4900	13 600	3800	11 500	1650
315 LK_	1000	170	10 300	8300	7800	5800	16 500	4100	14 000	1500

¹⁾ The maximum lifetime of the grease is 38 000 h, see Grease lifetime.

²⁾ The maximum lifetime of the grease is 27 000 h, see Grease lifetime.

Terminal box

Standard terminal box

Degree of protection and mounting options

The degree of protection for the standard terminal box is IP55. By default, terminal boxes are mounted on top of the motor at D-end and can be turned 4*90°. The terminal box can also be mounted on the left or right side of the motor (see Mounting arrangements).

Cable entries

Motor sizes 160 to 250 come with connection flanges with tapped cable entries and can be provided with cable glands as an option. In sizes 280 to 315 SM and 315 ML the standard terminal box has a flange with cable glands, and 315 LK has cable sealing end units. The standard flange material is siluminum. See the table below for details on standard terminal boxes.

Cable type and terminations

If no cable type is specified in the order, it will be a PVCinsulated non-armored cable, and its termination parts are determined as shown in the table below.

Terminations are suitable for copper and aluminum cables (Al-cables on request for motor sizes 160 to 250). Cables are connected to terminals by cable lugs, which are not included in the delivery.

Ordering

To ensure the delivery of desired terminations for the motor, state the cable type, quantity, size and outer diameter when ordering. Non-standard designs of terminal boxes, such as non-standard size, or higher degree of protection, are available as options.

See section Variant codes for all options available.

Standard terminal box connections

Motor size	Speed r/min	Terminal box type	Size of flange opening	Type of through holes	Size of through holes	Cable outer diameter mm	Max. connect- able core cross- section mm ² / phase	Number and size of terminal bolts	Method of connection
132	1500, 3000	Integrated	-	Knock-out	2x(M40+M32+M12)	2x(Ø19-27+Ø14-21)	1x35	6xM5, 6xM6	Terminal lugs
160	1000-3000	50	A	Threaded	2xM40x1.5	2xØ19-27	1x35	6xM6	Terminal lugs
180	1500-3000	50	A	Threaded	2xM40x1.5	2xØ19-27	1x35	6xM6	Terminal lugs
200	1500-3000	120	B	Threaded	2xM63x1.5	2xØ34-45	1x70	6xM10	Terminal lugs
225	3000	120	B	Threaded	2xM63x1.5	2xØ34-45	1x70	6xM10	Terminal lugs
250	1000-3000	120	B	Threaded	2xM63x1.5	2xØ34-45	1x70	6xM10	Terminal lugs
280	1000-1500	210	C	Threaded*	2xM63x1.5	2xØ32-49	2x150	6xM12	Terminal lugs
315 SM, ML	1000-1500	370	D	Threaded*	2xM63x1.5	2xØ32-49	2x240	6xM12	Terminal lugs
315 LKA, LKC	1000-1500	750**	E	End unit	Medium	2xØ48-60	4x240	6xM12	Terminal lugs

* With cable glands of the same size

** With adapter E-D and medium size end unit

Auxiliary cable entries

132	1500, 3000	2xM12	Ø3-6
160-250	1000-3000	1xM16x1.5	Ø5-9
280-315	1000-1500	2xM20x1.5	Ø8-14

Motor size	Earthing on frame	Earthing in main terminal box
132	M5	M5
160 - 200	clamp	M6
250	clamp	M8
280-315	M10	2xM10

Standard delivery if no other information is provided.

Note: For other network voltages and/or side-mounted motors, contact your ABB sales office.

Terminal box

Terminal boxes and boards

01 Integrated terminal box for motor size 132. Knock-out openings for cable entries.

02 Terminal box for motor sizes 160 – 200. Tapped cable entries integrated in the terminal box.

03 Terminal board for 160.

04 Terminal box for motor sizes 280 – 315 SM-ML. Adapter and cable sealing end unit.

05 Terminal board for 280 – 315 SM-ML.

06 Terminal board for 315 LK.

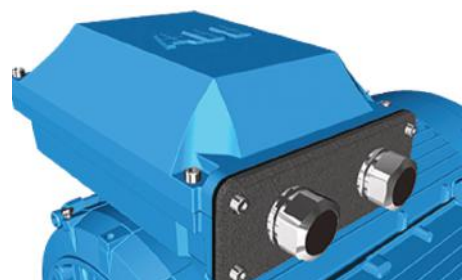
The pictures below show standard terminal boxes and the corresponding terminal boards for various motor sizes.

Motor size 132



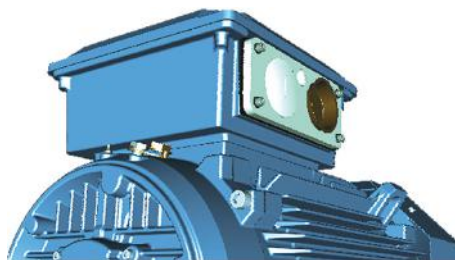
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Motor sizes 280 – 315

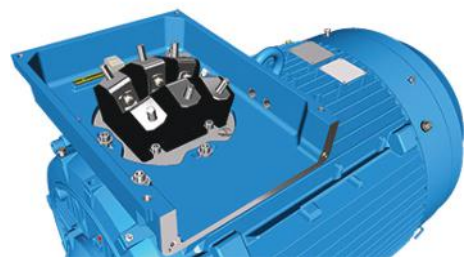


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Motor sizes 160 – 250



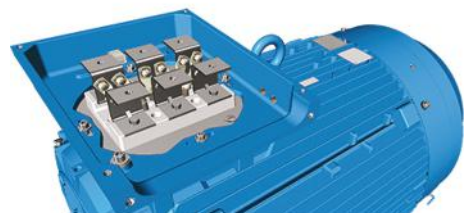
02



05



03



06

Terminal box

Terminal box alternatives

01 Main terminal box.

02 Adapters, Flange with glands; cable sealing end units.



01

Optional adapters

There is a broad selection of cable termination accessories available to allow termination of one or several cables. The most common ones are explained below.

How to order?

- Check first that the terminal box itself allows mounting of the desired cable and cores (refer to motor type and terminal box type cross reference on previous page)
- If very large cables are used it might be necessary to use a larger terminal box than standard. Select the right cable gland(s) or cable sealing end unit(s) that match outer diameter of the cable(s)
- Select appropriate adapter or flange
- Note that turning the terminal box to a non-standard position might limit the use of some adapters.

02

Main terminal box and maximum single core cross-section

The terminal boxes are named according to their current-carrying capacity, from 160 to 1200. You can select one size larger than standard terminal box if a larger single cross-section is needed. The standard sizes of the main terminal box are listed in the following table. Check also the capacity of the cable entry to make sure that the cables fit. A larger terminal box can be ordered with variant code 019.

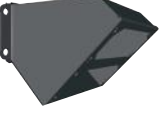
Standard terminal box	Size of opening	Max single cross-section mm ² /phase
160	B	1 x 70
210	C	2 x 240
370	D	2 x 300
750	E	4 x 500
1200	E	4 x 500

Ordering example for special cable entry and auxiliary terminal box

Motor Cables	250 kW, 1500 rpm, 400 V 50 Hz 2 pieces, outer diameter 58 mm, single core cross section 185 mm ² clamping device needed, cables coming from below
Needed one terminal box for anticondensation heaters and another for temperature detectors, material must be cast iron.	
Motor	M3BL 315 MLA, 1500 rpm, B3
Adapter	D-D - variant code 293
Cable sealing end unit	Variant code 278
Clamping	Variant code 231
Auxiliaries	Variant codes 380, 567, 568

Optional adapters

To allow easy termination of cables entering the terminal box from above or below, an angle adapter is recommended. These are available for motor sizes 280 - 315 and can also be used to allow the mounting of several cable sealing end units or gland plates.

				
Adapter				
Variant code	292	293	294	295
Suited for motor sizes	280	315 SM, ML	315 LKA, LKC	315 LKA, LKC
Opening to terminal box	C	D	E	E
Flange or opening for end unit	C	D	D	2 x D
Material	Steel	Steel	Steel	Steel
Notes			Included in type 750 terminal box when 750 is the standard size.	Only possible on type 1200 terminal box.

Cable sealing end units

As an alternative to flanges and cable glands, cable sealing end units can be used. These allow more space for spreading the cores for easy termination. Cable sealing end units have rubber-sealed entries for one of the two main cables. In addition, there are two plugged M20 holes for auxiliary cables.

			
End unit			
Variant code	277	278	279
Suited for motor sizes	280	315 SM, ML	315 SM, ML
Opening to terminal box	C	D	D
Cable outer diameter	1 - 2 cables, 48 - 60 mm	1 - 2 cables, 48 - 60 mm	1 - 2 cables, 60 - 80 mm
Cable entry for auxiliary cable	2xM20 plugged holes	2 x M20 plugged holes	2 x M20 plugged holes
Additional optional variants	EMC cable gland (704); Standard gland with clamping device (231)	EMC cable gland (704); Standard gland with clamping device (231)	EMC cable gland (704); Standard gland with clamping device (231)

Auxiliary terminal box

You can equip motors from frame size 160 upward with one or several auxiliary terminal boxes for connection of auxiliaries like heaters or temperature detectors. The standard auxiliary terminal box material for motor sizes 280 - 315 is aluminum and for 160 - 250 cast iron. For frame sizes 280 - 315, cast iron as box material is also available as an option.

Connection terminals are of a spring-loaded type for quick and easy connection. These are suitable for up to 2.5 mm² wires. Auxiliary terminal boxes for frame sizes 280 – 315 are equipped with an earthing terminal. The first auxiliary terminal box is located on the right-hand side at D-end as standard. The standard cable entry size is M20 for both aluminum and cast iron, and the number of entries depends on the terminal box type and the number of selected auxiliaries.

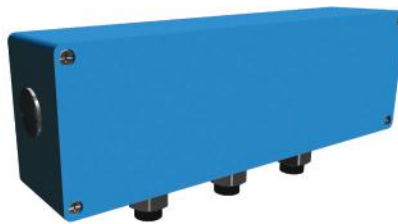
Related variant codes

380	Separate terminal box for temperature detectors, standard material
418	Separate terminal box for auxiliaries, standard material
567	Separate terminal box material: cast iron
568	Separate terminal box for heating elements, standard material
569	Separate terminal box for brake



Small auxiliary aluminum terminal box for motor sizes 280 - 315 (variant codes 418, 568, 380, 569)

The size of terminal box ordered with these codes depends on the number of accessories ordered. 80 x 125 mm, max 12 strips. Earthing size M4.



Large auxiliary aluminum terminal box for motor sizes 280 - 315.

The size of terminal box ordered with these codes depends on the number of accessories ordered. 80 x 250 mm, max 30 strips. Earthing size M4.



Auxiliary cast iron terminal box

Frame size for motor sizes 160 - 250 (variant code 418): 119 x 170 mm, max. 18 strips. No earthing.

Frame size for motor sizes 280 - 315 (variant code 567): 211 x 188 mm, max 30 strips. Earthing size M6.

Terminal box

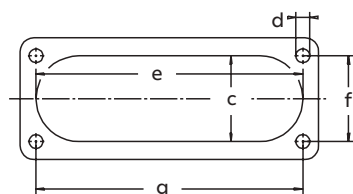
Terminal box dimensions

01 Motor sizes 160 – 250

02 Motor sizes 280 – 315.
Top- and side-mounted
terminal boxes.

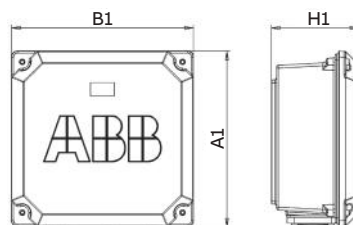
The terminal box dimensions presented on this page apply to cast-iron motors in sizes 160 – 315. For dimensions of integrated terminal boxes in aluminum motors, size 132, see the following Dimension drawings pages.

Dimensions for terminal box inlets

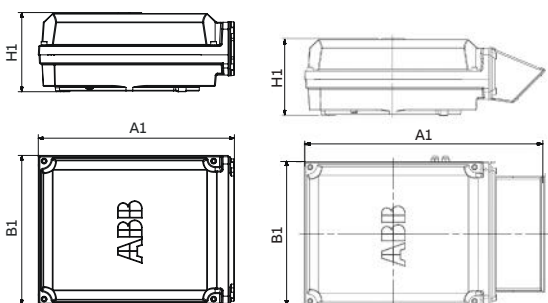


Flange opening	c mm	e mm	f mm	g mm	d thread type
B	71	194	62	193	M8
C	62	193	62	193	M8
D	100	300	80	292	M10
E	115	370	100	360	M12

Frame dimensions



01

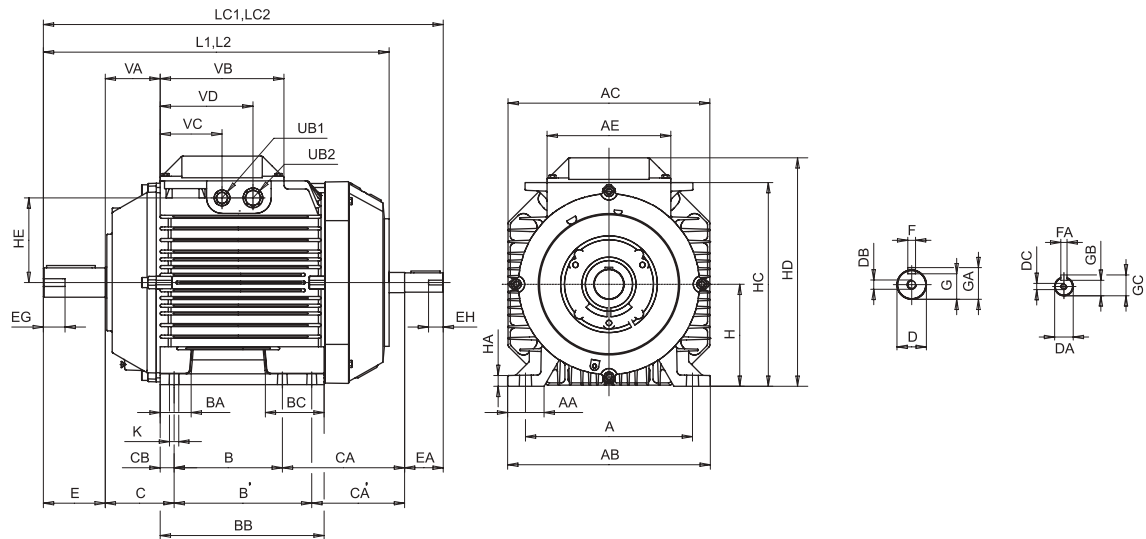


02

Terminal box types acc. to current capacity	A1	B1	H1
Box types for 132			
Terminal box integrated in frame			
Box types for 160 - 250			
160	257	257	145
260	257	257	136
350	300	311	150
Box types for 280 - 315			
210	416	306	177
370	451	347	200
750, top-mounted	542	413	219
750, side-mounted	525	413	219

Dimension drawings

Foot-mounted motors, 132



IM B3 (IM 1001), IM 1002

Motor size	A	AA	AB	AC	AE	B	B'	BA	BB	BC	C	CA	CA'	CB	D	DA	DB	DC	E	EA	EG	EH
132 SMA-D*	216	47	262	261	160	140	178	40	212	76	89	198	160	18	38	24	M12	M8	80	50	28	19
132 SMA-B**	216	47	262	261	160	140	178	40	212	76	89	261	223	18	38	24	M12	M8	80	50	28	19
132 SMC**	216	47	262	261	160	140	178	40	212	76	89	301	263	18	38	24	M12	M8	80	50	28	19

Motor size	F	FA	G	GA	GB	GC	H	HA	HC	HD	HE	K	KA	L	LC	UB	UC	UD	VA	VB	VC	VD	VE
132 SMA-D*	10	8	33	41	20	27	132	14	263.5	295.5	109.5	12	15	487	557	M20	M25	-	71	160	80	120	-
132 SMA-B**	10	8	33	41	20	27	132	14	287	321	123.5	12	15	550	620	M40	M32	M12	71	160	42	102	136
132 SMC**	10	8	33	41	20	27	132	14	287	321	123.5	12	15	590	660	M40	M32	M12	71	160	42	102	136

* 3000 RPM

** 1500 RPM

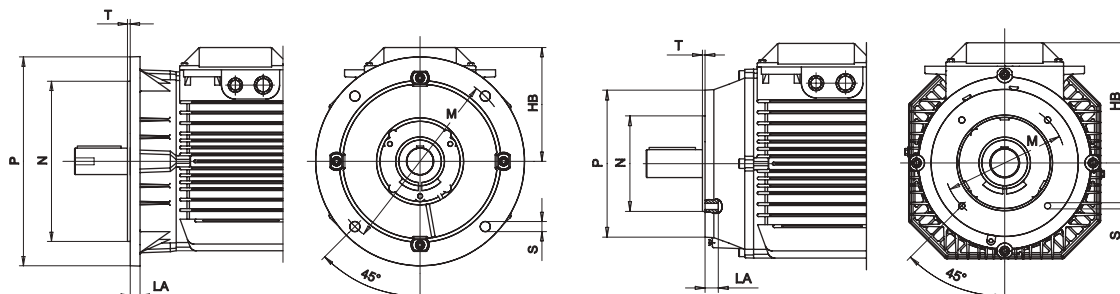
Tolerances

A, B	± 0.8
C, CA	± 0.8
D, DA	ISO j6
F, FA	ISO h9
H	+0 - 0.5
N	ISO j6

The tables show the main dimensions in millimeters. For detailed drawings, visit our web pages at www.abb.com/motors&generators or contact ABB.

Dimension drawings

Flange- and foot & flange-mounted motors, 132



IM B5 (IM 3001), IM 3002

Motor size	HB	LA	M	N	P	S	T
132 SMA-D*	163.5	14	265	230	300	14.5	4
132 SMA-C**	189	14	265	230	300	14.5	4

* 3000 RPM

** 1500 RPM

IM B14 (IM 3601), IM 3602

Motor size	HB	LA	M	N	P	S	T
132 SMA-D*	163.5	14.5	165	130	200	M10	3.5
132 SMA-C**	189	14.5	165	130	200	M10	3.5

Tolerances

A, B ± 0.8

C, CA ± 0.8

D, DA ISO j6

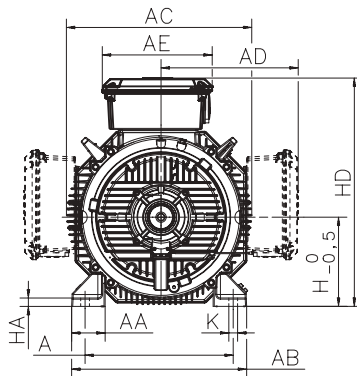
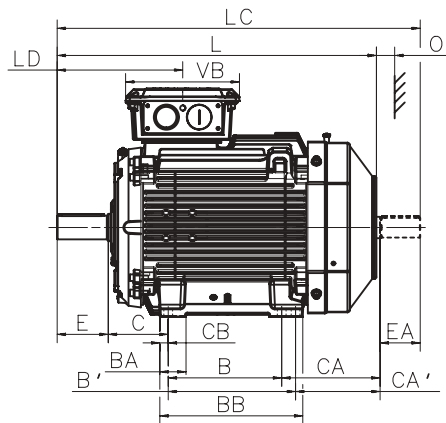
F, FA ISO h9

H $+0 - 0.5$

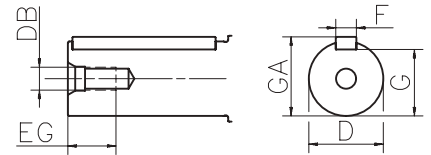
N ISO j6

Dimension drawings

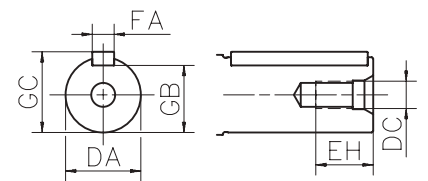
Foot-mounted motors, 160 - 250



D-end



N-end



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

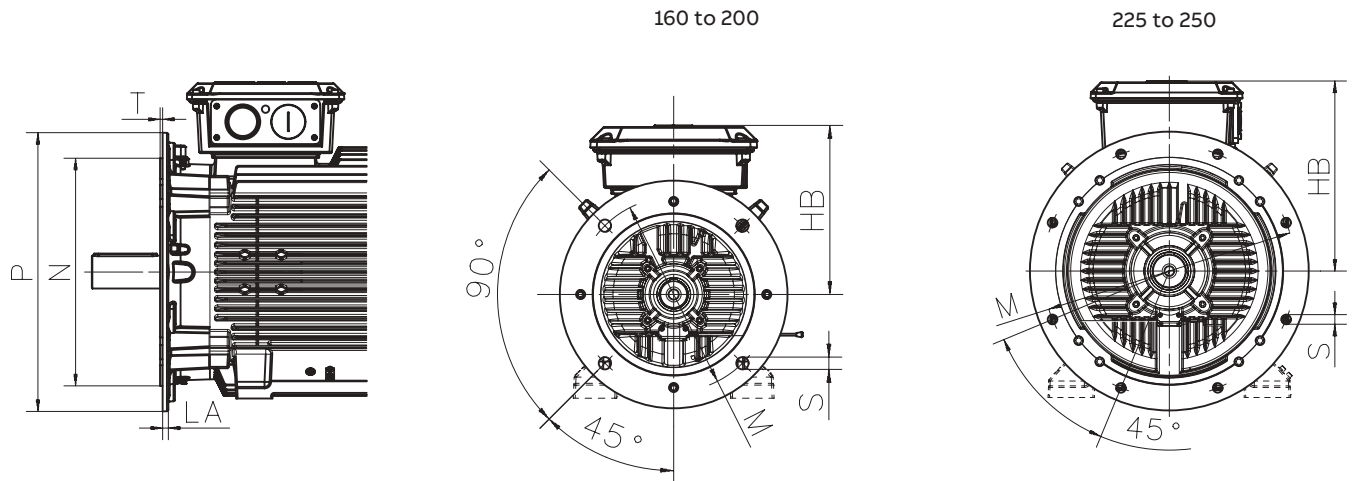
Motor size	Speed r/min	A	AA	AB	AC	AD	AE	B	B'	BA	BB	C	CA	CA'	CB	D	DA	DB	DC	E
160	3000	254	67	310	338	261	257	210	254	69	294	108	164	126	20	42	32	M16	M12	110
160	1000-1500	254	67	310	338	261	257	210	254	69	294	108	262	224	20	42	32	M16	M12	110
180	1500-3000	279	67	340	381	281	257	241	279	68	317	121	263	225	19	48	32	M16	M12	110
200	1000-3000	318	69	378	413	328	300	267	305	80	345	133	314	276	20	55	45	M20	M16	110
225	3000	356	84	435	460	348	300	286	311	69	351	149	314	289	20	55	45	M20	M16	110
250	1000-1500	406	92	480	508	376	300	311	349	72	392	168	281	243	23	65	55	M20	M20	140

Motor size	Speed r/min	EA	EG	EH	F	FA	G	GA	GB	GC	H	HA	HD	K	L	LC	LD	O	VB
160	3000	80	36	28	12	10	37	45	27	35	160	23	421	14.5	584	671.5	287.5	45	257
160	1000-1500	80	36	28	12	10	37	45	27	35	160	23	421	14.5	681	768.5	287.5	45	257
180	1500-3000	80	36	28	14	10	42.5	51.5	27	35	180	23	461	14.5	726	815	300.5	50	257
200	1000-3000	110	42	36	16	14	49	59	39.5	48.5	200	23	528	18.5	821	934	320.5	70	311
225	3000	110	42	42	16	16	49	59	49	59	225	23	573	18.5	879	1001	343.5	80	311
250	1000-1500	110	42	42	18	16	58	69	49	59	250	23	626	24.0	884	1010	343.5	90	311

Tolerances	
A, B	ISO js14
C, CA	± 0.8
D, DA	ISO k6 < Ø 50 mm
	ISO m6 > Ø 50 mm
F, FA	ISO h9
H	+0 - 0.5

Dimension drawings

Flange- and foot & flange-mounted motors, 160 - 250



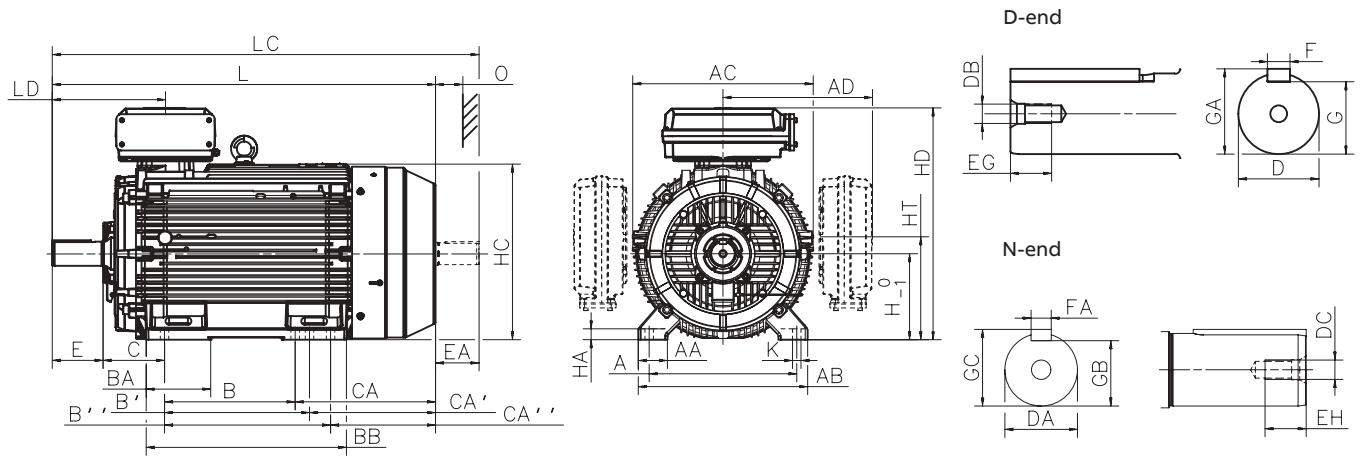
Mounting options IM B5 (IM 3001), V1 (IM 3011), V3 (IM 3031), IM B14 (IM 3601), V18 (IM 3611), V19 (IM 3631), IM B35 (IM 2001), IM V15 (IM 2011), IM V35 (IM 2031)

Flange								
Motor size	Speed r/min	HB	LA	M	N	P	S	T
160	1000-3000	261	20	300	250	350	19	5
180	1500-3000	281	15	300	250	350	19	5
200	1000-3000	328	20	350	300	400	19	5
225	3000	325	20	400	350	450	19	5
250	1000-1500	376	24	500	450	550	19	5

Tolerances	
A, B	ISO js14
C, CA	± 0.8
D, DA	ISO k6 < Ø 50 mm ISO m6 > Ø 50 mm
F, FA	ISO h9
H	+0 - 0.5
N	ISO j6

Dimension drawings

Foot-mounted motors, 280 – 315



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

Motor size	Speed r/min	A	AA	AB	AC	AD ¹⁾	AD ²⁾	B	B'	B''	BA	BB	C	CA	CA'	CA''	D	DA	DB	DC	E	EA
280 SM ₋	1000-1500	457	84	530	577	481	-	368	419	-	147	506	190	400	349	-	75	65	M20	M20	140	140
315 SM ₋	1000-1500	508	100	590	654	545	-	406	457	-	180	558	216	420	369	-	80	75	M20	M20	170	140
315 ML ₋	1000-1500	508	100	590	654	545	-	457	508	-	212	669	216	480	429	-	90	75	M24	M20	170	140
315 LK ₋	1000-1500	508	100	590	654	562	576	508	560	710	336	851	216	635	583	433	90	75	M24	M20	170	140

Motor size	Speed r/min	EG	EH	F	FA	G	GA	GB	GC	H	HA	HC	HD ¹⁾ top- m.	HD ²⁾ top- m.	HT	K	L	LC	LD top- m.	LD side- m.	O
280 SM ₋	1000-1500	40	40	20	18	67.5	79.5	58	69	280	31	564	762	-	337.5	24	1088	1238	336	539	100
315 SM ₋	1000-1500	40	40	22	20	71	85	67.5	79.5	315	40	638	852	-	375	28	1204	1352	386	615	115
315 ML ₋	1000-1500	48	40	25	20	81	95	67.5	79.5	315	40	638	852	-	375	28	1315	1463	386	670	115
315 LK ₋	1000-1500	48	40	25	20	81	95	67.5	79.5	315	40	638	852	880	359	28	1521	1669	386	751	115

¹⁾ Terminal box 370

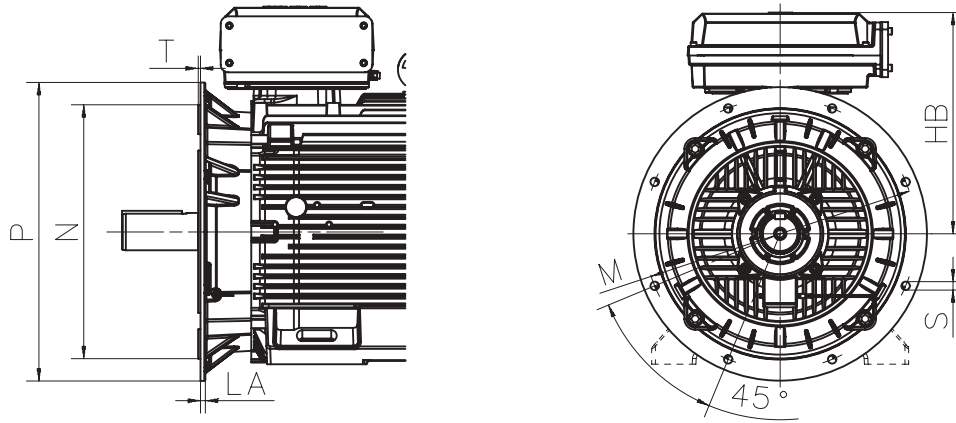
²⁾ Terminal box 750

Tolerances

A, B	± 0.8
C, CA	± 0.8
D	ISO k6 < Ø 50 mm ISO m6 > Ø 50 mm
F	ISO h9
H	+0 - 0.5
N	ISO j6

Dimension drawings

Flange- and foot & flange-mounted motors, 280 – 315



Mounting options IM B5 (IM 3001)V1, (IM 3011), V3 (IM 3031), IM B14 (IM 3601), V18 (IM 3611), V19 (IM 3631), IM B35 (IM 2001), IM V15 (IM 2011), IM V35 (IM 2031)

Flange									
Motor size	Speed r/min	HB ¹⁾	HB ²⁾	LA	M	N	P	S	T
280 SM_	1000-1500	482	-	23	500	450	550	18	5
315 SM_	1000-1500	537	-	25	600	550	660	23	6
315 ML_	1000-1500	537	-	25	600	550	660	23	6
315 LK_	1000-1500	537	565	25	600	550	660	23	6

¹⁾ Terminal box 370

²⁾ Terminal box 750

Tolerances	
A, B	± 0.8
D	ISO j6
F	ISO h9
H	+0 - 0.1
N	ISO j6 (280 SM_)
	ISO js6 (315_)
C	± 0.8

Motors in brief

Synchronous reluctance motors, 132 – 315

Motor size		132	160	180	200	225	250	280	315
Stator and end shields	Material	Die-cast aluminum alloy	Cast iron						
	Paint color shade	Munsell blue 8B 4.5/3.25							
	Corrosion class	Polyester powder paint C3 (medium) according to ISO/EN 12944-5							
Bearings	D-end	6308-2Z/C3	6309-2Z/C3	6310-2Z/C3	6312-2Z/C3	6313/C3	6315/C3	6316/C3	6319/C3
	N-end	6206-2Z/C3	6209-2Z/C3	6209-2Z/C3	6210-2Z/C3	6210/C3	6213/C3	6316/C3*	6316/C3*
Axially locked bearings	Inner bearing cover	Locked at D-end							
Bearing seals	D-end	V-ring	Gamma-ring					V-ring	V-ring or Labyrinth seal
	N-end	Labyrinth seal	Gamma-ring					V-ring	
Lubrication		Permanently lubricated shielded bearings, wide-temperature-range grease				Regreasable bearings, regreasing nipples M6×1		Regreasable bearings, regreasing nipples M10x1	
Measuring nipples		Not included	SPM as option		SPM as standard				
Rating plate	Material	Aluminum	Stainless steel						
Terminal box	Frame and cover	Die-cast aluminum alloy, integrated in stator	Cast iron						
	Corrosion class	Polyester powder paint	C3 (medium) according to ISO/EN 12944-5						
	Cover screws	Zinc-electroplated steel							
Connections	Cable entries	2x(M40, M32, M12) / 2x(M25, M20)	2x(M40x1.5, M20x1.5)		2x(M63x1.5, M20x1.5)				
	Terminals	6 terminals with lugs	6 terminals***						
	Cable glands	Integrated knock-out openings; no cable glands	Flange as standard, cable glands as option						
Fan	Material	Glass-fiber-reinforced polypropylene							
Fan cover	Material	Polypropylene	Steel						
	Paint color shade	Munsell blue 8B 4.5/3.25							
	Corrosion class	-	C3 (medium) according to ISO/EN 12944-5						
Stator winding	Material	Copper							
	Insulation	Class F							
	Winding protection	Optional	3 PTC thermistors, 150 °C					3 PTC thermistors, 155 °C	
Balancing method		Half-key balancing							
Keyway		Closed keyway							Open keyway
Drain holes		Standard, open on delivery							
Enclosure		IP 55, higher protection on request							
Cooling method		IC 411							

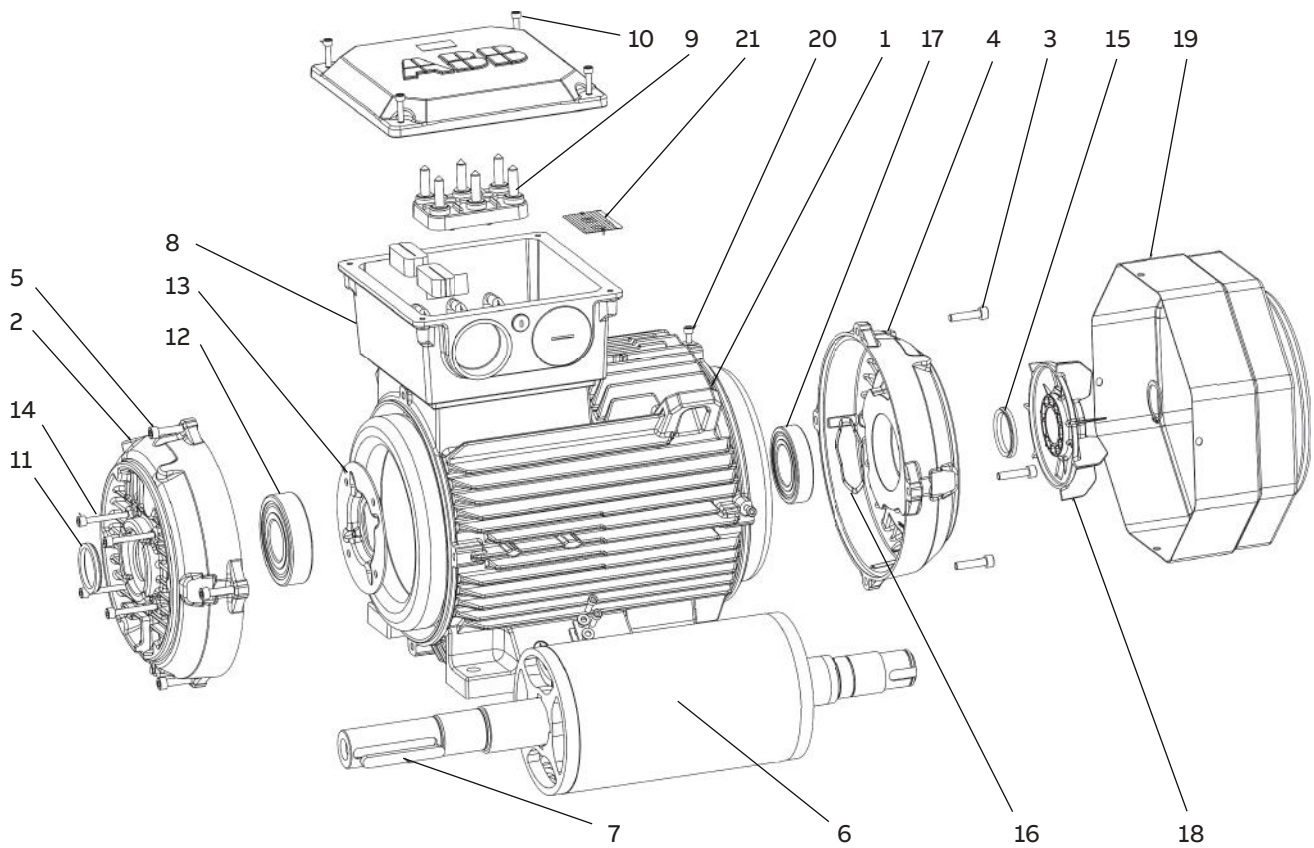
* Insulated bearing at N-end as standard.

** For detailed information on connections, see Terminal box alternatives section.

*** Terminals for connection with terminal lugs (lugs not included in the delivery).

Motor construction

Exploded view, frame size 160



- 1 Stator frame
- 2 End shield, D-end
- 3 Screws for end shield, N-end
- 4 End shield, N-end
- 5 Screws for end shield, D-end
- 6 Rotor with shaft
- 7 Key, D-end

- 8 Terminal box
- 9 Terminal board
- 10 Screws for terminal box cover
- 11 Seal, D-end
- 12 Bearing, D-end
- 13 Inner bearing cover, D-end
- 14 Screws for bearing cover

- 15 Seal, N-end
- 16 Wave spring
- 17 Bearing, N-end
- 18 Fan
- 19 Fan cover
- 20 Screws for fan cover
- 21 Rating plate

Total product offering

Motors, generators and mechanical power transmission products with a complete portfolio of services



IEC motors

- Low voltage motors
- High voltage induction and synchronous motors
- Marine motors
- Motors for explosive atmospheres
- Motors for food and beverage
- Motors for variable speed drives
- Permanent magnet motors
- Synchronous reluctance motors
- Traction motors

NEMA motors

- Low voltage motors
- High voltage induction and synchronous motors
- Marine motors
- Motors for explosive atmospheres
- Motors for variable speed drives
- Permanent magnet motors
- Servomotors
- Washdown motors

Generators

- Generators for wind turbines
- Generators for diesel and gas engine power plants
- Generators for steam and gas turbine power plants
- Generators for marine applications
- Generators for industrial applications
- Generators for traction applications
- Synchronous condensers for reactive power compensation

Mechanical power transmission components, bearings, gearings

- Mounted bearings
- Enclosed gearing
- Mechanical drive components
- Couplings
- Sheaves and bushings
- Conveyor components
- Geared motor units

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