



Catalog | June 2013

# Low voltage IE4 synchronous reluctance motor and drive package for pump and fan applications

We provide motors and generators, services and expertise to save energy and improve customers' processes over the total lifecycle of our products, and beyond.



# IE4 synchronous reluctance motor and drive package for pump and fan applications

## Sizes 160 to 315

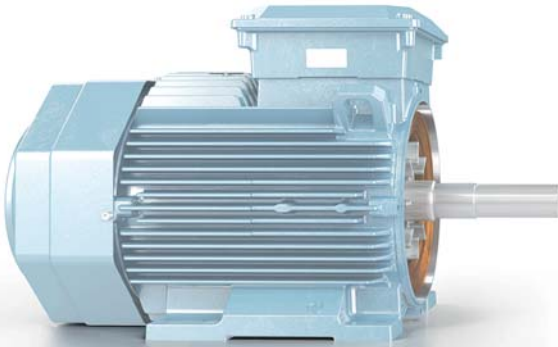
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# General information

## Package benefits

Lowest energy bill with maximum availability for pumps and fans



Traditional IE2 induction motor



IE4 SynRM motor and drive package

### IE4 super premium efficiency

The heart of the synchronous reluctance motor and drive package is a magnet-free efficiency-optimized synchronous reluctance motor. The draft standard IEC 60034-30-1 Edition 1.0 specifying IE classes applies exclusively to motors rated for line operation, which is not the case for ABB synchronous reluctance motors. Therefore, the motor does not have an IE class marking on the rating plate.

So why call the package an IE4? Because its package efficiency at the nominal operating point is the same or higher than that of a motor and drive package utilizing a motor with line-operated IE4 classification. An additional benefit related to synchronous reluctance motors is their excellent partial load efficiency performance compared to induction motors.

### Verified package efficiency

For the first time, you don't have to guess the combined energy consumption of the motor and drive for a given output power. The SynRM motor and drive package is measured to verify efficiency. When comparing efficiencies between different alternatives, make sure you're looking at efficiency values for the whole package and all the speeds that will be run. Read more about package efficiency on page 8.

### Upgrade system efficiency without mechanical modifications

Unlike many other IE4 motors, most synchronous reluctance motors follow harmonized Cenelec size and output combinations. This means that upgrading to the highest efficiency level is easy and straightforward, and there is no need for mechanical modifications, which keeps the payback time of the total investment very short.



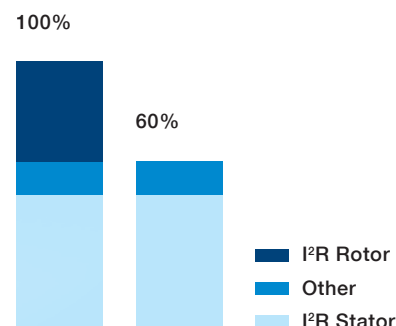
## Ultimate efficiency and reliability to optimize your cost of ownership



Traditional IE2 induction motor



IE4 SynRM motor



Losses

### Innovation inside

The idea is simple. Take a conventional, proven stator technology and a totally new, innovative rotor design. Then combine them with a best-in-class industrial drive loaded with new, purpose-designed software. Finally, optimize the whole package for pump and fan applications.

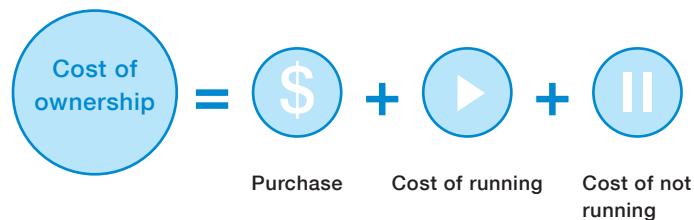
### Magnet-free design

Synchronous reluctance technology combines the performance of the permanent magnet motor with the simplicity and service-friendliness of an induction motor. The new 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.

### Superior reliability to minimize the cost of not running

IE4 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.



### Winner of the 2011 Automation Award – The 'Automations Oscars'

The new motor and drive package won Germany's most important automation award at the SPS/IPC/DRIVES trade show in Nuremberg.



SynRM technology is also available in high output motor and drive packages with up to two frame sizes smaller motor. To learn more, visit [www.abb.com](http://www.abb.com).

## Packaging the latest motor and drive technology



### Motor highlights

- Motors meet IE4 efficiency levels according to IEC 60034-30-1 Ed 1.0.
- Unprecedented reliability through very low winding and bearing temperatures.
- Can replace standard induction motors: same power-size combinations.
- Variant codes and mechanical construction based on the proven M3BP cast iron process performance motors – conventional yet innovative. Same parts, easy to source and change.
- No magnets, no cage – you cannot break what isn't there.
- Service procedures comparable to induction motors – easy to maintain.



### ACS850 drive highlights

- The setup is as easy as with induction motors – simply enter the parameters on the motor's rating plate, just as you do with an induction motor.
- Memory module – you can fine-tune all the drive settings and store them on the memory module. The memory module contains all the information needed to program the drive and can be installed in a new drive by anyone on the site. The compact memory module fits in an envelope.
- Runs any motor – the same drive can run induction, permanent magnet and SynRM motors and can therefore be deployed on other motors if needed.
- Slim design – the drive is designed to take up minimum cabinet space.
- Direct torque control (DTC) – accurate control which will improve your product quality, productivity and reliability even without feedback devices or encoders.



### Why motor and drive package

New technology motors are more challenging from the control point of view than traditional induction motor and drive packages. When selecting a new technology motor and drive package, it is important to ensure that the package is suitable for the application – the drive must have the right control software for the specific application. The performance of synchronous reluctance motor is verified with ABB drives. Performance and functionality with other drives cannot be guaranteed.

### Package selection

The technical data section of this catalog lists matched motor and drive packages to make the selection of an optimal package as easy as possible. However, if your requirements on speed are not fulfilled, contact ABB for package selection at other speeds.

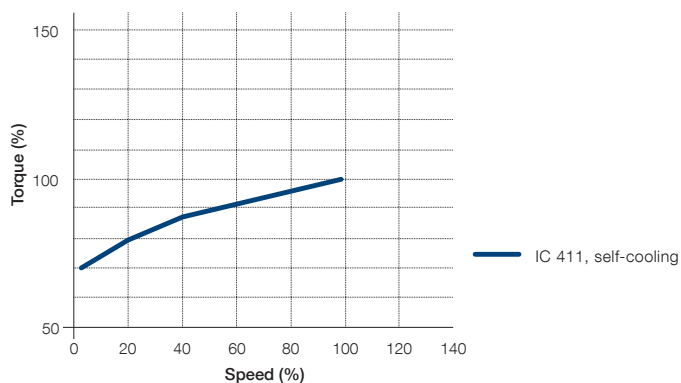
### Insulation protection

Synchronous reluctance motors have the same stator winding insulation as other ABB low voltage motors. The insulation is approved for a 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.

### Continuous loadability



### 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 the drive system", 3AFY61201998 R0125 REV B.

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.

### Efficiency & MEPS

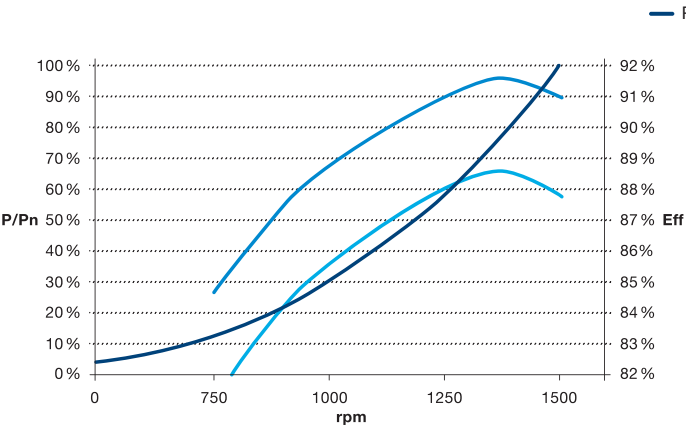
International minimum energy performance standards (MEPS) for measuring the efficiency of VSD-only types of motors – such as synchronous reluctance motors – are currently still under development. No local MEPS efficiency requirements for VSD-only motors have been issued by June 2013. Nor are they expected to be published in the foreseeable future.

### Service

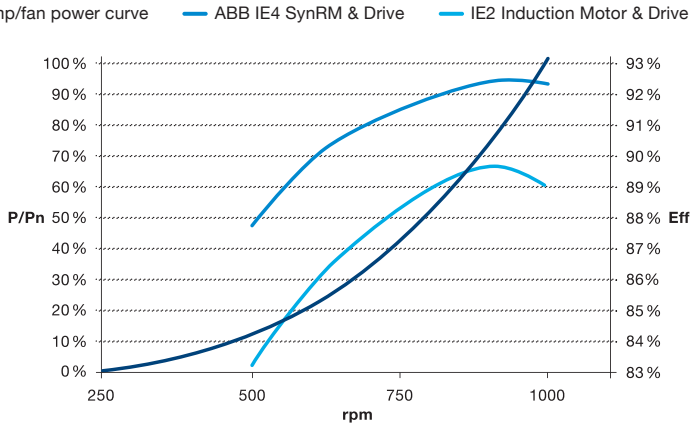
Servicing synchronous reluctance motors is as straightforward as with induction motors. The winding technology is identical to induction motors. The rotor does not include any magnetic materials, which means that the motor can be disassembled and serviced using the same procedure as for conventional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

# Why settle for high motor efficiency?

## Motor-drive package efficiency curves



15 kW, 1500 rpm, drive system in pump/fan duty



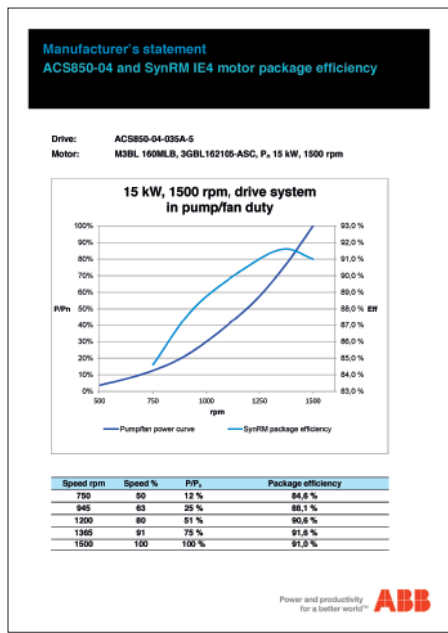
37 kW, 1000 rpm, drive system in pump/fan duty

Using a motor with the highest efficiency class together with speed control is a good start when it comes to minimizing your energy bill.

However, the IE class only indicates motor efficiency with a sinusoidal supply at nominal speed and power. This information is not relevant when calculating energy consumption in variable speed applications. Accurate calculations demand efficiency data for the whole motor-drive package and for the entire speed range.

Now – for the first time in the industry – ABB offers you the means to calculate actual energy consumption with a measured efficiency curve for the motor and drive package. Log the operating profile and energy consumption of your present system and calculate the energy consumption with the new IE4 SynRM package.

This time your calculations will be based on facts, not assumptions.



Motor-drive package efficiency data for pumps and fans by ABB.



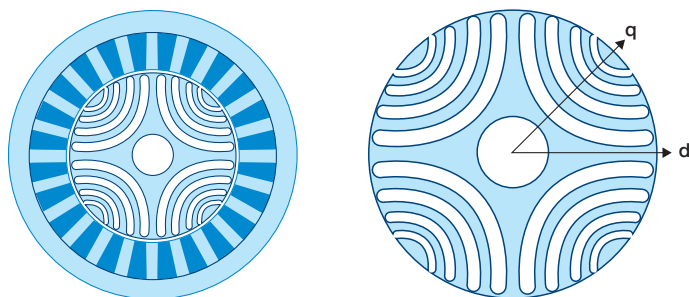
# Synchronous reluctance motor technology

## 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.



**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).**

## 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 be simply 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 figures on the previous page.

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 consequently 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.

# Ordering information

When placing an order, specify motor type, size, and product code according to the following example.

## 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 162 104 -             | A                         | S                          | C               | 445           |
|            |            | 1 2 3 4 5 6 7 8 9 10 11 12 | 13                        | 14                         | 15              |               |

### Positions 1 to 4

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

### Positions 5 and 6

#### IEC-frame

|     |     |
|-----|-----|
| 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 motor                                       |
| B: | Flange-mounted motor. Large flange with clearance holes. |

Use a variant code for ordering any other mounting arrangement.

### Position 13

Voltage and frequency code

### Position 14

#### Generation code

|   |                                           |
|---|-------------------------------------------|
| B | High output synchronous reluctance motors |
| C | IE4 synchronous reluctance motors         |

### Position 15

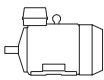
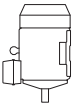
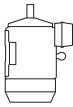
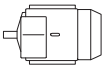
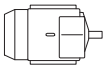
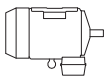
Variant code

# Mounting arrangements

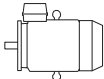
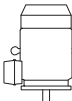
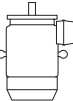
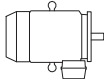
## Foot- and flange-mounted motors

Code I / code II Product code pos. 12

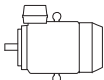
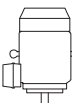
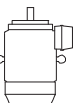
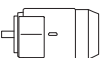
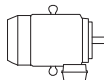
### Foot-mounted motor

|                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                                                                                            |
|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------|
|  |  |  |  |  |  | A: foot-mounted, term.box top<br>R: foot-mounted, term.box RHS<br>L: foot-mounted, term.box LHS<br>M000007 |
| IM B3                                                                             | IM V5                                                                             | IM V6                                                                             | IM B6                                                                             | IM B7                                                                             | IM B8                                                                               |                                                                                                            |
| IM 1001                                                                           | IM 1011                                                                           | IM 1031                                                                           | IM 1051                                                                           | IM 1061                                                                           | IM 1071                                                                             |                                                                                                            |

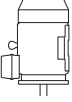
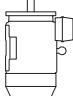
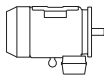
### Flange-mounted motor, large flange

|                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                   |                                                                                     |                                            |
|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|--------------------------------------------|
|  |  |  |  |  |  | B: flange mounted, large flange<br>M000008 |
| IM B5                                                                             | IM V1                                                                             | IM V3                                                                             | *)                                                                                | *)                                                                                | *)                                                                                  |                                            |
| IM 3001                                                                           | IM 3011                                                                           | IM 3031                                                                           | IM 3051                                                                           | IM 3061                                                                           | IM 3071                                                                             |                                            |

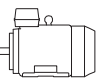
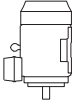
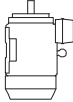
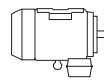
### Flange-mounted motor, small flange

|                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                       |                                            |
|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|--------------------------------------------|
|  |  |  |  |  |  | C: flange mounted, small flange<br>M000009 |
| IM B14                                                                              | IM V18                                                                              | IM V19                                                                              | *)                                                                                  | *)                                                                                  | *)                                                                                    |                                            |
| IM 3601                                                                             | IM 3611                                                                             | IM 3631                                                                             | IM 3651                                                                             | IM 3661                                                                             | IM 3671                                                                               |                                            |

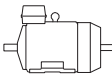
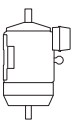
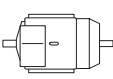
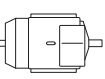
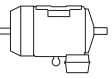
### Foot- and flange-mounted motor with feet, large flange

|                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                       |                                                                                           |
|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------|
|  |  |  |  |  |  | H: foot/flange-mounted, term. box top<br>S: foot/flange-mounted, term. box RHS<br>M000010 |
| IM B35                                                                              | IM V15                                                                              | IM V36                                                                              | *)                                                                                  | *)                                                                                  | *)                                                                                    |                                                                                           |
| IM 2001                                                                             | IM 2011                                                                             | IM 2031                                                                             | IM 2051                                                                             | IM 2061                                                                             | IM 2071                                                                               |                                                                                           |

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

|                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                       |                                                 |
|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|-------------------------------------------------|
|  |  |  |  |  |  | T: foot/flangemounted, term. box RHS<br>M000011 |
| IM B34                                                                              | IM V17                                                                              | IM 2131                                                                             | IM 2151                                                                             | IM 2161                                                                             | IM 2171                                                                               |                                                 |
| IM 2101                                                                             | IM 2111                                                                             | IM 2131                                                                             | IM 2151                                                                             | IM 2161                                                                             | IM 2171                                                                               |                                                 |

### Foot-mounted motor, shaft with free extensions

|                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                     |                                                                                       |                                                |
|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|------------------------------------------------|
|  |  |  |  |  |  | J: foot/flangemounted, small flange<br>M000012 |
| IM 1002                                                                             | IM 1012                                                                             | IM 1032                                                                             | IM 1052                                                                             | IM 1062                                                                             | IM 1072                                                                               |                                                |
| IM 1002                                                                             | IM 1012                                                                             | IM 1032                                                                             | IM 1052                                                                             | IM 1062                                                                             | IM 1072                                                                               |                                                |

\*) 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.

# Rating plates

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.

|                                  |    |                                                                                     |               |                 |       |                                                                                   |
|----------------------------------|----|-------------------------------------------------------------------------------------|---------------|-----------------|-------|-----------------------------------------------------------------------------------|
| 3 ~ SYNCHRONOUS RELUCTANCE MOTOR |    |                                                                                     |               |                 |       |                                                                                   |
| M3BL 280SMC 4 IMB3/IM1001        |    |                                                                                     |               |                 |       |  |
| 765780-6                         |    |                                                                                     | 2013          | No. 3GF13153877 |       |                                                                                   |
|                                  |    |                                                                                     |               | Ins.cl. F       |       | IP 55                                                                             |
| V                                | Hz | kW                                                                                  | r/min         | A               | Eff.  | Duty                                                                              |
| 370 D                            | 50 | 110                                                                                 | 1500          | 245             | 96.3% | S9                                                                                |
|                                  |    |                                                                                     |               |                 |       |                                                                                   |
|                                  |    |                                                                                     |               |                 |       |                                                                                   |
|                                  |    |                                                                                     |               |                 |       |                                                                                   |
| Prod. code 3GBL282233-ADC107445  |    |                                                                                     |               |                 |       |                                                                                   |
| NETWORK VOLTAGE 400 V            |    |                                                                                     |               |                 |       |                                                                                   |
|                                  |    |                                                                                     |               | Nmax 1500 r/min |       |                                                                                   |
| 6316/C3                          |    |  | 6316/C3VL0241 |                 |       | 697 kg                                                                            |
|                                  |    |                                                                                     |               | IEC 60034-1     |       |                                                                                   |

Main rating plate

|                                                               |                      |            |                                                                                     |                 |             |
|---------------------------------------------------------------|----------------------|------------|-------------------------------------------------------------------------------------|-----------------|-------------|
| <div>ABB</div>                                                |                      |            |                                                                                     |                 |             |
| Regreasing intervals in duty hours                            |                      |            |                                                                                     |                 |             |
| Bearings                                                      |                      | 6316/C3    |  | 6316/C3VL0241   |             |
| Amount of grease                                              |                      | 40 g       |  | 40 g            |             |
| Mounting                                                      | Ambient temp.        | 1800 r/min | 1500 r/min                                                                          | 1000 r/min      | 0-900 r/min |
| Hor                                                           | 25                   | 8000       | 10500                                                                               | 14000           | 17000       |
| Hor                                                           | 40                   | 4000       | 5250                                                                                | 7000            | 8500        |
| Vert                                                          | 25                   | 4000       | 5250                                                                                | 7000            | 8500        |
| Vert                                                          | 40                   | 2000       | 2630                                                                                | 3500            | 4250        |
| Do not exceed the motor max. speed                            |                      |            |                                                                                     |                 |             |
| The following or similar high performance grease can be used: |                      |            |                                                                                     |                 |             |
| Esso                                                          | Unirex N2 or N3      |            | Shell                                                                               | Albida EMS2     |             |
| Total                                                         | Multis Complex S2 A  |            | Mobil                                                                               | Mobilith SCH100 |             |
| Kluber                                                        | Kluberplex BEM41-132 |            | FAG                                                                                 | Arcanol TEMP110 |             |
|                                                               |                      |            | 765780-6                                                                            |                 |             |
| See respective "Motor Manual"                                 |                      |            |                                                                                     |                 |             |

Lubrication plate



# Technical data

## IE4 synchronous reluctance motors

This table presents technical performance data for the currently available IE4 motor and drive packages. Variant codes and construction details are based on the M3BP Process performance motors.

### IP 55 - IC 411 - Insulation class F, temperature rise class B

|              |                |                   | Performance at nominal speed |                |                                  |            |             |               |         |        |                  |
|--------------|----------------|-------------------|------------------------------|----------------|----------------------------------|------------|-------------|---------------|---------|--------|------------------|
| Output<br>kW | Motor type     | Product code      | Speed                        | Freq.          | Motor                            | Current    | Torque      | Torque        | Inertia | Weight | Suggested        |
|              |                |                   | $n_N$<br>r/min               | $f_{el}$<br>Hz | efficiency<br>with VSD<br>supply | $I_N$<br>A | $T_N$<br>Nm | $T_{0.8}/T_N$ |         |        |                  |
| 3000 r/min   |                |                   | 400 V network                |                |                                  |            |             |               |         |        |                  |
| 11           | M3BL 160 MLA 4 | 3GBL 162 101 -_SC | 3000                         | 100            | 92.6                             | 25.0       | 35          | 1.5           | 0.0579  | 133    | ACS850-04-025A-5 |
| 15           | M3BL 160 MLB 4 | 3GBL 162 102 -_SC | 3000                         | 100            | 93.3                             | 34.8       | 48          | 1.5           | 0.0579  | 133    | ACS850-04-035A-5 |
| 18.5         | M3BL 160 MLC 4 | 3GBL 162 103 -_SC | 3000                         | 100            | 93.7                             | 42.8       | 59          | 1.5           | 0.0579  | 133    | ACS850-04-044A-5 |
| 22           | M3BL 180 MLA 4 | 3GBL 182 101 -_SC | 3000                         | 100            | 94.0                             | 50.0       | 70          | 1.5           | 0.0702  | 160    | ACS850-04-050A-5 |
| 30           | M3BL 200 MLA 4 | 3GBL 202 101 -_SC | 3000                         | 100            | 94.5                             | 68.8       | 95          | 1.5           | 0.207   | 259    | ACS850-04-078A-5 |
| 37           | M3BL 200 MLB 4 | 3GBL 202 102 -_SC | 3000                         | 100            | 94.8                             | 84.6       | 118         | 1.5           | 0.207   | 259    | ACS850-04-094A-5 |
| 45           | M3BL 225 SMA 4 | 3GBL 222 101 -_SC | 3000                         | 100            | 95.0                             | 103        | 143         | 1.5           | 0.242   | 282    | ACS850-04-103A-5 |
| 55           | M3BL 225 SMF 4 | 3GBL 222 102 -_SC | 3000                         | 100            | 95.3                             | 122        | 175         | 1.5           | 0.242   | 282    | ACS850-04-144A-5 |
| 1500 r/min   |                |                   | 400 V network                |                |                                  |            |             |               |         |        |                  |
| 11           | M3BL 160 MLA 4 | 3GBL 162 104 -_SC | 1500                         | 50             | 93.3                             | 24.9       | 70          | 1.5           | 0.0702  | 160    | ACS850-04-025A-5 |
| 15           | M3BL 160 MLB 4 | 3GBL 162 105 -_SC | 1500                         | 50             | 93.9                             | 33.7       | 95          | 1.5           | 0.0864  | 177    | ACS850-04-035A-5 |
| 18.5         | M3BL 180 MLA 4 | 3GBL 182 102 -_SC | 1500                         | 50             | 94.2                             | 42.0       | 118         | 1.5           | 0.0864  | 177    | ACS850-04-044A-5 |
| 22           | M3BL 200 MLF 4 | 3GBL 202 106 -_SC | 1500                         | 50             | 94.5                             | 49.1       | 140         | 1.5           | 0.287   | 304    | ACS850-04-050A-5 |
| 30           | M3BL 200 MLA 4 | 3GBL 202 103 -_SC | 1500                         | 50             | 94.9                             | 66.7       | 191         | 1.5           | 0.287   | 304    | ACS850-04-078A-5 |
| 37           | M3BL 250 SMF 4 | 3GBL 252 104 -_SC | 1500                         | 50             | 95.2                             | 82.0       | 236         | 1.5           | 0.575   | 428    | ACS850-04-094A-5 |
| 45           | M3BL 250 SMG 4 | 3GBL 252 105 -_SC | 1500                         | 50             | 95.4                             | 99.5       | 286         | 1.5           | 0.575   | 428    | ACS850-04-103A-5 |
| 55           | M3BL 250 SMA 4 | 3GBL 252 102 -_SC | 1500                         | 50             | 95.7                             | 121        | 350         | 1.5           | 0.633   | 454    | ACS850-04-144A-5 |
| 75           | M3BL 280 SMA 4 | 3GBL 282 213 -_DC | 1500                         | 50             | 96.0                             | 173        | 478         | 1.7           | TBA     | TBA    | ACS850-04-202A-5 |
| 90           | M3BL 280 SMB 4 | 3GBL 282 223 -_DC | 1500                         | 50             | 96.1                             | 202        | 573         | 1.7           | 1.00    | 639    | ACS850-04-202A-5 |
| 110          | M3BL 280 SMC 4 | 3GBL 282 233 -_DC | 1500                         | 50             | 96.3                             | 245        | 699         | 1.8           | 1.21    | 697    | ACS850-04-260A-5 |
| 110          | M3BL 315 SMA 4 | 3GBL 312 213 -_DC | 1500                         | 50             | 96.3                             | 244        | 702         | 1.8           | 1.64    | 873    | ACS850-04-260A-5 |
| 132          | M3BL 315 SMB 4 | 3GBL 312 223 -_DC | 1500                         | 50             | 96.4                             | 290        | 842         | 1.9           | 1.87    | 925    | ACS850-04-290A-5 |
| 160          | M3BL 315 SMC 4 | 3GBL 312 233 -_DC | 1500                         | 50             | 96.6                             | 343        | 1018        | 1.7           | 2.04    | 965    | ACS850-04-387A-5 |
| 200          | M3BL 315 MLA 4 | 3GBL 312 413 -_DC | 1500                         | 50             | 96.7                             | 427        | 1272        | 1.7           | 2.45    | 1116   | ACS850-04-500A-5 |
| 250          | M3BL 315 LKA 4 | 3GBL 312 813 -_DC | 1500                         | 50             | 96.7                             | 542        | 1591        | 1.8           | 3.04    | 1357   | ACS850-04-580A-5 |
| 315          | M3BL 315 LKC 4 | 3GBL 312 833 -_DC | 1500                         | 50             | 96.7                             | 650        | 2006        | 1.6           | 3.77    | 1533   | ACS850-04-650A-5 |
| 1000 r/min   |                |                   | 400 V network                |                |                                  |            |             |               |         |        |                  |
| 7.5          | M3BL 160 MLA 4 | 3GBL 162 106 -_SC | 1000                         | 33.3           | 91.3                             | 17.3       | 72          | 1.5           | 0.0702  | 160    | ACS850-04-018A-5 |
| 11           | M3BL 160 MLB 4 | 3GBL 162 107 -_SC | 1000                         | 33.3           | 92.3                             | 25.0       | 105         | 1.5           | 0.0864  | 177    | ACS850-04-025A-5 |
| 15           | M3BL 200 MLF 4 | 3GBL 202 107 -_SC | 1000                         | 33.3           | 92.9                             | 34.0       | 143         | 1.5           | 0.242   | 282    | ACS850-04-035A-5 |
| 18.5         | M3BL 200 MLA 4 | 3GBL 202 104 -_SC | 1000                         | 33.3           | 93.4                             | 41.8       | 177         | 1.5           | 0.287   | 304    | ACS850-04-044A-5 |
| 22           | M3BL 200 MLB 4 | 3GBL 202 105 -_SC | 1000                         | 33.3           | 93.7                             | 49.5       | 210         | 1.5           | 0.287   | 304    | ACS850-04-050A-5 |
| 30           | M3BL 250 SMF 4 | 3GBL 252 106 -_SC | 1000                         | 33.3           | 94.2                             | 67.2       | 286         | 1.5           | 0.499   | 391    | ACS850-04-078A-5 |
| 37           | M3BL 250 SMA 4 | 3GBL 252 103 -_SC | 1000                         | 33.3           | 94.5                             | 82.6       | 353         | 1.5           | 0.575   | 428    | ACS850-04-094A-5 |
| 45           | M3BL 280 SMA 4 | 3GBL 282 212 -_DC | 1000                         | 33.3           | 94.8                             | 103        | 430         | 1.9           | TBA     | TBA    | ACS850-04-103A-5 |
| 55           | M3BL 280 SMB 4 | 3GBL 282 222 -_DC | 1000                         | 33.3           | 95.1                             | 123        | 526         | 1.7           | 1.00    | 639    | ACS850-04-144A-5 |
| 75           | M3BL 280 SMC 4 | 3GBL 282 232 -_DC | 1000                         | 33.3           | 95.4                             | 166        | 715         | 1.8           | 1.21    | 697    | ACS850-04-166A-5 |
| 75           | M3BL 315 SMA 4 | 3GBL 312 212 -_DC | 1000                         | 33.3           | 95.4                             | 166        | 717         | 1.8           | 1.64    | 873    | ACS850-04-166A-5 |
| 90           | M3BL 315 SMB 4 | 3GBL 312 222 -_DC | 1000                         | 33.3           | 95.6                             | 198        | 859         | 1.8           | 1.87    | 925    | ACS850-04-202A-5 |
| 110          | M3BL 315 SMC 4 | 3GBL 312 232 -_DC | 1000                         | 33.3           | 95.8                             | 241        | 1051        | 1.7           | 2.04    | 965    | ACS850-04-260A-5 |
| 132          | M3BL 315 MLA 4 | 3GBL 312 412 -_DC | 1000                         | 33.3           | 96.0                             | 279        | 1261        | 1.6           | 2.45    | 1116   | ACS850-04-290A-5 |
| 160          | M3BL 315 LKA 4 | 3GBL 312 812 -_DC | 1000                         | 33.3           | 96.2                             | 340        | 1527        | 1.7           | 3.04    | 1357   | ACS850-04-387A-5 |
| 200          | M3BL 315 LKC 4 | 3GBL 312 832 -_DC | 1000                         | 33.3           | 96.3                             | 418        | 1910        | 1.7           | 3.77    | 1533   | ACS850-04-500A-5 |

TBA: To be advised later

# Variant codes

## IE4 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. In case of some variants, applicability depends not only on frame size but on package length (SM, ML, etc.).

| Code / Variant                  |                                                                              | Frame size |     |     |     |     |     |     |
|---------------------------------|------------------------------------------------------------------------------|------------|-----|-----|-----|-----|-----|-----|
|                                 |                                                                              | 160        | 180 | 200 | 225 | 250 | 280 | 315 |
| <b>Administration</b>           |                                                                              |            |     |     |     |     |     |     |
| 530                             | 2-year extension on standard warranty                                        | R          | R   | R   | R   | R   | P   | P   |
| 531                             | Sea freight packing                                                          | NA         | NA  | NA  | NA  | NA  | P   | P   |
| 532                             | Packing of motor in vertical mounting position                               | NA         | NA  | NA  | NA  | NA  | P   | P   |
| <b>Balancing</b>                |                                                                              |            |     |     |     |     |     |     |
| 417                             | Vibration acc. to grade B (IEC 60034-14)                                     | R          | R   | R   | R   | R   | R   | R   |
| 423                             | Balanced without key                                                         | P          | P   | P   | P   | P   | P   | P   |
| 424                             | Full-key balancing                                                           | P          | P   | P   | P   | P   | P   | P   |
| <b>Bearings and lubrication</b> |                                                                              |            |     |     |     |     |     |     |
| 036                             | Transport lock for bearings                                                  | P          | P   | P   | P   | P   | P   | P   |
| 037                             | Roller bearing at D-end                                                      | M          | M   | M   | M   | M   | M   | M   |
| 039                             | Cold-resistant grease                                                        | R          | R   | R   | R   | R   | P   | P   |
| 040                             | Heat-resistant grease                                                        | R          | R   | R   | R   | R   | P   | P   |
| 041                             | Bearings regreasable via grease nipples                                      | P          | P   | P   | S   | S   | S   | S   |
| 043                             | SPM compatible nipples for vibration measurement                             | P          | P   | P   | S   | S   | S   | S   |
| 057                             | 2RS bearings at both ends                                                    | P          | P   | P   | P   | P   | NA  | NA  |
| 058                             | Angular contact bearing at D-end, shaft force away from bearing              | P          | P   | P   | P   | P   | P   | P   |
| 059                             | Angular contact bearing at N-end, shaft force towards bearing                | P          | P   | P   | P   | P   | P   | P   |
| 060                             | Angular contact bearing at D-end, shaft force towards bearing                | NA         | NA  | NA  | NA  | NA  | P   | P   |
| 061                             | Angular contact bearing at N-end, shaft force away from bearing              | NA         | NA  | NA  | NA  | NA  | P   | P   |
| 107                             | Pt100 2-wire in bearings                                                     | P          | P   | P   | P   | P   | M   | M   |
| 128                             | Double PT100, 2-wire in bearings                                             | NA         | NA  | NA  | NA  | NA  | P   | P   |
| 129                             | Double PT100, 3-wire in bearings                                             | NA         | NA  | NA  | NA  | NA  | P   | P   |
| 130                             | Pt100 3-wire in bearings                                                     | NA         | NA  | NA  | NA  | NA  | P   | P   |
| 188                             | 63-series bearings                                                           | S          | S   | S   | S   | S   | S   | S   |
| 194                             | 2Z bearings greased for life at both ends                                    | S          | S   | S   | P   | P   | NA  | NA  |
| 420                             | Bearing mounted PTC thermistors                                              | NA         | NA  | NA  | NA  | NA  | P   | P   |
| 433                             | Outlet grease collector                                                      | NA         | NA  | NA  | NA  | NA  | P   | P   |
| 506                             | Nipples for vibration measurement: SKF Marlin Quick Connect stud CMSS-2600-3 | NA         | NA  | NA  | NA  | NA  | P   | P   |
| 654                             | Provision for vibration sensors (M8x1)                                       | NA         | NA  | NA  | NA  | NA  | P   | P   |
| 796                             | Grease nipples JIS B 1575 PT 1/8 Type A                                      | P          | P   | P   | P   | P   | P   | P   |
| 797                             | Stainless steel SPM nipples                                                  | P          | P   | P   | P   | P   | P   | P   |
| 798                             | Stainless steel grease nipples                                               | P          | P   | P   | P   | P   | P   | P   |
| 799                             | Grease nipples flat type DIN 3404, thread M10x1                              | NA         | NA  | NA  | NA  | NA  | P   | P   |
| 800                             | Grease nipples JIS B 1575 PT 1/8" pin type                                   | NA         | NA  | NA  | NA  | NA  | P   | P   |
| <b>Brakes</b>                   |                                                                              |            |     |     |     |     |     |     |
| 412                             | Built-in brake                                                               | R          | R   | R   | R   | R   | P   | P   |
| <b>Branch standard designs</b>  |                                                                              |            |     |     |     |     |     |     |
| 178                             | Stainless steel / acid proof bolts                                           | P          | P   | P   | P   | P   | P   | P   |
| 204                             | Jacking bolts for foot mounted motors                                        | NA         | NA  | NA  | NA  | NA  | P   | P   |
| 209                             | Non-standard voltage or frequency (special winding)                          | P          | P   | P   | P   | P   | P   | P   |
| 419                             | Textile industry design                                                      | P          | P   | P   | P   | P   | P   | P   |
| 425                             | Corrosion protected stator and rotor core                                    | P          | P   | P   | P   | P   | P   | P   |

S: Included as standard

P: New manufacture only

M: On modification for a stocked motor or on new manufacture; the number of variants per order may be limited.

R: On request

NA: Not available

| Code / Variant               |                                                                                                                               | Frame size |     |     |     |     |     |     |
|------------------------------|-------------------------------------------------------------------------------------------------------------------------------|------------|-----|-----|-----|-----|-----|-----|
|                              |                                                                                                                               | 160        | 180 | 200 | 225 | 250 | 280 | 315 |
| <b>Cooling system</b>        |                                                                                                                               |            |     |     |     |     |     |     |
| 53                           | Metal fan cover                                                                                                               | S          | S   | S   | S   | S   | S   | S   |
| 68                           | Light-alloy metal fan                                                                                                         | P          | P   | P   | P   | P   | P   | P   |
| 75                           | Cooling method IC 418 (without fan)                                                                                           | P          | P   | P   | P   | P   | P   | P   |
| 183                          | Separate motor cooling (axial fan, N-end)                                                                                     | P          | P   | P   | P   | P   | P   | P   |
| 189                          | Separate motor cooling, IP 44, 400 V, 50 Hz (axial fan, N-end)                                                                | P          | P   | P   | P   | P   | NA  | NA  |
| 206                          | Steel fan                                                                                                                     | NA         | NA  | NA  | NA  | NA  | P   | P   |
| 422                          | Separate motor cooling (fan on top, N-end)                                                                                    | NA         | NA  | NA  | NA  | NA  | P   | P   |
| 791                          | Stainless steel fan cover                                                                                                     | NA         | NA  | NA  | NA  | NA  | P   | P   |
| 793                          | Fan for reduced noise level (2-p fan)                                                                                         | R          | R   | R   | R   | R   | NA  | NA  |
| 794                          | Fan for reduced noise level (4-p fan)                                                                                         | R          | R   | R   | R   | R   | NA  | NA  |
| <b>Coupling</b>              |                                                                                                                               |            |     |     |     |     |     |     |
| 35                           | Assembly of customer supplied coupling-half                                                                                   | NA         | NA  | NA  | NA  | NA  | P   | P   |
| <b>Documentation</b>         |                                                                                                                               |            |     |     |     |     |     |     |
| 141                          | Binding dimension drawing                                                                                                     | P          | P   | P   | P   | P   | P   | P   |
| <b>Drain holes</b>           |                                                                                                                               |            |     |     |     |     |     |     |
| 65                           | Plugged existing drain holes                                                                                                  | P          | P   | P   | P   | P   | P   | P   |
| 448                          | Drain holes with metal plugs                                                                                                  | NA         | NA  | NA  | NA  | NA  | P   | P   |
| <b>Earthing bolt</b>         |                                                                                                                               |            |     |     |     |     |     |     |
| 67                           | External earthing bolt                                                                                                        | S          | S   | S   | S   | S   | S   | S   |
| <b>Heating elements</b>      |                                                                                                                               |            |     |     |     |     |     |     |
| 450                          | Heating element, 100-120V                                                                                                     | P          | P   | P   | P   | P   | P   | P   |
| 451                          | Heating element, 200-240V                                                                                                     | M          | M   | M   | M   | M   | M   | M   |
| <b>Insulation system</b>     |                                                                                                                               |            |     |     |     |     |     |     |
| 405                          | Special winding insulation for frequency converter supply                                                                     | P          | P   | P   | P   | P   | P   | P   |
| <b>Mounting arrangements</b> |                                                                                                                               |            |     |     |     |     |     |     |
| 009                          | IM 2001 foot/flange mounted, IEC flange, from IM 1001 (B35 from B3)                                                           | M          | M   | M   | M   | M   | M   | M   |
| 066                          | Modified for specified mounting position differing from IM B3 (1001), IM B5 (3001), B14 (3601), IM B35 (2001) & IM B34 (2101) | M          | M   | M   | M   | M   | M   | M   |
| 305                          | Additional lifting lugs                                                                                                       | P          | P   | P   | P   | P   | P   | P   |
| <b>Noise reduction</b>       |                                                                                                                               |            |     |     |     |     |     |     |
| 055                          | Noise reduction cover for foot mounted motor                                                                                  | NA         | NA  | NA  | NA  | NA  | P   | P   |
| <b>Painting</b>              |                                                                                                                               |            |     |     |     |     |     |     |
| 105                          | Paint thickness report                                                                                                        | NA         | NA  | NA  | NA  | NA  | P   | P   |
| 114                          | Special paint color, standard grade                                                                                           | M          | M   | M   | M   | M   | M   | M   |
| 115                          | Painting system C4M acc. to ISO 12944-5: 2007                                                                                 | R          | R   | R   | R   | R   | P   | P   |
| 168                          | Primer paint only                                                                                                             | NA         | NA  | NA  | NA  | NA  | P   | P   |
| 179                          | Special paint specification                                                                                                   | R          | R   | R   | R   | R   | NA  | NA  |
| 754                          | Painting system C5M acc. to ISO 12944-5:2007                                                                                  | R          | R   | R   | R   | R   | P   | P   |
| 755                          | Aluminum metalizing and painting accorcing to NORSOK M501 revision 5, Method 2A                                               | NA         | NA  | NA  | NA  | NA  | P   | P   |
| <b>Protection</b>            |                                                                                                                               |            |     |     |     |     |     |     |
| 005                          | Metal protective roof, vertical motor, shaft down                                                                             | P          | P   | P   | P   | P   | P   | P   |
| 072                          | Radial seal at D-end                                                                                                          | P          | P   | P   | P   | P   | P   | P   |
| 073                          | Sealed against oil at D-end                                                                                                   | P          | P   | P   | P   | P   | P   | P   |
| 158                          | Degree of protection IP65                                                                                                     | P          | P   | P   | P   | P   | P   | P   |
| 211                          | Weather protected, IP xx W                                                                                                    | P          | P   | P   | P   | P   | NA  | NA  |
| 401                          | Protective roof, horizontal motor                                                                                             | NA         | NA  | NA  | NA  | NA  | P   | P   |
| 403                          | Degree of protection IP56                                                                                                     | P          | P   | P   | P   | P   | P   | P   |
| 404                          | Degree of protection IP56, without fan and fan cover                                                                          | P          | P   | P   | P   | P   | R   | R   |
| 434                          | Degree of protection IP56, open deck                                                                                          | NA         | NA  | NA  | NA  | NA  | P   | P   |
| 783                          | Labyrinth sealing at D-end                                                                                                    | NA         | NA  | NA  | NA  | NA  | P   | P   |
| 784                          | Gamma seal at D-end                                                                                                           | P          | P   | P   | S   | S   | NA  | NA  |

S: Included as standard

P: New manufacture only

M: On modification for a stocked motor or on new manufacture; the number of variants per order may be limited.

R: On request

NA: Not available

| Code / Variant                     |                                                                                                             | Frame size |     |     |     |     |     |     |
|------------------------------------|-------------------------------------------------------------------------------------------------------------|------------|-----|-----|-----|-----|-----|-----|
|                                    |                                                                                                             | 160        | 180 | 200 | 225 | 250 | 280 | 315 |
| Rating & instruction plates        |                                                                                                             |            |     |     |     |     |     |     |
| 002                                | Restamping voltage, frequency and output, continuous duty                                                   | P          | P   | P   | P   | P   | P   | P   |
| 003                                | Individual serial number                                                                                    | S          | S   | S   | S   | S   | S   | S   |
| 004                                | Additional text on std rating plate (max 12 digits on free text line)                                       | P          | P   | P   | P   | P   | P   | P   |
| 098                                | Stainless rating plate                                                                                      | S          | S   | S   | S   | S   | NA  | NA  |
| 126                                | Tag plate                                                                                                   | NA         | NA  | NA  | NA  | NA  | P   | P   |
| 135                                | Mounting of additional identification plate, stainless                                                      | P          | P   | P   | P   | P   | P   | P   |
| 139                                | Additional identification plate delivered loose                                                             | P          | P   | P   | P   | P   | P   | P   |
| 159                                | Additional plate with text "Made in ..."                                                                    | NA         | NA  | NA  | NA  | NA  | P   | P   |
| 160                                | Additional rating plate affixed                                                                             | P          | P   | P   | P   | P   | P   | P   |
| 161                                | Additional rating plate delivered loose                                                                     | P          | P   | P   | P   | P   | P   | P   |
| 163                                | Frequency converter rating plate. Rating data according to quotation.                                       | M          | M   | M   | M   | M   | M   | M   |
| Shaft & rotor                      |                                                                                                             |            |     |     |     |     |     |     |
| 069                                | Two shaft extensions as per basic catalog                                                                   | P          | P   | P   | P   | P   | P   | P   |
| 070                                | One or two special shaft extensions, standard shaft material                                                | R          | R   | R   | R   | R   | P   | P   |
| 131                                | Motor delivered with half key (key not exceeding shaft diameter)                                            | P          | P   | P   | P   | P   | NA  | NA  |
| 164                                | Shaft extension with closed key-way                                                                         | S          | S   | S   | S   | S   | P   | P   |
| 165                                | Shaft extension with open key-way                                                                           | P          | P   | P   | P   | P   | S   | S   |
| 410                                | Stainless steel shaft (standard or non-standard design)                                                     | R          | R   | R   | R   | R   | P   | P   |
| Stator winding temperature sensors |                                                                                                             |            |     |     |     |     |     |     |
| 120                                | KTY 84-130 (1 per phase) in stator winding                                                                  | R          | R   | R   | R   | R   | P   | P   |
| 121                                | Bimetal detectors, break type (NCC), (3 in series), 130 °C, in stator winding                               | P          | P   | P   | P   | P   | P   | P   |
| 122                                | Bimetal detectors, break type (NCC), (3 in series), 150 °C, in stator winding                               | P          | P   | P   | P   | P   | P   | P   |
| 123                                | Bimetal detectors, break type (NCC), (3 in series), 170 °C, in stator winding                               | P          | P   | P   | P   | P   | P   | P   |
| 124                                | Bimetal detectors, break type (NCC), (3 in series), 140 °C, in stator winding                               | P          | P   | P   | P   | P   | P   | P   |
| 125                                | Bimetal detectors, break type (NCC), (2 × 3 in series), 150 °C, in stator winding                           | P          | P   | P   | P   | P   | P   | P   |
| 127                                | Bimetal detectors, break type (NCC), (3 in series, 130 °C & 3 in series, 150 °C), in stator winding         | P          | P   | P   | P   | P   | P   | P   |
| 435                                | PTC - thermistors (3 in series), 130 °C, in stator winding                                                  | P          | P   | P   | P   | P   | P   | P   |
| 436                                | PTC - thermistors (3 in series), 150 °C, in stator winding                                                  | S          | S   | S   | S   | S   | S   | S   |
| 437                                | PTC - thermistors (3 in series), 170 °C, in stator winding                                                  | P          | P   | P   | P   | P   | P   | P   |
| 438                                | PTC - thermistors (3 in series), 190 °C, in stator winding                                                  | NA         | NA  | NA  | NA  | NA  | P   | P   |
| 439                                | PTC - thermistors (2 × 3 in series), 150 °C, in stator winding                                              | P          | P   | P   | P   | P   | P   | P   |
| 441                                | PTC - thermistors (3 in series, 130 °C & 3 in series, 150 °C), in stator winding                            | P          | P   | P   | P   | P   | P   | P   |
| 442                                | PTC - thermistors (3 in series, 150 °C & 3 in series, 170 °C), in stator winding                            | P          | P   | P   | P   | P   | P   | P   |
| 445                                | Pt-100 2-wire in stator winding, 1 per phase                                                                | M          | M   | M   | M   | M   | M   | M   |
| 446                                | Pt-100 2-wire in stator winding, 2 per phase                                                                | M          | M   | M   | M   | M   | M   | M   |
| 502                                | Pt-100 3-wire in stator winding, 1 per phase                                                                | NA         | NA  | NA  | NA  | NA  | P   | P   |
| 503                                | Pt-100 3-wire in stator winding, 2 per phase                                                                | NA         | NA  | NA  | NA  | NA  | P   | P   |
| 511                                | PTC thermistors (2 × 3 in series), 130 °C, in stator winding                                                | NA         | NA  | NA  | NA  | NA  | P   | P   |
| S:                                 | Included as standard                                                                                        |            |     |     |     |     |     |     |
| P:                                 | New manufacture only                                                                                        |            |     |     |     |     |     |     |
| M:                                 | On modification for a stocked motor or on new manufacture; the number of variants per order may be limited. |            |     |     |     |     |     |     |
| R:                                 | On request                                                                                                  |            |     |     |     |     |     |     |
| NA:                                | Not available                                                                                               |            |     |     |     |     |     |     |

| Code / Variant |                                                                                                                                        | Frame size |     |     |     |     |     |     |
|----------------|----------------------------------------------------------------------------------------------------------------------------------------|------------|-----|-----|-----|-----|-----|-----|
|                |                                                                                                                                        | 160        | 180 | 200 | 225 | 250 | 280 | 315 |
| Terminal box   |                                                                                                                                        |            |     |     |     |     |     |     |
| 015            | Motor supplied in D connection                                                                                                         | R          | R   | R   | R   | R   | R   | R   |
| 017            | Motor supplied in Y connection                                                                                                         | R          | R   | R   | R   | R   | R   | R   |
| 019            | Larger than standard terminal box                                                                                                      | NA         | NA  | NA  | NA  | NA  | P   | P   |
| 020            | Detached terminal box                                                                                                                  | NA         | NA  | NA  | NA  | NA  | P   | P   |
| 021            | Terminal box LHS (seen from D-end)                                                                                                     | P          | P   | P   | P   | P   | P   | P   |
| 022            | Cable entry LHS (seen from D-end)                                                                                                      | P          | P   | P   | P   | P   | P   | P   |
| 157            | Terminal box degree of protection IP65                                                                                                 | P          | P   | P   | P   | P   | P   | P   |
| 180            | Terminal box RHS (seen from D-end)                                                                                                     | P          | P   | P   | P   | P   | P   | P   |
| 230            | Standard metal cable glands                                                                                                            | M          | M   | M   | M   | M   | S   | S   |
| 231            | Standard cable glands with clamping device                                                                                             | NA         | NA  | NA  | NA  | NA  | P   | P   |
| 277            | Cable sealing end unit, size small for C-opening                                                                                       | NA         | NA  | NA  | NA  | NA  | P   | NA  |
| 278            | Cable sealing end unit, size medium for D-opening                                                                                      | NA         | NA  | NA  | NA  | NA  | NA  | P   |
| 279            | Cable sealing end unit, size large for D-opening                                                                                       | NA         | NA  | NA  | NA  | NA  | NA  | P   |
| 292            | Adapter C-C                                                                                                                            | NA         | NA  | NA  | NA  | NA  | P   | NA  |
| 293            | Adapter D-D                                                                                                                            | NA         | NA  | NA  | NA  | NA  | NA  | P   |
| 294            | Adapter E-D                                                                                                                            | NA         | NA  | NA  | NA  | NA  | NA  | P   |
| 295            | Adapter E-2D                                                                                                                           | NA         | NA  | NA  | NA  | NA  | NA  | P   |
| 296            | Adapter E-3D*                                                                                                                          | NA         | NA  | NA  | NA  | NA  | NA  | P   |
| 380            | Separate terminal box for temperature detectors, std. material                                                                         | NA         | NA  | NA  | NA  | NA  | P   | P   |
| 400            | 4 × 90 degree turnable terminal box                                                                                                    | S          | S   | S   | S   | S   | S   | S   |
| 402            | Terminal box adapted for Al cables                                                                                                     | NA         | NA  | NA  | NA  | NA  | S   | S   |
| 409            | Large terminal box with two terminal blocks                                                                                            | NA         | NA  | NA  | NA  | NA  | P   | P   |
| 413            | Extended cable connection, no terminal box                                                                                             | NA         | NA  | NA  | NA  | NA  | P   | P   |
| 418            | Separate terminal box for auxiliaries, standard material                                                                               | P          | P   | P   | P   | P   | P   | P   |
| 444            | Adapter E-2E*                                                                                                                          | NA         | NA  | NA  | NA  | NA  | NA  | P   |
| 447            | Top mounted separate terminal box for monitoring equipment                                                                             | NA         | NA  | NA  | NA  | NA  | P   | P   |
| 466            | Terminal box at N-end                                                                                                                  | NA         | NA  | NA  | NA  | NA  | P   | P   |
| 467            | Lower than standard terminal box and rubber extended cable. Cable length 2 m.                                                          | P          | P   | P   | P   | P   | NA  | NA  |
| 468            | Cable entry from D-end                                                                                                                 | R          | R   | R   | R   | R   | P   | P   |
| 469            | Cable entry from N-end                                                                                                                 | P          | P   | P   | P   | P   | P   | P   |
| 567            | Separate terminal box material: cast iron                                                                                              | P          | P   | P   | P   | P   | P   | P   |
| 568            | Separate terminal box for heating elements, std. material                                                                              | NA         | NA  | NA  | NA  | NA  | P   | P   |
| 569            | Separate terminal box for brakes                                                                                                       | NA         | NA  | NA  | NA  | NA  | P   | P   |
| 729            | Aluminum non-drilled flange for cable glands                                                                                           | P          | P   | P   | P   | P   | P   | P   |
| 730            | Prepared for NPT cable glands                                                                                                          | NA         | NA  | NA  | NA  | NA  | P   | P   |
| 731            | Two standard-size metal cable glands                                                                                                   | P          | P   | P   | P   | P   | S   | S   |
| 740            | Prepared for PG cable glands                                                                                                           | P          | P   | P   | P   | P   | NA  | NA  |
| 742            | Protective cover for accessory terminal block in main terminal box                                                                     | NA         | NA  | NA  | NA  | NA  | P   | P   |
| 743            | Painted non-drilled flange in steel for cable glands                                                                                   | P          | P   | P   | P   | P   | P   | P   |
| 744            | Stainless steel non-drilled flange for cable glands                                                                                    | NA         | NA  | NA  | NA  | NA  | P   | P   |
| 745            | Painted steel flange equipped with nickle plated brass cable glands                                                                    | NA         | NA  | NA  | NA  | NA  | P   | P   |
| 746            | Stainless steel cable flange equipped with standard nickle plated brass cable glands                                                   | NA         | NA  | NA  | NA  | NA  | P   | P   |
| Testing        |                                                                                                                                        |            |     |     |     |     |     |     |
| 149            | Test according to separate test specification                                                                                          | R          | R   | R   | R   | R   | R   | R   |
| 760            | Vibration level test                                                                                                                   | P          | P   | P   | P   | P   | P   | P   |
| 761            | Vibration spectrum test for one motor from specific delivery batch                                                                     | NA         | NA  | NA  | NA  | NA  | P   | P   |
| 762            | Noise level test for one motor from specific delivery batch                                                                            | P          | P   | P   | P   | P   | P   | P   |
| 763            | Noise spectrum test for one motor from specific delivery batch                                                                         | NA         | NA  | NA  | NA  | NA  | P   | P   |
| 764            | Test for one motor from specific delivery batch with ABB frequency converter available at ABB test field. ABB standard test procedure. | NA         | NA  | NA  | NA  | NA  | P   | P   |

\*Variants 296 and 444 can only be selected together with 019.

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R: On request  
NA: Not available



| Code / Variant        |                                                                                                           | Frame size |     |     |     |     |     |     |
|-----------------------|-----------------------------------------------------------------------------------------------------------|------------|-----|-----|-----|-----|-----|-----|
|                       |                                                                                                           | 160        | 180 | 200 | 225 | 250 | 280 | 315 |
| Variable speed drives |                                                                                                           |            |     |     |     |     |     |     |
| 62                    | Tachogenerator                                                                                            | NA         | NA  | NA  | NA  | NA  | P   | P   |
| 182                   | Mounting of non-listed pulse tacho                                                                        | NA         | NA  | NA  | NA  | NA  | P   | P   |
| 429                   | Separate motor cooling (fan top, N-end) and 1024 pulse tacho (Leine & Linde 861) mounted                  | NA         | NA  | NA  | NA  | NA  | P   | P   |
| 470                   | Prepared for hollow shaft pulse tacho (L&L equivalent)                                                    | P          | P   | P   | P   | P   | P   | P   |
| 472                   | 1024 pulse tacho (L&L 861007455-1024)                                                                     | P          | P   | P   | P   | P   | P   | P   |
| 473                   | 2048 pulse tacho (L&L 861007455-2048)                                                                     | P          | P   | P   | P   | P   | P   | P   |
| 474                   | Separate motor cooling (fan axial, N-end) and prepared for hollow shaft tacho (L&L equivalent)            | P          | P   | P   | P   | P   | P   | P   |
| 476                   | Separate motor cooling (fan axial, N-end) and 1024 pulse tacho (L&L 861007455-1024)                       | P          | P   | P   | P   | P   | P   | P   |
| 477                   | Separate motor cooling (fan axial, N-end) and 2048 pulse tacho (L&L 861007455-2048)                       | P          | P   | P   | P   | P   | P   | P   |
| 478                   | Separate motor cooling (fan top, N-end) and prepared for hollow shaft tacho (L&L equivalent)              | NA         | NA  | NA  | NA  | NA  | P   | P   |
| 479                   | Mounting of other type of pulse tacho with shaft extension, tacho not included                            | R          | R   | R   | R   | R   | P   | P   |
| 486                   | Separate motor cooling (fan top, N-end) and prepared for DC-tacho                                         | NA         | NA  | NA  | NA  | NA  | P   | P   |
| 510                   | Separate motor cooling (fan top, N-end) and 2048 pulse tacho (Leine & Linde 861) mounted                  | NA         | NA  | NA  | NA  | NA  | P   | P   |
| 570                   | Prepared for hollow shaft pulse tacho (L&L 503)                                                           | P          | P   | P   | P   | P   | NA  | NA  |
| 572                   | 1024 pulse tacho (L&L 503)                                                                                | P          | P   | P   | P   | P   | NA  | NA  |
| 573                   | 2048 pulse tacho (L&L 503)                                                                                | P          | P   | P   | P   | P   | NA  | NA  |
| 574                   | Separate motor cooling (fan axial, N-end) and prepared for hollow shaft tacho (L&L 503)                   | P          | P   | P   | P   | P   | NA  | NA  |
| 576                   | Separate motor cooling (fan axial, N-end) and 1024 pulse tacho (L&L 503)                                  | P          | P   | P   | P   | P   | NA  | NA  |
| 577                   | Separate motor cooling (fan axial, N-end) and 2048 pulse tacho (L&L 503)                                  | P          | P   | P   | P   | P   | NA  | NA  |
| 578                   | Separate motor cooling, IP44, 400V, 50Hz (fan axial, N-end) and prepared for hollow shaft tacho (L&L 503) | P          | P   | P   | P   | P   | NA  | NA  |
| 580                   | Separate motor cooling, IP44, 400V, 50Hz (fan axial, N-end) and 1024 pulse tacho (L&L 503)                | P          | P   | P   | P   | P   | NA  | NA  |
| 581                   | Separate motor cooling, IP44, 400V, 50Hz (fan axial, N-end) and 2048 pulse tacho (L&L 503)                | P          | P   | P   | P   | P   | NA  | NA  |
| 582                   | 1024 pulse tacho, GHK912-GBR-1024, BEI IDEACOD                                                            | NA         | NA  | NA  | NA  | NA  | P   | P   |
| 583                   | 2048 pulse tacho, GHK912-GBR-2048, BEI IDEACOD                                                            | NA         | NA  | NA  | NA  | NA  | P   | P   |
| 658                   | Special tacho mounted, price category 1                                                                   | NA         | NA  | NA  | NA  | NA  | P   | P   |
| 659                   | Special tacho mounted, price category 2                                                                   | NA         | NA  | NA  | NA  | NA  | P   | P   |
| 660                   | Special tacho mounted, price category 3                                                                   | NA         | NA  | NA  | NA  | NA  | P   | P   |
| 701                   | Insulated bearing at N-end                                                                                | P          | P   | P   | P   | P/S | S   | S   |
| 704                   | EMC cable gland                                                                                           | M          | M   | M   | M   | M   | M   | M   |

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# Mechanical design

## Motor frame and drain holes

### Motor frame

The motor frame is made of cast iron, and the standard design includes cast iron feet, bearing housing, and terminal box. Integrated cast iron feet provide rigid mounting and minimize vibration. Motors can be supplied for foot mounting, flange mounting, and combinations of these.

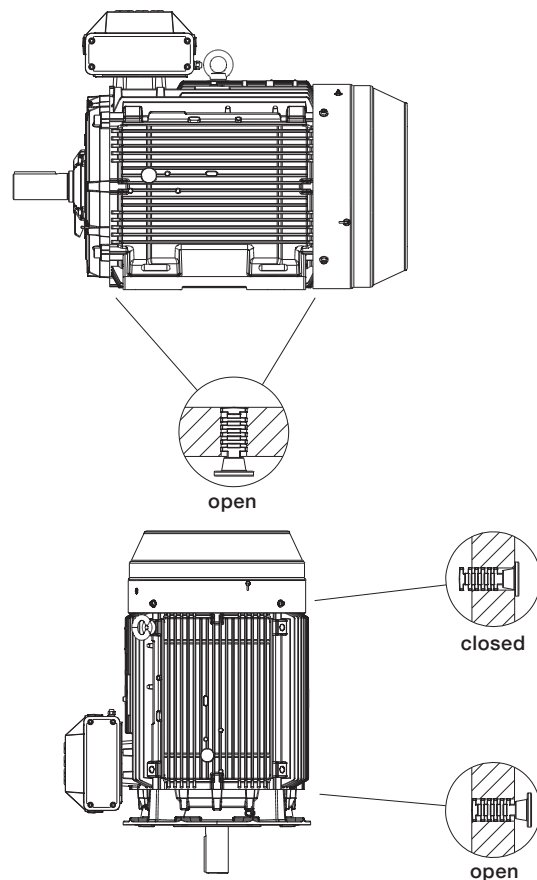
### Drain holes

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.)



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

# 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 <sub>N</sub> r/min | Deep-groove ball bearings |            |
|------------|----------------------|---------------------------|------------|
|            |                      | D-end                     | N-end      |
| 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                 | 6313-2Z/C3                | 6210-2Z/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 <sub>N</sub> r/min | Roller bearings<br>D-end |
|------------|----------------------|--------------------------|
| 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 <sub>N</sub> r/min | Standard design<br>Axial seal |       |
|------------|----------------------|-------------------------------|-------|
|            |                      | D-end                         | N-end |
| 160        | 1000 - 3000          | V-45A                         | V-45A |
| 180        | 1500 - 3000          | V-50A                         | V-45A |
| 200        | 1000 - 3000          | V-60A                         | V-50A |
| 225        | 3000                 | RB65                          | V-50A |
| 250        | 1000 - 1500          | RB75                          | V-65A |

| Motor size | n <sub>N</sub> r/min | Standard design |                 |
|------------|----------------------|-----------------|-----------------|
|            |                      | D-end           | N-end           |
| 280        | 1000 - 1500          | Axial seal VS80 | Axial seal VS80 |
| 315 SM, ML | 1000 - 1500          | Axial seal VS95 | Axial seal VS80 |
| 315 LK     | 1000 - 1500          | Labyrinth seal  | Axial seal VS80 |

### Alternative designs in motor sizes 160 – 250

| Motor size | n <sub>N</sub> r/min | Alternative design, D-end<br>Radial seal (DIN 3760), variant code 072 |
|------------|----------------------|-----------------------------------------------------------------------|
| 160        | 1000 - 3000          | 45×62×8                                                               |
| 180        | 1500 - 3000          | 50×68×8                                                               |
| 200        | 1000 - 3000          | 60×80×8                                                               |
| 225        | 3000                 | 65×85×10                                                              |
| 250        | 1000 - 1500          | 75×95×10                                                              |

### Alternative designs in motor sizes 280 – 315

| Motor size | n <sub>N</sub> 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 <sub>N</sub> 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 |

## 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                | 160 | 180 | 200 | 225 | 250 | 280 | 315  |
|---------------------------|-----|-----|-----|-----|-----|-----|------|
| Heating element power (W) | 25  | 50  | 50  | 50  | 50  | 60  | 2×60 |

# 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  $L_i$  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 regreaseable 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  $L_i$  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.

| Frame size    | Amount of grease, g/bearing | Interval h at |            |            |
|---------------|-----------------------------|---------------|------------|------------|
|               |                             | 3000 r/min    | 1500 r/min | 1000 r/min |
| Ball bearings |                             |               |            |            |
| 160           | greased for life            |               |            |            |
| 180           | greased for life            |               |            |            |
| 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 ball bearings

| Frame size      | Amount of grease, g/bearing | Interval h at |            |            |
|-----------------|-----------------------------|---------------|------------|------------|
|                 |                             | 3000 r/min    | 1500 r/min | 1000 r/min |
| Roller bearings |                             |               |            |            |
| 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       |

## Lubrication intervals in duty hours for roller bearings

## 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.

| Motor size | Speed r/min | Ambient temperature and grease lifetime |        |        |        |        |        |
|------------|-------------|-----------------------------------------|--------|--------|--------|--------|--------|
|            |             | 25 °C                                   | 40 °C  | 50 °C  | 60 °C  | 70 °C  | 80 °C  |
| 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 |

Grease lifetime  $L_{10}$  in deep groove ball bearings of type 2Z, horizontally mounted motors in continuous duty

## Radial forces

### Pulley diameter

When the desired bearing life has been determined, the minimum permissible pulley diameter can be calculated with the permissible radial force  $F_R$  as follows:

$$D = \frac{1.9 \cdot 10^7 \cdot K \cdot P}{n \cdot F_R}$$

Where:

D = pulley diameter, mm

P = power requirement, kW

n = motor speed, r/min

K = belt tension factor, dependent on belt type and duty type.

A common factor for V-belts is 2.5.

$F_R$  = permissible radial force

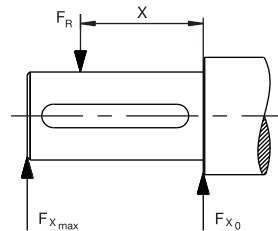
These calculated values further assume mounting position IM B3 (foot-mounted), with force directed sideways. In some cases, the strength of the shaft affects permissible forces.

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

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

$$F_R = F_{X_0} - \frac{X}{E} (F_{X_0} - F_{X_{max}})$$

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



### 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.

### Permissible radial forces, motor sizes 160 – 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  |                   |
|            |             |                                  | $F_{X_0}$ (N) | $F_{X_{max}}$ (N) | $F_{X_0}$ (N)      | $F_{X_{max}}$ (N)  | $F_{X_0}$ (N)   | $F_{X_{max}}$ (N) | $F_{X_0}$ (N) | $F_{X_{max}}$ (N) |
| 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 <sup>1)</sup> | 4305 <sup>1)</sup> | 7600            | 5500              | 6560          | 5500              |
| 180        | 1500        | 110                              | 4800          | 3940              | 4020               | 3300               | 7280            | 5500              | 6140          | 5500              |
| 200        | 3000        | 110                              | 8300          | 6900              | 7200 <sup>2)</sup> | 6000 <sup>2)</sup> | 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            |

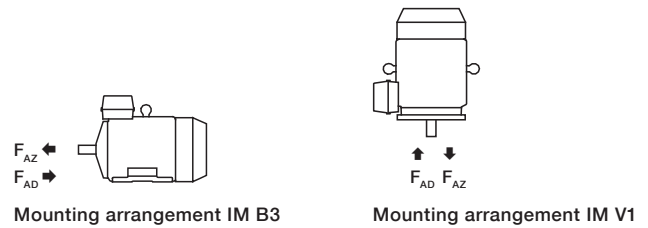
<sup>1)</sup> The maximum lifetime of the grease is 38 000 h, see Grease lifetime

<sup>2)</sup> The maximum lifetime of the grease is 27 000 h, see Grease lifetime

## Axial forces

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.



### Permissible axial forces, motor sizes 160 – 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)       |
| 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 <sup>1)</sup> | 4600 <sup>1)</sup> | 5920                       | 5515         | 5060 <sup>1)</sup> | 4255 <sup>1)</sup> |
| 180        | 1500  | 110                              | 4360                       | 4360         | 3540               | 3540               | 5080                       | 3860         | 4240               | 3020               |
| 200        | 3000  | 110                              | 5000                       | 7350         | 5000 <sup>2)</sup> | 6150 <sup>2)</sup> | 5000                       | 7050         | 5000 <sup>2)</sup> | 5800 <sup>2)</sup> |
| 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               |

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

<sup>2)</sup> 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 IP 55. 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 PVC-insulated 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 Variant codes for all options available.

### Standard terminal box connections

| Motor size                     | Speed<br>r/min | Terminal<br>box type | Size of<br>flange<br>opening | Type of<br>through<br>holes | Size of<br>through<br>holes | Cable<br>outer<br>diameter mm | Max.<br>connectable<br>core<br>cross-section<br>mm <sup>2</sup> /phase | Number<br>and size of<br>terminal bolts | Method of<br>connection |
|--------------------------------|----------------|----------------------|------------------------------|-----------------------------|-----------------------------|-------------------------------|------------------------------------------------------------------------|-----------------------------------------|-------------------------|
| 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           |
| <b>Auxiliary cable entries</b> |                |                      |                              |                             |                             |                               |                                                                        |                                         |                         |
| 160-250                        | 1000-3000      |                      |                              |                             | 1xM16x1.5                   | Ø5-9                          |                                                                        |                                         |                         |
| 280-315                        | 1000-1500      |                      |                              |                             | 2xM20x1.5                   | Ø8-14                         |                                                                        |                                         |                         |

\* With cable glands of the same size

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

| Motor size | Earthing on frame | Earthing in main terminal box |
|------------|-------------------|-------------------------------|
| 160-250    | clamp             | M6                            |
| 280-315    | clamp             | 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 boxes and boards

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

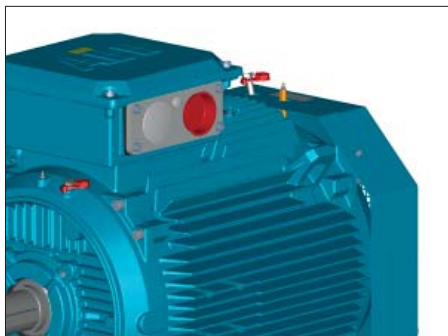


Fig. 1 Terminal box for motor sizes 160 – 250. Connection flange with tapped cable entries.

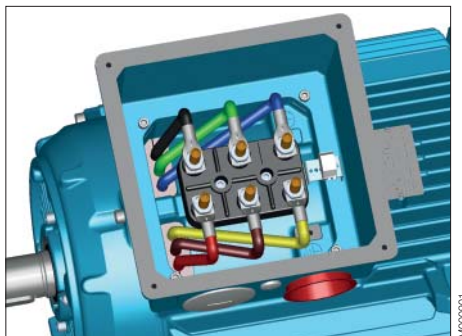


Fig. 2 Terminal board for motor sizes 160 – 250.

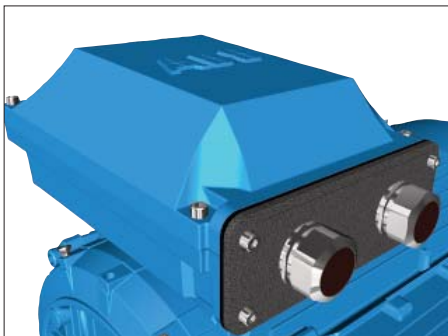


Fig. 3 Terminal box for motor sizes 280 – 315 SM-ML. Adapter and cable sealing end unit.

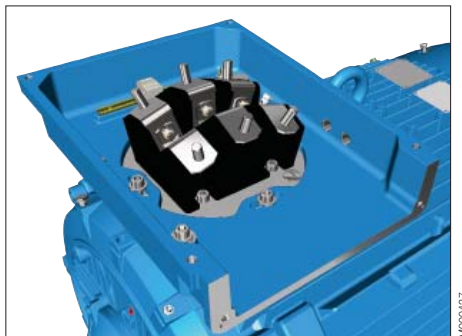


Fig. 4 Terminal board for motor sizes 280 – 315 SM-ML.

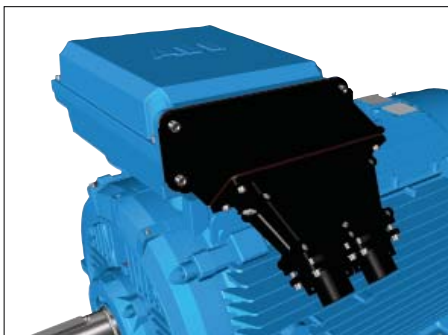


Fig. 5 Terminal box for motor size 315 LK. Adapter and cable sealing end unit.

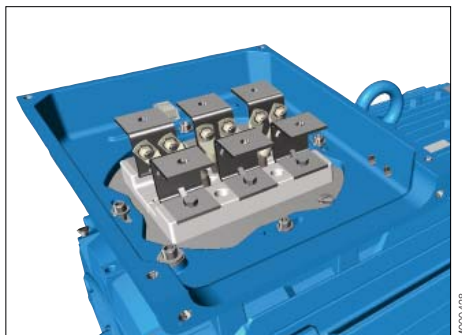


Fig. 6 Terminal board for 315 LK.

# Terminal box

## Terminal box alternatives

### Optional adapters

There is a broad selection of cable termination accessories for the termination of one or several cables. The most common ones are presented below.



Main terminal box



Adapters



Flange with glands; cable sealing end units

### How to order

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

### Ordering example for special cable entry and auxiliary terminal box

|                                                                                                                         |                                                                                                                                |
|-------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|
| Motor                                                                                                                   | 200 kW, 1500 rpm, 400 V 50 Hz                                                                                                  |
| Cables                                                                                                                  | 2 pieces, outer diameter 58 mm, single core cross section 185 mm <sup>2</sup> 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                                                                                                    |

### Main terminal box and maximum single core cross-section

The terminal boxes are named according to their current-carrying capacity, from 50 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 <sup>2</sup> /phase |
|-----------------------|-----------------|---------------------------------------------------|
| 50                    | A               | 1×35                                              |
| 120                   | B               | 1×70                                              |
| 210                   | C               | 2×240                                             |
| 370                   | D               | 2×300                                             |
| 750                   | E               | 4×500                                             |
| 1200                  | E               | 4×500                                             |

## 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. For detailed information on suitability in a certain motor size, refer to the 'terminal box opening' column in section Standard terminal box.

|                                       |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |
|---------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
|                                       |  |  |  |  |  |  |
|                                       | M000430                                                                           | M000431                                                                           | M000432                                                                           | M000433                                                                            | M000434                                                                             | M000434                                                                             |
| <b>Adapter</b>                        |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |
| <b>Variant code</b>                   | 292                                                                               | 293                                                                               | 294                                                                               | 295                                                                                | 296                                                                                 | 444                                                                                 |
| <b>Suited for motor sizes</b>         | 280                                                                               | 315 SM, ML                                                                        | 315 LKA, LKC                                                                      | 315 LKA, LKC                                                                       | 315 LKA, LKC                                                                        | 315 LKA, LKC                                                                        |
| <b>Opening to terminal box</b>        | C                                                                                 | D                                                                                 | E                                                                                 | E                                                                                  | E                                                                                   | E                                                                                   |
| <b>Flange or opening for end unit</b> | C                                                                                 | D                                                                                 | D                                                                                 | 2×D                                                                                | 3×D                                                                                 | 2×E                                                                                 |
| <b>Material</b>                       | Steel                                                                             | Steel                                                                             | Steel                                                                             | Steel                                                                              | Steel                                                                               | Steel                                                                               |
| <b>Notes</b>                          |                                                                                   |                                                                                   | Included in type 750 terminal box when 750 is the standard size.                  | Only possible on type 1200 terminal box.                                           | Only possible on type 1200 terminal box.                                            | 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.

|                                        |                                                                                     |                                                                                     |                                                                                       |
|----------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
|                                        |  |  |  |
|                                        | M000436                                                                             | M000437                                                                             | M000438                                                                               |
| <b>End unit</b>                        |                                                                                     |                                                                                     |                                                                                       |
| <b>Variant code</b>                    | 277                                                                                 | 278                                                                                 | 279                                                                                   |
| <b>Suited for motor sizes</b>          | 280                                                                                 | 315 SM, ML                                                                          | 315 SM, ML                                                                            |
| <b>Opening to terminal box</b>         | C                                                                                   | D                                                                                   | D                                                                                     |
| <b>Cable outer diameter</b>            | 1 - 2 cables, 48 - 60 mm                                                            | 1 - 2 cables, 48 - 60 mm                                                            | 1 - 2 cables, 60 - 80 mm                                                              |
| <b>Cable entry for auxiliary cable</b> | 2×M20 plugged holes                                                                 | 2×M20 plugged holes                                                                 | 2×M20 plugged holes                                                                   |
| <b>Additional optional variants</b>    | EMC cable gland (704);<br>Standard gland with clamping device (231)                 | EMC cable gland (704);<br>Standard gland with clamping device (231)                 | EMC cable gland (704);<br>Standard gland with clamping device (231)                   |

Auxiliary terminal box

It is possible to equip the motors from frame size 160 upwards with one or several auxiliary terminal boxes for connection of auxiliaries like heaters or temperature detectors. The standard auxiliary terminal box is made of aluminum and equipped with M20 glands for entry of the connection cables. As an option cast iron box is also available.

Connection terminals are of a spring-loaded type for quick and easy connection. These are suitable for up to 2.5 mm<sup>2</sup> wires. Auxiliary terminal boxes are equipped with an earthing terminal. The first auxiliary terminal box is as standard located on the right-hand side at D-end.



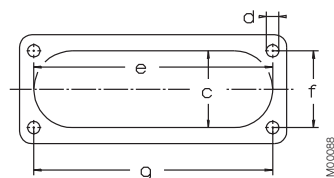
Standard cable entry size M20. The number of entries depends on the terminal box type and the number of selected auxiliaries.

| Related variant codes |                                                                    |
|-----------------------|--------------------------------------------------------------------|
| 380                   | Separate terminal box for temperature detectors, standard material |
| 418                   | Separate terminal box for auxiliaries, aluminum                    |
| 567                   | Separate terminal box material: cast iron                          |
| 568                   | Separate terminal box for heating elements, standard material      |
| 569                   | Separate terminal box for brake                                    |

# Terminal box

## Dimensions

### Dimensions for terminal box inlets



| Inlet | c<br>mm | e<br>mm | f<br>mm | g<br>mm | d<br>thread type |
|-------|---------|---------|---------|---------|------------------|
| A     | 47      | 120     | 30      | 120     | M6               |
| B     | 71      | 194     | 62      | 193     | M6               |
| C     | 62      | 193     | 62      | 193     | M8               |
| D     | 100     | 300     | 80      | 292     | M10              |
| E     | 115     | 370     | 100     | 360     | M12              |

### Frame dimensions

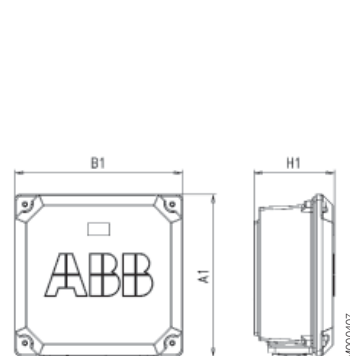


Fig. 1 Motor sizes 160 – 250

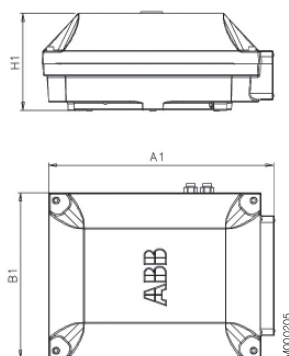


Fig. 2 Motor sizes 280 – 315  
SM, ML; top- and side-mounted  
terminal boxes 210 and 370

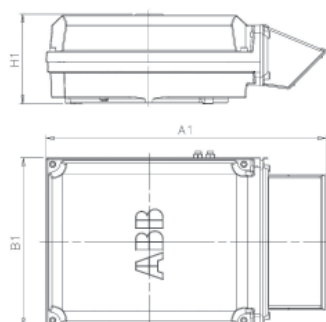


Fig. 3 Motor sizes 315 LKA, LKC;  
terminal box 750 (top-mounted)  
+ adapter

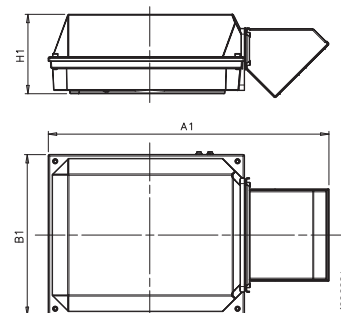


Fig. 4 Optional terminal box for  
315 LKA and LKC; terminal box  
1200 (top-mounted) + adapter

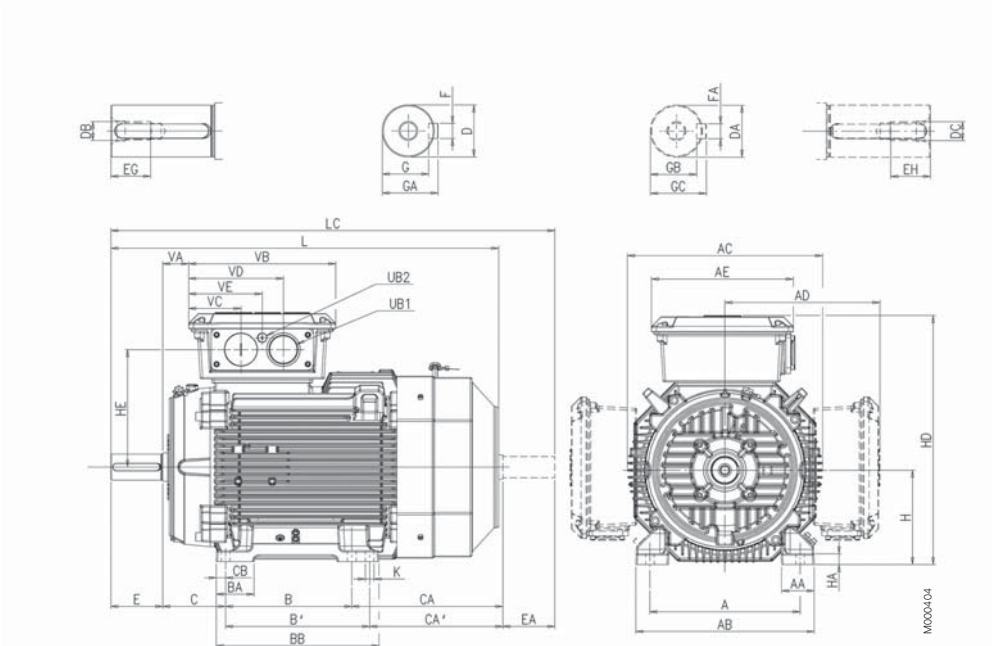
| Terminal box types acc. to current capacity | A1   | B1  | H1  |
|---------------------------------------------|------|-----|-----|
| <b>Box types for 160 - 250</b>              |      |     |     |
| 50                                          | 257  | 257 | 106 |
| 120                                         | 300  | 311 | 150 |
| <b>Box types for 280 - 315</b>              |      |     |     |
| 210                                         | 416  | 306 | 177 |
| 370                                         | 451  | 347 | 200 |
| 750, top-mounted                            | 686  | 413 | 219 |
| 750, side-mounted                           | 525  | 413 | 219 |
| 1200 (variant code 295)                     | 1000 | 578 | 285 |
| 1200 (variant code 444)                     | 1195 | 578 | 285 |
| 1200 (variant code 296)                     | 1250 | 578 | 285 |

See Optional adapters for more information.



# Dimension drawings

## Foot-mounted motors, 160 - 250



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   | EA  | EG |
|-------------------|-------------|-----|----|-----|-----|-----|-----|-----|-----|----|-----|-----|-----|-----|----|----|----|-----|-----|-----|-----|----|
| 160 <sup>1)</sup> | 1500-3000   | 254 | 67 | 310 | 338 | 261 | 257 | 210 | 254 | 69 | 294 | 108 | 172 | 128 | 20 | 42 | 32 | M16 | M12 | 110 | 80  | 36 |
| 160 <sup>2)</sup> | 1500-3000   | 254 | 67 | 310 | 338 | 261 | 257 | 210 | 254 | 69 | 294 | 108 | 269 | 225 | 20 | 42 | 32 | M16 | M12 | 110 | 80  | 36 |
| 180               | 1500-3000   | 279 | 72 | 340 | 338 | 261 | 257 | 241 | 279 | 68 | 318 | 121 | 269 | 225 | 19 | 48 | 32 | M16 | M12 | 110 | 80  | 36 |
| 200               | 1500-3000   | 318 | 69 | 378 | 413 | 328 | 300 | 267 | 305 | 80 | 345 | 133 | 314 | 276 | 20 | 55 | 45 | M20 | M16 | 110 | 110 | 42 |
| 225               | 3000        | 356 | 90 | 435 | 413 | 328 | 300 | 286 | 311 | 69 | 351 | 149 | 316 | 291 | 20 | 55 | 45 | M20 | M16 | 110 | 110 | 42 |
| 250               | 3000        | 406 | 92 | 480 | 508 | 376 | 300 | 311 | 349 | 69 | 392 | 168 | 281 | 243 | 23 | 60 | 55 | M20 | M20 | 140 | 110 | 42 |
| 250               | 1500-2100   | 406 | 92 | 480 | 508 | 376 | 300 | 311 | 349 | 69 | 392 | 168 | 281 | 243 | 23 | 65 | 55 | M20 | M20 | 140 | 110 | 42 |

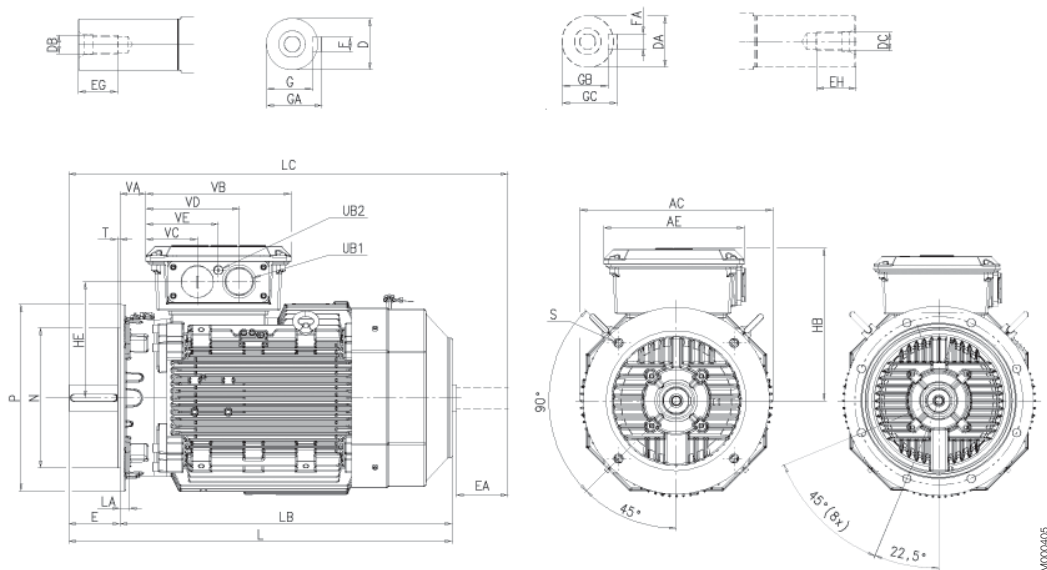
| Motor size        | Speed r/min | EH | F  | FA | G    | GA   | GB   | GC   | H   | HA | HD  | HE  | K    | L   | LC    | UB1 | UB2 | VA | VB  | VC  | VD  | VE  |
|-------------------|-------------|----|----|----|------|------|------|------|-----|----|-----|-----|------|-----|-------|-----|-----|----|-----|-----|-----|-----|
| 160 <sup>1)</sup> | 1500-3000   | 28 | 12 | 10 | 37   | 45   | 27   | 35   | 160 | 23 | 421 | 195 | 14.5 | 584 | 671.5 | M40 | M16 | 49 | 257 | 95  | 162 | 129 |
| 160 <sup>2)</sup> | 1500-3000   | 28 | 12 | 10 | 37   | 45   | 27   | 35   | 160 | 23 | 421 | 195 | 14.5 | 681 | 768.5 | M40 | M16 | 49 | 257 | 95  | 162 | 129 |
| 180               | 1500-3000   | 28 | 14 | 10 | 42.5 | 51.5 | 27   | 35   | 180 | 23 | 441 | 195 | 14.5 | 681 | 770   | M40 | M16 | 49 | 257 | 95  | 162 | 129 |
| 200               | 1500-3000   | 36 | 16 | 14 | 49   | 59   | 39.5 | 48.5 | 200 | 23 | 528 | 249 | 18.5 | 821 | 934   | M63 | M16 | 55 | 311 | 111 | 201 | 156 |
| 225               | 3000        | 42 | 16 | 16 | 49   | 59   | 49   | 59   | 225 | 23 | 553 | 249 | 18.5 | 821 | 934   | M63 | M16 | 55 | 311 | 111 | 201 | 156 |
| 250               | 3000        | 42 | 18 | 16 | 53   | 64   | 49   | 59   | 250 | 23 | 626 | 297 | 24.0 | 884 | 1010  | M63 | M16 | 48 | 311 | 111 | 201 | 156 |
| 250               | 1500-2100   | 42 | 18 | 16 | 58   | 69   | 49   | 59   | 250 | 23 | 626 | 297 | 24.0 | 884 | 1010  | M63 | M16 | 48 | 311 | 111 | 201 | 156 |

M3BL:  
<sup>1)</sup> MLB  
<sup>2)</sup> MLC and MLE

| 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          |

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

## 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).

| Motor size        | Speed<br>r/min | AC  | AE  | D  | DA | DB  | DC  | E   | EA  | EG | EH | F  | FA | G    | GA   | GB   | GC   | HB  |
|-------------------|----------------|-----|-----|----|----|-----|-----|-----|-----|----|----|----|----|------|------|------|------|-----|
| 160 <sup>1)</sup> | 1500-3000      | 338 | 257 | 42 | 32 | M16 | M12 | 110 | 80  | 36 | 28 | 12 | 10 | 37   | 45   | 27   | 35   | 300 |
| 160 <sup>2)</sup> | 1500-3000      | 338 | 257 | 42 | 32 | M16 | M12 | 110 | 80  | 36 | 28 | 12 | 10 | 37   | 45   | 27   | 35   | 300 |
| 180               | 1500-3000      | 338 | 257 | 48 | 32 | M16 | M12 | 110 | 80  | 36 | 28 | 14 | 10 | 42.5 | 51.5 | 27   | 35   | 261 |
| 200               | 1500-3000      | 413 | 257 | 55 | 45 | M20 | M16 | 110 | 110 | 42 | 36 | 16 | 14 | 49   | 59   | 39.5 | 48.5 | 314 |
| 225               | 3000           | 413 | 300 | 55 | 45 | M20 | M16 | 110 | 110 | 42 | 36 | 16 | 14 | 49   | 59   | 39.5 | 48.5 | 328 |
| 250               | 3000           | 508 | 300 | 60 | 55 | M20 | M20 | 140 | 110 | 42 | 42 | 18 | 16 | 53   | 64   | 49   | 59   | 376 |
| 250               | 1500-2100      | 508 | 300 | 65 | 55 | M20 | M20 | 140 | 110 | 42 | 42 | 18 | 16 | 58   | 69   | 49   | 59   | 376 |

| Motor size        | Speed r/min | HE  | L   | LA | LB  | LC    | M   | N   | P   | S  | T | UB1 | UB2 | VA | VB  | VC  | VD  | VE  |
|-------------------|-------------|-----|-----|----|-----|-------|-----|-----|-----|----|---|-----|-----|----|-----|-----|-----|-----|
| 160 <sup>1)</sup> | 1500-3000   | 195 | 584 | 20 | 474 | 671.5 | 300 | 250 | 350 | 19 | 5 | M63 | M16 | 49 | 257 | 81  | 177 | 129 |
| 160 <sup>2)</sup> | 1500-3000   | 195 | 681 | 20 | 571 | 768.5 | 300 | 250 | 350 | 19 | 5 | M63 | M16 | 49 | 257 | 81  | 177 | 129 |
| 180               | 1500-3000   | 195 | 681 | 18 | 571 | 768.5 | 300 | 250 | 350 | 19 | 5 | M40 | M16 | 49 | 257 | 95  | 162 | 129 |
| 200               | 1500-3000   | 241 | 821 | 20 | 711 | 934   | 350 | 300 | 400 | 19 | 5 | M63 | M16 | 82 | 257 | 81  | 177 | 129 |
| 225               | 3000        | 249 | 821 | 20 | 711 | 934   | 400 | 350 | 450 | 19 | 5 | M63 | M16 | 55 | 311 | 111 | 201 | 156 |
| 250               | 3000        | 297 | 884 | 24 | 744 | 1010  | 500 | 450 | 550 | 19 | 5 | M63 | M16 | 48 | 311 | 111 | 201 | 156 |
| 250               | 1500-2100   | 297 | 884 | 24 | 744 | 1010  | 500 | 450 | 550 | 19 | 5 | M63 | M16 | 48 | 311 | 111 | 201 | 156 |

M3BL:

1) MLB

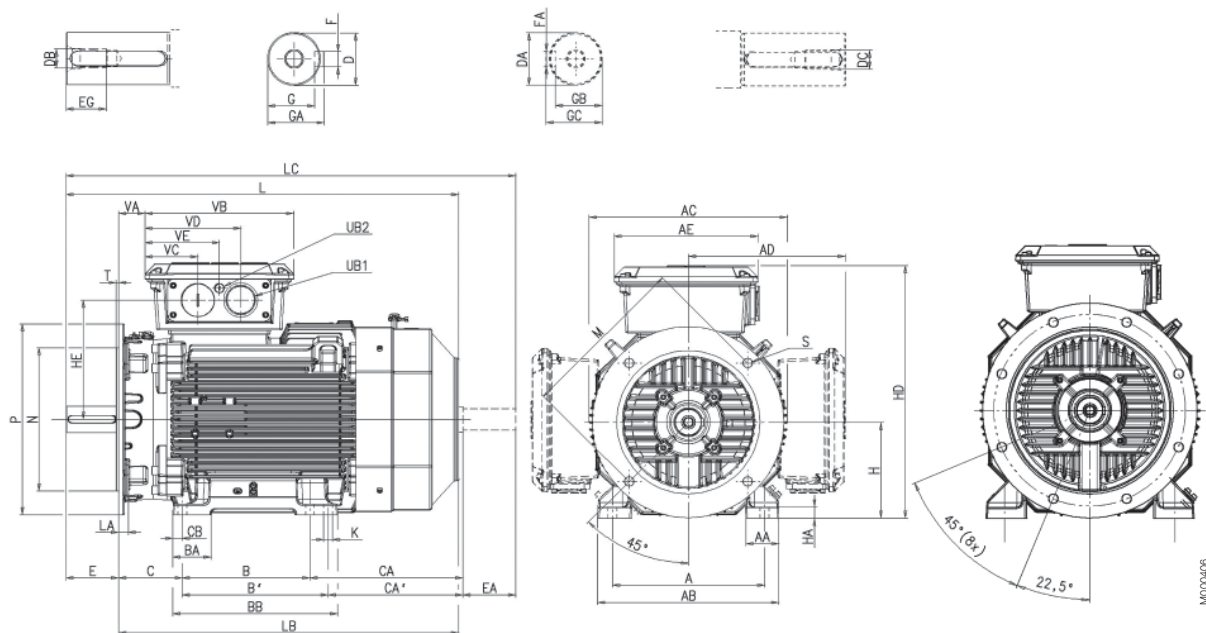
## 2) MLC and MLE

## Tolerances

|       |                  |
|-------|------------------|
| D, DA | ISO k6 < Ø 50 mm |
|       | ISO m6 < Ø 50 mm |
| F, FA | ISO h9           |
| N     | ISO j6           |

# Dimension drawings

## Foot- and flange-mounted motors, 160 – 250



Mounting options IM B35 (IM 2001), IM V15 (IM 2011), IM V36 (IM 2031).

| Motor size        | Speed r/min | A   | AA | AB  | AC  | AD  | AE  | B   | B'  | BA | BB  | C   | CA  | CA' | CB | D  | DA | DB  | DC  | E   | EA  | EG |
|-------------------|-------------|-----|----|-----|-----|-----|-----|-----|-----|----|-----|-----|-----|-----|----|----|----|-----|-----|-----|-----|----|
| 160 <sup>1)</sup> | 1500-3000   | 254 | 67 | 310 | 338 | 261 | 257 | 210 | 254 | 69 | 294 | 108 | 172 | 128 | 20 | 42 | 32 | M16 | M12 | 110 | 80  | 36 |
| 160 <sup>2)</sup> | 1500-3000   | 254 | 67 | 310 | 338 | 261 | 257 | 210 | 254 | 69 | 294 | 108 | 269 | 225 | 20 | 42 | 32 | M16 | M12 | 110 | 80  | 36 |
| 180               | 1500-3000   | 279 | 72 | 340 | 338 | 261 | 257 | 241 | 279 | 68 | 318 | 121 | 269 | 225 | 19 | 48 | 32 | M16 | M12 | 110 | 80  | 36 |
| 200               | 1500-3000   | 318 | 69 | 378 | 413 | 314 | 257 | 267 | 305 | 80 | 345 | 133 | 314 | 276 | 20 | 55 | 45 | M20 | M16 | 110 | 110 | 42 |
| 225               | 3000        | 356 | 90 | 435 | 413 | 328 | 300 | 286 | 311 | 69 | 351 | 149 | 316 | 291 | 20 | 55 | 45 | M20 | M16 | 110 | 110 | 42 |
| 250               | 3000        | 406 | 92 | 480 | 508 | 376 | 300 | 311 | 349 | 69 | 392 | 168 | 281 | 243 | 23 | 60 | 55 | M20 | M20 | 140 | 110 | 42 |
| 250               | 1500-2100   | 406 | 92 | 480 | 508 | 376 | 300 | 311 | 349 | 69 | 392 | 168 | 281 | 243 | 23 | 65 | 55 | M20 | M20 | 140 | 110 | 42 |

| Motor size        | Speed r/min | EH | F  | FA | G    | GA   | GB   | GC   | H   | HA | HD  | HE  | K    | L   | LA | LB  | LC    | M   | N   | P   | S  | T |
|-------------------|-------------|----|----|----|------|------|------|------|-----|----|-----|-----|------|-----|----|-----|-------|-----|-----|-----|----|---|
| 160 <sup>1)</sup> | 1500-3000   | 28 | 12 | 10 | 37   | 45   | 27   | 35   | 160 | 23 | 460 | 227 | 14.5 | 584 | 20 | 474 | 671.5 | 300 | 250 | 350 | 19 | 5 |
| 160 <sup>2)</sup> | 1500-3000   | 28 | 12 | 10 | 37   | 45   | 27   | 35   | 160 | 23 | 460 | 227 | 14.5 | 681 | 20 | 571 | 768.5 | 300 | 250 | 350 | 19 | 5 |
| 180               | 1500-3000   | 28 | 14 | 10 | 42.5 | 51.5 | 27   | 25   | 180 | 23 | 441 | 195 | 14.5 | 681 | 18 | 571 | 768.5 | 300 | 250 | 350 | 19 | 5 |
| 200               | 1500-3000   | 36 | 16 | 14 | 49   | 59   | 39.5 | 48.5 | 200 | 23 | 514 | 241 | 18.5 | 821 | 20 | 711 | 934   | 350 | 300 | 400 | 19 | 5 |
| 225               | 3000        | 42 | 16 | 16 | 49   | 59   | 49   | 59   | 225 | 23 | 553 | 249 | 18.5 | 821 | 20 | 711 | 934   | 400 | 350 | 450 | 19 | 5 |
| 250               | 3000        | 42 | 18 | 16 | 53   | 64   | 49   | 59   | 250 | 23 | 626 | 297 | 24.0 | 884 | 24 | 744 | 1010  | 500 | 450 | 550 | 19 | 5 |
| 250               | 1500-2100   | 42 | 18 | 16 | 58   | 69   | 49   | 59   | 250 | 23 | 626 | 297 | 24.0 | 884 | 24 | 744 | 1010  | 500 | 450 | 550 | 19 | 5 |

| Motor size        | Speed r/min | UB1 | UB2 | VA | VB  | VC  | VD  | VE  |
|-------------------|-------------|-----|-----|----|-----|-----|-----|-----|
| 160 <sup>1)</sup> | 1500-3000   | M63 | M16 | 49 | 257 | 81  | 177 | 129 |
| 160 <sup>2)</sup> | 1500-3000   | M63 | M16 | 49 | 257 | 81  | 177 | 129 |
| 180               | 1500-3000   | M40 | M16 | 49 | 257 | 95  | 162 | 129 |
| 200               | 1500-3000   | M63 | M16 | 82 | 257 | 81  | 177 | 129 |
| 225               | 3000        | M63 | M16 | 55 | 311 | 111 | 201 | 156 |
| 250               | 3000        | M63 | M16 | 48 | 311 | 111 | 201 | 156 |
| 250               | 1500-2100   | M63 | M16 | 48 | 311 | 111 | 201 | 156 |

### 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           |

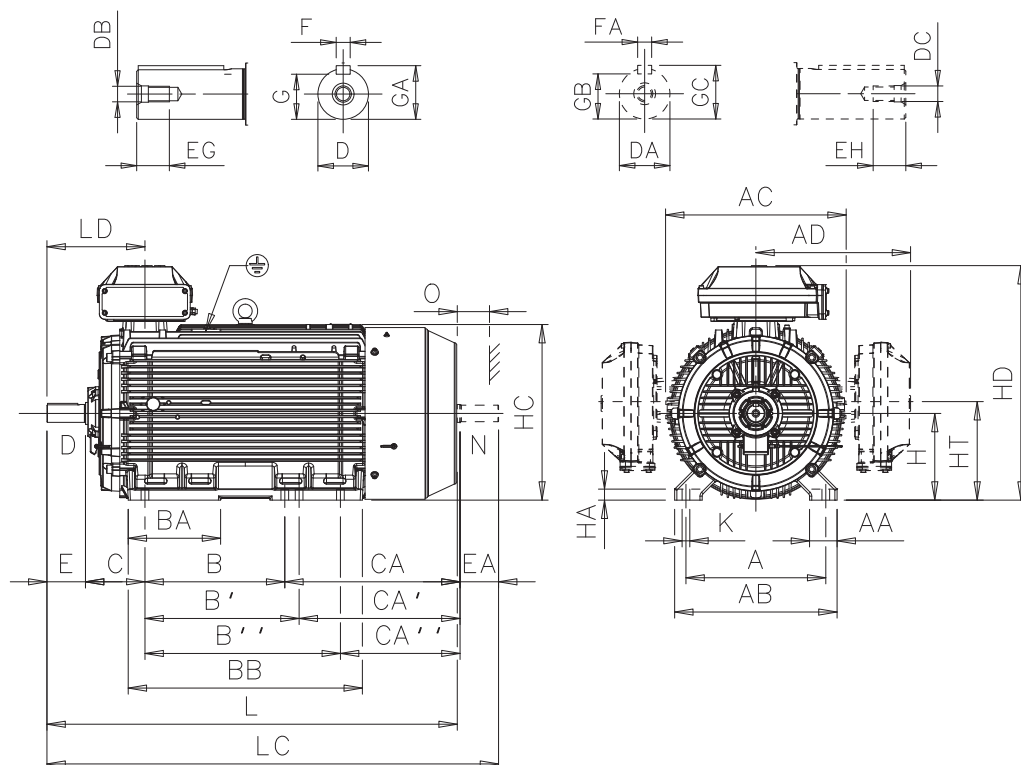
M3BL:

<sup>1)</sup> MLB

<sup>2)</sup> MLC and MLE

# 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 <sup>1)</sup> | AD <sup>2)</sup> | 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 <sup>1)</sup> top-m. | HD <sup>2)</sup> 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 |

<sup>1)</sup> Terminal box 370

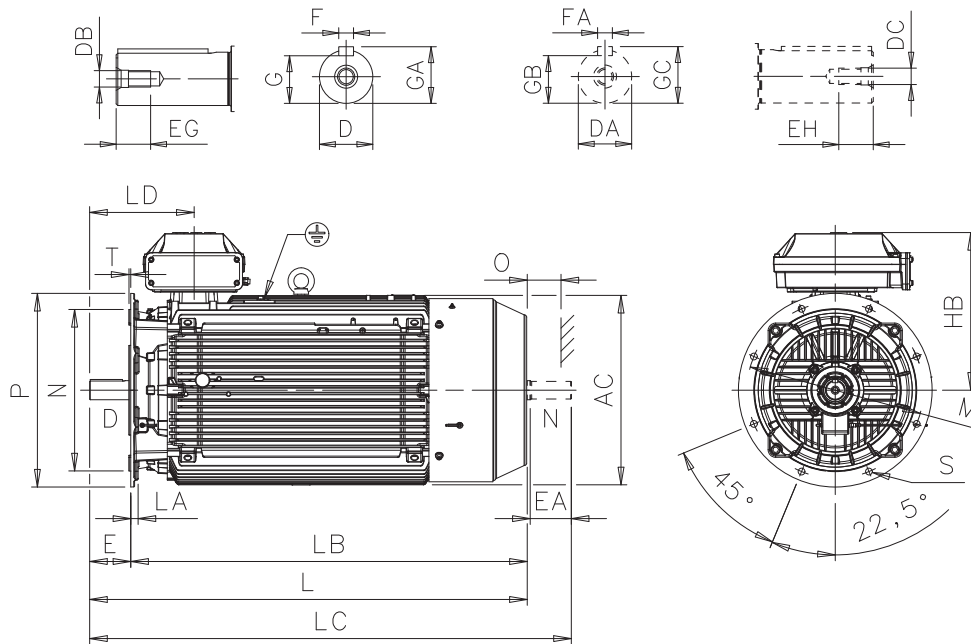
<sup>2)</sup> Terminal box 750

### Tolerances

|       |                                      |
|-------|--------------------------------------|
| A, B  | ± 0,8                                |
| C, CA | ± 0,8                                |
| D     | ISO k6 < Ø 50 mm<br>ISO m6 < Ø 50 mm |
| F     | ISO h9                               |
| H     | +0 -0,5                              |
| N     | ISO j6                               |

# Dimension drawings

## Flange-mounted motors, 280 – 315



Mounting options IM B5 (IM 3001), V1 (IM 3011), V3 (IM 3031) and IM B14 (IM 3601), V18 (IM 3611), V19 (IM 3631).

| Motor size | Speed r/min | AC  | D  | DA | DB  | DC  | E   | EA  | EG | EH | F  | FA | G    | GA   | GB   |
|------------|-------------|-----|----|----|-----|-----|-----|-----|----|----|----|----|------|------|------|
| 280 SM_    | 1000-1500   | 577 | 75 | 65 | M20 | M20 | 140 | 140 | 40 | 40 | 20 | 18 | 67.5 | 79.5 | 58   |
| 315 SM_    | 1000-1500   | 645 | 80 | 75 | M20 | M20 | 170 | 140 | 40 | 40 | 22 | 20 | 71   | 85   | 67.5 |
| 315 ML_    | 1000-1500   | 645 | 90 | 75 | M24 | M20 | 170 | 140 | 48 | 40 | 25 | 20 | 81   | 95   | 67.5 |
| 315 LK_    | 1000-1500   | 645 | 90 | 75 | M24 | M20 | 170 | 140 | 48 | 40 | 25 | 20 | 81   | 95   | 67.5 |

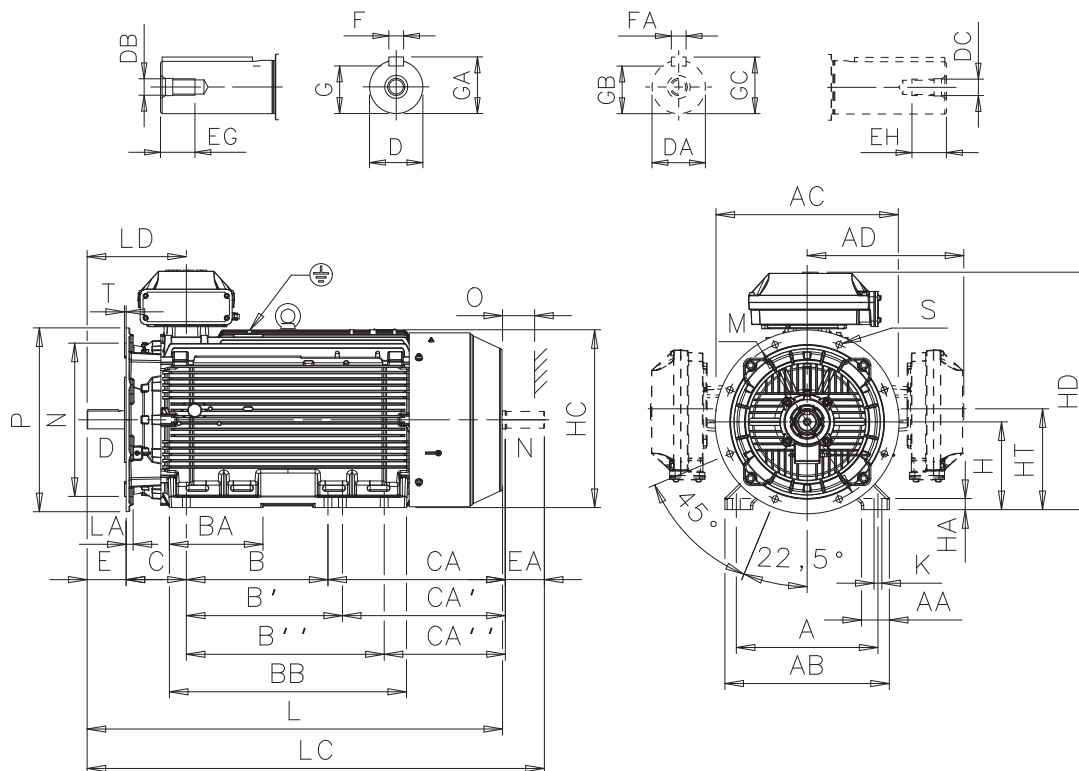
| Motor size | Speed r/min | GC   | HB <sup>1)</sup> | HB <sup>2)</sup> | L    | LA | LB   | LC   | LD  | M   | N   | O   | P   | S  | T |
|------------|-------------|------|------------------|------------------|------|----|------|------|-----|-----|-----|-----|-----|----|---|
| 280 SM_    | 1000-1500   | 69   | 482              | -                | 1088 | 23 | 948  | 1238 | 336 | 500 | 450 | 100 | 550 | 18 | 5 |
| 315 SM_    | 1000-1500   | 79.5 | 537              | -                | 1204 | 25 | 1034 | 1352 | 386 | 600 | 550 | 115 | 660 | 23 | 6 |
| 315 ML_    | 1000-1500   | 79.5 | 537              | -                | 1315 | 25 | 1145 | 1463 | 386 | 600 | 550 | 115 | 660 | 23 | 6 |
| 315 LK_    | 1000-1500   | 79.5 | 537              | 565              | 1521 | 25 | 1306 | 1669 | 386 | 600 | 550 | 115 | 660 | 23 | 6 |

### 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

## Foot- and flange-mounted motors, 280 – 315



Mounting options IM B35 (IM 2001), IM V15 (IM 2011) and IM V36 (IM 2031).

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

| Motor size | Speed r/min | EA  | EG | EH | F  | FA | G    | GA   | GB   | GC   | H   | HA | HC  | HD <sup>1)</sup><br>top-m. | HD <sup>2)</sup><br>top-m. | HT    | K  | L    | LA | LC   | LD<br>top-m. |
|------------|-------------|-----|----|----|----|----|------|------|------|------|-----|----|-----|----------------------------|----------------------------|-------|----|------|----|------|--------------|
| 280 SM_    | 1000-1500   | 140 | 40 | 40 | 20 | 18 | 67.5 | 79.5 | 58   | 69   | 280 | 31 | 564 | 762                        | -                          | 337.5 | 24 | 1088 | 23 | 1238 | 336          |
| 315 SM_    | 1000-1500   | 140 | 40 | 40 | 22 | 20 | 71   | 85   | 67.5 | 79.5 | 315 | 40 | 638 | 852                        | -                          | 375   | 28 | 1204 | 25 | 1352 | 386          |
| 315 ML_    | 1000-1500   | 140 | 48 | 40 | 25 | 20 | 81   | 95   | 67.5 | 79.5 | 315 | 40 | 638 | 852                        | -                          | 375   | 28 | 1315 | 25 | 1463 | 386          |
| 315 LK_    | 1000-1500   | 140 | 48 | 40 | 25 | 20 | 81   | 95   | 67.5 | 79.5 | 315 | 40 | 638 | 852                        | 880                        | 359   | 28 | 1521 | 25 | 1669 | 386          |

| Motor size | Speed r/min | LD side-m. | M   | N   | O   | P   | S  | T |
|------------|-------------|------------|-----|-----|-----|-----|----|---|
| 280 SM_    | 1000-1500   | 539        | 500 | 450 | 100 | 550 | 18 | 5 |
| 315 SM_    | 1000-1500   | 615        | 600 | 550 | 115 | 660 | 23 | 6 |
| 315 ML_    | 1000-1500   | 670        | 600 | 550 | 115 | 660 | 23 | 6 |
| 315 LK_    | 1000-1500   | 751        | 600 | 550 | 115 | 660 | 23 | 6 |

### Tolerances

|       |                                      |
|-------|--------------------------------------|
| A, B  | ± 0,8                                |
| C, CA | ± 0,8                                |
| D     | ISO k6 < Ø 50 mm<br>ISO m6 < Ø 50 mm |
| F     | ISO h9                               |
| H     | +0 -0,5                              |
| N     | ISO j6                               |



# Accessories

## Separate cooling

### Axial fan, N-end

Fan motors with an axial fan are available for motor sizes 160 – 315 and can be ordered with variant code 183. The values here are given for 400 V, but technical data for other voltages can be found in MotSize.

#### Axial fan, N-end (motor sizes 160 - 315)

| Main motor        | Fan motor type<br>(at 50 Hz) | Voltage<br>V at 50 Hz | Power<br>kW | Current<br>A |
|-------------------|------------------------------|-----------------------|-------------|--------------|
| M3BL 160 - 250    | M2VA 63 B 4 B14              | 400                   | 0.18        | 0.61         |
| M3BL 280 - 315 ML | M3BP 80 MD 4 B14             | 400                   | 0.75        | 1.83         |
| M3BL 315 LK       | M3BP 90 SLD 4 B14            | 400                   | 1.5         | 3.0          |

### Fan on top, N-end

The non-axial fan available for motor sizes 280 – 315 is a Ziehl-Abegg fan with an integrated motor. This cooling option is suited for 400 V, 50 Hz networks and can be ordered with variant code 422.

#### Fan on top

| Main motor | Fan motor type   | Voltage<br>V | Freq.<br>Hz | Power<br>kW | Current |
|------------|------------------|--------------|-------------|-------------|---------|
| M3BL 280   | Ziehl-Abegg RH35 | 400 VY       | 50          | 0.35        | 0.83    |
|            |                  | 460 VY       | 60          | 0.5         | 0.9     |
| M3BL 315   | Ziehl-Abegg RH40 | 400 VY       | 50          | 0.50        | 1.0     |
|            |                  | 460 VY       | 60          | 0.8         | 1.4     |

### Special motor and fan on top, N-end

A special ABB fan motor type is available for motor sizes 280 – 315. It is suited for environments where IP 65 is the required IP class or where the input voltage must be other than 360 – 420 V (50 Hz).

The values here are given for 400 V, but technical data for other voltages can be found in MotSize.

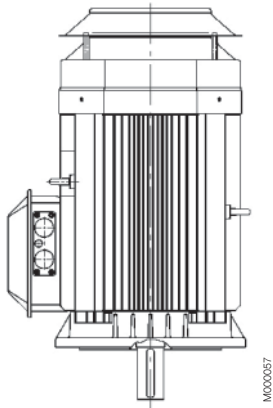
The centrifugal impeller used in the fan is a Ziehl-Abegg impeller. This type of cooling can be ordered with variant code 514.

#### Special motor and fan on top

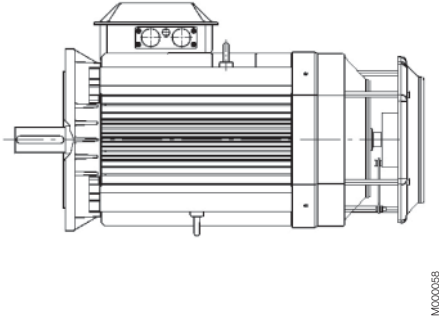
| Main motor     | Fan motor type   | Voltage<br>V at 50 Hz | Power<br>kW | Current<br>A |
|----------------|------------------|-----------------------|-------------|--------------|
| M3BL 280 - 315 | M3BP 80 MD 4 B34 | 400                   | 0.75        | 1.83         |

# Accessories

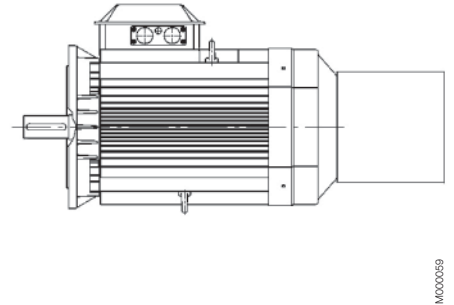
## Protective roof and tachometer



Protective roof, variant code 005



Tachometer, variant codes 472, 473, 572, and 573



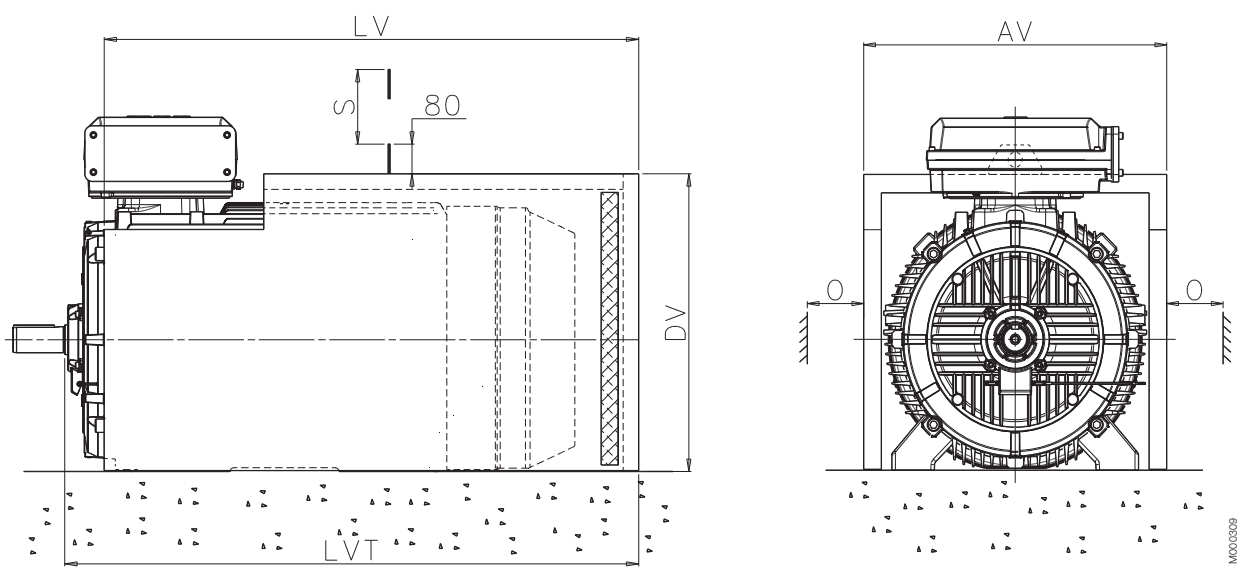
Separate cooling without tachometer: 183 and 189  
With tachometer: 474, 476, 477, 574, 576, and 577

# Accessories

## Silencer for motor sizes 280 - 315

Both foot-mounted and flange-mounted motors can be fitted with a silencer to reduce noise level by about 5 – 6 dB(A). The silencer is painted blue and made of 2 mm steel sheet. The sound absorbing material is 40 mm thick polyurethane foam. On the rim there is a rubber strip for sealing on the floor. The silencer fits loosely over the motor.

The variant code for ordering a silencer is 055.



| Motor size | AV  | LV   | LVT  | DV  | O <sup>1)</sup> | S <sup>2)</sup> | Weight kg |
|------------|-----|------|------|-----|-----------------|-----------------|-----------|
| 280 SM_    | 681 | 1010 | 1090 | 616 | 50              | 762             | 38        |
| 315 SM_    | 760 | 1094 | 1191 | 697 | 60              | 852             | 47        |
| 315 ML_    | 760 | 1205 | 1302 | 697 | 60              | 852             | 51        |
| 315 LK_    | 760 | 1411 | 1508 | 697 | 60              | 852             | 58        |

<sup>1)</sup> Clearance for motor cooling  
<sup>2)</sup> Clearance for removing the silencer

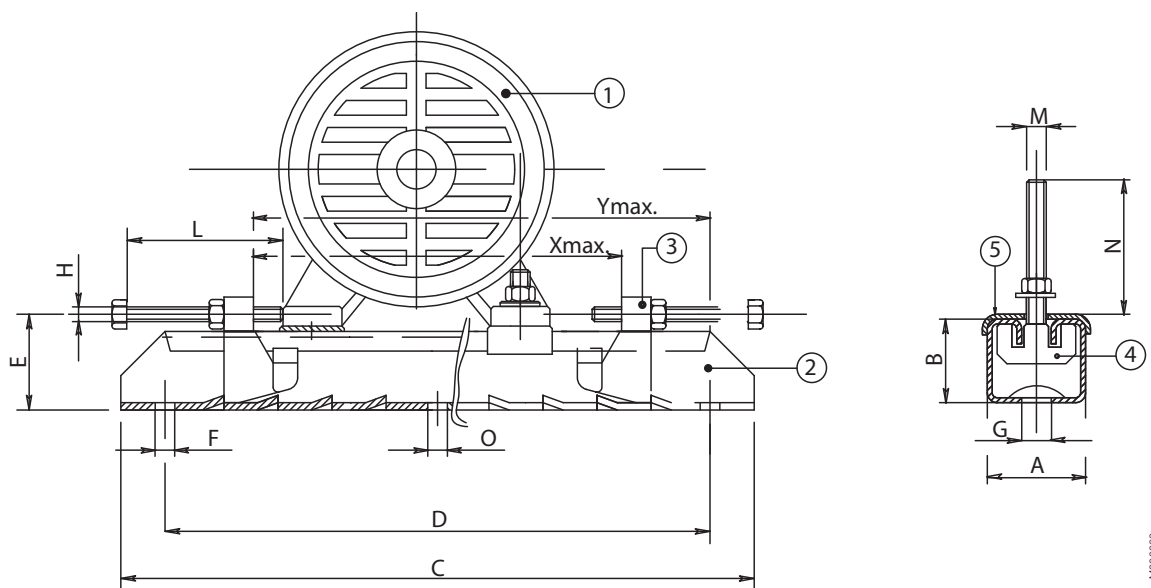
Note: The dimensions are only valid for standard foot-mounted motors.

# Accessories

## Slide rails for motor sizes 160 - 250

A set of slide rails includes two complete rails with screws for mounting the motor on the rails. Screws for mounting the rails on the foundation are not included. Slide rails have unmachined lower surfaces and should, before tightening down, be supported in a suitable manner.

Slide rails can be ordered with article numbers shown in the table.



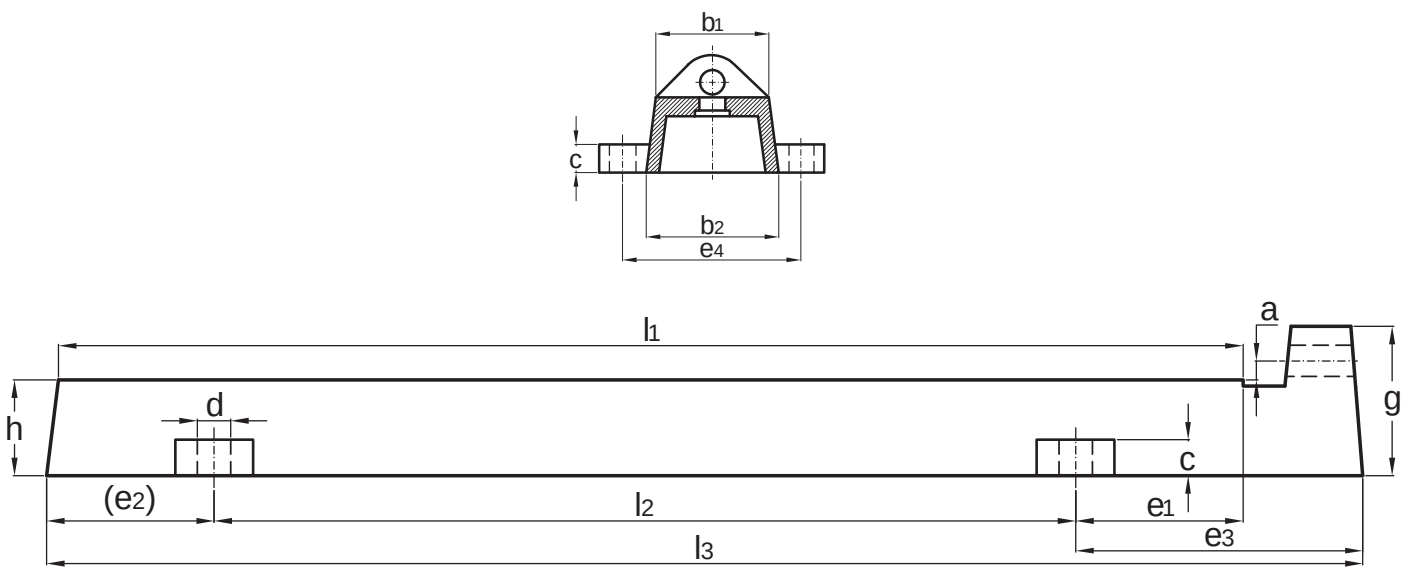
| Motor size | Type     | Article no.<br>3GZV103001- | A   | B  | C    | D    | E  | F  | G  | H   | L   | M   | N  | O  | Xmax | Ymax | Weight/<br>rail kg |
|------------|----------|----------------------------|-----|----|------|------|----|----|----|-----|-----|-----|----|----|------|------|--------------------|
| 160-180    | TT180/12 | -14                        | 75  | 42 | 700  | 630  | 57 | 17 | 26 | M12 | 120 | M12 | 50 | -  | 520  | 580  | 12.0               |
| 200-225    | TT225/16 | -15                        | 82  | 50 | 864  | 800  | 68 | 17 | 27 | M16 | 140 | M16 | 65 | 17 | 670  | 740  | 20.4               |
| 250        | TT280/20 | -16                        | 116 | 70 | 1072 | 1000 | 90 | 20 | 27 | M18 | 150 | M20 | 80 | 20 | 870  | 940  | 43.0               |

# Accessories

## Slide rails for motor sizes 280 - 315

A set of slide rails includes two complete rails with screws for mounting the motor on the rails. Screws for mounting the rails on the foundation are not included. Slide rails have unmachined lower surfaces and should be supported in a suitable manner before tightening down.

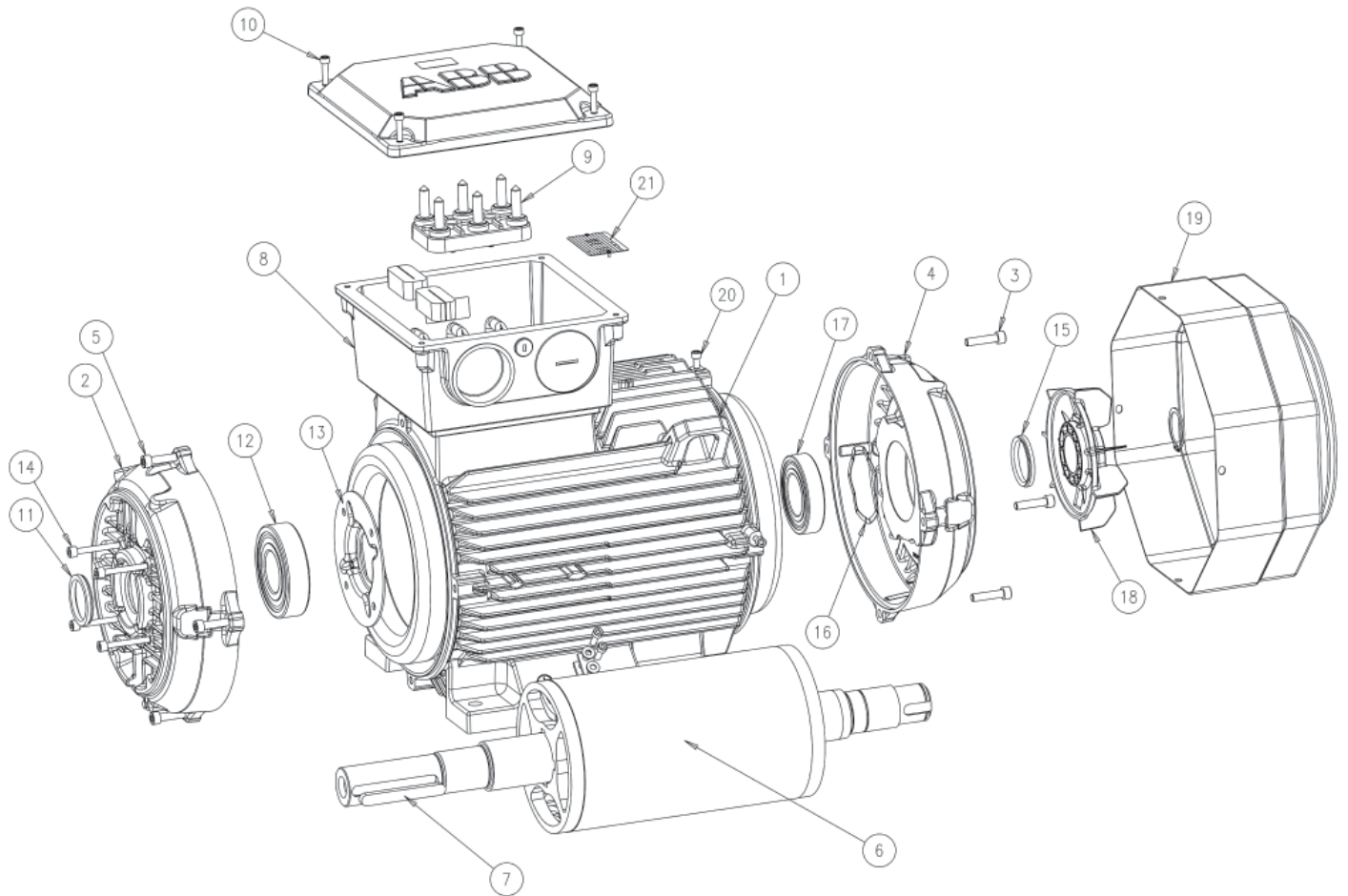
Slide rails can be ordered with article numbers shown in the table.



Note: The drawings are suggestive and do not give all details.

| Motor size | Article no.   | $l_1$ | $l_2$ | $l_3$ | $a$ | $h$ | $b_1$ | $b_2$ | $c$ | $d$ | $e_1$ | $e_2$ | $e_3$ | $e_4$ | Bolts to feet | Horizontal bolts | Weight kg/2 pcs |
|------------|---------------|-------|-------|-------|-----|-----|-------|-------|-----|-----|-------|-------|-------|-------|---------------|------------------|-----------------|
| 280        | 3GZF334730-55 | 800   | 600   | 900   | 16  | 75  | 100   | 120   | 35  | 28  | 100   | 100   | 200   | 165   | M20×90        | M24×300          | 50              |
| 315        | 3GZF334730-56 | 1000  | 720   | 1100  | 16  | 80  | 120   | 140   | 40  | 28  | 140   | 140   | 240   | 190   | M24×100       | M24×300          | 80              |

# Motor construction



|   |                              |    |                               |    |                      |
|---|------------------------------|----|-------------------------------|----|----------------------|
| 1 | Stator frame                 | 8  | Terminal box                  | 15 | Seal, N-end          |
| 2 | End shield, D-end            | 9  | Terminal board                | 16 | Wave spring          |
| 3 | Screws for end shield, N-end | 10 | Screws for terminal box cover | 17 | Bearing, N-end       |
| 4 | End shield, N-end            | 11 | Seal, D-end                   | 18 | Fan                  |
| 5 | Screws for end shield, D-end | 12 | Bearing, D-end                | 19 | Fan cover            |
| 6 | Rotor with shaft             | 13 | Inner bearing cover, D-end    | 20 | Screws for fan cover |
| 7 | Key, D-end                   | 14 | Screws for bearing cover      | 21 | Rating plate         |

# Motors in brief

## IE4 synchronous reluctance motors

| Motor size              |                    | 160                                                                     | 180        | 200        | 225                                           | 250                                        | 280                                                                           | 315                                 |
|-------------------------|--------------------|-------------------------------------------------------------------------|------------|------------|-----------------------------------------------|--------------------------------------------|-------------------------------------------------------------------------------|-------------------------------------|
| Stator and end shields  | Material           | Cast iron                                                               |            |            |                                               |                                            |                                                                               |                                     |
|                         | Paint color shade  | Munsell blue 8B 4.5/3.25                                                |            |            |                                               |                                            |                                                                               |                                     |
|                         | Corrosion class    | C3 (medium) according to ISO/EN 12944-5                                 |            |            |                                               |                                            |                                                                               |                                     |
| Bearings                | D-end              | 6309-2Z/C3                                                              | 6310-2Z/C3 | 6312-2Z/C3 | 6313-2Z/C3                                    | 6315/C3                                    | 6316/C3                                                                       | 6319/C3                             |
|                         | N-end              | 6209-2Z/C3                                                              | 6209-2Z/C3 | 6210-2Z/C3 | 6210-2Z/C3                                    | 6213/C3                                    | 6316/C3                                                                       | 6316/C3*                            |
| Axially locked bearings |                    | Locked at D-end                                                         |            |            |                                               |                                            |                                                                               |                                     |
| Bearing seals           |                    | Axial seal as standard, radial seal on request                          |            |            |                                               |                                            | V-ring or labyrinth seal as standard. See the Bearing seals page for options. |                                     |
| Lubrication             |                    | Permanently lubricated shielded bearings, wide-temperature-range grease |            |            | Regreasable bearings, regreasing nipples M6×1 |                                            | Regreasable bearings, regreasing nipples M10×1                                |                                     |
| Measuring nipples       |                    | SPM as standard                                                         |            |            |                                               |                                            |                                                                               |                                     |
| Rating plate            | Material           | Stainless steel                                                         |            |            |                                               |                                            |                                                                               |                                     |
| Terminal box            | Frame material     | Cast iron                                                               |            |            |                                               |                                            |                                                                               |                                     |
|                         | Corrosion class    | C3 (medium) according to ISO/EN 12944-5                                 |            |            |                                               |                                            |                                                                               |                                     |
|                         | Cover screws       | Zinc-electroplated steel                                                |            |            |                                               |                                            |                                                                               |                                     |
| Connections             | Cable entries      | 2×M63×1.5, 1×M16×1.5**                                                  |            |            |                                               |                                            | 2×M63×1.5, 2×M20×1.5**                                                        |                                     |
|                         | Terminals          | 6 terminals***                                                          |            |            |                                               |                                            |                                                                               |                                     |
|                         | Cable glands       | Cable entries integrated in terminal box                                |            |            |                                               | Flange as standard, cable glands as option |                                                                               | Cable flange and glands as standard |
| Fan                     | Material           | Glass-fiber-reinforced polypropylene                                    |            |            |                                               |                                            |                                                                               |                                     |
| Fan cover               | Material           | Hot-dip-galvanized 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 | 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                                                                   |            |            |                                               |                                            |                                                                               |                                     |
| Cooling method          |                    | IC 411                                                                  |            |            |                                               |                                            |                                                                               |                                     |

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

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



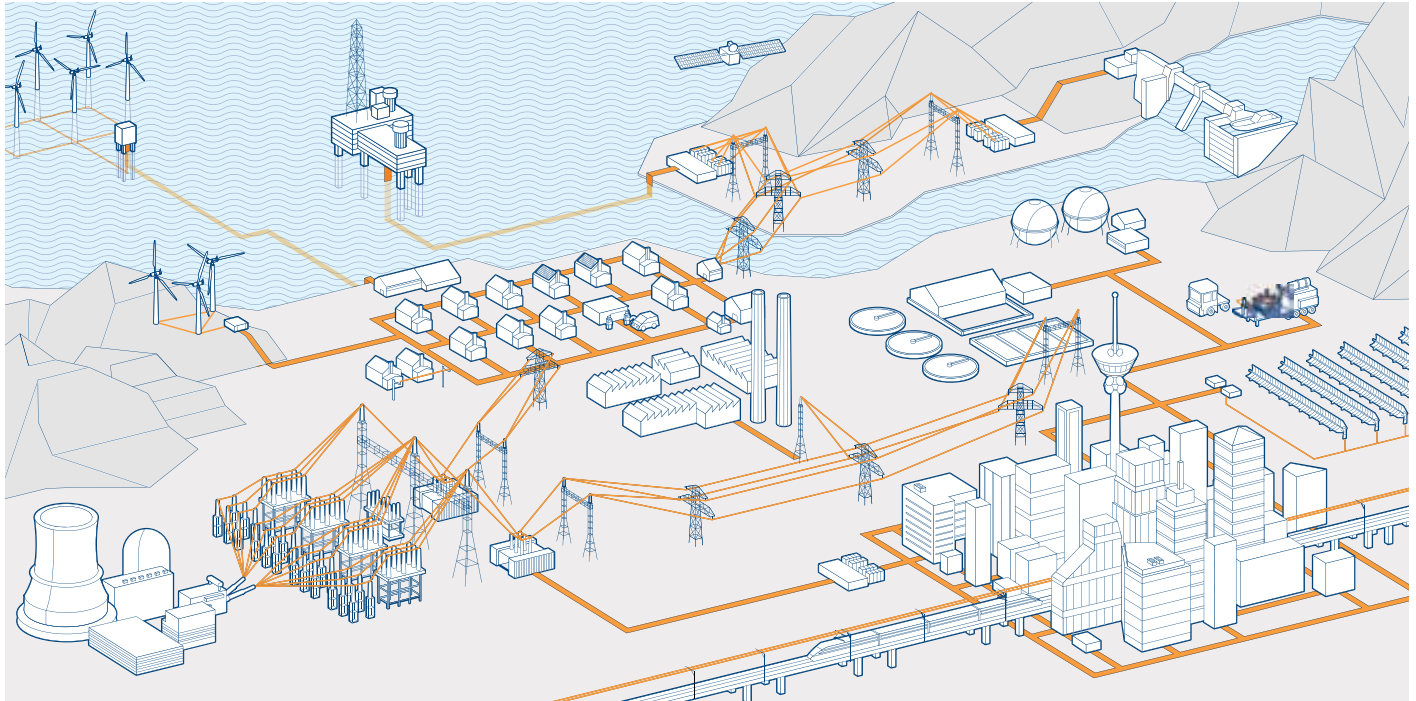
For your notes

For your notes

For your notes

# Total product offering

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



**ABB is the leading manufacturer of low, medium and high voltage motors and generators, and mechanical power transmission products. ABB products are backed by a complete portfolio of services. Our in-depth knowledge of virtually every type of industrial process ensures we always specify the best solution for your needs.**

## > Low and high voltage IEC induction motors

- Process performance motors
- General performance motors
- High voltage cast iron motors
- Induction modular motors
- Slip-ring modular motors
- Synchronous reluctance motors

## > Low and medium voltage NEMA motors

- Steel frame open drip proof (ODP) motors
- Weather protected, water cooled, fan ventilated
- Cast iron frame (TEFC)
- Air to air cooled (TEAAC) motors

## > Motors and generators for explosive atmospheres

- IEC and NEMA motors and generators, for all protection types

## > Synchronous motors

### > Synchronous generators

- Synchronous generators for diesel and gas engines
- Synchronous generators for steam and gas turbines

## > Wind power generators

## > Generators for small hydro

## > Other motors and generators

- Brake motors
- DC motors and generators
- Gear motors
- Marine motors and generators
- Single phase motors
- Motors for high ambient temperatures
- Permanent magnet motors and generators
- High speed motors
- Smoke extraction motors

- Wash down motors
- Water cooled motors
- Generator sets
- Roller table motors
- Low inertia motors
- Traction motors and generators

## > Life cycle services

- Installation and commissioning
- Spares and consumables
- Preventive maintenance
- Predictive maintenance
- Condition monitoring
- On-site and workshop
- Remote troubleshooting
- Technical support
- Engineering and consulting
- Extensions, upgrades and retrofits
- Replacements
- Training
- Service agreements

## > Mechanical power transmission components, bearings, gears

# Life cycle services and support

## From pre-purchase to migration and upgrades

**ABB offers a complete portfolio of services to ensure trouble-free operation and long product lifetimes. These services cover the entire life cycle. Local support is provided through a global network of ABB service centers and certified partners.**

### **Pre-purchase**

ABB's front-end sales organization can help customers to quickly and efficiently select, configure and optimize the right motor or generator for their application.

### **Installation and commissioning**

Professional installation and commissioning by ABB's certified engineers represent an investment in availability and reliability over the entire life cycle.

### **Engineering and consulting**

ABB's experts provide energy efficiency and reliability appraisals, advanced condition and performance assessments and technical studies.

### **Condition monitoring and diagnosis**

Unique services collect and analyze data to provide early warnings of problems before failures can occur. All critical areas of the equipment are covered.

### **Maintenance and field services**

ABB offers life cycle management plans and preventive maintenance products. The recommended four-level maintenance program covers the entire product lifetime.

### **Spare parts**

Spare parts and support are offered throughout the life cycle of ABB products. In addition to individual spares, tailored spare part packages are also available.

### **Repair and refurbishment**

Support for all ABB motors and generators and other brands is provided by ABB's global service organization. Specialist teams can also deliver emergency support.

### **Migration and upgrades**

Life cycle audits determine the optimum upgrades and migration paths. Upgrades range from individual components to direct replacement motors and generators.

### **Training**

Product and service training courses take a practical approach. The training ranges from standard courses to specially tailored programs to suit customer requirements.

### **Specialized support**

Specialized support is offered through ABB's global service organization. Local units provide major and minor repairs as well as overhauls and reconditioning.

### **Service contracts**

Service contracts are tailored to the customer's needs. The contracts combine ABB's entire service portfolio and 120 years of experience to deploy the optimal service practices.



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