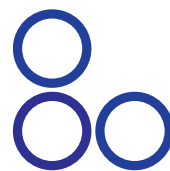


Keeping industry  
turning

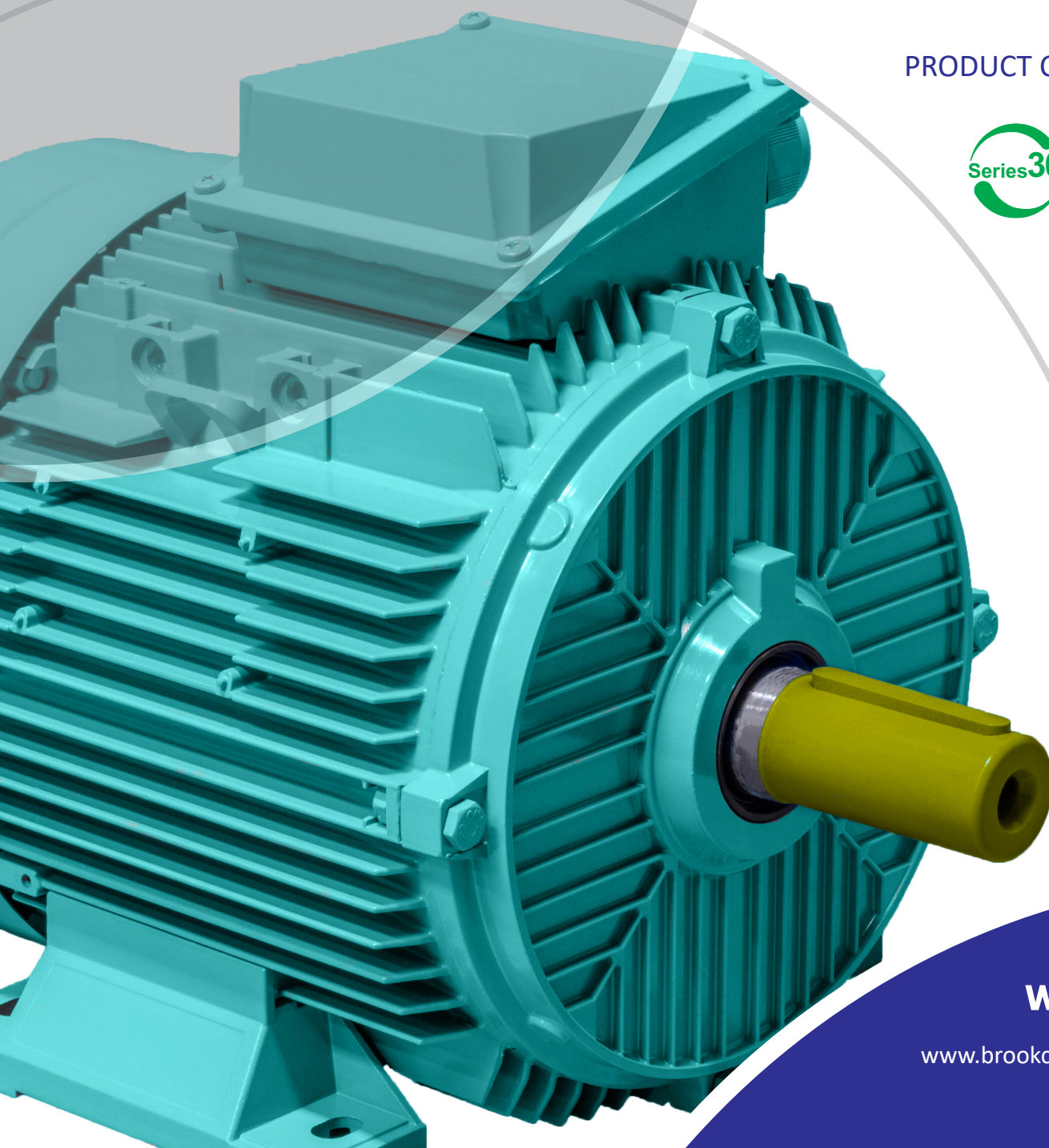
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High efficiency aluminium motors

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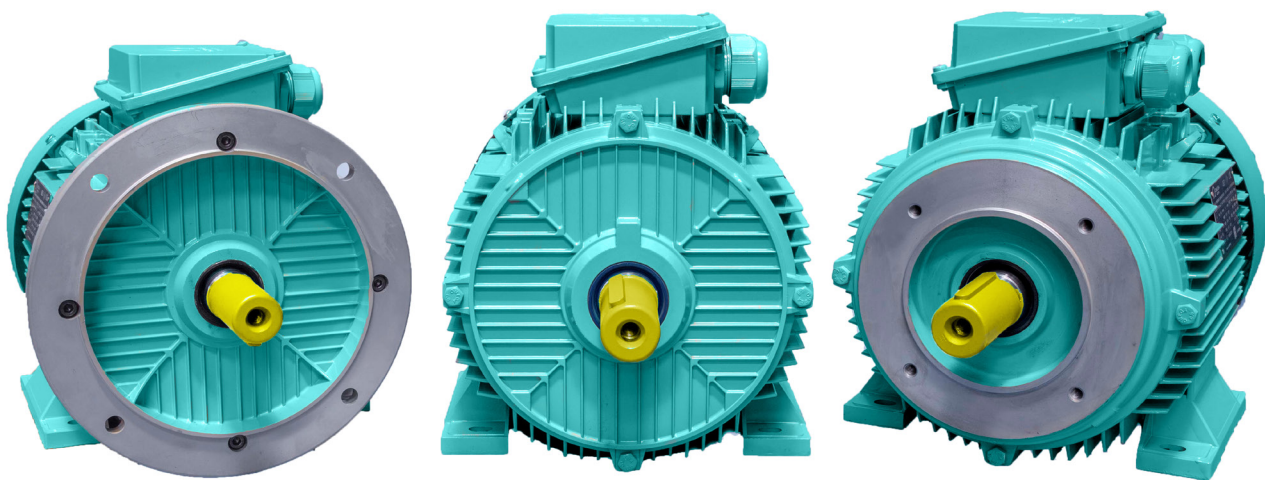
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# STANDARDS

| Standards name | Title                                                                                                                     |
|----------------|---------------------------------------------------------------------------------------------------------------------------|
| IEC 60034-1    | Rating and performance                                                                                                    |
| IEC 60034-2-1  | Standard methods for determining losses and efficiency from tests                                                         |
| IEC 60034-5    | Degrees of protection provided by the integral design of rotating electrical machines (IP Code)                           |
| IEC 60034-6    | Methods of cooling (IC Code)                                                                                              |
| IEC 60034-7    | Classification of types of construction, mounting arrangements and terminal box position (IM Code)                        |
| IEC 60034-8    | Terminal markings and direction of rotation                                                                               |
| IEC 60034-9    | Noise limits                                                                                                              |
| IEC 60034-11   | Thermal protection                                                                                                        |
| IEC 60034-12   | Starting performance of single-speed three-phase cage induction motors                                                    |
| IEC 60034-14   | Measurement, evaluation and limits of vibration severity                                                                  |
| IEC 60034-26   | Effects of unbalanced voltages on the performance of three-phase cage induction motors                                    |
| IEC 60034-30-1 | Efficiency classes of line operated AC motors (IE Code)                                                                   |
| IEC 60034-31   | Selection of energy-efficient motors including variable speed applications - Application guide                            |
| IEC 60038      | Standard voltages                                                                                                         |
| IEC 60072-1    | Dimensions and output series for rotating electrical machines - Frame numbers 56 to 400 and flange numbers 55 to 1080     |
| IEC 60072-2    | Dimensions and output series for rotating electrical machines - Frame numbers 355 to 1000 and flange numbers 1180 to 2360 |
| IEC 60085      | Electrical insulation - Thermal evaluation and designation                                                                |
| IEC 60947-8    | Control units for built-in thermal protection (PTC) for rotating electrical machines                                      |
| EN ISO 1680    | Test code for the measurement of airborne noise emitted by rotating electrical machines                                   |



# ECODESIGN REGULATION (EU) 2019/1781

The previous Ecodesign Regulation [EC] 640/2009 expired on the 30th June 2021. This has now been replaced by Ecodesign Regulation [EU] 2019/1781.

## Stage one

Stage one came into effect on the 1st July 2021. This stage introduced efficiency requirements for motors 0.12 to 0.74kW, which must now meet IE2 efficiency levels. Previously the IE3 efficiency requirement stopped at 375kW, this has now been increased to 1000kW.

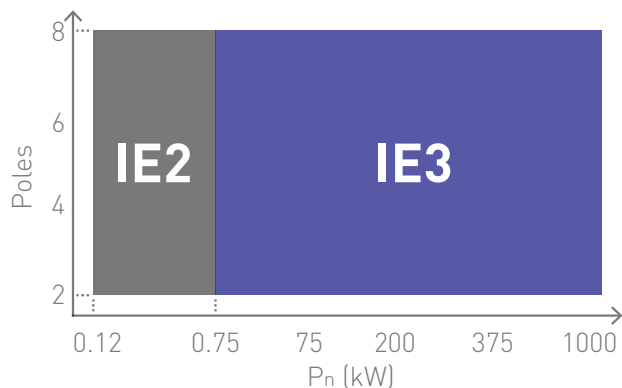
In addition to the efficiency level changes above, the following motor types have been introduced:

- 8 pole speeds
- brake motors
- hazardous area motors: Ex ec, Ex tb, Ex tc, Ex db & Ex dc
- Totally Enclosed Air Over motors
- motors with duty cycles: S1, S3  $\geq$  80%.

Please note: IE2 +VSD is no longer applicable.

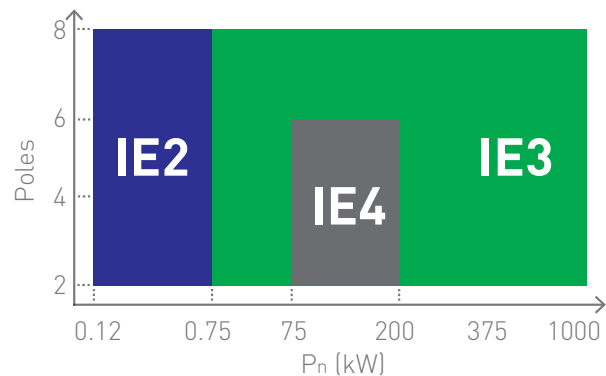
Motors exempt from the new regulation:

- high voltage motors
- mining motors
- Totally Enclosed Non-Ventilated (IC410) motors



## Stage two

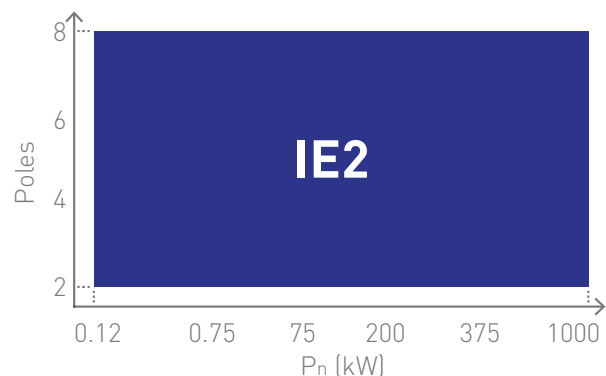
Stage two comes into effect on the 1st July 2023. IE4 is introduced, this will be mandatory for motor outputs 75kW to 200kW in 2, 4 & 6 poles. This is applicable to all the motors listed in stage one.



Stage two also introduces a minimum efficiency value of IE2 for single phase motors and Ex eb (increased safety) motors.

As in stage one, the following motors are exempt:

- high voltage motors
- mining motors
- Totally Enclosed Non-Ventilated (IC410) motors



# Minimum efficiency level at rated output power (P<sub>N</sub>) for each energy efficiency class

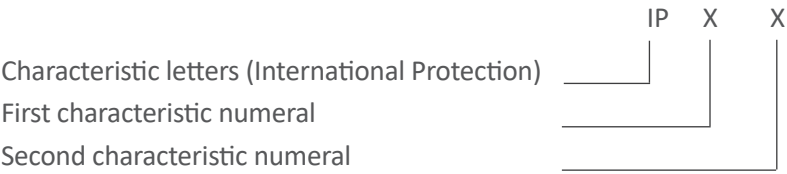
| 50 Hz      |                       |        |        |        |                          |        |        |        |
|------------|-----------------------|--------|--------|--------|--------------------------|--------|--------|--------|
| kW         | IE2 - high efficiency |        |        |        | IE3 - premium efficiency |        |        |        |
|            | 2 pole                | 4 pole | 6 pole | 8 pole | 2 pole                   | 4 pole | 6 pole | 8 pole |
| 0.12       | 53.6                  | 59.1   | 50.6   | 39.8   | 60.8                     | 64.8   | 57.7   | 50.7   |
| 0.18       | 60.4                  | 64.7   | 56.6   | 45.9   | 65.9                     | 69.9   | 63.9   | 58.7   |
| 0.20       | 61.9                  | 65.9   | 58.2   | 47.4   | 67.2                     | 71.1   | 65.4   | 60.6   |
| 0.25       | 64.8                  | 68.5   | 61.6   | 50.6   | 69.7                     | 73.5   | 68.6   | 64.1   |
| 0.37       | 69.5                  | 72.7   | 67.6   | 56.1   | 73.8                     | 77.3   | 73.5   | 69.3   |
| 0.40       | 70.4                  | 73.5   | 68.8   | 57.2   | 74.6                     | 78.0   | 74.4   | 70.1   |
| 0.55       | 74.1                  | 77.1   | 73.1   | 61.7   | 77.8                     | 80.8   | 77.2   | 73.0   |
| 0.75       | 77.4                  | 79.6   | 75.9   | 66.2   | 80.7                     | 82.5   | 78.9   | 75.0   |
| 1.1        | 79.6                  | 81.4   | 78.1   | 70.8   | 82.7                     | 84.1   | 81.0   | 77.7   |
| 1.5        | 81.3                  | 82.8   | 79.8   | 74.1   | 84.2                     | 85.3   | 82.5   | 79.7   |
| 2.2        | 83.2                  | 84.3   | 81.8   | 77.6   | 85.9                     | 86.7   | 84.3   | 81.9   |
| 3.0        | 84.6                  | 85.5   | 83.3   | 80.0   | 87.1                     | 87.7   | 85.6   | 83.5   |
| 4.0        | 85.8                  | 86.6   | 84.6   | 81.9   | 88.1                     | 88.6   | 86.8   | 84.8   |
| 5.5        | 87.0                  | 87.7   | 86.0   | 83.8   | 89.2                     | 89.6   | 88.0   | 86.2   |
| 7.5        | 88.1                  | 88.7   | 87.2   | 85.3   | 90.1                     | 90.4   | 89.1   | 87.3   |
| 11         | 89.4                  | 89.8   | 88.7   | 86.9   | 91.2                     | 91.4   | 90.3   | 88.6   |
| 15         | 90.3                  | 90.6   | 89.7   | 88.0   | 91.9                     | 92.1   | 91.2   | 89.6   |
| 18.5       | 90.9                  | 91.2   | 90.4   | 88.6   | 92.4                     | 92.6   | 91.7   | 90.1   |
| 22         | 91.3                  | 91.6   | 90.9   | 89.1   | 92.7                     | 93.0   | 92.2   | 90.6   |
| 30         | 92.0                  | 92.3   | 91.7   | 89.8   | 93.3                     | 93.6   | 92.9   | 91.3   |
| 37         | 92.5                  | 92.7   | 92.2   | 90.3   | 93.7                     | 93.9   | 93.3   | 91.8   |
| 45         | 92.9                  | 93.1   | 92.7   | 90.7   | 94.0                     | 94.2   | 93.7   | 92.2   |
| 55         | 93.2                  | 93.5   | 93.1   | 91.0   | 94.3                     | 94.6   | 94.1   | 92.5   |
| 75         | 93.8                  | 94.0   | 93.7   | 91.6   | 94.7                     | 95.0   | 94.6   | 93.1   |
| 90         | 94.1                  | 94.2   | 94.0   | 91.9   | 95.0                     | 95.2   | 94.9   | 93.4   |
| 110        | 94.3                  | 94.5   | 94.3   | 92.3   | 95.2                     | 95.4   | 95.1   | 93.7   |
| 132        | 94.6                  | 94.7   | 94.6   | 92.6   | 95.4                     | 95.6   | 95.4   | 94.0   |
| 160        | 94.8                  | 94.9   | 94.8   | 93.0   | 95.6                     | 95.8   | 95.6   | 94.3   |
| 200 - 1000 | 95.0                  | 95.1   | 95.0   | 93.5   | 95.8                     | 96.0   | 95.8   | 94.6   |

| 50 Hz               |        |        |        |        |
|---------------------|--------|--------|--------|--------|
| IE4 - super premium |        |        |        |        |
| kW                  | 2 pole | 4 pole | 6 pole | 8 pole |
| 0.12                | 66,5   | 69.8   | 64.9   | 62.3   |
| 0.18                | 70,8   | 74.7   | 70.1   | 67.2   |
| 0.20                | 71.9   | 75.8   | 71.4   | 68.4   |
| 0.25                | 74.3   | 77.9   | 74.1   | 70.8   |
| 0.37                | 78.1   | 81.1   | 78.0   | 74.3   |
| 0.40                | 78.9   | 81.7   | 78.7   | 74.9   |
| 0.55                | 81.5   | 83.9   | 80.9   | 77.0   |
| 0.75                | 83.5   | 85.7   | 82.7   | 78.4   |
| 1.1                 | 85.2   | 87.2   | 84.5   | 80.8   |
| 1.5                 | 86.5   | 88.2   | 85.9   | 82.6   |
| 2.2                 | 88.0   | 89.5   | 87.4   | 84.5   |
| 3.0                 | 89.1   | 90.4   | 88.6   | 85.9   |
| 4.0                 | 90.0   | 91.1   | 89.5   | 87.1   |
| 5.5                 | 90.9   | 91.9   | 90.5   | 88.3   |
| 7.5                 | 91.7   | 92.6   | 91.3   | 89.3   |
| 11                  | 92.6   | 93.3   | 92.3   | 90.4   |
| 15                  | 93.3   | 93.9   | 92.9   | 91.2   |
| 18.5                | 93.7   | 94.2   | 93.4   | 91.7   |
| 22                  | 94.0   | 94.5   | 93.7   | 92.1   |
| 30                  | 94.5   | 94.9   | 94.2   | 92.7   |
| 37                  | 94.8   | 95.2   | 94.5   | 93.1   |
| 45                  | 95.0   | 95.4   | 94.8   | 93.4   |
| 55                  | 95.3   | 95.7   | 95.1   | 93.7   |
| 75                  | 95.6   | 96.0   | 95.4   | 94.2   |
| 90                  | 95.8   | 96.1   | 95.6   | 94.4   |
| 110                 | 96.0   | 96.3   | 95.8   | 94.7   |
| 132                 | 96.2   | 96.4   | 96.0   | 94.9   |
| 160                 | 96.3   | 96.6   | 96.2   | 95.1   |
| 200 - 249           | 96.5   | 96.7   | 96.3   | 95.4   |
| 250 - 314           | 96.5   | 96.7   | 96.5   | 95.4   |
| 315 - 1000          | 96.5   | 96.7   | 96.6   | 95.4   |

# DEGREES OF PROTECTION

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

## Example of designation

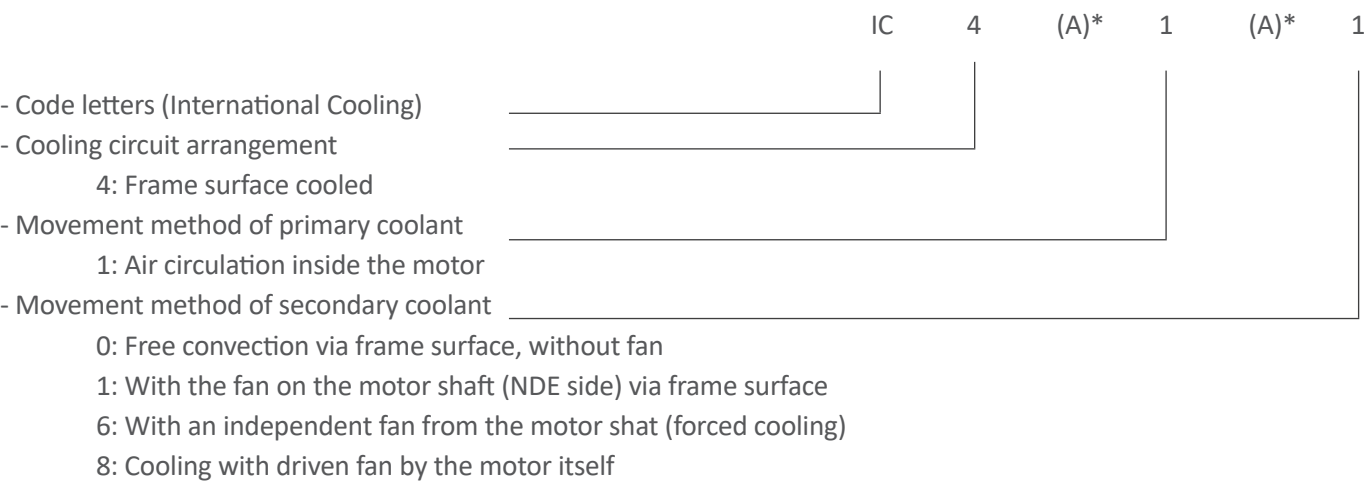


| Motor              | Degree of protection | First numeral                                                 |                                                                                                                                                              | Second numeral                                                                                                            |
|--------------------|----------------------|---------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------|
|                    |                      | Protection against contact                                    | Protection against foreign bodies                                                                                                                            | Protection against water                                                                                                  |
| Surface ventilated | IP55                 | Complete protection against contact with live or moving parts | Dust protected. Ingress of dust is not totally prevented but dust cannot enter in sufficient quantity to interfere with satisfactory operation of the motors | Protected against jets. Water projected by a nozzle against the motor from any direction shall not do any harmful effect. |
|                    | IP56                 |                                                               |                                                                                                                                                              | Protected against water from heavy seas.                                                                                  |
|                    | IP65                 |                                                               | Dust tight. Ingress of dust is totally prevented                                                                                                             | Water projected by a nozzle from any direction.                                                                           |

# COOLING METHOD

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

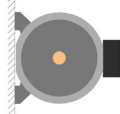
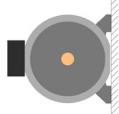
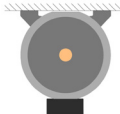
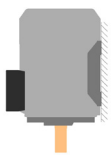
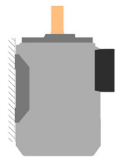
Brief information on the cooling methods, specified in IEC 60034-6, is given below.

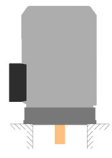
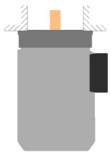
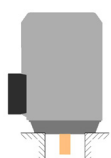
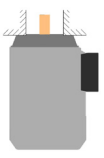


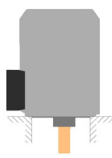
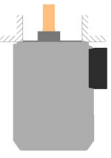
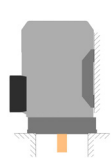
\* (A): This letter indicates the surrounding medium (A for air. W for water). For air cooled motors, A is omitted for simpler designation.

# TYPES OF CONSTRUCTION

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

| Foot mounted motors   |                                                                                   |                                                                                   |                                                                                   |                                                                                    |                                                                                     |                                                                                     |
|-----------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Example sketch        |  |  |  |  |  |  |
| Mounting arrangements | IM B3<br>IM 1001                                                                  | IM B6<br>IM 1051                                                                  | IM B7<br>IM 1061                                                                  | IM B8<br>IM 1071                                                                   | IM V5<br>IM 1011                                                                    | IM V6<br>IM 1031                                                                    |
| Frame size            | 80 - 225                                                                          | 80 - 225                                                                          | 80 - 225                                                                          | 80 - 225                                                                           | 80 - 225                                                                            | 80 - 225                                                                            |

| Flange mounted motors |                                                                                   |                                                                                    |                                                                                    |                                                                                    |                                                                                      |                                                                                      |
|-----------------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| Example sketch        |  |  |  |  |  |  |
| Mounting arrangements | IM B5<br>IM 3001                                                                  | IM V1<br>IM 3011                                                                   | IM V3<br>IM 3031                                                                   | IM B14<br>IM 3601                                                                  | IM V18<br>IM 3611                                                                    | IM V19<br>IM 3631                                                                    |
| Frame size            | 80 - 225                                                                          | 80 - 225                                                                           | 80 - 225                                                                           | 80 - 160                                                                           | 80 - 160                                                                             | 80 - 160                                                                             |

|                       | Motors without foot and endshield at drive end                                      |                                                                                     |                                                                                     | Foot and flange mounted motors                                                       |                                                                                       |                                                                                       |
|-----------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| Example sketch        |  |  |  |  |  |  |
| Mounting arrangements | IM B9<br>IM 9101                                                                    | IM V8<br>IM 9111                                                                    | IM V9<br>IM 9131                                                                    | IM B35<br>IM 2001                                                                    | IM V15<br>IM 2011                                                                     | IM B34<br>IM 2101                                                                     |
| Frame size            | 80 - 225                                                                            | 80 - 225                                                                            | 80 - 225                                                                            | 80 - 225                                                                             | 80 - 225                                                                              | 80 - 160                                                                              |

# LIMITS OF VIBRATION SEVERITY

The permissible vibration severities for electric motors are specified in standard IEC 60034-14. All motors from frame size 80 to 225 already meet or remain below the limit values specified for vibration severity grade A (normal). Vibration severity grade A is the standard version and is valid up to a rated frequency of 60 Hz. Vibration severity grade B can be supplied on request. For converter operation with frequencies higher than 60 Hz, special balancing is required for compliance with the specified limit values.

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

| Vibration grade | Frame size       | 80 ≤ H ≤ 132       |                  |                                  | 132 < H ≤ 225      |                  |                                  |
|-----------------|------------------|--------------------|------------------|----------------------------------|--------------------|------------------|----------------------------------|
|                 |                  | Displacement<br>μm | Velocity<br>mm/s | Acceleration<br>m/s <sup>2</sup> | Displacement<br>μm | Velocity<br>mm/s | Acceleration<br>m/s <sup>2</sup> |
| A               | Free suspension  | 25                 | 1,6              | 2,5                              | 35                 | 2,2              | 3,5                              |
|                 | Rigid suspension | 21                 | 1,3              | 2,0                              | 29                 | 1,8              | 2,8                              |
| B               | Free suspension  | 11                 | 0,7              | 1,1                              | 18                 | 1,1              | 1,7                              |
|                 | Rigid suspension | -                  | -                | -                                | 14                 | 0,9              | 1,4                              |

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

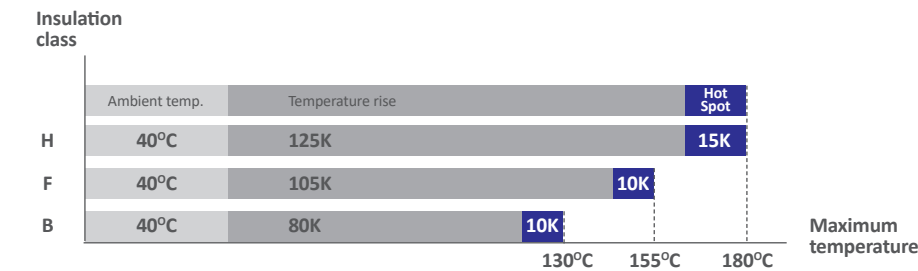
# INSULATION SYSTEM

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

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

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

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



Insulation system in brief;

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

# VARIABLE SPEED DRIVES

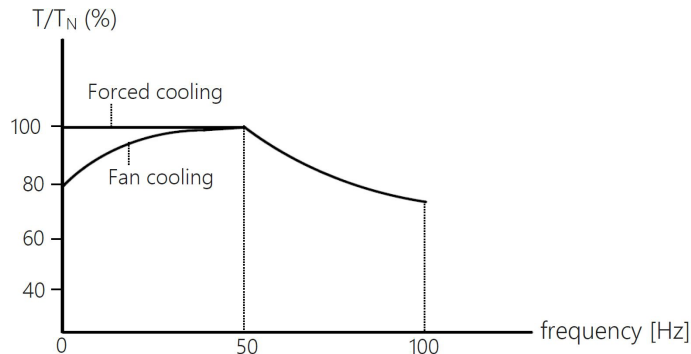
Squirrel cage induction motors used throughout industry offer highly efficient, robust and reliable operation. The performance of motors having constant speed and starting DOL can be further improved when used with a frequency converter. The VSD enables the process to be accurately controlled by adjusting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

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

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

## WINDING INSULATION

The output voltage waveform from a frequency converter is not fully sinusoidal. Further, harmonics will be produced in the inverter. This may affect the motor additional losses and increase the motor temperature rise. In this case, the motor must be correctly sized to compensate for the losses incurred. In addition to thermal dimensioning, an adequate torque margin must be maintained for stabilities which must be at least 30% higher than the load torque. However, standard production of S30 that are IE3 premium and IE4 super premium efficiency motors, may be enough to maintain the torque and output requirements over the whole duty range without the need to oversize the motor as the temperature rise is considerably reduced due to the lower losses.



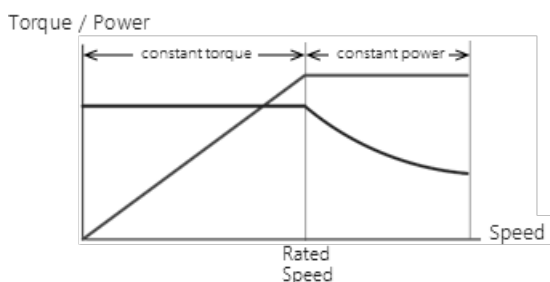
The adjacent figure gives an idea about the thermal capacity of a motor. Mechanical speed limits should be taken into consideration during the operation above nominal speeds.

## COOLING

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

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

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



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

When placing the order, operating conditions must be stipulated.

## BEARING LIFE - LUBRICATION

Bearing temperature varies as a function of motor load and speed, in variable speed applications. The ideal way to determine the bearing life expectancy of permanently lubricated bearings of frame sizes 80 to 225 is best done by measuring the bearing temperature during motor operation. Please note that the lubrication periods and grease amount will be different for variable speed applications than that given in the technical catalogue and motor label.

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

## MECHANICAL SPEED LIMITS

The permissible mechanical speed limits of S30 are given in the following table. The speed limits of the bearings, critical rotor speeds and rigidity of the rotating parts determines the maximum mechanical speeds. Please note that operation at speeds higher than nominal speed may cause higher mechanical vibrations.

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

# TOLERANCES

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

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

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

\* + 25% may be exceeded by agreement

# MECHANICAL DESIGN

## FRAME, ENDSHIELDS AND FLANGES

| Frame size                 | 80        | 90 | 100 | 112 | 132       | 160                    | 180 | 200       | 225 |
|----------------------------|-----------|----|-----|-----|-----------|------------------------|-----|-----------|-----|
| Frame                      | Aluminium |    |     |     |           | Aluminium or cast iron |     |           |     |
| End shields (DE/NDE Sides) | Aluminium |    |     |     |           | Aluminium or cast iron |     | Cast iron |     |
| Flange (B5)                | Aluminium |    |     |     |           | Cast iron              |     |           |     |
| Face (B14)                 | Aluminium |    |     |     | Cast iron |                        | -   |           |     |
| Face (B14B) (up one frame) | Aluminium |    |     |     | Cast iron | -                      |     |           |     |

The motor frames are made of pressure die cast aluminium alloy from frame size 80 to 225. Frame sizes 80 to 112 have removable foot construction where terminal box is located on top. Frame sizes 132 to 225 are multi mount and have removable/bolt-on feet that allows the motor to be left, right or top terminal box mounting position. All removable feet are made of pressure die cast aluminium alloy. Multi mount frame motors are available on top terminal box position as standard. Please enquire if left or right terminal box position is required.

# LIFTING LUGS

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

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

No lifting facility is provided in frame size 80 to 90S. Four lifting lugs integral with aluminium frame are available in frame size 90L to 225. Once feet are bolted onto the frame, two lifting lugs opposite to each other can be used to lift the horizontal motor no matter if the terminal box is on top, right or left position. Furthermore, two optional points are available for fitting eyebolts in aluminium frame motors from frame size 160 to 225 which has to be requested.



# VIBRATION MEASURING POINTS AND NIPPLES

There is one flat area on the drive and non drive end of the motors from frame size 80 to 112, for better placement of accelerometer or vibration tester. Motors of frame size 132 to 225 have four of these flat areas on both ends. Measuring nipples for SPM shock pulse measurement are optionally possible to check the bearings.



# EXTERNAL FINISH

S30 motors are protected with a range of surface finishes as shown below.

| Surface         | Parts                                              | Treatment              |
|-----------------|----------------------------------------------------|------------------------|
| Cast iron       | End shields, housing                               | Shot blasting + Primer |
| Steel           | Fan cover                                          | Zinc galvanized        |
| Aluminium alloy | Housing, end shields, terminal boxes, bearing caps | Shot blasting          |
| Polymer         | Ventilation fans                                   | None                   |

## Paint specification

| Motors                        | Atmosphere                                                         | Applications                                | Corrosivity category<br>Acc. to ISO 12944-2 |
|-------------------------------|--------------------------------------------------------------------|---------------------------------------------|---------------------------------------------|
| 80 to 112<br>Aluminium frame  | Non-harsh and not very harsh<br>(indoors, industrial)              | Solvent-based acrylic paint                 | C3                                          |
| 132 to 225<br>Aluminium frame | Moderately corrosive,<br>humid and outdoors<br>(temperate climate) | 2 pack (water based)<br>Epoxy top coat 50µm | C3                                          |
| 160 to 355<br>Cast iron       |                                                                    |                                             |                                             |

Final paint colour is RAL 5021 with a RAL 9005 fan cowl

# SHAFT EXTENSION

All standard design motors are produced with one shaft extension and fitted with a proper shaft key in accordance with IEC 60072-1. Motors with second standard shaft extension can be delivered upon request with special order code M30. The shaft ends have a 60° centre hole to DIN332, Part 2 with M5 to M24 tapped hole depending on the shaft diameter.

# COOLING

All standard motors are totally enclosed and fan cooled (TEFC)-IC411 as per IEC 60034-6. Motors frame size 80 to 225 have radial flow fan, fitted on the non-drive end shaft of the motor and operate regardless of the direction of rotation. The air flows from the non-drive end (NDE) to drive end (DE) direction. Totally Enclosed Non-Ventilated (TENV) – IC410, Totally Enclosed Air Over (TEAO) – IC418 and Totally Enclosed Forced Ventilated (TEFV) – IC416 versions are also available on request.

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

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

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

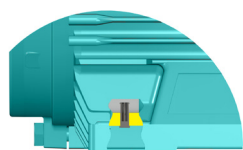
| Frame Size     | 80 | 90 | 100 | 112 | 132 | 160 | 180 | 200 | 225 |
|----------------|----|----|-----|-----|-----|-----|-----|-----|-----|
| Clearance (mm) | 25 |    | 30  |     |     | 45  |     | 60  |     |

## DRAIN HOLES

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

These drain holes are situated underneath of the frame as standard for horizontal mounting arrangement where the terminal box is on top. Condensation drain holes can also be implemented in motors designed for vertical operation (shaft up or down), feet located on side or top provided that it is enquired with the order. Motors with a protection degree of IP55 are delivered with plugs closed. It is advisable to periodically open the drain plugs in order to ensure that the condensed water drains out. When opened, the enclosure degree of protection will reduce to IP44.

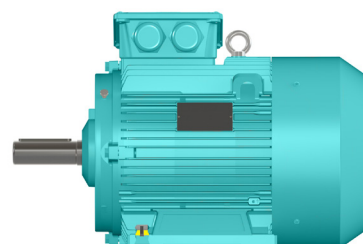
The open and closed positions of drain plugs are illustrated below.



Drain hole  
open position



Drain hole  
closed position



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

## CABLE GLAND

Cable entry to the terminal box is maintained by means of polyamide cable glands produced according to DIN EN 62444 and sealed with IP68 protection degree. Motors from frame size 80 and 90 have one and motors of frame sizes 100 and 112 have two snap-in glands and are fitted on right when viewed from drive end shaft extension. Motors from frame size 132 to 225 have two glands with thread and are fitted on right when viewed from drive end shaft extension.

| Frame size                     | 80      | 90 | 100     | 112 | 132     | 160     | 180 | 200     | 225 |
|--------------------------------|---------|----|---------|-----|---------|---------|-----|---------|-----|
| Cable glands                   | 1 x M25 |    | 2 x M25 |     | 2 x M32 | 2 x M40 |     | 2 x M50 |     |
| Max. Cable Outer Diameter [mm] | Ø18     |    | Ø18     |     | Ø25     | Ø32     |     | Ø39     |     |
| Min. Cable Outer Diameter [mm] | Ø10     |    | Ø10     |     | Ø12     | Ø18     |     | Ø27     |     |

# ANTI-CONDENSATION HEATING ELEMENTS

Heating elements are used to protect the windings of the motor against condensation. The use of anti-condensation heaters are recommended for motors installed in highly humid environments and left idle for long periods or for motors that are subjected to widely fluctuating temperatures. The supply voltage for anti-condensation heaters must be defined by the customer. It can be either 115V or 230V.

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

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

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

| Frame size                      | 80      | 90 | 100 | 112     | 132 | 160 | 180     | 200 | 225 |
|---------------------------------|---------|----|-----|---------|-----|-----|---------|-----|-----|
| No. of heaters and output power | 2 x 20W |    |     | 2 x 30W |     |     | 2 x 40W |     |     |

# TERMINAL BOX

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

From frame size 132 to 225, it is diagonally split for easier access and handling of leads and connections. It allows cable entry from both sides simply by rotating the terminal box 180°.

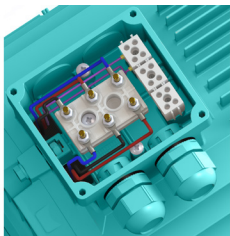
From frame size 80 to 112, the terminal box is integrally cast with the aluminium motor frame. Cable entry is maintained by means of readily fit snap-in cable gland. It also permits cable entry from the opposite side by removing the aluminium knockout.

All motors from frame size 80 to 225 are provided with earth terminal on the frame inside the terminal box.

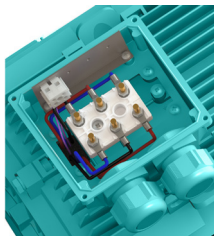
Accessory terminals are assembled on connectors whenever the motor is supplied with thermistors, thermostats, PT100 monitoring sensors or anti-condensation heaters. A M16 cable gland is fitted for the incoming connection leads.

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

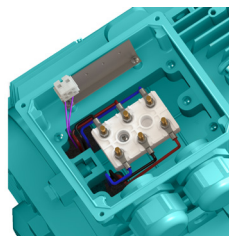
| Frame size    | 80      | 90 | 100 | 112 | 132     | 160     | 180 | 200     | 225 |
|---------------|---------|----|-----|-----|---------|---------|-----|---------|-----|
| Terminal size | M4 x 12 |    |     |     | M5 x 15 | M6 x 24 |     | M8 x 28 |     |



For **80 to 112** frame sizes  
terminal box, terminal and  
cable outputs are shown  
above.



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



For **160 to 225** frame sizes terminal box, terminal and cable outputs are shown above.

## BEARINGS

The standard bearing configuration of S10 is single row deep groove ball bearings. The maximum permissible radial and axial forces are given on pages 21 to 23. Reinforced design with cylindrical roller bearing at DE should be considered in applications where high radial load is available and exceeding the values given for standard design on page 21. Roller bearings are suitable for belt and pulley applications. When high axial loads greater than the values given for standard design on pages 21, 22 and 23 are available, then an angular contact ball bearing should be used. When ordering a motor with an angular contact ball bearing, specify also the method of mounting and the direction and magnitude of axial force.

| Frame size | No. of poles | Standard design<br>Deep groove ball bearing |                             |         | Reinforced design for high radial forces<br>NU bearing at DE |                             |         | Reinforced design for high axial forces<br>Angular contact ball bearing at DE |                             |         |
|------------|--------------|---------------------------------------------|-----------------------------|---------|--------------------------------------------------------------|-----------------------------|---------|-------------------------------------------------------------------------------|-----------------------------|---------|
|            |              | Drive end (DE) bearing                      | Non-drive end (NDE) bearing | Fig no. | Drive end (DE) bearing                                       | Non-drive end (NDE) bearing | Fig no. | Drive end (DE) bearing                                                        | Non-drive end (NDE) bearing | Fig no. |
| 80         | 2 to 8       | 6204 ZZ CM                                  |                             | 1       | -                                                            |                             | -       | -                                                                             |                             | -       |
| 90         | 2 to 8       | 6205 ZZ CM                                  |                             |         | -                                                            |                             |         | -                                                                             |                             |         |
| 100        | 2 to 8       | 6206 ZZ CM                                  |                             |         | -                                                            |                             |         | -                                                                             |                             |         |
| 112        | 2 to 8       | 6206 ZZ CM                                  |                             |         | -                                                            |                             |         | -                                                                             |                             |         |
| 132        | 2 to 8       | 6208 ZZ C3                                  |                             |         | -                                                            |                             |         | -                                                                             |                             |         |
| 160        | 2 to 8       | 6309 ZZ C3                                  | 6209 ZZ C3                  | 2       | NU 309 E / CN                                                | 6309 C3                     | 5       | 6309 C3                                                                       | 7309 B                      | 6       |
| 180        | 2 to 8       | 6310 ZZ C3                                  | 6210 ZZ C3                  |         | NU 310 E / CN                                                | 6310 C3                     |         | 6310 C3                                                                       | 7310 B                      |         |
| 200        | 2 to 8       | 6312 ZZ C3                                  | 6212 ZZ C3                  |         | NU 312 E / CN                                                | 6312 C3                     |         | 6312 C3                                                                       | 7312 B                      |         |
| 225        | 2 to 8       | 6313 ZZ C3                                  | 6213 ZZ C3                  |         | NU 313 E / CN                                                | 6313 C3                     |         | 6313 C3                                                                       | 7313 B                      |         |

# STANDARD DESIGN WITH DEEP GROOVE BALL BEARINGS

From frame size 80 to 225, the motors are fitted with double shielded (ZZ) deep groove ball bearings which are factory grease packed for life.

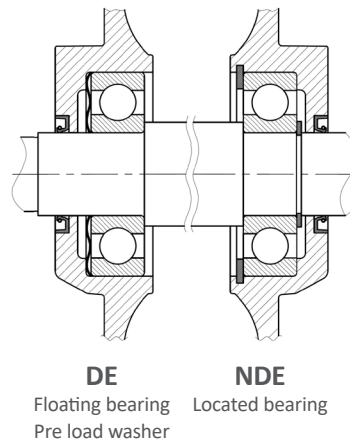
Motors from frame size 80 to 225 have NDE located bearings (see Fig.1). On request, axially-secured located bearing can be supplied on the drive end (DE) complete with a retaining ring to avoid the play of the shaft.

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

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

To compensate for any axial movement of the shaft, the motors are fitted with pre-load washers up to frame size 225 at DE.

**Fig. 1**



# REINFORCED DESIGN WITH NU CYLINDRICAL ROLLER BEARING

Reinforced design with NU cylindrical roller bearing is recommended for belt and pulley application in cases where the permissible radial force values given for standard deep groove ball bearing design on page 21 is not enough.

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

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

## REINFORCED DESIGN WITH ANGULAR CONTACT BALL BEARING

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

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

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

## BEARING LIFETIME AND LUBRICATION

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

The nominal bearing lifetime  $L_{10h}$  as defined in ISO 281 is the life that 90% of a sufficiently large group of apparently identical bearings can be expected to reach or exceed when operating under conventional conditions, i.e. after a stated amount of time 90% of a group of identical bearings will not yet have developed metal fatigue. The majority of bearings last much longer than the nominal lifetime; the average lifetime achieved or exceeded by 50% of bearings is around 5 times longer than the nominal lifetime.

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

The approximate bearing life of four-pole motors at 50 Hz operation with horizontal mounting is about 40,000 hours if there is no additional axial or radial forces when direct coupled to the load and 20,000 hours when utilised according to the maximum admissible loads given on pages 20 to 23. The nominal bearing lifetime is reduced for converter operation at higher frequencies.

## MOTORS WITH BEARINGS GREASED FOR LIFE

Motors in frame size 80 to 225, are fitted with double shielded (ZZ) deep groove ball bearings which are factory grease packed for life. The bearing grease lifetime is matched to the bearing lifetime. This can, however, only be achieved if the motor is operated in accordance with the catalogue specifications.

## MOTORS WITH RELUBRICATION NIPPLES

On request, motors in frame size 160 to 225 can be equipped with greasing nipples. In aluminium frame motors, both DE and NDE end shields will be cast iron if regreasing facility is requested.

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

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

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

### Lubrication intervals for deep groove ball bearing

| Frame size | Grease amount          |                           | Lubrication intervals (hour) |                    |                    |                   |
|------------|------------------------|---------------------------|------------------------------|--------------------|--------------------|-------------------|
|            | Drive end (DE) bearing | Non-drive end NDE bearing | 2 pole<br>3000 rpm           | 4 pole<br>1500 rpm | 6 pole<br>1000 rpm | 8 pole<br>750 rpm |
|            | g                      | g                         | hour                         | hour               | hour               | hour              |
| 160        | 12                     | 12                        | 8500                         | 16000              | 20000              | 22000             |
| 180        | 15                     | 15                        | 7500                         | 15000              | 19000              | 21000             |
| 200        | 20                     | 20                        | 6000                         | 13000              | 17000              | 20000             |
| 225        | 23                     | 23                        | 5000                         | 12000              | 16500              | 19000             |

### Lubrication intervals for roller bearing

| Frame size | Grease amount          |                           | Lubrication intervals (hour) |                    |                    |                   |
|------------|------------------------|---------------------------|------------------------------|--------------------|--------------------|-------------------|
|            | Drive end (DE) bearing | Non-drive end NDE bearing | 2 pole<br>3000 rpm           | 4 pole<br>1500 rpm | 6 pole<br>1000 rpm | 8 pole<br>750 rpm |
|            | g                      | g                         | hour                         | hour               | hour               | hour              |
| 160        | 12                     | 12                        | 3000                         | 8000               | 11000              | 13000             |
| 180        | 15                     | 15                        | 2500                         | 7500               | 10000              | 12000             |
| 200        | 20                     | 20                        | 1900                         | 6000               | 9000               | 11000             |
| 225        | 23                     | 23                        | 1600                         | 5500               | 9000               | 11000             |

# PERMISSIBLE RADIAL FORCES

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

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

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

$F_R$  = radial force in N

$n$  = rated motor speed in rpm

$P$  = rated motor power (transmitted power) in kW

$D$  = pulley diameter in mm

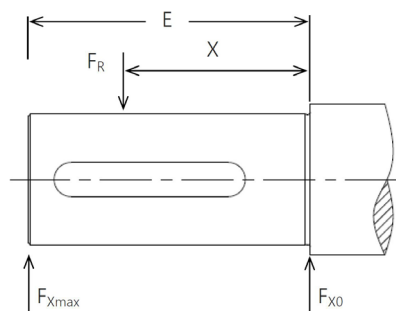
$k$  = belt tension factor, dependent on belt type and type of duty

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

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

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

$$F_R = F_{X0} \cdot \frac{X}{E} \quad F_{X0} - F_{X_{max}}$$



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

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

| Pole number | 2 pole   |           |                      | 4 pole   |           |                      | 6 pole   |           |                      | 8 pole   |           |                      |
|-------------|----------|-----------|----------------------|----------|-----------|----------------------|----------|-----------|----------------------|----------|-----------|----------------------|
| Frame size  | $F_{xo}$ | $F_{max}$ | Shaft extension<br>E | $F_{xo}$ | $F_{max}$ | Shaft extension<br>E | $F_{xo}$ | $F_{max}$ | Shaft extension<br>E | $F_{xo}$ | $F_{max}$ | Shaft extension<br>E |
|             | N        | N         | mm                   | N        | N         | mm                   | N        | N         | mm                   | N        | N         | mm                   |
| 80          | 710      | 588       | 40                   | 893      | 739       | 40                   | -        | -         | -                    | -        | -         | -                    |
| 90          | 792      | 648       | 50                   | 996      | 816       | 50                   | -        | -         | -                    | -        | -         | -                    |
| 100         | 1095     | 877       | 60                   | 1375     | 1101      | 60                   | -        | -         | -                    | -        | -         | -                    |
| 112         | 1094     | 887       | 60                   | 1376     | 1115      | 60                   | -        | -         | -                    | -        | -         | -                    |
| 132         | 1610     | 1275      | 80                   | 2000     | 1580      | 80                   | 2300     | 1820      | 80                   | 2530     | 2000      | 80                   |
| 160         | 3000     | 2400      | 110                  | 3750     | 3000      | 110                  | 4300     | 3440      | 110                  | 4730     | 3785      | 110                  |
| 180         | 3500     | 2840      | 110                  | 4370     | 3540      | 110                  | 5045     | 4090      | 110                  | 5570     | 4515      | 110                  |
| 200         | 4580     | 3820      | 110                  | 5700     | 4750      | 110                  | 6600     | 5500      | 110                  | 7280     | 6070      | 110                  |
| 225         | 5095     | 4270      | 110                  | 6400     | 5145      | 140                  | 7430     | 5970      | 140                  | 8230     | 6610      | 140                  |

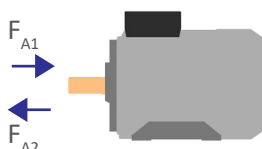
Reinforced design with NU cylindrical roller bearing ( $F_A = 0$ )

| Pole number | 2 pole   |           |                      | 4 pole   |           |                      | 6 pole   |           |                      | 8 pole   |           |                      |
|-------------|----------|-----------|----------------------|----------|-----------|----------------------|----------|-----------|----------------------|----------|-----------|----------------------|
| Frame size  | $F_{xo}$ | $F_{max}$ | Shaft extension<br>E | $F_{xo}$ | $F_{max}$ | Shaft extension<br>E | $F_{xo}$ | $F_{max}$ | Shaft extension<br>E | $F_{xo}$ | $F_{max}$ | Shaft extension<br>E |
|             | N        | N         | mm                   | N        | N         | mm                   | N        | N         | mm                   | N        | N         | mm                   |
| 160         | 7505     | 6000      | 110                  | 9200     | 7360      | 110                  | 10400    | 8315      | 110                  | 11330    | 9060      | 110                  |
| 180         | 8430     | 6830      | 110                  | 10330    | 8370      | 110                  | 11700    | 9485      | 110                  | 12775    | 10350     | 110                  |
| 200         | 11490    | 9580      | 110                  | 14070    | 11730     | 110                  | 15955    | 13300     | 110                  | 17410    | 14515     | 110                  |
| 225         | 13637    | 11437     | 110                  | 16765    | 13470     | 140                  | 19025    | 15280     | 140                  | 20780    | 16700     | 140                  |

# PERMISSIBLE AXIAL FORCES

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

## HORIZONTAL MOUNTING



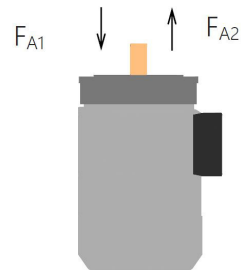
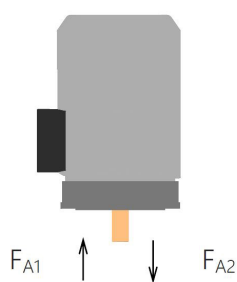
Standard design with deep groove ball bearing

| Pole number | 2 pole    |              |             |           | 4 pole    |              |             |           | 6 pole    |              |             |           | 8 pole    |              |             |           |
|-------------|-----------|--------------|-------------|-----------|-----------|--------------|-------------|-----------|-----------|--------------|-------------|-----------|-----------|--------------|-------------|-----------|
| Frame size  | $F_{A1}$  |              |             | $F_{A2}$  | $F_{A1}$  |              |             | $F_{A2}$  | $F_{A1}$  |              |             | $F_{A2}$  | $F_{A1}$  |              |             | $F_{A2}$  |
|             | $F_R = 0$ | $F_R = \max$ |             | $F_R = 0$ | $F_R = 0$ | $F_R = \max$ |             | $F_R = 0$ | $F_R = 0$ | $F_R = \max$ |             | $F_R = 0$ | $F_R = 0$ | $F_R = \max$ |             | $F_R = 0$ |
|             |           | $F_{x0}$     | $F_{x\max}$ |           |           | $F_{x0}$     | $F_{x\max}$ |           |           | $F_{x0}$     | $F_{x\max}$ |           |           | $F_{x0}$     | $F_{x\max}$ |           |
|             | N         | N            | N           | N         | N         | N            | N           | N         | N         | N            | N           | N         | N         | N            | N           | N         |
| 80          | 390       | 343          | 289         | 150       | 573       | 505          | 431         | 150       | -         | -            | -           | -         | -         | -            | -           | -         |
| 90          | 429       | 385          | 320         | 160       | 626       | 562          | 477         | 160       | -         | -            | -           | -         | -         | -            | -           | -         |
| 100         | 583       | 525          | 421         | 220       | 846       | 764          | 639         | 220       | -         | -            | -           | -         | -         | -            | -           | -         |
| 112         | 580       | 525          | 426         | 220       | 843       | 764          | 645         | 220       | -         | -            | -           | -         | -         | -            | -           | -         |
| 132         | 1050      | 970          | 840         | 1650      | 1475      | 1365         | 1190        | 2075      | 1814      | 1685         | 1465        | 2415      | 2060      | 1920         | 1690        | 2660      |
| 160         | 1155      | 1045         | 800         | 1655      | 1585      | 1435         | 1135        | 2085      | 1935      | 1740         | 1375        | 2435      | 2200      | 2000         | 1575        | 2700      |
| 180         | 1380      | 1260         | 990         | 1900      | 1880      | 1710         | 1380        | 2400      | 2300      | 2090         | 1650        | 2820      | 2625      | 2410         | 1930        | 3145      |
| 200         | 2065      | 1895         | 1595        | 2565      | 2760      | 2545         | 2175        | 3255      | 3340      | 3075         | 2615        | 3840      | 3825      | 3515         | 2980        | 4325      |
| 225         | 2345      | 2140         | 1815        | 2905      | 3160      | 2910         | 2420        | 3720      | 3835      | 3520         | 2915        | 4395      | 4405      | 4035         | 3325        | 4965      |

Reinforced design with NU cylindrical roller bearing

| Pole number | 2 pole    |              |             |           | 4 pole    |              |             |           | 6 pole    |              |             |           | 8 pole    |              |             |           |
|-------------|-----------|--------------|-------------|-----------|-----------|--------------|-------------|-----------|-----------|--------------|-------------|-----------|-----------|--------------|-------------|-----------|
| Frame size  | $F_{A1}$  |              |             | $F_{A2}$  | $F_{A1}$  |              |             | $F_{A2}$  | $F_{A1}$  |              |             | $F_{A2}$  | $F_{A1}$  |              |             | $F_{A2}$  |
|             | $F_R = 0$ | $F_R = \max$ |             | $F_R = 0$ | $F_R = 0$ | $F_R = \max$ |             | $F_R = 0$ | $F_R = 0$ | $F_R = \max$ |             | $F_R = 0$ | $F_R = 0$ | $F_R = \max$ |             | $F_R = 0$ |
|             |           | $F_{x0}$     | $F_{x\max}$ |           |           | $F_{x0}$     | $F_{x\max}$ |           |           | $F_{x0}$     | $F_{x\max}$ |           |           | $F_{x0}$     | $F_{x\max}$ |           |
|             | N         | N            | N           | N         | N         | N            | N           | N         | N         | N            | N           | N         | N         | N            | N           | N         |
| 160         | 2445      | 2165         | 1570        | 2445      | 3210      | 2835         | 2105        | 3210      | 3825      | 3355         | 2790        | 3825      | 4275      | 3805         | 2805        | 4275      |
| 180         | 2830      | 2520         | 1900        | 2830      | 3710      | 3310         | 2540        | 3710      | 4420      | 3930         | 3015        | 4420      | 4980      | 4455         | 3400        | 4980      |
| 200         | 3690      | 3270         | 2535        | 2690      | 4815      | 4295         | 3380        | 4815      | 5735      | 5095         | 4015        | 5735      | 6490      | 5765         | 4525        | 6490      |
| 225         | 4160      | 3625         | 2795        | 4160      | 5460      | 4810         | 3505        | 5460      | 6505      | 5710         | 4215        | 6505      | 7380      | 6470         | 4755        | 7380      |

# VERTICAL MOUNTING



Standard design with deep groove ball bearings

| Frame size | Pole number | Shaft down |            |         |            |            |         | Shaft up   |            |         |            |            |         |
|------------|-------------|------------|------------|---------|------------|------------|---------|------------|------------|---------|------------|------------|---------|
|            |             | $F_{A1}$   |            |         | $F_{A2}$   |            |         | $F_{A1}$   |            |         | $F_{A2}$   |            |         |
|            |             | $F_R=\max$ |            | $F_R=0$ | $F_R=\max$ |            | $F_R=0$ | $F_R=\max$ |            | $F_R=0$ | $F_R=\max$ |            | $F_R=0$ |
|            |             | $F_{x0}$   | $F_{xmax}$ |         | $F_{x0}$   | $F_{xmax}$ |         | $F_{x0}$   | $F_{xmax}$ |         | $F_{x0}$   | $F_{xmax}$ |         |
|            |             | N          | N          |         | N          | N          |         | N          | N          |         | N          | N          |         |
| 80         | 2           | 369        | 316        | 416     | 135        | 135        | 135     | 324        | 271        | 371     | 165        | 165        | 165     |
|            | 4           | 541        | 467        | 609     | 125        | 125        | 125     | 479        | 405        | 547     | 170        | 170        | 170     |
| 90         | 2           | 426        | 362        | 470     | 135        | 135        | 135     | 355        | 291        | 399     | 180        | 180        | 180     |
|            | 4           | 618        | 532        | 683     | 125        | 125        | 125     | 522        | 436        | 587     | 190        | 190        | 190     |
| 100        | 2           | 591        | 489        | 649     | 190        | 190        | 190     | 481        | 379        | 539     | 255        | 255        | 255     |
|            | 4           | 850        | 724        | 933     | 165        | 165        | 165     | 703        | 577        | 786     | 265        | 265        | 265     |
| 112        | 2           | 607        | 509        | 662     | 175        | 175        | 175     | 471        | 373        | 526     | 265        | 265        | 265     |
|            | 4           | 877        | 756        | 957     | 150        | 150        | 150     | 693        | 572        | 773     | 290        | 290        | 290     |
| 132        | 2           | 1120       | 990        | 1200    | 1450       | 1325       | 1530    | 850        | 720        | 930     | 1720       | 1590       | 1800    |
|            | 4           | 1580       | 1405       | 1695    | 1760       | 1585       | 1870    | 1160       | 980        | 1270    | 1580       | 1405       | 2295    |
|            | 6           | 1895       | 1670       | 2015    | 2080       | 1860       | 2205    | 1480       | 1260       | 1605    | 2495       | 2270       | 2615    |
|            | 8           | 2180       | 1960       | 2320    | 2285       | 2070       | 2420    | 1685       | 1465       | 1820    | 2780       | 2560       | 2920    |
| 160        | 2           | 1325       | 1085       | 1440    | 1280       | 1040       | 1390    | 780        | 540        | 890     | 1825       | 1585       | 1940    |
|            | 4           | 1840       | 1535       | 1995    | 1555       | 1250       | 1710    | 1055       | 750        | 1210    | 2340       | 2035       | 2495    |
|            | 6           | 2160       | 1785       | 2355    | 1830       | 1455       | 2025    | 1330       | 955        | 1525    | 2660       | 2285       | 2855    |
|            | 8           | 2470       | 2040       | 2660    | 2040       | 1610       | 2235    | 1540       | 1115       | 1735    | 2970       | 2540       | 3160    |
| 180        | 2           | 1700       | 1430       | 1825    | 1430       | 1160       | 1550    | 910        | 640        | 1030    | 2220       | 1950       | 2350    |
|            | 4           | 2310       | 1970       | 2485    | 1725       | 1390       | 1900    | 1205       | 865        | 1380    | 2830       | 2490       | 3005    |
|            | 6           | 2740       | 2320       | 2960    | 2110       | 1690       | 2330    | 1590       | 1170       | 1810    | 3260       | 2840       | 3480    |
|            | 8           | 3070       | 2595       | 3285    | 2400       | 1925       | 2620    | 1880       | 1405       | 2100    | 3590       | 3115       | 3810    |
| 200        | 2           | 2525       | 2210       | 2680    | 1895       | 1585       | 2050    | 1395       | 1080       | 1550    | 3025       | 2710       | 3180    |
|            | 4           | 3460       | 3080       | 3675    | 2285       | 1900       | 2500    | 1785       | 1405       | 2000    | 3960       | 3580       | 4175    |
|            | 6           | 3960       | 3490       | 4235    | 2840       | 2365       | 3115    | 2340       | 1870       | 2615    | 4460       | 3990       | 4735    |
|            | 8           | 4445       | 3885       | 4720    | 3260       | 2705       | 3535    | 2760       | 2200       | 3035    | 4945       | 4385       | 5220    |
| 225        | 2           | 3055       | 2715       | 3240    | 1930       | 1600       | 2115    | 1370       | 1035       | 1555    | 3615       | 3275       | 3800    |
|            | 4           | 4010       | 3505       | 4265    | 2475       | 1975       | 2730    | 1915       | 1410       | 2170    | 4570       | 4065       | 4825    |
|            | 6           | 4755       | 4125       | 5080    | 3135       | 3510       | 3460    | 2575       | 1950       | 2900    | 5315       | 4685       | 5640    |
|            | 8           | 5300       | 4560       | 5630    | 3660       | 2925       | 3990    | 3100       | 2360       | 3430    | 5860       | 5120       | 6190    |

Reinforced design with NU cylindrical roller bearing

| Frame size | Pole number | Shaft down |             |         |            |             |         | Shaft up   |             |         |            |             |         |
|------------|-------------|------------|-------------|---------|------------|-------------|---------|------------|-------------|---------|------------|-------------|---------|
|            |             | $F_{A1}$   |             |         | $F_{A2}$   |             |         | $F_{A1}$   |             |         | $F_{A2}$   |             |         |
|            |             | $F_R=\max$ |             | $F_R=0$ | $F_R=\max$ |             | $F_R=0$ | $F_R=\max$ |             | $F_R=0$ | $F_R=\max$ |             | $F_R=0$ |
|            |             | $F_{x0}$   | $F_{x\max}$ |         | $F_{x0}$   | $F_{x\max}$ |         | $F_{x0}$   | $F_{x\max}$ |         | $F_{x0}$   | $F_{x\max}$ |         |
|            |             | N          | N           | N       | N          | N           | N       | N          | N           | N       | N          | N           | N       |
| 160        | 2           | 2445       | 1850        | 2725    | 1900       | 1310        | 2185    | 1900       | 1310        | 2185    | 2445       | 1850        | 2725    |
|            | 4           | 3240       | 2515        | 3625    | 2450       | 1730        | 2835    | 2450       | 1730        | 2835    | 3240       | 2515        | 3625    |
|            | 6           | 3775       | 2895        | 4240    | 2940       | 2065        | 3410    | 2940       | 2065        | 3410    | 3775       | 2895        | 4240    |
|            | 8           | 4275       | 3265        | 4735    | 3350       | 2340        | 3810    | 3350       | 2340        | 3810    | 4275       | 3265        | 4735    |
| 180        | 2           | 2970       | 2335        | 3270    | 2180       | 1545        | 2480    | 2180       | 1545        | 2480    | 2970       | 2335        | 3270    |
|            | 4           | 3905       | 3135        | 4310    | 2800       | 2030        | 3205    | 2800       | 2030        | 3205    | 3905       | 3135        | 4310    |
|            | 6           | 4575       | 3645        | 5080    | 3430       | 2495        | 3930    | 3430       | 2495        | 3930    | 4575       | 3645        | 5080    |
|            | 8           | 5135       | 4055        | 5635    | 2870       | 3950        | 4450    | 2870       | 3950        | 4450    | 5135       | 4055        | 5635    |
| 200        | 2           | 3895       | 3145        | 4305    | 2760       | 2015        | 3175    | 2760       | 2015        | 3175    | 3895       | 3145        | 4305    |
|            | 4           | 5205       | 4295        | 5735    | 3530       | 2625        | 4060    | 3530       | 2625        | 4060    | 5205       | 4295        | 5735    |
|            | 6           | 5975       | 4880        | 6630    | 4355       | 3260        | 5005    | 4355       | 3260        | 5005    | 5975       | 4880        | 6630    |
|            | 8           | 6690       | 5420        | 7390    | 5000       | 3730        | 5700    | 5000       | 3730        | 5700    | 6690       | 5420        | 7390    |
| 225        | 2           | 4535       | 3680        | 5055    | 2850       | 2000        | 3370    | 2850       | 2000        | 3370    | 4535       | 3680        | 5055    |
|            | 4           | 5905       | 4605        | 6565    | 3805       | 2505        | 4470    | 3805       | 2505        | 4470    | 5905       | 4605        | 6565    |
|            | 6           | 6930       | 5410        | 7750    | 4755       | 3235        | 5570    | 4755       | 3235        | 5570    | 6930       | 5410        | 7750    |
|            | 8           | 7720       | 5970        | 8610    | 5520       | 3770        | 6410    | 5520       | 3770        | 6410    | 7720       | 5970        | 8610    |

# MOTOR PROTECTION

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

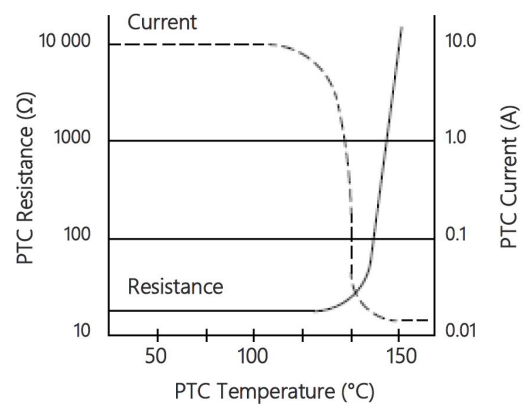
Long-term operating of motor under overload condition, with an unbalanced or low supply voltage, may cause current flow through the stator winding that is more than the nominal value. This in turn will raise the winding temperature over expected and permissible values. To prevent any damage caused by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

## PTC (POSITIVE TEMPERATURE COEFFICIENT) THERMISTORS

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

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

PTC thermistors should be chosen according to motor insulation class.



## VOLTAGE AND FREQUENCY

S30 are designed for a rated supply of 400V and frequency of 50Hz. However, motors for any standard supply from 110V to 690V at frequencies of 50Hz or 60Hz may be supplied on request. Any request different than 400V 50Hz supply should be specified in the order.

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

# PERFORMANCE DATA



Standard 3 phase, squirrel cage induction motors

2 Pole, 3000 rpm; 400 V 50 Hz

IP 55 protection, IC 411 cooling, class F insulation, B temperature rise

IE3: Premium Efficiency Class

Aluminium frame

## Standard motors

| Output power | Motor type | Speed | Current        | Torque         | Power factor | Efficiency |          |          | Starting current ratio          | Starting torque ratio           | Breakdown torque ratio          | Moment of inertia J | Weight B3 |
|--------------|------------|-------|----------------|----------------|--------------|------------|----------|----------|---------------------------------|---------------------------------|---------------------------------|---------------------|-----------|
|              |            | n     | I <sub>N</sub> | T <sub>N</sub> |              | 4/4 Load   | 3/4 Load | 2/4 Load |                                 |                                 |                                 |                     |           |
|              |            | rpm   | A              | Nm             |              | 100%       | 75%      | 50%      |                                 |                                 |                                 |                     |           |
| kW           |            |       |                |                | cosφ         |            |          |          | I <sub>A</sub> / I <sub>N</sub> | M <sub>A</sub> / M <sub>N</sub> | M <sub>K</sub> / M <sub>N</sub> | kgm <sup>2</sup>    | kg        |
| 0,75         | JP-DA80MA  | 2880  | 1,76           | 2,48           | 0,76         | 80,7       | 80,1     | 75,7     | 5,1                             | 2,6                             | 3,3                             | 0,0009              | 9         |
| 1,1          | JP-DA80MB  | 2870  | 2,52           | 3,65           | 0,76         | 82,7       | 82,4     | 78,9     | 5,8                             | 3,0                             | 3,6                             | 0,0011              | 10        |
| 1,5          | JP-DA90S   | 2870  | 3,13           | 4,99           | 0,82         | 84,2       | 84,9     | 83,2     | 6,2                             | 2,7                             | 3,4                             | 0,0018              | 13        |
| 2,2          | JP-DA90L   | 2875  | 4,45           | 7,31           | 0,83         | 85,9       | 86,9     | 85,8     | 7,0                             | 2,8                             | 3,6                             | 0,0022              | 16        |
| 3            | JP-DA100L  | 2900  | 5,77           | 9,87           | 0,86         | 87,1       | 87,8     | 86,8     | 8,0                             | 3,0                             | 3,8                             | 0,0041              | 22        |
| 4            | JP-DA112M  | 2910  | 7,44           | 13,1           | 0,88         | 88,1       | 88,9     | 88,2     | 8,0                             | 3,0                             | 3,8                             | 0,0068              | 28        |
| 5,5          | JP-DA132SA | 2910  | 10,5           | 18,1           | 0,85         | 89,2       | 90,5     | 90,6     | 7,6                             | 2,8                             | 3,6                             | 0,0146              | 43        |
| 7,5          | JP-DA132SB | 2920  | 14,0           | 24,6           | 0,86         | 90,1       | 91,3     | 91,4     | 7,4                             | 3,0                             | 3,7                             | 0,0180              | 49        |
| 11           | JP-DA160MA | 2940  | 19,6           | 35,8           | 0,89         | 91,2       | 90,7     | 91,1     | 7,5                             | 3,0                             | 3,4                             | 0,0385              | 81        |
| 15           | JP-DA160MB | 2940  | 26,5           | 48,8           | 0,89         | 91,9       | 92,8     | 92,7     | 7,1                             | 2,4                             | 3,0                             | 0,0470              | 91        |
| 18,5         | JP-DA160L  | 2940  | 32,1           | 60,1           | 0,90         | 92,4       | 93,3     | 93,3     | 8,3                             | 2,8                             | 3,4                             | 0,0558              | 106       |
| 22           | JP-DA180M  | 2960  | 38,1           | 71,0           | 0,90         | 92,7       | 93,2     | 93,0     | 7,8                             | 2,4                             | 3,3                             | 0,101               | 132       |
| 30           | JP-DA200LA | 2960  | 52,2           | 96,9           | 0,89         | 93,3       | 93,5     | 93,1     | 7,2                             | 2,6                             | 3,1                             | 0,151               | 197       |
| 37           | JP-DA200LB | 2955  | 64,3           | 120            | 0,89         | 93,7       | 94,3     | 94,0     | 7,3                             | 2,7                             | 3,1                             | 0,172               | 212       |
| 45           | JP-DA225M  | 2976  | 75,8           | 144            | 0,91         | 94,0       | 94,2     | 93,6     | 8,4                             | 2,7                             | 3,4                             | 0,309               | 275       |

## Increased output motors

| Output power | Motor type | Speed | Current        | Torque         | Power factor | Efficiency |          |          | Starting current ratio          | Starting torque ratio           | Breakdown torque ratio          | Moment of inertia J | Weight B3 |
|--------------|------------|-------|----------------|----------------|--------------|------------|----------|----------|---------------------------------|---------------------------------|---------------------------------|---------------------|-----------|
|              |            | n     | I <sub>N</sub> | T <sub>N</sub> |              | 4/4 Load   | 3/4 Load | 2/4 Load |                                 |                                 |                                 |                     |           |
|              |            | rpm   | A              | Nm             |              | 100%       | 75%      | 50%      |                                 |                                 |                                 |                     |           |
| kW           |            |       |                |                | cosφ         |            |          |          | I <sub>A</sub> / I <sub>N</sub> | M <sub>A</sub> / M <sub>N</sub> | M <sub>K</sub> / M <sub>N</sub> | kgm <sup>2</sup>    | kg        |
| 1,5          | JP-DA80MK  | 2870  | 3,30           | 5,00           | 0,78         | 84,2       | 84,7     | 82,8     | 6,6                             | 3,4                             | 3,8                             | 0,0012              | 12        |
| 3            | JP-DA90LK  | 2895  | 6,06           | 9,90           | 0,82         | 87,1       | 87,6     | 87,2     | 8,0                             | 3,8                             | 4,1                             | 0,0024              | 18        |
| 4            | JP-DA100LK | 2900  | 7,63           | 13,2           | 0,86         | 88,1       | 88,8     | 88,0     | 7,2                             | 3,2                             | 4,1                             | 0,0048              | 26        |
| 5,5          | JP-DA112MK | 2910  | 9,80           | 18,1           | 0,91         | 89,2       | 90,3     | 90,2     | 8,2                             | 3,2                             | 3,8                             | 0,0089              | 33        |
| 11           | JP-DA132MK | 2910  | 19,8           | 36,1           | 0,88         | 91,2       | 92,6     | 93,1     | 7,9                             | 3,0                             | 3,6                             | 0,0236              | 57        |
| 22           | JP-DA160LK | 2940  | 38,1           | 71,5           | 0,90         | 92,7       | 93,7     | 94,0     | 7,6                             | 2,8                             | 3,2                             | 0,0643              | 125       |
| 30           | JP-DA180MK | 2955  | 52,8           | 97,0           | 0,88         | 93,3       | 93,0     | 92,8     | 8,7                             | 2,9                             | 3,4                             | 0,116               | 155       |
| 45           | JP-DA200LK | 2952  | 77,0           | 146            | 0,90         | 94,0       | 94,6     | 94,5     | 7,5                             | 2,6                             | 3,1                             | 0,224               | 244       |
| 55           | JP-DA225MK | 2972  | 92,6           | 177            | 0,91         | 94,3       | 94,7     | 94,5     | 8,0                             | 2,6                             | 3,4                             | 0,347               | 312       |

# PERFORMANCE DATA



Standard 3 phase, squirrel cage induction motors

4 Pole, 1500 rpm; 400 V 50 Hz

IP 55 protection, IC 411 cooling, class F insulation, B temperature rise

IE3: Premium Efficiency Class

Aluminium frame

## Standard motors

| Output power | Motor type | Speed | Current        | Torque         | Power factor | Efficiency |          |          | Starting current ratio          | Starting torque ratio           | Breakdown torque ratio          | Moment of inertia J | Weight B3 |
|--------------|------------|-------|----------------|----------------|--------------|------------|----------|----------|---------------------------------|---------------------------------|---------------------------------|---------------------|-----------|
|              |            | n     | I <sub>N</sub> | T <sub>N</sub> |              | 4/4 Load   | 3/4 Load | 2/4 Load |                                 |                                 |                                 |                     |           |
|              |            | rpm   | A              | Nm             |              | 100%       | 75%      | 50%      |                                 |                                 |                                 |                     |           |
| kW           |            |       |                |                | cosφ         |            |          |          | I <sub>A</sub> / I <sub>N</sub> | M <sub>A</sub> / M <sub>N</sub> | M <sub>K</sub> / M <sub>N</sub> | kgm <sup>2</sup>    | kg        |
| 0,55         | JP-DA80MA  | 1429  | 1,40           | 3,67           | 0,70         | 80,8       | 80,4     | 76,8     | 5,4                             | 2,8                             | 3,2                             | 0,0017              | 10        |
| 0,75         | JP-DA80MB  | 1430  | 1,87           | 5,00           | 0,70         | 82,5       | 82,2     | 79,0     | 6,0                             | 3,2                             | 3,6                             | 0,0022              | 12        |
| 1,1          | JP-DA90S   | 1439  | 2,59           | 7,31           | 0,73         | 84,1       | 84,2     | 81,8     | 6,6                             | 3,3                             | 3,7                             | 0,0035              | 14        |
| 1,5          | JP-DA90L   | 1438  | 3,34           | 9,96           | 0,76         | 85,3       | 85,7     | 83,8     | 7,2                             | 3,4                             | 3,8                             | 0,0042              | 17        |
| 2,2          | JP-DA100LA | 1444  | 4,83           | 14,6           | 0,76         | 86,7       | 86,6     | 85,2     | 7,0                             | 2,9                             | 3,5                             | 0,0049              | 22        |
| 3            | JP-DA100LB | 1444  | 6,40           | 19,8           | 0,77         | 87,7       | 88,3     | 87,3     | 7,3                             | 3,3                             | 3,7                             | 0,0062              | 25        |
| 4            | JP-DA112M  | 1447  | 8,15           | 26,4           | 0,80         | 88,6       | 89,4     | 88,6     | 7,5                             | 3,2                             | 3,6                             | 0,0124              | 31        |
| 5,5          | JP-DA132S  | 1455  | 11,0           | 36,1           | 0,81         | 89,6       | 90,4     | 90,2     | 6,6                             | 2,7                             | 3,1                             | 0,0279              | 45        |
| 7,5          | JP-DA132M  | 1460  | 15,0           | 49,2           | 0,80         | 90,4       | 91,3     | 90,9     | 7,3                             | 3,0                             | 3,2                             | 0,0361              | 58        |
| 11           | JP-DA160M  | 1466  | 21,2           | 71,7           | 0,82         | 91,4       | 92,4     | 92,2     | 6,9                             | 2,8                             | 3,0                             | 0,0770              | 89        |
| 15           | JP-DA160L  | 1466  | 28,3           | 97,7           | 0,83         | 92,1       | 92,9     | 92,8     | 6,5                             | 2,6                             | 2,8                             | 0,0986              | 111       |
| 18,5         | JP-DA180M  | 1473  | 35,6           | 120            | 0,81         | 92,6       | 93,4     | 93,4     | 7,1                             | 2,8                             | 3,1                             | 0,154               | 134       |
| 22           | JP-DA180L  | 1473  | 42,5           | 142            | 0,80         | 93,0       | 93,8     | 93,9     | 7,2                             | 2,6                             | 3,2                             | 0,177               | 152       |
| 30           | JP-DA200L  | 1477  | 53,2           | 194            | 0,87         | 93,6       | 94,4     | 94,6     | 7,5                             | 2,6                             | 3,1                             | 0,305               | 211       |
| 37           | JP-DA225S  | 1480  | 66,1           | 239            | 0,86         | 93,9       | 94,2     | 93,8     | 7,5                             | 2,6                             | 3,1                             | 0,465               | 260       |
| 45           | JP-DA225M  | 1479  | 81,0           | 290            | 0,85         | 94,2       | 94,7     | 94,7     | 7,6                             | 2,7                             | 3,1                             | 0,537               | 291       |

## Increased output motors

| Output power | Motor type | Speed | Current        | Torque         | Power factor | Efficiency |          |          | Starting current ratio          | Starting torque ratio           | Breakdown torque ratio          | Moment of inertia J | Weight B3 |
|--------------|------------|-------|----------------|----------------|--------------|------------|----------|----------|---------------------------------|---------------------------------|---------------------------------|---------------------|-----------|
|              |            | n     | I <sub>N</sub> | T <sub>N</sub> |              | 4/4 Load   | 3/4 Load | 2/4 Load |                                 |                                 |                                 |                     |           |
|              |            | rpm   | A              | Nm             |              | 100%       | 75%      | 50%      |                                 |                                 |                                 |                     |           |
| kW           |            |       |                |                | cosφ         |            |          |          | I <sub>A</sub> / I <sub>N</sub> | M <sub>A</sub> / M <sub>N</sub> | M <sub>K</sub> / M <sub>N</sub> | kgm <sup>2</sup>    | kg        |
| 10*          | JP-DA132MK | 1462  | 20,6           | 65,4           | 0,77         | 91,2       | 91,9     | 91,4     | 7,5                             | 3,1                             | 3,6                             | 0,0431              | 62        |
| 18,5         | JP-DA160LK | 1475  | 35,2           | 120            | 0,82         | 92,6       | 93,0     | 92,7     | 7,8                             | 2,8                             | 3,4                             | 0,132               | 119       |
| 30           | JP-DA180LK | 1472  | 56,2           | 194            | 0,82         | 93,6       | 93,8     | 93,0     | 7,9                             | 2,6                             | 2,8                             | 0,236               | 185       |
| 37           | JP-DA200LK | 1478  | 64,6           | 239            | 0,88         | 93,9       | 94,7     | 95,0     | 7,5                             | 2,4                             | 2,9                             | 0,360               | 234       |
| 55           | JP-DA225MK | 1478  | 97,5           | 355            | 0,86         | 94,6       | 95,3     | 95,4     | 6,8                             | 2,5                             | 2,9                             | 0,652               | 325       |

\* 132MK4 motor's output power is 10kW and it can be run under 11kW load with 1,10 service factor.

# PERFORMANCE DATA



Standard 3 phase, squirrel cage induction motors

6 Pole, 1000 rpm; 400 V 50 Hz

IP 55 protection, IC 411 cooling, class F insulation, B temperature rise

IE3: Premium Efficiency Class

Aluminium frame

## Standard motors

| Output power | Motor type | Speed | Current        | Torque         | Power factor | Efficiency    |              |              | Starting current ratio          | Starting torque ratio           | Breakdown torque ratio          | Moment of inertia J | Weight B3 |
|--------------|------------|-------|----------------|----------------|--------------|---------------|--------------|--------------|---------------------------------|---------------------------------|---------------------------------|---------------------|-----------|
|              |            | n     | I <sub>N</sub> | T <sub>N</sub> |              | 4/4 Load 100% | 3/4 Load 75% | 2/4 Load 50% |                                 |                                 |                                 |                     |           |
| kW           |            | rpm   | A              | Nm             | cosφ         |               |              |              | I <sub>A</sub> / I <sub>N</sub> | M <sub>A</sub> / M <sub>N</sub> | M <sub>K</sub> / M <sub>N</sub> | kgm <sup>2</sup>    | kg        |
| 3            | JP-DA132S  | 970   | 6,92           | 29,5           | 0,73         | 85,6          | 87,2         | 86,2         | 5,8                             | 2,4                             | 3,1                             | 0,0318              | 37        |
| 4            | JP-DA132MA | 970   | 8,78           | 39,5           | 0,76         | 86,8          | 87,5         | 86,9         | 6,5                             | 2,3                             | 3,4                             | 0,0408              | 46        |
| 5,5          | JP-DA132MB | 972   | 12,2           | 54,1           | 0,74         | 88,0          | 88,7         | 87,9         | 6,6                             | 2,7                             | 3,5                             | 0,0542              | 57        |
| 7,5          | JP-DA160M  | 975   | 16,6           | 73,3           | 0,73         | 89,1          | 89,5         | 88,3         | 6,6                             | 2,2                             | 3,2                             | 0,0784              | 77        |
| 11           | JP-DA160L  | 975   | 22,6           | 108            | 0,78         | 90,3          | 90,9         | 90,2         | 7,0                             | 2,4                             | 3,3                             | 0,114               | 103       |
| 15           | JP-DA180L  | 976   | 30,5           | 147            | 0,78         | 91,2          | 92,1         | 93,2         | 6,1                             | 2,4                             | 3,0                             | 0,181               | 131       |
| 18,5         | JP-DA200LA | 982   | 36,9           | 180            | 0,79         | 91,7          | 92,1         | 91,7         | 6,1                             | 2,4                             | 2,9                             | 0,318               | 177       |
| 22           | JP-DA200LB | 985   | 43,5           | 213            | 0,79         | 92,2          | 92,7         | 92,4         | 7,3                             | 2,7                             | 3,4                             | 0,373               | 199       |
| 30           | JP-DA225M  | 985   | 60,4           | 290            | 0,77         | 92,9          | 93,5         | 93,0         | 7,0                             | 2,6                             | 3,2                             | 0,584               | 263       |

## Increased output motors

| Output power | Motor type | Speed | Current        | Torque         | Power factor | Efficiency    |              |              | Starting current ratio          | Starting torque ratio           | Breakdown torque ratio          | Moment of inertia J | Weight B3 |
|--------------|------------|-------|----------------|----------------|--------------|---------------|--------------|--------------|---------------------------------|---------------------------------|---------------------------------|---------------------|-----------|
|              |            | n     | I <sub>N</sub> | T <sub>N</sub> |              | 4/4 Load 100% | 3/4 Load 75% | 2/4 Load 50% |                                 |                                 |                                 |                     |           |
| kW           |            | rpm   | A              | Nm             | cosφ         |               |              |              | I <sub>A</sub> / I <sub>N</sub> | M <sub>A</sub> / M <sub>N</sub> | M <sub>K</sub> / M <sub>N</sub> | kgm <sup>2</sup>    | kg        |
| 37           | JP-DA225MK | 985   | 72,7           | 360            | 0,79         | 93,3          | 93,6         | 93,4         | 7,0                             | 2,8                             | 3,2                             | 0,706               | 276       |

# PERFORMANCE DATA



Standard 3 phase, squirrel cage induction motors  
IP 55 protection, IC 411 cooling, class F insulation, B temperature rise  
IE3: Premium Efficiency Class

8 Pole, 750 rpm; 400 V 50 Hz

Aluminium frame

## Standard motors

| Output power | Motor type | Speed | Current        | Torque         | Power factor | Efficiency    |              |              | Starting current ratio          | Starting torque ratio           | Breakdown torque ratio          | Moment of inertia J | Weight B3 |
|--------------|------------|-------|----------------|----------------|--------------|---------------|--------------|--------------|---------------------------------|---------------------------------|---------------------------------|---------------------|-----------|
|              |            | n     | I <sub>N</sub> | T <sub>N</sub> |              | 4/4 Load 100% | 3/4 Load 75% | 2/4 Load 50% |                                 |                                 |                                 |                     |           |
| kW           |            | rpm   | A              | Nm             | cosφ         |               |              |              | I <sub>A</sub> / I <sub>N</sub> | M <sub>A</sub> / M <sub>N</sub> | M <sub>K</sub> / M <sub>N</sub> | kgm <sup>2</sup>    | kg        |
| 2,2          | JP-DA132S  | 720   | 5,88           | 29,2           | 0,66         | 81,9          | 81,0         | 78,0         | 5,3                             | 2,0                             | 3,6                             | 0,0460              | 27        |
| 3            | JP-DA132M  | 720   | 7,74           | 39,8           | 0,67         | 83,5          | 83,0         | 81,2         | 5,6                             | 2,1                             | 3,7                             | 0,0556              | 35        |
| 4            | JP-DA160MA | 730   | 9,86           | 52,3           | 0,69         | 84,8          | 85,0         | 84,0         | 5,2                             | 2,0                             | 2,8                             | 0,108               | 58        |
| 5,5          | JP-DA160MB | 730   | 13,3           | 71,8           | 0,69         | 86,2          | 86,5         | 95,8         | 5,4                             | 2,1                             | 3,0                             | 0,126               | 72        |
| 7,5          | JP-DA160L  | 730   | 17,5           | 98,3           | 0,71         | 87,3          | 88,0         | 97,8         | 5,2                             | 2,0                             | 2,8                             | 0,181               | 94        |
| 11           | JP-DA180L  | 728   | 25,5           | 144            | 0,70         | 88,6          | 88,5         | 97,6         | 5,6                             | 2,1                             | 2,8                             | 0,245               | 116       |
| 15           | JP-DA200L  | 732   | 32,3           | 196            | 0,75         | 89,6          | 90,2         | 89,8         | 5,3                             | 2,0                             | 2,5                             | 0,460               | 181       |
| 18,5         | JP-DA225S  | 736   | 38,0           | 240            | 0,78         | 90,1          | 90,5         | 90,2         | 5,8                             | 2,2                             | 2,6                             | 0,705               | 218       |
| 22           | JP-DA225M  | 738   | 45,0           | 285            | 0,78         | 90,6          | 90,8         | 90,0         | 6,0                             | 2,3                             | 2,8                             | 0,837               | 245       |

# PERFORMANCE DATA



Standard 3 phase, squirrel cage induction motors

2 Pole, 3000 rpm; 400 V 50 Hz

IP 55 protection, IC 411 cooling, class F insulation, B temperature rise

IE4: Super Premium Efficiency Class

Aluminium frame

## Standard motors

| Output power | Motor type  | Speed | Current        | Torque         | Power factor | Efficiency    |              |              | Starting current ratio          | Starting torque ratio           | Breakdown torque ratio          | Moment of inertia J | Weight B3 |
|--------------|-------------|-------|----------------|----------------|--------------|---------------|--------------|--------------|---------------------------------|---------------------------------|---------------------------------|---------------------|-----------|
|              |             | n     | I <sub>N</sub> | T <sub>N</sub> |              | 4/4 Load 100% | 3/4 Load 75% | 2/4 Load 50% |                                 |                                 |                                 |                     |           |
| kW           |             | rpm   | A              | Nm             | cosφ         |               |              |              | I <sub>A</sub> / I <sub>N</sub> | M <sub>A</sub> / M <sub>N</sub> | M <sub>K</sub> / M <sub>N</sub> | kgm <sup>2</sup>    | kg        |
| 0,75         | JSP-DA80MA  | 2875  | 1,54           | 2,49           | 0,84         | 83,5          | 84,0         | 83,3         | 7,7                             | 3,6                             | 4,0                             | 0,0010              | 10        |
| 1,1          | JSP-DA80MB  | 2875  | 2,21           | 3,65           | 0,84         | 85,2          | 85,9         | 85,0         | 8,0                             | 3,6                             | 4,0                             | 0,0012              | 11        |
| 1,5          | JSP-DA90S   | 2885  | 2,98           | 4,97           | 0,84         | 86,5          | 87,0         | 86,7         | 8,2                             | 3,8                             | 3,8                             | 0,0019              | 15        |
| 2,2          | JSP-DA90L   | 2890  | 4,25           | 7,27           | 0,85         | 88,0          | 88,5         | 88,1         | 9,3                             | 3,9                             | 4,4                             | 0,0024              | 17        |
| 3            | JSP-DA100L  | 2900  | 5,52           | 9,88           | 0,88         | 89,1          | 89,4         | 88,9         | 9,1                             | 3,3                             | 4,1                             | 0,0048              | 26        |
| 4            | JSP-DA112M  | 2915  | 7,21           | 13,1           | 0,89         | 90,0          | 90,4         | 90,1         | 9,0                             | 3,2                             | 4,0                             | 0,0082              | 32        |
| 5,5          | JSP-DA132SA | 2925  | 10,3           | 18,0           | 0,85         | 90,9          | 91,5         | 90,7         | 7,8                             | 2,9                             | 3,8                             | 0,0166              | 47        |
| 7,5          | JSP-DA132SB | 2925  | 13,8           | 24,6           | 0,86         | 91,7          | 92,6         | 92,5         | 8,2                             | 3,3                             | 3,8                             | 0,0206              | 54        |
| 11           | JSP-DA160MA | 2960  | 19,3           | 35,6           | 0,89         | 92,6          | 92,7         | 91,7         | 8,4                             | 3,2                             | 3,7                             | 0,0496              | 88        |
| 15           | JSP-DA160MB | 2960  | 26,1           | 48,5           | 0,89         | 93,3          | 93,6         | 92,9         | 8,5                             | 3,3                             | 3,7                             | 0,0637              | 104       |
| 18,5         | JSP-DA160L  | 2955  | 31,7           | 59,9           | 0,90         | 93,7          | 94,2         | 93,8         | 8,4                             | 3,1                             | 3,8                             | 0,0753              | 122       |
| 22           | JSP-DA180M  | 2960  | 37,1           | 70,9           | 0,91         | 94,0          | 94,5         | 94,3         | 8,4                             | 3,2                             | 3,5                             | 0,115               | 160       |
| 30           | JSP-DA200LA | 2970  | 51,5           | 96,5           | 0,89         | 94,5          | 94,6         | 93,9         | 8,4                             | 3,1                             | 3,4                             | 0,185               | 223       |
| 37           | JSP-DA200LB | 2970  | 63,3           | 119            | 0,89         | 94,8          | 94,9         | 94,2         | 8,5                             | 3,2                             | 3,5                             | 0,209               | 254       |
| 45           | JSP-DA225M  | 2975  | 74,9           | 144            | 0,91         | 95,0          | 95,3         | 95,0         | 8,3                             | 2,7                             | 3,3                             | 0,349               | 337       |

# PERFORMANCE DATA



Standard 3 phase, squirrel cage induction motors

4 Pole, 1500 rpm; 400 V 50 Hz

IP 55 protection, IC 411 cooling, class F insulation, B temperature rise

IE4: Super Premium Efficiency Class

Aluminium frame

## Standard motors

| Output power | Motor type  | Speed | Current        | Torque         | Power factor | Efficiency    |              |              | Starting current ratio          | Starting torque ratio           | Breakdown torque ratio          | Moment of inertia J | Weight B3 |
|--------------|-------------|-------|----------------|----------------|--------------|---------------|--------------|--------------|---------------------------------|---------------------------------|---------------------------------|---------------------|-----------|
|              |             | n     | I <sub>N</sub> | T <sub>N</sub> |              | 4/4 Load 100% | 3/4 Load 75% | 2/4 Load 50% |                                 |                                 |                                 |                     |           |
| kW           |             | rpm   | A              | Nm             | cosφ         |               |              |              | I <sub>A</sub> / I <sub>N</sub> | M <sub>A</sub> / M <sub>N</sub> | M <sub>K</sub> / M <sub>N</sub> | kgm <sup>2</sup>    | kg        |
| 0,55         | JSP-DA80MA  | 1420  | 1,21           | 3,69           | 0,78         | 83,9          | 84,2         | 83,5         | 6,5                             | 3,7                             | 3,9                             | 0,0019              | 11        |
| 0,75         | JSP-DA80MB  | 1420  | 1,60           | 5,05           | 0,79         | 85,7          | 86,0         | 85,4         | 7,0                             | 4,0                             | 4,1                             | 0,0027              | 14        |
| 1,1          | JSP-DA90S   | 1440  | 2,25           | 7,30           | 0,81         | 87,2          | 87,5         | 86,8         | 8,1                             | 3,9                             | 4,3                             | 0,0046              | 17        |
| 1,5          | JSP-DA90L   | 1440  | 2,95           | 9,93           | 0,83         | 88,2          | 88,5         | 87,7         | 8,2                             | 3,9                             | 4,3                             | 0,0059              | 20        |
| 2,2          | JSP-DA100LA | 1450  | 4,28           | 14,5           | 0,83         | 89,5          | 89,5         | 88,8         | 8,7                             | 3,6                             | 4,4                             | 0,0068              | 26        |
| 3            | JSP-DA100LB | 1450  | 5,65           | 19,8           | 0,85         | 90,4          | 90,8         | 90,0         | 8,8                             | 3,7                             | 4,4                             | 0,0085              | 31        |
| 4            | JSP-DA112M  | 1450  | 7,36           | 26,3           | 0,86         | 91,1          | 91,5         | 90,8         | 8,7                             | 3,3                             | 4,3                             | 0,0159              | 37        |
| 5,5          | JSP-DA132S  | 1470  | 10,8           | 35,8           | 0,80         | 91,9          | 91,7         | 90,2         | 8,2                             | 3,3                             | 3,8                             | 0,0391              | 55        |
| 7,5          | JSP-DA132M  | 1470  | 14,8           | 48,8           | 0,79         | 92,6          | 92,9         | 92,1         | 8,2                             | 3,4                             | 3,8                             | 0,0431              | 62        |
| 11           | JSP-DA160M  | 1475  | 21,0           | 71,2           | 0,81         | 93,3          | 93,1         | 92,4         | 7,5                             | 2,9                             | 3,5                             | 0,112               | 109       |
| 15           | JSP-DA160L  | 1475  | 28,1           | 97,1           | 0,82         | 93,9          | 94,1         | 93,3         | 8,0                             | 3,1                             | 3,5                             | 0,131               | 139       |
| 18,5         | JSP-DA180M  | 1480  | 35,3           | 119            | 0,80         | 94,2          | 94,4         | 93,9         | 8,0                             | 3,3                             | 3,7                             | 0,204               | 167       |
| 22           | JSP-DA180L  | 1480  | 42,0           | 142            | 0,80         | 94,5          | 94,8         | 94,3         | 8,2                             | 3,4                             | 3,8                             | 0,234               | 184       |
| 30           | JSP-DA200L  | 1485  | 52,7           | 194            | 0,87         | 94,9          | 95,1         | 94,6         | 8,0                             | 2,9                             | 3,4                             | 0,358               | 275       |
| 37           | JSP-DA225S  | 1485  | 65,2           | 238            | 0,86         | 95,2          | 95,2         | 94,7         | 8,4                             | 3,3                             | 3,6                             | 0,627               | 319       |
| 45           | JSP-DA225M  | 1485  | 80,3           | 290            | 0,85         | 95,4          | 95,4         | 94,8         | 8,6                             | 3,4                             | 3,7                             | 0,750               | 366       |

# PERFORMANCE DATA



Standard 3 phase, squirrel cage induction motors

6 Pole, 1000 rpm; 400 V 50 Hz

IP 55 protection, IC 411 cooling, class F insulation, B temperature rise

IE4: Super Premium Efficiency Class

Aluminium frame

## Standard motors

| Output power | Motor type  | Speed | Current        | Torque         | Power factor | Efficiency    |              |              | Starting current ratio          | Starting torque ratio           | Breakdown torque ratio          | Moment of inertia J | Weight B3 |
|--------------|-------------|-------|----------------|----------------|--------------|---------------|--------------|--------------|---------------------------------|---------------------------------|---------------------------------|---------------------|-----------|
|              |             | n     | I <sub>N</sub> | T <sub>N</sub> |              | 4/4 Load 100% | 3/4 Load 75% | 2/4 Load 50% |                                 |                                 |                                 |                     |           |
| kW           |             | rpm   | A              | Nm             | cosφ         |               |              |              | I <sub>A</sub> / I <sub>N</sub> | M <sub>A</sub> / M <sub>N</sub> | M <sub>K</sub> / M <sub>N</sub> | kgm <sup>2</sup>    | kg        |
| 3            | JSP-DA132S  | 972   | 6,88           | 29,5           | 0,71         | 88,6          | 88,9         | 87,3         | 6,0                             | 2,4                             | 3,2                             | 0,0331              | 42        |
| 4            | JSP-DA132MA | 975   | 8,60           | 39,2           | 0,75         | 89,5          | 89,5         | 88,7         | 6,2                             | 2,3                             | 2,7                             | 0,0495              | 53        |
| 5,5          | JSP-DA132MB | 975   | 11,7           | 53,9           | 0,75         | 90,5          | 90,4         | 90,0         | 6,4                             | 2,5                             | 2,8                             | 0,0657              | 66        |
| 7,5          | JSP-DA160M  | 975   | 16,2           | 73,2           | 0,73         | 91,3          | 91,3         | 89,7         | 7,3                             | 2,7                             | 3,7                             | 0,100               | 94        |
| 11           | JSP-DA160L  | 980   | 22,3           | 107            | 0,77         | 92,3          | 92,4         | 91,3         | 7,6                             | 2,8                             | 3,8                             | 0,168               | 133       |
| 15           | JSP-DA180L  | 980   | 30,2           | 146            | 0,77         | 92,9          | 92,8         | 92,3         | 7,3                             | 3,0                             | 3,6                             | 0,230               | 164       |
| 18,5         | JSP-DA200LA | 985   | 36,1           | 179            | 0,79         | 93,4          | 93,3         | 92,6         | 7,4                             | 2,5                             | 3,2                             | 0,399               | 200       |
| 22           | JSP-DA200LB | 985   | 42,8           | 213            | 0,79         | 93,7          | 93,6         | 93,2         | 7,6                             | 2,9                             | 3,4                             | 0,473               | 236       |
| 30           | JSP-DA225M  | 986   | 59,4           | 291            | 0,78         | 94,2          | 94,0         | 93,6         | 7,3                             | 3,0                             | 3,4                             | 0,716               | 318       |

# NAMEPLATE

Nominal efficiency values are determined according to IEC 60034-2-1:2014 and efficiency classes are based on IEC 60034-30-1:2014. Label material is aluminium as standard and is located on right hand side (viewed from DE side). Following nameplates are only samples.

|                                            |     |                |         |                        |         |               |        |                                                                                   |                                                                                     |                                                                                   |  |                                                                                                              |  |   |
|--------------------------------------------|-----|----------------|---------|------------------------|---------|---------------|--------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|--|--------------------------------------------------------------------------------------------------------------|--|---|
| ○ <b>BROOK CROMPTON</b><br>HUDDERSFIELD UK |     |                |         | 3 ~ AC MOTOR IEC 60034 |         |               |        |  |                                                                                     |  |  | <br>www.brookcrompton.com |  | ○ |
| TYPE JP-DA100LA1                           |     |                |         |                        |         |               |        | P/No 100J249223                                                                   |                                                                                     |                                                                                   |  |                                                                                                              |  |   |
| S 3                                        |     | Th.Cl. 155 (4) |         | Tamb 50 °C             |         | No 1620009356 |        |                                                                                   |                                                                                     | YR 721                                                                            |  |                                                                                                              |  |   |
| 8V                                         | 9Hz | 10kW           | 11r/min | 12A                    | 13cos φ | η %           | 14     | 0.75                                                                              | 0.5                                                                                 |                                                                                   |  |                                                                                                              |  |   |
| △ 230                                      | 50  | 2.2            | 1440    | 8.61                   | 0.74    | IE3           | 86.7   | 87.3                                                                              | 86.4                                                                                |                                                                                   |  |                                                                                                              |  |   |
| Y 400                                      |     |                | 1440    | 4.95                   | 0.74    |               | 86.7   | 87.3                                                                              | 86.4                                                                                |                                                                                   |  |                                                                                                              |  |   |
| Y 460                                      |     |                | 1725    | 4.17                   | 0.74    |               | 89.5   | 90.1                                                                              | 89.2                                                                                |                                                                                   |  |                                                                                                              |  |   |
| DE                                         |     | 6206 ZZ C15    |         |                        | IP 17   |               | 218 kg |                                                                                   |  |                                                                                   |  |                                                                                                              |  |   |
| NDE                                        |     | 6206 ZZ C16    |         |                        | IC 19   |               |        |                                                                                   |                                                                                     |                                                                                   |  |                                                                                                              |  |   |
| ○                                          |     |                |         |                        |         |               |        |                                                                                   | ○                                                                                   |                                                                                   |  |                                                                                                              |  |   |



Rating plate for frame sizes 80 to 112 is given above.

|                                                                   |     |                        |         |                                    |                   |                                                                                                                                     |                 |
|-------------------------------------------------------------------|-----|------------------------|---------|------------------------------------|-------------------|-------------------------------------------------------------------------------------------------------------------------------------|-----------------|
| <div>○</div> <div><b>BROOK CROMPTON</b><br/>HUDDERSFIELD UK</div> |     | 3 ~ AC MOTOR IEC 60034 |         | <div>CE</div> <div>UK<br/>CA</div> |                   | <div><div>Series30</div><div>www.brookcrompton.com</div></div> <div>○</div>                                                         |                 |
| TYPE JP-DA132SB 1                                                 |     |                        |         |                                    | P/No 132J329203 2 |                                                                                                                                     |                 |
| S 1 3                                                             |     | Th.Cl.155(F) 4         |         | Tamb 5 40 °C                       |                   | No 16181234567 6 YR 7 21                                                                                                            |                 |
| V 8                                                               | Hz9 | kW10                   | r/min11 | A12                                | cos φ13           | η %                                                                                                                                 | 1.0 14 0.75 0.5 |
| △ 400                                                             | 50  | 7.5                    | 2935    | 13.6                               | 0.87              | IE3                                                                                                                                 | 91.7 92.3 92.1  |
| Y 690                                                             |     |                        | 2935    | 7.9                                | 0.87              |                                                                                                                                     | 91.7 92.3 92.1  |
| △ 460                                                             |     |                        | 3522    | 11.8                               | 0.87              |                                                                                                                                     | 91.7 92.3 92.1  |
| DE                                                                |     | 6208 ZZ C3 15          |         | IP 5517                            |                   | 4818 kg                                                                                                                             |                 |
| NDE                                                               |     | 6208 ZZ C3 16          |         | IC 41119                           |                   | <div><div>○</div><div></div><div>○</div></div> |                 |



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

1. Motor type

2. Part number

3. Duty type

4. Thermal class

5. Ambient temperature (max)

6. Serial number

7. Year of manufacture

8. Voltage and connection type
9. Frequency

10. Rated output power

11. Full load speed

12. Full load current

13. Power factor at rated output

14. Efficiency class & efficiency ratings at 1.0x 0.75x 0.5x rated output
15. DE bearing size and type

16. NDE bearing size and type

17. Ingress protection level

18. Motor weight

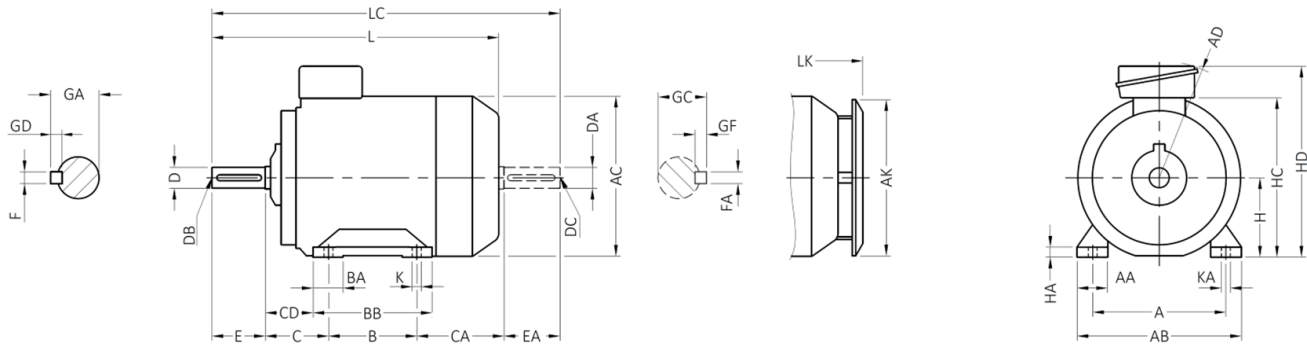
19. Cooling code

# DIMENSION DRAWINGS

80M - 225M  
Aluminium frame

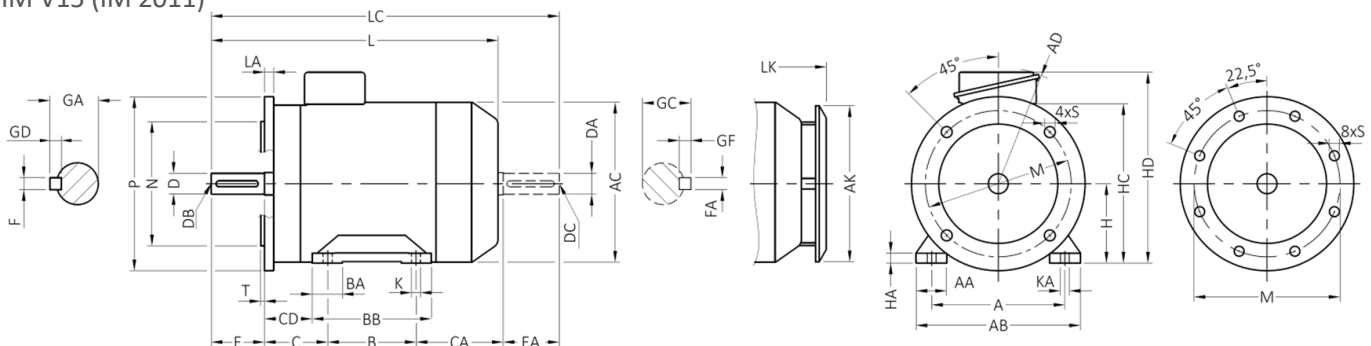
## IM B3 (IM 1001)

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



## IM B35 (IM 2001)

IM V15 (IM 2011)



**80 to 200**  
Frame sizes

**225**  
Frame size

## Tolerances

|              |        |             |
|--------------|--------|-------------|
| <b>D, DA</b> | ISO j6 | 80M - 112M  |
|              | ISO k6 | 132S - 180L |
|              | ISO m6 | 225M        |
| <b>N</b>     | ISO j6 | 80M - 180L  |
|              | ISO h6 | 200L - 225M |
| <b>H</b>     | -0.5   |             |
| <b>F, FA</b> | ISO h6 |             |

- Shoulder of shaft extension and contact surface of flange are in the same plane.

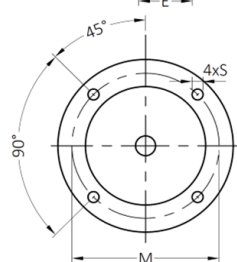
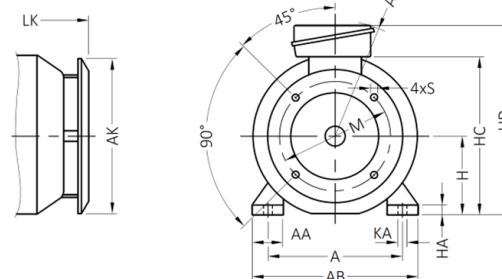
- The unit for all dimensions is mm.

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

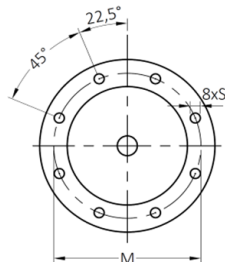
80M - 225M  
Aluminium frame

Technical drawing of a ball bearing showing dimensions and labels. The drawing includes a side view and two end views. The side view shows the outer ring, inner ring, balls, and cage. Dimensions are labeled with letters and numbers. The end views show the balls and cage from the front and back. The labels and dimensions are as follows:

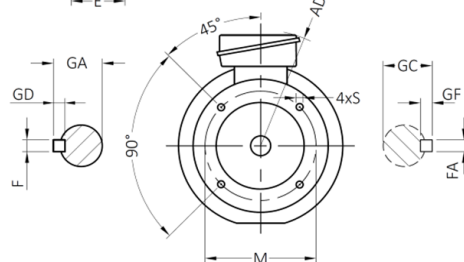
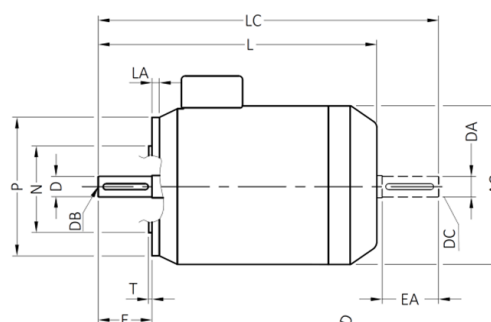
- Labels:** LA, DB, BA, BB, CA, FA, GA, GC, GF, FA, DC, AC, DA, LC, L, P, N, D, T, CD, C, B, CA, FA, GD, F.
- Dimensions:** LA, DB, BA, BB, CA, FA, GA, GC, GF, FA, DC, AC, DA, LC, L, P, N, D, T, CD, C, B, CA, FA, GD, F.



## Frame sizes



Frame size

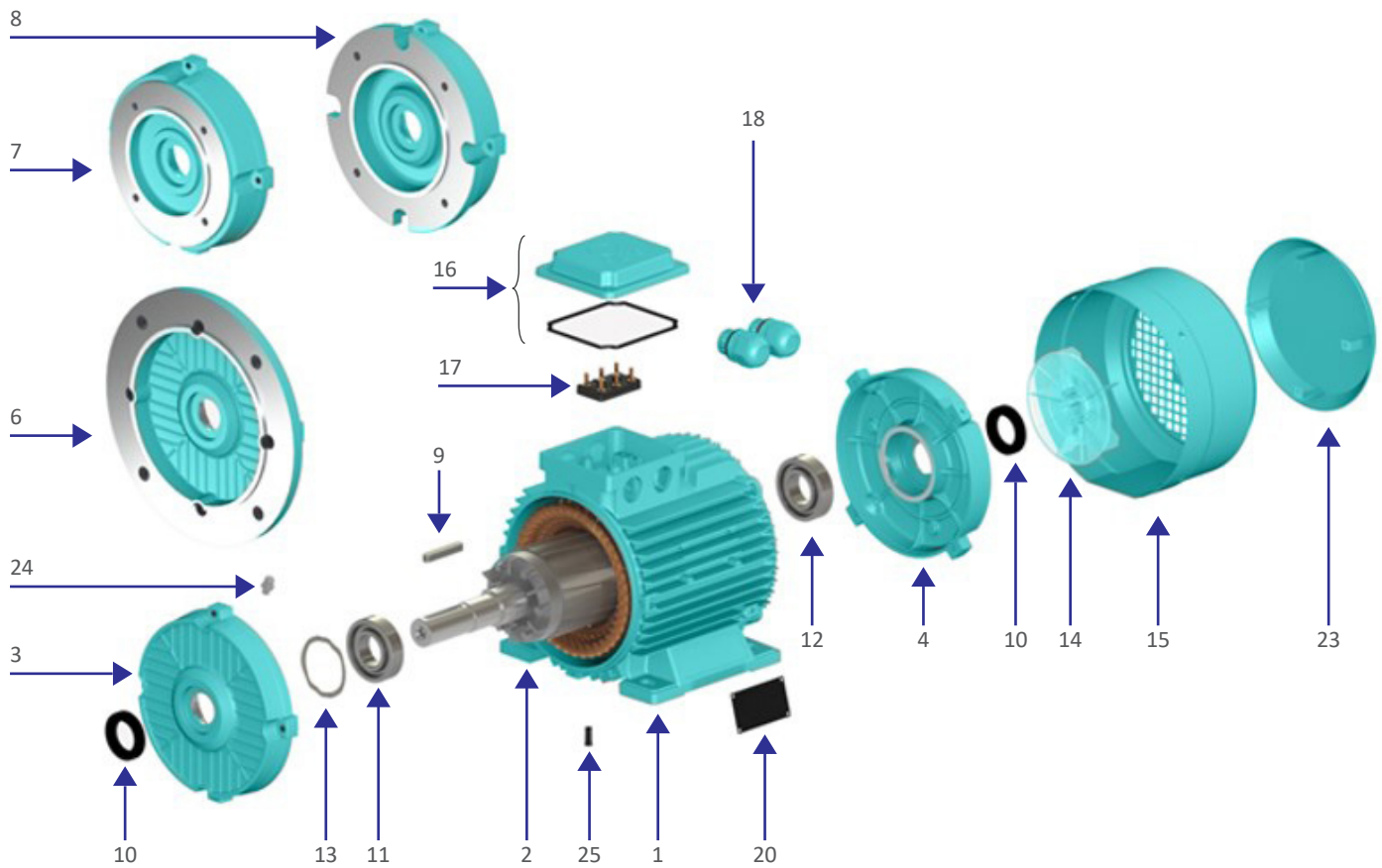


- [illegible]

# SPECIFICATION: IE3 & IE4 MOTORS

80 - 112  
Aluminium frame

| Frame size                    |                    | 80                                                                | 90      | 100     | 112 |
|-------------------------------|--------------------|-------------------------------------------------------------------|---------|---------|-----|
| Frame                         |                    | Pressure die-cast aluminium alloy                                 |         |         |     |
| End shields                   | Material           | Pressure die-cast aluminium alloy                                 |         |         |     |
| Flange (B5)                   | Material           | Pressure die-cast aluminium alloy                                 |         |         |     |
| Face (B14)                    | Material           | Pressure die-cast aluminium alloy                                 |         |         |     |
| Face (B14B) (up one frame)    | Material           | Cast iron GG 20                                                   |         |         |     |
| Feet                          |                    | Integrated, pressure die-cast aluminium feet                      |         |         |     |
| Painting                      | Material           | Solvent-based acrylic paint, RAL 5021                             |         |         |     |
|                               | Corrosion class    | C3; ISO 12944-2:2007                                              |         |         |     |
| Bearings                      | Location           | NDE                                                               |         |         |     |
|                               | DE side            | 6204 ZZ                                                           | 6205 ZZ | 6206 ZZ |     |
|                               | NDE side           | 6204 ZZ                                                           | 6205 ZZ | 6206 ZZ |     |
|                               | Seal               | Radial seals on both DE and NDE sides                             |         |         |     |
| Lubrication                   | Grease             | Sealed for life bearings                                          |         |         |     |
| Vibration measurement nipples | On request         | SPM                                                               |         |         |     |
| Terminal box                  | Materials          | Pressure die-cast aluminium alloy                                 |         |         |     |
|                               | Position           | Top as standard                                                   |         |         |     |
| Cable connections             | Cable glands       | 1 x M25                                                           |         | 2 x M25 |     |
|                               | Terminal           | 6 terminals for connection with cable lugs (lugs not included)    |         |         |     |
| Stator winding                | Material           | Enameled copper wire                                              |         |         |     |
|                               | Insulation         | Insulation class F, temperature rise B                            |         |         |     |
|                               | Winding protection | PTC                                                               |         |         |     |
| Anti-condensation heaters     | On request         | 110v or 240v                                                      |         |         |     |
| Rotor winding                 | Material           | Medium pressure die-cast, pure aluminium                          |         |         |     |
| Shaft                         | Screw hole         | M6                                                                | M8      | M10     |     |
| Vibration                     |                    | Grade A                                                           |         |         |     |
| Balance                       |                    | Half key method                                                   |         |         |     |
| Shaft key                     |                    | Closed profile keyway                                             |         |         |     |
| Rating plate                  | Material           | Aluminium plate; 0,5 mm                                           |         |         |     |
| Earthing                      |                    | One inside the terminal box and one on the frame next to the foot |         |         |     |
| Protection degree             |                    | IP 55 as standard, higher protection on request                   |         |         |     |
| Cooling method                |                    | Totally enclosed, fan cooled - IC 411                             |         |         |     |
| Fan                           | Material           | Polypropylene                                                     |         |         |     |
| Fan cover                     | Material           | Steel                                                             |         |         |     |
| Drain holes                   | Material           | PA 6                                                              |         |         |     |



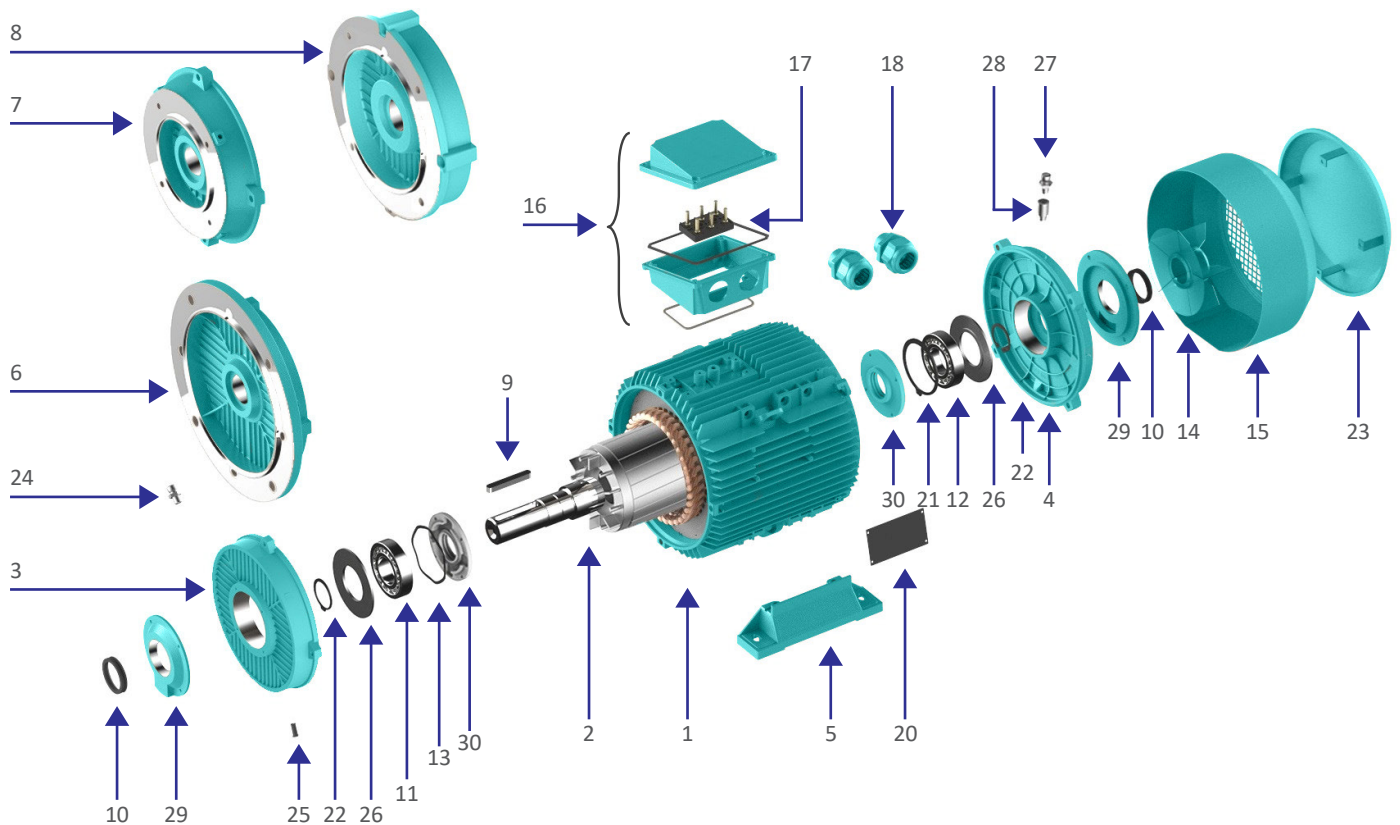
## Standard design motors 80 - 112 frame sizes

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

# MOTORS IN BRIEF: IE3 & IE4 MOTORS

132 - 225  
Aluminium frame

| Frame size                    |                    | 132                                                                                         | 160                              | 180        | 200             | 225        |
|-------------------------------|--------------------|---------------------------------------------------------------------------------------------|----------------------------------|------------|-----------------|------------|
| Frame                         |                    | Pressure die-cast aluminium alloy                                                           |                                  |            |                 |            |
| End shields                   | Material           | Pressure die-cast aluminium alloy                                                           |                                  |            | Cast iron GG 20 |            |
| Flange (B5)                   | Material           | Pressure die-cast aluminium alloy                                                           | Cast iron GG 20                  |            |                 |            |
| Face (B14)                    | Material           | Pressure die-cast aluminium alloy                                                           | Cast iron GG 20                  | ---        |                 |            |
| Face (B14B) (up one frame)    | Material           | Pressure die-cast                                                                           | ---                              |            |                 |            |
| Feet                          |                    | Feet bolted to the frame, pressure die-cast aluminium                                       |                                  |            |                 |            |
| Painting                      | Material           | Water based, RAL 5021                                                                       |                                  |            |                 |            |
|                               | Corrosion class    | C3; ISO 12944-2:2007                                                                        |                                  |            |                 |            |
| Bearings                      | Location           | NDE                                                                                         |                                  |            |                 |            |
|                               | DE side            | 6208 ZZ C3                                                                                  | 6309 ZZ C3                       | 6310 ZZ C3 | 6312 ZZ C3      | 6313 ZZ C3 |
|                               | NDE side           | 6208 ZZ C3                                                                                  | 6209 ZZ C3                       | 6210 ZZ C3 | 6212 ZZ C3      | 6213 ZZ C3 |
|                               | Seal               | Radial seals on both DE and NDE sides                                                       |                                  |            |                 |            |
| Lubrication                   | Grease             | Sealed for life bearings                                                                    |                                  |            |                 |            |
|                               | Relubrication      | -                                                                                           | M8x1 greasing nipples on request |            |                 |            |
| Vibration measurement nipples | On request         | SPM                                                                                         |                                  |            |                 |            |
| Terminal box                  | Material           | Pressure die-cast aluminium alloy                                                           |                                  |            |                 |            |
|                               | Position           | Top as standard, changeable to LHS and RHS positions by simply bolting the feet accordingly |                                  |            |                 |            |
| Cable connections             | Cable glands       | 2 x M32                                                                                     | 2 x M40                          |            | 2 x M50         |            |
|                               | Terminal           | 6 terminals for connection with cable lugs (lugs not included)                              |                                  |            |                 |            |
| Stator winding                | Material           | Enameled copper wire                                                                        |                                  |            |                 |            |
|                               | Insulation         | Insulation class F, Temperature rise B                                                      |                                  |            |                 |            |
|                               | Winding protection | PTC (thermistors)                                                                           |                                  |            |                 |            |
| Anti-condensation heaters     | On request         | 110v or 240v                                                                                |                                  |            |                 |            |
| Rotor winding                 | Material           | Medium pressure die-cast, pure aluminium                                                    |                                  |            |                 |            |
| Shaft                         | Screw hole         | M12                                                                                         | M16                              |            | M20             |            |
| Vibration                     |                    | Grade A                                                                                     |                                  |            |                 |            |
| Balance                       |                    | Half key method                                                                             |                                  |            |                 |            |
| Shaft key                     |                    | Closed profile keyway                                                                       |                                  |            |                 |            |
| Rating plate                  | Material           | Aluminium plate; 0,5 mm                                                                     |                                  |            |                 |            |
| Earthing                      |                    | One inside the terminal box and one on the frame next to the foot                           |                                  |            |                 |            |
| Protection degree             |                    | IP 55 as standard, higher protection on request                                             |                                  |            |                 |            |
| Cooling method                |                    | Totally enclosed, fan cooled - IC 411                                                       |                                  |            |                 |            |
| Fan                           | Material           | Polypropylene                                                                               |                                  |            |                 |            |
| Fan cover                     | Material           | Steel                                                                                       |                                  |            |                 |            |
| Drain holes                   | Material           | PA 6                                                                                        |                                  |            |                 |            |



## Standard design motors

### 132 - 225 frame sizes

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

## Motors with greasing nipples

### 160 - 225 frame sizes

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

## NOTES

# NOTES



## Contact

### Asia

**Brook Crompton Asia Pacific Pte Ltd**  
19 Keppel Road #08-01, Jit Poh Building  
Singapore 089058  
T: +65 6227 0308  
F: +65 6227 0605  
E: [marketing@brookcrompton-ap.com](mailto:marketing@brookcrompton-ap.com)  
[www.brookcrompton.com](http://www.brookcrompton.com)

**Brook Crompton Australia Pty Ltd**  
4 Corymbia Street, Croudace Bay  
NSW, 2280  
Australia  
T: +61 (02) 4946 1108  
E: [australia@brookcrompton.com](mailto:australia@brookcrompton.com)  
[www.brookcrompton.com](http://www.brookcrompton.com)

### Europe

**Brook Crompton UK Ltd**  
St. Thomas' Road  
Huddersfield, HD1 3LJ, UK  
T: +44 (0)1484 557200  
F: +44 (0)1484 557201  
E: [sales@brookcrompton.com](mailto:sales@brookcrompton.com)  
[www.brookcrompton.com](http://www.brookcrompton.com)

**Brook Crompton UK LTD -  
Sede secondaria in Italia**  
Via De Chirico, 9/11  
42124 – Reggio Emilia (RE)  
T: +39 0522 345055  
E: [italy@brookcrompton.com](mailto:italy@brookcrompton.com)  
[www.brookcrompton.com](http://www.brookcrompton.com)

### Americas

**Brook Crompton Inc**  
1100 E. 222nd Street  
Euclid, Ohio 44117, USA  
T: +1 800 668 6779  
T: +1 - 800 463 8917  
E: [sales@brookcromptonna.com](mailto:sales@brookcromptonna.com)  
[www.brookcromptonna.com](http://www.brookcromptonna.com)

**Brook Crompton Ltd**  
264 Attwell Drive  
Toronto, Ontario, M9W 5B2, Canada  
T: + 416 675 3844 (Toronto)  
T: +1 888 668 9843 (Quebec)  
E: [sales@brookcromptonna.com](mailto:sales@brookcromptonna.com)  
[www.brookcromptonna.com](http://www.brookcromptonna.com)