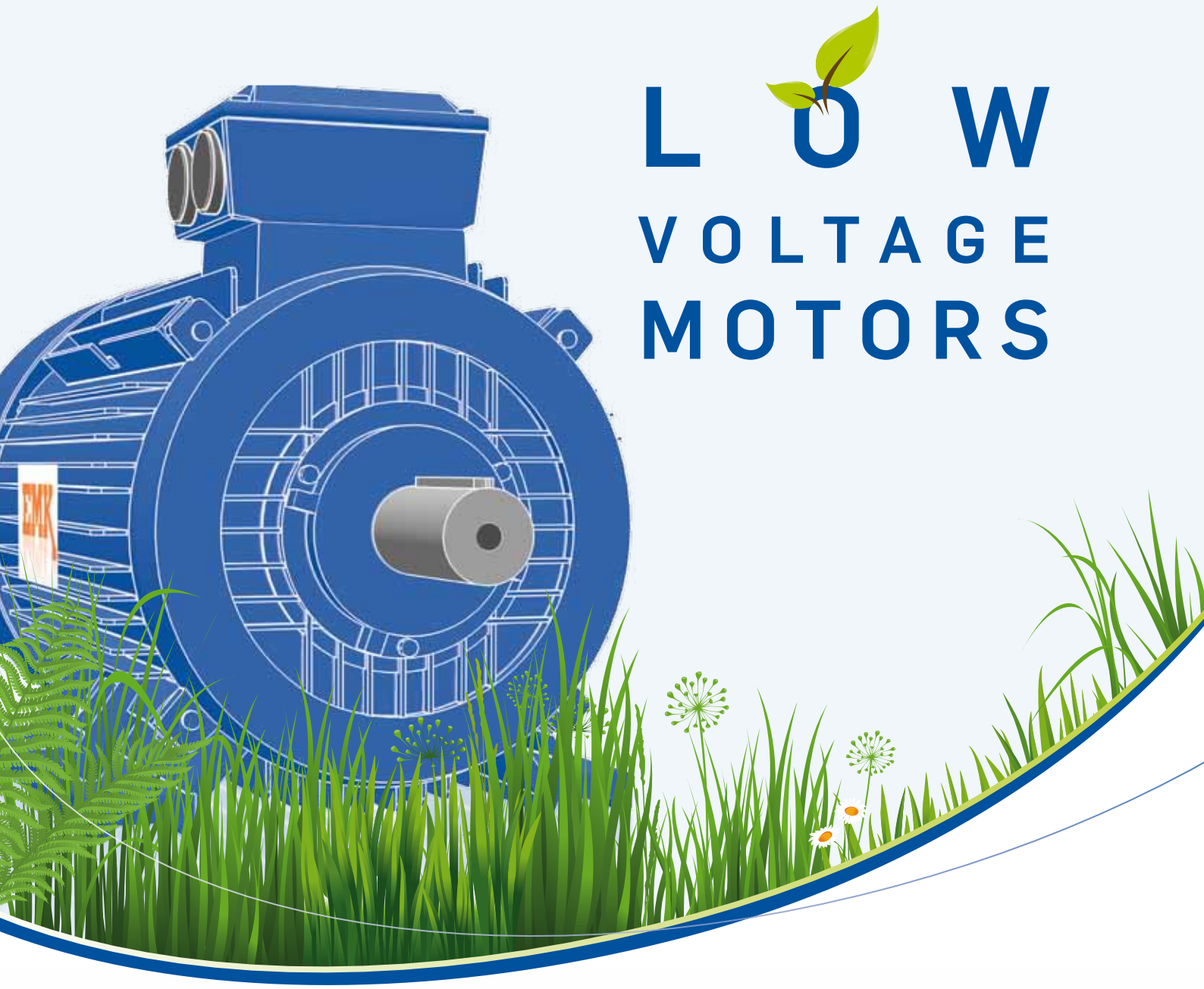
EMZ



LOW VOLTAGE MOTORS

- IE2 three-phase motors *up to 375 kW*
- Energy-saving motors *up to 1.000 kW*
- Single-phase AC motors *up to 2.2 kW*
- Slip-ring rotors *up to 400 kW*

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ABOUT EMZ

We are EMZ

EMZ stand for top quality at fair prices and this is what we have been proving to our customers for the last 60 years. With the combination of excellent quality, reliable products and a highly-skilled service network, we have established ourselves successfully in the market. We are a growing, medium-sized enterprise in the field of electric drives. Our 70 qualified employees provide support to ensure the smooth execution of your projects. Thanks to our wide product range and a high availability of stock, we are a competent partner at your side.

Product range:

- → Electrical motors
- → Geared motors
- → Power electronics
- → Transformers

Services:

- → Competent consultation
- → 24-hour emergency service
- → Repairs
- → Maintenance

Satisfaction is proof!

Approximately 2,000 renowned customers choose products and services from EMZ every year.

WHY EMK MOTORS?

Quality

The EMK motor is a patented brand product of Elektro-Maschinen-Zentrale GmbH. In our design concepts for EMK induction rotors, we place special emphasis on exceptional quality and a sound cost-to-performance ratio. They are manufactured according to ISO 9001 and also supplemented by our own quality standards. The technical design complies in all respects with the requirements of IEC and VDE standards. In addition, EMK motors of the JS/JF series are MOT certified and also subject to continuous quality controls.

Areas of application

Our EMK motors guarantee a powerful drive for pumps, compressors, blasters and crushing plants. Thanks to their robust design, they are suitable for almost any application. As standard, our EMK motors are designed for operation with frequency converters.

- → EMK motors = quality
- → Converter-suitable up to 500 V
- → Available from stock up to 630 kW

SAVE ENERGY WITH EMK MOTORS

Save up to 70% of energy with EMK motors and frequency converters.

Substantial savings can be achieved in many areas by modifying existing systems to speed-regulated drives. EMK motors are designed for converter operation, as standard, and EMZ can provide the most suitable converter for your specific requirements, with installation and initial start-up on request.

Background information

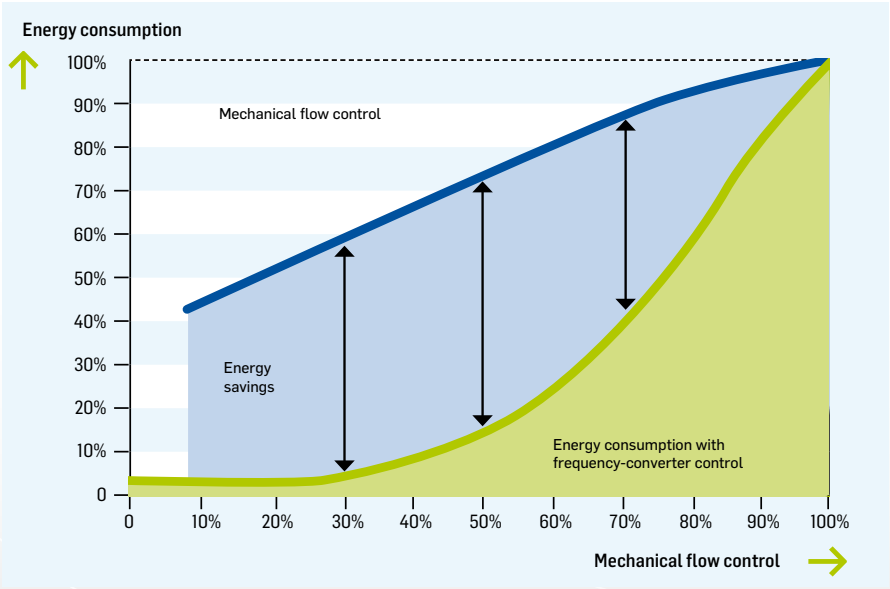
Energy is saved by the increased use of high-efficiency IE2 motors. However, even more energy can be saved with modern frequency converters that control the rotational speed of motors. The potential savings increase yet further when using quadratic counter-torque (e.g. pumps, fans and compressors).

Here, saving of up to 70% are possible. In traditional and mechanical control concepts, e.g. throttle or torsion-flap control, the engine always runs at a fixed rotation speed and at maximum capacity. However, this is seldom used in practice. Unlike mechanical control concepts, drive systems with frequency converters adapt the rotation speed and the energy input to suit current processing conditions.

EMZ provide:

→ Ready-to-use motor converter solutions

→ benergy saving up to 70%



If, for example, the rotation speed of a fan drive (M ~ n 2) is reduced by just 15%, the power consumption is reduced by as much as 38.5%. Should, during the entire process, the rotation speed be adjusted to its full potential, the additional outlay for the frequency converter will be recovered in a very short period of time.

EMK BASIC CONCEPT

Thanks to their optimised design combined with the high quality material used for production in accordance with ISO 9001 and their robust layout, EMK motors are well-suited for almost every field of application.

Constant high quality at very favourable prices was of paramount importance during the design of the EMK three-phase motors.

EMK MOTORS ARE...

- certified by the German technical control board (TÜV) and are subject to further permanent quality controls.
- versatile and also serve as powerful drives for pumps, compressors and fans.
- designed, as standard, for frequency-converter operation.

Quality controls

All motors are subjects to in-house testing which is documented in a comprehensive test protocol and includes the following:

- Insulation-resistance test
- Winding-resistance measurement
- No-load test
- Verification of sense of rotation
- High-voltage test
- Functional check of accessories
- Visual inspection

On request, further tests can be carried out:

- Full-load test
- Heat-run test
- Shock-pulse test
- Loss-factor measurement
- Polarisation-index measurement
- Noise-level measurement

made by EMZ

EMK

EMK is a patent-protected brand of EMZ GmbH.

SERVICES & CUSTOMISED SOLUTIONS

Worldwide after-sales service

Thanks to their service department with 20 employees, EMZ can also offer set-up, alignment and start-up of high-voltage motors.

In addition, since 1996 EMZ have been an active member of EASA (Electrical Apparatus Service Association), a worldwide alliance of electrical engineering companies with more than 2,000 members. Through this network, EMZ have service partners in almost every country in the world.

EMK motors with frequency converters

The standard insulation of EMK motors is designed to allow the converter to operate with a supply voltage of ≤ 500 V. For higher voltage, increased motor-insulation strength is required, which we can offer on request.

Areas of application:

In combination with frequency converters, EMK motors can be used in various drive applications with modifiable speeds. The vast range of applications also extends to the following:

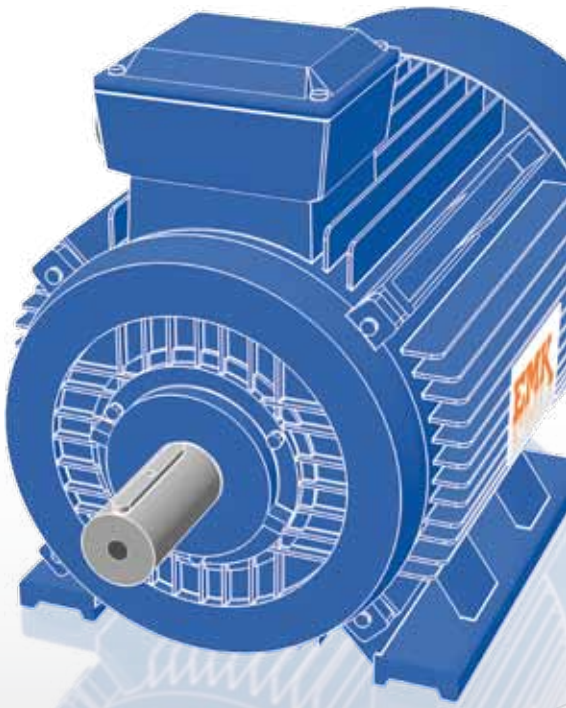
- Pumps and fans
- Compressors
- Centrifugal and agitator drives
- Extruder and breaker drives

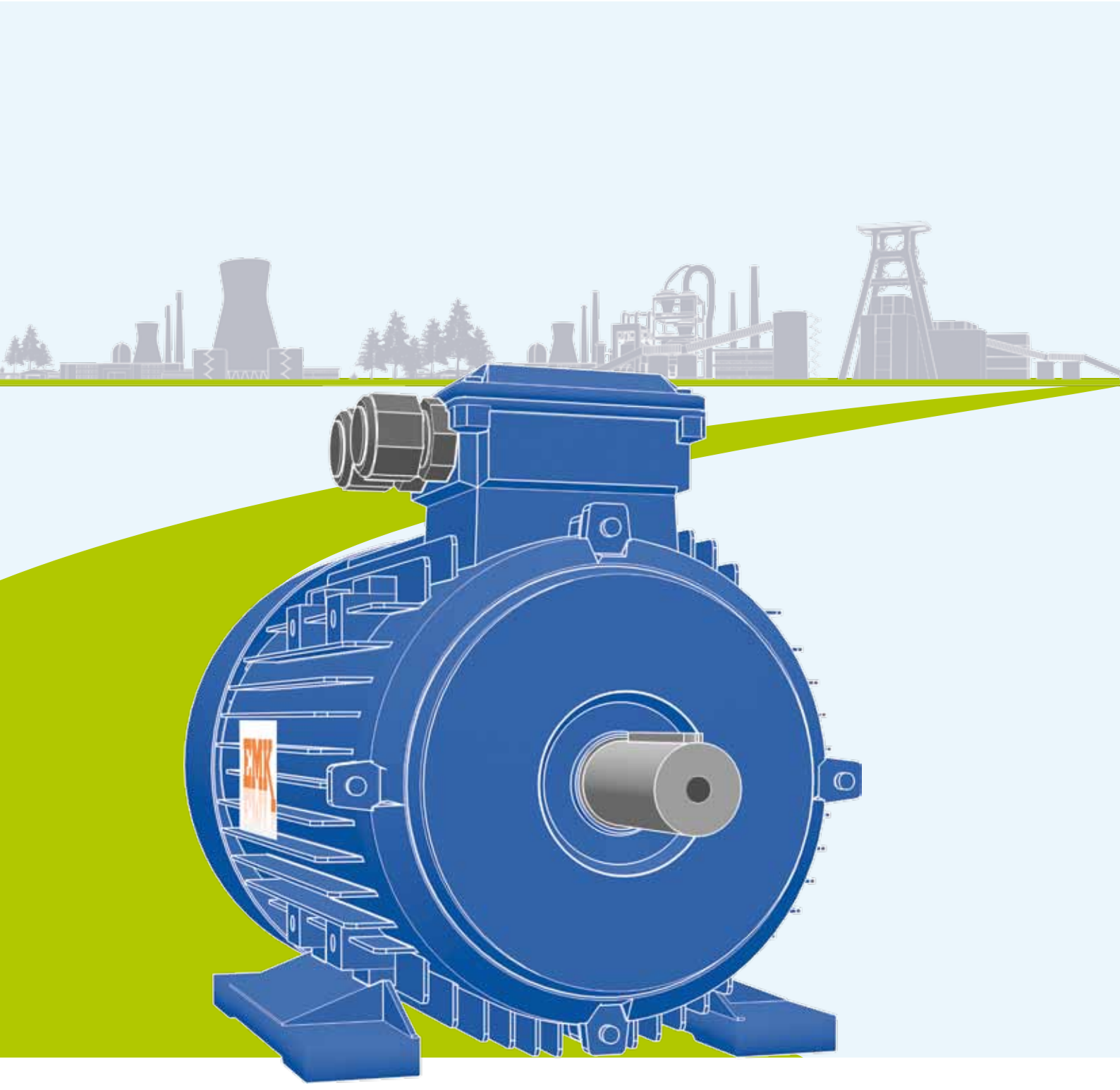
Customised solutions

EMZ also offer motors that are specially adjusted to your particular requirements. Not only customised mechanical solutions but also special electrical designs that include:

Such adjustments include, among other things:

- Addition of external ventilation
- Incremental encoder/addition of tachometer
- Addition of frequency converter
- Installation of electrically-insulated bearings
- Adjustment of the shaft height and/or fixing dimensions
- Adjustment of the shaft dimensions
- Motors for start-up under heavy load





TECHNICAL BASICS

- → Electrical designs
  - General technical basics
  - Operating modes
- → Mechanical designs
  - General technical basics
  - Rotors & shafts
  - Slip-ring rotors & starter motors
- → Information on IE conversion
- → Explosion-protection zone 22
- → Conversion & formulae

GENERAL TECHNICAL BASICS

→ Electrical designs

Standards

The indicated motors are in line with the current European standards and regulations:

Titel:	IEC	DIN/EN/ISO
General regulations for rotating electrical machines	IEC 60034-1	DIN EN 60034-1
Protection types for rotating electrical machines (IP-Code)	IEC 60034-5	DIN EN 60034-5
Methods of cooling for rotating electrical machines (IC-Code)	IEC 60034-6	DIN EN 60034-6
Types of construction. mounting arrangements and terminal box position for rotating electrical machines (IM-Code)	IEC 60034-7	DIN EN 60034-7
Terminal markings and direction of rotation for rotating electrical machines	IEC 60034-8	DIN EN 60034-8
Mechanical vibration for rotating electrical machines	IEC 60034-14	DIN EN 60034-14
Rated impulse voltage withstand for rotating electrical machines	IEC 60034-15	DIN EN 60034-15
Electrical insulation - Thermal evaluation	IEC 60085	DIN EN 60085
Mechanical vibration - Balance quality requirements for rotors	----------	DIN ISO 1940-1
Methods for determining losses and efficiency from tests	IEC 60034-2-1	DIN EN 60034-2-1

Insulation

All motors are of thermal class F. In case of main operation, the thermal layout of the motors up to BG315 corresponds to thermal class B. The motors are suitable for inverter operation. Depending on the field of application, we recommend conversion to insulated bearings.

Efficiency

The 2-pole, 4-pole and 6-pole motors with a rated output between 0.75 kW and 375 kW correspond to efficiency class IE2 in accordance with IEC60034-30:2008 and IEC60034-2-1:2007.

Voltage and Frequency

The motors are produced for a mains voltage of 400 V 50 Hz or 500 V 50 Hz respectively. The voltage range, e.g. 380-420 V, 50 Hz, will no longer be stated on the new type plates. Instead only the rated voltage is indicated. Unless otherwise stated, there is a voltage tolerance up to 10% in accordance with En60034-1 part B. Motors with a rated output of up to and including 2.2 kW are Y-connected, from 3 kW they are delta-connected.

Upon request, the motors can also be supplied for other voltages up to 690 V.

GENERAL TECHNICAL BASICS

→ Electrical designs

Overload capacity

The EMK low-voltage motors can be loaded with 1.5 times the rated current at the rated voltage for 2 minutes.

Motor protection

As standard, all motors are equipped with 3 thermistors for shut-off. The supply lines are fed into the terminal box and wired to a special terminal strip.

Rated output/ambient temperature/height of installation

The rated output is valid for permanent operation (S1) at nominal voltage and nominal frequency with an ambient temperature of 40°C and an installation height of 1,000 m above sea level.

In deviating surrounding conditions, output changes in accordance with the following chart are to be observed!

Ambient temperature [°C]	Output [%]
40°	100
45°	95
50°	90
55°	85
60°	80

Installation height [m]	Output [%]
1.000	100
1.500	96
2.000	92
2.500	88
3.000	84
3.500	79
4.000	75

GENERAL TECHNICAL BASICS

→ *Electrical designs*

Operating modes

EMK low-voltage motors made by EMZ can be designed for different types of operation.

1. Permanent operation - mode of operation S1
   Operation at constant load that is long enough to reach the thermal-steady state.

2. Short-term operation - mode of operation S2
   Operation at constant load that is not long enough to reach the thermal-steady state with a subsquent rest period, where the fallen machine temperatures deviate less than 2 K from the temperature of the cooling agent.

3. Intermittent operation - mode of operation S3
   Operation consisting of a sequence of similar intervals, each of which comprises a period of constant load and a rest period without the starting current considerably contributing to the development of heat.

4. Intermittent operation with influence on the starting process - mode of operation S4
   Operation consisting of a sequence of similar intervals, each of which comprises a noticeable starting period, a period of constant load and a rest period.

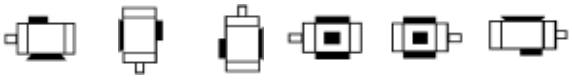
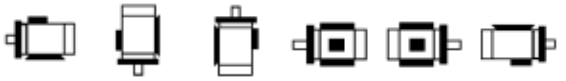
5. Continuous operation task with non-periodic load and speed variations
   Operation that generally involves non-periodic changes in load and speed within the permitted range. This type of task often involves peak loads that can greatly exceed the rated load.

GENERAL TECHNICAL BASICS

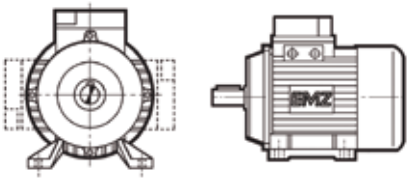
→ Mechanical designs

Types in accordance with IEC

The motors can be aproduced in the different basic types B3 (IM 1001), B5 (IM 3001) and up to size 132 also in B14 (IM 3601). The stated types correspond to IEC regulation 34-7.

IMB3	IM V5	IM V6	IM B6	IM B7	IM B8
IM1001	IM1011	IM1031	IM1051	IM1061	IM1071
					
IMB5	**IM V1**	**IM V3**			
IM3001	IM3011	IM3031			
					
IM B35	**IM V15**	**IM V36**			
IM2001	IM2011	IM2031	IM2051	IM2061	IM2071
					
IM B34					
IM2101					
					
IM B14					
IM3601					
					

Multimounting



Removable or "modifiable" motor feet/variable terminal box position

The motors of size 63 to 132 have removable feet. The motor feet are fixed to the motor cage with two hexagon sockets each. The feet can also be screwed to the sides of the motors to allow a left-hand and right-hand positioning of the terminal box. The motor cages are equipped with the corresponding threaded holes. Conversion to B35 or B34 is also easily possible.

Paint

As standard, the motors are painted with a bicomponent synthetic resin in RAL5010.

Special colours can be supplied on request.

GENERAL TECHNICAL BASICS

→ *Mechanical designs*

Protection type

The protection type of the motors shown in this catalogue is IP55. Other protection types are possible on request.

First digit: Levels of protection against contact and foreign objects.		Second digit: Levels of protection against water	
IP	Explanation	IP	Explanation
0	No particular protection	0	No particular protection
1	Protection against solid foreign objects larger than 50mm (e.g.: accidental contact with hand)	1	Protection against vertically falling water drops (condensation)
2	Protection against solid foreign objects larger than 12mm (e.g.: contact with fingers)	2	Protection against dripping water when tilted at an angle of up to 15°
3	Protection against solid foreign objects larger than 2.5mm (e.g.: wires. tools)	3	Protection against spray water at an angle of up to 60° from the vertica
4	Protection against solid foreign objects larger than 1mm (e g : wires. bands)	4	Protection against water splashing from any direction
5	Protection against dust (harmful settlement of dust)	5	Protection against water projected by a nozzle from any direction
6	Complete protection against dust	6	Protection against heavy seas or water projected in powerful jets
		7	Protection in case of immersion between 0.15 and 1m
		8	Protection in case of continous immersion under pressure

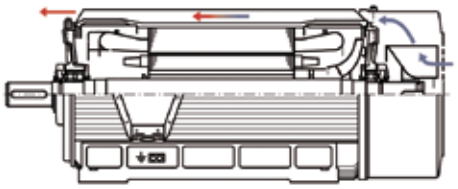
Note: *When in use or storage in the open, penetration of liquids along the shaft or long-term exposure to direct sunlight, rain, snow, ice or dust must be prevented.*

Vibration characteristics

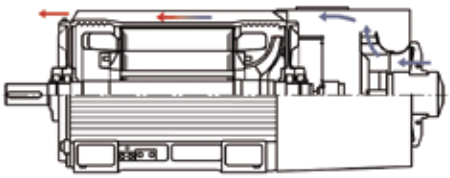
As standard, horizontal motors up to 3600 rpm conform to vibration severity degree A in accordance with IEC 60034-14. Vibration severity degree B is an available option. Values for vertical motors on request.

Cooling

The squirrel-cage motors are fan-cooled devices (IC411).



A different type of cooling such as IC416 with external ventilation is also possible upon request.



Metric cable entries in accordance with EN 50262

IEC size	Plug *EC-J & KJG*	Plug *KAE - IE1*	Plug *KAE - IE2*
56 - 71	1 x M20 x1.5	1 x M20 x1.5	----------
80 - 100	1x M20×1.5	2x M25x1.5	2x M25x1.5
112	2x M20×1.5	2x M32x1.5	2x M25x1.5
132	2x M25×1.5	2x M32x1.5	2x M25x1.5
IEC size	**Plug** *EC-H3 & EC2-H*	**Plug** *EC-K*	**Plug** *KQM*
160 - 180	2x M40x1.5	2x M40x1.5	2x M40x1.5
200 - 225	2x M50x1.5	2x M40x1.5	2x M40x1.5
250 - 280	2x M63x1.5	2x M50x1.5	2x M50x1.5
315	2x M72x2	2x M72x2	2x M72x2
355	2x M80x2	2x Ø60	2x Ø72

GENERAL TECHNICAL BASICS

→ Mechanical designs

Motor torque / Starting torque / Breakdown torque

The rated torque at the motor shaft in Nm is as follows:

$$M = 9550 * P/n$$

P = rated output in kW

n = rotational speed in min-1

Starting torque and starting current are shown in the table of operating values as multiples of the nominal values. According to VDE 0530, the tolerance for these values is + 20%.

The breakdown torque is the maximum torque that can be achieved by the running motors. If the operating values for voltage or frequency deviate from the nominal values, the starting and breakdown torques will change in the ratio of the squares of the voltages and in the inverse ratio of the squares of the frequencies.

Bearings

As a general rule, motors of all sizes are equipped with two identical ball bearings of series 62 or 63. From size 160 roller bearings can be utilised to increase radial forces. High-quality bearings are used as standard. Motors from size 160 are equipped with an axially-fixed bearing on the B side.

Balancing quality

The rotors are balanced dynamically with a half key (without mounted coupling half). The balancing quality in accordance with ISO 1940 is G 2.5 up to and including 1500 rpm and G1 beyond.

Number of mounting holes in the feet of EMK motors

For the types EC-H3... , EC2-H... , KQM...

Frame size:	Frame length:	Holes:
160	M	4
160	L	6
180	M	4
180	L	6
200	L	4
225	S	4
225	M	6
250	M	4
280	S	4
280	M	6
315	S	4
315	M	6
315	L	6
355	M	6
355	L	6

*B5: 2. Holes for mounting the eyelets are available for the types

EC-H3... , EC2-H... , KQM

ROTORS & SHAFTS

The rotor cage for all motors is made of cast aluminium. Motors of standard design are supplied with a free shaft end. On consultation with our sales team, all motors can also be supplied with a second free shaft end.

Rotor types

EMK low-voltage motors made by EMZ are constructed as squirrel-cage induction rotors or as slip-ring rotors.

Cage or squirrel cage induction rotors

Application permitting, the cage rotor should be given preference over the slip-ring rotor as it is sturdier, easier to start and more cost-effective. In addition, the rotational speed of these motors can be controlled by a frequency converter. In general, the cage rotor is designed as a key bar rotor, deep bar rotor or double squirrel cage rotor, depending on the respective operating conditions. Usually, the rotor cages are made of aluminium die cast.

A special design is required for frequent gear changes and for slow-starting engines. Here the type and the number of gear changes per hour, the interval cycle and the inertia torque (J) of the engine must be indicated in kgm2 in relation to the motor shaft and the development of the load torque depending on the rotational speed.

Operation with the converter

As standard, EMK motors are suitable for converter operation. However, the following must be observed: For frequency converter operation we recommend the use of an electrically-insulated bearing from size 280. Depending on the type of application it may be necessary to equip the motor with external ventilation. In addition, it must be ensured that the motor does not pass through critical speeds within the desired speed range and that the maximum speed does not exceed the motor's mechanical speed limit!

Mechanical load and service life of grease

The high speed beyond the rated speed and the resulting stronger vibrations affect the smoothness of the mechanical operation, thus increasing the mechanical load on the bearings.

This will reduce the service life of both grease and bearings.

→ Further information on request.

SLIP-RING ROTORS & STARTER MOTORS

Slip-ring rotors

Slip-ring rotors should be used when larger centrifugal masses need to be started or if a lower starting current is required. In some test facilities the slip-ring rotor can also be used for controlling the rotational speed if permanent slip resistances are utilised. With slip-ring rotors, the breakdown torque can be obtained as the starting torque.

Liquid starters for slip-ring rotors

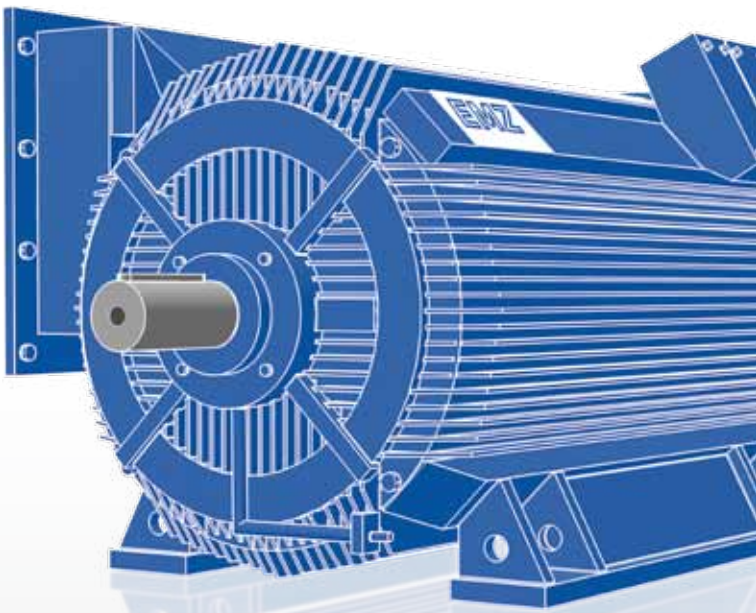
As an option, the matching EMZ starters can be supplied for the EMZ slip-ring rotors.

EMZ liquid starters are used for starting and controlling slip-ring rotors with a performance of up to 20 MW.

They consist of a thick-walled container made of sheet steel that houses the resistance liquid (electrolyte) and the electrode system. The electrode system is comprised of 3 movable and 3 fixed electrodes. The movable electrodes are connected to one another by a copper star point, thus forming the starter's star point.

The fixed electrodes are located in phase separators that separate the phases. The electrolyte concentration (water and starting soda) is calculated by choosing the optimum combination of electrodes and separator according to the rotor and engine characteristics.

This optimum adjustment prevents a torque jerk when activating the short-circuit switch. Oil-cooling drum starters are usually used for starting slip-ring rotors with less output.



INFORMATION ON IE CONVERSION

New efficiency classes in accordance with IEC 60034- 30:2008

The international standard, IEC60034-30:2008, was created to ensure uniformity on an international level. This standard classifies low-voltage synchronous motors in new efficiency classes (valid from October 2008). The efficiencies of IEC60034-30:2008 are based on the calculation of loss according to standard part IEC60034-2-1:2007.

New measuring method in accordance with IEC 60034-2-1:2007

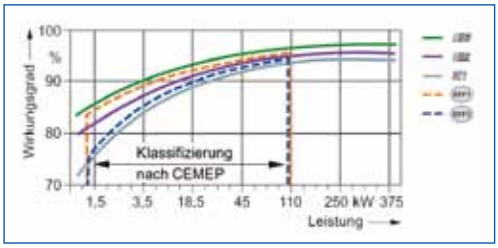
With the new measuring method, additional losses are no longer rated across the board (at 0.5 %) but determined by actual measurements (IEC60034-2-1:2007). Even though no technical or physical changes have been made to the motors, the nominal efficiency is downgraded from EFF1 to IE2 and from EFF2 to IE1.

Further information on EuP

- **Excluded:** Explosion-proof motors according to ATEX, brake motors and smoke extraction motors
- **Deadline 16th June 2011:** IE2 minimum efficiency for motors between 0.75 kW and 375 kW
- **Deadline 1st January 2015:** IE3 minimum efficiency for motors between 7.5 kW and 375 kW or combinations of IE2 motor and frequency converters
- **Deadline 1st January 2017:** IE3 minimum efficiency for all motors between 0.75 kW and 375 kW or combinations of IE2 motor and frequency converters

What are the changes?

- Nominal standard efficiencies corresponding to standard IEC 60034-30 will be stated irrespective of the physical efficiency. This means that only nominal standard efficiencies in accordance with efficiency class IE1, IE2 and, if available, IE3 are offered according to the standardised performance rating. The new name plates no longer state a voltage range.



- Only the rated voltages are given. Unless otherwise stated, there is a voltage tolerance of ±10% in accordance with EN6034-1 part B.

Summary

This applies to all motors presently designated as “EFF2” and “EFF1” as well as to the motor types that were added on account of the efficiency standard IEC600-30:2008:

The motors in question are:

- 2-pole, 4-pole and 6-pole motors (only “single rotation” motors, no dual-speed motors and no 8-pole motors)
- Output range 0.75 kW to 375 kW

EXPLOSION-PROTECTION ZONE 22

→ for EMK motors between 0.75 kW and 90 kW

Definition of dust

In industry, e.g. in the wood, plastic, food and feed industries, solids in the form of dust often occur. An increase in the temperature of settled dust can result in spontaneous ignition of the dusty combustibles. Furthermore, there can be a risk of explosion if small-grained dust is stirred. Stirred-up smouldering layers of dust are often the cause of dust explosions. This is why the surface temperature of the motors must be restricted to values below the temperature at which a cloud or layer of dust can ignite.

Ex II 3D tD A22 IP55 T125°C Dc

Risk of dust explosion in zone 22 with non-electroconductive dust, ignition point of the cloud of dust ≥ 190°C, smouldering temperature of the layer of dust ≥ 200°C with reference to a maximum layer thickness of 5mm (device category 3D, EPL Dc).

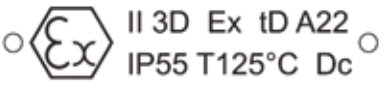
Explanation on zone 22

Areas in which an explosive atmosphere, in the form of stirred-up dust, is unlikely to occur. Should it happen, it will be a rare occurrence lasting for a short period of time.

Delivery period

The motors of series JS/JF, HS/HF and H3S/H3F have been approved for operation in zone 22 by an expert following the corresponding conversions.

Thanks to our employees, who are qualified in the field of explosion protection, our service centre can convert our standard EMK motors for operation in zone 22 (main operation) within 2-3 working days.



Documentation

In addition to the standard documentation you will receive the following for zone 22 motors:

- → Operation manual
- → EC declaration of conformity
- → Expert's declaration

CONVERSION & FORMULAE

Output

1 kW = 1.36 PS = 102 kpm/s = 1000 Nm/s

1 PS = 0.736 kW = 75 kpm/s = 736 Nm/s

Work

1 kWh = 3.6 x 106 Nm

= 0.367 x 106 kpm

Force

1 N = 0.102 kp

1 kp = 9.81 N

Power Requirement

$$P = \frac{M \times n}{9550 \times \eta} \text{ (kW)}$$

P = Output (kW)

M = Torque (Nm)

n = Speed (rpm)

η = Efficiency

Torque

Calculation of motor torque

$$M = 9550 \times \frac{P}{n} \times \text{(Nm)}$$

P = Rated output (kW)

N = Speed (rpm)

Conversion of transmission ratio

$$M2 = \frac{M1 \times n1}{n2}$$

n1 = Motor speed

M1 = Motor torque

n2 = Driven machine speed

M2 = Driven machine torque at n2

Mass moment of inertia

Relation of centrifugal moment

$$J = \frac{GD^2}{4}$$

J = Mass moment of inertia (kgm^2)

GD2 = centrifugal moment (kpm^2)

Mass moment of inertia of masses in linear motion, in relation to engine speed.

$$J = 91.2 \times m \left(\frac{v}{n} \right)^2 (kgm^2)$$

m= Weight (kg)

v= Speed (m/sec)

n= Motor speed (rpm)

CONVERSION & FORMULAE

Torque

1 Nm = 0.102 kpm = 1 Ws

1 kpm = 9.81 Nm = 9.81 Ws

Power consumption of stator current

The input P_a in kW is

$$P_a = \frac{P \times 100}{\eta}$$

whereat P = rated power in kW. η = efficiency in % is.

The current I (Ampere) at rated current U (Volt) is :

$$I = \frac{1000 \times P_a}{U \times \sqrt{3} \times \cos \varphi}$$

or

$$I = \frac{1000 \times P \times 100}{U \times \sqrt{3} \times \cos \varphi \times \eta}$$

The data of the current mentioned in the charts are approximated to VDE 0530. The no-load current is 25 to 50% of the rated current.

Starting-time calculation

$$t_{an} = (J_{Motor} + J_{Machine} \times (\frac{n_{Machine}}{n_{Motor}}))^2 \times Y$$

$$Y = \frac{n_{syn} \times 0.104}{0.45 \times (M_K + M_{ST})} - \frac{1}{3} M_{Machine} \times \frac{n_{Machine}}{n_{Motor}}$$

t_{an} = Starting-time in sec.

J_{Motor} = Mass moment of inertia of motor

$J_{Machine}$ = Mass moment of inertia of driven machine

n_{syn} = Synchronous speed

M_K = Breakdown torque

M_{ST} = Starting torque

$M_{Machine}$ = Torque of driven machine

$n_{Machine}$ = Speed of driven machine

n_{Motor} = Motorspeed


SQUIRREL-CAGE INDUCTION ROTORS
→ Technical Data
2-pole, 3000 rpm, IP55
400 V, 50 Hz
Aluminium Housing
Cast-iron Housing

TECHNICAL DATA & PERFORMANCE CURVES

- Squirrel-cage induction rotors
  - Technical data (2-pole to 8-pole)
  - Performance curves for all frame sizes
  - Progressive series
- AC motors
  - Technical data
  - Performance curves
- Slip-ring rotors
  - Technical data (4-and 6-pole)
  - Performance curves

SQUIRREL-CAGE INDUCTION ROTORS

→ *Technical Data*

2-pole, 3000 rpm, IP55 — 400 V, 50 Hz

Type	Rated output	Rated speed	Rated current at 400V	Efficiency at 100%	Efficiency at 75%	Efficiency at 50%	Power factor	Rated torque	Locked rotor torque	Locked rotor current	Break-down torque	Moment of inertia	Weight
	kW	rpm	A	%	%	%	cos φ	Nm	Ma / Mn	Ia / In	Mmax / Mn	kgm²	kg
Aluminium Housing EC-J and KJG													
56 1-2	0.09	2750	0.30	62.0	----------	----------	0.77	0.30	2.1	5.2	2.2	0.00018	3.6
56 2-2	0.12	2750	0.40	67.0	----------	----------	0.78	0.40	2.1	5.2	2.2	0.00023	3.9
63 1-2	0.18	2720	0.50	65.0	----------	----------	0.80	0.60	2.2	5.5	2.3	0.00031	4.8
63 2-2	0.25	2720	0.70	68.0	----------	----------	0.81	0.90	2.2	5.5	2.3	0.0006	5.1
71 1-2	0.37	2740	0.90	70.0	----------	----------	0.81	1.30	2.2	6.1	2.3	0.00075	6
71 2-2	0.55	2740	1.30	73.0	----------	----------	0.82	1.90	2.2	6.1	2.3	0.0009	6.5
80A-2	0.75	2875	1.68	77.4	77.6	76.5	0.84	2.50	2.2	6.5	2.3	0.0008	12
80B-2	1.1	2875	2.37	79.6	78.8	79.5	0.84	3.72	2.2	7.0	2.3	0.0009	13.5
90S-2	1.5	2890	3.16	81.3	81.5	81.2	0.84	5.04	2.2	7.0	2.3	0.0012	17.5
90L-2	2.2	2890	4.48	83.2	83.4	83.1	0.85	7.40	2.3	7.0	2.3	0.0014	22
100L-2	3	2891	5.86	84.6	84.8	84.4	0.87	9.95	2.3	7.5	2.3	0.0029	29
112M-2	4	2914	7.64	85.8	86.0	85.6	0.88	13.22	2.2	7.5	2.3	0.0055	32
132S1-2	5.5	2937	10.6	87.0	87.2	86.8	0.88	18.11	2.2	7.5	2.3	0.0109	47.5
132S2-2	7.5	2940	13.9	88.1	88.3	88.0	0.88	24.70	2.2	7.5	2.3	0.0126	53
Cast-iron Housing EC2-H and EC-H3 (from BG 400)													
160M 1-2	11	2930	20.0	89.4	89.7	87.9	0.89	35.9	2.2	7.9	2.3	0.0391	122
160M 2-2	15	2935	26.9	90.3	90.6	90.1	0.89	48.8	2.2	8.0	2.4	0.0464	133
160L-2	18.5	2930	33.0	90.9	91.2	91.0	0.89	60.2	2.3	8.0	2.3	0.0567	163
180M-2	22	2950	39.1	91.3	91.7	91.4	0.89	71.2	2.2	8.1	2.4	0.0783	190
200L 1-2	30	2960	52.9	92.0	92.1	91.7	0.89	96.8	2.3	7.5	2.3	0.1277	252
200L 2-2	37	2960	64.9	92.5	92.6	91.9	0.89	119.4	2.2	7.5	2.3	0.1432	275
225M-2	45	2965	78.6	92.9	92.8	91.6	0.89	144.8	2.2	7.6	2.3	0.2400	315
250M-2	55	2965	95.7	93.2	93.8	93.3	0.89	177.0	2.2	7.6	2.3	0.3214	417
280S-2	75	2970	129.7	93.8	93.9	93.5	0.89	240.9	2.0	6.9	2.3	0.5964	572
280M-2	90	2970	155.1	94.1	94.2	93.6	0.89	289.2	2.1	7.0	2.3	0.6953	605
315S-2	110	2980	187.1	94.3	94.5	93.9	0.90	352.7	2.0	7.1	2.2	1.21	965
315M-2	132	2980	223.8	94.6	95.0	94.1	0.90	423.3	2.0	7.1	2.3	1.59	1067
315L 1-2	160	2975	267.7	94.8	94.9	94.2	0.91	513.8	2.1	7.1	2.3	1.81	1151
315L 2-2	200	2980	333.9	95.0	95.2	94.6	0.91	641.2	2.1	7.2	2.2	2.08	1253
355M-2	250	2980	412.9	95.0	95.1	94.3	0.92	801.1	1.5	6.1	2.4	3.49	1600
355L 2-2	315	2980	520.2	95.0	95.1	94.4	0.92	1009.6	1.5	6.0	2.3	4.43	1850
355Lx-2	355	2980	586.3	95.0	95.2	94.5	0.92	1139.09	1.5	6.5	2.5	6.22	2300
400M2-2	400	2980	678	95.9	----------	----------	0.90	1282	1.6	7.5	2.0	----------	3200
400L1-2	450	2980	763	96.1	----------	----------	0.90	1442	1.5	7.5	2.0	----------	3300
400L2-2	500	2980	847	96.1	----------	----------	0.90	1602	1.5	7.5	2.0	----------	3400
400L-3	560	2985	914	96.1	----------	----------	0.92	1792	1.2	7.0	2.0	----------	3550
450L1-2	630	2985	1029	96.1	----------	----------	0.92	2016	1.2	7.0	2.0	----------	3800
450L2-2	710	2985	1159	96.1	----------	----------	0.92	2272	1.2	7.0	2.0	----------	4000
450L3-2	800	2985	1303	96.3	----------	----------	0.92	2559	1.2	7.0	2.0	----------	4400

IE2-design according to IEC60034-30:2008 - IEC60034-2-1-2007*

Other voltages, types and coolings are available on request.

*Standard IE2 exclusively applies to motors with a rated output between 0.75 and 375 kW, cf. page 18.

SQUIRREL-CAGE INDUCTION ROTORS

→ *Technical Data*

4-pole, 1500 rpm, IP55 — 400 V, 50 Hz

Type	Rated output	Rated speed	Rated current at 400V	Efficiency at 100%	Efficiency at 75%	Efficiency at 50%	Power factor	Rated torque	Locked rotor torque	Locked rotor current	Break-down torque	Moment of inertia	Weight
	kW	rpm	A	%	%	%	cos φ	Nm	Ma / Mn	Ia / In	Mmax / Mn	kgm²	kg
Aluminium Housing EC-J und KJG													
56 2-4	0.09	1325	0.37	58.0	----------	----------	0.61	0.64	2.0	4.0	2.1	0.0004	3.9
63 1-4	0.12	1310	0.42	57.0	----------	----------	0.72	0.84	2.1	4.4	2.2	0.0005	4.8
63 2-4	0.18	1310	0.59	60.0	----------	----------	0.73	1.26	2.1	4.4	2.2	0.0006	5.1
71 1-4	0.25	1330	0.75	65.0	----------	----------	0.74	1.73	2.1	5.2	2.2	0.0008	6
71 2-4	0.37	1330	1.06	67.0	----------	----------	0.75	2.56	2.1	5.2	2.2	0.0013	6.3
80 1-4	0.55	1390	1.49	71.1	----------	----------	0.75	3.75	2.3	5.2	2.3	0.0018	9.4
80B-4	0.75	1400	1.78	79.6	79.8	79.4	0.76	5.15	2.3	6.0	2.3	0.0021	14.5
90S-4	1.1	1440	2.53	81.4	81.6	81.3	0.77	7.5	2.2	6.5	2.2	0.0023	18.5
90L-4	1.5	1445	3.39	82.8	83.0	82.6	0.79	10.3	2.3	7.0	2.3	0.0027	21
100L1-4	2.2	1440	4.64	84.3	84.5	84.1	0.81	14.8	2.3	7.0	2.3	0.0054	31
100L2-4	3	1440	6.18	85.5	85.7	85.2	0.82	20.18	2.3	7.0	2.3	0.0067	37
112M-4	4	1445	8.12	86.6	86.8	86.3	0.82	26.53	2.3	7.5	2.3	0.0095	42
132S-4	5.5	1455	10.9	87.7	87.8	87.5	0.83	36.48	2.2	7.0	2.2	0.0214	52.5
132M-4	7.5	1455	14.5	88.7	88.9	88.6	0.84	49.74	2.2	7.0	2.2	0.0296	64
Cast-iron Housing EC2-H and EC-H3 (from BG 400)													
160M 1-4	11	1465	20.8	89.8	90.0	89.4	0.85	71.6	2.3	7.5	2.4	0.0780	134
160L-4	15	1470	27.8	90.6	90.8	90.1	0.86	97.4	2.2	7.5	2.4	0.0957	169
180M-4	18.5	1470	34.0	91.2	91.8	91.0	0.86	120.0	2.3	7.7	2.5	0.1446	196
180L-4	22	1470	40.3	91.6	92.0	91.6	0.86	142.7	2.2	7.8	2.4	0.1643	242
200L1-4	30	1470	54.6	92.3	92.4	91.8	0.86	194.5	2.2	7.2	2.4	0.2725	275
225S-4	37	1480	67.0	92.7	92.9	92.5	0.86	238.6	2.2	7.3	2.4	0.4222	328
225M-4	45	1480	81.1	93.1	93.4	93.0	0.86	290.1	2.2	7.4	2.3	0.4878	355
250M-4	55	1480	98.7	93.5	93.7	93.6	0.86	354.5	2.2	7.4	2.3	0.6864	451
280S-4	75	1485	130.9	94.0	94.1	93.7	0.88	481.8	2.3	6.7	2.4	1.16	591
280M-4	90	1485	156.7	94.2	94.3	93.7	0.88	578.3	2.3	6.9	2.3	1.51	692
315S-4	110	1485	190.9	94.5	94.7	94.2	0.88	706.3	2.2	6.9	2.3	3.23	1012
315M-4	132	1485	228.6	94.7	94.6	94.3	0.88	848.0	2.2	6.9	2.3	3.42	1147
315L 1-4	160	1485	273.4	94.9	95.0	94.6	0.89	1027.5	2.2	6.9	2.3	3.94	1224
315L 2-4	200	1485	341.1	95.1	94.9	94.6	0.89	1285.1	2.2	6.9	2.3	4.66	1331
355M 2-4	250	1485	421.6	95.1	95.1	94.6	0.90	1603.9	2.1	6.7	2.5	8.40	1650
355L 2-4	315	1490	531.2	95.1	95.0	94.8	0.90	2020.3	2.1	7.1	2.5	9.93	2040
355L1-4	355	1490	598.7	95.1	95.2	94.7	0.90	2277.72	2.1	7.0	2.5	11.84	2159
400M1-4	400	1490	678	95.7	----------	----------	0.89	2564	1.6	7.0	2.0	----------	2850
400M2-4	450	1490	763	95.7	----------	----------	0.89	2884	1.6	7.0	2.0	----------	2900
400L1-4	500	1490	847	95.7	----------	----------	0.89	3205	1.5	7.0	2.0	----------	3000
400L2-4	560	1490	949	95.7	----------	----------	0.89	3589	1.4	7.0	2.0	----------	3100
400L3-4	630	1490	1068	95.7	----------	----------	0.89	4038	1.4	7.0	2.0	----------	3200
450M-4	710	1490	1202	95.8	----------	----------	0.89	4551	1.2	7.0	2.0	----------	4500
450L2-4	800	1490	1350	96.1	----------	----------	0.89	5128	1.2	7.0	2.0	----------	4750
450L3-4	900	1490	1519	96.1	----------	----------	0.89	5768	1.2	7.0	2.0	----------	4950
500LA-4	1000	1490	1627	96.6	----------	----------	0.89	6409	1.0	7.0	1.8	----------	5320

IE2-design according to IEC60034-30:2008 - IEC60034-2-1-2007*

Other voltages, types and coolings are available on request.

*Standard IE2 exclusively applies to motors with a rated output between 0.75 and 375 kW, cf. page 18.

SQUIRREL-CAGE INDUCTION ROTORS

→ *Technical Data*

6-pole, 1000 rpm, IP55 — 400 V, 50 Hz

IE2-design according to IEC60034-30:2008 - IEC60034-2-1-2007*

Type	Rated output	Rated speed	Rated current at 400V	Efficiency at 100%	Efficiency at 75%	Efficiency at 50%	Power factor	Rated torque	Locked rotor torque	Locked rotor current	Break-down torque	Moment of inertia	Weight
	kW	rpm	A	%	%	%	cos φ	Nm	Ma / Mn	Ia / In	Mmax / Mn	kgm²	kg
Aluminium Housing EC-J and KJG													
63 2-6	0.12	840	0.60	48.0	----------	----------	0.60	2.25	1.8	3.5	1.9	0.0004	5.1
71M 1-6	0.18	850	0.70	56.0	----------	----------	0.66	1.91	1.9	4.0	2.0	0.0011	6
71M 2-6	0.25	850	0.90	59.0	----------	----------	0.68	2.65	1.9	4.0	2.0	0.0014	6.3
80M 1-6	0.37	885	1.23	62.0	----------	----------	0.70	3.93	1.9	4.7	2.0	0.0016	8.9
80M 2-6	0.55	885	1.69	65.0	----------	----------	0.72	5.84	1.9	4.7	2.1	0.0019	10.4
90S-6	0.75	934	1.98	75.9	76.0	75.8	0.72	7.87	2.0	5.5	2.1	0.0029	18.5
90L-6	1.1	945	2.82	78.1	78.3	78.0	0.73	11.54	2.0	6.0	2.1	0.0035	21
100L-6	1.5	945	3.61	79.8	79.9	79.7	0.75	15.24	2.1	7.0	2.1	0.0069	28.5
112M-6	2.2	960	5.10	81.8	81.9	81.7	0.76	22.35	2.1	7.0	2.1	0.0140	33.5
132S-6	3	964	6.83	83.3	83.5	83.1	0.76	29.84	2.1	7.0	2.1	0.0286	44
132M1-6	4	965	8.96	84.6	84.7	84.2	0.76	39.79	2.1	6.5	2.1	0.0357	53
132M2-6	5.5	965	12.0	86.0	86.2	85.8	0.77	54.71	2.1	7.0	2.1	0.0449	63.5
Cast-iron Housing EC2-H and EC-H3 (from BG 400)													
160M-6	7.5	970	15.9	87.2	87.8	87.1	0.78	73.9	2.2	6.7	2.4	0.0924	114
160L-6	11	970	22.7	88.7	89.2	88.5	0.79	108.1	2.1	6.9	2.3	0.1218	154
180L-6	15	980	29.8	89.7	90.2	90.1	0.81	146.3	2.0	7.2	2.2	0.2174	197
200L1-6	18.5	980	36.5	90.4	90.6	90.0	0.81	180.1	2.2	7.2	2.3	0.3308	231
200L2-6	22	980	42.6	90.9	91.2	90.7	0.82	214.1	2.2	7.3	2.4	0.3780	240
225M-6	30	985	58.3	91.7	92.2	91.9	0.81	291.4	2.1	7.1	2.3	0.5744	302
250M-6	37	985	69.0	92.2	92.6	92.4	0.84	358.6	2.2	7.1	2.2	0.8757	387
280S-6	45	990	81.5	92.7	92.9	92.5	0.86	434.6	2.1	7.2	2.2	1.47	502
280M-6	55	990	99.2	93.1	93.3	92.9	0.86	531.2	2.1	7.2	2.1	1.73	548
315S-6	75	990	135.9	93.7	93.6	92.8	0.85	722.8	2.0	6.7	2.1	4.31	976
315M-6	90	990	164.5	94.0	93.9	93.3	0.84	867.3	2.0	6.7	2.1	4.49	1007
315L1-6	110	990	198.1	94.3	94.4	93.7	0.85	1061.2	2.0	6.7	2.1	5.72	1097
315L2-6	132	990	234.2	94.6	94.6	94.1	0.86	1271.6	2.0	6.7	2.2	6.42	1168
355M1-6	160	990	279.4	94.8	94.9	94.4	0.87	1543.5	2.0	6.5	2.6	9.29	1554
355M3-6	200	990	349.3	95.0	95.1	94.7	0.87	1929.9	1.9	6.3	2.5	11.94	1814
355L2-6	250	990	436.6	95.0	95.2	95.0	0.87	2415.3	1.7	6.3	2.2	13.37	1980
355LX-6	315	990	548	95.0	95.1	94.8	0.87	3037.9	1.8	6.5	2.5	16.68	2400
355LX2-6	355	990	620	95.0	95.2	94.8	0.87	3425.3	2.0	6.9	2.3	----------	2460
400L-6	400	990	693	95.7	----------	----------	0.87	3859	1.4	6.5	2.0	----------	3400
400L1-6	450	990	778	95.9	----------	----------	0.87	4341	1.4	6.5	2.0	----------	3650
450M-6	500	970	879	95.5	----------	----------	0.86	4923	1.4	6.5	1.8	----------	4320
450L1-6	560	990	952	95.7	----------	----------	0.86	5402	1.4	6.5	1.8	----------	4530
450L2-6	630	990	1105	95.7	----------	----------	0.86	6077	1.4	6.5	1.8	----------	4750
450L3-6	710	990	1243	95.9	----------	----------	0.86	6849	1.4	6.5	1.8	----------	5200
500LA-6	800	995	1414	96	----------	----------	0.85	7678	1.4	6.5	1.8	----------	5320

Other voltages, types and coolings are available on request.

*Standard IE2 exclusively applies to motors with a rated output between 0.75 and 375 kW, cf. page 18.

SQUIRREL-CAGE INDUCTION ROTORS

→ *Technical Data*

8-pole, 750 rpm, IP55 — 400 V, 50 Hz

Type	Rated output	Rated speed	Rated current at 400V	Efficiency at 100%	Power factor	Rated torque	Locked rotor torque	Locked rotor current	Break-down torque	Moment of inertia	Weight
	kW	rpm	A	%	cos φ	Nm	Ma / Mn	Ia / In	Mmax / Mn	kgm²	kg
Aluminium Housing EC-J											
80M1-8	0.18	645	0.84	51.0	0.61	2.5	1.8	3.3	1.9	0.0025	8.9
80M2-8	0.25	645	1.10	54.0	0.61	3.5	1.8	3.3	1.9	0.0030	10.4
90S-8	0.37	670	1.41	62.0	0.61	5.1	1.8	4.0	1.9	0.0051	12.1
90L-8	0.55	670	2.07	63.0	0.61	7.6	1.8	4.0	2.0	0.0065	13.7
100L1-8	0.75	680	2.28	71.0	0.67	10.2	1.8	4.0	2.0	0.0095	23
100L-8	1.1	680	3.15	73.0	0.69	15	1.8	5.0	2.0	0.0110	25.1
112M-8	1.5	690	4.18	75.0	0.69	20.5	1.8	5.0	2.0	0.0245	28.2
132S-8	2.2	705	5.73	78.0	0.71	29.6	1.8	6.0	2.0	0.0300	40.3
132M-8	3	705	7.51	79.0	0.73	40.4	1.8	6.0	2.0	0.0395	45
Cast-iron Housing EC-H3											
160M1-8	4	720	9.7	81.6	0.73	53.1	2.2	4.4	2.5	0.0800	90
160M2-8	5.5	720	12.9	83.3	0.74	73	2.2	5.0	2.4	0.0900	102
160L-8	7.5	720	16.8	85.9	0.75	99.5	2.1	5.7	2.3	0.1300	122
180L-8	11	730	24.1	87.8	0.75	144	2.3	5.6	2.5	0.2000	150
200L-8	15	730	32.3	88.3	0.76	196	2.1	5.5	2.4	0.3400	212
225S-8	18.5	730	39.0	90.2	0.76	242	2.2	5.6	2.6	0.4900	285
225M-8	22	730	44.8	90.8	0.78	288	2.1	5.4	2.4	0.5500	385
250M-8	30	740	60.1	91.2	0.79	387	2.2	5.3	2.5	0.8300	378
280S-8	37	740	73.6	91.8	0.79	478	2.3	5.6	2.7	1.39	485
280M-8	45	740	89.4	92.0	0.79	581	2.1	5.2	2.8	1.65	568
315S-8	55	740	105.3	93.1	0.81	710	1.9	5.7	2.5	4.79	745
315M8	75	740	142.6	93.7	0.81	968	2.1	5.9	2.8	5.58	805
315L1-8	90	740	168.5	94.0	0.82	1161	2.3	6.2	2.9	6.37	998
315L2-8	110	740	216.4	94.2	0.82	1420	2.2	6.0	2.8	7.23	1175
355M1-8	132	740	246.0	94.3	0.82	1704	1.9	6.4	2.7	7.55	1580
355M2-8	160	740	298.0	94.5	0.82	2065	1.7	6.3	2.6	11.73	1680
355L2-8	200	740	366.9	94.8	0.83	2581	1.8	6.5	2.9	12.86	1995
400M1-8	250	745	475	94.9	0.80	3205	1.5	6.0	1.8	----------	3100
400L1-8	315	745	598	95.1	0.80	4038	1.4	6.0	1.8	----------	3300
400L2-8	355	745	673	95.2	0.80	4551	1.4	6.0	1.8	----------	3400
400L3-8	400	745	758	95.2	0.80	5128	1.4	6.0	1.8	----------	3550
450L1-8	450	750	853	95.2	0.80	5730	1.2	6.0	1.8	----------	4420
450L2-8	500	750	946	95.3	0.80	6367	1.2	6.0	1.8	----------	4750
450L3-8	560	750	1060	95.3	0.80	7131	1.2	6.0	1.8	----------	5230
500LA-8	630	740	1191	95.4	0.80	8130	1.0	6.5	1.8	----------	5490
500LB-8	710	740	1343	95.4	0.80	9163	1.0	6.5	1.8	----------	5750
500LC-8	800	740	1510	95.6	0.80	10324	1.0	6.5	1.8	----------	5950

Other voltages, types and coolings are available on request.

SQUIRREL-CAGE INDUCTION ROTORS

→ *Technical Data*

2-pole, 3000 rpm, IP55 — 400 V, 50 Hz

IE2-design according to IEC60034-30:2008 - IEC60034-2-1-2007*

Type	Rated output	Rated speed	Rated current at 400V	Efficiency at 100%	Efficiency at 75%	Efficiency at 50%	Power factor	Rated torque	Locked rotor torque	Locked rotor current	Break-down torque	Moment of inertia	Weight
	kW	rpm	A	%	%	%	cos φ	Nm	Ma / Mn	Ia / In	Mmax / Mn	kgm²	kg
Aluminium Housing KAE													
56A-2	0.09	2758	0.31	62.0	----------	----------	0.68	0.31	2.3	6.0	2.4	0.0001	3.2
56B-2	0.12	2780	0.36	67.0	----------	----------	0.71	0.41	2.3	6.0	2.4	0.0001	3.4
63A-2	0.18	2715	0.50	69.0	----------	----------	0.75	0.63	2.2	6.0	2.4	0.0002	4
63B-2	0.25	2715	0.66	68.0	----------	----------	0.81	0.88	2.2	6.0	2.4	0.0002	4.5
71A-2	0.37	2690	0.94	70.0	----------	----------	0.81	1.31	2.2	6.0	2.4	0.0004	6
71B-2	0.55	2715	1.33	73.0	----------	----------	0.82	1.93	2.2	6.0	2.4	0.0004	6.5
80A-2	0.75	2875	1.69	77.4	77.2	74.4	0.83	2.49	2.8	7.1	3.3	0.0010	8.5
80B-2	1.1	2875	2.37	79.6	79.5	77.2	0.84	3.65	3.1	7.3	3.5	0.0013	10.5
90S-2	1.5	2890	3.17	81.3	81.2	80.7	0.84	4.96	2.9	8.5	3.5	0.0022	14.5
90L-2	2.2	2890	4.49	83.2	83.4	82.0	0.85	7.27	2.8	8.1	3.3	0.0028	18
100L-2	3	2891	5.88	84.6	84.8	83.8	0.87	9.91	3.5	8.8	3.5	0.0044	25.3
112M-2	4	2914	7.65	85.8	85.7	83.9	0.88	13.1	3.1	9.1	3.7	0.0070	31.3
132S1-2	5.5	2937	10.6	87.0	86.8	85.8	0.86	17.9	2.6	8.4	3.5	0.0141	46.5
132S2-2	7.5	2940	14.0	88.1	88.1	86.7	0.88	24.4	2.6	9.0	2.8	0.0169	51.6
Cast-iron Housing EC-K and KQM													
160M 1-2	11	2930	19.96	89.4	89.4	88.8	0.89	35.67	2.2	8.1	2.3	0.0489	123
160M 2-2	15	2930	26.94	90.3	90.3	89.0	0.89	48.64	2.2	8.1	2.3	0.0559	132
160L-2	18.5	2930	32.64	90.9	90.9	90.0	0.90	60.09	2.2	8.1	2.3	0.0648	151
180M-2	22	2940	38.65	91.3	91.3	90.2	0.90	70.98	2.0	8.1	2.3	0.0808	203
200L 1-2	30	2950	52.3	92.0	92.0	91.1	0.90	96.62	2.0	8.1	2.3	0.1630	246
200L 2-2	37	2950	64.15	92.5	92.5	91.6	0.90	119.17	2.0	8.1	2.3	0.1720	256
225M-2	45	2960	77.69	92.9	92.5	92.0	0.90	144.94	2.0	8.1	2.3	0.3020	328
250M-2	55	2970	94.64	93.2	93.2	92.3	0.90	176.55	2.0	8.1	2.3	0.4200	433
280S-2	75	2975	128.24	93.8	93.8	92.9	0.90	240.35	2.0	8.1	2.3	0.9860	572
280M-2	90	2975	151.71	94.1	94.1	93.6	0.91	288.42	2.0	8.1	2.3	1.04	632
315S-2	110	2980	185.03	94.3	94.3	93.9	0.91	352.51	1.8	7.7	2.2	1.33	950
315M-2	132	2980	221.33	94.6	94.6	94.0	0.91	423.02	1.8	7.7	2.2	1.50	1080
315L 1-2	160	2980	264.80	94.8	94.8	94.4	0.92	512.75	1.8	7.7	2.2	1.67	1210
315L 2-2	200	2980	330.30	95.0	95.0	94.5	0.92	640.94	1.8	7.7	2.2	1.88	1240
355M-2	250	2980	412.88	95.0	95.0	94.6	0.92	799.83	1.6	7.7	2.2	4.02	1970
355L 2-2	315	2980	520.23	95.0	95.0	94.7	0.92	1007.79	1.6	7.7	2.2	4.86	2000
355Lx-2	355	2980	586.29	95.0	95.0	94.7	0.92	1137.67	1.6	7.7	2.2	----------	2300
400M2-2	400	2980	678	95.9	----------	----------	0.9	1282	1.6	7.5	2	----------	3200
400L1-2	450	2980	763	96.1	----------	----------	0.9	1442	1.5	7.5	2	----------	3300
400L2-2	500	2980	847	96.1	----------	----------	0.9	1602	1.5	7.5	2	----------	3400
450M-2	560	2985	914	96.1	----------	----------	0.92	1792	1.2	7	2	----------	3550
450L1-2	630	2985	1029	96.1	----------	----------	0.92	2016	1.2	7	2	----------	3800
450L2-2	710	2985	1159	96.1	----------	----------	0.92	2272	1.2	7	2	----------	4000
450L3-2	800	2985	1303	96.3	----------	----------	0.92	2559	1.2	7	2	----------	4400
450LC-2	900	2985	1469	96.2	----------	----------	0.92	2879	1	7	1.8	----------	4700

Other voltages, types and coolings are available on request.

*Standard IE2 exclusively applies to motors with a rated output between 0.75 and 375 kW, cf. page 18.

SQUIRREL-CAGE INDUCTION ROTORS

→ *Technical Data*

4-pole, 1500 rpm, IP55 — 400 V, 50 Hz

Type	Rated output	Rated speed	Rated current at 400V	Efficiency at 100%	Efficiency at 75%	Efficiency at 50%	Power factor	Rated torque	Locked rotor torque	Locked rotor current	Break-down torque	Moment of inertia	Weight
	kW	U/min	A	%	%	%	cos φ	Nm	Ma / Mn	Ia / In	Mmax / Mn	kgm²	kg
Aluminium Housing KAE													
56B-4	0.09	1371	0.33	46.0	----------	----------	0.56	0.42	2.3	6.0	2.4	0.0002	3
63A-4	0.12	1350	0.45	49.0	----------	----------	0.56	0.64	2.3	6.0	2.4	0.0002	3.4
63B-4	0.18	1350	0.49	53.0	----------	----------	0.64	0.85	2.2	6.0	2.4	0.0003	3.5
71A-4	0.25	1340	0.7	56.0	----------	----------	0.66	1.28	2.2	6.0	2.4	0.0004	4.9
71B-4	0.37	1390	0.75	65.0	----------	----------	0.74	1.72	2.2	6.0	2.4	0.0006	6
80A-4	0.55	1375	1.06	67.0	----------	----------	0.75	2.57	2.2	6.0	2.4	0.0007	6.4
80B-4	0.75	1370	1.49	71.0	79.8	77.8	0.75	3.83	2.2	6.0	2.4	0.0013	9.5
90S-4	1.1	1400	2.53	81.4	81.5	79.5	0.77	7.5	2.7	7.0	3.3	0.0037	18
90L-4	1.5	1445	3.4	82.8	82.7	80.9	0.77	9.9	2.9	7.3	3.5	0.0049	19.5
100L1-4	2.2	1440	4.65	84.3	84.4	83.4	0.81	14.6	2.3	6.8	3.1	0.0093	26.5
100L2-4	3	1440	6.18	85.5	85.6	84.1	0.82	19.9	2.7	7.7	3.4	0.0115	30.5
112M-4	4	1445	8.13	86.6	86.8	85.8	0.82	26.44	2.7	7.9	3.4	0.0163	40
132S-4	5.5	1455	10.9	87.7	87.9	87.3	0.83	36.1	2.5	8.9	2.7	0.0345	51.6
132M-4	7.5	1455	14.5	88.7	89.0	88.3	0.84	49.23	2.4	8.6	2.7	0.0437	62.5
Cast-iron Housing EC-K and KQM													
160M 1-4	11	1465	21.05	89.8	90.0	88.7	0.84	71.46	2.2	8.9	2.3	0.0771	123
160L-4	15	1465	28.11	90.6	91.0	89.1	0.85	97.12	2.2	8.9	2.3	0.1010	153
180M-4	18.5	1470	34.05	91.2	91.6	90.6	0.86	119.78	2.2	7.9	2.3	0.1520	204
180L-4	22	1470	40.31	91.6	91.8	90.5	0.86	142.44	2.2	7.9	2.3	0.1870	215
200L1-4	30	1470	54.55	92.3	92.7	92.0	0.86	193.58	2.2	7.9	2.3	0.2850	243
225S-4	37	1475	66.22	92.7	93.1	92.6	0.87	237.95	2.2	7.9	2.3	0.4730	305
225M-4	45	1475	80.19	93.1	93.5	92.7	0.87	289.39	2.2	7.9	2.3	0.5540	328
250M-4	55	1480	97.59	93.5	94.0	93.0	0.87	352.5	2.2	7.9	2.3	0.7510	452
280S-4	75	1480	132.38	94.0	94.0	93.2	0.87	480.7	2.2	7.9	2.3	1.92	592
280M-4	90	1480	158.51	94.2	94.5	94.0	0.87	576.84	2.2	7.9	2.3	2.32	672
315S-4	110	1480	190.93	94.5	94.7	94.1	0.88	705.03	2.1	7.6	2.2	2.34	980
315M-4	132	1480	228.63	94.7	94.9	94.3	0.88	846.04	2.1	7.6	2.2	2.58	1040
315L 1-4	160	1480	273.44	94.9	95.1	94.5	0.89	1025.5	2.1	7.6	2.2	2.96	1180
315L 2-4	200	1480	341.08	95.1	95.1	94.6	0.89	1281.88	2.1	7.6	2.2	3.46	1260
355M 2-4	250	1485	421.61	95.1	95.1	94.6	0.90	1602.35	2.1	7.6	2.2	6.60	1810
355L 2-4	315	1485	531.23	95.1	95.1	94.6	0.90	2018.96	2.1	7.6	2.2	7.55	1910
355L1-4	355	1485	598.68	95.1	95.1	94.6	0.90	2283	2.0	7.6	2.1	----------	2290
400M1-4	400	1490	686	95.5	----------	----------	0.88	2564	1.4	6.9	2.8	----------	3000
400M2-4	450	1490	773	95.5	----------	----------	0.88	2884	1.4	6.9	2.8	----------	3100
400L1-4	500	1490	848	95.6	----------	----------	0.89	3205	1.4	7	2.8	----------	3200
400L2-4	560	1490	946	96	----------	----------	0.89	3589	1.4	7	2.8	----------	3400
400L3-4	630	1490	1064	96	----------	----------	0.89	4038	1.5	7.1	2.8	----------	3500
450M-4	710	1490	1202	95.8	----------	----------	0.89	4551	1.2	7	2	----------	4500
450L2-4	800	1490	1350	96.1	----------	----------	0.89	5128	1.2	7	2	----------	4750
450L3-4	900	1490	1519	96.1	----------	----------	0.89	5768	1.2	7	2	----------	4950
500LA-4	1000	1490	1627	96.6	----------	----------	0.89	6409	1	7	1.8	----------	5320

IE2-design according to IEC60034-30:2008 - IEC60034-2-1-2007*

Other voltages, types and coolings are available on request.

*Standard IE2 exclusively applies to motors with a rated output between 0.75 and 375 kW, cf. page 18.

SQUIRREL-CAGE INDUCTION ROTORS

→ *Technical Data*

6-pole, 1000 rpm, IP55 — 400 V, 50 Hz

IE2-design according to IEC60034-30:2008 - IEC60034-2-1-2007*

Type	Rated output	Rated speed	Rated current at 400V	Efficiency at 100%	Efficiency at 75%	Efficiency at 50%	Power factor	Rated torque	Locked rotor torque	Locked rotor current	Break-down torque	Moment of inertia	Weight
	kW	rpm	A	%	%	%	cos φ	Nm	Ma / Mn	Ia / In	Mmax / Mn	kgm²	kg
Aluminium Housing KAE													
63B-6	0.12	830	0.64	40.0	----------	----------	0.68	1.38	2.2	6.0	2.4	0.0005	5
71A-6	0.18	880	0.70	59.0	----------	----------	0.63	1.95	2.2	6.0	2.4	0.0008	5.9
71B-6	0.25	900	0.90	59.0	----------	----------	0.68	2.65	2.2	6.0	2.4	0.0010	6.3
80A-6	0.37	915	1.23	62.0	----------	----------	0.70	3.86	2.2	6.0	2.4	0.0016	8.3
80B-6	0.55	920	1.70	65.0	----------	----------	0.72	5.71	2.2	6.0	2.4	0.0021	9.6
90S-6	0.75	934	1.98	75.9	76.1	74.7	0.72	7.67	2.0	4.6	2.6	0.0048	14.5
90L-6	1.1	945	2.82	78.1	78.3	77.2	0.72	11.12	2.1	5.0	2.8	0.0068	19
100L-6	1.5	945	3.62	79.8	80.1	78.9	0.75	15.16	2.2	5.2	2.8	0.0125	24
112M-6	2.2	960	5.11	81.8	81.9	81.5	0.76	21.89	2.2	6.1	2.9	0.0170	32
132S-6	3	964	6.84	83.3	83.6	82.5	0.76	29.72	2.3	6.4	3.1	0.0368	43
132M1-6	4	965	8.98	84.6	84.7	83.6	0.76	39.6	2.4	7.4	3.3	0.0484	52
132M2-6	5.5	965	12.0	86.0	86.2	85.3	0.77	54.4	2.6	7.3	3.5	0.0632	63
Cast-iron Housing EC-K and KQM													
160M-6	7.5	970	16.12	87.2	87.2	86.2	0.77	73.09	2.0	6.9	2.1	0.0964	123
160L-6	11	970	22.95	88.7	88.7	87.9	0.78	107.19	2.0	6.9	2.1	0.1270	157
180L-6	15	970	29.8	89.7	89.7	88.1	0.81	146.17	2.0	7.5	2.1	0.2010	206
200L1-6	18.5	970	36.47	90.4	90.4	89.3	0.81	179.36	2.1	7.5	2.1	0.3250	243
200L2-6	22	970	42.09	90.9	90.9	90.1	0.83	213.3	2.1	7.5	2.1	0.3710	256
225M-6	30	980	56.22	91.7	91.7	90.9	0.84	290.8	2.0	7.5	2.1	0.5330	306
250M-6	37	980	67.35	92.2	91.7	91.5	0.86	356.92	2.1	7.5	2.1	0.8770	416
280S-6	45	980	81.48	92.7	92.7	92.1	0.86	434.04	2.1	7.5	2.0	1.85	603
280M-6	55	980	99.15	93.1	93.1	92.3	0.86	530.55	2.1	7.5	2.0	2.12	693
315S-6	75	990	134.34	93.7	93.7	92.5	0.86	719.85	2.0	7.5	2.0	2.61	970
315M-6	90	990	160.7	94.0	94.0	93.0	0.86	863.82	2.0	7.5	2.0	3.04	1180
315L1-6	110	990	195.78	94.3	94.3	93.1	0.86	1055.82	2.0	7.3	2.0	3.71	1240
315L2-6	132	990	231.5	94.6	94.6	94.2	0.87	1266.93	2.0	7.3	2.0	4.24	1300
355M1-6	160	990	276.84	94.8	94.8	94.3	0.88	1535.68	1.9	7.3	2.0	7.44	1740
355M3-6	200	990	345.32	95.0	95.0	94.4	0.88	1919.6	1.9	7.3	2.0	9.10	1945
355L2-6	250	990	431.64	90.0	95.0	94.4	0.88	2399.5	1.9	7.3	2.0	10.80	2070
355L3-6	315	990	543.9	95	95	94.4	0.88	3039	1.9	7.3	2	13.42	2100
355L4-6	355	990	612.9	95	95	94.4	0.88	3424	1.9	7.3	2	15.58	2250
400L-6	400	990	685	95.8	----------	----------	0.88	3859	1.5	7.5	2.9	----------	3400
400L1-6	450	990	790	95.6	----------	----------	0.86	4341	1.5	7.5	2.9	----------	3600
450M-6	500	970	879	95.5	----------	----------	0.86	4923	1.4	6.5	1.8	----------	4320
450L1-6	560	990	952	95.7	----------	----------	0.86	5402	1.4	6.5	1.8	----------	4530
450L2-6	630	990	1105	95.7	----------	----------	0.86	6077	1.4	6.5	1.8	----------	4750
450L3-6	710	990	1243	95.9	----------	----------	0.86	6849	1.4	6.5	1.8	----------	5200
500LA-6	800	995	1414	96	----------	----------	0.85	7678	1.4	6.5	1.8	----------	5320
500LB-6	900	995	1571	96.2	----------	----------	0.85	8638	1.4	6.5	1.8	----------	5750

Other voltages, types and coolings are available on request.

*Standard IE2 exclusively applies to motors with a rated output between 0.75 and 375 kW, cf. page 18.

SQUIRREL-CAGE INDUCTION ROTORS

→ *Technical Data*

8-pole, 750 rpm, IP55 — 400 V, 50 Hz

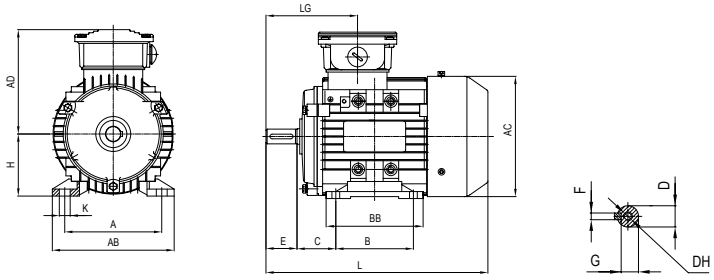
Type	Rated output	Rated speed	Rated current at 400V	Efficiency at 100%	Power factor	Rated torque	Locked rotor torque	Locked rotor current	Break-down torque	Moment of inertia	Weight
	kW	U/min	A	%	cos φ	Nm	Ma / Mn	Ia / In	Mmax / Mn	kgm²	kg
Aluminium Housing KAE											
80A-8	0.18	680	0.93	51.0	0.55	2.53	2.2	6.0	2.4	0.0018	9
80B-8	0.25	680	1.1	54.0	0.61	3.51	2.2	6.0	2.4	0.0022	11
90S-8	0.37	680	1.41	62.0	0.61	5.2	2.2	6.0	2.4	0.0036	14
90L-8	0.55	700	2.07	63.0	0.61	7.5	2.2	6.0	2.4	0.0045	17
100L1-8	0.75	700	2.28	71.0	0.67	10.23	2.2	6.0	2.3	0.0062	19
100L2-8	1.1	710	3.15	73.0	0.69	14.8	2.2	6.0	2.3	0.0079	20
112M-8	1.5	710	4.18	75.0	0.69	20.18	2.2	6.0	2.3	0.0134	28
132S-8	2.2	720	5.73	78.0	0.71	29.18	2.0	6.0	2.0	0.0289	46
132M-8	3	720	7.51	79.0	0.73	39.79	2.0	5.5	2.0	0.0383	47
Cast-iron Housing EC-K and KQM											
160M1-8	4	710	9.8	81.0	0.73	53.1	1.9	6.0	2.0	0.0753	118
160M2-8	5.5	720	12.9	83.0	0.74	73	2.0	6.0	2.0	0.0931	119
160L-8	7.5	720	16.9	85.5	0.75	99.5	2.0	6.0	2.0	0.1260	145
180L-8	11	730	23.8	87.5	0.76	144	2.0	6.6	2.0	0.2030	184
200L-8	15	730	32.4	88.0	0.76	196	2.0	6.6	2.0	0.3390	250
225S-8	18.5	730	38.6	90.0	0.76	242	1.9	6.6	2.0	0.4910	266
225M-8	22	730	45.0	90.5	0.78	284	1.9	6.6	2.0	0.5470	292
250M-8	30	730	60.8	91.0	0.79	387	1.9	6.6	2.0	0.8340	405
280S-8	37	730	74.1	91.5	0.79	478	1.9	6.6	2.0	1.39	520
280M-8	45	730	89.3	92.0	0.79	581	1.9	6.6	2.0	1.65	592
315S-8	55	730	105.5	92.8	0.81	710	1.8	6.6	2.0	4.79	1000
315M8	75	740	143.5	93.0	0.81	968	1.8	6.6	2.0	5.58	1100
315L1-8	90	740	169.1	93.8	0.82	1161	1.8	6.6	2.0	6.37	1160
315L2-8	110	740	206.2	94.0	0.82	1420	1.8	6.4	2.0	7.23	1230
355M1-8	132	740	248.0	93.7	0.82	1704	1.8	6.4	2.0	10.55	1600
355M2-8	160	740	299.2	94.2	0.82	2065	1.8	6.4	2.0	11.73	1700
355L2-8	200	740	368.6	94.5	0.83	2581	1.8	6.4	2.0	12.86	1800
400M1-8	250	745	469	95	0.81	3205	1.2	6.6	3.4	----------	3100
400L1-8	315	745	584	95	0.82	4038	1.2	6.5	3	----------	3300
400L2-8	355	745	679	92	0.82	4551	1.3	7	3	----------	3400
400L3-8	400	745	740	95.2	0.82	5128	1.3	7.2	3	----------	3550
450L1-8	450	750	853	95.2	0.8	5730	1.2	6	1.8	----------	4420
450L2-8	500	750	946	95.3	0.8	6367	1.2	6	1.8	----------	4750
450L3-8	560	750	1060	95.3	0.8	7131	1.2	6	1.8	----------	5230
500LA-8	630	740	1191	95.4	0.8	8130	1	6.5	1.8	----------	5490
500LB-8	710	740	1343	95.4	0.8	9163	1	6.5	1.8	----------	5750
500LC-8	800	740	1510	95.6	0.8	10324	1	6.5	1.8	----------	5950

Other voltages, types and coolings are available on request.

B3

Type: JS

Frame size: 56 - 132



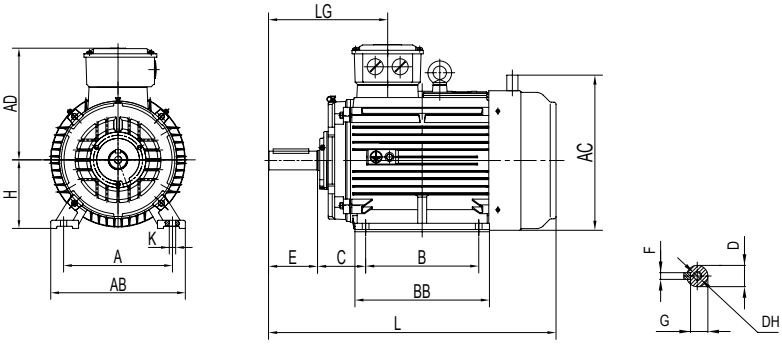
B3

Type: HS

Framesize: 160 - 355

Type: ES

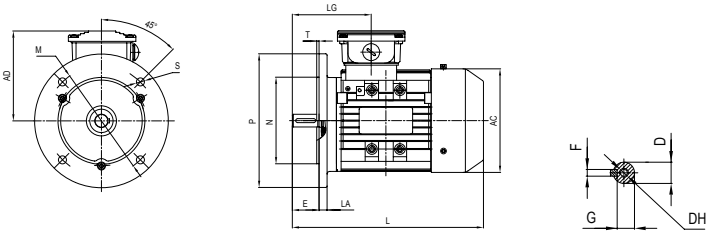
Frame size: 400 - 560



B5

Type: JF

Frame size: 56 - 132



B5

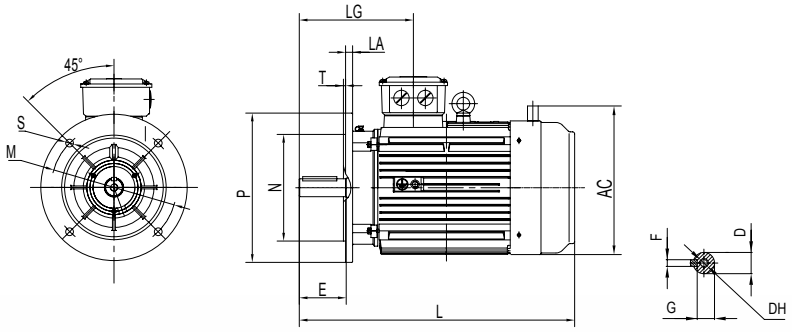
Type: HF

Frame size: 160 - 355

Type: WF

Frame size: 400 - 560

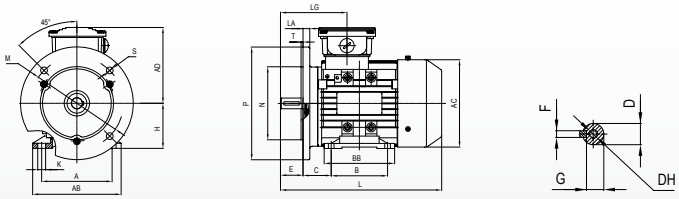
From framesize 280, 8 mounting holes



B35

Type: JS

Frame size: 56 - 132



PERFORMANCE CURVES

Type: JS / JF und HS / HF B3 / B5 / B35

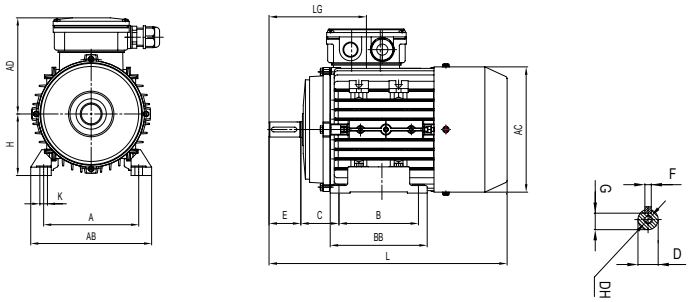
Frame size: 56 - 355

TYPE		A	B	C	D	DH	E	F	G	H	K	AB	AC	AD	BB	L	LA	LG	M	N	P	S	T
56	2-8	90	71	36	9	M4x12	20	3	7.2	56	5.8x8.3	111	113	105	88	199	8	83	100	80	120	7	3
63	2-8	100	80	40	11	M4x12	23	4	8.5	63	7x9.5	123	120	110	100	217	10	95.5	115	95	140	10	3
71	2-8	112	90	45	14	M5x12	30	5	11	71	7x11	138	136	119	110	245	10	110.5	130	110	160	10	3.5
80	2-8	125	100	50	19	M6x16	40	6	15.5	80	10x14	157	155	134.5	125	286	12	118	165	130	200	12	3.5
90S	2-8	140	100	56	24	M8x19	50	8	20	90	10x14	173	175	146.5	125	310	12	136	165	130	200	12	3.5
90L	2-8	140	125	56	24	M8x19	50	8	20	90	10x14	173	175	146.5	150	335	12	136	165	130	200	12	3.5
100L	2-8	160	140	63	28	M10x22	60	8	24	100	12x16	196	195	160.5	172	383	13	143.5	215	180	250	15	4
112M	2-8	190	140	70	28	M10x22	60	8	24	112	12x16	227	219	175.5	180	401	14	151.5	215	180	250	15	4
132S	2-8	216	140	89	38	M12x28	80	10	33	132	12x16	262	258	194.5	186	475	14	180	265	230	300	15	4
132M	2-8	216	178	89	38	M12x28	80	10	33	132	12x16	262	258	194.5	224	513	14	180	265	230	300	15	4
160M	2-8	254	210	108	42	M16x36	110	12	37	160	14.5	320	330	265	305	655	15	267.5	300	250	350	18.5	5
160L	2-8	254	254	108	42	M16x36	110	12	37	160	14.5	320	330	265	325	685	15	267.5	300	250	350	18.5	5
180M	2-8	279	241	121	48	M16x36	110	14	42.5	180	14.5	350	380	280	330	728	15	277	300	250	350	18.5	5
180L	2-8	279	279	121	48	M16x36	110	14	42.5	180	14.5	350	380	280	370	768	15	277	300	250	350	18.5	5
200L	2-8	318	305	133	55	M20x42	110	16	49	200	18.5	395	420	315	370	760	17	300	350	300	400	18.5	5
225S	4-8	356	286	149	60	M20x42	140	18	53	225	18.5	436	465	328	355	825	19	340	400	350	450	18.5	5
225M	2	356	311	149	55	M20x42	110	16	49	225	18.5	436	465	328	380	820	19	310	400	350	450	18.5	5
225M	4-8	356	311	149	60	M20x42	140	18	53	225	18.5	436	465	328	380	850	19	340	400	350	450	18.5	5
250M	2	406	349	168	60	M20x42	140	18	53	250	24	495	520	370	440	925	20	353	500	450	550	18.5	5
250M	4-8	406	349	168	65	M20x42	140	18	58	250	24	495	520	370	440	925	20	353	500	450	550	18.5	5
280S	2	457	368	190	65	M20x42	140	18	58	280	24	550	570	405	535	960	22	350	500	450	550	18.5	5
280S	4-8	457	368	190	75	M20x42	140	20	67.5	280	24	550	570	405	535	975	22	350	500	450	550	18.5	5
280M	2	457	419	190	65	M20x42	140	18	58	280	24	550	570	405	535	1000	22	350	500	450	550	18.5	5
280M	4-8	457	419	190	75	M20x42	140	20	67.5	280	24	550	570	405	535	1015	22	350	500	450	550	18.5	5
315S	2	508	406	216	65	M20x42	140	18	58	315	28	635	650	505	565	1160	24	387	600	550	660	24	6
315M	2	508	457	216	65	M20x42	140	18	58	315	28	635	650	505	675	1270	24	387	600	550	660	24	6
315L	2	508	508	216	65	M20x42	140	18	58	315	28	635	650	505	675	1270	24	387	600	550	660	24	6
315S	4-8	508	406	216	80	M20x42	170	22	71	315	28	635	650	505	515	1210	24	417	600	550	660	24	6
315M	4-8	508	457	216	80	M20x42	170	22	71	315	28	635	650	505	675	1320	24	417	600	550	660	24	6
315L	4-8	508	508	216	80	M20x42	170	22	71	315	28	635	650	505	675	1320	24	417	600	550	660	24	6
355M	2	610	560	254	75	M20x42	140	20	67.5	355	28	735	735	645	775	1500	25	420	740	680	800	24	6
355L	2	610	630	254	75	M20x42	140	20	67.5	355	28	735	735	645	775	1500	25	420	740	680	800	24	6
355M	4-8	610	560	254	100	M20x42	210	28	90	355	28	735	735	645	775	1570	25	490	740	680	800	24	6
355L	4-8	610	630	254	100	M20x42	210	28	90	355	28	735	735	645	875	1670	25	490	740	680	800	24	6

B3

Type: KAE

Frame size: 56 - 132



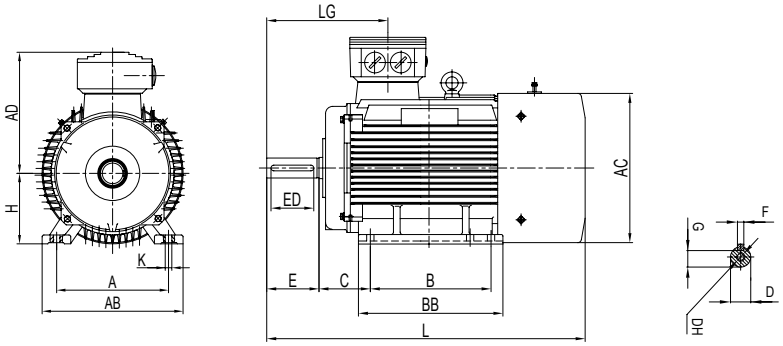
B3

Type: KS / KQM

Frame size: 160 - 355

Type: ES

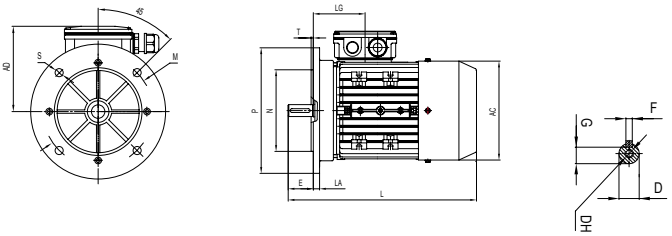
Frame size: 400 - 560



B5

Type: KAE

Frame size: 56 - 132



B5

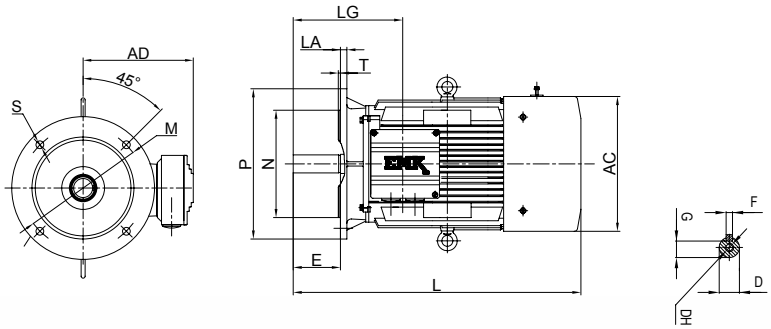
Type: KF / KQM

Frame size: 160 - 355

Type: WF

Frame size: 400 - 560

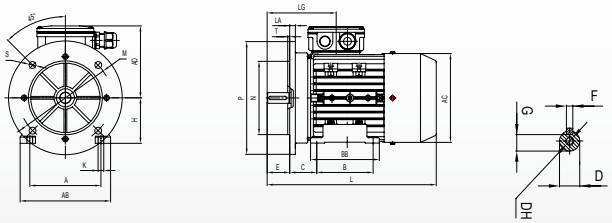
From Frame size 280, 8 mounting holes



B35

Type: KAE

Frame size: 56 - 132



PERFORMANCE CURVES

Type: KAE and EC-K / KQM B3 / B5 / B35

Frame size: 56 - 355

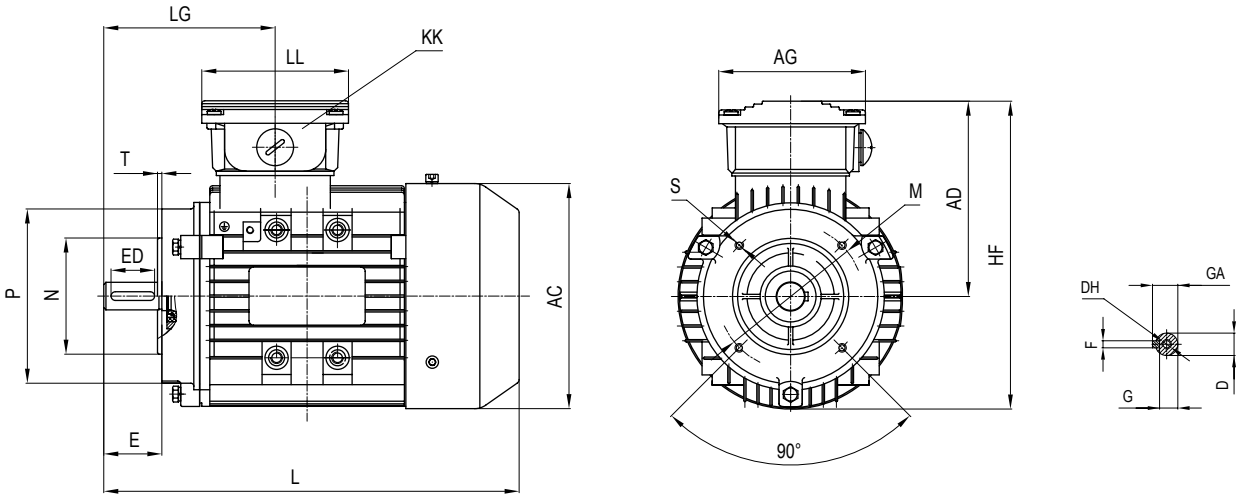
TYPE		A	B	C	D	DH	E	F	G	H	K	AB	AC	AD	BB	L	LA	LG	M	N	P	S	T
56	2-8	90	71	36	9	M3×9	20	3	7.2	56	6	108	120	101	90	195	10	79	100	80	120	7	3
63	2-8	100	80	40	11	M4×10	23	4	8.5	63	7	120	129	109	105	213	10	86	115	95	140	10	3
71	2-8	112	90	45	14	M5×12.5	30	5	11	71	7	132	145	119	105	255	10	100	130	110	160	10	3.5
80	2-8	125	100	48	19	M6×16	40	6	15.5	80	10	160	158	143	122	302	10	122.5	165	130	200	12	3.5
90S	2-8	140	100	57	24	M8×19	50	8	20	90	10	178	175	148	155	335	10	133.5	165	130	200	12	3.5
90L	2-8	140	125	57	24	M8×19	50	8	20	90	10	178	175	148	155	361	10	133.5	165	130	200	12	3.5
100L	2-8	160	140	63	28	M10×22	60	8	24	100	12	206	197	165	176	406	14	144.3	215	180	250	15	4
112M	2-8	190	140	70	28	M10×22	60	8	24	112	12	222	220	178	180	422	14	150	215	180	250	15	4
132S	2-8	216	140	89	38	M12×28	80	10	33	132	12	257	258	198	180	464	14	182	265	230	300	15	4
132M	2-8	216	178	89	38	M12×28	80	10	33	132	12	257	258	198	218	522	15	182	265	230	300	15	4
160M	2-8	254	210	108	42	M16x36	110	12	37	160	4x15	320	314	275	260	615	15	255	300	250	350	4x19	5
160L	2-8	254	254	108	42	M16x36	110	12	37	160	6x15	320	314	275	304	670	15	255	300	250	350	4x19	5
180M	2-8	279	241	121	48	M16x40	110	14	42.5	180	4x15	355	355	290	311	700	15	271	300	250	350	4x19	5
180L	2-8	279	279	121	48	M16x40	110	14	42.5	180	4x15	355	355	290	349	740	15	271	300	250	350	4x19	5
200L	2-8	318	305	133	55	M20x50	110	16	49	200	4x19	395	397	325	369	770	17	301	350	300	400	4x19	5
225S	4-8	356	286	149	60	M20x56	140	18	53	225	4x19	435	445	347	375	820	20	329	400	350	450	8x19	5
225M	2	356	311	149	55	M20x56	110	16	49	255	6x19	435	445	347	400	815	20	299	400	350	450	8x19	5
225M	4-8	356	311	149	60	M20x56	140	18	53	255	6x19	435	445	347	400	845	20	325	400	350	450	8x19	5
250M	2	406	349	168	60	M20x56	140	18	53	250	6x24	490	484	392	450	910	22	347	500	450	550	8x19	5
250M	4-8	406	349	168	65	M20x56	140	18	58	250	6x24	490	484	392	450	910	22	347	500	450	550	8x19	5
280S	2	457	368	190	65	M20x56	140	18	58	280	4x24	542	547	421	485	985	22	355	500	450	550	8x19	5
280S	4-8	457	368	190	75	M20x56	140	20	67.5	280	4x24	542	547	421	485	985	22	355	500	450	550	8x19	5
280M	2	457	419	190	65	M20x56	140	18	58	280	6x24	542	547	421	536	1035	22	355	500	450	550	8x19	5
280M	4-8	457	419	190	75	M20x56	140	20	67.5	280	6x24	542	547	421	536	1035	22	355	500	450	550	8x19	5
315S	2	508	406	216	65	M20x56	140	18	58	315	4x28	635	620	559	570	1185	22	395	600	550	660	8x24	6
315M	2	508	457	216	65	M20x56	140	18	58	315	6x28	635	620	559	680	1295	22	395	600	550	660	8x24	6
315L	2	508	508	216	65	M20x56	140	18	58	315	6x28	635	620	559	680	1295	22	395	600	550	660	8x24	6
315S	4-8	508	406	216	80	M20x56	170	22	71	315	4x28	635	620	559	57	1215	22	425	600	550	660	8x24	6
315M	4-8	508	457	216	80	M20x56	170	22	71	315	6x28	635	620	559	680	1325	22	425	600	550	660	8x24	6
315L	4-8	508	508	216	80	M20x56	170	22	71	315	6x28	635	620	559	680	1325	22	425	600	550	660	8x24	6
355M	2	610	630	254	75	M24x56	140	20	67.5	355	6x28	730	698	657	760	1500	25	424	740	680	800	8x24	6
355L	2	610	630	254	75	M24x56	140	20	67.5	355	6x28	730	698	657	760	1500	25	424	740	680	800	8x24	6
355M	4-8	610	630	254	100	M24x56	210	28	86	355	6x28	730	698	657	760	1530	25	494	740	680	800	8x24	6
355L	4-8	610	630	254	100	M24x56	210	28	86	355	6x28	730	698	657	760	1530	25	494	740	680	800	8x24	6

PERFORMANCE CURVES

Type: JF

Frame size: 56 - 132

B14A



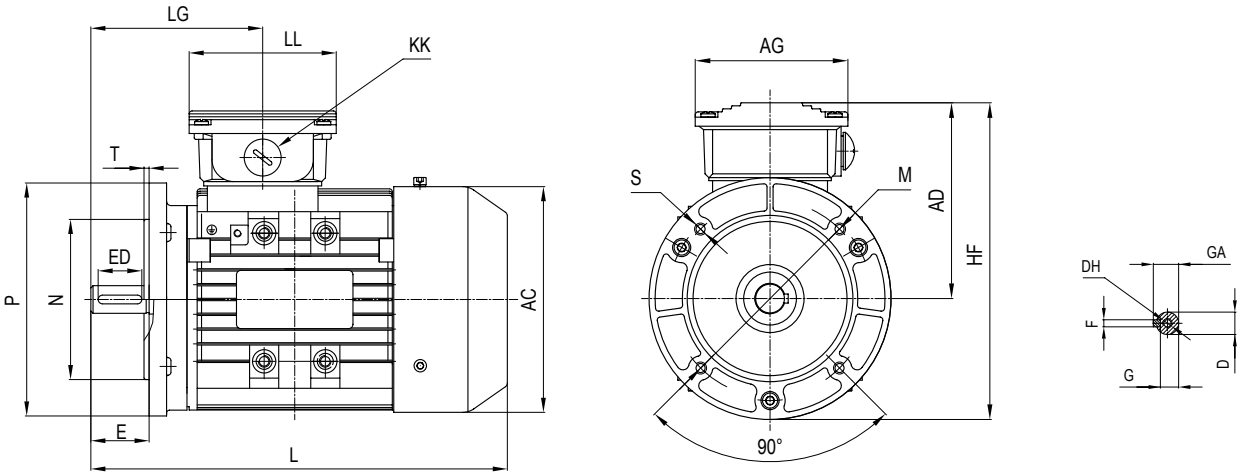
Type		AC	AD	AG	D	DH	E	ED	F	G	GA	HF	KK	L	LG	LL	M	N	P	S	T
56	2-8	113	105	85	9	M4x12	20	16	3	7.2	10.2	161.3	1xM20x1.5	199	83	86	65	50	80	M5	2.5
63	2-8	120	110	101	11	M4x12	23	16	4	8.5	12.5	170	1xM20x1.5	217	95.5	101	75	60	90	M5	2.5
71	2-8	136	119	101	14	M5x12	30	25	5	11	16	187	1xM20x1.5	245	110.5	101	85	70	105	M6	2.5
80	2-8	155	134.5	101	19	M6x16	40	30	6	15.5	21.5	212	1xM20x1.5	286	118	101	100	80	120	M6	3
90S	2-8	175	146.5	109	24	M8x19	50	40	8	20	27	234	1xM20x1.5	310	136	108.5	115	95	140	M8	3
90L	2-8	175	146.5	109	24	M8x19	50	40	8	20	27	234	1xM20x1.5	335	136	108.5	115	95	140	M8	3
100L	2-8	195	160.5	109	28	M10x22	60	50	8	24	31	258	1xM20x1.5	383	143.5	108.5	130	110	160	M8	3.5
112M	2-8	219	175.5	117	28	M10x22	60	50	8	24	31	285	2xM32x1.5	401	151.5	117	130	110	160	M8	3.5
132S	2-8	258	194.5	117	38	M12x28	80	65	10	33	41	323.5	2xM32x1.5	475	180	117	165	130	200	M10	3.5
132M	2-8	258	194.5	117	38	M12x28	80	65	10	33	41	323.5	2xM32x1.5	513	180	117	165	130	200	M10	3.5

PERFORMANCE CURVES

Type: JF

Frame size: 56 - 132

B14B



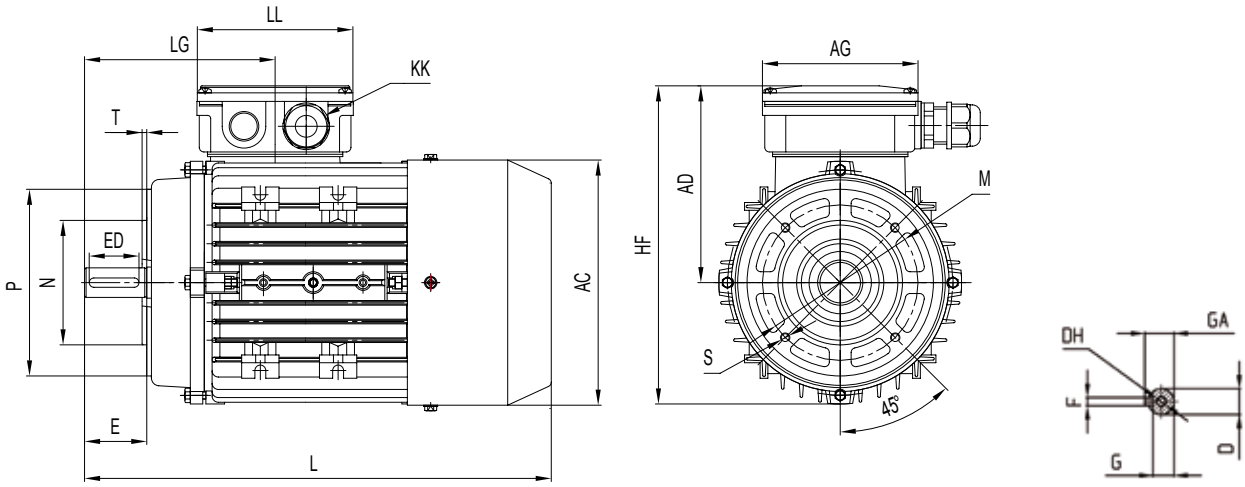
Type		AC	AD	AG	D	DH	E	ED	F	G	GA	HF	KK	L	LG	LL	M	N	P	S	T
56	2-8	113	105	85	9	M4x12	20	16	3	7.2	10.2	161.3	1xM20x1.5	199	83	86	85	70	105	M6	2.5
63	2-8	120	110	101	11	M4x12	23	16	4	8.5	12.5	170	1xM20x1.5	217	95.5	101	100	80	120	M6	3
71	2-8	136	119	101	14	M5x12	30	25	5	11	16	189	1xM20x1.5	245	110.5	101	115	95	140	M8	3
80	2-8	155	134.5	101	19	M6x16	40	30	6	15.5	21.5	209.5	1xM20x1.5	287	118	101	130	110	160	M8	3.5
90S	2-8	175	146.5	109	24	M8x19	50	40	8	20	27	234	1xM20x1.5	310	136	108.5	130	110	160	M8	3.5
90L	2-8	175	146.5	109	24	M8x19	50	40	8	20	27	234	1xM20x1.5	335	136	108.5	130	110	160	M8	3.5
100L	2-8	195	160.5	109	28	M10x22	60	50	8	24	31	260.5	1xM20x1.5	383	143.5	108.5	165	130	200	M10	3.5
112M	2-8	219	175.5	117	28	M10x22	60	50	8	24	31	285	2xM32x1.5	401	151.5	117	165	130	200	M10	3.5
132S	2-8	258	194.5	117	38	M12x28	80	65	10	33	41	323.5	2xM32x1.5	475	180	117	215	180	250	M12	4
132M	2-8	258	194.5	117	38	M12x28	80	65	10	33	41	323.5	2xM32x1.5	513	180	117	215	180	250	M12	4

PERFORMANCE CURVES

Type: KAE

Frame size: 56 - 132

B14A



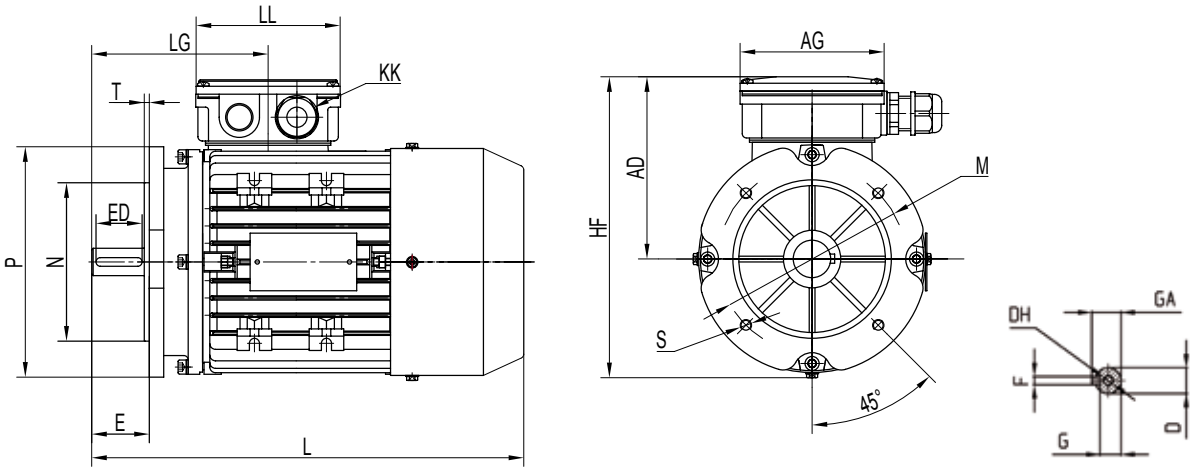
Type		AC	AD	AG	D	DH	E	ED	F	G	GA	HF	KK	L	LG	LL	M	N	P	S	T
56	2-8	113	105	88	9	M3×9	20	16	3	7.2	10.2	161.3	1xM20x1.5	195	83	86	65	50	80	M5	2.5
63	2-8	120	110	94	11	M4×10	23	16	4	8.5	12.5	170	1xM20x1.5	213	95.5	101	75	60	90	M5	2.5
71	2-8	136	119	94	14	M5×12.5	30	25	5	11	16	187	1xM20x1.5	255	110.5	101	85	70	105	M6	2.5
80	2-8	158	128	105	19	M6×16	40	30	6	15.5	21.5	212	1xM20x1.5	302	118	101	100	80	120	M6	3
90S	2-8	175	133	105	24	M8×19	50	40	8	20	27	234	1xM20x1.5	335	136	108.5	115	95	140	M8	3
90L	2-8	175	133	105	24	M8×19	50	40	8	20	27	234	1xM20x1.5	361	136	108.5	115	95	140	M8	3
100L	2-8	194	150	105	28	M10×22	60	50	8	24	31	258	1xM20x1.5	406	143.5	108.5	130	110	160	M8	3.5
112M	2-8	220	170	120	28	M10×22	60	50	8	24	31	285	2xM32x1.5	422	151.5	117	130	110	160	M8	3.5
132S	2-8	258	190	120	38	M12×28	80	65	10	33	41	323.5	2xM32x1.5	464	180	117	165	130	200	M10	3.5
132M	2-8	258	190	120	38	M12×28	80	65	10	33	41	323.5	2xM32x1.5	522	180	117	165	130	200	M10	3.5

PERFORMANCE CURVES

Type: KAE

Frame size: 56 - 132

B14B

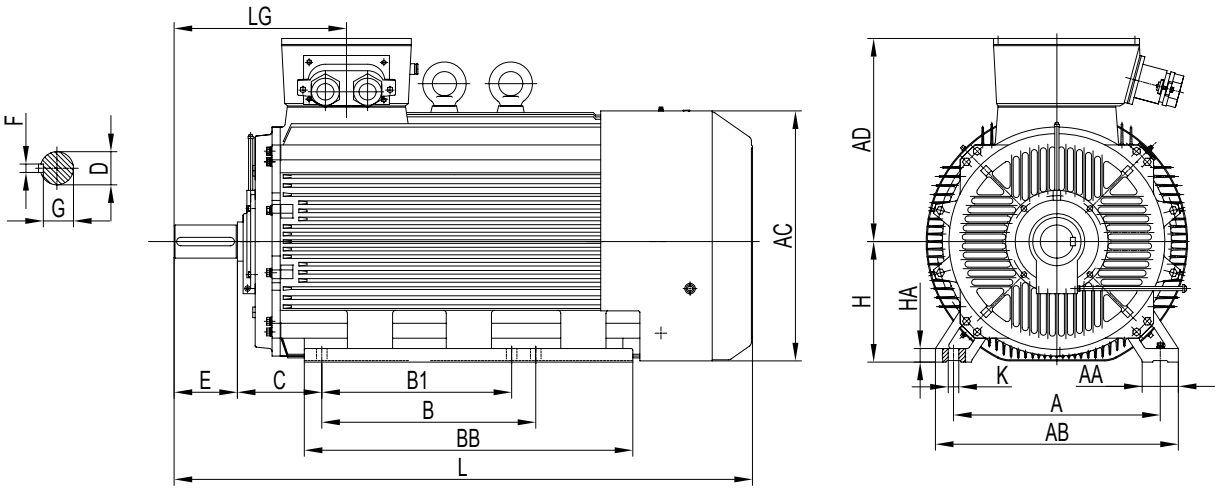


Type		AC	AD	AG	D	DH	E	ED	F	G	GA	HF	KK	L	LG	LL	M	N	P	S	T
56	2-8	113	105	85	9	M4x12	20	16	3	7.2	10.2	161.3	1xM20x1.5	195	83	86	85	70	105	M6	2.5
63	2-8	120	110	101	11	M4x12	23	16	4	8.5	12.5	170	1xM20x1.5	213	95.5	101	100	80	120	M6	3
71	2-8	136	119	101	14	M5x12	30	25	5	11	16	189	1xM20x1.5	255	110.5	101	115	95	140	M8	3
80	2-8	155	134.5	101	19	M6x16	40	30	6	15.5	21.5	209.5	1xM20x1.5	302	118	101	130	110	160	M8	3.5
90S	2-8	175	146.5	109	24	M8x19	50	40	8	20	27	234	1xM20x1.5	335	136	108.5	130	110	160	M8	3.5
90L	2-8	175	146.5	109	24	M8x19	50	40	8	20	27	234	1xM20x1.5	361	136	108.5	130	110	160	M8	3.5
100L	2-8	195	160.5	109	28	M10x22	60	50	8	24	31	260.5	1xM20x1.5	406	143.5	108.5	165	130	200	M10	3.5
112M	2-8	219	175.5	117	28	M10x22	60	50	8	24	31	285	2xM32x1.5	422	151.5	117	165	130	200	M10	3.5
132S	2-8	258	194.5	117	38	M12x28	80	65	10	33	41	323.5	2xM32x1.5	464	180	117	215	180	250	M12	4
132M	2-8	258	194.5	117	38	M12x28	80	65	10	33	41	323.5	2xM32x1.5	522	180	117	215	180	250	M12	4

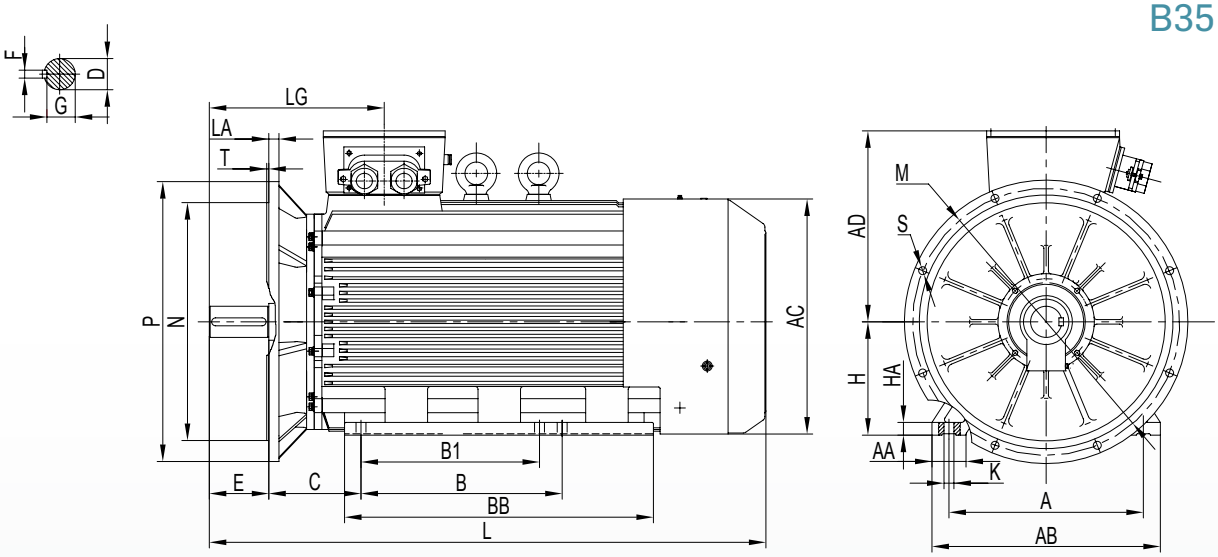
PERFORMANCE CURVES

Type: KQM
Frame size: 400-560

B3



B35

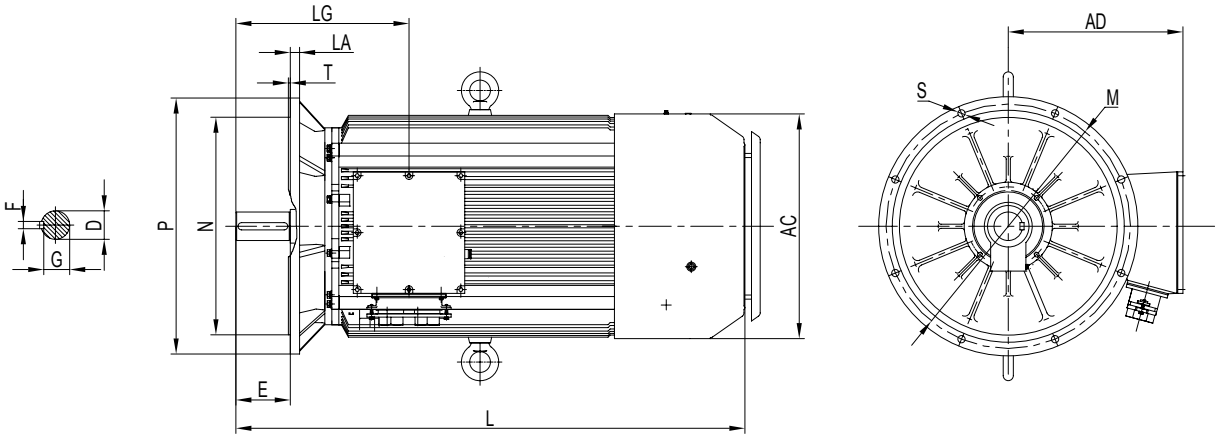


PERFORMANCE CURVES

Type: KQM

Frame size: 400-560

V1



Dimension tables of sizes and shapes

B3 / B35 / V1

TYPE		A	B1	B	C	D	E	F	G	H	K	AA	AB	AC	AD	BB	HA	L	LG	LA	M	N	P	S	T
400	2	686	630	710	280	80	170	22	71	400	35	120	806	867	690	1090	45	1880	532	25	940	880	1000	8x 28	6
400	4-8	686	630	710	280	110	210	28	100	400	35	120	806	867	690	1090	45	1920	572	25	940	880	1000	8x 28	6
450	2	800	------	1000	250	95	170	25	86	450	42	190	990	959	920	1300	50	2030	542						
450	4-8	800	------	1000	250	120	210	32	109	450	42	190	990	959	920	1300	50	2070	582						
500	2		------																						
500	4-8	900	------	1250	315	130	250	32	119	500	42		1100	1050	950	1600		2850							
560	2		------																						
560	4-8	1000	------	1400	355	150	250	36	138	560	42	186	1180	1128	980	1680	76	3400 max	900						

PROGRESSIVE SERIES without efficiency class

→ *Technical Data EC-J & EC-H3*

Aluminium Housing

Type	Rated output	Rated speed	Rated current	Efficiency	Power factor	Rated torque	Locked rotor torque	Locked rotor current	Break-down torque	Moment of inertia	Weight
EC-J	kW	rpm	A	%	cos φ	Nm	Ma / Mn	Ia / In	Mmax / Mn	kgm2	kg
2-pole, 3000 rpm, IP55, multimounting (removable feet)											400 V, 50 Hz
71-2	0.75	2780	1.70	76.7	0.83	2.60	2.2	6.1	2.9	----------	7.3
80-2	1.5	2840	3.30	78.1	0.84	5.00	2.2	7.0	2.9	----------	12.5
90L-2	3	2860	4.60	82.9	0.87	10.00	2.2	7.5	2.9	----------	15.5
100L-2	4	2860	8.00	82.9	0.87	13.40	2.2	7.5	2.9	----------	27
112M-2	5.5	2890	10.70	85.3	0.87	18.20	2.2	7.5	2.9	----------	30
132M-2	11	2900	20.00	88.2	0.90	36.20	2.2	8.1	2.9	----------	48
4-pole, 1500 rpm, IP55, multimounting (removable feet)											400 V, 50 Hz
71-4	0.55	1390	1.49	71.1	0.75	3.75	2.3	5.2	2.3	----------	7.3
80-4	1.1	1390	2.74	75.0	0.77	7.56	2.3	6.3	2.4	0.0023	12
90L-4	2.2	1390	4.91	79.7	0.81	15.12	2.3	6.5	2.4	0.0054	15.5
100L-4	4	1410	8.46	83.1	0.82	27.09	2.4	7.0	2.4	0.0095	27
112M-4	5.5	1435	11.30	84.7	0.83	36.60	2.3	7.0	2.4	0.0214	30
132M-4	11	1440	21.60	87.6	0.84	72.95	2.2	6.5	2.3	0.0747	58

Cast-iron housing

Type	Rated output	Rated speed	Rated current	Efficiency	Power factor	Rated torque	Locked rotor torque	Locked rotor current	Break-down torque	Moment of inertia	Weight
EC-H3	kW	rpm	A	%	cos φ	Nm	Ma / Mn	Ia / In	Mmax / Mn	kgm2	kg
2-pole, 3000 rpm, IP55											400 V, 50 Hz
160L-2	22	2927	37.10	0.9	0.93	71.80	1.8	6.4	2.5	0.0613	141
180L-2	30	2930	51.60	0.9	0.92	97.80	1.7	5.5	2.7	0.0849	200
200L-2	45	2947	75.30	0.9	0.93	145.80	1.8	5.7	2.8	0.1460	255
225M-2	55	2962	92.60	0.9	0.92	177.30	1.5	5.1	2.4	0.2718	435
4-pole, 1500 rpm, IP55											400 V, 50 Hz
160L2-4	18.5	1450	34.20	0.9	0.87	121.80	2.0	6.0	2.2	0.1025	135
180L-4	30	1463	53.00	0.9	0.89	195.80	2.3	6.6	2.7	0.1783	224
200L2-4	37	1469	64.00	0.9	0.90	240.50	2.6	7.2	3.0	0.3257	280
225L-4	55	1479	95.10	0.9	0.89	355.10	2.0	6.3	2.6	1.02	373

Other voltages, types and coolings are available on request.

PROGRESSIVE SERIES without efficiency class

→ *Technical Data KAE & EC-K*

Aluminium Housing

Type	Rated output	Rated speed	Rated current	Efficiency	Power factor	Rated torque	Locked rotor torque	Locked rotor current	Break-down torque	Moment of inertia	Weight
KAE	kW	rpm	A	%	cos φ	Nm	Ma / Mn	Ia / In	Mmax / Mn	kgm2	kg
2-pole, 3000 rpm, IP55, multimounting (removable feet)											400 V, 50 Hz
71C-2	0.75	2700	1.74	75.0	0.83	2.65	2.6	6.0	2.9	0.0006	8.3
80C-2	1.5	2770	3.26	79.0	0.84	5.17	2.8	6.0	3.1	0.0013	12.5
90L2-2	3	2800	6.00	83.0	0.87	10.23	3.0	6.0	3.2	0.0024	18.7
100L2-2	4	2880	7.72	85.0	0.88	13.26	2.5	7.0	2.7	0.0044	26
112M2-2	5.5	2900	10.49	86.0	0.88	18.11	2.5	7.0	2.7	0.0081	29
132M2-2	11	2919	20.27	88.0	0.89	35.99	2.5	7.5	2.7	0.0210	60.5
4-pole, 1500 rpm, IP55, multimounting (removable feet)											400 V, 50 Hz
71C-4	0.55	1380	1.49	71.0	0.75	3.81	2.2	6.0	2.4	0.0009	7.5
80C-4	1.1	1380	2.75	75.0	0.77	7.61	2.3	6.0	2.5	0.0021	12.5
90L2-4	2.2	1400	4.90	80.0	0.81	15.01	2.5	6.0	2.7	0.0039	18
100L3-4	4	1420	8.38	84.0	0.82	26.90	2.5	7.0	2.7	0.0098	29
112M2-4	5.5	1435	11.25	85.0	0.83	36.60	2.7	7.0	3.0	0.0162	46
132M3-4	11	1460	21.23	88.0	0.85	71.95	2.5	7.0	2.7	0.0441	70

Cast-iron housing

Type	Rated output	Rated speed	Rated current	Efficiency	Power factor	Rated torque	Locked rotor torque	Locked rotor current	Break-down torque	Moment of inertia	Weight
EC-K	kW	rpm	A	%	cos φ	Nm	Ma / Mn	Ia / In	Mmax / Mn	kgm2	kg
2-pole, 3000 rpm, IP55											400 V. 50 Hz
160L1-2	22	2930	39.50	89.3	0.90	71.70	2.2	8.1	2.3	0.0658	155
180L-2	30	2940	53.50	89.9	0.90	97.40	2.0	8.1	2.3	0.1055	230
200L3-2	45	2950	79.10	91.2	0.90	145.70	2.0	8.1	2.3	0.1674	275
225M1-2	55	2960	96.10	91.7	0.90	177.40	2.0	8.1	2.3	0.2800	320
4-pole, 1500 rpm, IP55											400 V. 50 Hz
160L2-4	18.5	1450	35.40	88.7	0.85	121.80	2.2	8.9	2.3	0.1213	150
180L2-4	30	1465	56.00	89.9	0.86	195.60	2.2	7.9	2.3	0.2126	230
200L2-4	37	1470	68.40	90.7	0.86	240.40	2.2	7.9	2.3	0.3220	280
225M2-4	55	1475	99.50	91.7	0.87	356.10	2.2	7.9	2.3	0.6030	338

Other voltages, types and coolings are available on request.

EMK 1~ AC-MOTORS

→ *Technical Data*

Running capacitor and starting capacitor 1~ 230 V

Type	Rated output	Rated cur-rent	Rated speed	Efficiency	Power factor	Rated torque	Locked rotor torque	Break down torque	Locked rotor current	Running capacitor	Starting capacitor	Weight
	kW	A	rpm	%	cos φ	Nm	Ma / Mn	Mmax / Mn	A	µ f/V	µ f/V	kg
TSW63 1-2	0.18	1.31	2750	65.0	0.92	0.63	2.50	1.70	8.0	8 µ F/450V	40 µ F/250V	4.2
TSW 63 2-2	0.25	1.76	2760	67.0	0.92	0.87	2.60	1.70	10.0	10 µ F/450V	50 µ F/250V	4.7
TSW71 1-2	0.37	2.42	2780	70.0	0.95	1.27	2.70	1.70	15.0	12 µ F/450V	75 µ F/250V	5.3
TSW71 2-2	0.55	3.45	2790	73.0	0.95	1.88	2.80	1.70	20.0	16 µ F/450V	100 µ F/250V	7.4
TSW80 1-2	0.75	4.54	2800	74.0	0.97	2.59	2.90	1.70	30.0	20 µ F/450V	100 µ F/250V	9.5
TSW80 2-2	1.10	6.45	2810	76.0	0.97	3.74	2.10	1.70	40.0	25 µ F/450V	150 µ F/250V	11.2
TSW90S-2	1.50	8.62	2810	78.0	0.97	5.10	2.11	1.80	55.0	40 µ F/450V	150 µ F/250V	14
TSW90L-2	2.20	12.5	2810	79.0	0.97	7.48	2.20	1.80	75.0	50 µ F/450V	250 µ F/250V	17
TSW63 1-4	0.12	1.04	1350	55.0	0.91	0.85	2.50	1.60	6.0	10 µ F/450V	40 µ F/250V	4
TSW 63 2-4	0.18	1.54	1360	56.0	0.91	1.26	2.50	1.60	8.5	12 µ F/450V	40 µ F/250V	4.8
TSW71 1-4	0.25	1.94	1380	61.0	0.92	1.73	2.50	1.60	10.0	14 µ F/450V	50 µ F/250V	5.9
TSW71 2-4	0.37	2.8	1380	62.5	0.92	2.56	2.50	1.50	15.0	16 µ F/450V	75 µ F/250V	6.9
TSW80 1-4	0.55	3.8	1400	67.0	0.94	3.75	2.50	1.70	20.0	20 µ F/450V	100 µ F/250V	9.6
TSW80 2-4	0.75	4.75	1410	73.0	0.94	5.08	2.50	1.70	30.0	25 µ F/450V	150 µ F/250V	10.8
TSW90S-4	1.10	6.76	1410	74.5	0.95	7.45	2.20	1.80	40.0	30 µ F/450V	150 µ F/250V	13.5
TSW90L-4	1.50	9.03	1420	76.0	0.95	10.09	2.20	1.80	55.0	40 µ F/450V	200 µ F/250V	16.5
TSW100L 1-4	2.20	12.6	1430	78.0	0.97	14.69	2.20	1.80	75.0	50 µ F/450V	300 µ F/250V	24

Running capacitor 1~ 230 V

Type	Rated output	Rated current	Rated speed	Efficiency	Power factor	Rated torque	Locked rotor torque	Break down torque	Locked rotor current	Running capacitor	Weight
	kW	A	rpm	%	cos φ	Nm	M_a / M_n	M_{max} / M_n	A	µ f/V	kg
TSW63 1-2	0.18	1.33	2780	62.0	0.95	0.63	0.60	1.70	5.00	10 µ F/450V	4
TSW 63 2-2	0.25	1.76	2780	65.0	0.95	0.87	0.60	1.70	7.00	12 µ F/450V	4.5
TSW71 1-2	0.37	2.61	2700	65.0	0.95	1.27	0.60	1.70	10.44	16 µ F/450V	5.1
TSW71 2-2	0.55	3.66	2700	68.0	0.96	1.88	0.70	1.70	15.60	20 µ F/450V	7.2
TSW80 1-2	0.75	4.73	2760	71.0	0.95	2.59	0.70	1.80	20.00	25 µ F/450V	9.5
TSW80 2-2	1.1	6.73	2720	72.5	0.98	3.74	0.65	1.70	26.00	35 µ F/450V	11.3
TSW90S-2	1.5	8.87	2800	75.0	0.98	5.10	0.60	1.80	38.00	45 µ F/450V	15
TSW90L-2	2.2	12.80	2800	76.0	0.98	7.48	0.60	1.70	58.00	60 µ F/450V	17.6
TSW63 1-4	0.12	1.03	1380	55.0	0.92	0.85	0.65	1.60	3.50	10 µ F/450V	4
TSW 63 2-4	0.18	1.49	1380	57.0	0.92	1.26	0.65	1.50	5.50	12 µ F/450V	4.6
TSW71 1-4	0.25	1.97	1320	60.0	0.92	1.73	0.70	1.50	7.88	16 µ F/450V	5.7
TSW71 2-4	0.37	2.91	1320	60.0	0.92	2.56	0.70	1.50	11.66	20 µ F/450V	6.7
TSW80 1-4	0.55	4.17	1370	63.0	0.91	3.75	0.65	1.70	14.00	20 µ F/450V	9.7
TSW80 2-4	0.75	5.10	1370	67.3	0.95	5.08	0.63	1.65	18.00	30 µ F/450V	11.5
TSW90S-4	1.10	7.59	1350	68.5	0.92	7.45	0.55	1.70	27.00	40 µ F/450V	15.5
TSW90L-4	1.50	9.64	1370	72.0	0.94	10.09	0.55	1.70	35.00	45 µ F/450V	17.5
TSW100L 1-4	2.20	14.05	1400	74.0	0.92	14.69	0.45	1.80	60.00	75 µ F/450V	26

Other voltages, types and coolings are available on request.

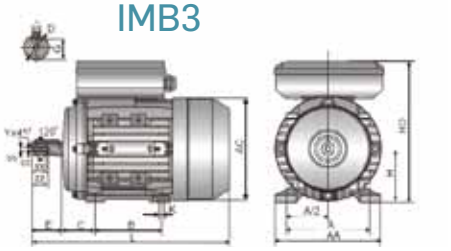
PERFORMANCE CURVES

Type: TSW / TFW

Frame size: 56 - 100

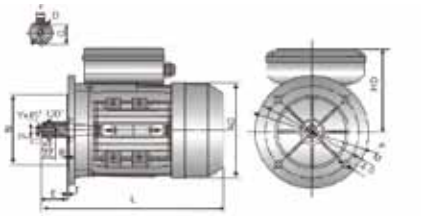
Frame-size	A	B	C	K	AA	D	E	F	G	SS	XX	ZZ	CC	Y	AC	AD	HD	L
56	90	71	36	5.8x8.8	108	9	20	3	7.2	M3	8	12	2.5	0.5	115	156	100	192
63	100	80	40	7x10	120	11	23	4	8.5	M4	10	15	3.3	0.8	130	179	116	212
71	112	90	45	7x10	132	14	30	5	11.0	M5	12	18	4.2	0.8	145	194	123	254
80	125	100	50	10x13	157	19	40	6	15.5	M6	16	22	5.0	10	165	223	143	290
90S	140	100	56	10x13	172	24	50	8	20.0	M8	20	25	6.8	1.0	185	240.2	150	310
90L	140	125	56	10x13	172	24	50	8	20.0	M8	20	25	6.8	1.0	185	240	150	335
100L	160	140	63	12x15	196	28	60	8	24.0	M10	22	28	8.5	1.5	205	260	160	375

IMB3



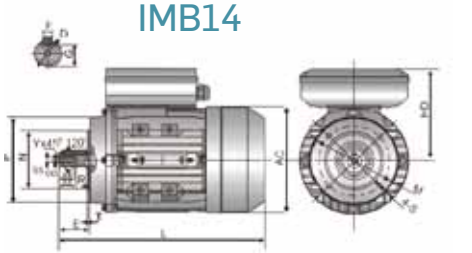
Frame-size	M	N	P	R	S	T	D	E	F	G	SS	XX	ZZ	CC	Y	AC	AD	HD	L
56	98	80	120	0	7	3.0	9	20	3	7.2	M3	8	12	2.5	0.5	115	156	100	192
63	115	95	140	0	10	3.0	11	23	4	8.5	M4	10	15	3.3	0.8	130	179	116	212
71	130	110	160	0	10	3.5	14	30	5	11.0	M5	12	18	4.2	0.8	145	194	123	254
80	165	130	200	0	12	3.5	19	40	6	15.5	M6	16	22	5.0	10	165	223	143	290
90S	165	130	200	0	12	3.5	24	50	8	20.0	M8	20	25	6.8	1.0	185	240.2	150	310
90L	165	130	200	0	12	3.5	24	50	8	20.0	M8	20	25	6.8	1.0	185	240	150	335
100L	215	180	250	0	15	4.0	28	60	8	24.0	M10	22	28	8.5	1.5	205	260	160	375

IMB5



Frame-size	M	N	P	R	S	T	D	E	F	G	SS	XX	ZZ	CC	Y	AC	AD	HD	L
56	65	50	80	0	M5	2.5	9	20	3	7.2	M3	8	12	2.5	0.5	115	156	100	192
63	75	60	90	0	M5	2.5	11	23	4	8.5	M4	10	15	3.3	0.8	130	179	116	212
71	85	70	105	0	M5	2.5	14	30	5	11.0	M5	12	18	4.2	0.8	145	194	123	254
80	100	80	120	0	M5	3.0	19	40	6	15.5	M6	16	22	5.0	10	165	223	143	290
90S	115	95	140	0	M5	3.0	24	50	8	20.0	M8	20	25	6.8	1.0	185	240.2	150	310
90L	115	95	140	0	M5	3.0	24	50	8	20.0	M8	20	25	6.8	1.0	185	240	150	335
100L	130	110	160	0	M5	3.4	28	60	8	24.0	M10	22	28	8.5	1.5	205	260	160	375

IMB14



SLIP-RING ROTORS

→ Technical Data

4-pole, 1500 rpm, IP55 — 400V, 50Hz

Type	Rated output	Rated speed	Rated current	Efficiency	Power factor	Locked rotor torque	Moment of inertia	Rotor		Weight
	kW	rpm	A	%	cos φ	M_a / M_n	kgm^2	V	A	kg
S-KMS-280S-4	55	1472	95	92	0.91	3.2	1.86	484	71	655
S-KMS-280M-4	75	1477	128	92.5	0.91	3.9	2.41	277	166	765
S-KMS-315S-4	90	1476	157	92.8	0.89	3	3.97	296	187	1175
S-KMS315M-4	110	1481	192	93.5	0.88	3.7	4.59	328	203	1263
S-KMS-315L1-4	132	1483	230	94	0.88	4	5.33	399	200	1338
S-KMS-315L2-4	160	1484	275	94.5	0.89	4	6.11	505	191	1450
S-KMS-355M1-4	200	1484	344	94	0.89	2.7	10.03	627	194	1952
S-KMS-355M2-4	250	1486	438	94.5	0.86	3.5	11.33	723	207	2078
S-KMS-355L-4	280	1488	489	94.8	0.87	3.5	12.47	704	238	2194
S-KMS-400L1-4	315	1485	524	95	0.91	2.8	17.85	557	340	3390
S-KMS-400L2-4	355	1486	587	95.2	0.91	2.8	19.34	620	344	3515
S-KMS-400L3-4	400	1487	659	95.5	0.91	2.8	21.11	698	343	3655

6-pole, 1000 rpm, IP55 — 400V, 50Hz

Type	Leistung	Drehzahl	Nenn-strom	Wirkungs-grad	Leistungs-faktor	Anzugs-moment	Moment of inertia	Rotor		Gewicht
	kW	rpm	A	%	cos φ	M_a / M_n	kgm^2	V	A	kg
S-KMS-315S-6	75	987	137	93	0.85	2.8	5.48	266	172	1220
S-KMS-315M-6	90	989	163	93.5	0.85	2.8	6.25	322	169	1335
S-KMS-315L1-6	110	989	194	94	0.87	2.8	7.3	381	175	1421
S-KMS315L2-6	132	990	234	94.2	0.86	2.8	8.45	464	171	1430
S-KMS-355M1-6	160	991	291	94.5	0.83	2.8	12.28	470	205	1950
S-KMS-355M2-6	200	991	353	94.8	0.84	2.7	14.86	575	209	2164
S-KMS-355L-6	220	992	388	94.8	0.84	2.7	16.71	647	204	2273
S-KMS-400L1-6	250	989	444	94.5	0.85	2.6	20.69	446	337	3345
S-KMS-400L2-6	315	990	553	94.8	0.86	2.6	23.73	536	352	3545
S-KMS-400L3-6	355	992	627	95.1	0.85	2.8	28.28	670	315	3835

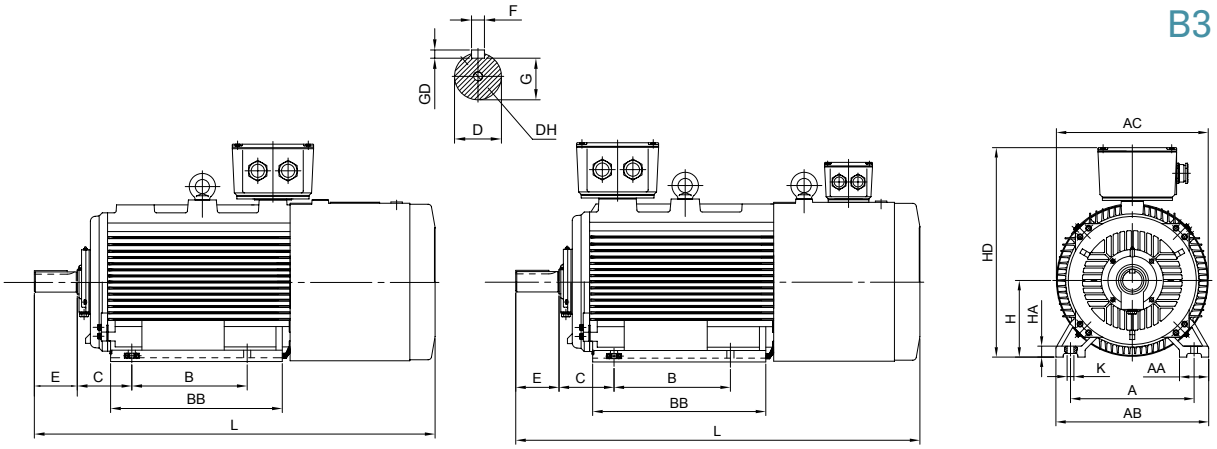
SLIP-RING ROTORS

→ Performance curves

Type: S-KMS

Frame size: 280 - 400

B3



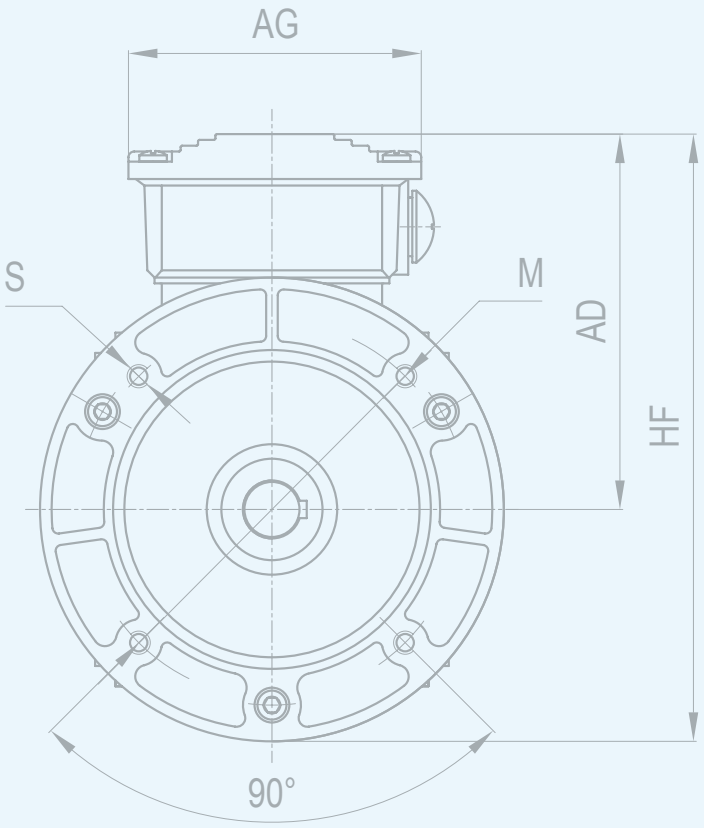
Type	A	B	C	D	E	DH	F x GD	G	H	K	AB	AC	AA	BB	HD	HA	L
280S	457	368	190	75	140	M20x42	20X12	67.5	280	24	550	580	85	490	680	35	1260
280M		419												540			1310
315S	508	406	216	80	170	M20x42	22X14	71	315	28	635	645	125	680	845	45	1700
315M		457															
315L		508															
355M	610	560	254	100	210	M20x42	28X16	90	355		730	710	125	750	1010	52	1910
355L		630															
400L	686	710	280	110		M20x42		100	400	35	840	820	150	985	1105	60	2115

Slip-ring motors with 8 poles are available on request.


EMZ

DOCU-MENTATION

- Operating instructions
- Maintenance instructions
- Spare parts' list
- EMZ catalogues



OPERATING INSTRUCTIONS

The electrical connection and maintenance of an electric drive may only be carried out by qualified electrical personnel, who are conversant with the relevant regulations. The applicable accident-prevention regulations must be adhered to at all times.

Every EMZ motor is dispatched only after the specifications on the order have been checked and a trial run carried out. Until installed, the motor is to be stored in a dry place and in the mounting position. For motors stocked for a longer period of time, the insulated resistance of every phase must be measured to earth. It has to be greater than 0.5 M. Professional installation and operation are essential for trouble-free functioning.

Installation

The motor must be installed according to its mounting position and on an even and vibration-free base. The shaft extensions up to 50 mm 0 have tolerances conforming to ISO k6 and above to ISO m6. Before fitting, the rust inhibitor must be removed from the shaft end. However, care must be taken to ensure that no solvent penetrates into the bearing. The motor-shaft end has been provided with a centre and a tapped hole, according to the DIN specification 332, type D, which can be used to pull on the transmission elements without exerting harmful forces on the motor bearings.

The permissible overhung loads shown in the catalogue may not be exceeded. They are valid for a force acting at the midpoint of the shaft extension. So as not to load the motor shaft excessively, the motor and the driven machine are to be carefully aligned.

Important for installations in wet internal or external conditions: trouble-free operation can only be ensured if all the measures set out below are carried out.

- The motor terminal box is to be fitted so that the cable entries are directed downwards.
- Use suitable conduit screw fittings for the cable being used and if necessary use reducing nipples.
- Conduit screw fittings and plugs are to be coated with sealing compound, tightened up securely and recoated. Cable intakes are also to be made completely watertight.
- The sealing surfaces of terminal boxes and terminal box covers are to be properly cleaned before reassembly. Gaskets are to be glued down on one face. Brittle gaskets are to be replaced!
- When reassembling after maintenance work, etc. the end shield centring spigots are also to coated with sealing compound.
- The corrosion protection consists of a number of paint coatings. Depending on environmental conditions the paint coating must be renewed on a regular basis or wherever necessary.

The stated rated motor power applies for a maximum 40 °C ambient temperature and installation altitude up to 1000 m (3330 feet) above sea level. For higher ambient temperatures or installation at greater heights the power rating is reduced accordingly. (Refer to DIN 57530). The unimpeded access of ventilating cooling air must be ensured. Condensation-water drain holes are stoppered with plastic plugs that can be opened as required. Open condensation-water drain holes are not permitted because the enclosure IP55 would be lost!

OPERATING INSTRUCTIONS

Electrical connection

The motor is connected in accordance with the data shown on the nameplate and the accompanying circuit diagram. Ensure that the terminal links are correctly placed and all connections, including the protective earth conductor, are screwed tightly.

In this manner the motors are fully-protected against almost all possible overloads. Fuses do not give this protection. For motors with high starting frequencies the conventional motor protection is insufficient; and it is advisable to purchase these motors with thermistors imbedded in the windings and to monitor them with an external tripping relay. In this manner the motors are fully protected against practical all possible overloads.

Insulation resistance measurement

With embedded machines, the insulation resistance of each phase must be measured to earth.

Do not touch the stanchion terminals during or after the measurement, as they could be live (high voltage)! After examining the terminals, earth briefly (5 seconds).

The insulation resistance of new or almost new windings is > 10 MΩ. Dirty and damp windings have considerably less resistance. If the ambient air is measured at less than 0.5 MΩ, the winding must be dried or cleaned, whereby the winding temperature must not exceed 80°C. Drying by means of an auxiliary heater, heating appliance or applying an alternating voltage of 5-6% of the rated voltage (Δ - create circuit) to the stanchion terminals U1 and V1. Then, repeat the measurement.

With the resistance at 0.5 MΩ, the machine can be put into operation.

MAINTENANCE INSTRUCTIONS

For motors up to and including size 132 it is sufficient to keep the cooling passages cleaned and to check the bearings. These motors have bearings with service-life lubrication. If the motor is being overhauled the bearings must be replaced. Motors larger than size 160 are provided with a lubricator. In addition to keeping the cooling passages clean the bearing should be checked regularly and relubricated with a grease pump according to the schedule below.

Instructions pertaining to greasing intervals and quantity are printed on the grease labels that are fitted on the motor. At the first greasing interval it is important to observe that the regreasing device is not filled. For this purpose, double the grease quantity must be used.

After several relubrication intervals (no more than 3-4 times) the old grease must be removed from the grease chambers and the bearings and cleaned thoroughly.

Framesize	Bearings				Lubricating interval
	Motortype: JS, JF ...		Motortype: KAE ...		
	AS	BS	AS	BS	
56	6201 ZZ	6201 ZZ	6201-2RZ	6201-2RZ	Selflubricated Bearings
63	6201 ZZ	6201 ZZ	6201-2RZ	6201-2RZ	
71	6202 ZZ	6202 ZZ	6202-2RZ	6202-2RZ	
80	6204 ZZ	6204 ZZ	6204-2RZ	6204-2RZ	
90	6205 ZZ	6205 ZZ	6205-2RZ	6204-2RZ	
100	6206 ZZ	6206 ZZ	6206-2RZ	6206-2RZ	
112	6206 ZZ	6208 ZZ	6306-2RZ	6306-2RZ	
132	6208 ZZ	6208 ZZ	6308-2RZ	6308-2RZ	

WARNING:
When motor is exploited in extremely conditions, i.e.:

- → dustiness > 800mg/m³
- → relative humidity > 80%
- → aggressive agents in air

it is necessary to decrease minimum two times period between consecutive inspections.

Framesize	Motor Type: HS, HF, H3S, H3F ...							Motor Type: KQM ...						
	Bearings		Lubricating interval [h]				Grease [g]	Bearings		Lubricating interval [h]				Grease [g]
	AS	BS	2 pol.	4 pol.	6 pol.	8 pol.	2-8 pol.	AS	BS	2 pol.	4 pol.	6 pol.	8 pol.	2-8 pol.
160	6309	6309	4200	7000	9000	10000	20	6309	6309	7000	10000	13000	18000	20
180	6311	6311	4200	7000	9000	10000	20	6311	6311	4300	9500	12700	15300	25
200	6312	6312	3100	6500	8500	9500	25	6312	6312	3800	9300	12400	15200	25
225 (2P)	6313	6313	3100	6500	8500	9500	25	6312	6312	3800	-	-	-	25
225 (4-8P)								6313	6312	-	8900	12200	14800	30
250 (2P)	6314	6314	2000	6000	8000	9000	35	6313	6313	4800	-	-	-	30
250 (4-8P)								6314	6313	-	4100	5900	6900	30
280 (2P)	6314	6314	2000	-	-	-	35	6314	6314	1100	-	-	-	30
280 (4-8P)	6317	6317	-	6000	8000	9000	35	6317	6314	-	3900	5600	6700	40
315 (2P)	6316	6316	2000	-	-	-	50	6317	6317	800	-	-	-	40
315 (4-8P)	6319	6319	-	5500	7500	8000	50	6319	6319	-	3700	5400	6500	50
355 (2P)	6319	6319	1000	-	-	-	60	6319	6319	500	-	-	-	50
355 (4-8P)	6322	6322	-	5000	7000	8000	60	6322	6322	-	3100	5000	6100	70
160	NU309	NDE see above	2000	5400	6900	7800	20	NU309	NDE see above	4200	6000	7800	10800	20
180	NU311		2000	5400	6900	7800	20	NU311		2600	5700	7500	9000	25
200	NU312		1500	5000	6500	7000	25	NU312		2300	5400	6700	7800	25
225	NU313		1500	5000	6500	7000	25	NU313		3100	5100	6000	7000	30
250 (2P)	NU314		1000	-	-	-	35	NU313		2800	-	-	-	30
250 (4-8)	NU314		-	4500	6300	6800	35	NU314		-	3100	4600	5500	30
280 (2P)	NU314		1000	-	-	-	35	NU314		3000	-	-	-	30
280 (4-8P)	NU317		-	4500	6300	6800	35	NU317		-	2600	4300	5300	40
315 (2P)	NU316		1000	-	-	-	50	NU317		400	-	-	-	40
315 (4-8P)	NU319		-	3800	6000	6500	50	NU319		-	2300	4100	5100	50
355 (4-8P)	NU322		-	3200	5500	6000	60	NU322		-	1900	3900	4800	70

MAINTENANCE INSTRUCTIONS

The bearings and the inner chamber must be provided with new grease, whereby the bearing and the inner bearing cap must be filled to a third with grease. The outer chambers must not be filled with grease.

The grease to be used for the lubrication of the bearings must be comprised of mineral-based oil and a thickener based on lithium soap or lithium soap complex with a consistency grade according to NLGI (e.g. Esso Unirex N2, N3, light Alvania RL2).

Condensation drain hole

EMK motors have a condensation drain hole (closed on delivery) that must be opened regularly while the motor is in operation to drain off the accumulated condensation.

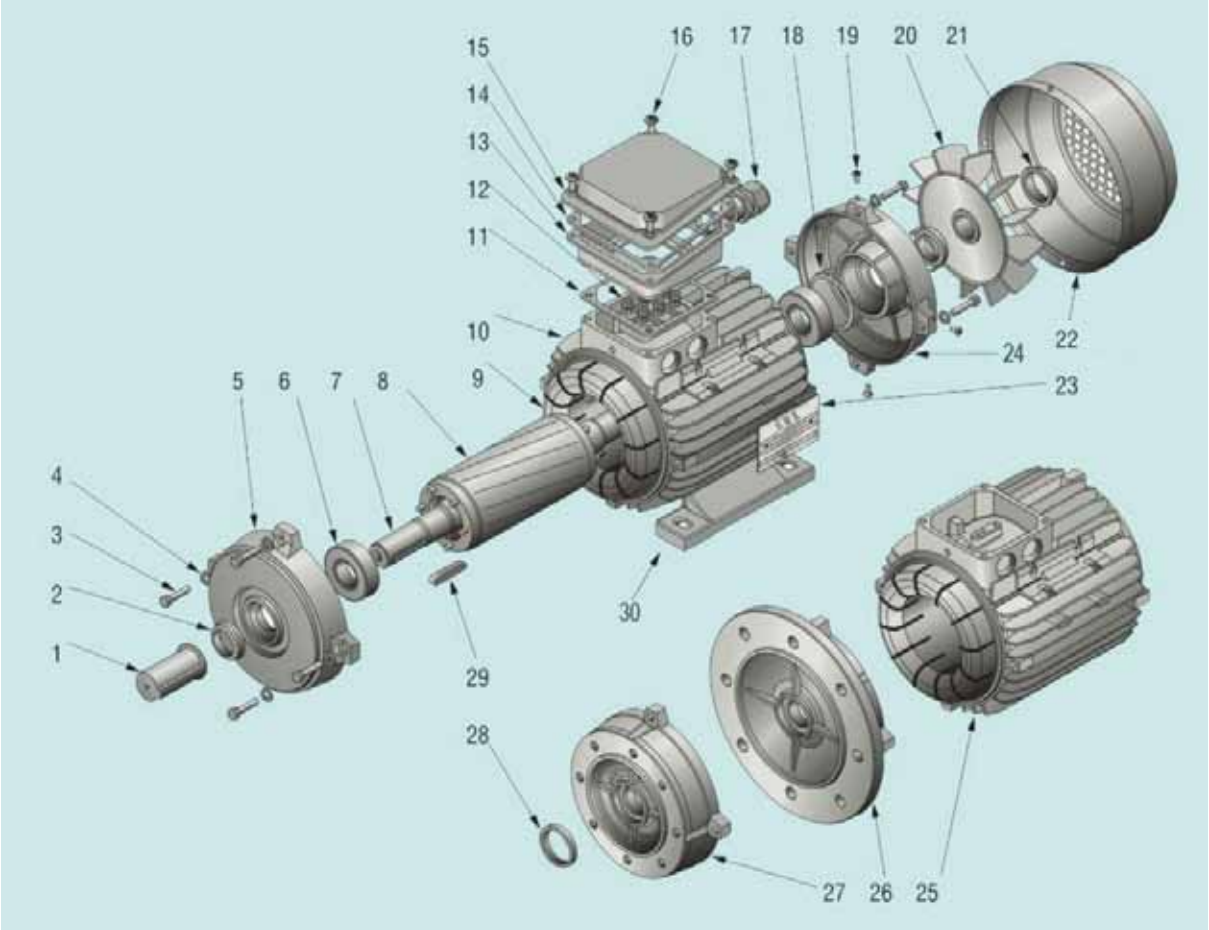
Inspection intervals

To ensure a trouble-free operation of the engine, regular inspections must be carried out to check for damage, purity etc. (see chart). Irrespective of the requirements, the engine should be inspected periodically during every working day.

Faults	Cause	Remedy
Motor overheated (can only be determined by measurement)	Motor connected in delta instead of in star as intended.	Correct the wiring connection.
	Mains voltage deviates from the rated motor voltage by more than 5 %. Too high voltage is particularly detrimental for multi-pole motors, since such motors have a „no-load" current approximately equal to the full load current even when operating on normal current.	Arrange for the correct mains voltage to be applied.
	Volume of cooling air inadequate, air ducts clogged up.	Ensure the unimpeded access and discharge of cooling air.
	Cooling air is preheated.	Arrange for cool air supply.
	Overload at normal mains voltage. Current excessive. Speed too low.	Install larger motor (determine the frame size by measuring the power).
	Motor capability exceeded (S1 to S8, DIN 57 530). The motor e.g. becomes overheated due to excessive starting frequency. Here it is not sufficient simply to use a larger motor since in all probability the same conditions would still arise.	Adapt to the duty-cycle rating necessary for the operating conditions. It is preferable under these circumstances to consult a qualified electrical engineer to determine the correct size of motor required in order that the motor may be adapted to suit the actual mode of operation.
	Supply cable has loose contact (temporary single phasing!) Fuse burnt out.	Correctly secure the loose contact.
Engine will not start.	Fuse burnt out.	Replace the fuse.
	Motor protection switch has tripped.	Check protection switch for correct setting and adjust.
	Motor contactor inoperative. Control fault.	Check contactor operation and control and rectify.
Engine will not start or is difficult to start.	Designed for delta connection but connected in star.	Connect motor correctly.
	Voltage or frequency of electrical supply deviates considerably from required rated value during starting conditions.	Improve mains supply conditions.
Motor will not start in star connection but will start in delta connection.	Torque insufficient from the connection in star.	If delta current is not excessive then reconnect for DIRECT-ON-LINE starting, otherwise a larger size of motor or motor having special windings will be required.
	Contact fault on the star/delta starter.	Rectify starter fault.
Motor hums and has a high power consumption.	Fault in windings.	Motor must be examined and repaired by an electrical service centre.
	Rotor grazing.	Check propulsion.
Fuses blow or motor overload-protection triggers immediately.	Short circuit on the line or motor.	Remove short circuit.
	Short circuit to motor frame of between the windings turns.	Fault to be remedied by a qualified electrical engineer.
	Motor incorrectly wired up.	Correct the connections.
Wrong rotation direction.	Motor incorrectly connected.	Interchange any two of the incoming mains phases.
Winding damage.		The motor MUST be repaired at an electrical service centre.

SPARE PARTS' LIST FOR IP55 MOTORS

→ Technical amendments reserved, errors excepted



N.	Description	N.	Description	N.	Description
1	Shaft cover	11	IP 55 gasket	21	Ring for fan tightening
2	V-ring	12	Mains power connection terminal block	22	Fan cover
3	Motor clamping screws	13	Terminal block box-base	23	Motor identification plate
4	Spring ring	14	IP 65 gasket	24	Shield NDE
5	Shield DE	15	Terminal block box-cover	25	B5 motor casing
6	Bearing	16	Terminal block box tightening screws	26	B5 flange
7	Motor shaft	17	Cable inlet bush	27	B14 flange
8	Rotor	18	Compensation ring	28	Sealing ring
9	Wound stator	19	Fan cover tightening screws	29	Shaft key
10	Motor casing B3-B5	20	PVC fan	30	Feet

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