High Efficiency three-phase LV Motors

www.lafert.com

2011

TECHNICAL CATALOGUE

AEG

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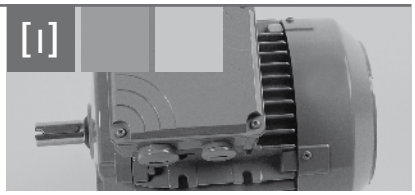
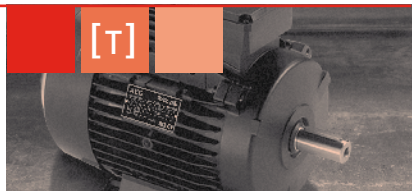
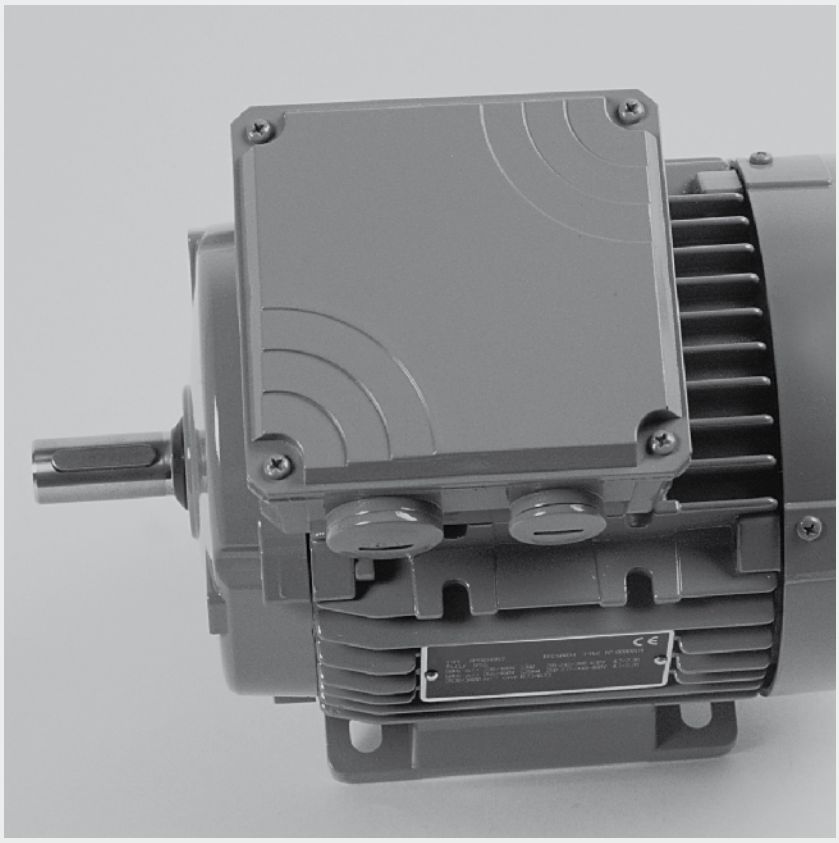




GENERAL INFORMATION



Lafert Group product range

In the next few pages we offer a detailed overview of our manufacturing program of AC induction motors.

The main scope of our core business is the development of dedicated solutions that improves our Customer's product design, thereby giving our customers a competitive advantage. The core business of our Company stands on the ability to adapt and engineer our standard Product design to any specific market demand.

Lafert's range of products is divided in five product sectors:

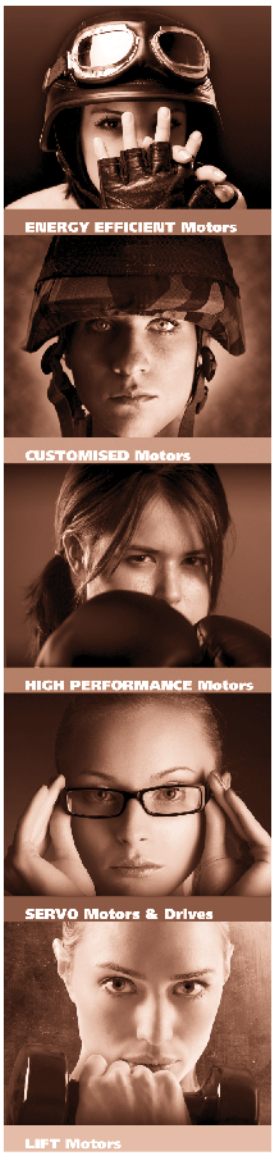
ENERGY EFFICIENT Motors, high efficiency motors, IE2 code in the range 56 to 315, IE3 code in the range 90 to 160

CUSTOMISED Motors, special and customised motors, brake motors and single-phase motors

HIGH PERFORMANCE Motors, high performance, permanent magnet motors and generators as well as the relevant drives

SERVO Motors & Drives, brushless servomotors and drives for industrial automation

LIFT Motors, synchronous gearless machines with permanent magnet rotor for elevators



ENERGY EFFICIENT MOTORS

High Efficiency Three-phase Motors

Motors conforming to the higher efficiency standards for Europe, North America and Australia.

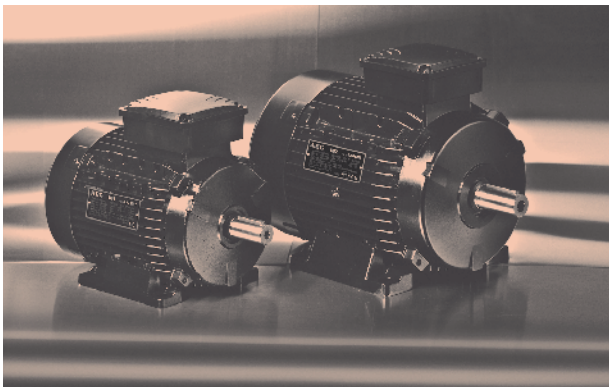
For Europe, Lafert offers its 'AMHE' and 'AMPE' range of AC induction motors, whose efficiency values are conforming to IE2 and IE3 requirements according to IEC 60034-30;2008.

IE2
IE3

Lafert motors for the North American market comprise the 'AMH' and 'AMPH' range. These machines meet the higher efficiency demands of the USA's Department of Energy's Energy Policy Act (EPAct) and are conforming to EISA (Energy Indipendence and Security Act) that imposes strict levels of minimum efficiency. It is illegal to import Motors into the USA and Canada that do not comply with this standard.

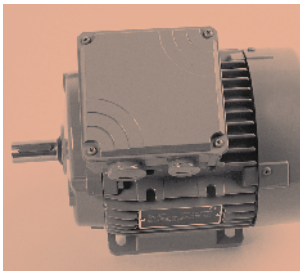
ENERGY
c UL us

In addition to EPAct requirements, these motors are a recognised component verified by Underwriters Laboratories and carry the UL approved logo.



The standard design includes the following basic features to give a high level of flexibility:

- Multi Mount Construction for an easy change of terminal box position
- Terminal box rotates by 90° to allow cable entry from any direction
- Easy-to-change flanges with over-sized and smaller-sized dimensions
- Provision for oil seal at Drive End

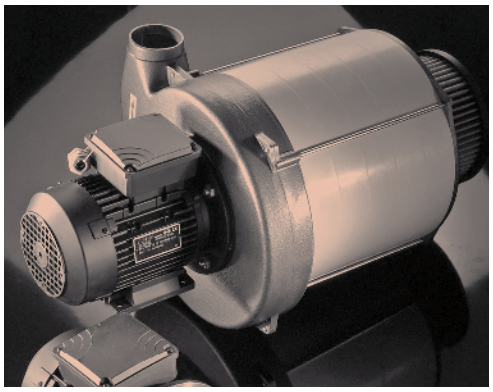


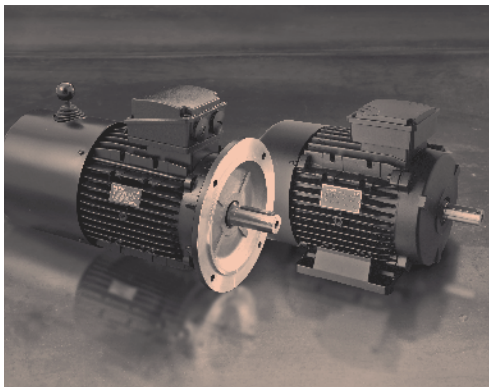
CUSTOMISED MOTORS

Dedicated and customised executions

Lafert specialises in customised solutions for non-standard motor applications. We are considered as a market leader in this field and have built a reputation for excellence for this core activity over the past 45 years.

The range of specials includes both electrical and mechanical variants:
- Extended stainless steel motor shafts for the fan industry
- Motors for pumping applications
- Complete Tailor made designs
- Customised flange and shaft for gear motors
- Electrical design to meet specific duty requests
- Specific wound motors for worldwide electrical supply
- Motor design to meet special environmental requests (Smoke and heat exhaust ventilation, Dust Ignition for Zone 22, Non Sparking Exn)





Brake Motors

Lafert's brake motors (3 and single phase) are engineered to give safety, versatility and long service life. The motor's mechanical design is specific for brake motors in order to avoid any risk of failure.

The three brake options available with AC or DC brake coil can fit any application.

The AMBY and AMBZ ranges have a very strong design and may meet any heavy duty application. The AMBY range is also available with low noise brake, specific for theatres.

The compact AMS range is the ideal solution for woodworking equipment manufacturers, packaging machines manufacturers, as well as small crane manufacturers.

As well as meeting industry specific safety requirements, the motors are also failsafe machines: a combination that ensures maximum machine safety.

HIGH PERFORMANCE MOTORS

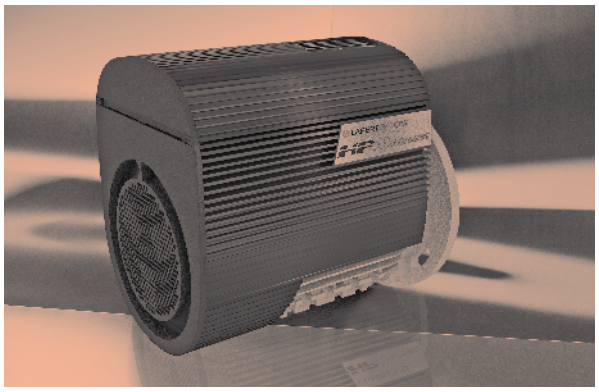
High Performance Motors with permanent magnet rotor

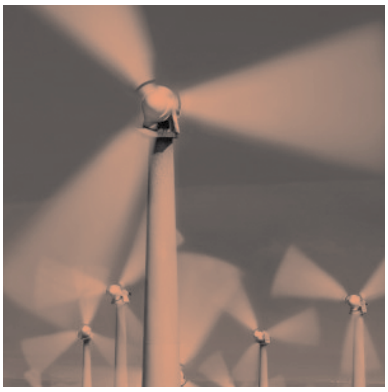
A differentiator with Sensorless Permanent Magnet Motors is the premium high efficiency level and the compact design. The efficiency level normally stands over 90% all along the motor's speed range.

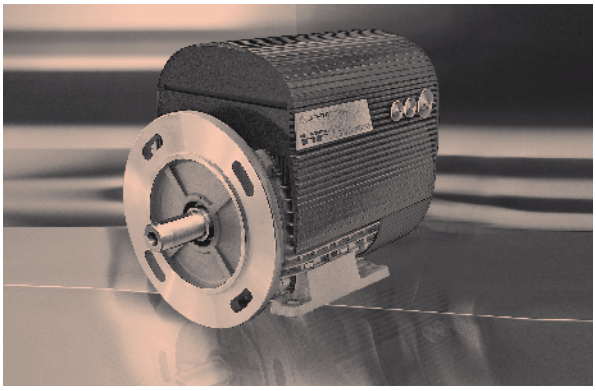
This Product must be driven by a frequency converter, that can also be on-board as an integral drive.

Major applications are the Pump and Fan Industry, Textile Machinery Manufacturers, Gearbox Manufacturers, Traction Systems for microcars and scooters; this Product can be produced as a Generator for Wind Energy.

A separate catalogue is available.







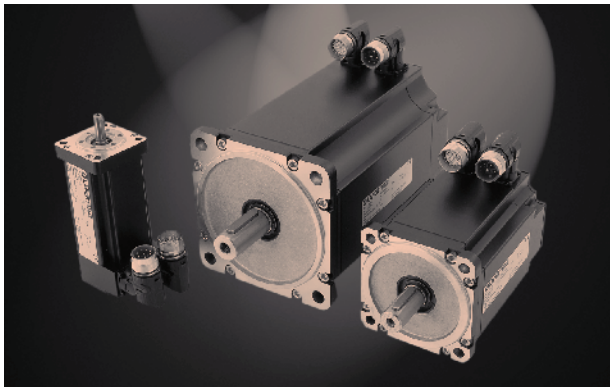
SERVO MOTORS & DRIVES

Brushless Servo Motors

Among the few independent manufacturers of Servo Motors in the market, Lafert can supply a wide range of standard and tailor made products for Industrial Automation.
The whole manufacturing process is integrated within Lafert manufacturing facilities, giving an excellent flexibility to specific market demands, as well as a high level of cost-efficiency.

- Brushless Standard Motors
- Direct Drive Motors
- Low Inertia Motors
- Compact Motors

A separate catalogue is available.



Servo Drives

Our products are manufactured according to the criterion of adaptability and flexibility. This ensures an easy and fast set-up, by means of the most advanced hardware and software technologies.
Every device always ensures the highest reliability and safety, because it is subject to strict tests in different load and climatic conditions.

A separate catalogue is available.

LIFT MOTORS

Gearless Machines for Elevators

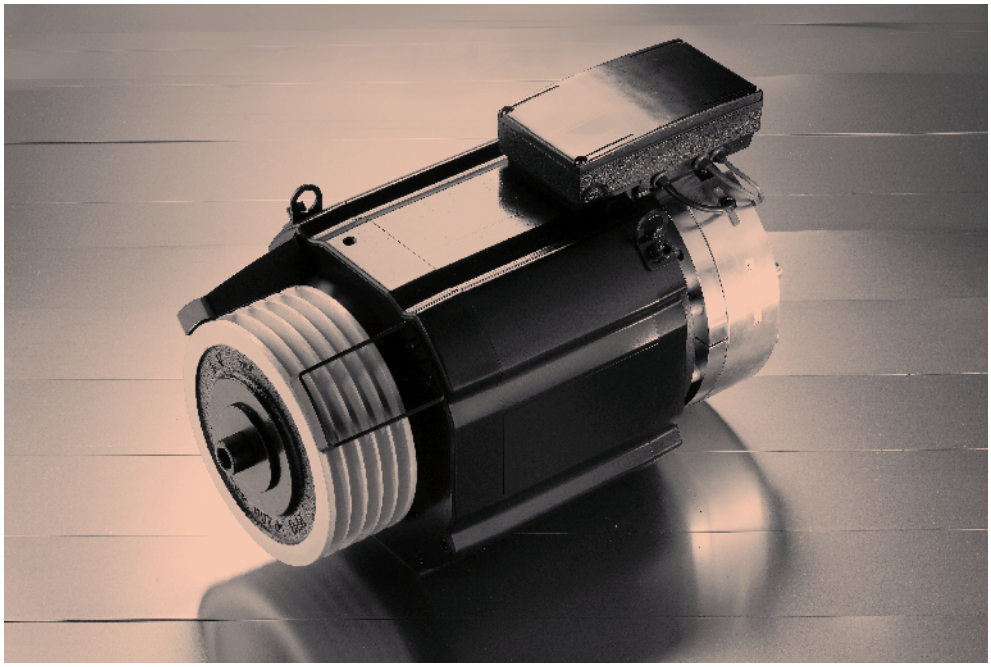
The LIFT range allows the manufacturing of systems where the traction machine is inside the elevator shaft, so there is no need for a machine room, with obvious space and cost savings and a more rational layout of the all components.

LIFT is permanent-magnet gearless synchronous machine with torque up to 660 Nm for systems up to 1,275 kg.

The compact and heavy-duty motor comes with the following features:

- Very small dimensions
- High Efficiency
- High comfort
- No maintenance
- Low noise level

A separate catalogue is available.

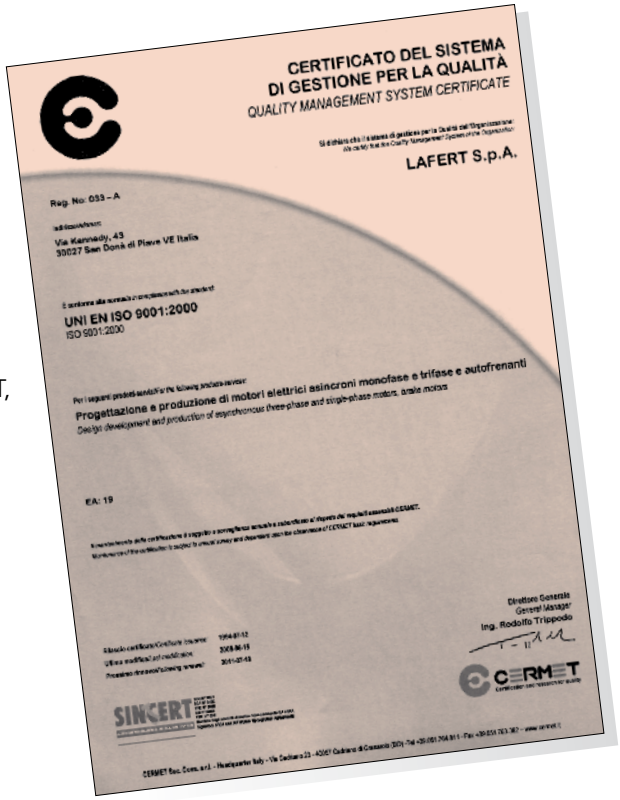


Our Strengths:
Customer Designs
Exact Engineering

…In Partnership with the Customer

STANDARDS AND REGULATIONS

The strictness of our quality control assures the flawless operation and reliability of our products.
That our quality scale fulfils your demands is confirmed by the certificate awarded by the CERMET, a Certification body authorized by ACCREDIA.


CERTIFICATO DEL SISTEMA
DI GESTIONE PER LA QUALITÀ
QUALITY MANAGEMENT SYSTEM CERTIFICATE

LAFERT S.p.A.

Reg. No: 033 – A

Via Kennedy, 43
30027 San Donà di Piave VE Italia

UNI EN ISO 9001:2000
ISO 9001:2000

Progettazione e produzione di motori elettrici asincroni monofase e trifase e autofrenanti
Design, development and production of asynchronous three-phase and single-phase motors, brake motors

IEA: 19

Direttore Generale
General Manager
Ing. Rodolfo Trippodo

CERMET

SINCERT

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CE Marking
Our motors comply with the requirements of the following international standard:
IEC 60034

as well as with the following European Directives: Low Voltage Directive 2006/95/EC, the EMC-Directive 2004/108/EC and Directive on the restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS) 2002/95/EC.

The above named products comply with the requirements of the EC Directive Machines 2006/42/EC. In accordance with this Directive induction motors are components and intended solely for integration into other machines.
Commissioning is forbidden until conformity of the end product with this Directive is proved!

The CE symbol was applied for the first time in 1995.

The safety instructions in the Operation Manual of the manufacturer and EN 60204-1 have to be observed.

IE1
IE2
IE3

Harmonized efficiencies to IEC 60034-30;2008 - IE1, IE2 and IE3 code.
Efficiency testing method IEC 60034-2-1;2007

All standard three-phase motors with standard rating included in this catalogue comply with efficiency class IE1 and bear the corresponding label on the rating plate.
For efficiency at 50%, 75% and full load, please refer to the electrical data tables.

New International Efficiency Levels for Motors: IE Codes

The International standard IEC 60034-30;2008 states the new efficiency levels IE1, IE2 and IE3 for electric motors, ensuring an international common base for motor designing and classification, as well as for national legislative activities.

The efficiency measurement method for motors has also been reviewed.
The new standard IEC 60034-2-1;2007 provides for test conditions and efficiency measurement methods which are more accurate and replaces the previous standard EN 60034-2;1996.
By comparing results from the same motor, the efficiency levels measured according to the new test method are lower than those with the old method.

The efficiency levels provided for by the standard for single speed, three-phase – brake motors included -50 Hz or 50/60 Hz, motors with rated output between 0,75 kW and 375 kW, 2, 4 or 6 poles, on the basis of continuous duty operation S1 or intermittent periodic duty operation S3 are the following:

- **IE1 = Standard Efficiency**
- **IE2 = High Efficiency**
- **IE3 = Premium Efficiency**

However, IEC 60034-30 states only the requirements for the efficiency levels, thus creating shared measures worldwide. It does not state the motors to be supplied or the minimum efficiency level. This depends on any regional laws that are applicable.

EUROPE –EcoDesign EuP directive (2005/32/EC)

The EcoDesign EuP directive (2005/32/CE) states the ecodesign requirements for energy-using products.
It is the Commission Regulation (EC) 640/2009 that specifies the efficiency requirements for electric motors and that introduces in all countries of the European Community the obligation of the IE2 minimum efficiency level as from 16th June 2011.
At further dates, progressively higher minimum efficiency requirements will be established. The IE3 level will come in from 2015-2017.

The scope of the Commission Regulation includes single speed, three-phase 50 Hz or 50/60 Hz, squirrel cage asynchronous motors with rated output between 0.75 kW and 375 kW, 2, 4 or 6 poles, on the basis of continuous duty operation S1.

Motors to be exclusively exported out of the EU (machine distributors or manufacturers) may be produced and distributed with IE1 efficiency level even after 16th June 2011.
To that end, a statement will have to be made to the manufacturer.

UNITED STATES, CANADA –EISA Energy Independence and Security Act, 2007

The Energy Independence and Security Act, 2007 (EISA) imposes in the USA and Canada Nema Premium Efficiency (IE3) as minimum level of efficiency as from 19th December 2010.

EISA, which replaces the current 1992 Energy Policy Act (EPAct) legislation, sets out new efficiency restrictive limits for a wide range of three-phase motors, including brake motors with power ratings from 1 to 500 HP.

Efficiency values according to IEC 60034-30;2008
Efficiency standard calculation: IEC 60034-2-1;2007

Output	IE1 code Standard Efficiency			IE2 code High Efficiency			IE3 code Premium Efficiency		
kW	2 poles	4 poles	6 poles	2 poles	4 poles	6 poles	2 poles	4 poles	6 poles
0.75	72.1	72.1	70.0	77.4	79.6	75.9	80.7	82.5	78.9
1.1	75.0	75.0	72.9	79.6	81.4	78.1	82.7	84.1	81.0
1.5	77.2	77.2	75.2	81.3	82.8	79.8	84.2	85.3	82.5
2.2	79.7	79.7	77.7	83.2	84.3	81.8	85.9	86.7	84.3
3	81.5	81.5	79.7	84.6	85.5	83.3	87.1	87.7	85.6
4	83.1	83.1	81.4	85.8	86.6	84.6	88.1	88.6	86.8
5.5	84.7	84.7	83.1	87.0	87.7	86.0	89.2	89.6	88.0
7.5	86.0	86.0	84.7	88.1	88.7	87.2	90.1	90.4	89.1
11	87.6	87.6	86.4	89.4	89.8	88.7	91.2	91.4	90.3
15	88.7	88.7	87.7	90.3	90.6	89.7	91.9	92.1	91.2
18.5	89.3	89.3	88.6	90.9	91.2	90.4	92.4	92.6	91.7
22	89.9	89.9	89.2	91.3	91.6	90.9	92.7	93.0	92.2
30	90.7	90.7	90.2	92.0	92.3	91.7	93.3	93.6	92.9
37	91.2	91.2	90.8	92.5	92.7	92.2	93.7	93.9	93.3
45	91.7	91.7	91.4	92.9	93.1	92.7	94.0	94.2	93.7
55	92.1	92.1	91.9	93.2	93.5	93.1	94.3	94.6	94.1
75	92.7	92.7	92.6	93.8	94.0	93.7	94.7	95.0	94.6
90	93.0	93.0	92.9	94.1	94.2	94.0	95.0	95.2	94.9
110	93.3	93.3	93.3	94.3	94.5	94.3	95.2	95.4	95.1
132	93.5	93.5	93.5	94.6	94.7	94.6	95.4	95.6	95.4
160	93.7	93.8	93.8	94.8	94.9	94.8	95.6	95.8	95.6
200	94.0	94.0	94.0	95.0	95.1	95.0	95.8	96.0	95.8
250	94.0	94.0	94.0	95.0	95.1	95.0	95.8	96.0	95.8
315	94.0	94.0	94.0	95.0	95.1	95.0	95.8	96.0	95.8
355	94.0	94.0	94.0	95.0	95.1	95.0	95.8	96.0	95.8
375	94.0	94.0	94.0	95.0	95.1	95.0	95.8	96.0	95.8

The motors comply with the relevant standards and regulations, especially:

Title	IEC	EU CENELEC	D DIN/VDE	I CEI/UNEL	GB BS	F NFC	E UNE
Electrical							
General stipulations for electrical machines	60034-1	EN 60034-1	DIN EN 60034-1	CEI EN 60034-1	4999-1 4999-69	51-200 51-111	UNE EN 60034-1
Rotating electrical machines: methods for determining losses and efficiency using tests	60034-2	HD 53 2	DIN EN 60034-2	CEI EN 60034-2	4999-34	51-112	UNE EN 60034-2
Standard method for determing losses and efficiency from tests	60034-2-1						
Efficiency classes of single speed, three-phase, cage-induction motors (IE-code)	60034-30						
Terminal markings and direction of rotation of rotating electrical machines	60034-8	HD 53 8 S4	DIN VDE 0530-8	CEI EN 60034-8	4999-3	51-118	20113-8-96
Starting performance	60034-12	EN 60034-12	DIN EN 60034-12	CEI EN 60034-12	4999-112		UNE EN 60034-12
Standard voltages	60038	HD 472 S1	DIN IEC 60038	CEI 8-6			
Insulating materials	60085		DIN IEC 60085	CEI EN 60085			
Mechanical							
Dimensions and output ratings	60072		DIN EN 50347	UNEL 13113			
Mounting dimensions and relationship frame sizes-output ratings, IM B3	60072		DIN 42673-1	UNEL 13113	4999-10 51-110	51-105 51-104	UNE EN 50347 1980
Mounting dimensions and relationship frame sizes-output ratings, IM B5	60072		DIN 42677-1	UNEL 13117		20106-2-74	
Mounting dimensions and relationship frame sizes-output ratings, IM B14	60072		DIN 42677-1	UNEL 13118	4999-10 51-110	51-105 51-104	UNE EN 50347
Cylindrical shaft ends for electric motors	60072	HD 231	DIN 748-3	UNEL 13502	4999-10	51-111	
Degrees of protection	60034-5	EN 60034-5	DIN EN 60034-5	CEI EN 60034-5	4999-20	EN60034-5	20111-5
Methods of cooling	60034-6	EN 60034-6	DIN EN 60034-6	CEI EN 60034-6	4999-21		EN 60034-6
Mounting arrangements	60034-7	EN 60034-7	DIN EN 60034-7	CEI EN 60034-7	4999-22	51-117	EN 60034-7
Noise limits	60034-9	EN 60034-9	DIN EN 60034-9	CEI EN 60034-9	4999-51	51-119	EN 60034-9
Mechanical vibration	60034-14	EN60034-14	DIN EN 60034-14	CEI EN 60034-14	4999-50	51-111	EN 60034-14
Mounting flanges			DIN 42948	UNEL 13501			
Tolerances of mounting and shaft extensions			DIN 42955	UNEL 13501/ 13502			
Classification of environmental conditions	60721-2-1		DIN IEC 60721-2-1	CEI EN 60721-1			
Mechanical vibration; balancing	ISO 8821		DIN ISO 8821				

Motors to special regulations:

• Motors with UL, CSA and $_{c}UR_{us}$ approval (performance data on request)

CONDITIONS OF INSTALLATION

The motors are designed for operation at altitudes ≤ 1000 m above sea-level and at ambient temperatures of up to 40° C. Exceptions are indicated on the rating plate.

Permissible temperature rises to various standards

Standard/Regulation	Temperature of coolant	Permissible temperature rise in K (measured by resistance method) Temperature class		
	°C	B	F	H
VDE 0530 part 1	40	80	105	125
International IEC 34-1	40	80	105	125
Britain BS 2613	40	80	105	
Canada CSA	40	80	105	
USA NEMA and ANSI	40	80	105	
Italy CEI	40	80	105	
Sweden SEN	40	80	105	
Norway NEK	40	80	105	
Belgium NBN	40	80	105	
France NF	40	80	105	
Switzerland SEV	40	80	105	
India IS	40	80	-	

on request

The motors conform to degree of protection IP 55 to IEC 60034-5. Higher protection on request.

The standard design for horizontal mounting is suitable for indoor and protected outdoor installation, climate group MODERATE (see page 18) (temperature of coolant -20° to +40° C).

For unprotected outdoor installation or severe climatic conditions (moisture category wet, climate group WORLDWIDE, extremely dusty site conditions, aggressive industrial atmosphere, danger of storm rain and coastal climate, danger of attack by termites, etc.), as well as vertical mounting, special protective measures are recommended, such as:

- Protective cowl (for vertical shaft-down motors)
- For vertical shaft-up motors additional bearing seal and flange drainage
- Special paint finish
- Treatment of winding with protective moisture-proof varnish
- Anti-condensation heating (possibly winding heating)
- Condensation drain holes

The special measures to be applied have to be agreed with the factory once the conditions of installation have been settled.

The corresponding conditions of installation have to be clearly indicated in the order.

Tolerances

For industrial motors to EN 60034-1, certain tolerances must be allowed on guaranteed values, taking into consideration the necessary tolerances for the manufacture of such motors and the materials used. The standard includes the following remarks:

1. It is not intended that guarantees necessarily have to be given for all or any of the items involved. Quotations including guaranteed values subject to tolerances should say so, and the tolerances should be in accordance with the table.
2. Attention is drawn to the different interpretation of the term guarantee. In some countries a distinction is made between guaranteed values and typical or declared values.
3. Where a tolerance is stated in only one direction, the value is not limited in the other direction.

Values for	Tolerance
Efficiency (η) (by indirect determination)	- 0.15 (1 - η) at $P_N \leq 150$ kW - 0.1 (1 - η) at $P_N > 150$ kW
Power factor ($\cos \varphi$)	$\frac{1 - \cos \varphi}{6}$, minimum 0.02, maximum 0.07
Slip (s) (at rated load and at working temperature)	± 20 % of the guaranteed slip at $P_N \geq 1$ kW ± 30 % of the guaranteed slip at $P_N < 1$ kW
Breakaway starting current (I_A) (in the starting circuit envisaged)	+ 20 % of the guaranteed starting current (no lower limit)
Breakaway torque (M_A)	- 15 % and + 25 % of the guaranteed breakaway torque (+ 25 % may be exceeded by agreement)
Pull-up torque (M_S)	- 15 % of the guaranteed value
Pull-out torque (M_K)	- 10 % of the guaranteed value (after allowing for this tolerance, M_K/M_N not less than 1.6)
Moment of inertia (J)	± 10 % of the guaranteed value

Mechanical tolerances

According to IEC 60072-1, the following tolerances on mechanical dimensions of electric motors are permitted:

Parameter	Code	Tolerances	
Shaft height	H	- up to 250 - over 250	-0,5 mm -1 mm
Diameter of shaft end[1)]	D-DA	- from 11 to 28 mm - from 38 to 48 mm - from 55 to 100 mm	j6 k6 m6
Hub key width	F-FA		h9
Flange spigot	N	- up to 132 - over size 132	j6 h6

[1)] Centerings holes in shaft extension to DIN 332 part 2

Degrees of protection

Degrees of mechanical protection for machines are designated in accordance with IEC 60034-5 by the letters **IP** and two characteristic numerals.

First numeral: Protection against contact and ingress of foreign bodies

IP	Description
0	No special protection
1	Protection against solid foreign bodies larger than 50 mm (Example: inadvertent contact with the hand)
2	Protection against solid foreign bodies larger than 12 mm (Example: inadvertent contact with the fingers)
3	Protection against solid foreign bodies larger than 2.5 mm (Example: Wires, tools)
4	Protection against solid foreign bodies larger than 1 mm (Example: Wires, bands)
5	Protection against dust (harmful deposits of dust)
6	Complete protection against dust

Second numeral: Protection against ingress of water

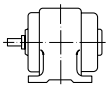
IP	Description
0	No special protection
1	Protection against vertically falling water drops (condensation)
2	Protection against dropping water when inclined by up to 15°
3	Protection against waterspray at up to 60° from vertical
4	Protection against water splashed from any direction
5	Protection against water projected by a nozzle from any direction
6	Protection against heavy seas or water projected in powerful jets
7	Protection when submerged between 0.15 and 1 m.
8	Protection when continuously submerged in water at conditions agreed between the manufacturer and the user

Mounting arrangements

Mounting arrangements for rotating electrical machines are designated according to IEC 60034-7, *Code I* (in brackets Code II).
Our motors are available with the mounting arrangements listed below, depending on design and frame size. Motors with aluminium frame are equipped with removable feet that allow easy change of mounting arrangement.

Foot mounting

IM B3 (IM 1001)

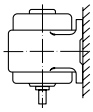


IM B6 (IM 1051)

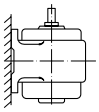
IM B7 (IM 1061)

IM B8 (IM 1071)

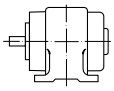
IM V5 (IM 1011)



IM V6 (IM 1031)

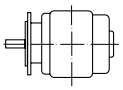


IM B34 (IM 2101)
Flange type C to DIN 42 948 at drive end

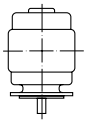


Flange mounting

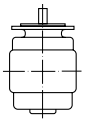
IM B5 (IM 3001)
Flange type A to DIN 42 948 at drive end



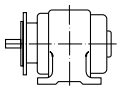
IM V1 (IM 3011)
Flange type A to DIN 42 948 at drive end



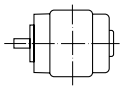
IM V3 (IM 3031)
Flange type A to DIN 42 948 at drive end



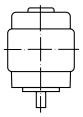
IM B35 (IM 2001)
Flange type A to DIN 42 948 at drive end



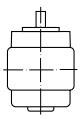
IM B14 (IM 3601)
Flange type C to DIN 42 948 at drive end



IM V18 (IM 3611)
Flange type C to DIN 42 948 at drive end

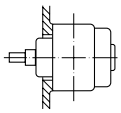


IM V19 (IM 3631)
Flange type C to DIN 42 948 at drive end

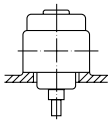


Motors without endshield

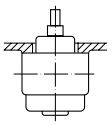
IM B9 (IM 9101)
without endshield and without ball bearings on drive end



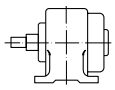
IM V8 (IM 9111)
without endshield and without ball bearings on drive end



IM V9 (IM 9131)
without endshield and without ball bearings on drive end



IM B15 (IM 1201)
without endshield and without ball bearings on drive end



It is essential to state the desired mounting arrangement when ordering, as the constructive design depends partly on the mounting arrangement.

Materials

Motor parts	Frame size	Material
Motor housing	56 - 160 180 - 315	Aluminium alloy Cast iron
Endshield	56 - 160 180 - 315	Aluminium alloy* Cast iron
Flanged endshield	56 - 160 180 - 315	Aluminium alloy* Cast iron
Fan cover	56 - 112 56 - 112 132 - 315	Plastics Sheet steel (optional) Sheet steel
Fan	56 - 315 56 - 160	Plastics Aluminium alloy (optional)
Terminal box	56 - 112 56 - 112 132 - 160 180 - 315	Plastics Aluminium alloy (optional) Aluminium alloy Cast iron

* Cast iron option for 112-132

Paint finish

Normal finish
Suitable for climate group **Moderate** to IEC 60721-2-1, e.g. indoor and outdoor installation.
For short periods: up to 100 % rel. humidity at temperatures up to +30° C.
Continuously: up to 85 % rel. humidity at temperatures up to +25° C.
Standard paint color: RAL 9005.

Special finish K1
Suitable for climate group **Worldwide** to IEC 60721-2-1, e.g. outdoor installation in corrosive chemical and marine atmospheres.
For short periods: up to 100 % rel. humidity at temperatures up to +35° C.
Continuously: up to 98 % rel. humidity at temperatures up to +30° C.

Bearings

Classification of bearings (standard design) [1)]
Bearings for standard design have permanent lubrication
Ball bearings to ISO15 (DIN 625)

Frame size	No. of poles	Drive end	Non-drive end
56	2 + 4	6201-2Z	6201-2Z
63	2 + 4	6202-2Z	6202-2Z
71	2 - 8	6203-2Z	6203-2Z
80	2 - 8	6204-2Z C3	6204-2Z C3
90	2 - 8	6205-2Z C3	6205-2Z C3
100	2 - 8	6206-2Z C3	6206-2Z C3
112	2 - 8	6306-2Z C3	6306-2Z C3
132	2 - 8	6208-2Z C3	6208-2Z C3
160	2 - 8	6309-2Z C3	6309-2Z C3
180	2 - 8	6311 C3	6311 C3
200	2 - 8	6312 C3	6312 C3
225	2 - 8	6313 C3	6313 C3
250	2 - 8	6314 C3	6314 C3
280	2 - 8	6316 C3	6316 C3
315 S/M/L	2	6317 C3	6317 C3
315 S/M/L	4 - 8	NU319 C3	NU319 C3

[1)] With regard on bearings for special design, consult us

Lubrication note
Permanent lubrication up to 160 frame
180 frame up with regreasing facility lubrication nipple is a flat M10x1 to DIN 3404

Roller bearings
Roller bearings available as an option. Please consult us.

Bearing arrangement

Frame size	Bearing drive end	Bearing non-drive end	Spring-loaded
56 - 160 Standard motors	Non-locating bearing	Non-locating bearing	Non-drive end
180 - 315 Standard motors	Locating bearing	Non-locating bearing	Non-drive end

Belt drive

The data apply only to the normal drive end shaft extension of IM B3 motors with one speed.
Calculation of belt drive:

$$F_R = \frac{19120 \cdot P \cdot k}{D_1 \cdot n}$$

F_R = Radial shaft load in N
P = Output in kW
n = Speed in min^{-1}
D_1 = Pulley diameter in m
k = Belt tension factor, varying with the type of belt, assumed to be approximately:
3-4 for normal flat belt without idler pulley
2-2.5 for normal flat belt with idler pulley
2.2-2.5 for V-belt
For exact data apply to the belt manufacturer.

Maximum permissible axial forces without additional radial forces*

Frame size	Horizontal shaft				Vertical shaft - force upwards				Vertical shaft - force downwards			
	3000 min^{-1} kN	1500 min^{-1} kN	1000 min^{-1} kN	750 min^{-1} kN	3000 min^{-1} kN	1500 min^{-1} kN	1000 min^{-1} kN	750 min^{-1} kN	3000 min^{-1} kN	1500 min^{-1} kN	1000 min^{-1} kN	750 min^{-1} kN
56	0.16	0.21	-	-	0.18	0.22	-	-	0.15	0.19	-	-
63	0.19	0.26	-	-	0.21	0.28	-	-	0.17	0.24	-	-
71	0.23	0.33	0.33	0.37	0.26	0.35	0.36	0.39	0.21	0.30	0.31	0.34
80	0.32	0.44	0.46	0.50	0.34	0.47	0.48	0.53	0.29	0.41	0.43	0.47
90	0.34	0.48	0.49	0.54	0.38	0.47	0.53	0.58	0.31	0.44	0.46	0.51
100	0.48	0.68	0.70	0.77	0.54	0.74	0.76	0.83	0.43	0.62	0.64	0.71
112	0.48	0.68	0.70	0.77	0.56	0.75	0.77	0.84	0.40	0.60	0.62	0.69
132 S	0.80	1.13	1.16	1.28	1.00	1.32	1.36	1.47	0.61	0.93	0.97	1.08
132 M	0.78	1.09	1.13	1.24	0.99	1.30	1.33	1.45	0.58	0.89	0.92	1.03
160 M	0.84	1.18	1.21	1.33	1.18	1.52	1.56	1.68	0.50	0.83	0.87	0.99
160 L	0.82	1.15	1.18	1.30	1.18	1.51	1.55	1.67	0.46	0.79	0.82	0.94
180	0.82	1.15	1.18	1.30	1.18	1.51	1.55	1.67	0.46	0.79	0.82	0.94
200	0.82	1.15	1.18	1.30	1.18	1.51	1.55	1.67	0.46	0.79	0.82	0.94
225	1.10	1.60	1.90	2.40	2.10	2.60	2.90	3.40	0.30	0.70	1.00	1.50
250	1.00	1.60	2.00	2.50	2.30	2.70	3.20	3.70	0.20	0.60	1.10	1.50
280	1.70	1.90	2.40	2.90	2.90	3.10	3.60	3.70	0.15	0.30	0.80	1.00
315	2.00	14.00	14.00	14.00	3.60	8.00	9.20	7.40	1.00	1.90	2.40	2.90

Values for 50 Hz. For service on 60 Hz, reduce values by 10%
* Consult according to direction of force

Permissible radial forces

Without additional axial force (Ball bearings)

Nominal life = 20.000 h (Lh10)

F_R = permissible radial force in kN in load point corresponding to half shaft extension

Size	3000 min^{-1} kN	1500 min^{-1} kN	1000 min^{-1} kN	750 min^{-1} kN
56	0.34	0.42	-	-
63	0.38	0.48	-	-
71	0.46	0.58	0.67	0.73
80	0.59	0.83	0.86	0.94
90	0.67	0.94	0.97	1.07
100	0.92	1.29	1.33	1.47
112	0.93	1.30	1.34	1.48
132 S	1.35	1.90	1.96	2.15
132 M	1.40	1.97	2.03	2.23
160 M	1.55	2.17	2.23	2.46
160 L	1.58	2.22	2.29	2.52
180 M	3.00	4.44	4.55	4.76
180 L	3.02	4.47	4.58	4.79
200 L	5.24	6.85	8.01	8.94
225 M	6.11	7.80	9.09	10.12
250 M	6.79	8.82	10.31	11.45
280 S	7.76	11.90	13.87	15.44
280 M	7.79	11.99	13.97	15.55
315 S/M	7.02	11.35	13.40	15.13
315 L	7.03	11.37	13.35	15.09

Special endshields and flanges

Full range of smaller sized and over sized flanges

Frame size	Smaller sized Flange IM B5 [1]	Smaller sized Flange IM B14	Over sized Flange IM B5	Over sized Flange IM B14
56	NA	NA	NA	63
63	56	56	71 [3]	71-80
71	56-63	63	80-90	80-90
80	63-71	63-71	NA	90-100
90 S-L	63-71	71-80	100 [3]	100-112
100 L	71-80	90	NA	132
112 M	80 [2]-90 [2]	90	132 [7]	132
132 S	112 [2]	112	NA	160 [1] [4]
132 M	112	112	160 [4]	160
160 M	NA	132	NA	NA
160 L	NA	132	NA	NA

Possibility to fit over sized bearings:

Frame size	IM B3	IM B5	IM B14
56	NA	NA	NA
63	6203-6205	6203	6203-6205
71	6204-6205	6204-6205	6204-6205
80	6205-6206	6205-6206	6205-6206
90 S-L	6206	6206-6308	6206
100 L	6306	6306-6208	6306
112 M	6208	6208	6208
132 S	6308-6309	6308 [4]	6308 [4]
132 M	6308-6309	6308-6309	6309
160 M	NA	6310	6310
160 L	NA	6310	6310

For higher output (progressive motor) please consult us

Availability of aluminium endshields and flanges with steel insert

Frame size	Endshield DE	Endshield NDE	IM B5	IM B14
71	A	A	A	NA
80	A	A	A	A
90 S-L	A	A	NA	NA
100 L	A	A	A	NA
112 M	A	A	A	NA
132 S	NA	NA	NA	NA
132 M	NA	NA	A [5]	NA
160 M	NA	NA	NA	NA
160 L	NA	NA	NA	NA

Availability of cast iron endshields and flanges

Frame size	Endshield DE	Endshield NDE	IM B5	IM B14	Regreasing device DE	Regreasing device NDE	Regreasing device IM B5	Regreasing device IM B14
71	NA	NA	NA	NA	NA	NA	NA	NA
80	A [6]	A [6]	NA	NA	NA	NA	NA	NA
90 S-L	A [6]	A [6]	NA	NA	NA	NA	NA	NA
100 L	A [6]	A [6]	NA	NA	NA	NA	NA	NA
112 M	A [6]	A [6]	NA	NA	NA	NA	NA	NA
132 S	A	A	A	A	NA	NA	A	A
132 M	A	A	A	A	A	A	A	A
160 M	A	A	A	A	A	A	A	A
160 L	A	A	A	A	A	A	A	A

A Available NA Not available

[1] Not available for all motor ratings; consult us
[2] Cast iron endshield with radial slotted holes
[3] Not interchangeable with standard execution
[4] Cast iron endshield
[5] Only with oversized bearing (6308)
[6] Special mechanical design
[7] Only with oversized bearing (6208)

Cooling

Surface cooling, independent of the direction of rotation.
Motors type AM available without internal fan as type AG, e.g. for installation in a directed air stream (outputs on request).

Vibration

The amplitude of vibration in electric motors is governed by EN 60034-14 *Mechanical vibration of rotating electrical machines with shaft heights 56 and larger - methods of measurement and limits.*
Standard motors are designed to vibration grade A (normal). Vibration grade B is available at extra cost.

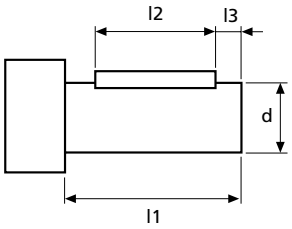
Pole-changing motors in Dahlander connection can only be supplied in vibration grade A.

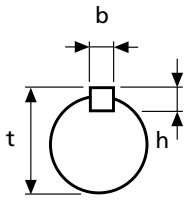
Rotors are at present dynamically balanced with **half** key fitted as per DIN ISO 8821. Other balancing only on request.
The motors are identified as follows:

"H" or "blank" means balanced with *half key*
"F" means balanced with *full key*
"N" means *no key*

Position and dimensions of key

Frame size	Poles	d x l1	b x h	l2	l3	t
56		9 x 20	3 x 3	15	2.5	10.2
63		11 x 23	4 x 4	15	4	12.5
71		14 x 30	5 x 5	20	5	16
80		19 x 40	6 x 6	30	6	21.5
90		24 x 50	8 x 7	40	6	27
100		28 x 60	8 x 7	50	6	31
112		28 x 60	8 x 7	50	6	31
132		38 x 80	10 x 8	70	6	41
160		42 x 110	12 x 8	100	6	45
180		48 x 110	14 x 9	90	5	51.5
200		55 x 110	16 x 10	90	5	59
225	**2**	55 x 110	16 x 10	90	5	59
225	**4**	60 x 140	18 x 10	110	5	64
250	**2**	60 x 140	18 x 11	110	5	64
250	**4**	65 x 140	20 x 10	110	5	74.5
280	**2**	65 x 140	18 x 11	110	5	69
280	**4**	75 x 140	20 x 12	140	5	85
315	**2**	65 x 140	18 x 11	125	5	69
315	**4**	80 x 170	22 x 14	160	5	85





Dimensions in mm.
For larger shafts in special design the dimensions l2 and l3 are maintained.

Anti-condensation heater

On request, motors which due to strong temperature fluctuations are exposed to condensation during standstill, can be fitted against surcharge with an anti-condensation heater (space heater).
For supply voltage and heater rating please refer to the following table:

Frame size	Supply voltage (V)	Heater rating per motor (W)
112 - 160	110 or 230	25
180 - 225	110 or 230	50
250 - 280	110 or 230	50
315	110 or 230	75

During operation of the motor, the heating must be switched off.

Noise

The noise level of an electrical machine is determined by measuring the sound pressure level in accordance with curve A of the sound level meter to EN 60651 and is indicated in dB (A). The permitted noise levels of electrical machines are fixed in EN 60034-9 (IEC 34-9). The noise level of our motors is well below these limit values.
Air-borne sound measurements are carried out in an anechoic testing chamber to EN 21680-ISO 1680.
Speed corresponding to a mains frequency of 50 Hz and the number of poles.

Noise levels
The noise values listed below refer to 50 Hz at rated voltage with a tolerance of up to + 3 dB(A). Values for pole-changing motors on request. For 60 Hz supply values are 3-5 dB(A) higher.
Sound pressure level L_{pA} and sound power level L_{WA} for three-phase single-speed motors with dimensions and output ratings to IEC 60072

Frame size	2 pole		4 pole		6 pole		8 pole	
	L_{WA}	L_{pA}	L_{WA}	L_{pA}	L_{WA}	L_{pA}	L_{WA}	L_{pA}
56	57	48	47	38				
63	58	49	47	38				
71	61	52	51	42	49	40		
80	72	60	60	48	52	40	47	35
90	74	62	61	49	58	46	54	42
100	78	66	62	50	62	51	58	46
112	80	68	65	53	65	53	58	46
132	81	72	71	59	69	57	64	52
160	87	74	75	62	71	58	69	56
180	99	87	88	76	85	73	83	71
200	101	89	91	79	87	75	85	73
225	103	91	92	80	89	77	86	75
250	104	93	93	80	89	77	86	75
280	105	94	98	86	95	83	91	80
315	105	94	98	86	95	83	91	80

Rated voltage

For the rated voltage of the motors, EN 60034-1 allows a tolerance of ± 5 %. According to IEC 60038, the mains voltages may have a tolerance of ± 10 %.

Therefore the three-phase motors are designed for the following rated voltage ranges (exceptions are shown in the data tables):

Mains voltage to DIN IEC 38	Rated voltage range of motor
230 V ± 10%	218-242 V ± 5%
400 V ± 10%	380-420 V ± 5%
690 V ± 10%	655-725 V ± 5%

Within the rated motor voltage range, the permissible maximum temperature is not exceeded. When the motors are operated at the limits of the voltage tolerance, the permissible overtemperature of the stator winding may be exceeded by 10 K.

Nameplates are marked with the maximum rated currents within the stated voltage ranges.

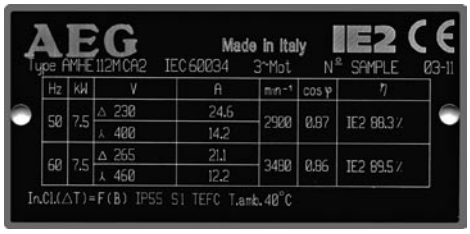
For brake motors, for motors in 500 V, 50 Hz design, and all not standard voltages, no voltage range is marked. The voltage tolerances to EN 60034-1 apply.

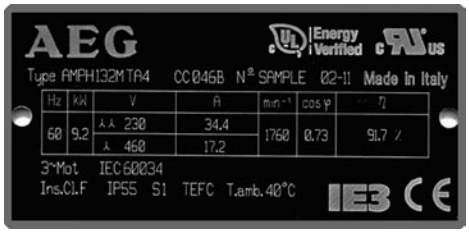
Rated frequency

Three-phase 50 Hz motors can also be operated on 60 Hz mains, provided the mains voltage increases proportionally to the frequency. The relative values for starting and breakaway torque remain nearly unchanged and slightly increase for the starting current. The rated speed increases by the factor 1.2 and output by factor 1.15. Should a motor designed for 50 Hz be operated at 60 Hz without the voltage being increased, the rated output of the motor cannot be increased. Under these operating conditions, rated speed increases by factor 1.2. The relative values for starting and breakaway torque are reduced by factor 0.82 and for starting current by factor 0.9.

Additionally to the voltage range for 50 Hz operation, three-phase single-speed motors (not brake motors) are also marked with the voltage range for 60 Hz operation.

Nameplate examples:





Rated current

For three-phase motors the rated currents listed in the data tables apply to an operating voltage of 400 V. The conversion to other operating voltages, with output and frequency remaining unchanged, is to be made as follows:

Nominal voltage (V)	230	380	**400**	440	500	660	690
Conversion factor x I_N	1.74	1.05	**1.0**	0.91	0.80	0.61	0.58

Rated torque

$$\text{Rated torque in Nm} = 9550 \times \frac{\text{Rated power in kW}}{\text{Rated speed in min}^{-1}}$$

Output

The outputs stated in this catalogue are for constant load in continuous running duty S1 according to EN 60034-1, based on an ambient temperature of 40° C and installation at altitudes up to 1000 m above sea level.

For severe operating conditions, e.g. high switching rate, long run-up time or electric braking, a thermal reserve is necessary, which could call for higher thermal class or the use of a motor with a higher rating. In these cases we recommend to enquire with detailed information on the operating conditions.

Overload

At operating temperature three-phase motors are capable of withstanding an overload for 15 seconds at 1.5 times the rated torque at rated voltage. This overload is according to EN 60034-1 and will not result in excessive heating.
Utilizing thermal class F, motors can be operated continuously with an overload of 12 %. Nevertheless this is not valid for motors which to catalogue are utilized to thermal class F.

Connection

Motor output at 50 Hz	230 V Δ 400 V Y	400 V Δ 690 V Y	500 V Y	500 V Δ	690 V Δ
under 3 kW	standard	on request	on request	on request	-
4 to 5.5 kW	standard	standard	on request	on request	on request
≥ 7.5 kW	on request	standard	on request	on request	on request

Insulation and temperature rise

Class F insulation to EN 60034-1 is used throughout.
In standard design motors are intended for operation at 40° C ambient temperature with class B temperature rise only, with an overtemperature limit of 80 K. This also applies for the rated voltage range to IEC 60038. Exceptions are shown on the data tables.

Temperature rise (ΔT*) and maximum temperatures at the hottest points of the winding (T_{max}) according to the temperature classes of EN 60034-1.

	ΔT*	T_{max}
Class B	80 K	125° C
Class F	105 K	155° C
Class H	125 K	180° C

*Measurement by resistance method

Output reduction at ambient temperatures over 40° C

Ambient temperature	45° C	50° C	55° C	60° C
Class B Reduction of nominal output to approx.	95 %	90 %	85 %	80 %

When a winding is utilized to temperature class F (105K), no output reduction is required up to an ambient temperature of 55° C. *This does not apply to motors which in their standard design are already utilized to thermal class F.*

Installation at altitudes of more than 1000 m above sea level (see also EN 60034-1)

Altitude of installation	2000 m	3000 m	4000 m
At 40°C ambient temperature and thermal class B Rated output reduced to approx.	92 %	84 %	76 %
At 40°C ambient temperature and thermal class F Rated output reduced to approx.	89 %	79 %	68 %
Full nominal output to data tables with thermal class B and ambient temperature of	32° C	24° C	16° C
Full nominal output to data tables with thermal class F and ambient temperature of	30° C	19° C	9° C

Starting rate

The permissible number of starts per hour can be taken as given in the table below, provided the following conditions are met.
Additional moment of inertia ≤ moment of inertia of the rotor: load torque rising with the square of the speed up to nominal torque; starts at even intervals.

Shaft height	Permissible No. of starts per hour for 2p		
	= 2	= 4	≥ 6
56 - 71	100	250	350
80 - 100	60	140	160
112 - 132	30	60	80
160 - 180	15	30	50
200 - 225	8	15	30
250 - 315	4	8	12

For permissible number of starts for pole-changing motors please consult us, indicating the complete operating conditions.

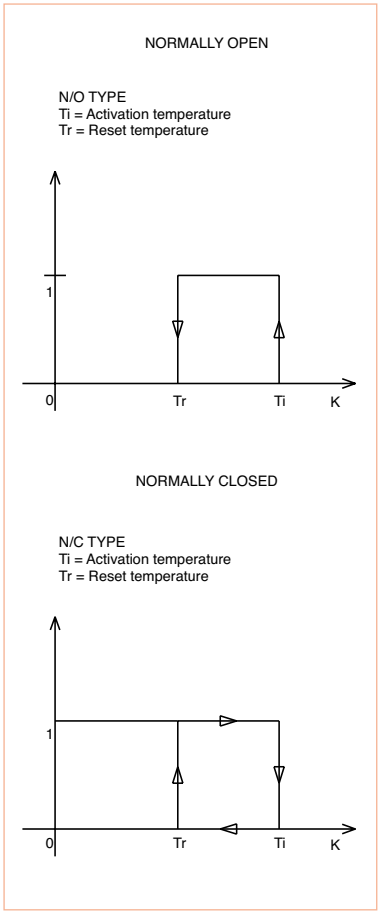
Thermal protection

The decision on a particular type of thermal protection should be taken according to the actual operating conditions. Motors may be protected by means of current-dependent thermal protection switches, overcurrent relays and temperature detectors.

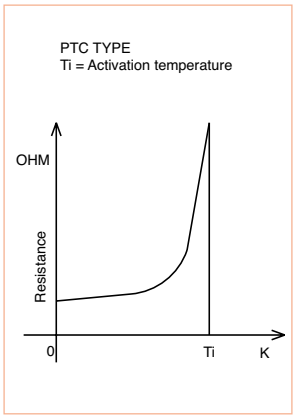
Thermal protection is possible as follows:
- Thermal protection switch with bimetal release
- Thermistor protection with semiconductor temperature detectors (PTC) in the stator winding in connection with release (if required, with additional motor protection switch).
- Bimetal temperature detector as N/C or N/O in the stator winding (if required, with additional motor protection switch).
- Resistance thermometer for monitoring winding and bearing temperature.

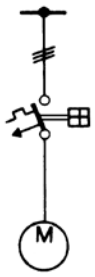
Should protection of the motor be required, we install protection switch with bimetal release (semiconductor temperature detectors on request).

Operating specifications
Thermal cut-out



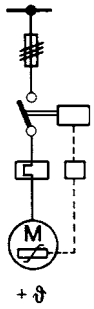
Operating specifications
of the thermistors





Examples of connection

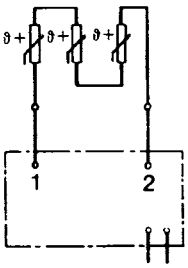
Protection method	Protection against:
Motor protection switch with thermal and electromagnetic overcurrent release	• Overload in continuous service • Locked rotor



Contactor with overcurrent relay
Thermistor protection and fuse

in service against:
- Overload in continous service
- Long starting and braking periods
- High switching rate

in case of fault against:
- Obstruction of cooling
- Increased ambient temperature
- Single-phase operation
- Frequency fluctuations
- Switching against locked rotor



Semiconductor temperature detector with release

in service against:
- Overload in continous service
- Long starting and braking periods
- High switching rate

in case of fault against:
- Obstruction of cooling
- Increased ambient temperature
- Single-phase operation
- Frequency fluctuations
- Switching against locked rotor

Auxiliaries

Encoder (standard design)

Pulses per revolution	200-2048
Max outputs frequency	100 kHz
Power supply	$5V_{dc}$
Electronics	line driver
Current consumption without load	100 mA
Outputs	2 signals with rectangular pulses A, B 2 signals with inverted rectangular pulses $\overline{A}$, $\overline{B}$ zero pulse and inverted zero pulse
Pulse displacement between outputs	90°
Protection	IP 54
Max speed	3000 (6000) min^{-1}
Operating temperature	-10°C ÷ 85°C

Motors for normal continuous duty (S1) and normal operating conditions

Quotation (if submitted)	No./Date
Quantity	Units
Designation	Type
Output (for pole-changing motors, outputs referred to speeds)	kW
Speed (for pole-changing motors, outputs referred to speeds)	min^{-1}
Direction of rotation (viewed on drive end)	
Mounting arrangement (to IEC 60034-7)	
Degree of protection, motor/terminal box (to IEC 60034-5)	
Mains voltage	V
Mains frequency	Hz
Method of starting (direct-on-line or Y-Δ)	
Location of terminal box	
Machine to be driven	

Dimensions of cables, if these differ from those allocated by VDE 0100, referred to an ambient temperature of 40° C, or when aluminium conductors are used. It should be stated when parallel connected conductors are used.

Additional information for special designs

Second or non-standard shaft extension
Radial sealing ring
Paint coating
Corrosive protection
Vibration level
Anti-condensation heating
Temperature detectors
Noise requirements
Mechanical or electrical brake
Special stipulations

Additional information for special duties and difficult operating conditions

S 2: ... min (short-time duty)

S 3: ... % - ... min (intermittent duty)

S 4: ... % - J_M ... kgm² - J_{ext} ... kgm² (intermittent duty with starting)

S 5: ... % - J_M ... kgm² - J_{ext} ... kgm² (intermittent duty with electric braking)

S 6: ... % - min (continuous-operation periodic duty with intermittent load)

S 7: J_M ... kgm² - J_{ext} ... kgm² (continuous-operation periodic duty with electric braking)

S 8: J_M ... kgm² - J_{ext} ... kgm² (continuous-operation periodic duty with speed changes)

S 9: ... kW (continuous duty with non-periodic load and speed variations).
For this duty type suitable full load values should be taken as the overload concept.

S10: p/Δt .... r .... TL (Duty with discrete constant loads).

Starting conditions (no-load or loaded starting)

Shock loads

Load torque curve during run-up (characteristic)

Moment of inertia (J_{ext}) referred to the motor shaft kgm²

Description of the type of drive (direct coupling, flat or V-belt, straight or helical gears, sprocket, crank, eccentric cam, etc.)

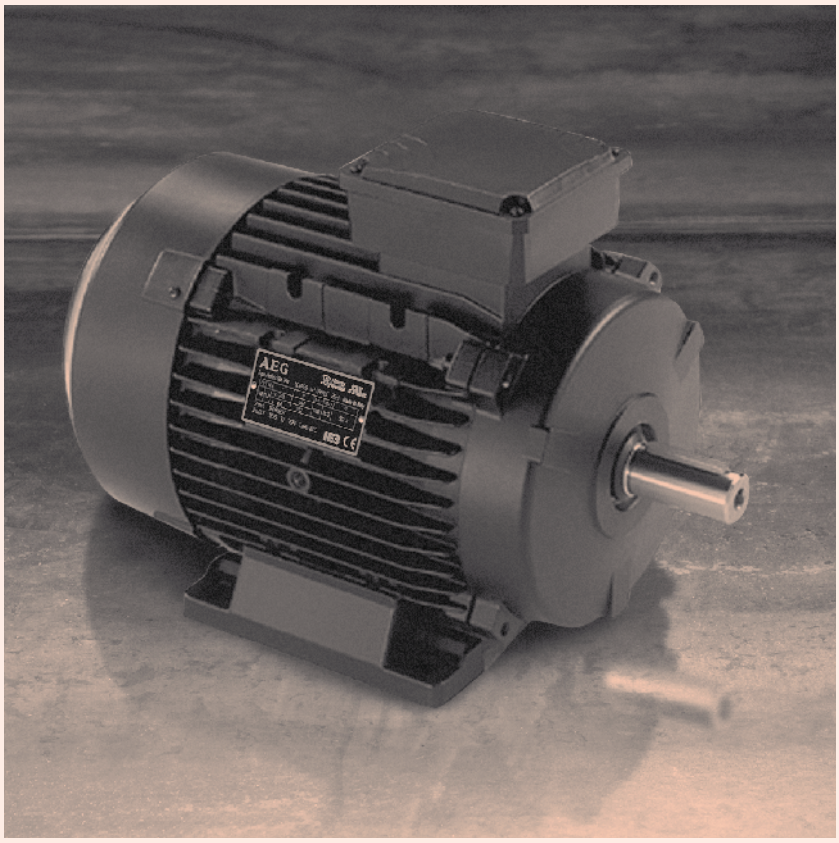
Radial force (or diameter of drive element) N

Direction of force and point of application (distance from shaft shoulder or width of drive element) mm

Axial force and direction of application (pull/thrust) N

Ambient conditions (e.g. increased humidity, dust accumulation, corrosive gases or vapours, increased or extremely low ambient temperature, outdoor installation, installation at altitudes over 1000 m above sea level, external vibration, etc.)

THREE-PHASE MOTORS



Terminal boxes

The location of the terminal box in standard design is on top; on the right or on the left are possible.

Motors 71-160 frame size have removable feet for easy change of terminal box position

For motors with mountings IM B6, IM B7, IM B8, IM V5, IM V6 the location of the terminal box is related to an IM B3 mounting.

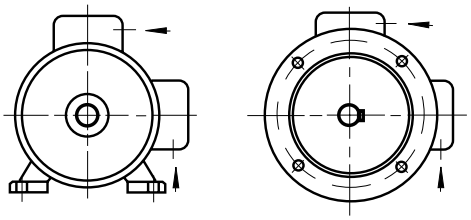
The position of the entry openings can be adjusted to suit the existing connection facilities by turning through 90°. Should special accessories be used (temperature detectors, anti-condensation heating, etc.) please enquire.

For motors in standard design, the cable gland does not belong to our scope of delivery.

For plastic terminal boxes, only plastic glands may be used (shock protection).

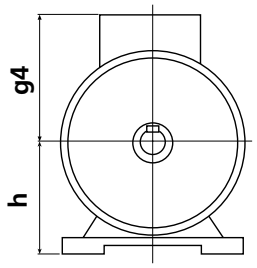
When using screened leads, a metal terminal box is required.

Direction of cable entries

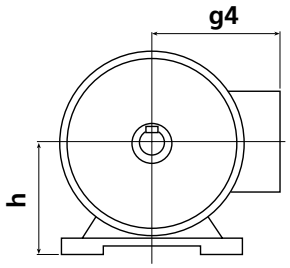


Frame size	Degree of protection	Thread for cable entry		Max. cable section	Terminal thread	Max. external cable diam.
		Metric [1]	Pg [2]	mm²		mm
56 - 71	IP 55	1 x M16/1 x M20	1 x Pg 11/1 x Pg 13.5	2.5	M4	12
80	IP 55	1 x M25/1 x M20	1 x Pg 13.5/1 x Pg 16	2.5	M4	16
90 - 112	IP 55	1 x M25/1 x M20	1 x Pg 13.5/1 x Pg 16	4	M5	16
132	IP 55	2 x M32	2 x Pg 21	4	M5	20
160	IP 55	2 x M40	2 x Pg 29	16	M6	28
180	IP 55	2 x M40/1 x M20		35	M8	28
200	IP 55	2 x M40/1 x M25		35	M8	34
225	IP 55	2 x M50/1 x M25		50	M10	34
250 - 280	IP 55	2 x M50/1 x M25		50	M10	40
315	IP 55	2 x M63/1 x M25 [3]		185	M12	48

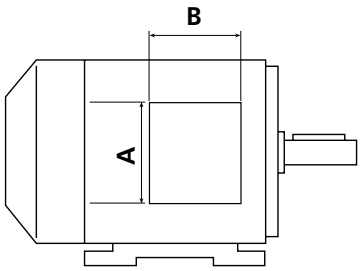
[1] Pitch 1.5
[2] Pg thread to DIN 40 430 (on request)
[3] Terminal box with unscrewable cable entry plate



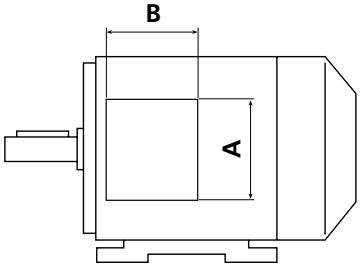
Terminal box on top



Terminal box at the side



left [1)]



right

[1)] On frame size 56-63 the terminal box is supplied displaced towards the non-drive end

Standard design

Frame size h	g_4	A	B	Material
56	98	91	93	Plastic UL 94 V0
63	103	91	93	Plastic UL 94 V0
71	112	91	93	Plastic UL 94 V0
80	129	111	116	Plastic UL 94 V0
90	138	111	116	Plastic UL 94 V0
100	145	111	116	Plastic UL 94 V0
112	161	111	116	Plastic UL 94 V0
132	198	133	133	Aluminium
160	238	150	150	Aluminium
180	268	187	162	Cast Iron
200	300	233	186	Cast Iron
225	335	233	186	Cast Iron
250	366	260	218	Cast Iron
280	408	260	218	Cast Iron
315	530	320	280	Cast Iron

Special design

Frame size h	g_4	A	B	Material
56	100	94	94	Aluminium
63	105	94	94	Aluminium
71	114	94	94	Aluminium
80	139	110	110	Aluminium
90	148	110	110	Aluminium
100	155	110	110	Aluminium
112	171	110	110	Aluminium
180	285	209	220	Cast Iron
200	310	241	246	Cast Iron
225	334	272	254	Cast Iron
250	375	272	254	Cast Iron
280	409	272	254	Cast Iron

Connection diagrams

Windings of standard three-phase **single speed** motors can be connected either in star or delta connection.

Star connection

A star connection is obtained by connecting W2, U2, V2 terminals to eachother and the U1, V1, W1 terminals to the mains. The phase current and voltage are:

$I_{ph} = I_n$; $U_{ph} = U_n / \sqrt{3}$

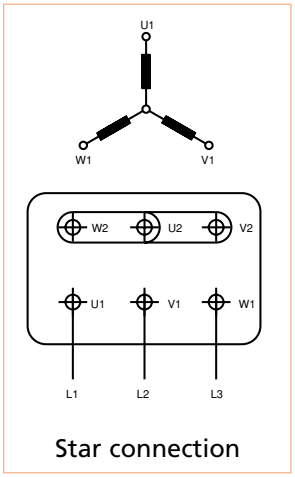
where I_n is the line current and U_n the line voltage referred to the star connection.

Delta connection

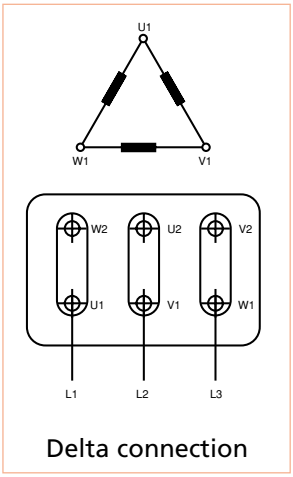
A delta connection is obtained by connecting the end of a phase to the beginning of the next phase.
The phase current I_{ph} and the phase voltage U_{ph} are:

$I_{ph} = I_n / \sqrt{3}$; $U_{ph} = U_n$

where I_n and U_n are referred to the delta connection.



Star connection



Delta connection

Star-delta starting

Star-delta starting allows a peak current reduction. It can be used only when the reduced starting torque obtained is higher than the resistant torque. Actually, it should be noted that the torque of an induction squirrel-cage motor is directly proportional to the square of the voltage. Motors whose rated voltage with delta connection corresponds to the mains voltage, can be started with the star-delta method.

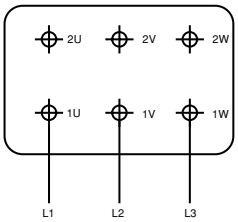
All motors can be supplied with windings designed for star-delta starting (for example: 400 V Δ / 690 V Y).

Pole-changing motors

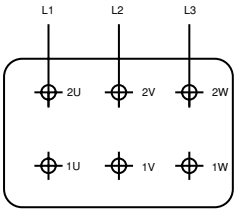
Standard pole-changing motors are designed for single voltage and direct-on-line starting.

When the ratio between the two speeds is from 1 to 2, the standard motors have one single winding (Dahlander connection). For the other speeds, the motors have two separate windings.

AM/AMV - two separate windings

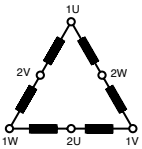


Low speed

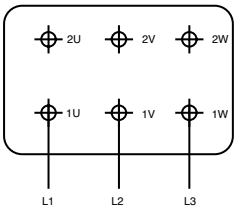


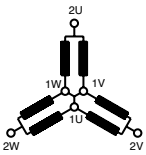
High speed

AM - Dahlander connection Δ/YY

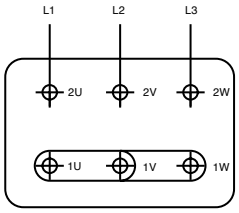


Low speed

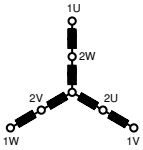




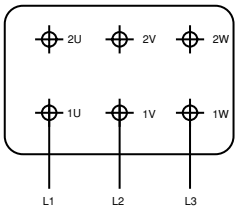
High speed

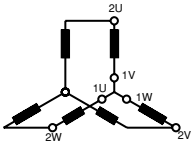


AMV - Dahlander connection Y/YY

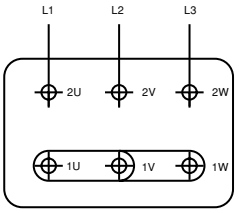


Low speed





High speed



Motors frame sizes 90 upwards in standard design are suitable for operation on static frequency converters, taking into account the following remarks:

• Maximum converter output voltage 500V at peak voltages $\hat{U} \leq 1460V$ and $du/dt \leq 13$ kV/us. For higher converter output voltages or stresses, a special insulation is required.

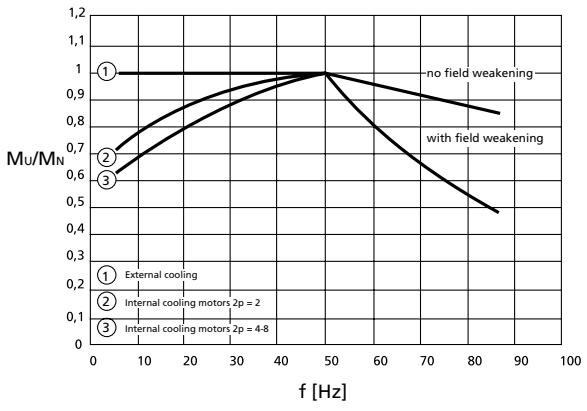
• With square characteristic of the load torque, motors can be driven with their rated torque.

• For constant torque, the rated torque of motors with internal cooling must be reduced due to reduced cooling air inlet. Depending on the control range, the use of an external fan would be advisable.

• The motors frame sizes 90 – 112 are suitable for a maximum output frequency of the converter of 60 Hz (e.g. applications with square torque, control range 1:10, such as pumps and fans). For higher frequencies, a special range with type designation AMI is available on request. From frame size 132 upwards, motors designed Δ/Y 230/400 V, 50 Hz can be operated in delta with a maximum frequency of 87 Hz (observe mechanical limit speed).

The motors frame size 56 – 80 can be operated on single-phase converters up to maximum 60 Hz. (Special range with type designation AMI for operation on three-phase converters with output voltage ≥ 400 V and output frequency > 60 Hz).

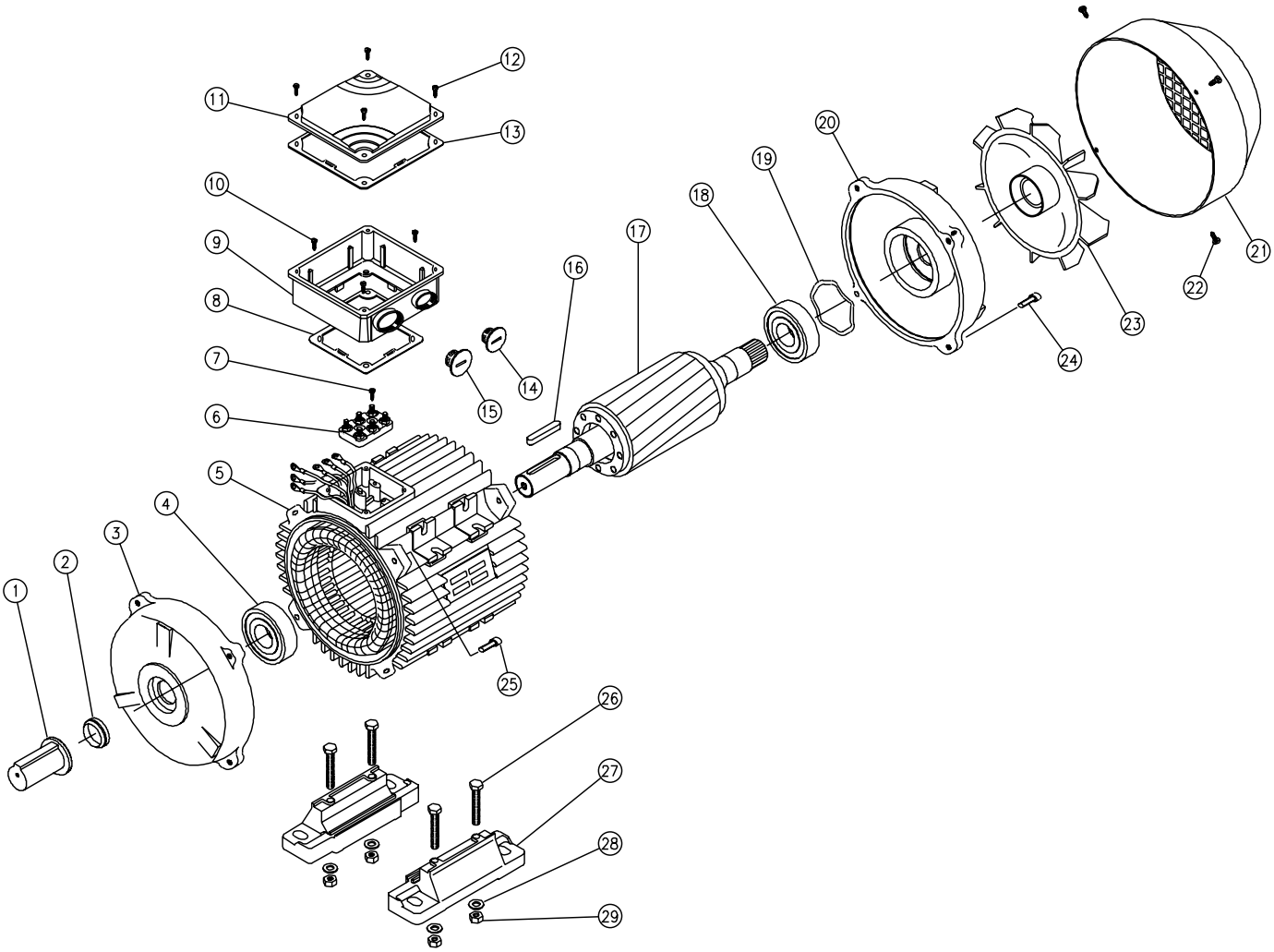
The electrical values and dimensions of the range AMI in frame size 56 to 112 are identical to AM motors (see data tables pages 41-43).



Torque caracteristics of three-phase motors driven by frequency converters.

Noise

Depending on the operating point and converter type, converter-fed motors produce between approx. 4 - 10 dB(A) higher noise values than when supplied from the mains. For motors driven with a frequency over 50 Hz, more fan noise is produced. We recommend the use of an external fan.



Part description

1	Shaft protection
2	Dust seal drive end
3	Endshield drive end
4	Bearing drive end
5	Stator frame
6	Terminal board
7	Fixing screw terminal board
8	Gasket terminal box
9	Terminal box
10	Fixing screw terminal box
11	Terminal box lid
12	Fixing screw terminal box lid
13	Gasket terminal box lid
14	Blank gland plug
15	Blank gland plug
16	Key
17	Rotor complete
18	Bearing non-drive end
19	Pre-load washer
20	Endshield non-drive end
21	Fan cover
22	Fixing screw fan cover
23	Fan
24	Fixing bolt endshield non-drive end
25	Fixing bolt endshield drive end
26	Fixing bolt motor feet
27	Motor feet
28	Fixing washer motor feet
29	Fixing nut motor feet

Only motors 71-160 frame size have removable feet for easy change of terminal box position

In enquires and orders for spare parts please state always: designation of spare part, motor type, mounting arrangement, motor serial number (Product No. when available).
Enquires and orders cannot be handled without these data.

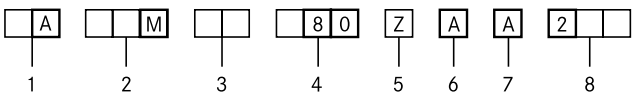
TYPE DESIGNATION

Apart from other information, it is necessary to specify the exact type designation in all enquiries, when ordering spare parts or replacement motors or when asking for documentary information.
The type designation of our motors comprises 8 points of reference, each of which may consist of several letters and/or numerals. The meaning of each symbol can be seen from the following table. For motors not included in our standard range, special symbols may be used which are not listed here.

Meaning of the symbols

Ref. point	Meaning	Description of symbols used for our motors	
1	Type of motor	A	Asynchronous motor
2	Cooling	M G MFV	Surface cooled with external fan, cooling fins Surface cooled without external fan, cooling fins Surface cooled with forced ventilation, cooling fins
3	Type of motor	blank H HE PH PE V I	Three-phase motor, standard efficiency IE1 code Three-phase motor, efficiency to EPACT regulations Three-phase motor, high efficiency IE2 code Three-phase motor, premium efficiency EISA regulations Three-phase motor, premium efficiency IE3 code Three-phase pole-changing motor for driving fans Special design for three-phase motor driven with frequency converter
4	Shaft centre height	56, 63, 71, 80, 90, 100, 112, 132,160, 180, 200, 225, 250, 280, 315	
5	Frame length	Z S M L	 Mechanical dimension (short) Mechanical dimension (medium) Mechanical dimension (long)
6	Mechanical design and output value	A B ... Z	
7	Frame material	A G	Aluminium frame Cast iron frame
8	Number of poles	2 - 4/2 4 - 8/4 6 - 4/6 8 - 6/8	

Example



Three-phase motors designed for range of rated voltage 380-420 V ± 5% - 50 Hz

IE1

For mains voltage to IEC 60038 400 V ± 10% - 50 Hz

Standard efficiency motors, IE1 code
Efficiency testing method IEC 60034-2-1;2007

Temperature rise to class B

Type		kW	HP	min^{-1}	M_N Nm	IE1 η 50%	75%	100%	cos φ	I_N 400V	380-420V	I_A/I_N	M_A/M_N	M_S/M_N	M_K/M_N	J 10^{-3} kgm^2	kg
3000 min^{-1} (2 poles)																	
AM 56Z AA	**2**	0.09	0.12	2810	0.3	49.0	53.0	59.0	0.67	0.35	0.40	3.9	3.8	3.8	3.9	0.09	3.4
AM 56Z BA	**2**	0.12	0.16	2800	0.4	51.0	56.0	62.0	0.68	0.40	0.45	3.5	3.4	3.4	3.5	0.1	3.5
AM 63Z AA	**2**	0.18	0.25	2790	0.6	54	58	63.0	0.73	0.60	0.65	3.7	3.0	3.0	3.1	0.14	3.6
AM 63Z BA	**2**	0.25	0.33	2790	0.9	57	62	66.0	0.70	0.80	0.75	4.5	3.2	3.2	3.3	0.17	4.1
AM 63Z CA	**2***	0.37 [1]	0.50 [1]	2800	1.3	54	58	65.0	0.70	1.20	1.25	4.6	3.4	3.3	3.4	0.20	4.4
AM 71Z AA	**2**	0.37	0.50	2820	1.3	58.0	64.0	70.0	0.78	1.0	1.2	4.7	3.6	3.4	3.6	0.36	5.8
AM 71Z BA	**2**	0.55	0.75	2830	1.9	57.0	64.0	71.0	0.77	1.5	1.6	4.8	3.2	3.1	3.3	0.42	6.2
AM 71Z CA	**2***	0.75 [1]	1.0 [1]	2800	2.6	58.9	65.7	72.6	0.76	2.0	2.1	5.2	3.1	3.2	3.1	0.61	7.2
AM 80Z AA	**2**	0.75	1	2840	2.5	66.3	71.5	73.0	0.78	1.9	2.0	5.0	2.8	2.8	2.9	0.75	8.4
AM 80Z BA	**2**	1.1	1.5	2810	3.7	72.1	75.0	75.3	0.82	2.5	2.6	4.6	2.4	2.8	2.9	0.89	9.5
AM 80Z CA	**2***	1.5 [1]	2 [1]	2825	5.1	74.7	77.5	77.8	0.83	3.3	3.4	5.0	2.9	3.0	3.3	1.05	11.1
AM 90S AA	**2**	1.5	2	2830	5.1	75.6	78.7	78.6	0.82	3.4	3.5	5.0	3.1	2.9	3.0	1.37	12.7
AM 90S BA	**2***	1.8	2.5	2805	6.1	74.9	78.0	78.2	0.80	4.2	4.3	4.5	2.6	2.4	2.5	1.37	12.7
AM 90L CA	**2**	2.2	3	2860	7.3	81.5	82.8	81.8	0.81	4.9	4.9	7.1	4.1	3.6	4.0	1.8	16.0
AM 90L DA	**2***	3 [1]	4 [1]	2860	10.0	78.7	81.8	82.2	0.80	6.6	6.8	7.2	3.9	3.4	3.8	2.09	18.7
AM 100L AA	**2**	3	4	2860	10.0	78.9	81.4	81.5	0.85	6.4	6.7	6.0	3.1	3.1	3.3	2.80	19.3
AM 100L BA	**2***	4 [1]	5.5 [1]	2835	13.5	81.1	82.5	81.7	0.88	8.0	8.1	6.2	2.9	2.5	2.9	3.35	19.7
AM 100L CA	**2***	5.5 [1]	7.5 [1]	2865	18.3	83.7	84.6	83.3	0.86	11.1	11.3	7.2	3.5	3.4	4.1	4.5	25.9
AM 112M AA	**2**	4	5.5	2880	13.3	81.9	84.0	83.5	0.82	8.4	8.7	8.0	3.4	3.5	3.6	5.20	24.3
AM 112M BA	**2***	5.5	7.5	2900	18.1	83.6	84.7	85.0	0.86	10.9	11.2	7.8	3.5	3.4	3.6	6.48	27.4
AM 112M CA	**2***	7.5	10	2900	24.7	86.7	87.8	87.1	0.87	14.3	14.8	8.7	4.0	3.9	4.0	8.58	33.6
AM 132S YA	**2**	5.5	7.5	2890	18.2	83.2	84.7	85.0	0.83	11.3	11.4	6.0	2.2	2.1	2.3	10.63	37.0
AM 132S ZA	**2**	7.5	10	2880	24.9	85.6	86.7	86.1	0.87	14.5	14.9	6.4	2.9	2.7	3.1	13.83	42.6
AM 132M ZA	**2***	9.2	12.5	2900	30.3	84.7	86.8	87.0	0.84	18.4	18.8	7.0	2.8	2.4	3.2	15.0	48.0
AM 132M RA	**2***	11	15	2880	36.5	87.1	88.1	88.0	0.85	21.3	21.7	6.9	3.2	2.8	3.8	17.13	52.5
AM 132M TA	**2***	15 [1]	20 [1]	2920	49.1	86.4	88.6	88.9	0.83	29.5	30.5	7.0	3.2	2.8	3.7	20.30	59.0
AM 160M VA	2	11	15	2940	35.7	83.4	86.4	87.7	0.83	21.9	22.7	7.4	2.5	2.3	3.1	40.00	77.0
AM 160M XA	2	15	20	2940	48.7	87.3	88.9	88.9	0.85	28.6	29.2	8.1	3.1	2.6	3.7	51.75	94.0
AM 160L XA	2	18.5	25	2950	59.9	88.2	89.7	89.6	0.87	34.3	34.8	8.5	3.6	3.0	4.2	64.00	107.8
AM 160L RA	2*	22	30	2940	71.5	88.7	90.5	90.4	0.90	39.1	39.4	8.4	3.0	2.6	3.7	64.00	108.7

1) Temperature rise to class F

* Higher output (progressive motor)

IE code not applicable to motors 2, 4, 6 poles with P_N < 0.75 kW. Efficiency testing method: IEC 60034-2;1996

High efficiency motors - IE2 code from 180 to 315 frame size

Standard efficiency motors, IE1 code
Efficiency testing method IEC 60034-2-1;2007

Temperature rise to class B

Type		kW	HP	min^{-1}	M_N Nm	IE1 η 50%	75%	100%	cos φ	I_N 400V	380-420V	I_A/I_N	M_A/M_N	M_S/M_N	M_K/M_N	J 10^{-3} kgm^2	kg
1500 min^{-1} (4 poles)																	
AM 56Z AA	**4**	0.06	0.08	1300	0.4	42.0	44.0	48.0	0.70	0.28	0.32	2.6	2.1	2.0	2.1	0.14	2.7
AM 56Z BA	**4**	0.09	0.12	1330	0.6	43.0	47.0	51.0	0.74	0.35	0.40	2.5	2.2	2.1	2.2	0.16	2.9
AM 63Z AA	**4**	0.12	0.16	1350	0.8	46.0	50.0	57.0	0.65	0.50	0.55	2.4	2.0	1.9	2.0	0.25	3.3
AM 63Z BA	**4**	0.18	0.25	1330	1.3	47.0	50.0	58.0	0.70	0.65	0.70	2.3	1.9	1.8	1.9	0.27	4.1
AM 63Z CA	**4***	0.25	0.33	1360	1.8	49.0	52.5	58.0	0.74	0.85	0.90	2.7	2.2	2.0	2.1	0.30	4.2
AM 71Z AA	**4**	0.25	0.33	1340	1.8	55.0	59.0	64.0	0.66	0.90	1.00	3.2	1.9	1.8	2.0	0.70	5.7
AM 71Z BA	**4**	0.37	0.50	1370	2.6	60.0	63.0	67.0	0.67	1.20	1.25	3.3	2.2	2.1	2.2	0.82	6.0
AM 71Z CA	**4***	0.55 [1]	0.75 [1]	1380	3.8	61.0	64.0	69.0	0.68	1.70	1.80	3.6	2.4	2.3	2.4	0.95	7.3
AM 80Z AA	**4**	0.55	0.75	1400	3.8	67.0	69.0	70.0	0.72	1.6	1.7	3.6	2.6	2.5	2.6	1.58	8.2
AM 80Z BA	**4**	0.75	1.0	1410	5.1	68.7	70.8	72.4	0.72	2.1	2.2	4.4	2.8	2.3	2.8	2.00	9.3
AM 80Z CA	**4***	1.1 [1]	1.5 [1]	1385	7.6	73.4	75.7	75.2	0.77	2.8	2.9	4.4	2.5	2.5	2.6	2.41	10.6
AM 90S AA	**4**	1.1	1.5	1400	7.5	75.8	76.0	75.4	0.78	2.7	2.9	5.2	2.5	2.4	2.8	2.5	12.5
AM 90L BA	**4**	1.5	2.0	1400	10.2	77.6	77.8	77.5	0.78	3.6	3.7	5.7	2.8	2.6	3.0	3.13	14.5
AM 90L CA	**4**	1.8 [1]	2.5 [1]	1380	12.5	76.3	76.5	75.9	0.81	4.2	4.3	5.5	2.7	2.5	2.9	3.13	14.5
AM 90L DA	**4***	2.2 [1]	3.0 [1]	1400	15.0	78.3	78.5	77.9	0.77	5.3	5.5	4.8	2.9	2.8	3.2	4.05	17.0
AM 100L AA	**4**	2.2	3.0	1435	14.6	76.5	79.1	79.9	0.74	5.4	5.6	5.3	2.5	2.4	2.7	4.6	19.5
AM 100L BA	**4**	3.0	4.0	1425	20.1	82.0	83.0	81.6	0.78	6.8	6.9	4.6	2.4	2.3	2.5	5.58	22.5
AM 100L CA	**4***	4.0 [1]	5.5 [1]	1400	27.3	80.8	81.8	80.4	0.78	9.2	9.3	6.0	2.6	2.4	2.9	6.05	25.0
AM 112M AA	**4**	4.0	5.5	1430	26.7	83.2	83.9	83.1	0.82	8.5	8.8	6.3	2.2	2.0	2.8	12.2	29.5
AM 112M BA	**4***	5.5 [1]	7.5 [1]	1430	36.7	84.1	84.8	84.0	0.83	11.4	11.7	6.5	2.2	2.0	2.9	15.2	34.0
AM 132S ZA	**4**	5.5	7.5	1430	36.7	87.2	87.1	86.1	0.82	11.3	11.7	5.8	3.0	2.7	3.0	22.40	41.9
AM 132M ZA	**4**	7.5	10.0	1440	49.7	87.3	87.2	86.2	0.83	15.3	15.5	6.8	3.1	2.7	3.1	29.25	51.0
AM 132M RA	**4**	9.2	12.5	1440	61.0	86.5	87.5	87.3	0.86	17.7	17.9	8.0	3.5	3.2	3.5	37.25	65.0
AM 132M TA	**4***	11.0 [1]	15.0 [1]	1440	72.9	83.5	83.9	84.5	0.87	21.5	22.0	8.3	3.1	3.0	3.3	37.25	65.0
AM 160M XA	**4**	11	15	1460	71.9	88.5	89.3	88.7	0.80	22.4	22.7	7.5	2.5	2.2	3.1	81.25	88.5
AM 160L XA	**4**	15	20	1460	98.1	89.4	90.2	89.6	0.84	28.8	29.6	7.0	2.5	2.2	3.3	105.7	106.5
AM 160L ZA	**4***	18.5	25	1460	121.8	89.9	90.7	90.1	0.84	35.4	36	7.6	2.5	2.2	3.3	120.4	117.3
AM 160L RA	**4***	22	30	1460	143.9	90.4	91.2	90.6	0.86	41.0	42	7.8	2.4	2.2	3.2	134.7	128.1

1) Temperature rise to class F

* Higher output (progressive motor)

IE code not applicable to motors 2, 4, 6 poles with P_N < 0.75 kW. Efficiency testing method: IEC 60034-2;1996

High efficiency motors - IE2 code from 180 to 315 frame size

Standard efficiency motors, IE1 code
Efficiency testing method IEC 60034-2-1;2007

Temperature rise to class B

Type		kW	HP	min^{-1}	M_N Nm	IE1 η 50%	75%	100%	cos φ	I_N 400V	380-420V	I_A/I_N	M_A/M_N	M_S/M_N	M_K/M_N	J 10^{-3} kgm²	kg
1000 min^{-1} (6 poles)																	
AM 71Z AA	**6**	0.18	0.25	880	2.0	46.0	48.0	53.0	0.60	0.85	0.9	2.2	1.6	1.5	1.6	0.60	6.1
AM 71Z BA	**6**	0.25 [1]	0.33 [1]	880	2.7	46.0	50.0	54.0	0.62	1.10	1.2	2.5	1.7	1.6	1.7	0.90	6.6
AM 80Z AA	**6**	0.37	0.5	920	3.8	47.0	58.0	60.0	0.70	1.25	1.3	2.7	1.6	1.6	2.1	1.97	8.0
AM 80Z BA	**6**	0.55	0.75	920	5.7	60.0	64.0	68.0	0.67	1.75	1.8	2.9	2.2	2.1	2.1	2.47	9.4
AM 90S AA	**6**	0.75	1.0	910	7.9	70.5	72.5	71.5	0.63	2.4	2.5	2.9	1.7	1.5	1.7	3.18	11.6
AM 90L BA	**6**	1.1	1.5	920	11.4	72.0	73.5	73.0	0.66	3.3	3.4	3.0	1.7	1.5	1.7	4.78	15.0
AM 100L AA	**6**	1.5	2.0	930	15.4	73.3	75.8	75.3	0.69	4.2	4.4	3.7	1.8	1.8	2.3	6.73	17.5
AM 100L BA	**6**	1.8	2.5	940	18.3	74.6	77.1	76.6	0.67	5.1	5.3	4.2	2.4	2.4	2.8	9.43	22.0
AM 112M AA	**6**	2.2	3.0	940	22.4	77.0	79.0	78.0	0.74	5.3	5.4	4.4	2.4	2.4	2.6	14.18	26.0
AM 112M CA	**6***	3	4.0	940	30.5	81.8	82.8	82.8	0.74	7.0	7.2	5.3	2.9	2.9	2.9	18.70	39.0
AM 132S ZA	**6**	3	4.0	950	30.2	79.5	81.5	81.3	0.72	7.4	7.5	4.9	2.0	1.8	2.4	23.53	36.7
AM 132M YA	**6**	4	5.5	950	40.2	81.4	83.1	82.7	0.71	9.9	10.5	4.5	2.2	2.0	2.5	29.50	42.5
AM 132M ZA	**6**	5.5	7.5	950	55.3	82.2	83.6	83.6	0.71	13.5	13.5	4.1	2.2	1.9	2.2	37.75	55.5
AM 132M TA	**6***	7.5 [1]	10 [1]	960	74.6	82.8	83.5	82.9	0.75	17.4	17.6	5.0	2.3	1.9	2.8	54.10	64.1
AM 160M ZA	**6**	7.5	10	970	73.8	84.4	86.5	86.3	0.78	16.0	16.3	6.2	2.8	2.7	3.2	103	96.6
AM 160L ZA	**6**	11	15	960	109.4	88.1	88.5	87.8	0.78	23.4	24.0	6.0	2.5	2.2	3.5	137	113.6

1) Temperature rise to class F

* Higher output (progressive motor)

IE code not applicable to motors 2, 4, 6 poles with P_N < 0.75 kW. Efficiency testing method: IEC 60034-2;1996

High efficiency motors - IE2 code from 180 to 315 frame size

Efficiency testing method IEC 60034-2;1996

Type		kW	HP	min^{-1}	M_N Nm	η 50%	75%	100%	cos φ	I_N 400V	380-420V	I_A/I_N	M_A/M_N	M_S/M_N	M_K/M_N	J 10^{-3} kgm²	kg
750 min^{-1} (8 poles)																	
AM 71Z AA	**8**	0.12	0.16	670	1.7	40	44	50	0.55	0.65	0.7	2.4	2.5	2.4	2.5	0.82	6.0
AM 80Z AA	**8**	0.25	0.33	680	3.5	40	47	51	0.62	1.1	1.2	2.2	1.8	1.9	2.0	1.97	8.0
AM 90S AA	**8**	0.37	0.5	680	5.2	52	58	59	0.53	1.7	1.8	2.1	1.4	1.3	1.6	3.18	11.4
AM 90L BA	**8**	0.55	0.75	680	7.7	52	58	59	0.54	2.5	2.7	2.1	1.4	1.3	1.6	4.78	15.0
AM 100L AA	**8**	0.75	1.0	690	10.4	59	64	65	0.65	2.6	2.8	3.0	1.6	1.5	1.7	6.72	17.6
AM 100L BA	**8**	1.1	1.5	690	15.2	59	67	68	0.62	3.9	4.0	3.0	1.9	1.3	1.6	15.93	22.6
AM 112M AA	**8**	1.5	2.0	696	20.6	66	69	70	0.66	4.6	4.8	4.0	1.8	2.0	2.4	16.70	35.0
AM 132S ZA	**8**	2.2	3.0	710	29.6	79.3	80.5	78.8	0.64	6.4	6.6	3.4	1.7	1.6	1.7	29.50	45.5
AM 132M ZA	**8**	3.0	4.0	710	40.4	81.3	82.0	79.8	0.67	8.1	8.4	3.6	1.7	1.6	1.9	37.75	54.5
AM 160M YA	**8**	4.0	5.5	700	54.6	84.9	84.5	84.4	0.72	9.5	9.7	4.5	1.8	1.6	2.2	75	75.0
AM 160M ZA	**8**	5.5	7.5	720	72.9	85.6	85.2	85.0	0.73	12.8	13.3	4.0	1.8	1.6	2.3	103	92.0
AM 160L ZA	**8**	7.5	10.0	710	100.9	86.3	85.8	85.5	0.74	17.1	17.8	4.0	1.8	1.6	2.3	137	113

1) Temperature rise to class F

High Efficiency motors, IE2 code
Efficiency testing method IEC 60034-2-1;2007

Temperature rise to class B

Type		kW	HP	min^{-1}	M_N Nm	IE2η 50%	75%	100%	cos φ	I_N 400V	I_A/I_N	M_A/M_N	M_S/M_N	M_K/M_N	J 10^{-3} kgm^2	kg
3000 min^{-1} (2 poles)																
AMHE 71Z AA	**2***	0.75	1	2865	2.5	75.0	78.1	79.4	0.71	1.9	5.2	3.1	3.0	3.1	0.69	8.2
AMHE 80Z AA	**2**	0.75	1	2900	2.5	77.3	78.5	80.5	0.78	1.7	7.0	3.6	3.4	3.6	0.7	9.5
AMHE 80Z BA	**2**	1.1	1.5	2880	3.6	79.5	81.2	81.5	0.78	2.5	6.8	3.6	3.4	3.6	0.89	11.1
AMHE 80Z CA	**2***	1.5	2	2880	5.0	80.5	82.1	82.4	0.78	3.4	7.0	3.5	3.4	3.6	1.1	13.5
AMHE 90S AA	**2**	1.5	2	2880	5.0	81.0	82.8	82.8	0.80	3.2	8.1	3.6	3.1	4.0	1.56	14.0
AMHE 90L CA	**2**	2.2	3	2860	7.3	82.5	84.0	84.0	0.85	4.4	8.5	3.5	3.2	3.7	1.8	16.0
AMHE 100L AA	**2**	3	4	2920	9.8	84.1	85.8	85.5	0.84	5.9	8.0	3.5	3.0	4.0	4.05	22.8
AMHE 100L BA	**2***	4	5.5	2920	13.1	85.2	86.4	86.1	0.86	7.8	8.2	3.3	3.0	3.8	4.1	22.8
AMHE 112M AA	**2**	4	5.5	2940	13.0	85.5	87.0	86.8	0.88	7.6	8.0	2.9	2.1	3.3	6.48	27.4
AMHE 112M BA	**2***	5.5	7.5	2920	18.0	85.8	87.4	87.3	0.88	10.4	8.0	3.0	2.1	3.2	8.58	34.0
AMHE 112M CA	**2***	7.5	10	2900	24.7	86.5	88.3	88.3	0.87	14.2	8.1	3.0	2.2	3.4	10.50	36.0
AMHE 132S YA	**2**	5.5	7.5	2900	18.1	86.0	88.0	87.9	0.89	10.2	7.3	2.7	2.3	3.2	14.0	46.0
AMHE 132S ZA	**2**	7.5	10	2900	24.7	86.3	88.6	88.4	0.89	13.8	7.5	2.8	2.5	3.3	16.0	53.0
AMHE 132M ZA	**2**	9.2	12.5	2920	30.1	88.4	89.9	90.0	0.87	16.9	8.8	3.2	3.0	3.8	17.5	58.0
AMHE 132M RA	**2***	11	15	2920	36.0	88.1	90.0	89.7	0.90	19.8	7.5	2.8	2.6	3.4	17.5	58.0
AMHE 132M TA	**2***	15	20	2920	49.1	88.9	90.6	90.3	0.89	27.0	7.5	3.0	2.8	3.5	21.0	61.0
AMHE 160M YA	**2**	11	15	2930	35.9	88.9	90.2	90.0	0.87	20.4	7.3	2.4	2.2	3.1	51.75	77.0
AMHE 160M ZA	**2**	15	20	2930	48.9	90.0	91.0	90.8	0.88	27.2	7.6	2.5	2.3	3.1	55.4	87.1
AMHE 160L ZA	**2**	18.5	25	2935	60.2	90.3	91.6	91.2	0.88	33.3	7.9	2.8	2.4	3.4	59.7	97.5
AMHE 160L TA	**2***	22	30	2935	71.6	91.0	91.7	91.5	0.90	38.6	8.3	3.0	2.6	3.7	64.0	108.7
AMHE 180M ZG	**2**	22	30	2930	71.7	90.9	91.8	91.4	0.89	39.04	7.5	2.3	2.0	2.8	98	163
AMHE 200L PG	**2**	30	40	2930	97.8	91.3	92.3	92.4	0.88	53.3	6.7	2.4	2.0	2.7	178	228
AMHE 200L RG	**2**	37	50	2930	120.6	91.6	92.9	92.8	0.90	64.0	6.3	2.3	2.0	2.7	204	242
AMHE 225M PG	**2**	45	60	2940	146.2	92.8	93.3	93.2	0.89	78.3	6.9	2.3	2.0	2.8	285	308
AMHE 250M PG	**2**	55	75	2950	178.0	92.9	93.8	93.7	0.90	94.1	8.0	2.3	1.9	2.7	411	405
AMHE 280S G	**2**	75	100	2960	242.0	93.2	94.5	94.1	0.90	127.8	8.0	2.2	1.9	2.7	791	542
AMHE 280M G	**2**	90	125	2960	290.4	93.6	94.3	94.4	0.91	151.2	7.7	2.2	1.9	2.6	907	596
AMHE 315S G	**2**	110	150	2970	353.7	93.7	94.6	94.8	0.90	186.0	7.7	2.0	1.8	2.3	1702	922
AMHE 315M G	**2**	132	180	2970	424.4	93.6	94.9	95.3	0.90	222.1	7.6	2.0	1.8	2.3	1908	1010
AMHE 315M RG	**2**	160	220	2970	514.5	94.1	95.2	95.3	0.91	266.3	7.8	2.0	1.8	2.3	2117	1085
AMHE 315L G	**2**	200	270	2975	642.0	94.1	95.3	95.4	0.90	336.2	7.9	2.0	1.8	2.3	2438	1220

* Higher output (progressive motor)

High efficiency motors, IE2 code
Efficiency testing method IEC 60034-2-1;2007

Temperature rise to class B

Type		kW	HP	min^{-1}	M_N Nm	IE2η 50%	75%	100%	cos φ	I_N 400V	I_A/I_N	M_A/M_N	M_S/M_N	M_K/M_N	J 10^{-3} kgm^2	kg
1500 min^{-1} (4 poles)																
AMHE 80Z AA	**4**	0.75	1	1430	5	79.2	80.3	80.2	0.76	1.8	5.5	2.8	2.7	3	2.5	11.0
AMHE 90S AA	**4**	1.1	1.5	1430	7.3	81.4	82.7	82.5	0.77	2.5	6.1	4.0	3.9	4.1	3.73	16.4
AMHE 90L BA	**4**	1.5	2	1430	10	82.0	83.5	83.0	0.77	3.4	6.4	3.9	3.8	4.0	3.73	16.4
AMHE 100L AA	**4**	2.2	3	1450	14.5	84.0	85.3	85.1	0.74	5.1	6.0	3.2	3.0	3.4	5.58	22.4
AMHE 100L BA	**4**	3	4	1440	19.9	85.3	86.6	86.4	0.77	6.5	6.3	3.4	3.1	3.6	7.3	26.5
AMHE 112M AA	**4**	4	5.5	1450	26.3	86.0	87.3	87.1	0.78	8.5	6.1	3.1	2.8	3.3	13.3	30.4
AMHE 132S RA	**4**	5.5	7.5	1450	36.2	87.5	88.3	88.1	0.84	10.8	7.4	3.0	2.4	3.3	30.0	55.0
AMHE 132M TA	**4**	7.5	10	1450	49.4	88.5	89.4	89.2	0.85	14.4	7.4	3.0	2.4	3.3	36.0	65.0
AMHE 160M ZA	**4**	11	15	1460	71.9	89.4	90.3	90.1	0.82	22.0	6.9	2.3	2.1	2.9	105.0	108.0
AMHE 160L ZA	**4**	15	20	1460	98.1	90.6	91.2	91.0	0.84	29.0	7.4	2.5	2.2	3.1	120.7	114.0
AMHE 180M ZG	**4**	18.5	25	1455	121.4	90.9	91.6	91.4	0.85	34.4	7.8	2.4	2.1	3.0	156	160
AMHE 180L ZG	**4**	22	30	1460	143.9	91.1	92.0	91.6	0.84	41.3	7.5	2.3	2.0	3.0	175	175
AMHE 200L RG	**4**	30	40	1460	196.2	90.2	92.8	92.5	0.88	53.2	7.9	2.4	2.0	2.7	281	238
AMHE 225S PG	**4**	37	50	1470	240.4	92.3	92.9	92.8	0.83	69.3	6.7	2.4	2.0	2.7	487	305
AMHE 225M PG	**4**	45	60	1480	290.4	92.5	93.2	93.3	0.83	83.9	7.0	2.3	2.0	2.8	575	310
AMHE 250M PG	**4**	55	75	1480	354.9	93.1	94.0	93.8	0.87	97.3	7.4	2.4	1.9	2.7	728	412
AMHE 280S G	**4**	75	100	1480	483.9	93.2	94.5	94.4	0.90	127.4	7.5	2.2	1.9	2.6	1741	560
AMHE 280M G	**4**	90	125	1480	580.7	93.4	94.8	94.7	0.90	152.4	7.7	2.2	1.9	2.6	2037	665
AMHE 315S G	**4**	110	150	1480	709.8	93.9	95.0	94.9	0.89	188.0	7.8	2.0	1.8	2.3	4026	910
AMHE 315M G	**4**	132	180	1480	851.8	94.0	95.2	95.1	0.90	222.6	7.8	2.0	1.8	2.3	4387	1120
AMHE 315M RG	**4**	160	220	1480	1032.4	94.2	95.3	95.3	0.90	269.3	7.9	2.0	1.8	2.3	4968	1185
AMHE 315LG	**4**	200	270	1480	1290.5	94.3	95.4	95.4	0.90	336.2	7.7	2.0	1.8	2.3	6488	1340

High efficiency motors, IE2 code
Efficiency testing method IEC 60034-2-1;2007

Temperature rise to class B

Type		kW	HP	min^{-1}	M_N Nm	IE2η 50%	IE2η 75%	IE2η 100%	cos φ	I_N 400V	I_A/I_N	M_A/M_N	M_S/M_N	M_K/M_N	J 10^{-3} kgm^2	kg
1000 min^{-1} (6 poles)																
AMHE 90S AA	**6**	0.75	1	925	7.7	75.3	75.8	76.2	0.65	2.2	4.6	1.7	1.6	1.8	4.78	15.0
AMHE 90L BA	**6**	1.1	1.5	935	11.2	78.5	78.7	78.9	0.67	3.0	4.2	1.8	1.8	2.3	6.45	20.3
AMHE 100L AA	**6**	1.1	1.5	950	11.1	75.7	77.6	79.5	0.67	3.0	5.5	1.9	1.9	2.4	7.48	19.4
AMHE 100L BA	**6**	1.5	2	950	15.1	78.5	79.4	79.8	0.77	3.5	6.7	2.4	2.4	2.8	11.6	27.1
AMHE 112M AA	**6**	2.2	3	960	21.9	79.4	81.0	81.8	0.73	5.3	10.4	2.7	1.5	3.7	18.7	39.0
AMHE 132S YA	**6**	3	4	960	29.8	82.3	82.9	83.5	0.58	8.9	9.5	2.2	1.4	3.2	37.7	55.8
AMHE 132M YA	**6**	4	5.5	955	40.0	84.1	84.8	85.2	0.66	10.3	8.9	2.1	1.2	2.9	44.4	65.5
AMHE 132M TA	**6**	5.5	7.5	970	54.1	85.0	86.2	86.5	0.75	12.2	8.4	1.9	1.1	2.7	54.1	64.1
AMHE 160M YA	**6**	5.5	7.5	975	53.9	84.7	85.6	86.1	0.71	13.0	9.2	3.3	3.1	4.2	75.2	70.5
AMHE 160M ZA	**6**	7.5	10	970	73.8	85.8	87.3	87.5	0.78	15.8	7.7	3.0	2.8	3.8	103	96.6
AMHE 160L ZA	**6**	9.2	12.4	965	91.0	86.3	87.4	87.8	0.83	18.1	8.3	3.1	2.7	4.1	125	103
AMHE 160L TA	**6**	11	15	965	108.9	87.9	88.2	88.7	0.79	22.5	9.1	3.1	2.9	3.9	156	129
AMHE 180LZG	**6**	15	20	965	148.45	88.5	90.3	90.1	0.83	29.0	7.0	2.3	2.1	2.9	285	172
AMHE 200LPG	**6**	18.5	25	965	183.09	88.9	90.8	90.6	0.84	35.1	7.0	2.4	2.1	3.2	405	225
AMHE 200LRG	**6**	22	30	970	216.6	89.3	91.4	91.2	0.85	41.0	7.0	2.3	1.9	3.1	471	275
AMHE 225MPG	**6**	30	40	975	293.85	89.6	91.7	91.9	0.86	54.8	7.0	2.2	1.9	2.7	801	312
AMHE 250MPG	**6**	37	50	975	362.41	90.7	92.4	92.5	0.84	68.7	7.0	2.3	2.1	2.7	992	386
AMHE 280SG	**6**	45	60	980	438.52	91.6	92.9	92.9	0.85	82.3	7.0	2.3	2.0	2.8	1785	560
AMHE 280MG	**6**	55	75	980	536.0	92.1	93.4	93.3	0.86	98.9	7.0	2.2	1.9	2.7	2208	593
AMHE 315SG	**6**	75	100	985	727.16	93.1	93.8	93.8	0.87	132.7	7.0	2.1	1.9	2.5	4632	741
AMHE 315MG	**6**	90	125	985	872.59	93.3	94.1	94.2	0.88	156.7	7.0	2.0	1.8	2.3	5525	920
AMHE 315MRG	**6**	110	150	980	1071.94	93.2	94.5	94.6	0.89	188.6	6.7	2.0	1.8	2.3	6896	1243
AMHE 315LG	**6**	132	160	980	1286.33	93.7	94.7	94.8	0.88	228.4	6.7	2.0	1.8	2.3	8023	1428

High Efficiency
Three-phase motors
according to EPAct

IE2 ENERGY

For mains voltage
460 V - 60 Hz

Insulation class F
Temperature rise to class B
S.F. 1.15

Verified by UL Underwriters Laboratories Inc.

Type		kW	HP	min^{-1}	M_N Nm	50%	η 75%	100%	cos φ	I_N 460V	I_A/I_N	M_A/M_N	M_S/M_N	M_K/M_N	J 10^{-3} kgm^2	kg
3600 min^{-1} (2 poles)																
AMH 90S AA	**2**	1.5	2	3470	4.1	83.8	84.9	84.3	0.88	2.7	7.7	3.1	3	3.6	1.6	14
AMH 90L BA	**2**	2.2	3	3500	6.0	85.4	86.6	86.3	0.84	3.9	7.5	4.4	4	4.4	1.8	16
AMH 100L AA	**2**	2.2	3	3530	6.0	86.5	87.9	87.8	0.84	3.9	11.5	4.7	4.1	5.5	3.3	19.7
AMH 100L BA	**2**	3	4	3525	8.1	86.4	87.8	87.7	0.82	5	10.5	5.6	5.3	5.8	4.0	22.8
AMH 112M AA	**2**	3.7	5	3530	10.0	86.1	88.4	88.1	0.84	6.3	14.3	5.7	2.1	5.8	8.6	33.6
AMH 112M AA	**2**	4	5.5	3540	10.8	86.1	88.3	88.0	0.87	6.6	13.7	5.3	1.9	5.4	8.6	33.6
AMH 112M BA	**2***	5.5	7.5	3500	15.0	85.0	88.6	88.5	0.85	9.3	10.9	4.5	2.48	4.3	8.6	34
AMH 132S ZA	**2**	5.5	7.5	3520	14.9	86.1	88.2	88.5	0.87	9.2	7.9	3.3	2.9	3.7	20.5	53
AMH 132S TA	**2**	7.5	10	3510	20.4	89.7	90.1	89.5	0.91	11	8.1	3.4	2.9	3.9	20.5	53
AMH 132M TA	**2**	9.2	12.4	3520	25.0	88.8	89.9	89.5	0.91	14	8.1	3.3	2.9	3.9	25	59
AMH 160M YA	**2**	11	15	3550	29.6	90.1	91	91.0	0.88	17.3	8.7	2.8	2.2	3.6	51.7	87.8
AMH 160M ZA	**2**	15	20	3545	40.4	91.2	89.9	91.0	0.88	23.5	8.7	2.8	2.2	3.6	64	104
AMH 160L ZA	**2**	18.5	25	3550	49.8	91.5	92	91.7	0.87	28.8	8.9	2.8	2.2	3.6	64	105

* Higher output (progressive motor)

Type		kW	HP	min^{-1}	M_N Nm	50%	η 75%	100%	cos φ	I_N 460V	I_A/I_N	M_A/M_N	M_S/M_N	M_K/M_N	J 10^{-3} kgm^2	kg
1800 min^{-1} (4 poles)																
AMH 90L AA	**4**	1.1	1.5	1745	6.0	82.2	84.2	84.2	0.76	2.1	7.2	3.8	4	4.6	3.7	16.4
AMH 90L BA	**4**	1.5	2	1735	8.3	82.1	84.4	84.4	0.73	3.1	7.5	4	3.9	4.2	3.7	16.4
AMH 90L CA	**4**	1.8	2.4	1720	10.0	82.2	84.3	84.3	0.77	3.4	7.4	4.4	3.3	4	3.7	16.4
AMH 100L AA	**4**	2.2	3	1750	12.0	85.8	87.6	87.5	0.70	4.6	6.5	3.8	3.1	3.9	5.6	22.4
AMH 100L BA	**4**	3	4	1740	16.5	85.7	87.7	87.6	0.76	5.6	7.4	3	2.8	3.2	7.3	26.5
AMH 112M AA	**4**	3.7	5	1750	20.2	86.3	87.9	87.8	0.79	6.8	6.9	4.2	3.5	4.5	13.3	30.4
AMH 112M AA	**4**	4	5.5	1745	21.9	86.5	88.1	88.0	0.81	7	6.7	3.9	3.2	4.2	13.3	30.4
AMH 132S ZA	**4**	5.5	7.5	1755	29.9	88.8	89.8	89.5	0.84	9.4	7.9	3.4	2.8	3.7	30	56
AMH 132M ZA	**4**	7.5	10	1750	40.9	89.5	90.2	89.5	0.84	12.4	8.1	3.5	2.9	3.8	36	65
AMH 132M TA	**4**	9.2	12.4	1745	50.3	89.2	90	89.5	0.84	16	8.3	3.6	2.9	3.9	36	65
AMH 160M ZA	**4**	11	15	1770	59.3	90.8	91.4	91.0	0.84	18.5	8.6	3.2	2.3	3.4	105.7	108
AMH 160L ZA	**4**	15	20	1770	80.9	91.4	91.6	91.0	0.84	24	8.2	3.2	2.3	3.4	120.7	114

Premium efficiency motors, IE3 code
Efficiency testing method IEC 60034-2-1;2007

Temperature rise to class B

Type		kW	HP	min^{-1}	M_N Nm	IE3η 50%	IE3η 75%	IE3η 100%	cos φ	I_N 400V	I_A/I_N	M_A/M_N	M_S/M_N	M_K/M_N	J 10^{-3} kgm^2	kg
3000 min^{-1} (2 poles)																
AMPE 90S AA	**2**	1.5	2	2910	4.9	80.1	83.8	85.0	0.72	3.5	9.1	3.9	4.3	4.6	1.6	14
AMPE 90L BA	**2**	2.2	3	2865	7.3	84.8	85.6	86.0	0.86	4.3	7.9	4.5	4.2	4.7	1.8	16
AMPE 100L AA	**2**	3	4	2900	9.9	84.6	86.8	87.1	0.85	5.8	10.9	5.5	3.5	4.5	4	22.8
AMPE 112M AA	**2**	3.7	5	2950	12.0	86.3	88.9	89.9	0.83	7.1	12.8	5.2	2.3	3.8	8.6	33.6
AMPE 112M BA	**2**	4	5.5	2945	13.0	86.9	88.4	90.1	0.85	7.5	12.6	4.7	2.3	3.8	8.6	33.6
AMPE 112M CA	**2**	5.5	7.5	2935	17.9	85.6	88.3	89.2	0.78	11.3	11.7	4.7	2.7	4	8.6	33.6
AMPE 132S ZA	**2**	5.5	7.5	2920	18.0	88.2	89.7	89.8	0.88	10.0	7.7	3.2	2.9	3.6	20.5	53
AMPE 132S TA	**2**	7.5	10	2930	24.4	89.4	91.0	91.1	0.88	13.5	7.7	3.6	3.3	4.2	22.8	56
AMPE 132M TA	**2**	9.2	12.4	2935	29.9	89.4	91.0	91.2	0.85	17.0	9.7	4.2	3.9	5.1	25	59
AMPE 132M RA	**2**	11	15	2935	35.8	89.2	90.8	91.2	0.81	21.4	9.5	4.2	3.7	4.9	25	59
AMPE 160M YA	**2**	11	15	2935	35.8	88.7	90.5	91.2	0.89	19.5	11.1	3.7	2.7	4.7	51.7	87.8
AMPE 160M ZA	**2**	15	20	2945	48.6	89.5	91.4	92.0	0.88	26.7	12.5	4.6	3.3	5.9	64	104
AMPE 160L ZA	**2**	18.5	25	2945	60.0	89.7	91.7	92.4	0.82	35.3	12.8	4.9	3.5	6.3	64	104
AMPE 160L TA	**2**	22	30	2930	71.7	91.6	92.6	92.7	0.85	40.2	10.9	4.1	3.0	5.3	64	104

For dimensions AMPE 2 poles motors, please see dimensions AMHE motors

Type		kW	HP	min^{-1}	M_N Nm	IE3η 50%	IE3η 75%	IE3η 100%	cos φ	I_N 400V	I_A/I_N	M_A/M_N	M_S/M_N	M_K/M_N	J 10^{-3} kgm^2	kg
1500 min^{-1} (4 poles)																
AMPE 90S AA	**4**	1.1	1.5	1445	7.3	82.3	85.2	85.8	0.70	2.6	8.5	4.6	4.5	4.9	3.7	16.4
AMPE 90L BA	**4**	1.5	2	1420	10.1	84.7	85.4	85.7	0.76	3.3	7.8	4.1	4.0	4.3	3.7	16.4
AMPE 90L CA	**4**	1.8	2.4	1420	12.1	83.8	84.9	85.3	0.70	4.3	8.0	4.1	4.0	4.3	3.7	16.4
AMPE 112M AA	**4**	3.7	5	1450	24.4	87.7	88.6	88.8	0.80	7.5	9.9	3.3	2.7	4.9	16.4	36
AMPE 112M BA	**4**	4	5.5	1445	26.4	87.9	88.5	88.8	0.82	7.9	9.3	3.1	2.4	4.6	16.4	36
AMPE 132S ZA	**4**	5.5	7.5	1450	36.2	90.6	91.0	91.2	0.82	10.6	9.4	3.7	3.2	4.3	36	65
AMPE 132M ZA	**4**	7.5	10	1465	48.9	89.8	91.2	91.5	0.68	17.5	9.7	4.4	3.7	5.1	45	79
AMPE 132M TA	**4**	9.2	12.4	1455	60.4	90.6	91.2	91.3	0.74	19.7	9.8	4.9	4.2	5.8	57	98
AMPE 160M ZA	**4**	11	15	1470	71.5	92.2	92.6	92.9	0.79	21.6	10.1	4.6	3.3	4.9	120.7	114
AMPE 160L ZA	**4**	15	20	1465	97.8	92.1	92.5	92.8	0.78	29.9	10.1	4.4	3.2	4.7	135	120

For dimensions AMPE 4 poles motors, please consult us

Premium Efficiency
Three-phase motors
according to EISA

IE3

c UL us

c UL Energy Verified

For mains voltage
460 V - 60 Hz

Verified by UL Environment

Temperature rise to class B

Type	kW	HP	min^{-1}	M_N Nm	η 50%	η 75%	η 100%	cos φ	I_N 460V	I_A/I_N	M_A/M_N	M_S/M_N	M_K/M_N	J 10^{-3} kgm²	kg
3600 min^{-1} (2 poles)															
AMPH 90S AA 2	1.5	2	3515	4.1	81.2	84.7	85.5	0.78	2.8	8.9	3.7	3.6	4.3	1.6	14.0
AMPH 90L BA 2	2.2	3	3480	6.0	83.6	86.1	86.5	0.84	3.8	7.7	4.4	4.0	4.4	1.8	16.0
AMPH 100L AA 2	3	4	3515	8.2	85.8	88.1	88.5	0.86	4.9	10.6	5.6	5.3	5.3	4.0	22.8
AMPH 112M AA 2	3.7	5	3550	10.0	84.0	87.6	88.5	0.86	6.1	12.5	5.1	1.9	5.2	8.6	33.6
AMPH 112M BA 2	4	5.5	3540	10.8	85.3	88.0	88.5	0.87	6.5	12.3	4.7	1.7	4.8	8.6	33.6
AMPH 112M CA 2	5.5	7.5	3530	14.9	86.2	89.0	89.5	0.86	8.9	11.4	4.5	2.5	4.3	8.6	33.6
AMPH 132S ZA 2	5.5	7.5	3540	14.8	87.3	89.6	89.5	0.88	8.8	7.5	3.0	2.6	3.3	20.5	53.0
AMPH 132S TA 2	7.5	10	3540	20.2	88.0	90.3	90.2	0.87	12.0	7.5	3.4	2.9	3.9	22.8	56.0
AMPH 132M TA 2	9.2	12.4	3545	24.8	87.7	90.1	90.2	0.88	14.5	9.4	4.0	3.5	4.7	25.0	59.0
AMPH 132M RA 2	11	15	3535	29.7	87.5	90.4	91.0	0.86	17.7	9.2	4.0	3.5	4.7	25.0	59.0
AMPH 160M YA 2	11	15	3550	29.6	86.6	90.0	91.0	0.89	17.0	10.8	3.5	2.5	4.5	51.7	87.8
AMPH 160M ZA 2	15	20	3555	40.3	90.1	92.0	91.0	0.85	24.4	12.2	4.4	3.1	5.6	64.0	104
AMPH 160L ZA 2	18.5	25	3555	49.7	90.0	92.2	91.7	0.82	31.0	12.5	4.6	3.3	6.0	64.0	104
AMPH 160L TA 2	22	30	3540	59.3	90.7	92.5	91.7	0.84	35.8	10.6	3.9	2.8	5.0	64.0	104

For dimensions AMPH 2 poles motors, please see dimensions AMH motors

Type	kW	HP	min^{-1}	M_N Nm	η 50%	η 75%	η 100%	cos φ	I_N 460V	I_A/I_N	M_A/M_N	M_S/M_N	M_K/M_N	J 10^{-3} kgm²	kg
1800 min^{-1} (4 poles)															
AMPH 90S AA 4	1.1	1.5	1745	6.0	82.8	85.6	86.5	0.71	2.2	8.2	4.4	4.3	4.6	3.7	16.4
AMPH 90L BA 4	1.5	2	1735	8.2	83.5	86.2	86.5	0.74	2.9	7.5	3.8	3.7	4.0	3.7	16.4
AMPH 90L CA 4	1.8	2.4	1730	9.9	85.2	86.7	86.5	0.68	3.8	7.8	3.9	3.8	4.1	3.7	16.4
AMPH 112M AA 4	3.7	5	1765	20.0	87.3	89.3	89.5	0.80	6.5	9.6	3.1	2.5	4.6	16.4	36.0
AMPH 112M BA 4	4	5.5	1760	21.7	87.7	89.4	89.5	0.81	6.9	9.0	2.9	2.3	4.3	16.4	36.0
AMPH 132S ZA 4	5.5	7.5	1760	29.9	91.0	92.1	91.7	0.81	9.3	9.1	3.5	3.0	4.1	36.0	65.0
AMPH 132M ZA 4	7.5	10	1760	40.7	90.8	91.5	91.7	0.79	13.0	9.4	4.1	3.5	4.8	45.0	79.0
AMPH 132M TA 4	9.2	12.4	1760	49.9	90.9	91.6	91.7	0.73	17.2	9.5	4.7	4.0	5.5	57.0	98.0
AMPH 160M ZA 4	11	15	1770	59.4	91.5	92.5	92.4	0.80	18.7	9.8	4.4	3.1	4.6	120.7	114
AMPH 160L ZA 4	15	20	1765	81.2	92.4	93.0	93.0	0.77	26.3	9.8	4.2	3.0	4.4	135.0	120

For dimensions AMPH 4 poles motors, please consult us

Three-phase pole-changing motors designed for range of rated voltage 380-420 V ± 5% - 50 Hz

For mains voltage to IEC 60038 400 V ± 10% - 50 Hz

Temperature rise to class B

Type		kW	HP	min^{-1}	M_N Nm	η 100%	cos φ	I_N 400V	I_N 380-420V	I_A/I_N	M_A/M_N	J 10^{-3} kgm^2	kg
1500/3000 min^{-1} (4/2 poles) - Dahlander connection Δ/YY													
AM 63Z AA	**4/2**	0.20/0.30	0.27/0.40	1345/2700	1.4/1.1	56/65	0.65/0.81	0.8/0.83	0.89/0.88	2.4/3.2	2.1/2.1	0.40	4.6
AM 71Z AA	**4/2**	0.30/0.45	0.40/0.65	1374/2830	2.1/1.5	61/66	0.78/0.73	1.0/1.35	1.2/1.5	3.3/3.0	2.3/2.1	0.76	6.3
AM 80Z AA	**4/2**	0.45/0.60	0.65/0.80	1390/2760	3.1/2.1	64/68.8	0.75/0.80	1.4/1.6	1.5/1.7	3.8/4.0	2.3/2.2	1.58	8.3
AM 80Z BA	**4/2**	0.55/0.75	0.75/1.0	1435/2850	3.7/2.5	70/71.2	0.67/0.77	1.7/2.0	1.8/2.1	4.5/5.0	2.6/2.8	2.00	11.5
AM 80Z CA	**4/2**	0.8/1.1	1.1/1.5	1425/2830	5.4/3.7	76.1/77.2	0.70/0.79	2.2/2.6	2.5/2.8	4.5/4.9	2.5/2.7	2.41	14.7
AM 90L AA	**4/2**	1.2/1.55	1.6/2.1	1435/2850	8/5.2	77.4/78.3	0.71/0.79	3.2/3.7	3.4/3.9	4.7/5.1	2.6/2.7	3.10	15.6
AM 90L BA	**4/2**	1.6/2.0 [1]	2.15/2.7 [1]	1390/2810	11/6.8	73.5/75.5	0.78/0.86	4.0/4.6	4.1/4.7	4.1/5.5	2.7/2.6	3.73	17.1
AM 100L AA	**4/2**	1.8/2.5	2.5/3.35	1420/2865	12.1/8.3	78.5/77.4	0.76/0.84	4.5/5.6	4.7/5.8	5.2/5.5	2.2/2.2	4.60	21.4
AM 100L BA	**4/2**	2.2/3.0	3.0/4.0	1410/2830	14.9/10.1	74.6/71.4	0.72/0.82	5.9/7.4	6.1/7.7	4.2/4.3	1.8/2.0	4.60	22.5
AM 100L CA	**4/2**	2.6/3.3	3.5/4.4	1430/2890	17.4/10.9	82.6/78.6	0.78/0.76	5.9/8.0	6.1/8.5	4.7/5.5	1.9/2.2	5.58	23.2
AM 112M AA	**4/2**	3.3/4.4	4.4/5.9	1410/2800	22.4/15	77.4/75.4	0.82/0.85	7.5/9.9	7.8/10.6	4.5/5.1	2.1/2.4	13.30	36.1
AM 132S ZA	**4/2**	4.4/5.5	6.0/7.5	1450/2925	29/18	83.0/84.6	0.70/0.87	11.0/10.8	12.0/11.8	4.4/7.2	2.2/2.7	13.83	42.6
AM 132M ZA	**4/2**	6.6/8.1	9.0/11.0	1460/2920	43.2/26.5	85.4/84.5	0.76/0.90	14.7/15.4	15.5/16.4	5.5/7.5	2.6/2.9	17.13	51.4
AM 160M ZA	**4/2**	8.8/11.0	12.0/15.0	1460/2940	57.6/35.7	87.1/87.5	0.79/0.91	18.5/20.0	19.0/21.0	5.5/7.5	2.0/1.9	51.75	94.0
AM 160L ZA	**4/2**	12.5/15.0	17.0/20.4	1470/2955	81.2/48.5	89.4/90.0	0.74/0.90	27.4/26.8	29.0/28.2	4.8/7.4	2.1/2.3	64.00	108.7

Type		kW	HP	min^{-1}	M_N Nm	η 100%	cos φ	I_N 400V	I_N 380-420V	I_A/I_N	M_A/M_N	J 10^{-3} kgm^2	kg
750/1500 min^{-1} (8/4 poles) - Dahlander connection Δ/YY													
AM 71Z AA	**8/4**	0.09/0.15	0.12/0.20	610/1310	1.4/1.1	40/56	0.61/0.75	0.53/0.52	0.59/0.57	2.5/3.2	1.6/1.6	0.71	6.3
AM 80Z AA	**8/4**	0.18/0.37	0.25/0.50	700/1370	2.5/2.6	43.2/58.7	0.63/0.83	1.0/1.1	1.1/1.2	2.6/3.4	1.8/1.6	1.97	7.9
AM 80Z BA	**8/4**	0.26/0.51	0.35/0.68	700/1360	3.5/3.6	44.1/61.2	0.60/0.88	1.2/1.4	1.3/1.5	2.5/3.6	2.0/1.6	2.47	9.2
AM 90S AA	**8/4**	0.37/0.75	0.50/1.0	690/1385	5.1/5.2	52.2/67.1	0.58/0.82	1.8/2.0	1.9/2.1	2.8/3.9	1.9/1.8	3.18	13.5
AM 90L BA	**8/4**	0.5/1.0	0.67/1.34	690/1410	6.9/6.8	52.2/72.5	0.58/0.80	2.4/2.4	2.5/2.5	3.3/4.0	2.3/1.9	4.78	15.7
AM 100L AA	**8/4**	0.7/1.4	0.94/1.9	700/1440	9.5/9.3	57.2/78.5	0.50/0.78	3.5/3.3	3.7/3.4	2.8/4.3	2.1/1.9	5.58	21.9
AM 100L BA	**8/4**	0.9/1.8 [1]	1.2/2.5 [1]	690/1415	12.5/12.1	62/76	0.56/0.87	3.8/4.0	4.0/4.3	2.5/4.5	1.9/1.8	6.00	23.7
AM 112M AA	**8/4**	1/1.8	1.34/2.5	710/1445	13.5/11.9	66.1/78.5	0.61/0.82	4.1/4.1	4.4/4.2	3.9/6.3	2.2/2.1	14.18	31.7
AM 112M BA	**8/4**	1.3/2.6 [1]	1.75/3.0 [1]	705/1420	17.6/17.5	70.0/76.3	0.65/0.88	4.6/5.7	4.8/5.9	3.2/4.8	2.1/2.0	16.70	34.2
AM 132S ZA	**8/4**	2.1/3.7	2.9/5.0	710/1440	28.2/24.5	70.2/76.1	0.66/0.84	6.5/8.4	6.7/8.6	4.0/5.2	1.9/1.7	29.50	42.5
AM 132M ZA	**8/4**	2.6/4.8	3.5/6.5	715/1450	34.7/31.6	71.6/78.8	0.60/0.80	8.8/11.0	9.8/12.0	4.3/5.5	2.3/1.8	37.75	55.5
AM 160M YA	**8/4**	4.0/6.3	5.5/8.6	710/1410	53.8/42.7	80.0/81.0	0.64/0.88	11.3/12.8	12.3/13.5	4.6/6.5	1.8/ 1.7	81.25	88.5
AM 160L YA	**8/4**	4.8/7.5	6.5/10.0	730/1470	62.8/48.7	80.0/85.0	0.65/0.85	13.2/15.0	14.0/16.0	4.5/6.5	1.8/1.6	105.75	106.5
AM 160L ZA	**8/4**	5.9/10.3	8.0/14.0	725/1450	77.7/67.8	81.0/87.0	0.66/0.88	16.1/19.5	17.0/20.4	5.0/6.0	1.9/1.6	127.50	110.5

1) Temperature rise to class F

Three-phase pole-changing motors designed for range of rated voltage 380-420 V ± 5% - 50 Hz

For mains voltage to IEC 60038 400 V ± 10% - 50 Hz

Temperature rise to class B

1500/1000 min^{-1} (4/6 poles) - separate windings

Type		kW	HP	min^{-1}	M_N Nm	η 100%	cos φ	I_N 400V	I_N 380-420V	I_A/I_N	M_A/M_N	J 10^{-3} kgm²	kg
AM 71Z AA	**4/6**	0.22/0.15	0.30/0.20	1430/900	1.5/1.6	61/44	0.7/0.64	0.78/0.68	0.83/0.73	1.9/3.4	1.5/1.8	0.73	6.2
AM 80Z AA	**4/6**	0.37/0.26	0.50/0.35	1385/905	2.6/2.7	61.4/48.1	0.82/0.80	1.1/1.0	1.1/1.1	3.7/2.6	1.7/1.3	1.97	8.3
AM 80Z BA	**4/6**	0.55/0.37	0.75/0.50	1380/900	3.8/3.9	60.5/51.1	0.64/0.82	1.5/1.3	1.6/1.4	3.7/2.7	1.6/1.2	2.47	10.0
AM 90S AA	**4/6**	0.75/0.5	1.0/0.67	1400/930	5.1/5.1	63/64	0.81/0.61	2.2/1.9	2.3/2.1	3.0/3.5	1.4/1.8	4.10	13.4
AM 90L BA	**4/6**	1/0.65	1.34/0.87	1380/920	6.9/6.7	68.8/67.1	0.81/0.62	2.6/2.3	2.8/2.5	2.9/3.4	1.1/1.6	4.78	16.4
AM 100L AA	**4/6**	1.2/0.8	1.6/1.07	1460/940	7.8/8.1	76.0/67.9	0.66/0.70	3.5/2.5	3.8/2.6	4.7/3.0	2.1/1.5	4.60	24.4
AM 100L BA	**4/6**	1.6/1.0	2.15/1.34	1445/935	10.6/10.2	77.6/69.5	0.73/0.63	4.1/3.3	4.3/3.5	5.8/3.0	2.8/1.7	5.58	33.2
AM 112M AA	**4/6**	1.8/1.3	2.5/1.75	1445/950	11.9/13.1	74.6/69.5	0.85/0.78	4.2/3.6	4.4/3.7	5.9/3.8	1.9/1.3	14.18	33.3
AM 112M BA	**4/6**	2.6/1.85	3.5/2.5	1445/950	17.2/18.6	73.8/71.6	0.86/0.73	6.0/5.2	6.2/5.4	6.1/4.4	2.0/1.7	17.53	37.0
AM 132S ZA	**4/6**	3.1/2.2	4.2/3.0	1440/965	20.6/21.8	80/78	0.80/0.74	7/5.5	7.5/6	5.8/5.6	2.1/2.0	22.4	41.9
AM 132M ZA	**4/6**	4.0/2.6	5.5/3.5	1470/975	26/25.5	81.0/79.3	0.83/0.74	8.6/6.4	9.3/7.0	7.7/5.2	2.0/1.9	29.25	51.0
AM 160M YA	**4/6**	5.5/3.7	7.5/5.0	1480/970	35.5/36.4	84.0/81.4	0.79/0.73	12.0/9.0	12.9/9.6	7.5/4.5	2.5/1.6	81.25	88.5
AM 160M ZA	**4/6**	7.5/4.8	10.2/6.5	1465/960	48.9/47.7	85.0/82.6	0.83/0.75	15..4/11.2	15.8/11.5	7.4/4.6	2.4/1.6	81.25	88.5
AM 160L ZA	**4/6**	11.0/6.6	15.0/9.0	1470/960	71.5/65.7	86.0/83.8	0.86/0.75	21.6/15.2	22.5/16.0	7.2/5.0	2.3/1.8	105.75	106.5

1000/750 min^{-1} (6/8 poles) - separate windings

Type		kW	HP	min^{-1}	M_N Nm	η 100%	cos φ	I_N 400V	I_N 380-420V	I_A/I_N	M_A/M_N	J 10^{-3} kgm²	kg
AM 80Z AA	**6/8**	0.37/0.18	0.50/0.25	915/700	3.9/2.5	51.1/44.2	0.81/0.65	1.3/1.0	1.4/1.0	2.8/2.5	1.4/1.7	2.47	9.5
AM 90L AA	**6/8**	0.55/0.30	0.75/0.40	950/710	5.5/4	65.2/45.1	0.62/0.52	2.0/1.8	2.1/1.9	3.9/2.6	2.5/1.9	4.78	16.2
AM 100L AA	**6/8**	0.75/0.45	1.0/0.60	960/720	7.5/6	72.6/61.8	0.67/0.54	2.2/2.0	2.3/2.1	4.1/2.9	1.9/1.9	6.73	23.4
AM 112M AA	**6/8**	0.95/0.65	1.3/0.90	965/715	9.4/8.7	65.2/62.1	0.78/0.70	3.0/2.2	3.2/2.3	4.5/3.8	1.4/1.7	14.18	32.0
AM 112M BA	**6/8**	1.5/0.75	2.0/1.0	970/720	14.8/9.9	75.3/64.6	0.66/0.60	4.4/2.8	4.6/3.0	4.6/3.8	2.2/2.1	18.70	36.2
AM 132S ZA	**6/8**	2.2/1.2	3.0/1.6	970/730	21.7/15.7	73.5/66.0	0.69/0.60	6.3/4.4	6.6/4.8	4.5/3.7	1.6/1.7	29.5	42.5
AM 132M ZA	**6/8**	3.0/1.7	4.1/2.3	980/730	29.2/22.2	78.2/72.5	0.72/0.64	7.7/5.3	8.2/5.9	5.4/4.3	1.7/1.7	37.75	55.5
AM 160M YA	**6/8**	4.8/2.6	6.5/3.5	970/730	47.3/34	83.0/74.0	0.80/0.70	10.5/7.3	11.0/7.7	4.8/3.6	1.9/1.8	112.7	88.0
AM 160M ZA	**6/8**	5.9/3.3	8.0/4.5	970/730	58.1/43.2	83.2/73.0	0.76/0.60	13.5/10.9	14.5/11.4	6.5/5.0	2.2/2.1	150.25	97.5

Three-phase pole-changing motors designed for range of rated voltage 380-420 V ± 5% - 50 Hz

For mains voltage to IEC 60038 400 V ± 10% - 50 Hz

Temperature rise to class B

Type		kW	HP	min^{-1}	M_N Nm	η 100%	cos φ	I_N 400V	I_N 380-420V	I_A/I_N	M_A/M_N	J 10^{-3} kgm^2	kg
1500/3000 min^{-1} (4/2 poles) - Dahlander connection Y/YY													
AMV 63Z AA	**4/2**	0.07/0.33	0.095/0.45	1350/2700	0.5/1.2	55/60	0.70/0.80	0.25/0.95	0.27/1.1	2.5/2.6	1.8/1.6	0.37	5.0
AMV 71Z AA	**4/2**	0.08/0.37	0.11/0.5	1350/2870	0.6/1.2	60/64	0.65/0.68	0.30/1.3	0.35/1.4	3.2/4.3	2.0/2.8	0.82	7.9
AMV 71Z BA	**4/2**	0.12/0.55	0.16/0.75	1430/2835	0.8/1.9	70/68	0.65/0.72	0.40/1.6	0.42/1.7	4.1/4.0	3/2.8	1.08	10.0
AMV 80Z AA	**4/2**	0.15/0.75	0.2/1.0	1400/2710	1/2.6	70/68	0.68/0.80	0.45/1.9	0.45/2.0	2.6/4.6	2.8/2.9	1.58	8.3
AMV 80Z BA	**4/2**	0.22/1.1	0.3/1.5	1420/2820	1.5/3.7	70/73	0.75/0.84	0.6/2.5	0.65/2.6	4.6/4.7	2.7/2.9	2.0	11.5
AMV 90L AA	**4/2**	0.30/1.5	0.4/2.0	1400/2830	2/5.1	69/70	0.70/0.84	0.9/3.5	1.0/3.7	4.7/5.0	2.7/3.0	3.13	15.6
AMV 90L BA	**4/2**	0.44/2.2	0.6/3.0	1430/2830	2.9/7.4	74/72	0.76/0.89	1.1/4.8	1.2/5.0	4.5/5.2	2.6/2.8	3.73	17.1
AMV 100L AA	**4/2**	0.50/2.5	0.67/3.3	1430/2840	3.3/8.4	72/73	0.77/0.88	1.3/5.3	1.4/5.6	4.6/5.0	2.2/2.3	4.6	21.4
AMV 100L BA	**4/2**	0.60/3.0	0.8/4.0	1440/2850	4/10.1	78/77	0.79/0.87	1.3/6.2	1.4/6.5	4.5/4.5	2.2/2.1	5.58	23.2
AMV 112M AA	**4/2**	0.75/3.70	1.0/5.0	1440/2850	5/12.4	74/72	0.80/0.90	1.7/7.9	1.9/2.2	4.5/5.1	2.0/2.4	13.3	36.1
AMV 112M BA	**4/2**	0.9/4.5	1.2/6.1	1440/2850	6/15.1	75/73	0.82/0.90	2.0/9.5	2.1/9.8	4.5/5.5	2.0/2.3	14.75	40.0
AMV 132S AA	**4/2**	1.1/5.5	1.5/7.5	1440/2880	7.3/18.2	81.5/84.8	0.78/0.90	2.5/10.4	2.6/11.0	5.0/6.0	2.1/2.8	13.83	42.6
AMV 132S BA	**4/2**	1.5/7 [1]	2/9.5 [1]	1440/2900	9.9/23.1	82.0/86.0	0.78/0.92	3.4/12.8	3.8/13.0	5.3/6.5	2.2/2.9	13.83	42.6
AMV 132M CA	**4/2**	1.9/8.0	2.6/10.9	1450/2930	12.5/26.1	83.7/88.0	0.82/0.87	4.0/15.1	4.0/16.0	5.5/7.0	2.2/3.0	17.13	51.4
AMV 160M AA	**4/2**	2.8/11	3.8/15.0	1440/2940	18.6/35.7	82.5/88.2	0.78/0.90	6.3/20.0	7.0/20.4	5.0/7.5	2.0/2.1	51.75	94
AMV 160M BA	**4/2**	3.3/13.5 [1]	4.5/18.3 [1]	1440/2920	21.9/44.2	83.0/88.5	0.80/0.92	7.2/24.0	7.5/24.0	5.5/7.5	2.0/2.2	51.75	94
AMV 160L CA	**4/2**	4.4/18.5 [1]	6.0/25.1 [1]	1450/2940	29/60.1	85.5/89.5	0.83/0.92	9.0/32.5	9.5/33.0	5.5/7.5	2.0/2.2	64.0	108.7

Type		kW	HP	min^{-1}	M_N Nm	η 100%	cos φ	I_N 400V	I_N 380-420V	I_A/I_N	M_A/M_N	J 10^{-3} kgm^2	kg
750/1500 min^{-1} (8/4 poles) - Dahlander connection Y/YY													
AMV 71Z AA	**8/4**	0.08/0.37	0.11/0.5	660/1370	1.2/2.6	26/57	0.63/0.72	0.60/1.25	0.65/1.35	2.8/3.4	1.9/1.7	1.24	6.8
AMV 80Z AA	**8/4**	0.12/0.55	0.16/0.75	685/1420	1.7/3.7	50/69	0.60/0.74	0.58/1.53	0.65/1.6	1.9/3.3	1.4/1.5	2.47	9.2
AMV 80Z BA	**8/4**	0.18/0.75	0.25/1.0	660/1380	2.6/5.2	53/67	0.73/0.81	0.65/1.9	0.7/2.0	2.0/3.5	1.6/1.7	2.41	10.6
AMV 90L AA	**8/4**	0.18/1.1	0.25/1.5	680/1400	2.5/7.5	60/70	0.65/0.82	0.9/2.7	1.0/2.8	2.8/4.0	1.5/2.0	2.98	15.7
AMV 90L CA	**8/4**	0.4/1.6	0.54/2.15	675/1400	5.7/10.9	61.5/75	0.64/0.79	1.8/4.0	1.8/4.1	3.1/5.0	1.6/2.2	3.70	19.6
AMV 100L AA	**8/4**	0.45/2.2	0.60/3.0	680/1420	6.3/14.8	63.1/75.3	0.60/0.80	1.7/5.0	1.9/5.3	2.7/4.7	1.7/2.0	5.58	21.9
AMV 100L BA	**8/4**	0.6/2.6	0.80/3.5	680/1435	8.4/17.3	64.0/76.2	0.63/0.75	2.2/6.5	2.3/6.7	2.7/4.8	1.7/2.2	6.00	23.7
AMV 112M AA	**8/4**	0.7/3.3	0.94/4.5	690/1420	9.7/22.2	62/78	0.70/0.80	2.2/7.4	2.3/7.6	3.4/6.5	1.8/2.4	16.70	34.2
AMV 112M CA	**8/4**	1.0/4.0	1.34/5.5	720/1420	13.3/26.9	60/77	0.70/0.82	3.1/8.6	3.3/9.0	3.5/5.0	2.3/1.9	19.50	40.0
AMV 132S AA	**8/4**	1.1/4.5	1.5/6.1	725/1450	14.5/29.6	77.0/85.5	0.58/0.82	3.6/9.3	4.0/9.7	3.5/5.4	2.2/2.7	22.4	41.9
AMV 132M BA	**8/4**	1.4/5.5	1.9/7.5	720/1440	18.6/36.5	78.0/86.0	0.62/0.82	4.2/11.3	4.5/12	3.6/5.5	2.0/2.5	29.25	51.0
AMV 132M CA	**8/4**	1.8/7.5	2.4/10.2	720/1450	23.9/49.4	78.2/86.5	0.64/0.86	5.2/14.6	5.5/15.0	4.6/6.0	2.0/2.5	37.25	65.0
AMV 160M ZA	**8/4**	2.2/10.0	3.0/13.0	720/1450	29.2/65.9	80.0/88.0	0.61/0.83	6.6/19.9	6.8/20.4	3.5/6.0	1.8/1.7	81.25	88.5
AMV 160L ZA	**8/4**	3.2/15.0 [1]	4.3/20.0 [1]	720/1450	42.4/98.8	81.0/90.0	0.61/0.88	9.4/27.3	9.8/28	3.5/6.5	1.7/1.8	105.75	106.5

1) Temperature rise to class F

Three-phase pole-changing motors for fan drives designed for range of rated voltage 380-420 V ± 5% - 50 Hz

For mains voltage to IEC 60038 400 V ± 10% - 50 Hz

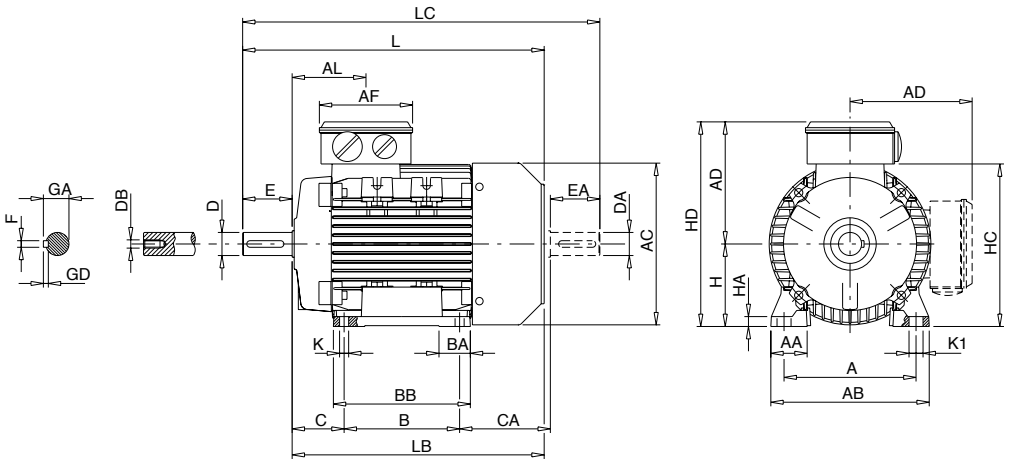
Temperature rise to class B

Type		kW	HP	min^{-1}	M_N Nm	η 100%	cos φ	I_N 400V	I_N 380-420V	I_A/I_N	M_A/M_N	J 10^{-3} kgm²	kg
1500/1000 min^{-1} (4/6 poles) - separate windings													
AMV 71Z AA	**4/6**	0.25/0.08	0.33/0.11	1370/900	1.7/0.4	60/40	0.80/0.70	0.75/0.4	0.8/0.45	3.0/2.5	1.6/1.6	1.15	6.7
AMV 71Z BA	**4/6**	0.37/0.13	0.50/0.18	1360/880	2.6/1.4	62/44	0.80/0.70	1.0/0.6	1.1/0.7	3.2/2.6	1.6/1.6	1.24	7.2
AMV 80Z AA	**4/6**	0.55/0.18	0.75/0.25	1380/920	3.8/1.9	60/42	0.83/0.82	1.60/0.75	1.7/0.8	3.5/2.4	1.6/1.0	1.97	8.3
AMV 80Z BA	**4/6**	0.75/0.25	1.0/0.33	1400/940	5.1/2.5	70/60	0.82/0.72	1.8/0.8	1.9/0.9	4.2/2.6	1.6/1.3	4.05	14
AMV 90S AA	**4/6**	0.75/0.24	1.0/0.32	1400/950	5.1/2.4	70/60	0.82/0.72	1.9/0.8	2.0/0.9	4.2/2.6	1.6/1.3	4.05	14
AMV 90L BA	**4/6**	1.1/0.37	1.5/0.50	1400/930	7.5/3.8	70/60	0.81/0.74	2.8/1.2	3.0/1.3	4.3/2.7	1.6/1.2	4.78	16.4
AMV 90L CA	**4/6**	1.5/0.5	2.0/0.67	1420/950	10.1/5	73/64	0.80/0.70	3.52/1.52	3.7/1.6	4.8/2.6	1.5/1.3	5.98	20.5
AMV 100L AA	**4/6**	1.85/0.60	2.5/0.75	1400/920	12.6/6.2	74/64	0.80/0.73	4.6/1.9	4.8/2.1	4.8/3.1	1.8/1.5	6.73	23.4
AMV 100L BA	**4/6**	2.2/0.75	3.0/1.0	1420/950	14.8/7.5	76/66	0.79/0.75	5.1/2.1	5.3/2.2	5.0/3.5	1.7/1.3	9.25	22.6
AMV 112M AA	**4/6**	3/1.0	4.0/1.34	1440/970	19.9/9.8	80/73	0.81/0.65	6.6/3.0	6.8/3.2	5.8/4.6	2.5/2.1	13.3	30.4
AMV 132S AA	**4/6**	3.8/1.3	5.2/1.8	1460/970	24.9/12.8	85.0/75.0	0.8/0.72	8.1/3.5	8.5/4	6.5/4.0	2.2/1.7	22.4	41.9
AMV 132M BA	**4/6**	4.4/1.5	6.0/2.0	1460/970	28.8/14.8	86.0/78.2	0.85/0.73	8.7/3.8	9.2/4.3	6.5/4.4	2.2/1.7	29.25	51.0
AMV 132M CA	**4/6**	5.5/1.8	7.5/2.4	1460/970	36/17.7	86.8/80.0	0.84/0.74	10.9/4.4	12.0/4.	7.0/4.7	2.6/1.8	37.25	65.0
AMV 132M DA	**4/6**	6.3/2.2 [1]	8.6/3.0 [1]	1460/970	41.2/21.7	86.8/81.0	0.84/0.73	12.5/5.4	13.5/5.	7.2/4.8	2.6/1.9	37.25	66.0
AMV 160M AA	**4/6**	7.5/2.5	10.0/3.4	1470/975	48.7/24.5	87.5/83.0	0.83/0.75	14.9/5.8	15.6/6.0	8.3/4.5	2.5/1.9	81.25	88.5
AMV 160L BA	**4/6**	11.0/3.7	15.0/5.0	1470/970	71.5/36.4	88.0/84.2	0.81/0.73	22.5/8.7	23.4/9.0	8.0/4.8	2.4/1.8	105.75	106.5
AMV 160L CA	**4/6**	13.0/4.0 [1]	17.7/5.4 [1]	1460/970	85/39.4	88.0/84.5	0.81/0.72	26.3/9.5	27.5/10	8.0/4.8	2.4/1.9	105.75	106.5

Type		kW	HP	min^{-1}	M_N Nm	η 100%	cos φ	I_N 400V	I_N 380-420V	I_A/I_N	M_A/M_N	J 10^{-3} kgm²	kg
1000/750 min^{-1} (6/8 poles) - separate windings													
AMV 80Z AA	**6/8**	0.25/0.11	0.33/0.15	930/720	2.6/1.5	53/49	0.79/0.62	0.9/0.55	1.0/0.7	2.9/3.0	1.6/1.8	1.97	7.9
AMV 80Z BA	**6/8**	0.37/0.15	0.50/0.25	920/715	3.8/2	52/47	0.81/0.63	1.3/0.8	1.4/0.9	2.8/2.8	1.4/1.9	2.47	9.5
AMV 90L AA	**6/8**	0.55/0.22	0.75/0.30	960/740	5.5/2.8	65/47	0.62/0.51	2.0/1.4	2.1/1.5	3.9/2.9	2.5/2.1	4.78	16.2
AMV 90L BA	**6/8**	0.75/0.30	1.0/0.40	940/720	7.6/4	64/45.5	0.67/0.52	2.5/1.85	2.7/1.9	3.4/2.6	2.2/1.9	4.78	16.2
AMV 100L AA	**6/8**	1.1/0.45	1.5/0.60	950/710	11.1/6.1	70.6/58	0.71/0.67	3.1/1.7	3.3/1.8	4.3/2.8	2.0/1.3	9.43	22.0
AMV 112M AA	**6/8**	1.5/0.6	2.0/0.80	970/720	14.8/8	75.8/65	0.65/0.60	4.4/2.3	3.7/2.5	5.5/3.4	2.8/2.1	18.70	39.0
AMV 132S ZA	**6/8**	2.2/0.9	3.0/1.2	970/715	21.7/12	78.0/69.0	0.67/0.55	6.1/3.5	6.7/4.0	4.8/4.0	1.6/1.6	29.5	42.5
AMV 132M YA	**6/8**	3/1.2	4.0/1.6	960/715	29.8/16	80/72	0.7/0.55	7.8/4.4	8.2/4.8	4.8/4.1	1.6/1.6	37.75	55.5
AMV 132M ZA	**6/8**	4/1.6	5.5/2.2	960/715	39.8/21.4	81.0/74.0	0.78/0.6	9.2/5.2	9.8/5.6	5.3/4.4	1.7/1.7	44.5	64.1
AMV 160M YA	**6/8**	5.5/2.2	7.5/3.0	970/730	54.1/28.8	83/76	0.77/0.6	12.5/7	13.5/7.5	5.7/5.6	1.6/1.9	112.7	88.0
AMV 160M ZA	**6/8**	7/3	9.5/4.1	970/730	68.9/39.2	84/77	0.80/0.65	15/8.7	16/9.3	6.0/5.8	1.7/2.2	150.25	97.5

1) Temperature rise to class F

THREE-PHASE FRAME SIZE 56 - 160 IM B3
AM SERIES - ALUMINIUM ALLOY FRAME



IEC DIN	H h	A b	B a	C w_1	K [1] s	AB f	BB e	CA	AD [2] g_4	HD [2]	AC m_1	HC g	HA
56	56	90	71	36	6	107	86	64	92	148	110	109	8
63	63	100	80	40	7	120	100	72	96	159	124	120	8
71	71	112	90	45	8	135	108	83	110	181	139	142	9
80	80	125	100	50	10	153	125	89	129	209	160	162	9.5
90S	90	140	100	56	10	170	150	116	138	228	180	181	11
90L	90	140	125	56	10	170	150	91	138	228	180	181	11
100L	100	160	140	63	11	192	166	110	145	245	196	198	12
112M	112	190	140	70	12.5	220	175	126	161	273	225	226	15
132S	132	216	140	89	12	256	180	134	195	327	248	261	17
132M	132	216	178	89	12	256	218	136	195	327	248	261	17
132M [4]	132	216	178	89	12	256	218	166	195	327	248	261	17
160M	160	254	210	108	14	320	270	180	238	398	317	316	23
160L	160	254	254	108	14	320	310	180	238	398	317	316	23
160L [5]	160	254	254	108	14	320	310	210	238	398	317	316	23

IEC DIN	K1 c	L k	LB	LC k_1	AL	AF	BA m	AA n	D/DA d/d_1	E/EA l/l_1	F/FA u/u_1	GD	GA/GC t/t_1	DB [3] d_6/d_7
56	9	188	168	211	61	92	27	27	9	20	3	3	10.2	M3
63	11	211	188	238	63	92	29	30	11	23	4	4	12.5	M4
71	11	246	216	278	69	92	28	31	14	30	5	5	16	M5
80	14	272	232	319	79	116	28.5	34.5	19	40	6	6	21.5	M6
90S	15	317	267	372	85	116	28/53	37	24	50	8	7	27	M8
90L	15	317	267	372	85	116	28/53	37	24	50	8	7	27	M8
100L	17	366	306	433	91	116	38	44	28	60	8	7	31	M10
112M	19	388	328	456	91.5	116	46	48	28	60	8	7	31	M10
132S	20	442	362	523	100	133	45	59	38	80	10	8	41	M12
132M	20	482	402	563	120	133	45	59	38	80	10	8	41	M12
132M [4]	20	500	420	593	120	133	45	59	38	80	10	8	41	M12
160M	18	608	498	718	146	150	65	76	42	110	12	8	45	M16
160L	18	652	542	762	168	150	65	76	42	110	12	8	45	M16
160L [5]	18	678	568	678	168	150	65	76	42	110	12	8	45	M16

1) Clearance hole for screw
2) Maximum dimension
3) Centering holes in shaft extensions to DIN 332 part 2
4) Only for MT A2
5) Only for LR A4

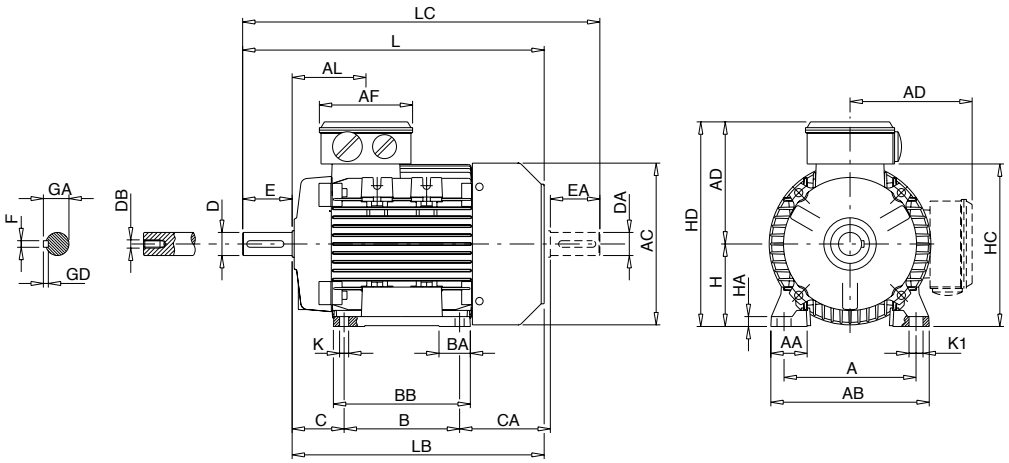
THREE-PHASE FRAME SIZE 180 - 315 IM B3
AM SERIES - CAST IRON FRAME

IEC DIN	Poles	H h	A b	B a	C W	K [1] s	AB f	BB e	AD g_4	HD m_1	AC g
180M		180	279	241	121	15	348	310	259	439	360
180L		180	279	279	121	15	348	348	259	439	360
200L		200	318	305	133	19	388	368	297	497	399
225S	**≥ 4**	225	356	286	149	19	436	361	328	553	465
225M	**2**	225	356	311	149	19	436	386	328	553	465
	≥ 4	225	356	311	149	19	436	386	328	553	465
250M	**2**	250	406	349	168	24	484	443	366	616	506
	≥ 4	250	406	349	168	24	484	443	366	616	506
280S	**2**	280	457	368	190	24	557	459	388	668	559
	≥ 4	280	457	368	190	24	557	459	388	668	559
280M	**2**	280	457	419	190	24	557	510	388	668	559
	≥ 4	280	457	419	190	24	557	510	388	668	559
315S	**2**	315	508	406	216	28	630	590	525	840	680
	≥ 4	315	508	406	216	28	630	590	525	840	680
315M	**2**	315	508	457	216	28	630	672	525	840	680
	≥ 4	315	508	457	216	28	630	672	525	840	680
315L	**2**	315	508	508	216	28	630	672	525	840	680
	≥ 4	315	508	508	216	28	630	672	525	840	680

IEC DIN	Poles	HA c	L k	LB	AL	AA n	D d	E l	F u	GD	GA t	DB [2] d_6
180M		27	687	577	261	75	48	110	14	9	51.5	M16
180L		27	725	615	261	75	48	110	14	9	51.5	M16
200L		25	768	658	285	80	55	110	16	10	59	M20
225S	**≥ 4**	28	814	674	295	85	60	140	18	11	64	M20
225M	**2**	28	809	699	295	85	55	110	16	10	59	M20
	≥ 4	28	839	699	295	85	60	140	18	11	64	M20
250M	**2**	30	918	778	342	80	60	140	18	11	64	M20
	≥ 4	30	918	778	342	80	65	140	18	11	69	M20
280S	**2**	34	984	844	400	100	65	140	18	11	69	M20
	≥ 4	34	984	844	400	100	75	140	20	12	79.5	M20
280M	**2**	34	1035	895	400	100	65	140	18	11	69	M20
	≥ 4	34	1035	895	400	100	75	140	20	12	79.5	M20
315S	**2**	45	1160	1020	292	120	65	140	18	11	69	M20
	≥ 4	45	1190	1020	292	120	80	170	22	14	85	M20
315M	**2**	45	1310	1170	292	120	65	140	18	11	69	M20
	≥ 4	45	1340	1170	292	120	80	170	22	14	85	M20
315L	**2**	45	1310	1170	292	120	65	140	18	11	69	M20
	≥ 4	45	1340	1170	292	120	80	170	22	14	85	M20

HIGH EFFICIENCY THREE-PHASE MOTORS IM B3
AMHE - AMPE* SERIES

*Only AMPE 2 poles motors. For AMPE 4 poles motors, please consult us



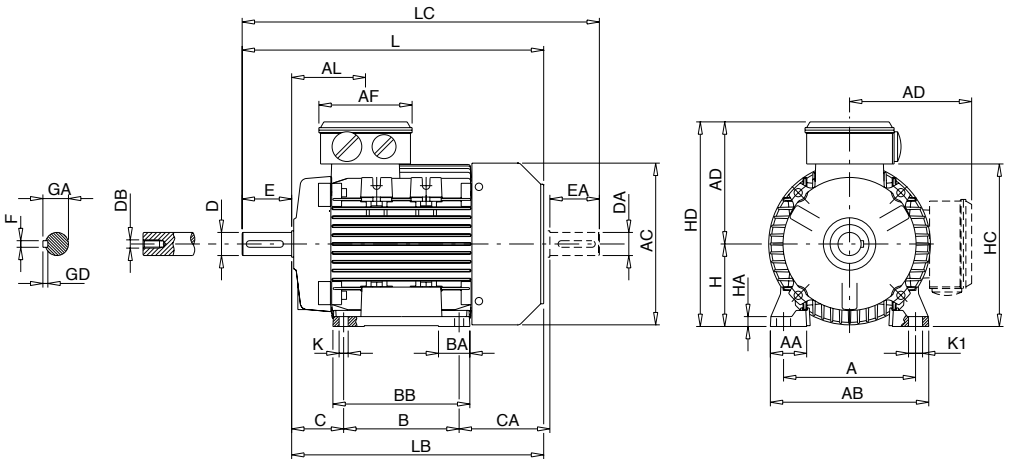
IEC DIN	Poles	kW	H h	A b	B a	C w_1	K [1] s	AB f	BB e	CA	AD [2]	HD [2] g_4	AC m_1	HC g
71	**2**	0.75	71	112	90	45	8	135	108	83	110	181	139	142
80	**2 - 4**	all	80	125	100	50	10	153	125	89	129	209	160	162
90S	**2 - 4**	all	90	140	100	56	10	170	150	116	138	228	180	181
90L	**2 - 4**	all	90	140	125	56	10	170	150	91	138	228	180	181
100L	**2**	all	100	160	140	63	11	192	166	110	145	245	196	198
	4	2.2	100	160	140	63	11	192	166	110	145	245	196	198
	4	3	100	160	140	63	11	192	166	144	145	245	194	198
112M	**2**	4 - 5.5	112	190	140	70	12.5	220	176	126	160	272	225	225
	2	7.5	112	190	140	70	12.5	220	176	148	160	272	222	225
	4	all	112	190	140	70	12.5	220	176	126	160	272	225	225
132S	**2**	5.5	132	216	140	89	12	256	180	134	194	326	248	261
	2	7.5	132	216	140	89	12	256	180	154	194	326	248	261
	4	5.5	132	216	140	89	12	256	180	134	194	326	248	261
132M	**2**	9.2 - 11	132	216	178	89	12	256	218	156	194	326	248	261
	2	15	132	216	178	89	12	256	218	207	194	326	248	261
	4	all	132	216	178	89	12	256	218	136	194	326	248	261
160M	**2 - 4**	all	160	254	210	108	14	320	270	180	238	398	317	316
160L	**2 - 4**	all	160	254	254	108	14	320	310	180	238	398	317	316

IEC DIN	Poles	kW	HA	K1 c	L k	LB	LC k_1	AL	AF	BA m	AA n	D/DA d/d_1	E/EA l/l_1	F/FA u/u_1	GD/GF	GA/GC t/t_1	DB/DC [3] d_6/d_7
71	**2**	0.75	9	11	246	216	278	69	92	28	31	14	30	5	5	16	M5
80	**2 - 4**	all	9.5	14	272	232	319	79	116	28.5	34.5	19	40	6	6	21.5	M6
90S	**2 - 4**	all	11	15	317	267	372	85	116	28/53	37	24	50	8	7	27	M8
90L	**2 - 4**	all	11	15	317	267	372	85	116	28/53	37	24	50	8	7	27	M8
100L	**2**	all	12	17	366	306	433	91	116	38	44	28	60	8	7	31	M10
	4	2.2	12	17	366	306	433	91	116	38	44	28	60	8	7	31	M10
	4	3	12	17	400	340	467	91	116	38	44	28	60	8	7	31	M10
112M	**2**	4 - 5.5	15	19	388	328	456	92	116	46	48	28	60	8	7	31	M10
	2	7.5	15	19	410	350	478	92	116	46	48	28	60	8	7	31	M10
	4	all	15	19	388	328	456	92	116	46	48	28	60	8	7	31	M10
132S	**2**	5.5	17	20	445	365	523	100	133	45	59	38	80	10	8	41	M12
	2	7.5	17	20	465	385	543	100	133	45	59	38	80	10	8	41	M12
	4	5.5	17	20	445	365	523	100	133	45	59	38	80	10	8	41	M12
132M	**2**	9.2 - 11	17	20	505	425	583	120	133	45	59	38	80	10	8	41	M12
	2	15	17	20	556	476	634	120	133	45	59	38	80	10	8	41	M12
	4	all	17	20	485	405	563	120	133	45	59	38	80	10	8	41	M12
160M	**2 - 4**	all	23	18	608	498	668	146	150	65	76	42/28	110/60	12/8	8/7	45/31	M16/M10
160L	**2 - 4**	all	23	18	652	542	712	168	150	65	76	42/28	110/60	12/8	8/7	45/31	M16/M10

1) Clearance hole for screw
2) Maximun distance
3) Centering holes in shaft extensions to DIN 332 part 2

HIGH EFFICIENCY THREE-PHASE MOTORS IM B3
AMH - AMPH* SERIES

*Only AMPH 2 poles motors. For AMPH 4 poles motors, please consult us



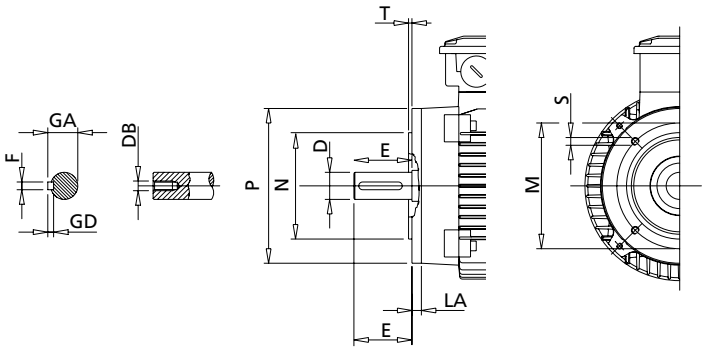
IEC DIN	Poli	kW	H h	A b	B a	C w_1	K [1]	AB s	BB f	CA e	AD [2]	HD [2] g_4	AC m_1	HC g
80	**2 - 4**	all	80	125	100	50	10	153	125	89	129	209	160	162
90S	**2 - 4**	all	90	140	100	56	10	170	150	116	138	228	180	181
90L	**2 - 4**	all	90	140	125	56	10	170	150	91	138	228	180	181
100L	**2**	all	100	160	140	63	11	192	166	110	145	245	196	198
	4	2.2	100	160	140	63	11	192	166	110	145	245	196	198
	4	3	100	160	140	63	11	192	166	144	145	245	194	198
112M	**2 - 4**	all	112	190	140	70	12,5	220	176	126	160	272	225	225
132S	**2**	5.5	132	216	140	89	12	256	180	134	194	326	248	261
	2	7.5	132	216	140	89	12	256	180	154	194	326	248	261
	4	5.5	132	216	140	89	12	256	180	134	194	326	248	261
132M	**2**	all	132	216	178	89	12	256	218	156	194	326	248	261
	4	all	132	216	178	89	12	256	218	136	194	326	248	261
160M	**2 - 4**	all	160	254	210	108	14	320	270	180	238	398	317	316
160L	**2 - 4**	all	160	254	254	108	14	320	310	180	238	398	317	316

IEC DIN	Poles	kW	HA	K1 c	L k	LB	LC k_1	AL	AF	BA m	AA n	D/DA d/d_1	E/EA l/l_1	F/FA u/u_1	GD/GF	GA/GC t/t_1	DB/DC [3] d_6/d_7
80	**2 - 4**	all	9.5	14	272	232	319	79	116	28.5	34.5	19	40	6	6	21.5	M6
90S	**2 - 4**	all	11	15	317	267	372	85	116	28/53	37	24	50	8	7	27	M8
90L	**2 - 4**	all	11	15	317	267	372	85	116	28/53	37	24	50	8	7	27	M8
100L	**2**	all	12	17	366	306	433	91	116	38	44	28	60	8	7	31	M10
	4	2.2	12	17	366	306	433	91	116	38	44	28	60	8	7	31	M10
	4	3	12	17	400	340	467	91	116	38	44	28	60	8	7	31	M10
112M	**2 - 4**	all	15	19	388	328	456	92	116	46	48	28	60	8	7	31	M10
132S	**2**	5.5	17	20	445	365	523	100	133	45	59	38	80	10	8	41	M12
	2	7.5	17	20	465	385	543	100	133	45	59	38	80	10	8	41	M12
	4	5.5	17	20	445	365	523	100	133	45	59	38	80	10	8	41	M12
132M	**2**	all	17	20	505	425	583	120	133	45	59	38	80	10	8	41	M12
	4	all	17	20	485	405	563	120	133	45	59	38	80	10	8	41	M12
160M	**2 - 4**	all	23	18	608	498	668	146	150	65	76	42/28	110/60	12/8	8/7	45/31	M16/M10
160L	**2 - 4**	all	23	18	652	542	712	168	150	65	76	42/28	110/60	12/8	8/7	45/31	M16/M10

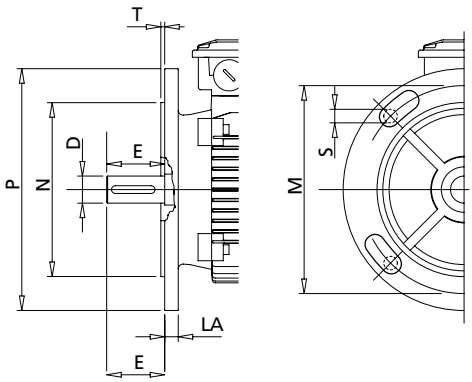
1) Clearance hole for screw
2) Maximun distance
3) Centering holes in shaft extensions to DIN 332 part 2

THREE-PHASE FRAME SIZE 56 - 160 IM B14, IM B5
AM-AMHE-AMH-AMPE-AMPH SERIES - ALUMINIUM ALLOY FRAME

IM B14

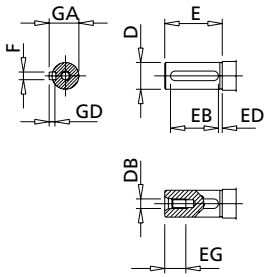


IM B5



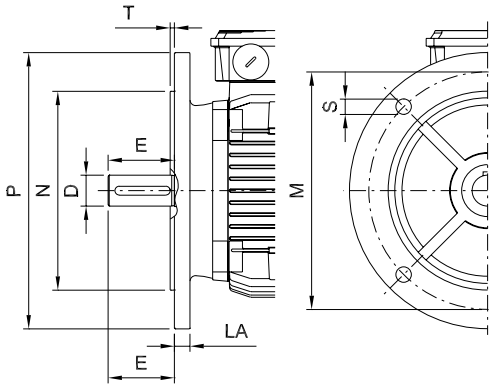
	Small flange B14						Large flange B14						Flange B5					
IEC DIN	P a_1	N b_1	LA c_1	M e_1	T f_1	S s_1	P a_1	N b_1	LA c_1	M e_1	T f_1	S s_1	M e_1	N b_1	P a_1	T f_1	LA c_1	S[1] s_1
56	80	50	8	65	2.5	M5	105	70	8	85	2.5	M6	100	80	120	2.5	7	M6
63	90	60	8	75	2.5	M5	120	80	8	100	2.5	M6	115	95	140	3	8	M8
71	105	70	8	85	2.5	M6	140	95	8	115	3	M8	130	110	160	3.5	10	M8
80	120	80	9	100	3	M6	160	110	8.5	130	3.5	M8	165	130	200	3.5	10	M10
90S-L	140	95	9	115	3	M8	160	110	9	130	3.5	M8	165	130	200	3.5	12	M10
100L	160	110	10	130	3.5	M8	200	130	12	165	3.5	M10	215	180	250	4	14	M12
112M	160	110	10	130	3.5	M8	200	130	12	165	3.5	M10	215	180	250	4	14	M12
132S-M	200	130	30	165	3.5	M10	250	180	12	215	4	M12	265	230	300	4	14	M12
160M-L	250	180	12	215	4	M12	300	230	12	265	5	M16	300	250	350	5	15	M16

1) Clearence hole for screw. Hole as standard for 132 to 160 frame size



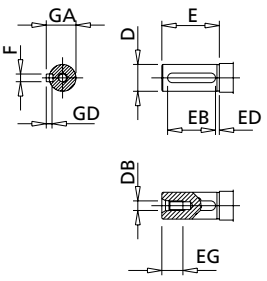
IEC DIN	D d	E l	F h9 u	GD	GA t	DB[1] d_6	EG	EB	ED
56	9 j6	20	3	3	10.2	M3	10	15	2.5
63	11 j6	23	4	4	12.5	M4	10	15	4
71	14 j6	30	5	5	16	M5	12.5	20	4
80	19 j6	40	6	6	21.5	M6	16	30	4
90S-L	24 j6	50	8	7	27	M8	19	40	4
100L	28 j6	60	8	7	31	M10	22	50	4
112M	28 j6	60	8	7	31	M10	22	50	4
132S-M	38 k6	80	10	8	41	M12	28	70	4
160M-L	42 k6	110	12	8	45	M16	36	100	4

1) Centering holes in shaft extension to DIN 332 part 2



	Poles	M e_1	N b_1	P a_1	T f_1	LA c_1	S [1] s_1
180M	**≥ 4**	300	250	350	5	15	19
180L	**≥ 4**	300	250	350	5	15	19
200L	**≥ 4**	350	300	400	5	17	19
225S	**≥ 4**	400	350	450	5	20	19
225M	**2**	400	350	450	5	20	19
	≥ 4	400	350	450	5	20	19
250M	**2**	500	450	550	5	20	19
	≥ 4	500	450	550	5	20	19
280S	**2**	500	450	550	5	22	19
	≥ 4	500	450	550	5	22	19
280M	**2**	500	450	550	5	22	19
	≥ 4	500	450	550	5	22	19
315S	**2**	600	550	660	6	22	24
	≥ 4	600	550	660	6	22	24
315M	**2**	600	550	660	6	22	24
	≥ 4	600	550	660	6	22	24
315L	**2**	600	550	660	6	22	24
	≥ 4	600	550	660	6	22	24

	Poles	D d	E l	F u	GD	GA t	DB [2] d_6
180M	**≥ 4**	48	110	14	9	51.5	M16
180L	**≥ 4**	48	110	14	9	51.5	M16
200L	**≥ 4**	55	110	16	10	59	M20
225S	**≥ 4**	60	140	18	11	64	M20
225M	**2**	55	110	16	10	59	M20
	≥ 4	60	140	18	11	64	M20
250M	**2**	60	140	18	11	64	M20
	≥ 4	65	140	18	11	69	M20
280S	**2**	65	140	18	11	69	M20
	≥ 4	75	140	20	12	79.5	M20
280M	**2**	65	140	18	11	69	M20
	≥ 4	75	140	20	12	79.5	M20
315S	**2**	65	140	18	11	69	M20
	≥ 4	80	170	22	14	85	M20
315M	**2**	65	140	18	11	69	M20
	≥ 4	80	170	22	14	85	M20
315L	**2**	65	140	18	11	69	M20
	≥ 4	80	170	22	14	85	M20



1) Clearence hole for screw
2) Centering holes in shaft extension to DIN 332 part 2

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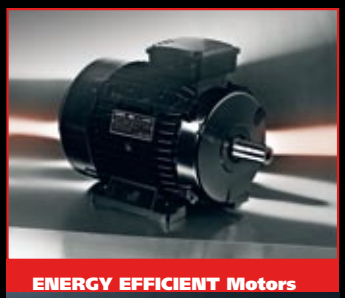

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