ICMEMOTORS

ASYNCHRONOUS MOTORS

THREE-PHASE MOTORS
SINGLE-PHASE MOTORS
BRAKE MOTORS

IE2 IE3 c UL us

TECHNICAL CATALOGUE 2015

ICMEMOTORS

TECHNICAL CATALOGUE MKTG-10-091/15

CUSTOM MADE
CUSTOM PHILOSOPHY

LAFERTGROUP

CONTENTS

GENERAL INFORMATION

MISSION

The Lafert Group, a leading European Motor Company, is committed to continuous growth by being the global leading manufacturer of **customised engineered Electric Motors and Drives** with specific focus on Industry Automation, Energy Saving, and Renewables.

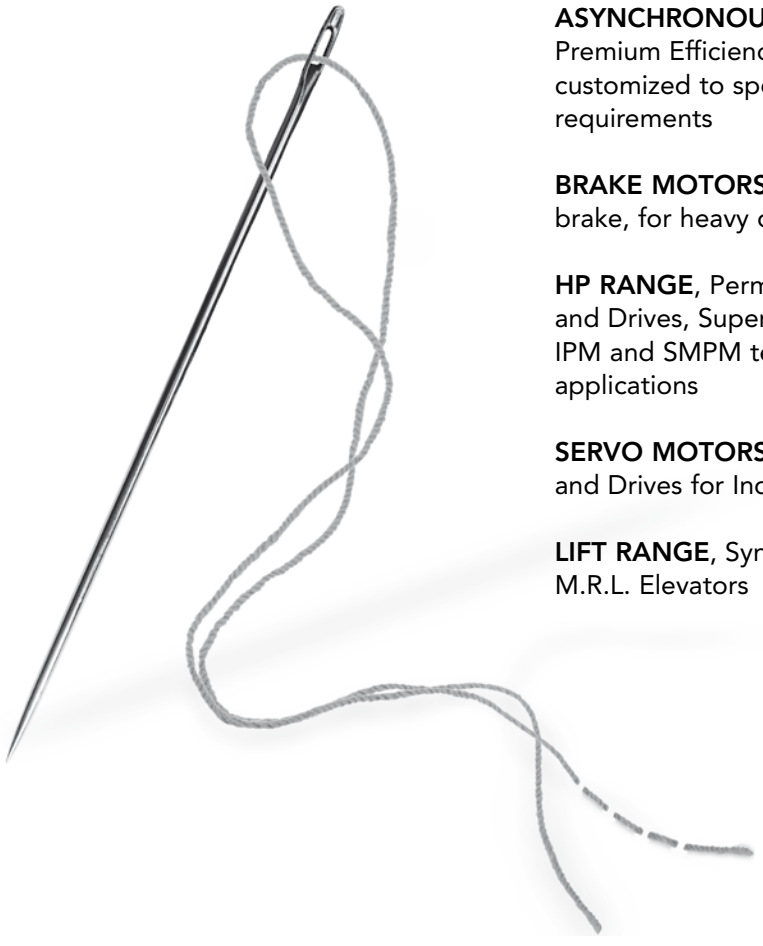
The Lafert Group will strive to be the ideal partner in the Electric Motors and Drives industry through focus on meeting specific customer demands. Mutually beneficial partnerships are developed by continuous process improvements utilising state-of-the-art products and techniques by a skilled, motivated and professional workforce.

CUSTOM MADE, CUSTOM PHILOSOPHY

Lafert specializes in the design and manufacture of customized electric motors produced to meet specific applications and needs of individual customers. **Over 90% of Lafert's output is non-standard motors.**

The control of the whole manufacturing process allows for any aspect of the motor to be modified. This gives the ability to engineer customized motors that fit the final application/work environment for maximum efficiency and reliability.

Lafert leverages over 50 years of experience in partnering with Global Companies from its 12 locations spread across Europe, North America, Asia and Australia.



ASYNCHRONOUS MOTORS, Three-phase Motors Premium Efficiency - IE3 and High Efficiency - IE2 customized to specific applications and OEM requirements

BRAKE MOTORS, Asynchronous Motors, DC and AC brake, for heavy duty applications

HP RANGE, Permanent Magnet Synchronous Motors and Drives, Super Premium Efficiency – IE4/IE5, IPM and SMPM technology, designed for HVAC applications

SERVO MOTORS & DRIVES, Brushless Servomotors and Drives for Industrial Automation

LIFT RANGE, Synchronous Gearless Machines for M.R.L. Elevators

ASYNCHRONOUS MOTORS

HIGH EFFICIENCY, ENERGY SAVING

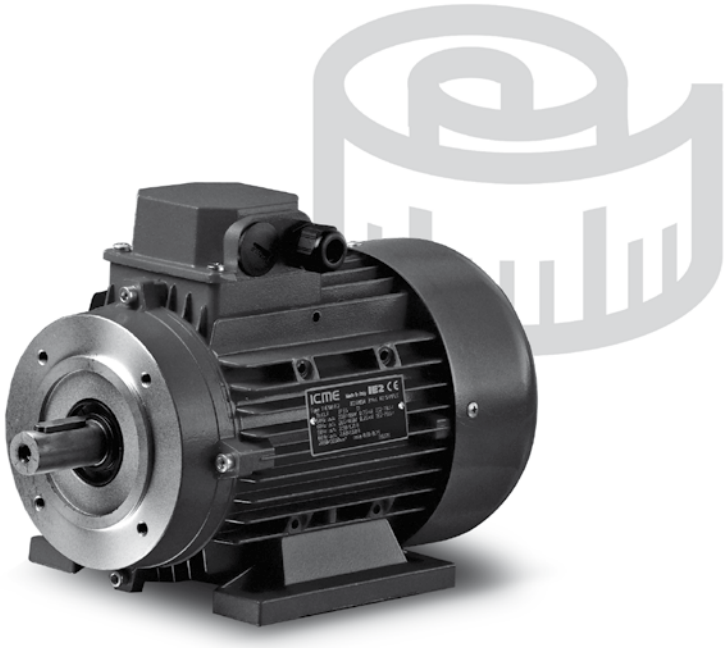
AC motors have a significant impact on the total energy operation cost for industrial, institutional and commercial buildings. Today, the major factor influencing the motor industry is energy efficiency driven by both increasingly demanding legislation and industry's greater awareness of green issue responsibilities.

Premium Efficiency and High Efficiency Three-phase Motors meeting the requirements of IE3 and IE2 efficiency levels in accordance with IEC 60034-30-1:2014 and test method IEC 60034-2-1;2007.

Premium Efficiency IE3 motors provide compliance with the requirements of EU MEPS that has come into force January 1, 2015 and NEMA EPAct/EISA, which has been in force since December 2010 in the USA and January 2011 in Canada.

High Efficiency IE2 motors comply with the EU's IE2 efficiency requirements, mandatory for all systems (motor <7.5kW + machinery) installed in the EU from January 2013 and for all motors 7.5 to 375kW put into operation with a variable speed drive (VSD) from January 2015.

IE2 IE3 c UL Energy Verified ENERGY C US



BRAKE MOTORS

EXTENSIVE CONFIGURATION OPTIONS MATCH MOTORS TO APPLICATIONS

The harsher the working environment the greater the demand on engineering standards, and non-standard then becomes the norm. Custom-design and engineering fulfil this need to give the reliability and performance demanded.

The Lafert Brake Motor series is engineered according to the client's specification. Total control over all aspects of production permits **multiple design options** including flanges, shafts, brakes plus optimum resistance to external agents and offshore environments for paints, seals, and magnet surfaces.

The result is a range of AC motors with DC and AC brake, produced entirely in-house which incorporates Lafert's own technical solutions for achieving robustness and performance, combined with the option for application-specific customization.

IE1 IE2 c UL us

HP RANGE

THE IE4 AVAILABLE SOLUTION

High Performance (HP) is a generation of **PM (Permanent Magnet) Synchronous Motors, achieving IE4 and IE5 Super Premium Efficiency** level, that offer improved electrical efficiency at stable and reduced production costs without applying rare earth magnets.

This uniquely engineered product combines the electrical design of Brushless Servomotors with the mechanical design of AC Induction Motors. The result is a compact motor primarily targeted toward HVAC applications in fans, compressors, and blowers, where there is emphasis on reducing the operating cost or weight and size of the motors.

The complete range 0.37 kW to 30 kW are supplied as s**tand-alone motors** (HPS/HPF) to be controlled by a separate drive or as **motor/drive integrated units** (HPI), specifically designed for their energy saving potential.

A separate catalogue is available.

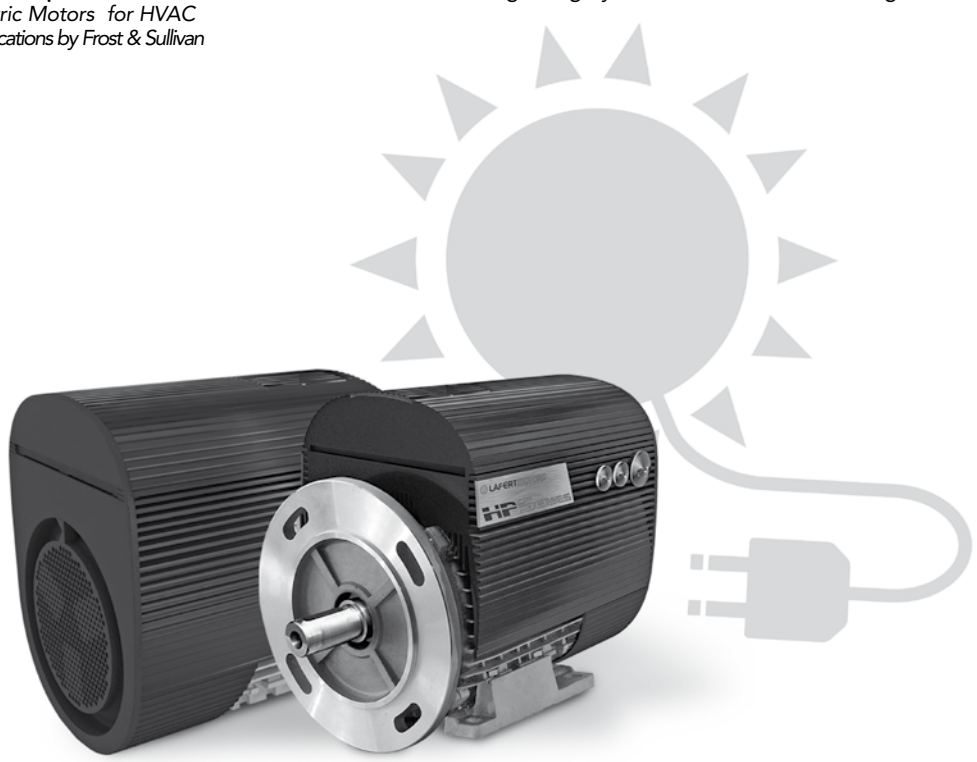
IE4 IE5 c UL us

The Awards

2013 European New Product Innovation Leadership Award:
Electric Motors for HVAC Applications by Frost & Sullivan

2014 AHR Expo Innovation Awards:
Green Building Category

ADI Index Design 2012:
Best Italian design in manufacturing



SERVO MOTORS & DRIVES

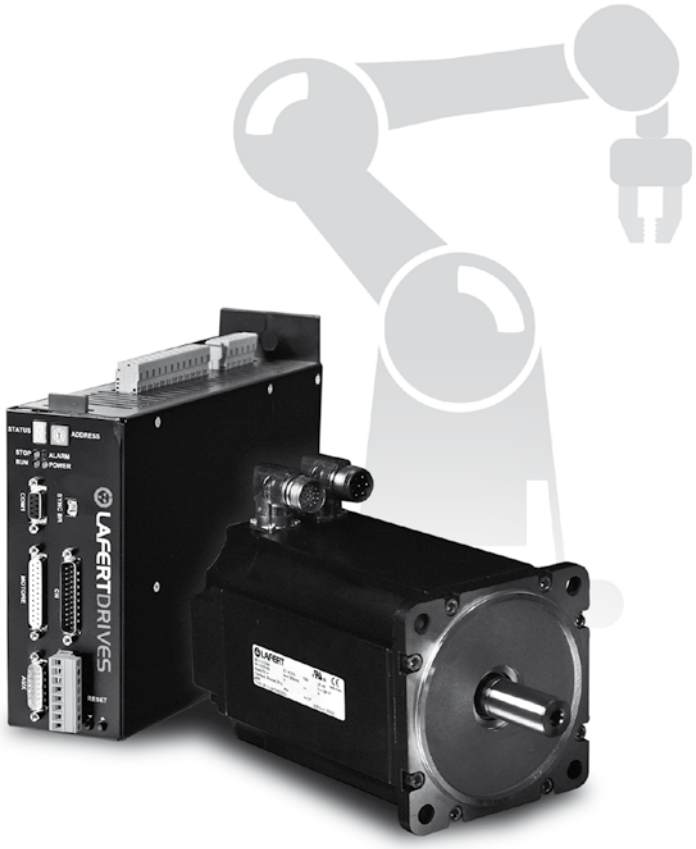
PRECISION IS STANDARD, ONLY THE MOTOR IS CUSTOMIZED!

Lafert know-how in manufacturing permanent magnet motors is combined with the company's on-going drive for excellence and its ability to offer **non-standard solutions**, all of which is invested in this product range. On-going research and development, often in conjunction with customers, continues to bestow superior performance in terms of speed, accuracy and control **to satisfy application needs**.

The range of brushless Servo Motors is one of the most complete available on the market, with nominal torques 0.20 Nm to 150 Nm. Direct Drive Motors cover torques 10 Nm to 500 Nm.

Lafert's Servo Drive range includes standard products and custom solutions that ensure high performance and cost reductions for diverse applications across the fields of **Industrial Automation and battery-powered applications** such as the automated handling of material and/or people.

A separate catalogue is available.



LIFT RANGE

HIGHER & FASTER

Lafert's LIFT range has established the company internationally as one of leading manufacturer.The motor's innovative design, with its protected encoder and no external cabling, offers compactness and low weight, ideal for **home lift systems or new concept M.R.L..**

Its novel **inner rotor and fractional slot gearless technology** are of products of Lafert's in-house design and manufacturing expertise. It provides the highest levels of performance and energy efficiency plus enhanced response to satisfy today's needs and trends in the elevator market i.e. higher speed to greater heights.

Motors with torque up to 850 Nm for systems with a capacity load up to 1,600 kg, machines with TÜV SÜD Certifications, in compliance with the Specifications UNI EN 81-1:2010 and Lifts Directive 95/16/EC.

A separate catalogue is available.


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

ICME S.p.A.

Reg. No: 9307 – A

Via Santa Barbara, 143
48010 FUSIGNANO RA Italia

UNI EN ISO 9001:2008
ISO 9001:2008

Progettazione e produzione di motori elettrici asincroni
Design and Production of Asynchronous Electric Motors

EA: 19

Direttore Generale
General Manager

kiwa

CERMET

IAF

ACCREDIA

QUALITY SYSTEM CERTIFICATE

The strictness of our quality control assures the flawless operation and reliability of our products. Our quality is confirmed by the **Certificate ISO 9001:2008** awarded by CERMET, a certification body authorized by ACCREDIA.

SAFETY STANDARDS

Our motors comply with the requirements of the International Standard **IEC 60034** for rotating electrical machines as well as with the following European Directives: **Low Voltage Directive** (LV) 2006/95/EC, **Electromagnetic Compatibility Directive** (EMC) 2004/108/EC and **RoHS Directive** 2011/65/EC on the restriction of hazardous substances in electrical and electronic equipment.

All products comply with the requirements of the **Directive Machines** (MD) 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.

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

When operating the motor, the observance of the Regulation EN 60204-1 and safety instructions indicated in our Operating Instructions must be complied with.

Motors complied with many other international standards are available on request:

c UL us Motors approved by UL Underwriters Laboratories Inc.

EFFICIENCY STANDARDS

IE1 IE2 IE3

Efficiencies are harmonized to the **International Standard IEC 60034-30-1:2014** that states new efficiency levels: Standard Efficiency IE1, High Efficiency IE2 and Premium Efficiency IE3. The efficiency levels are in accordance with the testing method IEC 60034-2-1;2007

INTERNATIONAL EFFICIENCY LEVELS: IE CODES

The International Standard **IEC 60034-30-1;2014** ensures an international common base for electric motor designing and classification, as well as for national legislative activities, increasing the level of harmonization in **MEPS** (Minimum Energy Performance Standard) all over the world. The IEC 60034-30-1 states the efficiency levels (IE codes) and requirements, provides test conditions and efficiency measurement methods specified in **IEC 60034-2-1;2007**. It doesn't state the motors to be supplied or the minimum efficiency level (MEPS). This depends on any national legislative activities and government targets to save energy and reduce environmental impact.

The efficiency levels provided by the standard for single speed and three-phase motors – brake included - 50 Hz or 50/60 Hz, with rated output 0.75kW to 375kW, 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**

EFFICIENCY VALUES FOR 50 HZ ACCORDING TO IEC 60034-30-1:2014

Efficiency standard calculation: IEC 60034-2-1;2007

Output	Standard Efficiency - IE1			High Efficiency - IE2			Premium Efficiency - IE3		
kW	2 poles	4 poles	6 poles	2 poles	4 poles	6 poles	2 poles	4 poles	6 poles
0.12	45.0	50.0	38.3	53.6	59.1	50.6	60.8	64.8	57.7
0.18	52.8	57.0	45.5	60.4	64.7	56.6	65.9	69.9	63.9
0.20	54.6	58.5	47.6	61.9	65.9	58.2	67.2	71.1	65.4
0.25	58.2	61.5	52.1	64.8	68.5	61.6	69.7	73.5	68.6
0.37	63.9	66.0	59.7	69.5	72.7	67.6	73.8	77.3	73.5
0.40	64.9	66.8	61.1	70.4	73.5	68.8	74.6	78.0	74.4
0.55	69.0	70.0	65.8	74.1	77.1	73.1	77.8	80.8	77.2
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
200-375	94.0	94.0	94.0	95.0	95.1	95.0	95.8	96.0	95.8

EFFICIENCY VALUES FOR 60 HZ ACCORDING TO IEC 60034-30-1:2014

Efficiency standard calculation: IEC 60034-2-1;2007

0.12	57.5	62.0	48.0	59.5	64.0	50.5	62.0	66.0	64.0
0.18	62.0	66.0	52.5	64.0	68.0	55.0	65.6	69.5	67.5
0.25	64.0	68.0	57.5	68.0	70.0	59.5	69.5	73.4	71.4
0.37	70.0	70.0	62.0	72.0	72.0	64.0	73.4	78.2	75.3
0.55	72.0	74.0	66.0	74.0	75.5	68.0	76.8	81.1	81.7
0.75	77.0	78.0	73.0	75.5	82.5	80.0	77.0	85.5	82.5
1.1	78.5	79.0	75.0	82.5	84.0	85.5	84.0	86.5	87.5
1.5	81.0	81.5	77.8	84.0	84.0	86.5	85.5	86.5	88.5
2.2	81.5	83.0	78.5	85.5	87.5	87.5	86.5	89.5	89.5
3.7	84.5	85.0	83.5	87.5	87.5	87.5	88.5	89.5	89.5
5.5	86.0	87.0	85.0	88.5	89.5	89.5	89.5	91.7	91.0
7.5	87.5	87.5	86.0	89.5	89.5	89.5	90.2	91.7	91.0
11	87.5	88.5	89.0	90.2	91.0	90.2	91.0	92.4	91.7
15	88.5	89.5	89.5	90.2	91.0	90.2	91.0	93.0	91.7
18.5	89.5	90.5	90.2	91.0	92.4	91.7	91.7	93.6	93.0
22	89.5	91.0	91.0	91.0	92.4	91.7	91.7	93.6	93.0
30	90.2	91.7	91.7	91.7	93.0	93.0	92.4	94.1	94.1
37	91.5	92.4	91.7	92.4	93.0	93.0	93.0	94.5	94.1
45	91.7	93.0	91.7	93.0	93.6	93.6	93.6	95.0	94.5
55	92.4	93.0	92.1	93.0	94.1	93.6	93.6	95.4	94.5
75	93.0	93.2	93.0	93.6	94.5	94.1	94.1	95.4	95.0
90	93.0	93.2	93.0	94.5	94.5	94.1	95.0	95.4	95.0
110	93.0	93.5	94.1	94.5	95.0	95.0	95.0	95.8	95.8
150	94.1	94.5	94.1	95.0	95.0	95.0	95.4	96.2	95.8
185-375	94.1	94.5	94.1	95.4	95.4	95.0	95.8	96.2	95.8

GLOBALLY MINIMUM EFFICIENCY STANDARDS

Country	Product range	Law / Regulation	MEPS	Next steps
EUROPE	400 V ± 10%; 50 Hz 0.75 - 375 kW - 2-6 poles	EC 4/2014 60034-30-1:2014	IE3 or IE2 (only with VSD) motors from 7.5 to 375 kW IE2 motors < 7.5 kW compulsory 01.01.2015	01.01.2017 - IE3 or IE2 (only with VSD) from 0.75 to 375 kW
SWITZERLAND	400 V ± 10%; 50 Hz 0.75 - 375 kW - 2-6 poles	EC 4/2014 60034-30-1:2014	IE3 or IE2 (only with VSD) motors from 7.5 to 375 kW IE2 motors < 7.5 kW compulsory 01.01.2015	01.01.2017 - IE3 or IE2 (only with VSD) from 0.75 to 375 kW
TURKEY	400 V ± 10%; 50 Hz 0.75 - 375 kW - 2-6 poles	EC 4/2014 60034-30-1:2014	IE3 or IE2 (only with VSD) motors from 7.5 to 375 kW IE2 motors < 7.5 kW compulsory 01.01.2015	01.01.2017 - IE3 or IE2 (only with VSD) from 0.75 to 375 kW
RUSSIA	up to 690 V ± 10%; 50 Hz 1 - 400 kW - All poles	GOST R 51677-2000	-	
USA	460 V ± 10%; 60 Hz 1 - 200 HP - 2-6 poles	Nema EPAct EISA 2007	IE3 compulsory 19.12.2010	01.01.2016 the scope of EISA will be extended.
CANADA	460 V/575 V ± 10%; 60 Hz 1 - 200 HP - 2-6 poles	CSA C390-10	IE3 compulsory 01.01.2011	No further changes are expected in the near future.
MEXICO	460 V ± 10%; 60 Hz 1 - 200 HP - 2-6 poles	NOM-016-ENER 2010 CSA 390	IE2 compulsory 01.01.2011	Will follow USA model
BRAZIL	220/380/440/460/480 V ± 10%; 60 Hz 0.75 - 250 kW - 2-8 poles	NBR 17094-1 Regulation 553	IE2 compulsory 08.12.2009	It is expected that the scope of regulation will be extended
CHILE	380/400/420/440/460/690 V ± 10%; 50 Hz 0.75 Kw - 7.5 kW - 2-6 poles	NCH 3086	IE2 compulsory 04.01.2011	
AUSTRALIA NEW ZEALAND	415 V/690 V ± 10%; 50 Hz 0.75 - 186 kW - 2-8 poles	AS/NZS 1359.5-2004	IE2 compulsory 01.04.2006	IE3 expected for near future
CHINA	380 V ± 10%; 50 Hz 0.75 - 315 kW - 2-6 poles	GB 18613-2012	IE2 compulsory 01.07.2011	01.09.2016 - IE3 from 7.5 to 375 kW 01.09.2017 - IE3 from 0.75 to 375 kW
HONG KONG	380 V ± 10%; 50 Hz 0.75 - 375 kW - 2-6 poles	Mandatary Buildings Energy Efficiency Bill	IE3 or IE2 (only with VSD) motors from 7.5 to 375 kW IE2 motors < 7.5 kW compulsory 01.01.2015	01.01.2017 - IE3 or IE2 (only with VSD) from 0.75 to 375 kW
INDIA	415 V/690 V ± 10%; 50 Hz 0.37 - 315 kW - 2-8 poles	IS:12615	IE2 compulsory 01.06.2011	
ISRAEL	400 V ± 10%; 50 Hz 0.75 - 185 kW - 2-8 poles	IS:5289	IE2 compulsory 01.02.2008	
JAPAN	200/220/400/440 V ± 10%; 50/60 Hz 0.2 - 160 kW - 2-6 poles	JIS C 4210 JIS C 4212	IE3 compulsory 01.04.2015	
KOREA	up to 600 V ± 10%; 60 Hz 0.75 - 200 kW - 2-6 poles	IEC 60034-30-1:2014	IE3 compulsory 01.01.2015 Motors from 37 to 200KW	01.01.2016 - IE3 from 15 to 37 kW 01.01.2017 - IE3 from 0.75 to 15 kW
SINGAPORE	415 V ± 10%; 50 Hz 1.1 - 90 kW - 2-4 poles	SS530:2006	IE2	Only government projects compulsory IE2
SAUDI ARABIA	380 V/ 460 V ± 5%; 60 Hz all kW - all poles	No regulation	-	
UNITED ARAB EMIRATES	400 V ± 10%; 50 Hz 0.75 - 375 kW - 2-6 poles	No regulation	-	

EU – COMMISSION REGULATION EC 4/2014

The **Commission Regulation EC 4/2014** specifies efficiency requirements for three-phase AC motors from 0.75 to 375kW, 2, 4 and 6 poles, and introduces in all countries of the European Community the following MEPS from 1st January 2015:
- motors from 7.5 to 375kW - **IE3 minimum efficiency or IE2 only for motors with variable speed drive (VSD**) and marked with specific label;
- motors < 7.5kW - **IE2 minimum efficiency**.

Motors to be exclusively exported out of the EEA (machine distributors or manufacturers) may be produced and distributed with IE1 and IE2 efficiency level even after relevant deadline. To that end, a statement will have to be made to the manufacturer.

Regulation-Standard	EC 4/2014 IEC 60034-30-1:2014
Testing Method	IEC 60034-2-1:2007
Product Range	• Three-phase squirrel cage asynchronous motors: 0.75 kW - 375 kW, 2,4 and 6 poles • Continuous duty S1 • Up to 1000 V • 50 Hz or 50/60 Hz
Meps	**Since 01.01.2015** **Energy Efficient (IE3) or (IE2) only with VSD - 7.5 to 375kW** **Energy Efficient (IE2) < 7.5kW**
Exclusions	• Brake Motors • Motors for explosive atmospheres
Future	01.01.2017 – IE3 or IE2 only with VSD – 0.75 to 375kW

USA – EISA 2007

The **Energy Independence and Security Act of 2007 (EISA)** was signed into law on Dec 2007 and enforced in Dec 2010.
EISA replaces the previous EPAct (Energy Policy Act 1992) approved by the U.S. Congress in 1992, and sets Nema Super Premium Efficiency **IE3 as minimum level** for general purpose, three-phase AC industrial motors from 1 to 500HP which are manufactured or imported for sale in USA.

The U.S. **Department of Energy (DOE)** is responsible for establishing the rules to implement. The rating plate must be market with the motor's nominal full load efficiency (NEMA nominal efficiency) and the manufacturer's CC-number (compliance certificate number).

Regulation-Standard	Epact 2007 EISA (NEMA-MG-1)
Testing Method	IEEE 112-B or CSA390-10
Product Range	• **Subtype I** - General Purpose Motors: 1HP-200HP, 2 to 6 poles • **Subtype II** - General purpose motors (Subtype I) Configured: U frame, Design C, close coupled pump, footless, vertical solid Shaft normal thrust (horizontal) and fire pumps : 1HP to 200HP (0.75kW-150kW) 2 to 8 poles • **General Purpose** - 201HP-500HP, 2 to 8 poles, Up to 600V 60Hz
Minimum Efficiency	Since 19.12.2010 **NEMA Premium (IE3) - Subtype I** **Energy Efficient (IE2) - Subtype II** **Energy Efficient (IE2) - General Purpose**
Exclusions	• IEC frame size < 90 and 100 • Not line started motors • Customized OEM mounting • Intermittent duty • Brake Motors with integral brake design (not removable) • TENV and TEAO enclosures • Hollow shaft motors • 201HP to 500HP design A
Future	01.01.2016 - the scope of EISA will be extended.

CANADA - ENERGY EFFICIENCY ACT

Canada has had minimum energy performance standards in place since 1995. These standards were amended in 1997 to include Explosion Proof Motors and Integral Gear Assembly Motors.

The regulation regarding electric motors was again revised and, as of January 2010, have a more stringent scope and the **minimum efficiency levels** are **either IE3 and IE2** depending on the output power or mounting position.

The rating plate must show NEMA nominal efficiency at 100% load and the safety certificate marking, such us CSA.

Regulation-Standard	EEA C390-10 (Nema-MG-1)
Testing Method	CSA C390-10
Product Range	• **Subtype I:** NEMA T frame or IEC frame designation 90 or above, NEMA design A or B or IEC design N, Standard shaft , R-shaft or S-shaft or an IEC equivalent: 1HP-200HP (0.75kW-150kW) 2 to 6 poles • **Subtype II:** NEMA U frame or equivalent IEC dimensions, NEMA design C, or IEC design H, close coupled pump, vertically-mounted solid shaft normal thrust(as tested in the horizontal position), footless:1HP-500HP (0.75kW-375kW), 2 to 8 poles • **General Purpose:** NEMA design B:200HP-500HP, 2 to 8 poles, IEC design N: 150kW-375kW, 2 to 8 poles Up to 600V 60Hz or 50/60Hz
Minimum Efficiency	Since 12.04.2012 **NEMA Premium (IE3):** Subtype I **Energy Efficient (IE2):** Subtype II and General Purpose
Exclusions	• Inverter duty motors • IEC frame size 80 and below
Future	No further changes to the regulations are expected in the near future

AUSTRALIA – MEPS SCHEME

The **Australian MEPS Scheme** was announced in 2001 by the Australian Greenhouse Office (AGO), and was revised in 2006. All motors covered by the scheme that will be sold in the Australian and New Zealand markets must be registered in a National online database system, www.energyrating.gov.au/appsearch/motors.asp.

Standards AS/NZS 1359,5:2004 stipulates two efficiency levels: the **compulsory minimum efficiency level IE2** or better, and a **voluntary high efficiency level IE3** or better.

The scheme is monitored by a regulatory body which conducts random testing to ensure compliance. Importing unregistered motors is subject to strict penalties.

Regulation-Standard	AS/NZS 1359,5:2004
Testing Method	Method A (equivalent to IEC60034-2-1:2007 and IEEE112-B) or Method B (equivalent to the old IEC 60034-2)
Product Range	• The phase electric motors: 0.73kW -185kW, 2 to 8 poles, Up to 1100V 50Hz
Minimum Efficiency	Since 2001 (2002 in New Zealand), revision in both countries 2006 **Energy Efficient (IE2)**
Exclusions	• Submersible motors • Integral geared motor systems • Variable or multispeed motors • Motors rated for short duty cycles
Future	IE3 expected for near future

BRAZIL – PBE LABELING PROGRAM

The **PBE Brazilian Labeling Program** has been in force since December 2009 and is overseen by INMETRO. From 2012 the **minimum efficiency level** is **IE2**.
All motors covered by NBR standards must be provided with specific rating plate marking and additional stickers depending on a degree of protection.

All motors must be registered on the INMETRO, website at www.inmetro.gov.br.

Regulation-Standard	553/NBR17094-1
Testing Method	NBR17094
Product Range	• Electric Motors, single speed for continuous duty IEC design N or Nema Design A,B or C, TEFC and Exn 0.75kW-185kW, 2&4 poles; 0.75kW-150kW 6 poles; 0.75kW-110kW 8 poles, Up to 600V 60Hz
Minimum Efficiency	MEPS since Dec 2009 Since 2012 **Energy Efficient (IE2)**
Exclusions	• Servo Motors • Permanent Magnet Motors • IP23 • S2 to S10 according to NBR 7094.2003 • Exd(e), EX(e), DIP
Future	It is expected thet the scope of regulation will be extended

CHINA – ENERGY LABEL SCHEME

The **China Energy Label Scheme** has been mandatory since 01.09.2008 and was revised in 2012. From 01.09.2012 motors must meet Grade 3 (IE2) requirements. China has taken a major step towards harmonizing its national standards with IEC standards.

Standard GB/T1032 defining the efficiency measuring method, has been updated and brought in line with IEC 60034-2-1 and the grades are in line with efficiency classes defined in IEC 60034-30-1.

In addition to energy efficiency requirements, low power motors are subject to CCC certification.

Regulation-Standard	GB 18613-2012
Testing Method	IEC 60034-2-1, efficiency grades in line with IEC 60034-30-1 (IE2,IE3)
Product Range	• Three phase electric induction motors, design N, TEFC 0.75kW to 315kW 2 to 6 poles, Up to 1000V 50Hz
Minimum Efficiency	Since 01.07.2011 **Energy Efficient (IE2)**
Exclusions	• Marine motors • Brake motors • Motors completely integrated into a machine • Motors with electro-magnetic braking incorporated • Motors with a duty type other than S1, or S3 with cyclic factor of 80% or higher • Multispeed motors • Inverter fed motors
Future	IE3 from 01.09.2016: 7.5kW-375kW IE3 from 01.09.2017: 0.75kW-375kW

KOREA – MEPS SCHEME

The **Korean MEPS Scheme** was introduced on 1.7.2008 by the Ministry of Commerce, Industry and Energy (MOCIE) and implemented in three steps. Certification is granted by the Korea Energy Management Corporation (KEMCO).

Korean MEPS is identical to IE3 (60HZ). A specific sticker is required and all motors must be registered with the authorities. Motors that do not have the MEPS sticker will not be allowed into Korea.

Regulation-Standard	IEC 60034-30-1
Testing Method	IEC60034-2-1 or IEEE112-B
Product Range	• Three phase induction motor, single speed, foot or flange design A or B 0.75kW-200kW (2,4 poles); 0.75kW-160kW (6 poles) 0.75kW-110kW (8 poles) Up to 600V 60Hz
Minimum Efficiency	Since 01.01.2015 **Energy Effecient (IE3) :37 to 200kW**
Exclusions	• TENV motors • Air over motors • Permanent Magnet motors
Future	Preliminary plans: IE3 from 01.01.2016: 15kW-37kW IE3 from 01.01.2017: 0.75kW-15kW

REST OF THE WORLD

Many Countries are recognizing the importance of Energy Efficiency in electric motors and its potential economic and environmental impact and are working on developing mandatory minimum energy performance standards to be implemented in the near future.
These standards are expected to follow the IEC60034-30-1 classification.

CONDITIONS OF INSTALLATION

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

ELECTRICAL	Rating and performance	IEC 60034-1
	Methods for determining losses and efficiency using tests	IEC 60034-2
	Standard method for determing losses and efficiency from tests	IEC 60034-2-1
	Efficiency classes of single speed, three-phase, cage-induction motors (IE-code)	IEC 60034-30-1
	Terminal markings and direction of rotation	IEC 60034-8
	Starting performance	IEC 60034-12
	Standard voltages	IEC 60038
	Insulating materials	IEC 60085
MECHANICAL	Dimensions and output ratings	IEC 60072
	Mounting dimensions and relationship frame sizes-output ratings, IM B3, IM B5, IM B14	IEC 60072
	Cylindrical shaft ends for electric motors	IEC 60072
	Degrees of protection	IEC 60034-5
	Methods of cooling	IEC 60034-6
	Mounting arrangements	IEC 60034-7
	Noise limits	IEC 60034-9
	Mechanical vibration	IEC 60034-14
	Mounting flanges	DIN 42948
	Tolerances of mounting and shaft extensions	DIN 42955
	Classification of environmental conditions	IEC 60721-2-1
	Mechanical vibration; balancing	ISO 8821

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.

The motors conform to **degree of protection IP 55** to IEC 60034-5[1)]. Higher protection on request.

The standard design for horizontal mounting is suitable for indoor and protected outdoor installation, climate group **"moderate"** (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.

1) IP54 for single-phase motors (series M) and brake motors (series FA-FC-FBA-FBC-FS-FMC)

ELECTRICAL 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 protection for mechanical 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

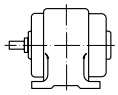
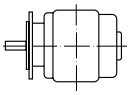
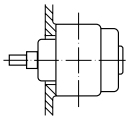
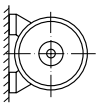
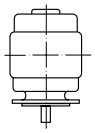
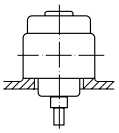
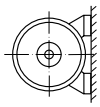
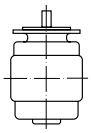
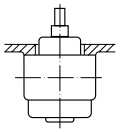
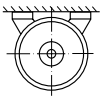
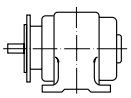
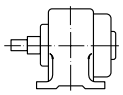
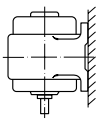
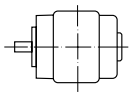
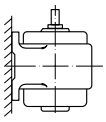
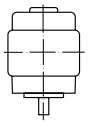
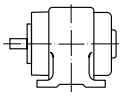
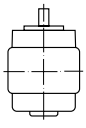
IP	Description
0	No special protection
1	Protection against solid foreign bodies larger than 50 mm (Example: inadvertent contact with the hand)
2	Protection against solid foreign bodies larger than 12 mm (Example: inadvertent contact with the fingers)
3	Protection against solid foreign bodies larger 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

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 vertica
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	Flange mounting	Motors without endshield
IM B3 (IM 1001) 	**IM B5 (IM 3001)** Flange type A to DIN 42 948 at drive end 	**IM B9 (IM 9101)** without endshield and without ball bearings on drive end 
IM B6 (IM 1051) 	**IM V1 (IM 3011)** Flange type A to DIN 42 948 at drive end 	**IM V8 (IM 9111)** without endshield and without ball bearings on drive end 
IM B7 (IM 1061) 	**IM V3 (IM 3031)** Flange type A to DIN 42 948 at drive end 	**IM V9 (IM 9131)** without endshield and without ball bearings on drive end 
IM B8 (IM 1071) 	**IM B35 (IM 2001)** Flange type A to DIN 42 948 at drive end 	**IM B15 (IM 1201)** without endshield and without ball bearings on drive end 
IM V5 (IM 1011) 	**IM B14 (IM 3601)** Flange type C to DIN 42 948 at drive end 	
IM V6 (IM 1031) 	**IM V18 (IM 3611)** Flange type C to DIN 42 948 at drive end 	
IM B34 (IM 2101) Flange type C to DIN 42 948 at drive end 	**IM V19 (IM 3631)** Flange type C to DIN 42 948 at drive end 	

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

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	DE	NDE
56	2 - 6	6201-2Z	6201-2Z
63	2 - 8	6202-2Z	6202-2Z
71	2 - 8	6202-2Z	6202-2Z
80	2 - 8	6204-2Z	6204-2Z
90	2 - 8	6205-2Z	6205-2Z
100	2 - 8	6206-2Z	6206-2Z
112	2 - 8	6306-2Z	6306-2Z
132	2 - 8	6208-2Z	6208-2Z

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

BEARING ARRANGEMENT

Frame size	Bearing DE	Bearing NDE	Spring-loaded
56 - 132	Non-locating bearing	Non-locating bearing	Non-drive end

PERMISSIBLE AXIAL FORCES

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	0.8	1.13	1.16	1.28	1.0	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	1.3	1.33	1.45	0.58	0.89	0.92	1.03

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

Frame 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
132S	1.35	1.90	1.96	2.15
132M	1.40	1.97	2.03	2.23

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 = elt 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.

COOLING

Surface cooling, independent of the direction of rotation.
Motors type T available without internal fan, 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 class N (normal).
Vibration class R (reduced) and vibration class S (special) are available at extra cost.

Pole-changing motors in Dahlander connection can only be supplied in vibration class N.

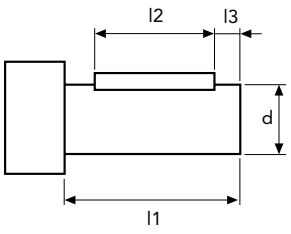
Rotors are at present dynamically balanced with half key fitted as per DIN ISO 8821. Other balancing only on request.
The motors are identified as follows:

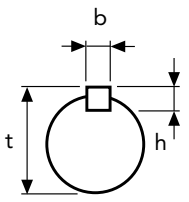
"H" or "blank" means balanced with half key
"F" means balanced with full key
"N" means no key

POSITION AND DIMENSIONS OF KEY

Frame size	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	5	41

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





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 motors.

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

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 IEC 60038	Rated voltage range
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

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.

Nameplates 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.

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
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 60° 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

THERMAL PROTECTION

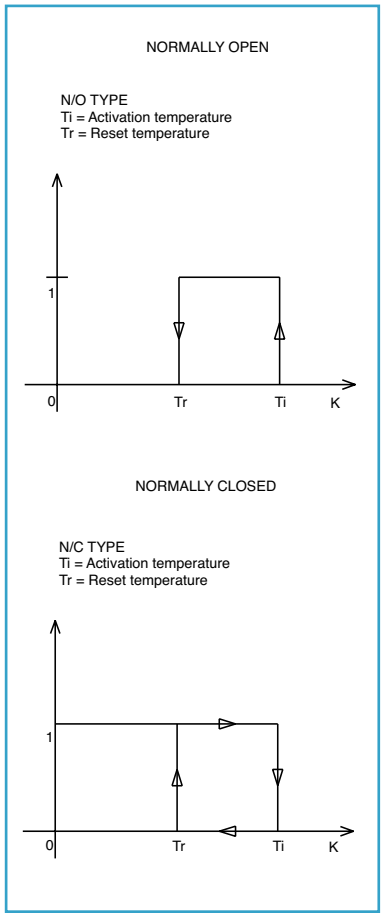
The decision on a particular type of thermal protection should be taken according to the actual operating conditions. Motors may be protected by means of current-dependent thermal protection switches, overcurrent relays and temperature detectors.

Thermal protection is possible as follows:

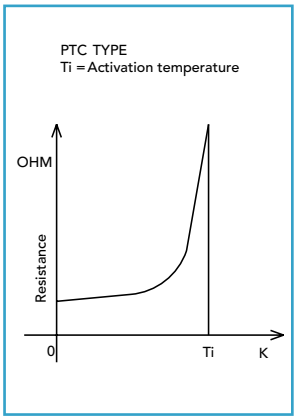
- Thermal protection switch with bimetal release
- Thermistor protection with semiconductor temperature detectors (PTC) in the stator winding in connection with release (if required, with additional motor protection switch).
- Bimetal temperature detector as N/C or N/O in the stator winding (if required, with additional motor protection switch).

Should protection of the motor be required, we install protection switch with bimetal release up to frame size 112 and semiconductor temperature detectors in motors ≥ 132.

Operating specifications
Thermal cut-out



Operating specifications
of the thermistors



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 outputs): 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 DUTIES

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

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

S 4: ... % - J_M ... kgm^2 - J_{ext} ... kgm^2 (intermittent duty with starting)

S 5: ... % - J_M ... kgm^2 - J_{ext} ... kgm^2 (intermittent duty with electric braking)

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

S 7: .J_M ... kgm^2 - J_{ext} ... kgm^2 (continuous-operation periodic duty with electric braking)

S 8: .J_M ... kgm^2 - J_{ext} ... kgm^2 (continuous-operation periodic duty with speed changes)

S 9: ... kW equ (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).

ADDITIONAL INFORMATION FOR DIFFICULT OPERATING CONDITIONS

Starting conditions (no-load or loaded starting)

Load torque curve during run-up (characteristic)

Moment of inertia (J_{ext}) referred to the motor shaft: kgm^2

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

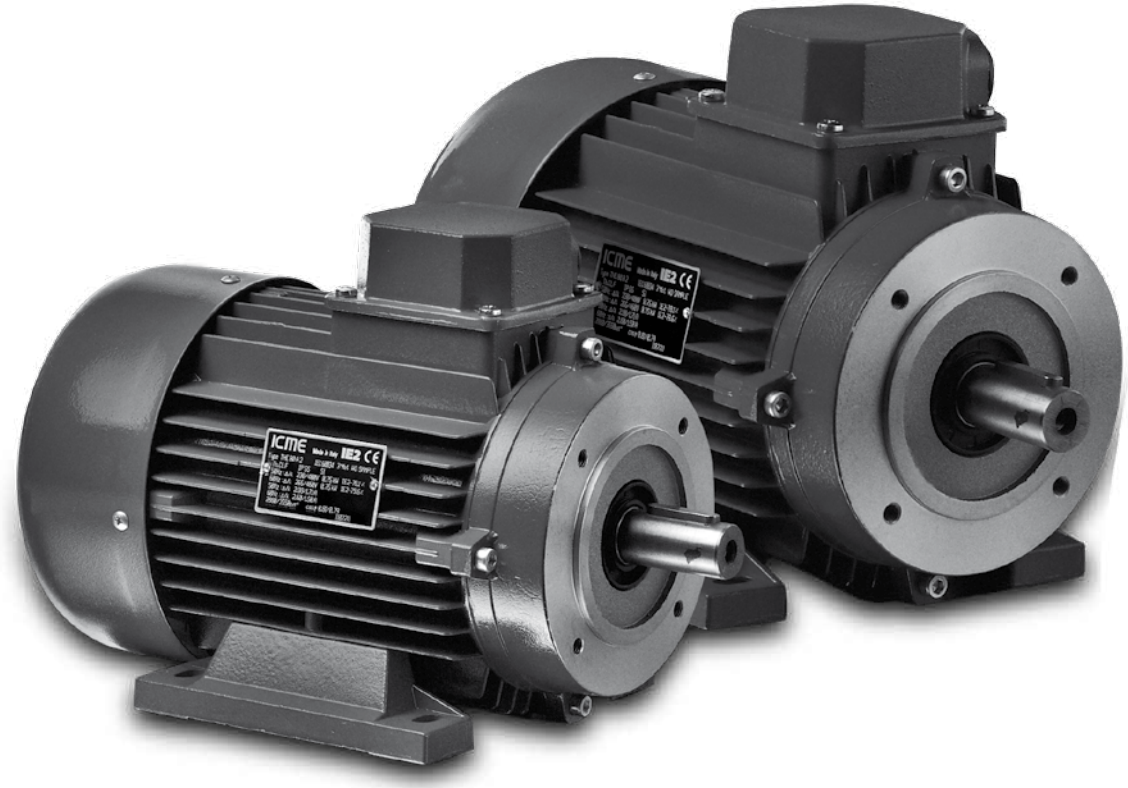
Radial force (or diameter of drive element): N

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, extraneous vibration, etc.)

THREE-PHASE MOTORS



TERMINAL BOX

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

All motors 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.

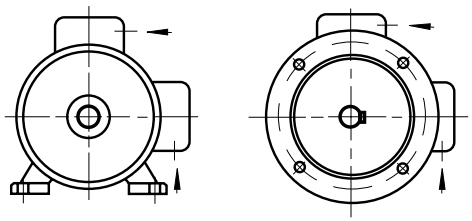
The position of the entry openings can be adjusted to suit the existing connection facilities by turning through 90°. Should special accessories be used (temperature detectors, anti-condensation heating, etc.) please enquire.

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.
		Pg [1]	Metric [2]	mm²		mm
56 - 71	IP 55* - IP 54**	2 x Pg 11	1 x M20	2.5	M4	12
80 - 100	IP 55* - IP 54**	1 x Pg 13.5/1 x Pg 16	1 x M25	2.5	M4	16
112	IP 55* - IP 54**	1 x Pg 13.5/1 x Pg 16	1 x M25	4	M5	16
132	IP 55* - IP 54**	2 x Pg 21	2 x M32	4	M5	20

1) Pg thread to DIN 40 430 (standard)
2) Pitch 1.5
* series T
** series BP

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:

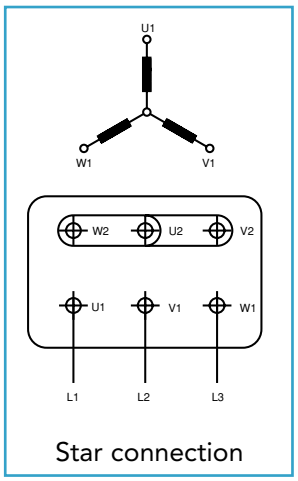
Iph = In ; Uph = Un / √3

where In is the line current and Un the line voltage referred to the star connection.

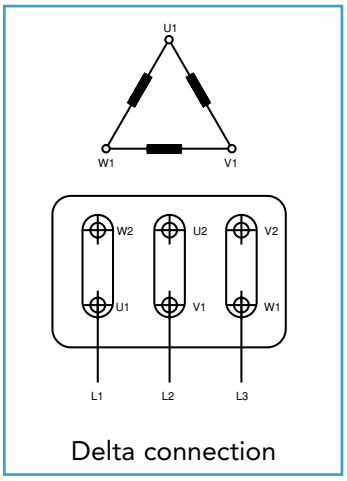
DELTA CONNECTION
A delta connection is obtained by connecting the end of a phase to the beginning of the next phase.
The phase current Iph and the phase voltage Uph are:

Iph = In / √3 ; Uph = Un

where In and Un 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.

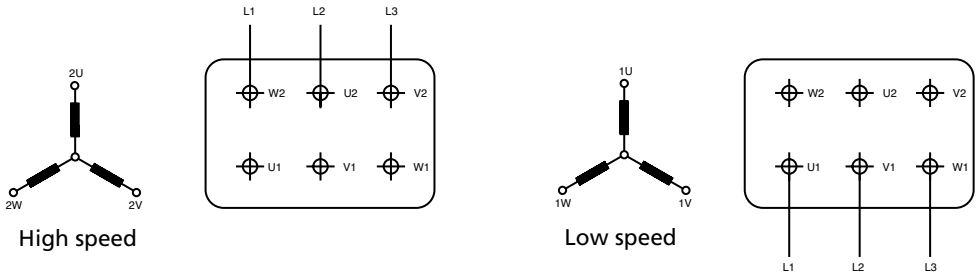
All motors can be supplied with windings designed for star-delta starting (for example: 400 V Δ / 690 V Y).

POLE-CHANGING MOTORS

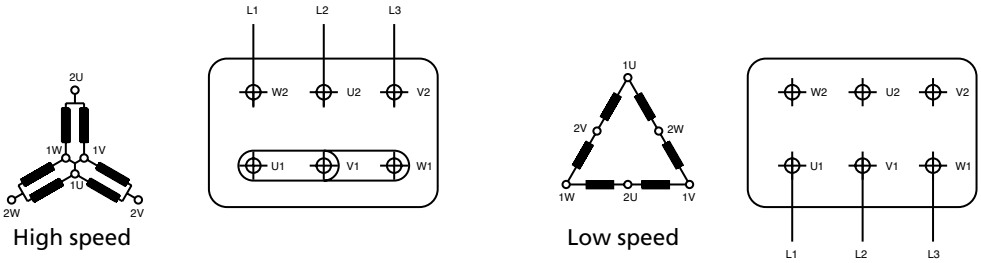
Standard pole-changing motors are designed for single voltage and direct-on-line starting special design for Y-Δ-connection on request).

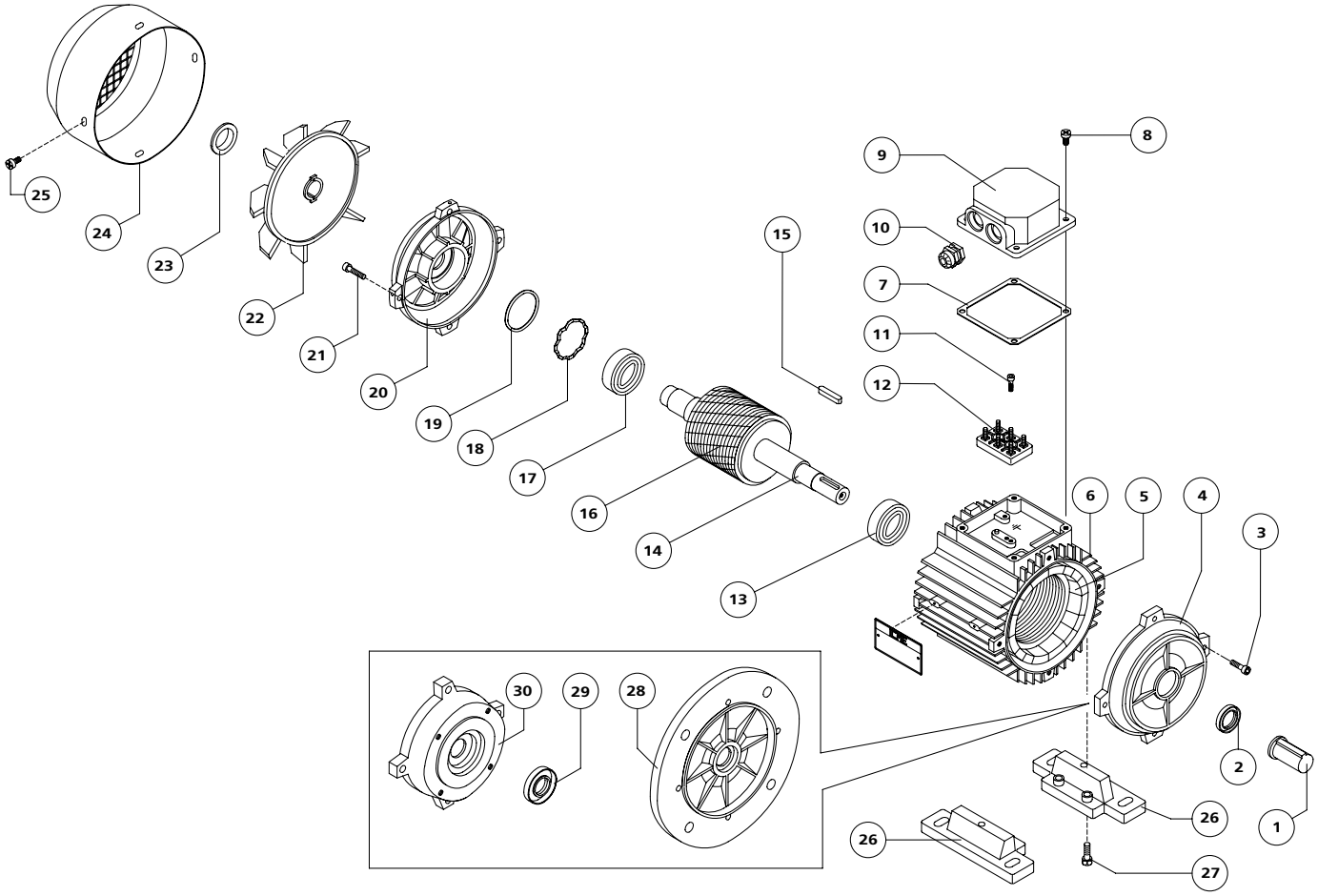
When the ratio between the two speeds is from 1 to 2, the standard motors have one single winding (Dahlander connection). For the other speeds, the motors have two separate windings.

BP - two separate windings



BP - Dahlander connection Δ/YY





PART DESCRIPTION

1	Shaft protection
2	Drive end dust seal
3	Drive end endshield fixing screw
4	Drive end endshield
5	Stator
6	Stator frame
7	Terminal box gasket
8	Terminal box fixing screw
9	Terminal box
10	Cable gland
11	Terminal board fixing screw
12	Terminal board
13	Drive end bearing
14	Motor shaft
15	Hub key
16	Rotor assembly
17	Non-drive end bearing
18	Non-drive end pre-load washer
19	Non-drive end shim ring
20	Non-drive end endshield
21	Non-drive end endshield fixing screw
22	Fan
23	Fan clamp
24	Fan cowl
25	Fan cowl fixing screw
26	Feet
27	Feet fixing bolt
28	Flange B5
29	Seal ring
30	Flange B14

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

PREMIUM EFFICIENCY THREE-PHASE MOTORS – IE3

EFFICIENCY LEVEL ACCORDING TO IEC 60034-30-1:2014
EFFICIENCY TESTING METHOD IEC 60034-2-1;2007

FOR MAINS VOLTAGE
400 V - 50 HZ

IE3

PROTECTION IP 55

Type	Rated output		Rated speed	Rated torque	Efficiency			Power factor	Rated current	Starting current ratio	Starting torque ratio	Pull-up torque ratio	Moment of inertia	Weight
					IE3 η									
	kW	HP	min^{-1}	M_N (Nm)	50%	75%	100%	cos φ	I_N 400 V	I_A/I_N	M_A/M_N	M_K/M_N	J 10^{-3} kgm²	kg
3000 min^{-1} (2 poles)														
TPE 80 A2	0.75	1.0	2880	2.5	80.5	81.9	82.0	0.82	1.6	5.7	3.2	3.4	1.53	9.5
TPE 80 B2	1.1	1.5	2910	3.6	83.4	83.7	84.0	0.82	2.3	6.8	4.2	4.3	1.73	10.5
TPE 90S A2	1.5	2.0	2880	5.0	84.2	84.7	85.2	0.85	3.0	7.2	4.5	4.6	2.48	14.3
TPE 90L B2	2.2	3.0	2880	7.3	85.1	85.4	85.9	0.84	4.0	8.2	4.8	4.7	3.10	17.4
TPE 100L A2	3.0	4.0	2900	9.9	86.8	87.0	87.4	0.84	5.9	8.6	5.1	5.0	8.61	26.4
TPE 112M A2	4.0	5.5	2900	13.2	87.5	87.8	88.1	0.84	7.8	9.1	6.1	6.2	12.84	31.7
1500 min^{-1} (4 poles)														
TPE 80 B4	0.75	1.0	1432	5.0	79.1	82.4	83.0	0.76	1.7	5.4	2.8	3.0	2.53	11.9
TPE 90S A4	1.1	1.5	1420	7.4	83.3	84.0	84.2	0.79	2.4	5.9	4.0	4.2	3.24	14.9
TPE 90L B4	1.5	2.0	1430	10.0	84.3	85.0	85.4	0.78	3.2	6.2	3.9	3.8	4.25	17.0
TPE 100L A4	2.2	3.0	1440	14.4	85.8	86.0	86.7	0.81	4.5	6.7	3.5	3.7	8.35	27.2
TPE 100L B4	3.0	4.0	1440	19.9	87.2	87.5	87.9	0.80	6.1	6.8	4.1	4.3	17.0	31.3
TPE 112M A4	4.0	5.5	1440	26.5	87.7	88.0	88.6	0.82	7.9	6.9	4.3	4.5	17.60	32.3

FOR MAINS VOLTAGE
400 V - 50 HZ

IE2

PROTECTION IP 55

Type	Rated output		Rated speed	Rated torque	Efficiency			Power factor	Rated current	Starting current ratio	Starting torque ratio	Pull-out torque ratio	Moment of inertia	Weight
					IE2 η									
	kW	HP	min^{-1}	M_N (Nm)	50%	75%	100%	cos φ	I_N 400 V	I_A/I_N	M_A/M_N	M_K/M_N	J 10^{-3} kgm^2	kg
3000 min^{-1} (2 poles)														
THE 71 C2	0.75	1.0	2875	2.4	75.0	77.5	78.0	0.81	1.7	5.5	3.0	3.2	1.00	9.0
THE 80 A2	0.75	1.0	2880	2.4	75.6	77.8	78.1	0.81	1.7	5.7	3.2	3.4	1.53	9.5
THE 80 B2	1.1	1.5	2850	3.6	77.5	79.5	80.2	0.82	2.4	6.8	4.2	4.3	1.73	10.5
THE 80 C2	1.5	2.0	2850	5.0	79.0	81.1	81.7	0.82	3.2	6.9	4.1	4.2	2.01	11.5
THE 80 D2	2.2	3.0	2860	7.3	79.9	82.9	83.2	0.83	4.6	7.1	4.2	4.1	2.19	12.3
THE 90S A2	1.5	2.0	2880	4.9	79.3	82.3	82.2	0.85	3.1	7.2	4.5	4.6	2.48	14.3
THE 90L B2	2.2	3.0	2890	7.2	80.1	83.1	83.2	0.83	4.6	8.2	4.8	4.7	3.10	17.4
THE 100L A2	3.0	4.0	2890	9.7	82.2	86.1	86.3	0.85	5.9	8.6	5.1	5.0	8.61	26.4
THE 112M A2	4.0	5.5	2920	13.0	83.5	86.6	86.9	0.85	7.8	9.1	6.1	6.2	12.84	31.7
THE 132S A2	5.5	7.5	2900	18.1	86.0	88.0	87.9	0.89	10.2	7.3	2.7	3.2	14.00	46.0
THE 132S A2	7.5	10	2900	24.7	86.3	88.6	88.4	0.89	13.8	7.5	2.8	3.3	16.00	53.0
1500 min^{-1} (4 poles)														
THE 80 B4	0.75	1.0	1430	5.0	79.1	80.2	80.3	0.71	1.9	5.4	2.8	3.0	2.53	11.9
THE 90S A4	1.1	1.5	1420	7.4	80.5	82.3	82.4	0.77	2.5	5.9	4.0	4.2	3.24	14.9
THE 90L B4	1.5	2.0	1430	10.0	81.2	83.9	83.8	0.76	3.4	6.2	3.9	3.8	4.25	17.0
THE 100L A4	2.2	3.0	1440	14.4	82.1	85.5	85.5	0.79	4.7	6.7	3.5	3.7	8.35	27.2
THE 100L B4	3.0	4.0	1440	19.9	85.3	86.6	86.4	0.77	6.5	6.3	3.4	3.6	7.30	26.5
THE 112M A4	4.0	5.5	1450	26.4	86.4	87.3	87.3	0.79	8.4	6.9	4.3	4.5	17.60	32.3
THE 132S A4	5.5	7.5	1450	36.2	87.5	88.3	88.1	0.84	10.8	7.4	3.0	3.3	30.00	55.0
THE 132M A4	7.5	10	1450	49.4	88.5	89.4	89.2	0.85	14.4	7.4	3.0	3.3	36.00	65.0

STANDARD EFFICIENCY THREE-PHASE MOTORS – IE1

EFFICIENCY LEVEL ACCORDING TO IEC 60034-30-1:2014
EFFICIENCY TESTING METHOD IEC 60034-2-1;2007

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

FOR MAINS VOLTAGE
400 V - 50 HZ

IE1

PROTECTION IP 55

Type	Rated output	Rated speed	Rated torque	Efficiency	Power factor	Rated current	Starting current ratio	Starting torque ratio	Pull-out torque ratio	Moment of inertia	Weight
	kW	min^{-1}	M_N (Nm)	η 100%	cos φ	I_N 400V(A)	I_A/I_N	M_A/M_N	M_K/M_N	J 10^{-3} kgm^2	kg
3000 min^{-1} (2 poles)											
T 56 B2	0.12	2720	0.42	56	0.77	0.40	3.0	2.7	3.0	0.09	3.5
T 63 A2	0.18	2740	0.63	56	0.78	0.60	3.5	2.7	3.0	0.13	4.1
T 63 B2	0.25	2770	0.86	66	0.78	0.70	4.5	3.2	3.0	0.19	4.6
T 63 C2	0.37	2820	1.25	69	0.71	1.09	4.5	3.2	3.0	0.38	5.9
T 71 A2	0.37	2820	1.25	68	0.69	1.15	4.6	3.6	3.7	0.36	5.7
T 71 B2	0.55	2820	1.86	71	0.70	1.60	4.7	3.6	3.5	0.46	6.3
T 80 A2	0.75	2830	2.53	76	0.75	1.90	5.7	3.6	3.6	0.77	9.0
T 80 B2	1.10	2840	3.70	77	0.79	2.60	6.5	3.7	3.8	0.91	10.5
T 90S A2	1.50	2850	5.03	79	0.81	3.40	5.8	2.7	3.1	1.15	13.0
T 90L B2	2.20	2860	7.34	80	0.79	5.00	6.9	3.9	4.0	1.80	15.0
T 100L A2	3.00	2850	10.00	82	0.86	6.15	6.2	2.8	3.1	3.25	19.6
T 112M A2	4.00	2910	13.13	85	0.83	8.20	7.8	2.9	3.0	6.20	36.0
T 132S A2	5.50	2910	18.04	85	0.80	11.70	6.5	2.9	3.3	13.10	45.0
T 132M B2	7.50	2930	24.40	86	0.85	14.80	7.0	3.2	3.4	17.50	50.0
1500 min^{-1} (4 poles)											
T 56 B4	0.09	1360	0.63	53	0.60	0.41	2.4	2.6	2.7	0.14	3.4
T 63 A4	0.12	1350	0.85	54	0.69	0.46	2.4	2.0	2.0	0.25	4.1
T 63 B4	0.18	1350	1.27	53	0.70	0.70	2.3	2.0	2.0	0.31	4.6
T 63 C4	0.25	1370	1.74	55	0.71	0.92	3.4	2.0	2.1	0.34	4.9
T 71 A4	0.25	1370	1.74	67	0.77	0.69	3.4	2.0	2.1	0.54	5.1
T 71 B4	0.37	1380	2.56	68	0.67	1.18	4.0	2.2	2.3	0.76	6.3
T 71 C4	0.55	1380	3.80	69	0.72	1.60	4.0	2.2	2.3	0.79	6.5
T 80 A4	0.55	1380	3.80	72	0.80	1.38	3.9	1.9	2.2	1.47	9.0
T 80 B4	0.75	1390	5.15	73	0.75	1.97	3.9	2.6	2.2	1.90	9.9
T 90S A4	1.10	1410	7.45	79	0.77	2.60	4.6	2.3	2.6	2.75	11.8
T 90L B4	1.50	1410	10.16	79	0.76	3.60	4.8	2.4	2.6	3.20	14.3
T 90L C4	1.80	1410	12.20	79	0.73	4.50	5.2	3.1	3.1	3.72	15.5
T 100L A4	2.20	1410	14.90	80	0.78	5.10	4.8	2.4	2.6	4.93	18.7
T 100L B4	3.00	1410	18.04	82	0.80	6.60	6.5	2.9	3.3	5.97	21.0
T 112M A4	4.00	1430	26.40	84	0.76	9.00	6.6	3.1	3.6	10.56	36.0
T 132S A4	5.50	1450	36.20	87	0.77	11.90	5.4	2.3	2.6	19.40	45.0
T 132M B4	7.50	1450	49.40	87	0.78	16.00	6.3	2.8	3.0	28.60	55.0

STANDARD EFFICIENCY THREE-PHASE MOTORS – IE1

EFFICIENCY LEVEL ACCORDING TO IEC 60034-30-1:2014
EFFICIENCY TESTING METHOD IEC 60034-2-1;2007

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

FOR MAINS VOLTAGE
400 V - 50 HZ

IE1

PROTECTION IP 55

Type	Rated output	Rated speed	Rated torque	Efficiency	Power factor	Rated current	Starting current ratio	Starting torque ratio	Pull-out torque ratio	Moment of inertia	Weight
	kW	min^{-1}	M_N (Nm)	η 100%	$cos\ \varphi$	I_N 400V(A)	I_A/I_N	M_A/M_N	M_K/M_N	J 10^{-3} kgm^2	kg
1000 min^{-1} (6 poles)											
T 56 B6	0.06	780	0.73	40	0.65	0.33	1.3	1.3	1.8	0.23	3.5
T 63 A6	0.09	890	0.96	40	0.49	0.67	1.7	2.5	2.5	0.30	4.1
T 63 B6	0.12	870	1.32	45	0.55	0.70	1.8	1.3	2.0	0.40	4.6
T 71 A6	0.18	850	2.00	51	0.73	0.70	2.1	1.4	2.1	0.60	5.7
T 71 B6	0.25	870	2.74	53	0.68	1.00	2.7	2.2	2.1	0.90	6.3
T 80 A6	0.37	880	4.00	56	0.71	1.35	2.7	2.2	2.1	1.32	8.8
T 80 B6	0.55	900	5.83	65	0.70	1.74	3.0	2.0	2.1	1.78	10.5
T 90S A6	0.75	910	7.87	70	0.72	2.15	3.7	2.2	2.1	2.80	13.0
T 90L B6	1.10	900	11.67	73	0.70	3.10	3.1	1.9	2.0	3.50	16.5
T 100L A6	1.50	935	15.30	76	0.70	4.09	4.2	2.1	2.5	6.40	21.0
T 100L B6	1.80	935	18.40	76	0.70	4.90	4.4	2.3	2.5	7.90	30.2
T 112M A6	2.20	945	22.23	79	0.64	6.30	4.6	2.7	2.7	11.00	40.0
T 132S A6	3.00	960	29.84	84	0.67	7.70	5.4	2.5	2.4	20.00	45.0
T 132M B6	5.50	950	55.30	85	0.72	12.97	5.8	2.1	3.1	35.00	60.0
EFFICIENCY TESTING METHOD IEC 600034-2;1996											
750 min^{-1} (8 poles)											
T 63 B8	0.08	630	1.21	45	0.53	0.48	1.3	1.3	1.8	0.40	4.6
T 71 B8	0.12	670	1.71	49	0.51	0.69	2.4	2.5	2.9	0.90	6.3
T 80 A8	0.18	670	2.56	47	0.60	0.92	2.1	1.8	2.0	1.32	9.0
T 80 B8	0.25	680	3.50	50	0.56	1.28	2.3	1.9	2.1	1.78	9.5
T 90S A8	0.37	670	5.30	61	0.62	1.40	2.5	1.7	2.2	2.80	13.0
T 90L B8	0.55	670	7.84	62	0.58	2.20	2.5	1.6	2.1	3.50	15.3
T 100L A8	0.75	690	10.40	67	0.65	2.50	2.9	1.7	1.9	6.40	20.0
T 100L B8	1.10	690	15.20	68	0.60	3.90	2.9	1.8	2.0	7.90	22.3
T 112M B8	1.50	710	20.20	76	0.63	4.50	3.9	1.7	2.4	11.00	36.0
T 132S A8	2.20	710	29.60	73	0.64	6.80	4.5	1.6	2.0	20.00	45.0
T 132M B8	3.00	705	40.60	80	0.70	7.70	5.2	1.5	2.2	35.00	55.0

FOR MAINS VOLTAGE
400 V - 50 HZ

PROTECTION IP 54

Type	Rated output	Rated speed	Rated torque	Efficiency	Power factor	Rated current	Starting current ratio	Starting torque ratio	Pull-out torque ratio	Moment of inertia	Weight
	kW	min^{-1}	M_N (Nm)	η 100%	$cos\ \varphi$	I_N 400V(A)	I_A/I_N	M_A/M_N	M_A/M_N	J 10^{-3} kgm^2	kg
3000/1500 min^{-1} (2/4 poles) - Dahlander connection Δ/YY											
BP 63 A2/4	0.16/0.11	2700/1270	0.55/0.83	57/53	0.72/0.65	0.56/0.46	2.4/2.6	1.3/1.6	1.7/1.4	0.25	4.1
BP 63 B2/4	0.22/0.15	2710/1280	0.77/1.12	58/55	0.78/0.68	0.70/0.58	3.3/3.5	2.2/2.5	2.5/3.0	0.31	4.6
BP 71 A2/4	0.30/0.20	2750/1330	1.04/1.43	60/57	0.80/0.70	0.90/0.72	3.1/3.3	2.2/2.0	2.4/2.9	0.54	5.1
BP 71 B2/4	0.45/0.30	2780/1350	1.54/2.12	63/59	0.79/0.69	1.30/1.06	3.4/3.3	2.1/2.4	2.3/2.7	0.76	6.3
BP 80 A2/4	0.60/0.45	2800/1380	2.05/3.11	64/67	0.76/0.65	1.78/1.49	3.2/3.4	2.3/2.5	2.2/2.4	1.47	9.0
BP 80 B2/4	0.80/0.60	2820/1390	2.71/4.12	65/70	0.80/0.71	2.2271.74	3.4/3.6	2.5/2.6	2.6/2.8	1.90	9.9
BP 90S A2/4	1.40/1.00	2830/1400	4.73/6.82	68/70	0.81/0.72	3.66/2.86	3.5/3.6	2.4/2.3	2.7/2.9	2.75	11.8
BP 90L B2/4	1.80/1.25	2830/1390	6.07/8.58	71/73	0.80/0.73	4.57/3.38	3.5/3.4	2.3/2.2	2.7/2.8	3.72	15.5
BP 100L A2/4	2.50/1.80	2860/1410	8.35/12.19	73/74	0.83/0.74	5.95/4.74	4.3/4.2	2.4/2.2	2.6/2.5	4.93	18.7
BP 100L B2/4	3.30/2.60	2880/1400	10.94/17.73	75/77	0.82/0.71	7.74/6.86	4.5/4.4	2.1/2.3	2.7/2.6	5.97	21.0
BP 112M A2/4	4.40/3.30	2900/1410	14.48/22.35	75/79	0.84/0.74	10.08/8.14	5.6/5.5	2.2/2.3	2.8/2.5	10.56	36.0
BP 132S A2/4	5.50/4.50	2910/1400	18.05/30.69	77/81	0.82/0.72	12.57/11.14	6.3/6.5	2.4/2.5	2.6/2.4	19.40	45.0
BP 132M B2/4	7.50/6.00	2920/1405	24.53/40.78	78/80	0.85/0.73	16.32/14.83	6.5/7.0	2.2/2.5	2.8/2.6	28.60	55.0
1500/750 min^{-1} (4/8 poles) - Dahlander connection Δ/YY											
BP 63 A4/8	0.09/0.04	1280/620	0.67/0.62	54/40	0.76/0.60	0.32/0.24	2.1/2.0	1.3/1.6	1.7/1.4	0.31	4.6
BP 71 B4/8	0.15/0.09	1305/610	1.09/1.40	56/40	0.75/0.61	0.52/0.53	2.4/2.6	2.2/2.5	2.5/3.0	0.54	5.1
BP 80 A4/8	0.37/0.20	1320/630	2.67/3.03	59/42	0.76/0.63	1.20/1.09	2.6/2.7	2.2/2.0	2.4/2.9	1.47	9.0
BP 80 B4/8	0.55/0.30	1350/650	3.89/4.41	60/45	0.78/0.64	1.69/1.50	2.7/2.5	2.1/2.4	2.3/2.7	1.90	9.9
BP 90S A4/8	0.75/0.37	1380/670	5.19/5.27	65/53	0.79/0.66	2.10/1.53	3.0/3.2	2.3/2.5	2.2/2.4	2.75	11.8
BP 90L B4/8	0.90/0.50	1400/680	6.14/7.02	68/56	0.80/0.68	2.39/1.89	3.0/3.3	2.5/2.6	2.6/2.8	3.72	15.5
BP 100L A4/8	1.40/0.70	1405/685	9.52/9.76	73/60	0.79/0.65	3.50/2.59	3.5/3.6	2.4/2.3	2.7/2.9	6.40	18.7
BP 100L B4/8	1.60/0.90	1410/690	10.84/12.46	75/64	0.81/0.68	3.80/2.98	3.5/3.4	2.3/2.2	2.7/2.8	7.90	21.0
BP 112M A4/8	1.70/1.00	1420/700	11.43/13.64	77/67	0.79/0.66	4.03/3.26	3.9/3.6	2.4/2.2	2.6/2.5	11.00	36.0
BP 112M A4/8	2.20/1.30	1410/690	14.90/18.00	78/69	0.77/0.64	5.29/4.25	4.6/4.0	2.1/2.3	2.7/2.6	13.54	39.0
BP 132S A4/8	3.70/2.20	1430/690	24.70/30.45	77/66	0.78/0.68	8.89/7.08	5.0/4.2	2.2/2.3	2.8/2.5	20.10	45.0
BP 132M B4/8	4.70/2.80	1445/710	31.06/37.66	80/72	0.82/0.64	10.34/8.77	5.2/4.4	2.4/2.5	2.6/2.4	35.00	55.0

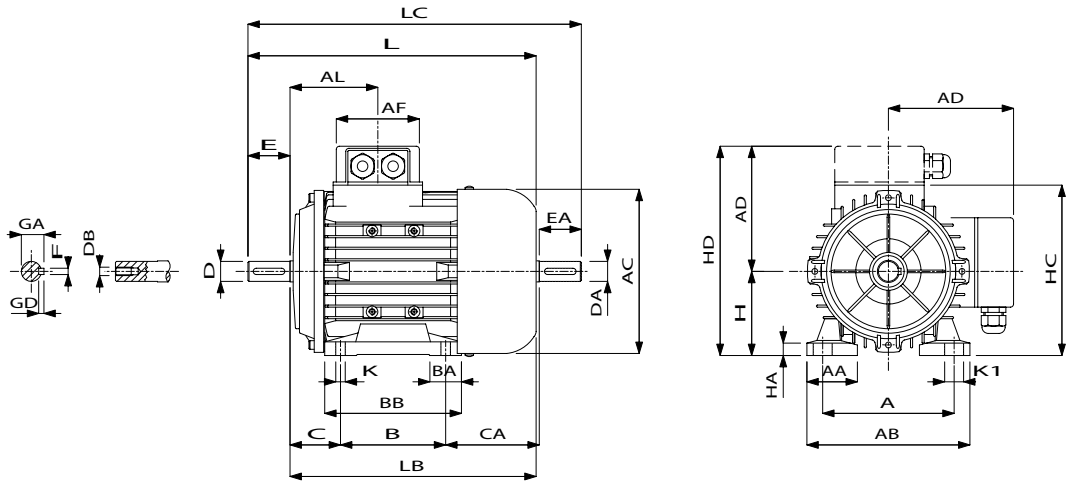
FOR MAINS VOLTAGE
400 V - 50 HZ

PROTECTION IP 54

Type	Rated output	Rated speed	Rated torque	Efficiency	Power factor	Rated current	Starting current ratio	Starting torque ratio	Pull-out torque ratio	Moment of inertia	Weight
	kW	min^{-1}	M_N (Nm)	η 100%	$cos\ \varphi$	I_N 400V(A)	I_A/I_N	M_A/M_N	M_A/M_N	J 10^{-3} kgm^2	kg
1500/1000 min^{-1} (4/6 poles) - separate windings											
BP 63 A4/6	0.18/0.04	1320/840	1.30/0.45	54/52	0.70/0.64	0.68/0.17	2.1/1.8	2.4/1.5	2.3/1.6	0.31	4.6
BP 71 B4/6	0.22/0.15	1360/860	1.54/1.66	63/55	0.73/0.65	0.69/0.61	2.3/1.9	2.3/1.6	2.2/1.5	0.76	5.1
BP 80 A4/6	0.37/0.26	1380/870	2.56/2.85	67/60	0.76/0.64	1.05/0.98	2.4/2.0	2.4/1.7	2.5/1.7	1.47	9.0
BP 80 B4/6	0.55/0.45	1380/880	3.80/4.88	69/63	0.77/0.66	1.50/1.56	3.2/2.8	2.5/1.7	2.6/1.8	1.90	9.9
BP 90S A4/6	0.75/0.50	1400/905	5.12/5.27	73/65	0.78/0.65	1.90/1.70	3.4/3.0	2.6/1.7	2.7/2.0	2.75	11.8
BP 90L B4/6	1.10/0.75	1410/910	7.45/7.87	75/67	0.80/0.66	2.65/2.44	3.7/3.2	2.5/1.6	2.8/2.2	3.72	15.5
BP 100L A4/6	1.50/0.90	1405/900	10.19/9.54	77/71	0.79/0.67	3.56/2.73	4.1/3.8	2.7/1.7	2.6/2.3	7.90	18.7
BP 112M A4/6	1.80/1.30	1420/910	12.10/13.64	80/74	0.81/0.68	4.00/3.73	4.4/4.0	2.9/1.8	2.8/2.5	11.00	36.0
BP 112M B4/6	2.60/1.80	1430/915	17.36/18.78	81/74	0.79/0.69	5.86/5.09	5.5/4.4	3.0/2.0	3.0/2.6	13.54	39.0
BP 132S A4/6	4.00/2.60	1425/920	26.80/26.98	80/75	0.80/0.68	9.02/7.36	5.7/4.8	3.2/2.2	3.1/2.7	20.00	45.0
BP 132M B4/6	5.50/3.70	1435/930	36.60/37.99	82/76	0.81/0.67	11.95/10.49	5.6/4.4	3.1/2.1	3.2/2.8	35.00	55.0
1000/750 min^{-1} (6/8 poles) - separate windings											
BP 63 A6/8	0.07/0.037	840/600	0.79/0.59	52/46	0.64/0.55	0.30/0.21	2.1/1.8	2.0/1.5	1.4/1.3	0.31	4.6
BP 71 B6/8	0.18/0.09	845/620	2.03/1.38	54/48	0.65/0.56	0.74/0.48	2.3/1.9	2.1/1.6	1.6/1.5	0.76	5.1
BP 80 A6/8	0.25/0.18	860/640	2.77/2.68	58/53	0.66/0.55	0.94/0.89	2.7/2.5	2.2/1.6	1.7/1.8	1.90	9.0
BP 90S A6/8	0.37/0.25	870/660	4.06/3.62	63/56	0.67/0.56	1.26/1.15	3.2/2.8	2.3/1.7	2.2/.2.1	2.75	11.8
BP 90L B6/8	0.55/0.37	890/680	5.90/5.20	67/59	0.67/0.55	1.77/1.65	3.5/3.1	2.4/1.8	2.3/2.1	3.72	15.5
BP 100L B6/8	0.75/0.55	900/670	7.96/7.84	73/63	0.66/0.57	2.25/2.21	3.8/3.3	2.6/1.9	2.5/2.2	7.90	18.7
BP 112M B6/8	1.10/0.75	905/690	11.60/10.38	76/67	0.68/0.56	3.07/2.88	4.6/4.2	2.4/2.0	2.3/2.5	11.00	36.0
BP 132S A6/8	1.50/1.10	910/700	15.74/15.00	79/70	0.70/0.61	3.92/3.72	5.5/4.4	2.6/2.3	3.0/2.8	20.00	45.0
BP 132M B6/8	2.20/1.50	920/700	22.84/20.46	80/73	0.72/0.63	5.51/4.71	5.5/4.6	2.4/2.1	3.1/2.7	35.00	55.0
3000/750 min^{-1} (2/8 poles) - separate windings											
BP 63 A2/8	0.18/0.06	2760/600	0.62/0.95	56/40	0.78/0.60	0.59/0.36	2.1/1.8	2.4/1.5	2.3/1.6	0.31	4.6
BP 71 B2/8	0.30/0.09	2770/620	1.03/1.39	59/43	0.80/0.63	0.92/0.48	2.3/1.9	2.3/1.6	2.2/1.5	0.76	5.1
BP 80 A2/8	0.55/0.12	2800/640	1.87/1.79	64/47	0.81/0.62	1.53/0.59	2.4/2.0	2.4/1.7	2.5/1.7	1.90	9.0
BP 90S A2/8	0.75/0.18	2810/675	2.55/2.54	69/54	0.83/0.63	1.89/0.76	3.2/2.8	2.5/1.7	2.6/1.8	2.75	11.8
BP 90L B2/8	1.10/0.30	2810/680	3.74/4.21	74/56	0.82/0.61	2.62/1.26	3.4/3.0	2.6/1.7	2.7/2.0	3.72	15.5
BP 100L A2/8	1.50/0.37	2815/690	5.08/5.12	78/63	0.84/0.64	3.30/1.33	3.7/3.2	2.5/1.6	2.8/2.2	4.93	18.7
BP 100L B2/8	1.80/0.45	2810/680	6.12/6.32	80/65	0.83/0.63	3.91/1.59	4.1/3.8	2.7/1.7	2.6/2.3	5.97	21.0
BP 112M A2/8	2.20/0.55	2820/700	7.45/7.50	83/70	0.82/0.64	4.66/1.77	4.4/4.0	2.9/1.8	2.8/2.5	10.56	36.0
BP 132S A2/8	3.00/0.75	2825/710	10.14/10.09	84/71	0.85/0.66	6.06/2.31	5.5/4.4	3.0/2.0	3.0/2.6	19.40	45.0
BP 132M B2/8	4.00/1.10	2830/715	13.50/14.69	84/73	0.84/0.67	8.18/3.25	5.7/4.8	3.2/2.2	3.1/2.7	28.60	55.0

THREE-PHASE FRAME SIZE 56 - 132 IM B3
SERIES TPE - THE - T - BF

FOR MOTOR TYPE THE 71 C2 AND THE 80 D2 SEE PAGE 73



IEC	H	A	B	C	K [1]	AB	BB	CA	AD [2]	HD [2]	AC	HC	HA	K1
56	56	90	71	36	6	107	90	65	94	150	110	114	8	12
63	63	100	80	40	7	126	105	72	98	161	124	126	10	12
71	71	112	90	45	7	144	109	86	107	178	137	143	12	17
80	80	125	100	50	9	155	130	85	122	202	156	162	13	18
90S	90	140	100	56	9	184	130	98	129	219	176	182	14	18
90L	90	140	125	56	9	184	154	98	129	219	176	182	14	18
100L	100	160	140	63	12	200	176	105	140	240	195	200	14	20
100L*	100	160	140	63	12	200	176	141	140	240	195	200	14	20
112M	112	190	140	70	12	220	176	118	160	272	219	225	15	21
112M*	112	190	140	70	12	220	176	155.5	160	272	219	225	15	21
132S	132	216	140	89	12	260	178	143	177	309	258	261	16	21
132M	132	216	178	89	12	260	216	143	177	309	258	261	16	21

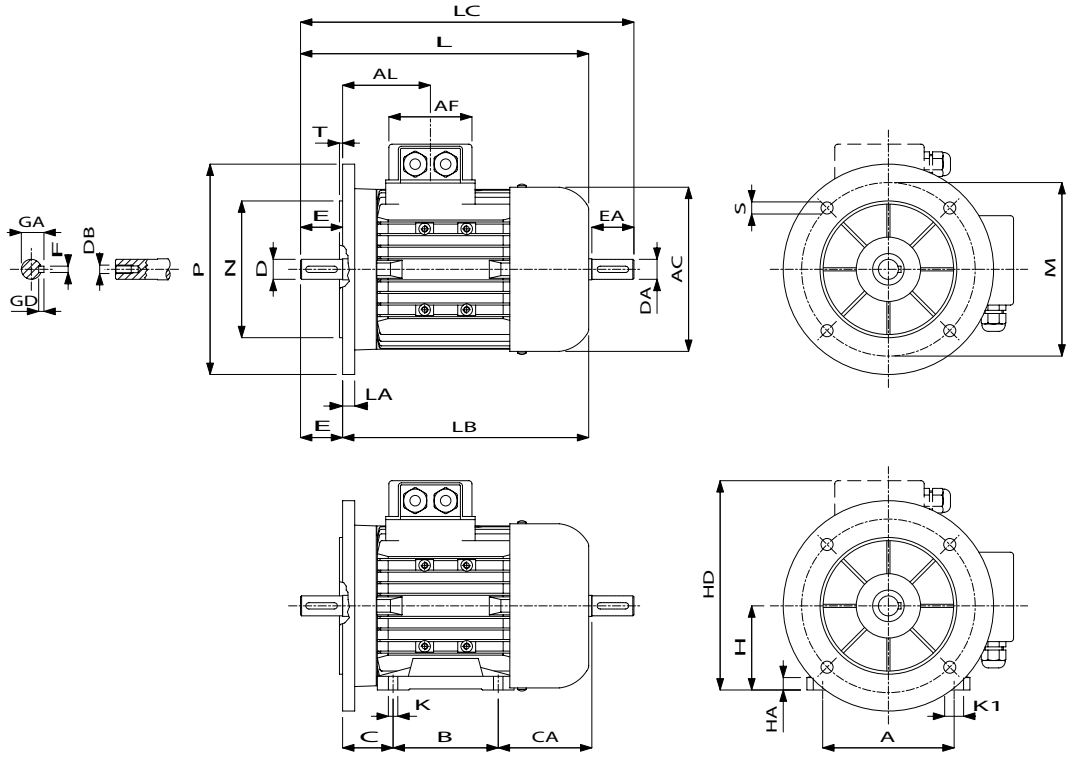
IEC	L	LB	LC	AL	AF	BA	AA	D/DA	E/EA	F/FA	GD	GA/GC	DB [3]
56	188	168	212	62	70	22	22	9	20	3	3	10.2	M4
63	211	191	238	66	70	26	26	11	23	4	4	12.5	M4
71	247	217	281	76	70	22	30	14	30	5	5	16	M5
80	275	235	315	85	84	31	32	19	40	6	6	21.5	M6
90S	302	252	354	86	84	32	39	24	50	8	7	27	M8
90L	326	276	378	86	84	32	39	24	50	8	7	27	M8
100L	366	306	429	96	84	40	42	28	60	8	7	31	M10
100L*	402.5	342.5	465.5	96	84	40	42	28	60	8	7	31	M10
112M	385	325	448	97	84	38	42	28	60	8	7	31	M10
112M*	422.5	362.5	485.5	97	84	38	42	28	60	8	7	31	M10
132S	449	369	532	117	92	44	58	38	80	10	8	41.5	M12
132M	487	407	570	117	92	44	58	38	80	10	8	41.5	M12

*TPE SERIES ONLY

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

THREE-PHASE FRAME SIZE 56 - 132 IM B5, IM B35
SERIES TPE - THE - T - BP

FOR MOTOR TYPE THE 71 C2 AND THE 80 D2 SEE PAGE 74



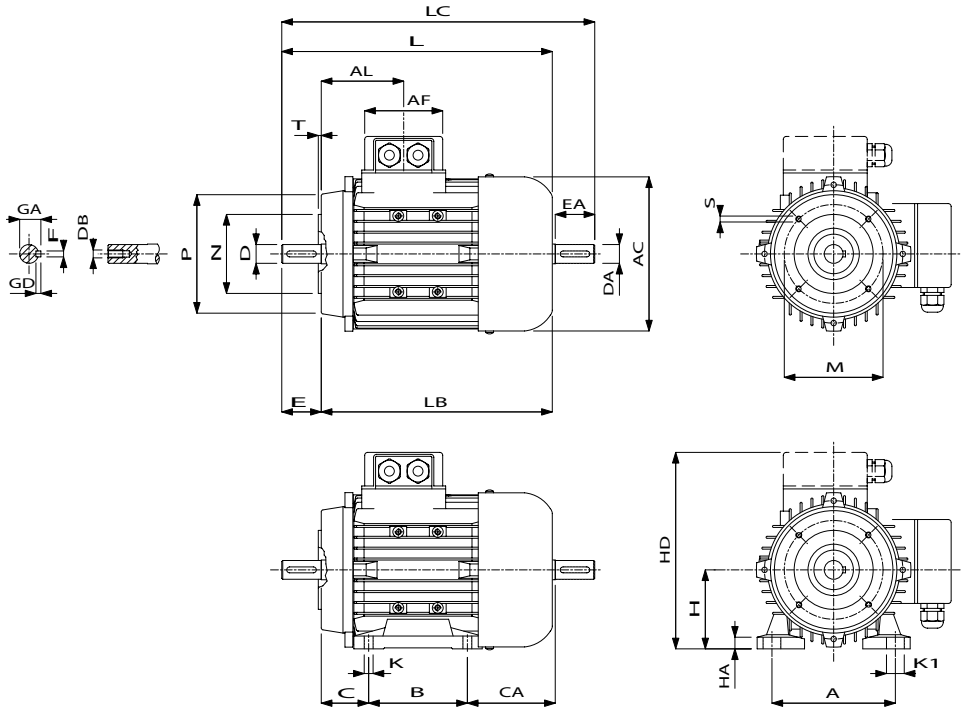
IEC	M	N	P	T	LA	S	H	A	B	C	K[1]	CA	HD[2]	AC
56	100	80	120	2.5	5.5	7.0	56	90	71	36	6	65	150	110
63	115	95	140	3.0	10	9.5	63	100	80	40	7	72	161	124
71	130	110	160	3.5	10	9.5	71	112	90	45	7	86	178	137
80	165	130	200	3.5	12	11.5	80	125	100	50	9	85	202	156
90S	165	130	200	3.5	12	11.5	90	140	100	56	9	98	219	176
90L	165	130	200	3.5	12	11.5	90	140	125	56	9	98	219	176
100L	215	180	250	4.0	14	14.0	100	160	140	63	12	105	240	195
100L*	215	180	250	4.0	14	14.0	100	160	140	63	12	141	240	195
112M	215	180	250	4.0	14	14.0	112	190	140	70	12	118	272	219
112M*	215	180	250	4.0	14	14.0	112	190	140	70	12	155.5	272	219
132S	265	230	300	4.0	14	14.0	132	216	140	89	12	143	309	258
132M	265	230	300	4.0	14	14.0	132	216	178	89	12	143	309	258

IEC	HA	K1	L	LB	LC	AL	AF	D/DA	E/EA	F/FA	GD	GA/GC	DB[3]
56	8	12	188	168	212	62	70	9	20	3	3	10.2	M4
63	10	12	211	191	238	66	70	11	23	4	4	12.5	M4
71	12	17	247	217	281	76	70	14	30	5	5	16	M5
80	13	18	275	235	315	85	84	19	40	6	6	21.5	M6
90S	14	18	302	252	354	86	84	24	50	8	8	27	M8
90L	14	18	326	276	378	86	84	24	50	8	8	27	M8
100L	14	20	366	306	429	96	84	28	60	8	8	31	M10
100L*	14	20	402.5	342.5	465.5	96	84	28	60	8	8	31	M10
112M	15	21	385	325	448	97	84	28	60	8	8	31	M10
112M*	15	21	422.5	362.5	485.5	97	84	28	60	8	8	31	M10
132S	16	21	449	369	532	117	92	38	80	8	10	41.5	M12
132M	16	21	487	407	570	117	92	38	80	8	10	41.5	M12

*TPE SERIES ONLY

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

THREE-PHASE FRAME SIZE 56 - 132 IM B14, IM B34
SERIES TPE - THE - T - BP

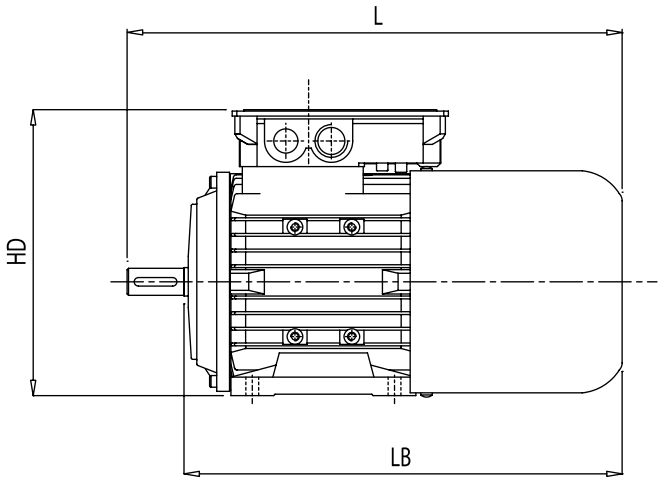


IEC	M	N	P	T	S	H	A	B	C	K[1]	CA	HD[2]	AC
56	65	50	80	2.5	M5	56	90	71	36	6	65	150	110
63	75	60	90	2.5	M5	63	100	80	40	7	72	161	124
71	85	70	105	2.5	M6	71	112	90	45	7	86	178	137
80	100	80	120	3.0	M6	80	125	100	50	9	85	202	156
90S	115	95	140	3.0	M8	90	140	100	56	9	98	219	176
90L	115	95	140	3.0	M8	90	140	125	56	9	98	219	176
100L	130	110	160	3.5	M8	100	160	140	63	12	105	240	195
100L*	130	110	160	3.5	M8	100	160	140	63	12	141	240	195
112M	130	110	160	3.5	M8	112	190	140	70	12	118	272	219
112M*	130	110	160	3.5	M8	112	190	140	70	12	155.5	272	219
132S	165	130	200	4.0	M10	132	216	140	89	12	143	309	258
132M	165	130	200	4.0	M10	132	216	178	89	12	143	309	258

IEC	HA	K1	L	LB	LC	AL	AF	D/DA	E/EA	F/FA	GD	GA/GC	DB[3]
56	8	12	188	168	212	62	70	9	20	3	3	10.2	M4
63	10	12	211	191	238	66	70	11	23	4	4	12.5	M4
71	12	17	247	217	281	76	70	14	30	5	5	16	M5
80	13	18	275	235	315	85	84	19	40	6	6	21.5	M6
90S	14	18	302	252	354	86	84	24	50	8	8	27	M8
90L	14	18	326	276	378	86	84	24	50	8	8	27	M8
100L	14	20	366	306	429	96	84	28	60	8	8	31	M10
100L*	14	20	402.5	342.5	365.5	96	84	28	60	8	8	31	M10
112M	15	21	385	325	448	97	84	28	60	8	8	31	M10
112M*	15	21	422.5	362.5	485.5	97	84	28	60	8	8	31	M10
132S	16	21	449	369	532	117	92	38	80	8	10	41.5	M12
132M	16	21	487	407	570	117	92	38	80	8	10	41.5	M12

*TPE SERIES ONLY

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



ELECTRICAL DATA

Frame size	Fan	W	V	A	MC/h	dB/A	Hz
TSV 90 S/L	A2D 170	50	230/400	0.2/0.12	500	59	50/60
TSV 100 L	A2D 170	50	230/400	0.2/0.12	500	59	50/60
TSV 112 M	A2D 200	60	230/400	0.26/0.15	600	67	50/60
TSV 132 S/M	A2D 200	60	230/400	0.26/0.15	600	67	50/60

DIMENSIONS*

Frame size	L	LB
90 S **90 L**	392 416	342 366
100 L	452	392
112 M	476	416
132 S **132 M**	539 577	459 497

Note
Data omitted are identical to those of the corresponding version (T)
* For dimensions of forced ventilated motors, refer to page 42

SINGLE-PHASE MOTORS

TERMINAL BOX

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

All motors 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.

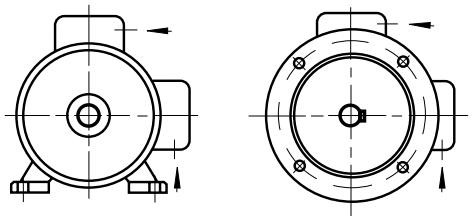
The position of the entry openings can be adjusted to suit the existing connection facilities by turning through 90°. Should special accessories be used (temperature detectors, anti-condensation heating, etc.) please enquire.

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

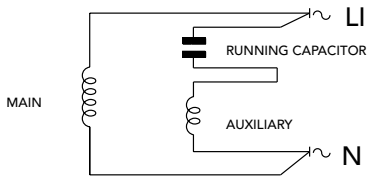


Frame size	Degree of protection	Thread for cable entry		Max. cable section	Terminal thread	Max. external cable diam.
		Pg [1]	Metric [2]	mm²		mm
56 - 71	IP 54	2 x Pg 11	1 x M20	2.5	M4	12
80 - 100	IP 54	1 x Pg 13.5/1 x Pg 16	1 x M25	2.5	M4	16

1) Pg thread to DIN 40 430 (standard)
2) Pitch 1.5

Single-phase motors are designed for a single rated voltage. The windings (running and starting winding) are connected to the capacitor supplied with the motor. The direction of rotation can be reversed by inverting the winding ends.

SERIES M



RUNNING CAPACITORS

The supplied capacitors are according to the following operating classes (refer to the marking on the capacitor case):

Operating classes and climatic categories IEC/EN 60252-1
Operating classes of capacitors for single-phase motors refer to EN 60252-1 Standards (June 2002) and are identified as follows:

a) Life expectancy

	30.000h Class a	10.000h Class B	3000h Class C	1000h Class D
Failure % max	3%	3%	3%	3%

b) Cliamtic category

25	/	85	/	21
Min. permissible temperature		Max. permissible temperature		Damp heat days

c) Class of safety protection

P0	No safety protection
P1	Safety achievable by external means (fuse)
P2	With internal safety protect

Misapplication, such as exceeding the design limits, use for applications different from those indicated in the catalogue or use for applications inappropriate for the characteristics of the capacitor used, may result in failure of the capacitor or in expulsion of the capacitor element from the case.

Normal end of life failure is characterized by loss of capacitance increase in dissipation factor and/or permanent open circuit.

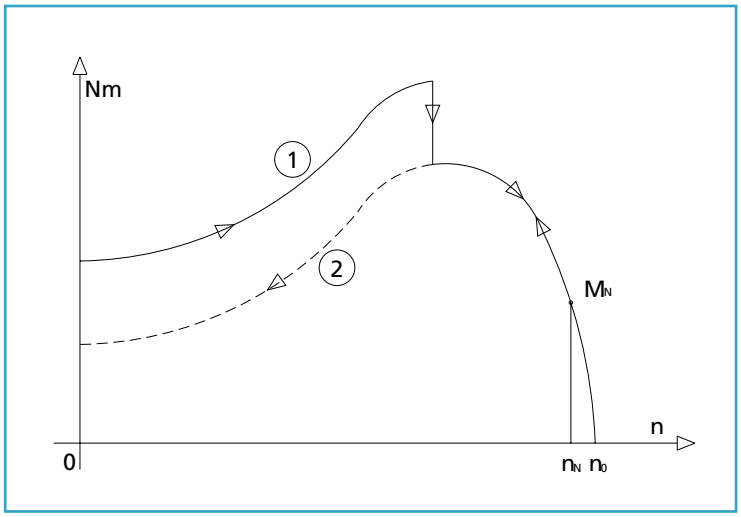
The user is therefore cautioned to provide whatever additional protection or enclosure necessary to avoid possible damage or injury in case of failure.

ELECTRONIC STARTING DEVICE (SE XX)

Single-phase motors with one single capacitor generally have lower starting torques than the full load torque. When higher starting torques are required, the motor is equipped with an additional starting electrolytic capacitor. It is connected by the electronic starting device (SE XX) in the moment of starting and disconnected automatically proximate to the pull-out torque (see figure). At this point the torque characteristic for the running capacitor (characteristic 2) applies again.

Characteristic 1 is not reversible. The starting capacitor is reconnected only when restarting the motor. In case of overload, characteristic 2 has to be applied.

Time between stop and restart of the motor must be higher than 15 s.



STARTING ELECTROLYTIC CAPACITORS

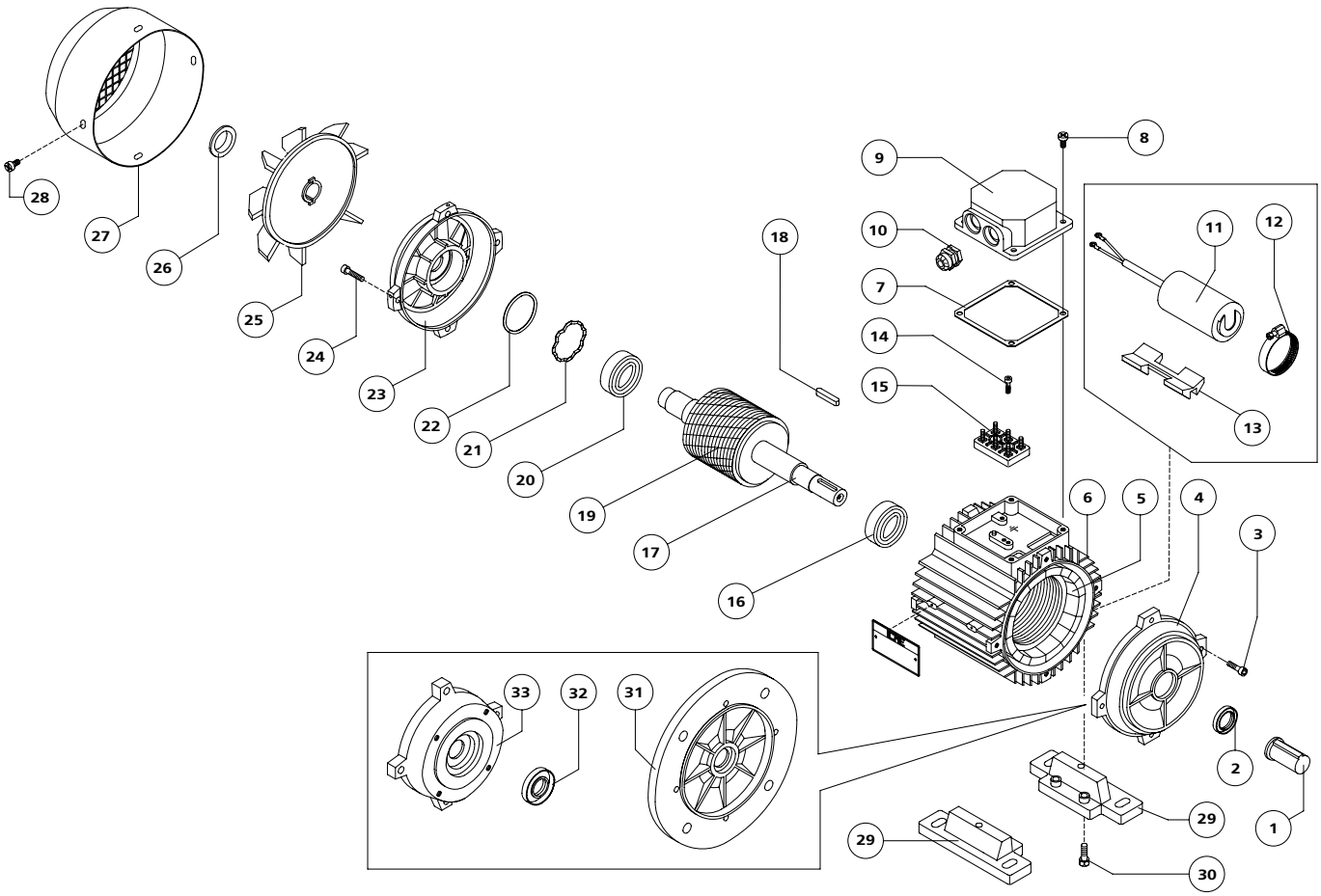
Electrolytic capacitors are normally employed in single-phase induction motors in order to increase the value of their starting torque. It is necessary that such starting should take place in a fraction of a second or at the most in a few seconds and with the contribution of an high reactive power.
Because of its reduced size, high capacitance value, the electrolytic capacitor is suitable for this type of application.

A typical duty cycle (refer to the marking on the nameplate) is the following:

3'/1.7%: 3s ON / 3min OFF

Misapplication, such as exceeding the design limits, use for applications different from those indicated in the catalogue or use for applications inappropriate for the characteristics of the capacitor used, may result in failure of the capacitor or in expulsion of the capacitor element from the case.

SPARE PARTS
SERIES M



PART DESCRIPTION

1	Shaft protection
2	Drive end dust seal
3	Drive end endshield fixing screw
4	Drive end endshield
5	Stator
6	Stator frame
7	Terminal box gasket
8	Terminal box fixing screw
9	Terminal box
10	Cable gland
11	Capacitor
12	Circle clamp
13	Cradle
14	Terminal board fixing screw
15	Terminal board
16	Drive end bearing
17	Motor shaft
18	Hub key
19	Rotor assembly
20	Non-drive end bearing
21	Non-drive end pre-load washer
22	Non-drive end shim ring
23	Non-drive end endshield
24	Non-drive end endshield fixing screw
25	Fan
26	Fan clamp
27	Fan cowl
28	Fan cowl fixing screw
29	Feet
30	Feet fixing bolt
31	Flange B5
32	Seal ring
33	Flange B14

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

FOR MAINS VOLTAGE
230 V - 50 HZ

PROTECTION IP 54

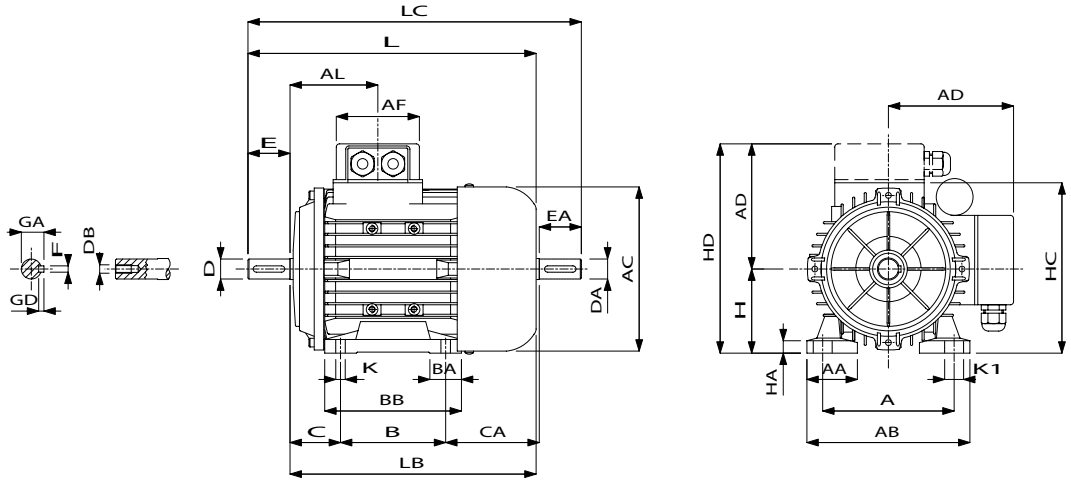
Type	Rated output	Rated speed	Rated torque	Efficiency	Power factor	Rated current	Starting current ratio	Starting torque ratio	Pull-out torque ratio	Running capacitor	Moment of inertia	Weight
	kW	min^{-1}	M_N (Nm)	η 100%	cos φ	I_N 230V(A)	I_A/I_N	M_A/M_N	M_K/M_N	C (µF)	J 10^{-3} kgm²	kg
3000 min^{-1} (2 poles)												
M 56 B2	0.12	2600	1.14	47.0	0.90	1.23	1.3	1.3	1.8	6.3	0.09	3.0
M 63 A2	0.18	2710	0.63	55.5	0.97	1.47	2.7	1.2	1.4	8.0	0.13	4.1
M 63 B2	0.25	2730	0.88	64.6	0.91	1.85	3.0	1.0	1.3	10.0	0.19	4.6
M 71 A2	0.37	2720	1.40	64.4	0.98	2.56	2.9	0.8	1.6	16.0	0.36	5.7
M 71 B2	0.55	2740	1.92	65.8	0.97	3.75	2.7	0.7	1.7	20.0	0.46	7.0
M 80 A2	0.75	2790	2.56	70.6	0.90	5.10	3.3	0.7	2.0	20.0	0.77	9.0
M 80 B2	1.10	2800	3.78	72.6	0.89	7.35	3.5	0.8	2.0	30.0	0.91	9.9
M 90S A2	1.50	2860	5.13	74.0	0.92	9.60	3.5	0.9	2.1	45.0	1.15	13.0
M 90L B2	1.85	2880	6.13	75.0	0.91	11.78	3.8	0.8	2.4	50.0	1.80	15.3
M 100L B2	2.20	2910	7.32	77.2	0.93	13.43	5.9	0.6	2.1	50.0	3.25	21.0
1500 min^{-1} (4 poles)												
M 56 B4	0.09	1100	0.76	45.0	0.91	0.95	1.5	0.7	1.2	8.0	0.14	3.5
M 63 A4	0.12	1370	0.84	46.0	0.85	1.32	2.0	1.3	1.4	8.0	0.25	4.1
M 63 B4	0.18	1290	1.33	47.4	0.85	2.00	1.8	0.8	1.2	8.0	0.31	4.1
M 71 A4	0.25	1340	1.78	53.4	0.90	2.26	2.2	0.7	1.5	12.5	0.54	5.5
M 71 B4	0.37	1370	2.57	60.4	0.87	3.00	2.7	0.8	1.6	16.0	0.76	6.3
M 80 A4	0.55	1370	3.82	65.9	0.97	3.70	3.1	0.8	1.4	20.0	1.47	9.0
M 80 B4	0.75	1390	5.14	67.4	0.89	5.40	3.2	0.7	1.7	25.0	1.90	10.3
M 90S A4	1.10	1353	7.59	67.2	0.95	7.23	3.0	0.7	1.6	35.0	2.75	13.0
M 90L B4	1.50	1380	10.44	68.0	0.95	10.10	2.7	0.9	1.7	40.0	3.20	15.5
M 100L A4	1.80	1380	12.60	71.2	0.95	11.74	3.2	0.7	1.8	50.0	4.93	23.0
M 100L B4	2.20	1410	15.24	72.6	0.88	15.16	3.2	0.6	2.1	60.0	5.97	24.0
1000 min^{-1} (6 poles)												
M 71 B6	0.18	840	2.04	48	0.87	1.87	2.7	0.8	1.6	12.5	0.90	6.3
M 80 A6	0.30	850	3.37	54	0.97	2.49	3.1	0.8	1.4	10.0	1.32	8.8
M 80 B6	0.37	870	4.06	56	0.89	3.23	3.2	0.7	1.7	16.0	1.78	10.5
M 90S A6	0.55	890	5.90	65	0.95	3.87	3.0	0.7	1.6	25.0	2.80	13.0
M 90L B6	0.75	890	8.05	67	0.95	5.12	2.7	0.9	1.7	25.0	3.50	16.5
M 100L A6	1.10	900	11.67	71	0.95	7.09	3.2	0.7	1.8	45.0	6.40	21.0
M 100L B6	1.50	910	15.74	73	0.88	10.15	3.2	0.6	2.1	50.0	7.90	30.2

FOR MAINS VOLTAGE
230 V - 50 HZ

PROTECTION IP 54

Type	Rated output	Rated speed	Rated torque	Efficiency	Power factor	Rated current	Starting current ratio	Starting torque ratio	Pull-out torque ratio	Running capacitor	Starting capacitor	Moment of inertia	Weight
	kW	min^{-1}	M_N (Nm)	η 100%	$\cos\varphi$	I_N 230V(A)	I_A/I_N	M_A/M_N	M_K/M_N	C (µF)	C (µF - 0+20%)	J 10^{-3} kgm^2	kg
3000 min^{-1} (2 poles)													
MD 63 A2	0.18	2800	0.62	57.6	0.96	1.41	2.9	2.8	3.1	12.5	35	0.13	4.1
MD 63 B2	0.25	2810	0.85	69.4	0.98	1.60	4.2	2.3	2.5	16	35	0.19	4.6
MD 71 A2	0.37	2840	1.27	53.0	0.88	3.40	4.1	2.4	2.5	25	43	0.4	5.7
MD 71 B2	0.55	2830	1.85	69.3	0.98	3.60	4.1	2.2	2.6	25	88	0.5	7.0
MD 80 A2	0.75	2840	2.49	74.8	0.97	4.60	4.3	2.6	2.6	30	125	0.8	9.0
MD 80 B2	1.10	2830	3.78	77.4	0.96	6.50	4.5	2.2	2.7	35	156	0.9	9.9
MD 90S A2	1.50	2880	4.95	73.1	0.98	8.30	4.7	2.5	2.6	50	250	1.2	13.0
MD 90L B2	1.80	2920	6.10	74.6	0.84	13.00	5.0	2.4	2.8	60	315	1.8	15.3
MD 100L B2	2.20	2930	7.18	70.5	0.94	14.40	7.0	2.9	2.9	100	500	3.3	21.0
1500 min^{-1} (4 poles)													
MD 63 A4	0.12	1365	0.93	56.0	0.87	1.35	3.1	3.0	3.1	10	30	0.25	4.1
MD 63 B4	0.18	1380	1.30	49.6	0.86	1.95	2.5	2.3	2.5	10	30	0.31	4.1
MD 71 A4	0.25	1420	1.67	57.8	0.97	2.00	3.3	2.5	2.5	12.5	40	5.5	5.5
MD 71 B4	0.37	1400	2.49	66.6	0.97	2.50	3.8	2.8	2.6	20	88	0.8	6.3
MD 80 A4	0.55	1390	3.75	68.5	0.97	3.60	3.8	2.2	2.6	25	100	1.5	9.0
MD 80 B4	0.75	1400	4.96	68.3	0.92	5.20	4.0	2.5	2.7	25	156	1.9	10.3
MD 90S A4	1.10	1430	7.32	68.3	0.88	7.90	4.3	3.0	2.6	40	200	2.8	13.0
MD 90L B4	1.50	1400	10.40	65.4	0.85	11.50	4.1	2.5	2.8	35	250	3.2	15.5
MD 100L A4	1.80	1410	12.20	68.0	0.85	13.54	4.2	2.4	2.8	45	315	4.9	23.0
MD 100L B4	2.20	1440	14.80	74.1	0.86	15.30	3.9	2.8	2.9	50	400	6.0	24.0

SINGLE-PHASE FRAME SIZE 56-100 IM B3
SERIES M

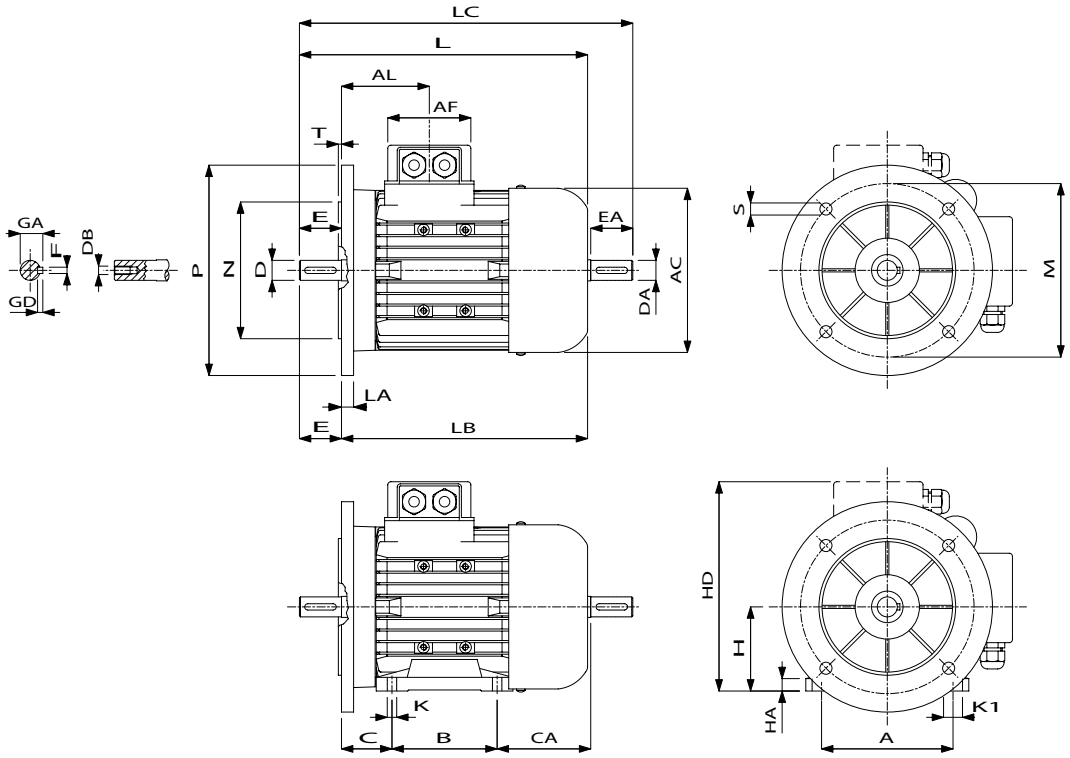


IEC	H	A	B	C	K [1]	AB	BB	CA	AD [2]	HD [2]	AC	HC	HA	K1
56	56	90	71	36	6	107	90	65	94	150	110	114	8	12
63	63	100	80	40	7	126	105	72	98	161	124	126	10	12
71	71	112	90	45	7	144	109	86	107	178	137	143	12	17
80	80	125	100	50	9	155	130	85	122	202	156	162	13	18
90S	90	140	100	56	9	184	130	98	129	219	176	182	14	18
90L	90	140	125	56	9	184	154	98	129	219	176	182	14	18
100L	100	160	140	63	12	200	176	105	140	240	195	200	14	20

IEC	L	LB	LC	AL	AF	BA	AA	D/DA	E/EA	F/FA	GD	GA/GC	DB [3]
56	188	168	212	62	70	22	22	9	20	3	3	10.2	M4
63	211	191	238	66	70	26	26	11	23	4	4	12.5	M4
71	247	217	281	76	70	22	30	14	30	5	5	16	M5
80	275	235	315	85	84	31	32	19	40	6	6	21.5	M6
90S	302	252	354	86	84	32	39	24	50	8	7	27	M8
90L	326	276	378	86	84	32	39	24	50	8	7	27	M8
100L	366	306	429	96	84	40	42	28	60	8	7	31	M10

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

SINGLE-PHASE FRAME SIZE 56-100 IM B5, IM B35
SERIES M

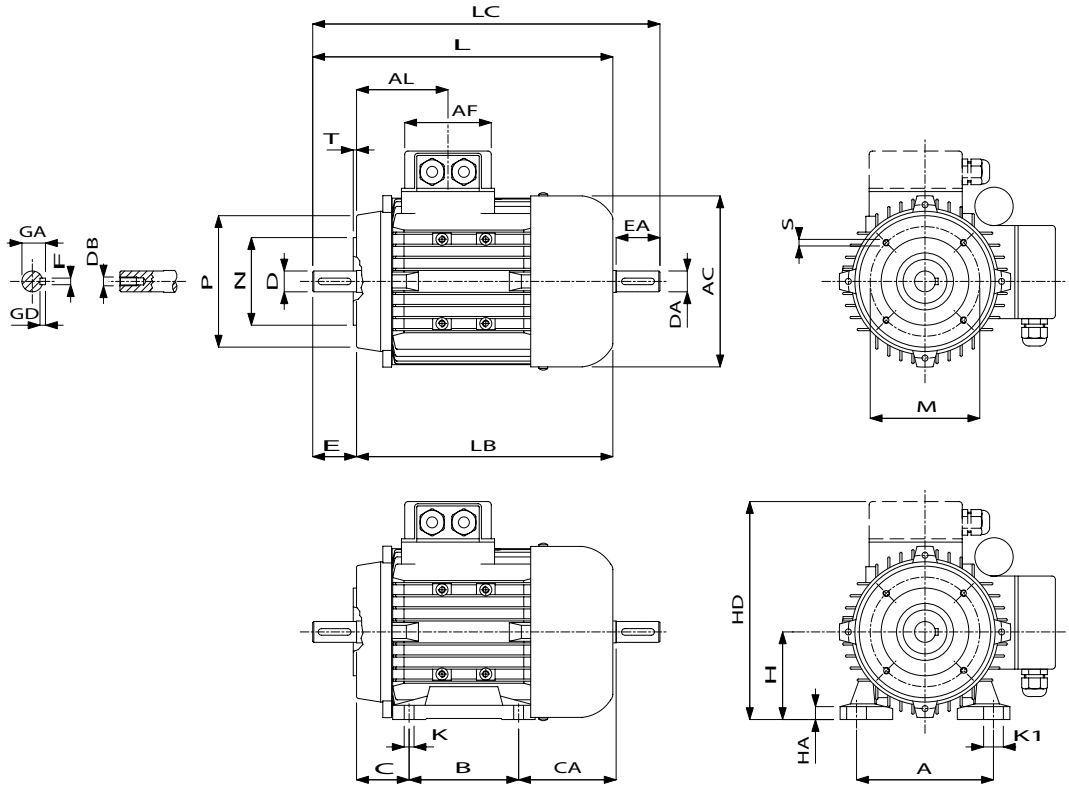


IEC	M	N	P	T	LA	S	H	A	B	C	K[1]	CA	HD[2]	AC
56	100	80	120	2.5	5.5	7.0	56	90	71	36	6	65	150	110
63	115	95	140	3.0	10	9.5	63	100	80	40	7	72	161	124
71	130	110	160	3.5	10	9.5	71	112	90	45	7	86	178	137
80	165	130	200	3.5	12	11.5	80	125	100	50	9	85	202	156
90S	165	130	200	3.5	12	11.5	90	140	100	56	9	98	219	176
90L	165	130	200	3.5	12	11.5	90	140	125	56	9	98	219	176
100L	215	180	250	4.0	14	14.0	100	160	140	63	12	105	240	195

IEC	HA	K1	L	LB	LC	AL	AF	D/DA	E/EA	F/FA	GD	GA/GC	DB[3]
56	8	12	188	168	212	62	70	9	20	3	3	10.2	M4
63	10	12	211	191	238	66	70	11	23	4	4	12.5	M4
71	12	17	247	217	281	76	70	14	30	5	5	16	M5
80	13	18	275	235	315	85	84	19	40	6	6	21.5	M6
90S	14	18	302	252	354	86	84	24	50	8	8	27	M8
90L	14	18	326	276	378	86	84	24	50	8	8	27	M8
100L	14	20	366	306	429	96	84	28	60	8	8	31	M10

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

SINGLE-PHASE FRAME SIZE 56-100 IM B14, IM B34
SERIES M

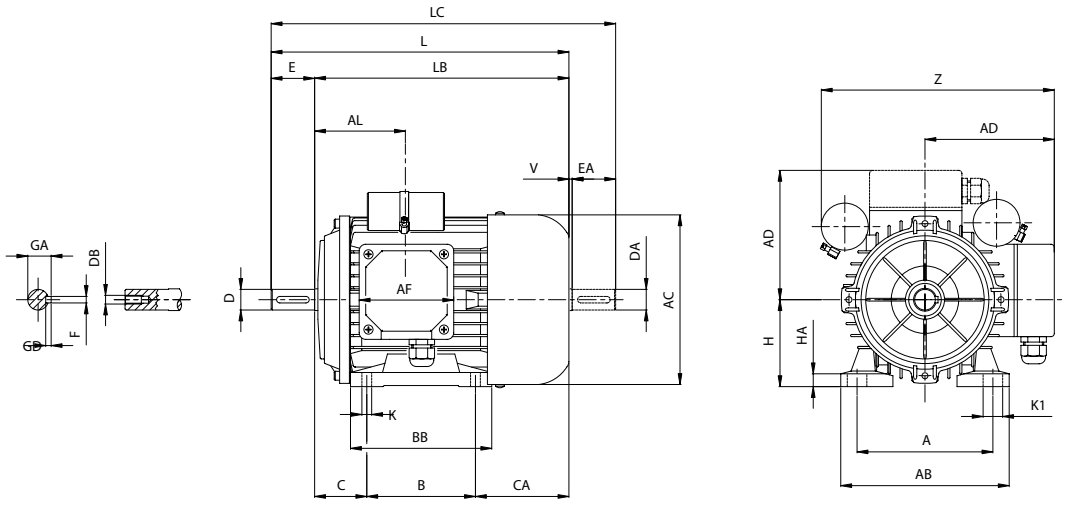


IEC	M	N	P	T	S	H	A	B	C	K[1]	CA	HD[2]	AC
56	65	50	80	2.5	M5	56	90	71	36	6	65	150	110
63	75	60	90	2.5	M5	63	100	80	40	7	72	161	124
71	85	70	105	2.5	M6	71	112	90	45	7	86	178	137
80	100	80	120	3.0	M6	80	125	100	50	9	85	202	156
90S	115	95	140	3.0	M8	90	140	100	56	9	98	219	176
90L	115	95	140	3.0	M8	90	140	125	56	9	98	219	176

IEC	HA	K1	L	LB	LC	AL	AF	D/DA	E/EA	F/FA	GD	GA/GC	DB[3]
56	8	12	188	168	212	62	70	9	20	3	3	10.2	M4
63	10	12	211	191	238	66	70	11	23	4	4	12.5	M4
71	12	17	247	217	281	76	70	14	30	5	5	16	M5
80	13	18	275	235	315	85	84	19	40	6	6	21.5	M6
90S	14	18	302	252	354	86	84	24	50	8	8	27	M8
90L	14	18	326	276	378	86	84	24	50	8	8	27	M8
100L	14	20	366	306	429	96	84	28	60	8	8	31	M10

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

SINGLE-PHASE FRAME SIZE 63-100 IM B3
SERIES MD

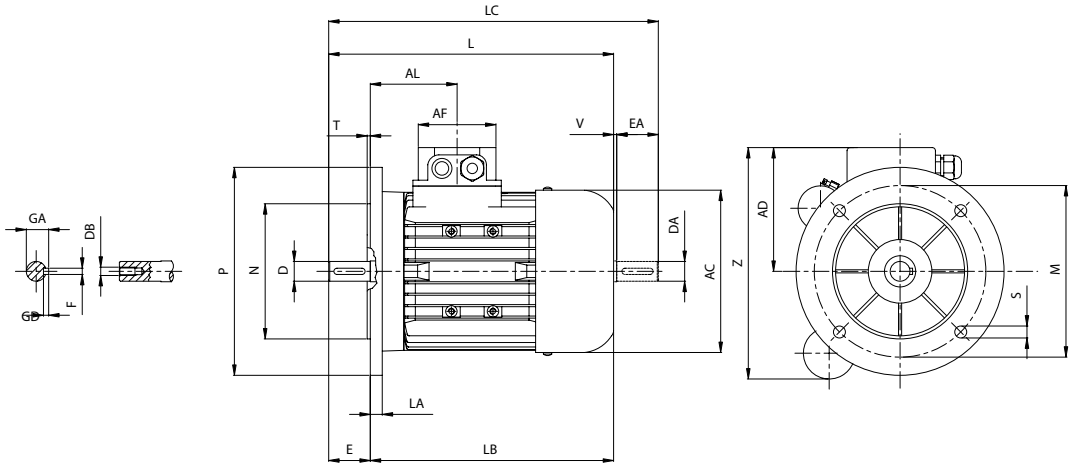


IEC	H	A	B	C	K[1]	AB	BB	CA	AD[2]	AC	HA	K1	L
63	63	100	80	40	7	126	105	98	98	124	10	12	241
71	71	112	90	45	7	144	109	103	107	137	12	17	268
80	80	125	100	50	9	155	130	115	122	156	13	18	305
90S	90	140	100	56	9	184	130	136	129	176	14	18	342
90L	90	140	125	56	9	184	154	135	129	176	14	18	366
100	100	160	140	63	12	200	176	140	140	195	14	20	403

IEC	LB	LC	V	AL	AF	D/DA	E/EA	F/FA	GD	GA/GC	DB[1]	Z
63	218	266	2	66	70	11	23	4	4	12.5	M4	184
71	238	300	2	76	70	14	30	5	5	16	M5	199
80	265	347	2	85	84	19	40	6	6	21.5	M6	219
90S	292	394	2	86	84	24	50	8	8	27	M8	230
90L	316	418	2	86	84	24	50	8	8	27	M8	230
100	343	466	3	96	84	28	60	8	8	31	M10	245

[1] Centering holes in shaft extensions to DIN 332 part 2

SINGLE-PHASE FRAME SIZE 63-100 IM B5
SERIES MD

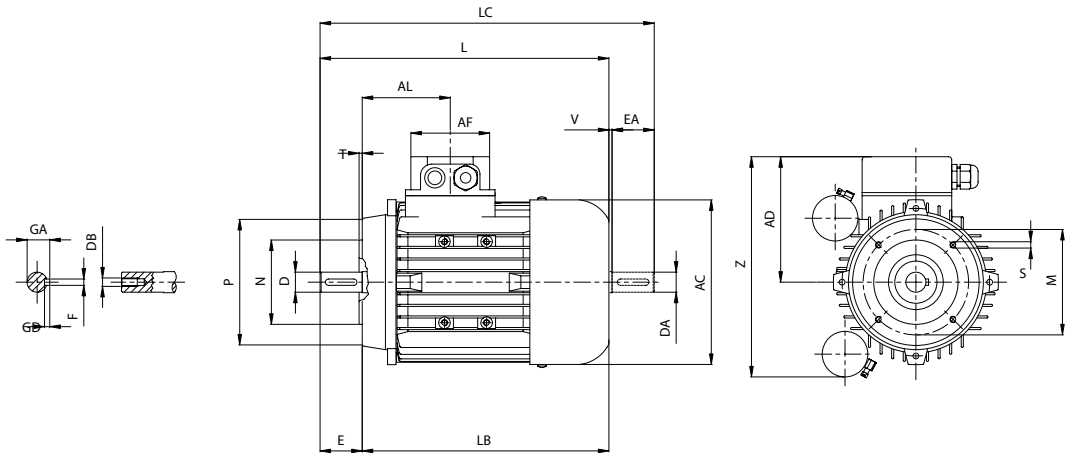


IEC	M	N	P	T	LA	S	AD	AC	L	LB	LC
63	115	95	140	3.0	10	9.5	98	124	241	218	266
71	130	110	160	3.5	10	9.5	107	137	268	238	300
80	165	130	200	3.5	12	11.5	122	156	305	265	347
90S	165	130	200	3.5	12	11.5	129	176	342	292	394
90L	165	130	200	3.5	12	11.5	129	176	366	316	418
100	215	180	250	4.0	14	14.0	140	195	403	343	466

IEC	V	AL	AF	D/DA	E/EA	F/FA	GD	GA/GC	DB [1)]	Z
63	2	66	70	11	23	4	4	12.5	M4	184
71	2	76	70	14	30	5	5	16	M5	199
80	2	85	84	19	40	6	6	21.5	M6	219
90S	2	86	84	24	50	8	8	27	M8	230
90L	2	86	84	24	50	8	8	27	M8	230
100	3	96	84	28	60	8	8	31	M10	245

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

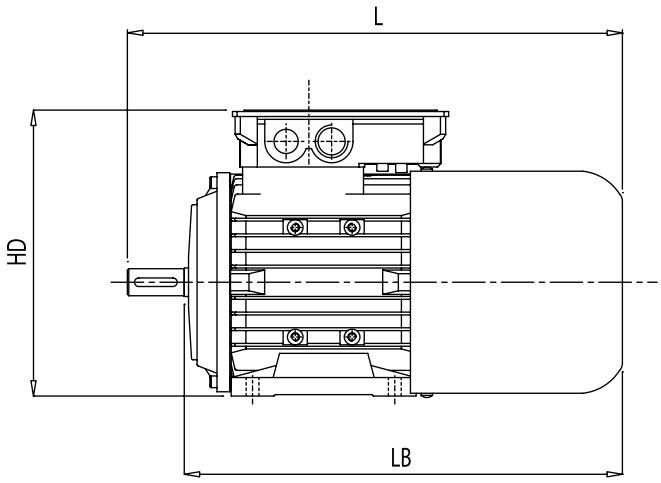
SINGLE-PHASE FRAME SIZE 63-100 IM B14
SERIES MD



IEC	M	N	P	T	S	AD	AC	L	LB	LC
63	75	60	90	2.5	M5	98	124	241	218	266
71	85	70	105	2.5	M6	107	137	268	238	300
80	100	80	120	3.0	M6	122	156	305	265	347
90S	115	95	140	3.0	M8	129	176	342	292	394
90L	115	95	140	3.0	M8	129	176	366	316	418
100	130	110	160	3.5	M8	140	195	403	343	466

IEC	V	AL	AF	D/DA	E/EA	F/FA	GD	GA/GC	DB [1]	Z
3	2	66	70	11	23	4	4	12.5	M4	184
71	2	76	70	14	30	5	5	16	M5	199
80	2	85	84	19	40	6	6	21.5	M6	219
90S	2	86	84	24	50	8	8	27	M8	230
90L	2	86	84	24	50	8	8	27	M8	230
100	3	96	84	28	60	8	8	31	M10	245

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



ELECTRICAL DATA

Frame size	Fan	W	V	A	MC/h	dB/A	Hz
71	A2S 107	20	230*	0.12	160	42	50/60
80	A2S 130	40	230*	0.18	360	49	50/60
90 S/L	A2E 170	50	230*	0.22	500	59	50/60
100 L	A2E 170	50	230*	0.22	500	59	50/60

DIMENSIONS*

Frame size	L	LB
71	305	275
80	350	310
90 S **90 L**	392 416	342 366
100 L	452	392

Note
Data omitted are identical to those of the corresponding version (T)
*For dimensions of forced ventilated motors, refer to page 54

BRAKE MOTORS

PRODUCT RANGE

Series	Supply, speed and poles	Frame size	Rated output range	Braking range	Brake coils
FA	Three-phase single-speed 2, 4, 6, 8, poles	56-112	0.09-4.0	7.5-60	AC
FAHE	High efficiency Three-phase Single -speed 2, 4 poles	80-112	0.75-5.5	7.5-60	AC
FBA	Three-phase two speed 2/4, 4/8, 4/6, 6/8, 2/8 poles	63-112	0.37-4.4	7.5-60	AC
FC	Three-phase single-speed 2, 4, 6, 8 poles	56-112	0.09-4.0	7.5-60	DC
FCHE	High efficiency Three-phase Single -speed 2, 4 poles	80-112	0.75-5.5	7.5-60	DC
FBC	Three-phase two speed 2/4, 4/8, 4/6, 6/8, 2/8 poles	63-112	0.37-4.4	7.5-60	DC
FMC	Single-phase single-speed 4 poles	56-100	0.09-2.2	7.5-45	DC
FS	Three-phase single-speed 2,4 poles	63-112	0.12-4.0	2.5-12.5	DC

The induction brake is very often the part of the motor that has to bear most of the electrical and mechanical load, since it is affected by the transient dynamics of the brake's mechanical starts and stops. Therefore it is easy to understand why our brake motors are subject to the strictest quality control.
Overall dimensions of our brake motors do not differ from series to series. This allows assembly of an AC or DC supplied brake, with the same performance standard.
Depending on the type of end use, our brake motors are divided into two main groups:

SERIES FA-FC-FBA-FBC
These series are especially designed for high braking torque requirements and other heavy-duty applications such as lifting, traversing and transmission in general.
In their standard version the FA and FBA motors are available with three-phase AC coils, while the FC-FBC-FMC motors are equipped with DC coils.
DC brake supply is an ideal choice for applications where a very silent braking is required. This option, combined with the other main specifications of our different brake motors, allows for a large range of application possibilities.

SERIES FS
These are brake motors with reduced braking torque, especially indicated for machines that require controlled, but not necessarily precision braking (Directive Machines 2006/42/EC and Low voltage 2006/95/EC). They are suitable for small to medium capacity crane traversing and, using a special brake, in low moment inertia automation.

PROTECTION

The standard mechanical protection of all brake motor series is IP 54. On request, higher degrees of protection can be supplied.

THERMAL CLASS

Except for brake motors for special applications, all motors are according to thermal class F. Supply voltage corresponds to Eurovoltage (230-400 V and 400/692 V, 50 Hz). On request, brake motors with special voltage, special duty and for special applications are available.
The windings of the brake coil are adapted to the motor voltage. The three- and single-phase coils are designed for continuous duty with running motor.
Motors with DC brake coil are equipped with the corresponding rectifier. The brake is connected in the terminal box of the motor.

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

All motors 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.

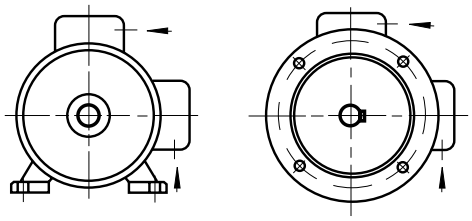
The position of the entry openings can be adjusted to suit the existing connection facilities by turning through 90°. Should special accessories be used (temperature detectors, anti-condensation heating, etc.) please enquire.

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.

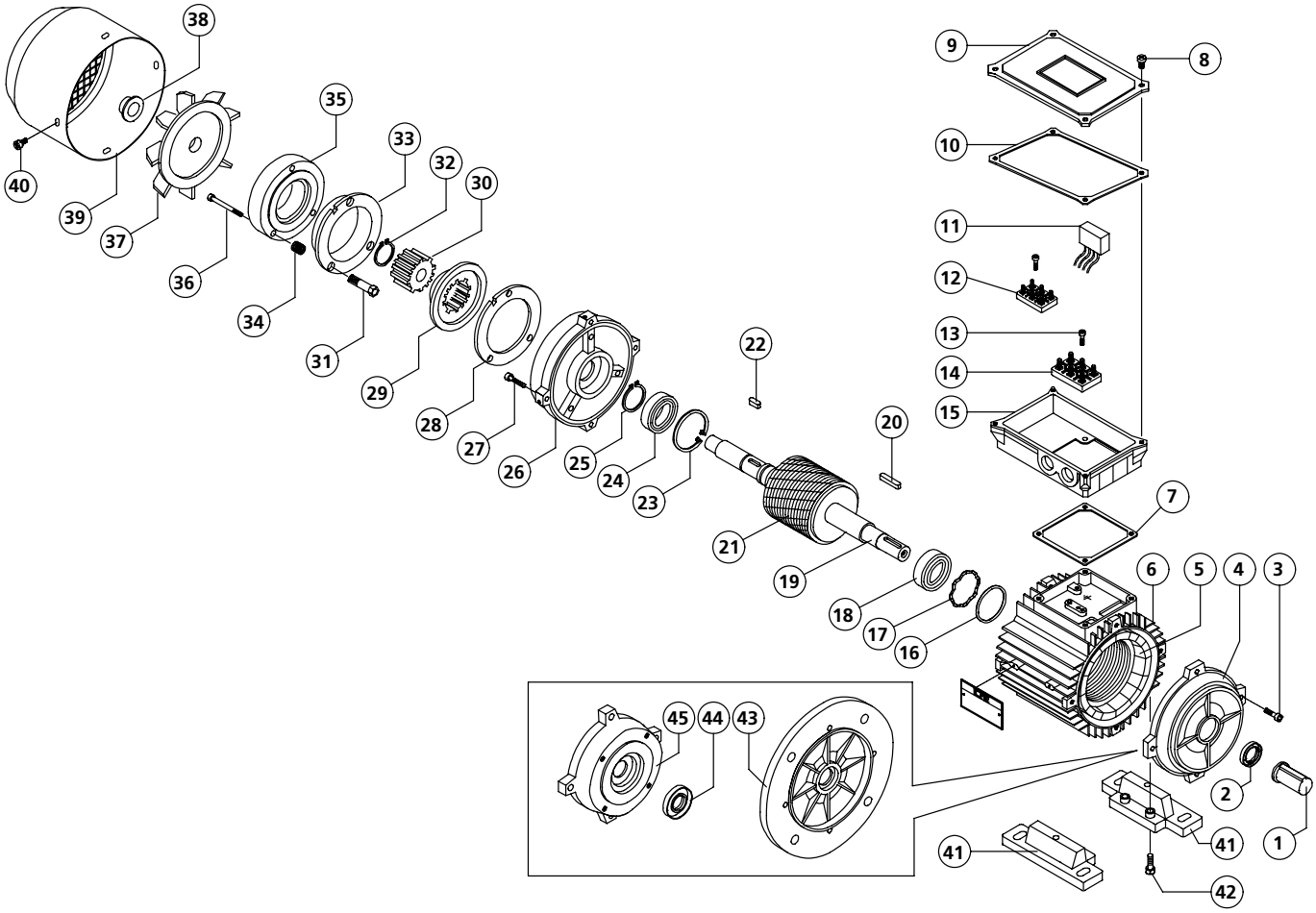
Direction of cable entries



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 54	1 x M16/1 x M20	1 x Pg 11/1 x Pg 13.5	2.5	M4	12
80 - 100	IP 54	1 x M25/1 x M20	1 x Pg 13.5/1 x Pg 16	2.5	M4	16
112	IP 54	1 x M25/1 x M20	1 x Pg 13.5/1 x Pg 16	4	M5	16

1) Pitch 1.5
2) Pg thread to DIN 40 430 (standard)

SPARE PARTS
SERIES FA - FC - FBA - FBC

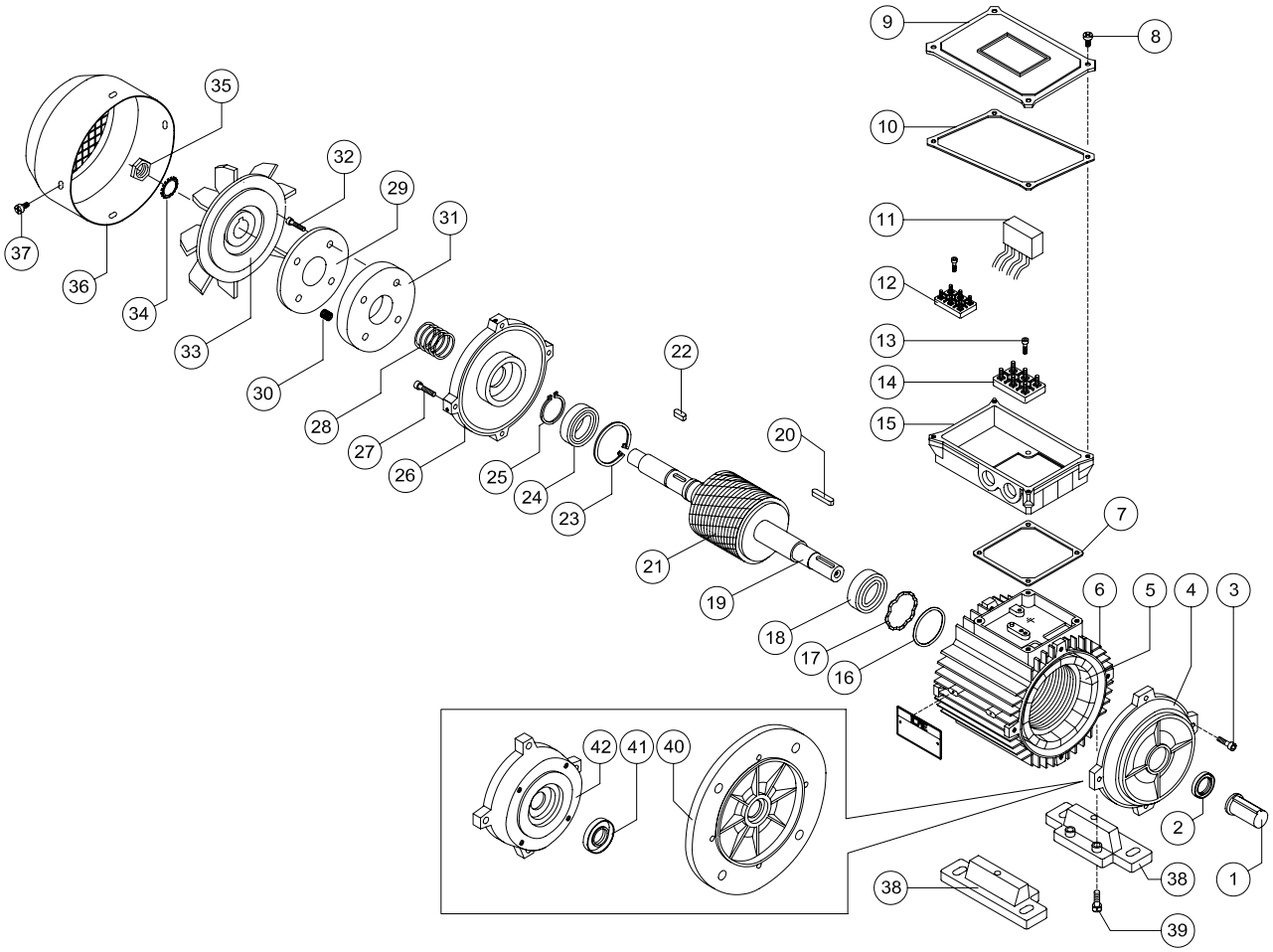


PART DESCRIPTION

1	Shaft protection
2	Drive end dust seal
3	Drive end endshield fixing screw
4	Drive end endshield
5	Stator
6	Stator frame
7	Terminal box gasket
8	Terminal box lid fixing screw
9	Terminal box lid
10	Terminal box lid gasket
11	Rectifier (only for series FC-FBC)
12	Brake terminal board (on request)
13	Terminal board fixing screw
14	Terminal board
15	Terminal box bases
16	Drive end shim ring
17	Non-drive end pre-load washer
18	Drive end bearing
19	Motor shaft
20	Hub key
21	Rotor assembly
22	Brake end hub key
23	Circle clip
24	Non-drive end bearing
25	Seeger ring for motor shaft
26	Non-drive end endshield
27	Non-drive end endshield fixing screw
28	Counter-disc
29	Brake disc
30	Hub
31	Bushing
32	Locking tab washer
33	Counter-brake coil
34	Brake spring
35	Brake coil
36	Brake screw
37	Fan
38	Brake adjustment and retaining nut
39	Fan cowl
40	Fan cowl fixing screw
41	Feet
42	Feet fixing bolt
43	Flange B5
44	Seal ring
45	Flange B14

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

SPARE PARTS
SERIES FS

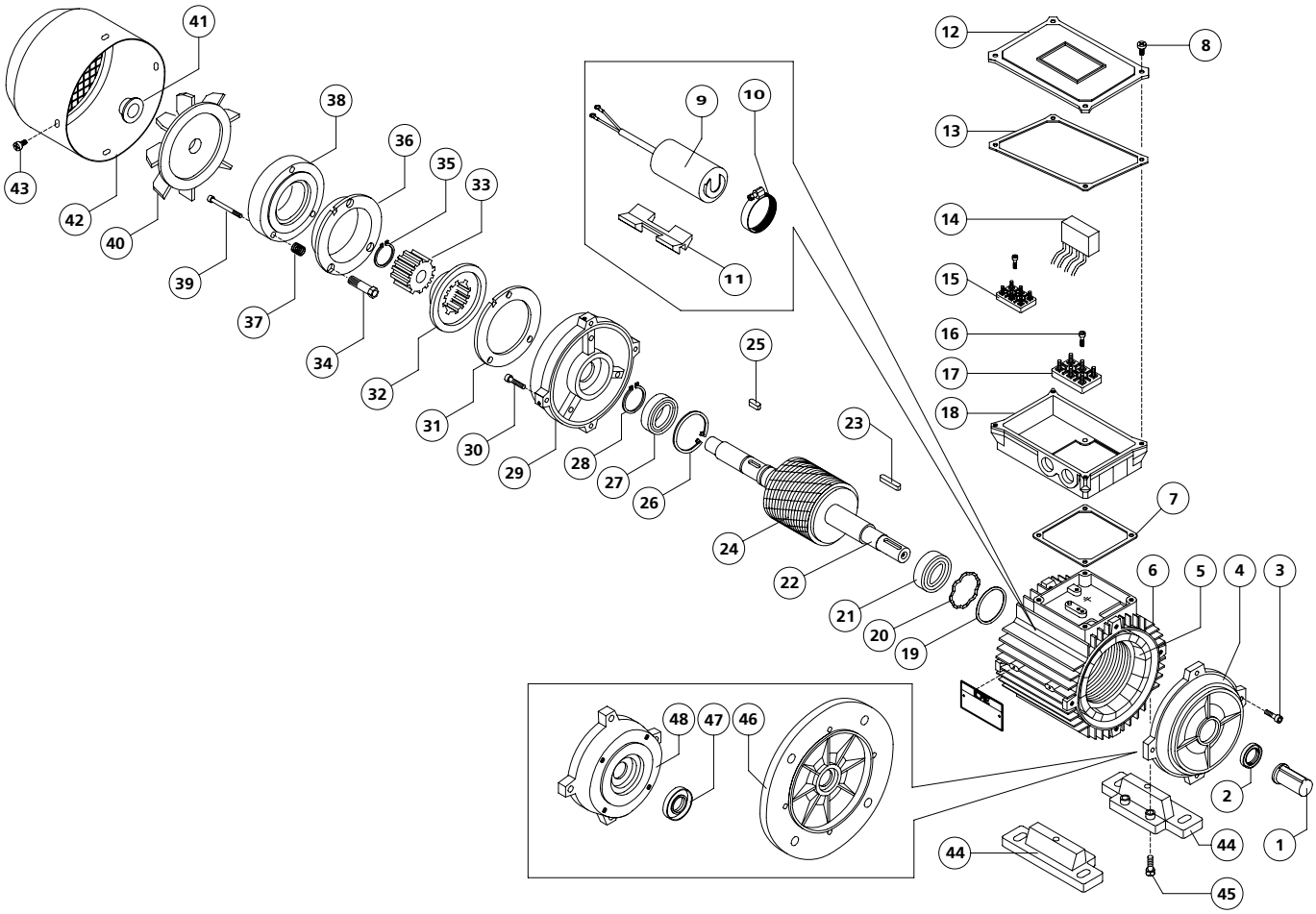


PART DESCRIPTION

1	Shaft protection
2	Drive end dust seal
3	Drive end endshield fixing screw
4	Drive end endshield
5	Stator
6	Stator frame
7	Terminal box gasket
8	Terminal box lid fixing screw
9	Terminal box lid
10	Terminal box lid gasket
11	Rectifier
12	Brake terminal board
13	Terminal board fixing screw
14	Terminal board
15	Terminal box bases
16	Drive end shim ring
17	Non-drive end pre-load washer
18	Drive end bearing
19	Motor shaft
20	Hub key
21	Rotor assembly
22	Brake end hub key
23	Seeger ring endshield end
24	Non-drive end bearing
25	Seeger ring for motor shaft
26	Non-drive end endshield
27	Non-drive end endshield fixing screw
28	Thrust spring
29	Counter-brake coil
30	Brake spring
31	Brake coil
32	Brake screw
33	Fan
34	Lock washer
35	Lock nut
36	Fan cowl
37	Fan cowl fixing screw
38	Feet
39	Feet fixing bolt
40	Flange B5
41	Seal ring
42	Flange B14

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

SPARE PARTS
SERIES FMC



PART DESCRIPTION

1	Shaft protection
2	Drive end dust seal
3	Drive end endshield fixing screw
4	Drive end endshield
5	Stator
6	Stator frame
7	Terminal box gasket
8	Terminal box lid fixing screw
9	Capacitor
10	Circle clamp
11	Cradle
12	Terminal box lid
13	Terminal box lid gasket
14	Rectifier
15	Brake terminal board (on request)
16	Terminal board fixing screw
17	Terminal board
18	Terminal box bases
19	Drive end shim ring
20	Non-drive end pre-load washer
21	Drive end bearing
22	Motor shaft
23	Hub key
24	Rotor assembly
25	Brake end hub key
26	Seeger ring endshield end
27	Non-drive end bearing
28	Seeger ring for motor shaft
29	Non-drive end endshield
30	Non-drive end endshield fixing screw
31	Counter-disc
32	Brake disc
33	Hub
34	Bushing
35	Seeger ring shaft end
36	Counter-brake coil
37	Brake spring
38	Brake coil
39	Brake screw
40	Fan
41	Fan clamp
42	Fan cowl
43	Fan cowl fixing screw
44	Feet
45	Feet fixing bolt
46	Flange B5
47	Seal ring
48	Flange B14

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

STANDARD EFFICIENCY BRAKE MOTORS - IE1

EFFICIENCY LEVEL ACCORDING TO IEC 60034-30-1:2014
EFFICIENCY TESTING METHOD IEC 60034-2-1;2007

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

FOR MAINS VOLTAGE
400 V - 50 HZ

IE1

PROTECTION IP 55

Type	Rated output	Rated speed	Rated torque	Efficiency	Power factor	Rated current	Starting current ratio	Starting torque ratio	Pull-out torque ratio	Max braking torque	Moment of inertia	Weight
	kW	min^{-1}	M_N (Nm)	η 100%	$\cos \varphi$	I_N 400V(A)	I_A/I_N (μF)	M_A/M_N	M_K/M_N	$M_{f\,max}$ (Nm)	J 10^{-3} kgm^2	kg
3000 min^{-1} (2 poles)												
FA/FC 56 A2	0.09	2790	0.30	51	0.67	0.38	2.8	2.3	4.0	7.5	0.14	4.0
FA/FC 56 B2	0.12	2720	0.42	56	0.77	0.40	3.0	2.7	3.0	7.5	0.14	4.5
FA/FC 63 A2	0.18	2740	0.63	56	0.78	0.60	3.5	2.7	3.0	7.5	0.20	5.1
FA/FC 63 B2	0.25	2770	0.86	66	0.78	0.70	4.5	3.2	3.0	7.5	0.23	5.6
FA/FC 71 A2	0.37	2820	1.25	68	0.69	1.15	4.6	3.6	3.7	7.5	0.54	7.3
FA/FC 71 B2	0.55	2820	1.86	71	0.70	1.60	4.7	3.6	3.5	7.5	0.69	7.9
FA/FC 80 A2	0.75	2830	2.53	76	0.75	1.90	5.7	3.6	3.6	15.0	1.15	11.7
FA/FC 80 B2	1.10	2840	3.70	77	0.79	2.60	6.5	3.7	3.8	15.0	1.37	13.2
FA/FC 90S A2	1.50	2850	5.03	79	0.81	3.40	5.8	2.7	3.1	25.0	1.73	17.0
FA/FC 90L B2	2.20	2860	7.34	80	0.79	5.00	6.9	3.9	4.0	25.0	2.70	19.0
FA/FC 100L A2	3.00	2850	10.00	81	0.86	6.20	6.2	2.8	3.1	40.0	4.87	23.6
FA/FC 112M A2	4.00	2910	13.13	85	0.83	8.20	7.8	2.9	3.0	60.0	9.30	41.2
1500 min^{-1} (4 poles)												
FA/FC 56 B4	0.09	1360	0.63	53	0.60	0.41	2.4	2.6	2.7	7.5	0.21	4.4
FA/FC 63 A4	0.12	1350	0.85	54	0.69	0.46	2.4	2.0	2.0	7.5	0.38	5.1
FA/FC 63 B4	0.18	1350	1.27	53	0.70	0.70	2.3	2.0	2.0	7.5	0.47	5.6
FA/FC 71 A4	0.25	1370	1.74	67	0.77	0.69	3.4	2.0	2.1	7.5	0.81	6.7
FA/FC 71 B4	0.37	1380	2.56	68	0.67	1.18	4.0	2.2	2.3	7.5	1.14	6.9
FA/FC 80 A4	0.55	1380	3.80	72	0.80	1.38	3.9	1.9	2.2	15.0	3.35	11.7
FA/FC 80 B4	0.75	1390	5.15	72	0.75	2.00	3.9	2.6	2.2	15.0	3.68	12.6
FA/FC 90S A4	1.10	1410	7.45	79	0.77	2.60	4.6	2.3	2.6	25.0	4.13	15.8
FA/FC 90L B4	1.50	1410	10.16	79	0.76	3.60	4.8	2.4	2.6	25.0	4.80	18.3
FA/FC 90L C4	1.80	1410	12.20	79	0.73	4.50	5.2	3.1	3.1	25.0	5.58	19.5
FA/FC 100L A4	2.20	1410	14.90	80	0.78	5.10	4.8	2.4	2.6	40.0	7.40	23.9
FA/FC 100L B4	3.00	1410	18.04	80	0.80	7.10	6.5	2.9	3.3	40.0	8.85	28.0
FA/FC 112M A4	**4.00**	1430	26.40	84	0.76	9.00	6.6	3.1	3.6	60.0	15.85	43.0

* Number of starts per hour permitted under no load

STANDARD EFFICIENCY BRAKE MOTORS - IE1

EFFICIENCY LEVEL ACCORDING TO IEC 60034-30-1:2014
EFFICIENCY TESTING METHOD IEC 60034-2-1;2007

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

FOR MAINS VOLTAGE
400 V - 50 HZ

IE1

PROTECTION IP 55

Type	Rated output	Rated speed	Rated torque	Efficiency	Power factor	Rated current	Starting current ratio	Starting torque ratio	Pull-out torque ratio	Max braking torque	Moment of inertia	Weight
	kW	min^{-1}	M_N (Nm)	η 100%	cos φ	I_N 400V(A)	I_A/I_N (μF)	M_A/M_N	M_K/M_N	$M_{f\,max}$ (Nm)	J 10^{-3} kgm²	kg
1000 min^{-1} (6 poles)												
FA/FC 56 B6	0.06	780	0.73	40	0.65	0.33	1.3	1.3	1.8	7.5	0.35	3.5
FA/FC 63 A6	0.09	890	0.96	40	0.49	0.67	1.7	2.5	2.5	7.5	0.45	4.1
FA/FC 63 B6	0.12	870	1.32	45	0.55	0.70	1.8	1.3	2.0	7.5	0.60	4.6
FA/FC 71 A6	0.18	850	2.00	51	0.73	0.70	2.1	1.4	2.1	7.5	0.90	5.7
FA/FC 71 B6	0.25	870	2.74	53	0.68	1.00	2.7	2.2	2.1	7.5	1.40	6.3
FA/FC 80 A6	0.37	880	4.00	56	0.71	1.35	2.7	2.2	2.1	15.0	1.98	8.8
FA/FC 80 B6	0.55	900	5.83	65	0.70	1.74	3.0	2.0	2.1	15.0	2.67	10.5
FA/FC 90S A6	0.75	910	7.87	68	0.72	2.20	3.7	2.2	2.1	25.0	4.20	13.0
FA/FC 90L B6	1.10	900	11.67	69	0.70	3.30	3.1	1.9	2.0	25.0	5.25	16.5
FA/FC 100L A6	1.50	935	15.30	75	0.70	4.10	4.2	2.1	2.5	40.0	9.60	21.0
FA/FC 100L B6	1.80	935	18.40	76	0.70	4.90	4.4	2.3	2.5	40.0	11.85	30.2
FA/FC 112M A6	2.20	945	22.23	79	0.64	6.30	4.6	2.7	2.7	60.0	16.50	40.0

EFFICIENCY TESTING METHOD IEC 600034-2;1996

750 min^{-1} (8 poles)												
FA/FC 63 B8	0.08	630	1.21	45	0.53	0.48	1.3	1.3	1.8	7.5	0.60	5.6
FA/FC 71 B8	0.12	670	1.71	49	0.51	0.69	2.4	2.5	2.9	7.5	1.35	7.9
FA/FC 80 A8	0.18	670	2.56	47	0.60	0.92	2.1	1.8	2.0	15.0	1.98	11.7
FA/FC 80 B8	0.25	680	3.50	50	0.56	1.28	2.3	1.9	2.1	15.0	2.67	12.2
FA/FC 90S A8	0.37	670	5.30	61	0.62	1.40	2.5	1.7	2.2	25.0	4.20	17.0
FA/FC 90L B8	0.55	670	7.84	62	0.58	2.20	2.5	1.6	2.1	25.0	5.25	19.3
FA/FC 100L A8	0.75	690	10.40	67	0.65	2.50	2.9	1.7	1.9	40.0	9.60	27.4
FA/FC 100L B8	1.10	690	15.20	68	0.60	3.90	2.9	1.8	2.0	40.0	11.85	30.2
FA/FC 112M B8	1.50	710	20.20	76	0.63	4.50	3.9	1.7	2.4	60.0	16.50	40.0

* Number of starts per hour permitted under no load

HIGH EFFICIENCY BRAKE MOTORS - IE2

EFFICIENCY LEVEL ACCORDING TO IEC 60034-30-1:2014
EFFICIENCY TESTING METHOD IEC 60034-2-1; 2007

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

FOR MAINS VOLTAGE
400 V - 50 HZ

IE2

PROTECTION IP 54

Type	Rated output		Rated speed	Rated torque	Efficiency	Power factor	Rated current	Starting current ratio	Starting torque ratio	Pull-out torque ratio	Max braking torque	Moment of inertia	Weight
	kW	HP	min^{-1}	M_N (Nm)	IE2 η 100 %	cos φ	I_N 400 V	I_A/I_N	M_A/M_N	M_K/M_N	$M_{f\,max}$ (Nm)	J 10^{-3} kgm^2	kg
3000 min-1 (2 poles)													
FA/FCHE 80 A2	0.75	1.0	2880	2.4	78.1	0.81	1.7	5.7	3.2	3.4	15	1.80	10.2
FA/FCHE 80 B2	1.1	1.5	2850	3.6	80.2	0.82	2.4	6.8	4.2	4.3	15	2.14	11.2
FA/FCHE 90S A2	1.5	2.0	2880	4.9	82.2	0.85	3.1	7.2	4.5	4.6	25	2.87	15.2
FA/FCHE 90L B2	2.2	3.0	2890	7.2	83.2	0.83	4.6	8.2	4.8	4.7	25	3.72	18.5
FA/FCHE 100L A2	3.0	4.0	2890	9.7	86.3	0.85	5.9	8.6	5.1	5.0	40	9.53	26.4
FA/FCHE 112M A2	4.0	5.5	2920	13.0	86.9	0.85	7.8	9.1	6.1	6.2	60	14.13	32.6
1500 min-1 (4 poles)													
FA/FCHE 80 B4	0.75	1.0	1430	5.0	80.3	0.71	1.9	5.4	2.8	3.0	15	2.74	12.6
FA/FCHE 90S A4	1.1	1.5	1420	7.4	82.4	0.77	2.5	5.9	4.0	4.2	25	3.65	15.8
FA/FCHE 90L B4	1.5	2.0	1430	10.0	83.8	0.76	3.4	6.2	3.9	3.8	25	4.97	18.,1
FA/FCHE 100L A4	2.2	3.0	1440	14.4	85.5	0.79	4.7	6.7	3.5	3.7	40	9.38	28.7
FA/FCHE 100L B4	3.0	4.0	1440	19.9	86.4	0.77	6.5	6.3	3.4	3.6	40	7.24	33.6
FA/FCHE 112M A4	4.0	5.5	1450	26.4	87.3	0.79	8.4	6.9	4.3	4.5	60	18.86	33.2

* Number of starts per hour permitted under no load

FOR MAINS VOLTAGE
400 V - 50 HZ

PROTECTION IP 54

Type	Rated output	Rated speed	Rated torque	Efficiency	Power factor	Rated current	Starting current ratio	Starting torque ratio	Pull-out torque ratio	Max braking torque	Moment of inertia	Weight
	kW	min^{-1}	M_N (Nm)	η 100%	cos φ	I_N 400V(A)	I_A/I_N (μF)	M_A/M_N	M_K/M_N	$M_{f\,max}$ (Nm)	J 10^{-3} kgm²	kg
3000/1500 min-1 (2/4 poles) - Dahlander connection Δ/YY												
FBA/FBC 63 A2/4	0.16/0.11	2700/1270	0.55/0.83	57/53	0.72/0.65	0.56/0.46	2.4/2.6	1.3/1.6	1.7/1.4	7.5	0.38	5.1
FBA/FBC 63 B2/4	0.22/0.15	2710/1280	0.77/1.12	58/55	0.78/0.68	0.70/0.58	3.3/3.5	2.2/2.5	2.5/3.0	7.5	0.47	5.1
FBA/FBC 71 A2/4	0.30/0.20	2750/1330	1.04/1.43	60/57	0.80/0.70	0.90/0.72	3.1/3.3	2.2/2.0	2.4/2.9	7.5	0.81	6.7
FBA/FBC 71 B2/4	0.45/0.30	2780/1350	1.54/2.12	63/59	0.79/0.69	1.30/1.06	3.4/3.3	2.1/2.4	2.3/2.7	7.5	1.14	6.9
FBA/FBC 80 A2/4	0.60/0.45	2800/1380	2.05/3.11	64/67	0.76/0.65	1.78/1.49	3.2/3.4	2.3/2.5	2.2/2.4	15	3.35	11.7
FBA/FBC 80 B2/4	0.80/0.60	2820/1390	2.71/4.12	65/70	0.80/0.71	2.22/1.74	3.4/3.6	2.5/2.6	2.6/2.8	15	3.68	12.6
FBA/FBC 90S A2/4	1.40/1.00	2830/1400	4.73/6.82	68/70	0.81/0.72	3.66/2.86	3.5/3.6	2.4/2.3	2.7/2.9	25	4.13	15.8
FBA/FBC 90L B2/4	1.80/1.25	2830/1390	6.07/8.58	71/73	0.80/0.73	4.57/3.38	3.5/3.4	2.3/2.2	2.7/2.8	25	5.58	19.5
FBA/FBC 100L A2/4	2.50/1.80	2860/1410	8.35/12.19	73/74	0.83/0.74	5.95/4.74	4.3/4.2	2.4/2.2	2.6/2.5	40	7.40	22.7
FBA/FBC 100L B2/4	3.30/2.60	2880/1400	10.94/17.73	75/77	0.82/0.71	7.74/6.86	4.5/4.4	2.1/2.3	2.7/2.6	40	8.85	25.0
FBA/FBC 112M A2/4	4.40/3.30	2900/1410	14.48/22.35	75/79	0.84/0.74	10.08/8.14	5.6/5.5	2.2/2.3	2.8/2.5	60	15.85	41.2
1500/750 min-1 (4/8 poles) - Dahlander connection Δ/YY												
FBA/FBC 63 A4/8	0.09/0.04	1280/620	0.67/0.62	54/40	0.76/0.60	0.32/0.24	2.1/2.0	1.3/1.6	1.7/1.4	7.5	0.47	5.6
FBA/FBC 71 B4/8	0.15/0.09	1305/610	1.09/1.40	56/40	0.75/0.61	0.52/0.53	2.4/2.6	2.2/2.5	2.5/3.0	7.5	1.14	6.9
FBA/FBC 80 A4/8	0.37/0.20	1320/630	2.67/3.03	59/42	0.76/0.63	1.20/1.09	2.6/2.7	2.2/2.0	2.4/2.9	15	3.35	11.7
FBA/FBC 80 B4/8	0.55/0.30	1350/650	3.89/4.41	60/45	0.78/0.64	1.69/1.50	2.7/2.5	2.1/2.4	2.3/2.7	15	3.68	12.6
FBA/FBC 90S A4/8	0.75/0.37	1380/670	5.19/5.27	65/53	0.79/0.66	2.10/1.53	3.0/3.2	2.3/2.5	2.2/2.4	25	4.13	15.8
FBA/FBC 90L B4/8	0.90/0.50	1400/680	6.14/7.02	68/56	0.80/0.68	2.39/1.89	3.0/3.3	2.5/2.6	2.6/2.8	25	4.80	18.3
FBA/FBC 100L A4/8	1.40/0.70	1405/685	9.52/9.76	73/60	0.79/0.65	3.50/2.59	3.5/3.6	2.4/2.3	2.7/2.9	40	5.58	23.9
FBA/FBC 100L B4/8	1.60/0.90	1410/690	10.84/12.46	75/64	0.81/0.68	3.80/2.98	3.5/3.4	2.3/2.2	2.7/2.8	40	9.60	28.0
FBA/FBC 112M A4/8	1.70/1.00	1420/700	11.43/13.64	77/67	0.79/0.66	4.03/3.26	3.9/3.6	2.4/2.2	2.6/2.5	60	11.85	43.0
FBA/FBC 112M A4/8	2.20/1.30	1410/690	14.90/18.00	78/69	0.77/0.64	5.29/4.25	4.6/4.0	2.1/2.3	2.7/2.6	60	16.50	47.0

* Number of starts per hour permitted under no load

FOR MAINS VOLTAGE
400 V - 50 HZ

PROTECTION IP 54

Type	Rated output	Rated speed	Rated torque	Efficiency	Power factor	Rated current	Starting current ratio	Starting torque ratio	Pull-out torque ratio	Max braking torque	Moment of inertia	Weight
	kW	min^{-1}	M_N (Nm)	η 100%	$cos\ \varphi$	I_N 400V(A)	I_A/I_N (µF)	M_A/M_N	M_K/M_N	$M_{f\,max}$ (Nm)	J 10^{-3} kgm^2	kg
1500/1000 min^{-1} (4/6 poles) - separate windings												
FBA/FBC 63 A4/6	0.18/0.04	1320/840	1.30/0.45	54/53	0.70/0.64	0.68/0.17	2.1/1.8	2.4/1.5	2.3/1.6	7.5	0.47	5.6
FBA/FBC 71 B4/6	0.22/0.15	1360/860	1.54/1.66	63/55	0.73/0.65	0.69/0.61	2.3/1.9	2.3/1.6	2.2/1.5	7.5	1.14	6.9
FBA/FBC 80 A4/6	0.37/0.26	1380/870	2.56/2.85	67/60	0.76/0.64	1.05/0.98	2.4/2.0	2.4/1.7	2.5/1.7	15	3.35	11.7
FBA/FBC 80 B4/6	0.55/0.45	1380/880	3.80/4.88	69/63	0.77/0.66	1.50/1.56	3.2/2.8	2.5/1.7	2.6/1.8	15	3.68	12.6
FBA/FBC 90S A4/6	0.75/0.50	1400/905	5.12/5.27	73/65	0.78/0.65	1.90/1.70	3.4/3.0	2.6/1.7	2.7/2.0	25	4.20	15.8
FBA/FBC 90L B4/6	1.10/0.75	1410/910	7.45/7.87	75/67	0.80/0.66	2.65/2.44	3.7/3.2	2.5/1.6	2.8/2.2	25	5.25	18.3
FBA/FBC 100L A4/6	1.50/0.90	1405/900	10.19/9.54	77/71	0.79/0.67	3.56/2.73	4.1/3.8	2.7/1.7	2.6/2.3	40	11.85	28.0
FBA/FBC 112M A4/6	1.80/1.30	1420/910	12.10/13.64	80/74	0.81/0.68	4.00/3.73	4.4/4.0	2.9/1.8	2.8/2.5	60	16.50	43.0
FBA/FBC 112M B4/6	2.60/1.80	1430/915	17.36/18.78	81/74	0.79/0.69	5.86/5.09	5.5/4.4	3.0/2.0	3.0/2.6	60	19.50	47.0
1500/750 min^{-1} (6/8 poles) - separate windings												
FBA/FBC 63 A6/8	0.07/0.037	840/600	0.79/0.59	52/46	0.64/0.55	0.30/0.21	2.1/1.8	2.0/1.5	1.4/1.3	7.5	0.47	4.6
FBA/FBC 71 B6/8	0.18/0.09	845/620	2.03/1.38	54/48	0.65/0.56	0.74/0.48	2.3/1.9	2.1/1.6	1.6/1.5	7.5	1.14	6.3
FBA/FBC 80 A6/8	0.25/0.18	860/640	2.77/2.68	58/53	0.66/0.55	0.94/0.89	2.7/2.5	2.2/1.6	1.7/1.8	15	3.68	10.5
FBA/FBC 90S A6/8	0.37/0.25	870/660	4.06/3.62	63/56	0.67/0.56	1.26/1.15	3.2/2.8	2.3/1.7	2.2/2.1	25	4.20	13.0
FBA/FBC 90L B6/8	0.55/0.37	890/680	5.90/5.20	67/59	0.67/0.55	1.77/1.65	3.5/3.1	2.4/1.8	2.3/2.1	25	5.25	16.5
FBA/FBC 100L B6/8	0.75/0.55	900/670	7.96/7.84	73/63	0.66/0.57	2.25/2.21	3.8/3.3	2.6/1.9	2.5/2.2	40	11.85	30.2
FBA/FBC 112M B6/8	1.10/0.75	905/690	11.60/10.38	76/67	0.68/0.56	3.07/2.88	4.6/4.2	2.4/2.0	2.3/2.5	60	16.50	40.0
3000/750 min^{-1} (2/8 poles) - separate windings												
FBA/FBC 63 A2/8	0.18/0.06	2760/600	0.62/0.95	56/40	0.78/0.60	0.59/0.36	2.1/1.8	2.4/1.5	2.3/1.6	7.5	0.47	4.6
FBA/FBC 71 B2/8	0.30/0.09	2770/620	1.03/1.39	59/43	0.80/0.63	0.92/0.48	2.3/1.9	2.3/1.6	2.2/1.5	7.5	1.14	6.3
FBA/FBC 80 A2/8	0.55/0.12	2800/640	1.87/1.79	64/47	0.81/0.62	1.53/0.59	2.4/2.0	2.4/1.7	2.5/1.7	15	3.68	10.5
FBA/FBC 90S A2/8	0.75/0.18	2810/675	2.55/2.54	69/54	0.83/0.63	1.89/0.76	3.2/2.8	2.5/1.7	2.6/1.8	25	3.35	13.0
FBA/FBC 90L B2/8	1.10/0.30	2810/680	3.74/4.21	74/56	0.82/0.61	2.62/1.26	3.4/3.0	2.6/1.7	2.7/2.0	25	3.68	16.5
FBA/FBC 100L A2/8	1.50/0.37	2815/690	5.08/5.12	78/63	0.84/0.64	3.30/1.33	3.7/3.2	2.5/1.6	2.8/2.2	40	7.40	21.0
FBA/FBC 100L B2/8	1.80/0.45	2810/680	6.12/6.32	80/65	0.83/0.63	3.91/1.59	4.1/3.8	2.7/1.7	2.6/2.3	40	8.85	30.2
BA/FBC 112M A2/8	2.20/0.55	2820/700	7.45/7.50	83/70	0.82/0.64	4.66/1.77	4.4/4.0	2.9/1.8	2.8/2.5	60	15.58	40.0

* Number of starts per hour permitted under no load

FOR MAINS VOLTAGE
400 V - 50 HZ

PROTECTION IP 54

Type	Rated output	Rated speed	Rated torque	Efficiency	Power factor	Rated current	Starting current ratio	Starting torque ratio	Pull-out torque ratio	Max braking torque	Moment of inertia	Weight
	kW	min^{-1}	M_N (Nm)	η 100%	$cos\ \varphi$	I_N 400V(A)	I_A/I_N (µF)	M_A/M_N	M_K/M_N	$M_{f\,max}$ (Nm)	J 10^{-3} kgm^2	kg
3000 min^{-1} (2 poles)												
FS 63 A2	0.18	2740	0.63	56	0.78	0.60	3.5	2.7	3.0	2.5	0.18	5.1
FS 63 B2	0.25	2770	0.86	66	0.78	0.70	4.5	3.2	3.0	2.5	0.21	5.6
FS 71 A2	0.37	2820	1.25	68	0.69	1.15	4.6	3.6	3.7	4.0	0.48	7.0
FS 71 B2	0.55	2820	1.86	71	0.70	1.60	4.7	3.6	3.5	4.0	0.59	7.6
FS 80 A2	0.75	2830	2.53	76	0.75	1.90	5.7	3.6	3.6	7.0	1.02	11.2
FS 80 B2	1.10	2840	3.70	77	0.79	2.60	6.5	3.7	3.8	7.0	1.16	12.7
FS 90S A2	1.50	2850	5.03	79	0.81	3.40	5.8	2.7	3.1	7.0	1.54	15.2
FS 90L B2	2.20	2860	7.34	80	0.79	5.00	6.9	3.9	4.0	7.0	2.43	17.2
FS 100L A2	3.00	2850	10.00	81	0.86	6.20	6.2	2.8	3.1	13.0	4.12	24.1
FS 112M A2	4.00	2910	13.13	85	0.83	8.20	7.8	2.9	3.0	13.0	8.57	39.7
1500 min^{-1} (4 poles)												
FS 63 A4	0.12	1350	0.85	54	0.69	0.46	2.4	2.0	2.0	2.5	0.27	5.1
FS 63 B4	0.18	1350	1.27	53	0.70	0.70	2.3	2.0	2.0	2.5	0.36	5.6
FS 71 A4	0.25	1370	1.74	67	0.77	0.69	3.4	2.0	2.1	4.0	0.75	6.4
FS 71 B4	0.37	1380	2.56	68	0.67	1.18	4.0	2.2	2.3	4.0	0.98	7.6
FS 80 A4	0.55	1380	3.80	72	0.80	1.38	3.9	1.9	2.2	7.0	2.90	11.2
FS 80 B4	0.75	1390	5.15	72	0.75	2.00	3.9	2.6	2.2	7.0	3.35	12.1
FS 90S A4	1.10	1410	7.45	79	0.77	2.60	4.6	2.3	2.6	7.0	3.87	14.0
FS 90L B4	1.50	1410	10.16	79	0.76	3.60	4.8	2.4	2.6	7.0	4.60	16.5
FS 90L C4	1.80	1410	12.20	79	0.73	4.50	5.2	3.1	3.1	7.0	5.23	17.7
FS 100L A4	2.20	1410	14.90	80	0.78	5.10	4.8	2.4	2.6	13.0	6.88	22.2
FS 100L B4	3.00	1410	18.04	80	0.80	7.10	6.5	2.9	3.3	13.0	8.34	24.5
FS 112M A4	4.00	1430	26.40	84	0.76	9.00	6.6	3.1	3.6	13.0	14.56	40.7

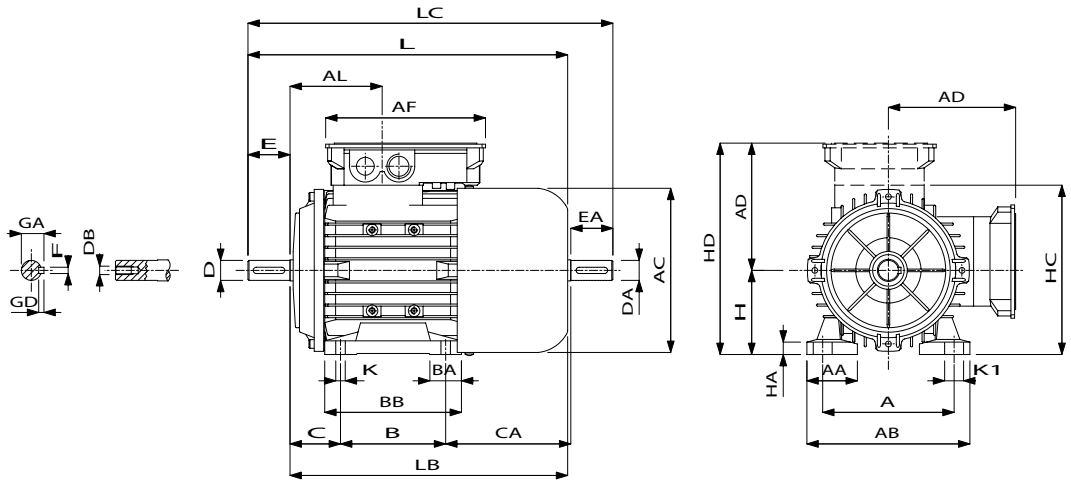
FOR MAINS VOLTAGE
230 V - 50 HZ

PROTECTION IP 54

Type	Rated output	Rated speed	Rated torque	Efficiency	Power factor	Rated current	Starting current ratio	Starting torque ratio	Pull-out torque ratio	Max braking torque	Running capacitor	Moment of inertia	Weight
	kW	min^{-1}	M_N (Nm)	η 100%	$cos\ \varphi$	I_N 230V(A)	I_A/I_N	M_A/M_N	M_K/M_N	$M_{f\,max}$ (Nm)	C (µF)	J 10^{-3} kgm²	kg
1500 min^{-1} (4 poles)													
FMC 56 B4	0.09	1100	0.76	45.0	0.91	0.95	1.5	0.7	1.2	7.5	8.0	0.21	4.5
FMC 63 A4	0.12	1370	0.84	46.0	0.85	1.32	2.0	1.3	1.4	7.5	8.0	0.38	5.1
FMC 63 B4	0.18	1290	1.33	47.4	0.85	2.00	1.8	0.8	1.2	7.5	8.0	0.47	5.1
FMC 71 A4	0.25	1340	1.78	53.4	0.90	2.26	2.2	0.7	1.5	7.5	12.5	0.81	7.1
FMC 71 B4	0.37	1370	2.57	60.4	0.87	3.00	2.7	0.8	1.6	7.5	16.0	1.14	7.9
FMC 80 A4	0.55	1370	3.82	65.9	0.97	3.70	3.1	0.8	1.4	15.0	20.0	3.35	11.7
FMC 80 B4	0.75	1390	5.14	67.4	0.89	5.40	3.2	0.7	1.7	15.0	25.0	3.68	13.0
FMC 90S A4	1.10	1353	7.59	67.2	0.95	7.23	3.0	0.7	1.6	25.0	35.0	4.13	17.0
FMC 90L B4	1.50	1380	10.44	68.0	0.95	10.10	2.7	0.9	1.7	25.0	40.0	5.58	19.5
FMC 100L A4	1.80	1380	12.60	71.2	0.95	11.74	3.2	0.7	1.8	40.0	50.0	7.40	27.0
FMC 100L B4	2.20	1410	15.24	72.6	0.88	15.16	3.2	0.6	2.1	40.0	60.0	8.85	28.0

* Number of starts per hour permitted under no load

BRAKE MOTORS FRAME SIZE 63-112 IM B3
SERIES FA - FC - FAHE - FCHE - FBA - FBC - FMC

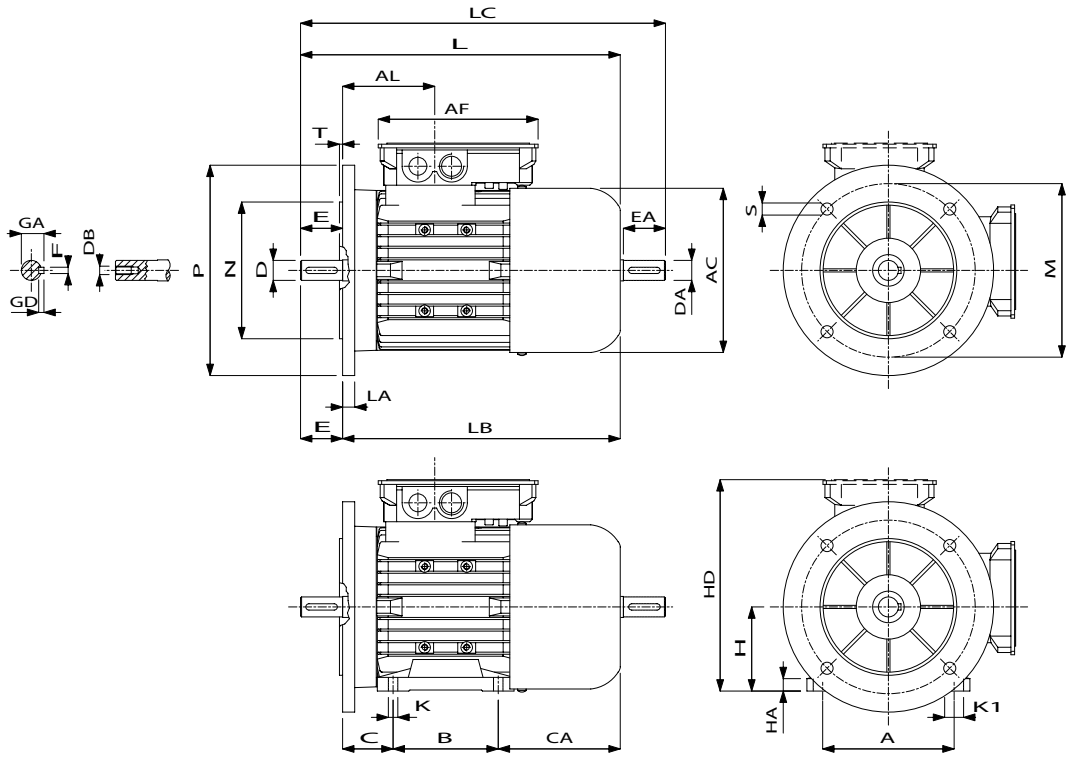


IEC	H	A	B	C	K [1]	AB	BB	CA	AD [2]	HD [2]	AC	HC	HA	K1
63	63	100	80	40	7	126	105	127	98	161	124	126	10	12
71	71	112	90	45	7	144	109	140	107	178	137	143	12	17
80	80	125	100	50	9	155	130	160	122	202	156	162	13	18
90S	90	140	100	56	9	184	130	186	129	219	176	182	14	18
90L	90	140	125	56	9	184	154	185	129	219	176	182	14	18
100L	100	160	140	63	12	200	176	189	140	240	195	200	14	20
112M	112	190	140	70	12	220	176	206	160	272	219	225	15	21

IEC	L	LB	LC	AL	AF	BA	AA	D/DA	E/EA	F/FA	GD	GA/GC	DB [3]
63	270	247	295	66	137	26	26	11	23	4	4	12.5	M4
71	305	275	337	76	152	22	30	14	30	5	5	16	M5
80	350	310	392	85	152	31	32	19	40	6	6	21.5	M6
90S	392	342	444	86	152	32	39	24	50	8	7	27	M8
90L	416	366	468	86	152	32	39	24	50	8	7	27	M8
100L	452	392	515	96	152	40	42	28	60	8	7	31	M10
112M	476	416	539	97	152	38	42	28	60	8	7	31	M10

Series FS frame sizes 63 to 112M see page 42
1) Clearance hole for screw
2) Maximum dimension
3) Centering holes in shaft extensions to DIN 332 part 2

BRAKE MOTORS FRAME SIZE 63-112 IM B5, IM B35
SERIES FA - FC - FAHE - FCHE - FBA - FBC - FMC



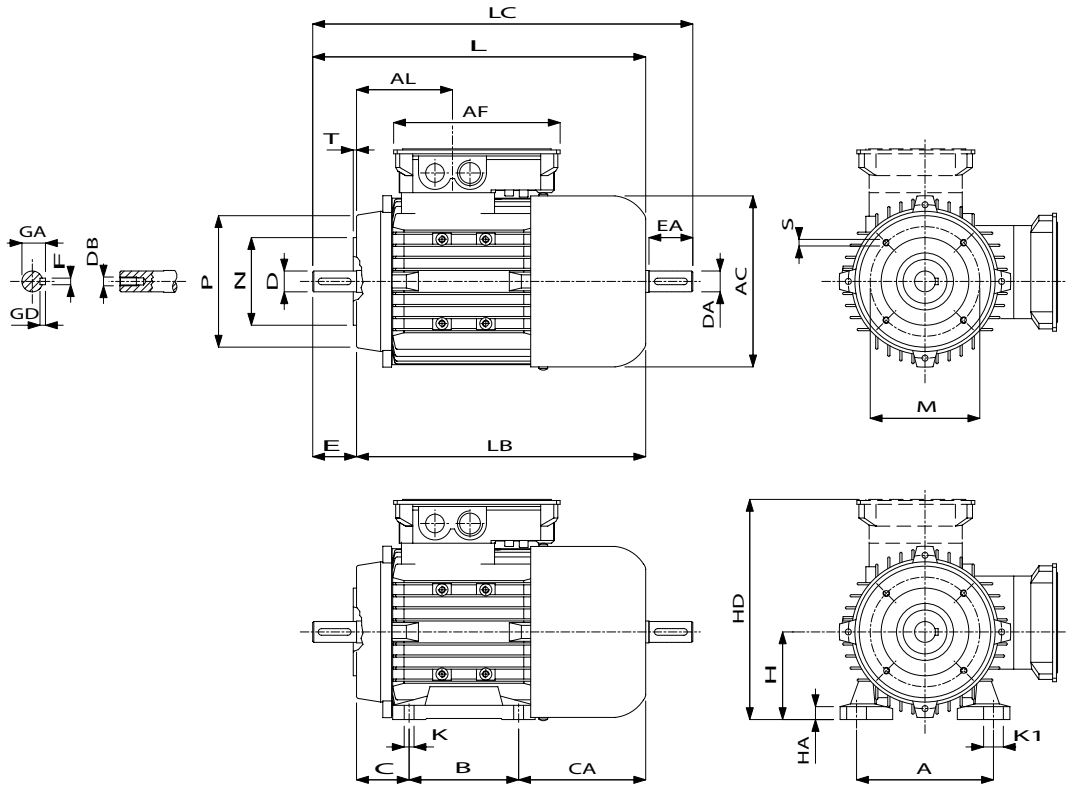
IEC	M	N	P	T	LA	S	H	A	B	C	K[1]	CA	HD[2]	AC
63	115	95	140	3.0	10	9.5	63	100	80	40	7	127	161	124
71	130	110	160	3.5	10	9.5	71	112	90	45	7	140	178	137
80	165	130	200	3.5	12	11.5	80	125	100	50	9	160	202	156
90S	165	130	200	3.5	12	11.5	90	140	100	56	9	186	219	176
90L	165	130	200	3.5	12	11.5	90	140	125	56	9	185	219	176
100L	215	180	250	4.0	14	14.0	100	160	140	63	12	189	240	195
112M	215	180	250	4.0	14	14.0	112	190	140	70	12	206	272	219

IEC	HA	K1	L	LB	LC	AL	AF	D/DA	E/EA	F/FA	GD	GA/GC	DB[3]
63	10	12	270	247	295	66	137	11	23	4	4	12.5	M4
71	12	17	305	275	337	76	152	14	30	5	5	16	M5
80	13	18	350	310	192	85	152	19	40	6	6	21.5	M6
90S	14	18	392	342	444	86	152	24	50	8	8	27	M8
90L	14	18	416	366	468	86	152	24	50	8	8	27	M8
100L	14	20	452	392	515	96	152	28	60	8	8	31	M10
112M	15	21	476	416	539	97	152	28	60	8	8	31	M10

Series FS frame sizes 63 to 112M see page 43

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

BRAKE MOTORS FRAME SIZE 63-112 IM B14, IM B34
SERIES FA - FC - FAHE - FCHE - FBA - FBC - FMC



IEC	M	N	P	T	S	H	A	B	C	K[1]	CA	HD[2]	AC
63	75	60	90	2.5	M5	63	100	80	40	7	127	161	124
71	85	70	105	2.5	M6	71	112	90	45	7	140	178	137
80	100	80	120	3.0	M6	80	125	100	50	9	160	202	156
90S	115	95	140	3.0	M8	90	140	100	56	9	186	219	176
90L	115	95	140	3.0	M8	90	140	125	56	9	185	219	176
100L	130	110	160	3.5	M8	100	160	140	63	12	189	240	195
112M	130	110	160	3.5	M8	112	190	140	70	12	206	272	219

IEC	HA	K1	L	LB	LC	AL	AF	D/DA	E/EA	F/FA	GD	GA/GC	DB[3]
63	10	12	270	247	295	66	137	11	23	4	4	12.5	M4
71	12	17	305	275	337	76	152	14	30	5	5	16	M5
80	13	18	350	310	192	85	152	19	40	6	6	21.5	M6
90S	14	18	392	342	444	86	152	24	50	8	8	27	M8
90L	14	18	416	366	468	86	152	24	50	8	8	27	M8
100L	14	20	452	392	515	96	152	28	60	8	8	31	M10
112M	15	21	476	416	539	97	152	28	60	8	8	31	M10

Series FS frame sizes 63 to 112M see page 44

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

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