

rotor^{b.v.}

flameproof electric motors

ATmosphères **EX**plosibles



Rotor b.v.:

Mors 1-5, P.O. Box 45, 7150 AA Eibergen, The Netherlands
Phone: +31-(0)545 46 46 40, Fax +31-(0)545 47 50 65
info@rotor.nl, www.rotor.nl

Rotor-Belgium:

Industriepark 2Q, 9031 Gent Drogen, Belgium
Phone: +32-(0)9 281 11 40, Fax +32-(0)9 281 11 45
info@rotor.be, www.rotor.be

Rotor UK Limited:

16, Everitt Close, Denington Industrial Estate Wellingborough NN8 2QF,
United Kingdom
Phone: +44-(0)1933 230900, Fax +44-(0)1933 272152
info@rotor.co.uk, www.rotor.co.uk



Introduction

About Rotor

Rotor is a manufacturer and supplier of both standard and special electric motors for industry, which are in accordance with the IEC and DIN standards. The special motors can be quickly adapted to suit the clients changing requirements because of Rotor's technical ability and extensive stocks.

Rotor has the ability to deliver a complete drive solution according to customer specifications for many varied applications such as pumps, ventilation systems, davits, cranes, dock & port machinery, hydraulic systems, compressors and many more industrial applications.

Quality

ROTOR is certified according ISO9001:2000 and has a ATEX-quality certificate according EN13980 which allows us to produce ATEX-motors.

Rotor's delivery program includes:

- electric motors in standard and special execution
- marine electric motors
- gas-explosion proof electric motors non-sparking / increased safety / flameproof
- dust-explosion proof electric motors
- single phase electric motors
- brake motors
- worm gear reducers, gear motors and - reducers

This brochure

contains information about rotor nl® flameproof electric motors.

The rotor nl® flameproof electric motors type 3RD and 4RD are according the new and strict ATEX rules. These motors are deliverable in frame size IEC 71 - 315, protection class standard IP 55, casing cast iron, and standard with PTC temperature measurement element.

Rotor is able to supply the rotor nl® flameproof electric motors according to all kind of executions and specifications like:

- EEx-de or EEx-d
- gas group II C
- temperature class T1 to T6
- power: 0.09 kW to 200 kW
- frequency 50 / 60 Hz
- suitable for frequency inverters
- pole changing motors



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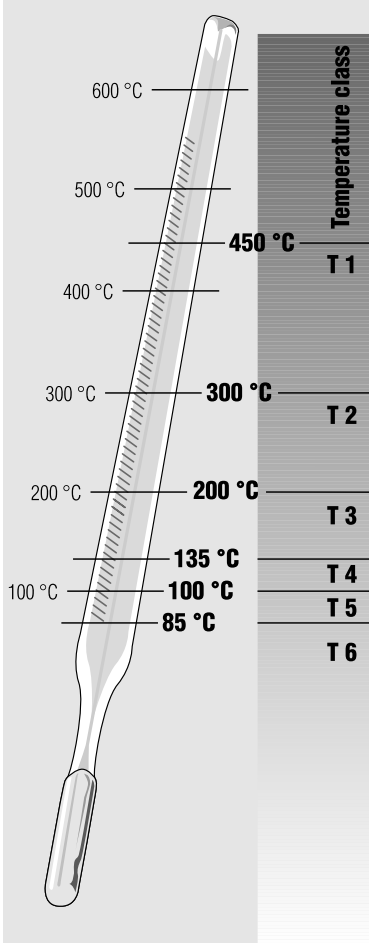


1

Ignition temperature - temperature class

The ignition temperature is influenced by various factors such as size, shape, type and composition of a surface. In IEC 79-4, IEC, CENELEC and other standards the authorities have agreed on a "procedure for the determination of ignition temperature" with a limit approaching the lowest possible value.

The gases and vapours are classified into temperature classes. In accordance with these temperature classes, electrical equipment is tested for its maximum surface temperature to ensure that the possibility of ignition due to the surface temperature is excluded in normal and abnormal operation. The standards specify to which extent these standard values may be exceeded and determine the necessary safety margins.



Temperature class	Ignition temperature range of mixture	Permissible surface temperature of electrical equipment	Permissible temperature rise
T1	> + 450 °C	+ 450 °C	+ 410 °C
T2	> + 300... ≤ + 450 °C	+ 300 °C	+ 260 °C
T3	> + 200... ≤ + 300 °C	+ 200 °C	+ 160 °C
T4	> + 135... ≤ + 200 °C	+ 135 °C	+ 95 °C
T5	> + 100... ≤ + 135 °C	+ 100 °C	+ 60 °C
T6	> + 85... ≤ + 100 °C	+ 85 °C	+ 45 °C

Examples of the categorisation of gases and vapours in temperature classes and explosion protection subgroups.

	T1	T2	T3	T4	T5	T6
IIA	Methane	Propane	Petrol	Acetaldehyde		
IIB		Ethylene	Diethylether			
IIC	Hydrogen	Acetylene				Carbon disulphide



2

Maintenance of explosion protection

Maintenance of explosion protection during operation.

Electric machines must be protected against overheating due to overloads. The type of protection depends on the type of operation as well as the electric machine and its use.

Explosion-proof electric motors are usually certified for S1 type of operation, i. e. continuous operation. Other duties are allowed only if the temperature of the motor is controlled by reliable devices.

Duty type	Protective control device
S1*	A Motor safety switch according to IEC 34-1 (VDE 0165/9.83) B Motor safety switch and temperature sensors in windings as additional protection. C Only temperature sensors as major protection. Only allowed if motor is tested and certified and if all control devices (power supplies) used are certified.
S2/S3*	D Motor safety switch with switch-on time control and/or temperature sensors in windings as additional protection. E Temperature sensors in windings as major protection. Only allowed if motor is tested and certified and if all control devices (power supplies) used are certified.
S4, S5, S6, S7, S8*	F Temperature sensors in windings. Motor must be tested and only certified control devices may be used.
Power supply by means of frequency converters	G Thermal protection of motor by means of sensors in windings is allowed as the only (independent) protection if motor is tested at all power supply frequencies, maximum voltage and S1-S7 (S8) types of operation. H If motor protection and converter are tested and certified as a unit.

* For explanation of duty cycles see pages 22-23



3

Introduction

Explosion-protected electric motors are used in industrial plants with a potentially explosive atmosphere containing inflammable fumes (vapours) or gases (i. e. chemical industry, oil refineries ...) as well as in mines where methane is present.

These are the three-phase, asynchronous electric motors with short-circuit rotor, explosion protected according to the CENELEC EN 50014, EN 50018, EN 50019 (IEC 79-0, IEC 79-1) standards.

The enclosures of electric motors are designed to be “flameproof” according to EN 50018 (IEC 79-1). The terminal boxes could also be in “flameproof” design or also in “increased safety” design according to EN 50019 (IEC 79-7).

The following regulations and standards have been considered in designing, manufacturing and testing of electric motors:

Standard	IEC international	EN-CENELEC Europe
Rotating electric machines - classification of insulation materials for electric machines	IEC 34-1	EN 60 034-1
Climatic protection (IP number) Protection against harmful contact and ingress of solids	IEC 34-5	EN 60 034-5
Cooling devices for electric machines	IEC 34-6	EN 60 034-6
Construction and mounting of electric rotating machines	IEC 34-7	EN 60 034-7
Marking of terminals and directions of rotating of electric machines	IEC 34-8	EN 60 034-8
Noise levels	IEC 34-9	EN 60 034-9
Starting performances of short-circuit motors at 50 Hz and voltages up to 660 V	IEC 34-12	EN 60 034-12
Limited vibration levels for electric machines	IEC 34-14	EN 60 034-14
Relation between terminal sizes and ratings of three-phase short-circuit surface-cooled electric motors	IEC 72-1, DIN 42673/3	
Relation between terminal sizes and ratings for arrangements: IM B5, IM B10, IM B14	IEC 72-2	

European directives

Description	Direct no.
Directive for explosive atmospheres (ATEX)	94/9/EC, 1999/92/EL
Electromagnetic Compatibility (EMC)	89/336/EEC
Low Voltage Directive (LVD)	73/23/EEC
Machinery Directive	98/37/EC
Packing and packaging waste	94/62/EC



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Construction

Explosion protection standards taken into consideration during manufacturing and testing

Standard	IEC international	EN-CENELEC Europe
Electric devices operating in explosive atmospheres Standard type	IEC 79-0	EN 50014
Electric devices operating in explosive atmospheres flameproof “d”	IEC 79-1	EN 50018
Electric devices operating in explosive atmospheres Increased safety “e”	IEC 79-7	EN 50019

Construction

Electric motors are of totally enclosed, fancooled (blow-over) type. Cooling is provided by fans blowing external air over the ribbed outside surface (cooling system IC 0141 according to IEC 34-6 or EN 60 034-6). Electric motors up to 160 frame size are made of grey cast iron. Motors frame sizes of 180 and more are made of welded housing and the terminal boxes of grey cast iron.

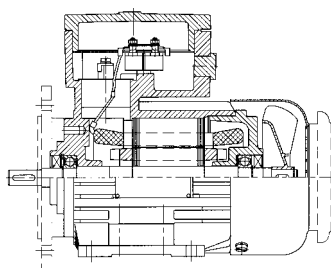
Frame size	Stator frame	Shield	Fan cover	Terminal box	Fan
71	Terminal box casting with stator housing	Cast iron B 5, B 14 Screw-on	Steel sheet -extruded-	Cast iron	Plastic
80	Cast iron Screw-on feet				
90					
100					
112					
132					
160					
180	Steel sheet -welded- -welded feet-	Steel sheet -welded-		Steel sheet -welded-	
200					
225					
250					
280					
315					



Dimensions

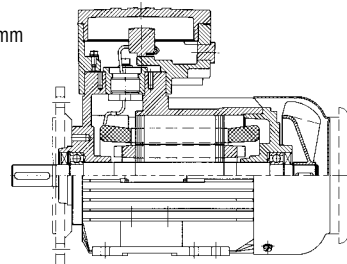
Cast iron

Frame size:
71 mm



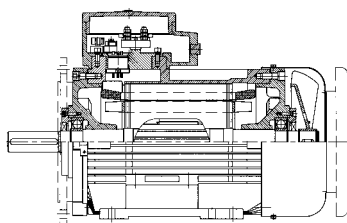
Cast iron

Frame size:
80 mm - 132 mm



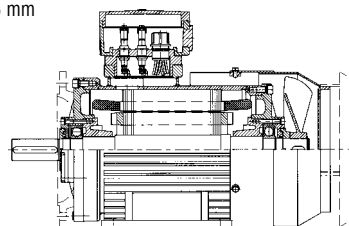
Cast iron

Frame size:
160 mm



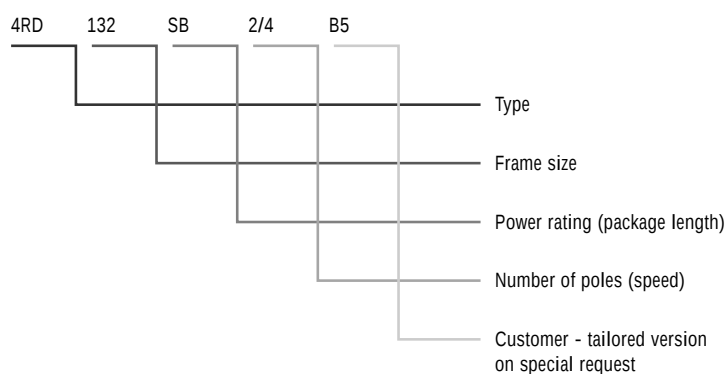
Welded

Frame size:
180 mm - 315 mm



Type codes

Example





Bearings

Bearing Lubrication

The following table lists the bearings used in the different motors. The bearings last about 20.000 hours in 4, 6 and 8 pole motors if the loads do not exceed the values indicated in the tables on pages 12 and 13.

Only the latest and most innovative bearings of known producers have been used in our motors. On customer request we equip the motors with other bearings (depends on the respective construction!).

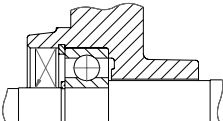
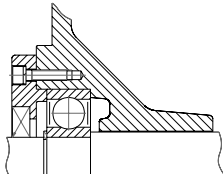
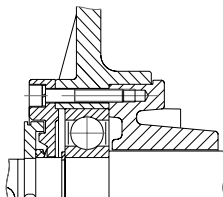
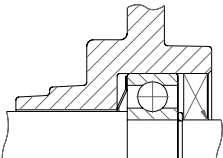
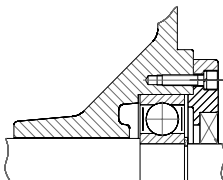
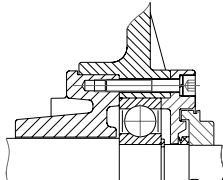
The rotors are standard constructions and fixed on the D-end (frame size 71 mm to 160 mm) and B-end (frame size 180 mm to 225 mm).

Bearing

Frame size	Poles	DE bearing	NDE bearing	Bearing dishes
71	2 - 8	6203 2Z C3	6203 2Z C3	17 x 40 x 12
80	2 - 8	6204 2Z C3	6204 2Z C3	20 x 47 x 14
90	2 - 8	6205 2Z C3	6205 2Z C3	25 x 52 x 15
100	2 - 8	6206 2Z C3	6206 2Z C3	30 x 62 x 16
112	2 - 8	6206 2Z C3	6206 2Z C3	30 x 62 x 16
132	2 - 8	6208 2Z C3	6208 2Z C3	40 x 80 x 18
160	2 - 8	6309 2Z C3	6309 2Z C3	45 x 100 x 25
180	2 - 8	6310 2Z C3	6310 2Z C3	50 x 110 x 27
200	2 - 8	6312 2Z C3	6312 2Z C3	60 x 130 x 31
225	2 - 8	6313 2Z C3	6313 2Z C3	65 x 140 x 33
250	2 - 8	6314 2Z C3	6314 2Z C3	70 x 150 x 35
280	2 - 8	6316 2Z C3	6316 2Z C3	80 x 170 x 39
315	2 - 8	6317 2Z C3 *NU 317	6317 2Z C3	85 x 180 x 41

*on request

Bearing assemblies

	4RD 71 - 132	4RD160	4RD 250 - 4RD 315 3RD 180 - 3RD 225
Drive end			
Non-drive end			



Shaft ends

The standard electric motor is equipped with one free shaft extension. On request we also supply versions with free shaft extensions on both sides.

The dimensions of the shaft ends correspond to the IEC 72 (1971) standard, fifth edition. Tolerances for shaft end-diameters are in accordance with DIN 7154:

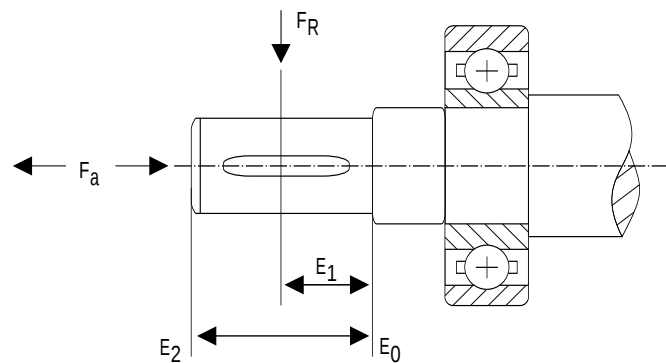
- up to diameter of 50 mm / ISO k6
- more than 50 mm / ISO m6

Free shaft extensions are equipped with keyways. Keyway and key correspond to DIN 6885.

The shafts have a threaded central hole for the drawing in, drawing out and fixing connections.

Shaft diameter	14 mm	19 mm	24 mm	28 mm	38 mm	from 42 to 48 mm	from 55 to 80 mm	from 90 to 100 mm
	M5	M6	M8	M10	M12	M16	M20	M24

Permissible loads on free shaft end





Allowable radial force

Frame size	Number of poles	Radial force F_R [kN]		
		E_0	E_1	E_2
71	2	0.48	0.43	0.39
	4	0.6	0.54	0.5
	6	0.69	0.62	0.56
	8	0.76	0.68	0.62
80	2	0.64	0.57	0.51
	4	0.81	0.72	0.65
	6	0.93	0.83	0.74
	8	1.02	0.91	0.82
90	2	0.72	0.64	0.57
	4	0.9	0.8	0.71
	6	1.04	0.92	0.82
	8	1.14	1.01	0.9
100	2	1.01	0.9	0.81
	4	1.28	1.15	1.04
	6	1.45	1.3	1.17
	8	1.61	1.43	1.3
112	2	0.99	0.87	0.79
	4	1.23	1.09	1.08
	6	1.42	1.25	1.12
	8	1.57	1.39	1.24
132	2	1.56	1.38	1.23
	4	1.96	1.78	1.55
	6	2.24	1.98	1.77
	8	2.45	2.16	1.96
160	2	2.99	2.63	2.35
	4	3.83	3.38	3.02
	6	4.33	3.81	3.4
	8	4.79	4.22	3.78
180	2	3.55	3.14	2.84
	4	4.43	3.82	3.53
	6	5.1	4.52	4.08
	8	5.63	5.0	4.52
200	2	4.33	4.24	3.6
	4	4.45	4.95	4.52
	6	6.28	5.71	5.23
	8	6.88	6.25	5.72
225	2	10.4	9.45	8.32
	4	13.1	11.65	10.49
	6	15.03	13.37	12.03
	8	16.6	14.78	13.3
250	2	11.64	10.41	9.4
	4	14.77	13.22	11.96
	6	16.97	15.2	13.75
	8	18.73	16.78	15.19
280	2	14.52	13.03	11.8
	4	18.18	16.31	14.76
	6	20.93	18.78	17.02
	8	22.93	20.56	18.62
315	2	16.55	14.92	13.57
	4	20.62	18.57	16.86
	6	19.73	17.58	15.82
	8	21.93	19.56	17.62
355	2	18.33	14.26	15.25
	4	23.1	17.98	19.49
	6	26.8	24.59	22.67
	8	29.29	26.83	26.72



Maximum axial loads, noise level and vibration

Maximum loads for free shaft extension Fa[kN]

Mounting arrangements	IM B7 IM B3	IM B8 IM B35	IM B14 IM B5	IM B34 IMJ B6	IM V18 IM V19 IM V1 IM V3 IM V5 IM V6							
					Weight of rotor in load direction				Weight of rotor in opposite load direction			
					3000	1500	1000	750	3000	1500	1000	750
71	0.27	0.34	0.39	0.43	0.33	0.43	0.47	0.52	0.35	0.46	0.51	0.55
80	0.36	0.45	0.52	0.57	0.43	0.55	0.62	0.69	0.47	0.6	0.69	0.76
90	0.41	0.51	0.59	0.65	0.48	0.61	0.69	0.77	0.54	0.68	0.79	0.86
100	0.55	0.69	0.79	0.88	0.64	0.81	0.92	1.03	0.75	0.94	1.07	1.11
112	0.55	0.69	0.79	0.88	0.63	0.77	0.89	1.0	0.76	0.98	1.1	1.14
132	0.83	1.04	1.2	1.32	0.92	1.13	1.3	1.48	1.16	1.47	1.67	1.82
160	1.52	1.91	2.19	2.41	1.65	2.1	2.4	2.65	2.13	2.68	3.08	3.31
180	1.77	2.24	2.56	2.82	1.85	2.3	2.71	3.0	2.55	3.26	3.74	4.13
200	2.33	2.94	3.37	3.71	2.39	3.06	3.54	3.89	3.45	4.38	4.91	5.5
225	2.66	3.36	3.85	4.23	2.71	3.3	3.78	4.25	4.03	5.05	5.94	6.28
250	2.98	3.76	4.30	4.73	2.92	3.85	4.07	4.48	4.62	5.55	6.81	7.46
280	3.50	4.41	5.05	5.56	3.18	3.76	4.52	4.82	5.51	7.13	7.94	8.89
315	3.58	4.51	5.17	5.69	2.33	2.31	2.01	2.55	6.09	8.15	9.34	10.05
355	3.7	4.65	5.3	5.8	0.6	0.3	0.7	1.4	8.0	10.8	12.2	13.0

The load rating of bearings has been calculated for at least 20 000 operating hours at a frequency of 50 Hz. Only the axial loads have been considered. If the load is made up of axial and radial loads, the working life of the bearings is shorter.



Noise level and vibrations

**Maximum noise level L dB allowed at 1 m distance from the machine surface
Values for fan-cooled (blow-over) machines; IP 55**

Power ratings P (kW)	Rotation speed min ⁻¹					
	600 < n ≤ 960	960 < n ≤ 1320	1320 < n ≤ 1900	1900 < n ≤ 2360	2360 < n ≤ 3150	3150 < n ≤ 3750
P ≤ 1.1	67	70	71	74	75	79
1.1 < P ≤ 2.2	69	70	73	78	80	82
2.1 < P ≤ 5.5	72	74	77	82	83	85
5.5 < P ≤ 11	75	78	81	86	87	90
11 < P ≤ 22	78	82	85	87	91	93
22 < P ≤ 37	80	84	86	89	92	95
37 < P ≤ 55	81	86	88	92	94	97
55 < P ≤ 110	84	89	92	93	96	98
110 < P ≤ 220	87	91	94	96	98	100
220 < P ≤ 400	88	92	96	98	99	102

Noise level and vibrations

The noise level of electric motors is below the limits prescribed by the IEC 34-9 recommendation for fan-cooled (blow-over) electric machines.

The rotors of electric motors are dynamically balanced with installed fan and 1/2 key. Vibration amplitude corresponds to N grade (normal) according to IEC 34-14 (ISO 2373-N grade).

**Limit values for the vibration
of electric machines (IEC 34-14; DIN ISO 2373)**

Degree	Rotation speed min ⁻¹	Limits of V _{ef} in mm/s		
		80 up to 132	160 up to 225	230 up to 315
N (normal)	600 to 1 800 nad 1 800 to 3 600	1.8	2.8	4.5
R (reduced)	600 to 1 800 nad 1 800 to 3 600	0.71 1.12	1.12 1.8	1.8 2.8
S (special)	600 to 1 800 nad 1 800 to 3 600	0.45 0.71	0.71 1.12	1.12 1.8

The vibration level is the maximum r. m. s. value of vibration velocity in a frequency range from 10 Hz to 1 000 Hz.

Measured according to DIN ISO 2373, IEC 34-14.



Terminal box and terminals for supply cable

Terminal box

The terminal box is fitted to the top of the motor with the cable entering from the fan end of the motor. It can be repositioned in steps of 90 ° to 180 ° to suit the application.

The motors with direct starting are equipped with 3 connection terminals. 6 connection terminals are fitted to Star-Delta, two speed and dual voltage machines.

The electric motors with sizes 71 to 132 inclusive and EEx e terminal boxes have 6 additional connection terminals for PTC sensors, heaters etc. The motors with EEx d terminal boxes are also equipped with 6 connection terminals. Exception is the 71 motor with only 4 connection terminals.

Each terminal box has one connection terminal for the protective conductor.

EEx d Terminal boxes include a threaded entry to accept EEx d cable glands (see table below). EEx d Thread reducers or adaptors can be included as an option for other thread sizes and thread forms.

Terminals for supply cable and cable entries

Frame size	Terminals for a max. cross section of supply cable (mm ²)	Cable entries for main connection		
		EEx e terminal box		EEx d terminal box
		Cable entries	External diameter of supply cable (mm)	Cable entries
71	2.5	M20 x 1.5	6 to 12	M20 x 1.5
80 90 100 112	4	M25 x 1.5	13 to 18	M25 x 1.5
132	4	2 x M25 x 1.5	13 to 18	2 x M25 x 1.5
160 180	10	2 x M40 x 1.5	22 to 32	2 x M40 x 1.5
200 225	70			
250 280	95 120	2 x Pg 42	32 to 38	
315	250	2 x M64	58 to 61.5	

Increased safety terminal boxes include EEx e cable glands in accordance with EN 50014 and EN 50019.

The empty entries are fitted with suitably certified stopping plugs. Additional entries can only be made in our factory under strict quality procedures.

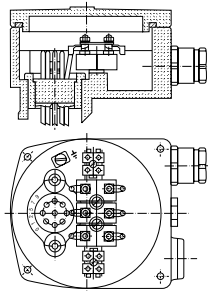
The EEx d terminal may receive additional threaded holes (NPT, ISO 7/1) by means of adapters.

One threaded hole M20 x 1.5 is provided on the EEx d terminal boxes for the thermal protection and for heaters. EEx e terminal boxes have an additional cable gland M20 x 1.5 for cable diameters of 6 to 12 mm.

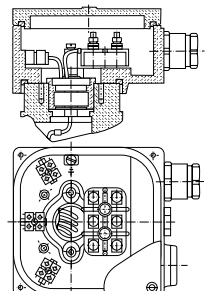


EEx e version Frame sizes

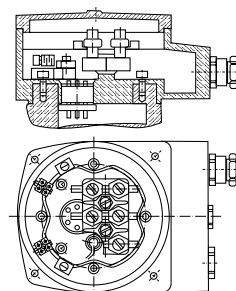
4RD71



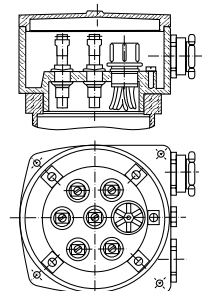
4RD80-132



4RD160

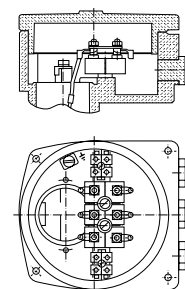


3RD180-225; 4RD250-315

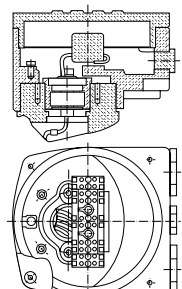


EEx d version Frame sizes

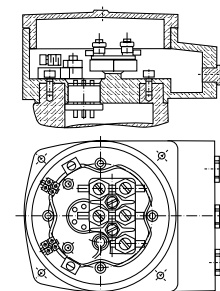
4RD71



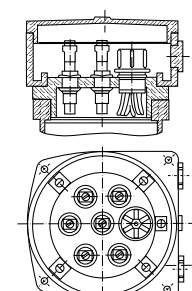
4RD80-132



4RD160



3RD180-225; 4RD250-315





Degrees of IP protection and coating

IP protection

IP protection of electric motors corresponds to IP 55. Motors with a higher degree of IP protection are manufactured on special request.

Protection against environmental influences IP protection

Protection class	Protection against harmful contact and ingress of solids (1st Numeral)
IP 44	Protection against direct contact with electrically live and rotating inner parts using tools, wire or similar objects with a diameter exceeding 1 mm. Protection against ingress of solids (diameter > 1 mm). Fan air outlets and water exhausts may have a second-degree level of protection.
IP 54 / IP 55 / IP 56	Complete protection against contact with electrically live and moving rotating inner parts. Protection against harmful ingress of dust. Ingress of dust is not fully prevented, but must not reach an extent causing harmful effects to machine operation.
IP 65*	Complete protection against contact with electrically live parts and rotating inner parts. Protection against ingress of dust (dust-proof machine).

Protection class	Protection against ingress of water (2nd Numeral)
IP 44 / IP 54	Water particles spraying from any direction do not have any harmful effects on the machine (i. e. rain).
IP 55 / IP 65*	A jet of water spraying from any direction does not have any harmful effects on the machine.
IP 56	During rough seas water must not penetrate into the interior of the motor to such an extent as to cause damage to the machine (deck-mounted motors).

*All vertically-mounted electric motors with free shaft extension on the top must be protected against particles falling into the fan cover. This protection is not necessary if the machine itself has such a protection. Electric motors mounted outdoors must be protected against exposure to direct sunlight.

Coating

Surface protection against aggressive environmental influences

	Anti-corrosion protection 2 (standard)	Anti-corrosion protection 3 (special)	Special surface protection
Surface	sanding and degreasing	sanding and degreasing	Products with surface protection against chemical influences and tropical conditions are available on special request.
Undercoating	Alkyd	Epoxy	
Coating	-	Epoxy	
Finishing	Alkyd (2 x)	Epoxy	
Total thickness μm	80	140	
Colour*	blue RAL 5010	blue RAL 5010	
Protection against corrosion in environments with water	high humidity, steam, sea water	high humidity, steam, sea water	
Environmental resistance	periodic spilling or spraying of anorganic acids and lyes	periodic spilling or spraying of anorganic acids and lyes	
Temperature resistance	- 40 °C to + 130 °C	- 40 °C to + 130 °C	
Suitable for	normal industrial atmospheres, relatively high humidity and high content of salt and aggressive gases (SO_2 , NO_x)	Chemically aggressive atmospheres, high content of salt and aggressive gases (SO_2 , NO_x). Condensation of moisture and electrolytes on surface. Solvents and oil derivatives have negative effects.	

* Mining industry: yellow RAL 1003 for 500 V, grey RAL 9003 for 1000 V



Arrangements

The types of electric motors and their symbols are prescribed by the IEC 34-7, EN 60 034-7 standards. Motors are manufactured following the basic IM B3, IM B5 and IM B14 types.

Table 4 shows the symbols and mounting arrangements for the standard models manufactured by our company. IM B3 type motors can also operate in IM B6, IM B7 and IM B8 mounting positions.

IEC code I	IM B3	IM B5	IM B34	IM B14	IM B35
IEC code II	IM 1001	IM 3001	IM 2101	IM 3601	IM 2001
IEC code I	IM V6	IM V3	IM V6/IM V19	IM V19	IM V36
IEC code II	IM 1031	IM 3031		IM 3631	IM 2031
IEC code I	IM V5	IM V1	IM V5/IM V18	IM V18	IM V15
IEC code II	IM 1011	IM 3011		IM 3611	IM 2011

Explosion protection and certifications

Explosion protection

Electric motors belong to the T4 temperature class. Electric motors of type 4RD are designed for gas group C.

Explosion protection markings are II 2 G EEx d IIC T4 or II 2 G EEx de IIC T4 (EN 50014, EN 50018, EN 50019).

Certifications

3/4RD-type motors are PTB-certified (Physikalisch-technische Bundesanstalt), Germany:

- PTB 05ATEX1015 frame sizes 80 to 132
- PTB 05ATEX1014 frame sizes 71 and 160
- PTB 05ATEX1016 frame sizes 180 to 225
- PTB 05ATEX1017/18/19 frame sizes 250 to 315



Electric system

Power, voltage and frequency

The power ratings given in the tables are valid for operation under uniform, continuous load (S-1 according to IEC 34-1, EN 60034-1) at a rated voltage, a frequency of 50 Hz, temperatures of up to + 40 °C and an altitude of less than 1 000 m above sea level. The data in the tables refer to 400 V, but motors have been designed for 380 V and 415 V.

Voltage or frequency variations of +/- 5 % are allowed; within these limits the power ratings remain unchanged and the maximum winding temperature is not exceeded.

Versions using 110 V to 1 000 V and frequencies of 50 or 60 Hz are available on special request. 50 Hz, 380 V, 400 V, 415 V electric motors may also be connected to **440 V - 480 V** and a frequency of **60 Hz**. Then the maximum load can be increased by 15 % and the number of revolutions by approximately 20 %.

If a 50 Hz, 380 V, 400 V, 415 V electric motor is connected to a 60 Hz line, its maximum load may not exceed the nominal power. The number of revolutions increases by 20 %, while the starting and maximum torque decreases by approx. 18 %.

Overload, efficiency and power factor

Electric motors heated to the operating temperature limit resist to a 2-minute overload of 1.5 I_n without being damaged. Variations between the 5/4 and 3/4 of the rated load have no essential influence on efficiency and power factor.

Efficiency η (%) of the rate load			
5/4	4/4	3/4	2/4
96	96	96	94.5
95	95	95	93.3
94	94	94	92
93	93	93	91
92	92	92	90
91	91	91	89
90	90	90	87
89	89	89	86
88	88	83	85.5
86	87	87	85
85	86	86	84.5
84	85	85	84
83	84	84	83
82	83	83	81
81	82	82	80.5
79	81	81	80
78	80	80	79
77	79	79	78
76	78	78	76
75	77	77	75
74	76	76	74
73	75	75	73
72	74	74	72
71	73	73	71
70	72	72	69
69	71	71	68
68	70	70	67
67	69	69	66
66	68	67.5	64
65	67	66.5	62
64	66	65	61

Power factor $\cos \varphi$ of the rate load			
5/4	4/4	3/4	2/4
0.94	0.94	0.92	0.74
0.94	0.93	0.92	0.68
0.92	0.92	0.89	0.65
0.91	0.91	0.88	0.64
0.9	0.9	0.87	0.63
0.89	0.89	0.88	0.6
0.88	0.88	0.85	0.58
0.88	0.87	0.84	0.57
0.87	0.86	0.83	0.55
0.86	0.85	0.82	0.53
0.86	0.84	0.81	0.51
0.85	0.83	0.8	0.49
0.85	0.82	0.78	0.47
0.83	0.81	0.76	0.45
0.82	0.8	0.75	0.43
0.82	0.79	0.73	0.42
0.79	0.78	0.73	0.41
0.78	0.77	0.72	0.4
0.78	0.76	0.7	0.38
0.77	0.75	0.69	0.36
0.76	0.74	0.67	0.36
0.75	0.73	0.66	0.35
0.74	0.72	0.65	0.34
0.73	0.71	0.64	0.34
0.72	0.7	0.63	0.33
0.71	0.69	0.62	0.33
0.7	0.68	0.61	0.32
0.7	0.67	0.59	0.3
0.68	0.66	0.57	0.3
0.68	0.65	0.55	0.3
0.67	0.64	0.54	0.3



Windings

Materials of thermal class F are used for the production of stator windings. They are designed to withstand an overtemperature of 80 K at a maximum ambient temperature of 40 °C. Electric motors operating under heavy conditions, conditions requiring frequent start-ups or ambient temperatures above 40 °C employ special insulation (thermal class H) and are available on special request. Windings of electric motors rated up to 3 kW are connected via star, while those of high-rated motors employ delta connection. Two-speed motors with 2:1 speed ratio use Dahlander windings. Electric motors with a pole relation of 4/6 or 8/6 have two separate stator windings in star connection.

Wiring diagram	EEx d	EEx e	EEx d and EEx e terminal box	EEx d	EEx e
Single speed Start with Y-D switch, remove Y-D jumper					
Y-D-jumper in Y-connection for direct coupling			Y-D-jumper in D-connection for direct coupling		
Pole-changing					
Low speed			High speed		
Pole-changing (Dahlander)					
Low speed			High speed		
Pole-changing (Dahlander)					
Low speed			High speed		

Installation instructions

for the mains connection and start-up of motors with EEx d terminal box.

Connect the motors via suitable cable and line entries that correspond to the EN 50018-1977 directives, paragraphs 12.1 and 12.2 and have a separate test certificate. Unused openings must be closed as prescribed by EN 50018-1977, paragraph 12.5. Cable and line entries (heavy-gauge conduit threads) and sealing plugs that do not meet these requirements must not be used.



Test and tolerance band of the rated values

Electric motors are tested in accordance with IEC 34-2, EN 60 034-2 regulations. All nominal and start-up value deviations are within the limits prescribed by IEC 34-1, EN 60 034-1.

The explosion-proof enclosure is tested according to the IEC 34-1, EN 60 034-1 regulations. All enclosure parts are tested with a water pressure of 1 000 kPa.

Rated values under extreme working conditions

When electric motors are used at temperatures above + 40 °C or at altitudes of more than 1 000 m, the permitted overtemperature for windings is lower; the rated power is reduced respectively. The relation between rated power and ambient temperature altitude is shown in the diagrams.

Tolerances of rated values

The rated values shown in the tables may vary according to IEC 34-1/7, EN 60034-1.

Performance

Rated power ≤ 50 kW - 0.15 (1- η)
 > 50 kW - 0.10 (1- η)

Power factor - $\frac{1 - \cos \varphi}{6}$

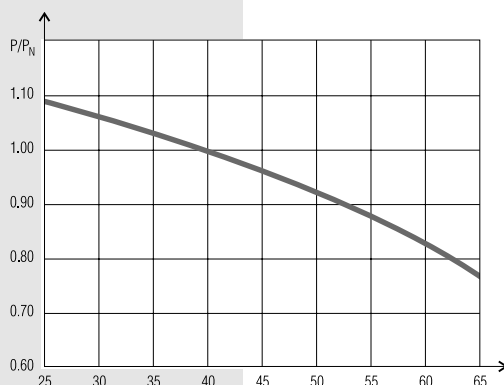
Slip at rated load
and machine heated
to operating temperature + 20 % of rated slip

Starting torque - 15 % of rated value + 25 %

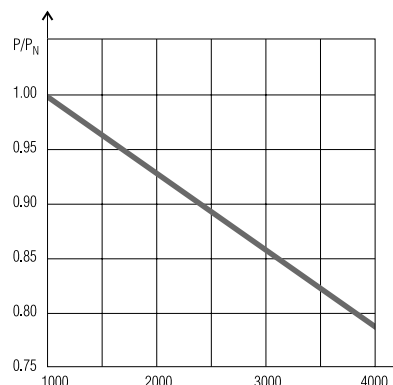
Maximum torque - 10 % of rated value

Starting current + 20 % lower limit not prescribed

Power reduction as temperatures rise



Power reduction at less cooling





Start-up characteristics

Start-up torque and current are the actual values the motor develops and the current values that cross the power supply cable when voltage is applied to the electric motor. The charts below show the values for both start-up torque and peak torque as well as the start-up current given as multiple of the nominal values.

Motor torque classification

For the right choice of the motor you not only have to know starting and maximum torque but also the torque curve and speed. To avoid the plotting of torque curves which are unique for each type of motor, the rotor torque class is defined as one of the electric motor's characteristics. This way the suitable motor can be chosen without the (exact) knowledge of the course of the torque curve.

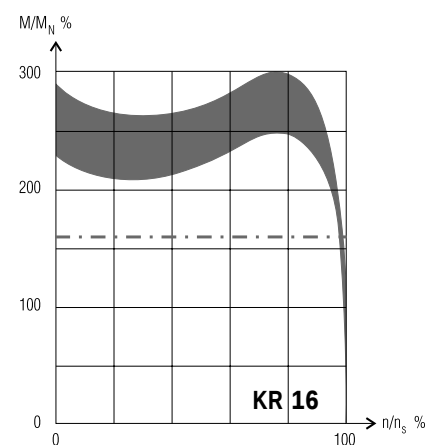
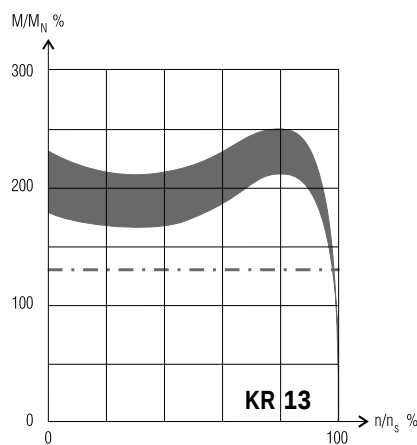
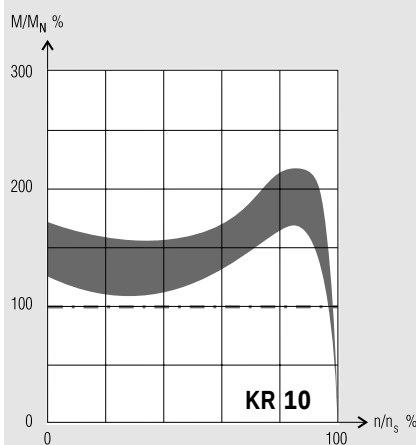
The motor torque class shows the maximum counter-torque for starting the motor. The starting torque class is specified according to the nominal voltage. In this catalog we distinguish three classes:

KR 10

KR 13

KR 16

The titles of the torque classes contain numbers which correspond to one tenth (1/10) of the maximum counter-torque value necessary to start up the motor. The following illustrations represent the torque curves of the classes KR 10, KR 13 and KR 16.



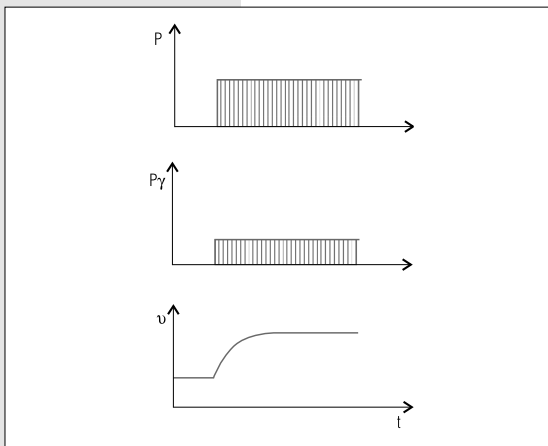


Duty cycles

S1 Continuous duty

Operation under constant load, lasting long enough to allow the machine to reach thermal equilibrium.

Designation: **S1**

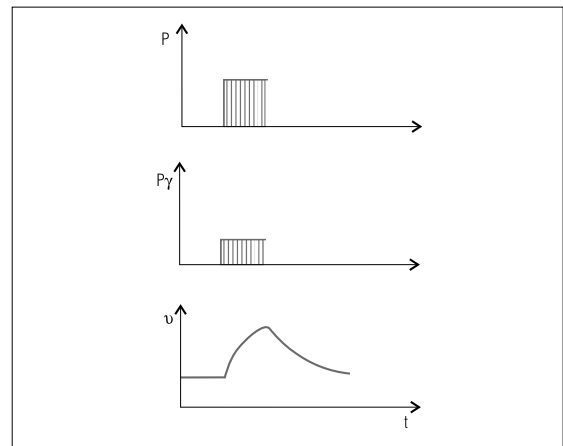


S2 Short-time duty

Operation under constant load, for a time too short to allow the machine to reach thermal equilibrium. Idle time of the machine is long enough to allow the machine to cool down to ambient temperature.

Standard duration of short-term operation:
10, 30, 60 and 90 minutes.

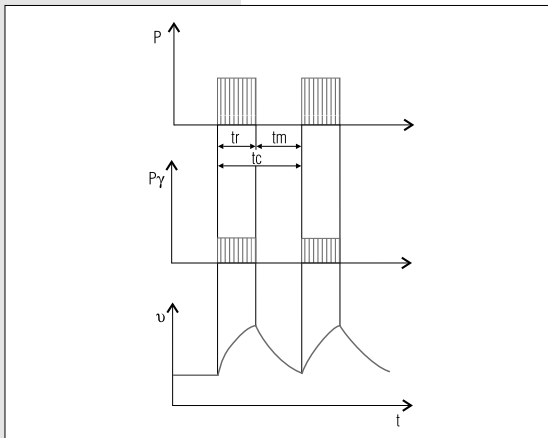
Designation: **S2** 30 minutes.



S3 Intermittent periodic duty

Operation under repeated, constant load in specified cycles. Neither operating nor resting period are long enough to allow the motor to reach thermal equilibrium. The starting losses are small and do not essentially influence the temperature rise. The nominal values of relative starting time are 15, 25, 40, 60 % at a daily 10-minute cycle.

Designation: **S3** 25 %

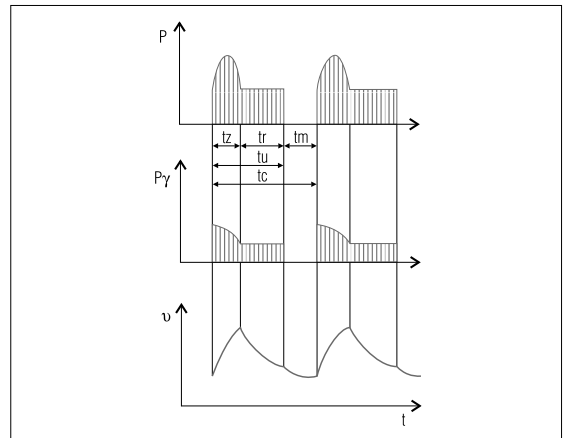


S4 Intermittent periodic duty

Operation under repeated, constant load in specified cycles. The start of the motor influences the temperature rise.

In order to define this type of operation, the number of cycles (starts per hour) and inertia constant must also be known.

Designation: **S4** 40 %; 120 starts/h; FI2

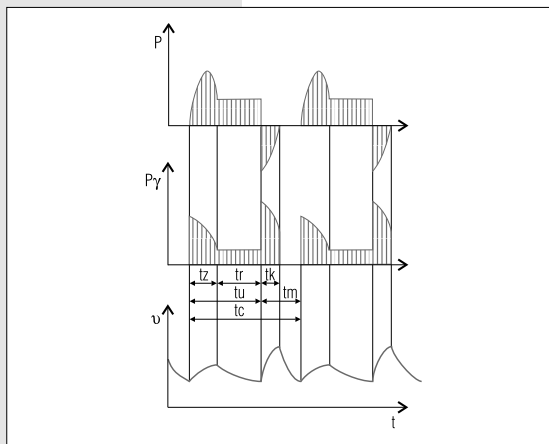




S5 Intermittent periodic duty

Same as S4 operation, except that the electric braking of the machine has an essential influence on the temperature rise.

Designation: **S5** 160 %; 120 starts/h; FI2



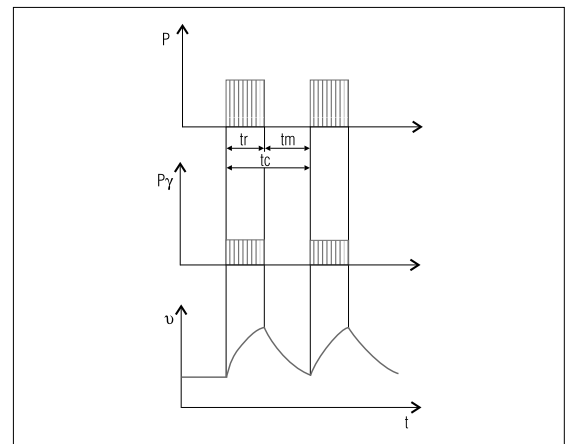
S6 Continuous operation with cyclic load

Operation consisting of a continuous series of equal cycles. Each cycle is made up of a no-load and a constant load period.

The cycle duration is not long enough to allow the machine to reach thermal equilibrium in one cycle.

In order to define S6 operation, the relative starting time must be specified.

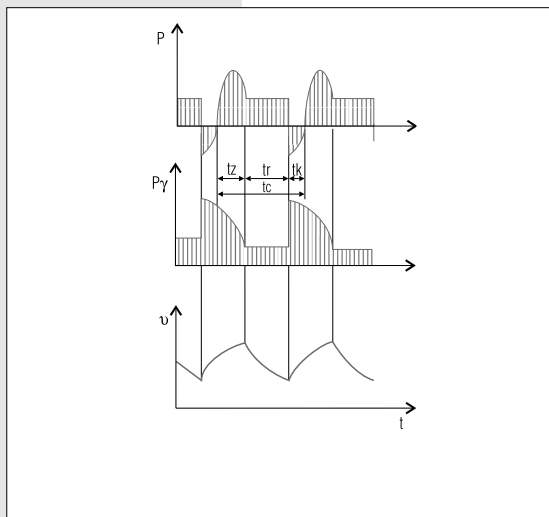
Designation: **S6** 15 %



S7 Intermittent periodic duty with starting and braking

Uninterrupted operation with a series of constant loading and braking periods. The most demanding type of operation for the motor. In order to define this type of operation, the number of cycles per hour and the inertia constant must be specified.

Designation: **S7** 500 starts/h; FI3



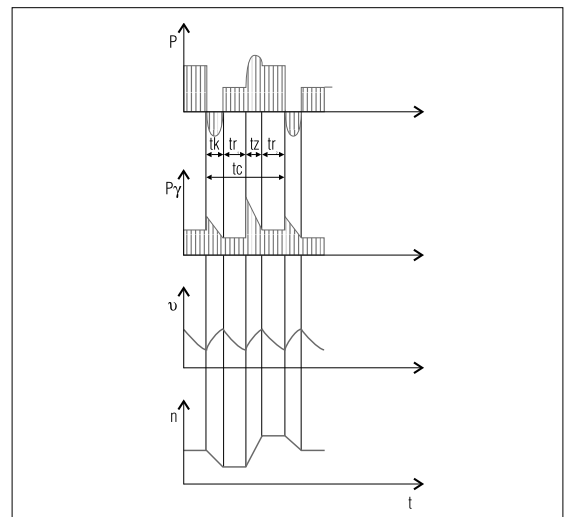
S8 Intermittent periodic duty with pole changing

This type of operation only exists with pole amplitude modulated motors. In this case the definition of operation must contain the following data for each pole:

- number of starts per hour
- inertia constant
- relative operating period

Designation: **S8** 30 starts/h; FI10; 740 min⁻¹; 40 %

S8 30 starts/h; FI10; 960 min⁻¹; 60 %



S9 Continuous operation with non-periodic load and speed variation

(e. g. converter operation)



Tables with ratings for single-speed motors

Three-phase motor with short-circuit rotor

Pole number 2

380 V, 400 V, 415 V, 500 V, 660 V, 690 V, 720 V (1000 V)

Protection class

IP 55

Temperature class

T1 to T4

Thermal class

F

Explosion protection	Type		
	71, 80, 90, 100, 112, 132, 160	180, 200, 225	250, 280, 315
PTB 05 ATEX 1014 PTB 05 ATEX 1015 PTB 05 ATEX 1016 PTB 05 ATEX 1017 PTB 05 ATEX 1018 PTB 05 ATEX 1019	4RD	3RD	4RD
II 2G EEx d IIC T4 II 2G EEx de IIC T4	4RD	3RD	4RD

Selection chart

Type		Power kW	Speed min ⁻¹	In (A) 400 Volt	Efficiency %	Power factor cos φ	Torque Nm	Starting torque (MA/MN)	Starting current (IA/IN)	Max. torque (MM/MN)	KR	Moment of inertia (kgm ²)	Weight kg
4RD71	A-2	0.37	2800	1.06	59.5	0.86	1.26	3	4.2	2.8	16	0.00034	15
4RD71	B-2	0.55	2805	1.32	70.0	0.86	1.87	2.9	5.5	3.1	16	0.00042	16
4RD80	A-2	0.75	2790	1.7	72.0	0.89	2.57	2.25	5.4	2.6	16	0.00063	24
4RD80	B-2	1.1	2790	2.35	77.0	0.87	3.77	2.6	6.1	2.9	16	0.00079	26
4RD90	S-2	1.5	2830	3.25	77.0	0.87	5.1	2.5	6.3	2.8	16	0.00124	32
4RD90	L-2	2.2	2845	4.4	82.0	0.88	7.4	2.8	6.9	2.65	16	0.00155	34
4RD100	L-2	3.0	2865	6.0	83.5	0.87	10.0	2.5	7.1	2.9	16	0.00251	42.5
4RD112	M-2	4.0	2890	7.8	84.5	0.88	13.2	2.5	7.6	2.95	16	0.00451	58
4RD132	SA-2	5.5	2910	10.8	84.5	0.88	18.1	2.7	6.6	2.8	16	0.00967	77
4RD132	SB-2	7.5	2925	14.5	85.5	0.89	24.5	2.7	7.9	3.1	16	0.01225	84
4RD160	MA-2	11.0	2840	22.3	80.6	0.88	35.8	2.8	6.9	3.0	16	0.02943	148
4RD160	MB-2	15.0	2940	28.5	83.0	0.92	48.9	3.0	7.7	3.2	16	0.03912	166
4RD160	L-2	18.5	2945	32.4	98.1	0.91	60.1	3.3	8.0	3.0	16	0.0459	178
3RD180	M-2	22.0	2930	39.0	92.0	0.89	71.7	2.4	7.2	2.9	16	0.06151	205
3RD200	LA-2	30.0	2930	53.0	93.0	0.88	97.8	2.1	7.3	2.8	16	0.10442	240
3RD200	LB-2	37.0	2930	64.0	93.5	0.89	120.6	2.2	7.3	2.9	16	0.12739	250
3RD225	M-2	45.0	2945	79.0	93.5	0.88	146.0	2.0	7.2	2.6	16	0.22155	375
4RD250	M-2	55.0	2970	95.0	94.4	0.89	177.0	2.8	7.5	3.2	16	0.675	485
4RD280	S-2	75.0	2980	131.0	94.5	0.88	241.0	3.1	8.0	3.0	16	0.95	650
4RD280	M-2	90.0	2980	152.0	95.0	0.9	289.0	3.0	8.0	2.9	16	1.1	700
4RD315	S-2	110.0	2970	194.0	95.5	0.86	354.0	2.3	6.0	2.4	13	1.55	820
4RD315	M-2	132.0	2970	228.0	95.5	0.88	425.0	2.5	6.5	2.8	13	1.8	930

**Three-phase motor with short-circuit rotor****Pole number 4**

380 V, 400 V, 415 V, 500 V, 660 V, 690 V, 720 V (1000 V)

Protection class
Temperature class
Thermal classIP 55
T1 to T4
F

Explosion protection	Type		
	71, 80, 90, 100, 112, 132, 160	180, 200, 225	250, 280, 315
PTB 05 ATEX 1014 PTB 05 ATEX 1015 PTB 05 ATEX 1016 PTB 05 ATEX 1017 PTB 05 ATEX 1018 PTB 05 ATEX 1019	4RD	3RD	4RD
II 2G EEx d IIC T4 II 2G EEx de IIC T4	4RD	3RD	4RD

Selection chart

Type		Power kW	Speed min ⁻¹	In (A) 400 Volt	Efficiency %	Power factor cos φ	Torque Nm	Starting torque (MA/MN)	Starting current (IA/IN)	Max. torque (MM/MN)	KR	Moment of inertia (kgm ²)	Weight kg
4RD71	A-4	0.25	1355	0.75	59.5	0.8	1.76	2.15	3.8	2.5	16	0.00051	15
4RD71	B-4	0.37	1350	1.05	63.0	0.81	2.61	2.25	3.8	2.9	16	0.00063	16
4RD80	A-4	0.55	1410	1.38	72.0	0.81	3.73	2.3	4.6	2.7	16	0.00098	24
4RD80	B-4	0.75	1400	1.8	76.0	0.8	5.1	2.4	5.0	2.6	16	0.00125	26
4RD90	S-4	1.1	1410	2.4	79.0	0.84	7.5	2.3	5.4	2.4	16	0.00204	32
4RD90	L-4	1.5	1405	3.25	79.0	0.84	10.2	2.5	5.8	2.6	16	0.0026	35
4RD100	LA-4	2.2	1405	4.8	79.0	0.84	15.0	2.1	5.1	2.2	16	0.00388	42.5
4RD100	LB-4	3.0	1400	6.4	81.0	0.84	20.5	2.1	5.3	2.3	16	0.00499	46
4RD112	M-4	4.0	1430	8.2	85.0	0.84	26.8	2.2	6.6	2.8	16	0.01014	60
4RD132	S-4	5.5	1435	10.9	84.5	0.86	36.7	2.3	5.5	2.7	16	0.02113	84
4RD132	M-4	7.5	1445	14.8	87.0	0.85	49.6	2.8	6.5	2.9	16	0.02793	93.5
4RD160	M-4	11.0	1470	22.0	87.0	0.83	71.5	2.7	6.7	2.8	16	0.05417	159
4RD160	L-4	15.0	1460	29.0	87.5	0.85	98.0	2.6	6.3	2.7	16	0.07116	178
3RD180	M-4	18.5	1460	35.0	92.0	0.84	121.0	2.5	6.5	2.3	16	0.1129	215
3RD180	L-4	22.0	1460	40.0	92.5	0.86	143.9	2.5	6.4	2.3	16	0.1339	236
3RD200	L-4	30.0	1460	56.0	93.0	0.83	196.0	2.2	6.2	3.0	16	0.21298	250
3RD225	S-4	37.0	1465	68.0	93.5	0.84	241.6	2.2	6.3	2.8	16	0.36225	310
3RD225	M-4	45.0	1465	83.0	94.0	0.83	293.0	2.3	6.2	2.8	16	0.42845	390
4RD250	M-4	55.0	1480	98.0	94.5	0.86	355.0	3.1	6.1	2.5	16	0.875	480
4RD280	S-4	75.0	1480	135.0	95.0	0.86	485.0	2.4	6.1	2.8	16	1.875	610
4RD280	M-4	90.0	1480	158.0	95.0	0.87	582.0	2.8	6.5	2.9	16	2.25	685
4RD315	S-4	110.0	1485	193.0	95.5	0.87	708.0	2.7	6.0	2.4	16	3.5	820
4RD315	MA-4	132.0	1485	232.0	95.8	0.87	850.0	2.5	6.5	2.6	16	3.875	930
4RD315	MB-4	160.0	1485	282.0	96.0	0.86	1030.0	2.7	7.0	2.6	16	5	1240

**Three-phase motor with short-circuit rotor****Pole number 6**

380 V, 400 V, 415 V, 500 V, 660 V, 690 V, 720 V (1000 V)

Protection class IP 55
 Temperature class T1 to T4
 Thermal class F

Explosion protection	Type		
	71, 80, 90, 100, 112, 132, 160	180, 200, 225	250, 280, 315
PTB 05 ATEX 1014 PTB 05 ATEX 1015 PTB 05 ATEX 1016 PTB 05 ATEX 1017 PTB 05 ATEX 1018 PTB 05 ATEX 1019	4RD	3RD	4RD
II 2G EEx d IIC T4 II 2G EEx de IIC T4	4RD	3RD	4RD

Selection chart

Type		Power kW	Speed min ⁻¹	In (A) 400 Volt	Efficiency %	Power factor cos φ	Torque Nm	Starting torque (MA/MN)	Starting current (IA/IN)	Max. torque (MM/MN)	KR	Moment of inertia (kgm ²)	Weight kg
4RD71	A-6	0.18	930	0.67	60.0	0.65	1.86	2.1	3.1	2.3	16	0.00081	15
4RD71	B-6	0.25	940	0.85	64.0	0.67	2.56	2.2	3.7	2.5	16	0.00101	16
4RD80	A-6	0.37	925	1.1	67.0	0.72	3.83	2.3	3.6	2.5	16	0.00191	25
4RD80	B-6	0.55	915	1.5	72.0	0.74	5.7	2.35	4.1	2.5	16	0.00239	26.5
4RD90	S-6	0.75	915	2.1	70.0	0.74	7.8	1.8	3.7	2.1	16	0.00323	32
4RD90	L-6	1.1	915	3.0	73.0	0.73	11.5	2.1	4.1	2.3	16	0.00419	35
4RD100	L-6	1.5	930	3.7	76.0	0.77	15.4	2.2	4.7	2.3	16	0.00657	46
4RD112	M-6	2.2	960	5.0	82.0	0.78	21.9	2.6	6.1	2.7	16	0.0158	60
4RD132	S-6	3.0	975	6.6	83.5	0.79	29.4	2.3	6.3	2.5	16	0.02722	84
4RD132	MA-6	4.0	960	8.8	83.0	0.8	39.9	2.4	6.3	2.9	16	0.03229	88
4RD132	MB-6	5.5	955	11.8	83.5	0.81	55.1	2.3	6.1	2.9	16	0.03838	95
4RD160	M-6	7.5	970	15.8	86.0	0.8	74.2	2.7	6.7	2.4	16	0.08121	161
4RD160	L-6	11.0	965	23.5	88.5	0.77	109.0	2.2	6.0	2.3	16	0.10916	182
3RD180	L-6	15.0	965	31.0	89.5	0.78	148.0	1.9	5.2	2.3	16	0.227	236
3RD200	LA-6	18.5	965	36.0	91.0	0.81	183.0	1.9	6.0	2.4	16	0.24369	240
3RD200	LB-6	22.0	965	43.0	91.5	0.81	218.6	1.9	6.0	2.4	16	0.27888	250
3RD225	M-6	30.0	975	56.0	92.5	0.83	293.0	1.8	5.8	2.5	16	0.66117	390
4RD250	M-6	37.0	985	69.0	93.5	0.83	359.0	2.8	6.0	2.6	16	1.125	480
4RD280	S-6	45.0	985	82.0	94.5	0.84	437.0	2.5	6.3	2.7	16	2.3	610
4RD280	M-6	55.0	985	101.0	94.5	0.84	534.0	2.4	6.0	2.8	16	2.625	685
4RD315	S-6	75.0	980	140.0	95.0	0.82	732.0	2.5	5.9	2.8	16	4.625	820
4RD315	MA-6	90.0	985	163.0	95.5	0.84	874.0	2.1	5.1	2.9	16	5.25	930

**Three-phase motor with short-circuit rotor****Pole number 8**

380 V, 400 V, 415 V, 500 V, 660 V, 690 V, 720 V (1000 V)

Protection class
Temperature class
Thermal classIP 55
T1 to T4
F

Explosion protection	Type		
	71, 80, 90, 100, 112, 132, 160	180, 200, 225	250, 280, 315
PTB 05 ATEX 1014 PTB 05 ATEX 1015 PTB 05 ATEX 1016 PTB 05 ATEX 1017 PTB 05 ATEX 1018 PTB 05 ATEX 1019	4RD	3RD	4RD
II 2G EEx d IIC T4 II 2G EEx de IIC T4	4RD	3RD	4RD

Selection chart

Type		Power kW	Speed min ⁻¹	In (A) 400 Volt	Efficiency %	Power factor cos φ	Torque Nm	Starting torque (MA/MN)	Starting current (IA/IN)	Max. torque (MM/MN)	KR	Moment of inertia (kgm ²)	Weight kg
4RD71	A-8	0.09	680	0.67	38.0	0.51	1.26	2.0	2.0	2.1	16	0.00081	15
4RD71	B-8	0.12	655	0.54	45.0	0.71	1.75	1.8	2.4	2.1	16	0.00101	16
4RD80	A-8	0.18	680	0.66	61.0	0.65	2.53	2.1	2.9	2.2	16	0.00191	25
4RD80	B-8	0.25	680	0.92	58.0	0.68	3.52	2.1	3.1	2.3	16	0.00239	26.5
4RD90	S-8	0.37	685	1.25	66.0	0.65	5.2	1.7	3.0	2.0	16	0.00323	32
4RD90	L-8	0.55	685	1.75	69.0	0.66	7.7	1.75	3.1	2.1	16	0.00419	35
4RD100	LA-8	0.75	690	2.3	69.0	0.69	10.4	1.8	3.5	2.1	16	0.00657	42.5
4RD100	LB-8	1.1	695	3.25	70.0	0.7	15.0	1.9	3.8	2.2	16	0.00857	46
4RD112	M-8	1.5	710	4.15	78.0	0.67	20.2	2.0	4.3	2.5	16	0.0158	60
4RD132	S-8	2.2	710	5.5	79.0	0.74	29.6	1.9	4.3	2.2	16	0.02606	79
4RD132	M-8	3.0	710	7.2	80.0	0.76	40.4	2.1	4.8	2.3	16	0.03446	85
4RD160	MA-8	4.0	720	10.0	82.6	0.71	53.1	1.8	4.8	2.3	16	0.0688	146
4RD160	MB-8	5.5	715	13.4	84.0	0.71	73.6	1.8	4.8	2.1	16	0.08939	160
4RD160	L-8	7.5	725	16.7	86.5	0.75	98.8	2.3	5.8	2.1	16	0.12027	182
3RD180	L-8	11.0	715	25.0	86.7	0.74	147.0	1.8	4.2	2.5	16	0.227	236
3RD200	L-8	15.0	720	29.0	91.0	0.82	196.0	2.1	4.5	2.5	16	0.37827	250
3RD225	S-8	18.5	710	37.0	91.0	0.79	249.0	2.1	4.6	2.6	16	0.57008	310
3RD225	M-8	22.0	715	45.0	91.5	0.77	294.0	2.1	4.6	2.6	16	0.67806	390
4RD250	M-8	30.0	730	59.0	92.8	0.79	398.0	1.7	5.4	2.4	16	1.175	480
4RD280	S-8	37.0	730	74.0	93.0	0.78	485.0	1.9	6.0	2.3	16	2.3	610
4RD280	M-8	45.0	735	90.0	93.5	0.78	586.0	1.9	6.4	2.7	16	2.625	685
4RD315	S-8	55.0	735	104.0	94.5	0.81	716.0	2.2	6.2	2.3	16	4.625	820
4RD315	M-8	75.0	740	140.0	94.5	0.82	969.0	1.8	6.3	2.1	16	5.25	930

*Technical data and tables with ratings for pole changing motors***Three-phase motor with short-circuit rotor****Pole number 4/2**

380 V, 400 V, 415 V, 500 V, 660 V, 690 V, 720 V (1000 V)

Protection class

IP 55

Temperature class

T1 to T4

Thermal class

F

Explosion protection	Type		
	71, 80, 90, 100, 112, 132, 160	180, 200, 225	250, 280, 315
PTB 05 ATEX 1014 PTB 05 ATEX 1015 PTB 05 ATEX 1016 PTB 05 ATEX 1017 PTB 05 ATEX 1018 PTB 05 ATEX 1019	4RD	3RD	3RD
II 2G EEx d IIC T4 II 2G EEx de IIC T4	4RD	3RD	4RD

Selection chart

Type	Power kW	Speed min ⁻¹	In (A) 400 Volt	Starting current (IA/IN)	Max. torque (MM/MN)	Weight kg	Type	Power kW	Speed min ⁻¹	In (A) 400 Volt	Starting current (IA/IN)	Max. torque (MM/MN)	Weight kg
4RD 71 A-4/2	0.21 0.28	1380 2800	0.75 0.9	3.6 3.9	2.1 2.1	16	4RD 160 L-4/2	12 15	1470 2940	27.5 31	7.2 7.5	2.8 2.7	189
4RD 71 B-4/2	0.3 0.43	1380 2800	1.05 1.25	3.8 4.0	2.1 2.0	17	3RD 180 M-4/2	14 17	1470 2940	29 33	6.8 7.5	2.5 2.5	220
4RD 80 A-4/2	0.5 0.65	1370 2760	1.26 1.43	3.7 3.4	1.8 1.9	25	3RD 180 L-4/2	17 20	1475 2950	35 39	6.9 7.5	2.5 2.5	240
4RD 80 B-4/2	0.7 0.85	1365 2810	1.75 1.85	4.1 5.5	2.0 2.4	28	3RD 200 L-4/2	20 23	1475 2950	41 46	7.0 7.5	2.5 2.5	260
4RD 90 S-4/2	1.1 1.4	1415 2800	2.6 2.95	4.4 4.7	1.9 2.0	34	3RD 225 S-4/2	24 28	1480 2955	46 59	7.0 7.5	2.5 2.5	320
4RD 90 L-4/2	1.5 1.9	1410 2850	3.3 3.9	4.9 5.3	2.1 2.3	36	3RD 225 M-4/2	29 34	1485 2960	62 66	7.2 7.6	2.5 2.6	400
4RD 100 LA-4/2	1.8 2.4	1430 2860	4.16 5.25	4.8 5.0	2.0 1.9	45	4RD 250 M-4/2	36 45	1485 2960	77 87	7.1 7.5	2.4 2.5	490
4RD 100 LB-4/2	2.6 3.2	1420 2870	5.65 6.6	5.1 5.85	2.1 2.3	49	4RD 280 S-4/2	46 58	1480 2970	85 95	6.8 7.0	2.0 2.0	610
4RD 112 M-4/2	3.7 4.4	1460 2890	8.4 8.5	6.6 7.4	2.8 2.9	64	4RD 280 M-4/2	65 80	1480 2970	128 142	6.6 6.8	1.8 1.8	685
4RD 132 S-4/2	5.0 6.0	1460 2900	11.5 11.9	6.2 6.4	2.7 2.8	89	4RD 315 S-4/2	78 90	1485 2970	154 176	6.5 6.0	1.8 1.7	820
4RD 132 M-4/2	6.1 7.5	1450 2910	13.8 15.4	6.7 6.9	2.5 2.3	99	4RD 315 MA-4/2	90 100	1485 2970	156 190	6.5 6.2	1.8 1.7	930
4RD 160 M-4/2	9.0 10.5	1465 2930	19.5 22	6.5 7.5	2.3 2.2	169	4RD 315 MB-4/2	100 120	1485 2970	208 230	6.2 6.0	1.8 1.6	1240

**Three-phase motor with short-circuit rotor****Pole number 8/4**

380 V, 400 V, 415 V, 500 V, 660 V, 690 V, 720 V (1000 V)

Protection class
Temperature class
Thermal classIP 55
T1 to T4
F

Explosion protection	Type		
	71, 80, 90, 100, 112, 132, 160	180, 200, 225	250, 280, 315
PTB 05 ATEX 1014 PTB 05 ATEX 1015 PTB 05 ATEX 1016 PTB 05 ATEX 1017 PTB 05 ATEX 1018 PTB 05 ATEX 1019	4RD	3RD	4RD
II 2G EEx d IIC T4 II 2G EEx de IIC T4	4RD	3RD	4RD

Selection chart

Type	Power kW	Speed min ⁻¹	In (A) 400 Volt	Starting current (I _A /I _N)	Max. torque (MM/MN)	Weight kg	Type	Power kW	Speed min ⁻¹	In (A) 400 Volt	Starting current (I _A /I _N)	Max. torque (MM/MN)	Weight kg
4RD 71 A-8/4	0.048 0.22	620 1370	0.32 0.57	2.1 3.8	1.6 1.8	16	4RD 160 MB-8/4	4.6 7.3	725 1460	12.8 14.6	4.6 7.0	1.8 1.9	165
4RD 71 B-8/4	0.07 0.32	620 1370	0.47 0.82	2.1 3.8	1.6 1.8	17	4RD 160 L-8/4	6.8 11	725 1460	21 23	4.8 7.0	1.8 2.0	197
4RD 80 A-8/4	0.2 0.3	690 1380	0.83 0.79	2.8 3.9	2.0 2.2	25	3RD 180 L-8/4	11 15	725 1460	29 30	4.6 7.0	1.7 2.0	240
4RD 80 B-8/4	0.27 0.4	690 1400	1.08 0.96	2.9 4.5	2.1 2.2	28	3RD 200 L-8/4	15 20	730 1465	33 44	5.3 6.8	1.5 1.8	260
4RD 90 S-8/4	0.42 0.8	705 1390	1.9 1.9	2.8 3.9	2.0 1.8	34	3RD 225 S-8/4	18 24	730 1465	42 50	5.3 6.8	1.6 1.8	320
4RD 90 L-8/4	0.5 1.0	710 1410	2.3 2.25	3.1 4.3	2.1 1.9	36	3RD 225 M-8/4	22 28	730 1465	50 55	5.0 7.0	1.5 2.0	400
4RD 100 LA-8/4	0.9 1.3	690 1380	3.05 3.0	3.2 4.2	2.0 2.1	45	4RD 250 M-8/4	30 42	730 1465	67 80	4.5 6.5	1.5 2.0	490
4RD 100 LB-8/4	1.0 1.6	720 1430	3.2 3.35	3.9 5.3	2.1 2.2	49	4RD 280 S-8/4	35 51	735 1470	80 96	4.6 6.5	1.6 1.6	610
4RD 112 M-8/4	1.5 2.5	710 1430	4.25 5.0	4.6 5.7	2.2 2.1	64	4RD 280 M-8/4	42 60	735 1470	88 105	5.0 6.3	1.5 1.5	685
4RD 132 S-8/4	2.3 3.6	720 1450	6.7 7.3	5.3 6.9	2.3 2.2	89	4RD 315 S-8/4	52 68	740 1475	109 130	5.0 6.4	1.6 1.5	820
4RD 132 M-8/4	3.0 5.0	720 1445	9.5 9.9	4.5 5.4	2.3 2.3	99	4RD 315 M-8/4	70 90	740 1475	147 173	5.8 6.5	1.7 1.5	930
4RD 160 MA-8/4	4.0 5.5	725 1460	10.5 10.8	5.2 7.0	1.8 1.8	155							

**Three-phase motor with short-circuit rotor****Pole number 6/4**

380 V, 400 V, 415 V, 500 V, 660 V, 690 V, 720 V (1000 V)

Protection class IP 55
 Temperature class T1 to T4
 Thermal class F

Explosion protection	Type		
	71, 80, 90, 100, 112, 132, 160	180, 200, 225	250, 280, 315
PTB 05 ATEX 1014 PTB 05 ATEX 1015 PTB 05 ATEX 1016 PTB 05 ATEX 1017 PTB 05 ATEX 1018 PTB 05 ATEX 1019	4RD	3RD	4RD
II 2G EEx d IIC T4 II 2G EEx de IIC T4	4RD	3RD	4RD

Selection chart

Type	Power	Speed	In (A)	Starting	Max.	Weight	Type	Power	Speed	In (A)	Starting	Max.	Weight
	kW	min ⁻¹	400 Volt	current (IA/IN)	torque (MM/MN)	kg		kW	min ⁻¹	400 Volt	current (IA/IN)	torque (MM/MN)	kg
4RD 71 A-6/4	0.15	920	0.75	2.6	1.5	16	4RD 160 L-6/4	5.5	980	13.3	7.0	2.1	197
	0.2	1440	0.85	3.3	1.5			8	1480	16.8	7.0	2.0	
4RD 71 B-6/4	0.21	920	1.20	2.6	2.0	17	3RD 180 M-6/4	7.5	980	16.6	6.3	2.0	220
	0.3	1420	1.35	3.4	1.9			11	1470	22	6.5	1.6	
4RD 80 A-6/4	0.22	930	0.7	3.3	1.9	25	3RD 180 L-6/4	9	980	20	6.5	2.0	240
	0.32	1455	1.05	4.2	2.1			13	1470	26	7.0	1.5	
4RD 80 B-6/4	0.26	940	0.94	3.5	2.2	28	3RD 200 L-6/4	13	980	31	6.8	2.1	260
	0.4	1425	1.28	3.6	1.9			19	1470	39	7.2	2.2	
4RD 90 S-6/4	0.45	945	1.5	3.6	2.1	34	3RD 225 S-6/4	19	980	40	6.0	2.0	320
	0.66	1450	1.75	5.3	2.2			23	1470	48	6.3	2.2	
4RD 90 L-6/4	0.6	960	1.8	3.6	2.1	36	3RD 225 M-6/4	23	980	48	6.0	2.1	400
	0.9	1425	2.1	4.4	1.9			27	1470	56	6.5	2.0	
4RD 100 LA-6/4	0.9	960	2.4	4.0	1.8	45	4RD 250 M-6/4	27	980	53	6.0	2.1	490
	1.3	1420	3.0	4.5	1.9			32	1470	65	6.5	2.2	
4RD 100 LB-6/4	1.1	960	2.8	4.3	1.8	49	4RD 280 S-6/4	32	985	63	6.5	2.3	610
	1.7	1450	3.7	4.7	2.1			45	1475	89	7.0	2.7	
4RD 112 M-6/4	1.5	970	3.55	5.3	2.2	64	4RD 280 M-6/4	37	985	72	6.5	2.3	685
	2.4	1450	5.05	5.4	1.9			55	1475	108	7.0	2.7	
4RD 132 S-6/4	2.2	965	5.05	5.7	1.9	89	4RD 315 S-6/4	45	985	88	6.8	2.1	820
	3.0	1465	6.0	6.1	2.1			67	1485	130	7.2	2.3	
4RD 132 M-6/4	3.0	975	6.7	6.5	2.2	99	4RD 315 M-6/4	55	985	108	6.8	2.1	930
	4.5	1460	8.9	6.3	1.9			80	1485	155	7.2	2.3	
4RD 160 M-6/4	3.8	965	9.0	6.0	2.0	155							
	5.7	1465	13.0	6.5	1.8								

**Three-phase motor with short-circuit rotor****Pole number 8/6**

380 V, 400 V, 415 V, 500 V, 660 V, 690 V, 720 V (1000 V)

Protection class
Temperature class
Thermal classIP 55
T1 to T4
F

Explosion protection	Type		
	71, 80, 90, 100, 112, 132, 160	180, 200, 225	250, 280, 315
PTB 05 ATEX 1014 PTB 05 ATEX 1015 PTB 05 ATEX 1016 PTB 05 ATEX 1017 PTB 05 ATEX 1018 PTB 05 ATEX 1019	4RD	3RD	4RD
II 2G EEx d IIC T4 II 2G EEx de IIC T4	4RD	3RD	4RD

Selection chart

Type	Power kW	Speed min ⁻¹	In (A) 400 Volt	Starting current (IA/IN)	Max. torque (MM/MN)	Weight kg	Type	Power kW	Speed min ⁻¹	In (A) 400 Volt	Starting current (IA/IN)	Max. torque (MM/MN)	Weight kg
4RD 90 S-8/6	0.35 0.45	695 960	1.35 1.5	2.7 3.3	1.7 1.8	34	3RD 180 L-8/6	7.0 9.5	725 980	18 24	5.5 6.2	2.0 1.8	240
4RD 90 L-8/6	0.45 0.6	695 960	1.68 2.07	2.7 3.5	1.8 2.0	36	3RD 200 L-8/6	10 13	725 980	23 27	5.5 6.8	2.3 2.1	260
4RD 100 LA-8/6	0.6 0.8	715 970	2.05 2.15	2.9 4.1	1.6 1.8	45	3RD 225 S-8/6	13 16	725 975	29 36	5.3 6.2	1.7 1.4	320
4RD 100 LB-8/6	0.75 0.9	710 970	2.4 2.5	3.1 4.7	1.6 2.0	49	3RD 225 M-8/6	17 22	725 975	42 54	5.4 6.5	1.7 1.4	400
4RD 112 M-8/6	0.9 1.2	720 970	2.8 3.0	4.2 5.1	2.2 2.4	64	4RD 250 M-8/6	22 30	730 985	51 65	5.8 6.5	1.9 1.6	490
4RD 132 S-8/6	1.5 2.0	725 975	5.05 5.5	4.8 6.2	2.5 2.4	89	4RD 280 S-8/6	27 35	735 985	63 80	5.8 6.5	1.8 1.5	610
4RD 132 M-8/6	2.2 3.0	725 975	6.8 8.1	3.9 5.3	2.1 2.2	99	4RD 280 M-8/6	33 41	735 985	74 90	6.0 6.7	1.8 1.5	685
4RD 160 M-8/6	3.5 5.0	725 975	8.8 12.0	5.5 6.4	2.3 2.1	155	4RD 315 S-8/6	40 50	735 985	90 102	6.0 7.0	1.8 1.4	820
4RD 160 L-8/6	5.0 7.0	725 975	12.0 16.0	5.5 6.5	2.4 2.2	197	4RD 315 M-8/6	48 62	735 985	103 125	6.0 7.0	1.8 1.4	930



Three-phase electric motors driven by frequency inverters

General description

The asynchronous motor with its short-circuit rotor and robust construction offers an excellent price-performance ratio. AC motors are designed for constant speed operation. It is not possible to change speed when they are running on fixed frequency supplies. There are drives which require the additional flexibility of smooth speed variations and this is best achieved with the use of an inverter.

Frequency inverters provide an excellent speed and the speed can be varied continuously over the entire frequency range. To avoid overheating, three PTC elements are built into the head of the winding. As the speed rises (higher frequency), the motor becomes louder. Voltage type frequency inverters cause a noise increase of about 7 to 15 dB, current type ones of about 3 dB.

We strongly recommend that you indicate frequency range and working characteristics of the motor ($T = f(n)$ or $P = f(n)$) when placing your order.

Power and torque characteristics of motors driven by frequency inverters

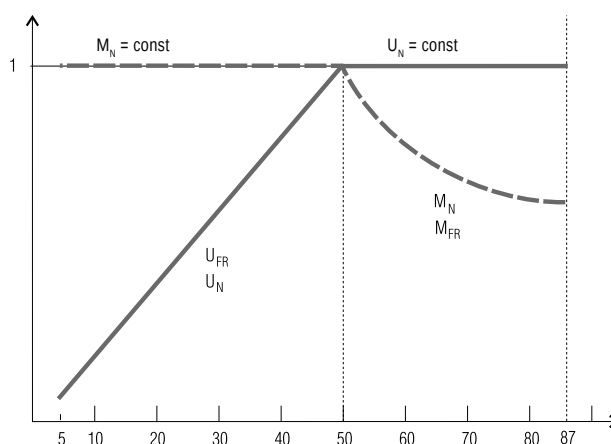
We distinguish two ranges:

■ 0 - 50 Hz range

Here the motor develops its normal torque on the shaft at 5 to 10 Hz of the output frequency (10 - 20 % of the nominal speed). The motor maintains the nominal torque at the shaft until the frequency reaches 50 Hz (100 % of the nominal speed). Voltage keeps rising while the magnetic flux is kept constant. The power increase in this range is linear to the revolutions ($P = k \times M \times n$).

■ 50 - 87 Hz range

Here the torque falls parallel to the speed. The voltage of the motor is maintained on a constant level while the magnetic flux is weaker. The current level is maintained and independent of the speed.



U_N = net voltage

U_{FR} = voltage of frequency inverter

M_N = motor torque on net

M_{FR} = motor torque on frequency inverter

**Three-phase electric motor driven by frequency inverter****Pole number 2****Explosion protection:** II 2 G EEx d IIC T4 or II2G EEx de IIC T4**Selection chart**

Operating	net	-	frequency inverter	frequency inverter	frequency inverter	frequency inverter	2p = 2
Cooling*	own	-	own	own	own	own	add cooling
Torque		T - n ²	constant	constant	constant	constant	constant
Frequency	50 Hz	5 to 50 Hz	20 to 50 Hz	10 to 50 Hz	5 to 50 Hz	50 to 87 Hz	5 to 87 Hz
Ratio		1 : 10	1 : 2.5	1 : 5	1 : 10	1 : 1.74	1 : 17.4
RPM		300 - 3000 min ⁻¹	1200 - 3000 min ⁻¹	600 - 3000 min ⁻¹	300 - 3000 min ⁻¹	3000 - 5220 min ⁻¹	300 - 5220 min ⁻¹

Type	Power kW	Power 50 Hz	Torque Nm	Power 50 Hz	Torque Nm	Power 50 Hz	Torque Nm	Power 87 Hz	Torque Nm	Power 50 Hz	Torque Nm	Power 50 Hz	Torque Nm/87 Hz
4RD 71 A-2	0.37	0.37	1.25	0.35	1.2	0.3	1.0	0.22	0.74	0.55	1.0	-	-
4RD 71 B-2	0.55	0.55	1.9	0.52	1.8	0.45	1.5	0.33	1.1	0.8	1.5	-	-
4RD 80 A-2	0.75	0.75	2.6	0.7	2.4	0.6	2.0	0.5	1.7	1.1	2.0	-	-
4RD 80 B-2	1.1	1.1	3.7	1.0	3.4	0.9	3.0	0.75	2.5	1.6	2.9	-	-
4RD 90 S-2	1.5	1.5	5.0	1.4	4.7	1.2	4.0	1.0	3.3	2.2	4.0	-	-
4RD 90 L-2	2.2	2.2	7.4	2.0	6.7	1.7	5.7	1.4	4.7	3.3	6.0	-	-
4RD 100 L-2	3.0	3.0	10.0	2.7	8.9	2.2	7.2	1.8	5.9	4.5	8.2	-	-
4RD 112 M-2	4.0	4.0	13.0	3.7	12.0	3.2	11.0	2.5	8.2	6.0	11.0	-	-
4RD 132 SA-2	5.5	5.5	18.0	5.0	16.0	4.5	15.0	3.7	12.0	8.0	15.0	5.5	8.0
4RD 132 SB-2	7.5	7.5	25.0	7.0	23.0	6.0	20.0	5.0	16.0	11.0	20.0	7.5	10.5
4RD 160 MA-2	11.0	11.0	36.0	10.0	32.0	9.0	29.0	7.5	24.0	16.0	29.0	11.0	15.0
4RD 160 MB-2	15.0	14.5	47.0	13.0	42.0	12.0	39.0	10.0	32.0	21.0	38.0	14.5	20.0
4RD 160 L-2	18.5	17.5	57.0	16.0	52.0	15.0	49.0	12.0	41.0	26.0	48.0	17.5	25.0
3RD 180 M-2	22.0	21.0	68.0	20.0	65.0	18.0	58.0	15.0	49.0	30.0	55.0	21.0	29.0
3RD 200 LA-2	30.0	28.0	90.0	27.0	87.0	24.0	77.0	22.0	71.0	40.0	73.0	28.0	38.0
3RD 200 LB-2	37.0	32.0	103.0	31.0	100.0	28.0	90.0	27.0	87.0	49.0	90.0	32.0	45.0
3RD 225 M-2	45.0	38.0	123.0	37.0	119.0	34.0	110.0	32.0	103.0	60.0	110.0	38.0	55.0

* range 60 to 87 Hz, motors with steel fan

**Three-phase electric motor driven by frequency inverter****Pole number 4****Explosion protection:** II 2 G EEx d IIC T4 or II2G EEx de IIC T4**Selection chart**

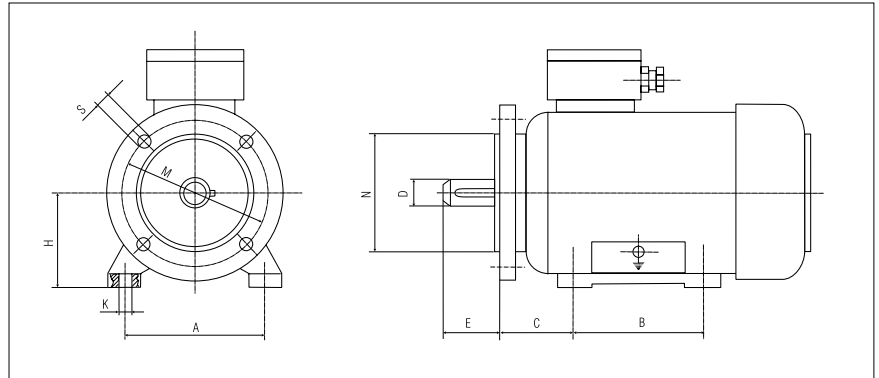
Operating	net	-	frequency inverter	frequency inverter	frequency inverter	frequency inverter	2p = 4
Cooling	own	-	own	own	own	own	forced cooling
Torque		T - n ²	constant	constant	constant	constant	constant
Frequency	50 Hz	5 to 50 Hz	20 to 50 Hz	10 to 50 Hz	5 to 50 Hz	50 to 87 Hz	5 to 87 Hz
Ratio		1 : 10	1 : 2.5	1 : 5	1 : 10	-	-
RPM		150 - 1500 min ⁻¹	600 - 1500 min ⁻¹	300 - 1500 min ⁻¹	150 - 1500 min ⁻¹	1500 - 2610 min ⁻¹	150 - 2610 min ⁻¹

Type	Power kW	Power 50 Hz	Torque Nm	Power 50 Hz	Torque Nm	Power 50 Hz	Torque Nm	Power 87 Hz	Torque Nm	Power 50 Hz	Torque Nm	Power 50 Hz	Torque Nm/87 Hz
4RD 71 A-4	0.25	0.25	1.7	0.22	1.5	0.19	1.25	0.15	1.0	0.37	1.4	-	-
4RD 71 B-4	0.37	0.37	2.5	0.33	2.2	0.28	1.9	0.22	1.5	0.55	2.0	-	-
4RD 80 A-4	0.55	0.55	3.8	0.52	3.5	0.45	3.0	0.33	2.2	0.8	2.9	-	-
4RD 80 B-4	0.75	0.75	5.2	0.7	4.8	0.6	4.0	0.5	3.3	1.1	4.0	-	-
4RD 90 S-4	1.1	1.1	7.5	1.0	6.7	0.9	6.0	0.75	5.0	1.6	5.9	-	-
4RD 90 L-4	1.5	1.5	10.0	1.4	9.5	1.2	8.0	1.0	6.7	2.2	8.0	-	-
4RD 100 LA-4	2.2	2.2	15.0	2.0	13.0	1.7	11.0	1.4	9.3	3.3	12.0	-	-
4RD 100 LB-4	3.0	3.0	20.0	2.8	19.0	2.2	15.0	1.8	12.0	4.5	16.0	-	-
4RD 112 M-4	4.0	4.0	27.0	3.6	24.0	3.0	20.0	2.5	16.0	6.0	22.0	-	-
4RD 132 S-4	5.5	5.5	37.0	5.0	33.0	4.4	29.0	3.7	24.0	8.0	29.0	5.5	8.0
4RD 132 M-4	7.5	7.5	50.0	7.0	46.0	6.0	39.0	5.0	33.0	11.0	40.0	7.5	10.5
4RD 160 M-4	11.0	11.0	72.0	10.0	65.0	9.0	58.0	7.5	49.0	16.0	59.0	11.0	15.0
4RD 160 L-4	15.0	15.0	98.0	13.5	88.0	12.0	78.0	10.0	65.0	21.0	79.0	15.0	20.0
3RD 180 M-4	18.5	18.0	118.0	17.0	111.0	15.0	97.0	12.5	81.0	26.0	95.0	18.0	25.0
3RD 180 L-4	22.0	21.0	137.0	20.0	130.0	18.0	117.0	15.0	97.0	30.0	110.0	21.0	29.0
3RD 200 L-4	30.0	28.0	183.0	27.0	176.0	24.0	156.0	21.0	136.0	40.0	146.0	28.0	37.0
3RD 225 S-4	37.0	32.0	208.0	31.0	201.0	29.0	188.0	26.0	168.0	49.0	179.0	32.0	45.0
3RD 225 M-4	45.0	38.0	247.0	37.0	440.0	35.0	227.0	32.0	207.0	60.0	220.0	38.0	55.0



Mounting dimensions

The mounting dimensions allow the following tolerances:

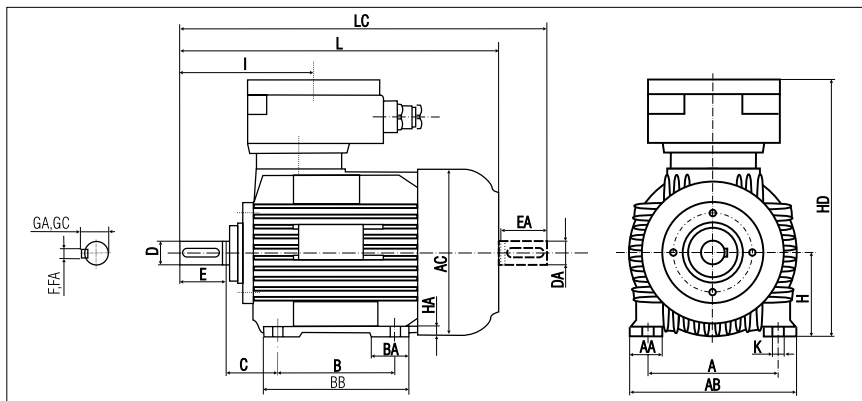


Dimension		Tolerance
A, B	≤ 250 mm	± 0.75 mm
	> 250 mm ... 500 mm	± 1.00 mm
	> 500 mm ... 750 mm	± 1.50 mm
H	> 50 mm ... 250 mm	- 0.50 mm
	> 250 mm ... 630 mm	- 1.00 mm
C	≤ 85 mm	± 1.00 mm
	> 85 mm ... 130 mm	± 2.00 mm
	> 130 mm ... 240 mm	± 3.00 mm
	> 240 mm ... 500 mm	± 4.00 mm
M	≤ 200 mm	± 0.25 mm
	> 200 mm ... 500 mm	± 0.50 mm
	> 500 mm	± 1.00 mm
K and S	+ 3 % diameter	
E	≤ 30 mm	- 0.20 mm
	> 30 mm ... 110 mm	- 0.30 mm
D	≤ Ø 50 mm	k 6
	≥ Ø 50 mm	m 6
N	≤ 230 mm	j 6
	≥ 250 mm	h 6



Dimensions 4RD, 3RD

Form IM B3



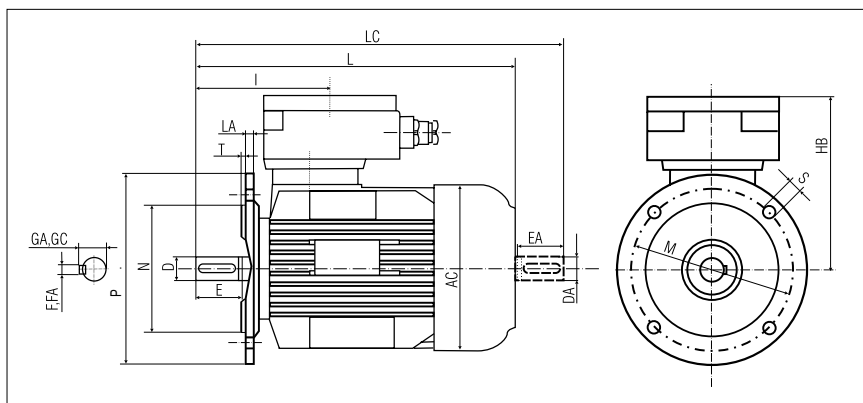
Dimensions

Frame size	A	AA	AB	AC	B	BA	BB	C	D DA	E EA	F FA	GC GA	H	HA	HD	I	K	L	LC
4RD 71 A, B	112	30	140	139	90	30	114	45	14	30	5	16	71	10	218	114	9	271	307
4RD 80 A, B	125	32	160	157	100	35	130	50	19	40	6	21.5	80	10	249	131	10	317	362
4RD 90 S, L	140	35	180	177	100 125	60	155	56	24	50	8	27	90	10	271	140	10	360	415
4RD 100 L	160	45	205	195	140	45	175	63	28	60	8	31	100	17	288	158	12	416	481
4RD 112 M	190	50	235	219	140	50	180	70	28	60	8	31	112	15	311	159	12	438	504
4RD 132 S, M	216	55	266	258	140 178	75	218	89	38	80	10	41	132	18	350	181	12	534	619
4RD 160 M, L	254	60	312	310	210 254	105	300	108	42	110	12	45	160	21	436	255	14	667	785
3RD 180 M, L	279	70	348	352	241 279	80	295 333	121	48	110	14	51	180	21	492	299	14	721 761	841 881
3RD 200 L	318	80	398	392	305	90	365	133	55	110	16	59	200	21	543	310	18	817	937
3RD 225 S	356	80	436	438	286	90	346	149	60	140	18	64	225	21	593	341	18	823	973
3RD 225 M-2					311		371		55	110	16	59				311		853	973
3RD 225 M					311		371		60	140	18	64				341		883	1033
4RD 250 M-2	406	100	506	491	349	90	429	168	60	140	18	64	250	23	687	380	24	997	1152
4RD 250 M									65			69							
4RD 280 S-2									65		18	69							
4RD 280 S									75		20	79.5							
4RD 280 M-2	457	110	557	537	419	100	505	190	65	140	18	69	280	23	744	382	24	1036	1191
4RD 280 M					419		505		75		20	79.5						1036	1191
4RD 315 S-2	508	110	628	617	406	115	526	216	65	140	18	69	315	25	859	454	28	1050	1210
4RD 315 S					406		526		80		22	85						1080	1270
4RD 315 M-2					457		577		65		18	69						1220	1380
4RD 315 M					457		577		80		22	85						1250	1440



Dimensions 4RD, 3RD

Form IM B5 (V1)



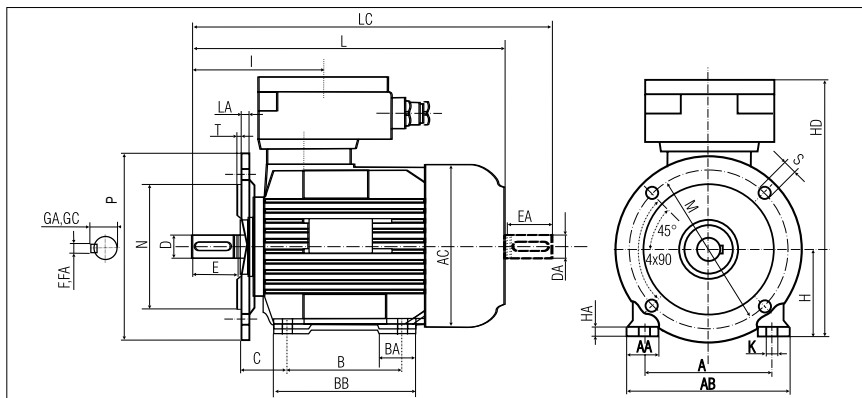
Dimensions

Frame size	Flange	AC	D DA	E EA	F FA	GC GA	HB	I	L	LA	LC	M	N	P	S	No. of fixing holes	T
4RD 71 A, B	F 130-I	139	14	30	5	16	147	114	271	10	307	130	110	160	9	4	3.5
4RD 80 A, B	F 165-I	157	19	40	6	21.50	169	131	317	10	362	165	130	200	12	4	3.5
4RD 90 S, L	F 165-I	177	24	50	8	27	181	140	360	10	415	165	130	200	12	4	3.5
4RD 100 L	F 215-I	195	28	60	8	31	188	158	416	11	481	215	180	250	14	4	4
4RD 112 M	F 215-I	219	28	60	8	31	199	159	438	11	504	215	180	250	14	4	4
4RD 132 S, M	F 265-I	258	38	80	10	41	218	181	534	16	619	265	230	300	14	4	4
4RD 160 M, L	F 300-I	310	42	110	12	45	276	255	667	19	785	300	250	350	18	4	5
3RD 180 M, L	F 300-I	352	48	110	14	51	312	299	721 761	15	841 881	300	250	350	18	4	5
3RD 200 L	F 350-I	392	55	110	16	59	343	310	817	18	937	350	300	400	18	4	5
3RD 225 S	F 400-I	438	60	140	18	64	368	341	823	18	973	400	350	450	18	8	5
3RD 225 M-2	F 400-I		55	110	16	59		311	853		973						
3RD 225 M	F 400-I		60	140	18	64		341	883		1033						
4RD 250 M-2	F 500-I	491	60	140	18	64	437	380	997	18	1152	500	450	550	19	8	5
4RD 250 M	F 500-I		65			69											
4RD 280 S-2	F 500-I	537	65	140	18	69	464	382	1036	18	1191	500	450	550	19	8	5
4RD 280 S	F 500-I		75		20	79.50			1036		1191						
4RD 280 M-2	F 500-I		65		18	69			1096		1224						
4RD 280 M	F 500-I		75		20	79.50			1096		1224						
4RD 315 S-2	F 600-I	617	65	140	18	69	544	454	1050	18	1210	600	550	660	24	8	6
4RD 315 S	F 600-I		80	170	22	85		484	1080		1270						
4RD 315 M-2	F 600-I		65	140	18	69		454	1220		1380						
4RD 315 M	F 600-I		80	170	22	85		484	1250		1440						



Dimensions 4RD, 3RD

Form IM B3/B5



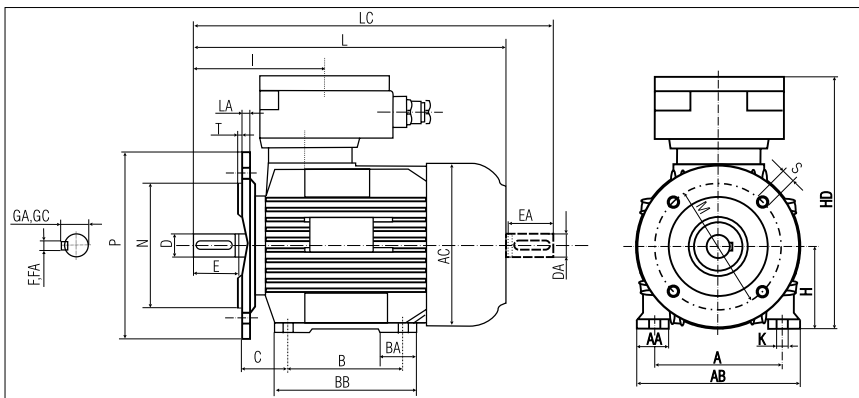
Dimensions

Frame size	Flange	A	AA	AB	AC	B	BA	BB	C	D DA	E EA	F FA	GC GA	H	HA	HD	I	K	L	LA	LC	M	N	P	S	No. of fixing holes
4RD 71 A, B	F 130-I	112	30	140	139	90	30	114	45	14	30	5	16	71	10	218	114	9	271	10	307	130	110	160	9	4
4RD 80 A, B	F 165-I	125	32	160	157	100	35	130	50	19	40	6	21.5	80	10	249	131	10	317	10	362	165	130	200	12	4
4RD 90 S, L	F 165-I	140	35	180	177	100	60	155	56	24	50	8	27	90	10	271	140	10	360	10	415	165	130	200	12	4
4RD 100 L	F 215-I	160	45	205	195	140	45	175	63	28	60	8	31	100	17	288	158	12	416	11	481	215	180	250	14	4
4RD 112 M	F 215-I	190	50	235	219	140	45	180	70	28	60	8	31	112	15	311	159	12	438	11	504	215	180	250	14	4
4RD 132 S, M	F 265-I	216	55	266	258	140	75	218	89	38	80	10	41	132	18	350	181	12	534	16	619	265	230	300	14	4
4RD 160 M, L	F 300-I	254	60	312	310	210	90	300	108	42	110	12	45	160	21	436	255	14	667	19	785	300	250	350	18	4
3RD 180 M, L	F 300-I	279	70	348	352	241	80	295	121	48	110	14	51	180	21	492	299	14	721	15	841	300	250	350	18	4
3RD 200 L	F 350-I	318	80	398	392	305	90	395	133	55	110	16	59	200	21	543	310	18	817	18	937	350	300	400	18	4
3RD 225 S	F 400-I					286		346		60	140	18	64				341		823		973					
3RD 225 M-2	F 400-I	356	80	436	438	311	90	371	149	55	110	16	59	225	21	593	311	18	853	18	973	400	350	450	18	8
3RD 225 M	F 400-I					311		371		60	140	18	64				341		883		1033					
4RD 250 M-2	F 500-I									60			64													
4RD 250 M	F 500-I	406	100	506	491	349	90	429	158	65	140	18	69	250	23	687	380	24	997	18	1152	500	450	550	19	8
4RD 280 S-2	F 500-I					368		454		65		18	69						1036		1191					
4RD 280 S	F 500-I					368		454		75		20	79.5						1036		1191					
4RD 280 M-2	F 500-I	457	110	557	537	419	100	505	190	65	140	18	69	280	23	744	382	24	1096	18	1224	500	450	550	19	8
4RD 280 M	F 500-I					419		505		75		20	79.5						1096		1224					
4RD 315 S-2	F 600-I					406		526		65	140	18	69				454		1050		1210					
4RD 315 S	F 600-I					406		526		80	170	22	85				484		1080		1270					
4RD 315 M-2	F 600-I	508	110	628	617	457	115	577	216	65	140	18	69	315	25	859	454	28	1220	18	1380	600	550	660	24	8
4RD 315 M	F 600-I					457		577		80	170	22	85				484		1250		1440					



Dimensions 4RD

Form IM B3/B14



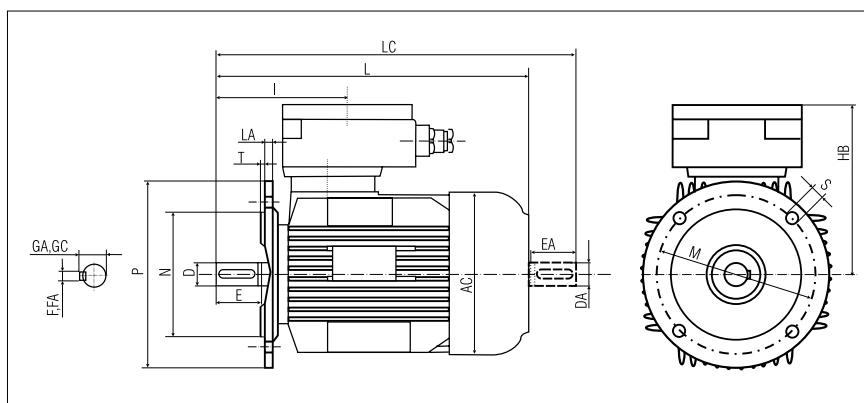
Dimensions

Frame size	Flange	A	AA	AB	AC	B	BA	BB	C	D DA	E EA	F FA	GC GA	H	HA	HD	I	K	L	LC	M	N	P	S	No. of fixing holes	T
4RD 71 A, B	F 85-II																				85	70	105	M6	4	2.5
	F 115-II	112	30	140	139	90	30	114	45	14	30	5	16	71	10	218	114	9	271	307	115	95	140	M8	4	3
4RD 80 A, B	F 100-II																				100	80	120	M6	4	3
	F 130-II	125	32	160	157	100	35	130	50	19	40	6	21.5	80	10	249	131	10	317	362	130	110	160	M8	4	3.5
4RD 90	S F 115-II					100															115	95	140	M8	4	3
	L F 130-II	140	35	180	177	125	60	155	56	24	50	8	27	90	10	271	140	10	360	415	130	110	160	M8	4	3.5
4RD 100	F 130-II																				130	110	160	M8	4	3.5
	L F 165-II	160	45	205	195	140	45	175	63	28	60	8	31	100	17	288	158	12	416	481	165	130	200	M10	4	3.5
4RD 112	F 130-II																				130	110	160	M8	4	3.5
	M F 165-II	190	50	235	219	140	50	180	70	28	60	8	31	112	15	311	159	12	438	504	165	130	200	M10	4	3.5



Dimensions 4RD

Form IM B14



Dimensions

Frame size		Flange	AC	D DA	E EA	F FA	GC GA	HB	I	L	LC	M	N	P	S	No. of fixing holes	T
4RD 71	A, B	F 85-II	139	14	30	5	16	147	114	271	307	85	70	105	M6	4	2.5
		F 115-II										115	95	140	M8	4	3
4RD 80	A, B	F 100-II	157	19	40	6	21.5	169	131	317	362	100	80	120	M6	4	3
		F 130-II										130	110	160	M8	4	3.5
4RD 90	L, S	F 115-II	177	24	50	8	27	181	140	360	415	115	95	140	M8	4	3
		F 130-II										130	110	160	M8	4	3.5
4RD 100	L	F 130-II	195	28	60	8	31	188	158	416	481	130	110	160	M8	4	3.5
		F 165-II										165	130	200	M10	4	3.5
4RD 112	M	F 130-II	219	28	60	8	31	199	159	438	504	130	110	160	M8	4	3.5
		F 165-II										165	130	200	M10	4	3.5

*Special applications/options*

Frame Size	71	80	90	100	112	132	160	180	200	225	250	280	315
Special voltage up to 759 V	●	●	●	●	●	●	●	●	●	●	●	●	●
Special frequency	●	●	●	●	●	●	●	●	●	●	●	●	●
Frequency inverter drive	●	●	●	●	●	●	●	op	op	op			
Special power	op	op	op	op	op	op	op	op	op	op	op	op	op
Special shaft end	op	op	op	op	op	op	op	op	op	op	op	op	op
Free shaft end on NDS-end of motor	●	●	●	●	●	●	●	●	●	●	●	●	●
Special flange	op	op	op	op	op	op	op	op	op	op	op	op	op
Flange made in R acc. to DIN 42955	●	●	●	●	●	●	●	●	●	●	●	●	●
Additional greasing								●	●	●	●	●	●
Fixed bearing on AS								●	●	●	●	●	●
2RS bearings	●	●	●	●	●	●	●	●	●	●	●	●	●
Labyrinth seal							●	●	●	●	●	●	●
Oil seal								●	●	●	●	●	●
Protection IP 56	●	●	●	●	●	●	●	●	●	●	●	●	●
Protection IP 65	op	op	op	op	op	op	op	op	op	op	op	op	op
Protection IP 66	op	op	op	op	op	op	op	op	op	op	op	op	op
Protection cover	●	●	●	●	●	●	●	●	●	●	●	●	●
Vibrations within R or S limits	●	●	●	●	●	●	●	●	●	●	●	●	●
Plastic ventilator								●	●	●	●	●	●
SPM placing							op	op	op	op	op	op	op
Special data plate	●	●	●	●	●	●	●	●	●	●	●	●	●
Terminal box with EEx d cable glands	op	op	op	op	op	op	op	op	op	op			
Tropical version	●	●	●	●	●	●	●	●	●	●	●	●	●
Thermal protection of winding	●	●	●	●	●	●	●	●	●	●	●	●	●
Heating of winding against condensation	●	●	●	●	●	●	●	●	●	●	●	●	●
Heating of winding at temp. lower - 20 °C	●	●	●	●	●	●	●	●	●	●	●	●	●
Insulation class H	●	●	●	●	●	●	●	●	●	●	●	●	●
Special colour	●	●	●	●	●	●	●	●	●	●	●	●	●

● on request
op = option

Ordering data

- Rating in kW
- Voltage and frequency
- Start connection (on-line or star-delta)
- R. p. m.
- Type of motor arrangement

- Type of explosion protection (gas group and T-classification)
- Mechanical requirements
- Special requirements (i. e. H-class thermal insulation, two-shaft, radial bearing seals).