



Electric Motors - www.felm.it

Electric Motors High Efficiency

Saudi Arabia – Hz.50/60

IE3

PREMIUM EFFICIENCY



GENERAL CHARACTERISTICS

The design, manufacturing and testing of squirrel cage induction motors made by Felm® are in accordance to IEC standard, Felm supply high quality steel frame motors with high performance and flexibility to meet customer request. The motors are widely used in various industries like: mining, pumps, compressors, wind machineries, fans ect.

Motors Technical details:

Efficiency level: Premium IE3 Motors < 0,75 kW - > 2500 kW High efficiency level	
Number of Poles: 2 up to 12	
Frequency: 50 Hz.	(Optional: 60 Hz.)
Voltage: 230/400-400/690	(Optional: other rated voltages)
Frames: 80 up to 630	
Steel welded frame	
Cooling system: IC611	(Options IC 616: Inverter use rated 1:10)
Copper bar Rotor	
Shaft sealing: O´Ring	
VPI Insulation System	
Insulation class F (class B temperature rise)	(Options: Class H)
Formed winding	
Degree of protection: IP55	(Options: IP56 - IP65 – IP66)
Mounting: B3	(Options: V1)
Painting procedure:	According to ISO 12944 S
Final color: RAL 5010	
Internal epoxy coating (tropicalized)	
Sintered drain plug	
Terminal box on side:	Left or Right
Shaft Material: C45	
Double grounding (1 inside terminal box + 2 on the frame)	
Grease Caltex SRI-2 or SKF LGHP2	(Different types recommended by Felm)
Regreasing system	
Options:	
Space Heaters	
PT100 windings and bearings	
Transmitters	
CT's Transformer	
Surge Arrestor & Capacitor & Suppressor	
Vibration probes	
Junction box	
Predisposition and All type of Encoder	
Special shaft materials	
DC or AC Brake	

FELM® has been operating in the electric motor sector since 1960 and has a well-consolidated background in the market of electrical machines. Thanks to the considerable experience of its staff, it can guarantee a technical back-up able to satisfy the most sophisticated technical requirements, both installations and maintenance, ensuring an International Service to its customers.

Our offices and warehouse cover an area of 10.000 square meters.



FELM® has a large stock, motors from KW 0, 12 up to 800 kW in different speed and thank to this and to the great distribution net can guarantee a good product availability and fast delivery in all Italy and Europe.

Special attention is dedicated to the production process in the factory, from the careful selection of the materials, copper, insulation to the control of the impregnation and polymerisation processes (VPI Vacuum Pressure Impregnation).



The high levels of quality offered by FELM® are proven by the ISO 9001 ICIM Certificate 2508/2:

Production of standard electric motors and special motors made in accordance to customer specifications.

Commercialization of electric motors and related electrical or electronic accessories for the construction and distribution of electric motors. Bearings are specially selected to guarantee best performance and product quality and a working life above the average.



GENERAL CHARACTERISTICS

Three phase asynchronous motors of cage rotor construction are in accordance with the following standards:

IEC (International Electrotechnical Commission) 60034-1.

Electrical: IEC/EN 60034-1, IEC/EN 60034-2-1, IEC 60034-8, IEC 60034-12, IEC/EN 60034-9, IEC 60034-14, IEC 60034-30

Mechanical: IEC 60072, IEC/EN 60034-5, IEC/EN 600

Unel, The UNEL rules are in accordance to the IEC int. standard

The principal characteristics are as follows:

- Robust construction in aluminium alloy or alternative cast iron up to size 132 with demontable feet.
- Frame and endshields in cast iron for sizes 160 / 560 with fixed feet. Feet, on request be supply motors with yeknical box on side
- Modern design.
- Generous starting torques.
- High efficiency ie for maximum energy saving.
- 2,4,6 pole motors meet or exceed the highest efficiency required by new IEC regulations:
- IEC 60034-2-1 new rules concerning efficiency testing methods.
- IEC 60034-30 new efficiency classes for motors
- Grade of Protection IP55 as standard
- Rated for continuous service - S1
- Low noise level.

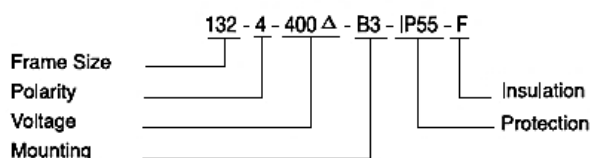
The use of the best materials for the construction has allowed us to achieve motors with the optimum electrical and mechanical characteristics.

The Felm standard range is ideal for arduous applications which require a high mechanical strength.

The motors are normally supplied for standard Eurovoltage supplies but on request can be produced for any non standard voltages and frequencies. In addition to Felm standard motors, the following derivatives can also be supplied:

- a - 2 or 3 speed motors with constant torque or fan/pump characteristics.
- b - forced ventilation for variable speed applications.
- c - motors with special tropicalisation treatment which are intended for use in humid tropical climates.
- d - flameproof EExd motors approved to ATEX standards.

INTERPRETATION OF MOTOR DATA (example)



SERVICE CONDITIONS

Felm motors will operate satisfactorily in an ambient temperature range of -20°C to 40°C (class B temperature rise) and altitudes up to 1000 metres above sea level. On request it is possible to supply motors suitable for ambient temperatures and altitudes in excess of these standard conditions.

STANDARD POWER RANGE

2 pole - 0,18 ÷ 1000 KW

4 pole - 0,12 ÷ 1500 KW

6 pole - 0,06 ÷ 1500 KW

8 pole - 0,18 ÷ 1200 KW

VOLTAGE AND FREQUENCY

Standard Voltage 230 Δ / 400Δ or 400 Δ / 690Δ

Connection Δ for outputs up to 3 KW

Connection Δ for outputs 4 KW and above.

Frequency 50 Hz with possibility to use at 60 Hz

STATOR

The stator windings have a double impregnation treatment which solidifies to give good mechanical strength characteristics which is also highly resistant to humidity and thermal stress.

The class F insulation system with only class B temperature rise (80°C) provides an exceptional margin of safety and ensures a longer thermal life even in "abnormal" operating conditions

ROTOR

A die cast aluminium rotor is pressed or shrunk onto the shaft and dynamically balanced with half key in accordance with IEC 72.

FAN AND FANCOVER

The standard arrangement is IC411, Totally Enclosed Fan Ventilated. Cooling fans are located to the motor shaft with a key, and are designed for optimized cooling even at low speeds.

Fan covers are in sheet steel throughout the complete range.

BEARINGS

Felm motors are equipped with SKF bearings or primary brands.

Felm motors are provided with bearings adapted to the use requested, ball or roller bearings, grease lubricated.

Felm motors series FA2 (aluminium) and F2 (cast iron) frames 63 – 225 are equipped with sealed bearings (longlife), or roll bearings on request.

Felm motors serie F2 (cast iron) are equipped with ball bearings (or roll bearings on request) from frame 280 lubricated with lubricating nipples on the Drive End and on Not Drive End side.

For these bearings is necessary a periodically relubricated according to the "Installation, operation and maintenance manual" or the table on the motor.

TERMINAL BOX

For standard motors, the terminal box is mounted:

Frame 63 – 132 on the top of the motors, multi-mount for aluminium housing. Fram 160 – 450 on the top of the motors and on request on the side. The orientation shown is related looking the motor from shaft. The terminal box is equipped with cable gland and can be oriented to obtain the power input. From frame size 160 the motors are fitted with PTC, with a connection in the terminal box.

VIBRATION

Vibration of motors tested under no load conditions should not exceed the data in the following table:

Motors are balanced with half key in accordance to the IEC 60034-143

Frame size (mm)	63•132	160•225	250•355
Velocity (mm/sec)	1,8	2,8	4,5

Guaranteed values are upon request.

PROTECTION FOR TROPICAL/HOSTILE ENVIRONEMENTS

EXTERNAL SURFACES

On special request Felm can supply motors with particular treatments on the outside surface in order to resist better to humid and tropical ambient.

These motors will be painted with special paint-an enhanced form which ensures both internal and external surfaces from corrosive attach, on request we can offer inox screws.

WINDINGS

Felm motors have windings tropicalized as standard with antifiash paint.

THERMIC PROTECTION

Felm motors are equipped as standard with PTC in the winding from size 160.

On special request we can put PT100 in the windings klixon (normally closed) heaters, PT100 on the bearings

PAINTING

Felm motors are painted as standard with RAL BLUE 5010. On request it is possible to have special painting with an additional extra price.

DERATING FOR HIGH TEMPERATURE				
Ambient temperature	45°C	50°C	55°C	60°C
Class B	96%	93%	87%	83%
Class F	100%	100%	100%	95%
DERATING FOR ALTITUDE				
Altitude	2000m	3000m	4000m	
Class B	94%	85%	75%	
Class F	100%	100%	95%	

DEGREES OF PROTECTION “IP” (International Protection)

FELM motors, in standard conditions, are with protection degree IP55 in according to the current regulations.

PROTECTION AGAINST SOLID BODIES	
1 st dligt	Description
0	no protect
1	protected against solid bodies of superior dimensions to 50mm
2	protected against solid bodies of superior dimensions to 12mm
3	protected against solid bodies of superior dimensions to 2,5mm
4	protected against solid bodies of superior dimensions to 1mm
5	protect against the powder
6	totally protect against the powder

PROTECTION AGAINST THE PENETRATION OF THE LIQUIDS	
2 nd dligt	Description
0	no protect
1	protect against the vertical fall of water drops
2	protect against the fall of water drops with inclination max of 15°
3	protect against the rain with maximum inclination 60°
4	protect against the water sprays coming from every direction
5	protect against water jets coming from every direction
6	protect against big waves coming from every direction
7	protect against the effects of immersion to precise conditions of pressure
8	protected against the effects of the submersion to precise conditions of pressure

FRAME AND TYPE OF MOUNTING (IEC 60034-7)

		Frame Size							Frame Size							
Code I	Code II		63 ÷112	132	160 ÷250	280 ÷315	355÷400		Code I	Code II		63 ÷112	132	160 ÷250	280 ÷315	355÷400
IM B3	IM 1001	 1)	•	•	•	•	•	IM V1	IM 3011	 2)	•!	•	•	•	•	•
IM B35	IM 2001	 1) 2)	•	•	•	•	•	IM V15	IM 2011	 1) 2)	•!	•	•	•	•	•
IM B34	IM 2101	 1) 3)	•	•				IM V3	IM 3031	 2)	•	•	•	X	X	X
IM B5	IM 3001	 2)	•	•	•	X	X	IM V36	IM2031	 1) 2)	•	•	•	X	X	X
IM B6	IM 1051	 1)	•	•	•	X	X	IM V5	IM 1011	 1)	•!	•	•	X	X	X
IM B7	IM 1061	 1)	•	•	•	X	X	IM V6	IM 1031	 1)	•	•	•	X	X	X
IM B8	IM 1071	 1)	•	•	•	X	X	IM V18	IM 3611	 3)	•!	•				
IM B14	IM 3601	 3)	•	•				IM V19	IM 3631	 3)	•	•				

1. Motors with feet

2. Flanged Motor: unthreaded through holes

3. Flanged Motor: threaded dead holes

•: Available

X: Consult Felm

!: Cast Iron Motors 63 frame without anti-rain canopy

For other mountings refer to IEC 60034-7.

TECHNICAL DATA ALLUMINIUM

TYPE	VA.	VA.	Hz.	Connection	kW	Amp	Amp	Eff. %	Cosφ	rpm	Weight Kg.	Duty	SF	Bearings D.E.	Bearings N.D.E.
FA3 80 K-2	230	380	50	Δ / Y	0,75	2,8	1,7	80,7	0,83	2850	18	S1	1.0	6204ZZ	6204ZZ
	230	380	60	Δ / Y	0,9	3,5	2,1	78,7	0,83	3420	18				
FA3 80 G-4	230	380	50	Δ / Y	0,75	3,0	1,8	82,5	0,76	1420	20	S1	1.0	6204ZZ	6204ZZ
	230	380	60	Δ / Y	0,9	3,7	2,2	80,5	0,76	1700	20				
FA3 90 S-6	230	380	50	Δ / Y	0,75	3,7	2,2	78,9	0,65	905	25	S1	1.0	6205ZZ	6205ZZ
	230	380	60	Δ / Y	0,9	4,5	2,7	76,9	0,65	1085	25				
FA3 80 G-2	230	380	50	Δ / Y	1,1	4,0	2,4	82,7	0,84	2860	19	S1	1.0	6204ZZ	6204ZZ
	230	380	60	Δ / Y	1,32	4,9	3,0	80,7	0,84	3430	19				
FA3 90 S-4	230	380	50	Δ / Y	1,1	4,3	2,6	84,1	0,76	1415	24	S1	1.0	6205ZZ	6205ZZ
	230	380	60	Δ / Y	1,32	5,3	3,2	82,1	0,76	1695	24				
FA3 90 L-6	230	380	50	Δ / Y	1,1	5,0	3,0	81	0,68	910	27	S1	1.0	6205ZZ	6205ZZ
	230	380	60	Δ / Y	1,32	6,2	3,7	79	0,68	1090	27				
FA3 90 S-2	230	380	50	Δ / Y	1,5	5,1	3,1	84,2	0,87	2875	24	S1	1.0	6205ZZ	6205ZZ
	230	380	60	Δ / Y	1,8	6,3	3,8	82,2	0,87	3450	24				
FA3 90 L-4	230	380	50	Δ / Y	1,5	5,7	3,4	85,3	0,78	1420	30	S1	1.0	6205ZZ	6205ZZ
	230	380	60	Δ / Y	1,8	7,0	4,2	83,3	0,78	1700	30				
FA3 100 L-6	230	380	50	Δ / Y	1,5	6,3	3,8	82,5	0,73	945	27	S1	1.0	6206ZZC3	6206ZZC3
	230	380	60	Δ / Y	1,8	7,7	4,7	80,5	0,73	1135	27				
FA3 90 L-2	230	380	50	Δ / Y	2,2	7,5	4,5	85,9	0,86	2865	27	S1	1.0	6205ZZ	6205ZZ
	230	380	60	Δ / Y	2,64	9,2	5,6	83,9	0,86	3430	27				
FA3 100 L-4	230	380	50	Δ / Y	2,2	8,1	4,9	86,7	0,79	1450	28	S1	1.0	6206ZZC3	6206ZZC3
	230	380	60	Δ / Y	2,64	9,9	6,0	84,7	0,79	1740	28				
FA3 112 M-6	230	380	50	Δ / Y	2,2	8,9	5,4	84,3	0,74	950	33	S1	1.0	6306ZZC3	6306ZZC3
	230	380	60	Δ / Y	2,5	10,3	6,2	82,3	0,74	1140	33				
FA3 100 L-2	230	380	50	Δ / Y	3	10,2	6,2	87,1	0,85	2875	24	S1	1.0	6206ZZC3	6206ZZC3
	230	380	60	Δ / Y	3,6	12,5	7,6	85,1	0,85	3450	24				
FA3 100LX-4	230	380	50	Δ / Y	3	10,7	6,5	87,7	0,8	1450	36	S1	1.0	6206ZZC3	6206ZZC3
	230	380	60	Δ / Y	3,6	13,2	8,0	85,7	0,8	1740	36				
FA3 132 S-6	230	380	50	Δ / Y	3	11,7	7,1	85,6	0,75	955	35	S1	1.0	6308ZZC3	6308ZZC3
	230	380	60	Δ / Y	3,5	14,0	8,5	83,6	0,75	1145	35				
FA3 112 M-2	380	415	50	Δ / Y	4	8,0	7,3	88,1	0,86	2890	29	S1	1.0	6306ZZC3	6306ZZC3
	380	415	60	Δ / Y	4,6	9,4	8,6	86,1	0,86	3465	29				
FA3 112 M-4	380	415	50	Δ / Y	4	8,6	7,9	88,6	0,8	1445	38	S1	1.0	6306ZZC3	6306ZZC3
	380	415	60	Δ / Y	4,6	10,1	9,2	86,6	0,8	1735	38				
FA3 132 M-6	380	415	50	Δ / Y	4	9,3	8,5	86,8	0,75	960	50	S1	1.0	6308ZZC3	6308ZZC3
	380	415	60	Δ / Y	4,6	11,0	10,1	84,8	0,75	1150	50				
FA3 132 S-2	380	415	50	Δ / Y	5,5	10,8	9,9	89,2	0,87	2890	32	S1	1.0	6308ZZC3	6308ZZC3
	380	415	60	Δ / Y	6,3	12,6	11,6	87,2	0,87	3465	32				
FA3 132 S-4	380	415	50	Δ / Y	5,5	11,4	10,4	89,6	0,82	1455	47	S1	1.0	6308ZZC3	6308ZZC3
	380	415	60	Δ / Y	6,3	13,3	12,2	87,6	0,82	1745	47				
FA3 132 MX-6	380	415	50	Δ / Y	5,5	12,5	11,4	88	0,76	960	66	S1	1.0	6308ZZC3	6308ZZC3
	380	415	60	Δ / Y	6,3	14,6	13,4	86	0,76	1150	66				
FA3 132 SX-2	380	415	50	Δ / Y	7,5	14,5	13,3	90,1	0,87	2890	40	S1	1.0	6308ZZC3	6308ZZC3
	380	415	60	Δ / Y	8,6	17,0	15,6	88,1	0,87	3465	40				
FA3 132 M-4	380	415	50	Δ / Y	7,5	15,4	14,1	90,4	0,82	1450	56	S1	1.0	6308ZZC3	6308ZZC3
	380	415	60	Δ / Y	8,6	18,0	16,5	88,4	0,82	1740	56				
FA3 160 M-6	380	415	50	Δ / Y	7,5	17,5	16,0	89,1	0,73	970	83	S1	1.0	6309ZZC3	6309ZZC3
	380	415	60	Δ / Y	8,6	20,6	18,8	87,1	0,73	1165	83				

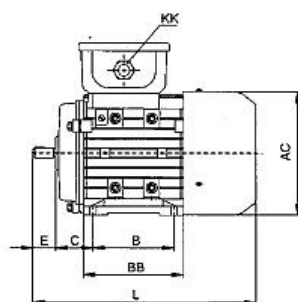
TECHNICAL DATA CAST IRON

TYPE	VA.	VA.	H _z .	Connection	kW	Amp	Amp	Eff. %	Cosφ	rpm	Weight Kg.	Duty	SF	Bearings D.E.	Bearings N.D.E.
F3 132 M-2	380	415	50	Δ / Y	9	17,7	16,2	86,8	0,89	2880	40	S1	1.0	6308ZZC3	6308ZZC3
	380	415	60	Δ / Y	10,3	20,7	19,0	84,8	0,89	3455	40				
F3 160 M-2	380	415	50	Δ / Y	11	21,1	19,3	91,2	0,87	2930	92	S1	1.0	6309ZZC3	6309ZZC3
	380	415	60	Δ / Y	12,6	24,7	22,6	89,2	0,87	3515	92				
F3 160 M-4	380	415	50	Δ / Y	11	22,6	20,7	91,4	0,81	1470	110	S1	1.0	6309ZZC3	6309ZZC3
	380	415	60	Δ / Y	12,6	26,4	24,2	89,4	0,81	1765	110				
F3 160 L-6	380	415	50	Δ / Y	11	25,0	22,9	90,3	0,74	970	120	S1	1.0	6309ZZC3	6309ZZC3
	380	415	60	Δ / Y	12,6	29,3	26,8	88,3	0,74	1165	120				
F3 160 MX-2	380	415	50	Δ / Y	15	28,5	26,1	91,9	0,87	2930	92	S1	1.0	6309ZZC3	6309ZZC3
	380	415	60	Δ / Y	17,2	33,4	30,6	89,9	0,87	3515	92				
F3 160 L-4	380	415	50	Δ / Y	15	30,5	28,0	92,1	0,81	1470	123	S1	1.0	6309ZZC3	6309ZZC3
	380	415	60	Δ / Y	17,2	35,8	32,8	90,1	0,81	1765	123				
F3 180 L-6	380	415	50	Δ / Y	15	31,6	29,0	91,2	0,79	975	201	S1	1.0	6311ZZC3	6311ZZC3
	380	415	60	Δ / Y	17,2	37,1	34,0	89,2	0,79	1170	201				
F3 160 L-2	380	415	50	Δ / Y	18,5	35,0	32,0	92,4	0,87	2930	92	S1	1.0	6309ZZC3	6309ZZC3
	380	415	60	Δ / Y	21,2	41,0	37,5	90,4	0,87	3515	92				
F3 180 M-4	380	415	50	Δ / Y	18,5	37,0	33,9	92,6	0,82	1470	186	S1	1.0	6311ZZC3	6311ZZC3
	380	415	60	Δ / Y	21,2	43,4	39,7	90,6	0,82	1760	186				
F3 200 L-6	380	415	50	Δ / Y	18,5	38,8	35,5	91,7	0,79	980	243	S1	1.0	6312ZZC3	6312ZZC3
	380	415	60	Δ / Y	21,2	45,5	41,6	89,7	0,79	1175	243				
F3 180 M-2	380	415	50	Δ / Y	22	41,0	37,5	92,7	0,88	2950	189	S1	1.0	6311ZZC3	6311ZZC3
	380	415	60	Δ / Y	25,3	48,2	44,1	90,7	0,88	3540	189				
F3 180 L-4	380	415	50	Δ / Y	22	43,8	40,1	93	0,82	1470	206	S1	1.0	6311ZZC3	6311ZZC3
	380	415	60	Δ / Y	25,3	51,5	47,2	91	0,82	1760	206				
F3 200 LX-6	380	415	50	Δ / Y	22	46,5	42,6	92,2	0,78	980	259	S1	1.0	6312ZZC3	6312ZZC3
	380	415	60	Δ / Y	25,3	54,6	50,0	90,2	0,78	1175	259				
F3 200 L-2	380	415	50	Δ / Y	30	55,5	50,8	93,3	0,88	2955	242	S1	1.0	6312ZZC3	6312ZZC3
	380	415	60	Δ / Y	34,5	65,2	59,7	91,3	0,88	3545	242				
F3 200 L-4	380	415	50	Δ / Y	30	58,0	53,1	93,6	0,84	1475	269	S1	1.0	6312ZZC3	6312ZZC3
	380	415	60	Δ / Y	34,5	68,1	62,4	91,6	0,84	1770	269				
F3 225 M-6	380	415	50	Δ / Y	30	59,8	54,8	92,9	0,82	985	333	S1	1.0	6313ZZC3	6313ZZC3
	380	415	60	Δ / Y	34,5	70,3	64,4	90,9	0,82	1180	333				
F3 200 LX-2	380	415	50	Δ / Y	37	69,0	63,1	93,7	0,87	2955	414	S1	1.0	6312ZZC3	6312ZZC3
	380	415	60	Δ / Y	42,55	81,0	74,2	91,7	0,87	3545	414				
F3 225 S-4	380	415	50	Δ / Y	37	70,4	64,5	93,9	0,85	1480	473	S1	1.0	6313ZZC3	6313ZZC3
	380	415	60	Δ / Y	42,55	82,8	75,8	91,9	0,85	1775	473				
F3 250 M-6	380	415	50	Δ / Y	37	71,7	65,7	93,3	0,84	985	410	S1	1.0	6314C3	6314C3
	380	415	60	Δ / Y	42,55	84,3	77,2	91,3	0,84	1180	410				
F3 225 M-2	380	415	50	Δ / Y	45	81,7	74,8	94	0,89	2960	328	S1	1.0	6313ZZC3	6313ZZC3
	380	415	60	Δ / Y	51,75	96,0	87,9	92	0,89	3550	328				
F3 225 M-4	380	415	50	Δ / Y	45	85,4	78,2	94,2	0,85	1480	314	S1	1.0	6313ZZC3	6313ZZC3
	380	415	60	Δ / Y	51,75	100,3	91,9	92,2	0,85	1775	314				
F3 280 S-6	380	415	50	Δ / Y	45	86,9	79,5	93,7	0,84	990	586	S1	1.0	6317C3	6317C3
	380	415	60	Δ / Y	51,75	102,1	93,5	91,7	0,84	1185	586				
F3 250 M-2	380	415	50	Δ / Y	55	100,7	92,2	94,3	0,88	2965	414	S1	1.0	6314C3	6314C3
	380	415	60	Δ / Y	63,25	118,3	108,3	92,3	0,88	3555	414				
F3 250 M-4	380	415	50	Δ / Y	55	103,9	95,2	94,6	0,85	1480	473	S1	1.0	6314C3	6314C3
	380	415	60	Δ / Y	63,25	122,1	111,8	92,6	0,85	1775	473				
F3 280 M-6	380	415	50	Δ / Y	55	105,7	96,8	94,1	0,84	990	665	S1	1.0	6317C3	6317C3
	380	415	60	Δ / Y	63,25	124,2	113,7	92,1	0,84	1185	665				

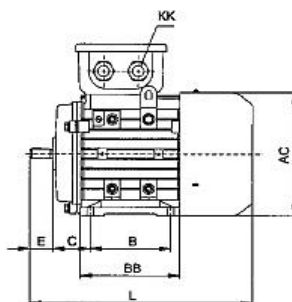
TECHNICAL DATA CAST IRON

TYPE	VA.	VA.	Hz.	Connection	kW	Amp	Amp	Eff. %	Cosφ	rpm	Weight Kg.	Duty	SF	Bearings D.E.	Bearings N.D.E.
F3 280 S-2	380	415	50	Δ / Y	75	136,7	125,2	94,7	0,88	2975	541	S1	1.0	6314C3	6314C3
	380	415	60	Δ / Y	86,25	160,6	147,1	92,7	0,88	3570	541				
F3 280 S-4	380	415	50	Δ / Y	75	141,1	129,2	95	0,85	1485	620	S1	1.0	6317C3	6317C3
	380	415	60	Δ / Y	86,25	165,8	151,8	93	0,85	1780	620				
F3 315 S-6	380	415	50	Δ / Y	75	145,1	132,9	94,6	0,83	990	860	S1	1.0	6319C3	6319C3
	380	415	60	Δ / Y	86,25	170,5	156,1	92,6	0,83	1185	860				
F3 280 M-2	380	415	50	Δ / Y	90	161,7	148,1	95	0,89	2975	645	S1	1.0	6314C3	6314C3
	380	415	60	Δ / Y	103,5	190,0	174,0	93	0,89	3570	645				
F3 280 M-4	380	415	50	Δ / Y	90	167,0	152,9	95,2	0,86	1490	673	S1	1.0	6317C3	6317C3
	380	415	60	Δ / Y	103,5	196,2	179,6	93,2	0,86	1785	673				
F3 315 M-6	380	415	50	Δ / Y	90	171,5	157,1	94,9	0,84	990	980	S1	1.0	6319C3	6319C3
	380	415	60	Δ / Y	103,5	201,5	184,5	92,9	0,84	1185	980				
F3 315 S-2	380	415	50	Δ / Y	110	192,9	176,6	95,2	0,91	2980	900	S1	1.0	6317C3	6317C3
	380	415	60	Δ / Y	126,5	226,6	207,5	93,2	0,91	3575	900				
F3 315 S-4	380	415	50	Δ / Y	110	201,4	184,4	95,4	0,87	1485	970	S1	1.0	6319C3	6319C3
	380	415	60	Δ / Y	126,5	236,5	216,6	93,4	0,87	1780	970				
F3 315 L-6	380	415	50	Δ / Y	110	209,2	191,6	95,1	0,84	990	1050	S1	1.0	6319C3	6319C3
	380	415	60	Δ / Y	126,5	245,8	225,0	93,1	0,84	1185	1050				
F3 315 M-2	380	415	50	Δ / Y	132	231,0	211,5	95,4	0,91	2980	1030	S1	1.0	6317C3	6317C3
	380	415	60	Δ / Y	151,8	271,4	248,5	93,4	0,91	3575	1030				
F3 315 M-4	380	415	50	Δ / Y	132	241,1	220,8	95,6	0,87	1485	1060	S1	1.0	6319C3	6319C3
	380	415	60	Δ / Y	151,8	283,2	259,3	93,6	0,87	1780	1060				
F3 315 LX-6	380	415	50	Δ / Y	132	247,3	226,5	95,4	0,85	985	1225	S1	1.0	6319C3	6319C3
	380	415	60	Δ / Y	151,8	290,5	266,0	93,4	0,85	1180	1225				
F3 315 L-2	380	415	50	Δ / Y	160	279,4	255,9	95,6	0,91	2980	1160	S1	1.0	6317C3	6317C3
	380	415	60	Δ / Y	184	328,2	300,5	93,6	0,91	3575	1160				
F3 315 L-4	380	415	50	Δ / Y	160	291,7	267,1	95,8	0,87	1485	1160	S1	1.0	6319C3	6319C3
	380	415	60	Δ / Y	184	342,6	313,7	93,8	0,87	1780	1160				
F3 355 M-6	380	415	50	Δ / Y	160	299,2	273,9	95,6	0,85	990	1790	S1	1.0	6322C3	6320C3
	380	415	60	Δ / Y	184	351,4	321,7	93,6	0,85	1190	1790				
F3 315 LX-2	380	415	50	Δ / Y	200	348,6	319,2	95,8	0,91	2980	1250	S1	1.0	6317C3	6317C3
	380	415	60	Δ / Y	230	409,4	374,9	93,8	0,91	3575	1250				
F3 315 LX-4	380	415	50	Δ / Y	200	359,7	329,4	96	0,88	1485	1270	S1	1.0	6319C3	6319C3
	380	415	60	Δ / Y	230	422,4	386,8	94	0,88	1780	1270				
F3 355 MY-6	380	415	50	Δ / Y	200	373,2	341,7	95,8	0,85	990	1890	S1	1.0	6322C3	6320C3
	380	415	60	Δ / Y	230	438,3	401,3	93,8	0,85	1190	1890				
F3 355 M-2	380	415	50	Δ / Y	250	435,7	399,0	95,8	0,91	2980	1780	S1	1.0	6317C3	6317C3
	380	415	60	Δ / Y	287,5	511,7	468,6	93,8	0,91	3580	1780				
F3 355 M-4	380	415	50	Δ / Y	250	444,6	407,1	96	0,89	1490	1815	S1	1.0	6322C3	6320C3
	380	415	60	Δ / Y	287,5	522,1	478,1	94	0,89	1785	1815				
F3 355 L-6	380	415	50	Δ / Y	250	461,0	422,2	95,8	0,86	990	1920	S1	1.0	6322C3	6320C3
	380	415	60	Δ / Y	287,5	541,5	495,8	93,8	0,86	1190	1920				
F3 355 L-2	380	415	50	Δ / Y	280	488,0	446,8	95,8	0,91	2985	1790	S1	1.0	6317C3	6317C3
	380	415	60	Δ / Y	322	573,1	524,8	93,8	0,91	3580	1790				
F3 355 L-4	380	415	50	Δ / Y	280	497,9	455,9	96	0,89	1490	1915	S1	1.0	6322C3	6320C3
	380	415	60	Δ / Y	322	584,8	535,5	94	0,89	1790	1915				
F3 355 LY-6	380	415	50	Δ / Y	280	516,4	472,8	95,8	0,86	990	2106	S1	1.0	6322C3	6320C3
	380	415	60	Δ / Y	322	606,5	555,3	93,8	0,86	1190	2106				
F3 355 LX-2	380	415	50	Δ / Y	315	549,0	502,7	95,8	0,91	2980	1808	S1	1.0	6317C3	6317C3
	380	415	60	Δ / Y	362,2	644,7	590,3	93,8	0,91	3580	1808				
F3 355 LX-4	380	415	50	Δ / Y	315	560,2	512,9	96	0,89	1490	2000	S1	1.0	6322C3	6320C3
	380	415	60	Δ / Y	362,2	657,8	602,3	94	0,89	1790	2000				
F3 355 L-2	380	415	50	Δ / Y	355	618,7	566,5	95,8	0,91	2980	1828	S1	1.0	6317C3	6317C3
	380	415	60	Δ / Y	408,2	726,6	665,3	93,8	0,91	3580	1828				

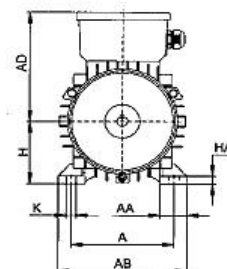
Aluminium Dimension



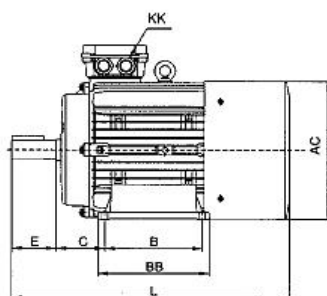
56-90



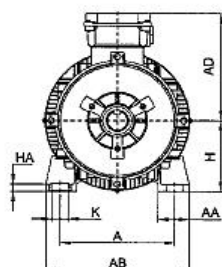
100-160



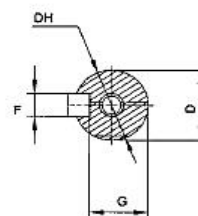
56-160



180-200

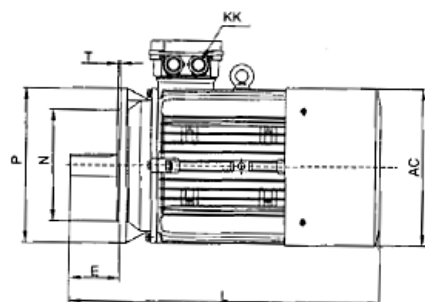


180-200

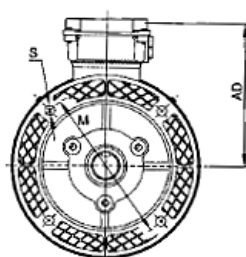


DIMENSIONI B3 DIMENSION B3

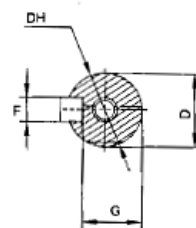
Type	A	AA	AB	BB	HA	AC	AD	B	C	D	DH	E	F	G	H	K	KK		Overall L
																	Metric	PG	
56	90	23	115	88	7	110	100	71	36	9	M4X12	20	3	7.2	56	5.8	1-M20X1.5	1-PG11	199
63	100	24	135	100	7	130	111	80	40	11	M4X12	23	4	8.5	63	7.0	1-M20X1.5	1-PG11	217
71	112	26	150	110	8	145	118	90	45	14	M5X12	30	5	11	71	7.0	1-M20X1.5	1-PG11	245
80	125	35	165	125	9	175	134	100	50	19	M6X16	40	6	15.5	80	10.0	1-M25X1.5	1-PG16	287
90S	140	37	180	125	10	195	140	100	56	24	M8X19	50	8	20.0	90	10.0	1-M25X1.5	1-PG16	315
90L	140	37	180	150	10	195	140	125	56	24	M8X19	50	8	20.0	90	10.0	1-M25X1.5	1-PG16	340
100L	160	40	205	172	11	215	160	140	63	28	M10X22	60	8	24.0	100	12.0	1-M32X1.5	1-PG21	385
112M	190	41	230	181	12	240	178	140	70	28	M10X22	60	8	24.0	112	12.0	2-M32X1.5	2-PG21	400
132S	216	51	270	186	15	275	206	140	89	38	M12X28	80	10	33.0	132	12.0	2-M32X1.5	2-PG21	483
132M	216	51	270	224	15	275	206	178	89	38	M12X28	80	10	33.0	132	12.0	2-M32X1.5	2-PG21	510
160M	254	55	320	260	18	330	255	210	108	42	M16X36	110	12	37.0	160	15.0	2-M40X1.5	2-PG29	615
160L	254	55	320	304	18	330	255	254	108	42	M16X36	110	12	37.0	160	16.0	2-M40X1.5	2-PG29	670
180M	279	75	350	315	18	355	272	241	221	48	M16X36	110	14	42.5	180	15	2-M32X1.5	2-PG29	765
180L	279	75	350	315	18	355	272	279	221	48	M16X36	110	14	42.5	180	15	2-M32X1.5	2-PG29	765
200L	318	100	398	355	24	355	272	305	133	55	M20X42	110	16	49	200	19	2-M32X1.5	2-PG36	790



56-200

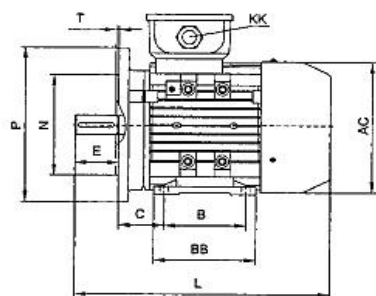


56-200

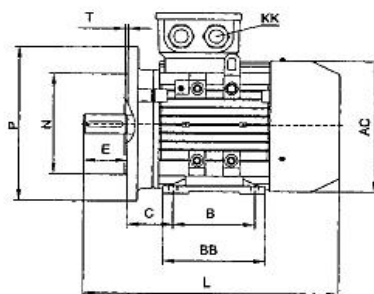


DIMENSIONI B5 DIMENSION B5

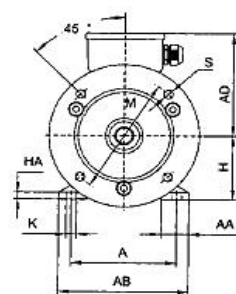
Type	HA	AC	AD	B	C	D	DH	E	F	G	H	K	KK		Overall dimensions					
													Metric	PG	L	M	N	P	S	T
56	7	110	100	71	36	9	M4X12	20	3	7.2	56	5.8	1-M20X1.5	1-PG11	199	100	80	120	7	3.0
63	7	130	111	80	40	11	M4X12	23	4	8.5	63	7.0	1-M20X1.5	1-PG11	217	115	95	140	10	3.0
71	8	145	118	90	45	14	M5X12	30	5	11	71	7.0	1-M20X1.5	1-PG11	245	130	110	160	12	3.5
80	9	175	134	100	50	19	M6X16	40	6	15.5	80	10.0	1-M25X1.5	1-PG16	287	165	130	200	12	3.5
90S	10	195	140	100	56	24	M8X19	50	8	20.0	90	10.0	1-M25X1.5	1-PG16	315	165	130	200	12	3.5
90L	10	195	140	125	56	24	M8X19	50	8	20.0	90	10.0	1-M25X1.5	1-PG16	340	165	130	200	12	3.5
100L	11	215	160	140	63	28	M10X22	60	8	24.0	100	12.0	1-M32X1.5	1-PG21	385	215	180	250	15	4.0
112M	12	240	178	140	70	28	M10X22	60	8	24.0	112	12.0	2-M32X1.5	2-PG21	400	215	180	250	15	4.0
132S	15	275	206	140	89	38	M12X28	80	10	33.0	132	12.0	2-M32X1.5	2-PG21	483	265	230	300	15	4.0
132M	15	275	206	178	89	38	M12X28	80	10	33.0	132	12.0	2-M32X1.5	2-PG21	510	265	230	300	15	4.0
160M	18	330	255	210	108	42	M16X36	110	12	37.0	160	15.0	2-M40X1.5	2-PG29	615	300	250	350	19	5.0
160L	18	330	255	254	108	42	M16X36	110	12	37.0	160	16.0	2-M40X1.5	2-PG29	670	300	250	350	19	5.0
180M	18	355	272	241	121	48	M16X36	110	14	42.5	180	15.0	2-M32X1.5	2-PG29	765	300	250	350	19	5
180L	18	355	272	279	121	48	M16X36	110	14	42.5	180	15.0	2-M32X1.5	2-PG29	765	300	250	350	19	5
200L	24	355	272	305	133	55	M20X42	110	16	49	200	19	2-M32X1.5	2-PG36	790	350	300	400	19	5



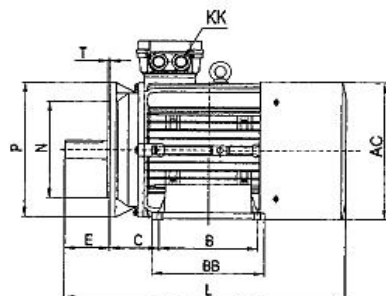
56-90



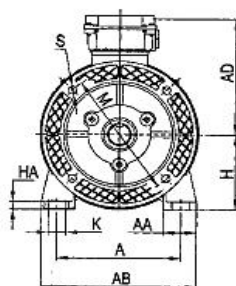
100-160



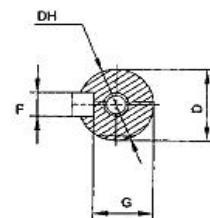
56-160



180-200

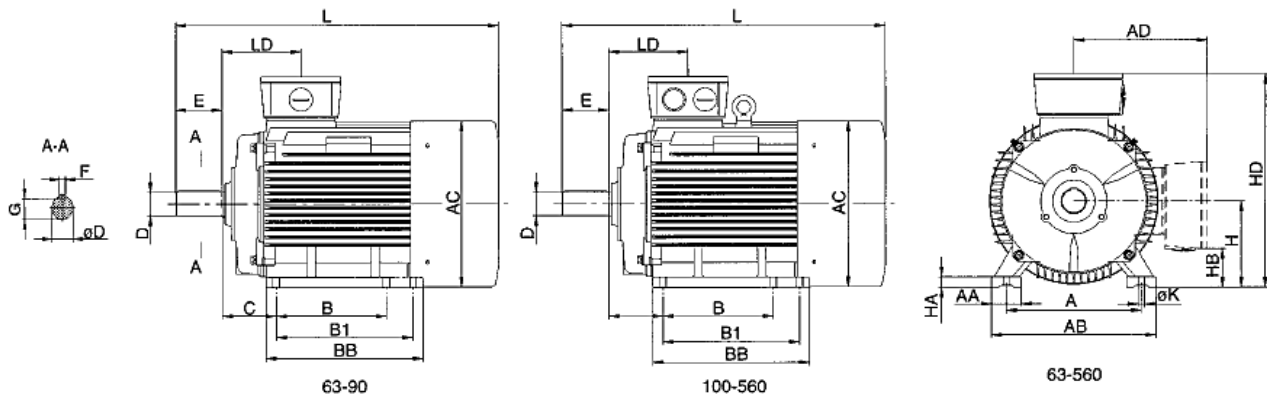


180-200



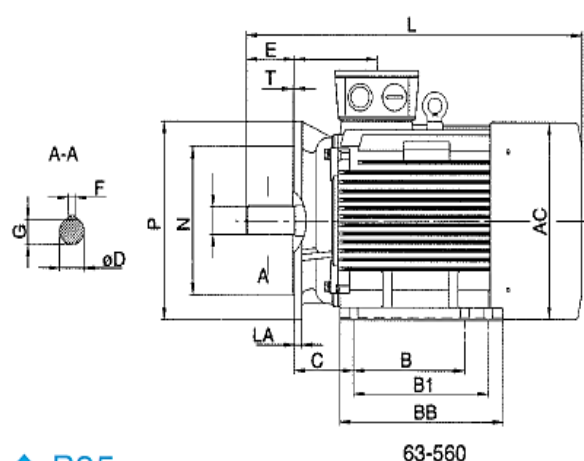
DIMENSIONI B35 DIMENSION B35

Type	A	AA	AB	BB	HA	AC	AD	B	C	D	DH	E	F	G	H	K	KK		Overall dimensions						
																	Metric	PG	L	M	N	P	S	T	
56	90	23	115	88	7	110	100	71	36	9	M4X12	20	3	7.2	56	5.8	1-M20X1.5	1-PG11	199	100	80	120	7	3.0	
63	100	24	235	100	7	130	111	80	40	11	M4X12	23	4	8.5	63	7.0	1-M20X1.5	1-PG11	217	115	95	140	10	3.0	
71	112	26	150	110	8	145	118	90	45	14	M5X12	30	5	11	71	7.0	1-M20X1.5	1-PG11	245	130	110	160	12	3.5	
80	125	35	165	125	9	175	134	100	50	19	M6X16	40	6	15.5	80	10.0	1-M25X1.5	1-PG16	287	165	130	200	12	3.5	
90S	140	37	180	125	10	195	140	100	56	24	M8X19	50	8	20.0	90	10.0	1-M25X1.5	1-PG16	315	165	130	200	12	3.5	
90L	147	37	180	150	10	195	140	125	56	24	M8X19	50	8	20.0	90	10.0	1-M25X1.5	1-PG16	340	165	130	200	12	3.5	
100L	160	40	205	172	11	215	160	140	63	28	M10X22	60	8	24.0	100	12.0	1-M32X1.5	1-PG21	385	215	180	250	15	4.0	
112M	190	41	230	181	12	240	178	140	70	28	M10X22	60	8	24.0	112	12.0	2-M32X1.5	2-PG21	400	215	180	250	15	4.0	
132S	216	51	270	186	15	275	206	140	89	38	M12X28	80	10	33.0	132	12	2-M32X1.5	2-PG21	483	265	230	300	15	4.0	
132M	216	51	270	224	15	275	206	178	89	38	M12X28	80	10	33.0	132	12.0	2-M32X1.5	2-PG21	510	265	230	300	15	4.0	
160M	254	55	320	260	18	330	255	210	108	42	M16X36	110	12	37.0	160	15.0	2-M40X1.5	2-PG29	615	300	250	350	19	5.0	
160L	254	55	320	304	18	330	255	254	108	42	M16X36	110	12	37.0	160	16.0	2-M40X1.5	2-PG29	670	300	250	350	19	5.0	
180M	279	75	350	315	18	355	272	241	121	48	M16*36	110	14	42.5	180	15	2-M32X1.5	2-PG29	765	300	250	350	19	5	
180L	279	75	350	315	18	355	272	279	121	48	M16*36	110	14	42.5	180	15	2-M32X1.5	2-PG29	765	300	250	350	19	5	
200L	318	100	398	355	24	355	272	305	133	55	M20*42	110	16	49	200	19	2-M32X1.5	2-PG36	790	350	300	400	19	5	

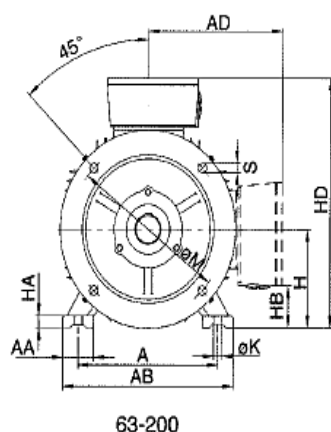


◆ B3

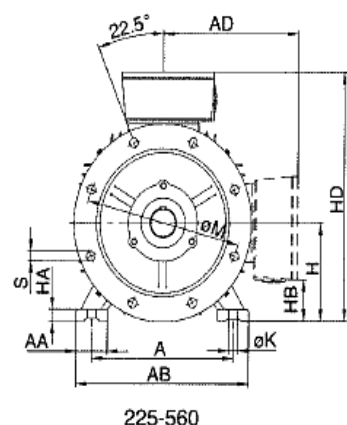
frame	Pole	Dimension							Dimension											
		A	B	B1	C	CA	H	K	AA	AB	AC	AD	BB	HA	HB	HB		LD	L	LC
																On top	L&R			
63	2-8	100	80		40	-	63° -0,5	7	30	135	130	-	115	8	-	180	-	65	225	253
71	2-8	112	90		45	-	71° -0,5	7	32	150	145	-	125	8		195	-	70	250	285
80	2-8	125	100	-	50	98	80° -0,5	10	35	160	160	145	130	12	36	225	160	75	280	336
90S	2-8	140	100	-	56	117	90° -0,5	10	36	180	180	155	140	12	50	245	180	75	315	373
90L	2-8	140	125	-	56	117	90° -0,5	10	36	180	180	155	165	12	50	245	180	75	340	373
100L	2-8	160	140	-	63	120	100° -0,5	12	40	200	200	180	175	14	55	280	200	83	375	443
112M	2-8	190	140	-	70	138	112° -0,5	12	45	230	220	190	180	15	60	305	222	87	400	468
132S	2-8	216	140	-	89	164	132° -0,5	12	55	265	260	220	190	18	65	355	262	102	465	553
132M	2-8	216	178	-	89	146	132° -0,5	12	55	265	260	220	230	18	65	355	262	102	505	593
160M	2-8	254	210	-	108	188	160° -0,5	15	65	315	315	265	260	20	81	425	385	146	608	726
160L	2-8	254	254	-	108	188	160° -0,5	15	65	315	315	265	305	20	81	425	385	146	652	770
180M	2.4	279	241	-	121	226	180° -0,5	15	70	350	360	280	315	22	105	460	420	161	690	808
180L	4-8	279	279	-	121	228	180° -0,5	15	70	350	360	280	350	22	105	460	420	161	730	848
200L	2-8	318	305	-	133	220	200° -0,5	19	70	390	400	310	370	25	85	510	475	186	760	878
225S	4-8	356	286	-	149	243	225° -0,5	19	75	435	450	335	370	28	110	555	535	189	810	928
225M	2	356	311	-	149	243	225° -0,5	19	75	435	450	335	395	28	110	555	535	189	805	923
	4-8	356	311	-	149	198	225° -0,5	19	75	435	450	335	395	28	110	555	535	189	835	953
250M	2	406	349	-	168	261	250° -0,5	24	80	485	485	375	445	30	110	625	570	207	910	1028
	4-8	406	349	-	168	261	250° -0,5	24	80	485	485	375	445	30	120	625	570	207	910	1028
280S	2	457	368	-	190	295	280° -1,0	24	85	545	550	405	490	35	142	685	660	215	985	1103
	4-8	457	368	-	190	315	280° -1,0	24	85	545	550	405	490	35	142	685	660	215	1005	1153
280M	2	457	419	-	190	289	280° -1,0	24	85	545	550	405	540	35	142	685	660	215	1030	1148
	4-8	457	419	-	190	319	280° -1,0	24	85	545	550	405	540	35	142	685	660	215	1060	1208
315S	2	508	406	-	216	426	315° -1,0	28	120	630	625	560	570	45	110	875	780	257	1180	1328
	4-8	508	406	-	216	426	315° -1,0	28	120	630	625	560	570	45	110	875	780	257	1210	1358
315M 315L	2	508	457	508	216	485	315° -1,0	28	120	630	625	560	680	45	110	875	780	257	1290	1438
	4-8	508	457	508	216	485	315° -1,0	28	120	630	625	560	680	45	110	875	780	257	1320	1498
355M	2	610	500	560	254	640	355° -1,0	28	120	730	700	615	750	52	110	970	830	284	1526	1674
	4-8	610	500	560	254	640	355° -1,0	28	120	730	700	615	750	52	110	970	830	284	1556	1734
355L	2	610	560	630	254	580	355° -1,0	28	120	730	700	615	750	52	110	970	830	284	1526	1674
	4-8	610	560	630	254	580	355° -1,0	28	120	730	700	615	750	52	110	970	830	284	1556	1734
400M 400L	2	686	710	-	280	698	400° -1,0	35	120	810	860	-	1100	45	-	1090	-	362	1850	2028
	4-8	686	710	-	280	733	400° -1,0	35	120	810	860	-	1100	45	-	1090	-	362	1925	2143



63-560



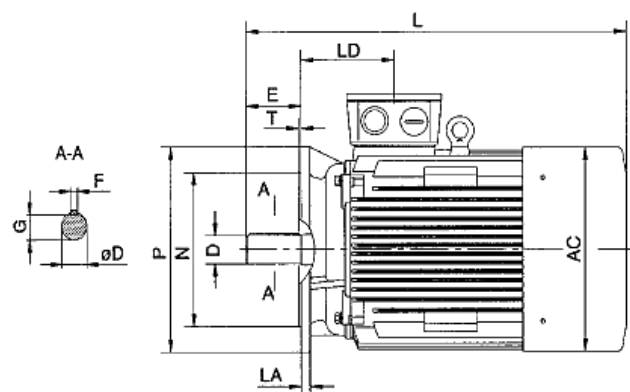
63-200



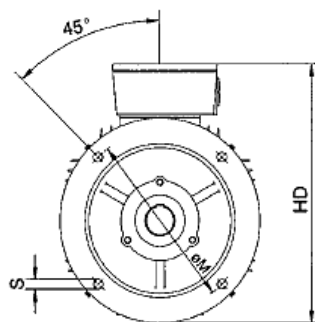
225-560

◆ B35

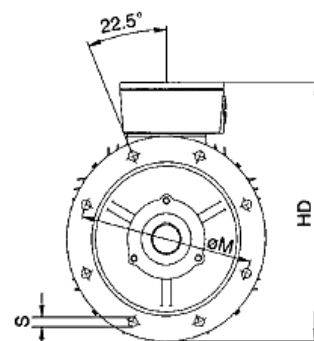
Frame	Poles	Dimension													Dimension												
		A	B	B1	C	CA	H	K	M	N	P	R	S	T	AA	AB	AC	AD	BB	HA	HB	HD		LA	LD	L	LC
																						Top	L&R				
80	2-8	125	100	-	50	98	80° -0,5	10	165	130	200	0	4-Ø12	4	35	160	160	145	130	12	36	225	160	12	75	280	336
90S	2-8	140	100	-	56	117	90° -0,5	10	165	130	200	0	4-Ø12	4	36	180	180	155	140	12	50	245	180	12	75	315	373
90L	2-8	140	125	-	56	117	90° -0,5	10	165	130	200	0	4-Ø12	4	36	180	180	155	165	12	50	245	180	12	75	340	373
100L	2-8	160	140	-	63	120	100° -0,5	12	215	180	250	0	4-Ø15	4	40	200	200	180	175	14	55	280	200	13	83	375	443
112M	2-8	190	140	-	70	138	112° -0,5	12	215	180	250	0	4-Ø15	4	45	230	220	190	180	15	60	305	222	14	87	400	468
132S	2-8	216	140	-	89	164	132° -0,5	12	265	230	300	0	4-Ø15	4	55	265	260	220	190	18	65	355	262	14	102	465	553
132M	2-8	216	178	-	89	146	132° -0,5	12	265	230	300	0	4-Ø15	4	55	265	260	220	230	18	65	355	262	14	102	505	593
160M	2-8	254	210	-	108	188	160° -0,5	15	300	250	350	0	4-Ø19	5	65	315	315	265	260	20	81	425	385	15	146	608	726
160L	2-8	254	254	-	108	188	160° -0,5	15	300	250	350	0	4-Ø19	5	65	315	315	265	305	20	81	425	385	15	146	652	770
180M	2.4	279	241	-	121	226	180° -0,5	15	300	250	350	0	4-Ø19	5	70	350	360	280	315	22	105	460	420	15	161	690	808
180L	4-8	279	279	-	121	228	180° -0,5	15	300	250	350	0	4-Ø19	5	70	350	360	280	350	22	105	460	420	15	161	730	848
200L	2-8	318	305	-	133	220	200° -0,5	19	350	300	400	0	4-Ø19	5	70	390	400	310	370	25	85	510	475	17	186	760	878
225S	4-8	356	286	-	149	243	225° -0,5	19	400	350	450	0	4-Ø19	5	75	435	450	335	370	28	110	555	535	20	189	810	928
225M	2	356	311	-	149	243	225° -0,5	19	400	350	450	0	4-Ø19	5	75	435	450	335	395	28	110	555	535	20	189	805	923
	4-8	356	311	-	149	198	225° -0,5	19	400	350	450	0	4-Ø19	5	75	435	450	335	395	28	110	555	535	20	189	835	953
250M	2	406	349	-	168	261	250° -0,5	24	500	450	550	0	4-Ø19	5	80	485	485	375	445	30	110	625	570	22	207	910	1028
	4-8	406	349	-	168	261	250° -0,5	24	500	450	550	0	4-Ø19	5	80	485	485	375	445	30	120	625	570	22	207	910	1028
280S	2	457	368	-	190	295	280° +1,0	24	500	450	550	0	4-Ø19	5	85	545	550	405	490	35	142	685	660	22	215	985	1103
	4-8	457	368	-	190	315	280° +1,0	24	500	450	550	0	4-Ø19	5	85	545	550	405	490	35	142	685	660	22	215	1005	1153
280M	2	457	419	-	190	289	280° +1,0	24	500	450	550	0	4-Ø19	5	85	545	550	405	540	35	142	685	660	22	215	1030	1148
	4-8	457	419	-	190	319	280° +1,0	24	500	450	550	0	4-Ø19	5	85	545	550	405	540	35	142	685	660	22	215	1060	1208
315S	2	508	406	-	216	426	315° +1,0	28	600	550	660	0	4-Ø24	6	120	630	625	560	570	45	110	875	780	22	257	1180	1328
	4-8	508	406	-	216	426	315° +1,0	28	600	550	660	0	4-Ø24	6	120	630	625	560	570	45	110	875	780	22	257	1210	1358
315M	2	508	457	508	216	485	315° +1,0	28	600	550	660	0	4-Ø24	6	120	630	625	560	680	45	110	875	780	22	257	1290	1438
	4-8	508	457	508	216	485	315° +1,0	28	600	550	660	0	4-Ø24	6	120	630	625	560	680	45	110	875	780	22	257	1320	1498
355M	2	610	500	560	254	640	355° +1,0	28	740	680	800	0	4-Ø24	6	120	730	700	615	750	52	125	970	830	25	284	1526	1674
	4-8	610	500	560	254	640	355° +1,0	28	740	680	800	0	4-Ø24	6	120	730	700	615	750	52	125	970	830	25	284	1556	1734
355L	2	610	560	630	254	580	355° +1,0	28	740	680	800	0	4-Ø24	6	120	730	700	615	750	52	125	970	830	25	284	1526	1674
	4-8	610	560	630	254	580	355° +1,0	28	740	680	800	0	4-Ø24	6	120	730	700	615	750	52	125	970	830	25	284	1556	1734
400M	2	686	710	-	280	698	400° +1,0	35	940	880	1000	0	4-Ø28	6	120	810	860	-	1100	45	-	1090	-	25	362	1850	2028
	4-8	686	710	-	280	733	400° +1,0	35	940	880	1000	0	4-Ø28	6	120	810	860	-	1100	45	-	1090	-	25	362	1925	2143



63-280



63-200

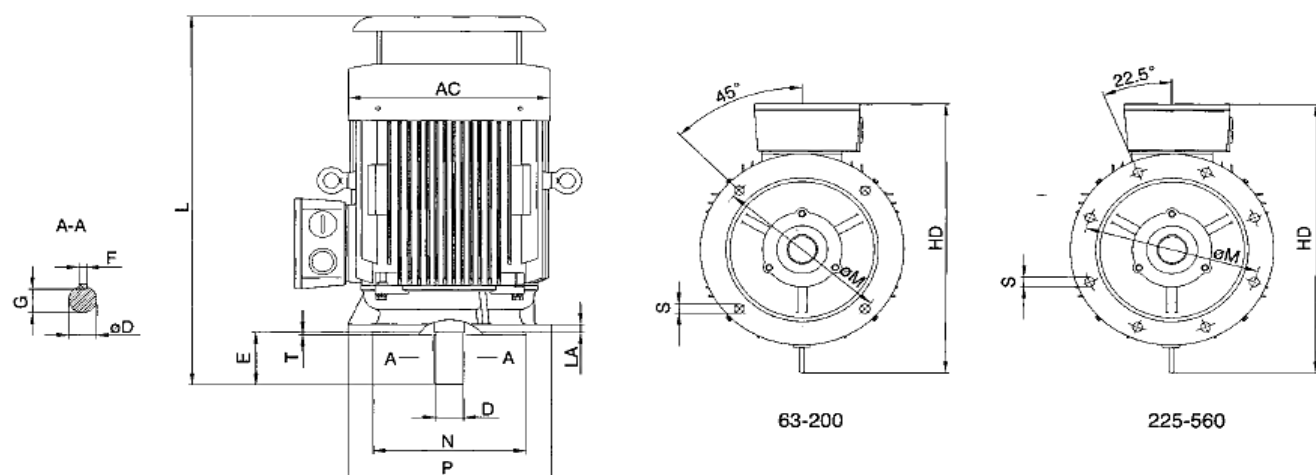


225-280

◆ B5

Frame	Pole	Dimension						Dimension					
		M	N	P	R	S	T	AC	AD	LA	LD	L	LC
80	2-8	165	130	200	0	4-Ø12	4	160	145	12	75	280	336
90S	2-8	165	130	200	0	4-Ø12	4	180	155	12	75	315	373
90L	2-8	165	130	200	0	4-Ø12	4	180	155	12	75	340	373
100L	2-8	215	180	250	0	4-Ø15	4	200	180	13	83	375	443
112M	2-8	215	180	250	0	4-Ø15	4	220	193	14	87	400	468
132S	2-8	265	230	300	0	4-Ø15	4	260	223	14	102	465	553
132M	2-8	265	230	300	0	4-Ø15	4	260	223	14	102	505	593
160M	2-8	300	250	350	0	4-Ø19	5	315	265	15	146	608	726
160L	2-8	300	250	350	0	4-Ø19	5	315	265	15	146	652	770
180M	2.4	300	250	350	0	4-Ø19	5	360	280	15	161	690	808
180L	4-8	300	250	350	0	4-Ø19	5	360	280	15	161	730	848
200L	2-8	350	300	400	0	4-Ø19	5	400	310	17	186	760	878
225S	4-8	400	350	450	0	4-Ø19	5	450	330	20	189	810	928
225M	2	400	350	450	0	4-Ø19	5	450	330	20	189	805	923
	4-8	400	350	450	0	4-Ø19	5	450	330	20	189	835	953
250M	2	500	450	550	0	4-Ø19	5	485	375	22	207	910	1028
	4-8	500	450	550	0	4-Ø19	5	485	375	22	207	910	1028
280S	2	500	450	550	0	4-Ø19	5	550	405	22	215	985	1103
	4-8	500	450	550	0	4-Ø19	5	550	405	22	215	1005	1153
280M	2	500	450	550	0	4-Ø19	5	550	405	22	215	1030	1148
	4-8	500	450	550	0	4-Ø19	5	550	405	22	215	1060	1208

Cast Iron Dimension

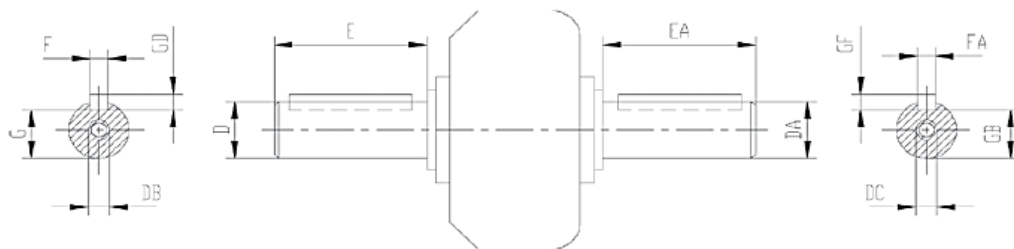


◆ V1

Frame	Pole	Dimension									Dimension					
		D	E	F	G	M	N	P	R	S	T	AC	HD	LA	LD	L
80	2-8	19	40	6	15.5	165	130	200	0	4-ø12	4	160	225	12	75	305
90S	2-8	24	50	8	20	165	130	200	0	4-ø12	4	180	245	12	75	345
90L	2-8	24	50	8	20	165	130	200	0	4-ø12	4	180	245	12	75	370
100L	2-8	28	60	8	24	215	180	250	0	4-ø15	4	200	280	13	83	410
112M	2-8	28	60	8	24	215	180	250	0	4-ø15	4	220	305	14	87	450
132S	2-8	38	80	10	33	265	230	300	0	4-ø15	4	260	365	14	102	510
132M	2-8	38	80	10	33	265	230	300	0	4-ø15	4	260	365	14	102	550
160M	2-8	42	110	12	37	300	250	350	0	4-ø19	5	315	445	15	146	660
160L	2-8	42	110	12	37	300	250	350	0	4-ø19	5	315	445	15	146	705
180M	2.4	48	110	14	42.5	300	250	350	0	4-ø19	5	360	480	15	161	750
180L	4-8	48	110	14	42.5	300	250	350	0	4-ø19	5	360	480	15	161	790
200L	2-8	55	110	16	49	350	300	400	0	4-ø19	5	400	530	17	186	840
225S	4-8	60	140	18	53	400	350	450	0	4-ø19	5	450	575	20	189	905
225M	2	55	110	16	49	400	350	450	0	4-ø19	5	450	575	20	189	910
	4-8	60	140	18	53	400	350	450	0	4-ø19	5	450	575	20	189	935
250M	2	60	140	18	53	500	450	550	0	4-ø19	5	485	635	22	207	1005
	4-8	65	140	18	58	500	450	550	0	4-ø19	5	485	635	22	207	1005
280S	2	65	140	18	58	500	450	550	0	4-ø19	5	550	725	22	215	1110
	4-8	75	140	20	67.5	500	450	550	0	4-ø19	5	550	725	22	215	1130
280M	2	65	140	18	58	500	450	550	0	4-ø19	5	550	725	22	215	1155
	4-8	75	140	20	67.5	500	450	550	0	4-ø19	5	550	725	22	215	1185
315S	2	65	140	18	58	600	550	660	0	4-ø24	6	625	895	22	257	1340
	4-8	80	170	22	71	600	550	660	0	4-ø24	6	625	895	22	257	1370
315M	2	65	140	18	58	600	550	660	0	4-ø24	6	625	895	22	257	1450
315L	4-8	80	170	22	71	600	550	660	0	4-ø24	6	625	895	22	257	1480
355M	2	75	140	20	67.5	740	680	800	0	4-ø24	6	700	970	25	284	1665
355L	4-8	100	210	25	86	740	680	800	0	4-ø24	6	700	970	25	284	1700
400M	2	80	170	22	71	940	880	1000	0	4-ø28	6	860	1150	25	362	2150
400L	4-8	110	210	28	100	940	880	1000	0	4-ø28	6	860	1150	25	362	2220

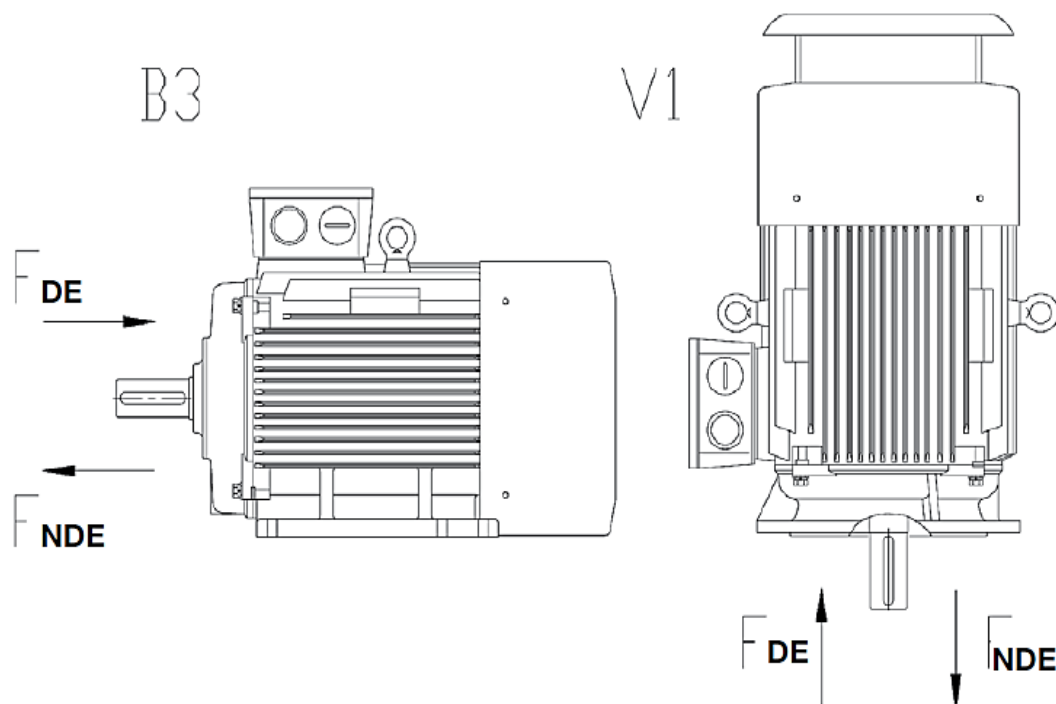
DIMENSIONE ALBERO SERIE GHISA

DIMENSION SHAFT CAST IRON SERIES



Frame	Pole	D	DA	E	EA	F	FA	G	GB	GD	GF	DB	DC							
56	2-4	9 j6($\begin{smallmatrix} +0.007 \\ -0.002 \end{smallmatrix}$)	9 j6($\begin{smallmatrix} +0.007 \\ -0.002 \end{smallmatrix}$)	20	20	3	3	7	7	3	3	M3	M3							
63	2-4	11 j6($\begin{smallmatrix} +0.008 \\ -0.003 \end{smallmatrix}$)	11 j6($\begin{smallmatrix} +0.008 \\ -0.003 \end{smallmatrix}$)	23	23	4	4	8.5	8.5	4	4	M4	M4							
71	2-4-6	14 j6($\begin{smallmatrix} +0.008 \\ -0.003 \end{smallmatrix}$)	14 j6($\begin{smallmatrix} +0.008 \\ -0.003 \end{smallmatrix}$)	30	30	5	5	11	11	5	5	M5	M5							
80	2-4-6-8	19 j6($\begin{smallmatrix} +0.009 \\ -0.004 \end{smallmatrix}$)	19 j6($\begin{smallmatrix} +0.009 \\ -0.004 \end{smallmatrix}$)	40	40	6	6	15.5	15.5	6	6	M6	M6							
90S	2-4-6-8	24 j6($\begin{smallmatrix} +0.009 \\ -0.004 \end{smallmatrix}$)	24 j6($\begin{smallmatrix} +0.009 \\ -0.004 \end{smallmatrix}$)	50	50	8	8	20	20	7	7	M8	M8							
90L	2-4-6-8																			
100L	2-4-6-8	28 k6($\begin{smallmatrix} +0.009 \\ -0.004 \end{smallmatrix}$)	28 k6($\begin{smallmatrix} +0.009 \\ -0.004 \end{smallmatrix}$)	60	60	8	8	24	24	7	7	M10	M10							
112M	2-4-6-8																			
132S	2-4-6-8	38 k6($\begin{smallmatrix} +0.018 \\ -0.002 \end{smallmatrix}$)	38 k6($\begin{smallmatrix} +0.018 \\ -0.002 \end{smallmatrix}$)	80	80	10	10	33	33	8	8	M12	M12							
132M	2-4-6-8																			
160M	2-4-6-8	42 k6($\begin{smallmatrix} +0.018 \\ -0.002 \end{smallmatrix}$)	42 k6($\begin{smallmatrix} +0.018 \\ -0.002 \end{smallmatrix}$)	110	110	12	12	37	37	9	9	M16	M16							
160L	2-4-6-8																			
180M	2-4	48 k6($\begin{smallmatrix} +0.018 \\ -0.002 \end{smallmatrix}$)	48 k6($\begin{smallmatrix} +0.018 \\ -0.002 \end{smallmatrix}$)			14	14	42.5	42.5					9	9					
180L	4-6-8																			
200L	2	55 m6($\begin{smallmatrix} +0.03 \\ -0.011 \end{smallmatrix}$)	48 k6($\begin{smallmatrix} +0.018 \\ -0.002 \end{smallmatrix}$)			16	14	49	42.5					10	9					
	4-6-8															55 m6($\begin{smallmatrix} +0.03 \\ -0.011 \end{smallmatrix}$)	16	16	49	49
225S	4-6-8	60 m6($\begin{smallmatrix} +0.03 \\ -0.011 \end{smallmatrix}$)	55 m6($\begin{smallmatrix} +0.03 \\ -0.011 \end{smallmatrix}$)	140	110	18	16	53	49	11	10	M20	M20							
225M	2	55 m6($\begin{smallmatrix} +0.03 \\ -0.011 \end{smallmatrix}$)	48 k6($\begin{smallmatrix} +0.018 \\ -0.002 \end{smallmatrix}$)	110										16	14	49	42.5	10	9	
	4-6-8	60 m6($\begin{smallmatrix} +0.03 \\ -0.011 \end{smallmatrix}$)	60 m6($\begin{smallmatrix} +0.03 \\ -0.011 \end{smallmatrix}$)	140		18	16	53	49	11	10									
250M	2	60 m6($\begin{smallmatrix} +0.03 \\ -0.011 \end{smallmatrix}$)												140	20	18	67.5	53	12	11
	4-6-8	65 m6($\begin{smallmatrix} +0.03 \\ -0.011 \end{smallmatrix}$)																		
280S	2	65 m6($\begin{smallmatrix} +0.03 \\ -0.011 \end{smallmatrix}$)												65 m6($\begin{smallmatrix} +0.03 \\ -0.011 \end{smallmatrix}$)	140	140	18	18	58	58
	4-6-8	75 m6($\begin{smallmatrix} +0.03 \\ -0.011 \end{smallmatrix}$)	65 m6($\begin{smallmatrix} +0.03 \\ -0.011 \end{smallmatrix}$)	140	140	20	18	67.5	53	12	11									
280M	2	65 m6($\begin{smallmatrix} +0.03 \\ -0.011 \end{smallmatrix}$)	55 m6($\begin{smallmatrix} +0.03 \\ -0.011 \end{smallmatrix}$)	110	110	18	16	58	49	11	10									
	4-6-8	75 m6($\begin{smallmatrix} +0.03 \\ -0.011 \end{smallmatrix}$)	65 m6($\begin{smallmatrix} +0.03 \\ -0.011 \end{smallmatrix}$)	140	140	20	18	67.5	53	12	11									
315S	2	65 m6($\begin{smallmatrix} +0.03 \\ -0.011 \end{smallmatrix}$)	65 m6($\begin{smallmatrix} +0.03 \\ -0.011 \end{smallmatrix}$)	140	140	18	18	58	58	11	11									
	4-6-8	80 m6($\begin{smallmatrix} +0.03 \\ -0.011 \end{smallmatrix}$)	80 m6($\begin{smallmatrix} +0.03 \\ -0.011 \end{smallmatrix}$)	170	170	22	22	71	71	14	14									
315M	2	65 m6($\begin{smallmatrix} +0.03 \\ -0.011 \end{smallmatrix}$)	65 m6($\begin{smallmatrix} +0.03 \\ -0.011 \end{smallmatrix}$)	140	140	18	18	58	58	11	11									
	4-6-8	80 m6($\begin{smallmatrix} +0.03 \\ -0.011 \end{smallmatrix}$)	80 m6($\begin{smallmatrix} +0.03 \\ -0.011 \end{smallmatrix}$)	170	170	22	22	71	71	14	14									
355M	2	75 m6($\begin{smallmatrix} +0.03 \\ -0.011 \end{smallmatrix}$)	75 m6($\begin{smallmatrix} +0.03 \\ -0.011 \end{smallmatrix}$)	140	140	20	20	67.5	67.5	12	12									
	4-6-8	100 m6($\begin{smallmatrix} +0.035 \\ -0.013 \end{smallmatrix}$)	95 m6($\begin{smallmatrix} +0.035 \\ -0.013 \end{smallmatrix}$)	210	170	28	25	86	86	14	14									
355L	2	75 m6($\begin{smallmatrix} +0.03 \\ -0.011 \end{smallmatrix}$)	75 m6($\begin{smallmatrix} +0.03 \\ -0.011 \end{smallmatrix}$)	140	140	20	20	67.5	67.5	12	12									
	4-6-8	100 m6($\begin{smallmatrix} +0.035 \\ -0.013 \end{smallmatrix}$)	95 m6($\begin{smallmatrix} +0.035 \\ -0.013 \end{smallmatrix}$)	210	170	28	25	86	86	14	14									
400M	2	80 m6($\begin{smallmatrix} +0.03 \\ -0.011 \end{smallmatrix}$)	80 m6($\begin{smallmatrix} +0.03 \\ -0.011 \end{smallmatrix}$)	170	170	22	22	71	71	14	14	M24	M24							
400L	4-6-8	110 m6($\begin{smallmatrix} +0.035 \\ -0.013 \end{smallmatrix}$)	110 m6($\begin{smallmatrix} +0.035 \\ -0.013 \end{smallmatrix}$)	210	210	28	28	100	100	16	16									

CARICHI ASSIALI AMMESSI. PERMISSIBLE AXIAL LOADS.



La seguente tabella fornisce le forze assiali ammissibili in Newton, assumendo come zero forza radiale. In questo caso il motore deve essere ordinato con cuscinetti a sfere standard. In caso di forze assiali superiori ai valori riportati nella tabella devono essere ordinati motori con cuscinetto a contatto angolare. I valori si basano su condizioni normali a 50Hz. e calcolato a 20000 ore di lavoro per motori a 2 poli e 40000 ore per i motori 4, 6 e 8 poli.

A 60Hz. i valori devono essere ridotti del 10%. Per i motori a due velocità i valori devono essere basati presso la velocità più elevata.

F_{pressione} (D.E.) è calcolata per un cuscinetto fisso sul lato comando.

The following table gives the permissible axial forces in Newton, assuming zero radial force. In this case motor should be ordered with standard ball bearings. In case of higher axial force than given in the table an angular contact bearing should be ordered. The values are based on normal conditions at 50Hz. and calculated at 20000 working hour for two pole motors and 40000 hours for 4, 6 and 8 pole motors. At 60Hz. the values must be reduced by 10%. For two-speed motors the values have to be based at the higher speed.

F_{pressure} (D.E.) is calculated for a fixed bearing at the Drive End.

Frame Size	pole	Maximum axial force (FA)			
		B3 FDE	B3 FNDE	V1 FDE	V1 FNDE
56	2	200	200	230	180
	4	240	240	260	200
63	2	250	250	260	230
	4	280	280	300	260
71	2	270	270	290	255
	4	350	350	370	320
	6	440	440	460	420
80	2	380	380	400	360
	4	470	470	490	450
	6	590	590	620	560
	8	620	620	650	595
90	2	440	440	470	410
	4	550	550	600	510
	6	620	620	680	460
	8	640	640	700	580
100	2	610	610	670	570
	4	750	750	840	710
	6	880	880	970	820
	8	895	895	970	845
112	2	1220	1220	1300	1170
	4	1440	1440	1520	1370
	6	1650	1650	1740	1580
	8	1780	1780	1880	1710
132	2	1500	1500	1620	1430
	4	1780	1780	1970	1610
	6	1820	1820	2000	1660
	8	1920	1920	2100	1760
160	2	1650	1650	1950	1350
	4	2100	2100	2470	1720
	6	2450	2450	2800	2050
	8	2650	2650	3050	2210

Frame Size	pole	Maximum axial force (FA)			
		B3 FDE	B3 FNDE	V1 FDE	V1 FNDE
180	2	2100	2100	2450	1720
	4	2600	2600	3200	2000
	6	2900	2900	3510	2280
	8	3170	3170	3780	2550
200	2	2400	2400	2940	1840
	4	3120	3120	3850	2390
	6	3480	3480	4350	2610
	8	3950	3950	4810	3090
225	2	2720	2720	3420	2020
	4	3480	3480	4370	2590
	6	3890	3890	5040	2820
	8	4330	4330	5330	3330
250	2	3100	3100	3940	2260
	4	3900	3900	5000	2800
	6	4450	4450	5570	3230
	8	4980	4980	6380	3580
280	2	5300	3100	6500	2100
	4	6300	4400	7800	3000
	6	6700	4300	7900	2900
	8	7100	5020	9100	3520
315	2	5900	3800	8000	2000
	4	7100	5100	10700	3150
	6	7600	5800	11800	3500
	8	8100	6300	12500	4400
355*	2	6100	1850	14000	800
	4	9800	3900	18300	2500*
	6	10500	4700	20700	3500*
	8	12500	6000	21500	3600*
400*	4	11200	3900	18500	1600*
	6	12500	4800	19500	2200*
	8	12800	4950	21500	2900*

*= Dati calcolati con cuscinetti a rulli

*= Data calculated with roll bearings

Per forme costruttive diverse e/o carichi diversi contattare FELM

Consult FELM for other mounting or different loads

CARICHI RADIALI AMMESSI. PERMISSIBLE RADIAL LOADS.

La seguente tabella fornisce le forze assiali ammissibili in Newton, assumendo come zero forza radiale. In questo caso il motore deve essere ordinato con cuscinetti a sfere standard. In caso di forze assiali superiori ai valori riportati nella tabella devono essere ordinati motori con cuscinetto a contatto angolare. I valori si basano su condizioni normali a 50Hz. e calcolato a 20000 ore di lavoro per motori a 2 poli e 40000 ore per i motori 4, 6 e 8 poli.

A 60Hz. i valori devono essere ridotti del 10%. Per i motori a due velocità i valori devono essere basati presso la velocità più elevata.

Fpressure (D.E.) è calcolata per un cuscinetto fisso sul lato comando.

The following table give the permissible radial forces in Newton, assuming zero axial force and standard ball bearings. In case of higher radial force than give in the table an enforced bearing should be ordered. The values are based on normal conditions at 50 Hz and calculated at 20 000 working hours for the two pole motors and 40 000 working hours for 4,6 and 8 poles. For 60 Hz the value must be reduced by 10%. For two speed motors, the values have to be based at the higher speed.

Diametro puleggio: Pulley diameter:

Quando la durata del cuscinetto desiderato è stato determinato, il diametro della puleggia minimo può essere calcolato con la seguente formula:

When the desired bearing life has been determined, the minimum pulley diameter can be calculated with the following formula:

$$D_{min} = \frac{1.9 \times 10^7 \times k \times p_N}{n_N \times F_R}$$

D_{min} = diameter of the pulley (mm)

P = power of the motor (kW)

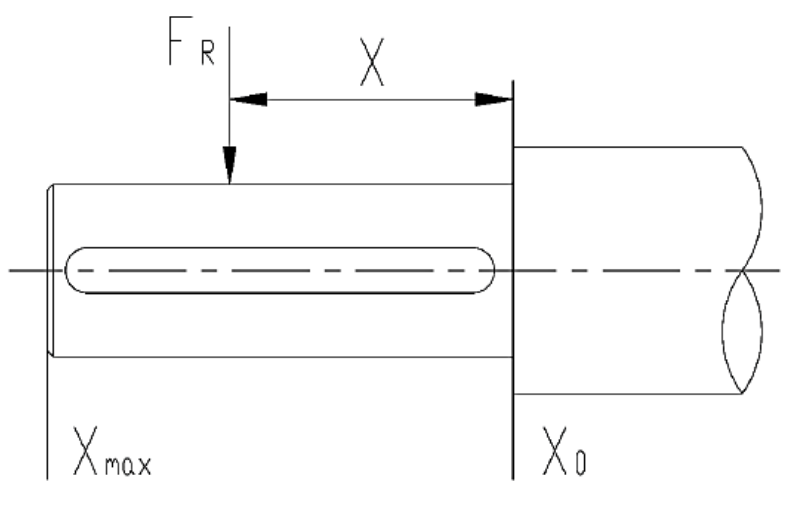
n = motor rated speed(r/min)

K = belt tension factor , $k=2.5$ for V-belt

$FR(X)$ = permissible radial force (N)

$$FR = F_R = F_{X0} - \frac{X}{E} (F_{X0} - F_{XMAX})$$

E = the length of the shaft diameter (mm.) in basic version



Size	pole	Maximum radial force (F_R)		
		X0	X1/2	Xmax
56	2	250	180	100
	4	250	180	100
63	2	360	300	230
	4	360	300	230
71	2	470	400	320
	4	470	400	320
	6	470	400	320
80	2	670	610	550
	4	730	650	590
	6	830	750	680
	8	920	820	750
90	2	740	660	590
	4	800	710	630
	6	920	810	730
	8	1010	890	800
100	2	1030	920	820
	4	1110	990	890
	6	1270	1130	1020
	8	1400	1240	1120
112	2	1490	1330	1200
	4	1600	1430	1290
	6	1840	1640	1480
	8	2020	1800	1630
132	2	2160	1900	1690
	4	2330	2040	1820
	6	2670	2340	2080
	8	2940	2570	2290
160	2	2800	2440	2170
	4	3000	2630	2330
	6	3440	3010	2670
	8	3850	3410	3060

Frame Size	pole	Maximum radial force (F_R)		
		X0	X1/2	Xmax
180	2	3930	3500	3150
	4	4240	3770	3390
	6	4890	4390	3980
	8	5380	4830	4380
200	2	4480	4050	3700
	4	4820	4360	3980
	6	5520	5000	4560
	8	6080	5500	5020
225	2	5000	4540	4160
	4	5360	4720	4210
	6	6180	5480	4920
	8	6750	5940	5310
250	2	5680	5100	4620
	4	6120	5490	4980
	6	7000	6280	5700
	8	7710	6920	6270
280	2	5620	5080	4640
	4	7790	7050	6430
	6	8920	8060	7360
	8	9820	8880	8100
315	2	7370	6840	6390
	4	9150	8370	7720
	6	10480	9590	8830
	8	11530	10550	9720
355*	2	16330	15390	8730
	4	28300	25860	14290
	6	32400	29600	16350
	8	35660	32580	18000
400*	4	33730	31140	19280
	6	38610	35650	22070
	8	42500	39240	24290

Note:

This image shows a blank sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

All data (technical, dimensions, etc..) listed in the tables are indicative and not binding. The guaranteed values are upon request. Felm srl reserves the right to change the project, the technical characteristics and dimensions at any time without previous notice.



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