Introduction

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Guide to selecting and ordering the motors

Overview

These "recommendations for drive selection" guide you step-by-step through this catalog to the required motor.

Step 1	Technical requirements for the motor	
Determine the required product profile, the following are required:	Rated frequency and rated voltage	3 AC 50/60 Hz, 400, 500 or 690 V
	Duty	Standard duty (continuous duty S1 according to DIN EN 60034-1)
	Degree of protection or type of explosion protection required	IP..
	Rated speed (No. of poles)	n =..... rpm
	Rated output	P =..... kW
	Rated torque	$M = P \cdot 9550/n$ =..... Nm
	Type of construction	IM..

Step 2	Environmental requirements for the motor		
Determine the installation conditions	Ambient temperature	≤40 °C	>40 °C
	Site altitude	≤1000 m	>1000 m
	Factors for derating	None	Determine the factor for derating (for derating factor, see "Technical information" – "Coolant temperature and site altitude")

Step 3	For preliminary selection of the motor, ⇒see subsequent pages and the corresponding "Preliminary selection of the motor" tables in the different catalog parts
Determine the range of possible motors	Select the frame size and therefore the possible motors on the basis of the following parameters: cooling method, degree of protection, rated output, rated speed and rated torque range. Note: The standard temperature range of the motors is from –20 to +40 °C.

Step 4	Detailed selection of the motor
Determine the basic Order No. of the motor	Determine the motor Order No. according to the following parameters: rated output, rated speed, rated torque and rated current from the "Selection and ordering data" for the motors that have already been identified as possibilities.

Step 5	Selection of the special versions (see under "Special versions")
Complete the motor Order No.	Determine special versions and the associated order codes (e. g. special voltages and types of construction, motor protection and degrees of protection, windings and insulation, colors and paint finish, mountings and technology, etc.) .

Step 6	
Select the frequency converter, if required	For Order No. of the converter as well as its selection, see Catalogs D 11, D 11.1 , DA 51.2 and DA 51.3.

Note on using this catalog

Due to the wide range of possible versions of low-voltage motors, the special features of the various motor series are not explained in detail in each case in this catalog part.
The availability of individual technical designs can be established from catalog parts 1 to 10.

Determine the motor type according to cooling method, degree of protection and frame design
(for further selection according to speed or number of poles, rated output, rated torque, rated speed and rated current, see the relevant "Preselection of the motor" tables in catalog parts 1 to 10)

Applications for surface-cooled motor types	Cooling method	Standard designation for degree of protection to DIN EN 60034 Part 5	Frame design	Motor type (Positions 1 to 3 of the Order No.) + type series (Position 4 of the Order No.) Rated output at 50 Hz Motor frame sizes (shaft heights) 56 63 71 80 90 100 112 132 160 180 200 225 250 280 315 355 400 450
New generation motors 1LE1/1PC1				**Catalog Part 1**
General Line motors with shorter delivery time	Self-ventilated	IP55	Aluminum	1LE1 1.5 ... 18.5 kW
Energy-saving motors with improved efficiency (Improved Efficiency EFF2)	Self-ventilated	IP55	Aluminum	1LE1 0.75 ... 18.5 kW
Energy-saving motors with high efficiency (High Efficiency EFF1)	Self-ventilated	IP55	Aluminum	1LE1 0.75 ... 18.5 kW
Motors with increased output and improved efficiency	Self-ventilated	IP55	Aluminum	1LE1 2.2 ... 22 kW
Motors with increased output and high efficiency	Self-ventilated	IP55	Aluminum	1LE1 2.2 ... 22 kW
Motors without external fan and fan cover with improved efficiency	Forced-air-cooled	IP55	Aluminum	1LE1 0.75 ... 18.5 kW
Motors without external fan and fan cover with high efficiency	Forced-air-cooled	IP55	Aluminum	1LE1 0.75 ... 18.5 kW
Motors without external fan and fan cover with improved efficiency	Self-cooled	IP55	Aluminum	1PC1 0.3 ... 7.4 kW
Motors without external fan and fan cover with high efficiency	Self-cooled	IP55	Aluminum	1PC1 0.37 ... 9 kW
Standard motors (up to frame size 315 L)				**Catalog Part 2**
Energy-saving motors with improved efficiency (Improved Efficiency EFF 2)	Self-ventilated	IP55	Aluminum	1LA7 0.06 ... 18.5 kW; 1LE1/1PC1; 1LA5 11 ... 45 kW
		IP55	Cast iron	1LA6 0.75 ... 18.5 kW; 1LG4 11 ... 200 kW
Pole-changing motors with improved efficiency	Self-ventilated	IP55	Aluminum	1LA7 0.15 ... 17 kW; 1LA5 18 ... 31 kW
Energy-saving motors with high efficiency (High Efficiency EFF1)	Self-ventilated	IP55	Aluminum	1LA9 0.06 ... 37 kW
		IP55	Cast iron	1LG6 11 ... 200 kW
Motors with increased output	Self-ventilated	IP55	Aluminum	1LA9 0.14 ... 53 kW
		IP55	Cast iron	1LG4 15 ... 110 kW
Motors without external fans	Self-cooled	IP55	Aluminum	1LP7 0.045 ... 7 kW; 1LE1/1PC1; 1LP5 5.5 ... 16.5 kW
		IP55	Cast iron	1LP4 3.7 ... 67 kW
Non-standard motors (frame size 315 and above)				**Catalog Part 3**
Motors for mains-fed operation	Self-ventilated	IP55	Cast iron	1LA8 160 ... 1000 kW
Motors for converter-fed operation	Self-ventilated	IP55	Cast iron	1LA8 145 ... 1000 kW
Motors with mounted separately driven fan for converter-fed operation	Forced-air cooled	IP55	Cast iron	1PQ8 145 ... 1000 kW
Motors with through-ventilation for mains-fed operation	Self-ventilated	IP23	Cast iron	1LL8 200 ... 1250 kW
Motors with through-ventilation for converter-fed operation	Self-ventilated	IP23	Cast iron	1LL8 200 ... 1250 kW

Guide to selecting and ordering the motors

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Determining the motor type according to cooling method, degree of protection and frame design (continued)

Applications for surface-cooled motor types	Cooling method	Standard designation for degree of protection to DIN EN 60034 Part 5	Frame design	Motor type (Positions 1 to 3 of the Order No.) + type series (Position 4 of the Order No.) Rated output at 50 Hz Motor frame sizes (shaft heights) 56 63 71 80 90 100 112 132 160 180 200 225 250 280 315 355 400 450
Explosion-proof motors				**Catalog Part 4**
Motors in Zone 1 with type of protection “e” (Zone 1 Exe II T3)	Self-ventilated	IP55	Aluminum	**1MA7 0.12 … 16 kW**
		IP55	Cast iron	**1MA6 1.3 … 165 kW**
Motors in Zone 1 with type of protection “de” (Zone 1 Exde IIC T4)	Self-ventilated	IP55	Cast iron	**1MJ6 0.25 … 37 kW** / **1MJ7 18.5 … 132 kW**
Motors in Zone 2 with type of protection “n”	Self-ventilated	IP55	Aluminum	**1LA7 0.09 … 18.5 kW**
		IP55	Aluminum	**1LA9 0.06 … 37 kW**
		IP55	Cast iron	**1LA6 0.75 … 18.5 kW** / **1LG4/1LG6 11 … 200 kW** / **1LA8 145 … 1000 kW**
Motors in Zone 21 with explosion protection	Self-ventilated	IP65	Aluminum	**1LA7 0.09 … 18.5 kW** / **1LA5 11 … 45 kW**
		IP65	Aluminum	**1LA9 0.06 … 37 kW**
		IP65	Cast iron	**1LG4/1LG6 11 … 200 kW**
Motors in Zone 22 with explosion protection	Self-ventilated	IP55	Aluminum	**1LA7 0.09 … 18.5 kW** / **1LA5 11 … 45 kW**
		IP55	Aluminum	**1LA9 0.06 … 37 kW**
		IP55	Cast iron	**1LA6 0.75 … 18.5 kW** / **1LG4/1LG6 11 … 200 kW** / **1LA8 145 … 1000 kW**
Motors operating with frequency converters				**Catalog Part 5**
Surface-cooled motors with standard insulation for voltages ≤500 V For standard motors, non-standard motors, explosion-proof motors and fan motors, see catalog part 5.				
Motors with special insulation for voltages up to 690 V (standard motors)	Self-ventilated	IP55	Aluminum	**1LA7 1.5 … 18.5 kW** / **1LA5 15 … 45 kW**
		IP55	Cast iron	**1LG6 11 … 200 kW**
Motors with special insulation for voltages up to 690 V (non-standard motors)	Self-ventilated	IP55	Cast iron	**1LA8 145 … 980 kW**
Motors with mounted separately driven fan with special insulation for voltages up to 690 V	Forced-air cooled	IP55	Cast iron	**1PQ8 145 … 980 kW**

Determining the motor type according to cooling method, degree of protection and frame design (continued)

Applications for surface-cooled motor types	Cooling method	Standard designation for degree of protection to DIN EN 60034 Part 5	Frame design	Motor type (Positions 1 to 3 of the Order No.) + type series (Position 4 of the Order No.) Rated output at 50 Hz Motor frame sizes (shaft heights) 56 63 71 80 90 100 112 132 160 180 200 225 250 280 315 355 400 450
Pump motors				**Catalog Part 6**
Energy-saving motors with improved efficiency (Improved Efficiency EFF2)	Self-ventilated	IP55	Aluminum	1LA7 0.06 … 18.5 kW; 1LE1/1PC1; 1LA5 11 … 45 kW
		IP55	Cast iron	1LA6 0.75 … 18.5 kW; 1LG4 11 … 200 kW
Motors with increased output	Self-ventilated	IP55	Aluminum	1LA9 0.14 … 53 kW
		IP55	Cast iron	1LG4 15 … 110 kW
Fan motors				**Catalog Part 7**
Motors in pole-changing version	Self-ventilated	IP55	Aluminum	1LA7 0.15 … 17 kW; 1LA5 18 … 31 kW
		IP55	Cast iron	1LG4 4.5 … 175 kW
Motors without external fan and without fan cover	Forced-air cooled	IP55	Aluminum	1PP7 0.09 … 18.5 kW; 1LE1/1PC1; 1PP5 11 … 37 kW
		IP55	Cast iron	1PP4 11 … 200 kW
Compressor motors				**Catalog Part 8**
Energy-saving motors with high efficiency	Self-ventilated	IP55	Aluminum	1LA9 0.06 … 37 kW
		IP55	Cast iron	1LG6 11 … 200 kW
Motors with increased output	Self-ventilated	IP55	Aluminum	1LA9 0.14 … 53 kW
		IP55	Cast iron	1LG4 15 … 110 kW
Non-standard motor for mains-fed and converter-fed operation	Self-ventilated	IP55	Cast iron	1LA8 160 … 1000 kW
Smoke extraction motors				**Catalog Part 9**
Temperature/time class F200, F300	Self-ventilated	IP55	Aluminum	1LA7 0.37 … 18.5 kW (0.09 … 3.85 kW pole-changing); 1LA5 15 … 45 kW (4.05 … 8.6 kW pole-changing)
		IP55	Cast iron	1LG6 37 … 200 kW
	Forced-air cooled	IP55	Aluminum	1PP7 0.37 … 18.5 kW (0.09 … 3.85 kW pole-changing); 1PP5 15 … 45 kW (4.05 … 8.6 kW pole-changing)
		IP55	Cast iron	1PP6 37 … 200 kW
Temperature/time class F400	Self-ventilated	IP55	Cast iron	1LA6 1.5 … 18.5 kW (0.3 … 3.45 kW pole-changing); 1LG6 15 … 200 kW
	Forced-air cooled	IP55	Cast iron	1PP6 1.5 … 200 kW (0.3 … 3.45 kW pole-changing)
Marine motors (motors for drives on ships below deck)				**Catalog Part 10**
Type approved standard motors up to frame size 315 L – Energy-saving motors with improved efficiency (Improved Efficiency EFF2)	Self-ventilated	IP55	Aluminum	1LA7 0.06 … 18.5 kW; 1LA5 11 … 45 kW
		IP55	Cast iron	1LA6 0.75 … 18.5 kW; 1LG4 11 … 200 kW
Type approved standard motors up to frame size 315 L – Energy-saving motors with high efficiency (High Efficiency EFF1)	Self-ventilated	IP55	Aluminum	1LA9 0.06 … 37 kW
		IP55	Cast iron	1LG6 11 … 200 kW
Type approved, explosion-proof motors up to frame size 315 L – Motors in Zone 1 with type of protection "e" (Zone 1 Exe II T3)	Self-ventilated	IP55	Aluminum	1MA7 0.12 … 16 kW
		IP55	Cast iron	1MA6 1.3 … 165

Determining the motor type according to cooling method, degree of protection and frame design (continued)

Applications for surface-cooled motor types	Cooling method	Standard designation for degree of protection to DIN EN 60034 Part 5	Frame design	Motor type (Positions 1 to 3 of the Order No.) + type series (Position 4 of the Order No.) Rated output at 50 Hz Motor frame sizes (shaft heights) 56 63 71 80 90 100 112 132 160 180 200 225 250 280 315 355 400 450
Marine motors (motors for drives on ships below deck) (continue)				**Catalog Part 10**
Type approved, explosion-proof motors up to frame size 315 L – Motors in Zone 1 with type of protection "de" (Zone 1 Exde IIC T4)	Self-ventilated	IP55	Cast iron	**1MJ6 0.25 … 37 kW** / **1MJ7 18.5 … 132 kW**
Type approved, explosion-proof motors up to frame size 315 L – Motors in Zone 2 with type of protection "n"	Self-ventilated	IP55	Aluminum	**1LA7 0.09 -18.5 kW**
		IP55	Aluminum	**1LA9 0.06 … 37 kW**
		IP55	Cast iron	**1LA6 0.75 … 18.5 kW** / **1LG4/1LG6 11 … 200 kW**
Explosion-proof motors up to frame size 315 L – Motors in Zone 21 with protection against dust explosions	Self-ventilated	IP55	Aluminum	**1LA7 0.09 … 18.5 kW** / **1LA5 11 … 45 kW**
		IP55	Aluminum	**1LA9 0.06 … 37 kW**
		IP55	Cast iron	**1LG4/1LG6 11 … 200 kW**
Explosion-proof motors up to frame size 315 L – Motors in Zone 22 with protection against dust explosions	Self-ventilated	IP55	Aluminum	**1LA7 0.09 … 18.5 kW** / **1LA5 11 … 45 kW**
		IP55	Aluminum	**1LA9 0.06 … 37 kW**
		IP55	Cast iron	**1LA6 0.75 … 18.5 kW** / **1LG4/1LG6 11 … 200 kW**
Type approved fan motors – Motors in pole-changing version	Self-ventilated	IP55	Aluminum	**1LA7 0.15 … 17 kW** / **1LA5 18 … 31 kW**
		IP55	Cast iron	**1LG4 4.5 … 83 kW**
Type approved fan motors – Motors without external fan and without fan cover	Forced-air cooled	IP55	Aluminum	**1PP7 0.09 … 18.5 kW** / **1PP5 15 … 37 kW**
		IP55	Cast iron	**1PP4 11 … 200 kW**
Standard motors up to frame size 315 L	Self-cooled	IP55	Aluminum	**1LP7 0.045 … 7 kW** / **1LP5 5.5 … 16.5 kW**
		IP55	Cast iron	**1LP4 3.7 … 67 kW**
Smoke-extraction motors Temperature/time classes F200 and F300	Self-ventilated	IP55	Aluminum	**1LA7 0.09 … 18.5 kW** / **1LA5 4.05 … 45 kW**
		IP55	Cast iron	**1LG6 37 … 200 kW**
	Forced-air cooled	IP55	Aluminum	**1PP7 0.09 … 18.5 kW** / **1PP5 4.05 … 45 kW**
		IP55	Cast iron	**1PP6 37 … 200 kW**
Smoke-extraction motors Temperature/time class F400	Self-ventilated	IP55	Cast iron	**1LA6 0.3 … 22 kW** / **1LG6 15 … 200 kW**
	Forced-air cooled	IP55	Cast iron	**1PP6 0.3…200 kW**
Non-standard motor frame size 315 and above – Motors for mains-fed and converter-fed operation	Self-ventilated	IP55	Cast iron	**1LA8 145 … 1000 kW**
Non-standard motors frame size 315 and above – Forced-air cooled motors with mounted separately driven fan for converter-fed operation	Forced-air cooled	IP55	Cast iron	**1PQ8 145 … 1000 kW**
Non-standard motors frame size 315 and above – Self-ventilated motors with through-ventilation for mains-fed and converter-fed operation	Self-ventilated	IP23	Cast iron	**1LL8 180 … 1250 kW**
Non-standard motors frame size 315 and above – Water-cooled motors for mains-fed and converter-fed operation	Forced-air cooled	IP55	Steel	**1)**
Explosion-proof motors frame size 315 and above – Self-ventilated motors in Zones 2, 22 with type of protection "n" or protection against dust explosions	Self-ventilated	IP55	Cast iron	**1LA8 160 … 1000 kW**

1) **1LH8** motor frame size 450, rated output 485 ... 1150 kW

Overview

The Order No. comprises a combination of letters and numbers and for clarity it is subdivided into two blocks which are connected by hyphens,
e. g.
1LA5223-4AA19-Z
M1F + A11 + G17

The first block (positions 1 to 7) identifies the motor type; further characteristics of the version are coded in the second block (positions 8 to 12).

For deviations in the second block from the catalog codes, either **-Z** or **9** should be used as appropriate.

Ordering data:

- Complete Order No. and order code(s) or plain text.
- If a quotation has been requested, please specify the quotation number in addition to the Order No.
- When ordering a complete motor as a spare part, please specify the works serial No. for the previously supplied motor as well as the Order No.

Structure of the Order No.:		Position:	1	2	3	4	5	6	7	-	8	9	10	11	12	
IEC squirrel-cage motors, surface-cooled																
Positions 1 to 3: Digit, letter, letter	• Self-ventilated by fan mounted on and driven by rotor, aluminum or cast-iron housing		1	L	A											
	• Self-ventilated by fan mounted on and driven by rotor, cast-iron housing		1	L	G											
	• Self-ventilated by fan mounted on and driven by rotor, increased safety, type of protection Ex e II		1	M	A											
	• Self-ventilated by fan mounted on and driven by rotor, explosion-proof enclosure, type of protection Ex de IIC		1	M	J											
	• Self-ventilated with through-ventilation, cast-iron housing		1	L	L											
	• Self-cooled without external fan, aluminum and cast-iron housing		1	L	P											
	• Forced-air cooled by air flow from the fan to be driven, aluminum or cast-iron housing		1	P	P											
	• Forced-air cooled by separately driven fan, cast-iron housing		1	P	Q											
Position 4: Digit	Type series 4					4										
	Type series 5					5										
	Type series 6					6										
	Type series 7					7										
	Type series 8					8										
	Type series 9					9										
Positions 5 to 7: 3 digits	Motor frame size (frame size comprising shaft height and construction length, codes from 050 to 457)															
Position 8: Digit	Number of poles															
Positions 9 to 10: Letter	Version															
Position 11: Digit	Voltage, circuit and frequency															
Position 12: Digit	Type of construction															
	Special order versions: Coded – Order code also required Not coded – Plain text also required															- Z

Ordering example

Selection criteria	Requirement	Structure of the Order No.
Motor type	Standard motor with improved efficiency, IP55 degree of protection, aluminum housing	1LA5❑❑❑-❑❑❑❑❑
Motor frame size/No. of poles/speed	4-pole/1500 rpm	1LA5223-4AA❑❑
Rated output	45 kW	
Voltage and frequency	230 VΔ/400 VY, 50 Hz	1LA5223-4AA1❑
Type of construction	IM V5 with protective cover	1LA5223-4AA19 M1F
Special versions	3 PTC thermistors	1LA5223-4AA19–Z M1F A11
	Mounted separately driven fan	1LA5223-4AA19–Z M1F A11 G17

Special versions

Overview

The order codes and availability are assigned to the individual motor series in the "Selection and ordering data" in the individual catalog parts 2 to 10.

For voltages, see "Voltages, currents and frequencies" in the "Introduction" as well as in catalog parts 2 to 10.
For types of construction, see "Types of construction" in the "Introduction" as well as in catalog parts 2 to 10.

All available options are listed according to topics in the following table. An alphanumerical listing according to order codes can be found in the appendix under "Overview of order codes".

Order code	Special versions	For further information, see Page
Motor protection		
A10	With PTC thermistors for alarm for converter-fed operation in Zones 2, 21, 22	0/33, 4/82
A11	Motor protection through PTC thermistor with 3 embedded temperature sensors for tripping	0/34, 0/38
A12	Motor protection through PTC thermistor with 6 embedded temperature sensors for tripping and alarm	0/35
A15	Motor protection with PTC thermistors for converter-fed operation with 3 or 4 embedded temperature sensors for tripping	0/35, 4/3, 4/82
A16	Motor protection with PTC thermistors for converter-fed operation with 6 or 8 embedded temperature sensors for alarm and tripping	0/33, 4/3, 4/82
A23	Motor temperature detection with embedded temperature sensor KTY 84-130	0/35
A25	Motor temperature detection with embedded temperature sensors 2 x KTY 84-130	0/35
A31	Temperature detectors for tripping	0/34
A60	Installation of 3 PT 100 resistance thermometers in stator winding	0/36
A61	Installation of 6 PT 100 resistance thermometers in stator winding	0/36
A72	Installation of 2 PT 100 screw-in resistance thermometers (basic circuit) for rolling-contact bearings	0/36
A78	Installation of 2 PT 100 screw-in resistance thermometers (3-wire circuit) for rolling-contact bearings	0/36
A80	Installation of 2 PT 100 double screw-in resistance thermometers (3-wire circuit) for rolling-contact bearings	0/36
Motor connection and connection box		
G55	ECOFAST motor plug Han-Drive 10e for 230 VΔ/400 VY	0/51
G56	ECOFAST motor plug EMC Han-Drive 10e for 230 VΔ/400 VY	0/51
K06	Two-part plate on connection box	0/39
K09	Connection box on RHS	0/38
K10	Connection box on LHS	0/38
K11	Connection box on top, feet screwed on	0/38
K15	Connection box in cast-iron version	0/38, 0/47 ...
K53	Explosion-proof connection box, Ex d IIC type of protection	0/38, 0/48 ...
K54	One cable gland, metal	0/39
K55	Cable gland, maximum configuration	0/39
K57	Cable gland DIN 89280, maximum configuration	0/39
K83	Rotation of the connection box through 90°, entry from DE	0/39
K84	Rotation of the connection box through 90°, entry from NDE	0/39
K85	Rotation of connection box through 180°	0/39
L00	Next larger connection box	0/38
L01	Undrilled entry plate	0/40
L13	External earthing	0/38
L44	3 cables protruding, 0.5 m long	0/40
L45	3 cables protruding, 1.5 m long	0/40
L47	6 cables protruding, 0.5 m long	0/40
L48	6 cables protruding, 1.5 m long	0/40
L49	6 cables protruding, 3 m long	0/40
L51	Protruding cable ends – right side	0/40
L52	Protruding cable ends – left side	0/40
L97	Auxiliary connection box 1XB3 020	0/50
M46	Stud terminal for cable connection, accessories pack (3 items)	0/49
M47	Saddle terminal for connection without cable lug, accessories pack	0/49
M50	Auxiliary connection box 1XB9 016	0/50
M58	Next larger connection box 1XB1 621	0/38
M64	Connection box on NDE	0/38
M69	Terminal strip for main and auxiliary terminals	0/49
M88	Auxiliary connection box 1XB9 014 (aluminum)	0/50
Windings and insulation		
C11	Temperature class 155 (F), used acc. to 155 (F), with service factor (SF)	0/32
C12	Temperature class 155 (F), used acc. to 155 (F), with increased power rating	0/32
C13	Temperature class 155 (F), used acc. to 155 (F), with increased coolant temperature	0/33
C18	Temperature class 180 (H) at rated output and max. CT 60 °C	0/33
C19	Increased air humidity/temperature with 30 to 60 g water per m^3 of air	0/33

Overview *(continued)*

Order code		Special versions	For further information, see Page
Windings and insulation (continued)			
C22		Temperature class 155 (F), used acc. to 130 (B), coolant temperature 45 °C, derating approx. 4 %	0/33
C23		Temperature class 155 (F), used acc. to 130 (B), coolant temperature 50 °C, derating approx. 8 %	0/33
C24		Temperature class 155 (F), used acc. to 130 (B), coolant temperature 55 °C, derating approx. 13 %	0/33
C25		Temperature class 155 (F), used acc. to 130 (B), coolant temperature 60 °C, derating approx. 18 %	0/33
C26		Increased air humidity/temperature with 60 to 100 g water per m^3 of air	0/33
Y50	*New!*	Temperature class 155 (F), used acc. to 130 (B), with increased coolant temperature and/or site altitude	0/33
Y52		Temperature class 155 (F), used acc. to 155 (F), other requirements	0/33
Colors and paint finish			
K23		Unpainted (only cast-iron parts primed)	0/17
K24		Unpainted, only primed	0/17
K26		Special finish in RAL 7030 stone gray	0/18
M91	*New!*	Offshore special finish	0/17
M94	*New!*	Sea air resistant special finish	0/17
Y51		Special finish in special RAL colors	0/17, 0/19
Y53		Standard finish in other standard RAL colors	0/17, 0/18
Y54		Special finish in other standard RAL colors	0/17, 0/18
Modular technology – Basic versions			
G17		Mounting of separately driven fan	0/76
G26		Mounting of brake	0/77 ...
H57		Mounting of 1XP8 001-1 (HTL) rotary pulse encoder	0/75
H58		Mounting of 1XP8 001-2 (TTL) rotary pulse encoder	0/75
Modular technology – Combinations of basic versions			
H61		Mounting of separately driven fan and 1XP8 001-1 rotary pulse encoder	0/84
H62		Mounting of brake and 1XP8 001-1 rotary pulse encoder	0/84
H63		Mounting of brake and separately driven fan	0/84
H64		Mounting of brake, separately driven fan and 1XP8 001-1 rotary pulse encoder	0/84
H97		Mounting of separately driven fan and 1XP8 001-2 rotary pulse encoder	0/84
H98		Mounting of brake and 1XP8 001-2 rotary pulse encoder	0/84
H99		Mounting of brake, separately driven fan and 1XP8 001-2 rotary pulse encoder	0/84
Modular technology – Additional versions			
C00		Brake supply voltage 24 V DC	0/83
C01		Brake supply voltage 400 V AC	0/83
C02		Brake supply voltage 180 V DC, for operation on MM411-ECOFAST	0/83
K82		Manual brake release with lever	0/83
Special technology			
H15		Prepared for mounting MMI	0/15, 0/85
H47		Mounting of brake NFA (Stomag)	0/85
H70		Mounting of LL 861 900 220 rotary pulse encoder	0/85
H72		Mounting of HOG 9 D 1024 I rotary pulse encoder	0/86
H73		Mounting of HOG 10 D 1024 I rotary pulse encoder	0/87
H78		Prepared for mounting LL 861 900 220	0/85
H79		Prepared for mounting HOG 9 D 1024 I	0/86
H80		Prepared for mounting HOG 10 D 1024 I	0/87
H86	*New!*	Mounting of explosion-proof rotary pulse encoder for use in Zones 2, 21, 22	4/5, 4/6
H87	*New!*	Mounting of explosion-proof rotary pulse encoder for use on Ex d/de motors in Zone 1	4/5, 4/6
J15	*New!*	Mounting of explosion-proof rotary pulse encoder HOG 10 DN 1024 I, connection box protection against moisture	0/87
J16	*New!*	Mounting of explosion-proof rotary pulse encoder HOG 10 DN 1024 I, connection box protection against dust	0/88
M95	*New!*	Mounting of explosion-proof separately driven fan Ex nA for use in Zone 2	4/5, 4/8
M96	*New!*	Mounting of explosion-proof separately driven fan II 2D for use in Zone 21	4/5, 4/8
M97	*New!*	Mounting of explosion-proof separately driven fan II 3D for use in Zone 22	4/5, 4/8
M98	*New!*	Mounting of explosion-proof separately driven fan Ex de for use in Zone 1	4/5, 4/8
Y70		Mounting a special type of rotary pulse encoder	0/85
Y74	*New!*	Mounting of rotary pulse encoder HOG 10 DN 1024 I + FSL, (speed .... rpm), connection box protection against moisture	0/88
Y76	*New!*	Mounting of rotary pulse encoder HOG 10 DN 1024 I + FSL, (speed .... rpm), connection box protection against dust	0/89
Y79	*New!*	Mounting of rotary pulse encoder HOG 10 DN 1024 I + E SL 93, (speed .... rpm), connection box protection against moisture	0/89

Special versions

Overview *(continued)*

Order code		Special versions	For further information, see Page
Mechanical design and degrees of protection			
K17		Drive-end seal for flange-mounting motors with oil resistance to 0.1 bar	0/54
K32		With two additional eyebolts for IM V1/IM V3	0/54
K37		Low-noise version for 2-pole motors with clockwise direction of rotation	0/55
K38		Low-noise version for 2-pole motors with counter-clockwise direction of rotation	0/55
K50		IP65 degree of protection	0/54
K52		IP56 degree of protection (non-heavy-sea)	0/54
L03		Vibration-proof version	0/55
L12		Condensation drainage holes	0/54
M27		Non-rusting screws (externally)	0/55
M44		Earth brushes for converter-fed operation	0/55
M68		Mechanical protection for encoder	0/55
Coolant temperature and site altitude			
D02		Coolant temperature –50 to +40 °C	0/32
D03		Coolant temperature –40 to +40 °C	0/32
D04		Coolant temperature –30 to +40 °C	0/32
D11		Coolant temperature 45 °C, derating 4 %	0/32
D12		Coolant temperature 50 °C, derating 8 %	0/32
D13		Coolant temperature 55 °C, derating 13 %	0/32
D14		Coolant temperature 60 °C, derating 18 %	0/32
D19	*New!*	Coolant temperature –40 °C to + 40 °C for EX motor	4/5
Designs in accordance with standards and specifications			
D01		CCC China Compulsory Certification	0/16
D30		Electrical according to NEMA MG1-12	0/15
D31		Design according to UL with “Recognition Mark”	0/15
D32		Ex certification for China	4/83
D33	*New!*	Certified for Korea according to KS C4202	0/16
D40		Canadian regulations (CSA)	0/15, 0/16
D46	*New!*	PSE Mark Japan	0/16
Design for Zones 1, 2, 21 and 22 according to ATEX			
C27		Stamping of Ex nA II on VIK rating plate	4/83
C30		Outputs T1/T2 on rating plate	4/81
K30		VIK design (comprises Zone 2 for mains-fed operation, without Ex nA II marking on rating plate)	4/83
M34		Design for Zone 21, as well as Zone 22 for conducting dust (IP65) for mains-fed operation	4/4, 4/81
M35		Design for Zone 22 for non-conducting dust (IP55) for mains-fed operation	4/4, 4/81
M38		Design for Zone 21, as well as Zone 22 for conducting dust (IP65) for converter-fed operation, derating	4/4, 4/83
M39		Design for Zone 22 for non-conducting dust (IP55) for converter-fed operation, derating	4/4, 4/83
M72		Design for Zone 2 for mains-fed operation Ex nA II T3 to IEC/EN 60079-15	4/4, 4/81 ...
M73		Design for Zone 2 for converter-fed operation, derating Ex nA II T3 to IEC/EN 60079-15	4/4, 4/83
M74	*New!*	Design for Zones 2 and 22, for non-conducting dust (IP55), for mains-fed operation	4/81
M75	*New!*	Design for Zones 2 and 22, for non-conducting dust (IP55), for converter-fed operation, derating	4/83
M76	*New!*	Design for Zones 1 and 21, as well as for Zone 22 for conducting dust (IP65), for mains-fed operation	4/81
M77	*New!*	Design for Zones 1 and 21, as well as for Zone 22 for conducting dust (IP65), for converter-fed operation, derating	4/82
Y68		Alternative converter (SIMOVERT MASTERDRIVES, SINAMICS G110, SINAMICS S120 or ET 200 S FC)	4/82
Marine version – Basic marine version			
E00		Without type test certificate according to ABS 50 °C/CCS 45 °C/RINA 45 °C, temperature class 155 (F), used according to 155 (F)	10/4 ...
E11		With/without type test certificate according to GL (Germanischer Lloyd), Germany, CT 45 °C, temperature class 155 (F), used according to 155 (F)	10/4 ...
E21		With/without type test certificate according to LR (Lloyds Register), Great Britain, CT 45 °C, temperature class 155 (F), used according to 155 (F)	10/4 ...
E31		With/without type test certificate according to BV (Bureau Veritas), France, CT 45 °C, temperature class 155 (F), used according to 155 (F)	10/4 ...
E51		With/without type test certificate according to DNV (Det Norske Veritas), Norway, CT 45 °C, temperature class 155 (F), used according to 155 (F)	10/4 ...
E61		With/without type test certificate according to ABS (American Bureau of Shipping), USA, CT 50 °C, temperature class 155 (F), used according to 155 (F)	10/4 ...
E71		With/without type test certificate according to CCS (Chinese Classification Society), China, CT 45 °C, temperature class 155 (F), used according to 155 (F)	10/4 ...
E80		Motor for use in shipping, higher ambient temperature and/or used as 155 (F) according to 130 (B)	10/10 ...

Overview *(continued)*

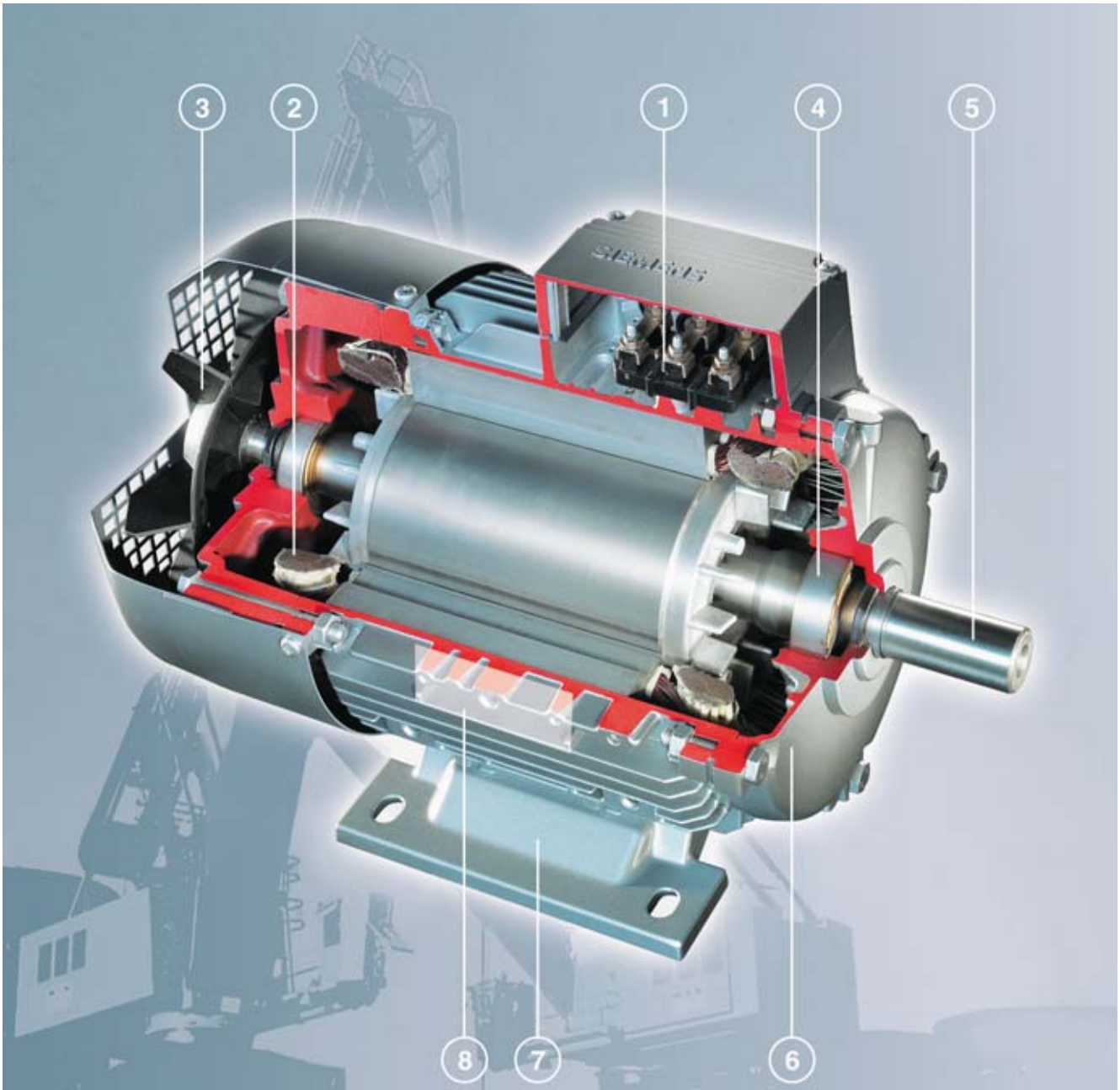
Order code		Special versions	For further information, see Page
Marine version – Acceptance/certification			
E09		Individual acceptance by marine classification society with supervision of construction and acceptance test certificate 3.2 according to EN 10204	10/4 ...
E10		Individual acceptance by marine classification society	10/4 ...
F83		Type test with heat run for horizontal motors, with acceptance	10/6 ...
F93		Type test with heat run for vertical motors, with acceptance	10/23 ...
***Standardline* (only for motor series 1LA8)**			
B20		*Standardline* version	3/13
Bearings and lubrication			
G50		Measuring nipple for SPM shock pulse measurement for bearing inspection	0/58
K20		Bearing design for increased cantilever forces	0/58, 0/62 ...
K36		Special bearing for DE and NDE, bearing size 63	0/58, 0/63 ...
K40		Regreasing device	0/58
K94		Located bearing DE	0/58
L04		Located bearing NDE	0/58
L27		Insulated bearing cartridge	0/58
Balance and vibration quantity			
K02		Vibration quantity level B	0/56
L68		Full key balancing	0/56
M37	*New!*	Balancing without key	0/56
Shaft and rotor			
K04		Concentricity of shaft extension, coaxiality and linear movement in accordance with DIN 42955 Tolerance R for flange-mounting motors	0/57
K16		Second standard shaft extension	0/56
K42		Shaft extension with standard dimensions, without featherkey way	0/57
L39		Concentricity of shaft extension in accordance with DIN 42955 Tolerance R	0/57
M65		Standard shaft made of non-rusting steel	0/57
Y55		Non-standard cylindrical shaft extension	0/57
Heating and ventilation			
H17		Fan cover for textile industry	0/37
K34		Cast-iron fan cover	0/37
K35		Metal external fan	0/37
K45		Anti-condensation heaters for 230 V	0/36
K46		Anti-condensation heaters for 115 V	0/36
L36		Sheet metal fan cover	0/37
M14	*New!*	Anti-condensation heater, Ex. 115 V	0/36
M15	*New!*	Anti-condensation heater, Ex. 230 V	0/36
Y81		Separately driven fan with non-standard voltage and/or frequency	0/37
Rating plate and extra rating plates			
B06	*New!*	Second lubricating plate, supplied loose	0/30
K31		Second rating plate, loose	0/30
Y80		Extra rating plate or rating plate with deviating rating plate data	0/30
Y82		Extra rating plate with identification code	0/30
Y84		Additional information on rating plate and on package label (maximum of 20 characters)	0/30
Packaging, safety notes, documentation and test certificates			
B00		Without safety and commissioning note. Customer's declaration of renouncement required.	0/21
B01		Complete with one set of safety and commissioning notes per wire-lattice pallet	0/21
B02		Acceptance test certificate 3.1 according to EN 10204	0/21
B23		Operating instructions German/English enclosed in print	0/21
B31		Document – Electrical data sheet	0/21, 3/52 ...
B32		Document – Order dimension drawing	0/21, 3/52 ...
B37		Document – Load characteristics	0/21, 3/52 ...
F01		Standard test (routine test) with acceptance	0/21, 3/52 ...
F03		Visual acceptance and report handover with acceptance	0/21, 3/52 ...
F04		Temperature-rise test, without acceptance	0/21, 3/53 ...
F05		Temperature-rise test, with acceptance	0/21, 3/53 ...
F28		Noise measurement during idling, no noise analysis, no acceptance	0/21, 3/53 ...
F29		Noise measurement during idling, no noise analysis, with acceptance	0/21, 3/53 ...

Overview *(continued)*

Order code	Special versions	For further information, see Page
Packaging, safety notes, documentation and test certificates (continued)		
F34	Recording of current and torque curves with torque metering shaft during starting, without acceptance	0/21, 3/53 ...
F35	Recording of current and torque curves with torque metering shaft during starting, with acceptance	0/21, 3/53 ...
F52	Measurement of the locked-rotor torque and locked-rotor current, without acceptance	0/21, 3/53 ...
F53	Measurement of the locked-rotor torque and locked-rotor current, with acceptance	0/21, 3/53 ...
F62	Noise analysis, without acceptance	0/21, 3/53 ...
F63	Noise analysis, with acceptance	0/21, 3/53 ...
F82	Type test with heat run for horizontal motors, without acceptance	0/21, 3/53 ...
F83	Type test with heat run for horizontal motors, with acceptance	0/21, 3/53 ... 10/6, 10/10 ...
F92	Type test with heat run for vertical motors, without acceptance	0/21, 3/53 ...
F93	Type test with heat run for vertical motors, with acceptance	0/21, 3/53 ...
L99	Wire-lattice pallet	0/20
M32	Connected in star for dispatch	0/20
M33	Connected in delta for dispatch	0/20

Overview

Cut-away diagram of a low-voltage motor



① Motor protection Page 0/34
Motor connection and connection box Page 0/38
Voltage, currents and frequencies 0/22

② Windings and insulation Page 0/32
Coolant temperature and site altitude Page 0/31

③ Heating and ventilation Page 0/36
Mechanical design and degrees of protection Page 0/54
Modular technology Page 0/75
Special technology Page 0/85

④ Bearings and lubrication Page 0/58

⑤ Shaft and rotor Page 0/56
Balance and vibration quantity Page 0/56

⑥ Colors and paint finish Page 0/17

⑦ Types of construction Page 0/52

⑧ Rating plates and extra rating plates Page 0/30

General technical data

Designs in accordance with standards and specifications

Applicable standards and specifications

The motors comply with the appropriate standards and regulations, especially those listed in the table below.

Title	IEC/EN	DIN EN
General specifications for rotating electrical machines	IEC 60034-1, IEC 60085	DIN EN 60034-1
Specification of the losses and efficiency of rotating electrical machines	IEC 60034-2	DIN EN 60034-2
Asynchronous AC motors for general use with standardized dimensions and outputs	IEC 60072 fixing only	DIN EN 50347
Restart characteristics for rotating electrical machines	IEC 60034-12	DIN EN 60034-12
Terminal designations and direction of rotation for electrical machines	IEC 60034-8	DIN EN 60034-8
Designation for type of construction, installation and terminal box position	IEC 60034-7	DIN EN 60034-7
Entry to terminal box	–	DIN 42925
Built-in thermal protection	IEC 60034-11	DIN EN 60034-11
Noise limit values for rotating electrical machines	IEC 60034-9	DIN EN 60034-9
IEC standard voltages	IEC 60038	DIN IEC 60038
Cooling methods for rotating electrical machines	IEC 60034-6	DIN EN 60034-6
Vibration severity of rotating electrical machines	IEC 60034-14	DIN EN 60034-14
Vibration limits	–	DIN ISO 10816
Degrees of protection of rotating electrical machines	IEC 60034-5	DIN EN 60034-5
In addition, the following applies to Ex motors:		
General regulations	IEC/EN 60079-0	DIN EN 60079-0
Explosion-proof enclosure “d”	IEC/EN 60079-1	DIN EN 60079-1
Increased safety “e”	IEC/EN 60079-7	DIN EN 60079-7
Type of protection “n” (non sparking)	IEC/EN 60079-15	DIN EN 60079-15
Areas containing flammable dust	IEC/EN 61241	DIN EN 61241

National standards

The motors comply with the IEC or European standards listed above. The European standards replace the national standards in the following European countries:
Germany (VDE), France (NF C), Belgium (NBNC), Great Britain (BS), Italy (CEI), Netherlands (NEN), Sweden (SS), Switzerland (SEV) etc.

The motors also comply with various national standards. The following standards (with the exception of non-standard motors) have been harmonized with IEC publication 60034-1 or replaced with DIN EN 60034-1 so that the motors can be operated at standard rated output.

AS 1359	Australia (higher output assignment than stated in DIN EN 50347 for frame size 250 M and above)
CSA C22.2, No. 100	Canada
IS 325 IS 4722	India
NEK – IEC 60034-1	Norway

Explosion-proof motors:
Since the requirements of explosion-proof motors comply with the European standards EN 60079-0, EN 60079-1, EN 60079-7 and Directive 94/9/EG (ATEX 95), certificates issued by authorized testing agencies (PTB, DMT, etc.) are accepted by all member states of the EU. The remaining members of CENELEC, Switzerland in particular, also accept the certificates.

The EU is currently changing the standard series from EN 50014ff to IEC / EN 60079-xx and IEC / EN 61241-xx. The transition period is approximately 2 years. After changing the standards, the first E of the marking of the type of protection will be omitted. For example: Old: EEx de – New: Ex de. The first E represented Euronorm.

Tolerances for electrical data

According to DIN EN 60034, the following tolerances are permitted: Motors which comply with DIN EN 60034-1 must have a voltage tolerance of ±5 % / frequency tolerance of ±2 % (Design A), if utilized, the permitted limit temperature of the temperature class may be exceeded by 10 K.

A tolerance of ±5 % also applies to the rated voltage range in accordance with DIN EN 60034-1. Rated voltage and rated voltage range see Page 0/23.

Efficiency η for
$P_{rated} \leq 150$ kW: $-0.15 \cdot (1 - \eta)$
$P_{rated} > 150$ kW: $-0.1 \cdot (1 - \eta)$

with η being a decimal number.

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

- Minimum absolute value: 0.02
- Maximum absolute value: 0.07

Slip ±20 % (for motors <1 kW ±30 % is admissible)
Locked-rotor current +20 %
Locked-rotor torque –15 % to +25 %
Breakdown torque –10 %
Moment of inertia ±10 %

 1MA motors:

Add 10 % to the certified values for the locked-rotor current.

Energy-saving motors with European efficiency classification in accordance with EU/CEMEP (European Commitee of Manufacturers of Electrical Machines and Power Electronics)

Low-voltage motors in the output range of 1.1 to 90 kW, 2-pole and 4-pole are marked in accordance with the EU/CEMEP agreement with the efficiency class (EFF2) (Improved Efficiency) or (EFF1) (High Efficiency).

So that the requirements of efficiency classes (EFF1) and (EFF2) are fulfilled, the active parts of the motor have been optimized. The procedure for calculating the efficiency is based on the loss-summation method according to IEC 60034-2.

Motors for the North American market

For motors which comply with North American regulations (NEMA, CSA, UL, etc.), it must always be checked whether the motors will be used in the US or Canada and whether they are subject to state laws.

Minimum efficiencies required by law

In 1997, an act was passed in the US to define minimum efficiencies for low-voltage three-phase motors (EPACT = Energy Policy Act). An act is in force in Canada that is largely identical, although it is based on different verification methods. The efficiency is verified for these motors for the USA using IEEE 112, Test Method B and for Canada using CSA-C390. Apart from a few exceptions, all low-voltage three-phase motors exported to the USA or Canada must comply with the legal requirements on efficiency.
The law requires minimum efficiencies for 2, 4 and 6-pole motors with a voltage of 230 and 460 V/60 Hz, in the output range of 1 to 200 HP (0.75 to 150 kW). Explosion-proof motors must also be included. 1LA9 and 1LG6 are also available in the design for Zones 2, 21 and 22.
According to EPACT, the following are excluded from the efficiency requirements, for example.

- Motors whose frame size output classification does not correspond with the standard series according to NEMA MG1-12.
- Flange-mounting motors without feet
- Brake motors
- Converter-fed motors
- Motors with design letter C and higher

For more information on EPACT:
http://www.eren.doe.gov/

Special requirements for the USA: Energy Policy Act

The act lays down that the nominal efficiency at full load and a "CC" number (Compliance Certification) must be included on the rating plate. The "CC" number is issued by the US Department of Energy (DOE). The following information is stamped on the rating plate of EPACT motors which must be marked by law: Nominal efficiency (service factor SF 1.15), design letter, code letter, CONT, CC-Nr. CC 032A (Siemens) and NEMA MG1-12.

Special requirements for Canada: CSA – Energy Efficiency Verification

These motors fulfill the minimum efficiency requirements laid down by the CSA standard C390. These motors are available as 1LA9 or 1LG6 and can be ordered with order code **D40** and are also marked with the CSA-E verification on the rating plate.

NEMA – Order code D30

The motors with increased efficiency according to EPACT are designed to meet the NEMA MG1-12 electrical standard and are marked accordingly. The mechanical design of all motors is compliant only to IEC, not to NEMA dimensions.
All motors in the **D30** version correspond to NEMA Design A (i. e. standard torque characteristic in accordance with NEMA and no starting current limitation).
For Design B, C and D, a special version is required (on request).
According to NEC-ANSI-C1, Division 2, Class I, Group A, B, D, all 1LA/1LG motors that comply with Zone 2 can be used.
All other 1LA/1LG motors must be ordered with order code **D30**.
Data on the rating plate: Rated voltage (voltage tolerance of ±10 %), nominal efficiency, design letter, code letter, CONT and NEMA MG1-12.

UL approval – Order code D31

The motors based on the 1LA/1LG basic series are listed for up to 600 V by Underwriters Laboratories Inc. ("Recognition Mark" = R/C).
For Zones 2, 21, 22 and Ex e motors or Ex de motors as well as marine motors, there is no listing.
This is not possible in combination with the option "temperature class 180 (H) at rated output and maximal coolant temperature of 60 °C", order code **C18**.
The motors must be ordered with order code **D31**, voltage code **"9"** and the order code for voltage and frequency.
According to UL, motor voltages are only certified up to 600 V, i. e. voltage codes 1, 3, 4 or 5. For this reason, voltage code "6" for example is omitted (400 VΔ/690 VY/ 50 Hz or 460 VΔ/60 Hz).
Voltages 400 VΔ and 460 VΔ, for example, should be ordered as follows:

Voltage	Voltage code
400 VΔ/50 Hz or 460 VΔ/60 Hz (50 Hz output)	**9** with **L1U** [1]
460 VΔ/60 Hz (50 Hz output)	**9** with **L2T**
460 VΔ/60 Hz (60 Hz output)	**9** with **L2F**

The "UL Recognition Mark" is included on the rating plate of the motor.

In addition, the motor is designed to meet the NEMA MG1-12 electrical standard (with the exception of non-standard motors) and includes the following data on the rating plate: Rated voltage (voltage tolerance of ±10 %), nominal efficiency, design letter, code letter, CONT and NEMA MG1-12.

Externally or internally mounted components such as

- Motor protection
- Heating element
- Separately driven fan
- Brake
- Encoder
- Power connection
- Plug connector

are UL-R/C, CSA or C-US listed or used by manufacturers in accordance with regulations. It may have to be decided whether the motor is suitable for the application.
The motors can be operated with a frequency converter – separate converter or built-on (**1UA7**/order code **H15**) – with 50/60 Hz.
Deviating frequency settings must be tested at final acceptance.

The external fans for 1LA8 and 1LL8 motors must be made of metal.

The following versions are possible:

- 2-pole [2] motors, only in combination with K37 or K38
- 4, 6 and 8-pole motors, only in combination with K35

[1] Only applicable to non-standard motors.

[2] Frame size 450 in 2-pole version, on request.

General technical data

For 1PQ8 motors, UL listed motors with separately driven fan (400 VΔ 50 Hz/460 VΔ 60 Hz) are used. Other voltages up to 600 V and/or other frequencies must be ordered using the order code Y81 and plain text. For 1LA8 and 1PQ8 motors of frame size 315, when option **D31** is ordered, connection box gt 640 will be automatically replaced without additional charge with connection box 1XB1 621. The connection boxes are designed with an undrilled cable entry. UL-R/C cable glands must be used for cable entry.

CSA approval – Order code D40

Motors based on the 1LA/1LG basic series are approved for up to 690 V in accordance with the Canadian regulations of the "Canadian Standard Association" (CSA). Externally or internally mounted components which are used are listed by CSA or are used by manufacturers in accordance with regulations. It may have to be decided whether the motor is suitable for the application. For Zones 2, 21, 22 and Ex e motors or Ex de motors as well as marine motors, there is no approval.

This is not possible in combination with the option "temperature class 180 (H) at rated output and maximal coolant temperature of 60 °C", order code C18, for 1LA5, 1LG4, 1PP4 and 1PP5 motor series.

The motors must be ordered with the order code **D40**, voltage code **"9"** and order code for voltage and frequency. The CSA mark and the rated voltage (voltage tolerance of ±10 %) are included on the rating plate.

When energy-saving motors (1LA9, 1LG6) are ordered, they also include the CSA-E mark on the rating plate.

Other versions:

For versions and certification of explosion-proof motors in compliance with directive 94/9/EU (ATEX) as well as VIK versions, see catalog part 4 "Explosion-proof motors".
For versions for use in shipping, see Section 10 "Marine motors".

Export of low-voltage motors to China

CCC – China Compulsory Certification – Order code D01

"Small power motors" which are exported to China must be certified up to a rated output of:
2-pole: ≤2.2 kW
4-pole: ≤1.1 kW
6-pole: ≤0.75 kW
8-pole: ≤0.55 kW

The **1LA7, 1LA9, 1MA7 and 1MJ6 motors which must be certified** have been certified by the CQC (China Quality Cert. Center). When ordered with the D01 order code, the "CCC" logo and "Factory Code" are included on the rating plate and packaging.

A005216

Factory Code:

A005216 = Works Bad Neustadt
A010607 = Works Mohelnice

Note:
Chinese customs checks the need for certification of imported products by means of commodity code.

The following do not need to be certified:

- Motors imported to China which have already been installed in a machine
- Repair parts

Export of low-voltage motors to Japan

PSE Mark Japan – Order Code D46

PSE marking is a mandatory certification in Japan in accordance with the electrical devices and safety of materials act. "Small power motors" with a rated output of up to 3 kW which are exported to Japan must bear the PSE marking. Marking is only applicable to motor series 1LA7, 1LP7, 1PP7 in catalog parts 2 "Standard motors up to frame size 315 L" and 7 "Motors with fans".

The motors concerned are marked on the rating plate with the following "PSE" logo.

Export of low-voltage motors to Korea

Korea certification – Order Code D33

Certification confirms that the efficiency and power factor are in compliance with KSC 4202 (KEMCO). The certification is applicable to EFF1 motors of the 1LA9 and 1LG6 series in 2, 4 and 6 pole versions from 0.75 kW to 200 kW 400 V 50 Hz.

Colors and paint finish

To protect the drives against corrosion and external influences, high-quality coatings based on 2-K epoxy resin are offered in various different colors.

Version	Suitability of paint finish for climate group in accordance with DIN IEC 60721, Part 2-1	
Standard finish	Moderate (extended) for indoors and outdoors under a roof not directly subjected to weather conditions	Briefly: up to 120 °C Contin.: up to 100 °C
Special finish	Worldwide (global) for outdoor use in direct sunlight and/or weather conditions. Suitable for use in the tropics for <60 % relative humidity at 40 °C	Briefly: up to 140 °C Contin.: up to 120 °C Also: for aggressive atmospheres up to 1 % acid and alkali concentration or permanent dampness in sheltered rooms

"Sea air resistant" special finish system – Order code **M94**

Field of application	Resistance
• Recommended for indoor installations or outdoor installations exposed to direct weather conditions • Industrial climate with moderate SO2 exposure, inshore maritime climate, but not offshore maritime climate, e.g. for crane drives and also in the paper industry • Complies with the test requirements of DIN EN ISO 12944-2 Corrosion Category C4	• Chemical exposure to 5 % acid and caustic solution concentration • Suitable for use in the tropics up to 75 % relative humidity at 50 °C • Thermal stability from –40 to 140 °C

"Offshore" special finish system – Order code **M91**

Field of application	Resistance
• Recommended for outdoor installations exposed to direct weather conditions • Industrial climate with moderate SO2 exposure and offshore maritime climate, e.g. for crane drives • Complies with the test requirements of DIN EN ISO 12944-2 Corrosion Category C5	• Chemical exposure to 5 % acid and caustic solution concentration • Suitable for use in the tropics up to 75 % relative humidity at 60 °C • Thermal stability from –40 to 140 °C

All motors are painted with RAL 7030 (stone gray) if the color is not specified.

Other colors can be ordered with standard finish using order code **Y53** and the RAL number in plain text for an additional charge (for an overview of the available RAL No./RAL colors see the following table for order code **Y53**).

Other colors in special finish must be ordered with the order code **Y51** or **Y54** and the RAL number in plain text (for an overview of the available RAL No./RAL colors, see the following tables for order codes **Y51** and **Y54**).

Direct sunlight can change the color. If color stability is required, it is recommended to use a polyurethane-based paint (only on request).

All paint finishes can be painted over with commercially available paints. Special paint with increased layer thickness available on request.

If required, the motors can be supplied only coated in primer, order code **K24**, or unpainted (unworked cast-iron surfaces in primer) using order code **K23**.

General technical data

Standard finish in other standard RAL colors – Order code **Y53** (RAL number is required in plain text)

RAL No.	Color name	RAL No.	Color name
1002	Sand yellow	6011	Reseda green
1013	Pearl white	6019	Pastel green
1015	Light ivory	6021	Pale green
1019	Gray beige	7000	Squirrel gray
2003	Pastel orange	7001	Silver gray
2004	Pure orange	7004	Signal gray
3000	Flame red	7011	Iron gray
3007	Black red	7016	Anthracite gray
5007	Brilliant blue	7022	Umber gray
5009	Azure blue	7031	Blue gray
5010	Gentian blue	7032	Pebble gray
5012	Light blue	7033	Cement gray
5015	Sky blue	7035	Light gray
5017	Traffic blue	9001	Cream
5018	Teal blue	9002	Gray white
5019	Capri blue	9005	Jet black

Special finish in standard RAL color with defined order codes (special finish in other standard RAL colors can be ordered indicating the RAL number in plain text with order code **Y54**)

For 1LA5, 1LA6, 1LA7, 1LA9, 1MA7, 1MA6, 1MJ6, 1PP5, 1LP5, 1PP7 and 1LP7 motors up to frame size 200 L, the special finish is in RAL 7030 stone gray (order code **K26**) standard version.

RAL No.	Color name	Order code
7030	Stone gray	**K26**

Special finish in other standard RAL colors – Order code **Y54** (RAL number is required in plain text)

RAL No.	Color name	RAL No.	Color name
1002	Sand yellow	6011	Reseda green
1013	Pearl white	6019	Pastel green
1015	Light ivory	6021	Pale green
1019	Gray beige	7000	Squirrel gray
2003	Pastel orange	7001	Silver gray
2004	Pure orange	7004	Signal gray
3000	Flame red	7011	Iron gray
3007	Black red	7016	Anthracite gray
5007	Brilliant blue	7022	Umber gray
5009	Azure blue	7031	Blue gray
5010	Gentian blue	7032	Pebble gray
5012	Light blue	7033	Cement gray
5015	Sky blue	7035	Light gray
5017	Traffic blue	9001	Cream
5018	Teal blue	9002	Gray white
5019	Capri blue	9005	Set black

Special finish in special RAL colors – Order code **Y51** (RAL number is required in plain text)

RAL No.	Color name	RAL No.	Color name	RAL No.	Color name	RAL No.	Color name
1000	Green beige	3014	Antique pink	6003	Olive green	7036	Platinum gray
1001	Beige	3015	Light pink	6004	Blue green	7037	Dusty gray
1003	Signal yellow	3016	Coral red	6005	Moss green	7038	Agate gray
1004	Golden yellow	3017	Rose	6006	Gray olive	7039	Quartz gray
1005	Honey yellow	3018	Strawberry red	6007	Bottle green	7040	Window gray
1006	Maize yellow	3020	Traffic red	6008	Brown green	7042	Traffic gray A
1007	Daffodil yellow	3022	Salmon pink	6009	Fir green	7043	Traffic gray B
1011	Brown beige	3027	Rasperry red	6010	Grass green	7044	Silk gray
1012	Lemon yellow	3031	Orient red	6012	Black green	7045	Tele gray 1
1014	Dark ivory	3032	Pearl ruby red	6013	Reed green	7046	Tele gray 2
1016	Sulfur yellow	3033	Pearl pink	6014	Yellow olive	7047	Tele gray 4
1017	Saffron yellow	4001	Red lilac	6015	Black olive	7048	Pearl mouse gray
1018	Zinc yellow	4002	Red violet	6016	Turquoise green	8000	Green brown
1020	Olive yellow	4003	Heather violet	6017	May green	8001	Ocher brown
1021	Rape yellow	4004	Claret violet	6018	Yellow green	8002	Signal brown
1023	Traffic yellow	4005	Blue lilac	6020	Chrome green	8003	Clay brown
1024	Ochre yellow	4006	Traffic purple	6022	Olive drab	8004	Copper brown
1027	Curry	4007	Purple violet	6024	Traffic green	8007	Fawn brown
1028	Melon yellow	4008	Signal violet	6025	Fern green	8008	Olive brown
1032	Broom yellow	4009	Pastel violet	6026	Opal green	8011	Nut brown
1033	Dahlia yellow	4010	Tele magenta	6027	Light green	8012	Red brown
1034	Pastel yellow	4011	Pearl violet	6028	Pine green	8014	Sepia brown
1035	Pearl beige	4012	Pearl blackberry	6029	Mint green	8015	Chestnut
1036	Pearl gold	5000	Violet blue	6032	Signal green	8016	Mahogany
1037	Sun yellow	5001	Green blue	6033	Mint turquoise	8017	Chocolate
2000	Yellow orange	5002	Ultramarine	6034	Pastel turquoise	8019	Gray brown
2001	Red orange	5003	Saphire blue	6035	Pearl green	8022	Black brown
2002	Vermilion	5004	Black blue	6036	Pearl opal green	8023	Orange brown
2008	Bright red orange	5005	Signal blue	7002	Olive gray	8024	Beige brown
2009	Traffic orange	5008	Gray blue	7003	Moss gray	8025	Pale brown
2010	Signal orange	5011	Steel blue	7005	Mouse gray	8028	Terra brown
2011	Deep orange	5013	Cobalt blue	7006	Beige gray	8029	Pearl copper
2012	Salmon orange	5014	Pigeon blue	7008	Khaki gray	9003	Signal white
2013	Pearl orange	5020	Ocean blue	7009	Green gray	9004	Signal black
3001	Signal red	5021	Water blue	7010	Tarpaulin gray	9006	White aluminum
3002	Carmine red	5022	Night blue	7012	Basalt gray	9007	Gray aluminum
3003	Ruby red	5023	Distant blue	7013	Brown gray	9010	Pure white
3004	Purple red	5024	Pastel blue	7015	Slate gray	9011	Graphite black
3005	Wine red	5025	Pearl gentian	7021	Black gray	9016	Traffic white
3009	Oxide red	5026	Pearl night blue	7023	Concrete gray	9017	Traffic black
3011	Brown red	6000	Patina green	7024	Graphite gray	9018	Papyrus white
3012	Beige red	6001	Emerald green	7026	Granite gray	9022	Pearl light gray
3013	Tomato red	6002	Leaf green	7034	Yellow gray	9023	Pearl dark gray

Coating structure and colors not specified in the catalog are available on request.

General technical data

Packaging, safety notes, documentation and test certificates

Connected in star for dispatch – Order code **M32**
The terminal board of the motor is connected in star for dispatch.

Connected in delta for dispatch – Order code **M33**
The terminal board of the motor is connected in delta for dispatch.

Packing weights and packing dimensions

Packing weights							
For motors		For land transport					
Frame size	Type	Type of construction IM B3			Types of construction IM B5, IM V1		
	1LA5 .../1LA7 ..., 1LA6 ..., 1LA9 ..., 1LG4 ..., 1LG6 ..., 1LP4 ..., 1LP5 .../1LP7 ..., 1MA6 ..., 1MA7 ..., 1MJ6 ..., 1MJ7 ... 1PP4 ..., 1PP5 .../1PP7 ...	In box Tare	On battens Tare	In crate Tare	In box Tare	On battens Tare	In crate Tare
		kg	kg	kg	kg	kg	kg
56 M	.... 050/053	0.65	–	–	0.65	–	–
63 M	.... 060/063	0.65	–	–	0.65	–	–
71 M	 070	0.65	–	–	0.65	–	–
	 073	0.65	–	–	0.65	–	–
80 M	 080	0.65	–	–	0.65	–	–
	 083	0.65	–	–	0.65	–	–
90 S	 090	0.65	–	–	0.65	–	–
90 L	.... 096/097	0.65	–	–	0.65	–	–
100 L	.... 106/107	1.3	–	–	1.3	–	–
112 M	 113	1.5	–	–	1.5	–	–
132 S	.... 130/131	4.7	–	–	5.2	–	–
132 M	.... 133/134	4.7	–	–	5.2	–	–
160 M	.... 163/164	4.8	–	–	5.7	–	–
160 L	 166	4.8	–	–	5.7	–	–
180 M	 183	13.0	–	–	13.4	–	–
180 L	 186	13.0	–	–	13.4	–	–
200 L	.... 206/207	13.5	–	–	13.5	–	–
225 S	 220	13.7	7	20	13.7	10	20
225 M	 223	13.7	7	20	13.7	10	20
250 M	 253	–	20	36	–	20	40
280 S	 280	–	20	36	–	20	40
280 M	 283	–	20	36	–	20	40
315 S	 310	–	20	38	–	20	45
315 M	 313	–	20	38	–	20	45
315 L	.... 316/317/318	–	22	40	–	22	45

Values for 1PP6 motors on request.

Data apply for individual packaging. For frame sizes 56 to 180 L, wire-lattice pallets can be used, order code **L99**.

Packing weights and packing dimensions for 1LA8, 1PQ8 and 1LL8 motors

For motors		**Packing weights**			
Frame size	Type	Land transport on battens		Sea transport in wooden cases	
	1LA8 ..., 1PQ8 ..., 1LL8 ...	Type of construction IM B3	Type of construction IM V1	Type of construction IM B3	Type of construction IM V1
		Tare	Tare	Tare	Tare
		kg	kg	kg	kg
315	.... 315/317	30	55	270	310
355	.... 353/355/357	40	65	320	365
400	.... 403/405/407	45	75	390	445
450	.... 453/455/457	50	85	450	510
Maximum motor dimensions		Allowances for maximum motor dimensions (packing dimensions = motor dimensions + allowance)			
		Land transport on battens		Sea transport in wooden cases	
		Type of construction IM B3	Type of construction IM V1	Type of construction IM B3	Type of construction IM V1
		approx.	approx.	approx.	approx.
		mm	mm	mm	mm
Length		+250	+250	+250	+250
Width		+200	+300	+200	+200
Height		+200	+250	+500	+500

Safety notes

The motors are supplied without safety and commissioning notes for most motor types and frame sizes. A customer's declaration of renouncement is required.

Without safety and commissioning note – Order code **B00**

The motors are supplied with only one set of safety and commissioning notes per wire-lattice pallet for most motor types and frame sizes.

Complete with one set of safety and commissioning notes per wire-lattice pallet – Order code **B01**

Documentation

The documentation for non-standard motors frame size 315 and above (catalog part 3) contains as standard:

- Safety and commissioning notes (paper)
- Operating instructions (on CD)
- EU manufacturer's declaration (on CD)
- Acceptance test certificate 3.1 according to EN 10204 (by e-mail)
- Routine test certificate (by e-mail)

For non-standard motors from frame size 315 and above (catalog part 3) the following documents are optionally available:

- Document – Electrical data sheet – Order code **B31**
- Document – Order dimension drawing – Order code **B32**
- Document – Load characteristics – Order code **B37** (on request, only available for motors for mains-fed operation)

Optionally available documents for other motors:

- Operating instructions German/English enclosed in print – Order code **B23**
- "SD Manual Collection": all manuals for low-voltage motors, geared motors and low-voltage converters on DVD in 5 languages, see catalog part 11 "Appendix".

Test certificates

Acceptance test certificate 3.1 according to EN 10204 – Order code **B02**

An acceptance test certificate 3.1 according to EN 10204 can be supplied for most motors.

The tests listed below are mainly intended for non-standard motors (catalog part 3). The assignment of order codes to motor types can be found in the "Special versions" section of the relevant catalog parts.

Standard test (routine test) with acceptance – Order code **F01**

Standard routine testing of the motor, but with acceptance by an external representative (e.g. customer). The routine test is required to check the correct functioning of a motor where the characteristic data are known and were determined on a machine of the same type in a detailed type test. For a routine test, characteristic variables are determined, which after being converted to the basic data, are compared with the reference values for this machine type.

Visual acceptance and report handover with acceptance – Order code **F03**

Visual acceptance of the motor by external representative (e.g. customer) and handover of the routine test report to external representative (e.g. customer).

Temperature-rise test without acceptance – Order code **F04**

For the temperature-rise test, the temperature rise of a motor is measured in continuous duty. To do this, the motor is connected to a load (dynamometer), and operated with the rated power.

Temperature-rise test with acceptance – Order code **F05**

As for order code F04, but with acceptance by an external representative (e.g. customer).

Noise measurement during idling, no noise analysis, no acceptance – Order code **F28**

The A-rated sound pressure level L_{pA} is measured during idling at rated voltage. The number of measuring points and their locations are specified in the test certificate.

Noise measurement during idling, no noise analysis, with acceptance – Order code **F29**

As for order code F28, but with acceptance by an external representative (e.g. customer).

Recording of current and torque curves with torque metering shaft during starting, without acceptance – Order code **F34**

The measurement is used to determine the starting response of a motor. By comparison with the load torque characteristic, the acceleration torque can be calculated. This can be used to check that a complete machine set has started correctly. This measurement is only meaningful for motors that are directly mains-fed and is not offered for motors that are designed for converter-fed operation.

Recording of current and torque curves with torque metering shaft during starting, with acceptance – Order code **F35**

As for order code F34, but with acceptance by an external representative (e.g. customer).

Measurement of the locked-rotor torque and locked-rotor current without acceptance – Order code **F52**

The torque and current are determined when the rotor is locked. This measurement is only meaningful for motors that are directly mains-fed and is not offered for motors that are designed for converter-fed operation.

Measurement of the locked-rotor torque and locked-rotor current with acceptance – Order code **F53**

As for order code F52, but with acceptance by an external representative (e.g. customer).

Noise measurement during idling, with noise analysis, without acceptance – Order code **F62**

As for F28, but a noise analysis is also performed. The signal is divided up into frequency bands and the level is determined in each band.

Noise measurement during idling, with noise analysis, with acceptance – Order code **F63**

As for order code F62, but with acceptance by an external representative (e.g. customer).

Type test with heat run for horizontal motors, without acceptance – Order code **F82**

During the type test, a temperature-rise test is performed; no-load, short-circuit and load characteristics are recorded; the iron losses and friction losses are determined and the efficiency is calculated from the summed losses. This option is only applicable to motors with a horizontal type of construction.

Type test with heat run for horizontal motors, with acceptance – Order code **F83**

As for order code F82, but with acceptance by an external representative (e.g. customer, classification society).

Type test with heat run for vertical motors, without acceptance – Order code **F92**

As for order code F82, but only for motors with a vertical type of construction.

Type test with heat run for vertical motors, with acceptance – Order code **F93**

As for order code F92, but with acceptance by an external representative (e.g. customer, classification society).

General technical data

Voltages, currents and frequencies

Standard voltages

EN 60034-1 differentiates between Category A (combination of voltage deviation ±5 % and frequency deviation ±2 %) and Category B (combination of voltage deviation ±10 % and frequency deviation +3/–5 %) for voltage and frequency fluctuations. The motors can supply their rated torque in both Category A and Category B. In Category A, the temperature rise is approx. 10 K higher than during normal operation.

Standard	Category	Category
EN 60034 – 1	A	B
Voltage deviation Frequency deviation	±5 % ±2 %	±10 % +3 %/–5 %
Rating plate data stamped with rated voltage (e.g. 230 V)	a ±5 % (e.g. 230 V ±5 %)	a ±10 % (e.g. 230 ±10 %)
Rating plate data stamped with rated voltage ranges b to c (e.g. 220 to 240 V)	b –5 % to c +5 % (e.g. 220 –5 % to 240 +5 %)	b –10 % to c +10 % (e.g. 220 –10 % to 240 +10 %)

According to the standard, longer operation is not recommended for Category B, therefore this is not permitted for explosion-proof motors. See Page 0/31 for details of the rating plate inscriptions and examples. The selection and ordering data state the rated current at 400 V and where applicable 690 V. The DIN IEC 60038 standard specifies a tolerance of ±10 % for mains voltages of 230 V, 400 V and 690 V. The rating plates of motors with voltage code 0, 1 or 6 also include a rated voltage range in addition to the rated voltage (see table).

The rated currents at 420 V and for 1LA8 motors 660 V or 725 V are listed in the table on Pages 0/26, 0/27 and on the rating plate.

The tolerance laid down by DIN EN 60034-1 applies to all converter-fed 1LA8 motors as well as to 1LA5, 1LA7, 1LG6, 1PQ8 and 1LL8 motors with special 690 V insulation, i.e. no rated voltage range is specified on the rating plate.

For 1LA and 1LG motors, type of protection “n” (Zone 2), a rated voltage range is not specified.

Mains voltages	Rated voltage range	Voltage code
1LA, 1LG, 1MJ, 1PQ8 and 1LL8 motors		
230 VΔ/400 VY, 50 Hz	220 ... 240 VΔ/380 ... 420 VY 50 Hz	1 [1]
400 VΔ/690 VY, 50 Hz	380 ... 420 VΔ/660 ... 725 VY, 50 Hz	6
500 VY, 50 Hz	–	3
500 VΔ, 50 Hz	–	5
1LA and 1LG motors		
Second rating plate with 50 and 60 Hz data, frame sizes 56 to 315 M for 1LA9 and 1LG6 with output at 60 Hz additionally in HP		
460 V, 60 Hz	440 ... 480V, 60 Hz	1, 6
1MA motors		
230 VΔ/400 VY, 50 Hz	218 ... 242 VΔ/380 ... 420 VY, 50 Hz	1
400 VΔ/690 VY, 50 Hz	380 ... 420 VΔ/655 ... 725 VY, 50 Hz	6

1MA motors:

For non-standard frequencies, the t_E times and, where applicable, the rated output, may differ from those specified in the selection tables; in this case, a new or supplementary certificate is needed. For Δ connection, overload protection with phase-failure protection must be provided.

Non-standard voltages and/or frequencies

The tolerance laid down by DIN EN 60034-1 applies to all non-standard voltages.
Order codes have been allocated for a number of non-standard voltages at 50 or 60 Hz. They are ordered by specifying the code digit 9 for voltage in the 11th position of the Order No. and the appropriate order code.

L8Y Standard winding
Winding in accordance with voltage codes 0, 4, 5, 6, 7 or 8; rating plate is stamped with order details.
The rated voltage is permitted to deviate up to ±5 % from the medium voltage of the defined voltage codes (0, 4, 5, 6, 7 or 8).
The order code **L8Y** is only possible for non-standard motors of the motor series 1LA8, 1PQ8 and 1LL8. Order code **L8Y** does not apply to explosion-proof motors, converter-fed motors and motors for the North American market (in connection with order codes D30, D31 or D40).

L1Y Non-standard winding for voltages between 200 V (380 V for 1LA8, 1PQ8 and 1LL8 motor series) and 690 V and rated outputs.
For voltages and rated outputs outside these ranges, please inquire.

Motor series	Frame size	Rated voltages for L1Y that can be supplied Lowest / highest voltage in V for	
		Delta	Star
1LA7, 1LA9, 1LP7, 1MA7, 1MJ6, 1PP7	56 ... 90	200/500 [2]	250/690 [3]
1LA6, 1LA7, 1LA9, 1LP7, 1MA6, 1MA7, 1MJ6, 1PP6, 1PP7	100 ... 160	200/690	250/690
1LA5, 1LA9, 1LP5, 1MA6, 1MJ6, 1PP5, 1PP6	180 ... 200	200/690	250/690
1LA5, 1LP5, 1PP5	225	200/690	250/690

L3Y Non-standard winding Y/Δ staring at low speed (only possible for 1LA7 and 1LA5 pole-changing motors).

When ordering **L8Y**, **L1Y** and **L3Y**, state in plain text:
Voltage, frequency and connection.

Order codes for other rated voltages in the relevant catalog parts

For converter-fed motors and smoke extraction motors, only order code **L1Y** is possible. For non-standard motors, order code **L8Y** is also possible for converter-fed operation.
The order codes listed below are possible for other motors; see the relevant catalog parts.

[1] Not applicable to non-standard motors.

[2] Highest voltage in delta circuit for 1MA7 060-2 and 1MA7 063-4 290 V as well as for 1MA7 060-4 230 V.

[3] Highest voltage in star circuit for 1MA7 060-2 and 1MA7 063-4 500 V as well as for 1MA7 060-4 400 V.

Further voltages for standard motors

Voltage at **50 Hz**	Required output at **50 Hz**	Order code for **50 Hz constant-speed motors** (not pole-changing) [1]	Frame sizes for motor 1LA5, 1LA7	1LA6	1LA9	1LG4, 1LG6	1LP5, 1LP7	1LP4
220 VΔ/380 VY [2] (210 ... 230 VΔ/ 360 ... 400 VY)	50 Hz output	**L1R**	56 ... 225	100 ... 160	56 ... 200	180 ... 315 M	63 ... 200	180 ... 315 L
230 VΔ (220 ... 240 VΔ)	50 Hz output	**L1E**	56 ... 225	100 ... 160	56 ... 200	180 ... 315 M	63 ... 200	180 ... 315 M
380 VΔ/660 VY [3] (360 ... 400 VΔ/ 625 ... 695 VY)	50 Hz output	**L1L**	56 ... 225	100 ... 160	56 ... 200	180 ... 315 L	63 ... 200	180 ... 315 L
415 VY (395 ... 435 VY)	50 Hz output	**L1C**	56 ... 225	100 ... 160	56 ... 200	180 ... 315 M	63 ... 200	180 ... 315 L
415 VΔ (395 ... 435 VΔ)	50 Hz output	**L1D**	56 ... 225	100 ... 160	56 ... 200	180 ... 315 L	63 ... 200	180 ... 315 L
400 VY (380 ... 420 VY)	50 Hz output	**L1A**	56 ... 225	100 ... 160	56 ... 200	180 ... 315 M	63 ... 200	180 ... 315 L
400 VΔ (380 ... 420 VΔ)	50 Hz output	**L1B**	56 ... 225	100 ... 160	56 ... 200	180 ... 315 L	63 ... 200	180 ... 315 L
400 VΔ (460 VΔ at 60 Hz) (380 ... 420 VΔ)	50 Hz output	**L1U**	56 ... 225	100 ... 160	56 ... 200	180 ... 315 L	63 ... 200	180 ... 315 L

Voltage at **60 Hz**	Required output at **60 Hz**	Order code for **60 Hz constant-speed motors** (not pole-changing)	Frame sizes for motors 1LA5, 1LA7	1LA6	1LA9	1LG4, 1LG6	1LP5, 1LP7	1LP4
220 VΔ/380 VY	50 Hz output	**L2A**	56 ... 225	100 ... 160	56 ... 200	180 ... 315 M	63 ... 200	180 ... 315 L
220 VΔ/380 VY	60 Hz output	**L2B**	56 ... 225	100 ... 160	56 ... 200	180 ... 315 M	63 ... 200	180 ... 315 L
380 VΔ/660 VY	50 Hz output	**L2C**	56 ... 225	100 ... 160	56 ... 200	180 ... 315 L	63 ... 200	180 ... 315 L
380 VΔ/660 VY	60 Hz output	**L2D**	56 ... 225	100 ... 160	56 ... 200	180 ... 315 L	63 ... 200	180 ... 315 L
440 VY	50 Hz output	**L2Q**	56 ... 225	100 ... 160	56 ... 200	180 ... 315 M	63 ... 200	180 ... 315 L
440 VY	60 Hz output	**L2W**	56 ... 225	100 ... 160	56 ... 200	180 ... 315 M	63 ... 200	180 ... 315 L
440 VΔ	50 Hz output	**L2R**	56 ... 225	100 ... 160	56 ... 200	180 ... 315 L	63 ... 200	180 ... 315 L
440 VΔ	60 Hz output	**L2X**	56 ... 225	100 ... 160	56 ... 200	180 ... 315 L	63 ... 200	180 ... 315 L
460 VY	50 Hz output	**L2S**	56 ... 225	100 ... 160	56 ... 200	180 ... 315 M	63 ... 200	180 ... 315 L
460 VY	60 Hz output	**L2E**	56 ... 225	100 ... 160	56 ... 200	180 ... 315 M	63 ... 200	180 ... 315 L
460 VΔ	50 Hz output	**L2T**	56 ... 225	100 ... 160	56 ... 200	180 ... 315 L	63 ... 200	180 ... 315 L
460 VΔ	60 Hz output	**L2F**	56 ... 225	100 ... 160	56 ... 200	180 ... 315 L	63 ... 200	180 ... 315 L
575 VY	50 Hz output	**L2U**	56 ... 225	100 ... 160	56 ... 200	180 ... 315 M	63 ... 200	180 ... 315 L
575 VY	60 Hz output	**L2L**	56 ... 225	100 ... 160	56 ... 200	180 ... 315 M	63 ... 200	180 ... 315 L
575 VΔ	50 Hz output	**L2V**	56 ... 225	100 ... 160	56 ... 200	180 ... 315 L	63 ... 200	180 ... 315 L
575 VΔ	60 Hz output	**L2M**	56 ... 225	100 ... 160	56 ... 200	180 ... 315 L	63 ... 200	180 ... 315 L

Voltage at **60 Hz**	Required output at **60 Hz**	Order code for **60 Hz motors multi-voltage**	Frame sizes for motors 1LA5, 1LA7	1LA6	1LA9	1LG4, 1LG6	1LP5, 1LP7	1LP4
230 VYY/460 VY 60 Hz	50 Hz output	**L3E**	56 ... 200	–	56 ... 200	–	63 ... 200	–
230 VYY/460 VY 60 Hz	60 Hz output	**L3F**	56 ... 200	–	56 ... 200	–	63 ... 200	–
230 VΔΔ/460 VΔ 60 Hz	50 Hz output	**L3G**	100 ... 200	–	100 ... 200	–	100 ... 200	–
230 VΔΔ/460 VΔ 60 Hz	60 Hz output	**L3H**	100 ... 200	–	100 ... 200	–	100 ... 200	–

Voltage at **60 Hz**	Required output at **60 Hz**	Order code for **60 Hz motors pole-changing**	Frame sizes for motors 1LA5, 1LA7	1LA6	1LA9	1LG4, 1LG6	1LP5, 1LP7	1LP4
220 V	50 Hz output	**L4A**	63 ... 200	–	–	–	–	–
220 V	60 Hz output	**L4B**	63 ... 200	–	–	–	–	–
380 V	50 Hz output	**L4C**	63 ... 200	–	–	–	–	–
380 V	60 Hz output	**L4D**	63 ... 200	–	–	–	–	–
440 V	50 Hz output	**L4G**	63 ... 200	–	–	–	–	–
440 V	60 Hz output	**L4E**	63 ... 200	–	–	–	–	–
460 V	50 Hz output	**L4J**	63 ... 200	–	–	–	–	–
460 V	60 Hz output	**L4H**	63 ... 200	–	–	–	–	–
575 V	50 Hz output	**L4N**	63 ... 200	–	–	–	–	–
575 V	60 Hz output	**L4M**	63 ... 200	–	–	–	–	–

1) For order codes **L1A, L1B, L1C, L1D, L1E, L1L, L1R** and **L1U**, a rated voltage range is also included on the rating plate.

2) For the order code **L1R** a voltage of 440 VY 60 Hz is also possible for 1LA5, 1LA7, 1LA9, 1LP5 and 1LP7 motor series.

3) For the order code **L1L** a voltage of 440 VΔ 60 Hz is also possible for 1LA5, 1LA7, 1LA9, 1LP5 and 1LP7 motor series.

General technical data

Further voltages for non-standard motors

Voltage at **60 Hz**	Required output at **60 Hz**	Order code for **60 Hz constant-speed motors** (not pole-changing)	Frame sizes for motors 1LA8	1PQ8	1LL8
220 VΔ/380 VY	50 Hz output	**L2A**	–	–	–
220 VΔ/380 VY	60 Hz output	**L2B**	–	–	–
380 VΔ/660 VY	50 Hz output	**L2C**	315 ... 450	315 ... 450	315 ... 450
380 VΔ/660 VY	60 Hz output	**L2D**	315 ... 450	315 ... 450	315 ... 450
440 VY	50 Hz output	**L2Q**	–	–	–
440 VY	60 Hz output	**L2W**	–	–	–
440 VΔ	50 Hz output	**L2R**	315 ... 450	315 ... 450	315 ... 450
440 VΔ	60 Hz output	**L2X**	315 ... 450	315 ... 450	315 ... 450
460 VY	50 Hz output	**L2S**	–	–	–
460 VY	60 Hz output	**L2E**	–	–	–
460 VΔ	50 Hz output	**L2T**	315 ... 450	315 ... 450	315 ... 450
460 VΔ	60 Hz output	**L2F**	315 ... 450	315 ... 450	315 ... 450
575 VY	50 Hz output	**L2U**	–	–	–
575 VY	60 Hz output	**L2L**	–	–	–
575 VΔ	50 Hz output	**L2V**	315 ... 450	315 ... 450	315 ... 450
575 VΔ	60 Hz output	**L2M**	315 ... 450	315 ... 450	315 ... 450

Further voltages for explosion-proof motors

Voltage at **50 Hz**	Required output at **50 Hz**	Order code for **50 Hz constant-speed motors** (not pole-changing) [1]	Frame sizes for motors 1LA5, 1LA7	1LA6	1LA9	1LG4, 1LG6	1MA6, 1MA7 [2]	1MJ6	1MJ7
220 VΔ/380 VY [3] (210 ... 230 VΔ/ 360 ... 400 VY)	50 Hz output	**L1R**	56 ... 225	100 ... 160	56 ... 200	180 ... 315 M	63 ... 315 M	71 ... 200	225 ... 315 M
230 VΔ (220 ... 240 VΔ)	50 Hz output	**L1E**	56 ... 225	100 ... 160	56 ... 200	180 ... 315 M	63 ... 315 M	71 ... 200	225 ... 315 M
380 VΔ/660 VY [4] (360 ... 400 VΔ/ 625 ... 695 VY)	50 Hz output	**L1L**	56 ... 225	100 ... 160	56 ... 200	180 ... 315 L	71 ... 315 L	71 ... 200	225 ... 315 M
415 VY (395 ... 435 VY)	50 Hz output	**L1C**	56 ... 225	100 ... 160	56 ... 200	180 ... 315 M	63 ... 315 M	71 ... 200	225 ... 315 M
415 VΔ (395 ... 435 VΔ)	50 Hz output	**L1D**	56 ... 225	100 ... 160	56 ... 200	180 ... 315 L	71 ... 315 L	71 ... 200	225 ... 315 M
400 VY (380 ... 420 VY)	50 Hz output	**L1A**	56 ... 225	100 ... 160	56 ... 200	180 ... 315 M	–	–	–
400 VΔ (380 ... 420 VΔ)	50 Hz output	**L1B** [5]	56 ... 225	100 ... 160	56 ... 200	180 ... 315 L	–	–	–
400 VΔ (460 VΔ at 60 Hz) (380 ... 420 VΔ)	50 Hz output	**L1U**	56 ... 225	100 ... 160	56 ... 200	180 ... 315 L	–	–	–
400 VΔ (only 4-8-pole)	87 Hz output	**L3A**	56 ... 225	100 ... 160	56 ... 200	180 ... 315 M	–	–	–

Voltage at **60 Hz**	Required output at **60 Hz**	Order code for **60 Hz constant-speed motors** (not pole-changing)	Frame sizes for motors 1LA5, 1LA7	1LA6	1LA9	1LG4, 1LG6	1MA6, 1MA7 [6]	1MJ6	1MJ7
220 VΔ/380 VY	50 Hz output	**L2A**	56 ... 225	100 ... 160	56 ... 200	180 ... 315 M	63 ... 315 M	71 ... 200	225 ... 315 M
220 VΔ/380 VY	60 Hz output	**L2B**	56 ... 225	100 ... 160	56 ... 200	180 ... 315 M	–	71 ... 200	225 ... 315 M
380 VΔ/660 VY	50 Hz output	**L2C**	56 ... 225	100 ... 160	56 ... 200	180 ... 315 L	63 ... 315 L	71 ... 200	225 ... 315 M
380 VΔ/660 VY	60 Hz output	**L2D**	56 ... 225	100 ... 160	56 ... 200	180 ... 315 L	–	71 ... 200	225 ... 315 M
440 VY	50 Hz output	**L2Q**	56 ... 225	100 ... 160	56 ... 200	180 ... 315 M	63 ... 315 M	71 ... 200	225 ... 315 M
440 VY	60 Hz output	**L2W**	56 ... 225	100 ... 160	56 ... 200	180 ... 315 M	–	71 ... 200	225 ... 315 M
440 VΔ	50 Hz output	**L2R**	56 ... 225	100 ... 160	56 ... 200	180 ... 315 L	63 ... 315 L	71 ... 200	225 ... 315 M
440 VΔ	60 Hz output	**L2X**	56 ... 225	100 ... 160	56 ... 200	180 ... 315 L	–	71 ... 200	225 ... 315 M
460 VY	50 Hz output	**L2S**	56 ... 225	100 ... 160	56 ... 200	180 ... 315 M	63 ... 315 M	71 ... 200	225 ... 315 M
460 VY	60 Hz output	**L2E**	56 ... 225	100 ... 160	56 ... 200	180 ... 315 M	–	71 ... 200	225 ... 315 M
460 VΔ	50 Hz output	**L2T**	56 ... 225	100 ... 160	56 ... 200	180 ... 315 L	63 ... 315 L	71 ... 200	225 ... 315 M
460 VΔ	60 Hz output	**L2F**	56 ... 225	100 ... 160	56 ... 200	180 ... 315 L	–	71 ... 200	225 ... 315 M
575 VY	50 Hz output	**L2U**	56 ... 225	100 ... 160	56 ... 200	180 ... 315 M	63 ... 315 M	71 ... 200	225 ... 315 M
575 VY	60 Hz output	**L2L**	56 ... 225	100 ... 160	56 ... 200	180 ... 315 M	–	71 ... 200	225 ... 315 M
575 VΔ	50 Hz output	**L2V**	56 ... 225	100 ... 160	56 ... 200	180 ... 315 L	63 ... 315 L	71 ... 200	225 ... 315 M
575 VΔ	60 Hz output	**L2M**	56 ... 225	100 ... 160	56 ... 200	180 ... 315 L	–	71 ... 200	225 ... 315 M

1) For order codes **L1A, L1C, L1D, L1E, L1L, L1R** and **L1U**, a rated voltage range is also included on the rating plate, with the exception of versions in Zone 2 type of protection "n" or Ex n II T3.

2) For further information on the rated voltage range see Page 4/84.

3) For the order code **L1R** a voltage of 440 VY 60 Hz is also possible for 1LA5, 1LA7, 1LA9, 1LP5 and 1LP7 motor series.

4) For the order code **L1L** a voltage of 440 VΔ 60 Hz is also possible for 1LA5, 1LA7, 1LA9, 1LP5 and 1LP7 motor series.

5) For converter-fed operation, the converter output for a voltage according to the table is included on the rating plate.

6) A special certificate is required.

Further voltages for fan motors

Voltage at **50 Hz**	Required output at **50 Hz**	Order code for **50 Hz constant-speed motors** (not pole-changing) [1]	Frame sizes for motors 1PP5, 1PP7	1PP4
220 VΔ/380 VY [2] (210 ... 230 VΔ/ 360 ... 400 VY)	50 Hz output	**L1R**	63 ... 200	180 ... 315 M
230 VΔ (220 ... 240 VΔ)	50 Hz output	**L1E**	63 ... 200	180 ... 315 M
380 VΔ/660 VY [3] (360 ... 400 VΔ/ 625 ... 695 VY)	50 Hz output	**L1L**	63 ... 200	180 ... 315 L
415 VY (395 ... 435 VY)	50 Hz output	**L1C**	63 ... 200	180 ... 315 M
415 VΔ (395 ... 435 VΔ)	50 Hz output	**L1D**	63 ... 200	180 ... 315 L
400 VY (380 ... 420 VY)	50 Hz output	**L1A**	63 ... 200	180 ... 315 M
400 VΔ (380 ... 420 VΔ)	50 Hz output	**L1B**	63 ... 200	180 ... 315 L
400 VΔ (460 VΔ at 60 Hz) (380 ... 420 VΔ)	50 Hz output	**L1U**	63 ... 200	180 ... 315 L

Voltage at **60 Hz**	Required output at **60 Hz**	Order code for **60 Hz constant-speed motors** (not pole-changing)	Frame sizes for motors 1PP5, 1PP7	1PP4
220 VΔ/380 VY	50 Hz output	**L2A**	63 ... 200	180 ... 315 M
220 VΔ/380 VY	60 Hz output	**L2B**	63 ... 200	180 ... 315 M
380 VΔ/660 VY	50 Hz output	**L2C**	63 ... 200	180 ... 315 L
380 VΔ/660 VY	60 Hz output	**L2D**	63 ... 200	180 ... 315 L
440 VY	50 Hz output	**L2Q**	63 ... 200	180 ... 315 M
440 VY	60 Hz output	**L2W**	63 ... 200	180 ... 315 M
440 VΔ	50 Hz output	**L2R**	63 ... 200	180 ... 315 L
440 VΔ	60 Hz output	**L2X**	63 ... 200	180 ... 315 L
460 VY	50 Hz output	**L2S**	63 ... 200	180 ... 315 M
460 VY	60 Hz output	**L2E**	63 ... 200	180 ... 315 M
460 VΔ	50 Hz output	**L2T**	63 ... 200	180 ... 315 L
460 VΔ	60 Hz output	**L2F**	63 ... 200	180 ... 315 L
575 VY	50 Hz output	**L2U**	63 ... 200	180 ... 315 M
575 VY	60 Hz output	**L2L**	63 ... 200	180 ... 315 M
575 VΔ	50 Hz output	**L2V**	63 ... 200	180 ... 315 L
575 VΔ	60 Hz output	**L2M**	63 ... 200	180 ... 315 L

Voltage at **60 Hz**	Required output at **60 Hz**	Order code for **60 Hz motors, multi-voltage**	Frame sizes for motors 1PP5, 1PP7	1PP4
230 VYY/460 VY 60 Hz	50 Hz output	**L3E**	63 ... 200	–
230 VYY/460 VY 60 Hz	60 Hz output	**L3F**	63 ... 200	–
230 VΔΔ/460 VΔ 60 Hz	50 Hz output	**L3G**	100 ... 200	–
230 VΔΔ/460 VΔ 60 Hz	60 Hz output	**L3H**	100 ... 200	–

Voltage at **60 Hz**	Required output at **60 Hz**	Order code for **60 Hz motors, pole-changing**	Frame sizes for motors 1LA5, 1LA7	1LG4
220 V	50 Hz output	**L4A**	80 ... 200	180 ... 280
220 V	60 Hz output	**L4B**	80 ... 200	180 ... 280
380 V	50 Hz output	**L4C**	80 ... 200	180 ... 280
380 V	60 Hz output	**L4D**	80 ... 200	180 ... 280
440 V	50 Hz output	**L4G**	80 ... 200	180 ... 280
440 V	60 Hz output	**L4E**	80 ... 200	180 ... 280
460 V	50 Hz output	**L4J**	80 ... 200	180 ... 280
460 V	60 Hz output	**L4H**	80 ... 200	180 ... 280
575 V	50 Hz output	**L4N**	80 ... 200	180 ... 280
575 V	60 Hz output	**L4M**	80 ... 200	180 ... 280

[1] For order codes **L1A, L1B, L1C, L1D, L1E, L1L, L1R** and **L1U** a rated voltage range is also included on the rating plate.

[2] For the order code **L1R** a voltage of 440 VY 60 Hz is also possible for 1PP5 and 1PP7 motor series.

[3] For the order code **L1L** a voltage of 440 VΔ 60 Hz is also possible for 1PP5 and 1PP7 motor series.

General technical data

Rated currents for rated voltage range 380 V to 420 V at 50 Hz

	Currents for voltage and number of poles							
	380 V 2-pole A	420 V A	380 V 4-pole A	420 V A	380 V 6-pole A	420 V A	380 V 8-pole A	420 V A
1LA7, 1LA5 motors								
1LA7 050	0.27	0.26	0.21	0.21	–	–	–	–
1LA7 053	0.33	0.32	0.30	0.31	–	–	–	–
1LA7 060	0.52	0.53	0.42	0.44	–	–	–	–
1LA7 063	0.69	0.71	0.58	0.59	0.48	0.5	–	–
1LA7 070	1.05	1.02	0.80	0.77	0.66	0.64	0.36	0.36
1LA7 073	1.38	1.41	1.07	1.06	0.80	0.80	0.51	0.52
1LA7 080	1.75	1.79	1.50	1.50	1.18	1.25	0.73	0.80
1LA7 083	2.45	2.50	2.12	2.17	1.62	1.66	1.01	1.10
1LA7 090	3.40	3.35	2.60	2.60	2.10	2.15	1.15	1.18
1LA7 096	4.70	4.65	3.50	3.50	3.0	2.95	1.63	1.60
1LA7 106	6.25	6.15	4.8	4.8	4.0	4.1	2.25	2.2
1LA7 107	–	–	6.5	6.8	–	–	3.0	3.0
1LA7 113	8.2	7.7	8.4	8.3	5.4	5.3	4.1	4.2
1LA7 130	10.6	10.4	11.4	11.9	7.3	7.5	5.9	6.0
1LA7 131	14.1	13.8	–	–	–	–	–	–
1LA7 133	–	–	15.4	15.5	9.5	9.7	7.9	7.9
1LA7 134	–	–	–		13.0	13.1	–	–
1LA7 163	21.0	20.5	22.3	21.5	17.5	17.3	9.9	10.6
1LA7 164	28.0	26.0	–	–	–	–	13.1	13.4
1LA7 166	34.0	32.0	29.5	28.5	24.8	24.7	17.6	18.4
1LA5 183	40	38	36	35	–	–	–	–
1LA5 186	–	–	42	41	32.7	31	26.5	23.5
1LA5 206	55	52	–	–	40	38.5	–	–
1LA5 207	67	64	57	54	46.5	45.5	34	31
1LA5 220	–	–	69	64	–	–	40	37
1LA5 223	81	76	84	78	64	63	47	43
1LA6, 1LG4 motors								
1LA6 106	6.25	6.15	4.8	4.8	4.0	4.1	2.25	2.2
1LA6 107	–	–	6.5	6.8	–	–	3.0	3.0
1LA6 113	8.2	7.7	8.4	8.3	5.4	5.3	4.1	4.2
1LA6 130	10.6	10.4	11.4	11.9	7.3	7.5	5.9	6.0
1LA6 131	14.1	13.8	–	–	–	–	–	–
1LA6 133	–	–	15.4	15.5	9.5	9.7	7.9	7.9
1LA6 134	–	–	–	–	13.0	13.1	–	–
1LA6 163	21.0	20.5	22.3	21.5	17.5	17.3	9.9	10.6
1LA6 164	28.0	26.0	–	–	–	–	13.1	13.4
1LA6 166	34.0	32.0	29.5	28.5	24.8	24.7	17.6	18.4
1LG4 183	41.5	40	36	35	–	–	–	–
1LG4 186	–	–	42.5	41.5	30.5	28.5	25.5	25
1LG4 188	56	54	59	60	38.5	37	34.5	34.5
1LG4 206	56	52	–	–	37	37	–	–
1LG4 207	67	63	57	55	45	42.5	33.5	32
1LG4 208	82	77	70	69	61	60	40.5	39
1LG4 220	–	–	72	65	–	–	40.5	36.5
1LG4 223	83	75	85	77	60	54	46.5	42
1LG4 228	100	90	104	94	73	66	64	58
1LG4 253	100	93	104	98	73	68	60	57
1LG4 258	134	128	138	134	87	81	73	69
1LG4 280	136	126	144	132	87	80	76	70
1LG4 283	162	150	168	156	106	97	92	84
1LG4 288	196	182	204	190	146	134	112	102
1LG4 310	198	188	205	194	142	136	110	104
1LG4 313	230	215	245	230	170	162	146	136
1LG4 316	280	255	295	275	205	190	174	164
1LG4 317	345	315	360	330	245	225	210	198
1LG4 318	–	–	–	–	295	275	250	240

	Currents for voltage and number of poles							
	380 V 2-pole	420 V	380 V 4-pole	420 V	380 V 6-pole	420 V	380 V 8-pole	420 V
	A	A	A	A	A	A	A	A
1LG6, 1LA8 motors								
1LG6 183	40.5	37.5	36	34.5	–	–	–	–
1LG6 186	–	–	42.5	40.5	30.5	29	24.5	23
1LG6 206	54	51	–	–	37	35.5	–	–
1LG6 207	66	62	56	54	44	40.5	32.5	30.5
1LG6 220	–	–	70	64	–	–	38	34.5
1LG6 223	81	73	84	76	59	53	45	41
1LG6 253	97	90	99	94	72	67	59	55
1LG6 280	134	124	138	128	85	79	75	69
1LG6 283	158	146	166	154	104	96	91	83
1LG6 310	192	174	200	184	142	134	106	100
1LG6 313	230	210	235	215	166	156	142	136
1LG6 316	275	250	285	265	205	190	170	158
1LG6 317	340	305	355	330	245	225	205	194
1LG6 318	–	–	–	–	290	275	250	230
1LA8 315	435	400	450	425	360	340	310	295
1LA8 317	540	495	560	530	450	420	385	365
1LA8 353	620	570	640	590	–	–	–	–
1LA8 355	690	630	720	680	570	530	480	455
1LA8 357	860	790	880	820	720	670	600	560
1LA8 403	950	880	990	930	810	760	680	640
1LA8 405	1080	990	1100	1040	890	840	760	720
1LA8 407	690 [1]	640 [2]	710 [1]	670 [2]	1000	940	850	810
1LA8 453	780 [1]	730 [2]	810 [1]	750 [2]	1160	1060	960	910
1LA8 455	880 [1]	810 [2]	910 [1]	860 [2]	740 [1]	690 [2]	1080	1020
1LA8 457	970 [1]	890 [2]	1000 [1]	940 [2]	830 [1]	770 [2]	1200	1140

The rating plates of 1MJ6 motors specify the maximum current in the voltage range in addition to the rated current. This maximum is approximately 5 % higher than the rated current.

[1] Only available for 690 V, see catalog part 3 “Non-standard motors frame size 315 and above”; but in 660 V design.

[2] Only available for 690 V, see catalog part 3 “Non-standard motors frame size 315 and above”; but in 725 V design.

General technical data

Outputs

The outputs and the rated outputs are listed in the selection tables and in the separate catalog parts for 50 Hz and in most cases also for 60 Hz. For 60 Hz, the rated output values must, in some cases, be increased, e.g. for pole-changing motors.

Table of rated output at 60 Hz for single-speed motors

Motor type			Admissible output at 60 Hz for voltages between 220 V or 380 V and 725 V			
			2-pole kW	4-pole kW	6-pole kW	8-pole kW
1LA6, 1LG4, 1LG6, 1LA7, 1MJ6, 1MJ7 motors						
1LA7 050	**–**	**–**	0.105	0.07	–	–
1LA7 053	**–**	**–**	0.14	0.105	–	–
1LA7 060	**–**	**–**	0.21	0.14	–	–
1LA7 063	**–**	**–**	0.29	0.21	0.1	–
1LA7 070	**–**	**1MJ6 070**	0.43	0.29	0.21	0.1
1LA7 073	**–**	**1MJ6 073**	0.63	0.43	0.29	0.14
1LA7 080	**–**	**1MJ6 080**	0.86	0.63	0.43	0.21
1LA7 083	**–**	**1MJ6 083**	1.3	0.86	0.63	0.29
1LA7 090	**–**	**1MJ6 096**	1.75	1.3	0.86	0.43
1LA7 096	**–**	**1MJ6 097**	2.55	1.75	1.3	0.63
1LA7 106	**1LA6 106**	**1MJ6 106**	3.45	2.55	1.75	0.86
1LA7 107	**1LA6 107**	**1MJ6 107**	–	3.45	–	1.3
1LA7 113	**1LA6 113**	**1MJ6 113**	4.6	4.6	2.55	1.75
1LA7 130	**1LA6 130**	**1MJ6 130**	6.3	6.3	3.45	2.55
1LA7 131	**1LA6 131**	**1MJ6 131**	8.6	–	–	–
1LA7 133	**1LA6 133**	**1MJ6 133**	–	8.6	4.6	3.45
1LA7 134	**1LA6 134**	**1MJ6 134**	–	–	6.3	–
1LA7 163	**1LA6 163**	**1MJ6 163**	12.6	12.6	8.6	4.6
1LA7 164	**1LA6 164**	**1MJ6 164**	17.3	–	–	6.3
1LA7 166	**1LA6 166**	**1MJ6 166**	21.3	17.3	12.6	8.6
1LA5 183	**1LG . 183**	**1MJ6 183**	24.5	21.3	–	–
1LA5 186	**1LG . 186**	**1MJ6 186**	–	25.3	18	3.2
–	**1LG . 188**	**–**	33.5	34.5	22	18
1LA5 206	**1LG . 206**	**1MJ6 206**	33.5	–	22	–
1LA5 207	**1LG . 207**	**1MJ6 207**	41.5	34.5	26.5	18
–	**1LG . 208**	**–**	51	42.5	36	22
1LA5 220	**1LG . 220**	**1MJ7 220**	–	42.5	–	22
1LA5 223	**1LG . 223**	**1MJ7 223**	51	52	36	26.5
–	**1LG . 228**	**–**	62	63	44.5	36
–	**1LG . 253**	**1MJ7 253**	62	63	44.5	36
–	**1LG . 258**	**–**	84	86	54	44.5
–	**1LG . 280**	**1MJ7 280**	84	86	54	44.5
–	**1LG . 283**	**1MJ7 283**	101	104	66	54
–	**1LG . 288**	**–**	123	127	90	66
–	**1LG . 310**	**1MJ7 310**	123	127	90	66
–	**1LG . 313**	**1MJ7 313**	148	152	108	90
–	**1LG . 316**	**–**	180	184	132	108
–	**1LG . 317**	**–**	224	230	158	132
–	**1LG . 318**	**–**	–	–	192	158

Motor type			Admissible output at 60 Hz for voltages between 380 V and 725 V			
			2-pole kW	4-pole kW	6-pole kW	8-pole kW
1LA8 motors						
1LA8 315	**–**	**–**	280	288	230	184
1LA8 317	**–**	**–**	353	362	288	230
1LA8 353	**–**	**–**	398	408	–	–
1LA8 355	**–**	**–**	448	460	362	288
1LA8 357	**–**	**–**	560	575	460	362
1LA8 403	**–**	**–**	616	644	518	408
1LA8 405	**–**	**–**	693	725	575	460
1LA8 407	**–**	**–**	–	817	644	518
1LA8 453	**–**	**–**	–	–	725	575
1LA8 455	**–**	**–**	–	–	–	644
1LA8 457	**–**	**–**	–	–	–	725

The speed increases to approx. 120 % in relation to 50 Hz motors.

Higher outputs/voltages are available on request!

Table of rated output at 60 Hz for pole-changing motors

At 60 Hz, the output can be increased in accordance with the factors listed in the table below.
The output is increased separately for each number of poles, i.e. for 6/4-pole motors, frame sizes 180 to 315, 60 Hz, the 6-pole output can be increased by 20 % and the 4-pole output can be increased by 15 %.

Frame size	Number of poles	Factor for increased output at 60 Hz for voltages between 220 or 380 and 725 V
56 to 160	2 to 8	1.15
180 to 315	2	1.12
	4	1.15
	6 and 8	1.2

Possible versions of 2-pole motors

Frame size	Horizontal type of construction				Vertical type of construction	
	50 Hz with foot	60 Hz with foot	50 Hz with flange	60 Hz with flange	50 Hz	60 Hz
56 to 315 M	•	•	•	•	•	•
315 L	•	•	–	–	•	•
315	•	•	•	•	•	•
355 and 400	•	•	•	•	•	–
450	•	–	•	–	•	–

Assignment of the standard power kW-HP and vice versa in accordance with IEC

kW · 1,341 = HP
HP · 0,746 = kW

P_{rated} kW	P_{rated} HP	P_{rated} kW	P_{rated} HP	P_{rated} kW	P_{rated} HP	P_{rated} kW	P_{rated} HP	P_{rated} kW	P_{rated} HP	P_{rated} kW	P_{rated} HP
0.06	0.08	0.37	0.5	2.2	3	11	15	37	50	110	150
0.09	0.12	0.55	0.75	3	4	15	20	45	60	132	200
0.12	0.16	0.75	1	4	5	18.5	25	55	75	160	250
0.18	0.25	1.1	1.5	5.5	7.5	22	30	75	100	200	300
0.25	0.33	1.5	2	7.5	10	30	40	90	125		

Efficiency, power factor, rated torque, rated speed and direction of rotation

Efficiency and power factor

The efficiency η and power factor cos φ for each rated output are listed in the selection tables in the individual sections of this catalog.

For EFF1 and EFF2 motors, the 3/4 load efficiency is also indicated.

Part-load efficiency % at 1/4 of full load	1/2	3/4	**4/4**	5/4
93	96	97	**97**	96.5
92	95	96	**96**	95.5
90	93.5	95	**95**	94.5
89	92.5	94	**94**	93.5
88	91.5	93	**93**	92.5
87	91	92	**92**	91.5
86	90	91	**91**	90
85	89	90	**90**	89
84	88	89	**89**	88
80	87	88	**88**	87
79	86	87	**87**	86
78	85	86	**86**	85
76	84	85	**85**	83.5
74	83	84	**84**	82.5
72	82	83	**83**	81.5
70	81	82	**82**	80.5
68	80	81	**81**	79.5
66	79	80	**80**	78.5
64	77	79.5	**79**	77.5
62	75.5	78.5	**78**	76.5
60	74	77.5	**77**	75
58	73	76	**76**	74
56	72	75	**75**	73
55	71	74	**74**	72
54	70	73	**73**	71
53	68	72	**72**	70
52	67	71	**71**	69
51	66	70	**70**	68
50	65	69	**69**	67
49	64	67.5	**68**	66
48	62	66.5	**67**	65
47	61	65	**66**	64
46	60	64	**65**	63
45	59	63	**64**	62
44	57	62	**63**	61
43	56	60.5	**62**	60.5
42	55	59.5	**61**	59.5
41	54	58.5	**60**	58.5

The part-load values stated in the tables below are averages; precise values can be provided on request.

Part-load power factor at 1/4 of full load	1/2	3/4	**4/4**	5/4
0.70	0.86	0.90	**0.92**	0.92
0.65	0.85	0.89	**0.91**	0.91
0.63	0.83	0.88	**0.90**	0.90
0.61	0.80	0.86	**0.89**	0.89
0.57	0.78	0.85	**0.88**	0.88
0.53	0.76	0.84	**0.87**	0.87
0.51	0.75	0.83	**0.86**	0.86
0.49	0.73	0.81	**0.85**	0.86
0.47	0.71	0.80	**0.84**	0.85
0.45	0.69	0.79	**0.83**	0.84
0.43	0.67	0.77	**0.82**	0.83
0.41	0.66	0.76	**0.81**	0.82
0.40	0.65	0.75	**0.80**	0.81
0.38	0.63	0.74	**0.79**	0.80
0.36	0.61	0.72	**0.78**	0.80
0.34	0.59	0.71	**0.77**	0.79
0.32	0.58	0.70	**0.76**	0.78
0.30	0.56	0.69	**0.75**	0.78
0.29	0.55	0.68	**0.74**	0.77
0.28	0.54	0.67	**0.73**	0.77
0.27	0.52	0.63	**0.72**	0.76
0.26	0.50	0.62	**0.71**	0.76

Rated torque

The rated torque in Nm delivered at the motor shaft is

$$M = \frac{9.55 \cdot P \cdot 1000}{n}$$

P Rated output in kW
n Speed in rpm

Note:
If the voltage deviates from its rated value within the allowed limits, the locked-rotor torque, the pull-up torque and the breakdown torque vary with the approximate square of the value, but the locked-rotor current varies approximately linearly.

In the case of squirrel-cage motors, the locked-rotor torque and breakdown torque are listed in the selection tables as multiples of the rated torque.
The normal practise is to start squirrel-cage motors directly on line. The torque class indicates that with direct-on-line starting, even if there is – 5 % undervoltage, it is possible to start up the motor against a load torque of

- 160 % for CL 16
- 130 % for CL 13
- 100 % for CL 10
- 70 % for CL 7
- 50 % for CL 5

of the rated torque.
The individual torque characteristics are available in the SD configurator. In addition, it is possible to perform calculations with the supplied start-up program.

For type 1MA motors in the standard design for T1/T2 and T3 and different rated outputs, the torque class specified for the higher output applies.

General technical data

Rated speed and direction of rotation

The rated speeds are applicable for the rated data. The synchronous speed changes proportionally with the line frequency. The motors are suitable for clockwise and counter-clockwise rotation.

This does not apply to the following 2-pole motors:

- 1LA8, 1LL8 frame size 355 and above for clockwise rotation only; alternatively order code **K38** for counter-clockwise rotation only
- 1LA8, 1MJ6, 1MA6 and 1LG4 in VIK version from frame size 315 and above.

If U1, V1, W1 are connected to L1, L2, L3, clockwise rotation results as viewed onto the drive-end shaft extension. Counter-clockwise rotation is achieved by swapping two phases (see also “Heating and ventilation”).

Rating plate and extra rating plates

DIN EN 60034-1 lays down that the approximate total weight for all motors from frame size 90 (from approx. 30 kg) is indicated on the rating plate.

An extra rating plate can be supplied loose for all motors, order code **K31**.
Supplementary data can be indicated on the rating plate or extra rating plate and on the packaging label (maximum of 20 characters), order code **Y84**.

An extra rating plate can also be supplied for the identification code, order code **Y82**.
An extra rating plate or a rating plate can also be ordered with different rating plate data, order code **Y80**.

An extra rating plate can be supplied loose for all motors of frame sizes 100 to 315, order code **B06**.

In the standard version, the rating plate is available in international format or in the English/German language. The language for the rating plate can be ordered by specifying in plain text. An overview of the languages that can be ordered, at additional cost in some cases, is provided by the table below.

⟨Ex⟩ In addition, for 1MA motors:
With the exception of 2-pole motors from frame size 225 M or larger, all motors are suitable for both T1/T2 and T3 (uniform design).
If the rated output for T1/T2 differs from that of T3, the data for both output values is stated separately.

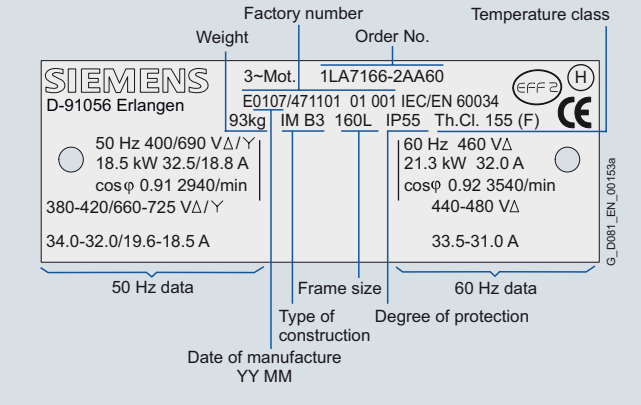
Overview of the languages on the rating plate

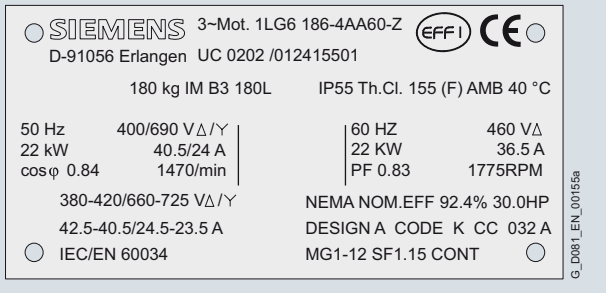
Motor type	Frame size	Rating plate								Double rating plate 50 Hz and 60 Hz data for	
		International	German (de)	English (en)	German (de)/ English (en)	French (fr)/ Spanish (es)	Italian (it)	Portuguese (pt)	Russian (ru)	500 VY and 575 VY 500 VΔ and 575 VΔ	230 VΔ/ 400 VY and 460 VY 400 VΔ/ 690 VY and 460 VΔ
1LA5	180 ... 225	□		○						□	□
1LA6	100 ... 160	□		○						□	□
1LA7	56 ... 160	□		○						□	□
1LA8	315 ... 450				□	○	○	○			
1LA9	56 ... 200	□		○						□	□
1LG4	180 ... 315				□				✓		□
1LG6	180 ... 315	□							✓		□
1LL8	315 ... 450				□	○	○	○			
1LP4	180 ... 315				□				✓		□
1LP5	63 ... 160	□		○						□	□
1LP7	180 ... 200	□		○						□	□
1MA6	100 ... 180			○	□						
1MA6	180 ... 200			○	□						
1MA6	225 ... 315			○	□	○	○	○	✓		
1MA7	63 ... 160	□		○							
1MJ6	71 ... 200	□		○							
1MJ7	225 ... 315				□	○	○	○	✓		
1PP4	180 ... 315				□				✓		□
1PP5	180 ... 200	□		○						□	□
1PP6	100 ... 315				□				✓		□
1PP7	63 ... 160	□		○						□	□
1PQ8	315 ... 450				□	○	○	○			

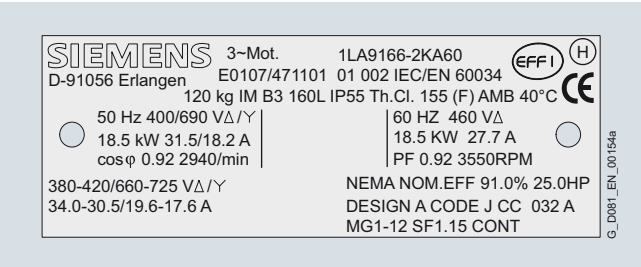
□ Standard version
○ Without additional charge
✓ With additional charge

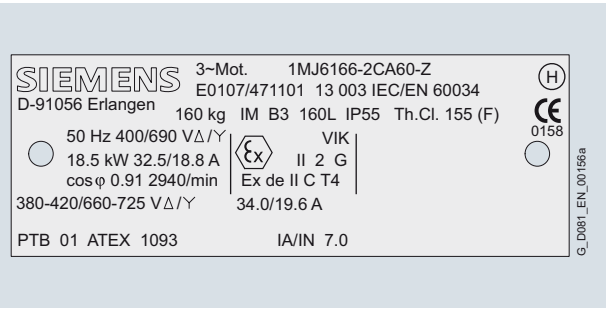
Examples of rating plates

See the catalog part “Non-standard motors” for rating plates for motor series 1LA8, 1PQ8 and 1LL8.









Coolant temperature and site altitude

The rated output specified in the selection tables is applicable for continuous duty in accordance with DIN EN 60034-1 at a frequency of 50 Hz, a coolant temperature (CT) or ambient temperature (AT) of 40 °C and a site altitude (SA) or up to 1000 m above sea level.

For higher coolant temperatures and/or site altitudes higher than 1000 m above sea level, the specified motor output must be reduced using the factor k_{HT}.

Depending on the frame size of the motor or the number of poles, special windings may be added to the motors for the different operating conditions.

This results in an admissible output of the motor of:

$P_{adm.} = P_{rated} \cdot k_{HT}$

If the admissible motor output is no longer adequate for the drive, it should be checked whether the motor with the next higher rate output fulfills the requirements.

Abbreviation	Description	Units
$P_{adm.}$	Admissible motor output	kW
P_{rated}	Rated output	kW
k_{HT}	Factor for abnormal coolant temperature and/or site altitude	

The motors are designed for temperature class 155 (F) and used in temperature class 130 (B). Under non-standard operating conditions, if they are to be used in class 130 (B), the admissible output must be determined from the tables below.
If explosion-proof motors are to be used (with the exception of 1MJ6) at coolant temperatures that exceed 40 °C and site altitudes higher than 1000 m above sea level, the appropriate correction factors must be requested.

Reduction factor k_{HT} for different site altitudes and/or coolant temperatures

Site altitude above **sea level**	Site altitude above sea level Coolant temperature					
m	<30 °C	30 °C ... 40 °C	45 °C	50 °C	55 °C	60 °C
1000	1.07	1.00	0.96	0.92	0.87	0.82
1500	1.04	0.97	0.93	0.89	0.84	0.79
2000	1.00	0.94	0.90	0.86	0.82	0.77
2500	0.96	0.90	0.86	0.83	0.78	0.74
3000	0.92	0.86	0.82	0.79	0.75	0.70
3500	0.88	0.82	0.79	0.75	0.71	0.67
4000	0.82	0.77	0.74	0.71	0.67	0.63

Coolant temperature and site altitude are rounded-off to 5 °C or 500 m.

General technical data

For the following outputs, rms values are specified for coolant temperatures (CT) of 45 °C and 50 °C that must be specified when ordering.

Power (kW)	Admissible output at 50 Hz	
	For CT 45 °C	For CT 50 °C
kW	kW	kW
11	10.5	10
15	14.5	13.8
18.5	17.8	17
22	21	20
30	29	27.5
37	35.5	34
45	43	41.5
55	53	51
75	72	69
90	86	83
110	106	101
132	127	122
145	139	133
160	153	147
180	173	166
200	192	184
250	240	230
280	269	258
315	302	290
355	340	325
400	384	368
450	432	414
500	480	460
560	538	515
630	605	580
710	682	663
800	768	736
900	864	828
1000	960	920

For details of derating for use in class 155 (F), see "DURIGNIT IR 2000" insulation system.
Motors for coolant temperatures other than 40 °C or site altitudes higher than 1000 m above sea level for use in temperature class 130 (B), must always be ordered with the supplementary order code **"–Z"** and plain text. In the case of extreme derating, the operating data for the motors will be less favourable due to partial utilization.

The following special versions are possible for 1LG4, 1LG6, 1LP4, 1PP4 and 1LA8 motors:

- Motors for coolant temperatures from –50 to +40 °C order code **D02** (not for 1LA8)
- Motors for coolant temperatures from –40 to +40 °C order code **D03**
- Motors for coolant temperatures from –30 to +40 °C order code **D04**

The following special versions are possible for 1LA8, 1PQ8 and 1LL8 motors:

- Motors for 45 °C coolant temperature, 4 % derating, order code **D11**
- Motors for 50 °C coolant temperature, 8 % derating, order code **D12**
- Motors for 55 °C coolant temperature, 13 % derating, order code **D13**
- Motors for 60 °C coolant temperature, 18 % derating, order code **D14**

For details of order codes for use in temperature class 155 (F), see "DURIGNIT IR 2000 insulation system" under "Windings and insulation".

The following applies to all motors:
The motors can withstand 1.5 times the rated current at rated voltage and frequency for two minutes (DIN EN 60034).

Ambient temperature:
All motors can be used in the standard version at ambient temperatures between –20 and +40 °C.
Motors can be used in temperature class 155 (F)

- at 40 °C with service factor 1.1, i.e. the motor can be continuously overloaded with 10 % of the rated output (for motors of 1LG6 and 1LA9 series, with the exception of 1LA9 with increased output, with service factor 1.15, i.e. 15 % of the rated output)
- above 40 °C at rated output.

When motors are used in temperature class 130 (B) for higher ambient temperatures and site altitudes, derating occurs in accordance with the table "Reduction factor k_{HT} for different site altitudes and/or coolant temperatures".
For motors ex-stock, the service factor is indicated on the rating plate.
For other temperatures, special measures are necessary.
When brakes are to be mounted on motors intended for operation at temperatures below freezing, please contact your local Siemens office.

Windings and insulation

DURIGNIT IR 2000 insulation system

The DURIGNIT IR 2000 insulation system comprises high-grade enameled wires and insulating sheet materials combined with solvent-free impregnating resin.
The system ensures a high level of mechanical and electrical strength as well as good serviceability and a long motor life.
The insulation system protects the winding against aggressive gases, vapors, dust, oil and increased air humidity. It can withstand the usual vibration stressing.
The insulation is suitable up to an absolute air humidity of 30 g water per m^3 of air. Moisture condensation should be prevented from forming on the winding. Please contact your local Siemens office if higher values are present.

Please inquire about extreme applications.

Winding and insulation design with regard to temperature class and air humidity

All motors are designed for temperature class 155 (F).
At rated output with mains-fed operation, the motors can be used in temperature class 130 (B).

Temperature class 155 (F), used according to 155 (F), with service factor (SF)
For all 1LA motors (with the exception of 1LA9 with increased output, as these are already used according to temperature class 155 (F)), 1LG, 1LL8 and 1PP motors for mains-fed operation in frame sizes 56 to 355 for the rated output given in the selection table and rated voltage, a service factor of 1.1 can be specified (for 1LA9 and 1LG6 SF = 1.15) and 1.05 for frame sizes 400 and 450.
Order code **C11**.

Temperature class 155 (F), used according to 155 (F), for increased output
For motors supplied from stock (with the exception of 1LA9 with increased output, as these are already used according to temperature class 155 (F)) and 1LA8 motors, the service factor is indicated on the rating plate as standard. For use according to temperature class 155 (F), the rated output according to the selection and ordering data can be increased by 10 % (15 % for 1LA9, with the exception of 1LA9 with increased output, and 1LG6) and by 1.05 for frame sizes 400 and 450.
Order code **C12**.

Temperature class 155 (F), used according to 155 (F), with increased coolant temperature
At the output specified in the catalog under mains-fed operation, the coolant temperature can be increased to 55 °C (50 °C for frame sizes 400 and 450) with the exception of 1LA9 with increased output.
Order code **C13**

The service factor (SF) is not indicated on the rating plate for order codes C12 and C13.
For converter-fed operation at the output specified in the catalog, the motors are used according to temperature class 155 (F). Order codes C11, C12 and C13 are not possible. This applies to motors up to 500 V and to motors up to 690 V.

Temperature class 180 (H), used according to 155 (F), with Service Factor (SF1.1)

For all 1LA8, 1PQ8 and 1LL8 motors for mains-fed operation in frame sizes 315 to 355 for the rated output given in the selection table and rated voltage, a service factor of 1.1 and 1.05 can be specified (for frame sizes 400 and 450. For use according to temperature class 180 (H), as service factor of 1.1 for mains-fed operation is also permissible.

For all 1LA8, 1PQ8 and 1LL8 motors for converter-fed operation in frame sizes 315 to 450 for the rated output given in the selection table and rated voltage, a service factor of 1.1 can be specified. The thermal service life of the motor winding increases by at least 5 times when used in converter-fed operation.

Use according to temperature class 180 (H) is not possible for all motors. All 400 V versions are available only on request. Due to the rated current, a larger connection box of type 1XB9600 is generally provided for frame sizes 400 (2 and 4 pole) and 450 (all pole numbers) – part of order code C14. The temperature class 180 (H) does not apply to motors with separately driven fan with 1PQ8.
Order code **C14**

Temperature class 155 (F), used according to 130 (B), with increased coolant temperature and/or site altitude

For standard motors, explosion-proof motors and fan motors 1LA5, 1LA6, 1LA7, 1LA9 (with the exception of 1LA9 with increased output since these are already used according to temperature class 155 (F)), 1LG4, 1LG6, 1LP4, 1MJ6, 1MJ7, 1PP4, 1PP5, and 1PP7, a version designed for temperature class 155 (F) for use according to temperature class 130 (B) can be ordered with other customized requirements with specification in plain text.
Order code **Y50**

Temperature class 155 (F), used according to 155 (F), other requirements
For 1LA5, 1LA6, 1LA7, 1LA9, 1LG4, 1LG6, 1PP4, 1PP5 and 1PP7 standard motors and fan motors as well as 1MA6 and 1MA7 explosion-proof motors, a version can be ordered designed for temperature class 155 (F), for use according to temperature class 155 (F) with different customized requirements, by specifying the information in plain text. Certification costs may be charged in the case of 1MA6 and 1MA7 motors.
Order code **Y52**

Temperature class 180 (H) at rated output and maximum coolant temperature (CT) 60 °C
For motor series 1LA5, 1LA6, 1LA7, 1LG4, 1PP4, 1PP5 and 1PP7, use according to temperature class 180 (H) is permitted at rated output and at a maximum coolant temperature of 60 °C. This does not apply to explosion-proof motors of Zones 2, 21 and 22 and to motors with UL approval (order code **D31**). Not possible for CSA approval (order code **D40**) for 1LA5, 1LG4, 1PP4 and 1PP5 motor series. The specified grease life applies to a coolant temperature of 40 °C. For a 10 K increase in coolant temperature, the grease life or lubrication interval is halved.
Order code **C18**

Temperature class 155 (F), used according to 130 (B), coolant temperature 45 °C, approx. 4 % derating
For motors of series 1LA5, 1LA6, 1LA7, 1LA9 (with the exception of 1LA9 with increased output), 1LG4, 1LG6, 1MA6, 1MA7, 1MJ6, 1MJ7, 1PP4, 1PP5, and 1PP7, a version can be ordered that is designed to temperature class 155 (F), for use according to temperature class 130 (B) at a maximum coolant temperature of 45 °C at 4 % derating.
Order code **C22**

Temperature class 155 (F), used according to 130 (B), coolant temperature 50 °C, approx. 8 % derating
For motors of series 1LA5, 1LA6, 1LA7, 1LA9 (with the exception of 1LA9 with increased output), 1LG4, 1LG6, 1MA6, 1MA7, 1MJ6, 1MJ7, 1PP4, 1PP5, and 1PP7, a version can be ordered that is designed to temperature class 155 (F), for use according to temperature class 130 (B) at a maximum coolant temperature of 50 °C at 8 % derating.
Order code **C23**

Temperature class 155 (F), used according to 130 (B), coolant temperature 55 °C, approx. 13 % derating
For motors of series 1LA5, 1LA6, 1LA7, 1LA9 (with the exception of 1LA9 with increased output), 1LG4, 1LG6, 1MA6, 1MA7, 1MJ6, 1MJ7, 1PP4, 1PP5, and 1PP7, a version can be ordered that is designed to temperature class 155 (F), for use according to temperature class 130 (B) at a maximum coolant temperature of 55 °C at 13 % derating.
Order code **C24**

Temperature class 155 (F), used according to 130 (B), coolant temperature 60 °C, approx. 18 % derating
For motors of series 1LA5, 1LA6, 1LA7, 1LA9 (with the exception of 1LA9 with increased output), 1LG4, 1LG6, 1MA6, 1MA7, 1MJ6, 1MJ7, 1PP4, 1PP5, and 1PP7, a version can be ordered designed for temperature class 155 (F), for use according to temperature class 130 (B) at a maximum coolant temperature of 60 °C at 18 % derating.
Order code **C25**

Increased air temperature/humidity with 30 to 60 g water per m^3 of air
For motors of series 1LA5, 1LA6, 1LA7, 1LA9, 1LG4, 1LG6, 1LP4, 1LP5, 1LP7, 1MA6, 1MA7, 1MJ6, 1MJ7, 1PP4, 1PP5 and 1PP7, a version can be ordered for increased air humidity of between 30 and 60 g water per m^3 of air depending on the temperature as listed in the table below. This version includes condensation drainage holes (order code L12) – with the exception of 1MJ motors. A condensation protection by means of anti-condensation heaters for 230 V (order code K45) is included in 1MJ6 and 1MJ7 motors.
Order code **C19**.
Please contact your local Siemens office if order code **C19** is to be combined with additional mountings.

Increased air temperature/humidity with more than 60 g up to 100 g water per m^3 of air
For motors of series 1LA5, 1LA6, 1LA7, 1LA9, 1LG4, 1LG6, 1LP4, 1LP5, 1LP7, 1MA6, 1MA7, 1MJ6, 1MJ7, 1PP4, 1PP5 and 1PP7, a version can be ordered for increased air humidity of between more than 60 g and 100 g water per m^3 of air depending on the temperature as listed in the table below. This version includes condensation drainage holes (order code L12) – with the exception of 1MJ motors. A condensation protection by means of anti-condensation heaters for 230 V (order code K45) is included in 1MJ6 and 1MJ7 motors.
Order code **C26**.
Please contact your local Siemens office if order code C26 is to be combined with additional mountings (e.g. rotary pulse encoders, brakes).

General technical data

Absolute/relative conversion of air humidity

Relative humidity	Temperature							
	20 °C	30 °C	40 °C	50 °C	60 °C	70 °C	80 °C	90 °C
10 %	2	3	5	8	13	20	29	42
15 %	3	5	8	12	19	30	44	63
20 %	3	6	10	17	26	39	58	84
25 %	4	8	13	21	32	49	73	105
30 %	5	9	15	25	39	59	87	126
35 %	6	11	18	29	45	69	102	146
40 %	7	12	20	33	52	79	116	167
45 %	8	14	23	37	58	89	131	188
50 %	9	15	26	41	65	98	145	209
55 %	10	17	28	46	71	108	160	230
60 %	10	19	31	50	78	118	174	251
65 %	11	20	33	54	84	128	189	272
70 %	12	21	36	58	91	138	203	293
75 %	13	23	38	62	97	148	218	314
80 %	14	24	41	66	104	157	233	335
85 %	15	26	43	70	110	167	247	356
90 %	16	27	46	74	117	177	262	377
95 %	16	29	49	79	123	187	276	398
100 %	17	30	51	83	130	197	291	419

The values in the table with a blue background are covered by the standard version (up to 30 g water per m^3 of air).

The values in the table with a light gray background are covered by order code **C19** (30 to 60 g of water per m^3 of air).

The values in the table with a dark gray background are covered by order code **C26** (60 to 100 g of water per m^3 of air).

Please contact your local Siemens office regarding requirements exceeding 100 g water per m^3 of air

Restarting against residual field and opposite phase

All motors can be reclosed against 100 % residual field after a mains voltage failure.

Motor protection

A distinction is made between current-dependent and motor-temperature-dependent protection devices.

Current-dependent protection devices

Fuses are only used to protect mains cables in the event of a short-circuit. They are not suitable for overload protection of the motor.

The motors are usually protected by delayed overload protection devices (circuit-breakers for motor protection or overload relays).
This protection is current-dependent and is particularly effective in the case of a locked rotor.

For standard duty with short start-up times and starting currents that are not excessive and for low numbers of switching operations, motor protection switches provide adequate protection. Motor protection switches are not suitable for high starting duty or large numbers of switching operations. Differences in the thermal time constants for the protection equipment and the motor results in unnecessary early tripping when the protection switch is set to rated current.

Motor-temperature-dependent protection devices

Temperature detectors installed in the motor winding are suitable protection devices in the case of slowly rising motor temperature.

When a limit temperature is reached, these **bimetal switches** (NC contacts) can deactivate an auxiliary circuit. The circuit can only be reclosed following a considerable fall in temperature. When the motor current rises quickly (e.g. with a locked rotor), these switches are not suitable due to their large thermal time constants.
Temperature detectors for tripping
Order code **A31**
The temperature monitors have the following current carrying capacity and switching capacity:
230 V AC cosφ: 2.5 A
24 V DC: 1.6 A

The most comprehensive protection against thermal overloading of the motor is provided by **PTC thermistors (thermistor motor protection)** installed in the motor winding. Due to its low heating capacity and excellent thermal contact with the winding, the winding temperature can be closely monitored.
When a limit temperature is reached (nominal tripping temperature), the PTC thermistor undergoes a step change in resistance. This is evaluated by a tripping unit and can be used to open auxiliary circuits. The PTC thermistors themselves cannot be subjected to high currents and voltages. This would result in destruction of the semiconductor. The switching hysteresis of the PTC thermistor and tripping unit is low, which supports fast restarting of the drive. Motors with this type of protection are recommended for high duty starting, switching duty, extreme changes in load, high ambient temperatures or fluctuating supply systems.

Motor protection with PTC thermistors with 3 embedded temperature sensors for tripping.
In the connection box, 2 auxiliary terminals are required. The maximum number of auxiliary terminals in the main connection box of the motor is specified under “Number of auxiliary terminals” in the section “Motor connection and connection box”. An auxiliary connection box is required when the total number of auxiliary terminals in the connection box of the motor exceeds the specified values. For an additional charge, the connections can be routed through a separate auxiliary connection box (order code L97, M50 or M88, see “Auxiliary connection box” in the section “Motor connection and connection box”).
Order code **A11**

For pole-changing motors with two separate windings, the number of temperature sensors must be doubled.

Two sets of three temperature sensors are used if a warning is required before the motor is shut down (tripped). The warning is normally set to 10 K below the tripping temperature.

Motor protection with PTC thermistors with 6 embedded temperature sensors for tripping and alarm.
In the connection box, 4 auxiliary terminals are required.
Order code **A12**

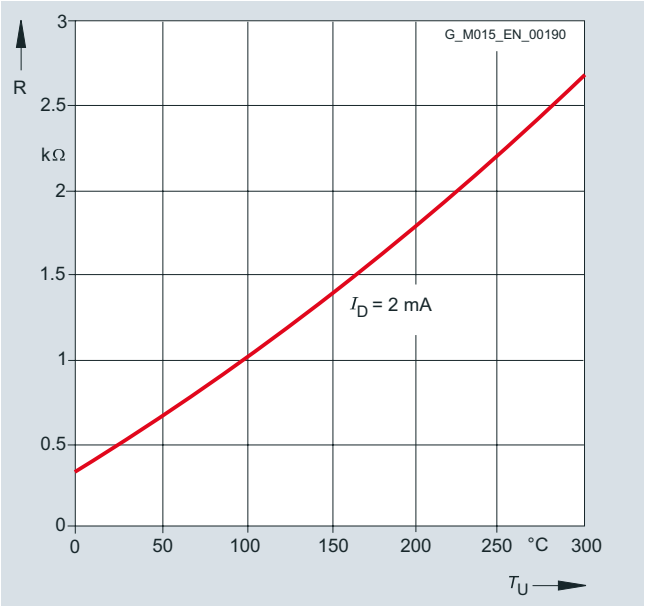
- All 1LA8 motors are equipped in the standard version with 6 PTC thermistors for alarm and tripping.
- For 1LA, 1MJ and 1LG motors, the tripping temperature corresponds to PTC thermistors for temperature class 155 (F).
- For 1LA8, 1LL and 1PQ motors, the tripping temperature corresponds to PTC thermistors for temperature class 155 (F), also for 1LA8 in Zone 22.
- For 1LA and 1LG motors for Zones 2, 21, 22 or VIK thermistors temperature class 130 (B) (see catalog part “Motors operating with frequency converters”).

In order to achieve full thermal protection it is necessary to combine a thermally delayed overcurrent release and a PTC thermistor. For full motor protection implemented only with PTC thermistors, please inquire.

Motor temperature detection with converter-fed operation

KTY 84-130 temperature sensor

This sensor is a semi-conductor that changes its resistance depending on temperature in accordance with a defined curve.



KTY 84-130 temperature sensor characteristic

Some converters from Siemens determine the motor temperature using the resistance of the temperature sensor. They can be set to a required temperature for alarm and tripping.

Motor temperature detection with embedded temperature sensor KTY 84-130.
In the connection box, 2 auxiliary terminals are required.
The maximum number of auxiliary terminals in the main connection box of the motor is specified under “Number of auxiliary terminals” in the section “Motor connection and connection box”.
An auxiliary connection box is required when the total number of auxiliary terminals in the connection box of the motor exceeds the specified values. For an additional charge, the connections can be routed through a separate auxiliary connection box (order code L97, M50 or M88, see “Auxiliary connection box” in the section “Motor connection and connection box”).
Order code **A23**
For 1LA8 motors, the standard PTC thermistors are omitted when ordering with order code **A23**. A combination of A12 and A23 is possible, price on request.

OR

Motortemperature detection with embedded temperature sensors 2 x KTY 84-130.
In the connection box, 4 auxiliary terminals are required.
Order code **A25**

The temperature sensor is embedded in the winding head of the motor in the same manner as a PTC thermistor. Evaluation is performed, for example, in the converter.

For mains-fed operation, the temperature monitoring device 3RS10 that is part of the protection equipment can be ordered separately. For further details, see Catalog LV 1,
Order No.: E86060-K1002-A101-A7-7600.

Motor protection

1LA and 1LG motors for Zones 2, 21 and 22 for converter-fed operation already have a PTC thermistor for tripping as standard.
For converter-fed operation, a PTC thermistor for alarm can be ordered additionally.
PTC thermistor for alarm for converter-fed operation in Zones 2, 21 and 22.
In the connection box, 2 auxiliary terminals are required.
Order code **A10**

1MJ motors:
PTC thermistors must always be used if the duty is not S1 (continuous operation) in accordance with IEC 60034-1/ DIN EN 60034-1.
If 1MJ motors are operated with converters, the PTC thermistor in the winding is essential. For 1MJ6/1MJ7 motors, an additional PTC thermistor is installed in the connection box.

Motor protection with PTC thermistors for converter-fed operation with 3 or 4 embedded temperature sensors for tripping.
In the connection box, 2 auxiliary terminals are required.
Order code **A15**.

or

Motor protection with PTC thermistors for converter-fed operation with 6 or 8 embedded temperature sensors for alarm and tripping.
In the connection box, 4 auxiliary terminals are required.
Order code **A16**.

For versions with temperature sensors, in some cases, anti-condensation heaters cannot be mounted or can only be mounted for certain frame sizes. See “Special versions” in the corresponding catalog parts.

If thermistor protection is required, 3 PTC thermistors connected in series are embedded in the stator winding of the motor.
The 3RN1 temperature monitoring device that is part of the protection equipment must be ordered separately – it is PTB certified. For further details about mode of operation, circuit and prices, see Catalog LV 1,
Order No.: E86060-K1002-A101-A7-7600.

General technical data

Motor temperature detection with resistance thermometers

The resistance thermometers are embedded in the stator winding or in the rolling contact bearings or bearing plates of the motors. The following possibilities can be implemented:

Stator winding:
3 or 6 PT 100 resistance thermometers are embedded in the stator winding in 2-wire connection. The two connections for each resistance thermometer are routed through the main connection box. In the connection box, 6 or 12 auxiliary terminals are required. The maximum number of auxiliary terminals in the main connection box of the motor is specified under “Number of auxiliary terminals” in the section “Motor connection and connection box”. An auxiliary connection box is required when the total number of auxiliary terminals in the connection box of the motor exceeds the specified values.
For an additional charge, the connections can be routed through a separate auxiliary connection box (order code L97, M50 or M88, see “Auxiliary connection box” in the section “Motor connection and connection box”); 3-wire or 4-wire connection (from the terminal strip) is also possible (please inquire).
The resistance thermometer embedded in the winding head is calbrated to 100 Ω at 0 °C. The base values for the resistances (i.e. the relationship between the resistance and temperature) as well as the admissible deviations are laid down in DIN IEC 751. The changes in temperature are transferred to a display device in the form of changes in resistance.
The display devices are not included in the price and are not included in the delivery package.

Installation of 3 PT 100 resistance thermometers in stator winding.
In the connection box, 6 auxiliary terminals are required.
Order code **A60**

Installation of 6 PT100 resistance thermometers in stator winding.
In the connection box, 12 auxiliary terminals are required.
Order code **A61**
Note regarding non-standard 1LA8 motors: When A61 is ordered, the PTC thermistors installed as standard in the motor are omitted. A combination of A12 and A61 is possible, price on request.

Rolling contact bearings or bearing plates:
The bearing thermometers are screwed into the bearing plates of the drive end (DE) and non-drive-end (NDE). The wires are routed through the main connection box.
In the connection box, auxiliary terminals are required. The maximum number of auxiliary terminals in the main connection box of the motor is specified under “Number of auxiliary terminals” in the section “Motor connection and connection box”. An auxiliary connection box is required when the total number of auxiliary terminals in the connection box of the motor exceeds the specified values.

For an additional charge, the connections can be routed through a separate auxiliary terminal box (order code L97, M50 or M88, see “Auxiliary connection box” in the section “Motor connection and connection box”). The changes in temperature are transferred to a display device in the form of changes in resistance. The display device is not included in the price and is not included in the delivery package.

Installation of 2 PT 100 screw-in resistance thermometers (basic circuit) for rolling-contact bearings.
In the connection box, 4 auxiliary terminals are required.
Order code **A72**

Installation of 2 PT 100 screw-in resistance thermometers (3-wire circuit) for rolling-contact bearings.
In the connection box, 6 auxiliary terminals are required.
Order code **A78**

Installation of 2 PT 100 double screw-in resistance thermometers (3-wire circuit) for rolling-contact bearings.
In the connection box, 12 auxiliary terminals are required.
Order code **A80**

Heating and ventilation

Anti-condensation heaters

Supply voltage 230 V (1~)
Order code **K45**
or
Order code **M15**

Supply voltage 115 V (1~)
Order code **K46**
or
Order code **M14**

Motors whose windings are at risk of condensation due to the climatic conditions, e.g. inactive motors in humid atmospheres or motors that are subjected to widely fluctuating temperatures can be equipped with anti-condensation heaters.
An additional cable entry M16 x 1.5 or M20 x 1.5 (M20 x 1.5 or M25 x 1.5 for 1LA8, 1PQ8 and 1LL8 motor series) is provided for the connecting cable.
Anti-condensation heaters must not be switched on during operation.

1MJ6 motors:
For 1MJ6 motors up to frame size 160 L, a built-in anti-condensation heater is not possible for versions with PTC thermistors.

For 1MA and 1LA motors. In designs for Zone 21:
Built-in anti-condensation heaters are not possible up to frame size 200L.

For 1LA8 and 1PQ8 motor series in designs for Zone 2, the anti-condensation heater can only be switched on after the motor has been switched off for one hour.

Instead of an anti-condensation heater, another possibility (without additional charge) is connection of a voltage that is approximately 4 to 10 % of the rated motor voltage to stator terminals U1 and V1; 20 to 30 % of rated motor current is sufficient to heat the motor (this does not apply to 1MA6 frame sizes 225 M to 315 L, 1LA8, 1PQ8 and 1LL8).

Motor series	Frame size	Heater output of the anti-condensation heaters in Watt (W) Supply voltage at 230 V Order code **K45**	115 V Order code **K46**
1LA5, 1LP5, 1PP5, 1LA6, 1LA7, 1LP7, 1PP7, 1LA9, 1MJ6	56 ... 80	25	25
	90 ... 112	50	50
	132 ... 200	100	100
	225	100	100
1LG4, 1LP4, 1PP4, 1LG6, 1MA6, 1MJ7	180 ... 200	55	55
	225 ... 250	92	92
1LG4, 1LG6 in designs for Zone 2	180 ... 200	48	48
	225 ... 250	92	92
	280 ... 315	105	105
1MA6	280 ... 315	105	105
1LG4, 1LP4, 1PP4, 1LG6, 1MJ7	280 ... 315	109	109
1LA8, 1PQ8, 1LL8	315 ... 450	200	183

Fans/Separately driven fans

Motors of frame sizes 63 to 450 have radial-flow fans in the standard version that cool regardless of the direction of rotation of the motor (cooling method IC 411 acc. to DIN EN 60034-6, IC01 for 1LL8 motor series). The air flow is forced from the non-drive-end (NDE) to the drive end (DE).
Motors of frame size 56 do not have a fan (IC 410).
For details of separately driven fans for frame sizes 100 to 315, see also Page 0/76.

1LA8 and 1LL8 (frame size 355 and above) 2-pole motors have an axial-flow fan for clockwise rotation in the standard version. The fan can be subsequently reinstalled for counter-clockwise rotation.
Motors of the 1LA8 series are also available in a version with a separately driven fan (cooling method IC 416 – 1PQ8 series) and in a version with through-ventilation (cooling method IC 01, IP23 degree of protection – 1LL8 series).
1PQ8 motors have separately driven fans that cool regardless of the speed of the main motor (IC416).

Supply voltages for 1PQ8 separately driven fans:
230 VΔ/400 VY ±10 %, 50 Hz, 460 VΔ ±10 %, 60 Hz.
Other voltages/frequencies can be ordered by specifying in plain text with order code **Y81** (additional charge).

Supply voltage of separately driven fan for 1LG motors:
The supply voltage of the separately driven fan conforms to the stated rated voltage ranges of table "Technical data of the separately driven fan", see Page 0/76. Deviating voltages/frequencies can be ordered with order code Y81 and plain text (additional charge).

When the motor is mounted and the air intake is restricted, then it must be ensured that a minimum clearance is maintained between the fan cover and the wall. This clearance is calculated from the difference between the protective cover and the fan cover (dimension LM – L) or is specified in the detail dimension drawing.

For design of the fan/separately driven fan and the fan cover, see the tables below.

Metal external fan impeller

The standard fan impeller made of plastic can be replaced with a fan impeller made of metal. This version can be supplied for motor series 1LA5, 1LA6, 1LA7, 1LA8, 1LA9, 1LG4, 1LG6, 1MA6, 1MA7, 1MJ6, 1MJ7 and 1LL8.
For motor series 1LA5, 1LA6, 1LA7, 1LA9, 1LG4 and 1LG6, the metal external fan can also be used with converter-fed operation.
A metal external fan is already included for the low-noise version.
Up to frame size 160, the metal external fan impeller is manufactured from sheet aluminum or steel and for frame size 180 and above it is manufactured from cast iron or sheet steel.
Order codes **K35**

Fan cover for textile industry

For motors 1LG4 and 1LG6, the fan cover can be used in the standard version for the textile industry.
For motor series 1LA5, 1LA6, 1LA7 and 1LA9, a version of the fan cover can be supplied specially for the textile industry. This has a protective cover and is made of non-corrosive sheet steel.
Order code **H17**

Cast-iron fan cover

For 1MA6 motor series, frame sizes 225 to 315, the fan cover can be supplied in cast-iron instead of plastic.
Order code **K34**

Sheet metal fan cover

For 1LG4 and 1LG6 motor series, the fan cover can be supplied in sheet metal instead of plastic.
Order code **L36**
For 1LA8, 1PQ8 and 1LL8 motor series, the sheet-metal fan cover is supplied as standard.

Design of fan and fan cover for standard motors, explosion-proof motors, motors operating with frequency converters, fan motors and smoke extraction motors:

Motor series	Frame size	Fan material [1]	Fan cover material [1]
1LA5, 1LA7	63 ... 225	Plastic	Non-corrosive sheet steel
1LA9	63 ... 200		
1LA6	100 ... 160		
1MA7	63 ... 160		
1MA6	100 ... 315		
1MJ6	71 ... 200		
1MJ7	255 ... 315		
1LG4, 1LG6	180 ... 315	Plastic	Glass fiber strengthened plastic [2]

Design of the fan/separately driven fan and the fan cover for non-standard motors

Motor series	Frame size	Fan material [3]		Fan cover material
		Number of poles	Number of poles	
		2	4 ... 8	
1LA8, 1LL8	315	Radial-flow fan, plastic	Radial-flow fan, plastic	Non-corrosive sheet steel
1PQ8		Radial-flow fan, sheet steel	Radial-flow fan, sheet steel	
1LA8, 1LL8	355 ... 400	Axial-flow fan, cast aluminum	Radial-flow fan, plastic	
1PQ8		Radial-flow fan, sheet steel	Radial-flow fan, sheet steel	
1LA8, 1LL8	450	Axial-flow fan, hub: cast aluminum, vane: plastic	Radial-flow fan, plastic	
1PQ8		Radial-flow fan, sheet steel	Radial-flow fan, sheet steel	

[1] The plastic fan can be used at ambient temperatures of up to 70 °C. For designs for Zones 21 and 22 and VIK, other materials are used in some cases.

[2] For designs:
for Zones 2, 21 and 22 VIK (order code **K30**),
CSA (order code **D40**)
UL (order code **D31**)
a fan cover is used that is made of non-corrosive sheet steel.

[3] The plastic fan can be used at ambient temperatures of up to 70 °C. For designs for Zones 21 and 22, VIK and UL, other materials are used in some cases.

General technical data

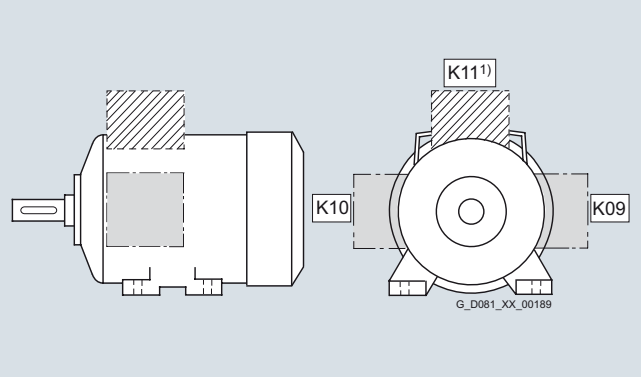
Motor connection and connection box

Connection, circuit and connection box

Location of the connection box

The connection box of the motor can be mounted in four different locations or positions. The position of the connection box must always be viewed from the drive end (DE). The standard position of the connection box is on top, with the exception of non-standard motors in which case the standard position of the connection box is on the right-hand side.
Connection box on right-hand side – Order code **K09**
Connection box on left-hand side – Order code **K10**

If rotation of the connection box is possible later for motors that are supplied as standard with cast feet, the version "Connection box on top, feet screwed on" is recommended.
Order code **K11**



The number of winding ends depends on the winding design. Three-phase motors are connected to the three phase conductors L1, L2 and L3 of a three-phase system. The rated voltage of the motor in the running connection must match the phase conductor voltages of the network.

When the three phases are operating in a time sequence and are connected to the terminals of the motor in alphabetical order U1, V1 and W1, clockwise rotation is established as viewed from the motor shaft. The direction of rotation of the motor can be reversed if two connecting leads are interchanged.

Labeled terminals are provided to connect the protective conductor.
A protective earth terminal is provided in the connection box for earthing. An earth terminal is located on the outside of the motor housing (special version in the case of 1LA5, 1LA6, 1LA7 and 1LA9 motors. Order code **L13**).

If a brake control system or thermal protection is installed, the connections will also be in the connection box.
The motors are suitable for direct connection to the line supply.

Design of the connection box

Connection boxes for motors to Exn (Zone 2) type of protection and for protection against dust explosions (Zone 21) differ from the basic version. For dust explosion protection (Zone 22), the connection boxes of the basic version are used.

For 1LG4 and 1LG6 motors, frame sizes 180 to 225 and 1MA6 motors frame sizes 180 to 200, 1MJ6 frame sizes 71 to 160 M and frame sizes 180 to 200 L, a connection box is available in cast iron.
Order code **K15**
For 1LA6 and 1MA6 frame size 100 – 160, 1MJ6 frame size 160 L and 1MJ7, 1MA6 frame size 225 – 315 standard version.
Not possible for 1LA7 and 1MA7.

For 1MJ motors:
The connection boxes are designed to Ex e type of protection. The ends of the windings for motors up to frame size 160 are routed through a shared explosion-proof leadthrough into the connection box; for frame size 180 and above, they are routed through single leadthroughs.

For 1MJ motors, an explosion-proof connection box with Ex d II C type of protection is available.
Order code **K53**

For motor series 1LA8, 1PQ8 and 1LL8, the ends of the windings are routed through single leadthroughs into the connection box.

The number of terminals and the size of the connection box is designed for standard requirements. For special requirements or if the customer requires a larger connection box, the connection box for the next larger frame size can be supplied.

For all motors except for non-standard motors and 1MJ motors:
Next larger connection box (only frame size 180 and above)
Order code **L00**
Detailed assignment of connection boxes, see Page 0/43 and 0/46.

For non-standard motors (motor series 1LA8, 1PQ8 and 1LL8)
Next larger 1XB1 621 connection box
Order code **M58**
Next larger 1XB1 631 connection box
Order code **L00**
Detailed assignment of connection boxes, see Page 0/43 and 0/44.

If the necessary installation angle of the motor would cause machine components to collide with the connection box, the connection box can be moved from the drive end (DE) to the non-drive end (NDE).
Order code **M64**
Not possible for explosion-proof motors.

Motor connection

Line feeder cables
The line feeder cables must be dimensioned acc. to DIN VDE 0298. The number of required feeder cables, if necessary in parallel, is defined by:

- The max. cable cross-section which can be connected
- The cable type
- Routing
- Ambient temperature and the corresponding admissible current in accordance with DIN VDE 0298

Parallel feeders

Some motors must be fitted with parallel feeders due to the admissible current per terminal. These motors are indicated in the selection and ordering data in the respective catalog parts. With 1XB7 connection boxes, 2 parallel feeders are possible; with 1XB1 631 connection boxes, up to 4 parallel feeders are possible; and with GT640 and 1XB1 621 connection boxes, 2 parallel feeders are possible.

For motors with an upper connection box section and auxiliary terminals (e.g. with order code **A11**), an M16 x 1.5 or M20 x 1.5 cable gland with plug is additionally available.

For further details, see the data sheet function in SD configurator.

1) Possible for frame size IM B3, IM B6, IM B7, IM B8, IM V6 with/without protective cover, IM B35.

1LA7 and 1LA9 in frame size 100 L to 160 L

The connection box is integrated into the frame. Two knock-outs are provided at each side for boltings. The nuts for the boltings are supplied with the connection box.

Cable entry on connection box

Unless stated otherwise, the cable entry is located in the standard position as shown in the illustration below.

The connection box can also be rotated such that the cable entry is located

- Towards the drive end (DE)
  (rotation of connection box by 90°, entry from DE)
  Order code **K83**
- Towards the non-drive end (NDE)
  (rotation of connection box by 90°, entry from NDE)
  Order code **K84**

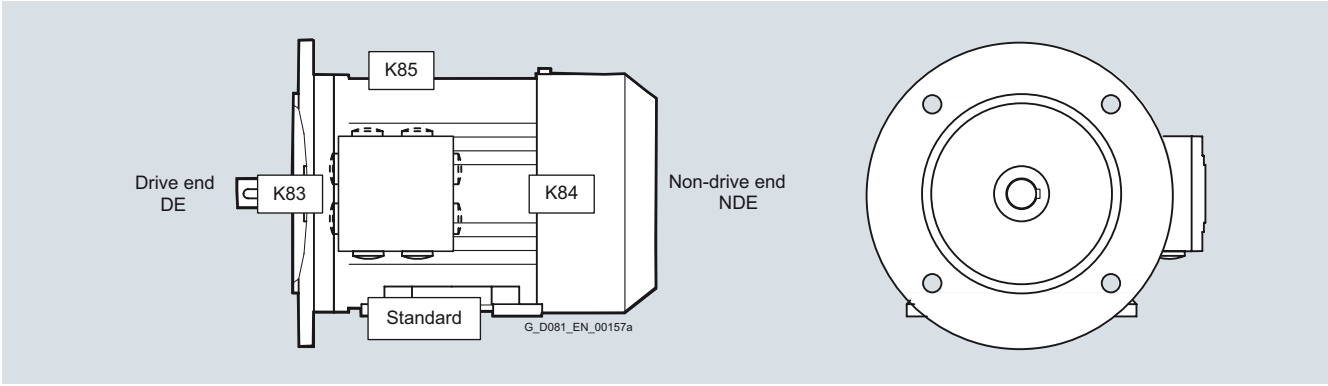
With options **K83** and **K84**, 1LA7 motors of frame sizes 100 to 160 require an additional connection box upper section. This measure results in increased height of the connection box. The dimension AD increases by approx. 30 mm, dimension AF changes depending on the frame size by between 45 and 47 mm. For the precise values of AD and AF, see “Dimension drawings” in the corresponding catalog parts.

If the cable entry is rotated by 180°, special measures are required for 1LA7 and 1LA5 motors of frame sizes 63 to 90 as well as 180 to 225 (without a change in dimensions). (Rotation of the connection box by 180°)
Order code **K85**

From frame size 100 to 160, the break-outs in the connection box can be used.
The dimensions of the connection box are listed in the relevant catalog parts in accordance with the frame size and the “Dimension drawings”.

If the position of the connection box (connection box RHS, LHS or above) is changed, the position of the cable entry must be checked and, if necessary, it can be ordered with the corresponding order codes (**K83**; **K84**; **K85**).

Ordering example
Connection box RHS (Order code **K09**):
If no other order code is specified, cable entry is from below.
With additional order code **K83**:
Cable entry from drive end (DE)



For cable entry to a standard connection box, a **cable gland** can be ordered for motor connection.
One cable gland, metal
Order code **K54**

For cable entry to a connection box with the options of motor protection or anti-condensation heating, **two cable glands** will be supplied.
Cable glands are supplied in metal as standard. For temperatures below –30 °C and/or higher than +60 °C, the material is selected/used according to the temperature.
Cable gland, maximum configuration
Order code **K55**

For non-standard motors (motor series 1LA8, 1PQ8 and 1LL8), the cable entry can be implemented in accordance with DIN 89280 for the maximum possible configuration of cable glands in the connection box.
Order code **K57**

A two-part plate on the connection box can be supplied if required.
Order code **K06**

General technical data

For special requirements for which the standard holes for the cable entries are inadequate, too large or when the routing must be implemented differently, an undrilled entry plate can be supplied to allow holes to be drilled as required on assembly.
Order code **L01**

Protruding cable ends

For confined spaces, protruding cable ends can be ordered, without a connection box with cover plate.

For protruding cable ends for smoke extraction motors, see catalog part 9 “Smoke extraction motors”.

The following lengths of protruding cables can already be ordered using order codes on request:

- 3 cables protruding, 0.5 m long [1]
  Order code **L44**
- 3 cables protruding, 1.5 m long [1]
  Order code **L45**
- 6 cables protruding, 0.5 m long
  Order code **L47**
- 6 cables protruding, 1.5 m long
  Order code **L48**
- 6 cables protruding, 3.0 m long
  Order code **L49**

The cross-section of the named cables refers to a coolant temperature up to CT 40 °C

It is also possible to rotate the position of the three protruding cables:

- Cable connection on right side, as viewed from drive end (DE) [2]
  Order code **L51**
- Cable connection on left side, as viewed from non-drive end (NDE) [2]
  Order code **L52**

For 1LG4/1LG6/1LP4/1PP4 motors, it is also possible to order the length of protruding cable in plian text with order codes **L51** and **L52**.

In combination with winding monitoring (order code **A11, A12, A15, A16, A23, A25 or A31**) or anti-condensation heating (order code **K45** or **K46**), option **L44, L45, L47, L48** or **L49** must be specified twice on ordering.

Position of protruding cables

Motor series 1LA7
Frame sizes 56 to 160:
As standard, above at drive end (DE).

Motor series 1LA6
Frame sizes 100 to 160:
As standard, above at drive end (DE).

Motor series 1LA5
Frame sizes 180 to 225:
As standard, above at drive end (DE).

Motor series 1LA9
Frame sizes 56 to 200:
As standard, above at drive end (DE).

Motor series 1LG4/1LG6/1LP4/1PP4
Frame sizes 180 to 315:
As standard, above at drive end (DE).
Optionally left or right at drive end (DE)

[1] With only 3 protruding cables additional plain text specifying star or delta connection is required.

[2] For motor series 1LA5, 1LA6, 1LA7, 1PP5 and 1PP6 only possible for smoke-extraction motors.

Connection, circuit and connection box

Type gk 030

Type gk 127

Type gk 130, gk 230, gk 330
(not for 1LA5, 1LG4, 1LG6)

Type gk 330 (for 1LA5, 1LG4, 1LG6)

Type gk 135, gk 235, gk 335

Type gk 430, gk 431

Type 1XB7 222

Type gt 520, gt 540, gt 620, gt 640

Type 1XB7 422, 1XB7 522

Type 1XB7 622

Type 1XB1 621

Type 1XB1 631

General technical data

Type gk 465

Type 1XC1 270, 1XC1 380

Type 1XC1 480, 1XC1 580

Type 1XB7 322

Connection boxes for 1LA, 1LG, 1LP and 1PP motors

Motors	Frame size	Number of cable entries	Connection box material	Feeder connection
1LA7, 1LA9 **1LP7, 1PP7**	56 ... 71	2 cable glands incl. Plugs	Aluminum alloy	Without cable lug or with cable lug
	80 ... 90			
	100 ... 160	2 holes 180° apart, 4 break-out openings sealed with cast iron skin (2 left, 2 right), connection box is moulded		
1LA5, 1LA9 **1LP5, 1PP5**	180 ... 225	2 holes with plugs		
1LA6	100 ... 160		Cast iron	
1LG4, 1LG6 **1LP4, 1PP4, 1PP6**	180 ... 200		Aluminum alloy [1]	Without cable lug
	225			With cable lug
	250 ... 315		Cast iron	
1LA8, 1PQ8, 1LL8	315 ... 355 [2] [3]			
	400 ... 450	4 holes with plugs		

Possible positions of connection boxes for 1LA, 1LG, 1LP and 1PP motors

Motors	Frame size	Connection box position			Rotation of connection box		
		top	Side, right or left	Retrofitting possible	90° [4]	180° [4]	Retrofitting possible
1LA5, 1LA7, 1LA9	56 ... 71	○	–	–	○	○	Yes
1LP5, 1LP7 **1PP5, 1PP7**	80 ... 90	○	○	–	○	○	Yes
	100 ... 160	○	○	–	– [5]	○	Yes
	180 ... 225	○	○	–	○	○	Yes
1LA6	100 ... 160	○	○	–	○	○	Yes
1LG4, 1LG6 **1LP4, 1PP4, 1PP6**	180 ... 315	○	○	– [6]	○	○	Yes
1LA8	315	○	○ [2]	–	○	○	–
	355	○	○ [2]	–	○	○	–
	400, 450	○	○ [2]	–	○	○	–

○ Available version

For further details of 1LA8 motors, see “Dimensions”, “1LA8”.

1) Connection box in cast-iron version **K15**.
2) 15° to the vertical in each case
3) Frame sizes 357-2 and 357-4 as for frame sizes 400 and 450
4) The position of the cable entry must be specified when ordering.
5) Design for 1LA7 motors available on request.
6) Retrofittable with screwed on feet (order codes **K09**, **K10** and **K11**).

Connection boxes for 1LA, 1LG, 1LL, 1LP, 1PP and 1PQ motors in standard version and for Zone 22

See the next section of the catalog for connection boxes for 1LA8, 1PQ8 and 1LL8.

Frame size	Connection box	Number of terminals	Contact screw thread	Max. conductor size	Sealing range	Cable entry [1) 2)]	Cable entry for CSA version order code **D40** [3)]
	Type			mm^2	mm	Size	Size
1LA5, 1LA7, 1LA9, 1LP5, 1LP7, 1PP5 and 1PP7							
56	gk 030	6	M4	1.5	9 ... 17	M25 x 1.5	NPT 1/2"
63	(gk 127) [4)]			(2.5 with cable lug)	4.5 ... 10	M16 x 1.5	
71							
80							
90							
100	gk 130	6	M4	4	11 ... 21	2 x M32 x 1.5	NPT 3/4"
112							
132	gk 230	6	M4	6	11 ... 21	2 x M32 x 1.5	NPT 3/4"
160	gk 330	6	M5	16	19 ... 28	2 x M40 x 1.5	NPT 1"
180							NPT 1 1/2'
200	gk 430	6	M6	25	27 ... 35	2 x M50 x 1.5	NPT 2"
225	gk 431	6	M8	35	27 ... 35	2 x M50 x 1.5	
1LA6							
100	gk 135	6	M4	4	11 ... 21	2 x M32 x 1.5	NPT 1/2"
112							
132	gk 235	6	M4	6	11 ... 21	2 x M32 x 1.5	NPT 3/4"
160	gk 335	6	M5	16	19 ... 28	2 x M40 x 1.5	NPT 1"
1LG4, 1LG6, 1LP4, 1PP4 and 1PP6							
180	gk 330	6	M5	16	19 ... 28	M40 x 1.5	M40 x 1.5 [13)]
200	gk 430	6	M6	25	27 ... 35	M50 x 1.5	M50 x 1.5 [13)]
225	gk 431	6	M8	35	27 ... 35	M50 x 1.5	M50 x 1.5 [13)]
250	gt 520	6	M10	120	34 ... 42	M63 x 1.5	M63 x 1.5 [13)]
280							
315	gt 620	6	M12	240 [5)]	38 ... 45	M63 x 1.5	M63 x 1.5 [13)]

The connection box table does not apply to pole-changing motors with three speeds.
A two-part plate can be supplied. Order code **K06**. For frame size 250 M and above, with strain relief.

Connection boxes for 1LA8 and 1PQ8 motors in standard version

Mains-fed operation

Frame size	Connection box	Number of terminals	Contact screw thread	Max. rec. conductor cross-section	Outer cable diameter (sealing range)	Cable entry [6)]	Cable gland option **K57** [7)]	Auxiliary lead		Two-part plate option **K06**		
								Outer cable diameter	Cable entry	Admissible outer cable diameter	Cable entry	Auxiliary lead outer cable diameter
	Type			mm^2	mm	Size	Size	mm	Size	mm	Size	mm
1LA8 . . . 1PQ8 . . .												
. . . . 315 **. . . . 317**	gt 640 [8) 9) 11)]	6	M12	185	41.0 ... 56.5	2 x M72x2 + 2 x M20x1.5	2 x M72x2	7 ... 13	2 x M20x1.5	–	–	–
. . . . 353 **. . . . 355** **. . . . 357-6** **. . . . 357-8**	1XB1 621 [8) 10)]	6	M16	240	56.0 ... 68.5	2 x M80x2 + 2 x M25x1.5	2 x M80x2	11.5 ... 15.5	2 x M25x1.5	40 ... 70	2 x D80 + 2 x M25x1.5	11.5 ... 15.5
. . . . 357-2	1XB1 631 [10)]	12	M16	240	56.0 ... 68.5	4 x M80x2 + 2 x M25x1.5	4x M80x2	11.5 ... 15.5	2 x M25x1.5	40 ... 75	4 x D80 + 2 x M25x1.5	11.5 ... 15.5
. . . . 357-4 **. . . . 40 .** **. . . . 45 .**	1XB1 631 [12)]											

1) Designed for cable glands with O-ring.

2) For 1LA7 motors frame sizes 100 to 160, speed nuts are enclosed for the cable glands.

3) Not possible for motors in Zone 22.

4) (gk 127) For frame sizes 63 to 90, with additional installation of several temperature sensors, order code **A12**, terminal strip for main and auxiliary terminals order code **M69** or a brake, a larger connection box will be necessary. The specified values do not change. The gk 127 is standard for Zone 22.

5) With cable cross-sections ≥240 mm^2, it is recommended that the next larger connection box is used (order code **L00**). Alternatively, order a two-part plate (order code **K06**).

6) Others available on request.

7) With option **K57**, the cable glands can be supplied.

8) With option **L00**, the motor can be supplied with the 1XB1 631 connection box (recommended for cable cross-sections ≥240 mm^2).

9) Cable entry without removable plate, cable entry in connection box casing.

10) Cable entry with removable plate or supports.

11) With option **M58**, the motor can be supplied with the 1XB1 621 connection box (recommended for cable cross-sections >185 mm^2).

12) With option **K11** connection box on top the 1XB1 634 connection box will be supplied.

13) NPT-thread can be ordered with order code **Y61**.

General technical data

Converter-fed operation

Frame size	Connection box	Number of terminals	Contact screw thread	Max. rec. conductor cross-section	Outer cable diameter (sealing range)	Cable entry [1]	Cable gland option **K57** [2]	Auxiliary lead Outer cable diameter	Cable gland option **K57** [2]
	Type			mm^2	mm	Size	Size	mm	Size
1LA8 . . . 1PQ8 . . .									
. . . . 315 317	gt 640 [3] [4] [6]	6	M12	185	41.0 ... 56.5	2 x M72x2 + 2 x M20x1.5	2 x M72x2	9 ... 13	2 x M20x1.5
. . . . 353 . . . . 355 . . . . 357-6 357-8	1XB1 621 [3] [5]	6	M16	240	56.0 ... 68.5	2 x M80x2 + 2 x M25x1.5	2 x M80x2	11 ... 16	2 x M25x1.5
. . . . 357-2 . . . . 357-4 . . . . 40 . . . . . 45 .	1XB1 631 [5] [7]	12	M16	240	56.0 ... 68.5	4 x M80x2 + 2 x M25x1.5	4 x M80x2	11 ... 16	2 x M25x1.5

Connection boxes for 1LL8 motors in standard version

Mains-fed operation

Frame size	Connection box	Number of terminals	Contact screw thread	Max. rec. conductor cross-section	Outer cable diameter (sealing range)	Cable entry [1]	Cable gland option **K57** [8]	Auxiliary lead Outer cable diameter	Auxiliary lead Cable gland option **K57** [8]	Two-part plate option **K06** Admissible outer cable diameter	Two-part plate option **K06** Cable entry	Two-part plate option **K06** Auxiliary lead outer cable diameter
	Type			mm^2	mm	Size	Size	mm	Size	mm	Size	mm
1LL8 . . .												
. . . . 31 .	1XB1 621 [9] [5]	6	M16	240	56.0 ... 68.5	2 x M80x2 + 2 x M25x1.5	2 x M80x2	11.5 ... 15.5	2 x M25x1.5	40 ... 70	2 x D80 + 2 x M25x1.5	11.5 ... 15.5
. . . . 35 .	1XB1 631 [5]	12	M16	240	56.0 ... 68.5	4 x M80x2 + 2 x M25x1.5	4 x M80x2	11.5 ... 15.5	2 x M25x1.5	40 ... 75	4 x D80 + 2 x M25x1.5	11.5 ... 15.5
. . . . 40 . . . . . 45 .	1XB1 631 [7]											

Converter-fed operation

Frame size	Connection box	Number of terminals	Contact screw thread	Max. rec. conductor cross-section	Outer cable diameter (sealing range)	Cable entry [1]	Cable gland option **K57** [2]	Auxiliary lead Outer cable diameter	Cable gland option **K57** [2]
	Type			mm^2	mm	Size	Size	mm	Size
1LL8 . . .									
. . . . 31.	1XB1 621 [9] [5]	6	M16	240	56.0 ... 68.5	2 x M80x2 + 2 x M25x1.5	2 x M80x2	11 ... 16	2 x M25x1.5
. . . . 35 .	1XB1 631 [5]	12	M16	240	56.0 ... 68.5	4 x M80x2 + 2 x M25x1.5	4 x M80x2	11 ... 16	2 x M25x1.5
. . . . 40 . . . . . 45 .	1XB1 631 [7]								

1) Others available on request.

2) Shielded cable (EMC); with option **K57**, the cable glands can be supplied.

3) With option **L00**, the motor can be supplied with the 1XB1 631 connection box (recommended for cable cross-sections ≥240 mm^2).

4) Cable entry without removable plate, cable entry in connection box casing.

5) Cable entry with removable plate or supports.

6) With option **M58**, the motor can be supplied with the 1XB1 621 connection box (recommended for cable cross-sections >185 mm^2).

7) With option **K11** connection box on top the 1XB1 634 connection box will be supplied.

8) With option **K57**, the cable glands can be supplied.

9) With option **L00**, the motor can be supplied with the 1XB1 631 connection box.

Connection boxes for 1MA6 and 1MA7 explosion-proof motors and for 1LA6/7/9 and 1LG4/6 motors in Ex n version or for Zone 2 and Zone 21

Motors	Frame size	Number of cable entries	Connection box material	Feeder connection
1MA7, 1LA7, 1LA9	56 [1] ... 90	2 holes incl. 1 certified cable gland with sealing washer and 1 certified plug	Aluminum alloy	Without cable lug [2] or with cable lug
	100 ... 160	4 holes incl. 1 certified cable gland with sealing washer and 3 certified plugs		
1MA6, 1LA6	100 ... 160	2 holes incl. 1 certified cable gland with sealing washer and 1 certified plug	Cast iron	
1MA6, 1LA9	180 ... 200	2 holes incl. 1 certified cable gland with sealing washer and 1 certified plug	Aluminum alloy	
	225	2 holes with 2 certified cable glands with sealing washer	Cast iron	
	250 ... 315			
1LG4, 1LG6	180 ... 225	2 holes incl. 1 certified cable gland with sealing washer and 1 certified plug	Aluminum alloy	
	250 ... 315	2 holes with 2 certified cable glands with sealing washer	Cast iron	

Connection boxes for 1LA8 and 1PQ8 explosion-proof motors in Ex n version or for Zone 2 and Zone 22

Motors	Frame size	Number of cable entries	Connection box material	Feeder connection
1LA8, 1PQ8	315, 355 [3] [4]	Undrilled cable entry	Cast iron	With cable lug
	400, 450			

Connection boxes for 1LA8 and 1PQ8 explosion-proof motors in Ex n version or for Zone 2 and Zone 22

Frame size	Connection box	Number of terminals	Contact screw thread	Recommended max. conductor cross-section	Cable entry [5]	Two-part plate option **K06**		
						Max. outer cable diameter	Cable entry	Auxiliary lead outer cable diameter
	Type			mm^2	Size	mm	Size	mm
1LA8 . . . 1PQ8 . . .								
. . . . 315 317	1XB1 621 [6] [7]	6	M16	240	Undrilled cable entry	40 ... 70	2 x D80 + 2 x M25x1.5	11.5 ... 15.5
. . . . 353 . . . . 355 . . . . 357-6 357-8	1XB1 621 [6] [8]	6	M16	240	Undrilled cable entry	40 ... 70	2 x D80 + 2 x M25x1.5	11.5 ... 15.5
. . . . 357-2 . . . . 357-4 . . . . 40 . . . . . 45 .	1XB1 631 [8]	12	M16	240	Undrilled cable entry	40 ... 75	4 x D80 + 2 x M25x1.5	11.5 ... 15.5

Possible positions of connection boxes for 1MA6 and 1MA7 explosion-proof motors and for 1LA6 and 1LA7 motors in Ex n version or for Zone 2 and Zone 21

Motors	Frame size	Connection box position			Rotation of connection box		
		Above	Side, right or left	Retrofitting possible	90° [9]	180° [9]	Retrofitting possible
1MA7 and 1LA7 in Zones 2, 21	56 [10] ... 71	O	–	–	O	O	Yes
	80 ... 90	O	O	–	O	O	Yes
	100 ... 160	O	O	O	–	O [11]	Yes
1MA6 and 1LA6 in Zones 2, 21	100 ... 160	O	O	O	O	O	Yes
	180 ... 225	O	O	–	O	O	Yes
	250 ... 315	O	O	–	O	O	Yes

O Available version

1) 1MA7 motor series as well as 1LA7/1LA9 motor series in Zone 2, only frame size 63 and above.

2) The components required for connection without cable lugs are supplied with motors of frame size 225 and above as an accessory pack in the connection box.

3) 15° to the vertical in each case.

4) Frame sizes 357-2 and 357-4 as for frame sizes 400 and 450.

5) Others available on request.

6) With option **L00**, the motor can be supplied with the 1XB1 631 connection box (recommended for cable cross-sections ≥240 mm^2).

7) Cable entry without removable plate, cable entry in connection box casing.

8) Cable entry with removable plate or supports.

9) The position of the cable entry must be specified when ordering.

10) 1MA7 motor series as well as 1LA7 motor series in Zone 2, only frame size 63 and above.

11) From frame size 100 upwards.

General technical data

Standard connection boxes for 1MA6, 1MA7 explosion-proof motors and for 1LA6, 1LA7, 1LA9, 1LG4 and 1LG6 motors in Ex n, VIK version, Zone 2 and Zone 21

Frame size	Connection box	Number of terminals	Contact screw thread	Max. connectable cross-section	Sealing range	Cable entry [1]	Two-part plate Max. outer cable diameter
	Type			mm^2	mm	Size	mm
1MA7, LA7, 1LA9							
56 [2]	gk 130	6	M4	4	9 ... 17	M25 x 1.5	–
63					4.5 ... 10	M16 x 1.5	
71							
80							
90							
100					14 ... 21	M32 x 1.5	–
112							
132	gk 230	6	M4	6	14 ... 21	M32 x 1.5	–
160	gk 330	6	M5	16	19 ... 28	M40 x 1.5	–
180	1XB7 222	6	M6	10	19 ... 28	M40 x 1.5	–
200	1XB7 322	6	M8	50	26 ... 35	M50 x 1.5	–
1MA6, 1LA6							
100	gk 135	6	M4	4	14 ... 21	M32 x 1.5	–
112							
132	gk 235	6	M4	6			
160	gk 335	6	M5	16	19 ... 28	M40 x 1.5	–
180	1XB7 222	6	M6	10	19 ... 28	M40 x 1.5	–
200	1XB7 322	6	M8	50	26 ... 35	M50 x 1.5	–
225							
250	1XB7 422	6	M10	120	34 ... 42	M63 x 1.5	–
280							
315	1XB7 522	6	M12	240	38 ... 45	M63 x 1.5	–
1LG4, 1LG6							
180	gt 351	6	M6	16	19 ... 27	M40 x 1.5	–
200	gt 451	6	M8	50	24 ... 35	M50 x 1.5	–
225							
250	gt 540	6	M10	120	34 ... 42	M63 x 1.5	–
280							
315	gt 640	6	M12	240	38 ... 45	M63 x 1.5	–

With 1MA motors, unused drilled holes must be sealed in accordance with EN 50014.

Connection boxes in Ex de IIC type of protection for explosion-proof motors 1MJ6 and 1MJ7

Motors	Frame size	Number of cable entries	Connection box material	Feeder connection
1MJ6	71 ... 160 M	2 holes incl. 1 certified cable gland with sealing washer and 1 certified plug	Aluminum alloy	Without cable lug [3] or with cable lug
	160 L		Cast iron	
	180 ... 200		Aluminum alloy	
1MJ7	225	2 holes with 2 certified cable glands with sealing washer	Cast iron	
	250 ... 315			

Possible positions of the connection boxes in Ex de type of protection for explosion-proof motors 1MJ6 and 1MJ7

Motors	Frame size	Connection box position			Rotation of connection box		
		Above	Side, right or left	Retrofitting possible	90° [4]	180° [4]	Retrofitting possible
1MJ6	71 ... 200	○	○	–	○	○	Yes
1MJ7	225 ... 315	○	○	–	○	○	Yes

○ Available version

1) Designed for cable glands with O-ring.

2) 1MA7 motor series as well as 1LA7/1LA9 motor series in Zone 2, only frame size 63 and above.

3) The components required for connection without cable lugs are supplied with 1MJ7 motors of frame size 225 M and above as an accessory pack in the connection box.

4) The position of the cable entry must be specified when ordering.

Standard connection boxes in Ex de type of protection for explosion-proof motors 1MJ6 and 1MJ7

Frame size	Connection box Type	Number of terminals	Contact screw thread	Max. connectable cross-section mm^2	Sealing range mm	Cable entry [1] Size
1MJ6, 1MJ7						
71	gk 330	6	M4	4	9 ... 17	2 x M25 x 1.5
80						1 x M16 x 1.5
90	gk 420	6	M4	6	9 ... 17	
100					11 ... 21	2 x M32 x 1.5
112	gk 420	6	M4	6	11 ... 21	1 x M16 x 1.5
132						
160 M	gk 420	6	M4	6	19 ... 28	2 x M40 x 1.5
160 L	gk 465	6	M5	16		1 x M16 x 1.5
180	1XC1 270	6	M6	25	19 ... 28	2 x M40 x 1.5 Version with auxiliary circuit 2 x M40 x 1.5 2 x M16 x 1.5
200	1XC1 380	6	M8	50	26 ... 35	2 x M50 x 1.5
225						Version with auxiliary circuit 2 x M50 x 1.5 2 x M16 x 1.5
250	1XC1 480	6	M10	120	34 ... 42	2 x M63 x 1.5
280						
315	1XC1 580	6	M12	240	38 ... 45	2 x M63 x 1.5

With 1MJ motors, unused drilled holes must be sealed in accordance with EN 50014.

Connection boxes in cast iron version (order code K15) for motors 1LG4, 1LG6 and 1MA6, 1MJ6, 1MJ7 explosion-proof motors

Motors	Frame size	Number of cable entries	Connection box material	Feeder connection
1MJ6	71 ... 160 M	2 holes incl. 1 certified cable gland with sealing washer and 1 certified plug	Cast iron	Without cable lug [3] or with cable lug
	180 ... 200			
1LG4, 1LG6, 1MA6, 1MJ7	180 ... 225	2 holes incl. 2 certified cable glands with sealing washer and 1 certified plug	Cast iron	

Possible positions of the connection boxes in cast iron version (order code K15) for 1LG4, 1LG6 motors and 1MA6, 1MJ6, 1MJ7 explosion-proof motors

Motors	Frame size	Connection box position			Rotation of connection box		
		Above	Side, right or left	Retrofitting possible	90° [4]	180° [4]	Retrofitting possible
1MJ6	71 ... 80	O	–	–	O	O	Yes
	90 ... 160 M	O	O	–	O	O	Yes
	180 ... 200	O	O	–	O	O	Yes
1LG4, 1LG6, 1MA6, 1MJ7	180 ... 225	O	O	–	O	O	Yes

O Available version

1) Designed for cable glands with O-ring.

2) Standard version with cable entry glands split lengthwise for 35 to 75 mm and strain relief.

3) The components required for connection without cable lugs are supplied with 1MJ7 motors of frame size 225 M and above as an accessory pack in the connection box.

4) The position of the cable entry must be specified when ordering.

General technical data

Connection boxes in cast iron version (order code K15) for motors 1LG4, 1LG6 and 1MA6, 1MJ6, 1MJ7 explosion-proof motors

Frame size	Connection box Type	Number of terminals	Contact screw thread	Max. connectable cross-section mm^2	Sealing range mm	Cable entry [1] Size
1MJ6						
71	gk 065	6	M4	4	9 ... 17	2 x M25 x 1.5 1 x M16 x 1.5
80						
90				6		
100	gk 065	6	M4	6	11 ... 21	2 x M32 x 1.5 1 x M16 x 1.5
112	gk 265	6	M4	6	11 ... 21	2 x M32 x 1.5 1 x M16 x 1.5
132	gk 465	6	M4	6	11 ... 21	2 x M32 x 1.5 1 x M16 x 1.5
160 M	gk 465	6	M4	6	19 ... 28	2 x M40 x 1.5 1 x M16 x 1.5
160 L [2]	gk 465	6	M5	16	19 ... 28	2 x M40 x 1.5 1 x M16 x 1.5
180	1XC1 290	6	M6	25	26 ... 35	2 x M50 x 1.5 Version with auxiliary circuit: 2 x M50 x 1.5 2 x M16 x 1.5
200	1XC1 390	6	M8	50	26 ... 35	2 x M50 x 1.5 Version with auxiliary circuit: 2 x M50 x 1.5 2 x M16 x 1.5
1LG4, 1LG6						
180	gt 320	6	M5	16	19 ... 28	M40 x 1.5
200	gt 420	6	M6	25	24 ... 35	M50 x 1.5
225	gt 421	6	M8	25	24 ... 35	M50 x 1.5
1MA6						
180	1XB7 323	6	M8	50	24 ... 35	M50 x 1.5
200	1XB7 323	6	M8	50	24 ... 35	M50 x 1.5

With 1MJ motors, unused drilled holes must be sealed in accordance with EN 50014.

Explosion-proof connection boxes in Ex d IIC type of protection (order code K53) for explosion-proof motors 1MJ6 and 1MJ7

Motors	Frame size	Number of cable entries	Connection box material	Feeder connection [3]
1MJ6	71 ... 200	In standard version: 1 certified plug In versions with PTC thermistors: 2 certified plugs	Cast iron	Without cable lug [4] or with cable lug
1MJ7	225	In standard version: 1 certified cable gland and 1 certified plug In versions with auxiliary circuit: 2 certified cable glands	Welded steel	
	250 ... 315			

Possible positions of the explosion-proof connection boxes in Ex d IIC type of protection (order code K53) for explosion-proof motors 1MJ6 and 1MJ7

Motors	Frame size	Connection box position			Rotation of connection box		
		Above	Side, right or left	Retrofitting possible	90° [5]	180° [5]	Retrofitting possible
1MJ6	71 ... 80	O	–	–	O	O	Yes
	90 ... 200	O	O	–	O	O	Yes
1MJ7	225 ... 315	O	O	–	O	O	Yes

O Available version

1) Designed for cable glands with O-ring.

2) With 1MJ6 frame size 160 L, option **K15** is the standard version. The connection box corresponds to the standard connection box.

3) The number of cables and their outer cable diameter must be specified when ordering – does not apply to 1MJ7 motors.

4) The components required for connection without cable lugs are supplied with 1MJ7 motors of frame size 225 M and above as an accessory pack in the connection box.

5) The position of the cable entry must be specified when ordering.

Explosion-proof connection boxes in Ex d IIC type of protection (order code K53) for explosion-proof motors 1MJ6 and 1MJ7

Frame size	Connection box	Number of terminals	Contact screw thread	Max. connectable cross-section	Sealing range	Cable entry
	Type			mm^2	mm	Size
1MJ6, 1MJ7						
71	gk 065d	6	M4	4		Standard: 1 x M25 x 1.5 [1] Version with auxiliary circuit: 1 x M25 x 1.5 1 x M20 x 1.5
80						
90				6		
100	gk 065d	6	M4	6		Standard: 1 x M32 x 1.5 [1] Version with auxiliary circuit: 1 x M32 x 1.5 1 x M20 x 1.5
112	gk 265d	6	M4	6		
132	gk 465d	6	M4	6		
160 M	gk 465d	6	M4	6		Standard: 1 x M40 x 1.5 [1] Version with auxiliary circuit: 1 x M40 x 1.5 1 x M20 x 1.5
160 L	gk 465d	6	M5	16		
180	1XC3 22.	6	M6	25		Standard: 1 x M40 x 1.5 [1] Version with auxiliary circuit: 1 x M40 x 1.5 1 x M20 x 1.5
200	1XC3 32.	6	M8	50		Standard: 1 x M50 x 1.5 [1] Version with auxiliary circuit: 1 x M50 x 1.5 1 x M20 x 1.5
225	1XC3 32.	6	M8	50	M40: 23.5 … 32 M20: 6.5 … 12	Standard: 1 x M40 x 1.5 1 x plug M40 x 1.5 Version with auxiliary circuit: 1 x M40 x 1.5 1 x M20 x 1.5
250	1XC3 42.	6	M10	120	M50: 31.5 … 44 M20: 6.5 … 12	Standard: 1 x M50 x 1.5 1 x plug M50 x 1.5 Version with auxiliary circuit:: 1 x M50 x 1.5 1 x M20 x 1.5
280						
315	1XC3 52.	6	M12	240	M50: 31.5 … 44 M20: 6.5 … 12	Standard: 1 x M50 x 1.5 1 x plug M50 x 1.5 Version with auxiliary circuit: 1 x M50 x 1.5 1 x M20 x 1.5

With 1MJ motors, unused drilled holes must be sealed in accordance with EN 50014.

Terminal connection

The terminal board accomodates the terminals that are connected to the leads to the motor windings. The terminals are designed so that up to frame size 225, the external (line) connections can be made without the need for cable lugs. With frame size 250 and above, standard connection is with cable lugs.

For the 1LG4/1LG6/1LP4/1PP4 motor series, for frame sizes 250 to 315, stud terminals are available for connection using cable lugs (accessory pack, 3 items).
Order code **M46**

With frame size 250 and above, if connection without cable lugs is required, the appropriate saddle terminals for connection without cable lugs (accessory pack, 6 items) must be ordered for motor series 1LG4/1LG6/1LP4/1PP4 frame sizes 250 to 315. In the connection box of 1MJ7 Ex motors, frame sizes 250 M to 315 L, 6 low saddle terminals are enclosed as standard for connection without cable lugs. When connecting cables with a large cross-section (not stranded), they can be connected optionally in two tiers. For this purpose, high saddle terminals can be supplied in the future as an accompanying pack (3 items).
Order code **M47**

For Exe and Exde motors, connection is generally without cable lugs.

The terminal board is permanently mounted on the housing for all motors so that if the connection box is rotated, rotation of the connections for the motor windings is prevented.
Exception:
With connection boxes 1XB1 621 and 1XB1 631, the terminal support is mounted on the lower section of the connection box.

For motor series 1LA7/1LP7/1PP7 frame sizes 63 to 90, a terminal strip can be supplied for the main and auxiliary terminals.
Order code **M69**

[1] Designed for explosion-proof cable glands. The drilled holes for cable entry are closed with plugs certified for explosion-proof applications.

General technical data

Number of auxiliary terminals for 1LA, 1LG, 1LL, 1LP, 1PP and 1PQ motors – Standard version

Motor series 1LA5, 1LA6, 1LA7, 1LP5, 1LP7, 1PP5, 1PP7 have no auxiliary terminals in the standard version.

The maximum number of auxiliary terminals in the main connection box of the motor is specified. An auxiliary connection box is required when the total number of auxiliary terminals exceeds the specified values. The connections can be routed through a separate auxiliary connection box.

For motor series

- 1LA8, 1PQ8 and 1LL8 frame sizes 315 to 450
- 1MA6 frame sizes 225 to 315
- 1MJ7 frame sizes 225 to 315

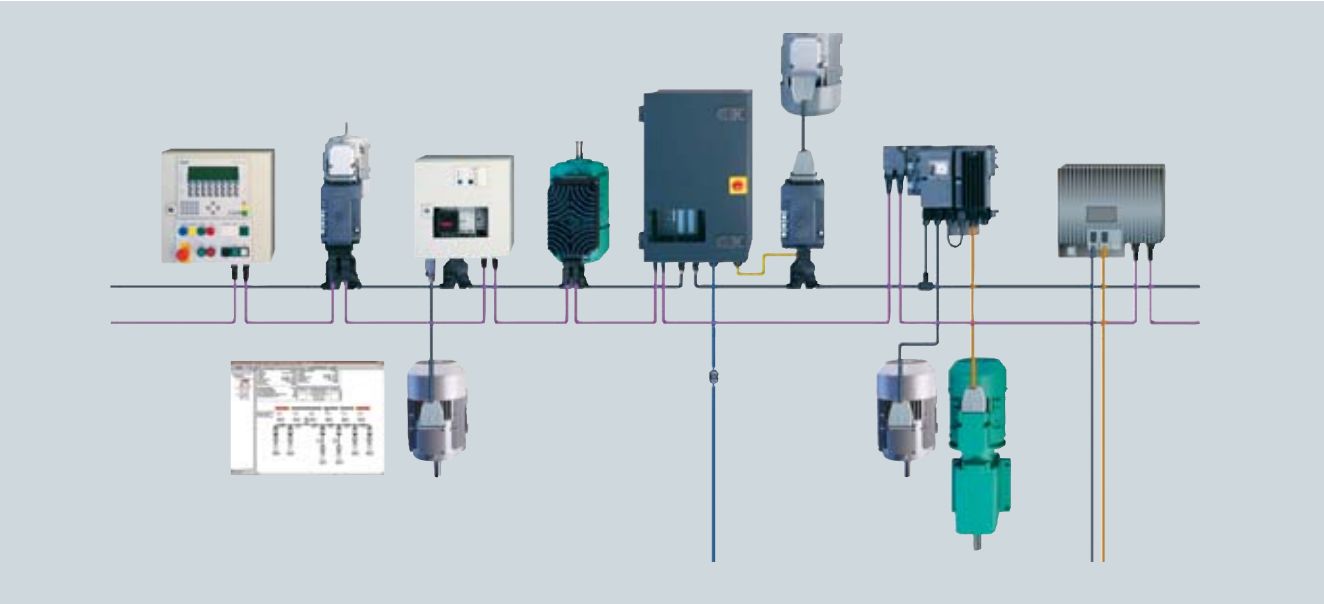
the 1XB3 020 connection box is available.

Order code **L97**

For non-standard motors (1LA8, 1PQ8 and 1LL8 motor series), the following can be supplied:
1XB9 016 auxiliary connection box – Order code **M50**
1XB9 014 auxiliary connection box (aluminum) – Order code **M88**

Type series	Frame size	Main connection box	Maximum No. of auxiliary terminals
1LG4, 1LG6, 1LP4, 1PP4, 1PP6	180	gk 330	4
	200	gk 430	10
	225	gk 431	10
	250	gt 520	12
	280		
	315	gt 620	18
1MA6	225	1XB7 322	8
	250	1XB7 422	12
	280		
	315	1XB7 522	14
1MJ7	225	1XC1 380	4
	250	1XC1 480	
	280		
	315	1XC1 580	6
1LA8, 1PQ8, 1LL8	315	gt 640	6
	355	1XB1 621	12
	400	1XB1 631	24
	450		

ECOFAST system



ECOFAST is a system which permits extensive decentralization and a modular structure for installation elements on the component level.

The following motor connectors are available for the separate MICROMASTER 411 frequency converter:

- ECOFAST motor connector Han Drive 10e for 230 VΔ/400 VY
  Order code **G55**
- ECOFAST motor connector EMC Han Drive 10e for 230 VΔ/400 VY
  Order code **G56**

In the basic version, cable entry for the ECOFAST connector is towards the non-drive end (NDE). The dimensions of the ECOFAST motor connector depend on the motor frame size and can be read from the dimension drawing generator for motors in the tool "Selection tool SD configurator" (see Appendix). It is particularly important to check the dimensions when a brake with a manual release lever is used towards the non-drive end (NDE) due to possible collision of the motor connector and manual release lever as well as in the direction of the drive end (DE) due to possible collision with drive units such as coupling or gear wheels.

Advantages:
The main advantages of the ECOFAST motor connector over a terminal strip are as follows:

- Fast assembly of I/O devices (e.g. motor starters) from the ECOFAST system.
- Reduction of assembly and repair times at the end user
- No wiring errors due to connector technology
- Replacement of motor without intervention in the electronics

Main features of the ECOFAST motor connector (with separate MICROMASTER 411 frequency converter):
The motor connector is mounted at the factory and replaces the connection box with terminal board. The connector is mounted towards the non-drive end (NDE). It comprises an angled motor connection casing that can be rotated by 4 x 90°. A 10-pole (+ earth) male insert is used in the housing. In the plug-in connector, the winding connections are connected and optionally the power supply for the brake and the signal leads for the temperature sensors. The ECOFAST motor connector is compatible with the products of the ECOFAST field device system. Further information can be found in Catalog IK PI.

The mounting dimensions of this casing match those of standard industrial connectors, so it is possible to use a complete series of different standard inserts (such as Han E, ES, ESS from Harting). The motor circuit (star or delta connection) is selected in the mating connector for motor connection. The relevant jumpers are inserted by the customer in the mating connector. As a casing for the mating connector, all standard sleeve casings with lengthwise locking, frame size 10B (e.g. from Harting) can be used.

Note:
Only one sensor (temperature sensor or PTC thermistor) can be connected. The admissible mains voltage at the motor connector is ≤500 V

Availability of the ECOFAST motor connector
The ECOFAST motor connector can be supplied for the following motor versions with the exception of the explosion-proof motors:

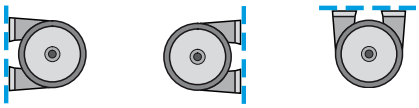
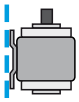
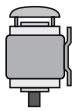
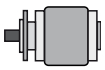
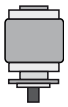
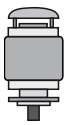
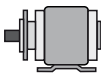
- Frame sizes 56 M to 132 M
- Output range 0.06 to 5.5 kW (7.5 kW on request)
- Direct on-line starting: Voltage code **1** for 230 VΔ/400 VY, 50 Hz
- Star-delta starting: Voltage code **9** with order code **L1U** 400 VΔ, 50 Hz

Further details:
Further information can be found in Catalog IK PI and in Catalog DA 51.3 "Distributed Drive Solutions MICROMASTER 411 COMBIMASTER 411" as well as on the Internet at:
http://www.siemens.com/ecofast

General technical data

Types of construction

Standard types of construction and special types of construction

Type of construction acc. to DIN EN 60034-7		Frame size	Code 12th position	Order code
Without flange				
IM B3		56 M to 450	**0** [4]	–
IM B6/IM 1051, IM B7/IM 1061, IM B8/IM 1071		56 M to 315 L	**0**	–
IM V5/IM1011 without protective cover		56 M to 315 M 315 L	**0** [5] **9** [1] [5]	– **M1D**
IM V6/IM 1031		56 M to 315 M 315 L	**0** **9** [1]	– **M1E**
IM V5/IM 1011 with protective cover		63 M to 315 L	**9** [1] [7]	**M1F**
With flange				
IM B5/IM 3001		56 M to 315 M	**1** [2]	–
IM V1/IM 3011 without protective cover		56 M to 315 M 315 L to 450	**1** [2] [3] [5] **8** [1] [4] [5]	– –
IM V1/IM 3011 with protective cover		63 M to 450	**4** [1] [2] [3] [7]	–
IM V3/IM 3031		56 M to 160 L 180 M to 315 M	**1** **9** [2] [3]	– **M1G**
IM B35/IM 2001 [6]		56 M to 450	**6** [4]	–

In the DIN EN 50347 standard, flange FF with through holes and flange FT with tapped holes are specified.

1) For 2-pole 1LG4 and 1LG6 motors, of frame size 315 L, a 60 Hz version is possible on request.

2) 1LG4/1LG6, 1MA6 and 1MJ7 motors in frame sizes 225 S to 315 L are supplied with two screw-in eyebolts (four eyebolts for 1LG6 318) in accordance with IM B5, whereby one can be rotated in accordance with IM V1 or IM V3. It is important to note that stress must not be applied perpendicular to the ring plane.

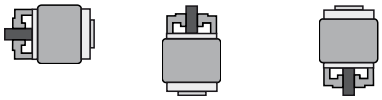
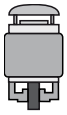
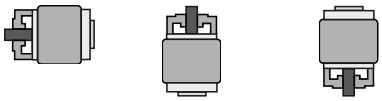
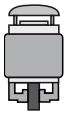
3) For frame sizes 180 M to 225 M, the 1LA5 motors can be supplied with two additional eyebolts; state Order No. suffix "**Z**" and order code **K32**.

4) Frame size 450, 2-pole, 60 Hz is not possible.

5) For explosion-proof motors:
For types of construction with shaft extension pointing downwards, the version "with protective cover" is mandatory. For types of construction with shaft extension pointing upwards, a suitable cover must be implemented to prevent small parts from falling into the fan cover (see the standard IEC/EN 60079-0). The cover must not block the cooling air-flow.

6) In the case of 1LA8, the corresponding flange diameter is greater than twice the shaft height.

7) A second **K16** shaft extension is not possible.

Type of construction acc. to DIN EN 60034-7		Frame size	Code 12th position	Order code
With standard flange				
IM B14/IM 3601, IM V19/IM 3631, IM V18/IM 3611 without protective cover		56 M to 160 L	**2** [2) 4)]	–
IM V 18/IM 3611 with protective cover		63 M to 160 L	**9** [1) 2)]	**M2A**
IM B34/IM 2101		56 M to 160 L	**7** [2) 4)]	–
With special flange				
IM B14/IM 3601, IM V19/IM 3631, IM V18/IM 3611 without protective cover		56 M to 160 L	**3** [3) 4)]	–
IM V18/IM 3611 with protective cover		63 M to 160 L	**9** [1) 3)]	**M2B**
IM B34/IM 2101		56 M to 160 L	**9** [3)]	**M2C**

In DIN EN 50347, standard flanges are assigned to the frame sizes as FT with tapped holes. The special flange was assigned as a large flange in the previous DIN 42677.

The dimensions of the following types of construction are identical:
IM B3, IM B6, IM B7, IM B8, IM V5 and IM V6
IM B5, IM V1 and IM V3
IM B14, IM V18 and IM V19

Motors in the standard output range can be ordered in basic types of construction IM B3, IM B5 or IM B14 and operated in mounting positions IM B6, IM B7, IM B8, IM V5, IM V6, IM V1, IM V3 (up to frame size 160 L) or IM V18 and IM V19. Eyebolts are available for transport and installation in a horizontal position. In conjunction with the eyebolts, for the purpose of stabilizing the position when the motor is arranged vertically, additional lifting straps (DIN EN 1492-1) and/or clamping bands (DIN EN 12195-2) must be used. If mounting position IM V1 is ordered, eyebolts are supplied for vertical mounting.

- For this reason, they are normally designated only with the basic type of construction on the rating plate.
- If motors of frame size 180 M in a type of construction with feet are mounted on the wall, it is recommended that the motor feet are supported.

With motors that have a vertical shaft extension, the end user must prevent an ingress of fluid along the shaft.

In the case of all types of construction with shaft extension down, the version “with protective cover” is urgently recommended, see the section “Degrees of protection”.

Motor series 1LA8, 1PQ8 and 1LL8 are available in types of construction IM B3, IM V1 with and without cover, as well as IM B35.

Frame design

Motors in the types of construction with feet have, in some case, two fixing holes at the non-drive end (NDE), see dimension tables. A code is cast into the motor close to the retaining holes to identify the frame size.

1) A second **K16** shaft extension is not possible.
2) For 1MJ6 motors, only possible up to frame size 90.
3) For 1MJ6 motors, only possible up to frame size 80.
4) Ex For explosion-proof motors:
For types of construction with shaft extension pointing downwards, the version “with protective cover” is mandatory. For types of construction with shaft extension pointing upwards, a suitable cover must be implemented to prevent small parts from falling into the fan cover (see the standard IEC/EN 60079-0). The cover must not block the cooling air-flow.

General technical data

Mechanical design and degrees of protection

Preparation for gear mounting

The flange-mounting motors can be equipped with a radial seal in order to mount gearing.
Order code **K17**.

It must be ensured that the sealing ring is lubricated using grease, oil mist or oil spray (it is not permissible to use pressurized oil > 0.1 bar).
We recommend that the admissible bearing loads are carefully checked.
Please inquire about gear mounting for 1LA8 non-standard motors.

Eyebolts and transport

1LA7, 1MA7 and 1LA5 motors of frame size 100 L and above have two horizontal eyebolts in the horizontal type of construction. For motors in vertical type of construction, two rotatable eyebolts are also supplied.

1LA6 and 1MA6 motors are supplied in a horizontal type of construction with feet complete with one eyebolt.

Horizontal types of construction for flange-mounting in frame sizes 100 to 160 are supplied with one eyebolt. With vertical types of construction, a rotatable eyebolt is also supplied. All flange-mounting types of construction in frame sizes 180 M to 315 L are supplied with two diagonal eyebolts. They can be relocated for vertical types of construction.

1LG4 and 1LG6 motors are supplied in a horizontal type of construction with two diagonal eyebolts. For vertical types of construction, the eyebolts can be rotated.

All the available eyebolts specifically provided for the type of construction must be used during transport.
1MA6, 1MJ6 and 1MJ7 motors of frame size 180 M and above have one eyebolt in type of construction IM B3 in the standard version and two eyebolts in type of construction IM B5. If type of construction IM V1 is used, one of the eyebolts must be rotated whereby it is important to note that forces perpendicular to the ring plane are not permitted.

1LA8, 1PQ8 and 1LL8 motors have two diagonally fixed eyebolts. The IM V1 types of construction have hinged eyebolts.

1MJ6 motors, frame sizes 90 L to 132 M have two eyebolts, frame sizes 160 M and 160 L have one eyebolt.

For frame sizes 180 M to 225 M, 1LA5 motors can be supplied with two additional eyebolts for types of construction IM V1/IM V3.
Order code **K32**

Frame material

Type series	Frame size	Frame material	Frame feet
1LA5, 1LA7, 1LA9	56 to 100 [1] 112 to 225	Aluminum alloy Aluminum alloy	Cast Screwed on
1MA7	63 to 100 [1] 112 to 160	Aluminum alloy Aluminum alloy	Cast Screwed on
1LG4, 1LG6	180 M to 315 L	Cast iron	Cast [2]
1LA6, 1MA6	100 to 200 225 to 315 M 315 L	Cast iron Cast iron Cast iron	Screwed on Cast Screwed on
1MJ6	71 and 80 90 to 200	Cast iron Cast iron	Cast Screwed on
1MJ7	225 to 315	Cast iron	Screwed on
1LA8, 1PQ8, 1LL8	315 to 450	Cast iron	Cast

1) Frame sizes 80, 90 and 100 in the version “Connection box on LHS/RHS” order code **K09**/**K10** have feet that are screwed on.

2) Basic version, cast feet: Special version “screwed on feet” for order codes **K09**, **K10** and **K11**.

Degrees of protection

All motors are designed to IP55 degree of protection. They can be installed in dusty or humid environments. The motors are suitable for operation in tropical climates. Guide value <60 % relative air humidity at CT 40 °C. Other requirements are available on request.

1LL8 motors are available to IP23 degree of protection and are of a similar construction to 1LA8 motors. IP23 degree of protection is achieved by opening the internal cooling circuit and supplying it with external cooling air. Motors of the 1LL8 type series are only intended for installation indoors. They must not be subjected to humid, salty or corrosive atmospheres.

Most motors can be supplied in IP56 and IP65 degrees of protection on request.

Brief explanation of the degrees of protection

IP55: Protection against harmful dust deposits, protection against water jets from any direction.

IP56 (non-heavy-sea)**:**
Protection against harmful dust deposits, protection against water jets from any direction.
Order code **K52**
DIN EN 60034-5 defines protection level 6 for water protection as: “Protection against water due to heavy seas or water in a powerful jet”. IP56 non-heavy-sea degree of protection can only be used with the requirement “Protection against a powerful jet” and not for the requirement “Protection against heavy sea”.
This is not possible in combination with brake 2LM8 (used for motors up to and including frame size 225, order code G26) and/or in combination with order code (K23) without paint finish, cast iron primed.

IP65: Complete protection against dust deposits, protection against water jets from any direction.
Order code **K50**
In DIN EN 60034-5, the code 6 for protection against the ingress of foreign bodies and touch hazard protection for electrical machines is not listed – Data for code 6 (protection against the ingress of dust) is given in EN 60529.
Not possible in combination with rotary pulse encoder HOG 9 D 1024I (order code H72, H79) and / or brake 2LM8 (used for motors up to and including frame size 225, order code G26) and/or in combination with order code (K23) without paint finish, cast iron primed.

DIN EN 60529 contains a comprehensive description of this degree of protection as well as test conditions.

With motors that have a vertical shaft extension, the end user must prevent an ingress of fluid along the shaft.

For motors with shaft extension pointing downwards, the version “with protective cover” is urgently recommended, see “Types of construction”.

With flange-mounting motors, for IM V3 type of construction, collection of fluid in the flange basin can be prevented by drainage holes (on request).
Drainage holes are usually available in 1MA6 and 1MA7 motors of frame size 225 and above and in all 1LG4 and 1LG6 motors.

1LG4, 1LG6, 1LA8, 1LL8, 1PQ8 motors and 1MA6 motors of frame size 225 and above have condensation drainage holes that are sealed with plugs.
Motors for Zones 2 and 21 (1MA6 of frame size 225 and above and 1LG4 and 1LG6) have condensation drainage holes that are sealed with screws.

Condensation drainage holes can also be implemented in motors designed for Zones 2, 21 and 22.
The condensation drainage holes at the drive end (DE) and non-drive end (NDE) are sealed (IP55) on delivery. If condensation drainage holes are required in motors of the IM B6, IM B7 or IM B8 type of construction (feet located on side or top), it is necessary to relocate the bearing plates at the drive end (DE) and non-drive end (NDE) so that the condensation drainage holes situated between the feet on delivery are underneath.
Order code **L12**

When the motors are used or are stored outdoors (not 1LL8) we recommend that they are kept under some sort of cover so that they are not subject to direct intensive solar radiation, rain, snow, ice or dust over a long period of time. In such cases, technical consultation may be appropriate.

When the motors are used outdoors or in a corrosive environment, it is recommended that non-rusting screws are used externally.
Order code **M27**

Vibration-proof version
A load of 1.5g in all 3 planes for up to 1 % of the service life of the motor is possible.
Order code **L03**

For availability of individual options for the relevant motor series, see Section “Special versions” in the individual catalog parts.

Noise levels for mains-fed operation

The noise levels are measured in accordance with DIN EN ISO 1680 in a dead room. It is specified as the A-weighted measuring-surface sound pressure level L_{pfA} in dB (A).
This is the spatial mean value of the sound pressure levels measured on the measuring surface. The measuring surface is a cube 1 m away from the surface of the motor. The sound power level is also specified as L_{WA} in dB (A).
The specified values are valid at 50 Hz at rated output (see the selection and ordering data in the appropriate catalog parts). The tolerance is +3 dB. At 60 Hz, the values are approximately 4 dB (A) higher. Please inquire about the noise levels for pole-changing motors, motors with increased output or converter-fed motors.

To reduce noise levels, 2-pole motors with frame size 132 S and above and 1LA8 and 1LL8 2-pole motors of frame size 315 can be fitted with an axial-flow fan that is only suitable for one direction of rotation. The values can be taken from the table “Low-noise version” below and for 1LA8 or 1LL8 2-pole motors from the selection and ordering data in catalog part 3 “Non-standard motors of frame size 315 and above”.

Clockwise rotation
Order code **K37**

Counter-clockwise rotation
Order code **K38**

The motors up to frame size 315 L are up to 80 mm longer than normal.
A second shaft extension and/or mounting of an encoder are not possible (see “Special versions” in the relevant catalog parts).

Low-noise version

Type series	Frame size	2-pole motors	
		L_{pfA} dB (A)	L_{WA} dB (A)
1LA5, 1LA6, 1LA7, 1MA7, 1MA6, 1MJ6, 1MJ7	132	64	76
	160	64	76
	180	63	76
	200	63	76
	225	68	80
	250	70	82
	280	72	84
	315	74	86
1LG4, 1LG6 [1)]	180	65	78
	200	70	83
	225	68	81
	250	70	83
	280	72	85
	315	74	87

Earth brushes are available for converter-fed operation for 1LG4 and 1LG6 motors.
Order code **M44**
Only available on request.

The rotary pulse encoders of “modular technology” and “special technology” are fitted as standard with a protective cover made of plastic, with the exception of 1LG motors. A protective cover made of non-corrosive sheet steel is available for 1LA5, 1LA6 and 1LA7 motors, see “Mechanical protection for encoders”.
Order code **M68**

1) Not necessary for 1LG6 motors because these motors are already noise optimized.

General technical data

Balance and vibration quantity

All of the rotors are dynamically balanced with half key. This corresponds to vibration quantity level A (normal). The vibrational characteristics and behaviour of electrical machinery is specified in DIN EN 60034-14. Feather key agreement for balancing "half-key" (H) is specified here based on DIN ISO 8821.

The feather key agreement type for balancing is stamped on the face of the customer-specific drive-end (DE) / non-drive end (NDE) shaft extension.

F = Balancing with full key
(Agreement full-key)
H = Balancing with half key
(Agreement half-key)
N = Balancing without key – Plain text required
(without feather key agreement)

Motors up to frame size 112 have the type of balancing marked exclusively on the rating plate.
Full key balancing or balancing with full key can be supplied if order code **L68** is specified (additional charge).

Balancing without key (N) is possible with order code **M37** on request (additional charge).

The vibration quantity level A is the standard version and is valid for a rated frequency up to 60 Hz.

For special requirements concerning smooth running, a low-vibration version B can be supplied (additional charge).

Vibration quantity level B.
Not possible with parallel roller bearings.
Order code **K02**

The limits stated in the table below are applicable to freely suspended motors running uncoupled and at no load as well as to rigidly installed 1LA8 motors, frame size 450.

For converter-fed operation with frequencies greater than 60 Hz, special balancing is required for compliance with the specified limit values (plain text: Max. supply frequency speed).

For further details, see the online help in SD configurator.

Limits (rms values) for max. vibration quantity of vibration distance (s), vibration speed (v) and acceleration (a) for the shaft height H

Vibration quantity level	Machine installation	Shaft height H in mm								
		56 ≤ H ≤ 132			132 < H ≤ 280			H > 280		
		s_{rms} µm	v_{rms} mm/s	a_{rms} mm/s²	s_{rms} µm	v_{rms} mm/s	a_{rms} mm/s²	s_{rms} µm	v_{rms} mm/s	a_{rms} mm/s²
A	Free suspension	25	1.6	2.5	35	2.2	3.5	45	2.8	4.4
	Rigid clamping	21	1.3	2.0	29	1.8	2.8	37	2.3	3.6
B	Free suspension	11	0.7	1.1	18	1.1	1.7	29	1.8	2.8
	Rigid clamping	–	–	–	14	0.9	1.4	24	1.5	2.4

For details, see standard DIN EN 60034-14 Sept. 2004.

Shaft and rotor

Shaft extension

60° center hole to DIN 332, Part 2 with M3 to M24 tapped hole depending on the shaft diameter (see dimension tables in the corresponding catalog parts)

Second standard shaft extension.
Order code **K16**.
Not possible for the motor version with protective cover.

The second shaft extension can transmit the full rated output via a coupling output up to frame size 315 M (please inquire about reduced transmitted power for frame sizes of 315 L and above). For motor series 1LA8 and 1LL8, the second shaft extension can transmit 50 % of the rated output with a coupling output. (Please contact your local Siemens office if higher values are required.) The full rated output is not applicable for 1LA motors, frame sizes 90 S to 112 M. These motors can only transmit the rated output of the next smaller size.

Please also inquire about the transmitted power and admissible cantilever force if belt pulleys, chains or gear pinions are used on the second shaft extension.

A second shaft extension is not available if a rotary pulse encoder and/or separately driven fan is mounted (also applicable to motor series 1PQ8). Please inquire if a brake is mounted.
For motor series 1LA8 and 1LL8, the second standard shaft extension is only available on request for 2-pole motors – please specify the weight of the coupling and type of lever arm.

The non-drive end (NDE) of frame sizes 100 L to 225 M has an M8 center hole, DR form, for mounting the 1XP8 001 rotary pulse encoder or for fitting and extraction tools.

The non-drive end (NDE) of the 1LG4 and 1LG6 motors of frame sizes 180 M to 315 L, has an M16 center hole, DS form.

Shaft extension (DE)	
Diameter	Thread
mm	mm
7 ... 10	DR M3
>10 ... 13	DR M4
>13 ... 16	DR M5
>16 ... 21	DR M6
>21 ... 24	DR M8
>24 ... 30	DR M10
>30 ... 38	DR M12
>38 ... 50	DS M16
>50 ... 85	DS M20
>85 ... 130	DS M24

Dimensions and tolerances for keyways and keys are designed to DIN EN 50347. The motors are always supplied with a key inserted in the shaft.

Shaft extension with standard dimensions, without featherkey way

For motor series 1LA5, 1LA6, 1LA7, 1LA8, 1LA9, 1LG4, 1LG6, 1LL8, 1LP4, 1LP5, 1LP7, 1MA6, 1MA7, 1PP4, 1PP5, 1PP7 and 1PQ8, the standard shaft extension can be ordered with standard dimensions without a featherkey way.
Order code **K42**

Standard shaft made of non-rusting steel

For motor series 1LA5, 1LA6, 1LA7, 1LP5, 1LP7, 1PP5 and 1PP7, a standard shaft made of non-rusting steel (material X20Cr13V) can be ordered. This is only possible for shaft extensions of standard dimensions. For non-standard shaft dimensions, there will be an additional charge!
Order code **M65**
Please inquire about other rust-resistant materials.
Please inquire regarding motor series 1LG4 and 1LG6.

Non-standard cylindrical shaft extension

The non-standard cylindrical shaft extension can be used on the drive end (DE) or non-drive end (NDE). The featherkey is always supplied with it.
Order code **Y55**

When motors are ordered which have a longer or shorter shaft extension as standard, the required position and length of the featherkey way must be specified in a sketch. It must be ensured that only featherkeys in accordance with DIN 6885, Form A are permitted to be used. The location of the featherkey way is in the center of the shaft extension and, in the case of non-standard motors, 5 mm from the shaft extension. The length is defined by the manufacturer normatively.

Not valid for: Conical shafts, non-standard threaded journals, non-standard shaft tolerances, friction welded journals, extremely "thin" shafts, special geometry dimensions (e.g. square journals, etc.), hollow shafts.

For 1MJ motors with longer shaft extensions than standard, the admissible cantilever force must be reduced accordingly. This will ensure that the shaft does not sag more than with the standard shaft extension (please inquire).
For order code **Y55** and second standard shaft extension **K16** (see previous page):

- Dimensions D and DA must be less than or equal to the inner diameter of the roller bearing (see dimension tables under "Dimensions" in the relevant catalog parts)
- Dimensions E and EA must be smaller than or equal to 2 x length E (standard) of the shaft extension

A non-standard cylindrical shaft extension can be supplied for the motor series listed in the table "Admissible changes to shaft extension" below up to the specified maximum lengths and diameters as compared to the standard shaft.

It is the responsibility of the customer to ensure that the admissible cantilever forces are reduced in accordance with the non-standard shaft extension.

Admissible changes to the shaft extension:

Motor series	Frame size	Number of poles	Shaft extension length E in mm		Shaft extension diameter D in mm	
			Standard	Up to max.	Standard	Up to max. [1]
1LA6, 1LA7, 1LA9, 1MA6, 1LP7, 1PP7	56	2 ... 8	20	40	9	12
	63		23	46	11	
	71		30	60	14	15
	80		40	80	19	20
	90		50	100	24	25
	100		60	120	28	30
	112					
	132		80	160	38	40
	160		110	220	42	45
1LA5, 1LA9, 1LG4, 1LG6, 1MA6, 1LP4, 1LP5, 1PP4, 1PP5	180	2 ... 8			48	48
	200				55	55
	225	2				60
		4 ... 8	140	280	60	
	250	2				70
		4 ... 8			65	
	280	2				75
		4 ... 8			75	80
	315	2			65	
		4 ... 8	170	340	80	90
1LA8, 1PQ8	315 [2]	2	140	280	65	70
		4 ... 8	170	340	85	85
	355 [2]	2	140	280	75	80
		4 ... 8	170	340	95	95
	400	2			80	80
		4 ... 8	210	420	110	115
	450	2	170	340	90	90
		4 ... 8	210	420	120	125

Concentricity of shaft extension, coaxiality and linear movement in accordance with DIN 42955 Tolerance R for flange-mounting motors

The following are specified in DIN 42955 with Tolerance N (normal) and Tolerance R (reduced):
1. Concentricity tolerances for the shaft extension
2. Coaxiality tolerances for the shaft extension and flange centering
3. Linear movement tolerances for the shaft extension and flange surface

The concentricity of the shaft extension, coaxiality and linear movement according to DIN 42955 Tolerance R for flange-mounting motors can be ordered using order code **K04**.
This order code can be combined for motors with deep-groove bearings of series 60.., 62.. and 63… This cannot be supplied in combination with parallel roller bearings (e.g. bearings for increased cantilever forces, order code K20), brake or encoder mounting.

Concentricity of the shaft extension can be ordered according to DIN 42955 Tolerance R for types of construction without a flange with order code **L39**.

[1] At admissible diameter, a step increase in shaft diameter is not possible.

[2] For bearing design for increased cantilever forces order code **K20** a shaft diameter of 95 mm for frame size 315 and a shaft diameter of 100 mm for frame size 355 is possible for 4, 6 and 8-pole motors. See dimension drawings Page 3/65 and 3/67.

General technical data

Bearings and lubrication

Bearing lifetime (nominal lifetime)

The nominal bearing lifetime is defined acc. to standardized calculation procedures (DIN ISO 281) and is reached or even exceeded for 90 % of the bearings when the motors are operated in the compliance with the data provided in the catalog.

Under average operating conditions, a lifetime (L_{h10}) of 100,000 hours can be achieved.

Generally, the bearing lifetime is defined by the bearing size, the bearing load, the operating conditions, the speed and the grease lifetime.

Bearing system

The bearing lifetime of motors with horizontal type of construction is at least 40,000 hours if there is no additional axial loading at the coupling output and at least 20,000 hours with the admissible permitted loads.

This assumes that the motor is operated at 50 Hz. The nominal bearing lifetime is reduced for converter-fed operation at higher frequencies.

For the admissible vibration values measured at the bearing plate, evaluation zones A and B specified in ISO 10816 are applicable in order to achieve the calculated lifetime under continuous duty. If higher vibration speeds will occur under the operating conditions, special arrangements will be necessary (please inquire).

For standard motors applies the following:
In the basic bearing system, the floating bearing is situated at the drive end (DE) and the located bearing (axially located from frame size 160 and above) is situated at the non-drive end (NDE). On request, the located bearing can also be supplied at the drive end (DE) (Fig. 3, Page 0/64).
For ordering standard motors quote
order code **K94**.

For 1LA8, 1PQ8 and 1LL8 non-standard motors applies the following:
In the basic bearing system, the floating bearing is situated at the non-drive end (NDE) and the located bearing is situated at the drive end (DE).
On request, the located bearing can also be supplied at the non-drive end (NDE).
Price on request.

The bearing system is axially preloaded with a spring element to ensure smooth running of the motor without play.

This is not the case in versions with parallel roller bearings. The bearings of these motors must always run under adequate radial force (motors must not be operated on a testbed without additional radial loads).

Motors of series 1LA6, 1LA7, 1LA9 and 1MA7 up to and including frame size 132 have a “floating” bearing arrangement (see Fig. 1, Page 0/64).

Up to frame size 132, an additional axially-secured located bearing can be supplied on the non-drive end (NDE) complete with a retaining ring (see Figure 2, Page 0/64).
Order code **L04**

For frame size 160 and above, bearings are usually axially located (see Figures 2, 4 and 5, Page 0/64).

For increased cantilever forces (e.g. belt drives), reinforced bearings can be used at the drive end (DE).
Order code **K20**

Motors 1LG4/6 in frame sizes 180 to 315, 2-pole, can be supplied with reinforced deep-groove bearings at both ends (size range 03).
Special bearings for DE and NDE, bearing size 63
Order code **K36**

A measuring nipple for SPM shock pulse measurement is mounted to check bearing vibration. The motors have 1 or 2 tapped holes per bearing plate and a measuring nipple with a protective cap. If a second tapped holes is provided, it is fitted with a sealing cap.
Order code **G50**

Bearing arrangement for increased cantilever forces on Pages 0/62 and 0/63 – admissible loading on Pages 0/67 and 0/68.

Insulated bearings

To prevent damage as a result of bearing currents, insulated bearings can be supplied at the non-drive end NDE from frame size 225 to 315 and are recommended for frame size 225 and above. This bearing design is also possible for 1MJ7 motors from frame size 250 to 315. In a version in combination with mounting of brake (order code G26), the insulated motor bearings are mounted on the drive end (DE).
Order code **L27**

The insulated bearing is standard for all 1LA8, 1PQ8 and 1LL8 motors which are identified for converter-fed operation.

Permanent lubrication

For permanent lubrication, the bearing grease lifetime is matched to the bearing lifetime. This can, however, only be achieved if the motor is operated in accordance with the catalog specifications.

In the basic version, the motors up to and including shaft height 250 have permanent lubrication.

Regreasing

For motors which can be re-greased at defined re-greasing intervals, the bearing lifetime can be extended and/or unfavourable factors such as temperature, mounting conditions, speed, bearing size and mechanical load can be compensated.

From a shaft height of 280 upwards, regreasing with an M10 x 1 flat greasing nipple to DIN 3404 is provided.

It is possible to regrease motors, shaft heights 100 to 250.
A lubricating nipple is optionally provided.
Order code **K40**

In the case of motors equipped with regreasing devices, information regarding greasing intervals, quantity and type of grease and any additional data is provided on the lubrication or rating plate. (Re-greasing intervals for basic version on Page 0/59).
The regreasing device cannot be mounted in combination with mounting of the brake, order Code G26.

Mechanical stress and grease lifetime

High speeds that exceed the rated speed with converter-fed operation and the resulting increased vibrations alter the mechanical running smoothness and the bearings are subjected to increased mechanical stress. This reduces the grease lifetime and the bearing lifetime (please inquire where applicable).

For converter-fed operation in particular, compliance with the mechanical limit speeds n_{adm} at admissible supply frequency $f_{max.}$ is essential, see catalog part 5 “Motors operating with frequency converters”.

Grease lifetime and regreasing intervals for horizontal installation

Permanent lubrication [1]				
Type series	Frame size	Type	Number of poles	Grease lifetime up to CT 40 °C [2]
All	56 to 250		2 to 8	20000 h or 40000 h [3]
Regreasing (basic version) [1]				
Type series	Frame size	Type	Number of poles	Regreasing interval up to CT 40 °C [2]
1LA6, 1PP6	100 to 160	**. . . . 10 . to . . . . 16 .**	2 to 8	8000 h
1LA5, 1LP5, 1PP5 1LA7, 1LP7, 1PP7 1LA9	100 to 225	**. . . . 10 . to . . . . 22 .**	2 to 8	8000 h
1LA8.. 1PQ8..	315 to 400	**. . . . 31. to . . . . 40 .**	2	4000 h
		. . . . 31. to . . . . 40 .	4 to 8	6000 h
	450	**. . . . 45 .**	2	3000 h
		. . . . 45 .	4 to 8	6000 h
1LL8..	315	**. . . . 31 .**	2	4000 h
		. . . . 31 .	4 to 8	8000 h / 4000 h [4]
	355 to 450	**. . . . 35 . to . . . . 45 .**	2	4000 h
		. . . . 35 . to . . . . 45 .	4 to 8	6000 h / 3000 h [4]
1LG4, 1LP4, 1PP4 1LG6, 1PP6	180 to 280	**. . . . 18 . to . . . . 28 .**	2	4000 h
			4 to 8	8000 h
	315	**. . . . 31**	2	3000 h
			4 to 8	6000 h
1MA6	100 to 200	**. . . . 10 . to . . . . 20 .**	2 to 8	8000 h
	225 to 280	**. . . . 22 . to . . . . 28 .**	2	4000 h
			4 to 8	8000 h
	315	**. . . . 315**	2	3000 h
			4 to 8	6000 h
1MA7	100 to 160	**. . . . 10 . to . . . . 16 .**	2 to 8	8000 h
1MJ6, 1MJ7	180 to 200	**. . . . 18 . to . . . . 20 .**	2 to 8	8000 h
	225 to 280	**. . . . 22 . to . . . . 28 .**	2	4000 h
			4 to 8	8000 h
	315	**. . . . 315**	2	4000 h
			4 to 8	8000 h

1) For special uses and special greases, please inquire about grease lifetime and regreasing intervals.

2) If the coolant temperature is increased by 10 K, the grease lifetime and regreasing interval are halved.

3) 40 000 h applies for horizontally installed motors with coupling output without additional axial loads.

4) Regreasing interval for IM V1 type of construction.

General technical data

Bearing selection table for 1LA5, 1LA6, 1LA7, 1LA9, 1LG, 1LP, 1MA and 1PP motors – basic version

The bearing selection tables are only intended for planning purposes. Authoritative information on the actual type of bearings fitted in motors already supplied can be obtained by the factory by quoting the serial number or can be read from the lubricating plate on 1LA8 motors.

When deep-groove ball bearings with sideplates are used, the side plate is on the inside. For located bearings on drive end DE for 1LA5, 1LA7, 1LA9, 1MA6 and 1MA7 motors, see special version in Figure 3 (Page 0/64).

For motors frame size	Type	Number of poles	Drive end (DE) bearing		Non-drive end NDE bearing		Figures on Pages 0/64 and 0/65
			Horizontal type of construction	Vertical type of construction	Horizontal type of construction	Vertical type of construction	
	1LA5 . . ., 1LA6 . . ., 1LA7 . . ., 1LA9 . . ., 1LP5 . . ., 1LP7 . . ., 1MA6 . . ., 1MA7 . . ., 1PP5 . . ., 1PP7 . . .						
56 M	**. . . . 05 .**	2 to 8	6201 2ZC3	6201 2ZC3	6201 2ZC3	6201 2ZC3	**Fig. 1**
63 M	**. . . . 06 .**	2 to 8	6201 2ZC3	6201 2ZC3	6201 2ZC3	6201 2ZC3	
71 M	**. . . . 07 .**	2 to 8	6202 2ZC3	6202 2ZC3	6202 2ZC3	6202 2ZC3	
80 M	**. . . . 08 .**	2 to 8	6004 2ZC3	6004 2ZC3	6004 2ZC3	6004 2ZC3	
90 S/L	**. . . . 09 .**	2 to 8	6205 2ZC3	6205 2ZC3	6004 2ZC3	6004 2ZC3	
100 L	**. . . . 10 .**	2 to 8	6206 2ZC3 [1]	6206 2ZC3 [1]	6205 2ZC3 [1]	6205 2ZC3 [1]	
112 M	**. . . . 11 .**	2 to 8	6206 2ZC3 [1]	6206 2ZC3 [1]	6205 2ZC3 [1]	6205 2ZC3 [1]	
132 S/M	**. . . . 13 .**	2 to 8	6208 2ZC3 [1]	6208 2ZC3 [1]	6208 2ZC3 [1]	6208 2ZC3 [1]	
160 M/L	**. . . . 16 .**	2 to 8	6209 2ZC3 [1]	6209 2ZC3 [1]	6209 2ZC3 [1]	6209 2ZC3 [1]	**Fig. 2**
180 M/L	**. . . . 18 .**	2 to 8	6210 ZC3 [2]	6210 ZC3 [2]	6210 ZC3 [2]	6210 ZC3 [2]	**Fig. 4**
200 L	**. . . . 20 .**	2 to 8	6212 ZC3 [2]	6212 ZC3 [2]	6212 ZC3 [2]	6212 ZC3 [2]	
225 S/M	**. . . . 22 .**	2 to 8	6213 ZC3 [2]	6213 ZC3 [2]	6212 ZC3 [2] [5]	6212 ZC3 [2] [5]	
250 M	**. . . . 25 .**	2 to 8	6215 ZC3 [2]	6215 ZC3 [2]	6215 ZC3 [2]	6215 ZC3 [2]	
280 S/M	**. . . . 28 .**	2 4 to 8	6216 C3 6317 C3	6216 C3 6317 C3	6216 C3 6317 C3	6216 C3 6317 C3	**Fig. 5**
315 S/M	**. . . . 310** **. . . . 313**	2 4 to 8	6217 C3 6319 C3	6217 C3 6319 C3	6217 C3 6319 C3	6217 C3 6319 C3	
315 L	**. . . . 316** **. . . . 317** **. . . . 318**	2 4 to 8	6217 C3 6319 C3	6217 C3 6319 C3	6217 C3 6319 C3	7217 BEP 6319 C3	
	1LG4 . . ., 1LG6 . . ., 1LP4 . . ., 1PP4 . . ., 1PP6 . . .						
180 M/L	**. . . . 18 .**	2 to 8	6210 ZC3 [4]	6210 ZC3 [4]	6210 ZC3 [4]	6210 ZC3 [4]	**Fig. 4**
200 L	**. . . . 20 .**	2 to 8	6212 ZC3 [4]	6212 ZC3 [4]	6212 ZC3 [4]	6212 ZC3 [4]	
225 S/M	**. . . . 22 .**	2 to 8	6213 ZC3 [4]	6213 ZC3 [4]	6213 ZC3 [4]	6213 ZC3 [4]	
250 M	**. . . . 25 .**	2 to 8	6215 ZC3 [4]	6215 ZC3 [4]	6215 ZC3 [4]	6215 ZC3 [4]	
280 S/M	**. . . . 28 .**	2 4 to 8	6217 C3 6317 C3	6217 C3 6317 C3	6217 C3 6317 C3	6217 C3 6317 C3	**Fig. 5**
315 S/M	**. . . . 310** **. . . . 313**	2 4 to 8	6219 C3 6319 C3	6219 C3 6319 C3	6219 C3 6319 C3	6219 C3 6319 C3	
315 L	**. . . . 316** **. . . . 317** **. . . . 318**	2 4 to 8	6219 C3 6319 C3	6219 C3 [3] 6319 C3	6219 C3 6319 C3	7219 BEP [3] 6319 C3	

1) Deep-groove bearings are used for regreasable versions (order code **K40**).

2) Deep-groove bearings are not used for regreasable versions (order code **K40**) of 1MA6 motors of frame sizes 180 M to 250 M.

3) Only at 50 Hz.

4) Deep-groove bearings are not used for regreasable versions (order code **K40**).

5) For 1MA6 motors frame size 225 S/M bearing 6213 ZC3 at the non-drive end NDE (BS).

Bearing selection table for 1LA8, 1PQ8 and 1LL8 motors – basic version

For motors frame size	Type	Number of poles	Drive end (DE) bearing		Non-drive end NDE bearing		Figures on Pages 0/64 and 0/65
			Horizontal type of construction	Vertical type of construction	Horizontal type of construction	Vertical type of construction	
	1LA8 . . ., 1PQ8 . . .						
315	**. . . . 31 .**	2	6218 C3	6218 C3	6218 C3	6218 C3	**Fig. 6 and Fig. 7**
		4 to 8	6218 C3	6218 C3	6218 C3	6218 C3	
355	**. . . . 35 .**	2	6218 C3	7218 B + 6218 C3	6218 C3	6218 C3	
		4 to 8	6220 C3	7220 B + 6220 C3	6220 C3	6220 C3	
400	**. . . . 40 .**	2	6218 C3	7218 B + 6218 C3	6218 C3	6218 C3	
		4 to 8	6224 C3	7224 B + 6224 C3	6224 C3	6224 C3	
450	**. . . . 45 .**	2	6220 C3	7220 B + 6220 C3	6220 C3	6220 C3	
		4 to 8	6226 C3	7226 B + 6226 C3	6226 C3	6226 C3	
	1LL8 . . .						
315	**. . . . 31 .**	2	6218 C3	6218 C3	6218 C3	6218 C3	**No figure**
		4 to 8	6220 C3	7220 B + 6220 C3	6218 C3	6218 C3	
355	**. . . . 35 .**	2	6218 C3	6218 C3	6218 C3	6218 C3	
		4 to 8	6224 C3	7224 B + 6224 C3	6220 C3	6220 C3	
400	**. . . . 40 .**	2	6218 C3	6218 C3	6218 C3	6218 C3	
		4 to 8	6226 C3	7226 B + 6226 C3	6224 C3	6224 C3	
450	**. . . . 45 .**	2	6220 C3	6220 C3	6220 C3	6220 C3	
		4 to 8	6228 C3	7228 B + 6226 C3	6228 C3	6226 C3	

1LA8, 1PQ8 and 1LL8 non-standard motors are transported horizontally. They can be transported vertically at an additional charge on request.

Bearing selection table for 1MJ motors – basic version

For motors frame size	Type	Number of poles	Drive end (DE) bearing		Non-drive end NDE bearing		Figure on Page 0/65
			Horizontal type of construction	Vertical type of construction	Horizontal type of construction	Vertical type of construction	
71 M	**1MJ6 07 .**	2 to 8	6202 ZC3	6202 ZC3	6202 ZC3	6202 ZC3	**Fig. 8**
80 M	**1MJ6 08 .**	2 to 8	6004 ZC3	6004 ZC3	6004 ZC3	6004 ZC3	
90 S/L	**1MJ6 09 .**	2 to 8	6205 C3	6205 C3	6205 C3	6205 C3	**Fig. 9**
100 L	**1MJ6 10 .**	2 to 8	6206 C3	6206 C3	6206 C3	6206 C3	
112 M	**1MJ6 11 .**	2 to 8	6306 C3	6306 C3	6306 C3	6306 C3	
132 S/M	**1MJ6 13 .**	2 to 8	6308 C3	6308 C3	6308 C3	6308 C3	**Fig. 10**
160 M/L	**1MJ6 16 .**	2 to 8	6309 C3	6309 C3	6309 C3	6309 C3	
180 M/L	**1MJ6 18 .**	2 to 8	6210 C3	6210 C3	6210 C3	6210 C3	**Fig. 11**
200 L	**1MJ6 20 .**	2 to 8	6212 C3	6212 C3	6212 C3	6212 C3	
225 S/M	**1MJ7 22 .**	2 to 8	6213 C3	6213 C3	6213 C3	6213 C3	
250 M	**1MJ7 25 .**	2 to 8	6215 C3	6215 C3	6215 C3	6215 C3	
280 S/M	**1MJ7 28 .**	2 to 8	NU 216	NU 216	6216 C3	6216 C3	**Fig. 12**
315 S/M	**1MJ7 31 .**	2	NU 217 [1)]	NU 217 [1)]	6217 C3	6217 C3	
		4 to 8	NU 218 [2)]	NU 218 [2)]	6218 C3	6218 C3	

[1)] Special version with deep groove bearing 6216 C3 on request. Recommended for coupling output or low cantilever forces.

[2)] Special version with deep groove bearing 6217 C3 on request. Recommended for coupling output or low cantilever forces.

General technical data

Bearing selection table for 1LA5, 1LA6, 1LA7, 1LA9, 1LG, 1LP, 1MA and 1PP motors – Bearings for increased cantilever forces – Order code **K20**

Please inquire about noise and vibration data.

For NU bearings (parallel roller bearings), in contrast to standard bearings, a minimum cantilever force is required. Parallel roller bearings are not suitable for coupling output.

The bearing selection tables are only intended for planning purposes. Authoritative information on the actual type of bearings fitted in motors already supplied can be obtained by the factory by quoting the serial number or can be read from the lubricating plate on 1LA8 motors.

When deep-groove ball bearings with sideplates are used, the side plate is on the inside.
1MJ8 motors at 60 Hz on request.

For motors frame size	Type	Number of poles	Drive end (DE) bearing		Non-drive end NDE bearing		Figure on Page 0/64
			Horizontal type of construction	Vertical type of construction	Horizontal type of construction	Vertical type of construction	
	1LA5 . . ., 1LA6 . . ., 1LA7 . . ., 1LA9 . . ., 1LP5 . . ., 1LP7 . . ., 1MA6 . . ., 1MA7 . . ., 1PP5 . . ., 1PP7 . . .						
100 L	**. . . . 10 .**	2 to 8	6306 ZC3	6306 ZC3	6205 2ZC3 [1]	6205 2ZC3 [1]	**No figure**
112 M	**. . . . 11 .**	2 to 8	6306 ZC3	6306 ZC3	6205 2ZC3 [1]	6205 2ZC3 [1]	
132 S/M	**. . . . 13 .**	2 to 8	6308 ZC3	6308 ZC3	6208 2ZC3 [1]	6208 2ZC3 [1]	
160 M/L	**. . . . 16 .**	2 to 8	6309 ZC3	6309 ZC3	6209 2ZC3 [1]	6209 2ZC3 [1]	
180 M/L	**. . . . 18 .**	2 to 8	6310 ZC3	6310 ZC3	6210 ZC3	6210 ZC3	
200 L	**. . . . 20 .**	2 to 8	6312 ZC3	6312 ZC3	6212 ZC3	6212 ZC3	
225 S/M	**. . . . 22 .**	2 to 8	NU 213 E [2] [3]	NU 213 E [2] [3]	6212 ZC3 [4]	6212 ZC3 [4]	
250 M	**. . . . 25 .**	2 to 8	NU 215 E [2]	NU 215 E [2]	6215 ZC3	6215 ZC3	
280 S/M	**. . . . 28 .**	2 4 to 8	NU 216 E NU 317 E	NU 216 E NU 317 E	6216 C3 6317 C3	6216 C3 6317 C3	
315 S/M	**. . . . 310** **. . . . 313**	2 4 to 8	NU 217 E NU 319 E	NU 217 E NU 319 E	6217 C3 6319 C3	6217 C3 6319 C3	
315 L	**. . . . 316** **. . . . 317** **. . . . 318**	2 4 to 8	NU 217 E NU 319 E	– NU 319 E	6217 C3 6319 C3	– 6319 C3	
	1LG4 . . ., 1LG6 . . ., 1LP4 . . ., 1PP4 . . .						
180 M/L	**. . . . 18 .**	2 to 8	NU 210	NU 210	6210 C3	6210 C3	**Fig. 4**
200 L	**. . . . 20 .**	2 to 8	NU 212	NU 212	6212 C3	6212 C3	
225 S/M	**. . . . 22 .**	2 to 8	NU 213	NU 213	6213 C3	6213 C3	
250 M	**. . . . 25 .**	2 to 8	NU 215	NU 215	6215 C3	6215 C3	
280 S/M	**. . . . 28 .**	2 4 to 8	NU 217 NU 317	NU 217 NU 317	6217 C3 6317 C3	6217 C3 6317 C3	**Fig. 5**
315 S/M	**. . . . 310** **. . . . 313**	2 4 to 8	NU 219 [5] NU 319	NU 219 [5] NU 319	6219 C3 6319 C3	6219 C3 6319 C3	
315 L	**. . . . 316** **. . . . 317** **. . . . 318**	2 4 to 8	NU 219 [5] NU 319	NU 219 [5] NU 319	6219 C3 6319 C3	6219 C3 6319 C3	

1) Bearings wth a side plate are used for regreasable versions (order code **K40**).

2) Deep-groove bearings of size range 03 are also possible (order code **K36**).

3) For 1LA5 motors frame size 225 S/M bearing 6313 ZC3 at the drive end.

4) For 1MA6 motors frame size 225 S/M bearing 6213 ZC3 at the non-drive end.

5) Only at 50 Hz.

Bearing selection table for 1LA8, 1PQ8 and 1LL8 motors – bearings for increased cantilever forces – Order code **K20**

For motors frame size	Type	Number of poles	Drive end (DE) bearing		Non-drive end NDE bearing		
			Horizontal type of construction	Vertical type of construction	Horizontal type of construction	Vertical type of construction	
	1LA8 . . ., 1PQ8 . . .						
315	**. . . . 31 .**	4 to 8	NU 320 E	On request	6218 C3	On request	**No figure**
355	**. . . . 35 .**	4 to 8	NU 322 E	On request	6220 C3	On request	

Please inquire about noise and vibration data. For NU bearings, in contrast to standard bearings, a minimum cantilever force is required. The bearing selection tables are only intended for planning purposes. Binding statements about the bearings for motors which have already been shipped can be requested. Please specify the serial number.

The motors are transported horizontally; they can be transported vertically at additional cost on request.
Reinforced bearings are available for frame sizes 400 and 450 as well as IM V1 types of construction as well as for 1LL8 motors on request. Please specify cantilever force and dimension x. Reinforced bearings cannot be supplied for 2-pole motors.

Bearing selection table for 1MJ6 and 1MJ7 motors – Bearings for increased cantilever forces – Order code **K20**

For motors frame size	Type	Number of poles	Drive end (DE) bearing		Non-drive end NDE bearing		
			Horizontal type of construction	Vertical type of construction	Horizontal type of construction	Vertical type of construction	
	1MJ6 . . .						
180 M/L	**. . . . 18 .**	2 to 8	NU 210	NU 210	6210 ZC3	6210 ZC3	**No figure**
200 L	**. . . . 20 .**	2 to 8	NU 212	NU 212	6212 ZC3	6212 ZC3	
	1MJ7 . . .						
225 M/L	**. . . . 22 .**	2 to 8	NU 213	NU 213	6213 C3	6213 C3	**No figure**
250 M	**. . . . 25 .**	2 to 8	NU 215	NU 215	6215 C3	6215 C3	

Bearing selection table for 1LG4, 1LG6, 1LP4 and 1PP4 motors – Deep-groove bearings reinforced at both ends – Order code **K36**

For motors frame size	Type	Number of poles	Drive end (DE) bearing		Non-drive end NDE bearing		Figure on Page 0/64
			Horizontal type of construction	Vertical type of construction	Horizontal type of construction	Vertical type of construction	
	1LG4 . . ., 1LG6 . . ., 1LP4 . . ., 1PP4 . . .						
180 M/L	**. . . . 18 .**	2 to 8	6310 ZC3 [1]	6310 ZC3 [1]	6310 ZC3 [1]	6310 ZC3 [1]	**Fig. 4**
200 L	**. . . . 20 .**	2 to 8	6312 ZC3 [1]	6312 ZC3 [1]	6312 ZC3 [1]	6312 ZC3 [1]	
225 S/M	**. . . . 22 .**	2 to 8	6313 ZC3 [1]	6313 ZC3 [1]	6313 ZC3 [1]	6313 ZC3 [1]	
250 M	**. . . . 25 .**	2 to 8	6315 ZC3 [1]	6315 ZC3 [1]	6315 ZC3 [1]	6315 ZC3 [1]	
280 S/M	**. . . . 28 .**	2 4 to 8	6317 C3 6317 C3 [2]	6317 C3 6317 C3 [2]	6317 C3 6317 C3 [2]	6317 C3 6317 C3 [2]	**Fig. 5**
315 S/M/L	**. . . . 31 .**	2 4 to 8	6316 C3 6319 C3 [2]	6316 C3 6319 C3 [2]	6316 C3 6319 C3 [2]	6316 C3 6319 C3 [2]	

[1] Deep-groove bearings are not used for regreasable versions (order code **K40**).

[2] As for basic version.

General technical data

Diagrams of bearings

Fig. 1 Drive-end bearing Non-drive end bearing

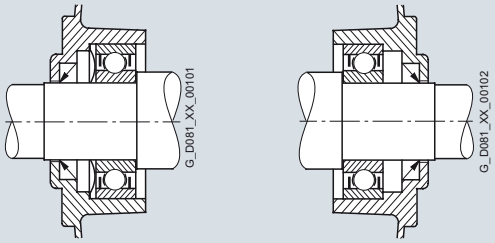


Fig. 2 Drive-end bearing Non-drive end bearing

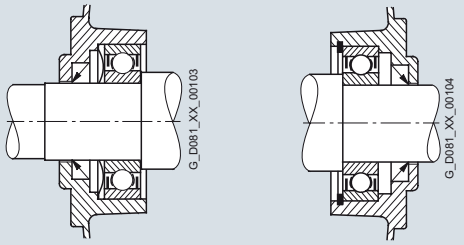
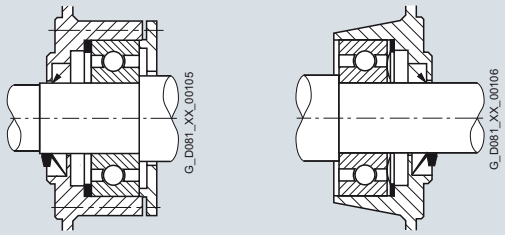


Fig. 3 Drive-end bearing Non-drive end bearing

Located bearing for 1LA7, 1LA9, 1MA7, frame sizes 56 to 160



Located bearings for 1LA5, frame sizes 180 to 225;
1LA9, 1MA6, frame sizes 180 to 200

Fig. 4 Drive-end bearing Non-drive end bearing

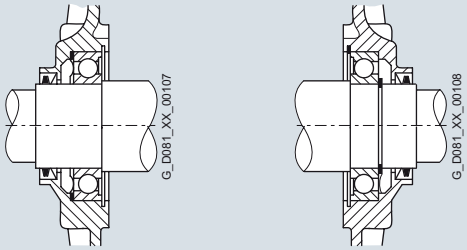
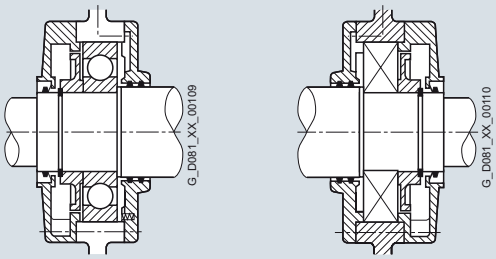
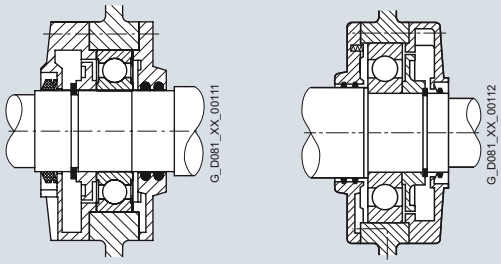


Fig. 5 Drive-end bearing Non-drive end bearing



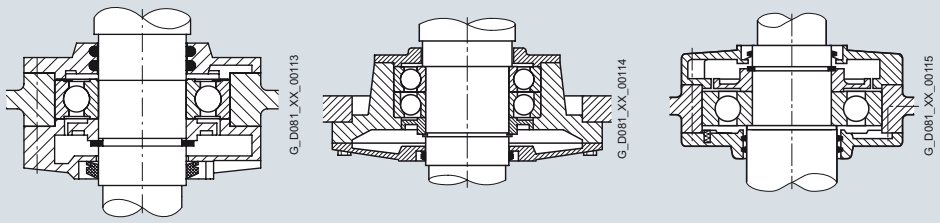
Frame sizes
280 S to 315 L, 2-pole to 8-pole

Fig. 6 Drive-end bearing Non-drive end bearing



Frame sizes
315 to 450, 2-pole to 8-pole, IM B3

Fig. 7 Drive-end bearing Drive-end bearing Non-drive end bearing



Frame size
315, 2-pole to 8-pole, IM V1

Frame sizes
355 and 450, 2-pole to 8-pole, IM V1

Frame sizes
315 to 450, 2-pole to 8-pole, IM V1

Fig. 8 Drive-end bearing Non-drive end bearing

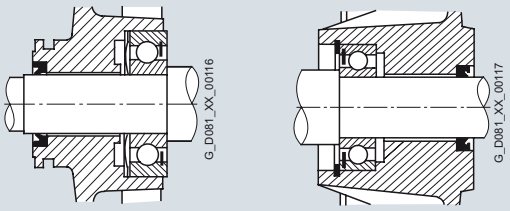


Fig. 9 Drive-end bearing Non-drive end bearing

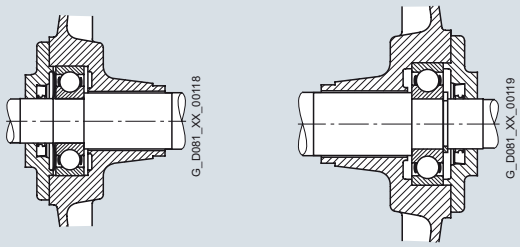


Fig. 10 Drive-end bearing Non-drive end bearing

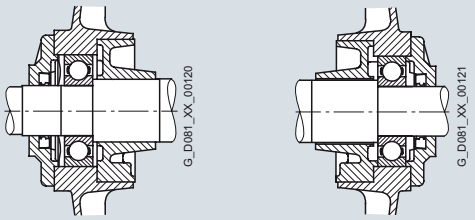


Fig. 11 Drive-end bearing Non-drive end bearing

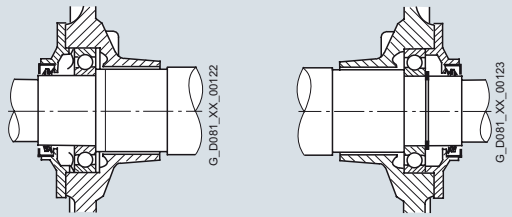
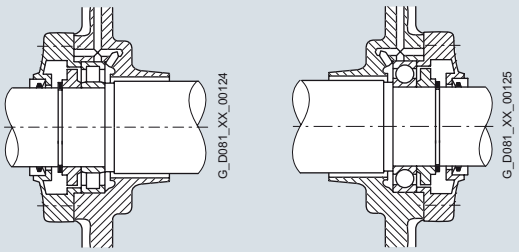


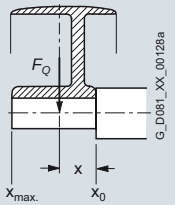
Fig. 12 Drive-end bearing Non-drive end bearing



General technical data

Admissible cantilever forces

Admissible cantilever forces, basic version



In order to calculate the admissible cantilever forces for a radial load, the line of force (i.e. the centerline of the pulley) of the cantilever force F_Q (N) must lie within the free shaft extension (dimension x).

Dimension x [mm] is the distance between the point of application of force F_Q and the shaft shoulder. Dimension $x_{max.}$ corresponds to the length of the shaft extension.

Total cantilever force $F_Q = c \cdot F_u$

The pre-tension factor c is a value gained from experience from the belt manufacturer. The following approximate value can be assumed:

For normal flat leather belts with an idler pulley c = 2;
for V-belts c = 2 to 2.5;
for special synthetic belts (depending on the type and load) c = 2 to 2.5.

The circumferential force F_u (N) is calculated using the following equation

$$F_u = 2 \cdot 10^7 \frac{P}{n \cdot D}$$

F_u circumferential force in N
P rated motor power (transmitted power) in kW
n rated motor speed
D pulley diameter in mm

The pulleys are standardized acc. to DIN 2211, Sheet 3.

The admissible cantilever forces at 60 Hz are approx. 80 % of the 50 Hz values (please inquire).

Admissible cantilever forces for the basic 50 Hz version

Valid are: x_0 values for x = 0 and $x_{max.}$ values for x = l (l = shaft extension)

For motors Frame size	Number of poles	Admissible cantilever force for x_0 Type			Admissible cantilever force for $x_{max.}$ Type		
		N	N	N	N	N	N
		1LG4 1LG6	**1MA6**	**1MJ6 1MJ7**	**1LG4 1LG6**	**1MA6**	**1MJ6 1MJ7**
250 M	2	3190	3650	3650	2530	2950	2950
	4	4000	4400	4400	3350	3600	3600
	6	4700	5350	5350	3900	4350	4350
	8	5200	5700	5700	4400	4700	4700
280 S 280 M	2	4000	3350	8100	3250	2800	6700
	4	8400	8400	9700	7000	7200	8050
	6	9700	10000	11700	8100	8900	9700
	8	10750	11000	12800	9000	9850	10600
315 S 315 M	2	4750	3950	9000	3890	3350	7600
	4	9100	9900	13100	7300	8100	10800
	6	10700	12100	15600	8700	9900	12800
	8	11600	13300	16900	9600	10900	13900
315 L	2	4000	3100	8800	3280	2700	7600
	4	8400	8800	24000	7500	7450	12000
	6	9700	11400	25000	9100	9600	12000
	8	11100	12500	26000	10200	10500	12000

Admissible cantilever forces for the basic 50 Hz version

Valid are: x_0 values for x = 0 and $x_{max.}$ values for x = l (l = shaft extension)

For motors Frame size	Number of poles	Admissible cantilever force for x_0 Type			Admissible cantilever force for $x_{max.}$ Type		
		N	N	N	N	N	N
		1LA5 1LA7 1LA9 1MA6 1MA7 1LA6 1LP5 1LP7 1PP5 1PP7	**1LG4 1LG6 1LP4 1PP4 1PP6**	**1MJ6 1MJ7**	**1LA5 1LA7 1LA9 1MA6 1MA7 1LA6 1LP5 1LP7 1PP5 1PP7**	**1LG4 1LG6 1LP4 1PP4 1PP6**	**1MJ6 1MJ7**
56 M	2	270	–	–	240	–	–
	4	350	–	–	305	–	–
	6	415	–	–	360	–	–
63 M	2	270	–	–	240	–	–
	4	350	–	–	305	–	–
	6	415	–	–	360	–	–
71 M	2	415	–	260	355	–	260
	4	530	–	260	450	–	260
	6	630	–	260	535	–	260
	8	690	–	–	585	–	–
80 M	2	485	–	485	400	–	400
	4	625	–	560	515	–	515
	6	735	–	560	605	–	560
	8	815	–	–	675	–	–
90 S 90 L	2	725	–	725	605	–	605
	4	920	–	920	775	–	775
	6	1090	–	1090	910	–	910
	8	1230	–	1230	1030	–	1030
100 L	2	1030	–	1030	840	–	840
	4	1310	–	1310	1060	–	1060
	6	1550	–	1550	1250	–	1250
	8	1720	–	1720	1400	–	1400
112 M	2	1010	–	1680	830	–	1490
	4	1270	–	1960	1040	–	1580
	6	1520	–	2140	1240	–	1720
	8	1690	–	2450	1380	–	1950
132 S 132 M	2	1490	–	2250	1180	–	1820
	4	1940	–	2720	1530	–	2170
	6	2260	–	3100	1780	–	2420
	8	2500	–	3400	1980	–	2700
160 M 160 L	2	1540	–	2800	1210	–	2250
	4	2040	–	3330	1590	–	2600
	6	2330	–	3750	1820	–	2900
	8	2660	–	3750	2080	–	2900
180 M 180 L	2	2000	1780	2000	1550	1410	1550
	4	2350	2240	2350	1950	1820	1950
	6	2800	2550	2800	2250	2120	2250
	8	3050	2860	3050	2500	2330	2500
200 L	2	2550	2380	2550	2100	1930	2100
	4	3350	3050	3350	2750	2530	2750
	6	3900	3500	3900	3200	2930	3200
	8	4150	3800	4150	3450	3210	3450
225 S 225 M	2	3050	2820	3050	2550	2290	2550
	4	3750	3500	3750	2950	2760	2950
	6	4550	4050	4550	3600	3240	3600
	8	4850	4500	4850	3900	3500	3900

Table continues overleaf

Admissible cantilever forces for the basic 50 Hz version

Valid are: x_0 values for x = 0 and $x_{max.}$ values for x = l (l = shaft extension)

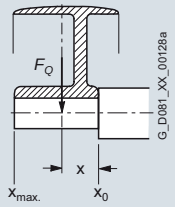
For motors		Admissible cantilever force for x_0	Admissible cantilever force for $x_{max.}$
Frame size	Number of poles	Type	Type
		N	N
		1LA8, 1PQ8 [1]	**1LA8, 1PQ8** [1]
315 ... 450	2 ... 8	See diagrams Page 0/69	See diagrams Page 0/69

For 1LA8 motors in horizontal type of construction, the admissible cantilever forces are specified with regard to the axial forces.

It should be observed that for types of construction IM B6, IM B7, IM B8, IM V5 and IM V6 the belt tension is only permitted to act parallel to the mounting plane or towards the mounting plane and the feet must be supported. Both feet must be secured for foot-mounting types of construction.

Refer to Pages 0/67 to 0/68 if the cantilever forces are higher than those listed above.

Bearing design for increased cantilever forces



Admissible cantilever forces at 50 Hz for 1LA, 1MA, 1MJ, 1LP and 1PP motors

Deep-groove ball bearings at the drive end (DE) – Order code K20

For motors			Admissible cantilever force F_Q	
Frame size	Type	Number of poles	at x_0	at $x_{max.}$
			N	N
	1LA5 . . ., 1LA6 . . ., 1LA7 . . ., 1LA9 . . ., 1MA6 . . ., 1MA7 . . ., 1MJ6 . . ., 1MJ7 . . ., 1LP5 . . ., 1LP7 . . ., 1PP5 . . ., 1PP7 . . .,			
100	**. . . . 10 .**	2	1680	1490
		4	1960	1580
		6	2140	1720
		8	2450	1950
112	**. . . . 113**	2	1680	1490
		4	1960	1580
		6	2140	1720
		8	2450	1950
132	**. . . . 13 .**	2	2250	1820
		4	2720	2170
		6	3100	2420
		8	3400	2700
160	**. . . . 16 .**	2	2800	2250
		4	3330	2600
		6	3750	2900
		8	3750	2900
180	**. . . . 18 .**	2	3700	3000
		4	4450	3600
		6	5100	4150
		8	5550	4500
200	**. . . . 20 .**	2	5200	4300
		4	6450	5350
		6	7300	6100
		8	7900	6550
225	**1LA522 .**	2	5200	4300
	1LP5 . . .	4	6450	5350
	1PP5 . . .	6	7300	6100
		8	7900	6550

[1] Data for 1LL8 is available on request.

General technical data

Admissible cantilever forces at 50 Hz for 1LG motors
Parallel roller bearings at the drive end (DE) – Order code K20
Valid are: x_0 values for x = 0 and $x_{max.}$ values for x = l (l = shaft extension)

For motors Frame size	Type	Number of poles	Admissible cantilever force F_Q at x_0 N	at $x_{max.}$ N
	1LG4 . . ., 1LG6 . . ., 1LP4 . . ., 1PP4 . . .			
180 M, 180 L	**. . . . 18 .**	2	4550	3600
		4	5650	4050
		6	6350	4050
		8	6950	4050
200 L	**. . . . 20 .**	2	6600	5350
		4	8200	6850
		6	9300	6300
		8	10100	7400
225 S, 225 M	**. . . . 22 .**	2	7500	6250
		4	9150	7200
		6	10400	7400
		8	11300	7350
250 M	**. . . . 25 .**	2	9100	7300
		4	11300	9300
		6	12800	10500
		8	14100	10500
280 S [1], 280 M [1]	**. . . . 28 .**	2	11400	9350
315 S [1], 315 M [1]	**. . . . 310** **. . . . 313**	2	14700	12300
315 L [1]	**. . . . 316** **. . . . 317**	2	14600	12700

Admissible cantilever forces at 50 Hz for 1LG motors
Deep-groove bearings reinforced at both ends DE/NDE – Order code K36
Valid are: x_0 values for x = 0 and $x_{max.}$ values for x = l (l = shaft extension)

For motors Frame size	Type	Number of poles	Admissible cantilever force F_Q at x_0 N	at $x_{max.}$ N
	1LG4 . . . 1LG6 . . .			
180 M, 180 L	**. . . . 18 .**	2	3280	2600
		4	4150	3430
		6	4750	3950
		8	5250	4050
200 L	**. . . . 20 .**	2	4350	3500
		4	5550	4550
		6	6350	5350
		8	7000	5900
225 S, 225 M	**. . . . 22 .**	2	4850	3950
		4	6100	4850
		6	7050	5650
		8	7750	6150
250 M	**. . . . 25 .**	2	5800	4600
		4	7400	6050
		6	8500	7050
		8	9350	7850
280 S, 280 M	**. . . . 28 .**	2	–	–
315 S, 315 M	**. . . . 310** **. . . . 313**	2	5650	4650
315 L	**. . . . 316** **. . . . 317**	2	5450	4650

Admissible cantilever forces at 50 Hz for 1MA and 1MJ motors
Parallel roller bearings at the drive end (DE) – Order code K20

For motors Frame size	Type	Number of poles	Admissible cantilever force F_Q at x_0 N	at $x_{max.}$ N
	1MA6 . . . 1MJ7 . . .			
225	**. . . . 22 .**	2	8100	6800
		4	9800	7800
		6	11200	8800
		8	12200	9700
250	**. . . . 25 .**	2	9600	7900
		4	11600	9600
		6	13200	10800
		8	14400	11800
280 [1] [2]	**. . . . 28 .**	2	10000	8400
315 S [1] [2], 315 M [1] [2]	**. . . . 310** **. . . . 313**	2	12000	10200
315 L [1] [2]	**. . . . 316** **. . . . 317**	2	11800 (horizontal type of construction)	10200
	1LA8 1PQ8			
315 to 355		2 to 8	See diagrams Page 0/70	

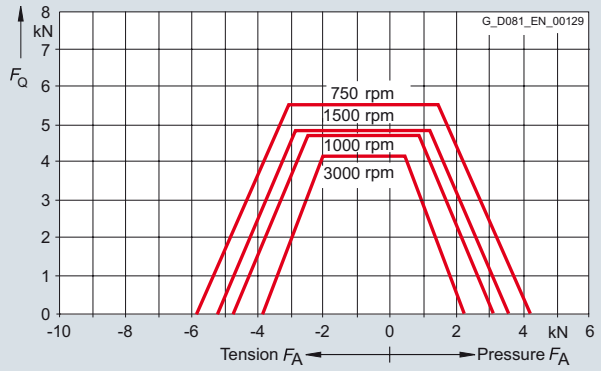
It should be observed that for types of construction IM B6, IM B7, IM B8, IM V5 and IM V6 the belt tension is only permitted to act parallel to the mounting plane or towards the mounting plane and the feet must be supported.

[1] Admissible cantilever forces for 1LG4, 1LG6, 1LP4, 1PP4 and 1MA6 frame sizes 280 to 315 L in 4-pole to 8-pole version, see Page 0/70.

[2] Not applicable to 1MJ motors with frame sizes 280 to 315, because this is the standard version.

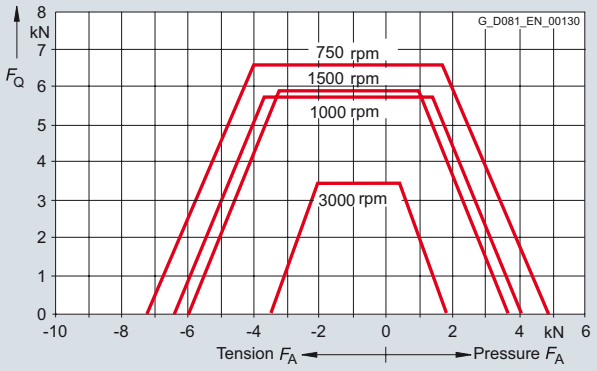
Admissible cantilever forces at 50 Hz for 1LA8 and 1PQ8 motors – basic version

Frame size 315, 1LA8 and 1PQ8 – Type of construction IM B3



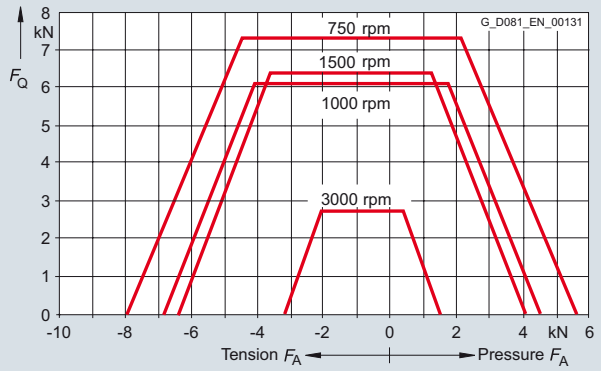
Cantilever force F_Q at x = l (shaft extension) via axial force F_A at nominal bearing service life L_{h10} = 20000 h

Frame size 355, 1LA8 and 1PQ8 – Type of construction IM B3



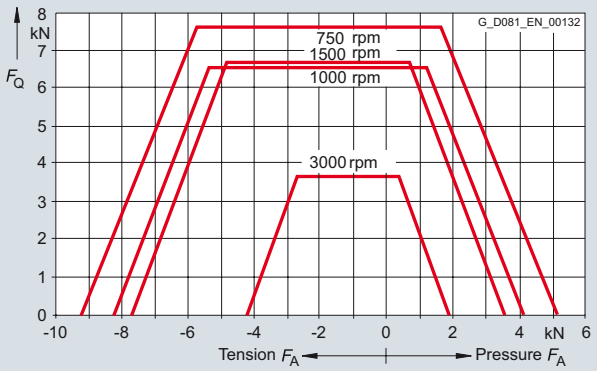
Cantilever force F_Q at x = l (shaft extension) via axial force F_A at nominal bearing service life L_{h10} = 20000 h

Frame size 400, 1LA8 and 1PQ8 – Type of construction IM B3



Cantilever force F_Q at x = l (shaft extension) via axial force F_A at nominal bearing service life L_{h10} = 20000 h

Frame size 450, 1LA8 and 1PQ8 – Type of construction IM B3

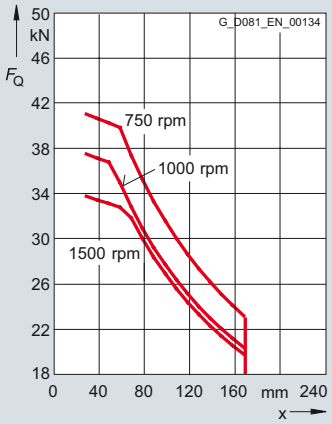


Cantilever force F_Q at x = l (shaft extension) via axial force F_A at nominal bearing service life L_{h10} = 20000 h

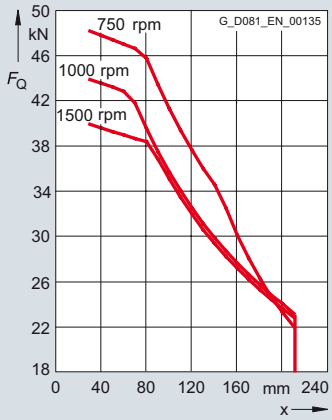
General technical data

Admissible cantilever forces at 50 Hz for 1LA8 and 1PQ8 motors – Bearings for increased cantilever forces – Order code **K20**

Frame size 315, 1LA8 and 1PQ8 – Type of construction IM B3



Frame size 355, 1LA8 and 1PQ8 – Type of construction IM B3

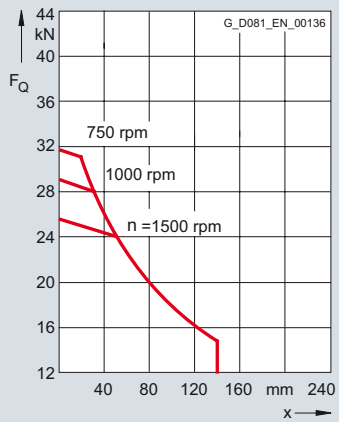


At 60 Hz, the admissible cantilever force must be reduced to 80 %.

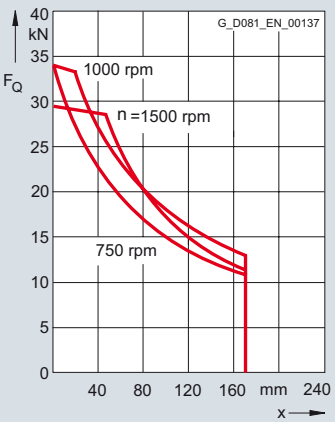
For all motors of frame sizes 400 and 450, IM V1 and 1LL8 motors with reinforced bearings available on request. Please specify cantilever force and lever arm.

Admissible cantilever forces at 50 Hz for 1LG motors – Bearings for increased cantilever forces – Order code **K20**

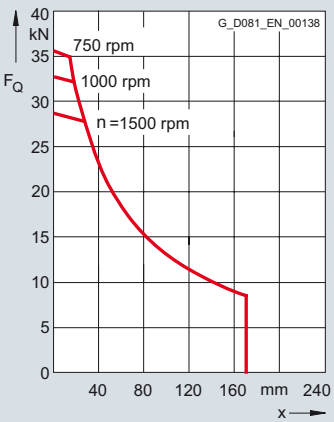
Frame size 280, 4-pole to 8-pole, 1LG4/1LG6, 1LP4/1PP4



Frame size 315, 4-pole to 8-pole, 1LG4/1LG6, 1LP4/1PP4

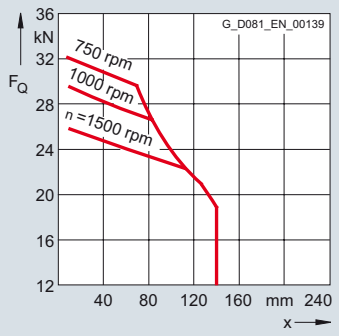


Frame size 315 S/M, 4-pole to 8-pole, 1LG4/1LG6, 1LP4/1PP4

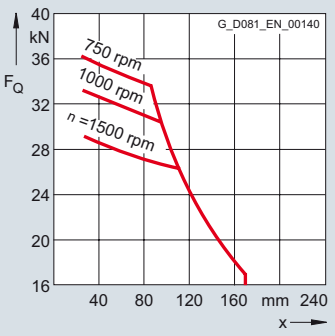


Admissible cantilever forces at 50 Hz for 1MA motors – Bearings for increased cantilever forces – Order code **K20**

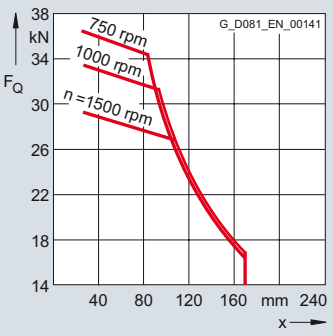
Frame size 280, 4-pole to 8-pole, 1MA6



Frame size 315 S/M, 4-pole to 8-pole, 1MA6



Frame size 315 L, 4-pole to 8-pole, 1MA6



Admissible axial load

1LA5, 1LA6, 1LA7, 1LP5, 1LP7, 1MA6, 1MA7, 1MJ6, 1MJ7, 1PP5, 1PP6, 1PP7 motors in vertical type of construction – basic version

Frame size	**Shaft extension pointing**															
	3000 rpm				1500 rpm				1000 rpm				750 rpm			
	downwards		**upwards**		**downwards**		**upwards**		**downwards**		**upwards**		**downwards**		**upwards**	
	Load		Load		Load		Load		Load		Load		Load		Load	
	down	up	down	up	down	up	down	up	down	up	down	up	down	up	down	up
	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
56	80	245	230	95	80	330	310	95	80	410	390	95	–	–	–	–
63	80	245	230	95	80	330	310	95	80	410	390	95	–	–	–	–
71	105	365	335	130	90	380	440	130	90	590	550	130	90	700	660	130
80	110	425	360	160	100	540	480	165	100	650	590	165	100	760	700	165
90	110	440	360	180	100	680	580	190	100	920	820	190	100	1150	1050	190
100	140	700	550	280	130	990	820	285	130	1280	1110	285	130	1560	1390	285
112	140 (140)*	710 (1050)*	550 (800)*	300 (300)*	130 (130)*	1000 (1350)*	820 (1100)*	310 (300)*	130 (130)*	1290 (1720)*	1110 (1500)*	310 (310)*	130 (130)*	1570 (2000)*	1390 (1850)*	310 (310)*
132	200 (1500)*	1200 (1550)*	950 (1300)*	470 (470)*	180 (1500)*	1680 (2100)*	1200 (1600)*	470 (470)*	180 (280)*	1900 (2400)*	1600 (2100)*	470 (470)*	190 (290)*	2200 (2800)*	1900 (2400)*	440 (440)*
160	1500 (2000)*	1400 (1720)*	950 (1300)*	1900 (2500)*	1900 (2500)*	1800 (2400)*	1300 (1720)*	2200 (2800)*	2200 (2800)*	2200 (2800)*	1600 (2130)*	2700 (3600)*	2700 (3600)*	2700 (3600)*	1950 (2600)*	2900 (3700)*

For motors		**Shaft extension downwards**															
Frame size		3000 rpm				1500 rpm				1000 rpm				750 rpm			
		Load **down**		Load **up**		Load **down**		Load **up**		Load **down**		Load **up**		Load **down**		Load **up**	
	Type	1LA5...	1MJ6..	1LA5...	1MJ6...	1LA5...	1MJ6...	1LA5...	1MJ6...	1LA5...	1MJ6...	1LA5...	1MJ6...	1LA5...	1MJ6...	1LA5...	1MJ6...
	1LA5 . . .	1MA6	1MJ7	1MA6	1MJ7	1MA6	1MJ7	1MA6	1MJ7	1MA6	1MJ7	1MA6	1MJ7	1MA6	1MJ7	1MA6	1MJ7
	1MA6 . . .	1LP5		1LP5		1LP5		1LP5		1LP5		1LP5		1LP5		1LP5	
	1MJ6 . . .	1PP5		1PP5		1PP5		1PP5		1PP5		1PP5		1PP5		1PP5	
	1MJ7 . . .																
	1LP5 . . .																
	1PP5 . . .																
		N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
180 M	 183	1150	1150	1900	1900	1400	1400	2350	2350	–	–	–	–	–	–	–	–
180 L	 186	–	–	–	–	1400	1400	2400	2400	1700	1700	2850	2850	2000	2000	3150	3150
200 L	 206	1650	1650	2750	2750	–	–	–	–	2550	2550	3950	3950	–	–	–	–
	 207	1550	1550	2800	2800	2000	2000	3350	3350	2400	2400	3950	3950	2800	2800	4500	4500
225 S	 220	–	–	–	–	2300	2300	3020	3020	–	–	–	–	3200	3200	4080	4080
225 M	 223	1890	1890	2190	2190	2180	2180	3060	3060	2700	2700	3500	3500	3040	3040	4120	4120
250 M	 253	1750	1750	2790	2790	2160	2160	3760	3760	2740	2740	4340	4340	2990	2990	4890	4890
280 S	 280	380	1150	4480	3850	3830	1350	8790	4950	5340	2350	10000	5650	6280	2850	11000	6250
280 M	 283	180	900	4580	3900	3550	1000	8910	5000	5000	2000	10100	5700	5930	2450	11100	6300
315 S	 310	210	900	5270	4500	3700	1700	10200	6400	5150	2300	11700	7050	6520	3400	13000	7950
315 M	 313	100	650	5350	4550	3330	1600	10400	6900	4740	2050	11700	7500	5800	2800	13000	8400
315 L	 316	9270	–	770	–	2330	–	10400	–	3650	–	11700	–	4630	–	13000	–
	 317	9270	–	840	–	1370	–	10800	–	2990	–	11600	–	3760	–	13000	–
	 318	9270	–	840	–	1370	–	10800	–	2990	–	11600	–	3760	–	13000	–

The values shown do not assume a cantilever force on the shaft extension.
The admissible loads are valid for operation at 50 Hz; for 60 Hz, please inquire.
The calculation of the admissible axial load was based on the drive with generally available coupling. For suppliers, see the relevant catalog part, section “Accessories”.
Please inquire if the load direction alternates.

* The values in brackets for frame sizes 112 to 160 apply to 1MJ6 motors.

General technical data

1LA5, 1LA6, 1LA7, 1LP7, 1MA6, 1MA7, 1MJ6, 1MJ7, 1PP6, 1PP7 motors in horizontal type of construction – Basic version

Frame size	3000 rpm				1500 rpm				1000 rpm				750 rpm			
	Tensile load	Thrust load (N) with radial load at		without radial load	Tensile load	Thrust load (N) with radial load at		without radial load	Tensile load	Thrust load (N) with radial load at		without radial load	Tensile load	Thrust load (N) with radial load at		without radial load
		x_0	$x_{max.}$			x_0	$x_{max.}$			x_0	$x_{max.}$			x_0	$x_{max.}$	
	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
56	90	120	90	240	90	140	110	320	90	170	120	400	–	–	–	–
63	90	120	90	240	90	140	110	320	90	170	120	400	–	–	–	–
71	120	150	120	350	120	210	150	460	120	260	180	570	120	300	210	680
80	140	190	150	400	140	300	260	510	140	330	280	620	140	340	290	730
90	150	300	280	400	150	400	360	630	150	480	430	870	150	550	500	1100
100	220	450	350	630	220	600	500	910	220	650	550	1200	220	750	650	1480
112	220 (220)*	450 (850)*	350 (700)*	630 (1050)*	220 (220)*	600 (1150)*	500 (1000)*	910 (1350)*	220 (220)*	650 (1300)*	550 (1150)*	1200 (1720)*	220 (220)*	750 (1450)*	650 (1300)*	1480 (2000)*
132	350 (350)*	650 (1000)*	520 (900)*	1200 (1550)*	350 (350)*	850 (1250)*	700 (1150)*	1600 (2100)*	350 (350)*	1020 (1500)*	890 (1400)*	1900 (2400)*	350 (350)*	1150 (1750)*	1020 (1650)*	2200 (2800)*
160	1500 (2100)*	850 (1280)*	720 (1100)*	1500 (2100)*	1500 (2100)*	1050 (1680)*	920 (1700)*	1800 (2350)*	1500 (2100)*	1250 (2050)*	1120 (1920)*	2200 (2900)*	1500 (2100)*	1350 (2400)*	1220 (2200)*	2600 (3300)*

For motors		3000 rpm		1500 rpm		1000 rpm		750 rpm	
		Loading direction		Loading direction		Loading direction		Loading direction	
Frame size	Type 1LA5 . . . 1MA6 . . . 1MJ6 . . . 1MJ7 . . . 1LP5 . . . 1PP5 . . .	Tension	Thrust	Tension	Thrust	Tension	Thrust	Tension	Thrust
		N	N	N	N	N	N	N	N
180 M	 183	1400	1400	1700	1700	–	–	–	–
180 L	 186	–	–	1700	1700	2050	2050	2400	2400
200 L	 206	2000	2000	–	–	3000	3000	–	–
	 207	1950	1950	2450	2450	2900	2900	3400	3400
225 S	 220	–	–	2980	1960	–	–	3880	2860
225 M	 223	2390	1370	2900	1880	3380	2360	3810	2790
250 M	 253	2450	1655	3070	2270	3620	2820	4000	3200
280 S	 280	1330 (3700)*	2900 (2100)*	5080 (4200)*	6740 (2600)*	6410 (5000)*	8070 (3400)*	7390 (5550)*	9050 (3950)*
280 M	 283	1200 (3600)*	2800 (2000)*	4990 (4000)*	6650 (2400)*	6260 (4800)*	7920 (3200)*	7220 (5350)*	8880 (3750)*
315 S	 310	1500 (3800)*	3160 (2200)*	5350 (4900)*	7450 (3300)*	6740 (5500)*	8810 (3900)*	8010 (6500)*	10110 (4900)*
315 M	 313	1400 (3650)*	3180 (2050)*	5260 (4900)*	7360 (3300)*	6560 (5450)*	8660 (3850)*	7690 (6250)*	9790 (4650)*
315 L	 316	1080	2740	4580	6680	5770	7870	6820	8920
	 317	940	2600	4170	6270	5410	7510	6410	8510
	 318	940	2600	4170	6270	5410	7510	6410	8510

The values shown do not assume a cantilever force on the shaft extension.
The admissible loads are valid for operation at 50 Hz; for 60 Hz, please inquire.
The calculation of the admissible axial load was based on the drive with generally available coupling. For suppliers, see the relevant catalog part, section “Accessories”.
Please inquire if the load direction alternates.

* The values in brackets for frame sizes 112 to 160 apply to 1MJ6 motors and frame sizes 280 S to 315 M apply to 1MJ7 motors.

1LG4, 1LG6, 1LP4, 1PP4 and 1PP6 motors in vertical type of construction – Basic version

For motors									
Frame size	Type 1LG4 . . . 1LG6 . . . 1LP4 . . . 1PP4 . . . 1PP6 . . .	3000 rpm Load down N	Load up N	1500 rpm Load down N	Load up N	1000 rpm Load down N	Load up N	750 rpm Load down N	Load up N
Shaft extension downwards									
180 M	 183	1140	1150	1500	1600	–	–	–	–
180 L	 186	–	–	1380	1630	1650	2000	2020	2250
	 188	1140	1190	1390	1650	1640	2030	1880	2280
200 L	 206	1610	1480	–	–	2420	2550	–	–
	 207	1510	1530	2030	2100	2220	2610	2610	2970
	 208	1510	1590	1990	2120	2210	2680	2600	3060
225 S	 220	–	–	2110	2690	–	–	2830	3710
225 M	 223	1540	1990	1920	2770	2260	3300	2620	3770
	 228	1540	2070	1950	2840	2240	3430	2610	3880
250 M	 253	1680	2760	2110	3740	2740	4350	3070	4920
	 258	1660	2870	2110	3960	2740	4520	3070	5160
280 S	 280	390	4670	3190	8200	4510	9290	5510	10300
280 M	 283	100	4780	2790	8340	4210	9450	5200	10400
	 288	100	4950	2700	8570	4170	9600	5160	10600
315 S	 310	840	6330	3380	10200	4760	11500	5860	12600
315 M	 313	530	6490	2870	10500	4200	11800	5420	12900
315 L	 316	8830	590	2450	11000	3680	12300	4800	13400
	 317	8410	690	1800	11400	3100	12800	4410	13900
	 318	8170	800	1620	12000	2690	13400	3820	14300
Shaft extension pointing upwards									
180 M	 183	1900	390	2260	840	–	–	–	–
180 L	 186	–	–	2140	870	2410	1240	2780	1490
	 188	1900	430	2150	890	2400	1270	2640	1520
200 L	 206	2760	330	–	–	3570	1400	–	–
	 207	2660	380	3180	950	3370	1460	3760	1820
	 208	2660	440	3140	970	3360	1530	3750	1910
225 S	 220	–	–	3130	1670	–	–	3850	2690
225 M	 223	2560	970	2940	1750	3280	2280	3640	2750
	 228	2560	1050	2970	1820	3260	2410	3630	2860
250 M	 253	2480	1960	2910	2940	3540	3550	3870	4120
	 258	2460	2070	2910	3160	3540	3720	3870	4360
280 S	 280	1960	3100	4760	6630	6080	7720	7080	8730
280 M	 283	1670	3210	4360	6770	5780	7880	6770	8830
	 288	1670	3380	4270	7000	5740	8030	6730	9030
315 S	 310	2410	4760	5380	8200	6760	9500	7860	10600
315 M	 313	2100	4920	4870	8500	6200	9800	7420	10900
315 L	 316	10400	–	4450	9000	5680	10300	6800	11400
	 317	9980	–	3800	9400	5100	10800	6410	11900
	 318	9740	–	3620	10000	4690	11400	5820	12300

Values shown without assuming a cantilever force on the shaft extension.
The admissible loads apply to operation at 50 Hz; please inquire about 60 Hz.
The figures for the admissible axial loads have been calculated assuming that standard coupling types are used for the drive.
For suppliers, see the relevant catalog part, section "Accessories".
Please inquire if the loading direction alternates.

General technical data

1LG4, 1LG6, 1LP4, 1PP4 and 1PP6 motors in horizontal type of construction – Basic version

For motors		3000 rpm		1500 rpm		1000 rpm		750 rpm	
Frame size	Type	Loading direction		Loading direction		Loading direction		Loading direction	
	1LG4 . . . 1LG6 . . . 1LP4 . . . 1PP4 . . . 1PP6 . . .	Tension	Thrust	Tension	Thrust	Tension	Thrust	Tension	Thrust
		N	N	N	N	N	N	N	N
180 M	 183	1550	790	1950	1190	–	–	–	–
180 L	 186	–	–	1890	1130	2220	1460	2470	1710
	 188	1550	790	1900	1140	2220	1460	2460	1700
200 L	 206	2150	990	–	–	3090	1940	–	–
	 207	2130	970	2670	1520	3030	1880	3410	2260
	 208	2130	970	2630	1480	3020	1870	3410	2250
225 S	 220	–	–	2950	1920	–	–	3820	2790
225 M	 223	2320	1290	2910	1880	3360	2330	3760	2740
	 228	2320	1290	2910	1880	3350	2320	3760	2730
250 M	 253	2510	1710	3150	2350	3750	2950	4180	3380
	 258	2510	1710	3140	2340	3750	2950	4170	3370
280 S	 280	1790	3360	4970	6540	6180	7750	7170	8740
280 M	 283	1720	3290	4860	6430	6110	7680	7090	8660
	 288	1720	3290	4850	6420	6100	7670	7080	8650
315 S	 310	2610	4180	5520	7520	6830	8830	7940	9940
315 M	 313	2500	4070	5320	7320	6520	8520	7850	9850
315 L	 316	2450	4020	5230	7230	6370	8370	7520	9520
	 317	2320	3890	5050	7050	6110	8110	7350	9350
	 318	2300	3870	4950	6950	5950	7950	7080	9080

1LA8 and 1PQ8 motors in vertical type of construction – Basic version

For motors		Shaft extension facing downwards							
Frame size		3000 rpm		1500 rpm		1000 rpm		750 rpm	
	Type	Load down	Load up	Load down	Load up	Load down	Load up	Load down	Load up
	1LA8 . . . 1PQ8 . . . 1LL8 . . .	N	N	N	N	N	N	N	N
315	 315	1900	5240	2790	6930	3060	8600	3850	9390
	 317	1440	5680	2280	7420	2390	9230	3190	10030
355	 353	8480	5570	14550	7900	–	–	–	–
	 355	8180	5860	14200	8240	15690	10650	17840	11650
	 357	7530	6500	13400	9030	14540	11780	16690	12780
400	 403	6780	7260	17640	11160	19500	14160	22260	15330
	 405	6330	7700	17040	11750	18750	14910	21510	16070
	 407	5930	8100	16340	12440	17900	15750	20660	16910
450	 453	5330	9650	17720	13020	19950	16250	23040	17550
	 455	4730	10250	17020	13720	19050	17140	22140	18440
	 457	4130	10840	16270	14460	18000	18180	21090	19480

For 1LA8 and 1PQ8 motors in a horizontal type of construction, the admissible cantilever forces are specified with regard to the axial forces, see Page 0/69.
Data is available for 1LL8 motors on request.

Values shown without assuming a cantilever force on the shaft extension.
The admissible loads apply to operation at 50 Hz; please inquire about 60 Hz.
The figures for the admissible axial loads have been calculated assuming that standard coupling types are used for the drive.
For suppliers, see the relevant catalog part, section “Accessories”.
Please inquire if the loading direction alternates.

Modular technology

Basic versions

The range of potential applications for the 1LA and 1LG motors can be broadened considerably by mounting the following modules (e.g. the motors can be used as brake motors).

- **1XP8 001** rotary pulse encoder, frame sizes 71 M to 315 L
- Separately driven fan, frame sizes 100 L to 315 L
- Brake, frame sizes 63 to 315 L

The brake must always be mounted in the factory for safety reasons. The rotary pulse encoder and/or the separately driven fan can also be retrofitted.

The degree of protection of the motors with modular technology is IP55. Higher degrees of protection on request.

When a rotary pulse encoder, brake or separately driven fan is mounted, the length of the motor increases by Δ l. For an explanation of the additional dimensions and weights, see "Technology", "Dimensions and weights".

1XP8 001 rotary pulse encoder

1XP8 001 rotary pulse encoder

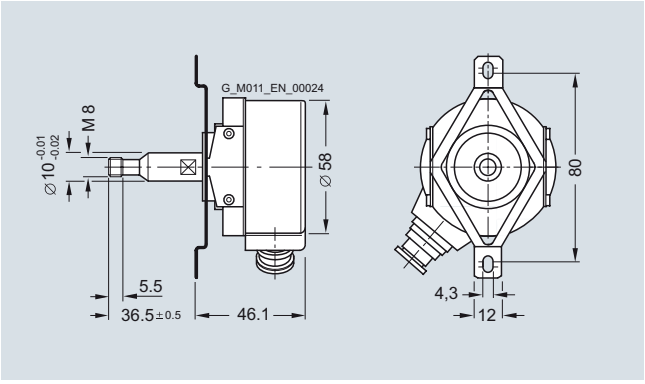
The rotary pulse encoder can be supplied already mounted in an HTL version as **1XP8 001-1** with order code **H57** or in a TTL version as **1XP8 001-2** with order code **H58**. The rotary pulse encoder can only be mounted on a standard non-drive end (NDE), i.e. a second shaft extension or protective cover cannot be supplied.

It can also be ordered separately and retrofitted (please inquire beforehand), Order No. **1XP8 001-1** or **1XP8 001-2** (see catalog part 2 "Standard motors", "Accessories").

The 1XP8 001 rotary pulse encoder is suitable for standard applications. The encoder does not have insulated bearings; therefore, it cannot be recommended at the risk of bearing currents in combination with insulated bearing cartridge NDE, order code L27, or with insulated bearing cartridge DE. For further encoders, see "Special technology" from Page 0/85.

All 1LG4 and 1LG6 motors that are listed in the catalog have an M16 center hole, form DS on the non-drive end (NDE). When a rotary pulse encoder is mounted, the length of the motor increases by Δ l. For an explanation of the additional dimensions and weights, see "Technology", "Dimensions and weights".

The rotary pulse encoders of "Modular technology" and "Special technology" are fitted as standard with a protective cover made of plastic. A protective cover made of non-corrosive sheet steel is available for 1LA5, 1LA6 and 1LA7 motors, see "Mechanical protection for encoders", order code **M68**, under "Mechanical design and degrees of protection".



Mounting dimensions of 1XP8 001 rotary pulse encoder

Mounting of encoder at temperatures below –20 °C and higher than +40 °C on request.

Technical data of rotary pulse encoders		
Supply voltage U_B	**1XP8 001-1** (HTL version) +10 V to +30 V	**1XP8 001-2** (TTL version) 5 V ±10 %
Current input without load	200 mA	150 mA
Admissible load current per output	max. 100 mA	max. 20 mA
Pulses per revolution	1024	1024
Outputs	2 square-wave pulses A, B – 2 inverted square-wave pulses A, B Zero pulse and inverted zero pulse	
Pulse offset between the two outputs	90° ±20 %	90° ±20 %
Output amplitude	U_{High} > U_B –3.5 V U_{Low} <3 V	U_{High} >2.5 V U_{Low} <0.5 V
Minimum edge interval	0.8 µs at 160 kHz	0.45 µs at 300 kHz
Edge steepness (without load or cable)	t_+, t_- ≤200 ns	t_+, t_- ≤100 ns
Maximum frequency	160 kHz	300 kHz
Maximum speed	9000 rpm	12000 rpm
Temperature range	–20 to +80 °C	–20 to +100 °C
Degree of protection	IP66	IP66
Admissible radial cantilever force	60 N	60 N
Admissible axial force	40 N	40 N
Termination system	12-pin connector (mating connector is supplied)	
Certification	CSA, UL	CSA, UL
Weight	0.3 kg	0.3 kg

General technical data

Separately driven fan

The use of a separately driven fan is recommended to increase motor utilization at low speeds and to limit noise generation at speeds significantly higher than the synchronous speed. Both of these results can only be achieved with converter-fed operation. Please inquire about traction and vibratory operation.

The separately driven fan can be supplied already fitted, order code **G17**.

It can also be ordered separately and retrofitted. For selection information and order numbers, see catalog part 2 “Standard motors”, “Accessories”. A rating plate listing all the important data is fitted to the separately driven fan. Order code **Y81** and plain text are required for supply voltages outside the rated voltage ranges for 1LG motors. Please note the direction of rotation of the separately driven fan (axial-flow fan) when connecting it. The admissible coolant temperatures for frame sizes 100 to 225 [1] are $CT_{min.}$ –25 °C and $CT_{max.}$ +65 °C [2], lower/higher coolant temperatures on request. The admissible coolant temperatures for frame sizes 250 to 315 are $CT_{min.}$ –20 °C and $CT_{max.}$ +50 °C, lower/higher coolant temperatures on request.

When a separately driven fan is mounted, the length of the motor increases by Δ l. For an explanation of the additional dimensions and weights, see “Technology”, “Dimensions and weights”.

Technical data of the separately driven fan (in accordance with tolerance DIN EN 60034-1)

Frame size	Rated voltage range		Frequency	Rated speed	Power consumption	Rated current
	V		Hz	rpm	kW	A
100	1 AC	230 to 277	50	2790	0.075	0.29
	3 AC	220 to 290 Δ	50	2830	0.086	0.27
	3 AC	380 to 500 Y	50	2830	0.086	0.16
	1 AC	230 to 277	60	3280	0.094	0.28
	3 AC	220 to 332 Δ	60	3490	0.093	0.27
	3 AC	380 to 575 Y	60	3490	0.093	0.16
112	1 AC	230 to 277	50	2720	0.073	0.26
	3 AC	220 to 290 Δ	50	2770	0.085	0.27
	3 AC	380 to 500 Y	50	2770	0.085	0.15
	1 AC	230 to 277	60	3000	0.107	0.31
	3 AC	220 to 332 Δ	60	3280	0.094	0.28
	3 AC	380 to 575 Y	60	3280	0.094	0.16
132	1 AC	230 to 277	50	2860	0.115	0.40
	3 AC	220 to 290 Δ	50	2880	0.138	0.45
	3 AC	380 to 500 Y	50	2880	0.138	0.24
	1 AC	230 to 277	60	3380	0.185	0.59
	3 AC	220 to 332 Δ	60	3470	0.148	0.41
	3 AC	380 to 575 Y	60	3470	0.148	0.24
160 to 225 [3]	1 AC	230 to 277	50	2780	0.236	0.96
	3 AC	220 to 290 Δ	50	2840	0.220	0.76
	3 AC	380 to 500 Y	50	2830	0.220	0.43
	3 AC	220 to 332 Δ	60	3400	0.284	0.94
	3 AC	380 to 575 Y	60	3400	0.284	0.56
250 M to 280 M	3 AC	200 to 240 Δ	50	2720	0.450	2.00
	3 AC	380 to 420 Y	50	2720	0.450	1.15
	3 AC	440 to 480 Y	60	3320	0.520	1.05
315 2-pole	3 AC	200 to 240 Δ	50	2750	0.650	2.85
	3 AC	380 to 420 Y	50	2750	0.650	1.64
	3 AC	440 to 480 Y	60	3365	0.750	1.60
315 4, 6, 8-pole	3 AC	200 to 240 Δ	50	2720	0.450	2.00
	3 AC	380 to 420 Y	50	2720	0.450	1.15
	3 AC	440 to 480 Y	60	3320	0.520	1.05

1) Separately driven fans with order numbers **1PP. ...** are used for 1LG motors of frame size 225 and above. The admissible coolant temperatures are $CT_{min.}$ –20 °C and $CT_{max.}$ +50 °C

2) The admissible coolant temperature for single phase versions (1AC) for frame size 160 and above is $CT_{max.}$ +50 °C.

3) Separately driven fans with order numbers **1PP. ...** are used for 1LG motors of frame size 225 and above. The values for frame sizes 250 M to 280 M are then applicable.

Mounting of separately driven fan and rotary pulse encoder with separately driven fan for 1LA5, 1LA6, 1LA7 and 1LG motors			
Version	Frame size	Number of poles	Order No.
Separately driven fan incl. mounting parts [1]	100	all	**2CW2 180-8RF54-1AB0**
	112	all	**2CW2 210-8RF54-1AB1**
	132	all	**2CW2 250-8RF54-1AB2**
	160	all	**2CW2 300-8RF54-1AB3**
	180	all	**2CW2 300-8RF54-1AB4**
	200	all	**2CW2 300-8RF54-1AB5**
	225 [2]	all	**2CW2 300-8RF54-1AB6**
	250	all	**1PP9 063-2LA12-Z A11+K50** [3]
	280	all	**1PP9 063-2LA12-Z A11+K50** [3]
	315	2	**1PP9 070-2LA12-Z A11+K50** [3]
	315	4 to 8	**1PP9 063-2LA12-Z A11+K50** [3]
Separately driven fan and rotary pulse encoder 1XP8 001-1 (HTL) [4] incl. mounting parts [1]	100	all	**2CW2 180-8RF54-2AB0**
	112	all	**2CW2 210-8RF54-2AB1**
	132	all	**2CW2 250-8RF54-2AB2**
	160	all	**2CW2 300-8RF54-2AB3**
	180	all	**2CW2 300-8RF54-2AB4**
	200	all	**2CW2 300-8RF54-2AB5**
	225 [2]	all	**2CW2 300-8RF54-2AB6**

Brakes

Spring-operated disk brakes are used for the brakes with order code **G26**. **Depending on the selected motor, brake types 2LM8 or KFB are used.** In the standard version, the brakes are supplied for connection to 230 V with rectifier. The supply voltage for brakes is explained under “Modular technology – Additional versions”.

For the design of each brake type, the braking time, run-on revolutions, braking energy per braking procedure as well as the service life of the brake linings, see “Configuration of motors with brakes”.

When a brake is mounted, the length of the motor increases by Δ l. For an explanation of the additional dimensions and weights, see “Technology”, “Dimensions and weights”. When a brake is mounted on a 1LA7 motor, a larger connection box (GK 127) is used for frame sizes 63 to 90.

2LM8 spring-operated disk brake

This brake is mounted on 1LA5 and 1LA7 motors in the frame sizes 63 to 225 and on 1LG motors in the frame sizes 180 to 225 as standard.

The 2LM8 brake has IP55 degree of protection.

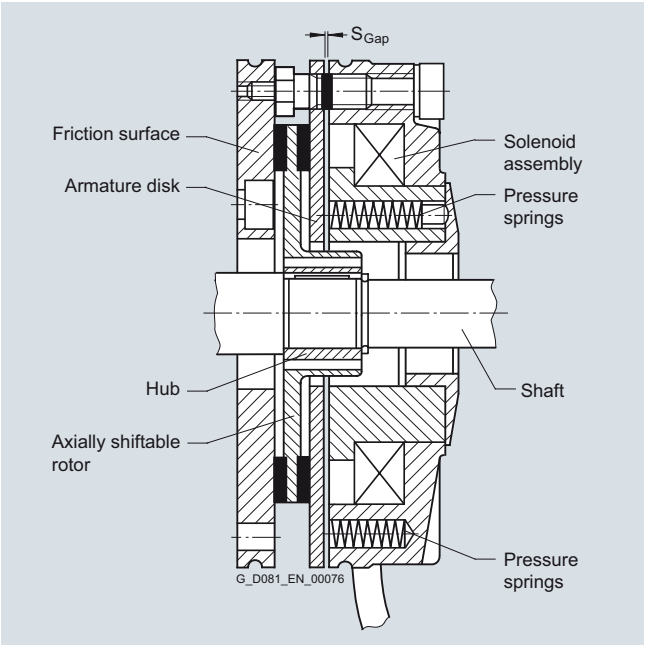
Please inquire if motors with brakes are to be operated below the freezing point or in very humid environments (e.g. close to the sea) with long standstill times.

Design and mode of operation

The brake takes the form of a single-disk brake with two friction surfaces.

The braking torque is generated by friction when pressure is applied by one or more pressure springs in the de-energized state. The brake is released electromagnetically.

When the motor brakes, the rotor which can be axially shifted on the hub or the shaft is pressed via the armature disk against the friction surface by means of the springs. In the braked state, there is a gap S_{Gap} between the armature disk and the solenoid component. To release the brake, the solenoid is energized with DC voltage. The resulting magnetic force pulls the armature disk against the spring force on to the solenoid component. The spring force is then no longer applied to the rotor which can rotate freely.



Design of the 2LM8 spring-operated disk brake

Rating plate

The motors have a second rating plate on the opposite side to the motor rating plate. The brake data is indicated on this second rating plate.

[1] The separately driven fan **2CW2 ...** comprises a complete fan unit with impeller, the separately driven fan **1PP9 ...** only comprises the fan motor without mounting components and impeller.

[2] For 1LG motors with separately driven fan with Order No.. **1PP9 063-2LA12-Z A11+K50** (weight 4.37 kg).

[3] For replacement purposes only.

[4] Rotary pulse encoder **1XP8001-2** (TTL) on request.

General technical data

Operating values for spring-operated brakes with standard excitation

For motor frame size	Brake type	Rated braking torque at 100 rpm	Rated braking torque in relation to rated braking torque at 100 rpm in % for the following speeds			Supply voltage	Current/power input [1]		Brake application time t_2 [2]	Brake release time	Brake moment of inertia	Noise level Lp with rated air gap	**Service capability of the brake** Lifetime of brake lining L	Air gap adjustment required after braking energy L_N
			1500 rpm	3000 rpm	Max. speed									
		Nm	%	%	%	V	A	W	ms	ms	kg m^2	dB (A)	Nm · 10^6	Nm · 10^6
63	**2LM8 005-1NA10** **2LM8 005-1NA60** **2LM8 005-1NA80**	5	87	80	65	AC 230 AC 400 DC 24	0.1 0.11 0.83	20	25	56	0.000013	77	105	16
71	**2LM8 005-2NA10** **2LM8 005-2NA60** **2LM8 005-2NA80**	5	87	80	65	AC 230 AC 400 DC 24	0.1 0.11 0.83	20	25	56	0.000013	77	105	16
80	**2LM8 010-3NA10** **2LM8 010-3NA60** **2LM8 010-3NA80**	10	85	78	65	AC 230 AC 400 DC 24	0.12 0.14 1.04	25	26	70	0.000045	75	270	29
90	**2LM8 020-4NA10** **2LM8 020-4NA60** **2LM8 020-4NA80**	20	83	76	66	AC 230 AC 400 DC 24	0.15 0.17 1.25	32	37	90	0.00016	75	740	79
100	**2LM8 040-5NA10** **2LM8 040-5NA60** **2LM8 040-5NA80**	40	81	74	66	AC 230 AC 400 DC 24	0.2 0.22 1.67	40	43	140	0.00036	80	1350	115
112	**2LM8 060-6NA10** **2LM8 060-6NA60** **2LM8 060-6NA80**	60	80	73	65	AC 230 AC 400 DC 24	0.25 0.28 2.1	53	60	210	0.00063	77	1600	215
132	**2LM8 100-7NA10** **2LM8 100-7NA60** **2LM8 100-7NA80**	100	79	72	65	AC 230 AC 400 DC 24	0.27 0.31 2.3	55	50	270	0.0015	77	2450	325
160	**2LM8 260-8NA10** **2LM8 260-8NA60** **2LM8 260-8NA80**	260	75	68	65	AC 230 AC 400 DC 24	0.5 0.47 4.2	100	165	340	0.0073	79	7300	935
180	**2LM8 315-0NA10** **2LM8 315-0NA60** **2LM8 315-0NA80**	315	75	68	65	AC 230 AC 400 DC 24	0.5 0.56 4.2	100	152	410	0.0073	79	5500	470
200, 225	**2LM8 400-0NA10** **2LM8 400-0NA60** **2LM8 400-0NA80**	400	73	68	65	AC 230 AC 400 DC 24	0.55 0.61 4.6	110	230	390	0.0200	93	9450	1260

[1] For 400 V AC and for 24 V DC, the power can deviate by up to +10 % as a function of the selected supply voltage.

[2] The specified switching times are valid for switching on the DC side with a rated release travel and with the coil already warm. They are average values which may vary depending on factors such as the rectifier type and the release travel. The brake application time for switching on the AC side, for example, is approximately 6 times longer than for switching on the DC side.

Lifetime of the brake lining

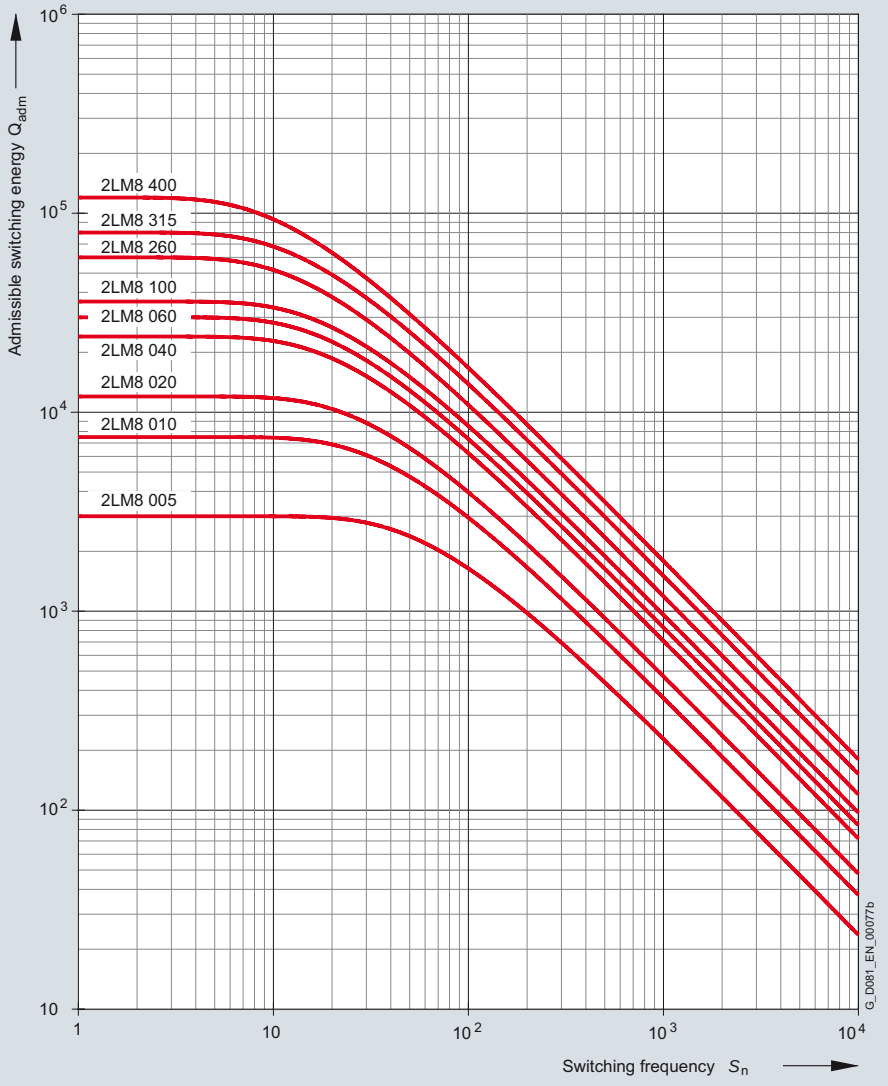
The braking energy L_N up to when the brake should be adjusted, depends on various factors. The main influencing factors include the masses to be braked, the operating speed, the switching frequency and therefore the temperature at the frictional surfaces. It is therefore not possible to specify a value for the friction energy until readjustment that is valid for all operating conditions.

The specific wear on the friction surfaces (volume of wear per unit of friction energy) is approximately 0.05 to 2 cm^3/kWh when the brake is used as a service brake.

Admissible speeds

The maximum admissible speeds from which emergency stops can be made, are listed in the table. These speeds should be considered as recommended values and must be checked under actual operating conditions.

The maximum admissible friction energy depends on the switching frequency and is shown for the various brakes in the figure “Admissible switching energy as a function of the switching frequency”. Increased wear can be expected when the brakes are used for emergency stops.



General technical data

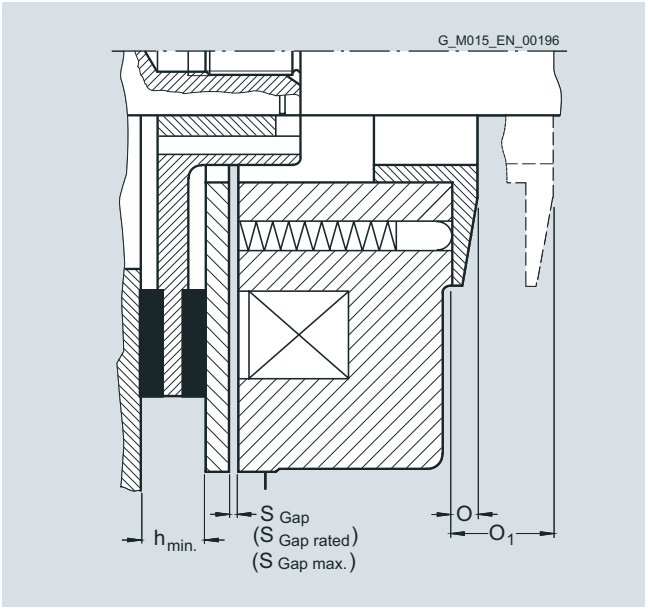
		Admissible speeds			Changing the braking torque			Readjusting the air gap		
For motor frame size	Brake type	Max. operating rpm if max. operating energy utilised	Max. no-load rpm with emergency stop function		Reduction per notch	Dim. "O_1"	Min. braking torque	Rated air gap $S_{Gap\ Rated}$	Max. air gap $S_{Gap\ max.}$	Min. rotor thickness $h_{min.}$
			Horizontal mounting	Vertical mounting						
		rpm	rpm	rpm	Nm	mm	Nm	mm	mm	mm
63	**2LM8 005-1NA . .**	3000	6000	6000	0.17	7.0	3.7	0.2	0.4	4.5
71	**2LM8 005-2NA . .**	3000	6000	6000	0.17	7.0	3.7	0.2	0.4	4.5
80	**2LM8 010-3NA . .**	3000	6000	6000	0.35	8.0	7.0	0.2	0.45	5.5
90	**2LM8 020-4NA . .**	3000	6000	6000	0.76	7.5	18.2	0.2	0.55	7.5
100	**2LM8 040-5NA . .**	3000	6000	6000	1.29	12.5	21.3	0.3	0.65	8.0
112	**2LM8 060-6NA . .**	3000	6000	6000	1.66	11.0	32.8	0.3	0.75	7.5
132	**2LM8 100-7NA . .**	3000	5300	5000	1.55	13.0	61.1	0.3	0.75	8.0
160	**2LM8 260-8NA . .**	1500	4400	3200	5.6	17.0	157.5	0.4	1.2	12.0
180	**2LM8 315-0NA . .**	1500	4400	3200	5.6	17.0	178.4	0.4	1.0	12.0
200, 225	**2LM8 400-0NA . .**	1500	3000	3000	6.15	21.0	248.7	0.5	1.5	15.5

Changing the braking torque

The brake is supplied with the braking torque already set. For 2LM8 brakes, the torque can be reduced to the dimension O_1 by unscrewing the adjusting ring with a hook spanner. The braking torque changes by the values shown in the above table for each notch of the adjusting ring.

Readjusting the air gap

Under normal operating conditions, the brake is practically maintenance-free. The air gap S_{Gap} must only be checked at regular intervals if the application requires an extremely large amount of frictional energy and readjusted to the rated gap $S_{Gap\ Rated}$ at the latest when the maximum air gap $S_{Gap\ max.}$ is reached.



KFB spring-operated brake

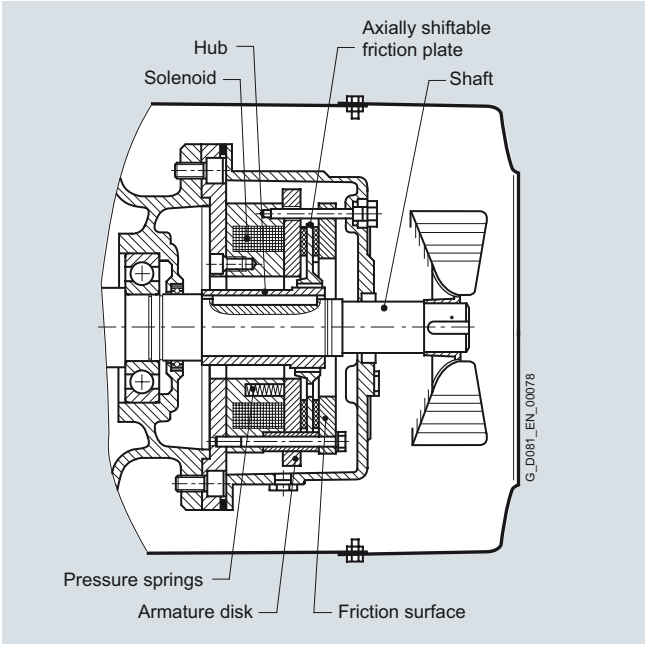
This brake is the standard brake for 1LG motors in frame sizes 250 to 315. For frame sizes 180 to 225, apart from the standard brake 2LM8, KFB brakes can also be supplied. Special brake selections are available on request.

KFB spring-operated brake

The KFB solenoid double-disk spring-operated brake is a safety brake which brakes the motor if the supply is disconnected (power failure, emergency stop). The KFB brake, IP65 degree of protection, is mainly used for electric motors for traversing, cross-traversing and lifting gear in cranes as well as for special industrial applications.

Design and mode of operation

When the brake current is switched on, an electromagnetic field develops which overcomes the spring force of the brake. The corresponding modules, including the motor shaft, can rotate freely. The brake is released. If the brake current is switched off or if there is a power failure, the electromagnetic field of the brake disappears. The mechanical braking energy is transferred to the motor shaft. The motor is braked.



Rating plate

The motors have a rating plate that indicates the brake data on the opposite side to the motor rating plate.

Other characteristics of the KFB brake

- High IP65 degree of protection
- Corrosion-resistant in seawater and in the tropics.
- The brake is a dynamic brake, not simply a holding brake. For this reason there is less wear, especially in the case of emergency stops (commissioning).
- High wear reserves – repeated stepless air gap readjustment is possible. This results in extremely long operating times and low service and operating costs.
- The function and wear can be monitored with microswitches and proximity switches. Microswitch On/Off is standard for LG motors. Anti-condensation heating is possible as an option.
- Fully functional brake for enclosure acceptance test. Visual inspection of brake is possible during operation.
- The brake (air gap) can be adjusted in the factory, for example, and mounted on the motor without further adjustments.

The wear parts can be replaced without great outlay. After the housing has been opened (three screws), it is easy to replace the friction plate. It is not necessary to disassemble the entire brake.

Overview of brake selection for 1LG motors

		For motor Frame size 180 [1]	200 [1]	225 [1]	250 [2]	280 [2]	315 [2]
Number of poles		2 to 8	2 to 8	2 to 8	2 to 8	4 to 8	4 to 8
NDE bearing		6310C3	6312C3	6313C3	6215C3	6317C3	6319C3
Flange bearing plate for NDE brake mounting		A300	A350	A350	A400	A450	A550
Max. diameter for 2nd. shaft extension		48k6	55m6	55m6	48m6	65m6	70m6
Brake type		**KFB 25**	**KFB 40**	**KFB 40**	**KFB 63**	**KFB 100**	**KFB 160**
Braking torque	Nm	250	400	400	630	1000	1600
$n_{max.}$ – IM B3	rpm	6000	5500	5500	4700	4000	3600
$n_{max.}$ – IM V1	rpm	6000	5500	5500	4700	4000	3600
Output at 110 V DC	W	158	196	196	220	307	344
Current at 230 V AC (207 V DC coil voltage)	A	0.77	0.91	0.91	1	1.53	1.64
Current at 400 V AC (180 V DC coil voltage)	A	0.8	1.18	1.18	1.25	1.8	2.1
Current at 110 V DC	A	1.44	1.78	1.78	2	2.79	3.13
Current at 24 V DC	A	5.21	6.92	9.62	8.17	12.2	12.8
Application time t_2	ms	70	80	80	110	125	180
Release time	ms	240	250	250	340	370	500
Brake moment of inertia	Kg m^2	0.0048	0.0068	0.0068	0.0175	0.036	0.050
Lifetime of brake lining L	Nm · 10^6	3600	3110	3110	4615	7375	10945
Air gap adjustment required after braking energy L_N	Nm · 10^6	810	935	935	1185	2330	3485

[1] The standard brake for frame sizes 180 to 225 is the 2LM8 brake. KFB brake on request.

[2] The standard brake for frame sizes 250 to 315 is the KFB brake.

General technical data

Configuration of motors with brakes

Braking time

The time it takes the motor to come to a standstill comprises two components:

a.) The application time of the brake t_2

b.) The braking time t_{Br}

$$t_{Br} = \frac{J \cdot n_{rated}}{9.55 \cdot (T_B \pm T_L)}$$

t_{Br} Braking time in s

J Total moment of inertia in kgm^2

n_{Rated} Rated speed of the motor with brake in rpm

T_B Rated braking torque in Nm

T_L Average load torque in Nm
(if T_L supports braking, T_L is positive)

Braking energy per braking operation Q_{adm}

The braking energy per braking operation in Nm comprises the energy of the moments of inertia to be braked Q_{Kin} and the energy Q_L, which must be applied in order to brake against a load torque.

$Q_{adm} = Q_{Kin} + Q_L$

a.) The energy of the moments of inertia in Nm

$$Q_{Kin} = \frac{J \cdot n_{rated}^2}{182.4}$$

n_{Rated} Rated speed before braking in rpm

J Total moment of inertia in kgm^2

b.) The braking energy in Nm against a load torque:

$$Q_L = \frac{\pm T_L \cdot n_{rated} \cdot t_{Br}}{19.1}$$

T_L average load torque in Nm

T_L is positive if it acts against the brake

T_L is negative if it supports the brake

Run-on revolutions U

The number of run-on revolutions U of the motor with brake can be calculated as follows:

$$U = \frac{n_{rated}}{60}\left(t_2 + \frac{t_{Br}}{2}\right)$$

t_2 Brake application time in ms

Lifetime of the brake lining L and readjustment of the air gap

The brake lining wears due to friction which increases the air gap and the release time for the brake at standard excitation.

When the brake lining is worn out, it can be replaced easily.

In order to calculate the lifetime of the brake lining in terms of operations $S_{max.}$, then the lifetime of the brake lining L in Nm must be divided by the braking energy Q_{adm}:

$$S_{max} = \frac{L}{Q_{adm}}$$

The interval between adjustments N in can be calculated in terms of operations by dividing the braking energy L_N which the brake can output until it is necessary to readjust the working air gap by Q_{adm}:

$$N = \frac{L_N}{Q_{adm}}$$

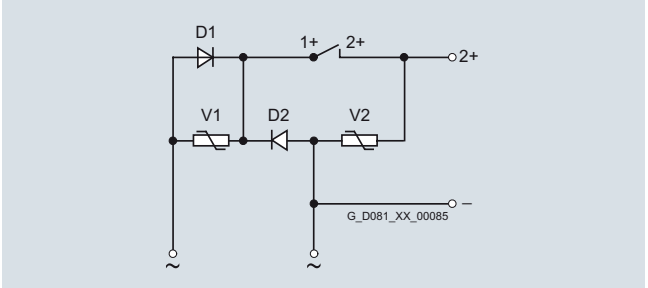
Additional versions

Depending on the selected motor, brake types 2LM8 or KFB are used.

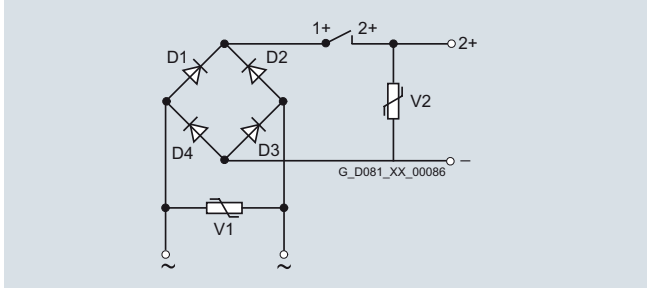
2LM8 spring-operated disk brake	KFB spring-operated brake
Motor series	
This brake is mounted on 1LA5 and 1LA7 motors in the frame sizes 63 to 225 and on 1LG motors in the frame sizes 180 to 225 as standard.	This brake is the standard brake for 1LG motors in frame sizes 250 to 315.
Voltage and frequency	
The solenoids and the rectifiers of the brakes are designed for connection to the following voltages: 1 AC 50 Hz 230 V ±10 % or 1 AC 60 Hz 230 V ±10 %	The solenoids and the rectifiers of the brakes are designed for connection to the following voltages: 1 AC 50 Hz 230 V ±10 %
When 60 Hz is used, the voltage for the brake must not be increased!	**When 60 Hz is used, the voltage for the brake must not be increased!**
The brake can also be supplied for other voltages: • Brake supply voltage: 24 V DC Order code **C00** • Brake supply voltage: 400 V AC (directly at the terminal strip) Order code **C01** • Brake supply voltage: 180 V DC, for operation on MM411 ECOFAST (directly at the terminal strip) Order code **C02**	The brake can also be supplied for other voltages: • Brake supply voltage: 24 V DC Order code **C00** • Brake supply voltage: 400 V AC (directly at the terminal strip) Order code **C01**
Order codes **C00**, **C01** and **C02** may only be used in conjunction with order code **G26**.	The codes **C00** and **C01** may only be used in conjunction with Code **G26**.
Connections	
Labeled terminals are provided in the main connection box of the motor to connect the brake. The AC voltage for the brake excitation winding is connected to the two free terminals of the rectifier block (~). The brake can be released when the motor is at a standstill by separately exciting the solenoid. In this case, an AC voltage must be connected at the rectifier block terminals. The brake remains released as long as this voltage is present. The rectifier is protected against overvoltages by varistors in the input and output circuits. For 24 V DC brakes, the brake terminals are directly connected to the DC voltage source. See the circuit diagrams below.	The motors are equipped with an additional connection box on the side of the main connection box that is used specifically for connection of the brake. KFB brakes are connected through a standard bridge or half-wave rectifier. See the circuit diagrams below. A special circuit is not required. Optimal switching times are achieved without the need to use special circuits.
Fast brake application	
If the brake is disconnected from the line supply, the brake is applied. The application time for the brake disk is delayed as a result of the inductance of the solenoid (shutdown on the AC side). This results in a considerable delay before the brake is mechanically applied. In order to achieve short brake application times, the circuit must be interrupted on the DC side. To realize this, the wire jumpers, located between contacts 1+ and 2+ at the rectifier are removed and replaced by the contact of an external switch (see circuit diagrams below). For 1LG motors with a 2LM8 brake, “Fast application of the brake” is not possible in the standard version. Please contact your local Siemens office for advice.	Not available for the KFB brake.
Manual brake release with lever	
The brakes can be supplied with a mechanical manual release with lever. Order code **K82**. The dimensions of the brake lever depend on the motor frame size and can be read from the dimension drawing generator for motors in the SD configurator tool for low-voltage motors.	The brake can be released manually with screws as standard. Mechanical manual release with a lever can be ordered with Order code **K82**. The dimensions of the brake lever depend on the motor frame size and can be read from the dimension drawing generator for motors in the SD configurator tool for low-voltage motors.

Bridge rectifier / half-wave rectifier

Brakes are connected through a standard bridge or half-wave rectifier or directly to the 2LM8 or KFB brake. See the circuit diagrams below.

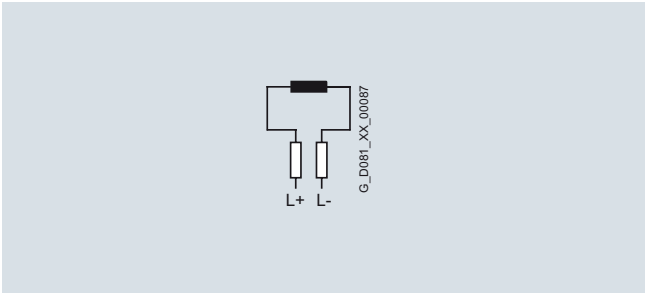


Half-wave rectifier 400 V AC



Bridge rectifier, 230 V AC

General technical data



Brake connection for 24 V DC

Combinations of basic versions

The following combinations of modular technology can be supplied by the factory when ordered using the predefined order codes:

Mounting of brake [1] and 1XP8 001 rotary pulse encoder

The brake (order code G26) and the rotary pulse encoder 1XP8 001-1 HTL (order code H57) can be supplied already mounted in combination.
Order code **H62**.

The brake (order code G26) and the rotary pulse encoder 1XP8 001-2 TTL (order code H58) can be supplied already mounted in combination.
Order code **H98**.

Mounting of separately driven fan and 1XP8 001 rotary pulse encoder

The separately driven fan (order code G17) and the rotary pulse encoder 1XP8 001-1 HTL (order code H57) can be supplied already mounted in combination.
Order code **H61**.

The separately driven fan (order code G17) and the rotary pulse encoder 1XP8 001-2 TTL (order code H58) can be supplied already mounted in combination.
Order code **H97**.

Mounting of brake [1] and separately driven fan

The brake (order code G26) and separately driven fan (order code G17) can be supplied already mounted in combination.
Order code **H63**.

Mounting of brake,[1] separately driven fan and 1XP8 001 rotary pulse encoder

The brake (order code G26), the separately driven fan (order code G17) and the rotary pulse encoder 1XP8 001-1 HTL (order code H57) can be supplied already mounted in combination.
Order code **H64**.

The brake (order code G26), the separately driven fan (order code G17) and the rotary pulse encoder 1XP8 001-2 TTL (order code H58) can be supplied already mounted in combination.
Order code **H99**.

When a rotary pulse encoder, brake or separately driven fan is mounted, the length of the motor increases by Δ l. For an explanation of the additional dimensions and weights, see “Technology”, “Dimensions and weights”.

[1] The spring-operated brake 2LM8 (see from Page 0/77) is mounted as standard on 1LA5 and 1LA7 motors in the frame sizes 63 to 225 and on 1LG motors in frame sizes 180 to 225.
For 1LG motors in the frame sizes 250 to 315 the spring-operated brake KFB is the standard brake (see from Page 0/80).

Special technology

Prepared for mounting MICROMASTER Integrated (MMI)

Converter mounting is possible for motor series 1LA7 frame sizes 56 to 132 for 230 VΔ/400 VY if the MICROMASTER DA 51.3 type is specified. Not possible for motors with special insulation for 690 V.
Order code **H15**

Brake (specially for 1LA8 and 1PQ8 motor series)

For motor series 1LA8 and 1PQ8, a solenoid double-disk spring-operated brake of type NFA (from Stromag) can be supplied at the drive end (DE). The brake can only be used as a holding brake. See the table below for values for the holding brake torque.
Order code **H47**, price on request

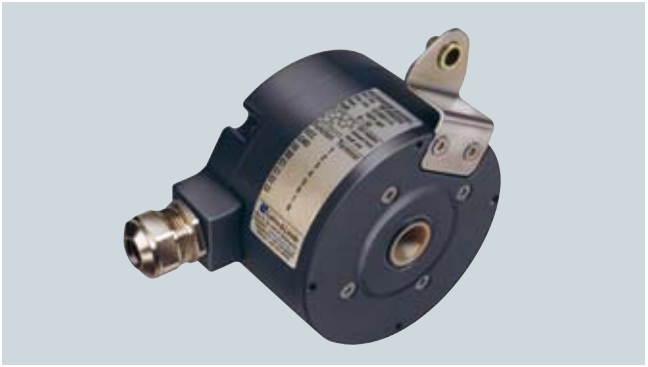
For motors	Brake size	Holding brake torque T_H
1LA8, 1PQ8	NFA	Nm
31 .	160/250	2500
35 .	160/250	2500
	250/400	4000
40 .	250/400	4000
	400/630	6300
45 .	400/630	6300
	630/1000	10000

When a brake is mounted, the length of the motor increases by Δ l. For an explanation of the additional dimensions and weights, see “Technology”, “Dimensions and weights”.
The brake is generally procured and mounted by the factory.

Further information is available on request.

The “Special technology” comprises rotary pulse encoders for frame sizes 100 L to 450 of 1LA5, 1LA6, 1LA7, 1LA8 and 1LG4/6 motors. Please inquire about the specified rotary pulse encoders for 1LA9 motors.
The order codes listed under “Special technology” cannot be combined in the case of 1LA motors with order codes from the modular technology range.
For 1LG motors, order codes **G17** (mounting of separately driven fan), **G26** (mounting of brake) and **H63** (mounting of brake and separately driven fan) from the modular technology range can be combined with the “Special technology” rotary pulse encoders.
When a rotary pulse encoder is mounted, the length of the motor increases by Δ l. For an explanation of the additional dimensions and weights, see “Technology”, “Dimensions and weights”.

LL 861 900 220 rotary pulse encoder



With its rugged construction, this rotary pulse encoder is also suitable for difficult operating environments. It is resistant to shock and vibration and has insulated bearings.

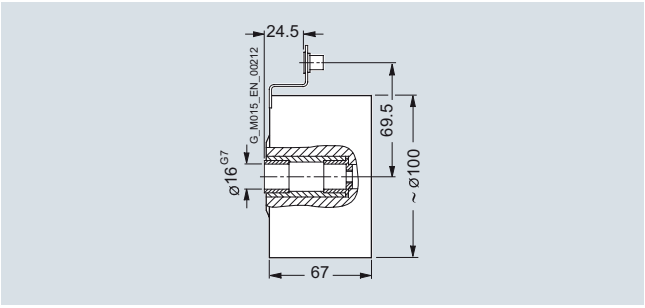
The LL 861 900 220 rotary pulse encoder can be supplied already mounted.
Order code **H70**.

The LL 861 900 220 rotary pulse encoder can be retrofitted. The motor must be prepared for this. When the motor is ordered, order code **H78** must be specified. The rotary pulse encoder is not part of the scope of supply in this case. The mounting components required will be supplied. For motors in Zone 2 (Ex n), a special rotary pulse encoder can be supplied (please inquire).

The version of the rotary pulse encoder with a diagnostics system (ADS) can be supplied by Leine and Linde.

Manufacturer:
Leine and Linde (Germany) GmbH
Bahnhofstraße 36
73430 Aalen
Tel. +49 (0)73 61-78093-0
Fax +49 (0)73 61-78093-11

http://www.leinelinde.com
e-mail: info@leinelinde.se



Mounting dimensions of LL 861 900 220 rotary pulse encoder

Technical data for LL 861 900 220 (HTL version)

Mounting of encoder at temperatures below –20 °C and higher than +40 °C on request.

Supply voltage U_B	**9 V to +30 V**
Current input without load	max. 80 mA
Admissible load current per output	40 mA
Pulses per revolution	1024
Outputs	6 short-circuit proof square-wave pulses A, A', B, B', 0, 0', High Current HTL
Pulse offset between the two outputs	90° ±25° el.
Output amplitude	$U_{High} > U_B - 4$ V $U_{Low} < 2.5$ V
Mark space ratio	1:1 ±10 %
Edge steepness	50 V/µs (without load)
Maximum frequency	100 kHz for 350 m cable
Admissible speed	4000 rpm
Temperature range	–20 to +80 °C
Degree of protection	IP65
Admissible radial cantilever force	300 N
Admissible axial force	100 N
Termination system	Terminal strips in encoder, cable connection M20 x 1.5 radial
Weight	Approx. 1.3 kg

Mounting a special type of rotary pulse encoder

For motor series 1LA8, 1PQ8 and 1LL8, if the encoder designation is specified in the order, a special type of rotary pulse encoder can be supplied already mounted, provided the technical executability is given. In this case, the encoder is procured by the factory. When ordering, specify the rotary pulse encoder in plain text.
Order code **Y70**. Price and availability on request.

General technical data

HOG9 D 1024 I rotary pulse encoder

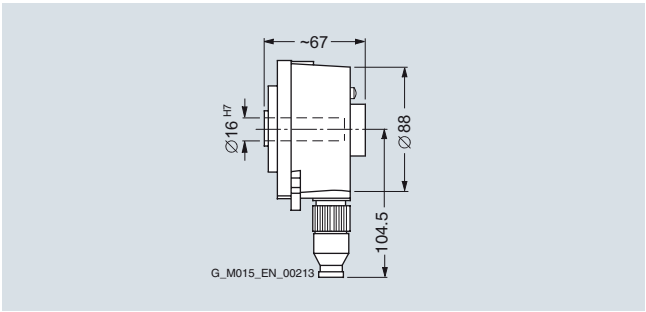
The encoder is fitted with insulated bearings.

The HOG 9 D 1024 I rotary pulse encoder can be supplied already mounted.
Order code **H72**.

The HOG 9 D 1024 I rotary pulse encoder can be retrofitted. The motor must be prepared for this. When the motor is ordered, order code **H79** must be specified. The rotary pulse encoder is not part of the scope of supply in this case. The mounting components required will be supplied.

Manufacturer:
Baumer Hübner GmbH
Planufer 92b
10967 Berlin
Tel. +49 (0)30-6 90 03-0
Fax +49 (0)30-6 90 03-1 04

http://www.baumerhuebner.com
e-mail: info@baumerhuebner.com



HOG 9 D 1024 I rotary pulse encoder

Technical data for HOG 9 D 1024 I rotary pulse encoder (HTL version)

Mounting of encoder at temperatures below –20 °C and higher than +40 °C on request.

Supply voltage U_B	**+9 V to +30 V**
Current input without load	50 to 100 mA
Admissible load current per output	60 mA, 300 mA (peak)
Pulses per revolution	1024
Outputs	4 short-circuit proof square-wave pulses A, B and A', B'
Pulse offset between the two outputs	90° ±20 %
Output amplitude	$U_{High} \geq U_B -$ 3.5 V $U_{Low} \leq$ 1.5 V
Mark space ratio	1:1 ±20 %
Edge steepness	10 V/µs
Maximum frequency	120 kHz
Maximum speed	7000 rpm
Temperature range	–30 to +100 °C
Degree of protection	IP56
Admissible radial cantilever force	300 N
Admissible axial force	200 N
Termination system	Radial plug (mating connector is part of the scope of supply)
Mech. design acc. to Hübner Ident. No.	73 522 E
Weight	Approx. 0.7 kg

HOG 10 D rotary pulse encoder

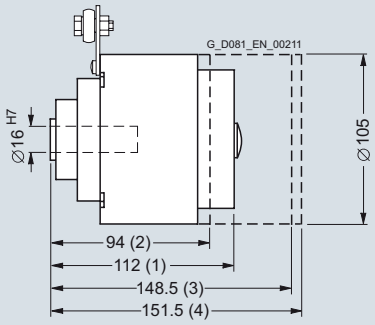
This encoder is extremely rugged and is therefore suitable for difficult operating conditions. It is fitted with insulated bearings.

The HOG 10 D rotary pulse encoder can be supplied already mounted in different versions. The manufacturer is the same; only the technical data and the respective dimensions and weights change.

Mounting of encoder at temperatures below –20 °C and higher than +40 °C on request.

Manufacturer:
Baumer Hübner GmbH
Planufer 92b
10967 Berlin
Tel. +49 (0)30-6 90 03-0
Fax +49 (0)30-6 90 03-1 04

http://www.baumerhuebner.com
e-mail: info@baumerhuebner.com



(1) Standard – Order code **H73**
(2) With connection boxes – Order codes **J15**, **J16**
(3) With mechanical centrifugal switch (FSL) – Order codes **Y74**, **Y76**
(4) With electronical speed switch (ESL) – Order code **Y79**

HOG 10 D 1024 rotary pulse encoder

HOG 10 D 1024 I rotary pulse encoder

The rotary pulse encoder HOG 10 D 1024 I can be supplied already mounted.
Order code **H73**

The rotary pulse encoder HOG 10 D 1024 I can also be retrofitted to a motor prepared for this. When the motor is ordered, order code **H80** must be specified. The rotary pulse encoder is not part of the scope of supply in this case. The mounting components required will be supplied.

Technical data for HOG 10 D 1024 I (HTL version)

Supply voltage U_B	**+9 V to +30 V**
Current input without load	Approx. 100 mA
Admissible load current per output	60 mA, 300 mA (peak)
Pulses per revolution	1024
Outputs	4 short-circuit proof square-wave pulses A, B and A', B'
Pulse offset between the two outputs	90° ±20 %
Output amplitude	$U_{High} \geq U_B - 3.5$ V $U_{Low} \leq 1.5$ V
Mark space ratio	1:1 ±20 %
Edge steepness	10 V/µs
Maximum frequency	120 kHz
Maximum speed	7000 rpm
Temperature range	–40 to +100 °C
Degree of protection	IP66
Admissible radial cantilever force	400 N
Admissible axial force	250 N
Termination system	Terminals, cable connection M20 x 1.5
Mech. design acc. to Hübner Ident. No.	74 055 E
Weight	Approx. 1.6 kg

Rotary pulse encoder HOG 10 DN 1024 I, connection box protection against moisture

The rotary pulse encoder HOG 10 DN 1024 I can be supplied with the already mounted connection box in version with protection against moisture (IP56).
Order code **J15**

Technical data HOG 10 DN 1024 I (HTL version), connection box protection against moisture

Supply voltage U_B	**+9 V to +30 V**
Current input without load	Approx. 100 mA
Admissible load current per output	60 mA, 300 mA peak
Pulses per revolution	1024
Outputs	6 short-circuit proof square-wave pulses A, B and A', B', N, N'
Pulse offset between the two outputs	90° ±20 %
Output amplitude	$U_{High} \geq U_B - 3.5$ V $U_{Low} \leq 1.5$ V
Mark space ratio	1:1 ±20 %
Edge steepness	10 V/µs
Maximum frequency	120 kHz
Maximum speed	7000 rpm
Temperature range	–40 to +100 °C
Degree of protection	IP66
Max. admissible radial cantilever force	400 N
Max. admissible axial force	250 N
Termination system	Terminals, cable connection M20 x 1.5
Mech. design acc. to Hübner Ident. No.	74 007E-HOG10
Weight	Approx. 1.6 kg

General technical data

Rotary pulse encoder HOG 10 DN 1024 I, connection box protection against dust

The rotary pulse encoder HOG 10 DN 1024 I can be supplied with the already mounted connection box in version with protection against dust (IP65).
Order code **J16**

Technical data HOG 10 DN 1024 I (HTL version), connection box protection against dust

Supply voltage U_B	**+9 V to +30 V**
Current input without load	Approx. 100 mA
Admissible load current per output	60 mA, 300 mA peak
Pulses per revolution	1024
Outputs	6 short-circuit proof square-wave pulses A, B and A', B', N, N'
Pulse offset between the two outputs	90° ±20 %
Output amplitude	$U_{High} \geq U_B - 3.5$ V $U_{Low} \leq 1.5$ V
Mark space ratio	1:1 ±20 %
Edge steepness	10 V/µs
Maximum frequency	120 kHz
Maximum speed	7000 rpm
Temperature range	–40 to +100 °C
Degree of protection	IP66
Max. admissible radial cantilever force	400 N
Max. admissible axial force	250 N
Termination system	Terminals, cable connection M20 x 1.5
Mech. design acc. to Hübner Ident. No.	74 006E-HOG10
Weight	Approx. 1.6 kg

Rotary pulse encoder HOG 10 DN 1024 I + FSL, (speed … rpm), connection box protection against moisture

The rotary pulse encoder HOG 10 DN 1024 I can be supplied with the already mounted connection box in version with protection against moisture (IP56) and mechanical centrifugal switch (FSL).
An operating speed of the centrifugal switch within the admissible range must be specified in plain text, see technical data of the rotary pulse encoder.
Order code **Y74**

Technical data HOG 10 DN 1024 I (HTL version) + FSL, (speed .... rpm), connection box protection against moisture

Supply voltage U_B	**+9 V to +30 V**
Current input without load	Approx. 100 mA
Admissible load current per output	60 mA, 300 mA peak
Pulses per revolution	1024
Outputs	6 short-circuit proof square-wave pulses A, B and A', B', N, N'
Pulse offset between the two outputs	90° ±20 %
Output amplitude	$U_{High} \geq U_B - 3.5$ V $U_{Low} \leq 1.5$ V
Mark space ratio	1:1 ±20 %
Edge steepness	10 V/µs
Maximum frequency	120 kHz
Maximum speed	7000 rpm
Temperature range	–40 to +100 °C
Degree of protection	IP66
Max. admissible radial cantilever force	400 N
Max. admissible axial force	250 N
Centrifugal switch	
Operating speed	850 ... 4900 rpm
Maximum speed	1.25 x n
Differential gap, clockwise/counter-clockwise	≈ 3 %
Speed hysteresis	≈ 40 %
Switching capacity	6 A/230 V AC; 1 A 125 V DC
Termination system	Terminals, cable connection M20 x 1.5 + M20 x 1.5
Mech. design acc. to Hübner Ident. No.	74 035F-HOG10
Weight	Approx. 2.1 kg

Rotary pulse encoder HOG 10 DN 1024 I +FSL, connection box protection against dust

The rotary pulse encoder HOG 10 DN 1024 I can be supplied with the already mounted connection box in version with protection against dust (IP65) and mechanical centrifugal switch (FSL). An operating speed of the centrifugal switch within the admissible range must be specified in plain text, see technical data of the rotary pulse encoder.
Order code **Y76**

Technical data HOG 10 DN 1024 I (HTL version +) + FSL, (speed …. rpm), connection box protection against dust

Supply voltage U_B	**+9 V to +30 V**
Current input without load	Approx. 100 mA
Admissible load current per output	60 mA, 300 mA peak
Pulses per revolution	1024
Outputs	6 short-circuit proof square-wave pulses A, B and A', B', N, N'
Pulse offset between the two outputs	90° ±20 %
Output amplitude	$U_{High} \geq U_B - 3.5$ V $U_{Low} \leq 1.5$ V
Mark space ratio	1:1 ±20 %
Edge steepness	10 V/µs
Maximum frequency	120 kHz
Maximum speed	7000 rpm
Temperature range	–40 to +100 °C
Degree of protection	IP66
Max. admissible radial cantilever force	400 N
Max. admissible axial force	250 N
Centrifugal switch	
Operating speed	850 ... 4900 rpm
Maximum speed	1.25 x n
Differential gap, clockwise/counter-clockwise	≈ 3 %
Speed hysteresis	≈ 40 %
Switching capacity	6 A/230 V AC; 1 A 125 V DC
Termination system	Terminals, cable connection M20 x 1.5 + M20 x 1.5
Mech. design acc. to Hübner Ident. No.	74 022F-HOG10
Weight	Approx. 2.1 kg

Rotary pulse encoder HOG 10 DN 1024 I + ESL 93, (speed … rpm), connection box protection against dust

The rotary pulse encoder HOG 10 DN 1024 I can be supplied with the already mounted connection box in version with protection against dust (IP65) and electronical speed switch (ESL). One up to three operating speeds of the electronical switch within the admissible range must be specified in plain text, see technical data of the rotary pulse encoder.
Order code **Y79**

Technical data HOG 10 DN 1024 I (HTL version) + ESL 93, (speed …. rpm), connection box protection against dust

Supply voltage U_B	**+9 V to +30 V**
Current input without load	Approx. 100 mA
Admissible load current per output	60 mA, 300 mA peak
Pulses per revolution	1024
Outputs	6 short-circuit proof square-wave pulses A, B and A', B', N, N'
Pulse offset between the two outputs	90° ±20 %
Output amplitude	$U_{High} \geq U_B - 3.5$ V $U_{Low} \leq 1.5$ V
Mark space ratio	1:1 ±20 %
Edge steepness	10 V/µs
Maximum frequency	120 kHz
Maximum speed	7000 rpm
Temperature range	–40 to +100 °C
Degree of protection	IP66
Max. admissible radial cantilever force	400 N
Max. admissible axial force	250 N
Electronical switch	
Operating speed	3 x 200 ... 5000 rpm
Maximum speed	6000 rpm
Switching accuracy	± (2-4) %
Switching capacity	3 x 49 mADC
With relay module (external relay module required!)	3 x 6 A/230 V AC; 1 A 125 V DC
Differential gap, clockwise/ counter-clockwise	≈ 3 %
Speed hysteresis	max. 30 %
Principle	Electronics
Auxiliary power	12 V/5 mA
Termination system	Terminals, cable connection M20 x 1.5 + M20 x 1.5
Mech. design acc. to Hübner Ident. No.	74 031E-HOG10
Weight	Approx. 2.9 kg

General technical data

Dimensions and weight

Fig. 1 Brake
Order code **G26**
[optionally with manual release, order code **K82**]

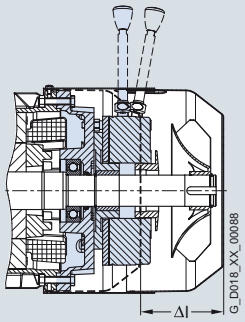


Fig. 2 Brake for 1LA8 and 1PQ8 motor series at drive end (DE)
Order code **H47**

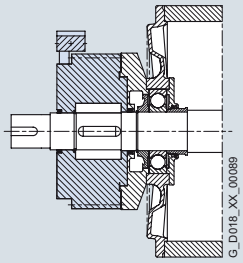


Fig. 3 Rotary pulse encoders (on cover)
Order codes **H57**, **H58**, **H70**, **H72**, **H73**, (**H78**), (**H79**), (**H80**), **J15, J16, Y74, Y76, Y79**

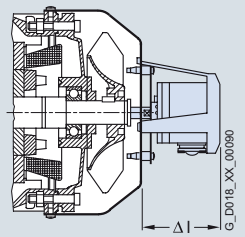
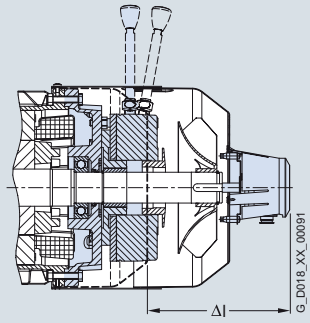
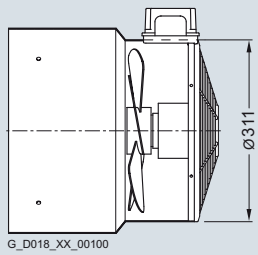


Fig. 4 Brake and rotary pulse encoder (on cover) 1XP8 001
Order codes **H62**, **H98**
[optionally with manual release, order code **K82**]



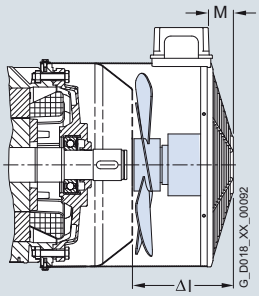


For motor series 1LA5 frame sizes 180 to 225 with separately driven fan, the fan attachment becomes narrower on the non-drive end (NDE) of the motor housing.

1LA frame sizes 100 to 225, 1LG frame sizes 180 and 200

1LG frame size 225 and above

Fig. 5 Separately driven fan
Order code **G17**



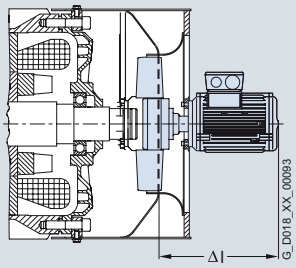
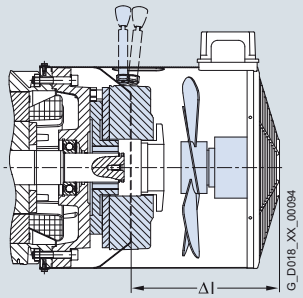


Fig. 6 Brake and separately driven fan
Order code **H63**
[optionally with manual release **K82**]



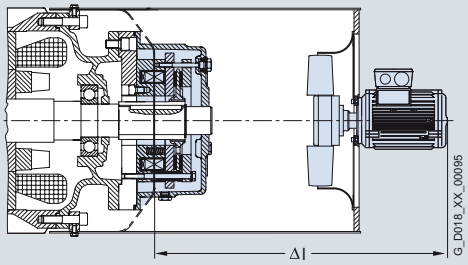
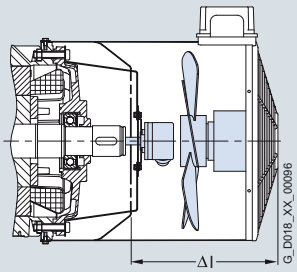


Fig. 7 Rotary pulse encoder (under cover) 1XP8 001 and separately driven fan
Order codes **H61**, **H97**



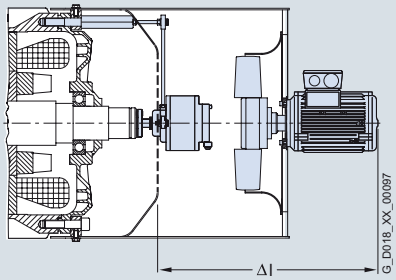
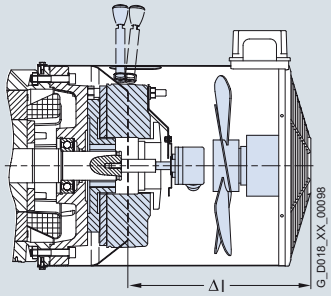
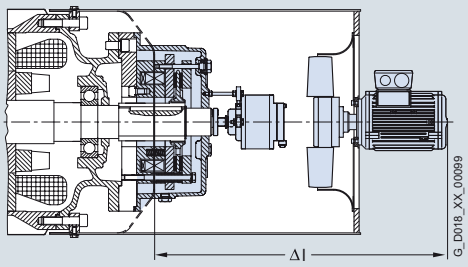


Fig. 8 Brake, rotary pulse encoder (under cover) 1XP8 001 and separately driven fan
Order codes **H64**, **H99**
[optionally with manual release (**K82**)]





General technical data

	Assignment																	
	Fig. 1		Fig. 2		Fig. 3													
Frame size	Brake		Brake		Pulse encoder													
					1XP8 001		LL 861 900220		HOG9 D 1024 I		HOG10 D 1024 I							
	Order code G26		Order code H47		Order code H57, H58		Order codes H70		Order codes H72		Order codes H73		J15, J16		Y74, Y76		Y79	
	Δl	Weight approx.	Δl	Weight approx.	Δl	Weight approx.	Δl	Weight approx.	Δl	Weight approx.	Δl	Weight approx.	Δl	Weight approx.	Δl	Weight approx.	Δl	Weight approx.
	mm	kg	mm	kg	mm	kg	mm	kg	mm	kg	mm	kg	mm	kg	mm	kg	mm	kg
1LA7, 1LA5																		
63	51	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
71	51	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
80	54	2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
90	75	4	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
100	78	6	–	–	78	0.3	91	1.3	89	0.9	134	1.6	–	–	–	–	–	–
112	87	8	–	–	78	0.3	91	1.3	89	0.9	134	1.6	–	–	–	–	–	–
132	106	12	–	–	78	0.3	91	1.3	89	0.9	134	1.6	–	–	–	–	–	–
160	129	26	–	–	78	0.3	91	1.3	89	0.9	134	1.6	–	–	–	–	–	–
180	137	27	–	–	78	0.3	91	1.3	89	0.9	134	1.6	–	–	–	–	–	–
200	142	41	–	–	78	0.3	91	1.3	89	0.9	134	1.6	–	–	–	–	–	–
225	142	41	–	–	78	0.3	91	1.3	89	0.9	134	1.6	–	–	–	–	–	–
1LA6																		
100	–	–	–	–	78	0.3	91	1.3	89	0.9	134	1.6	116	1.6	–	–	–	–
112	–	–	–	–	78	0.3	91	1.3	89	0.9	134	1.6	116	1.6	–	–	–	–
132	–	–	–	–	78	0.3	91	1.3	89	0.9	134	1.6	116	1.6	–	–	–	–
160	–	–	–	–	78	0.3	91	1.3	89	0.9	134	1.6	116	1.6	–	–	–	–
1LG4, 1LG6																		
180	125	22	–	–	63	0.3	86	1.3	72	0.9	116	1.6	98	1.6	153	2.1	156	2.9
200	137	32	–	–	63	0.3	86	1.3	72	0.9	116	1.6	98	1.6	153	2.1	156	2.9
225	239	63	–	–	63	0.3	86	1.3	72	0.9	116	1.6	98	1.6	153	2.1	156	2.9
250	225	83	–	–	63	0.3	86	1.3	72	0.9	116	1.6	98	1.6	153	2.1	156	2.9
280	227	118	–	–	63	0.3	86	1.3	72	0.9	116	1.6	98	1.6	153	2.1	156	2.9
315	265	255	–	–	63	0.3	86	1.3	72	0.9	116	1.6	98	1.6	153	2.1	156	2.9
1LA8, 1PQ8																		
315	–	–	205	120	–	–	125	1.3	–	–	125	1.6	–	–	–	–	–	–
355	–	–	225	165	–	–	125	1.3	–	–	125	1.6	–	–	–	–	–	–
400	–	–	251	220	–	–	125	1.3	–	–	125	1.6	–	–	–	–	–	–
450	–	–	270	325	–	–	125	1.3	–	–	125	1.6	–	–	–	–	–	–
1LL8																		
315	–	–	–	–	–	–	125	1.3	–	–	125	1.6	–	–	–	–	–	–
355	–	–	–	–	–	–	125	1.3	–	–	125	1.6	–	–	–	–	–	–
400	–	–	–	–	–	–	125	1.3	–	–	125	1.6	–	–	–	–	–	–
450	–	–	–	–	–	–	125	1.3	–	–	125	1.6	–	–	–	–	–	–

	Assignment											
	Fig. 4		Fig. 5			Fig. 6		Fig. 7		Fig. 8		
Frame size	Brake and rotary pulse encoder (on cowl) **1XP8 001**		Separately driven fan [1]			Brake and separately driven fan [1]		Rotary pulse encoder (under the cowl) **1XP8 001** and separately driven fan [1]		Brake, rotary pulse encoder (under the cowl) **1XP8 001** and separately driven fan [1]		Diameter of the fan cowl
	Order codes **H62**, **H98**		Order code **G17**			Order code **H63**		Order codes **H61**, **H97**		Order codes **H64**, **H99**		
	Δl	Weight, approx.	Δl	M	Weight, approx.	Δl	Weight, approx.	Δl	Weight, approx.	Δl	Weight, approx.	
	mm	kg	mm	mm	kg	mm	kg	kg	kg	mm		mm
1LA7, 1LA5												
63	–	–	–	–	–	–	–	–	–	–	–	–
71	–	–	–	–	–	–	–	–	–	–	–	–
80	–	–	–	–	–	–	–	–	–	–	–	–
90	–	–	–	–	–	–	–	–	–	–	–	–
100	156	6.3	141	30	4.0	141	10.0	226	4.3	226	10.3	202
112	165	8.3	158	30	4.5	158	12.5	226	4.8	226	12.8	227
132	184	12.3	177	40	5.5	177	17.5	247	5.8	247	17.8	226
160	207	26.3	227	40	7.0	227	33.0	289	7.3	289	33.3	320
180	215	27.3	269	40	10.0	269	37.0	269	10.3	269	37.3	311 (358)
200	220	41.3	272	40	11.0	272	52.0	272	11.3	272	52.3	311 (398)
225	220	41.3	272	40	11.0	272	52.0	272	11.3	272	52.3	311 (398)
1LA6												
100	–	–	141	30	4.0	–	–	226	4.3	–	–	202
112	–	–	158	30	4.5	–	–	226	4.8	–	–	227
132	–	–	177	40	5.5	–	–	247	5.8	–	–	226
160	–	–	227	40	7.0	–	–	289	7.3	–	–	320
1LG4, 1LG6												
180	203	22.3	269	40	10.0	269	32	269	10.3	269	32.3	356
200	215	32.3	272	40	11.0	272	43	272	11.3	272	43.3	396
225	317	63.3	235	0	22.0	576	85	425	22.3	576	85.3	439
250	303	83.3	235	0	25.0	578	108	425	25.3	578	108.3	489
280	305	118.3	235	0	28.0	550	146	425	28.3	550	146.3	539
315	343	255.3	247	0	36.0	577	291	437	36.3	577	291.3	604

The values in brackets ( ) refer to the diameter of the motor flange because this is larger than the diameter of the fan cowl (see figure on Page 0/90).

[1] For frame sizes 100 to 200 and for 1LA5 up to frame size 225, the dimensions of the connection box for the separately driven fan, length x width x height, are 95 mm x 105 mm x 54 mm. For motor series 1LG4/1LG6 (frame sizes 225 to 315), the dimensions of the connection box for the separately driven fan, length x width x height, are 75 mm x 75 mm x 38 mm.

0

Order No. code

Overview

The order number consists of a combination of figures and letters and is divided into three blocks linked with hyphens for a better overview, e.g.
1LE1001-1DB20-1AA5-Z
H00

The first block (Positions 1 to 7) identifies the motor type; the second block (Positions 8 to 12) defines the motor frame size and length, the number of poles and in some cases the frequency/output; and in the third block (Positions 13 to 16), the frequency/output, type of construction and other design features are encoded.

For deviations in the second and third block from the catalog codes, either **-Z** or **9** should be used as appropriate.

Ordering data:

- Complete Order No. and order code(s) or plain text.
- If a quotation has been requested, please specify the quotation number in addition to the Order No.
- When ordering a complete motor as a spare part, please specify the works serial No. for the previously supplied motor as well as the Order No.

Structure of the Order No.:	Position:	1	2	3	4	5	6	7	-	8	9	10	11	12	-	13	14	15	16	
IEC squirrel-cage motors, surface-cooled																				
Positions 1 to 4: Digit, letter, letter, digit	**New generation** Design or version (motor type) • Standard: Self-ventilated by fan mounted on and driven by rotor • Expansion option (F90): Forced-air cooled by air flow from the fan to be driven	1	L	E	1															
	• Special: Self-cooled without external fan and fan cover	1	P	C	1															
Positions 5 to 7: 3 digits	• Motors with high efficiency (High Efficiency, EFF1), aluminum housing					0	0	1												
	• Motors with improved efficiency (Improved Efficiency, EFF2), aluminum housing					0	0	2												
Positions 8, 9 and 11: Digit, letter, digit	**Motor frame size** (frame size as a combination of shaft height and overall length, encoded)									1	A ... D		0 ... 6							
Position 10: Letter	**Number of poles** A ... D = 2-, 4-, 6-, 8-pole											A ... D								
Positions 12 and 13: 2 digits	**Voltage, circuit and frequency**													0 ... 9		0 ... 8				
Position 14: Letter	**Type of construction** (A – V)																A ... V			
Position 15: Letter	**Motor protection** (A – Z; special versions encoded)																	A ... Z		
Position 16: Digit	**Mechanical design (motor version and connection box position)** • **General Line motors with shorter delivery times, limited options** (connection box on top, cast feet, only basic versions possible, non-drive-end (NDE) cannot be modified) • **All options are possible or can be modified** - Connection box on top - Connection box on RHS (viewed from DE) - Connection box on LHS (viewed from DE) - Connection box below																		0 4 5 6 7	
	Special order versions: encoded – additional order code required not encoded – additional plain text required																			- Z

Ordering example

Selection criteria	Requirement	Structure of the Order No.
Motor type	New generation Standard motor with high efficiency EFF1, IP55 degree of protection, aluminum version	**1LE1001-❑❑❑❑❑-❑❑❑❑**
Motor frame size/No. of poles/speed	160/4-pole/1500 rpm	**1LE1001-1DB2❑-❑❑❑❑**
Rated output	11 kW	
Voltage and frequency	230 VΔ/400 VY, 50 Hz	**1LE1001-1DB22-2❑❑❑**
Type of construction	IM V5 with protective cover [1]	**1LE1001-1DB22-2C❑❑-Z** **H00**
(Special versions)	3 PTC thermistors (motor protection with 3 embedded temperature sensors for tripping [2]	**1LE1001-1DB22-2CB❑-Z** **H00**
Mechanical design (motor version)	Connection box on RHS (viewed from DE)	**1LE1001-1DB22-2CB5-Z** **H00**
	Mounted separately driven fan	**1LE1001-1DB22-2CB5-Z** **H00 F70**

[1] Standard without protective cover – the protective cover is defined with option **H00** and this option must be ordered in addition.

[2] No additional option must be specified in the order.

Overview

The order codes and availability are assigned to the individual motor series in the "Selection and ordering data" in catalog part 1.

For

- Voltages
- Types of constructions
- Motor protection
- Motor connection and connection box

see the relevant heading in section "General technical data" in this catalog part.

Attention:
For 1LE1 and 1PC1 motors apply only the "Special versions" of the following table and of catalog part 1. Motor protection and motor connection or connection box can be defined as Order No. supplement with the positions 15 or 16 of the Order No.

All available options are listed according to topics in the following table. An alphanumerical listing according to order codes can be found in the appendix under "Overview of order codes".

Order code		Special versions	For further information, see Page
Motor connection and connection box			
R15		One cable gland, metal	0/114
R10		Rotation of the connection box through 90°, entry from DE	0/114
R11		Rotation of the connection box through 90°, entry from NDE	0/114
R12		Rotation of the connection box through 180°	0/114
R50	*New!*	Larger connection box	0/113
R30	*New!*	Reduction piece for M cable gland in accordance with British standard, both cable entries mounted	0/114
H04		External earthing	0/113
R20	*New!*	3 cables protruding, 0.5 m long	0/114
R21	*New!*	3 cables protruding, 1.5 m long	0/114
R22	*New!*	6 cables protruding, 0.5 m long	0/114
R23	*New!*	6 cables protruding, 1.5 m long	0/114
R24	*New!*	6 cables protruding, 3 m long	0/114
H08	*New!*	Connection box on NDE	0/113
Windings and insulation			
N01		Temperature class 155 (F), used acc. to 155 (F), with service factor (SF)	0/108
N02		Temperature class 155 (F), used acc. to 155 (F), with increased output	0/108
N03		Temperature class 155 (F), used acc. to 155 (F), with increased coolant temperature	0/108
N11	*New!*	Temperature class 180 (H) at rated power and max. CT 60 °C	0/108
N20	*New!*	Increased air humidity/temperature with 30 to 60 g water per m^3 of air	0/108
N05		Temperature class 155 (F), used acc. to 130 (B), coolant temperature 45 °C, derating approx. 4 %	0/108
N06		Temperature class 155 (F), used acc. to 130 (B), coolant temperature 50 °C, derating approx. 8 %	0/108
N07		Temperature class 155 (F), used acc. to 130 (B), coolant temperature 55 °C, derating approx. 13 %	0/108
N08		Temperature class 155 (F), used acc. to 130 (B), coolant temperature 60 °C, derating approx. 18 %	0/108
N21	*New!*	Increased air humidity/temperature with 60 to 100 g water per m^3 of air	0/108
Y52		Temperature class 155 (F), used acc. to 155 (F), other requirements	0/108
Colors and paint finish			
Y54		Special finish in other standard RAL colors	0/101
Y51		Special finish in special RAL colors	0/101
S03	*New!*	Special finish sea air resistant	0/100
S00		Unpainted (only cast iron parts primed)	0/100
S01		Unpainted, only primed	0/100
Modular technology – Basic versions			
F70		Mounting of separately driven fan	0/129
F01		Mounting of brake	0/130 ...
G01		Mounting of 1XP8012-10 (HTL) rotary pulse encoder	0/128
G02		Mounting of 1XP8012-20 (TTL) rotary pulse encoder	0/128
Modular technology – Additional versions			
F10		Brake supply voltage 24 V DC	0/133
F11		Brake supply voltage 230 V AC, 50/60 Hz	0/133
F12		Brake supply voltage 400 V AC, 50/60 Hz	0/133
F50		Mechanical manual brake release with lever (no locking)	0/133
Special technology			
G04		Mounting of LL 861 900 220 rotary pulse encoder	0/134
G05		Mounting of HOG 9 D 1024 I rotary pulse encoder	0/135
G06		Mounting of HOG 10 D 1024 I rotary pulse encoder	0/136

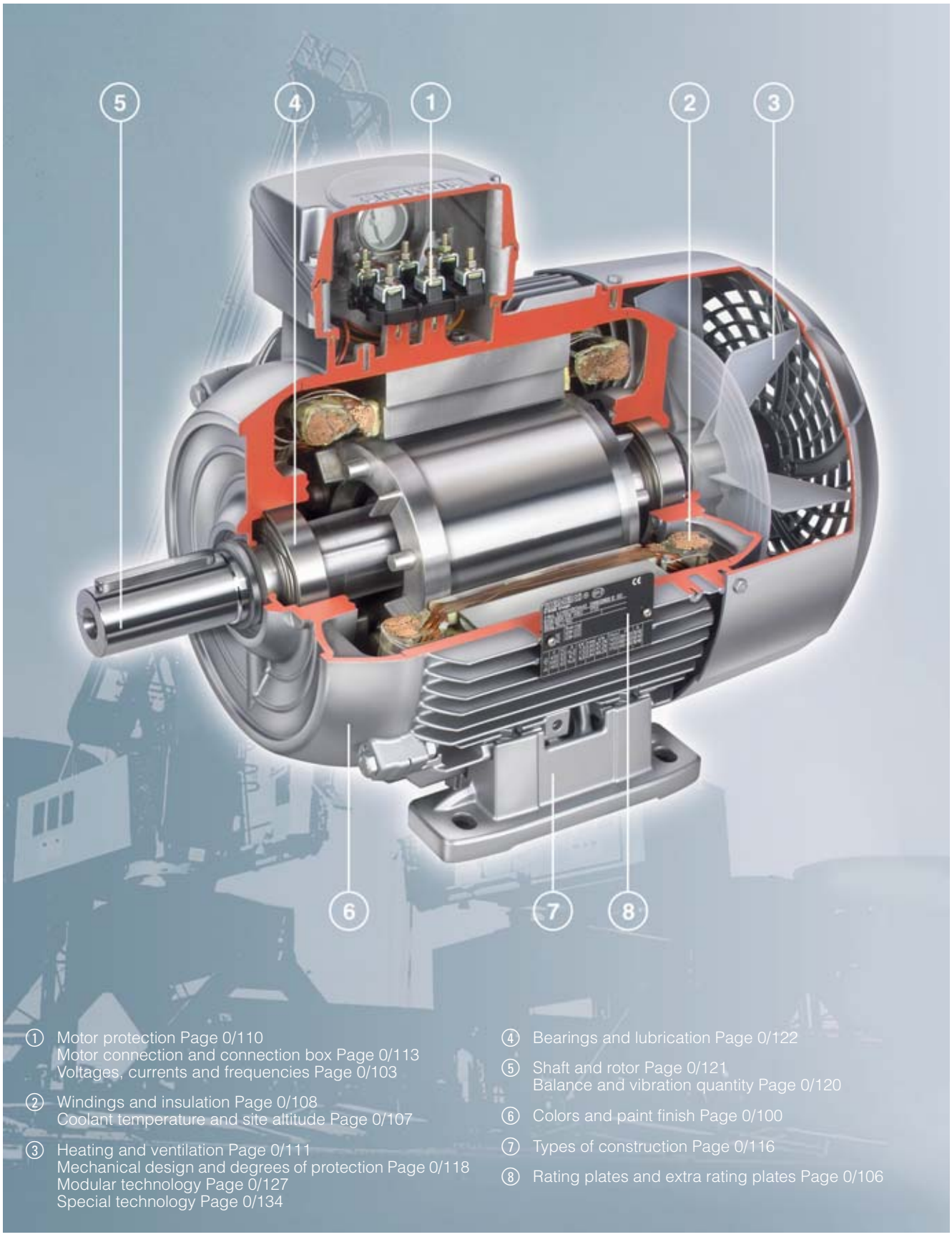
Special versions

Overview "Special versions" *(Fortsetzung)*

Order code		Special versions	For further information, see Page
Mechanical design and degrees of protection			
H00		Protective cover for types of construction	0/119
H01		Screwed-on feet (instead of cast)	0/113
H23	*New!*	Radial seal on DE for flange-mounting motors with oil resistance to 0.1 bar	0/118
F77	*New!*	Low-noise version for 2-pole motors with clockwise direction of rotation	0/119
F78	*New!*	Low-noise version for 2-pole motors with counter-clockwise direction of rotation	0/119
H20	*New!*	IP65 degree of protection	0/119
H22	*New!*	IP56 degree of protection (non-heavy-sea)	0/119
H02	*New!*	Vibration-proof version	0/119
H03		Condensation drainage holes	0/119
H07	*New!*	Non-rusting screws (externally)	0/119
G40		Prepared for mountings, only center hole	0/118
G41		Prepared for mountings with D12 shaft	0/118
G42		Prepared for mountings with D16 shaft	0/118
G43	*New!*	Protective cover for encoder (loosely enclosed – only for mountings acc. to order codes G40, G41 and G42)	0/118
Coolant temperature and site altitude			
D03	*New!*	Coolant temperature –40 °C to +40 °C	0/107
D04	*New!*	Coolant temperature –30 °C to +40 °C	0/107
Designs in accordance with standards and specifications			
D30	*New!*	Electrical according to NEMA MG1-12	0/99
D31	*New!*	Design according to UL with "Recognition Mark"	0/99
D40	*New!*	Canadian regulations (CSA)	0/98, 0/99
D46	*New!*	PSE Mark Japan	0/99
Bearings and lubrication			
Q01		Measuring nipple for SPM shock pulse measurement for bearing inspection	0/122
L22		Bearing design for increased cantilever forces	0/122, 0/124 ...
L25		Special bearing for DE and NDE, bearing size 63	0/122, 0/124 ...
L23		Regreasing device	0/122
L20		Located bearing at DE	0/122
L21		Located bearing at NDE	0/122
Balance and vibration quantity			
L00		Vibration quantity level B	0/120
L02		Full-key balancing	0/120
L01		Balancing without fitted key	0/120
Shaft and rotor			
L08		Concentricity of shaft extension, coaxiality and linear movement in accordance with DIN 42955 Tolerance R for flange-mounting motors	0/121
L05		Second standard shaft extension	0/121
L04	*New!*	Shaft extension with standard dimensions, without featherkey way	0/121
L07		Concentricity of shaft extension in accordance with DIN 42955 Tolerance R	0/121
L06		Standard shaft made of non-rusting steel	0/121
Y55	*New!*	Non-standard cylindrical shaft extension	0/121
Heating and ventilation			
F75	*New!*	Fan cover for textile industry	0/111
F76	*New!*	Metal external fan	0/111
Q02		Anti-condensation heaters for 230 V	0/111
Q03		Anti-condensation heaters for 115 V	0/111
F74		Sheet metal fan cover	0/111
Rating plate and extra rating plates			
M10		Second rating plate, loose	0/106
M11		Nirosta rating plate	0/106
Y80		Extra rating plate or rating plate with deviating rating plate data	0/106
Y82		Extra rating plate with identification codes	0/106
Y84		Additional information on rating plate and on package label (max. of 20 characters)	0/106
Packaging, safety notes, documentation and test certificates			
B00		Without safety and commissioning note. Customer's declaration of renouncement required.	0/102
B01		With one safety and start-up guide per box pallet	0/102
B02		Acceptance test certificate 3.1 in accordance with EN 10204	0/102
B04		Printed operating instructions English/German enclosed	0/102
B83	*New!*	Type test with heat run for horizontal motors, with acceptance	0/102
B99		Wire-lattice pallet	0/102
M01		Connected in star for dispatch	0/102
M02		Connected in delta for dispatch	0/102

Overview

Cut-away diagram of a low-voltage motor



① Motor protection Page 0/110
Motor connection and connection box Page 0/113
Voltages, currents and frequencies Page 0/103

② Windings and insulation Page 0/108
Coolant temperature and site altitude Page 0/107

③ Heating and ventilation Page 0/111
Mechanical design and degrees of protection Page 0/118
Modular technology Page 0/127
Special technology Page 0/134

④ Bearings and lubrication Page 0/122

⑤ Shaft and rotor Page 0/121
Balance and vibration quantity Page 0/120

⑥ Colors and paint finish Page 0/100

⑦ Types of construction Page 0/116

⑧ Rating plates and extra rating plates Page 0/106

General technical data

Designs in accordance with standards and specifications

Applicable standards and specifications

The motors comply with the appropriate standards and regulations, especially those listed in the table below.

Title	IEC/EN	DIN EN
General specifications for rotating electrical machines	IEC 60034-1, IEC 60085	DIN EN 60034-1
Specification of the losses and efficiency of rotating electrical machines	IEC 60034-2	DIN EN 60034-2
Asynchronous AC motors for general use with standardized dimensions and outputs	IEC 60072 mounting dimensions only	DIN EN 50347
Restart characteristics for rotating electrical machines	IEC 60034-12	DIN EN 60034-12
Terminal designations and direction of rotation for electrical machines	IEC 60034-8	DIN EN 60034-8
Designation for type of construction, installation and connection box position	IEC 60034-7	DIN EN 60034-7
Entry to connection box	–	DIN 42925
Built-in thermal protection	IEC 60034-11	DIN EN 60034-11
Noise limit values for rotating electrical machines	IEC 60034-9	DIN EN 60034-9
IEC standard voltages	IEC 60038	DIN IEC 60038
Cooling methods for rotating electrical machines	IEC 60034-6	DIN EN 60034-6
Vibration severity of rotating electrical machines	IEC 60034-14	DIN EN 60034-14
Vibration limits	–	DIN ISO 10816
Degrees of protection of rotating electrical machines	IEC 60034-5	DIN EN 60034-5

National standards

The motors comply with the IEC or European standards listed above. The European standards replace the national standards in the following EU member states: Germany (VDE), France (NF C), Belgium (NBNC), Great Britain (BS), Italy (CEI), Netherlands (NEN), Sweden (SS), Switzerland (SEV) etc.

The motors also comply with various national standards. The following standards have been harmonized with IEC publication 60034-1 or replaced with DIN EN 60034-1 so that the motors can be operated at standard rated output.

Title	Country
CSAC22.2, No. 100	Canada
IS 325 IS 4722	India
NEK – IEC 60034-1	Norway

Tolerances for electrical data

According to DIN EN 60034, the following tolerances are permitted:
Motors which comply with DIN EN 60034-1 must have a voltage tolerance of ±5 % / frequency tolerance of ±2 % (Design A). If utilized, the admissible limit temperature of the temperature class may be exceeded by 10 K.

A tolerance of ±5 % also applies to the rated voltage range in accordance with DIN EN 60034-1. For rated voltage and rated voltage range, see Page 0/103.

Efficiency η at
$P_{rated} \leq 150$ kW: $-0.15 \cdot (1 - \eta)$
$P_{rated} > 150$ kW: $-0.1 \cdot (1 - \eta)$

With η being a decimal number.

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

- Minimum absolute value: 0.02
- Maximum absolute value: 0.07

Slip ±20 % (for motors <1 kW ±30 % is admissible)
Locked-rotor current +20 %
Locked-rotor torque –15 % to +25 %
Breakdown torque –10 %
Moment of inertia ±10 %

Energy-saving motors with European efficiency classification in accordance with EU/CEMEP (European Commitee of Manufacturers of Electrical Machines and Power Electronics)

Low-voltage motors in the output range of 1.1 to 90 kW, 2-pole and 4-pole are marked in accordance with the EU/CEMEP agreement with the efficiency class (EFF2) (Improved Efficiency) or (EFF1) (High Efficiency).

So that the requirements of efficiency classes (EFF1) and (EFF2) are fulfilled, the active parts of the motor have been optimized. The procedure for calculating the efficiency is based on the losssummation method according to IEC 60034-2.

Motors for the North American market

For motors which comply with North American regulations (NEMA, CSA, UL, etc.), it must always be checked whether the motors will be used in the US or Canada and whether they are subject to state laws.

Minimum efficiencies required by law

In 1997, an act was passed in the US to define minimum efficiencies for low-voltage three-phase motors (EPACT = Energy Policy Act). An act is in force in Canada that is largely identical, although it is based on different verification methods. The efficiency is verified for these motors for the USA using IEEE 112, Test Method B and for Canada using CSA-C390. Apart from a few exceptions, all low-voltage three-phase motors exported to the USA or Canada must comply with the legal requirements on efficiency.
The law requires minimum efficiencies for 2, 4 and 6-pole motors with a voltage of 230 and 460 V/60 Hz, in the output range of 1 to 200 HP (0.75 to 150 kW).
According to EPACT, the following are excluded from the efficiency requirements, for example.

- Motors whose frame size output classification does not correspond with the standard series according to NEMA MG1-12.
- Flange-mounting motors without feet
- Brake motors
- Converter-fed motors
- Motors with design letter C and higher

For more information on EPACT:
http://www.eren.doe.gov/

Special requirements for the USA: Energy Policy Act

The act lays down that the nominal efficiency at full load and a "CC" number (Compliance Certification) must be included on the rating plate. The "CC" number is issued by the US Department of Energy (DOE). The following information is stamped on the rating plate of EPACT motors which must be marked by law: Nominal efficiency (service factor SF 1.15), design letter, code letter, CONT, CC-Nr. CC 032A (Siemens) and NEMA MG1-12.

Special requirements for Canada: CSA – Energy Efficiency Verification

These motors fulfill the minimum efficiency requirements laid down by the CSA standard C390. These motors are available as 1LE1 and can be ordered with order code **D40** and are also marked with the CSA-E verification on the rating plate.

NEMA – Order code D30

The motors with increased efficiency according to EPACT are designed to meet the NEMA MG1-12 electrical standard and are marked accordingly. The mechanical design of all motors is compliant only to IEC, not to NEMA dimensions.
All motors in the EPACT and **D30** version correspond to NEMA Design A (i. e. standard torque characteristic in accordance with NEMA and no starting current limitation).
For Design B, C and D, a special version is required (on request).
All other 1LE1/1PC1 motors must be ordered with order code **D30**.
Data on the rating plate: Rated voltage (voltage tolerance of 10 %), nominal efficiency, design letter, code letter, CONT and NEMA MG1-12.

UL approval – Order code D31

The motors based on the 1LE1/1PC1 basic series are listed for up to 600 V by Underwriters Laboratories Inc. (“Recognition Mark” = R/C).
This is not possible in combination with the option “temperature class 180 (H) at rated output and maximal coolant temperature of 60 °C”, order code N11.
According to UL, motor voltages are only certified up to 600 V, i.e. voltage codes 22, 27 or 40. For this reason, the indication 690 VY for voltage code “34” (400 VΔ/690 VY/ 50 Hz or 460 VΔ/60 Hz), for example, is omitted on the rating plate.

The “UL Recognition Mark” is included on the rating plate of the motor.

In addition, the motor is designed to meet the NEMA MG1-12 electrical standard and includes the following data on the rating plate: Rated voltage (voltage tolerance of 10 %), nominal efficiency, design letter, code letter, CONT and NEMA MG1-12. The motors must only be ordered with order code **D31**.

Externally or internally mounted components such as

- Motor protection
- Heating element
- Separately driven fan
- Brake
- Encoder
- Power connection
- Plug connector

are UL-R/C, CSA or C-US listed or used by manufacturers in accordance with regulations. It may have to be decided whether the motor is suitable for the application.
The motors can be operated with a frequency converter with 50/60 Hz.
Deviating frequency settings must be tested at final acceptance.

The following versions are possible:

- 2-pole motors, only in combination with F77 or F78 low-noise versions
- 4, 6 and 8-pole motors, only in combination with F76 metal external fan

CSA approval – Order code D40

Motors based on the 1LE1/1PC1 basic series are approved for up to 690 V in accordance with the Canadian regulations of the “Canadian Standard Association” (CSA). Externally or internally mounted components which are used are listed by CSA or are used by manufacturers in accordance with regulations. It may have to be decided whether the motor is suitable for the application.
This is not possible in combination with the option “temperature class 180 (H) at rated output and maximal coolant temperature of 60 °C”, order code N11, for 1LE1 and 1PC1 motor series.

The motors must be ordered with the order code **D40**, voltage code “**90**” and order code for voltage and frequency. The CSA mark and the rated voltage (voltage tolerance of 10 %) are included on the rating plate.

When energy-saving motors (1LE1 in design EFF1) are ordered, they also include the CSA-E mark on the rating plate.

Export of low-voltage motors to China

CCC – China Compulsory Certification – Order code D01

“Small power motors” which are exported to China must be certified up to a rated output of:
2-pole: ≤ 2.2 kW
4-pole: ≤ 1.1 kW
6-pole: ≤ 0.75 kW
8-pole: ≤ 0.55 kW

The **1LE1 motors which must be certified** have been certified by the CQC (China Quality Cert. Center). When ordered with the D01 order code, the “CCC” logo and “Factory Code” are included on the rating plate and packaging.

A005216

Factory Code:

A005216 = Works Bad Neustadt
A010607 = Works Mohelnice

Note:
Chinese customs checks the need for certification of imported products by means of commodity code.

The following do not need to be certified:

- Motors imported to China which have already been installed in a machine
- Repair parts

Export of low-voltage motors to Japan

PSE Mark Japan – Order Code D46

PSE marking is a mandatory certification in Japan in accordance with the electrical devices and safety of materials act. “Small power motors” with a rated output of up to 3 kW which are exported to Japan must bear the PSE marking.

The motors concerned are marked on the rating plate with the following “PSE” logo.

General technical data

Colors and paint finish

To protect the drives against corrosion and external influences, high-quality coatings based on 2-K epoxy resin are offered in various different colors.

Type	Suitability of paint finish for climate group in accordance with DIN IEC 60721, Part 2-1	
Special finish	Worldwide (global) for outdoor use in direct sunlight and/or weather conditions. Suitable for use in the tropics for <60 % relative humidity at 40 °C	Briefly: Up to 140 °C Contin.: Up to 120 °C Also: for aggressive atmospheres up to 1 % acid and alkali concentrations or permanent dampness in sheltered rooms

Special finish system “sea air resistant” – Order code **S03**

Field of application	Resistance
• Recommended for indoor installations or outdoor installations exposed to direct weather conditions • Industrial climate with moderate SO2 exposure, inshore maritime climate, but not offshore maritime climate, e.g. for crane drives and also in the paper industry • Complies with the test requirements of DIN EN ISO 12944-2 Corrosion Category C4	• Chemical exposure to 5 % acid and caustic solution concentration • Suitable for use in the tropics up to 75 % relative humidity at 50 °C • Thermal stability from –40 to 140 °C

All motors are painted with RAL 7030 (stone gray) if the color is not specified.

Other colors in special finish must be ordered with order codes **Y51** or **Y54** and the required RAL number in plain text (for a selection of the available RAL numbers/colors, see the following page for tables for order codes **Y51** and **Y54**).

Direct sunlight may change the color. If consistent colors are required, we recommend paint based on polyurethane. Please inquire.

All paint finishes can be painted over with commercially available paints. Special paints and increased layer thickness available on request.

If required, the motors can be supplied coated only in primer, order code **S01**, or unpainted (unmachined cast-iron surfaces, but primed) using order code **S00**.

Special finish in standard RAL colors – Order code **Y54** (RAL number is required in plain text)

RAL No.	Color name	RAL No.	Color name
1002	Sand yellow	6011	Reseda green
1013	Pearl white	6019	Pastel green
1015	Light ivory	6021	Pale green
1019	Gray beige	7000	Squirrel gray
2003	Pastel orange	7001	Silver gray
2004	Pure orange	7004	Signal gray
3000	Flame red	7011	Iron gray
3007	Black red	7016	Anthracite gray
5007	Brilliant blue	7022	Umber gray
5009	Azure blue	7031	Blue gray
5010	Gentian blue	7032	Pebble gray
5012	Light blue	7033	Cement gray
5015	Sky blue	7035	Light gray
5017	Traffic blue	9001	Cream
5018	Teal blue	9002	Gray white
5019	Capri blue	9005	Jet black

Special finish in special RAL colors – Order code **Y51** (RAL number is required in plain text)

RAL No.	Color name	RAL No.	Color name	RAL No.	Color name	RAL No.	Color name
1000	Green beige	3014	Antique pink	6003	Olive green	7036	Platinum gray
1001	Beige	3015	Light pink	6004	Blue green	7037	Dusty gray
1003	Signal yellow	3016	Coral red	6005	Moss green	7038	Agate gray
1004	Golden yellow	3017	Rose	6006	Gray olive	7039	Quartz gray
1005	Honey yellow	3018	Strawberry red	6007	Bottle green	7040	Window gray
1006	Maize yellow	3020	Traffic red	6008	Brown green	7042	Traffic gray A
1007	Daffodil yellow	3022	Salmon pink	6009	Fir green	7043	Traffic gray B
1011	Brown beige	3027	Raspberry red	6010	Grass green	7044	Silk gray
1012	Lemon yellow	3031	Orient red	6012	Black green	7045	Tele gray 1
1014	Dark ivory	3032	Pearl ruby red	6013	Reed green	7046	Tele gray 2
1016	Sulfur yellow	3033	Pearl pink	6014	Yellow olive	7047	Tele gray 4
1017	Saffron yellow	4001	Red lilac	6015	Black olive	7048	Pearl mouse gray
1018	Zinc yellow	4002	Red violet	6016	Turquoise green	8000	Green brown
1020	Olive yellow	4003	Heather violet	6017	May green	8001	Ocher brown
1021	Rape yellow	4004	Claret violet	6018	Yellow green	8002	Signal brown
1023	Traffic yellow	4005	Blue lilac	6020	Chrome green	8003	Clay brown
1024	Ochre yellow	4006	Traffic purple	6022	Olive drab	8004	Copper brown
1027	Curry	4007	Purple violet	6024	Traffic green	8007	Fawn brown
1028	Melon yellow	4008	Signal violet	6025	Fern green	8008	Olive brown
1032	Broom yellow	4009	Pastel violet	6026	Opal green	8011	Nut brown
1033	Dahlia yellow	4010	Tele magenta	6027	Light green	8012	Red brown
1034	Pastel yellow	4011	Pearl violet	6028	Pine green	8014	Sepia brown
1035	Pearl beige	4012	Pearl blackberry	6029	Mint green	8015	Chestnut
1036	Pearl gold	5000	Violet blue	6032	Signal green	8016	Mahogany
1037	Sun yellow	5001	Green blue	6033	Mint turquoise	8017	Chocolate
2000	Yellow orange	5002	Ultramarine	6034	Pastel turquoise	8019	Gray brown
2001	Red orange	5003	Saphire blue	6035	Pearl green	8022	Black brown
2002	Vermilion	5004	Black blue	6036	Pearl opal green	8023	Orange brown
2008	Bright red orange	5005	Signal blue	7002	Olive gray	8024	Beige brown
2009	Traffic orange	5008	Gray blue	7003	Moss gray	8025	Pale brown
2010	Signal orange	5011	Steel blue	7005	Mouse gray	8028	Terra brown
2011	Deep orange	5013	Cobalt blue	7006	Beige gray	8029	Pearl copper
2012	Salmon orange	5014	Pigeon blue	7008	Khaki gray	9003	Signal white
2013	Pearl orange	5020	Ocean blue	7009	Green gray	9004	Signal black
3001	Signal red	5021	Water blue	7010	Tarpaulin gray	9006	White aluminum
3002	Carmine red	5022	Night blue	7012	Basalt gray	9007	Gray aluminum
3003	Ruby red	5023	Distant blue	7013	Brown gray	9010	Pure white
3004	Purple red	5024	Pastel blue	7015	Slate gray	9011	Graphite black
3005	Wine red	5025	Pearl gentian	7021	Black gray	9016	Traffic white
3009	Oxide red	5026	Pearl night blue	7023	Concrete gray	9017	Traffic black
3011	Brown red	6000	Patina green	7024	Graphite gray	9018	Papyrus white
3012	Beige red	6001	Emerald green	7026	Granite gray	9022	Pearl light gray
3013	Tomato red	6002	Leaf green	7034	Yellow gray	9023	Pearl dark gray

Coating structure and colors not specified in the catalog are available on request.

General technical data

Packaging, safety notes, documentation and test certificates

Connected in star for dispatch – Order code **M01**
The terminal board of the motor is connected in star for dispatch.

Connected in delta for dispatch – Order code **M02**
The terminal board of the motor is connected in delta for dispatch.

Packing weights

Packing weights									
For motors		For land transport							
Frame size	Type	Type of construction IM B3				Type of construction IM B5, IM V1			
	1LE1 ... - 1PC1 ... -	In box Tare	On wooden board ISPM covered by cardboard on top and sides Tare	On battens Tare	In crate Tare	In box Tare	On wooden board ISPM covered by cardboard on top and sides Tare	On battens Tare	In crate Tare
		kg	kg	kg	kg	kg	kg	kg	kg
100 L	**1A.4**	–	5.0	–	–	–	5.0	–	–
	1A.5	–	5.0	–	–	–	5.0	–	–
	1A.6	–	5.0	–	–	–	5.0	–	–
112 M	**1B.2**	–	5.0	–	–	–	5.0	–	–
	1B.6	–	5.0	–	–	–	5.0	–	–
132 S	**1C.0**	4.7	–	–	–	5.2	–	–	–
	1C.1	4.7	–	–	–	5.2	–	–	–
132 M	**1C.2**	4.7	–	–	–	5.2	–	–	–
	1C.3	4.7	–	–	–	5.2	–	–	–
	1C.6	8.7	–	–	–	9.2	–	–	–
160 M	**1D.2**	4.8	–	–	–	5.7	–	–	–
	1D.3	4.8	–	–	–	5.7	–	–	–
160 L	**1D.4**	4.8	–	–	–	5.7	–	–	–
	1D.6	8.8	–	–	–	9.7	–	–	–

Data apply for individual packaging. Packing in wire-lattice pallets can be used, order code **B99**.

Safety notes

If the motors are to be delivered without safety and commissioning notes, a customer's declaration of renouncement is required.

Without safety and commissioning note – Order code **B00**

The motors are supplied with only one set of safety and commissioning notes per wire-lattice pallet for most motor types and frame sizes.

Complete with one set of safety and commissioning notes per wire-lattice pallet – Order code **B01**

Documentation

The following documents are optionally available:

- Printed operating instructions English/German enclosed – Order code **B04**
- All manuals for low-voltage motors, geared motors and low-voltage converters are now available on DVD in 5 languages, see "SD Manual Collection for CA 01" in catalog part 11 "Appendix".

Test certificates

Acceptance test certificate 3.1 according to **EN 10204** – Order code **B02**

An acceptance test certificate 3.1 according to EN 10204 can be supplied for most motors.

Type test with heat run for horizontal motors, with acceptance – Order code **B83**

During the type test, a temperature-rise test is performed; no-load, short-circuit and load characteristics are recorded; the iron losses and friction losses are determined and the efficiency is calculated from the summed losses. This option is only applicable to motors with a horizontal type of construction. The acceptance is carried out by an external representative (e.g. customer, classification society).

Voltages, currents and frequencies

Standard voltages

EN 60034-1 differentiates between Category A (combination of voltage deviation ±5 % and frequency deviation ±2 %) and Category B (combination of voltage deviation ±10 % and frequency deviation +3/–5 %) for voltage and frequency fluctuations. The motors can supply their rated torque in both Category A and Category B. In Category A, the temperature rise is approx. 10 K higher than during rated duty.

Standard	Category	Category
60034 – 1	A	B
Voltage deviation Frequency deviation	±5 % ±2 %	±10 % +3 %/–5 %
Rating plate data stamped with rated voltage a (e.g. 230 V)	a ±5 % (e.g. 230 V ±5 %)	a ±10 % (e.g. 230 ±10 %)
Rating plate data stamped with rated voltage ranges b to c (e.g. 220 to 240V)	b –5 % to c +5 % (e.g. 220 –5 % to 240 +5 %)	b –10 % to c +10 % (e.g. 220 – 10 % to 240 +10 %)

According to the standard, longer duty is not recommended for Category B. See “Rating plates and extra rating plates” for details of the rating plate inscriptions and corresponding examples. The selection and ordering data state the rated current at 400 V. The DIN IEC 60038 standard specifies a tolerance of ±10 % for mains voltages of 230 V, 400 V and 690 V. The rating plates of motors with voltage code 22 or 34 specify a rated voltage range in addition to the rated voltage (see table below).

The rated currents at 380/420 V are specified in the table “Rated currents for rated voltage range 380 V to 420 V at 50 Hz” and on the rating plate.

Mains voltages	Rated voltage range	Voltage code
1LE1 motors		
230 VΔ/400 VY, 50 Hz	220 ... 240 VΔ/380 ... 420 VY, 50 Hz	22
400 VΔ/690 VY, 50 Hz	380 ... 420 VΔ/660 ... 725 VY, 50 Hz	34
500 VY, 50 Hz	–	27
500 VΔ, 50 Hz	–	40

Non-standard voltages and/or frequencies

The tolerance laid down by DIN EN 60034-1 applies to all non-standard voltages.
Order codes have been allocated for a number of non-standard voltages at 50 or 60 Hz. They are ordered by specifying the code digit 9 for voltage in the 12th position of the Order No. as well as the code digit 0 in the 13th position of the Order No. and the appropriate order code.

M1Y Non-standard winding for voltages between 200 V and 690 V and rated outputs.
For voltages and rated outputs outside the range, please inquire.

Motor series	Frame size	Rated voltages that are available for **M1Y** Lowest/highest voltage in V for	
		Delta connection	Star connection
1LE1	100 … 160	200/690	250/690

Order codes for other rated voltages are listed under “Order No. supplements” in the “Selection and ordering data” as well as “Special versions” under “Voltages”.

General technical data

Rated currents for rated voltage range 380 V to 420 V at 50 Hz

Motor type	Frame size	Currents for voltage and number of poles							
		380 V 2-pole / A	420 V / A	380 V 4-pole / A	420 V / A	380 V 6-pole / A	420 V / A	380 V 8-pole / A	420 V / A
General Line motors with shorter delivery time Self-ventilated energy-saving motors with improved efficiency – Aluminum series 1LE1 Forced-air cooled motors without external fan and fan cover with improved efficiency – Aluminum series 1LE1									
1LE1002-1A.4	100 L	6.3	5.7	5.0	4.9	3.75	4.15	2.8	3.3
1LE1002-1A.5	100 L	–	–	6.4	6.1	–	–	3.65	4.1
1LE1002-1B.2	112 M	8.3	7.5	8.4	8.1	5.4	5.5	4.0	4.4
1LE1002-1C.0	132 S	10.9	10.3	11.5	11.4	7.3	7.7	5.9	6.0
1LE1002-1C.1	132 S	14.5	13.9	–	–	–	–	–	–
1LE1002-1C.2	132 M	–	–	15.2	15.2	9.3	9.4	7.9	8.1
1LE1002-1C.3	132 M	–	–	–	–	13.7	12.9	–	–
1LE1002-1D.2	160 M	21.7	20.7	22.4	22.8	17.0	17.7	10.5	11.6
1LE1002-1D.3	160 M	29.6	28.9	–	–	–	–	13.8	14.6
1LE1002-1D.4	160 L	35.0	33.5	30.0	30.2	22.3	24.7	18.9	19.4
Self-ventilated energy-saving motors with high efficiency – Aluminum series 1LE1 Forced-air cooled motors without external fan and fan cover with high efficiency – Aluminum series 1LE1									
1LE1001-1A.4	100 L	6.1	6.1	4.65	4.65	3.55	3.55	2.65	2.95
1LE1001-1A.5	100 L	–	–	6.2	6.1	–	–	3.85	4.35
1LE1001-1B.2	112 M	7.8	7.6	8.3	8.2	5.1	5.0	4.3	4.3
1LE1001-1C.0	132 S	10.1	10.5	11.4	11.4	7.0	7.1	6.6	6.6
1LE1001-1C.1	132 S	14.2	13.7	–	–	–	–	–	–
1LE1001-1C.2	132 M	–	–	14.8	14.4	8.6	8.9	7.9	8.2
1LE1001-1C.3	132 M	–	–	–	–	12	11.9	–	–
1LE1001-1D.2	160 M	20.0	21.0	21.5	20.5	16.1	15.8	9.8	9.6
1LE1001-1D.3	160 M	28.0	27.0	–	–	–	–	13.4	13.3
1LE1001-1D.4	160 L	34.0	33.0	28.5	27.5	22.5	21.5	17.5	16.8
Self-ventilated motors with increased output with improved efficiency – Aluminum series 1LE1									
1LE1002-1A.6	100 L	8.1	7.9	8.5	8.5	5.4	5	–	–
1LE1002-1B.6	112 M	11.2	10.2	12	10.8	7.5	8.0	–	–
1LE1002-1C.6	132 M	20.3	18.9	21.8	21.3	17.0	17.6	–	–
1LE1002-1D.6	160 L	40.2	37.9	36.1	35.5	33.5	34.0	–	–
Self-ventilated motors with increased output and high efficiency – Aluminum series 1LE1									
1LE1001-1A.6	100 L	7.8	7.6	8.3	8.4	5.0	4.95	–	–
1LE1001-1B.6	112 M	10.4	9.8	11.2	11.1	6.6	6.5	–	–
1LE1001-1C.6	132 M	20	19.1	21.5	21	16.5	16.5	–	–
1LE1001-1D.6	160 L	40.0	37.5	35.5	34.5	30.5	29.0	–	–

Outputs

The outputs or rated outputs are listed in the selection tables for both 50 Hz and 60 Hz.

Assignment of the standard power kW-HP and vice versa in accordance with IEC

kW · 1.341 = HP
HP · 0.746 = kW

P_{rated} kW	P_{rated} HP	P_{rated} kW	P_{rated} HP	P_{rated} kW	P_{rated} HP	P_{rated} kW	P_{rated} HP	P_{rated} kW	P_{rated} HP	P_{rated} kW	P_{rated} HP
0.06	0.08	0.37	0.5	2.2	3	11	15	37	50	110	150
0.09	0.12	0.55	0.75	3	4	15	20	45	60	132	200
0.12	0.16	0.75	1	4	5	18.5	25	55	75	160	250
0.18	0.25	1.1	1.5	5.5	7.5	22	30	75	100	200	300
0.25	0.33	1.5	2	7.5	10	30	40	90	125		

Efficiency, power factor, rated torque, rated speed and direction of rotation

Efficiency and power factor

The efficiency η and power factor cos φ for each rated output are listed in the selection tables in the individual sections of this catalog.

For EFF1 and EFF2 motors, the 3/4-load-efficiency is also indicated in the selection tables.

The part-load values stated in the two tables below are averages; precise values can be provided on request.

Part-load efficiency in % at 1/4 of full load	1/2	3/4	**4/4**	5/4
93	96	97	**97**	96.5
92	95	96	**96**	95.5
90	93.5	95	**95**	94.5
89	92.5	94	**94**	93.5
88	91.5	93	**93**	92.5
87	91	92	**92**	91.5
86	90	91	**91**	90
85	89	90	**90**	89
84	88	89	**89**	88
80	87	88	**88**	87
79	86	87	**87**	86
78	85	86	**86**	85
76	84	85	**85**	83.5
74	83	84	**84**	82.5
72	82	83	**83**	81.5
70	81	82	**82**	80.5
68	80	81	**81**	79.5
66	79	80	**80**	78.5
64	77	79.5	**79**	77.5
62	75.5	78.5	**78**	76.5
60	74	77.5	**77**	75
58	73	76	**76**	74
56	72	75	**75**	73
55	71	74	**74**	72
54	70	73	**73**	71
53	68	72	**72**	70
52	67	71	**71**	69
51	66	70	**70**	68
50	65	69	**69**	67
49	64	67.5	**68**	66
48	62	66.5	**67**	65
47	61	65	**66**	64
46	60	64	**65**	63
45	59	63	**64**	62
44	57	62	**63**	61
43	56	60.5	**62**	60.5
42	55	59.5	**61**	59.5
41	54	58.5	**60**	58.5

Part-load power factor at 1/4 of full load	1/2	3/4	**4/4**	5/4
0.70	0.86	0.90	**0.92**	0.92
0.65	0.85	0.89	**0.91**	0.91
0.63	0.83	0.88	**0.90**	0.90
0.61	0.80	0.86	**0.89**	0.89
0.57	0.78	0.85	**0.88**	0.88
0.53	0.76	0.84	**0.87**	0.87
0.51	0.75	0.83	**0.86**	0.86
0.49	0.73	0.81	**0.85**	0.86
0.47	0.71	0.80	**0.84**	0.85
0.45	0.69	0.79	**0.83**	0.84
0.43	0.67	0.77	**0.82**	0.83
0.41	0.66	0.76	**0.81**	0.82
0.40	0.65	0.75	**0.80**	0.81
0.38	0.63	0.74	**0.79**	0.80
0.36	0.61	0.72	**0.78**	0.80
0.34	0.59	0.71	**0.77**	0.79
0.32	0.58	0.70	**0.76**	0.78
0.30	0.56	0.69	**0.75**	0.78
0.29	0.55	0.68	**0.74**	0.77
0.28	0.54	0.67	**0.73**	0.77
0.27	0.52	0.63	**0.72**	0.76
0.26	0.50	0.62	**0.71**	0.76

Rated speed and direction of rotation

The rated speeds are applicable for the rated data. The synchronous speed changes proportionally with the line frequency. The motors are suitable for clockwise and counter-clockwise rotation.

If U1, V1, W1 are connected to L1, L2, L3, clockwise rotation results as viewed onto the drive-end shaft extension. Counter-clockwise rotation is achieved by swapping two phases (see also “Heating and ventilation”, Page 0/111).

Rated torque

The rated torque in Nm delivered at the motor shaft is

$$M = \frac{9.55 \cdot P \cdot 1000}{n}$$

P Rated output in kW
n Speed in rpm

Note:
If the voltage deviates from its rated value within the admissible limits, the locked-rotor torque, the pull-up torque and the breakdown torque vary with the approximate square of the value, but the locked-rotor current varies approximately linearly.

In the case of squirrel-cage motors, the locked-rotor torque and breakdown torque are listed in the selection tables as multiples of the rated torque.
The normal practice is to start squirrel-cage motors directly on line. The torque class indicates that with direct-on-line starting, even if there is an undervoltage of –5 %, it is possible to start up the motor against a load torque of

- 160 % for CL 16
- 130 % for CL 13
- 100 % for CL 10
- 70 % for CL 7
- 50 % for CL 5

of the rated torque.

General technical data

Rating plate and extra rating plates

DIN EN 60034-1 lays down that the approximate total weight for all motors is indicated on the rating plate.

An extra rating plate can be supplied loose for all motors, order code **M10**.

Non-rusting steel rating plate, for scratch, heat, cold and acid resistance can be obtained, order code **M11**.

Supplementary data (max. of 20 characters) can be indicated on the rating plate or extra rating plate and on the packaging label, order code **Y84**.

An extra rating plate for identification codes is also possible, order code **Y82**.
An extra rating plate or a rating plate with different rating plate data can also be ordered, order code **Y80**.

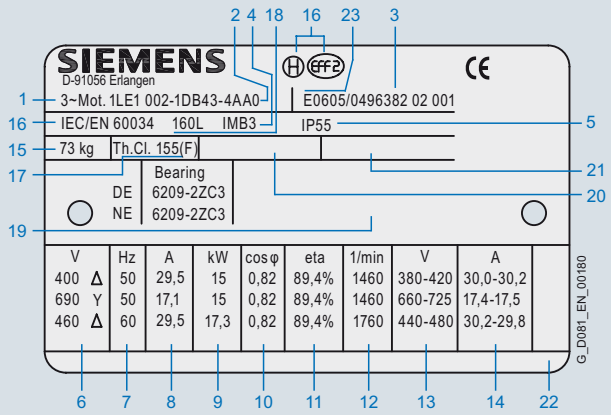
In the standard version, the rating plate is available in international format or in the German/English language. The language for the rating plate can be ordered by specifying it in plain text. An overview of the languages that can be ordered, at additional cost in some cases, is provided in the table below.

Overview of the languages on the rating plate

Motor type	Frame size	Rating plate								Double rating plate 50/60 Hz data for	
		International	German (de)	English (en)	German (de)/ English (en)	French (fr)/ Spanish (es)	Italian (it)	Portuguese (pt)	Russian (ru)	500 VY and 575 VY 500 VΔ and 575 VΔ	230 VΔ/ 400 VY and 460 V 400 VΔ/ 690 VY and 460 VΔ
1LE1/1PC1	100 … 160	□		○						□	□

□ Standard version
○ Without additional charge

Example of a rating plate



1 Machine type: Three-phase Low-voltage motor
2 Order No.
3 Factory number (Ident No., serial number)
4 Type of construction
5 Degree of protection
6 Rated voltage [V] and winding connections
7 Frequency [Hz]
8 Rated current [A]
9 Rated output [kW]
10 Power factor [cos φ]
11 Efficiency
12 Rated speed [rpm]
13 Voltage range [V]
14 Current range [A]
15 Machine weight [kg]
16 Standards and regulations
17 Temperature class
18 Frame size
19 Additional details (optional)
20 Operating temberature range (only if it deviates from normal)
21 Site altitude (only when higher than 1000 m)
22 Customer data (optional)
23 Date of manufacture YYMM

Coolant temperature and site altitude

The rated output specified in the selection tables is applicable for continuous duty in accordance with DIN EN 60034-1 at the frequency of 50 Hz, a coolant temperature (CT) or ambient temperature of 40 °C and a site altitude (SA) up to 1000 m above sea level.

For higher coolant temperatures and/or site altitudes greater than 1000 m above sea level, the specified motor output must be reduced using the factor k_{HT}.

Depending on the frame size of the motor or the number of poles, special windings may be added to the motors for different operating conditions.

This results in an admissible output of the motor of:

$P_{adm.} = P_{rated} \cdot k_{HT}$

If the admissible motor output is no longer adequate for the drive, it should be checked whether the motor with the next higher rated output fulfills the requirements.

Abbreviation	Description	Unit
$P_{adm.}$	Admissible motor output	kW
P_{rated}	Rated output	kW
k_{HT}	Factor for abnormal coolant temperature and/or site altitude	

The motors are designed for temperature class 155 (F) and used in temperature class 130 (B). Under non-standard operating conditions, if they are to be used in class 130 (B), the admissible output must be determined from the tables below.

Reduction factor k_{HT} for different site altitudes and/or coolant temperatures

Site altitude above **sea level**	Site altitude above sea level Coolant temperature					
m	<30 °C	30 °C ... 40 °C	45 °C	50 °C	55 °C	60 °C
1000	1.07	1.00	0.96	0.92	0.87	0.82
1500	1.04	0.97	0.93	0.89	0.84	0.79
2000	1.00	0.94	0.90	0.86	0.82	0.77
2500	0.96	0.90	0.86	0.83	0.78	0.74
3000	0.92	0.86	0.82	0.79	0.75	0.70
3500	0.88	0.82	0.79	0.75	0.71	0.67
4000	0.82	0.77	0.74	0.71	0.67	0.63

Coolant temperature and site altitude are rounded-off to 5 °C or 500 m.

For the following outputs, rms values are specified for coolant temperatures (CT) of 45 °C and 50 °C that must be specified when ordering.

Power	Admissible output at 50 Hz	
	for CT 45 °C	for CT 50 °C
kW	kW	kW
11	10.5	10
15	14.5	13.8
18.5	17.8	17
22	21	20
30	29	27.5

For details of derating for use in class 155 (F), see “DURIGNIT IR 2000 insulation system”.

Motors for coolant temperatures other than 40 °C or site altitudes higher than 1000 m above sea level for use in temperature class 130 (B) must always be ordered with the supplementary order code “**-Z**” and plain text. In the case of extreme derating, the operating data for the motors will also be less favorable due to partial utilization.

The following special versions are possible for 1LE1 and 1PC1 motors:

- Motors for coolant temperatures from –40 to +40 °C order code **D03**
- Motors for coolant temperatures from –30 to +40 °C order code **D04**

When ordering with order codes **D03** and **D04** in combination with mountings, the respective technical data have to be observed; request required.

For details of order codes for use in temperature class 155 (F), see “DURIGNIT IR 2000 insulation system” under “Windings and insulation”, Page 0/108.

The following applies to all motors:
The motors can withstand 1.5 times the rated current at rated voltage and frequency for two minutes (DIN EN 60034).

Ambient temperature:
All motors can be used in the standard version at ambient temperatures between –20 to +40 °C.
Motors can be used in temperature class 155 (F)

- at 40 °C with service factor 1.1, i.e. the motor can be continuously overloaded with 10 % of the rated output in the case of EFF2 motors
- at 40 °C with service factor 1.15, i.e. the motor can be continuously overloaded with 15 % of the rated output in the case of EFF1 motors
- above 40 °C at rated output.

When motors are used in temperature class 130 (B) for higher ambient temperatures and/or site altitudes, derating occurs in accordance with the table “Reduction factor k_{HT} for different site altitudes and/or coolant temperatures”.
For motors ex stock, the service factor is indicated on the rating plate.
For other temperatures, special measures are necessary.
When brakes are to be mounted on at temperatures below freezing, please inquire.

General technical data

Windings and insulation

DURIGNIT IR 2000 insulation system

The DURIGNIT IR 2000 insulation system comprises high-grade enameled wires and insulating sheet materials combined with solvent-free impregnating resin.
The system ensures a high level of mechanical and electrical strength as well as good serviceability and a long motor life.
The insulation system protects the winding against aggressive gases, vapors, dust, oil and increased air humidity. It can withstand the usual vibration stressing.
The insulation is suitable up to an absolute air humidity of 30 g water per m^3 of air. Moisture condensation should be prevented from forming on the winding. Please inquire if higher values are required.

Please inquire about extreme applications.

Restarting against residual field and opposite phase

All motors can be reclosed against 100 % residual field after a mains voltage failure.

Winding and insulation design with regard to temperature class and air humidity

All motors are designed for temperature class 155 (F).
At rated output with mains-fed operation, the motors can be used in temperature class 130 (B).

Temperature class 155 (F), used according to 155 (F), with service factor (SF)
For all 1LE1/1PC1 motors for mains-fed operation for the rated output given in the selection table and rated voltage, a service factor of 1.1 can be specified for EFF2 motors (SF = 1.15 for EFF1 motors) also for motors with increased output.
Order code **N01**

Temperature class 155 (F), used according to 155 (F), for increased output
When used according to temperature class 155 (F), the rated output as specified in the selection and ordering data can be increased by 10 % for EFF2 motors (15 % for EFF1 motors) also for motors with increased output.
Order code **N02**

Temperature class 155 (F), used according to 155 (F), with increased coolant temperature
For mains-fed motors at outputs in accordance with the catalog, the coolant temperature can be raised to 55 °C.
Order code **N03**

The service factor (SF) is not indicated on the rating plate for order codes N02 and N03.
For converter-fed operation at the output specified in the catalog, the motors are used in accordance with temperature class 155 (F). Order codes N01, N02 and N03 are not possible. This applies to motors up to 460 V.

Temperature class 155 (F), used according to 155 (F), other requirements
The motors can be ordered according to temperature class 155 (F) for use according to temperature class 155 (F) with other customized requirements if they are specified in plain text in the order.
Order code **Y52**

Temperature class 180 (H) at rated output and maximum coolant temperature CT 60 °C

For motor series 1LE1 and 1PC1, use according to temperature class 180 (H) is permitted at rated output and at a maximum coolant temperature of 60 °C. This does not apply to motor series 1LE1 and 1PC1 with UL approval (order code D31) and CSA approval (order code D40). The specified grease life applies to a coolant temperature of 40 °C. For a 10 K increase in coolant temperature, the grease life or lubrication interval is halved.
Order code **N11**

Temperature class 155 (F), used according to 130 (B), coolant temperature 45 °C, approx. 4 % derating
For the 1LE1 motor series, a version for temperature class 155 (F) can be used according to temperature class 130 (B) at a maximum coolant temperature of 45 °C with a 4 % reduction in rated output.
Order code **N05**

Temperature class 155 (F), used according to 130 (B), coolant temperature 50 °C, approx. 8 % derating
For the 1LE1 motor series, a version for temperature class 155 (F) can be used according to temperature class 130 (B) at a maximum coolant temperature of 50 °C with a 8 % reduction in rated output.
Order code **N06**

Temperature class 155 (F), used according to 130 (B), coolant temperature 55 °C, approx. 13 % derating
For the 1LE1 motor series, a version for temperature class 155 (F) can be used according to temperature class 130 (B) at a maximum coolant temperature of 55 °C with a 13 % reduction in rated output.
Order code **N07**

Temperature class 155 (F), used according to 130 (B), coolant temperature 60 °C, approx. 18 % derating
For the 1LE1 motor series, a version for temperature class 155 (F) can be used according to temperature class 130 (B) at a maximum coolant temperature of 60 °C with a 18 % reduction in rated output.
Order code **N08**

Increased air temperature/humidity with 30 to 60 g water per m^3 of air

For motors of series 1LE1 and 1PC1, a version can be ordered for increased air humidity of between 30 and 60 g water per m^3 of air depending on the temperature as listed in the table below. This option includes condensation drainage holes (order code H03).
Order code **N20**
Please contact your local Siemens office if order code N20 is to be combined with additional mountings (eg. rotary pulse encoders, brakes).

Increased air temperature/humidity with 60 to 100 g water per m^3 of air

For motors of series 1LE1 and 1PC1, a version can be ordered for increased air humidity of between 60 and 100 g water per m^3 of air depending on the temperature as listed in the table below. This option includes condensation drainage holes (order code H03).
Order code **N21**
Please contact your local Siemens office if order code N21 is to be combined with additional mountings (eg. rotary pulse encoders, brakes).

Absolute/relative conversion of air humidity

Relative humidity	Temperature							
	20 °C	30 °C	40 °C	50 °C	60 °C	70 °C	80 °C	90 °C
10 %	2	3	5	8	13	20	29	42
15 %	3	5	8	12	19	30	44	63
20 %	3	6	10	17	26	39	58	84
25 %	4	8	13	21	32	49	73	105
30 %	5	9	15	25	39	59	87	126
35 %	6	11	18	29	45	69	102	146
40 %	7	12	20	33	52	79	116	167
45 %	8	14	23	37	58	89	131	188
50 %	9	15	26	41	65	98	145	209
55 %	10	17	28	46	71	108	160	230
60 %	10	19	31	50	78	118	174	251
65 %	11	20	33	54	84	128	189	272
70 %	12	21	36	58	91	138	203	293
75 %	13	23	38	62	97	148	218	314
80 %	14	24	41	66	104	157	233	335
85 %	15	26	43	70	110	167	247	356
90 %	16	27	46	74	117	177	262	377
95 %	16	29	49	79	123	187	276	398
100 %	17	30	51	83	130	197	291	419

The values in the table with a blue background are covered by the standard version (up to 30 g water per m^3 of air).

The values in the table with a light gray background are covered by order code **N20** (30 to 60 g of water per m^3 of air).

The values in the table with a dark gray background are covered by order code **N21** (60 to 100 g of water per m^3 of air).

Please contact your local Siemens office regarding requirements exceeding 100 g water per m^3 of air

Restarting against residual field and opposite phase

All motors can be reclosed against 100 % residual field after a mains voltage failure.

General technical data

Motor protection

The order variants for motor protection are coded with letters in the 15th position of the Order No. and, if necessary, using order codes.

In the standard version, the motor is designed without motor protection.
15th position of Order No. letter **A**

A distinction is made between current-dependent and motor-temperature-dependent protection devices.

Current-dependent protection devices

Fuses are only used to protect mains cables in the event of a short-circuit. They are not suitable for overload protection of the motor.

The motors are usually protected by delayed overload protection devices (circuit breakers for motor protection or overload relays).

This protection is current-dependent and is particularly effective in the case of a locked rotor.

For standard duty with short start-up times and starting currents that are not excessive and for low numbers of switching operations, motor protection switches provide adequate protection. Motor protection switches are not suitable for heavy starting duty or large numbers of switching operations. Differences in the thermal time constants for the protection equipment and the motor results in unnecessary early tripping when the protection switch is set to rated current.

Motor-temperature-dependent protection devices

Temperature detectors installed in the motor winding are suitable protection devices in the case of slowly rising motor temperature.

When a limit temperature is reached, these **bimetal switches** (NC contacts) can deactivate an auxiliary circuit. The circuit can only be reclosed following a considerable fall in temperature. When the motor current rises quickly (e.g. with a locked rotor), these switches are not suitable due to their large thermal time constants.
Temperature detectors for tripping
15th position of Order No. letter **Z** and order code **Q3A**

The most comprehensive protection against thermal overloading of the motor is provided by **PTC thermistors (thermistor motor protection)** installed in the motor winding. The temperature of the winding can be accurately monitored thanks to its low heating capacity and the excellent heat contact with the winding. When a limit temperature is reached (rated tripping temperature), the PTC thermistors undergo a step change in resistance. This is evaluated by a tripping unit and can be used to open auxiliary circuits. The PTC thermistors themselves cannot be subjected to high currents and voltages. This would result in destruction of the semiconductor. The switching hysteresis of the PTC thermistor and tripping unit is low, which supports fast restarting of the drive. Motors with this type of protection are recommended for heavy duty starting, switching duty, extreme changes in load, high ambient temperatures or fluctuating supply systems.

Motor protection with PTC thermistors with 3 embedded temperature sensors for tripping. In the connection box, 2 auxiliary terminals are required.
15th position of Order No. letter **B**

The temperature detectors have the following current carrying capacity and switching capacity:
230 V AC cosφ: 2.5 A
24 V DC: 1.6 A

Two sets of three temperature sensors are used if a warning is required before the motor is shut down (tripped). The warning is normally set to 10 K below the tripping temperature.

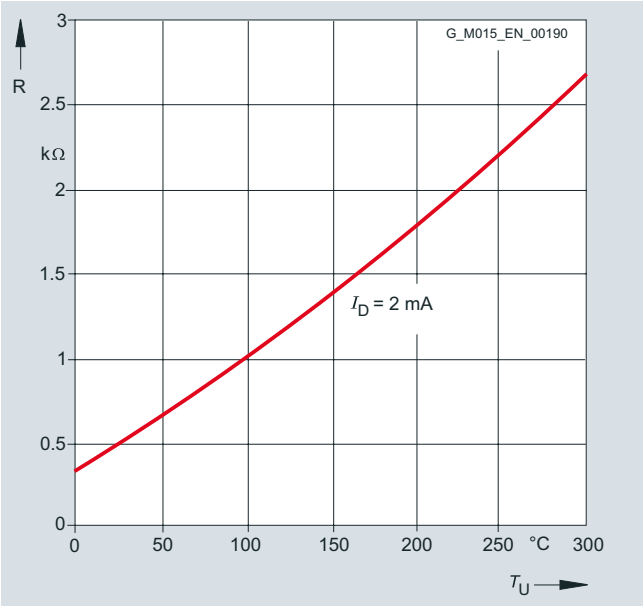
Motor protection with PTC thermistors with 6 embedded temperature sensors for alarm and tripping. In the connection box, 4 auxiliary terminals are required.
15th position of Order No. letter **C**

In order to achieve full thermal protection, it is necessary to combine a thermally delayed overcurrent release and a PTC thermistor. For full motor protection implemented only with PTC thermistors, please inquire.

Motor temperature detection with converter-fed operation

KTY 84-130 temperature sensor

This sensor is a semiconductor that changes its resistance depending on temperature in accordance with a defined curve.



KTY 84-130 temperature sensor characteristic

Some converters from Siemens determine the motor temperature using the resistance of the temperature sensor. They can be set to a required temperature for alarm and tripping.

Motor temperature detection with embedded temperature sensor KTY 84-130. Two auxiliary terminals are required in the connection box.
15th position of Order No. letter **F**

The temperature sensor is embedded in the winding head of the motor in the same manner as a PTC thermistor. Evaluation is performed, for example, in the converter.
For mains-fed operation, the temperature monitoring device 3RS10 that is part of the protection equipment can be ordered separately. For further details, see Catalog LV 1,
Order No.: E86060-K1002-A101-A7-7600.

With NTC thermistors (mainly in the case of special machines), the tripping temperature can also be adjusted later on the tripping unit. NTC thermistors for tripping
15th position of Order No. letter **Z** and order code **Q2A**

Heating and ventilation

Anti-condensation heaters

Supply voltage 230 V (1~)
Order code **Q02**

Supply voltage 115 V (1~)
Order code **Q03**

Motors whose windings are at risk of condensation due to the climatic conditions, e.g. inactive motors in humid atmospheres or motors that are subjected to widely fluctuating temperatures, can be equipped with anti-condensation heaters.
An additional M16 x 1.5 cable entry is provided for the connecting cable in the connection box.
Anti-condensation heaters must not be switched on during operation.

Motor series	Frame size	Heater output of anti-condensation heaters in Watt (W) Supply voltage at	
		230 V	115 V
		Order code	Order code
		Q02	**Q03**
1LE1/1PC1	100 ... 112	50	50
1LE1/1PC1	132 … 160	100	100

Instead of an anti-condensation heater, another possibility (at no extra cost) is connection of a voltage that is approximately 4 to 10 % of the rated motor voltage to stator terminals U1 and V1; 20 to 30 % of the rated motor current are sufficient to heat the motor.

Fans/Separately driven fans

1LE1 motors of frame sizes 100 ... 160 have radial-flow fans in the standard version (with the exception of 1LE1 with option F90 – version “Forced-air cooled motors without external fan and fan cover”) that cool regardless of the direction of rotation of the motor (cooling method IC 411 acc. to DIN EN 60034-6). The air flow is forced from the non-drive-end (NDE) to the drive end (DE).
For details of separately driven fans for frame sizes 100 ... 160, see Page 0/129.

Supply voltage of separately driven fan for 1LE1 motors:
The supply voltage tolerance of the separately driven fan is ±5 %; for voltage ranges, Page 0/129.

When the motor is mounted and the air intake is restricted, it must be ensured that a minimum clearance is maintained between the fan cover and the wall. This clearance is calculated from the difference between the protective cover and the fan cover (differential dimension LM – L) or is specified in the detailed dimension drawing (see also Dimensional drawings from Page 1/68).

For design of the fan/separately driven fan and the fan cover, see the table below.

Motor series	Frame size	Fan material	Fan cover material
1LE1	100 … 160	plastic	plastic [1)]

Metal external fan impeller

The standard fan impeller made of plastic can be replaced with a fan impeller made of metal. This version can be supplied 1LE1 (with the exception of 1LE1 with option F90 – version “Forced-air cooled motors without external fan and fan cover”). With the 1LE1 mortor series, the metal fan can also be used for converter-fed operation.
A metal external fan is already included for the low-noise version.
Up to frame size 160, the metal external fan impeller is manufactured from sheet aluminum or steel.
Order codes **F76**

Fan cover for textile industry

For motors 1LE1 (with the exception of 1LE1 with option F90 – version “Forced-air cooled motors without external fan and fan cover”), the fan cover can be used in the standard version for the textile industry.
For motor series 1LE1 (with the exception of 1LE1 with option F90 – version “Forced-air cooled motors without external fan and fan cover”), a version of the fan cover can be supplied specially for the textile industry. This has a protective cover and is made of non-corrosive sheet steel.

When a fan cover is mounted for the textile industry, the length of the motor increases by 64 mm for frame sizes 100/112 and by 71 mm for frame sizes 132/160.
Order code **F75**

Sheet metal fan cover

For 1LE1 motor series (with the exception of 1LE1 with option F90 – version “Forced-air cooled motors without external fan and fan cover”), the fan cover can be supplied in sheet metal instead of plastic.
Order code **F74**

[1)] The sheet metal fan cover is used for type of constuction codes **A, D, F, H, J, K, L, N, T, U, V** in combination with option **H03** (condensation drainage holes). Mounted separately driven fans and brakes are only available for versions with sheet metal fan covers.

General technical data

Necessary minimum cooling air flow for forced-air-cooled motors in standard duty

The required cooling air flow indicated in the selection table applies to continuous duty according to DIN EN 60034-1 at a coolant temperature (CT) and ambient temperature, respectively, of 40 °C and a site altitude (SA) of up to 1000 m above sea level.

In the motor version without external fan and fan cover, order code **F90**, the motor is located in the air flow of the fan to be driven which must drive the minimum cooling air flow over the motor housing. The minimum air flow must pass closely over the housing (comparable to self-ventilation of the motor). Otherwise, higher air flows are required to comply with admissible motor heating levels. For a higher cooling air flow, the operating temperature of the motor can be reduced.

Frame size	Required cooling air flow for number of poles									
	2		4				6		8	
	EFF1/EFF2		EFF1		EFF2		EFF1/EFF2		EFF1/EFF2	
	50 Hz	60 Hz	50 Hz	60 Hz	50 Hz	60 Hz	50 Hz	60 Hz	50 Hz	60 Hz
	m^3/min.	m^3/min.	m^3/min.	m^3/min.	m^3/min.	m^3/min.	m^3/min.	m^3/min.	m^3/min.	m^3/min.
100	3.8	4.4	2.1	2.6	2.3	2.8	1.5	1.8	1.2	1.3
112	5.0/5.4 [1)]	5.7/6.1 [1)]	2.9	3.5	2.9	3.5	1.9	2.3	1.4	1.6
132	6.3	7.3	4.6	5.7	4.6	5.7	3.1	3.8	2.4	2.9
160	10.9	13.3	6.7	8.1	7.6	9.1	5	6.1	3.8	4.5

1) Value: EFF1/EFF2

Motor connection and connection box

Connection, circuit and connection box

Location of the connection box

The order variants for motor connection are coded with digits in the 16th position of the Order No.

The connection box of the motor can be mounted in four different locations or positions. The position of the connection box must always be viewed from the drive end (DE).

The standard position of the connection box for *General Line motors* is on top
16th position of Order No. digit **0**.

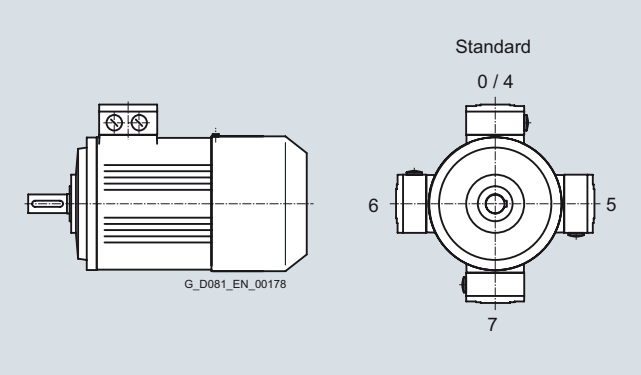
The standard position of the connection box for all other motors is on top
16th position of Order No. digit **4**.

For all motors with feet (apart from motors with increased output), cast feet are standard. If rotation of the connection box in the future has to be provided for, it is recommended that the option “Screwed-on feet” (instead of cast feet), order code **H01**, is ordered.
For motors with feet and increased output, screwed-on feet are standard. The connection box can be rotated later.

Connection box on RHS
16th position of Order No. digit **5**.

Connection box on LHS
16th position of Order No. digit **6**.

Connection box bottom
16th position of Order No. digit **7**.



Location of the connection box with the corresponding digits in the 16th position of the order number

The number of winding ends depends on the winding design. Three-phase motors are connected to the three phase conductors L1, L2 and L3 of a three-phase system. The rated voltage of the motor in the running connection must match the phase conductor voltages of the network.

When the three phases are operating in a time sequence and are connected to the terminals of the motor in alphabetical order U1, V1 and W1, clockwise rotation is established as viewed from the motor shaft. The direction of rotation of the motor can be reversed if two connecting leads are interchanged.

Labeled terminals are provided to connect the protective conductor.
A PE terminal is provided in the connection box for grounding. A grounding terminal is provided on the outside of the motor frame – special version for 1LE1/1PC1 motors.
Order code **H04**.

If a brake control system or thermal protection is installed, the connections will also be in the connection box. The motors are suitable for direct connection to the line supply.

Design of the connection box

The number of terminals and the size of the connection box are designed for standard requirements.

For special requirements or upon the customer´s request, a larger connection box, can be delivered.
Order code **R50**

If the necessary installation angle of the motor would cause machine components to collide with the connection box, the connection box can be moved from the drive end (DE) to the non-drive end (NDE). Only use according to temperature class 155 (F) possible.
Order code **H08**
Not possible for explosion-proof motors.

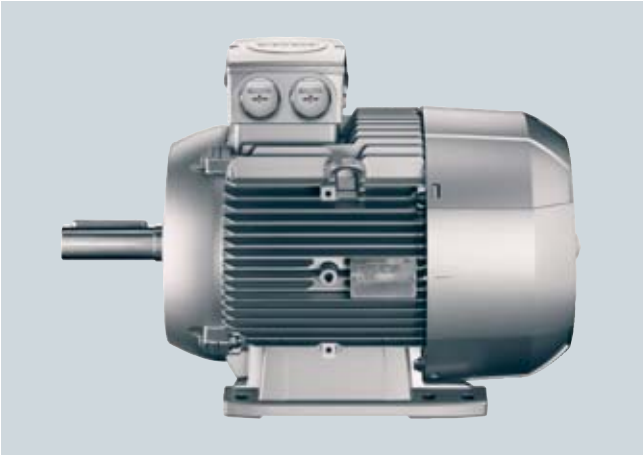
Motor connection

Line feeder cables
The line feeder cables must be dimensioned acc. to DIN VDE 0298. The number of required feeder cables, if necessary in parallel, is defined by:

- The max. cable cross-section which can be connected
- The cable type
- Routing
- Ambient temperature and the corresponding admissible current in accordance with DIN VDE 0298

For motors with auxilliary terminals (e.g. 15th position of Order No. is letter **B**) an M16 x 1.5 cable gland with plug is additonally provided.
For further details, see the data sheet function in the SD generator.

The connection box is located on the housing and bolted in place. The connection box can be turned 4 x 90° on the terminal base of the machine's housing in the case of a terminal board with 6 terminal studs (standard design).
There are 2 entry holes at the standard position complete with sealing plugs and locknuts (see figure).



Connection box in standard position

General technical data

Cable entry on connection box

Unless stated otherwise, the cable entry is located in the standard position as shown in the illustration.

The connection box can also be rotated such that the cable entry is located

- Towards the drive end (DE)
  (rotation of connection box by 90°, entry from DE)
  Order code **R10**
- Towards the non-drive end (NDE)
  (rotation of connection box by 90°, entry from NDE)
  Order code **R11**
- Opposite
  (rotation of connection box by 180°, entry from opposite end)
  Order code **R12**

The dimensions of the connection box are listed in part "Dimensions", see Pages 1/65 to 1/75 in accordance with the frame size and the "Dimension drawings".
If the position of the connection box (connection box RHS, LHS or above) is changed, the position of the cable entry must be checked and, if necessary, it can be ordered with the corresponding order codes (**R10**, **R11** and **R12**).

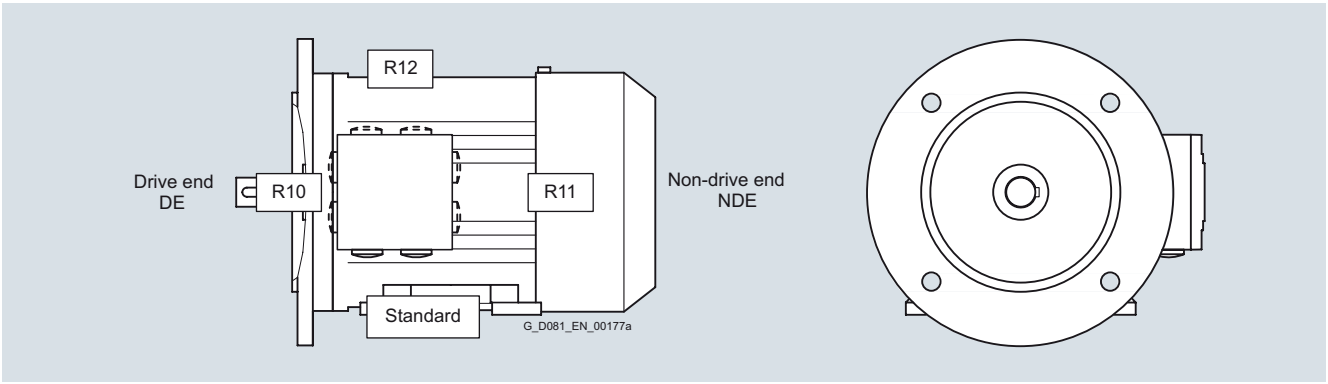
Ordering example:

Connection box on RHS (16th position of Order No. digit 5):
Without additional order code, cable entry from below.

With additional order code **R10**:
Cable entry from drive end (DE)

Connection box in standard position, detailed view

For cable entry to a standard connection box, a metal cable entry can be ordered for motor connection.
One cable gland, metal
Order code **R15**



Locations of the cable entries with corresponding order codes

For special requirements for which standard holes for the cable entries are inadequate for the British market in UK, reduction pieces for M cable glands in accordance with British Standard that are mounted on both cable entries can be supplied.
Order code **R30**

Frame size	Cable entry acc. to	
	IEC	British Standard
100	2 x M32	2 x M20
112/132	2 x M32	2 x M25
160	2 x M40	2 x M32

Protruding cable ends

For confined spaces, protruding cable ends can be ordered, without a connection box with cover plate.

The following lengths of protruding cables can already be ordered using order codes on request:

- 3 cables protruding, 0.5 m long [1)]
  Order code **R20**
- 3 cables protruding, 1.5 m long [1)]
  Order code **R21**
- 6 cables protruding, 0.5 m long
  Order code **R22**
- 6 cables protruding, 1.5 m long
  Order code **R23**
- 6 cables protruding, 3.0 m long
  Order code **R24**

The cross-section of the named cables refers to a coolant temperature up to CT 40 °C.

1) With only 3 protruding cables additional plain text specifying star or delta connection is required.

Connection, circuit and connection box

Standard connection box TB1 F00, TB1 H00, TB1 J00

Larger connection box type TB1F10, TB1H10, TB1J10

Standard connection boxes/larger connection box for 1LE1/1PC1 motors – basic data

Motors	Frame size	Number of cable entries	Connection box material	Feeder connection
1LE1	100 … 160	2 entries complete with sealing plugs and locknuts Connection box is mounted and bolted in place.	Aluminum alloy	Without cable lug

Possible positions of the standard connection boxes/Larger connection box for 1LE1/1PC1 motors

Motors	Frame size	Connection box position			Rotation of connection box		
		Above	Side, right or left	Retrofitting possible	90°	180°	Retrofitting possible
1LE1	100 … 160	O	O	– [1]	O	O	Yes

O Available version

Standard connection boxes/larger connection box for 1LE1/1PC1 motors in standard version

Frame size	Connection box	Number of terminals	Contact screw thread	Max. connectable cross-section	Outer cable diameter (sealing range)	Cable entry [2]	Two-part plate Adm. outer cable diameter
	standard / larger			mm^2	mm		mm
1LE1							
100	TB1 F00/TB1F10	6	M4	4	11 … 21	2 x M32 x 1.5	–
112							
132	TB1 H00/TB1H10	6	M4	6	11 … 21	2 x M32 x 1.5	–
160	TB1 J00/TB1J10	6	M5	16	19 … 28	2 x M40 x 1.5	–

– Not available

Terminal connection

The terminal board accommodates the terminals that are connected to the leads to the motor windings. The terminals are designed so that for frame sizes 100 ... 160 the external (line) connections can be made without the need for cable lugs.

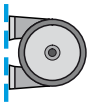
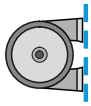
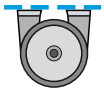
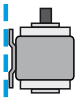
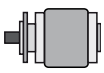
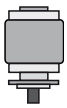
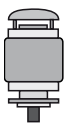
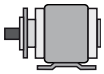
1) Retrofittable screwed-on feet (16th position of Order No. digit **5, 6, 7** and **4** with order code **H01**).

2) Designed for cable glands with O-ring.

General technical data

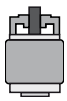
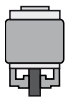
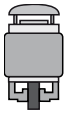
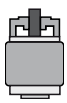
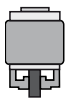
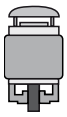
Types of construction

Standard types of construction and special types of construction

Type of construction acc. to DIN EN 60034-7	Frame size	Letter 14th position of the Order No.	Order No. supplement **-Z** with order code
Without flange			
IM B3 	100 L to 160 L	**A**	–
IM B6/IM 1051 	100 L to 160 L	**T**	–
IM B7/IM 1061 	100 L to 160 L	**U**	–
IM B8/IM 1071 	100 L to 160 L	**V**	–
IM V5/IM 1011 without protective cover 	100 L to 160 L	**C**	–
IM V6/IM 1031 	100 L to 160 L	**D**	–
IM V5/IM 1011 with protective cover 	100 L to 160 L	**C**	**+ H00** [1]
With flange			
IM B5/IM 3001 	100 L to 160 L	**F**	–
IM V1/IM 3011 without protective cover 	100 L to 160 L	**G**	–
IM V1/IM 3011 with protective cover 	100 L to 160 L	**G**	**+ H00** [1]
IM V3/IM 3031 	100 L to 160 L	**H**	–
IM B35/IM 2001 	100 L to 160 L	**J**	–

In the DIN EN 50347 standard, flanges FF with through holes and flanges FT with tapped holes are specified.

[1] A second shaft extension **L05** is not possible.

Type of construction acc. to DIN EN 60034-7		Frame size	Letter 14th position of the Order No.	Order No. supplement **-Z** with order code
With standard flange				
IM B14/IM 3601		100 L to 160 L	**K**	–
IM V19/IM 3631		100 L to 160 L	**L**	–
IM V18/IM 3611 without protective cover		100 L to 160 L	**M**	–
IM V 18/IM 3611 with protective cover		100 L to 160 L	**M**	**+ H00** [1]
IM B34/IM 2101		100 L to 160 L	**N**	–
With special flange (next larger standard flange)				
IM B14/IM 3601		100 L to 160 L	**K**	**+ P01**
IM V19/IM 3631		100 L to 160 L	**L**	**+ P01**
IM V18/IM 3611 without protective cover		100 L to 160 L	**M**	**+ P01**
IM V 18/IM 3611 with protective cover		100 L to 160 L	**M**	**+ P01** **+ H00** [1]
IM B34/IM 2101		100 L to 160 L	**N**	**+ P01**

In DIN EN 50347, standard flanges are assigned to the frame sizes as FT with tapped holes. The special flange was assigned as a large flange in the previous DIN 42677.

The dimensions of the following types of construction are identical:
IM B3, IM B6, IM B7, IM B8, IM V5 and IM V6
IM B5, IM V1 and IM V3
IM B14, IM V18 and IM V19

Motors in the standard output range can be ordered in basic types of construction IM B3, IM B5 and IM B14 and can be operated in the following mounting positions – IM B6, IM B7, IM B8, IM V5, IM V6, IM V1, IM V3 (up to frame size 160 L) or IM V18 and IM V19. Eyebolts are available for transport and installation in a horizontal position. In conjunction with the eyebolts, for the purpose of stabilizing the position when the motor is arranged vertically, additional lifting straps (DIN EN 1492-1) and/or clamping bands (DIN EN 12195-2) must be used.

If mounting position IM V1 is ordered, eyebolts are supplied for vertical mounting.
The motors are designated in accordance with the types of construction on the rating plate.

With motors that have a vertical shaft extension, the end user must prevent an ingress of fluid along the shaft.
In the case of all types of construction with shaft extension down, the version “with protective cover” is urgently recommended, see the section “Degrees of protection”, Page 0/119.

Frame design

Motors in the types of construction with feet have, in some cases, two fixing holes at the feet at the non-drive end (NDE), see dimension tables, Pages 1/68 to 1/75. A code is cast into the motor close to the fixing retaining holes to identify the frame size.

A metal fan cover is used as standard for horizontal types of construction and types of constructions with shaft extension facing upwards (14th position of Order No. letter **A**, **T**, **U**, **V**, **D**, **F**, **H**, **J**, **K**, **L** or **N**) in combination with condensation drainage holes, order code **H03**.

[1] A second shaft extension **L05** is not possible.

General technical data

Mechanical design and degrees of protection

Preparation for gear mounting

The flange-mounting motors can be equipped with a radial seal in order to mount gearing.
Order code **H23**

It must be ensured that the sealing ring is lubricated using grease, oil mist or oil spray (it is not ermissible to use pressurized oil > 0.1 bar).
We recommend that the admissible bearing loads are carefully checked.

Eyebolts and transport

1LE1/1PC1 motors without feet have four cast eyebolts as standard, each offset by 90°; in the case of screwed-on feet, two eyebolts are covered by the feet, so in this case only two eyebolts are available for use.

Frame material			
Type series	Frame size	Frame material	Frame feet
1LE1/1PC1	100 … 160	Aluminum alloy	Cast [1]

Preparation for mountings

The encoders of the “modular and special technology” can be fitted at a later time. The motor must be prepared for this. Possible for all 1LE1 motors (with the exception of 1LE1 with option F90 – version “Forced-air cooled motors without external fan and fan cover”).

For the brake with order code F01 and for all encoders from the “modular and special technology”, this preparation of the shaft extension on NDE can be ordered with the option “Prepared for mounting, only center hole”.
Order code **G40**
The length of the motor does not change because the shaft extension is still under the fan cover.

For the encoders

- 1XP8 012-10 order code G01
- 1XP8 012-20 order code G02

from the “modular technology”, this preparation of the shaft extension on NDE can be ordered with the option “Prepared for mounting with shaft D12”.
Order code **G41**
By using option **G41**, the motor length increases by dimension ΔI. For explanations of additional dimensions and weights, see “Technology”, “Dimensions and weights” from Page 0/137.

For the encoders

- LL 861 900 220 order code G04
- HOG 9 D 1024 I order code G05
- HOG 10 D 1024 I order code G06

from the “special technology”, this preparation of the shaft extension on NDE can be ordered with the option “Prepared for mounting with shaft D16”.
Order code **G42**
By using option **G42**, the motor length increases by dimension ΔI. For explanations of additional dimensions and weights, see “Technology”, “Dimensions and weights” from Page 0/137.

Motors that are prepared for additional mountings (order codes G40, G41, G42) are supplied without protective cover as standard.
If a protective cover is requested as cover or as mechanical protection for mounting provided by the customer, it can be ordered with order code **G43**. It must be mounted according to the supplied installation instructions. The protective cover has supports of different lengths that, depending on the height of the mounting, can be used during the installation.

The standard protective cover (order code **H00**) is not suitable for protecting additional mountings such as the rotary pulse encoder.

The order codes **G40**, **G41** and **G42** are not possible in combination with order code **L00**, vibration quantity level B.

[1] Basic version, cast feet: Special version “Screwed-on feet (instead of cast)” with digit **5**, **6** and **7** in the 16th position of the Order No. or digit **4** with order code **H01**. Screwed-on feet are standard for motors with increased output.

Degrees of protection

All motors are designed to IP55 degree of protection. They can be installed in dusty or humid environments. The motors are suitable for operation in tropical climates. Guide value <60 % relative air humidity at CT 40 °C. Other requirements are available on request.

Brief explanation of the degree of protection

IP55: Protection against harmful dust deposits, protection against water jets from any direction.

IP56 (non-heavy-sea):
Protection against harmful dust deposits, protection against water jets from any direction.
Order code **H22**
DIN EN 60034-5 defines protection level 6 for water protection as: "Protection against water due to heavy seas or water in a powerful jet". IP56 non-heavy-sea degree of protection can only be used with the requirement "Protection against a powerful jet" and not for the requirement "Protection against heavy sea".
Not possible in combination with brake 2LM8 (order code **F01**).

IP65: Complete protection against dust deposits, protection against water jets from any direction.
Order code **H20**
In DIN EN 60034-5, the code 6 for protection against the ingress of foreign bodies and touch hazard protection for electrical machines is not listed – data for code 6 (protection against the ingress of dust) is given in EN 60529.
Not possible in combination with rotary pulse encoder HOG 9 D 1024I (order code **G05**) and/or brake 2LM8 (order code **F01**) and/or in combination with option "unpainted, only cast iron parts primed" (**S00**).

DIN EN 60529 contains a comprehensive description of this degree of protection as well as test conditions.

With motors that have a vertical shaft extension, the end user must prevent an ingress of fluid along the shaft.

For motors with shaft extension pointing downwards, the version "protective cover for types of construction", order code **H00**, is urgently recommended, see also "Types of construction", Page 0/116.

With flange-mounting motors, for IM V3 type of construction, collection of fluid in the flange basin can be prevented by drainage holes (on request).

The condensation drainage holes at the drive end (DE) and non-drive end (NDE) are sealed (IP55) on delivery. If the condensation drainage holes are ordered for motors fo the IM B6, IM B7 or IM B8 type of construction (feet located on side or top), the position of the drainage holes will be in the correct position for the type of construction.
Order code **H03**

A metal fan cover is used as standard for horizontal types of construction and types of constructions with shaft extension facing upwards (14th position of Order No. letter **A**, **T**, **U**, **V**, **D**, **F**, **H**, **J**, **K**, **L** or **N**) in combination with condensation drainage holes, order code **H03**, to facilitate mounting/demounting.

When the motors are used or stored outdoors we reccommend that they are kept under some sort of cover so that they are not subjected to direct intensive solar radiation, rain, snow, ice or dust over a long period of time. In such cases, technical consultation may be appropriate.

When the motors are used outdoors or in a corrosive environment, it is recommended that non-rusting screws are used externally.
Order code **H07**

Vibration-proof version
A load of 1.5 g in all 3 planes for up to 1 % of the service life of the motor is possible.
Order code **H02**

For availability of individual options for the relevant motor series, see section "Special versions" in catalog part 1.

Noise levels for mains-fed operation

The noise levels are measured in accordance with DIN EN ISO 1680 in a dead room. It is specified as the A-valued measuring-surface sound pressure level L_{pfA} in dB (A).
This is the spatial mean value of the sound pressure levels measured on the measuring surface. The measuring surface is a cube 1 m away from the surface of the motor. The sound power level is also specified as L_{WA} in dB (A).
The specified values are valid at 50 Hz at rated output (see the Selection and ordering data). The tolerance is +3 dB. At 60 Hz, the values are approximately 4 dB (A) higher. Please inquire about the noise levels for motors with converter-fed operation.

To reduce noise levels, 2-pole motors with frame size 132 S can be fitted with an axial-flow fan that is only suitable for one direction of rotation. The values can be taken from the table "Low-noise version" below.

Clockwise rotation
Order code **F77**

Counter-clockwise rotation
Order code **F78**

A second shaft extension and/or mountings (mounting of brake, external fan, or encoder) are not possible.

Low-noise version

Type series	Frame size	2-pole motors	
		L_{pfA} dB (A)	L_{WA} dB (A)
1LE1 [1)]	132	60	72
	160	60	72

1) With the exception of 1LE1 with option F90 – version "Forced-air cooled motors without external fan and fan cover".

General technical data

Balance and vibration quantity

All of the rotors are dynamically balanced with an inserted half key. This corresponds to vibration quantity level A (normal/standard). The vibrational characteristics and behavior of electrical machinery is specified in DIN EN 60034-14 Sept. 2004. Based on DIN ISO 8821, the key convention "half key" (H) must be used for balancing.

The type of key convention used for balancing is stamped on the face of the DE/NDE.

F = Balancing with full key
(Full-key convention)
H = Balancing with half key
(Half-key convention) – standard
N = Balancing without key –
Plain text required (Convention without key)

This is indicated on the rating plate of motors up to frame size 112. Full-key balancing or balancing with full-key (F) is possible on request with order code **L02** (additional charge).

Balancing without featherkey (N) is possible on request by specifying code **L01** (additional charge).

Vibration quantity level A is the standard version and is valid for a rated frequency of 60 Hz.

Low-vibration version B can be supplied to fulfill stricter requirements on smooth running (additional charge).

Vibration quantity level B
Not possible with parallel roller bearings.
Order code **L00**

The order code **L00** vibration quantity level B is not possible in combination with order codes **G40**, **G41** and **G42**.

The limits stated in the table are applicable for uncoupled, idling motors in free suspension.

For converter-fed operation with frequencies greater than 60 Hz, special balancing is required for compliance with the specified limit values (plain text: max. supply frequency/speed).

For further details, see the online help in the SD configurator (available soon).

Limits (rms values) for max. vibration quantity of vibration distance (s), vibration speed (v) and acceleration (a) for the shaft height H

Vibration quantity level	Machine installation	Shaft height H in mm								
		56 ≤ H ≤ 132			132 < H ≤ 280			H > 280		
		s_{rms} µm	v_{rms} mm/s	a_{rms} mm/s²	s_{rms} µm	v_{rms} mm/s	a_{rms} mm/s²	s_{rms} µm	v_{rms} mm/s	a_{rms} mm/s²
A	Free suspension	25	1.6	2.5	35	2.2	3.5	45	2.8	4.4
	Rigid clamping	21	1.3	2.0	29	1.8	2.8	37	2.3	3.6
B	Free suspension	11	0.7	1.1	18	1.1	1.7	29	1.8	2.8
	Rigid clamping	–	–	–	14	0.9	1.4	24	1.5	2.4

For details, see standard DIN EN 60034-14, Sept. 2004.

Shaft and rotor

Shaft extension

60° center hole to DIN 332, Part 2 with M3 to M24 tapped hole depending on the shaft diameter (see dimension tables, Pages 1/68 to 1/75.)

Second standard shaft extension.
Order code **L05**

Possible for all 1LE1 motors (with the exception of 1LE1 with option F90 – version "Forced-air cooled motors without external fan and fan cover").

The second shaft extension can transmitt the full rated output via coupling output.

Please also inquire about the transmitted power and admissible cantilever force if belt pulleys, chains or gear pinions are used on the second shaft extension.

A second shaft extension is not available if a rotary pulse encoder and/or separately driven fan is mounted. Please inquire if a brake is mounted.

DE (shaft extension)	
Diameter	Thread
mm	mm
7 ... 10	DR M3
>10 ... 13	DR M4
>13 ... 16	DR M5
>16 ... 21	DR M6
>21 ... 24	DR M8
>24 ... 30	DR M10
>30 ... 38	DR M12
>38 ... 50	DS M16
>50 ... 85	DS M20
>85 ... 130	DS M24

Dimensions and tolerances for keyways and keys are designed to DIN EN 50347. The motors are always supplied with a key inserted in the shaft.

Admissible changes to the shaft extension:

Motor series	Frame size	Shaft extension length E in mm		Shaft extension diameter D in mm	
		Standard	Up to max.	Standard	Up to max. [1]
1LE1, 1PC1	100	60	120	28	30
	112				
	132	80	160	38	40
	160	110	220	42	45

Shaft extension with standard dimensions, without featherkey way

For motor series 1LE1 and 1PC1, the standard shaft extension can be ordered with standard dimensions without featherkey way.
Order code **L04**

Standard shaft made of non-rusting steel

For motor series 1LE1, a standard shaft made of non-rusting steel can be ordered. This is only possible for shaft extensions of standard dimensions. For non-standard shaft dimensions, there will be an additional charge!
Order code **L06**

Please inquire about other non-rusting materials.

Non-standard cylindrical shaft extension

The non-standard cylindrical shaft extension can be used on the drive end (DE) or non-drive end (NDE). The featherkey is always supplied with it.
Order code **Y55**

When motors are ordered which have a longer or shorter shaft extension as standard, the required position and length of the featherkey way must be specified in a sketch. It must be ensured that only featherkeys in accordance with DIN 6885, Form A are permitted to be used. The location of the featherkey way is in the center of the shaft extension. The length is defined by the manufacturer normatively.

Not valid for: Conical shafts, non-standard threaded journals, non-standard shaft tolerances, friction welded journals, extremely "thin" shafts, special geometry dimensions (e.g. square journals, etc.), hollow shafts.

For order code **Y55** and second standard shaft extension **L05** (see previous page):

- Dimensions D and DA must be less than or equal to the inner diameter of the roller bearing (see dimension tables under "Dimensions" in catalog part 1)
- Dimensions E and EA must be smaller than or equal to 2 x length E (standard) of the shaft extension

A non-standard cylindrical shaft extension can be supplied for the motor series listed in the table "Admissible changes to shaft extension" below up to the specified maximum lengths and diameters as compared to the standard shaft.

It is the responsibility of the customer to ensure that the admissible cantilever forces are reduced in accordance with the non-standard shaft extension.

Concentricity of shaft extension, coaxiality and linear movement in accordance with DIN 42955 Tolerance R for flange-mounting motors

The following are specified in DIN 42955 with Tolerance N (normal) and Tolerance R (reduced):

1. Concentricity tolerances for the shaft extension
2. Coaxiality tolerances for the shaft extension and flange centering
3. Linear movement tolerances for the shaft extension and flange surface

The concentricity of the shaft extension, coaxiality and linear movement according to DIN 42955 Tolerance R for flange-mounting motors can be ordered using order code **L08.**
This order code can be combined for motors with deep-groove bearings of series 60.., 62.. and 63… This cannot be supplied in combination with brake or encoder mounting.

Concentricity of the shaft extension can be ordered according to DIN 42955 Tolerance R for types of construction without flange with order code **L07**.

[1] At maximum admissible diameter, a step increase in shaft diameter is not possible.

General technical data

Bearings and lubrication

Bearing lifetime (nominal lifetime)

The nominal bearing lifetime is defined acc. to standardized calculation procedures (DIN ISO 281) and is reached or even exceeded for 90 % of the bearings when the motors are operated in compliance with the data provided in the catalog.

Under average operating conditions, a lifetime (L_{h10}) of 100 000 hours can be achieved.

Generally, the bearing lifetime is defined by the bearing size, the bearing load, the operating conditions, the speed and the grease lifetime.

Bearing system

The bearing lifetime of motors with horizontal type of construction is at least 40 000 hours if there is no additional axial loading at the coupling output and at least 20 000 hours with the maximum admissible loads.

This assumes that the motor is operated at 50 Hz. The nominal bearing lifetime is reduced for converter-fed operation at higher frequencies.

For the admissible vibration values measured at the bearing plate, evaluation zones A and B specified in ISO 10816 are applicable in order to achieve the calculated lifetime under continuous duty. If higher vibration speeds will occur under the operating conditions, special arrangements will be necessary (please inquire).

In the basic bearing system, the floating bearing is situated at the drive end (DE) and the located bearing is situated at the non-drive end (NDE).

The bearing system is axially preloaded with a spring element at the drive end (DE) to ensure smooth running of the motor without play. (see Figure 1 of the Diagrams of bearings, Page 0/124).

For frame size 160 and above, the located bearing is axially secured at the non-drive end (NDE). Up to frame size 132, an additional axially-secured located bearing can be supplied on the non-drive end (NDE) complete with a retaining ring (see Figure 2 of the Diagrams of bearings, Page 0/124).
Order code **L21**

On request, the located bearing can also be supplied at the drive end (DE) (see Figure 3 of the Diagrams of bearings, Page 0/124).
Order code **L20**

For increased cantilever forces (e.g. belt drives), reinforced bearings can be used at the drive end (DE).
Order code **L22**

Motors 1LE1/1PC1 can be supplied with reinforced deep-groove bearings at both ends (size range 03).
Special bearings for DE and NDE, bearing size 63, the bearing plates are manufactured from cast-iron for this purpose.
Order code **L25**

A measuring nipple for SPM shock pulse measurement is mounted to check bearing vibration. The motors have a tapped hole for each bearing plate and a measuring nipple with a protective plug. If a second tapped hole is provided, it is fitted with a sealing plug.
Order code **Q01**

Bearing selection for increased cantilever forces (see the table “Bearing selection for 1LE1/1PC1 motors – Bearing for increased cantilever forces”, Page 0/124) – “Admissible axial load” from Page 0/126.

Permanent lubrication

For permanent lubrication, the bearing grease lifetime is matched to the bearing lifetime. This can, however, only be achieved if the motor is operated in accordance with the catalog specifications.
In the basic version, the motors have permanent lubrication.

Regreasing

For motors which can be regreased at defined regreasing intervals, the bearing lifetime can be extended and/or unfavorable factors such as temperature, mounting conditions, speed, bearing size and mechanical load can be compensated.

It is possible to regrease motors, shaft heights 100 to 160. A lubricating nipple is optionally provided.
Order code **L23**

For motors with regreasing device, data concerning regreasing intervals, grease quantity, type of grease and, where applicable, additional data are stated on the rating plate or lubricating plate.
For regreasing intervals for basic versions see table “Grease lifetime and regreasing intervals for horizontal installation”.
The regreasing device cannot be mounted in combination with mounting of the brake, order code F01.

Mechanical stress and grease lifetime

High speeds that exceed the rated speed with converter-fed operation and the resulting increased vibrations alter the mechanical running smoothness and the bearings are subjected to increased mechanical stress. This reduces the grease lifetime and the bearing lifetime (please inquire where applicable).

For converter-fed operation in particular, compliance with the mechanical limit speeds $n_{max.}$ at maximum supply frequency $f_{max.}$ is essential, see the following table “Mechanical limit speeds $n_{max.}$ at maximum supply frequency $f_{max.}$”.

Mechanical limit speeds $n_{max.}$ at maximum supply frequency $f_{max.}$ (standard values)

Motor frame size	2-pole		4-pole		6-pole		8-pole	
	$n_{max.}$ rpm	$f_{max.}$ Hz	$n_{max.}$ rpm	$f_{max.}$ Hz	$n_{max.}$ rpm	$f_{max.}$ Hz	$n_{max.}$ rpm	$f_{max.}$ Hz
1LE1/1PC1								
100 L	6000	100	4200	140	3600	180	3000	200
112 M	6000	100	4200	140	3600	180	3000	200
132 S/M	5600	90	4200	140	3600	180	3000	200
160 M/L	4800	80	4200	140	3600	180	3000	200

Grease lifetime and regreasing intervals for **horizontal** installation

Permanent lubrication [1]			
Type series	Frame size	Number of poles	Grease lifetime up to CT 40 °C [2]
1LE1/1PC1	100 … 160	2 to 8	20000 h or 40000 h [3]
Regreasing (basic version) [1]			
Type series	Frame size	Number of poles	Regreasing interval up to CT 40 °C [2]
1LE1/1PC1	100 … 160	2 to 8	8000 h

1) For special uses and special greases, please inquire about grease lifetime and regreasing intervals.

2) If the coolant temperature is increased by 10 K, the grease lifetime and regreasing interval are halved.

3) 40000 h apply to horizontally installed motors with coupling output without additional axial loads.

General technical data

Bearing selection table for 1LE1/1PC1 motors – basic version

The bearing selection tables are only intended for planning purposes. Authoritative information on the actual type of bearings fitted in motors already supplied can be obtained by the factory by quoting the serial number or can be read from the rating plate.

When deep-groove ball bearings with side plates are used, the side plate is on the inside. Located bearing at drive end (DE) for 1LE1/1PC1 motors, see special version Figure 2 in the "Diagrams of bearings", below on this page.

For motors frame size	Number of poles	Drive end (DE) bearing		Non-drive end (NDE) bearing		Figure, below on this page
		Horizontal type of construction	Vertical type of construction	Horizontal type of construction	Vertical type of construction	
1LE1/1PC1						
100 L	2 to 8	6206 2ZC3	6206 2ZC3	6206 2ZC3	6206 2ZC3	**Fig. 1**
112 M	2 to 8	6206 2ZC3	6206 2ZC3	6206 2ZC3	6206 2ZC3	**Fig. 1**
132 S/M	2 to 8	6208 2ZC3 [1]	6208 2ZC3 [1]	6208 2ZC3 [1]	6208 2ZC3 [1]	**Fig. 1**
160 M/L	2 to 8	6209 2ZC3 [1]	6209 2ZC3 [1]	6209 2ZC3 [1]	6209 2ZC3 [1]	**Fig. 2**

Bearing selection table for 1LE1/1PC1 motors – Bearings for increased cantilever forces – Order code **L22**

Please inquire about noise and vibration data. The bearing selection tables are only intended for planning purposes. Authoritative information on the actual type of bearings fitted in motors already supplied can be obtained by the factory by quoting the serial number or can be read from the rating plate.
When deep-groove ball bearings with side plates are used, the side plate is on the inside.

For motors frame size	Number of poles	Drive end (DE) bearing		Non-drive end (NDE) bearing		Figure, below on this page
		Horizontal type of construction	Vertical type of construction	Horizontal type of construction	Vertical type of construction	
1LE1/1PC1						
100 L	2 to 8	6306 2ZC3 [1]	6306 2ZC3 [1]	6206 2ZC3 [1]	6206 2ZC3 [1]	**Fig. 1**
112 M	2 to 8	6306 2ZC3 [1]	6306 2ZC3 [1]	6206 2ZC3 [1]	6206 2ZC3 [1]	**Fig. 1**
132 S/M	2 to 8	6308 2ZC3 [1]	6308 2ZC3 [1]	6208 2ZC3 [1]	6208 2ZC3 [1]	**Fig. 1**
160 M/L	2 to 8	6309 2ZC3 [1]	6309 2ZC3 [1]	6209 2ZC3 [1]	6209 2ZC3 [1]	**Fig. 2**

Bearing selection table for 1LE1/1PC1 motors – Deep-groove bearings reinforced at both ends – Order code **L25**

Please inquire about noise and vibration data. The bearing selection tables are only intended for planning purposes. Authoritative information on the actual type of bearings fitted in motors already supplied can be obtained by the factory by quoting the serial number or can be read from the rating plate.
When deep-groove ball bearings with side plates are used, the side plate is on the inside.

For motors frame size	Number of poles	Drive end (DE) bearing		Non-drive end (NDE) bearing		Figure, below on this page
		Horizontal type of construction	Vertical type of construction	Horizontal type of construction	Vertical type of construction	
1LE1/1PC1						
100 L	2 to 8	6306 2ZC3 [1]	6306 2ZC3 [1]	6306 2ZC3 [1]	6306 2ZC3 [1]	**Fig. 1**
112 M	2 to 8	6306 2ZC3 [1]	6306 2ZC3 [1]	6306 2ZC3 [1]	6306 2ZC3 [1]	**Fig. 1**
132 S/M	2 to 8	6308 2ZC3 [1]	6308 2ZC3 [1]	6308 2ZC3 [1]	6308 2ZC3 [1]	**Fig. 1**
160 M/L	2 to 8	6309 2ZC3 [1]	6309 2ZC3 [1]	6309 2ZC3 [1]	6309 2ZC3 [1]	**Fig. 2**

Diagrams of bearings

Fig. 1: Drive-end bearing Non-drive end bearing

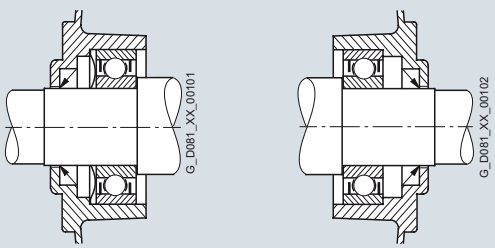


Fig. 2: Drive-end bearing Non-drive end bearing
Located bearings for 1LE1 frame size 160

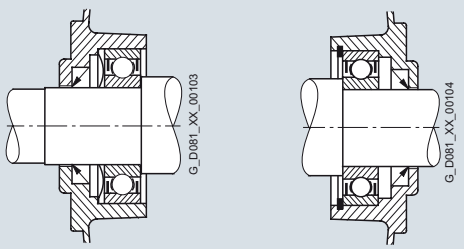
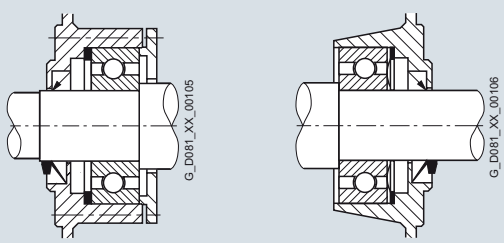


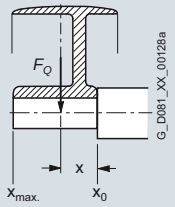
Fig. 3: Drive-end bearing Non-drive end bearing



[1] Bearings with a side plate are used for regreasable versions (order code **L23**).

Admissible cantilever forces

Admissible cantilever forces, basic version



In order to calculate the admissible cantilever forces for a radial load, the line of force (i.e. the centerline of the pulley) of the cantilever force F_Q (N) must lie within the free shaft extension (dimension X).

Dimension x [mm] is the distance between the point of application of force F_Q and the shaft shoulder. Dimension $x_{max.}$ corresponds to the length of the shaft extension.

Total cantilever force $F_Q = c \cdot F_u$

The pre-tension factor c is a value gained from experience from the belt manufacturer. The following approximate value can be assumed:

For normal flat leather belts with an idler pulley c = 2;
for V-belts c = 2 to 2.5;
for special synthetic belts (depending on the type of load and type of belt) c = 2 to 2.5.

The circumferential force F_u (N) is calculated using the following equation

$$F_u = 2 \cdot 10^7 \frac{P}{n \cdot D}$$

F_u circumferential force in N
P rated motor output (transmitted power) in kW
n fan speed in rpm
D belt pulley diameter in mm

The pulleys are standardized acc. to DIN 2211, Sheet 3.

The admissible cantilever forces at 60 Hz are approx. 80 % of the 50 Hz values (please inquire).

It should be observed that for types of construction IM B6, IM B7, IM B8, IM V5 and IM V6 the belt tension is only permitted to act parallel to the mounting plane or towards the mounting plane and the feet must be supported. Both feet must be secured for foot-mounting types of construction.

Refer to “Bearing design for increased cantilever forces”, Page 0/126.

Admissible cantilever forces for the basic 50 Hz version
Valid are: x_0 values for x = 0 and $x_{max.}$ values für x = l (l = shaft extension)

For motors			Admissible cantilever force	
			at x_0	at $x_{max.}$
Frame size	Order No.	Number of poles	Type	Type
			N	N
1LE1 motor values for EFF1 motors with increased output [1] (Self-ventilated motors with increased output and high efficiency):				
100	**1LE1001-1AA**	2	1010	825
	1LE1001-1AB	4	1230	1010
	1LE1001-1AC	6	1440	1180
112	**1LE1001-1BA**	2	970	785
	1LE1001-1BB	4	1235	1000
	1LE1001-1BC	6	1440	1165
132	**1LE1001-1CA**	2	1470	1180
	1LE1001-1CB	4	1830	1470
	1LE1001-1CC	6	2150	1730
160	**1LE1001-1DA**	2	1550	1270
	1LE1001-1DB	4	1910	1550
	1LE1001-1DC	6	2230	1810

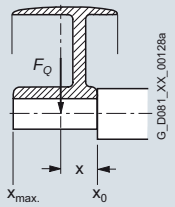
Admissible cantilever forces for the basic 50 Hz version
Valid are: x_0 values for x = 0 and $x_{max.}$ values für x = l (l = shaft extension)

For motors			Admissible cantilever force	
			at x_0	at $x_{max.}$
Frame size	Order No.	Number of poles	Type	Type
			N	N
1LE1 motors, standard values for EFF1 motors [1] (Self-ventilated energy-saving motors with high efficiency/ Forced-air cooled motors without external fan and fan cover with high efficiency) 1PC1 motors, standard values for EFF1 motors [1] (Self-cooled motors with high efficiency):				
100	**1LE1001-1AA 1PC1001-1AA**	2	1020	815
	1LE1001-1AB 1PC1001-1AB	4	1250	1000
	1LE1001-1AC 1PC1001-1AC	6	1450	1155
	1LE1001-1AD 1PC1001-1AD	8	1615	1290
112	**1LE1001-1BA 1PC1001-1BA**	2	1000	790
	1LE1001-1BB 1PC1001-1BB	4	1250	990
	1LE1001-1BC 1PC1001-1BC	6	1450	1150
	1LE1001-1BD 1PC1001-1BD	8	1610	1275
132	**1LE1001-1CA 1PC1001-1CA**	2	1505	1170
	1LE1001-1CB 1PC1001-1CB	4	1880	1460
	1LE1001-1CC 1PC1001-1CC	6	2170	1680
	1LE1001-1CD 1PC1001-1CD	8	2420	1880
160	**1LE1001-1DA 1PC1001-1DA**	2	1560	1240
	1LE1001-1DB 1PC1001-1DB	4	2040	1590
	1LE1001-1DC 1PC1001-1DC	6	2350	1820
	1LE1001-1DD 1PC1001-1DD	8	2610	2030

[1] The admissible cantilever force load of EFF2 motors can be increased by up to 5 %.

General technical data

Bearing design for increased cantilever forces



It should be observed that for types of construction IM B6, IM B7, IM B8, IM V5 and IM V6 the belt tension is only permitted to act parallel to the mounting plane or towards the mounting plane and the feet must be supported. Both feet must be secured for foot-mounted types of construction.

Admissible cantilever forces for the basic 50 Hz version
Deep-groove ball bearings at the drive end (DE) – Order code L22
Valid are: x_0 values for x = 0 and $x_{max.}$ values für x = l (l = shaft extension)

For motors			Admissible cantilever force	
			at x_0	at $x_{max.}$
Frame size	Order No.	Number of poles	Type	Type
			N	N
1LE1 motor values for EEF 1 motors with increased output [1] (Self-ventilated motors with increased output and high efficiency):				
100	**1LE1001-1AA**	2	1585	1300
	1LE1001-1AB	4	1960	1610
	1LE1001-1AC	6	2270	1865
112	**1LE1001-1BA**	2	1545	1250
	1LE1001-1BB	4	1960	1585
	1LE1001-1BC	6	2270	1835
132	**1LE1001-1CA**	2	2285	1840
	1LE1001-1CB	4	2860	2300
	1LE1001-1CC	6	3320	2670
160	**1LE1001-1DA**	2	2800	2240
	1LE1001-1DB	4	3450	2270
	1LE1001-1DC	6	4000	3200

Admissible cantilever forces for the basic 50 Hz version
Deep-groove ball bearings at the drive end (DE) – Order code L22
Valid are: x_0 values for x = 0 and $x_{max.}$ values für x = l (l = shaft extension)

For motors			Admissible cantilever force	
			at x_0	at $x_{max.}$
Frame size	Order No.	Number of poles	Type	Type
			N	N
1LE1 motors standard values for EFF1 motors [1] (Self-ventilated energy-saving motors with high efficiency/ Forced-air cooled motors without external fan and fan cover with high efficiency) 1PC1 motors, standard values for EFF1 motors [1] (Self-cooled motors with high efficiency):				
100	**1LE1001-1AA 1PC1001-1AA**	2	1590	1270
	1LE1001-1AB 1PC1001-1AB	4	1970	1575
	1LE1001-1AC 1PC1001-1AC	6	2270	1815
	1LE1001-1AD 1PC1001-1AD	8	2520	2015
112	**1LE1001-1BA 1PC1001-1BA**	2	1565	1240
	1LE1001-1BB 1PC1001-1BB	4	1965	1555
	1LE1001-1BC 1PC1001-1BC	6	2270	1800
	1LE1001-1BD 1PC1001-1BD	8	2510	1990
132	**1LE1001-1CA 1PC1001-1CA**	2	2310	1795
	1LE1001-1CB 1PC1001-1CB	4	2900	2250
	1LE1001-1CC 1PC1001-1CC	6	3330	2580
	1LE1001-1CD 1PC1001-1CD	8	3700	2870
160	**1LE1001-1DA 1PC1001-1DA**	2	2810	2170
	1LE1001-1DB 1PC1001-1DB	4	3540	2750
	1LE1001-1DC 1PC1001-1DC	6	4070	3160
	1LE1001-1DD 1PC1001-1DD	8	4510	3500

Admissible axial load

1LE1 motors in vertical type of construction – basic version (exept motors with increased output)

Frame size	**Shaft extension pointing**															
	3000 rpm				1500 rpm				1000 rpm				750 rpm			
	downwards		**upwards**		**downwards**		**upwards**		**downwards**		**upwards**		**downwards**		**upwards**	
	Load		Load		Load		Load		Load		Load		Load		Load	
	down	up	down	up	down	up	down	up	down	up	down	up	down	up	down	up
	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
100	140	700	550	280	130	990	820	285	130	1280	1110	285	130	1560	1390	285
112	140	710	550	300	130	1000	820	310	130	1290	1110	310	130	1570	1390	310
132	200	1200	950	470	180	1680	1200	470	180	1900	1600	470	190	2200	1900	440
160	1500	1400	950	1900	1900	1800	1300	2200	2200	2200	1600	2700	2700	2700	1950	2900

The values shown do not assume a cantilever force on the shaft extension.
The admissible loads are valid for operation at 50 Hz; for 60 Hz, please inquire.

The calculation of the admissible axial load was based on the drive with generally available coupling. For suppliers, see the relevant section of the catalog, section “Accessories”, Page 1/64.
Please inquire if the load direction alternates.

[1] The admissible cantilever force load of EFF2 motors can be increased by up to 5 %.

1LE1/1PC1 motors in horizontal type of construction – basic version (exept motors with increased output)

Frame size	3000 rpm				1500 rpm				1000 rpm				750 rpm			
	Tensile load	Thrust load (N) with radial load at		without radial load	Tensile load	Thrust load (N) with radial load at		without radial load	Tensile load	Thrust load (N) with radial load at		without radial load	Tensile load	Thrust load (N) with radial load at		without radial load
		x_0	$x_{max.}$			x_0	$x_{max.}$			x_0	$x_{max.}$			x_0	$x_{max.}$	
	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
100	220	450	350	630	220	600	500	910	220	650	550	1200	220	750	650	1480
112	220	450	350	630	220	600	500	910	220	650	550	1200	220	750	650	1480
132	350	650	520	1200	350	850	700	1600	350	1020	890	1900	350	1150	1020	2200
160	1500	850	720	1500	1500	1050	920	1800	1500	1250	1120	2200	1500	1350	1220	2600

The values shown do not assume a cantilever force on the shaft extension.
The admissible loads are valid for operation at 50 Hz; for 60 Hz, please inquire.

The calculation of the admissible axial load was based on the drive with generally available coupling. For suppliers, see the relevant section of the catalog “Accessories”, Page 1/64.
Please inquire if the load direction alternates.

Modular technology

Basic versions

The range of potential applications for the 1LE1 motors (with the exception of 1LE1 with option F90 – version “Forced-air cooled motors without external fan and fan cover” and 1PC1) can be broadened considerably by mounting the following modules (e.g. as brake motors).

- **1XP8 012** rotary pulse encoder
- Separately driven fan
- Brake

The brake must always be mounted in the factory for safety reasons. The rotary pulse encoder and/or the separately driven fan can also be retrofitted.

The degree of protection of the motors with modular technology is IP55. Higher degrees of protection on request.

When a rotary pulse encoder, brake or separately driven fan is mounted, the length of the motor increases by Δ l. For an explanation of the additional dimensions and weights, see “Technology”, “Dimensions and weights” from Page 0/137.

General technical data

1XP8 012 rotary pulse encoder

The rotary pulse encoder can be supplied already mounted in an HTL version as **1XP8 012-10** with order code **G01** or in a TTL version as **1XP8 012-20** with order code **G02**. The rotary pulse encoder can only be mounted on a standard non-drive end (NDE), i.e. a second shaft extension cannot be supplied.

The encoder can be retrofitted. The motor must be prepared for this. When the motor is ordered, the option "Prepared for mountings, center hole only", order code **G40**, or the option "Prepared for mountings with shaft D12", order code **G41**, must be specified (see "Mechanical design and degrees of protection", Page 0/118).

The 1XP8 012 rotary pulse encoder is suitable for standard applications. For further encoders, see "Special technology", Page 0/134.

When the rotary pulse encoder is mounted, the length of the motor increases by Δ l. For an explanation of the additional dimensions and weights, see "Technology", "Dimensions and weights" from Page 0/137.

The rotary pulse encoders of "Modular technology" and "Special technology" are fitted as standard with a protective cover made of non-corrosive sheet steel.

Mounting of encoder at temperatures below –20 °C and higher than +40 °C on request.

Technical data of rotary pulse encoders		
Supply voltage U_B	**1XP8 012-10** (HTL version) +10 V to +30 V	**1XP8 012-20** (TTL version) 5V ±10 %
Current input without load	150 mA	120 mA
Admissible load current per output	max. 100 mA	max. 20 mA
Pulses per revolution	1024	1024
Outputs	2 square-wave pulses A, B – 2 inverted square-wave pulses A, B Zero pulse and inverted zero pulse	
Pulse offset between the two outputs	90°	90°
Output amplitude	$U_{High} = U_B - 2.5$ V $U_{Low} = 1.6$ V	$U_{High} > 2.5$ V $U_{Low} < 0.5$ V
Edge interval	≥ 0.43 µs	≥ 0.43 µs
Sampling rate	≤ 300 kHz	≤ 300 kHz
Maximum speed	6000 rpm	6000 rpm
Transportation/storage temperature range	–30 to +80 °C	–30 to +80 °C
Operating temperature range flange socket or fixed cable	–40 to +100 °C	–40 to +100 °C
Operating temperature range flexible cable	–10 to +100 °C	–10 to +100 °C
Degree of protection	IP66	IP66
Maximum admissible radial cantilever force	60 N	60 N
Maximum admissible axial force	40 N	40 N
Connection system	12-pin connector (mating connector is supplied)	
Certification	CSA, UL	CSA, UL
Weight	0.3 kg	0.3 kg

Separately driven fan

The use of a separately driven fan is recommended to increase motor utilization at low speeds and to limit noise generation at speeds significantly higher than the synchronous speed. Both of these results can only be achieved with converter-fed operation. Please inquire about traction and vibratory operation.

The separately driven fan can be supplied already fitted, order code **F70**.

It can also be ordered separately and retrofitted. For selection information and order numbers, see the section “Accessories” (available soon). A rating plate listing all the important data is fitted to the separately driven fan. Please note the direction of rotation of the separately driven fan (axial-flow fan) when connecting it. Admissible coolant temperatures $CT_{min.}$ –25 °C, $CT_{max.}$ +65 °C [1], lower/higher coolant temperatures on request. When the separately driven fan is mounted, the length of the motor increases by Δ l. For an explanation of the additional dimensions and weights, see “Technology”, “Dimensions and weights” from Page 0/137.

Technical data of the separately driven fan (acc. to DIN EN 60034-1 Tolerance)

Frame size	Rated voltage range		Frequency	Rated speed	Power consumption	Rated current
	V		Hz	rpm	kW	A
100	1 AC	230 to 277	50	2790	0.075	0.29
	3 AC	220 to 290 Δ	50	2830	0.086	0.27
	3 AC	380 to 500 Y	50	2830	0.086	0.16
	1 AC	230 to 277	60	3280	0.094	0.28
	3 AC	220 to 332 Δ	60	3490	0.093	0.27
	3 AC	380 to 575 Y	60	3490	0.093	0.16
112	1 AC	230 to 277	50	2720	0.073	0.26
	3 AC	220 to 290 Δ	50	2770	0.085	0.27
	3 AC	380 to 500 Y	50	2770	0.085	0.15
	1 AC	230 to 277	60	3000	0.107	0.31
	3 AC	220 to 332 Δ	60	3280	0.094	0.28
	3 AC	380 to 575 Y	60	3280	0.094	0.16
132	1 AC	230 to 277	50	2860	0.115	0.40
	3 AC	220 to 290 Δ	50	2880	0.138	0.45
	3 AC	380 to 500 Y	50	2880	0.138	0.24
	1 AC	230 to 277	60	3380	0.185	0.59
	3 AC	220 to 332 Δ	60	3470	0.148	0.41
	3 AC	380 to 575 Y	60	3470	0.148	0.24
160	1 AC	230 to 277	50	2780	0.236	0.96
	3 AC	220 to 290 Δ	50	2840	0.220	0.76
	3 AC	380 to 500 Y	50	2830	0.220	0.43
	3 AC	220 to 332 Δ	60	3400	0.284	0.94
	3 AC	380 to 575 Y	60	3400	0.284	0.56

[1] The admissible coolant temperature for single phase versions (1 AC) for frame size 160 is $CT_{max.}$ +50 °C.

General technical data

Brakes

Spring-operated disk brakes are used for the brakes with order code **F01**. When the brake is ordered, the supply voltage must be specified. The supply voltage for brakes is explained under "Modular technology – Additional versions", Page 0/133.

For the design of each brake type, the braking time, run-on revolutions, braking enery per braking procedure as well as the service life of the brake linings, see "Configuration of motors with brakes", Page 0/132.

When a brake is mounted, the length of the motor increases by Δ l. For an explanation of the additional dimensions and weights, see "Technology", "Dimensions and weights" from Page 0/137.

The brake can be retrofitted by authorized partners. The motor must be prepared for this. When the motor is ordered, the option "Prepared for mountings, center hole only", order code G40, must be specified (see "Mechanical design and degrees of protection", Page 0/118).

2LM8 spring-operated disk brake

The 2LM8 brake has IP55 degree of protection.

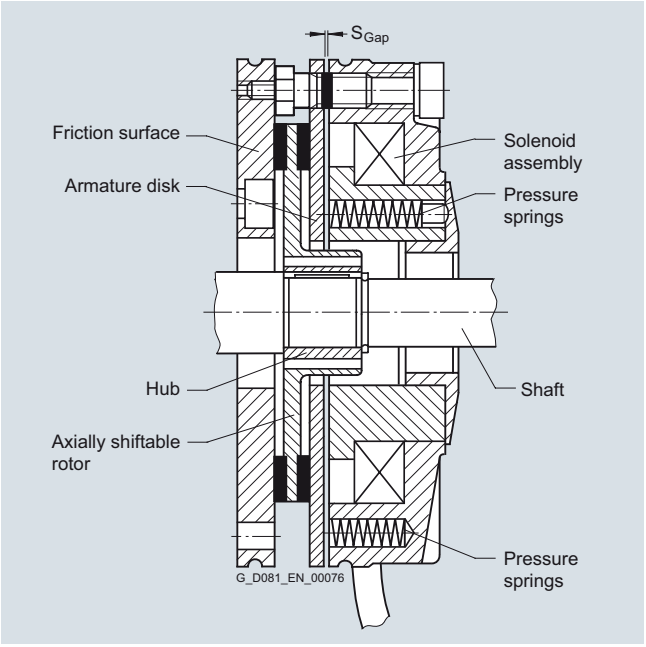
Please inquire if motors with brakes are to be operated below the freezing point or in very humid environments (e.g. close to the sea) with long standstill times. Please inquire if the brake motors are used for converter-fed operation with low speeds.

Design and mode of operation

The brake takes the form of a single-disk brake with two friction surfaces.

The braking torque is generated by friction when pressure is applied by one or more pressure springs in the de-energized state. The brake is released electromagnetically.

When the motor brakes, the rotor which can be axially shifted on the hub or the shaft is pressed via the armature disk against the friction surface by means of the springs. In the braked state, there is a gap S_{Gap} between the armature disk and the solenoid component. To release the brake, the solenoid is energized with DC voltage. The resulting magnetic force pulls the armature disk against the spring force on to the solenoid component. The spring force is then no longer applied to the rotor which can rotate freely.



Design of the 2LM8 spring-operated disk brake

Rating plate

The following brake data are specified on the motor rating plate.

Brake type, supply voltage, frequency, current, temperature class, braking torque

Operating values for spring-operated brakes with standard excitation

For motor Frame size	Brake type	Rated braking torque at 100 rpm	Rated braking torque at 100 rpm in % at the following speeds			Supply voltage	Current/power input [1]		Brake application time t_2 [2]	Brake release time	Brake moment of inertia	Noise level L_p with rated air gap	Service capability of the brake: Lifetime of brake lining L	Service capability of the brake: Air gap adjustment required after braking energy L_N
			1500 rpm	3000 rpm	Max. speed									
		Nm	%	%	%	V	A	W	ms	ms	kgm^2	dB (A)	Nm · 10^6	Nm · 10^6
100	**2LM8 040-5NA10**	40	81	74	66	AC 230	0.2	40	43	140	0.00036	80	1350	115
	2LM8 040-5NA60					AC 400	0.22							
	2LM8 040-5NA80					DC 24	1.67							
112	**2LM8 060-6NA10**	60	80	73	65	AC 230	0.25	53	60	210	0.00063	77	1600	215
	2LM8 060-6NA60					AC 400	0.28							
	2LM8 060-6NA80					DC 24	2.1							
132	**2LM8 100-7NA10**	100	79	72	65	AC 230	0.27	55	50	270	0.0015	77	2450	325
	2LM8 100-7NA60					AC 400	0.31							
	2LM8 100-7NA80					DC 24	2.3							
160	**2LM8 260-8NA10**	260	75	68	65	AC 230	0.5	100	165	340	0.0073	79	7300	935
	2LM8 260-8NA60					AC 400	0.47							
	2LM8 260-8NA80					DC 24	4.2							

[1] For 400 V AC and for 24 V DC, the power can deviate by up to +10 % as a result of the selected supply voltage.

[2] The specified switching times are valid for switching on the DC side with a rated release travel and with the coil already warm. They are average values which may vary depending on factors such as the rectifier type and the release travel. The brake application time for switching on the AC side, for example, is approximately 6 times longer than for switching on the DC side.

Lifetime of the brake lining

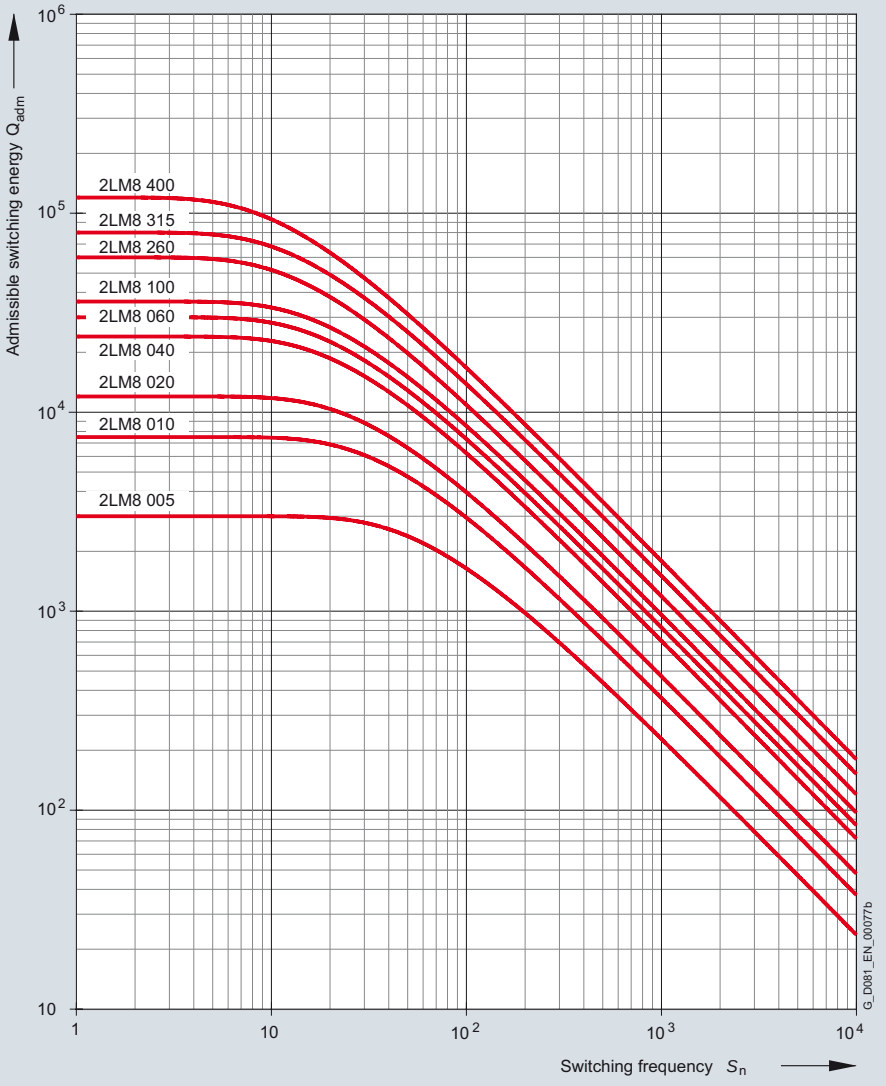
The braking energy L_N up to when the brake should be adjusted, depends on various factors. The main influencing factors include the masses to be braked, the operating speed, the switching frequency and therefore the temperature at the frictional surfaces. It is therefore not possible to specify a value for the friction energy until readjustment that is valid for all operating conditions.

When used as operating brake, the specific frictional surface wear (wear volume for the frictional work) is approximately 0.05 up to 2 cm^3/kWh.

Maximum admissible speeds

The maximum admissible speeds from which emergency stops can be made, are listed in the next table. These speeds should be considered as recommended values and must be checked under actual operating conditions.

The maximum admissible friction energy depends on the switching frequency and is shown for the individual brakes in the following diagram. Increased wear can be expected when the brakes are used for emergency stops.



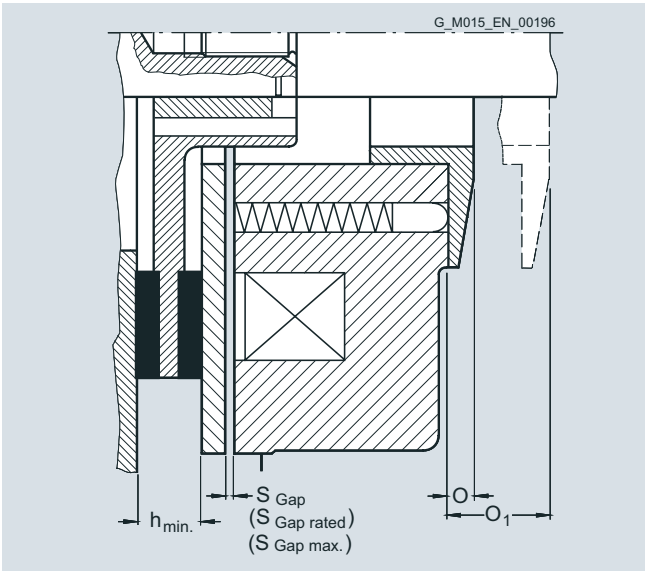
For motor Frame size	Brake type	Maximum admissible speeds: Max. adm. operating speed if max. adm. operating energy utilized	Max. adm. no-load speed with emergency stop function: Horizontal mounting	Max. adm. no-load speed with emergency stop function: Vertical mounting	Changing the braking torque: Reduction per notch	Changing the braking torque: Dimension "O1"	Changing the braking torque: Min. braking torque	Readjusting the air gap: Rated air gap $S_{Gap\ Rated}$	Readjusting the air gap: Maximum air gap $S_{Gap\ max.}$	Readjusting the air gap: Min. rotor thickness $h_{min.}$
		rpm	rpm	rpm	Nm	mm	Nm	mm	mm	mm
100	**2LM8 040-5NA . .**	3000	6000	6000	1.29	12.5	21.3	0.3	0.65	8.0
112	**2LM8 060-6NA . .**	3000	6000	6000	1.66	11.0	32.8	0.3	0.75	7.5
132	**2LM8 100-7NA . .**	3000	5300	5000	1.55	13.0	61.1	0.3	0.75	8.0
160	**2LM8 260-8NA . .**	1500	4400	3200	5.6	17.0	157.5	0.4	1.2	12.0

Changing the braking torque

The brake is supplied with the braking torque already set. For 2LM8 brakes, the torque can be reduced to the dimension O_1 by unscrewing the adjusting ring with a hook spanner. The braking torque changes by the values shown in the above table for each notch of the adjusting ring.

Readjusting the air gap

Under normal operating conditions, the brake is practically maintenance-free. The air gap S_{Gap} must only be checked at regular intervals if the application requires an extremely large amount of frictional energy and readjusted to the rated gap $S_{Gap\ rated}$ at the latest when the maximum air gap $S_{Gap\ max.}$ is reached.



Configuration of motors with brakes

Braking time

The time it takes the motor to come to a standstill comprises two components:

a.) The application time of the brake t_2

b.) The braking time t_{Br}

$$t_{Br} = \frac{J \cdot n_{rated}}{9.55 \cdot (T_B \pm T_L)}$$

t_{Br} Braking time in s
J Total moment of inertia in kgm^2
n_{rated} Rated speed of the motor with brake in rpm
T_B Rated braking torque in Nm
T_L Average load torque in Nm
(if T_L supports braking, T_L is positive)

Braking energy per braking operation Q_{adm}

The braking energy per braking operation in Nm comprises the energy of the moments of inertia to be braked Q_{Kin} and the energy Q_L, which must be applied in order to brake against a load torque:

$Q_{adm} = Q_{Kin} + Q_L$

a.) The energy of the moments of inertia in Nm

$$Q_{Kin} = \frac{J \cdot n_{rated}^2}{182.4}$$

n_{rated} Rated speed before braking in rpm
J Total moment of inertia in kg m^2

b.) The braking energy in Nm against a load torque

$$Q_L = \frac{\pm T_L \cdot n_{rated} \cdot t_{Br}}{19.1}$$

T_L average load torque in Nm
T_L is positive if it acts against the brake
T_L is negative if it supports the brake

Run-on revolutions U

The number of run-on revolutions U of the motor with brake can be calculated as follows:

$$U = \frac{n_{rated}}{60}\left(t_2 + \frac{t_{Br}}{2}\right)$$

t_2 Brake application time in ms

Lifetime of the brake lining L and readjustment of the air gap

The brake lining wears due to friction which increases the air gap and the release time for the brake at standard excitation.

When the brake lining is worn out, it can be replaced easily.

In order to calculate the lifetime of the brake lining in terms of operations $S_{max.}$, the lifetime of the brake lining L in Nm must be divided by the braking energy Q_{adm}:

$$S_{max} = \frac{L}{Q_{adm}}$$

The interval between adjustments N in switching frequencies can be calculated in terms of operations by dividing the braking energy L_N which the brake can output until it is necessary to readjust the working air gap by Q_{adm}:

$$N = \frac{L_N}{Q_{adm}}$$

Additional versions

2LM8 spring-operated disk brake

Motor series

This brake is mounted on 1LE1 motors as standard (with the exception of 1LE1 with order code F90 – version "Forced-air cooled motors without external fan and fan cover", and 1PC1).

Voltage and frequency

The solenoid coil and the brake rectifier can be connected to the following voltages or can be supplied for the following voltages:

- Brake supply voltage: 24 V DC
  Order code **F10**
- Brake supply voltage: 230 V AC
  Order code **F11**
- Brake supply voltage: 400 V AC
  (directly at the terminal strip)
  Order code **F12**

When 60 Hz is used, the voltage for the brake must not be increased!

Order codes **F10** , **F11** and **F12** may only be used in conjunction with order code **F01**.

Connections

Labeled terminals are provided in the main connection box of the motor to connect the brake.

The AC voltage for the brake excitation winding is connected to the two free terminals of the rectifier block (~).

The brake can be released when the motor is at a standstill by separately exciting the solenoid. In this case, an AC voltage must be connected at the rectifier block terminals. The brake remains released as long as this voltage is present.

The rectifier is protected against overvoltages by varistors in the input and output circuits.

For 24 V DC brakes, the brake terminals are directly connected to the DC voltage source.

See the circuit diagrams below.

Fast brake application

If the brake is disconnected from the line supply, the brake is applied. The application time for the brake disk is delayed as a result of the inductance of the solenoid (shutdown on the AC side). This results in a considerable delay before the brake is mechanically applied. In order to achieve short brake application times, the circuit must be interrupted on the DC side. To realize this, the wire jumpers, located between contacts 1+ and 2+ at the rectifier are removed and replaced by the contacts of an external switch (see circuit diagrams below).

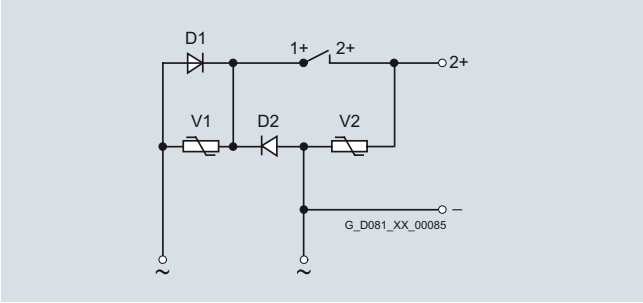
Manual brake release with lever

The brakes can be supplied with a mechanical manual release with lever.
Order code **F50**.

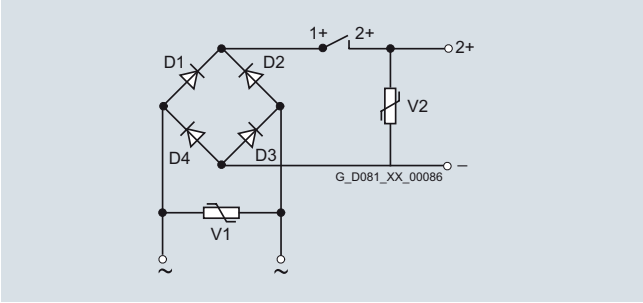
The dimensions of the brake lever depend on the motor frame size and can be read from the dimension drawing generator for motors in the SD configurator tool for low-voltage motors.

Bridge rectifier / half-wave rectifier

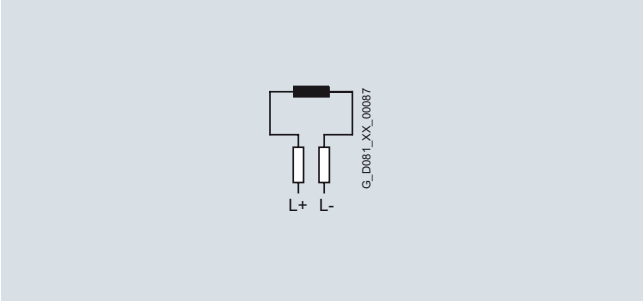
Brakes are connected through a standard bridge or half-wave rectifier or directly to the 2LM8 brake. See the circuit diagrams below.



Half-wave rectifier, 400 V AC



Bridge rectifier, 230 V AC



Brake connection for 24 V DC

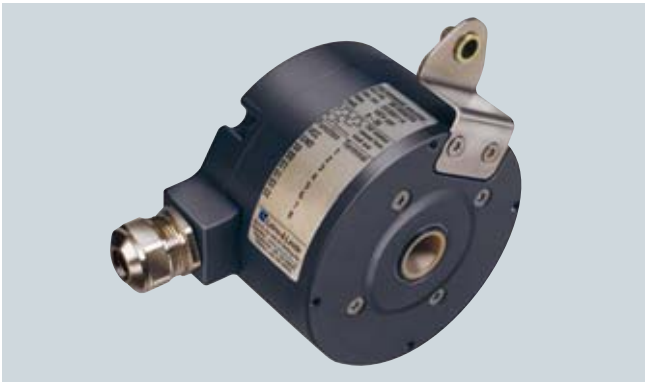
General technical data

Special technology

The range of "Special technology" comprises rotary pulse encoders for the 1LE1 motors (with the exception of 1LE1 with order code F90 – version "Forced-air cooled motors without external fan and fan cover", and 1PC1).
The 1LE1 motors with the order codes **F70** (mounted separately driven fan), **F01** (mounted brake) and **F01 + F70** (mounted brake and separately driven fan) from the "Modular technology" range can be combined with the LL 861 900 200, HOG 9 D 1024 I and HOG 10 D 1024 I rotary pulse encoders from the "Special technology" range.
When a rotary pulse encoder is mounted, the length of the motor increases by Δ l. For an explanation of the additional dimensions and weights, see "Technology", "Dimensions and weights" from Page 0/137.

The rotary pulse encoders of "Modular technology" and "Special technology" are fitted as standard with a protective cover made of non-corrosive sheet steel.

Rotary pulse encoder LL 861 900 220



With its rugged construction, this rotary pulse encoder is also suitable for difficult operating environments. It is resistant to shock and vibration and has insulated bearings.

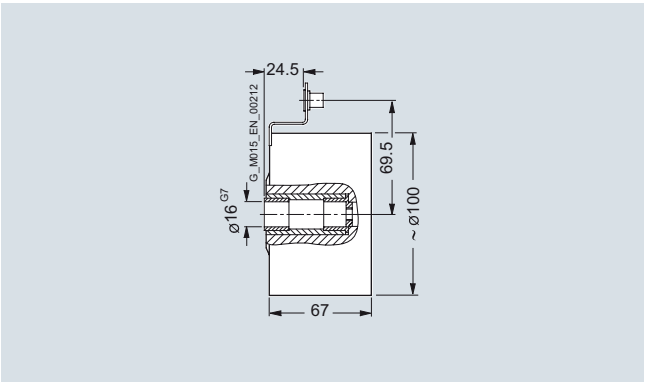
The LL 861 900 220 rotary pulse encoder can be supplied already mounted.
Order code **G04**.

*The LL 861 900 220 rotary pulse encoder can be retrofitted. The motor must be prepared for this. When the motor is ordered, the option "Prepared for mountings, center hole only", order code **G40**, or the option "Prepared for mountings with shaft D16", order code **G42**, must be specified (see "Mechanical design and degrees of protection", Page 0/118). The rotary pulse encoder is not part of the scope of supply in this case.*

The version of the rotary pulse encoder with a diagnostics system (ADS) can be supplied by Leine and Linde.

Manufacturer:
Leine and Linde (Deutschland) GmbH
Bahnhofstraße 36
73430 Aalen
Tel. +49 (0) 73 61-78093-0
Fax +49 (0) 73 61-78093-11

http://www.leinelinde.com
e-mail: info@leinelinde.se



Mounting dimensions of rotary pulse encoder LL 861 900 220

Technical data for LL 861 900 220 (HTL version)

Mounting of encoder at temperatures below –20 °C and higher than +40 °C on request.

Supply voltage U_B	**+9 V to +30 V**
Current input without load	max. 80 mA
Admissible load current per output	40 mA
Pulses per revolution	1024
Outputs	6 short-circuit proof square-wave pulses A, A', B, B', 0, 0'
Pulse offset between the two outputs	90° ±25° el.
Output amplitude	U_{High} >20 V U_{Low} <2.5 V
Mark space ratio	1:1 ±10 %
Edge steepness	50 V/µs (without load)
Maximum frequency	100 kHz for 350 m cable
Maximum speed	4000 rpm
Temperature range	–20 to +80 °C
Degree of protection	IP65
Maximum adm. radial cantilever force	300 N
Maximum adm. axial force	100 N
Connection system	Terminal strips in encoder Cable connection M20 x 1.5 radial
Weight	Approx. 1.3 kg

HOG 9 D 1024 rotary pulse encoder

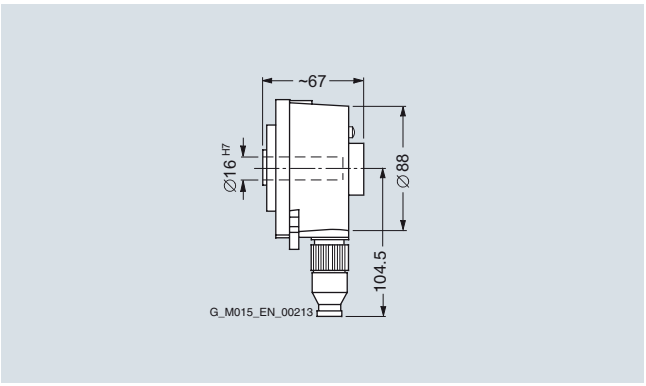
The encoder is fitted with insulated bearings.

The HOG 9 D 1024 I rotary pulse encoder can be supplied already mounted.
Order code **G05**.

*The HOG 9 D 1024 I rotary pulse encoder can be retrofitted. The motor must be prepared for this. When the motor is ordered, the option "Prepared for mountings, center hole only", order code **G40**, or the option "Prepared for mountings with shaft D16", order code **G42**, must be specified (see "Mechanical design and degrees of protection", Page 0/118). The rotary pulse encoder is not part of the scope of supply in this case.*

Manufacturer:
Baumer Hübner GmbH
Planufer 92b
10967 Berlin
Tel. +49 (0) 30-6 90 03-0
Fax +49 (0) 30-6 90 03-1 04

http://www.baumerhuebner.com
e-mail: info@baumerhuebner.com



Mounting dimensions for HOG 9 D 1024 I rotary pulse encoder

Technical data for HOG 9 D 1024 (TTL version)

Mounting of encoder at temperatures below –20 °C and higher than +40 °C on request.

Supply voltage U_B	**+9 V to +30 V**
Current input without load	50 mA to 100 mA
Admissible load current per output	60 mA, 300 mA peak
Pulses per revolution	1024
Outputs	4 short-circuit proof square-wave pulses A, B and A', B'
Pulse offset between the two outputs	90° ±20 %
Output amplitude	$U_{High} \geq U_B - 3.5$ V $U_{Low} \leq 1.5$ V
Mark space ratio	1:1 ±20 %
Edge steepness	10 V/µs
Maximum frequency	120 kHz
Maximum speed	7000 rpm
Temperature range	–20 to +100 °C
Degree of protection	IP56
Maximum adm. radial cantilever force	150 N
Maximum adm. axial force	100 N
Connection system	Radial right-angle plug (mating connector is part of the scope of supply)
Mech. design acc. to Hübner Ident. No.	73 522 B
Weight	Approx. 0.9 kg

General technical data

HOG 10 D 1024 I rotary pulse encoder

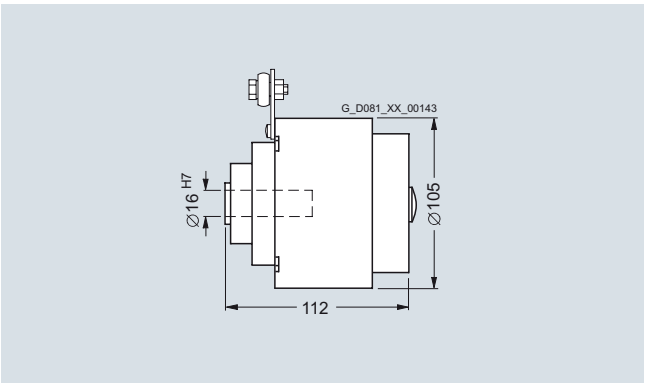
This encoder is extremely rugged and is therefore suitable for difficult operating conditions. It is fitted with insulated bearings.

The HOG 10 D 1024 I rotary pulse encoder can be supplied already mounted.
Order code **G06**.

*The HOG 10 D 1024 I rotary pulse encoder can be retrofitted. The motor must be prepared for this. When the motor is ordered, the option "Prepared for mountings, center hole only", order code **G40**, or the option "Prepared for mountings with shaft D16", order code **G42**, must be specified (see "Mechanical design and degrees of protection", Page 0/118). The rotary pulse encoder is not part of the scope of supply in this case.*

Manufacturer:
Baumer Hübner GmbH
Planufer 92b
10967 Berlin
Tel. +49 (0) 30-6 90 03-0
Fax +49 (0) 30-6 90 03-1 04

http://www.baumerhuebner.com
e-mail: info@baumerhuebner.com



Mounting dimensions for HOG 10 D 1024 I rotary pulse encoder

Technical data for HOG 10 D 1024 (HTL version)

Mounting of encoder at temperatures below –20 °C and higher than +40 °C on request.

Supply voltage U_B	**+9 V to +30 V**
Current input without load	Approx. 100 mA
Admissible load current per output	60 mA, 300 mA peak
Pulses per revolution	1024
Outputs	4 short-circuit proof square-wave pulses A, B and A', B'
Pulse offset between the two outputs	90° ±20 %
Output amplitude	$U_{High} \geq U_B - 3.5$ V $U_{Low} \leq 1.5$ V
Mark space ratio	1:1 ±20 %
Edge steepness	10 V/µs
Maximum frequency	120 kHz
Maximum speed	7000 rpm
Temperature range	–20 to +100 °C
Degree of protection	IP66
Maximum adm. radial cantilever force	150 N
Maximum adm. axial force	80 N
Connection system	Terminals, cable connection M20 x 1.5
Mech. design acc. to Hübner Ident. No.	74 055 B
Weight	Approx. 1.6 kg

Dimensions and weight

Fig. 1 Brake
Order code **F01**
[optionally with manual release, order code **F50**]

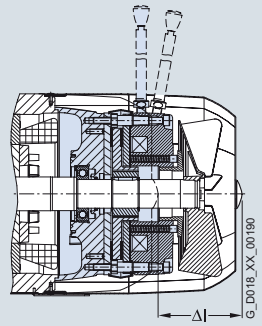


Fig. 2 Standard protective cover for types of construction
Order code **H00**

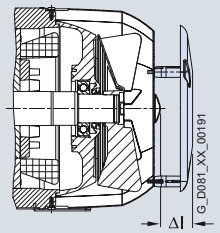


Fig. 3 Rotary pulse encoder (on cover)
Order code **G01/G02/G04/G05/G06**
[protective cover as standard]

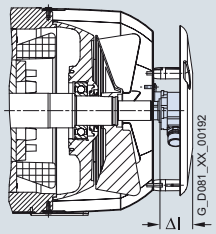


Fig. 4 Brake and rotary pulse encoder (on cover)
Order code **F01**
+ G01/G02/G04/G05/G06
[optionally with manual release, order code **F50**;
protective cover as standard]

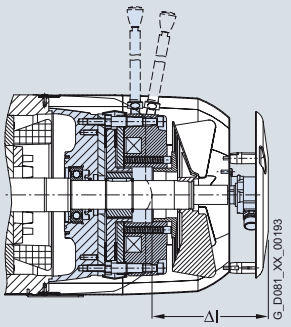


Fig. 5 Separately driven fan
Order code **F70**

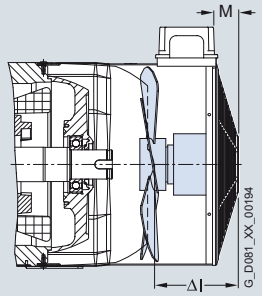
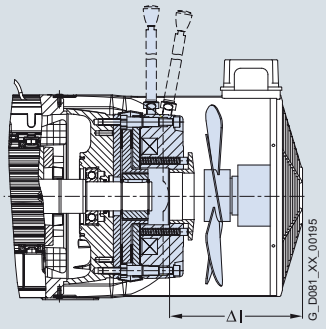


Fig. 6 Brake and separately driven fan
Order code **F01 + F70**
[optionally with manual release, order code **F50**]



Dimensions ΔI and weights, see from Page 0/139.

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Fig. 7 Rotary pulse encoder (under the cover) and separately driven fan
Order code **F70**
+ G01/G02/G04/G05/G06

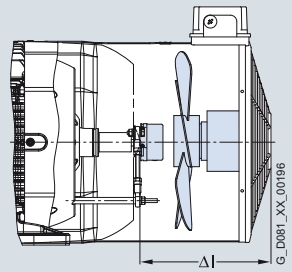


Fig. 8 Brake, rotary pulse encoder (under the cover) and separately driven fan
Order code **F01 + F70**
+ G01/G02/G04/G05/G06
[optionally with manual release, order code **F50**]

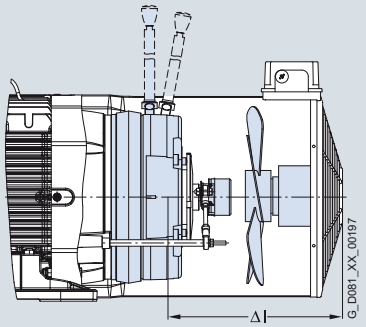


Fig. 9 Protective cover for separately driven fan
Order code **H00**

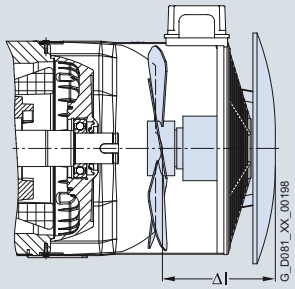


Fig. 10 Prepared for mountings – only center hole
(for brake order code **F01** and/or rotary pulse encoder order codes **G01**/**G02**/**G04**/**G05**/**G06**)
Order code **G40**

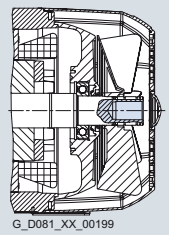
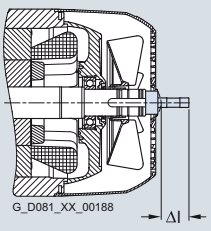


Fig. 11 Prepared for mountings with shaft D12/D16
Order codes **G41**/**G42**



Dimensions ΔI and weights, see from Page 0/139.

	Assignment											
	Fig. 1		Fig. 2		Fig. 3							
Frame size	Brake		Protective cover		Rotary pulse encoder including protective cover							
					1XP8 012		LL 861 900 220		HOG9 D 1024 I		HOG10 D 1024 I	
	Order code F01		Order code H00		Order codes G01, G02		Order code G04		Order code G05		Order code G06	
	Δl	Weight approx.	Δl	Weight approx.	Δl	Weight approx.	Δl	Weight approx.	Δl	Weight approx.	Δl	Weight approx.
	mm	kg	mm	kg	mm	kg	mm	kg	mm	kg	mm	kg
1LE1												
100	81	5.9	33	0.4	49	0.9	76	1.9	76	1.5	119	2.2
112	88	7.8	33	0.4	49	0.8	76	1.9	76	1.5	119	2.2
132	114	11.9	51.5	0.7	51.5	1.3	78.5	2.4	78.5	2	121.5	2.7
160	130	30.7	50	0.7	50	1.5	77	2.7	77	2.3	120	3

	Assignment										
	Fig. 4								Fig. 5		
Frame size	Brake and rotary pulse encoder (on cover)								Separately driven fan		
	1XP8 012		LL 861 900 220		HOG9 D 1024 I		HOG10 D 1024 I				
	Order codes F01 + G01/G02		Order codes F01 + G04		Order codes F01 + G05		Order codes F01 + G06		Order code F70		
	Δl	Weight approx.	Δl	Weight approx.	Δl	Weight approx.	Δl	Weight approx.	Δl	M	Weight approx.
	mm	kg	mm	kg	mm	kg	mm	kg	mm	mm	kg
1LE1											
100	130	6.8	157	7.8	157	7.4	200	8.1	86.5	30	2.4
112	137	8.6	164	9.7	164	9.3	207	10	81.5	30	2.6
132	165.5	13.2	192.5	14.3	192.5	13.9	235.5	14.6	116	40	3.8
160	180	32.2	207	33.4	207	33	250	33.7	135.5	40	6.5

	Assignment									
	Fig. 6		Fig. 7							
Frame size	Brake and separately driven fan		Separately driven fan and rotary pulse encoder (under cover)							
	Order codes F01 + F70		Order codes F70 + G01/G02		Order codes F70 + G04		Order codes F70 + G05		Order codes F70 + G06	
	Δl	Weight approx.	Δl	Weight approx.	Δl	Weight approx.	Δl	Weight approx.	Δl	Weight approx.
	mm	kg	mm	kg	mm	kg	mm	kg	mm	kg
1LE1										
100	161.5	8.3	161.5	3.3	161.5	4.3	161.5	3.9	196.5	4.6
112	156.5	10.4	156.5	3.4	156.5	4.5	156.5	4.1	191.5	4.8
132	186	15.7	186	5.1	186	6.2	186	5.8	241	6.5
160	205.5	37.2	205.5	8	205.5	9.2	205.5	8.8	270.5	9.5

	Assignment										
	Fig. 8								Fig. 9		
Frame size	Brake, separately driven fan and rotary pulse encoder (under cover)								Protective cover for separately driven fan		
	Order codes F01 + F70 + G01/G02		Order codes F01 + F70 + G04		Order codes F01 + F70 + G05		Order codes F01 + F70 + G06		Order code H00		
	Δl	Weight approx.	Δl	Weight approx.	Δl	Weight approx.	Δl	Weight approx.	Δl	Weight approx.	Diameter of the fan cover
	mm	kg	mm	kg	mm	kg	mm	kg	mm	kg	mm
1LE1											
100	196.5	9.2	196.5	10.2	196.5	9.8	246.5	10.5	30	1.4	210
112	191.5	11.2	191.5	12.3	191.5	11.9	241.5	12.6	33	1.8	249
132	241	17	241	18.1	241	17.7	291	18.4	24	2.4	300
160	270.5	38.7	270.5	39.9	270.5	39.5	320.5	40.2	31	3	338

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	Assignment					
	Fig. 10		**Fig. 11**			
Frame size	Prepared for mountings – only center hole (for Brake order code **F01** and/or rotary pulse encoder order codes **G01**/**G02**/**G04**/**G05**/**G06**) Order code **G40**		Prepared for mountings with shaft D12/D16 Order codes **G41**/**G42**			
	Order code **G40**		Order code **G41**		Order code **G42**	
	Δl	Weight approx.	Δl	Weight approx.	Δl	Weight approx.
	mm	kg	mm	kg	mm	kg
1LE1						
100	0	0	11.3	0.15	47.3	0.2
112	0	0	7.5	0.15	47.3	0.2
132	0	0.1	10.3	0.3	50.3	0.4
160	0	0.2	5.6	0.4	45.6	0.7