Technical specifications

Applicable standards and specifications

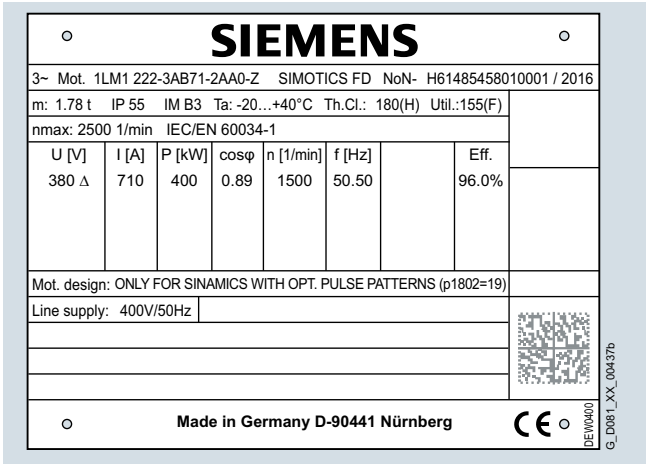
The SIMOTICS FD motors comply with the IEC 60034 series of international product standards for rotating electrical machines and, in particular, those parts that are listed in the table below.

Title	IEC/EN	EN
General specifications for rotating electrical machines	IEC 60034-1, IEC 60085	EN 60034-1
Specification of the losses and efficiency of rotating electrical machines	IEC 60034-2-1	EN 60034-2-1
Starting performance of rotating electrical machines	IEC 60034-12	EN 60034-12
Terminal designations and direction of rotation for electrical machines	IEC 60034-8	EN 60034-8
Designation for type of construction, mounting and terminal box position (IM code)	IEC 60034-7	EN 60034-7
Terminal box cable entries	–	DIN 42925
Built-in thermal protection	IEC 60034-11	EN 60034-11
Noise limits of rotating electrical machines	IEC 60034-9	EN 60034-9
IEC standard voltages	IEC 60038	IEC 60038
Methods of cooling of rotating electrical machines (IC code)	IEC 60034-6	EN 60034-6
Vibration severity of rotating electrical machines	IEC 60034-14	EN 60034-14
Vibration limits	–	ISO 10816
Degrees of protection for rotating electrical machines (IP code)	IEC 60034-5	EN 60034-5
International efficiency classes for rotating electrical machines (IE code)	IEC 60034-30-1	EN 60034-30-1
In addition, the following applies to Ex motors:		
General provisions	IEC/EN 60079-0	EN 60079-0
Type of protection "n" (non-sparking)	IEC/EN 60079-15	EN 60079-15
Areas containing flammable dust	IEC/EN 60079-31	EN 60079-31

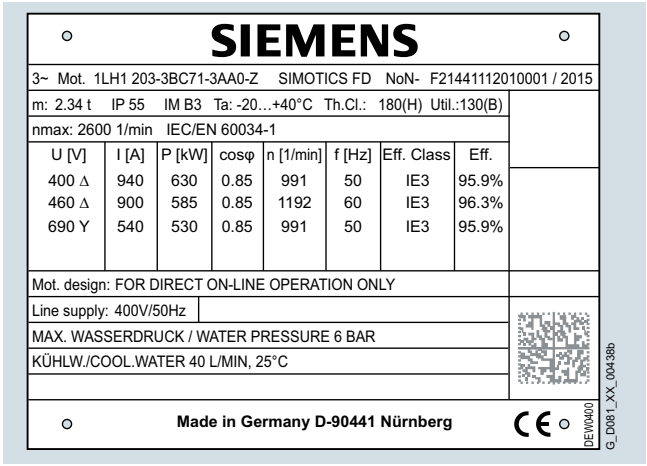
Technical specifications (continued)

Rating plate

In accordance with IEC 60034-1:2010, the approximate total weight is specified on the rating plate. An additional rating plate can be supplied loose for all motors, order code **K31**.
An additional rating plate for customer specifications is also possible, order code **Y82**.
As standard, the rating plate is in English.



Example of a rating plate for 1LM1 for SINAMICS converter operation



Example of a rating plate for 1LH1 for line operation

All motors, specifically designed for line operation, that comply with the international standard IEC 60034-30-1:2014 (Rotating electrical machines – Part 30-1: Efficiency classes of line operated AC motors (IE code)) have the efficiency class and the efficiency stamped on the rating plate. These efficiencies are based, according to the above standard, on the losses determined in accordance with standard IEC 60034-2-1:2014.

Motors specially designed for converter operation

These motors have been specifically designed for converter operation. The catalog data – especially the sound pressure level at the rated speed in no-load operation – are valid for operation with a SINAMICS converter (from firmware Version 4.6 and higher).

When operated with an alternative converter, the catalog data apply (thermal torque limits, maximum overload torques), with the exception of the sound pressure level, under the following boundary conditions:

- The converter is operated with a rated pulse frequency of at least 2.5 kHz.
- The converter can provide the rated voltage as listed in the catalog. This means that it is known whether the infeed (rectifier) is controlled or uncontrolled.

If the infeed is unknown, an uncontrolled infeed should be assumed, and the motor power rating should be reduced (please inquire).

For SINAMICS converters (from firmware Version 4.6 and higher), the SIMOTICS FD motor series can be selected as motor category in the SINAMICS converter using the STARTER commissioning tool software or on the converter operator panel (AOP – Advanced Operation Panel).

Rated voltage

The tolerance for the rated voltage is in accordance with IEC 60034-1:2010. A rated voltage is not specified.

The rated motor voltages are selected so that when operated with a SINAMICS converter, the available voltage is optimally utilized.

In addition to the line voltage, the type of converter infeed (controlled or uncontrolled rectifier) defines the motor voltage that is available. A converter with controlled rectifier always provides the motor with a higher voltage than a converter with uncontrolled rectifier.

Note:

When operating at the limits of voltage ranges A and B (see Fig. 12 in standard IEC 60034-1:2010), the temperatures and overtemperatures exceed the limits specified in the standard. Under certain circumstances, this can negatively impact the lifetime (continuous duty with undervoltage, on request).

Technical specifications (continued)

Insulation

The well-proven DURIGNIT IR 2000 insulation system is used adapted to the motor and converter. The insulation system corresponds to Impulse Voltage Insulation Class (IVIC) C (significant stress according to IEC 60034-18-41:2014) for operation with a two-level converter, and a distinction is made between two categories. The level of converter DC-link voltage and the rise times of the voltage are important factors in the voltage stress of the winding:

- For a converter DC link voltage of $U_{DC,max}$ < 750 V (line voltage 500 V with uncontrolled infeed) the insulation system **IVIC-C advanced** is used.
- For a converter DC link voltage of U_{DC} ≥ 750 V (line voltage 500 V with controlled infeed) up to $U_{DC,max}$ = 1035 V the insulation system **IVIC-C premium** is used.
- The following applies for the voltage rise time: T_a > 0.5 µs/2250 V (IVIC-C advanced) and T_a > 0.4 µs/1500 V (IVIC-C premium). The voltage limits for low rise times can be found in the customer information for insulation technology (TU-IK 002).

For converter operation with the power ratings specified in the catalog, the motors can be utilized corresponding to thermal class 155 (F) (service factor 1.0).

In the case of a fault when connected to an IT supply system (ground fault), the insulation is excessively stressed. In this case, the process should be terminated as quickly as possible (t < 2 h), and the fault resolved. We do not recommend operation on TN supply systems with transition-point grounding.

Noise

The motors have been designed, so that at every rated speed a maximum sound pressure level of

- L_{PA} = 79 dB(A) for motors with self ventilation, forced ventilation and air-water heat exchanger (1LM1/1MM1, 1LL1, 1LQ1/1MQ1, 1LP1, 1LN1/1MN1) as well as with forced ventilation in low-noise version (1LQ1/1MQ1, 1LP1, 5th position of Article No. = 2)
- L_{PA} = 85 dB(A) for motors with forced ventilation in increased power version (1LQ1/1MQ1, 1LP1, position 5 of Article No. = 3)
- L_{PA} = 78 dB(A) for water-cooled motors (1LH1/1MH1)

when operated with SINAMICS converters (from firmware Version 4.6 and higher) in no-load operation is maintained.

Forced ventilation

The separately driven fans of motors of the 1LQ1 and 1LP1 series as well as the separately driven fans in the air-to-water heat exchangers for the 1LN1 series are especially quiet. The line voltage and frequency for the separately driven fan motors are specified, as for the drive system itself, in position 12 of the Article No.

The separately driven fan motors are only designed for line operation.

The ambient conditions listed in the following table apply to the technical specifications for the separately driven fan motors.

Motor series	Installation altitude above sea level	Ambient temperatures
	m	°C
1LQ1, 1LP1, 1MQ1	1000	-20 ... +60
1LN1, 1MN1		-20 ... +40

Technical specifications of the separately driven fan motor (1LQ1, 1LP1) [1)]

Frame size	5th position of the Article No.	Mounting position	P_{rated}, 50 Hz	I_{rated}, 400 V, 50 Hz	P_{rated}, 60 Hz	I_{rated}, 460 V, 60 Hz
			kW	A	kW	A
315	2	Radial	1.41	2.96	2.24	3.9
	2	Axial	1.75	3.2	2.1	3
	3	Radial	5.17	9.87	5.59	9.1
355	2	Radial	1.41	2.96	2.24	3.9
	2	Axial	1.41	2.96	2.24	3.9
	3	Radial	5.17	9.87	5.59	9.1
400	2	Radial	2.82	5.26	3.76	6
	2	Axial	2.82	5.26	3.76	6
	3	Radial	7.05	12.31	7.05	11.5
450	2	Radial	2.82	5.26	3.76	6
	2	Axial	2.82	5.26	3.76	6
	3	Radial	7.05	12.31	7.05	11.5

Technical specifications of the separately driven fan motor (1LN1) [1)]

Frame size	P_{rated}, 50 Hz	I_{rated}, 400 V, 50 Hz	P_{rated}, 60 Hz	I_{rated}, 460 V, 60 Hz
	kW	A	kW	A
315	3	6.1	3.45	5.8
355	4	7.8	4.55	7.5
400	7.5	13.1	8.6	13.0
450	7.5	13.1	8.6	13.0

Technical specifications of the separately driven fan motor (1MQ1)

Frame size	5th position of the Article No.	Mounting position	P_{rated}, 50 Hz	I_{rated}, 400 V, 50 Hz	P_{rated}, 60 Hz	I_{rated}, 460 V, 60 Hz
			kW	A	kW	A
315	2	Radial	1.8	3.61	2.46	4.89
	2	Axial	–	–	–	–
	3	Radial	4.51	8.61	4.51	8.36
355	2	Radial	1.8	3.61	2.46	4.89
	2	Axial	1.8	3.61	2.46	4.89
	3	Radial	4.51	8.61	4.51	8.36
400	2	Radial	3.28	6.07	3.73	5.99
	2	Axial	3.28	6.07	3.73	5.99
	3	Radial	6.15	10.8	7.05	10.70
450	2	Radial	3.28	6.07	3.73	5.99
	2	Axial	3.28	6.07	3.73	5.99
	3	Radial	6.15	10.8	7.05	10.70

Technical specifications of the separately driven fan motor (1MN1)

Frame size	P_{rated}, 50 Hz	I_{rated}, 400 V, 50 Hz	P_{rated}, 60 Hz	I_{rated}, 460 V, 60 Hz
	kW	A	kW	A
315	3.0	6.1	3.45	5.8
355	4.0	7.8	4.55	7.5
400	7.5	13.1	8.6	13.0
450	7.5	13.1	8.6	13.0

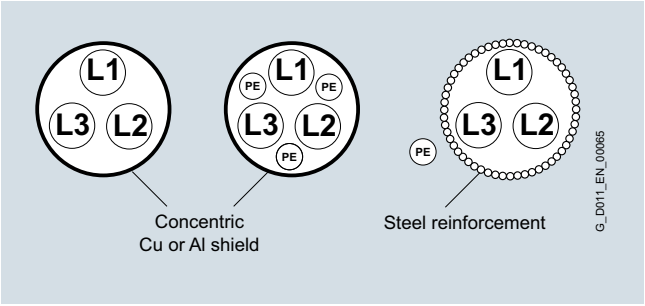
[1)] The motor data on the rating plate may differ.

Technical specifications (continued)

Reducing bearing currents

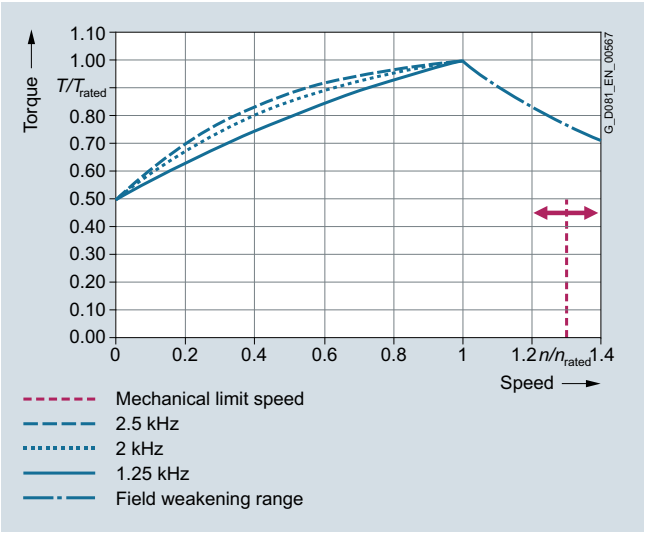
To specifically reduce and prevent damage caused by bearing currents, the system must be considered as a whole, which comprises the motor, converter, and driven machine. To prevent damage caused by bearing currents, the SIMOTICS FD converter motors are equipped with insulated bearings at NDE as standard. Important factors which will help to prevent bearing currents include:

- Set up a properly meshed grounding system in the system as a whole, with low impedance for high-frequency currents
- No potential difference between the motor, converter, and driven machine
  - Use symmetrical, shielded connecting cables
  - Connect the cable shield at both ends over the greatest possible surface area (360° contact)
  - Use equipotential bonding conductors between the motor and the driven machine, the motor and the converter, within the motor, as well as between the terminal boxes and the HF grounding position on the motor housing.
- Attach iron cores above the motor connecting cable at the converter output (selection and dimensioning through your Siemens sales partner)
- Limit the voltage rate of rise by using an output filter to dampen harmonic components in the output voltage
- Implement common-mode filter by employing damping cores to reduce common-mode components
- Use converters with a low switching frequency
- Use cables with a symmetrical cable cross-section:

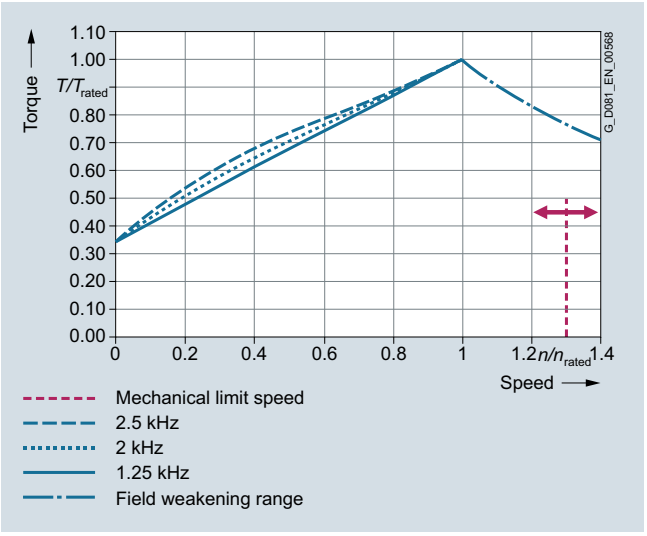


Thermal torque limits (continuous duty)

The thermal torque limit characteristics of the SIMOTICS FD motor series define the maximum load torque for continuous duty (S1) at the converter over the complete speed control range. The characteristic curves are differentiated according to type of modulation (optimized pulse patterns or space-vector modulation) and cooling method. The speed control range is limited by the mechanical speed limit, which depends on the motor's mechanical design (mechanical speed limit of the built-in fan with 1.M1 and 1.L1, type of construction, bearings). When operated on SINAMICS converter with optimized pulse patterns the motor can be utilized to its maximum at the rated operating point. The optimized pulse patterns are suitable for applications without increased requirements on torque or speed accuracy and operations without high dynamic response (e.g. pumps, fans, belt conveyor systems, see also "SIMOTICS FD motor on SINAMICS converter" on page 3/8). An increase in the thermal torque limit at speeds considerably below the rated speed is possible by increasing the converter pulse frequency, e.g. from 1.25 kHz to 2.5 kHz. However, this action results in derating of the converter based on increased switching losses.

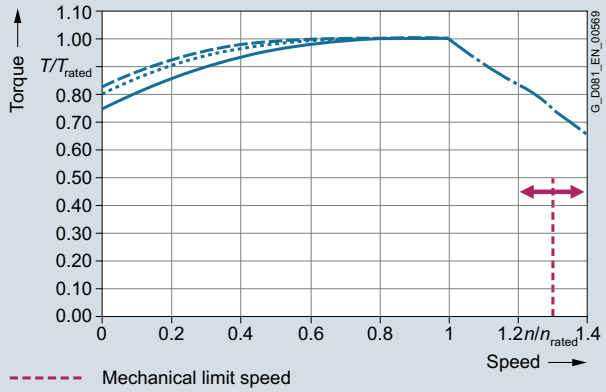


Thermal torque limit characteristic for the 1LM1 series (on SINAMICS converter with optimized pulse patterns)

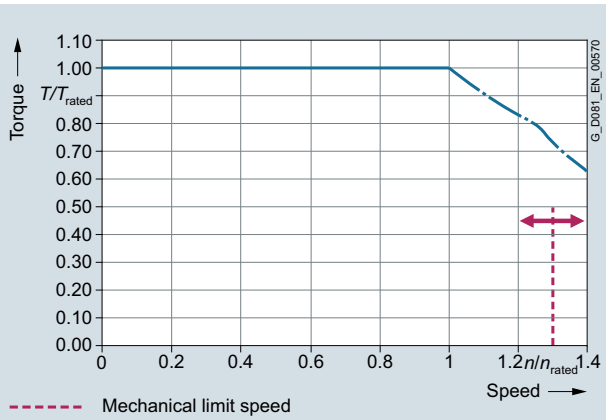


Thermal torque limit characteristic for the 1LL1 series (on SINAMICS converter with optimized pulse patterns)

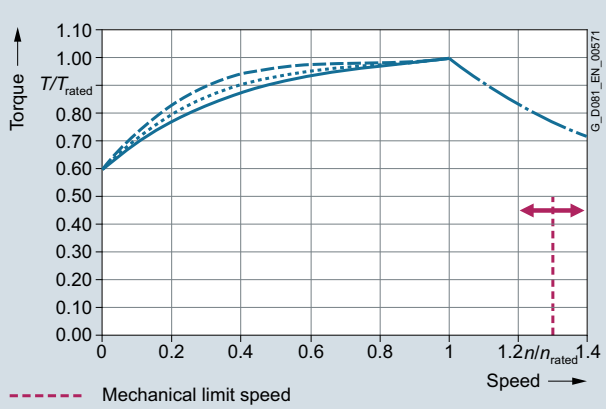
Technical specifications (continued)



Thermal torque limit characteristic for the 1LQ1 series
(on SINAMICS converter with optimized pulse patterns)

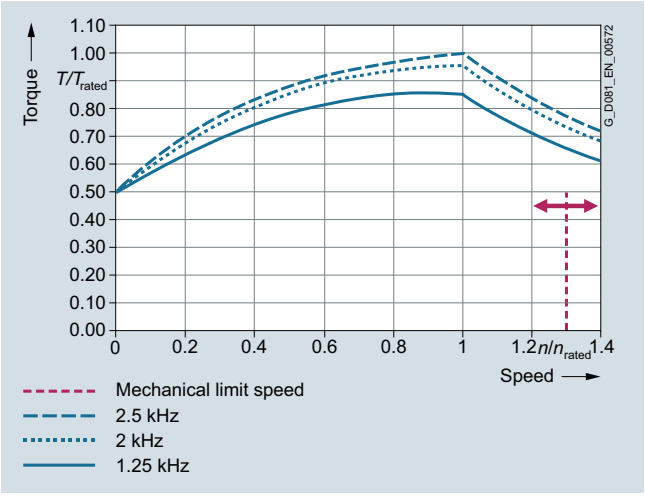


Thermal torque limit characteristic for the 1LP1 and 1LN1 series
(on SINAMICS converter with optimized pulse patterns)

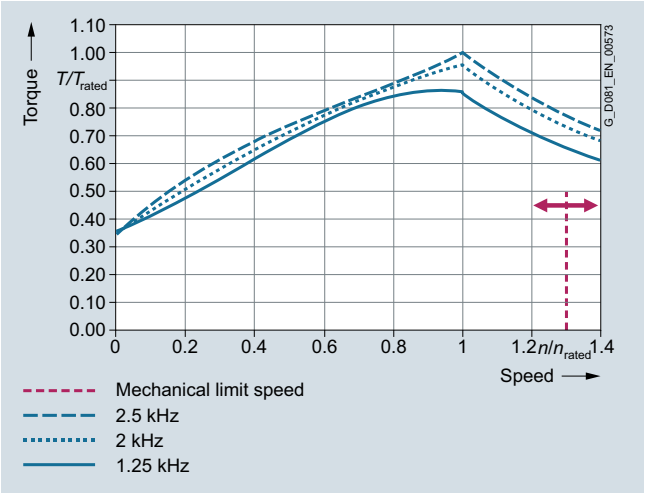


Thermal torque limit characteristic for the 1LH1 series
(on SINAMICS converter with optimized pulse patterns)

If operation with optimized pulse patterns is not possible or desired with SINAMICS then the SINAMICS converter can also be operated with space-vector modulation. This is particularly the case with applications with increased requirements on torque or speed accuracy and operations with high dynamic response (e.g. paper or foil production, rolling mills, centrifuges, see also "SIMOTICS FD motor on SINAMICS converter" on page 3/8). Unlike optimized pulse patterns, this type of modulation results in derating of the motor if the pulse frequency is below 2.5 kHz, see "Options for engineering the drive system - detail level 2" on page 3/6 and "SIMOTICS FD motor on SINAMICS converter" on page 3/8. If the motor is operated on an alternative converter, it is assumed that the modulation method is comparable to the space-vector modulation of the SINAMICS converter.

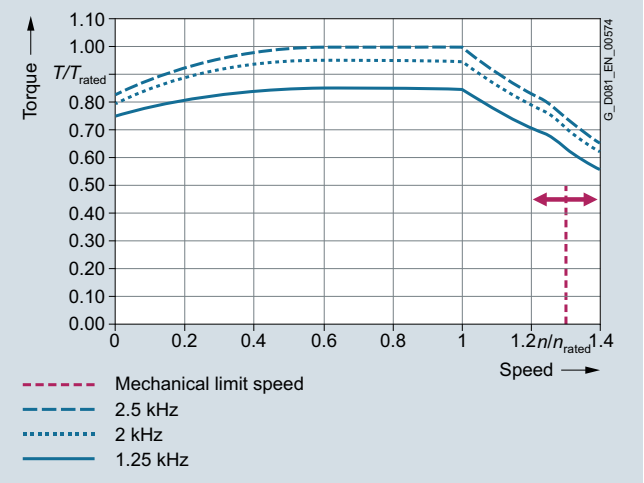


Thermal torque limit characteristic for the 1LM1 series
(with the SINAMICS converter with space-vector modulation or with an alternative converter)

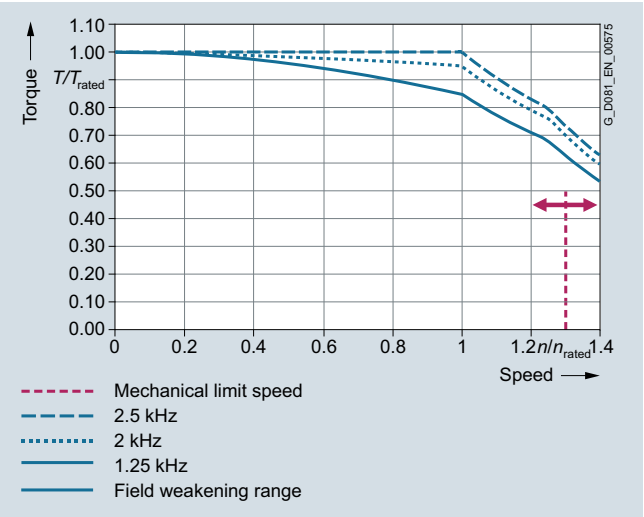


Thermal torque limit characteristic for the 1LL1 series
(with the SINAMICS converter with space-vector modulation or with an alternative converter)

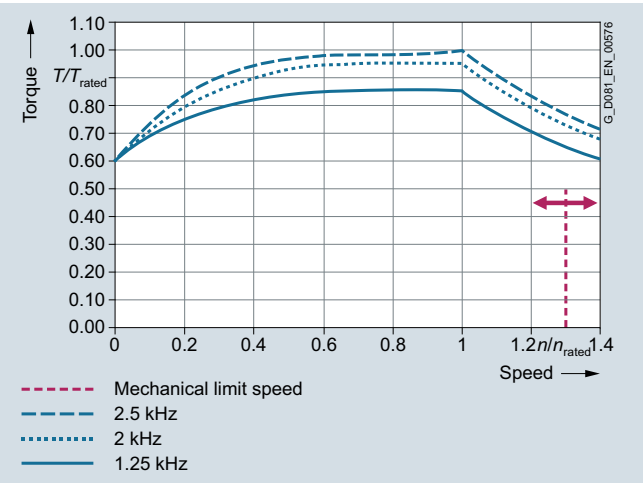
Technical specifications (continued)



Thermal torque limit characteristic for the 1LQ1 series (with the SINAMICS converter with space-vector modulation or with an alternative converter)



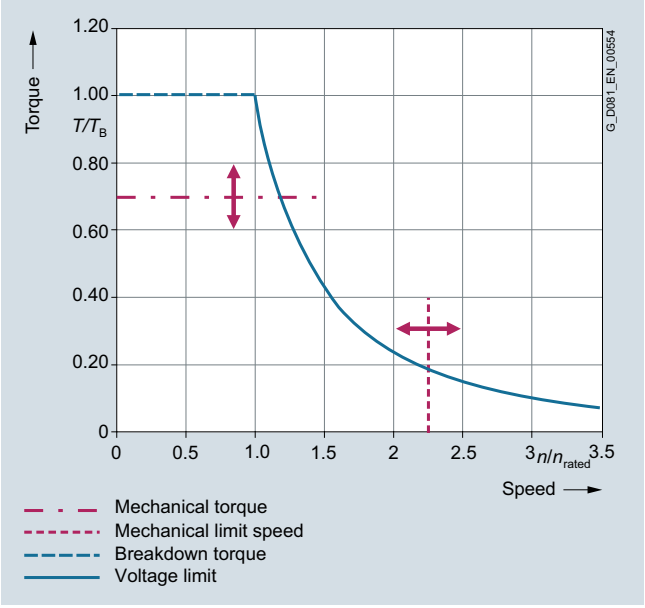
Thermal torque limit characteristic for the 1LP1 and 1LN1 series (with the SINAMICS converter with space-vector modulation or with an alternative converter)



Thermal torque limit characteristic for the 1LH1 series (with the SINAMICS converter with space-vector modulation or with an alternative converter)

Maximum overload torques

The maximum overload torque output from the motor is defined by the overload torque characteristic over the complete speed control range. The reference variable is the breakdown torque at rated speed (T_B). Depending on the frame size and length of the motor the maximum overload torque can be limited by the mechanical strength oft he shaft extension (T_{max}). Operation at the maximum overload torque is only briefly permissible, for instance, when accelerating. The speed control range is limited by the mechanical speed limit (n_{max}), which depends on the motor's mechanical design.



SIMOTICS FD overload torque characteristic

More information

Water cooling

The catalog data for motors with water cooling (1LH1/1MH1) or with air-to-water heat exchanger (1LN1/1MN1) are applicable for the following coolant flow rates:

Frame size	Motor series	
	1LH1/1MH1	1LN1/1MN1
315	40 l/min	115 l/min
355	40 l/min	150 l/min
400	60 l/min	150 l/min
450	60 l/min[1)]	200 l/min

Mechanical load, grease lifetime

When motors are operated at speeds above the rated speed, the mechanical smooth running operation and the bearings are subjected to greater mechanical stress. This reduces the grease lifetime and the bearing lifetime. More detailed information is available on request. The SIMOTICS FD series optionally has spent grease removal at both bearings.

[1)] Applicable to 1LH motors with code digits **1** and **3** at the 11th position of the Article No.
For 1LH motors with code digits **5** and **7** at the 11th position in the Article No. the coolant flow increases to 80 l/min.

Technical specifications (continued)

Motor protection

A motor protection function can be implemented using the I^2t sensing circuit implemented in the converter software.

If precise motor protection is required, this is possible by directly sensing the temperature using the following sensors in the winding:

- 2 temperature sensors KTY 84-130 (standard)
- 6 temperature sensors KTY 84-130 – order code **A27**
- 6 PTC thermistors – order code **A12**
- 6 resistance thermometers Pt100 – order code **A61**
- 6 Pt100 resistance thermometers, 3-wire connection from the auxiliary terminal box – order code **A64**
- 2 Pt1000 resistance thermometers (4 terminals) – order code **A36**
- 6 Pt1000 resistance thermometers (12 terminals) – order code **A37**

When ordering **A12**, **A27**, **A36**, **A37**, **A61** or **A64** the standard temperature sensors KTY 84 are eliminated. Several motor protection sensors can be combined. Additional price on request.

Motor protection sensors can be evaluated in the converter, for example. Siemens converters can determine the motor temperature using the resistance of KTY or Pt100 sensors. They can be set to a required temperature for alarm and tripping.

For line motors, the 3RS10 temperature monitoring device that forms part of the protective equipment must be ordered separately, for further details, see Catalog IC 10.

Motor protection elements (2 × KTY84-130 as standard, as well as order codes **A12**, **A27**, **A61** and **A64**) have a basic insulation. If protective separation is required, this must be implemented when designing the temperature monitoring system. The motor protection elements with order codes **A36** and **A37** have a protective separation.

Anti-condensation heating

- Supply voltage 230 V (1~) – order code **K45**
- Supply voltage 115 V (1~) – order code **K46**
- Supply voltage 400 V (1~) – order code **L08**
- Supply voltage 500 V (1~) – order code **L09**

On 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, anti-condensation heaters must be used.

An additional M20 × 1.5 or M25 × 1.5 cable entry is provided for the connecting cable in the terminal box. Please refer to the terminal boxes table on page 2/16 for the assignment.

Anti-condensation heaters must not be switched on during operation.

Heating power of the anti-condensation heating

Supply voltage at			
230 V	115 V	400 V	500 V
Order code			
K45	**K46**	**L08**	**L09**
200 W	200 W	332 W	500 W

Motor connection

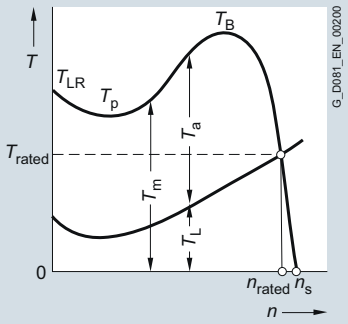
When connecting the motors, it is important to consider the restrictions for line motors as well as the maximum conductor cross-sections permitted for the converter.

Motors specially designed for line operation (1LH1/1MH1)

The 1LH1/1MH1 series also includes motors specifically for line operation. Contrary to motors specifically for converter operation, it is possible to switch between star and delta connection.

Torque characteristic

The torque generated by a three-phase motor at its shaft varies considerably within the speed range $n = 0$ to $n = n_s$. The characteristic curve of the torque as a function of the speed of a three-phase motor with squirrel-cage rotor is shown in the following diagram.



T_{rated}	Rated torque	T_{LR}	Locked-rotor torque
T_m	Motor torque	T_B	Breakdown torque
T_L	Load torque	T_p	Pull-up torque
T_a	Acceleration torque	n_{rated}	Rated speed
		n_s	Synchronous speed

The values for locked-rotor torque and breakdown torque as well as for locked-rotor current for a specific motor can be found in the selection and ordering data.

The limit for the mechanical overload capability is the breakdown torque. Corresponding to IEC/EN 60034-1 induction motors must have an overload capability at rated voltage and rated frequency of at least 1.6 times the rated torque for a duration of 15 s. The minimum required starting, pull-up and breakdown torques depend on the rated power defined in IEC/EN 60034-12.

According to IEC/EN 60034-1, the following tolerances are admissible:

- For locked-rotor torque, from -15 to 25 % of the stated locked-rotor torque
- For locked-rotor current, up to 20 % of the stated locked-rotor current without lower limit
- For the breakdown torque, up to -10 % of the specified breakdown torque
- For pull-up torque, -15 % of the guaranteed value.

Taking these tolerances into account, the locked-rotor torque must be sufficiently higher than the breakaway torque of the driven machine; and the motor torque must constantly exceed the load torque during start-up until the operating speed is achieved.

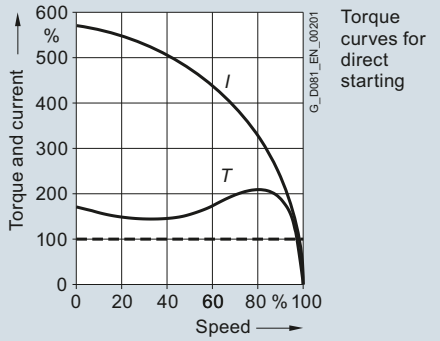
In the case of squirrel-cage motors, the locked-rotor torque and breakdown torque are listed in the selection and ordering data as multiples of the rated torque.

Technical specifications (continued)

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

- 130 % (for CL 13)
- 100 % (for CL 10)

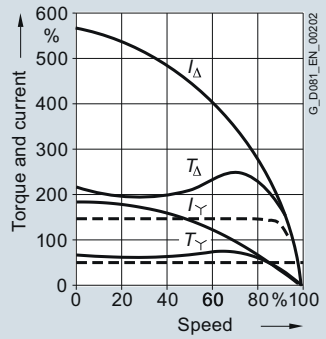
of the rated torque.



Torque curves for direct starting

Motors with CL 10 torque class

– – – – – maximum load torque during the starting



Motors with CL 13 torque class

– – – – – maximum load torque during starting

The rated torque can be calculated as follows:

$$T_{rated} = 9.55 \cdot P_{rated} \cdot \frac{1000}{n_{rated}}$$

T_{rated} Rated torque in Nm
n_{rated} Rated speed in rpm
P_{rated} Rated power in kW

The rated speed of the motor differs from the synchronous speed by the slip s_{rated}.
Where:

$$s_{rated} = \frac{n_s - n_{rated}}{n_s} \cdot 100$$

s_{rated} Slip in %
n_s Synchronous speed in rpm
n_{rated} Rated speed in rpm

Calculating the DOL starting time

The starting time from $n = 0$ to $n = n_b$ can be approximately determined using the average acceleration torque.

$$t_a = \frac{\sum J \cdot n_b}{9.55 \cdot T_{aav}}$$

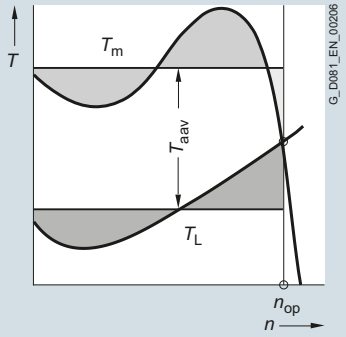
t_a Starting time in s
J Total moment of inertia in kgm^2
n_b Operating speed in rpm
T_{aav} Average acceleration torque in Nm

The total moment of inertia is made up of the motor moment of inertia plus the moment of inertia of the driven machine and the coupling or belt pulleys and is converted to the speed of the motor shaft.

Limit values for the start-up curve of three-phase squirrel-cage motors for voltages up to and including 690 V are included in IEC/EN 60034.

If problem-free starting is not possible due to a high moment of inertia and/or a high load torque, a larger motor or a three-phase motor with a SINAMICS frequency converter can be used for SIMOTICS FD motors.

A mechanical solution for coping with heavy starting is to use a starting coupling, whose application is limited by its capability to absorb heat.



T_m Motor torque
T_L Load torque
T_{aav} Average acceleration torque
n_{op} Operating speed

Determination of the average acceleration torque

Technical specifications (continued)

Starting procedure for three-phase motors with squirrel-cage rotor

Three-phase motors with squirrel-cage rotors should, as far as possible, be started directly on-line.

- It should be noted that for any specific motor, the torque and current characteristics are given, independent of the load to be started. Star-delta starting for motors with squirrel-cage rotor is to be used if low locked-rotor currents (e.g. specified by the local power utility) or an especially low starting torque (soft starting) is specified. Locked-rotor torque, breakdown torque and all other torque values as well as the locked-rotor current are 25 to 30 % of the values at direct-on-line starting.
- The motor torque must be sufficiently higher than the load torque during start-up in the star stage. The change from star to delta must not occur before approximately the operating speed.

The first diagram shows a case in which star-delta start-up is not appropriate because the excessive load torque causes the premature switchover which in turn causes a high torque and current surge that renders star-delta starting ineffective.

The torque curve can be approximately reduced by the square of the voltage and the current curve linearly with the voltage by reducing the voltage at the motor terminals with the help of a starting transformer or starting resistors.

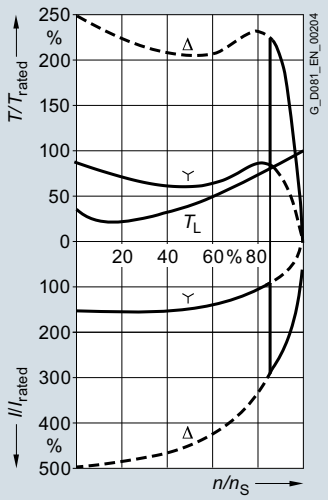
Soft starting for motors with squirrel-cage rotor can also be achieved with short-circuit soft starting. A resistor can be connected in one phase upon or during start-up. The locked-rotor torque can be arbitrarily reduced with the help of this circuit.

The locked-rotor current without a resistor or reactor is slightly higher in both phases than with direct on-line starting.

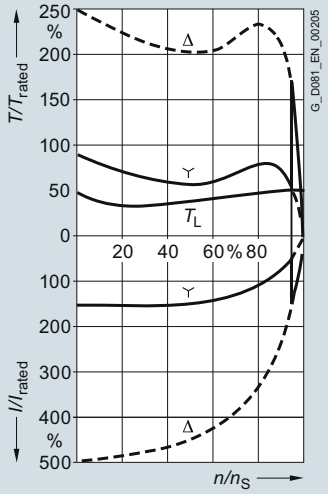
The electronic SIKOSTART motor starter can be used to better implement starting based on this principle. This device limits the torque and current while starting.

Any inquiries regarding start-up procedures must include the following information:

1. Power required by the driven machine and its rated speed
2. Planned motor speed
3. Load torque of the driven machine, depending on the speed of the driven machine or the motor speed
4. Total external moment of inertia and rated speed of the driven machine or referred to the motor speed
5. Number of starts in a specific time period and duty cycle or
6. Characteristics and number of operating cycles in a certain time (method of braking)



Unfavorable star-delta starting



Correct star-delta starting

Technical specifications (continued)

Connection and terminal boxes

Terminal box mounting positions

Terminal box position	Motor type		Fig. on page 2/16	Type of construction [1]											
				IM B3 14th position of the Article No.: **A**						IM B35 14th position of the Article No.: **K**					
				Cable entry (order code)											
	1..1...-.....-.. ■ .			right	left (**L52**)	top[5] (**N83**)	bottom (**L63**)	DE (**L61**)	NDE (**L62**)	right	left (**L52**)	top[5] (**N83**)	bottom (**L63**)	DE (**L61**)	NDE (**L62**)
1.M1, 1.Q1, 1LL1, 1LP1 motors – with cooling method IC411, IC416, IC01, IC06															
Version with one terminal box [15]															
Standard version (DE top) [4]	**A**	**1**		■ [11]	✓ [11]	–	–	✓ [2],[11]	✓ [2]	■ [11]	✓ [11],[17]	–	–	–	✓
DE right [4],[14]	**B**	**2**		–	–	✓ [11]	✓ [11],[13]	✓ [3],[11],[17]	■ [3]	–	–	✓ [11],[17]	✓ [11],[13],[17]	–	■ [3]
DE left [4],[14]	**C**	**2**		–	–	✓ [11]	✓ [11],[13]	✓ [3],[11]	■ [3],[17]	–	–	✓ [11]	✓ [11],[13],[17]	–	■ [3],[17]
NDE top [7]	**D**	**3**		■	✓	–	–	✓	✓	■	✓	–	–	✓ [8]	✓
NDE right [7],[14]	**E**			–	–	✓	✓ [13]	✓ [3]	■ [3]	–	–	✓	✓ [13]	✓ [3],[8],[17]	■ [3]
NDE left [7],[14]	**F**			–	–	✓	✓ [13]	✓ [3]	■ [3]	–	–	✓	✓ [13]	✓ [3],[8]	■ [3],[17]
Version with two terminal boxes [16]															
Both top (NDE and DE) [7]	**K**	**4**		■ [9]	✓ [9]	–	–	–	–	■ [9]	✓ [9]	–	–	–	–
Both left (NDE and DE) [7],[14]	**L**			–	–	■ [9]	–	–	–	–	–	■ [9]	–	–	–
Both right (NDE and DE) [7],[14]	**M**			–	–	■ [9]	–	–	–	–	–	■ [9]	–	–	–
1.H1 motors – with IC71W cooling method															
Version with one terminal box [15]															
Standard version (DE top)	**A**			■	✓	–	–	✓ [2]	✓ [2]	■	✓ [17]	–	–	–	✓
DE right	**B**	**2**		–	–	✓	✓ [13]	✓ [3],[17]	■ [3]	–	–	✓ [17]	✓ [13]	–	■ [3]
DE left	**C**	**2**		–	–	✓	✓ [13]	✓ [3]	■ [3],[17]	–	–	✓	✓ [13]	–	■ [3],[17]
NDE top	**D**			■	✓	–	–	✓	✓	■	✓	–	–	✓ [8]	✓
NDE right	**E**			–	–	✓	✓ [13]	✓ [3],[17]	■ [3]	–	–	✓	✓ [13]	✓ [3],[8],[17]	■ [3]
NDE left	**F**			–	–	✓	✓ [13]	✓ [3]	■ [3],[17]	–	–	✓	✓ [13]	✓ [3],[8]	■ [3],[17]
Version with two terminal boxes [16]															
Both top (NDE and DE)	**K**			■ [9]	✓ [9]	–	–	–	–	■ [9]	✓ [9]	–	–	–	–
Both left (NDE and DE)	**L**			–	–	■ [9]	–	–	–	–	–	■ [9]	–	–	–
Both right (NDE and DE)	**M**			–	–	■ [9]	–	–	–	–	–	■ [9]	–	–	–
Both DE (right and left)	**N**			–	–	✓ [11]	–	✓ [3],[11]	■ [3]	–	–	✓ [11]	–	–	■ [3]
Both NDE (right and left)	**P**			–	–	✓	–	✓ [3]	■ [3]	–	–	✓	–	✓ [3],[8]	■ [3]
1.N1 motors – with IC86W cooling method															
Version with one terminal box [15]															
Standard version (DE right)	**B**			–	–	✓	✓ [13]	✓ [3],[17]	■ [3]	–	–	✓ [17]	✓ [13],[17]	–	■ [3]
DE left	**C**			–	–	✓	✓ [13]	✓ [3]	■ [3],[17]	–	–	✓	✓ [13],[17]	–	■ [3],[17]
NDE top	**D**			–	–	–	–	–	–	–	–	–	–	–	–
NDE right	**E**			–	–	✓ [10]	✓ [13]	✓ [3]	■ [3]	–	–	✓ [10]	✓ [13]	✓ [3],[8],[17]	■ [3]
NDE left	**F**			–	–	✓ [10]	✓ [13]	✓ [3]	■ [3]	–	–	✓ [10]	✓ [13]	✓ [3],[8]	■ [3],[17]
Version with two terminal boxes [16]															
Both left (NDE and DE)	**L**			–	–	■ [9],[10]	–	–	–	–	–	■ [9],[10]	–	–	–
Both right (NDE and DE)	**M**			–	–	■ [9],[10]	–	–	–	–	–	■ [9],[10]	–	–	–
Both DE (right and left)	**N**			–	–	✓ [11]	–	✓ [3],[11]	■ [3]	–	–	✓ [11]	–	–	■ [3]
Both NDE (right and left)	**P**			–	–	–	–	✓ [3]	■ [3]	–	–	–	–	✓ [3],[8]	■ [3]

■ Standard version
✓ Combination is possible
– Combination not possible

[1] When ordering the optional type of construction IM V15, IM V5 or IM V6, the position of the terminal box must be checked with regard to lifting method, accessibility of foot mounting bolts, etc.

[2] Not for 1XB1631 terminal boxes and frame size 315.

[3] Not for 1XB1631 and frame sizes 315, 355.

[4] If the terminal box and separately driven fan unit are both mounted on the top, or on the same side, then NDE cable entry is not possible – and for terminal boxes GT640, 1XB1621, 1XB7730 and 1XB7731, it is not possible to mount an auxiliary terminal box.

[5] The position and direction "top" corresponds to the housing side opposite to the one with the mounting feet. For all types of construction, an housing with feet is used, but in the case of IM V1, the feet are not used.

[6] The radially mounted separately driven fan unit must be mounted on the left or right side.

[7] The radially mounted separately driven fan unit cannot be mounted on the same side as the terminal box.

[8] Note bending radius, where applicable.

Technical specifications (continued)

Terminal box position	Motor type		Fig. on page 2/16	Type of construction [1]											
				IM B5 with support foot 14th position of the Article No.: **F**						IM V1 14th position of the Article No.: **J**					
				Cable entry (order code)											
	1..1...-.....-..■ .			right	left (**L52**)	top5) (**N83**)	bottom (**L63**)	DE (**L61**)	NDE (**L62**)	right	left (**L52**)	top [5] (**N83**)	bottom (**L63**)	DE (**L61**)	NDE (**L62**)
1.M1, 1.Q1, 1LL1, 1LP1 motors – with cooling method IC411, IC416, IC01, IC06															
Version with one terminal box [15]															
Standard version (DE top) [4]	**A**	**1**		■ [11]	✓ [11],[17]	–	–	–	✓	✓ [11],[12]	✓ [11],[12],[17]	–	–	–	■ [6],[17]
DE right [4],[14]	**B**	**2**		–	–	✓ [11],[17]	✓ [11]	–	■	–	–	✓ [11],[17]	✓ [11]	–	■
DE left [4],[14]	**C**	**2**		–	–	✓ [11]	✓ [11],[17]	–	■	–	–	✓ [11]	✓ [11],[17]	–	■
NDE top [7]	**D**	**3**		■	✓	–	–	✓ [8]	✓	✓ [12]	✓ [12]	–	–	✓ [8],[17]	■ [17]
NDE right [7],[14]	**E**			–	–	✓	✓ [13]	✓ [3],[8],[17]	■ [3]	–	–	✓	✓	✓ [8]	■
NDE left [7],[14]	**F**			–	–	✓	✓ [13]	✓ [3],[8]	■ [3],[17]	–	–	✓	✓	✓ [8]	■
Version with two terminal boxes [16]															
Both top (NDE and DE) [7]	**K**	**4**		■ [9]	✓ [9]	–	–	–	–	■ [9],[12]	✓ [9],[12]	–	–	–	–
Both left (NDE and DE) [7],[14]	**L**			–	–	■ [9]	–	–	–	–	–	■ [9]	✓ [9]	–	–
Both right (NDE and DE) [7],[14]	**M**			–	–	■ [9]	–	–	–	–	–	■ [9]	✓ [9]	–	–
1.H1 motors – with IC71W cooling method															
Version with one terminal box [15]															
Standard version (DE top)	**A**			■	✓ [17]	–	–	–	✓	✓ [12]	✓ [12],[17]	–	–	–	■ [17]
DE right	**B**	**2**		–	–	✓ [17]	✓	–	■	–	–	✓ [17]	✓	–	■
DE left	**C**	**2**		–	–	✓	✓ [17]	–	■	–	–	✓	✓ [17]	–	■
NDE top	**D**			■	✓	–	–	✓ [8]	✓	✓ [12]	✓ [12]	–	–	✓ [8],[17]	■ [17]
NDE right	**E**			–	–	✓	✓ [13]	✓ [3],[8],[17]	■ [3]	–	–	✓	✓	✓ [8]	■
NDE left	**F**			–	–	✓	✓ [13]	✓ [3],[8]	■ [3],[17]	–	–	✓	✓	✓ [8]	■
Version with two terminal boxes [16]															
Both top (NDE and DE)	**K**			■ [9]	✓ [9]	–	–	–	–	■ [9],[12]	✓ [9],[12]	–	–	–	–
Both left (NDE and DE)	**L**			–	–	■ [9]	–	–	–	–	–	■ [9]	✓ [9]	–	–
Both right (NDE and DE)	**M**			–	–	■ [9]	–	–	–	–	–	■ [9]	✓ [9]	–	–
Both DE (right and left)	**N**			–	–	✓ [11]	✓ [11]	–	■	–	–	✓ [11]	✓ [11]	–	■
Both NDE (right and left)	**P**			–	–	✓	–	✓ [3],[8]	■ [3]	–	–	✓	✓	✓ [8]	■
1.N1 motors – with IC86W cooling method															
Version with one terminal box [15]															
Standard version (DE right)	**B**			–	–	✓ [17]	✓	–	■	–	–	✓ [17]	✓	–	■
Terminal box on DE left	**C**			–	–	✓	✓ [17]	–	■	–	–	✓	✓ [17]	–	■
Terminal box on NDE top	**D**			–	–	–	–	–	–	–	–	–	–	–	–
Terminal box on NDE right	**E**			–	–	✓ [10]	✓ [13]	✓ [3],[8],[17]	■ [3]	–	–	✓ [10]	✓	✓ [8]	■
Terminal box on NDE left	**F**			–	–	✓ [10]	✓ [13]	✓ [3],[8]	■ [3],[17]	–	–	✓ [10]	✓	✓ [8]	■
Version with two terminal boxes [16]															
Both left (NDE and DE)	**L**			–	–	■ [9],[10]	–	–	–	–	–	■ [9],[10]	✓ [9]	–	–
Both right (NDE and DE)	**M**			–	–	■ [9],[10]	–	–	–	–	–	■ [9],[10]	✓ [9]	–	–
Both DE (right and left)	**N**			–	–	✓ [11]	✓ [11]	–	■	–	–	✓ [11]	✓ [11]	–	■
Both NDE (right and left)	**P**			–	–	–	–	✓ [3],[8]	■ [3]	–	–	–	✓	✓ [8]	■

■ Standard version
✓ Combination is possible
– Combination not possible

[9] The cable entries of the two terminal boxes must be mounted in the same direction.

[10] Cable entry top, only when the water connection of the cooler is on the other side.

[11] In the case of an optional auxiliary terminal box, mounting must be (one side) on the cable duct instead of the console.

[12] For terminal boxes 1XB7740 and 1XB1631, the combination is only possible from frame size 400.

[13] Combination only possible from frame size 400 and only for terminal box types GT640, 1XB1621, 1XB7730 and 1XB7731; not for 1XB7740, 1XB7750 and 1XB1631.

[14] For horizontal types of construction (IM B3, IM B35, IM B5), not for 1LL1 and 1LP1 motors.

[15] Terminal boxes 1XB7750 not with frame sizes 315 and 355.

[16] Version with two terminal boxes not for frame size 315 and not for terminal boxes GT640, 1XB1621, 1XB7730, 1XB7731 and 1XB7750.

[17] Not with terminal box 1XB7750.

Technical specifications (continued)

Fig. 1

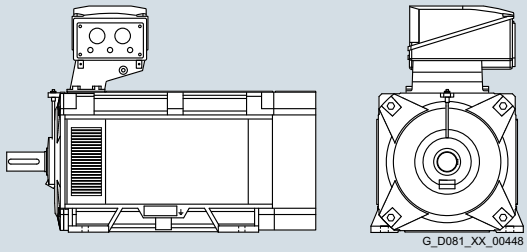


Fig. 2

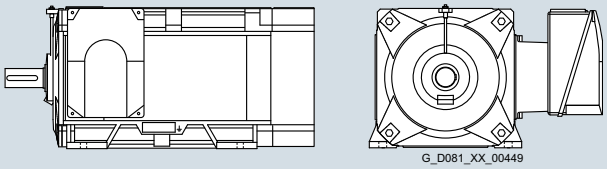


Fig. 3

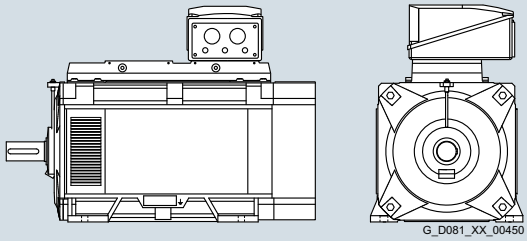
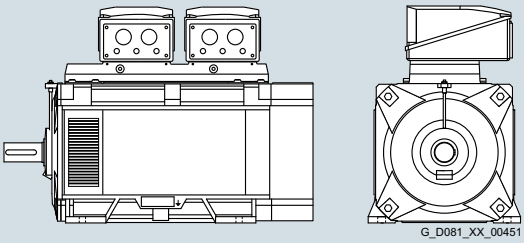


Fig. 4



Terminal boxes

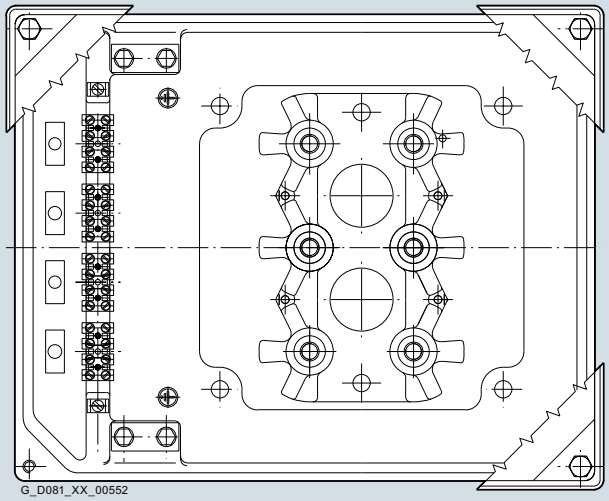
Terminal box	Number of terminals	Contact screw thread	Recommended max. conductor cross-section	Number of auxiliary terminal slots [1]	Standard cable entry [1]	Outer cable diameter (sealing range)	Auxiliary lead outer cable diameter	Glands provided (EMC glands for converter operation) can be ordered using option K57; ability to be installed tested [2]	Cable entry (option L01 or explosion-proof motor) [1]
Type			mm^2		Size	mm	mm	Size	
GT640	6	M12	185	18	Cannot be removed 2 × M72 × 2 + 2 × M20 × 1.5	41.0 … 56.5	7 … 13	2 × M72 × 2	–
1XB1621	6	M16	240	12	Removable 2 × M80 × 2 + 2 × M25 × 1.5	56.0 … 68.0	11.5 … 15.5	2 × M80 × 2	Removable Not drilled
1XB1631	12	M16	240	24	Removable 4 × M80 × 2 + 2 × M25 × 1.5	56.0 … 68.0	11.5 … 15.5	4 × M80 × 2	Removable Not drilled
1XB7730	3	M12	185	20	Removable 1 × M72 × 2 + 3 × M25 × 1.5	41.0 … 56.5	11.5 … 15.5	1 × M72 x 2	Removable Not drilled
1XB7731	6	M12	185	20	Removable 2 × M72 × 2 + 3 × M25 × 1.5	41.0 … 56.5	11.5 … 15.5	2 × M72 × 2	Removable Not drilled
1XB7740	12	M12	240	20	Removable 4 × M80 × 2 + 3 × M25 × 1.5	56.0 … 68.0	11.5 … 15.5	4 × M80 × 2	Removable Not drilled
1XB7750	24	M12	240	20	Removable 8 × M72 × 2 + 3 × M25 × 1.5	41.0 … 56.5	11.5 … 15.5	8 × M72 × 2	Removable Not drilled

[1] Others available on request.

[2] When using a different cable gland in conjunction with the standard cable entry, the minimum clearances according to the dimension drawing must be carefully observed: You can find the dimension drawings at the end of the chapter on the particular motor version.

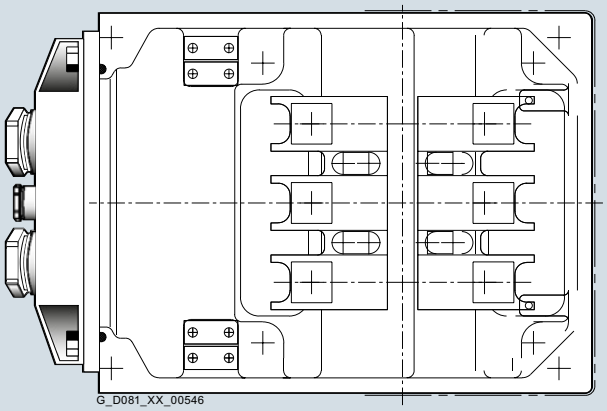
Technical specifications (continued)

Terminal box type GT640



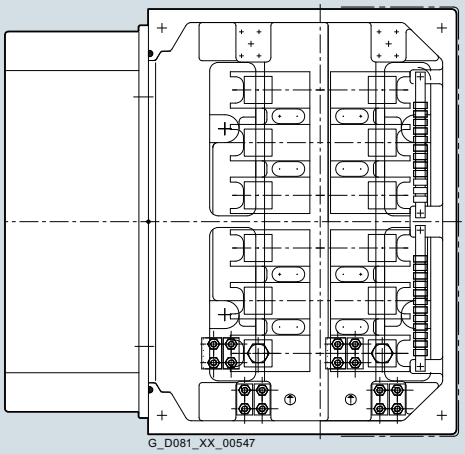
G_D081_XX_00552

Terminal box type 1XB1621



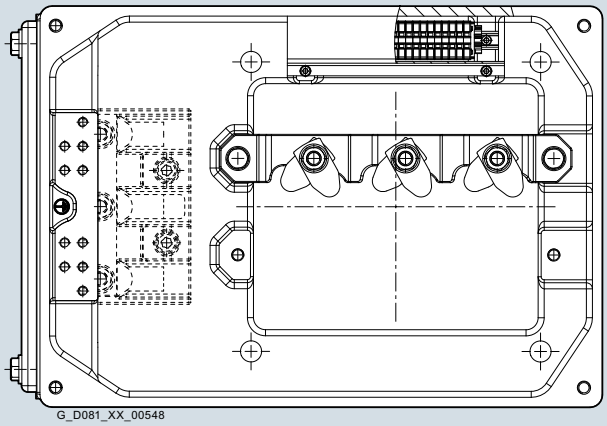
G_D081_XX_00546

Terminal box type 1XB1631



G_D081_XX_00547

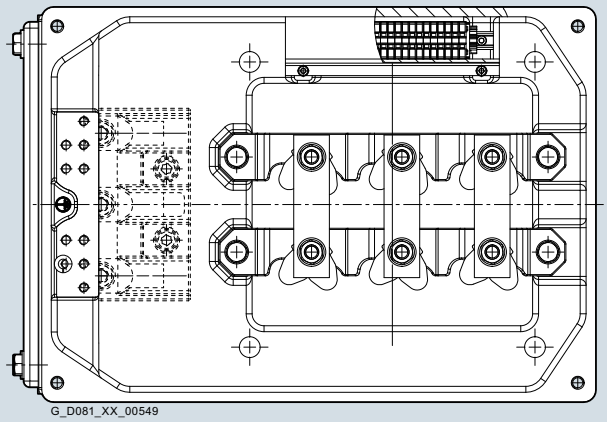
Terminal box type 1XB7730



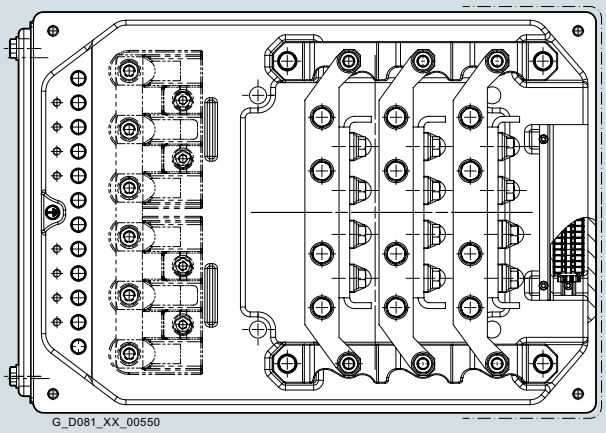
G_D081_XX_00548

Technical specifications (continued)

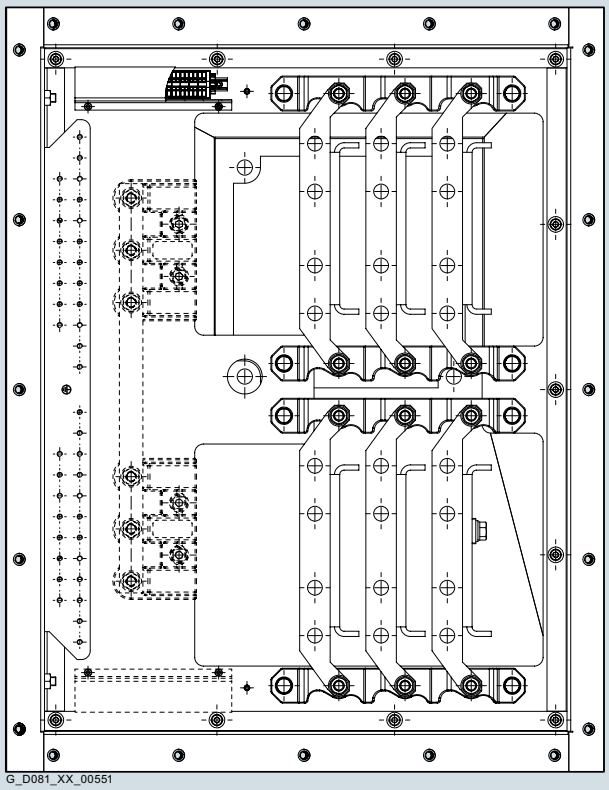
Terminal box type 1XB7731



Terminal box type 1XB7740



Terminal box type 1XB7750



Technical specifications (continued)

Bearings and lubrication

Bearing assignment

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 lubrication plate.

Bearing design					
Frame size	Pole no. code letter 10th position of the Article No.	Rated speed code 13th position of the Article No.	Type of construction	DE	NDE
	1..1...-..■..-....	**1..1...-.....-■...**		Bearing type	Bearing type
315	**B**	**1, 2, 5, 6**	IM B3, IM B35, IM B5[1)], IM V1	6218 C3	6218 C3
		2, 6	IM B3 + K20	NU320E	6218 C3
	C	**3, 4, 7, 8**	IM B3, IM B35, IM B5[1)], IM V1	6218 C3	6218 C3
			IM B3 + K20	NU320E	6218 C3
	D	**4, 8**	IM B3, IM B35, IM B5, IM V1	6218 C3	6218 C3
			IM B3 + K20	NU320E	6218 C3
355	**B**	**1, 2, 6**	IM B3, IM B35, IM B5[1)]	6220 C3	6220 C3
		2, 6	IM V1	7220 B + 6220 C3	6220 C3
			IM B3 + K20	NU322E	6220 C3
	C	**3, 4, 7, 8**	IM B3, IM B35, IM B5[1)]	6220 C3	6220 C3
			IM V1	7220 B + 6220 C3	6220 C3
			IM B3 + K20	NU322E	6220 C3
	D	**4, 8**	IM B3, IM B35, IM B5[1)]	6220 C3	6220 C3
			IM V1	7220 B + 6220 C3	6220 C3
			IM B3 + K20	NU322E	6220 C3
400	**B**	**2, 6**	IM B3, IM B35, IM B5[1)]	6224 C3	6224 C3
			IM V1	7224 B + 6224 C3	6224 C3
			IM B3 + K20	NU326E	6224 C3
	C	**3, 4, 7, 8**	IM B3, IM B35, IM B5[1)]	6224 C3	6224 C3
			IM V1	7224 B + 6224 C3	6224 C3
			IM B3 + K20	NU326E	6224 C3
	D	**4, 8**	IM B3, IM B35, IM B5[1)]	6224 C3	6224 C3
			IM V1	7224 B + 6224 C3	6224 C3
			IM B3 + K20	NU326E	6224 C3
450	**B**	**2, 6**	IM B3, IM B35, IM B5[1)]	6226 C3	6226 C3
			IM V1	7226 B + 6226 C3	6226 C3
			IM B3 + K20	NU328E	6226 C3
	C	**3, 4, 7, 8**	IM B3, IM B35, IM B5[1)]	6226 C3	6226 C3
			IM V1	7226 B + 6226 C3	6226 C3
			IM B3 + K20	NU328E	6226 C3
	D	**4, 8**	IM B3, IM B35, IM B5[1)]	6226 C3	6226 C3
			IM V1	7226 B + 6226 C3	6226 C3
			IM B3 + K20	NU328E	6226 C3

[1)] Type of construction IM B5 only with support foot.

Technical specifications (continued)

Bearing lifetime (nominal lifetime)

The nominal bearing lifetime is defined according 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.

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

The bearing lifetime of motors with horizontal mounting is 40000 hours if there is no additional axial loading at the coupling output and 20000 hours when utilized according to the maximum admissible load.

Bearing system

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 non-drive end (NDE) and the located bearing is situated at the drive end (DE).

The bearing system is axially preloaded with a spring element to ensure smooth running of the motor backlash-free.

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

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

Shaft seal and degree of protection

The standard degree of protection for the 1.M1, 1.Q1, 1.H1 and 1.N1 motor series is IP55. When the following operating speeds are exceeded, the degree of protection falls to IP54:

- > 3000 rpm for frame size 315
- > 2670 rpm for frame size 355
  (in combination with order code **M61** or **K20**: > 2430 rpm)
- > 2200 rpm for frame size 400
- > 2000 rpm for frame size 450

Insulated bearings for converter operation

An insulated bearing is installed at the non-drive end (NDE).

Regreasing

Regreasing with an M10 × 1 flat greasing nipple according to DIN 3404 is provided.

Specifications for regreasing intervals, grease type and quantity and any other data can be found on the lubrication plate or rating plate.

Grease lifetime and regreasing intervals

Horizontal installation – basic version				
Speed	Regreasing interval up to CT 40 °C/ regrease quantity			
rpm	Frame size			
	315	355	400	450
750	6000 h/25 g	6000 h/30 g	6000 h/40 g	6000 h/50 g
1000	6000 h/25 g	6000 h/30 g	6000 h/40 g	6000 h/50 g
1500	6000 h/25 g	6000 h/30 g	5000 h/40 g	5000 h/50 g
1800	6000 h/25 g	6000 h/30 g	4000 h/40 g	4000 h/50 g
3000	3000 h/25 g	2000 h/30 g	2000 h/30 g	2000 h/30 g
3300	–/–	2000 h/30 g	–/–	–/–
3600	2000 h/25 g	–/–	–/–	–/–

Vertical installation – basic version				
Speed	Regreasing interval up to CT 40 °C/ regrease quantity			
rpm	Frame size			
	315	355	400	450
750	6000 h/25 g	6000 h/60/30 g	6000 h/90/45 g	6000 h/100/55 g
1000	6000 h/25 g	6000 h/60/30 g	5000 h/90/45 g	5000 h/100/55 g
1500	5000 h/25 g	4000 h/60/30 g	3500 h/90/45 g	3000 h/100/55 g
1800	5000 h/25 g	3500 h/60/30 g	3500 h/90/45 g	2000 h/100/55 g
2000	–/–	3500 h/60/30 g	On request	On request
2500	2500 h/25 g	–/–	On request	On request

Horizontal installation (IM B3 only) for reinforced bearing (K20):				
Speed	Regreasing interval up to CT 40 °C/ Regrease quantity DE/NDE			
rpm	Frame size			
	315	355	400	450
750	5000 h/55/20 g	4000 h/65/30 g	4000 h/85/25 g	4000 h/95/25 g
1000	4000 h/55/20 g	3000 h/65/30 g	3000 h/85/25 g	3000 h/95/25 g
1500	3000 h/55/20 g	2000 h/65/30 g	1500 h/85/25 g	1500 h/95/25 g
1800	2000 h/55/20 g	1500 h/65/30 g	1000 h/85/25 g	1000 h/95/25 g

Coupling weight at the DE shaft extension

Coupling weight at the DE shaft extension – basic version				
	Frame size			
	315	355	400	450
Weight	40 kg	60 kg	60 kg [1]	60 kg [1]
			90 kg	120 kg

Permissible coupling weight (half coupling) at the DE shaft extension.

Coupling aligned according to the operating instructions.

[1] At rated speed 3000 rpm

Technical specifications (continued)

Additional axial load for motors in the basic version

Additional axial load for motors in horizontal type of construction – basic version

Frame size	Type	3000 rpm		1500 rpm		1000 rpm		750 rpm	
		Load direction							
		Tensile	Thrust	Tensile	Thrust	Tensile	Thrust	Tensile	Thrust
		N	N	N	N	N	N	N	N
315	**1■.1...-...1.**	3500	1900	4800	3100	5500	3900	6300	4600
	1■.1...-...3.	3500	1800	4700	3000	5500	3800	6200	4500
	1■.1...-...5.	3400	1700	4600	2900	5300	3600	6000	4300
	1■.1...-...7.	3300	1700	4500	2900	5300	3600	6000	4300
355	**1■.1...-...5.**	4400	2100	6000	3700	6800	4500	7700	5400
	1■.1...-...7.	4400	2100	6000	3700	6700	4400	7700	5400
400	**1■.1...-...3.**	3900	1600	6300	4000	7300	5000	8400	6100
	1■.1...-...5.	3900	1600	6300	4000	7200	4900	8300	6000
	1■.1...-...7.	3800	1500	6200	3900	7200	4900	8200	5900
450	**1■.1...-...1.**	3700	1400	7400	3300	8400	4300	9600	5500
	1■.1...-...3.	3600	1300	7300	3200	8400	4300	9500	5400
	1■.1...-...5.			7000	2900	8000	3900	9100	5000
	1■.1...-...7.			7000	2900	7900	3800	9000	4900

L Motors without explosion protection
M Motors with explosion protection

Tensile:Additional axial load in DE direction
Thrust:Additional axial load in NDE direction

Additional axial load for motors in vertical type of construction – basic version

Frame size	Type	2500/2000 rpm [2]		1500 rpm		1000 rpm		750 rpm	
		Shaft extension pointing downwards							
		Load							
		Tensile	Thrust	Tensile	Thrust	Tensile	Thrust	Tensile	Thrust
		N	N	N	N	N	N	N	N
315	**1■.1...-...1.**	1500	6300	2500	7400	2700	8900	3500	9700
	1■.1...-...3.	1000	6800	2000	7800	2000	9600	2800	10400
	1■.1...-...5.	500	7300	1500	8300	1500	10200	2300	11000
	1■.1...-...7.	–	7800 [1]	1000	8800	1200	10500	2000	11300
355	**1■.1...-...5.**	7800	8100	7800	8700	6200	11100	6200	11900
	1■.1...-...7.	7500	8400	7500	9000	5600	11700	5600	12500
400	**1■.1...-...3.**	5800	10100	5100	10000	3400	11700	3400	11700
	1■.1...-...5.	5200	10700	4500	10600	2600	12500	2600	12500
	1■.1...-...7.	4400	11400	3800	11300	1900	13300	1900	13300
450	**1■.1...-...1.**	3900	11900	6200	13600	4500	15300	4400	15400
	1■.1...-...3.	3000	12800	5500	14300	3500	16300	3500	16300
	1■.1...-...5.			4500	15300	2200	17600	2100	17700
	1■.1...-...7.			3300	16500	700	19100	700	19100

L Motors without explosion protection
M Motors with explosion protection

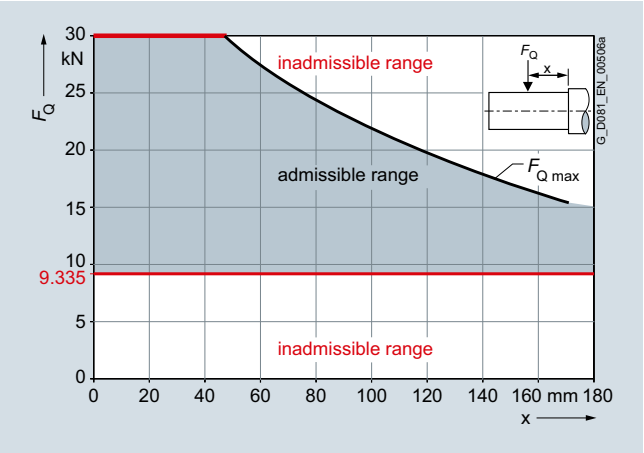
Data for 2500 rpm and 1500 rpm are applicable to 4-pole motors.
Data for 1000 rpm and 750 rpm are applicable to 6- or 8-pole motors. Types IM V15, IM V5 and IM V6 available on request.

[1] Without additional axial load, the bearing lifetime is less than 20000 h.

[2] Maximum speed IM V1: Frame size 315 = 2500 rpm and
frame sizes 355/400/450 = 2000 rpm

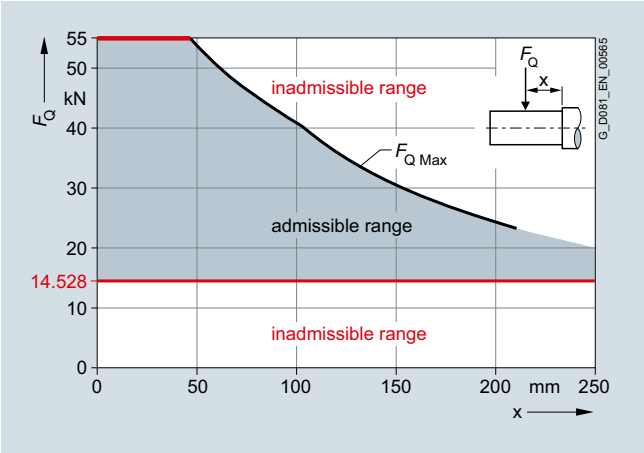
Technical specifications (continued)

Admissible cantilever forces for motors, frame size 315, in IM B3 type of construction with reinforced bearings (order code **K20**)



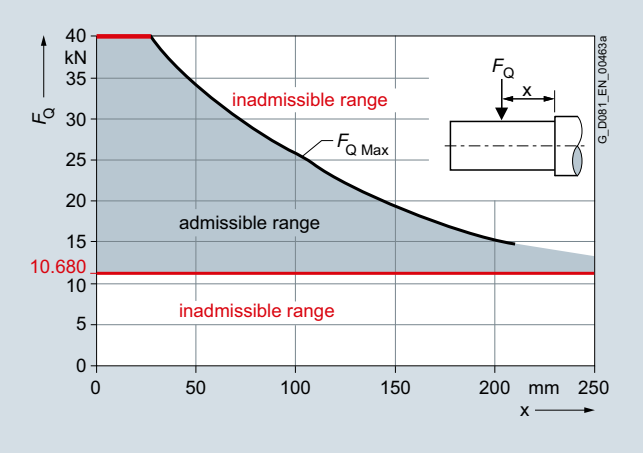
Bearings DE: NU320-E
NDE: 6218
Bearing lifetime: 20000 h
Torsional torque T_m, T_a: 5600 Nm rising
Minimum cantilever force: 9.335 kN
The maximum cantilever force is limited to 30 kN.

Admissible cantilever forces for motors, frame size 400, in IM B3 type of construction with reinforced bearings (order code **K20**)



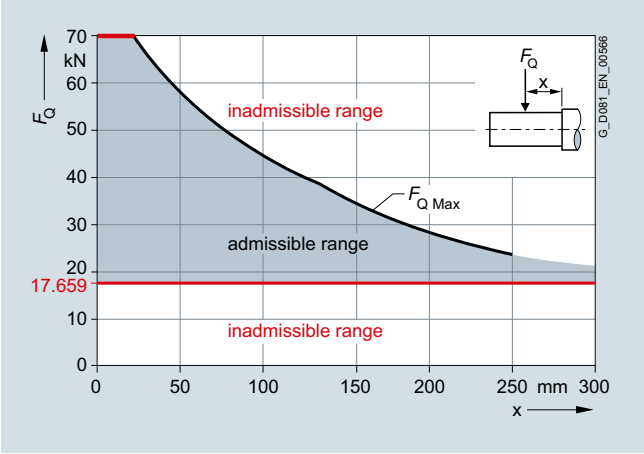
Bearings DE: NU326-E
NDE: 6224
Bearing lifetime: 20000 h
Torsional torque T_m, T_a: 12300 Nm rising
Minimum cantilever force: 14.528 kN
The maximum cantilever force is limited to 55 kN.

Admissible cantilever forces for motors, frame size 355, in IM B3 type of construction with reinforced bearings (order code **K20**)



Bearings DE: NU322-E
NDE: 6220
Bearing lifetime: 20000 h
Torsional torque T_m, T_a: 7600 Nm rising
Minimum cantilever force: 10.680 kN
The maximum cantilever force is limited to 40 kN.

Admissible cantilever forces for motors, frame size 450, in IM B3 type of construction with reinforced bearings (order code **K20**)



Bearings DE: NU328-E
NDE: 6226
Bearing lifetime: 20000 h
Torsional torque T_m, T_a: 15400 Nm rising
Minimum cantilever force: 17.659 kN
The maximum cantilever force is limited to 70 kN.

Technical specifications (continued)

Retrofit

A simple exchange is possible based on identical foot hole measurements for the same frame size for SIMOTICS FD and N-compact. Any differences in frame size that may exist as a result of the higher power density for the SIMOTICS FD series compared with older motors are balanced out using adapter plates. These can be ordered as an option for the corresponding motor types.

As a result of the design the SIMOTICS FD terminal boxes are not at the same position as they are with N-compact. In some cases existing connecting cables may no longer be long enough or there may be incompatibilities with other system parts. This often results in a need for corresponding measures (interim flange, cable length, change in the foundation, etc.). These must be taken into account at the configuring stage.

The system must generally always be seen in its entirety with a retrofit. Synchronizing the mechanical and electrical properties (e.g. torque, voltage, etc.) for the new motor with those of the old motor is not adequate. On the contrary, any minimum clearance requirements for ventilation or other mechanical conditions such as the total length of the motor must also be taken into account. This geometric data can be found in the relevant machine documentation. Together with the system data a judgment can then be made as to whether a 1:1 exchange is possible or whether further measures are required.

If a SIMOTICS FD motor is being operated with an existing SINAMICS converter then this is generally possible. If, in this converter, the pulse patterns are stored in the software, optimized pulse patterns can be imported for SIMOTICS FD motors using a simple software update and the motor operated. However, if the pulse patterns are defined on a PC board, then the appropriate parts must be exchanged; this will incur a specific cost. The required measures are listed in the following table.

16th position of the Article No.	Parts / components to be replaced	SINAMICS				
.....-.....-... ■		G130	G150	S120	S120 CM	S150
3	**It is not necessary to retrofit** the hardware, as the pulse pattern is contained in the software.					
0	Control Unit	✓	✓	✓	✓	✓
1	Electronics Motor Module	✓	✓	✓	✓	✓
2	Electronics Active Line Module	–	–	✓	✓	✓
	Auxiliary function TM31	–	–	✓	✓	✓