Planning Guide 01/2003 Edition

simodrive & masterdrive

AC Servomotors 1FK7
SIMODRIVE 611/Masterdrive MC

SIEMENS

SIEMENS

SIMODRIVE 611
MASTERDRIVES MC

AC Servomotors
1FK7

Planning Guide

01.2003 Edition

SIMODRIVE® documentation

Printing history

Brief details of this edition and previous editions are listed below.

The status of each edition is shown by the code in the “Remarks” column.

Status code in the “Remarks” column:

A . . . . . New documentation.
B . . . . . Unrevised reprint with new Order No.
C . . . . . Revised edition with new status.

If factual changes have been made on the page since the last edition, this is indicated by a new edition coding in the header on that page.

Edition	Order No.	Remarks
01.03	6SN1197–0AD06–0BP0	**A**

This manual is included in the documentation available on CD–ROM (DOConCD)

Edition	Order No.	Remarks
11.03	6FC5298–6CA00–0BG3	**C**

For more information refer to the Internet under:
http://www.ad.siemens.de/simodrive

This publication was produced with Interleaf V 7.0

Other functions not decribed in this documentation might be executable in the control. This does not, however, represent an obligation to supply such functions with a new control or when servicing.

We have checked that the contents of this document correspond to the hardware and software described. Nonetheless, differences might exist and therefore we cannot guarantee that they are completely identical. The information contained in this document is, however, reviewed regularly and any necessary changes will be included in the next edition. We welcome suggestions for improvement.

Subject to change without prior notice.

Order No. 6SN1197-0AD06-0BP0
Printed in the Federal Republic of Germany

Siemens–Aktiengesellschaft

Foreword

Information on the SIMODRIVE documentation

This document is part of the technical customer documentation developed for SIMODRIVE. All of the documents are available individually. The documentation list, which includes all Advertising Brochures, Catalogs, Overviews, Short Descriptions, Operating Instructions and Technical Descriptions can be obtained from your local Siemens office with Order No, where they can be ordered from and price.

This Manual does not purport to cover all details or variations in equipment, nor to provide for every possible contingency to be met in connection with installation, operation or maintenance.

Furthermore, the contents of this document shall neither become part of nor modify any prior or existing agreement, commitment or relationship. The sales contract contains the entire obligation of Siemens. The warranty contained in the contract between the parties is the sole warranty of Siemens. Any statements contained herein neither create new warranties nor modify the existing warranty.

Structure of the documentation for 1FK and 1FT motors

The complete documentation for 1FK and 1FT motors includes 5 documents.
These can be ordered in paper form with the Order No. [MLFB]:
German 6SN1197–0AC20–0AP0
English 6SN1197–0AC20–0BP0

Each document can also be ordered separately:
Order No. [MLFB] for ”General Section” (German): 6SN1197–0AD07–0AP0
Order No. [MLFB] for ”1FK7 Motor Section” (German): 6SN1197–0AD06–0AP0
Order No. [MLFB] for ”1FK6 Motor Section” (German): 6SN1197–0AD05–0AP0
Order No. [MLFB] for ”1FT6 Motor Section” (German): 6SN1197–0AD02–0AP0
Order No. [MLFB] for ”1FT5 Motor Section” (German): 6SN1197–0AD01–0AP0

Hotline

If you have any questions contact the following Hotline:

A&D Technical Supports Tel.: +49 (180) 50 50–222
Fax: +49 (180) 50 50–223
eMail: adsupport@siemens.com

For questions regarding the documentation (suggestions, corrections) please send a fax to the following number:
+49 (9131) 98–2176

Fax form: Refer to the response sheet at the end of the document

Definition of qualified personnel

For the purpose of this documentation and product labels, ”qualified personnel” are those personnel who are familiar with the installation, mounting, start–up and operation of the equipment and the hazards involved. They must have the following qualifications:

- Trained and authorized to energize, de–energize, clear, ground and tag circuits and equipment in accordance with established safety procedures.
- Trained in the proper care and use of protective equipment in accordance with established safety procedures.
- Trained in rendering first aid.

Explanation of the symbols

The following danger and warning concept is used in this document:

Danger

This symbol indicates that death, severe personal injury or substantial property damage **will** result if proper precautions are not taken.

Warning

This symbol indicates that death, severe personal injury or substantial property damage **can** result if proper precautions are not taken.

Caution

This symbol indicates that minor personal injury or material damage **can** result if proper precautions are not taken.

Caution

This warning notice (without warning triangle) means that a material damage **can** result if proper precautions are not taken.

Notice

This warning notice means that an undesired event or an undesired state **can** result if the appropriate notices are not observed.

Note

Observation of the Note text in this document is possibly advantageous.

Danger and warning information

Danger

- Start–up/commissioning is absolutely prohibited until it has been ensured that the machine, in which the components described here are to be installed, fulfills the regulations/specifications of the 98/37/EC Directive.
- Only appropriately qualified personnel may commission/start–up the SIMODRIVE units and the AC motors.
- This personnel must take into account the technical customer documentation belonging to this product and know and observe the specified danger and warning information.
- Operational electrical equipment and motors have parts and components which are at hazardous voltage levels.
- Hazardous axis motion can occur when working with the equipment.
- All work on the electrical equipment must be undertaken with the system in a no–voltage condition.
- SIMODRIVE units are designed for operation on line supplies grounded through a low ohmic path (TN line supplies).

Warning

- Perfect, safe and reliable operation of these units and motors assumes that they have been professionally transported, stored, mounted and installed as well as careful operator control and service.
- For special versions of the units and motors, the information in the associated catalogs and quotations applies.
- In addition to the danger and warning information supplied with the technical customer documentation, all of the relevant national, local and plant/specific regulations and specifications must be taken into account.

Caution

- The motors can have surface temperatures of over +80° C.
- Therefore, no temperature–sensitive parts or components e.g. cables or electronic components may be in contact with the motor or connected to the motor.
- When handling cables, the following must be observed
  - they must not be damaged
  - they must not be strained and
  - they must not come into contact with rotating components**.**

Caution

- SIMODRIVE drive units with AC motors are subject to a voltage test corresponding to EN 50178 as part of the routine test. In compliance with EN 60204-1, Section 19.4, when electrical equipment on industrial machines is being tested, all of the SIMODRIVE drive unit connections must be disconnected / withdrawn. This prevents the SIMODRIVE drive units from being destroyed/damaged.
- Motors should be connected–up according to the circuit diagram supplied. It is not permissible to directly connect motors to the three–phase line supply. If the motors were to be connected to the three–phase line supply, they would be destroyed.

Note

- In their operational state, SIMODRIVE drive units with three–phase motors fulfill, in dry operating areas, the low–voltage Directive 73/23/EEC.
- SIMODRIVE drive units with three–phase motors fulfill, in the configurations, specified in the associated EC Declaration of Conformance, the EMC Directive 89/336/EEC.

ESDS information

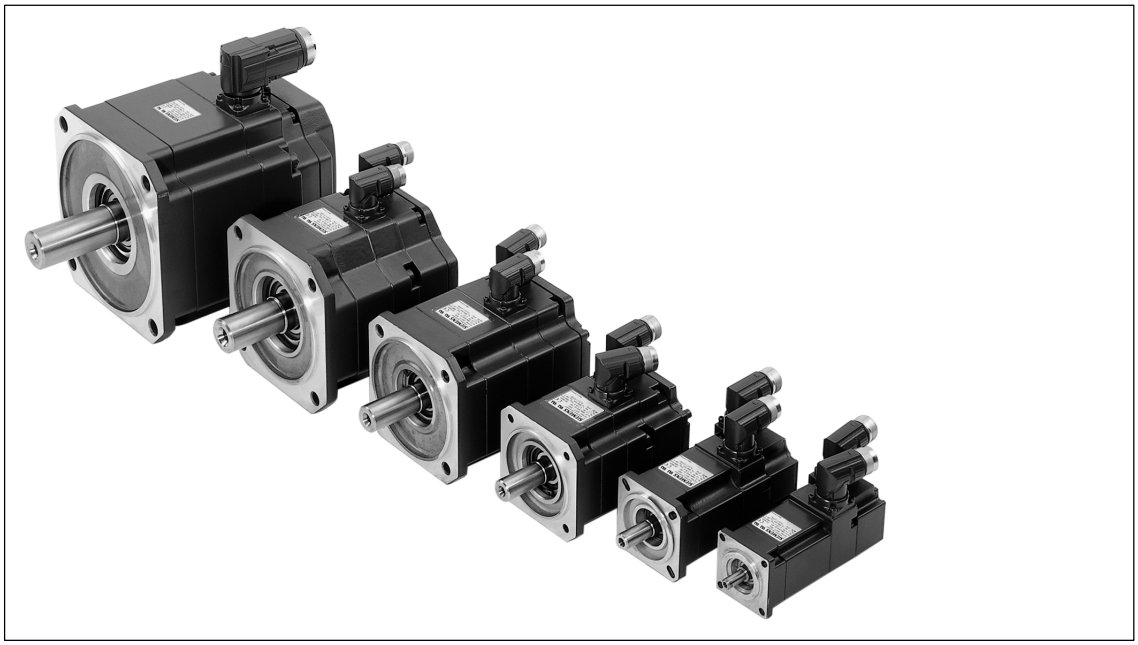
Caution

Electro**s**tatic **d**ischarge **s**ensitive devices (ESDS) are individual components, integrated circuits or boards, which can be damaged by electrostatic fields or electrostatic discharge.

Handling ESDS boards:

- The human body, working area and packing should be well grounded when handling electronic components!
- Electronic components may only be touched by people in ESDS areas with conductive flooring if
  - they are grounded with an ESDS bracelet
  - they are wearing ESDS shoes or ESDS shoe grounding strips.
- Electronic boards should only be touched when absolutely necessary.
- Electronic boards may not come into contact with plastics and clothing manufactured out of man–made fibers.
- Electronic boards may only be placed on conductive surfaces (table with ESDS surface, conductive ESDS foam rubber, ESDS packing bag, ESDS transport containers).
- Electronic boards may not be brought close to data terminals, monitors or television sets (minimum clearance to screen > 10 cm).
- Measuring work may only be carried out on the electronic boards if
  - the measuring device is grounded (e.g. via the protective conductor) or
  - for floating measuring equipment, the probe is briefly discharged before making measurements (e.g. a bare control housing is touched).

1FK7 Table of Contents



Motor Description

1

1.1 Characteristics

Applications for 1FK7 CT and 1FK7 HD

The 1FK7 CT series was essentially developed for applications involving robots, handling systems, milling and laser machines, production machines and auxiliary axes.

A reliable drive system is obtained in conjunction with Siemens drive converters.

The 1FK7 HD series is suitable for high–dynamic applications with low load moments of inertia. The main applications are for packaging, plastic and textile machines, which require a high dynamic response, as well as fast handling and feed systems.

Characteristics and benefits

- High standstill torque referred to the motor envelop dimensions
- Up to a 25% higher utilization with the same envelop dimensions in comparison to conventional motors. This means that the motors can be more easily integrated if space is restricted.
- This means that plants and machines can be designed to be more compact.
- DC link voltages up to 740 V can be used without de–rating.

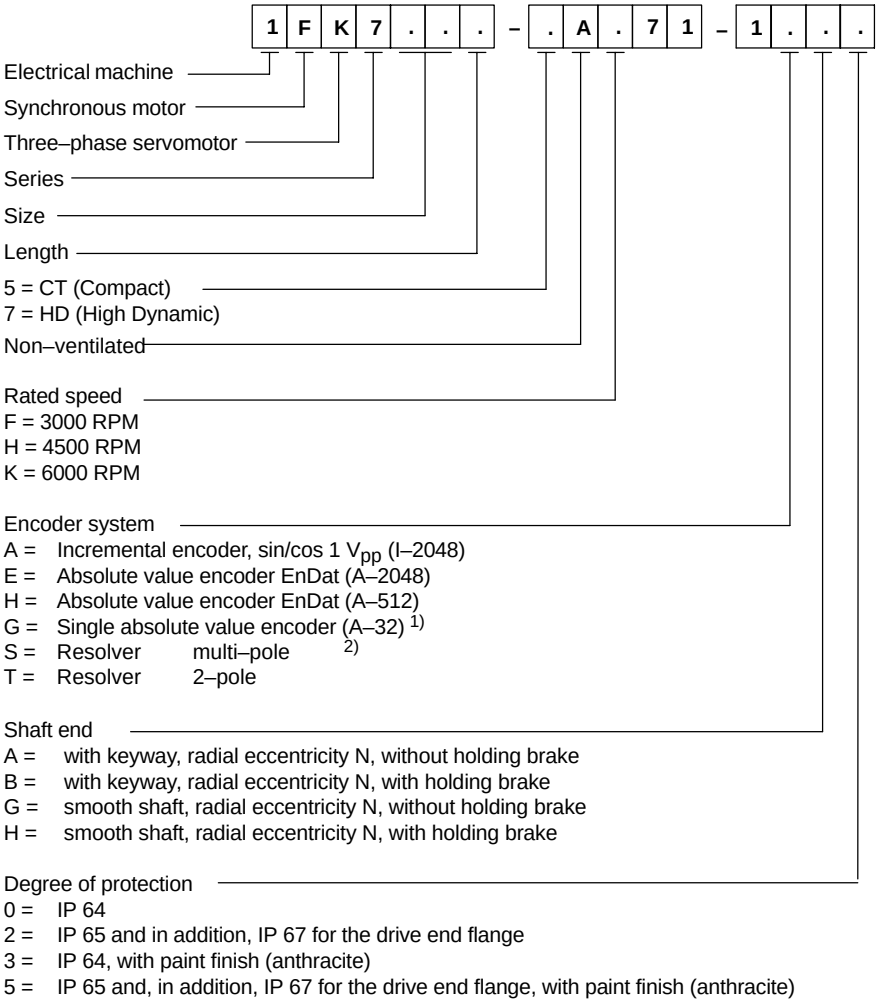
1.2 Order designation

Structure of the order designation

The order designation comprises a combination of digits and letters. It is structured using three hyphenated blocks.

The motor type is defined in the 1st block Additional features are described in the 2nd and 3rd blocks.

Explanation of the order designation



1) Not for shaft heights 28 and 36
2) The encoder pole number corresponds to that of the motor

1.3 Technical version 1FK7 – motor

Table 1-1 Version features 1FK7

Technical features	Version
Motor type	Permanent–magnet synchronous motor; AC servomotor
Type of construction (acc. to EN 60034-7; IEC 60034-7)	IM B5 (IM V1, IM V3)
Degree of protection (acc. to EN 60034-5; IEC 60034-5)	IP 64, (option, refer to Table 1-2)
Cooling (acc. to EN 60034-6; IEC 60034-6)	Non–ventilated
Thermal motor protection (acc. to EN 60034–11, IEC 60034-11)	KTY84 temperature sensor in the stator winding
Shaft end (acc. to DIN 748-3; IEC 60072-1)	Cylindrical; without keyway and without key tolerance field k6, (option, refer to Table 1-2)
Radial eccentricity, concentricity and axial eccentricity (acc. to DIN 42955, IEC 60072-1)	Tolerance N (normal)
Vibration severity (acc. to EN 60034-14, IEC 60034-14)	Level N (normal)
Bearings	Roller bearings with permanent grease lubrication (lubricated for the bearing lifetime)
Sound pressure level, max. EN 21680	1FK703: 55 dB (A) 1FK704: 55 dB (A) 1FK706: 65 dB (A) 1FK708: 70 dB (A) 1FK710: 70 dB (A)
Stator winding insulation (acc. to EN 60034-1, IEC 60034-1)	Insulating material class F permits a winding temperature rise of ΔT = 100 K for an ambient temperature of +40 °C
Installation height above sea level (acc. to EN 60034–1, IEC 60034–1)	≤ 1000 m above sea level, otherwise de–rating 2000 m factor 0.94 2500 m factor 0.9
Magnetic material	Rare earth material
Electr. connection	Connector for power and encoder signals which can be rotated
Integrated speed encoder	Optical encoder: • Incremental encoder, sin/cos 1 V_{pp} (I–2048) • Single absolute value encoder (A–32) 1) • Absolute value encoder EnDat (A–2048 and A–512) 1) • Resolver, two–pole/multi–pole For more detailed information, refer to the Section, Encoders.
Rating plate	A rating plate is supplied loose with all motors

1) When an absolute value encoder is used, the rated torque is reduced by 10% (refer to the Table, Technical Data)

1.4 Technical Version, options

Table 1-2 Option

Technical features	Version
Degree of protection (acc. to EN 60034-5, IEC 60034-5)	IP 65, in addition, IP 67 for the drive end flange
Integrated/mounted components	• Holding brake; 24V supply voltage ±10% (acc. to DIN 0580 7/79) • Planetary gearbox (requirement: Smooth shaft (no keyway))
Shaft end (acc. to EN 60034–14, IEC 60034–14)	Cylindrical; with keyway and key; Tolerance field k6 (half key balancing)
Paint finish	Anthracite (similar to RAL 7016) The motors must be ordered with a special paint finish if they are to be used in sub–tropical regions and if they are to be transported by sea. This paint finish prevents the stator core from corroding.

1.5 Technical data

Table 1-3 Technical data 1FK7 CT and 1FK7 HD; 100K values are specified in the Table

n_N [RPM]	M_0 [Nm]	M_N [Nm]	M_N 4) [Nm]	Motor type 1FK7–	Motor current I_0 3) [A]	Rated converter current 3) [A]	Connec-tor size	Cross–section 1) [mm²]	Cable type 6FX□002– 5)
1FK7 CT									
3000	3.0	2.6	2.3	042–5AF71	2.2	3	1	4 x 1.5	5□A01–1□□0
3000	6.0	4.7	4.2	060–5AF71	4.5	5	1	4 x 1.5	5□A01–1□□0
3000	11.0	7.3	6.5	063–5AF71	8.0	9	1	4 x 1.5	5□A01–1□□0
3000	8.0	6.8	6.1	080–5AF71	4.8	5	1	4 x 1.5	5□A01–1□□0
3000	16.0	10.5	9.4	083–5AF71	10.4	18	1	4 x 1.5	5□A01–1□□0
3000	18.0	12.0	10.8	100–5AF71	11.2	18	1	4 x 1.5	5□A01–1□□0
3000	27.0	15.5	13.9	101–5AF71	19.0	18	1.5	4 x 2.5	5□A31–1□□0
3000	36.0	14.0	12.6	103–5AF71	27.5	28	1.5	4 x 4	5□A41–1□□0
4500	6.0	3.7	3.3	060–5AH71	6.2	9	1	4 x 1.5	5□A01–1□□0
4500	11.0	3.0	2.7	063–5AH71	12.0	18	1	4 x 1.5	5□A01–1□□0
4500	8.0	4.5	4.0	080–5AH71	7.4	9	1	4 x 1.5	5□A01–1□□0
4500	16.0	3.0	2.7	083–5AH71	15.0	18	1	4 x 1.5	5□A01–1□□0
6000	0.85	0.6	0.45	022–5AK71	1.8	3	1	4 x 1.5	5□A01–1□□0
6000	1.1	0.8	0.6	032–5AK71	1.7	3	1	4 x 1.5	5□A01–1□□0
6000	1.6	1.1	1.0	040–5AK71	2.25	3	1	4 x 1.5	5□A01–1□□0
6000	3.0	1.5	1.35	042–5AK71	4.4	5	1	4 x 1.5	5□A01–1□□0
1FK7 HD 6)									
3000	4.0	3.5	3.2	044–7AF71	4.5	5	1	4 x 1.5	5□A01–1□□0
3000	6.4	5.4	4.9	061–7AF71	6.1	9	1	4 x 1.5	5□A01–1□□0
3000	12	8.0	7.2	064–7AF71	11.0	18	1	4 x 1.5	5□A01–1□□0
3000	14	8.0	7.2	082–7AF71	10.6	18	1	4 x 1.5	5□A01–1□□0
3000	22	6.5	5.8	085–7AF71	22.5	28	1.5	4 x 4.0	5□A41–1□□0
4500	3.1	2.6	2.3	043–7AH71	4.5	5	1	4 x 1.5	5□A01–1□□0
4500	6.4	4.3	3.9	061–7AH71	8.0	9	1	4 x 1.5	5□A01–1□□0
4500	12	5.0	4.5	064–7AH71	15.0	18	1	4 x 1.5	5□A01–1□□0
6000	1.3	0.9	0.67	033–7AK71	2.2	3	1	4 x 1.5	5□A01–1□□0
6000	3.1	2.0	1.8	043–7AK71	6.4	9	1	4 x 1.5	5□A01–1□□0
6500	4.0	3.0	2.7	044–7AH71	6.3	9	1	4 x 1.5	5□A01–1□□0

without brake cable: without overall shield A
with overall shield C
with brake cable: without overall shield B
with overall shield D

Lengths 2) (examples)

5 m	AF
10 m	BA
15 m	BF
18 m	BJ
25 m	CF

Cables are not included with the motors;
these cables must be separately ordered.

1) Designed for I_{rms} (100 K); ambient temperature 40 °C; PVC–insulated cable; brake connection 2 x 1 mm².
2) Cables can be sold by the meter; refer to the documentation "General Section" for the length code.
3) The specified values are RMS values
4) With absolute value encoder (due to the max. encoder temperature)
5) 8 = MOTION-CONNECT 800, 5 = MOTION-CONNECT 500; technical data, refer to Catalog NC Z
6) 1FK7 HD motors are equipped with spring–operated brakes. A slight clicking noise may be heard at low speeds due to the inherent design.

1.6 Armature short–circuit braking

The description of the mode of operation of armature short–circuit braking is described in the documentation ”General Section”.

Dimensioning the brake resistors for optimum short–circuit braking

The correct dimensioning ensures an optimum braking time. The braking torques which are obtained are listed in the following table. Data is valid for braking from the rated speed. If the drive is braked from another speed, then the braking time **cannot** be proportionally reduced. However, longer braking times cannot occur (refer to the documentation ”General Section”).

Table 1-4 Resistor braking for 1FK7 CT and 1FK7 HD

Motor type	External brake resistor R_{opt} [Ω]	Average braking torque $M_{br\ rms}$[Nm]		Max. braking torque $M_{br\ max}$ [Nm]	rms braking current $I_{br\ rms}$ [A]	
		without external brake resistor	with external brake resistor		without external brake resistor	with external brake resistor
1FK7 CT						
1FK7022-5AK71	8.5	0.9	1.2	1.5	4.6	4.2
1FK7032-5AK71	11.6	1.0	1.3	1.7	4.4	4.0
1FK7040-5AK71	18.1	0.5	1.0	1.2	3.5	3.1
1FK7042-5AF71	13.1	1.7	2.5	3.1	4.2	3.8
1FK7042-5AK71	7.2	1.2	2.7	3.3	9.0	8.1
1FK7060-5AF71	7.8	2.2	4.5	5.5	7.9	7.1
1FK7060-5AH71	5.9	1.9	4.8	6.0	11.9	10.7
1FK7063-5AF71	4.2	4.1	9.1	11.3	15.6	14.0
1FK7063-5AH71	2.7	3.5	9.6	12.0	25.0	22.3
1FK7080-5AF71	7.8	2.9	6.9	8.6	10.1	9.0
1FK7080-5AH71	5.5	2.0	6.7	8.4	14.9	13.3
1FK7083-5AF71	3.4	5.6	14.4	17.9	22.3	19.9
1FK7083-5AH71	2.6	3.8	14.2	17.6	31.8	28.5
1FK7100-5AF71	4.1	4.2	13.4	16.6	19.9	17.8
1FK7101-5AF71	1.7	7.9	24.8	30.8	41.3	37.0
1FK7103-5AF71	1.2	10.1	33.9	42.2	59.2	53.0
1FK7 HD						
1FK7033–7AK71	13.4	0.6	1.1	1.4	4.1	3.7
1FK7043–7AH71	9.4	0.7	1.7	2.1	5.5	4.9
1FK7043–7AK71	7.8	0.4	1.3	1.7	6.4	5.8

Table 1-4 Resistor braking for 1FK7 CT and 1FK7 HD, continued

Motor type	**External brake resistor** R_{opt} [Ω]	**Average braking torque** $M_{br\ rms}$[Nm]		**Max. braking torque** $M_{br\ max}$ [Nm]	**rms braking current** $I_{br\ rms}$ [A]	
		without external brake resistor	**with** external brake resistor		**without** external brake resistor	**with** external brake resistor
1FK7044–7AF71	7.9	1.0	2.0	2.5	5.2	4.7
1FK7044–7AH71	7.0	0.8	2.0	2.4	7.0	6.3
1FK7061–7AF71	8.7	0.9	3.0	3.7	6.4	5.8
1FK7061–7AH71	6.4	0.7	3.1	3.8	9.4	8.4
1FK7064–7AF71	4.7	1.6	5.6	7.0	12.0	10.8
1FK7064–7AH71	3.8	1.2	5.7	7.1	16.7	15.0
1FK7082–7AF71	5.9	2.0	7.1	8.8	12.1	10.8
1FK7085–7AF71	2.0	2.8	11.0	13.7	26.3	23.5

1.7 Electrical connections

Warning

The motors may not be directly connected to the line supply.

Connector assignment, power connector and signal connector on the motor

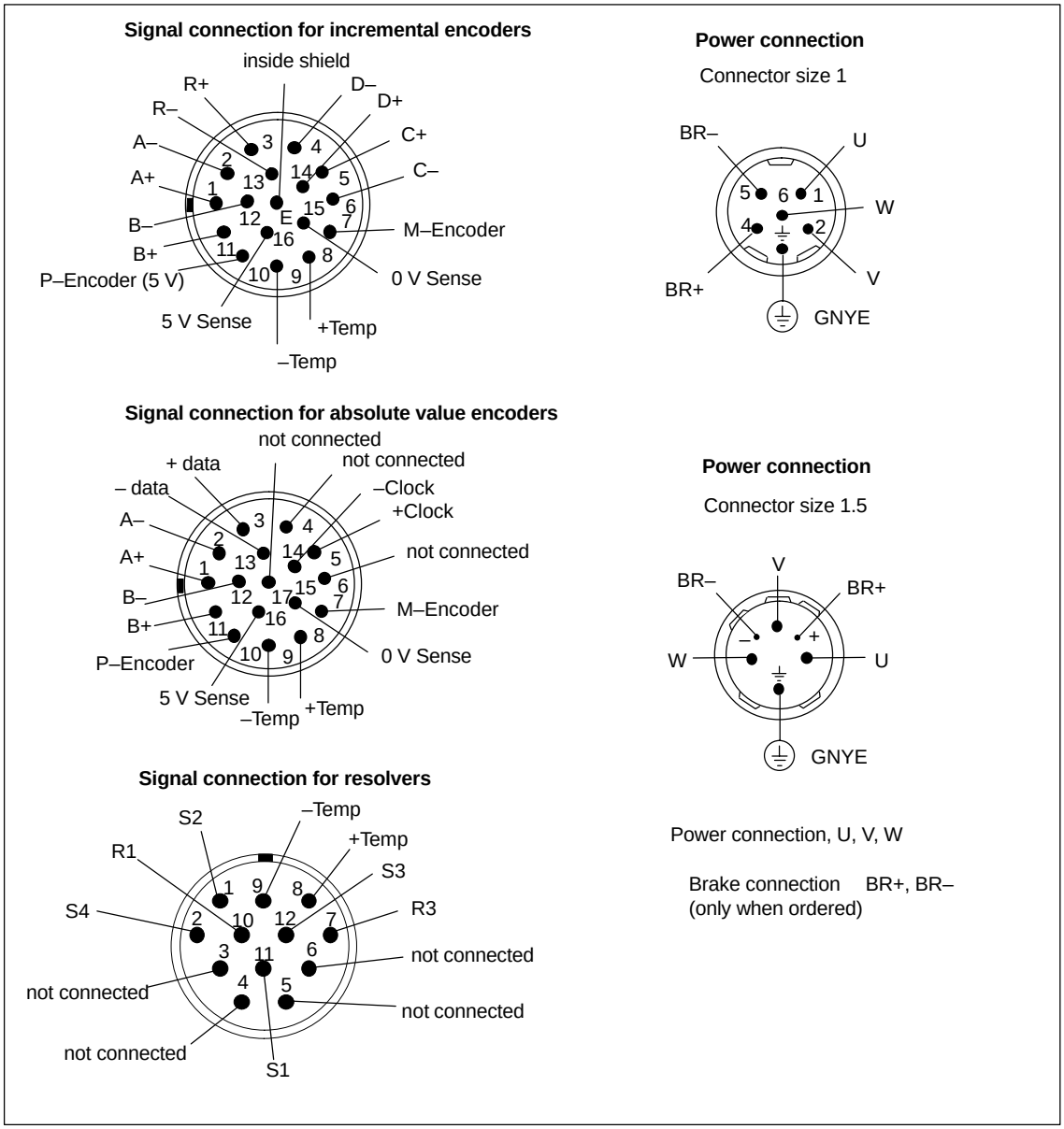


Fig. 1-1 Connector assignment: Power, brake, encoder, temperature sensor

Power connector and signal connectors can be rotated

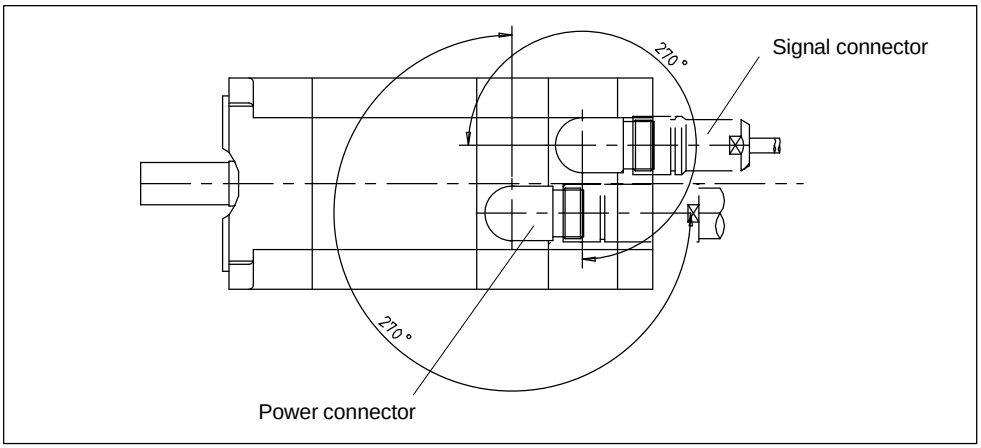


Fig. 1-2 Connector which can be rotated using as an example a 1FK706□ motor

How the connectors can be rotated (for all 1FK7 CT motors) can be taken from the dimension drawings.

- **Direction of rotation:**
  - When supplied: Power and signal connector, non–drive end
  - Power connector: 270° in the clockwise sense
  - Signal connector: Shaft heights 36 to 80: 180° counter–clockwise sense
    90° in the clockwise sense
    Shaft height 100: 90° counter–clockwise sense
    90° in the clockwise sense
- **Torques when rotating the connector:**
  - Power connector: Size 1: M_{max} = 8 Nm
    Size 1.5: M_{max} = 15 Nm
  - Signal connector: M_{max} = 8 Nm

  The connector should be rotated using the mating connector on the connector thread.

Note

- The permissible range through which the connectors are rotated may not be exceeded.
- A max. of 10 revolutions are permissible in order to guarantee the degree of protection.
- Max. rotating torques may not be exceeded.
- Secure the connecting cables against tension and bending.
- The motor connectors must be secured so that they cannot rotate any further.
- It is not permissible to apply a continuous force to the connectors.

1.8 Drive–out coupling

Ordering address, refer to the documentation ”General Section” or through the Internet www.ktr.com

Table 1-5 Assignment of the drive–out couplings to the motors

Shaft height	Rotex GS Type	Torques which can be transferred with an 80 or 92 Sh–A–GS annular gear	
		T_{KN} [Nm]	T_{Kmax} [Nm]
28	9	1.8	3.6
36	14	7.5	15
48	19/24	10	20
63	24/28	35	70
80	28/38	95	190
100	38/45	190	380

It may be necessary to use other annular gears (e.g. Shore hardness 80 Sh–A). They must be optimally harmonized with the mounted mechanical system.

Warning

The accelerating torque may not exceed the clamping torque of the coupling!

Notice

Siemens assumes not guarantee for the characteristics and quality of third–party products.

■

Space for your notes

Technical Data and Characteristics

2

Note

- For converter operation on a 480 V line supply, DC link voltages occur which are greater than 600 V. The motors are suitable for DC link voltages up to 740 V.
- Refer to the ”General Section” documentation for a description about the shift of the voltage limiting characteristics.
- The specified thermal S3 limiting characteristics are referred to ΔT = 100 K for a 1 min duty duration.

2.1 Speed–torque diagrams 1FK7 CT

Table 2-1 1FK7022 CT

Technical data	Code	Units	–5AK71	
Engineering data				
Rated speed	n_N	RPM	6000	
Pole number	2p		6	
Rated torque (100 K)	$M_{N\ (100\ K)}$	Nm	0.6	
Rated current	I_N	A	1.4	
Standstill torque (60K)	$M_{0\ (60\ K)}$	Nm	0.7	
Standstill torque (100K)	$M_{0\ (100\ K)}$	Nm	0.85	
Standstill current (60K)	$I_{0\ (60\ K)}$	A	1.5	
Standstill current (100K)	$I_{0\ (100\ K)}$	A	1.8	
Moment of inertia (with brake)	J_{mot}	10^{-4} kgm^2	0.35	
Moment of inertia (without brake)	J_{mot}	10^{-4} kgm^2	0.28	
Optimum operating point				
Optimum speed	n_{opt}	RPM	6000	
Optimum power	P_{opt}	kW	0.38	
Limiting data				
Max. perm. speed (mechan.)	n_{max}	RPM	10000	
Max. torque	M_{max}	Nm	3.4	
Peak current	I_{max}	A	7.5	
Physical constants				
Torque constant	k_T	Nm/A	0.46	
Voltage constant	k_E	V/1000 RPM	29	
Winding resistance at 20°C	R_{phase}	Ohm	4.2	
Rotating field inductance	L_D	mH	5.5	
Electrical time constant	T_{el}	ms	1.3	
Shaft torsional stiffness	c_t	Nm/rad	3000	
Mechanical time constant	T_{mech}	ms	1.7	
Thermal time constant	T_{th}	min	5	
Weight with brake	m	kg	2.0	
Weight without brake	m	kg	1.8	

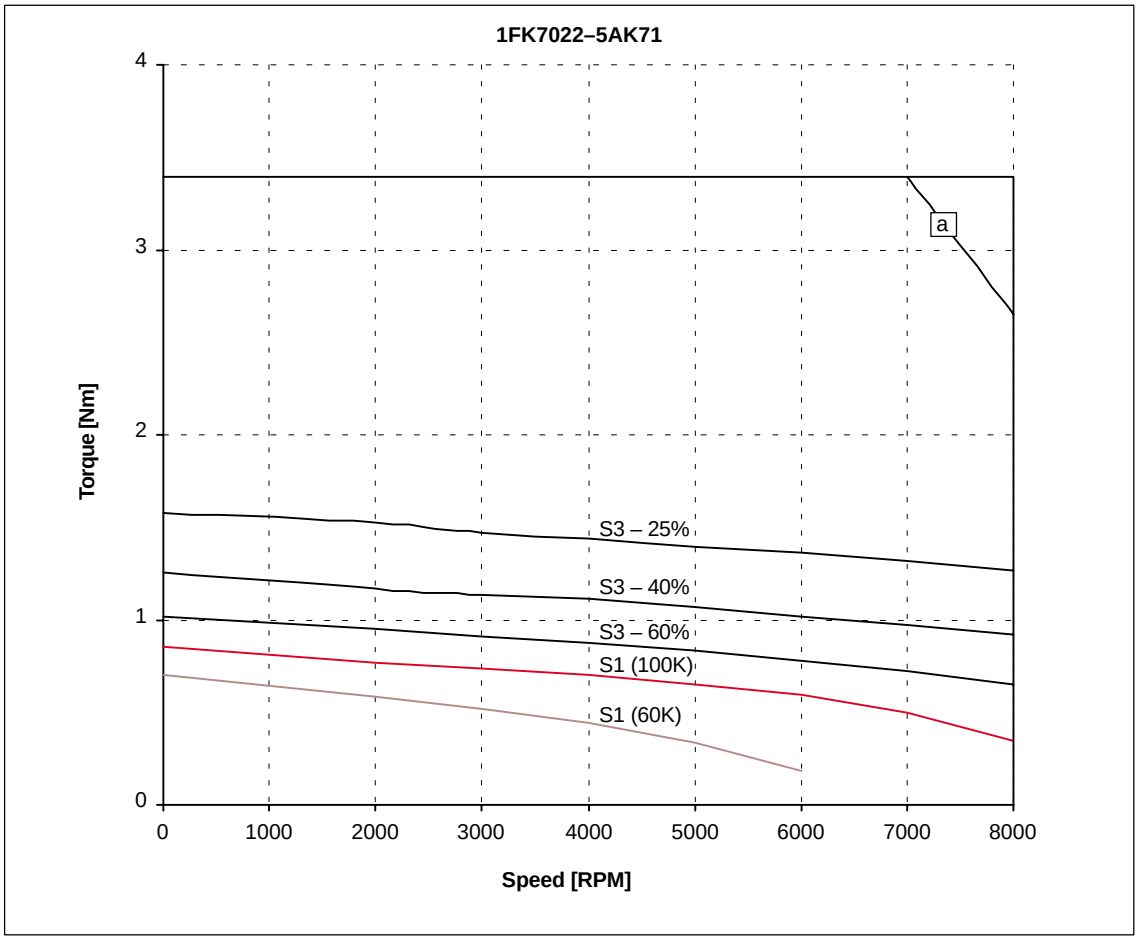


Fig. 2-1 Speed–torque diagram 1FK7022 CT

[a] MASTERDRIVES MC, $V_{DC\ link}$=540V (DC), V_{mot}=340V_{rms}
[b] SIMODRIVE 611 (UE), $V_{DC\ link}$=540V (DC) and MASTERDRIVES MC (AFE), $V_{DC\ link}$=600V (DC), V_{mot}=380V_{rms}
[c] SIMODRIVE 611 (IR), $V_{DC\ link}$=600V (DC), V_{mot}=425V_{rms}

Table 2-2 1FK7032 CT

Technical data	Code	Units	–5AK71	
Engineering data				
Rated speed	n_N	RPM	6000	
Pole number	2p		6	
Rated torque (100 K)	$M_{N\ (100\ K)}$	Nm	0.8	
Rated current	I_N	A	1.4	
Standstill torque (60K)	$M_{0\ (60\ K)}$	Nm	0.85	
Standstill torque (100K)	$M_{0\ (100\ K)}$	Nm	1.1	
Standstill current (60K)	$I_{0\ (60\ K)}$	A	1.4	
Standstill current (100K)	$I_{0\ (100\ K)}$	A	1.7	
Moment of inertia (with brake)	J_{mot}	10^{-4} kgm^2	0.69	
Moment of inertia (without brake)	J_{mot}	10^{-4} kgm^2	0.61	
Optimum operating point				
Optimum speed	n_{opt}	RPM	6000	
Optimum power	P_{opt}	kW	0.5	
Limiting data				
Max. perm. speed (mechan.)	n_{max}	RPM	10000	
Max. torque	M_{max}	Nm	4.5	
Peak current	I_{max}	A	7.5	
Physical constants				
Torque constant	k_T	Nm/A	0.66	
Voltage constant	k_E	V/1000 RPM	42	
Winding resistance at 20°C	R_{phase}	Ohm	5.2	
Rotating field inductance	L_D	mH	18.5	
Electrical time constant	T_{el}	ms	3.6	
Shaft torsional stiffness	c_t	Nm/rad	6500	
Mechanical time constant	T_{mech}	ms	2.2	
Thermal time constant	T_{th}	min	5	
Weight with brake	m	kg	3.0	
Weight without brake	m	kg	2.7	

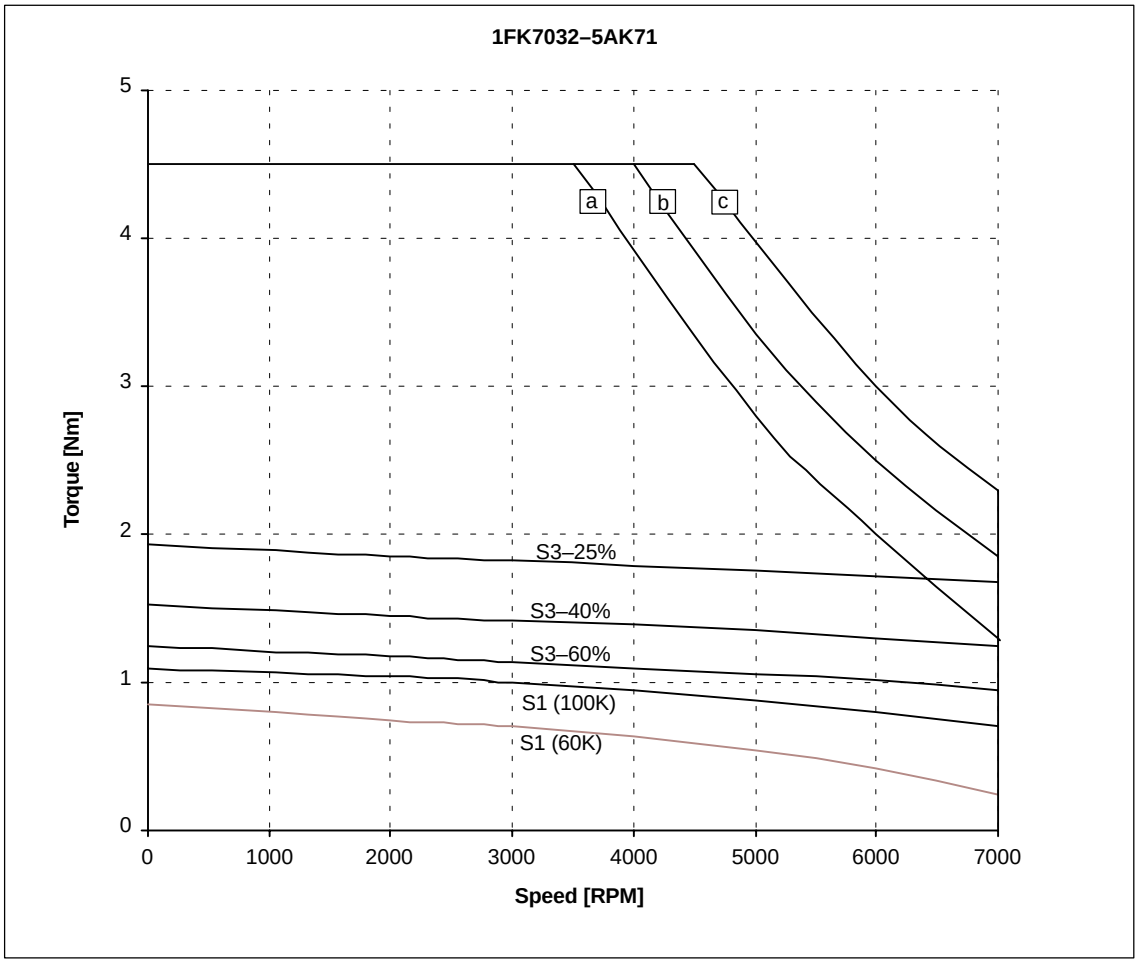


Fig. 2-2 Speed–torque diagram 1FK7032 CT

[a] MASTERDRIVES MC, $V_{DC\ link}$=540V (DC), V_{mot}=340V_{rms}
[b] SIMODRIVE 611 (UE), $V_{DC\ link}$=540V (DC) and MASTERDRIVES MC (AFE), $V_{DC\ link}$=600V (DC), V_{mot}=380V_{rms}
[c] SIMODRIVE 611 (IR), $V_{DC\ link}$=600V (DC), V_{mot}=425V_{rms}

Table 2-3 1FK7040 CT

Technical data	Code	Units	–5AK71	
Engineering data				
Rated speed	n_N	RPM	6000	
Pole number	2p		8	
Rated torque (100 K)	$M_{N\ (100\ K)}$	Nm	1.1	
Rated current	I_N	A	1.7	
Standstill torque (60K)	$M_{0\ (60\ K)}$	Nm	1.3	
Standstill torque (100K)	$M_{0\ (100\ K)}$	Nm	1.6	
Standstill current (60K)	$I_{0\ (60\ K)}$	A	1.8	
Standstill current (100K)	$I_{0\ (100\ K)}$	A	2.25	
Moment of inertia (with brake)	J_{mot}	10^{-4} kgm^2	2.41	
Moment of inertia (without brake)	J_{mot}	10^{-4} kgm^2	1.69	
Optimum operating point				
Optimum speed	n_{opt}	RPM	6000	
Optimum power	P_{opt}	kW	0.69	
Limiting data				
Max. perm. speed (mechan.)	n_{max}	RPM	9000	
Max. torque	M_{max}	Nm	5.1	
Peak current	I_{max}	A	7.7	
Physical constants				
Torque constant	k_T	Nm/A	0.68	
Voltage constant	k_E	V/1000 RPM	43	
Winding resistance at 20°C	R_{phase}	Ohm	3.3	
Rotating field inductance	L_D	mH	17	
Electrical time constant	T_{el}	ms	5.15	
Shaft torsional stiffness	c_t	Nm/rad	19000	
Mechanical time constant	T_{mech}	ms	3.62	
Thermal time constant	T_{th}	min	25	
Weight with brake	m	kg	4.0	
Weight without brake	m	kg	3.5	

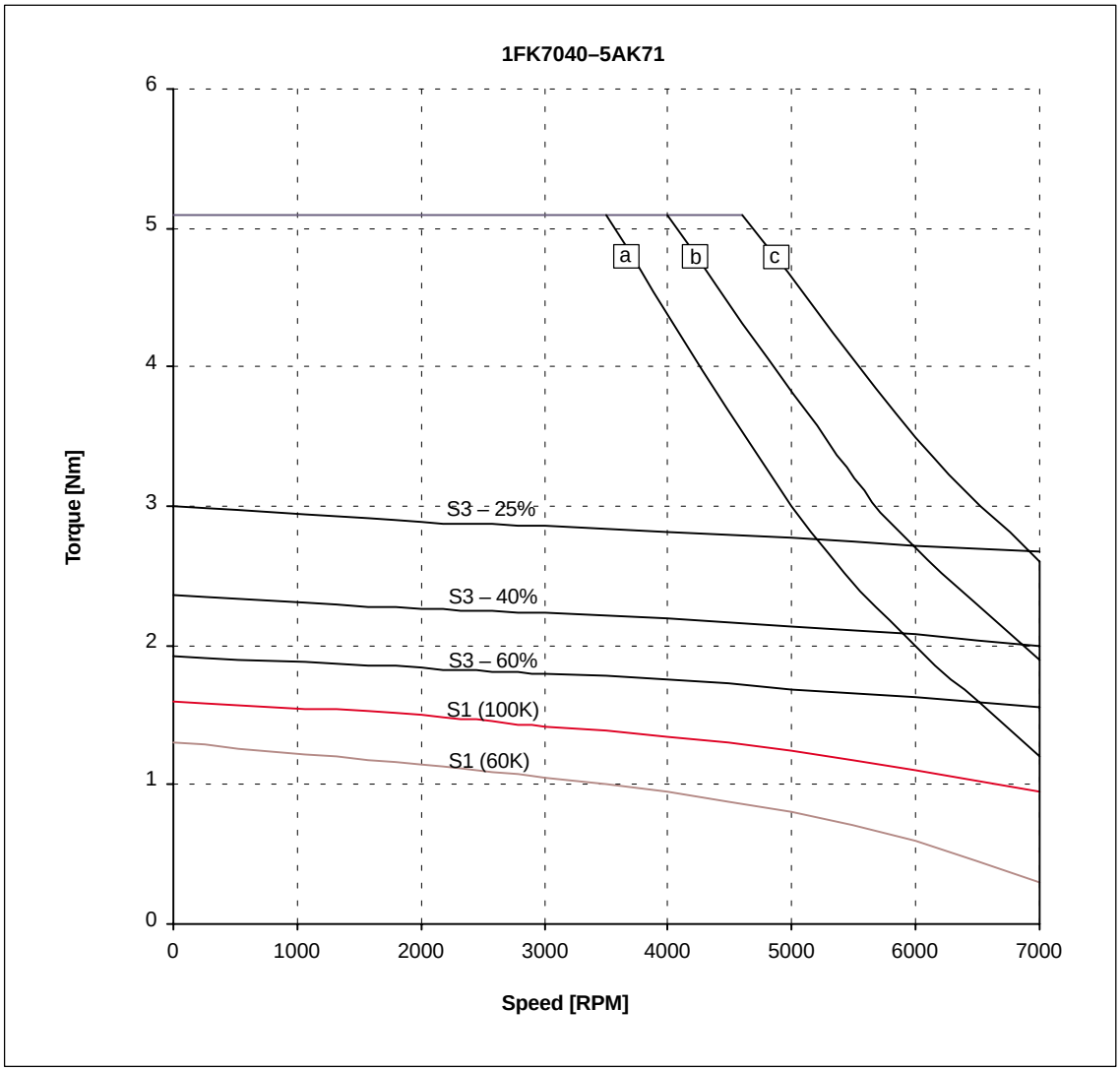
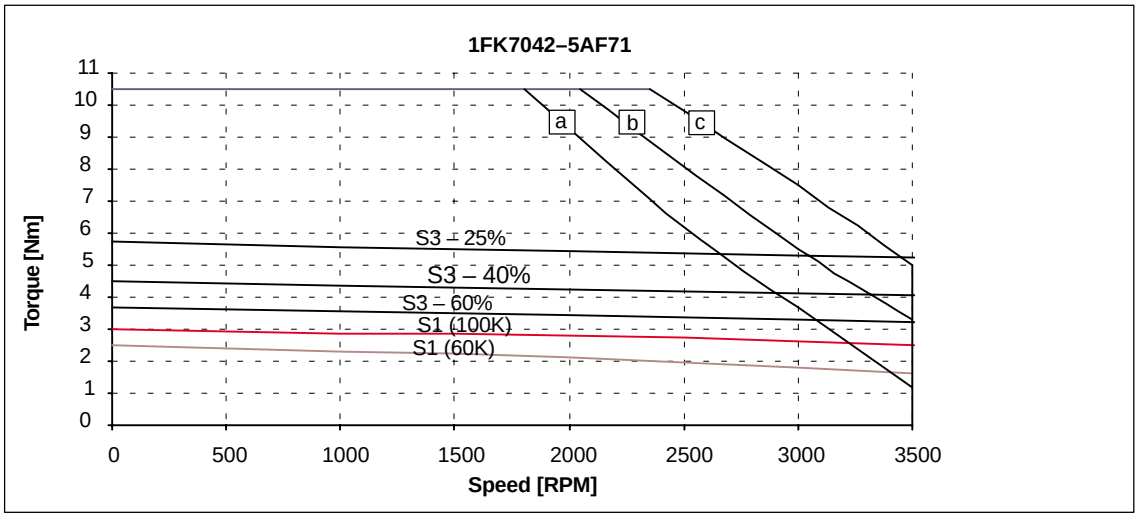


Fig. 2-3 Speed–torque diagram 1FK7040 CT

[a] MASTERDRIVES MC, $V_{DC\ link}$=540V (DC), V_{mot}=340V_{rms}
[b] SIMODRIVE 611 (UE), $V_{DC\ link}$=540V (DC) and MASTERDRIVES MC (AFE), $V_{DC\ link}$=600V (DC), V_{mot}=380V_{rms}
[c] SIMODRIVE 611 (IR), $V_{DC\ link}$=600V (DC), V_{mot}=425V_{rms}

Table 2-4 1FK7042 CT

Technical data	Code	Units	–5AF71	–5AK71
Engineering data				
Rated speed	n_N	RPM	3000	6000
Pole number	2p		8	8
Rated torque (100 K)	$M_{N\ (100\ K)}$	Nm	2.6	1.5
Rated current	I_N	A	1.95	2.45
Standstill torque (60K)	$M_{0\ (60\ K)}$	Nm	2.5	2.5
Standstill torque (100K)	$M_{0\ (100\ K)}$	Nm	3.0	3.0
Standstill current (60K)	$I_{0\ (60\ K)}$	A	1.8	3.6
Standstill current (100K)	$I_{0\ (100\ K)}$	A	2.2	4.4
Moment of inertia (with brake)	J_{mot}	10^{-4} kgm^2	3.73	3.73
Moment of inertia (without brake)	J_{mot}	10^{-4} kgm^2	3.01	3.01
Optimum operating point				
Optimum speed	n_{opt}	RPM	3000	5000
Optimum power	P_{opt}	kW	0.82	1.02
Limiting data				
Max. perm. speed (mechan.)	n_{max}	RPM	9000	9000
Max. torque	M_{max}	Nm	10.5	10.5
Peak current	I_{max}	A	7.35	15.3
Physical constants				
Torque constant	k_T	Nm/A	1.4	0.69
Voltage constant	k_E	V/1000 RPM	89	44
Winding resistance at 20°C	R_{phase}	Ohm	5.15	1.2
Rotating field inductance	L_D	mH	29	6.7
Electrical time constant	T_{el}	ms	5.6	5.6
Shaft torsional stiffness	c_t	Nm/rad	16000	16000
Mechanical time constant	T_{mech}	ms	2.37	2.27
Thermal time constant	T_{th}	min	35	35
Weight with brake	m	kg	5.4	5.4
Weight without brake	m	kg	4.9	4.9



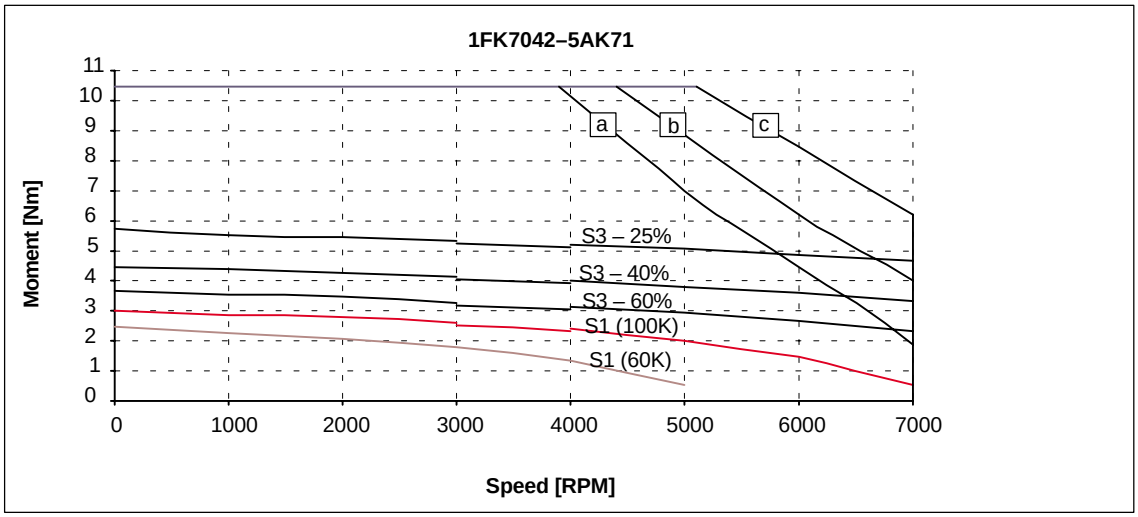
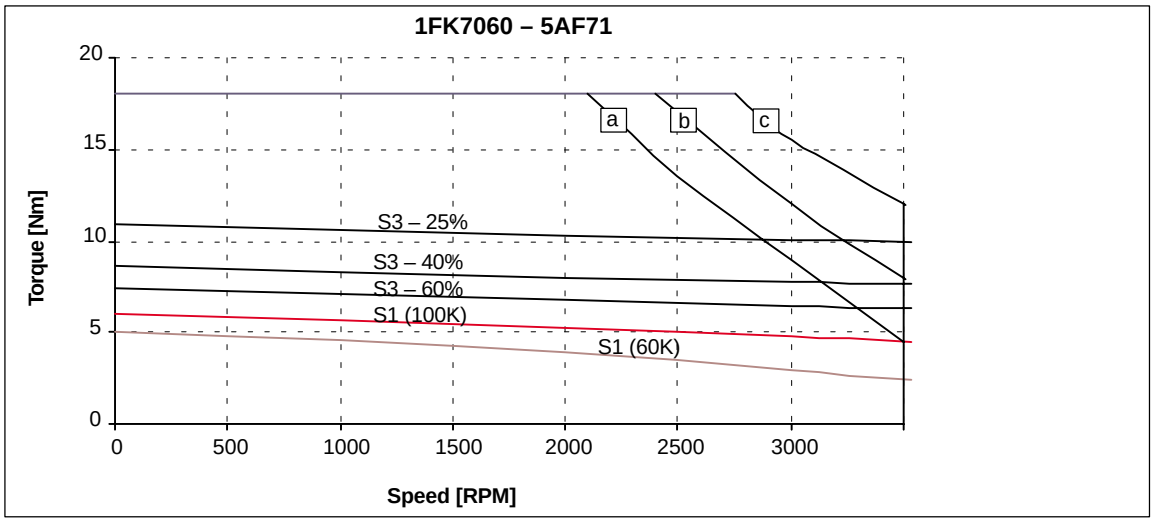


Fig. 2-4 Speed–torque diagram 1FK7042 CT

[a] MASTERDRIVES MC, $V_{DC\ link}$=540V (DC), V_{mot}=340V_{rms}
[b] SIMODRIVE 611 (UE), $V_{DC\ link}$=540V (DC) and MASTERDRIVES MC (AFE), $V_{DC\ link}$=600V (DC), V_{mot}=380V_{rms}
[c] SIMODRIVE 611 (IR), $V_{DC\ link}$=600V (DC), V_{mot}=425V_{rms}

Table 2-5 1FK7060 CT

Technical data	Code	Units	–5AF71	–5AH71
Engineering data				
Rated speed	n_N	RPM	3000	4500
Pole number	2p		8	8
Rated torque (100 K)	$M_{N\ (100\ K)}$	Nm	4.7	3.7
Rated current	I_N	A	3.7	4.1
Standstill torque (60K)	$M_{0\ (60\ K)}$	Nm	5.0	5.0
Standstill torque (100K)	$M_{0\ (100\ K)}$	Nm	6.0	6.0
Standstill current (60K)	$I_{0\ (60\ K)}$	A	3.7	5.1
Standstill current (100K)	$I_{0\ (100\ K)}$	A	4.5	6.2
Moment of inertia (with brake)	J_{mot}	10^{-4} kgm^2	10.2	10.2
Moment of inertia (without brake)	J_{mot}	10^{-4} kgm^2	7.95	7.95
Optimum operating point				
Optimum speed	n_{opt}	RPM	3000	4500
Optimum power	P_{opt}	kW	1.48	1.74
Limiting data				
Max. perm. speed (mechan.)	n_{max}	RPM	7200	7200
Max. torque	M_{max}	Nm	18	18
Peak current	I_{max}	A	15	19.5
Physical constants				
Torque constant	k_T	Nm/A	1.33	0.95
Voltage constant	k_E	V/1000 RPM	84.5	60.5
Winding resistance at 20°C	R_{phase}	Ohm	1.44	0.73
Rotating field inductance	L_D	mH	14.7	7.0
Electrical time constant	T_{el}	ms	10.2	9.6
Shaft torsional stiffness	c_t	Nm/rad	42000	42000
Mechanical time constant	T_{mech}	ms	1.94	1.93
Thermal time constant	T_{th}	min	30	30
Weight with brake	m	kg	8	8
Weight without brake	m	kg	7	7



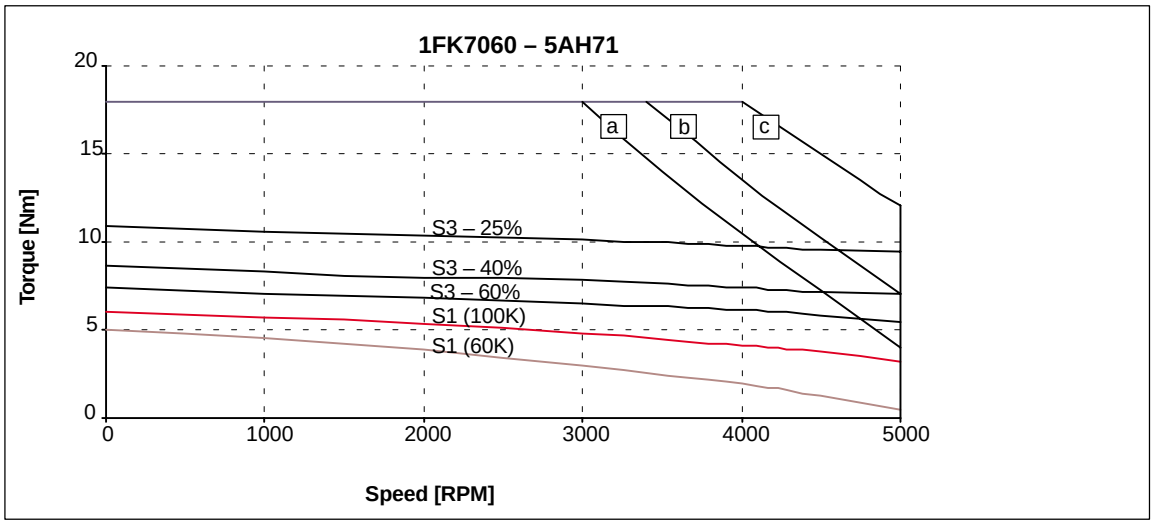
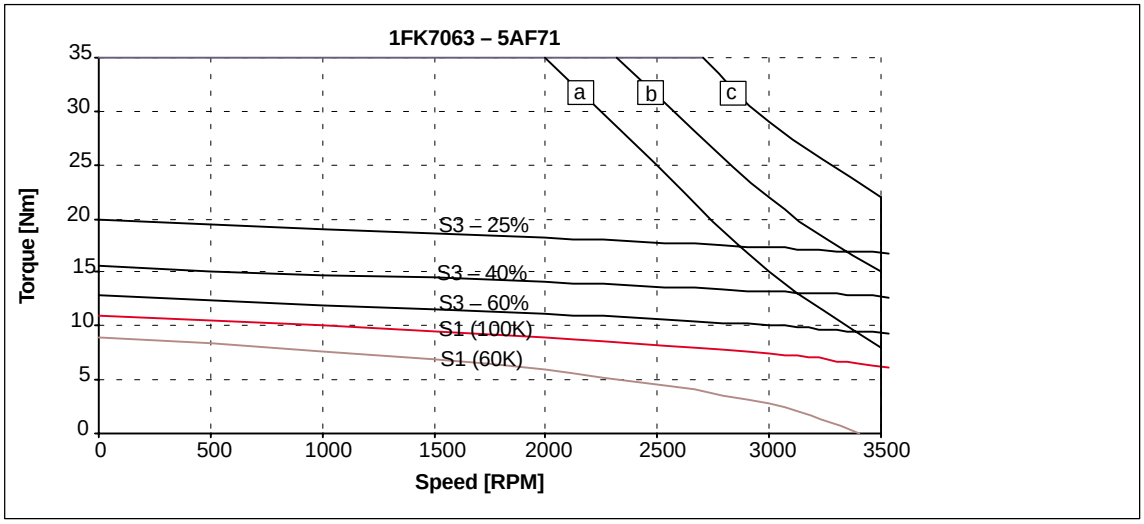


Fig. 2-5 Speed–torque diagram 1FK7060 CT

[a] MASTERDRIVES MC, $V_{DC\ link}$=540V (DC), V_{mot}=340V_{rms}
[b] SIMODRIVE 611 (UE), $V_{DC\ link}$=540V (DC) and MASTERDRIVES MC (AFE), $V_{DC\ link}$=600V (DC), V_{mot}=380V_{rms}
[c] SIMODRIVE 611 (IR), $V_{DC\ link}$=600V (DC), V_{mot}=425V_{rms}

Table 2-6 1FK7063 CT

Technical data	Code	Units	–5AF71	–5AH71
Engineering data				
Rated speed	n_N	RPM	3000	4500
Pole number	2p		8	8
Rated torque (100 K)	$M_{N\ (100\ K)}$	Nm	7.3	3
Rated current	I_N	A	5.6	3.8
Standstill torque (60K)	$M_{0\ (60\ K)}$	Nm	9.1	9.1
Standstill torque (100K)	$M_{0\ (100\ K)}$	Nm	11	11
Standstill current (60K)	$I_{0\ (60\ K)}$	A	6.6	9.9
Standstill current (100K)	$I_{0\ (100\ K)}$	A	8.0	12.0
Moment of inertia (with brake)	J_{mot}	10^{-4} kgm^2	17.3	17.3
Moment of inertia (without brake)	J_{mot}	10^{-4} kgm^2	15.1	15.1
Optimum operating point				
Optimum speed	n_{opt}	RPM	3000	3300
Optimum power	P_{opt}	kW	2.29	2.32
Limiting data				
Max. perm. speed (mechan.)	n_{max}	RPM	7200	7200
Max. torque	M_{max}	Nm	35	35
Peak current	I_{max}	A	28	42
Physical constants				
Torque constant	k_T	Nm/A	1.37	0.91
Voltage constant	k_E	V/1000 RPM	87.5	58
Winding resistance at 20°C	R_{phase}	Ohm	0.65	0.29
Rotating field inductance	L_D	mH	7.7	3.2
Electrical time constant	T_{el}	ms	11.8	11
Shaft torsional stiffness	c_t	Nm/rad	35000	35000
Mechanical time constant	T_{mech}	ms	1.56	1.58
Thermal time constant	T_{th}	min	35	35
Weight with brake	m	kg	12	12
Weight without brake	m	kg	11.5	11.5



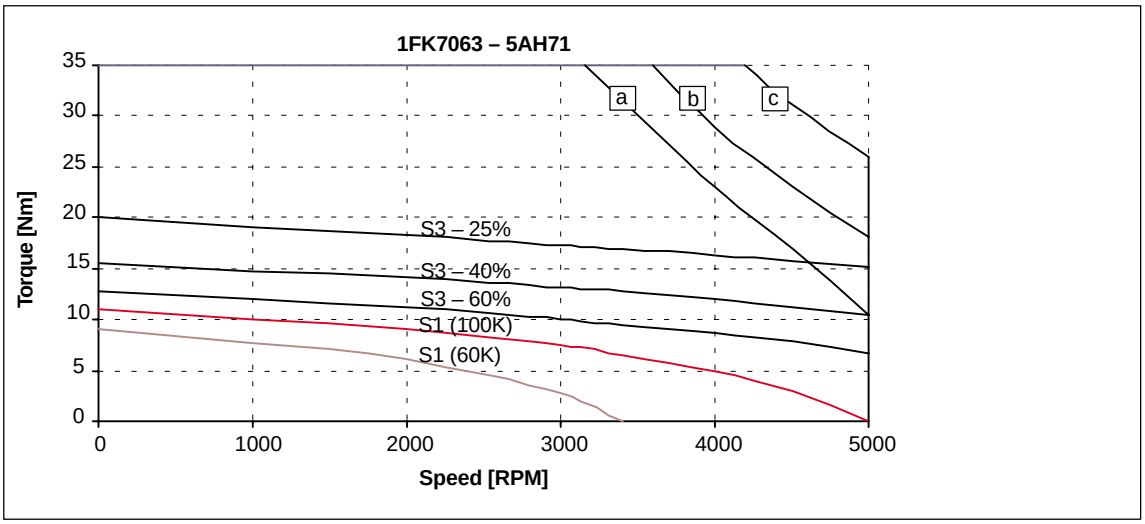
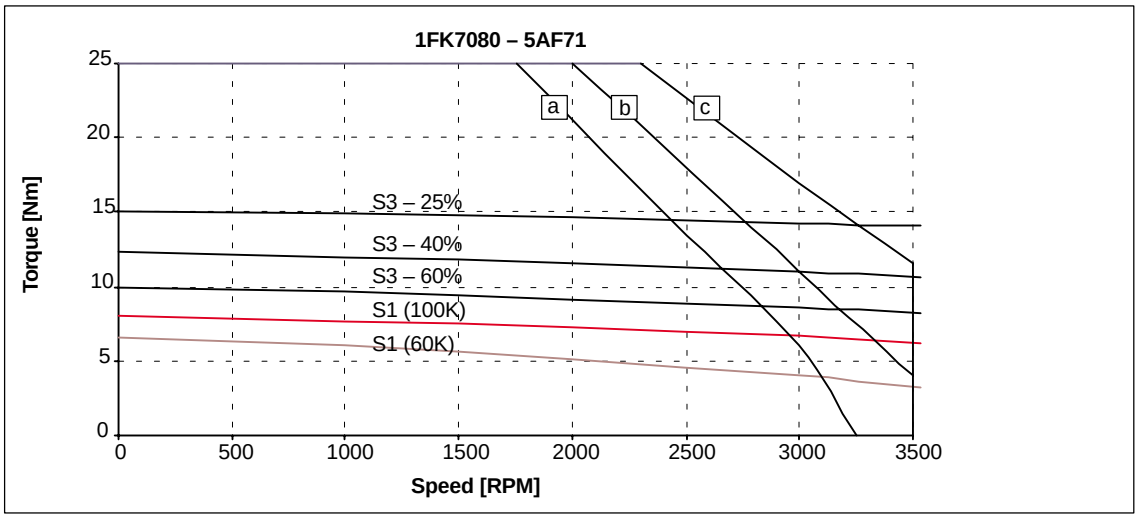


Fig. 2-6 Speed–torque diagram 1FK7063 CT

[a] MASTERDRIVES MC, $V_{DC\ link}$=540V (DC), V_{mot}=340V_{rms}
[b] SIMODRIVE 611 (UE), $V_{DC\ link}$=540V (DC) and MASTERDRIVES MC (AFE), $V_{DC\ link}$=600V (DC), V_{mot}=380V_{rms}
[c] SIMODRIVE 611 (IR), $V_{DC\ link}$=600V (DC), V_{mot}=425V_{rms}

Table 2-7 1FK7080 CT

Technical data	Code	Units	–5AF71	–5AH71
Engineering data				
Rated speed	n_N	RPM	3000	4500
Pole number	2p		8	8
Rated torque (100 K)	$M_{N\ (100\ K)}$	Nm	6.8	4.5
Rated current	I_N	A	4.4	4.7
Standstill torque (60K)	$M_{0\ (60\ K)}$	Nm	6.6	6.6
Standstill torque (100K)	$M_{0\ (100\ K)}$	Nm	8	8
Standstill current (60K)	$I_{0\ (60\ K)}$	A	4	6.1
Standstill current (100K)	$I_{0\ (100\ K)}$	A	4.8	7.4
Moment of inertia (with brake)	J_{mot}	10^{-4} kgm^2	18.1	18.1
Moment of inertia (without brake)	J_{mot}	10^{-4} kgm^2	15	15
Optimum operating point				
Optimum speed	n_{opt}	RPM	3000	4000
Optimum power	P_{opt}	kW	2.14	2.39
Limiting data				
Max. perm. speed (mechan.)	n_{max}	RPM	6000	6000
Max. torque	M_{max}	Nm	25	25
Peak current	I_{max}	A	18	25
Physical constants				
Torque constant	k_T	Nm/A	1.61	1.06
Voltage constant	k_E	V/1000 RPM	102.5	68.0
Winding resistance at 20°C	R_{phase}	Ohm	1.04	0.44
Rotating field inductance	L_D	mH	14.0	6.3
Electrical time constant	T_{el}	ms	13.5	14.3
Shaft torsional stiffness	c_t	Nm/rad	126000	126000
Mechanical time constant	T_{mech}	ms	1.78	1.76
Thermal time constant	T_{th}	min	30	30
Weight with brake	m	kg	12.5	12.5
Weight without brake	m	kg	10	10



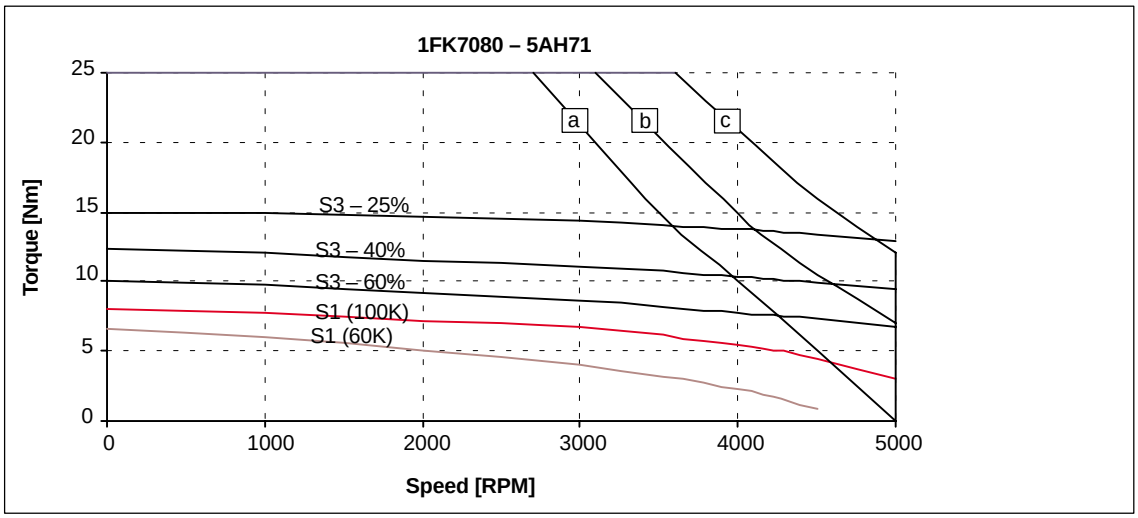
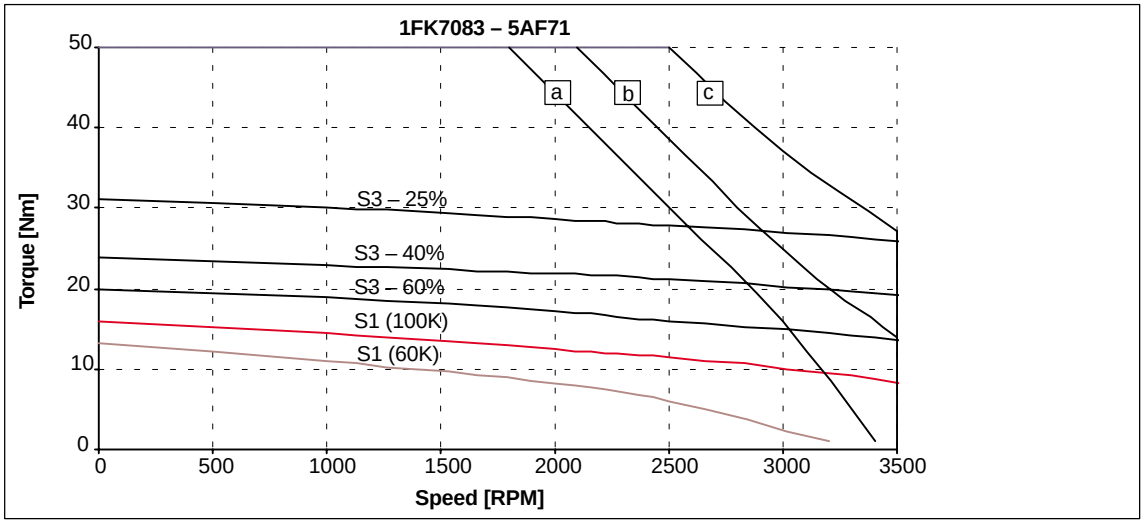


Fig. 2-7 Speed–torque diagram 1FK7080 CT

[a] MASTERDRIVES MC, $V_{DC\ link}$=540V (DC), V_{mot}=340V_{rms}
[b] SIMODRIVE 611 (UE), $V_{DC\ link}$=540V (DC) and MASTERDRIVES MC (AFE), $V_{DC\ link}$=600V (DC), V_{mot}=380V_{rms}
[c] SIMODRIVE 611 (IR), $V_{DC\ link}$=600V (DC), V_{mot}=425V_{rms}

Table 2-8 1FK7083 CT

Technical data	Code	Units	–5AF71	–5AH71
Engineering data				
Rated speed	n_N	RPM	3000	4500
Pole number	2p		8	8
Rated torque (100 K)	$M_{N\ (100\ K)}$	Nm	10.5	3
Rated current	I_N	A	7.4	3.6
Standstill torque (60K)	$M_{0\ (60\ K)}$	Nm	13.3	13.3
Standstill torque (100K)	$M_{0\ (100\ K)}$	Nm	16	16
Standstill current (60K)	$I_{0\ (60\ K)}$	A	8.6	12.4
Standstill current (100K)	$I_{0\ (100\ K)}$	A	10.4	15
Moment of inertia (with brake)	J_{mot}	10^{-4} kgm^2	35.9	35.9
Moment of inertia (without brake)	J_{mot}	10^{-4} kgm^2	27.3	27.3
Optimum operating point				
Optimum speed	n_{opt}	RPM	3000	3000
Optimum power	P_{opt}	kW	3.3	3.3
Limiting data				
Max. perm. speed (mechan.)	n_{max}	RPM	6000	6000
Max. torque	M_{max}	Nm	50	50
Peak current	I_{max}	A	37	52
Physical constants				
Torque constant	k_T	Nm/A	1.52	1.05
Voltage constant	k_E	V/1000 RPM	97	67
Winding resistance at 20°C	R_{phase}	Ohm	0.4	0.17
Rotating field inductance	L_D	mH	6.0	2.9
Electrical time constant	T_{el}	ms	15	17
Shaft torsional stiffness	c_t	Nm/rad	105000	105000
Mechanical time constant	T_{mech}	ms	1.41	1.26
Thermal time constant	T_{th}	min	35	35
Weight with brake	m	kg	16.5	16.5
Weight without brake	m	kg	14	14



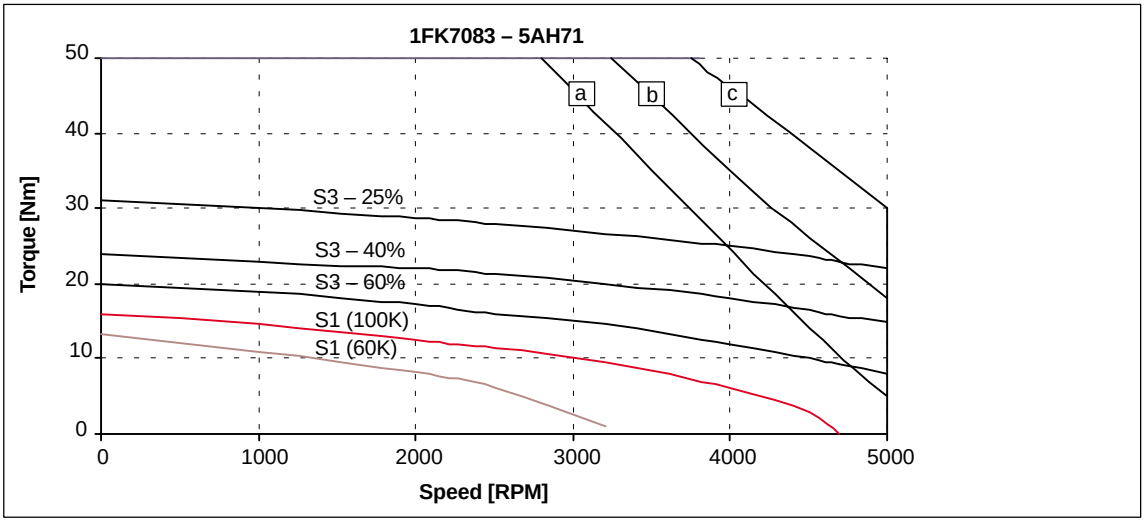


Fig. 2-8 Speed–torque diagram 1FK7083 CT

[a] MASTERDRIVES MC, $V_{DC\ link}$=540V (DC), V_{mot}=340V_{rms}
[b] SIMODRIVE 611 (UE), $V_{DC\ link}$=540V (DC) and MASTERDRIVES MC (AFE), $V_{DC\ link}$=600V (DC), V_{mot}=380V_{rms}
[c] SIMODRIVE 611 (IR), $V_{DC\ link}$=600V (DC), V_{mot}=425V_{rms}

Table 2-9 1FK7100 CT

Technical data	Code	Units	–5AF71	
Engineering data				
Rated speed	n_N	RPM	3000	
Pole number	2p		8	
Rated torque (100 K)	$M_{N\ (100\ K)}$	Nm	12	
Rated current	I_N	A	8	
Standstill torque (60K)	$M_{0\ (60\ K)}$	Nm	15	
Standstill torque (100K)	$M_{0\ (100\ K)}$	Nm	18	
Standstill current (60K)	$I_{0\ (60\ K)}$	A	9.2	
Standstill current (100K)	$I_{0\ (100\ K)}$	A	11.2	
Moment of inertia (with brake)	J_{mot}	10^{-4} kgm^2	63.9	
Moment of inertia (without brake)	J_{mot}	10^{-4} kgm^2	55.3	
Optimum operating point				
Optimum speed	n_{opt}	RPM	3000	
Optimum power	P_{opt}	kW	3.77	
Limiting data				
Max. perm. speed (mechan.)	n_{max}	RPM	5000	
Max. torque	M_{max}	Nm	55	
Peak current	I_{max}	A	37	
Physical constants				
Torque constant	k_T	Nm/A	1.59	
Voltage constant	k_E	V/1000 RPM	101	
Winding resistance at 20°C	R_{phase}	Ohm	0.34	
Rotating field inductance	L_D	mH	7.0	
Electrical time constant	T_{el}	ms	20.5	
Shaft torsional stiffness	c_t	Nm/rad	184000	
Mechanical time constant	T_{mech}	ms	2.23	
Thermal time constant	T_{th}	min	35	
Weight with brake	m	kg	21.5	
Weight without brake	m	kg	19	

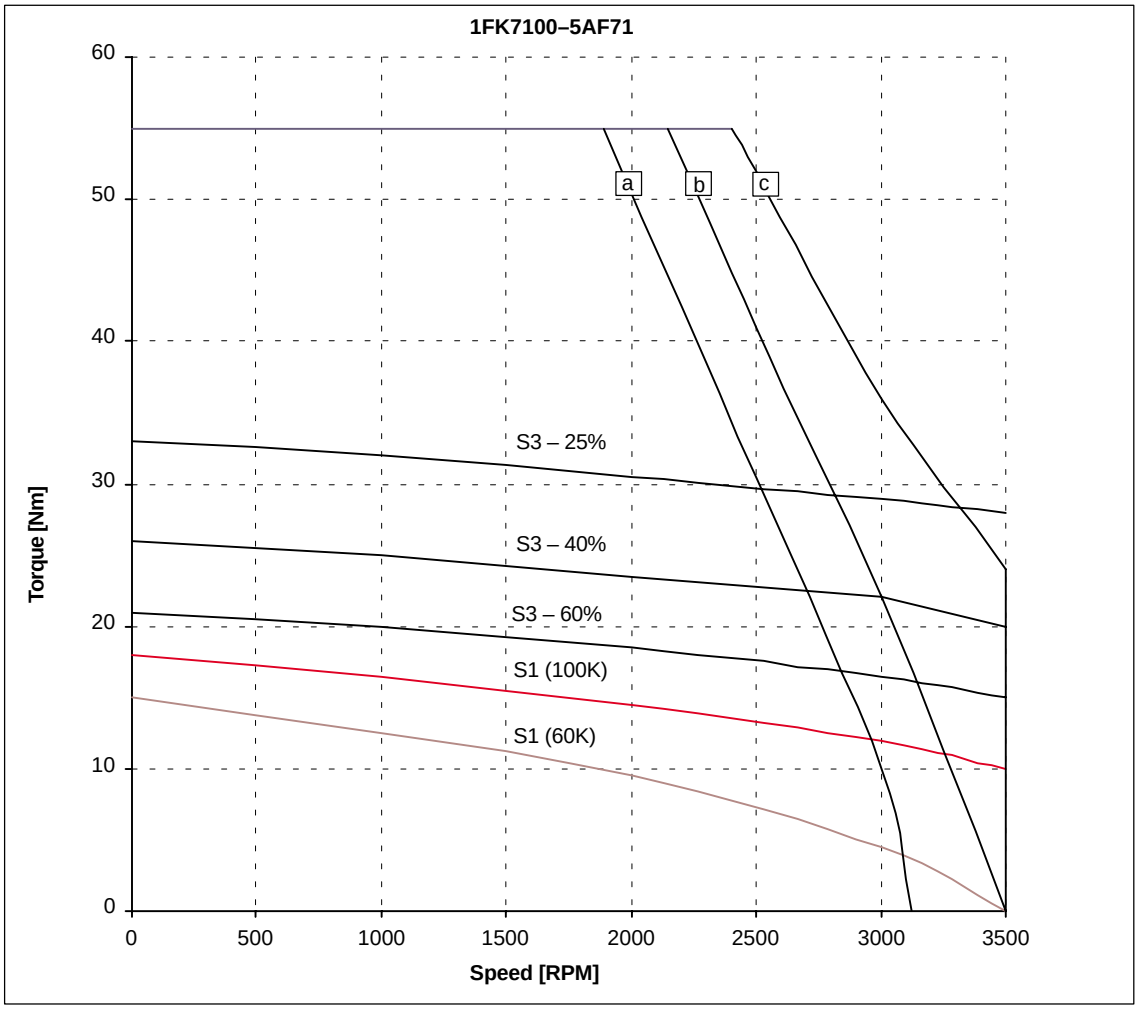


Fig. 2-9 Speed–torque diagram 1FK7100 CT

[a] MASTERDRIVES MC, $V_{DC\ link}$=540V (DC), V_{mot}=340V_{rms}
[b] SIMODRIVE 611 (UE), $V_{DC\ link}$=540V (DC) and MASTERDRIVES MC (AFE), $V_{DC\ link}$=600V (DC), V_{mot}=380V_{rms}
[c] SIMODRIVE 611 (IR), $V_{DC\ link}$=600V (DC), V_{mot}=425V_{rms}

Table 2-10 1FK7101 CT

Technical data	Code	Units	–5AF71	
Engineering data				
Rated speed	n_N	RPM	3000	
Pole number	2p		8	
Rated torque (100 K)	$M_{N\ (100\ K)}$	Nm	15.5	
Rated current	I_N	A	11.8	
Standstill torque (60K)	$M_{0\ (60\ K)}$	Nm	22.4	
Standstill torque (100K)	$M_{0\ (100\ K)}$	Nm	27	
Standstill current (60K)	$I_{0\ (60\ K)}$	A	15.7	
Standstill current (100K)	$I_{0\ (100\ K)}$	A	19	
Moment of inertia (with brake)	J_{mot}	10^{-4} kgm^2	92.3	
Moment of inertia (without brake)	J_{mot}	10^{-4} kgm^2	79.9	
Optimum operating point				
Optimum speed	n_{opt}	RPM	3000	
Optimum power	P_{opt}	kW	4.87	
Limiting data				
Max. perm. speed (mechan.)	n_{max}	RPM	5000	
Max. torque	M_{max}	Nm	80	
Peak current	I_{max}	A	63	
Physical constants				
Torque constant	k_T	Nm/A	1.41	
Voltage constant	k_E	V/1000 RPM	90	
Winding resistance at 20°C	R_{phase}	Ohm	0.15	
Rotating field inductance	L_D	mH	3.0	
Electrical time constant	T_{el}	ms	20	
Shaft torsional stiffness	c_t	Nm/rad	165000	
Mechanical time constant	T_{mech}	ms	1.80	
Thermal time constant	T_{th}	min	40	
Weight with brake	m	kg	24	
Weight without brake	m	kg	21	

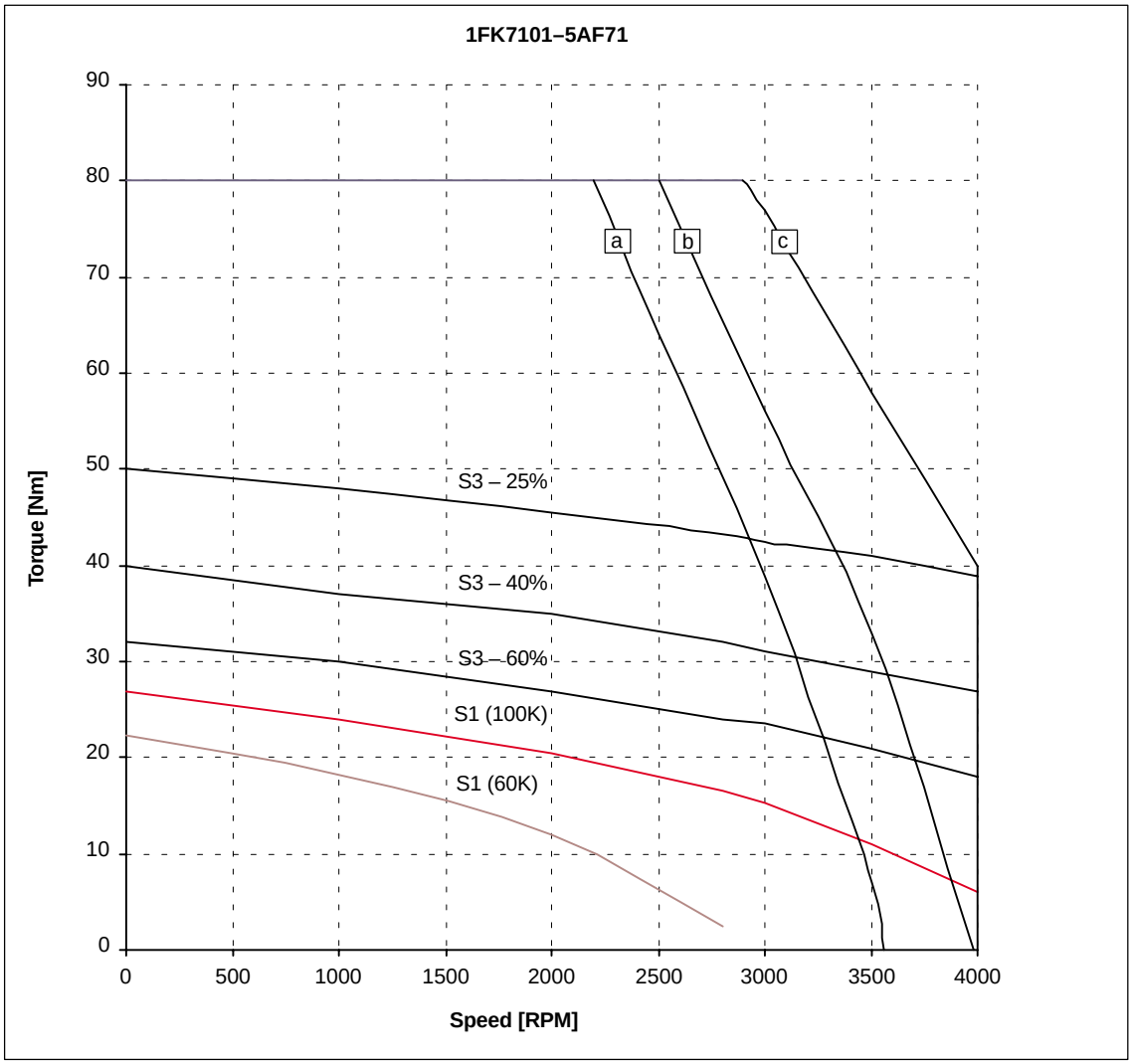


Fig. 2-10 Speed–torque diagram 1FK7101 CT

[a] MASTERDRIVES MC, $V_{DC\ link}$=540V (DC), V_{mot}=340V_{rms}
[b] SIMODRIVE 611 (UE), $V_{DC\ link}$=540V (DC) and MASTERDRIVES MC (AFE), $V_{DC\ link}$=600V (DC), V_{mot}=380V_{rms}
[c] SIMODRIVE 611 (IR), $V_{DC\ link}$=600V (DC), V_{mot}=425V_{rms}

Table 2-11 1FK7103 CT

Technical data	Code	Units	–5AF71	
Engineering data				
Rated speed	n_N	RPM	3000	
Pole number	2p		8	
Rated torque (100 K)	$M_{N\ (100\ K)}$	Nm	14	
Rated current	I_N	A	12	
Standstill torque (60K)	$M_{0\ (60\ K)}$	Nm	30	
Standstill torque (100K)	$M_{0\ (100\ K)}$	Nm	36	
Standstill current (60K)	$I_{0\ (60\ K)}$	A	22.8	
Standstill current (100K)	$I_{0\ (100\ K)}$	A	27.5	
Moment of inertia (with brake)	J_{mot}	10^{-4} kgm^2	118	
Moment of inertia (without brake)	J_{mot}	10^{-4} kgm^2	105	
Optimum operating point				
Optimum speed	n_{opt}	RPM	2500	
Optimum power	P_{opt}	kW	5.37	
Limiting data				
Max. perm. speed (mechan.)	n_{max}	RPM	5000	
Max. torque	M_{max}	Nm	108	
Peak current	I_{max}	A	84	
Physical constants				
Torque constant	k_T	Nm/A	1.35	
Voltage constant	k_E	V/1000 RPM	86	
Winding resistance at 20°C	R_{phase}	Ohm	0.09	
Rotating field inductance	L_D	mH	2.0	
Electrical time constant	T_{el}	ms	22.2	
Shaft torsional stiffness	c_t	Nm/rad	149000	
Mechanical time constant	T_{mech}	ms	1.55	
Thermal time constant	T_{th}	min	45	
Weight with brake	m	kg	32	
Weight without brake	m	kg	29	

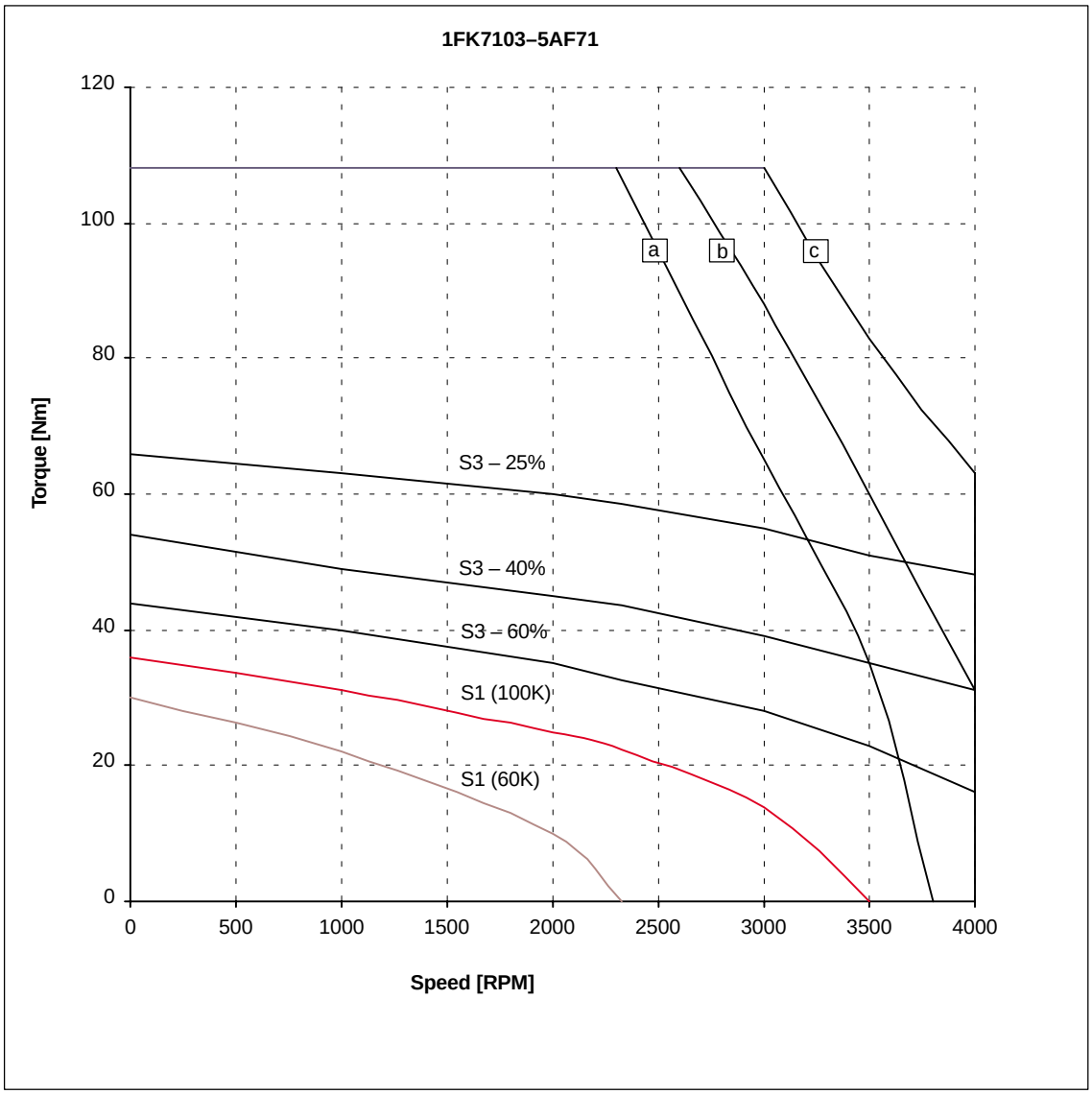


Fig. 2-11 Speed–torque diagram 1FK7103–5AF71 CT

[a] MASTERDRIVES MC, $V_{DC\ link}$=540V (DC), V_{mot}=340V_{rms}
[b] SIMODRIVE 611 (UE), $V_{DC\ link}$=540V (DC) and MASTERDRIVES MC (AFE), $V_{DC\ link}$=600V (DC), V_{mot}=380V_{rms}
[c] SIMODRIVE 611 (IR), $V_{DC\ link}$=600V (DC), V_{mot}=425V_{rms}

2.2 Speed–torque diagrams 1FK7 HD

Table 2-12 1FK7033 HD

Technical data	Code	Units	–7AK71	
Engineering data				
Rated speed	n_N	RPM	6000	
Pole number	2p		6	
Rated torque (100 K)	$M_{N\ (100\ K)}$	Nm	0.9	
Rated current	I_N	A	1.5	
Standstill torque (60K)	$M_{0\ (60\ K)}$	Nm	1.0	
Standstill torque (100K)	$M_{0\ (100\ K)}$	Nm	1.3	
Standstill current (60K)	$I_{0\ (60\ K)}$	A	1.7	
Standstill current (100K)	$I_{0\ (100\ K)}$	A	2.2	
Moment of inertia (with brake)	J_{mot}	10^{-4} kgm^2	0.3	
Moment of inertia (without brake)	J_{mot}	10^{-4} kgm^2	0.27	
Optimum operating point				
Optimum speed	n_{opt}	RPM	6000	
Optimum power	P_{opt}	kW	0.56	
Limiting data				
Max. perm. speed (mechan.)	n_{max}	RPM	10000	
Max. torque	M_{max}	Nm	4.3	
Peak current	I_{max}	A	7.2	
Physical constants				
Torque constant	k_T	Nm/A	0.6	
Voltage constant	k_E	V/1000 RPM	40	
Winding resistance at 20°C	R_{phase}	Ohm	3.7	
Rotating field inductance	L_D	mH	18	
Electrical time constant	T_{el}	ms	4.9	
Shaft torsional stiffness	c_t	Nm/rad	8000	
Mechanical time constant	T_{mech}	ms	0.83	
Thermal time constant	T_{th}	min	25	
Weight with brake	m	kg	3.4	
Weight without brake	m	kg	3.1	

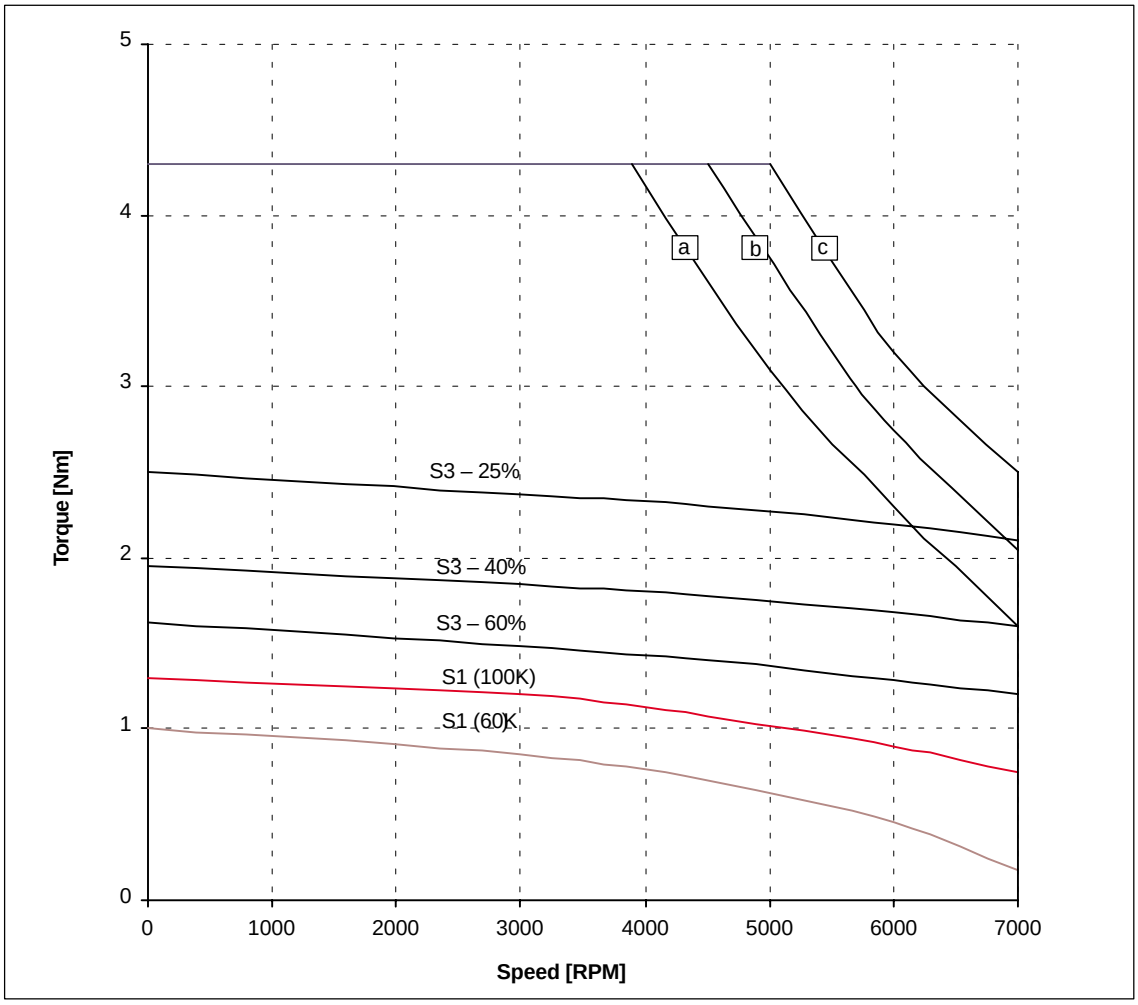
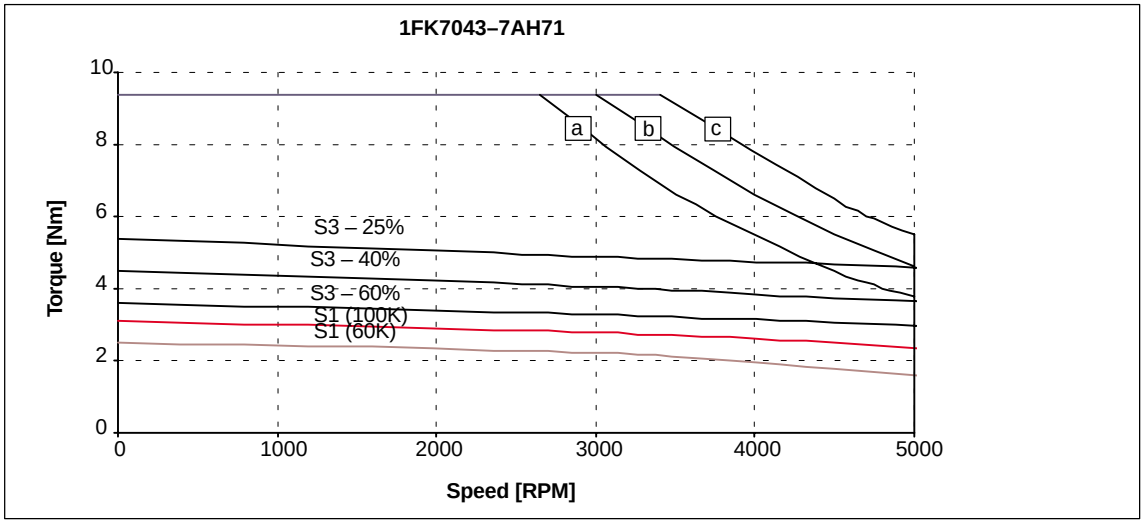


Fig. 2-12 Speed–torque diagram 1FK7033 HD

[a] MASTERDRIVES MC, $V_{DC\ link}$=540V (DC), V_{mot}=340V_{rms}
[b] SIMODRIVE 611 (UE), $V_{DC\ link}$=540V (DC) and MASTERDRIVES MC (AFE), $V_{DC\ link}$=600V (DC), V_{mot}=380V_{rms}
[c] SIMODRIVE 611 (IR), $V_{DC\ link}$=600V (DC), V_{mot}=425V_{rms}

Table 2-13 1FK7043 HD

Technical data	Code	Units	–7AH71	–7AK71
Engineering data				
Rated speed	n_N	RPM	4500	6000
Pole number	2p		6	6
Rated torque (100 K)	$M_{N\ (100\ K)}$	Nm	2.6	2
Rated current	I_N	A	4.0	4.4
Standstill torque (60K)	$M_{0\ (60\ K)}$	Nm	2.5	2.5
Standstill torque (100K)	$M_{0\ (100\ K)}$	Nm	3.1	3.1
Standstill current (60K)	$I_{0\ (60\ K)}$	A	3.6	4.8
Standstill current (100K)	$I_{0\ (100\ K)}$	A	4.5	6.4
Moment of inertia (with brake)	J_{mot}	10^{-4} kgm^2	1.14	1.14
Moment of inertia (without brake)	J_{mot}	10^{-4} kgm^2	1.01	1.01
Optimum operating point				
Optimum speed	n_{opt}	RPM	4500	6000
Optimum power	P_{opt}	kW	1.23	1.26
Limiting data				
Max. perm. speed (mechan.)	n_{max}	RPM	8000	8000
Max. torque	M_{max}	Nm	9.4	9.4
Peak current	I_{max}	A	14.8	20
Physical constants				
Torque constant	k_T	Nm/A	0.67	0.48
Voltage constant	k_E	V/1000 RPM	44	32
Winding resistance at 20°C	R_{phase}	Ohm	1.2	0.65
Rotating field inductance	L_D	mH	15	9
Electrical time constant	T_{el}	ms	12.5	13.8
Shaft torsional stiffness	c_t	Nm/rad	11000	11000
Mechanical time constant	T_{mech}	ms	0.81	0.85
Thermal time constant	T_{th}	min	35	35
Weight with brake	m	kg	7.0	7.0
Weight without brake	m	kg	6.3	6.3



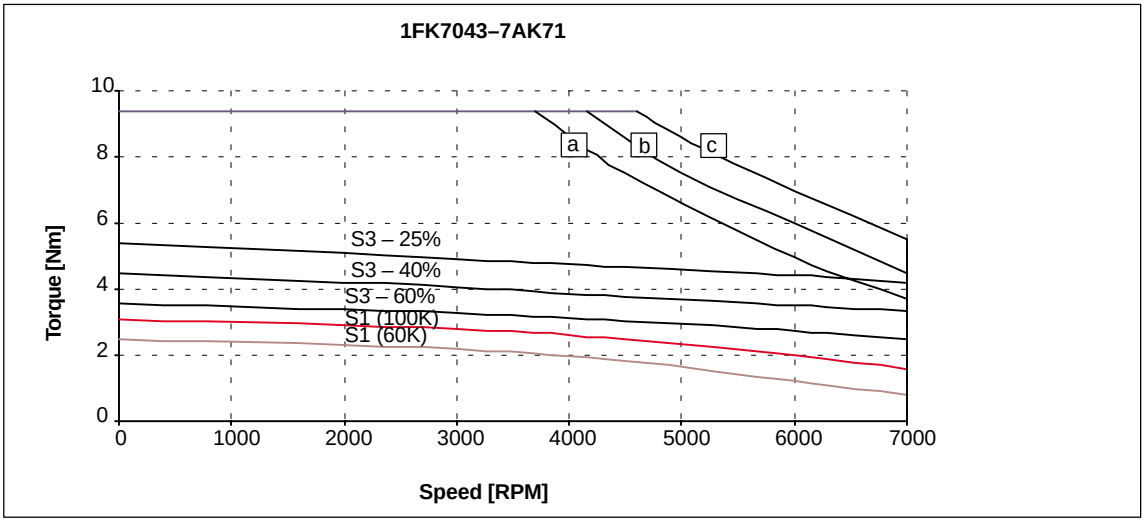
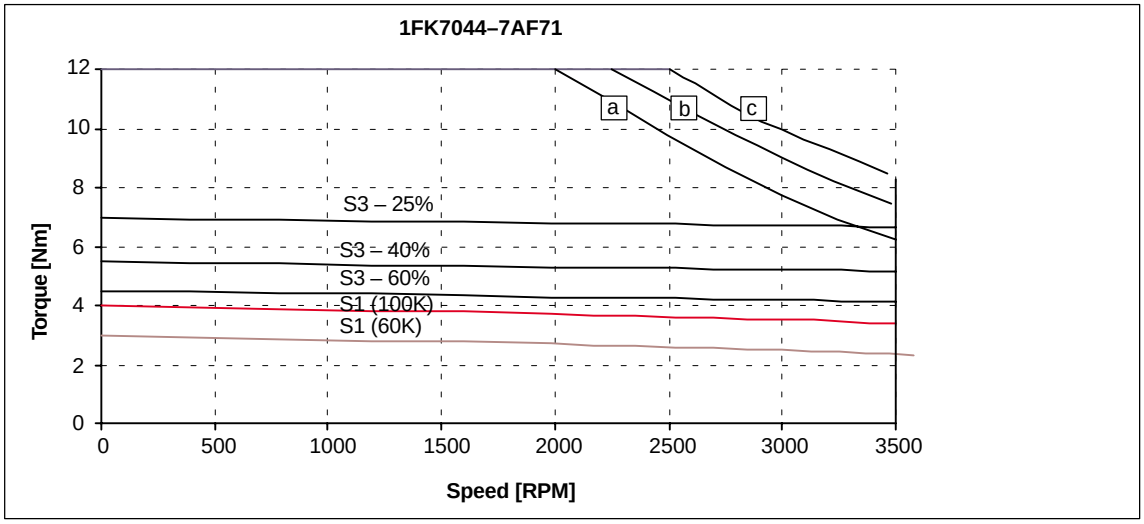


Fig. 2-13 Speed–torque diagram 1FK7043 HD

[a] MASTERDRIVES MC, $V_{DC\ link}$=540V (DC), V_{mot}=340V_{rms}
[b] SIMODRIVE 611 (UE), $V_{DC\ link}$=540V (DC) and MASTERDRIVES MC (AFE), $V_{DC\ link}$=600V (DC), V_{mot}=380V_{rms}
[c] SIMODRIVE 611 (IR), $V_{DC\ link}$=600V (DC), V_{mot}=425V_{rms}

Table 2-14 1FK7044 HD

Technical data	Code	Units	–7AF71	–7AH71
Engineering data				
Rated speed	n_N	RPM	3000	4500
Pole number	2p		6	6
Rated torque (100 K)	$M_{N\ (100\ K)}$	Nm	3.5	3.0
Rated current	I_N	A	4.0	4.9
Standstill torque (60K)	$M_{0\ (60\ K)}$	Nm	3.0	3.0
Standstill torque (100K)	$M_{0\ (100\ K)}$	Nm	4.0	4.0
Standstill current (60K)	$I_{0\ (60\ K)}$	A	3.4	4.6
Standstill current (100K)	$I_{0\ (100\ K)}$	A	4.5	6.3
Moment of inertia (with brake)	J_{mot}	10^{-4} kgm^2	1.41	1.41
Moment of inertia (without brake)	J_{mot}	10^{-4} kgm^2	1.28	1.28
Optimum operating point				
Optimum speed	n_{opt}	RPM	3000	4500
Optimum power	P_{opt}	kW	1.1	1.41
Limiting data				
Max. perm. speed (mechan.)	n_{max}	RPM	8000	8000
Max. torque	M_{max}	Nm	12	12
Peak current	I_{max}	A	14.8	20
Physical constants				
Torque constant	k_T	Nm/A	0.86	0.63
Voltage constant	k_E	V/1000 RPM	57	42
Winding resistance at 20°C	R_{phase}	Ohm	1.5	0.81
Rotating field inductance	L_D	mH	20	11
Electrical time constant	T_{el}	ms	13.3	13.5
Shaft torsional stiffness	c_t	Nm/rad	9500	9500
Mechanical time constant	T_{mech}	ms	0.78	0.78
Thermal time constant	T_{th}	min	45	45
Weight with brake	m	kg	8.3	8.3
Weight without brake	m	kg	7.7	7.7



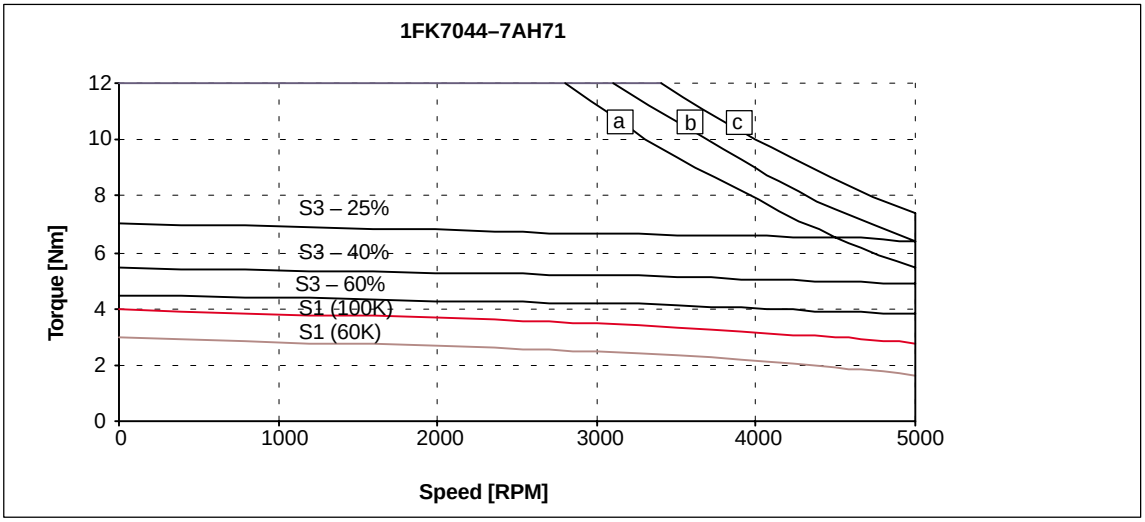
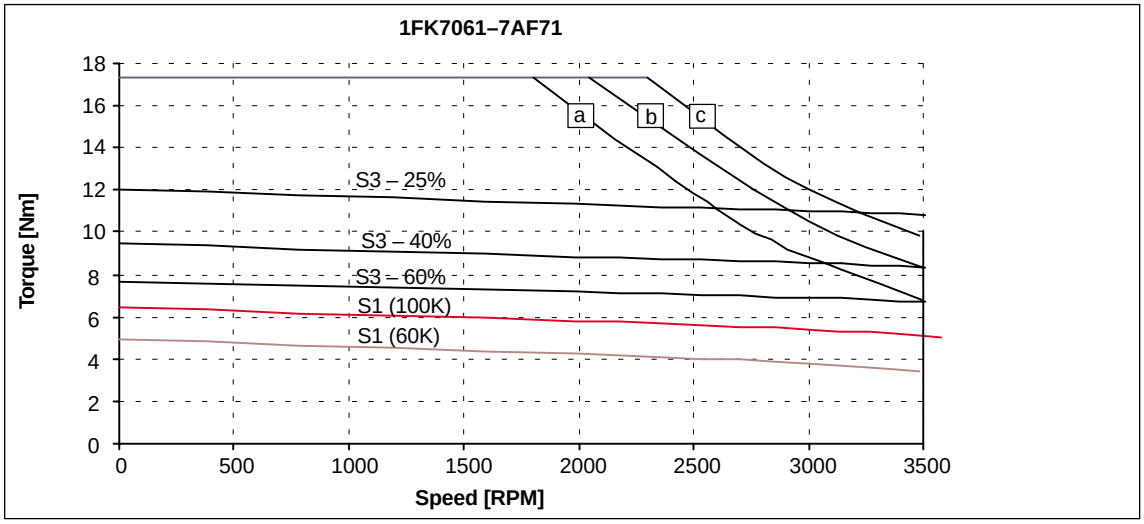


Fig. 2-14 Speed–torque diagram 1FK7044 HD

[a] MASTERDRIVES MC, $V_{DC\ link}$=540V (DC), V_{mot}=340V_{rms}
[b] SIMODRIVE 611 (UE), $V_{DC\ link}$=540V (DC) and MASTERDRIVES MC (AFE), $V_{DC\ link}$=600V (DC), V_{mot}=380V_{rms}
[c] SIMODRIVE 611 (IR), $V_{DC\ link}$=600V (DC), V_{mot}=425V_{rms}

Table 2-15 1FK7061 HD

Technical data	Code	Units	–7AF71	–7AH71
Engineering data				
Rated speed	n_N	RPM	3000	4500
Pole number	2p		6	6
Rated torque (100 K)	$M_{N\ (100\ K)}$	Nm	5.4	4.3
Rated current	I_N	A	5.3	5.9
Standstill torque (60K)	$M_{0\ (60\ K)}$	Nm	4.9	4.9
Standstill torque (100K)	$M_{0\ (100\ K)}$	Nm	6.4	6.4
Standstill current (60K)	$I_{0\ (60\ K)}$	A	4.8	7.0
Standstill current (100K)	$I_{0\ (100\ K)}$	A	6.1	8.0
Moment of inertia (with brake)	J_{mot}	10^{-4} kgm^2	3.74	3.74
Moment of inertia (without brake)	J_{mot}	10^{-4} kgm^2	3.4	3.4
Optimum operating point				
Optimum speed	n_{opt}	RPM	3000	4500
Optimum power	P_{opt}	kW	1.7	2.03
Limiting data				
Max. perm. speed (mechan.)	n_{max}	RPM	6000	6000
Max. torque	M_{max}	Nm	17.3	17.3
Peak current	I_{max}	A	17.5	25.3
Physical constants				
Torque constant	k_T	Nm/A	1.0	0.7
Voltage constant	k_E	V/1000 RPM	66	46
Winding resistance at 20°C	R_{phase}	Ohm	0.74	0.36
Rotating field inductance	L_D	mH	20	9.6
Electrical time constant	T_{el}	ms	27	27
Shaft torsional stiffness	c_t	Nm/rad	37000	37000
Mechanical time constant	T_{mech}	ms	0.75	0.75
Thermal time constant	T_{th}	min	30	30
Weight with brake	m	kg	11.2	11.2
Weight without brake	m	kg	10	10



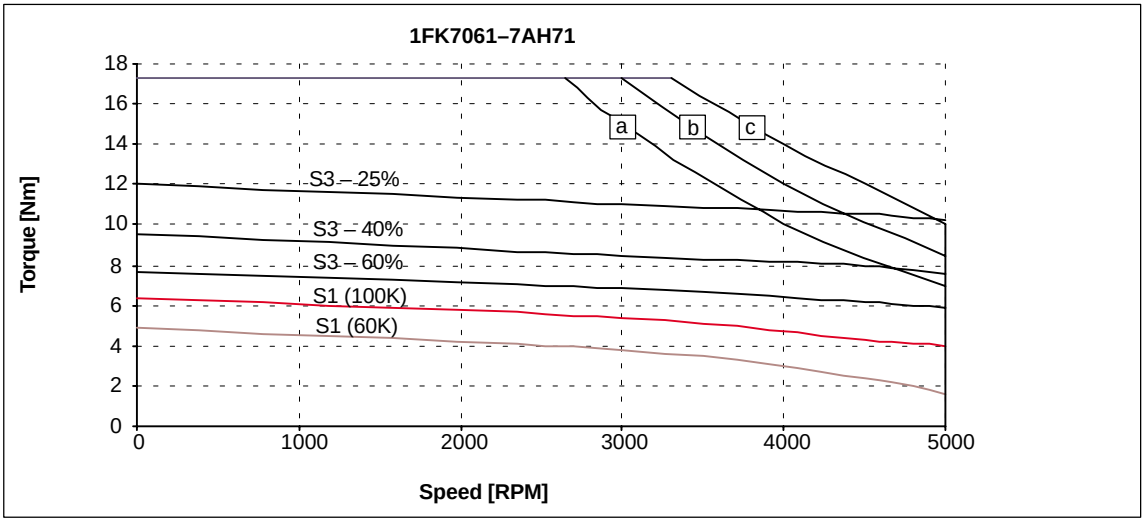
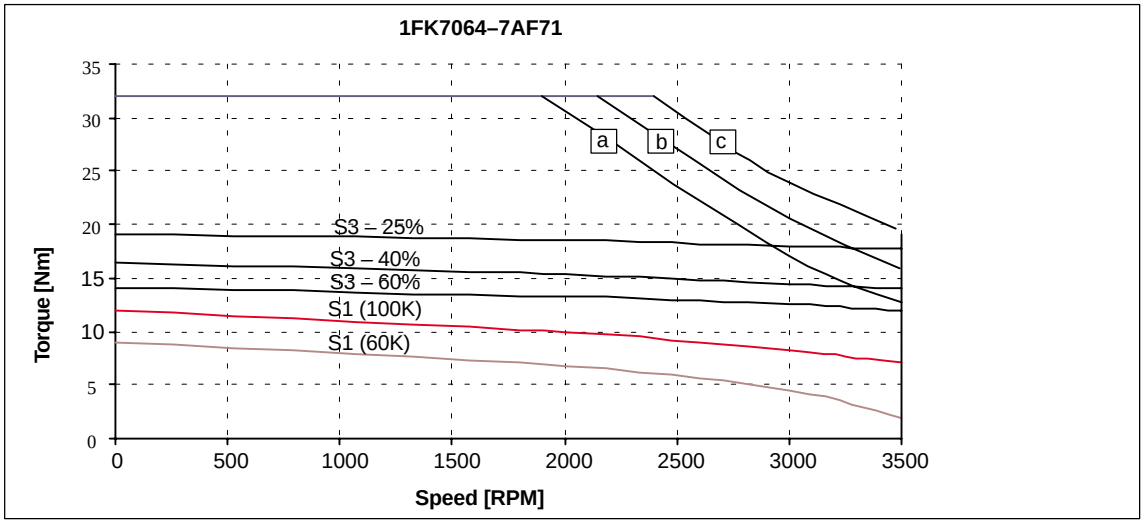


Fig. 2-15 Speed–torque diagram 1FK7061 HD

[a] MASTERDRIVES MC, $V_{DC\ link}$=540V (DC), V_{mot}=340V_{rms}
[b] SIMODRIVE 611 (UE), $V_{DC\ link}$=540V (DC) and MASTERDRIVES MC (AFE), $V_{DC\ link}$=600V (DC), V_{mot}=380V_{rms}
[c] SIMODRIVE 611 (IR), $V_{DC\ link}$=600V (DC), V_{mot}=425V_{rms}

Table 2-16 1FK7064 HD

Technical data	Code	Units	–7AF71	–7AH71
Engineering data				
Rated speed	n_N	RPM	3000	4500
Pole number	2p		6	6
Rated torque (100 K)	$M_{N\ (100\ K)}$	Nm	8.0	5.0
Rated current	I_N	A	7.5	7.0
Standstill torque (60K)	$M_{0\ (60\ K)}$	Nm	9.0	9.0
Standstill torque (100K)	$M_{0\ (100\ K)}$	Nm	12	12
Standstill current (60K)	$I_{0\ (60\ K)}$	A	8.5	12
Standstill current (100K)	$I_{0\ (100\ K)}$	A	11	15
Moment of inertia (with brake)	J_{mot}	10^{-4} kgm^2	6.84	6.84
Moment of inertia (without brake)	J_{mot}	10^{-4} kgm^2	6.5	6.5
Optimum operating point				
Optimum speed	n_{opt}	RPM	3000	3500
Optimum power	P_{opt}	kW	2.51	2.75
Limiting data				
Max. perm. speed (mechan.)	n_{max}	RPM	6000	6000
Max. torque	M_{max}	Nm	32	32
Peak current	I_{max}	A	31	42
Physical constants				
Torque constant	k_T	Nm/A	1.03	0.77
Voltage constant	k_E	V/1000 RPM	68	51
Winding resistance at 20°C	R_{phase}	Ohm	0.35	0.18
Rotating field inductance	L_D	mH	10.7	5.6
Electrical time constant	T_{el}	ms	30.5	31.1
Shaft torsional stiffness	c_t	Nm/rad	30000	30000
Mechanical time constant	T_{mech}	ms	0.64	0.59
Thermal time constant	T_{th}	min	35	35
Weight with brake	m	kg	16.8	16.8
Weight without brake	m	kg	15.5	15.5



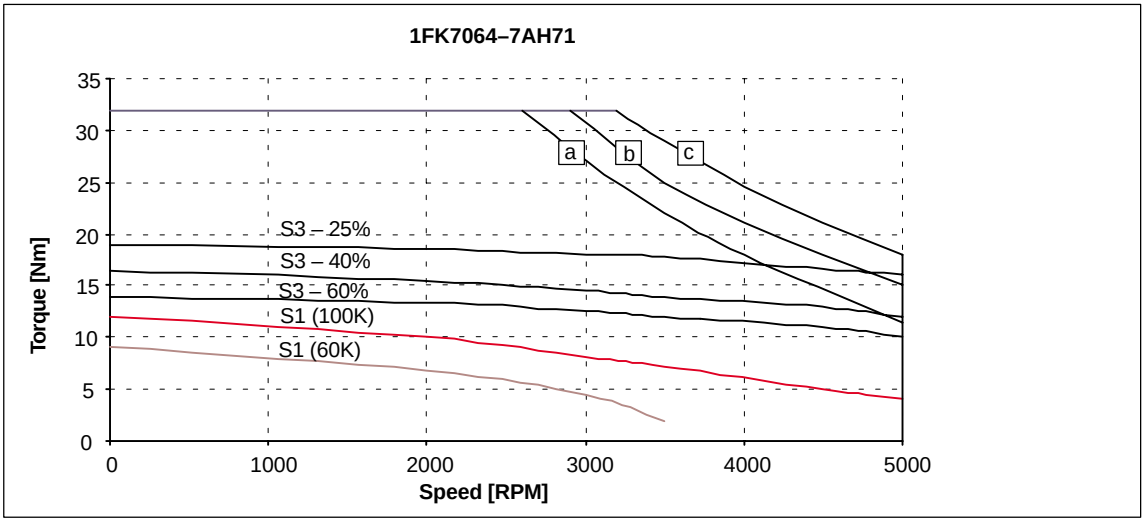


Fig. 2-16 Speed–torque diagram 1FK7064 HD

[a] MASTERDRIVES MC, $V_{DC\ link}$=540V (DC), V_{mot}=340V_{rms}
[b] SIMODRIVE 611 (UE), $V_{DC\ link}$=540V (DC) and MASTERDRIVES MC (AFE), $V_{DC\ link}$=600V (DC), V_{mot}=380V_{rms}
[c] SIMODRIVE 611 (IR), $V_{DC\ link}$=600V (DC), V_{mot}=425V_{rms}

Table 2-17 1FK7082 HD

Technical data	Code	Units	–7AF71	
Engineering data				
Rated speed	n_N	RPM	3000	
Pole number	2p		8	
Rated torque (100 K)	$M_{N\ (100\ K)}$	Nm	8.0	
Rated current	I_N	A	6.7	
Standstill torque (60K)	$M_{0\ (60\ K)}$	Nm	10.5	
Standstill torque (100K)	$M_{0\ (100\ K)}$	Nm	14	
Standstill current (60K)	$I_{0\ (60\ K)}$	A	8.0	
Standstill current (100K)	$I_{0\ (100\ K)}$	A	10.6	
Moment of inertia (with brake)	J_{mot}	10^{-4} kgm^2	16	
Moment of inertia (without brake)	J_{mot}	10^{-4} kgm^2	14	
Optimum operating point				
Optimum speed	n_{opt}	RPM	3000	
Optimum power	P_{opt}	kW	2.51	
Limiting data				
Max. perm. speed (mechan.)	n_{max}	RPM	6000	
Max. torque	M_{max}	Nm	40	
Peak current	I_{max}	A	36	
Physical constants				
Torque constant	k_T	Nm/A	1.33	
Voltage constant	k_E	V/1000 RPM	88	
Winding resistance at 20°C	R_{phase}	Ohm	0.43	
Rotating field inductance	L_D	mH	8	
Electrical time constant	T_{el}	ms	23.2	
Shaft torsional stiffness	c_t	Nm/rad	101000	
Mechanical time constant	T_{mech}	ms	1.02	
Thermal time constant	T_{th}	min	35	
Weight with brake	m	kg	18.8	
Weight without brake	m	kg	17.2	

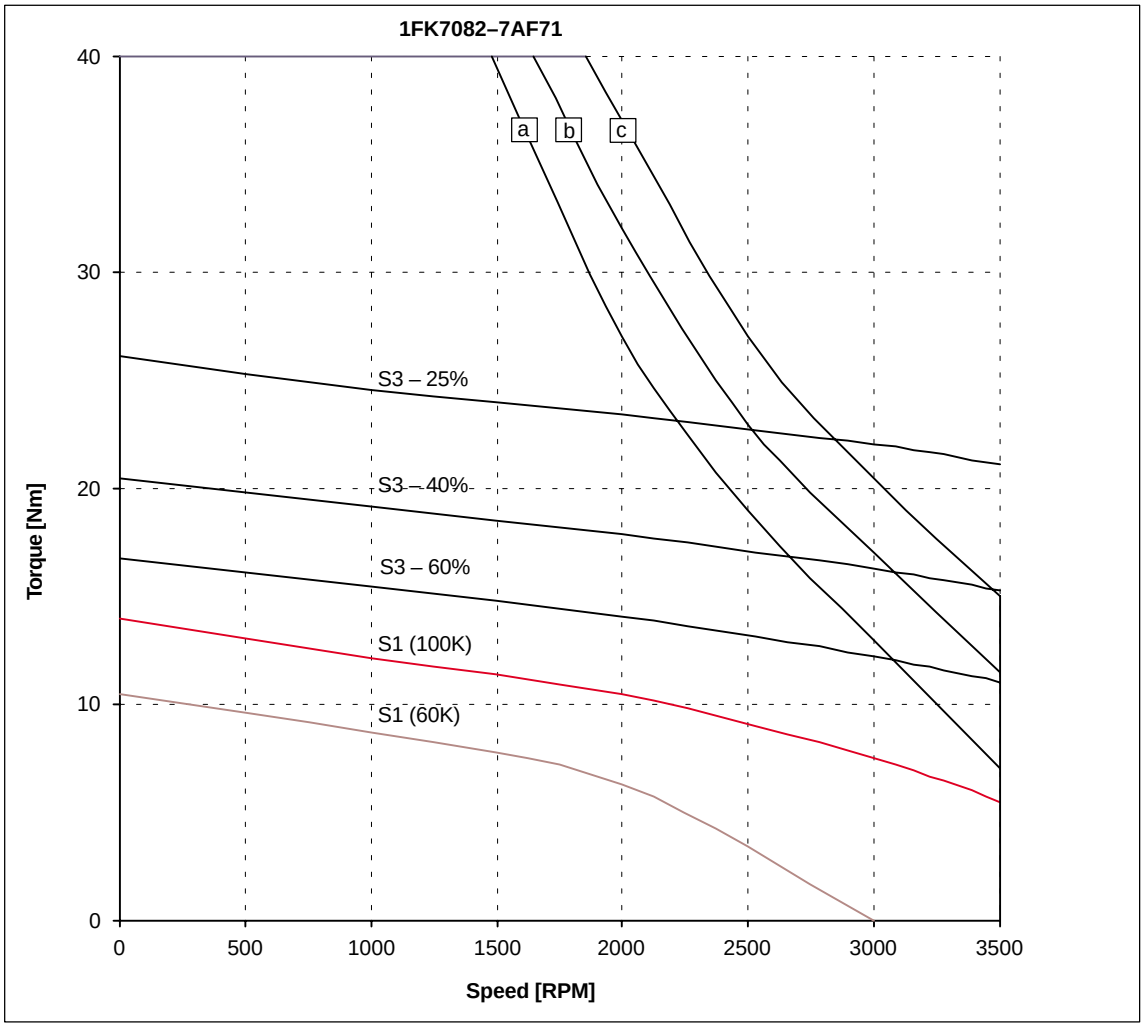


Fig. 2-17 Speed–torque diagram 1FK7082 HD

[a] MASTERDRIVES MC, $V_{DC\ link}$=540V (DC), V_{mot}=340V_{rms}
[b] SIMODRIVE 611 (UE), $V_{DC\ link}$=540V (DC) and MASTERDRIVES MC (AFE), $V_{DC\ link}$=600V (DC), V_{mot}=380V_{rms}
[c] SIMODRIVE 611 (IR), $V_{DC\ link}$=600V (DC), V_{mot}=425V_{rms}

Table 2-18 1FK7085 HD

Technical data	Code	Units	–7AF71	
Engineering data				
Rated speed	n_N	RPM	3000	
Pole number	2p		8	
Rated torque (100 K)	$M_{N\ (100\ K)}$	Nm	6.5	
Rated current	I_N	A	7.0	
Standstill torque (60K)	$M_{0\ (60\ K)}$	Nm	17	
Standstill torque (100K)	$M_{0\ (100\ K)}$	Nm	22	
Standstill current (60K)	$I_{0\ (60\ K)}$	A	16.5	
Standstill current (100K)	$I_{0\ (100\ K)}$	A	22.5	
Moment of inertia (with brake)	J_{mot}	10^{-4} kgm^2	25	
Moment of inertia (without brake)	J_{mot}	10^{-4} kgm^2	23	
Optimum operating point				
Optimum speed	n_{opt}	RPM	2500	
Optimum power	P_{opt}	kW	3.14	
Limiting data				
Max. perm. speed (mechan.)	n_{max}	RPM	6000	
Max. torque	M_{max}	Nm	65	
Peak current	I_{max}	A	80	
Physical constants				
Torque constant	k_T	Nm/A	0.96	
Voltage constant	k_E	V/1000 RPM	63	
Winding resistance at 20°C	R_{phase}	Ohm	0.12	
Rotating field inductance	L_D	mH	3.3	
Electrical time constant	T_{el}	ms	27.5	
Shaft torsional stiffness	c_t	Nm/rad	83000	
Mechanical time constant	T_{mech}	ms	0.9	
Thermal time constant	T_{th}	min	45	
Weight with brake	m	kg	25.7	
Weight without brake	m	kg	23.5	

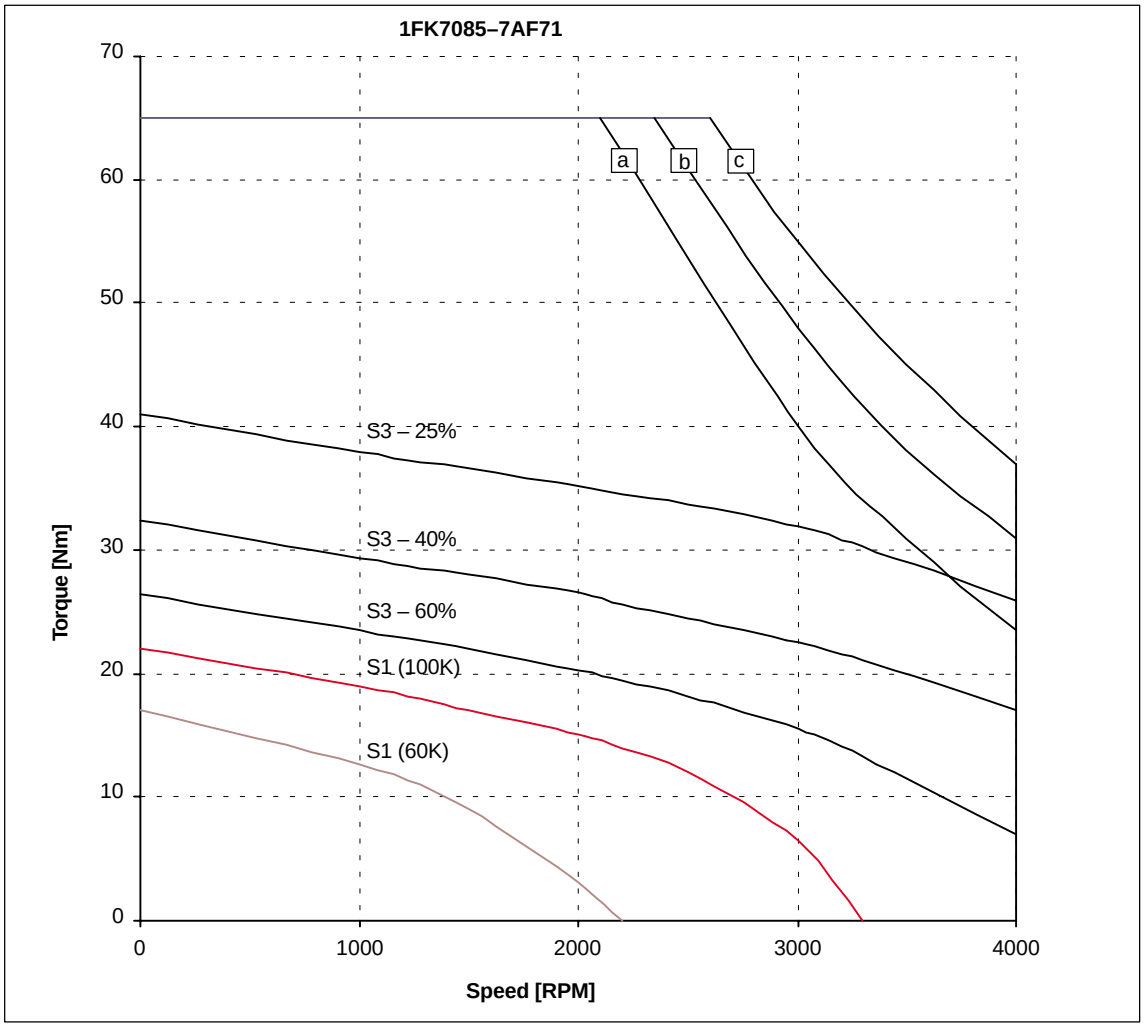


Fig. 2-18 Speed–torque diagram 1FK7085 HD

[a] MASTERDRIVES MC, $V_{DC\ link}$=540V (DC), V_{mot}=340V_{rms}
[b] SIMODRIVE 611 (UE), $V_{DC\ link}$=540V (DC) and MASTERDRIVES MC (AFE), $V_{DC\ link}$=600V (DC), V_{mot}=380V_{rms}
[c] SIMODRIVE 611 (IR), $V_{DC\ link}$=600V (DC), V_{mot}=425V_{rms}

2.3 Cantilever force diagrams

Cantilever force stressing

Point of action of cantilever forces at the shaft end

- for average operating speeds
- for a nominal bearing lifetime of 20 000 h

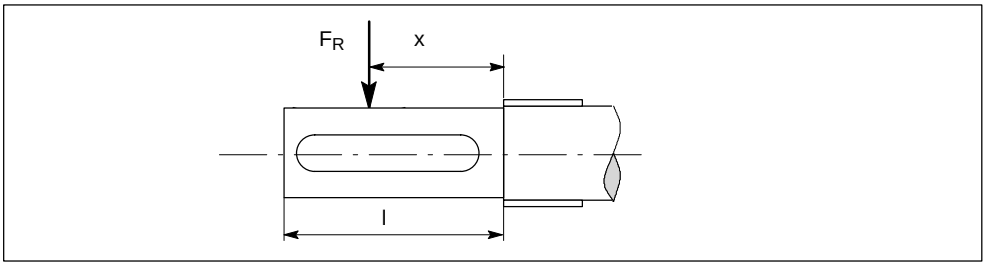


Fig. 2-19 Force application at the drive shaft end

Dimension x: Distance between the point of application of force F_Q and the shaft shoulder in mm.

Dimension l: Length of the shaft end in mm.

Calculating the pre–tensioning force of the belt

$F_R = 2 * M_0 * c/d_R$

F_R	[N]	Belt pre–tensioning force
M_0	[Nm]	Motor stall torque
d_R		Effective diameter of the belt pulley
c		Pre–tensioning factor for the accelerating torque Experience values for toothed belts c = 1.5 to 2.2 Experience values for flat belts c = 2.2 to 3.0

For other designs, the actual forces as a result of the torque being transmitted must be taken into account.

$F_R \leq F_{Qperm}$

Cantilever force 1FK702□

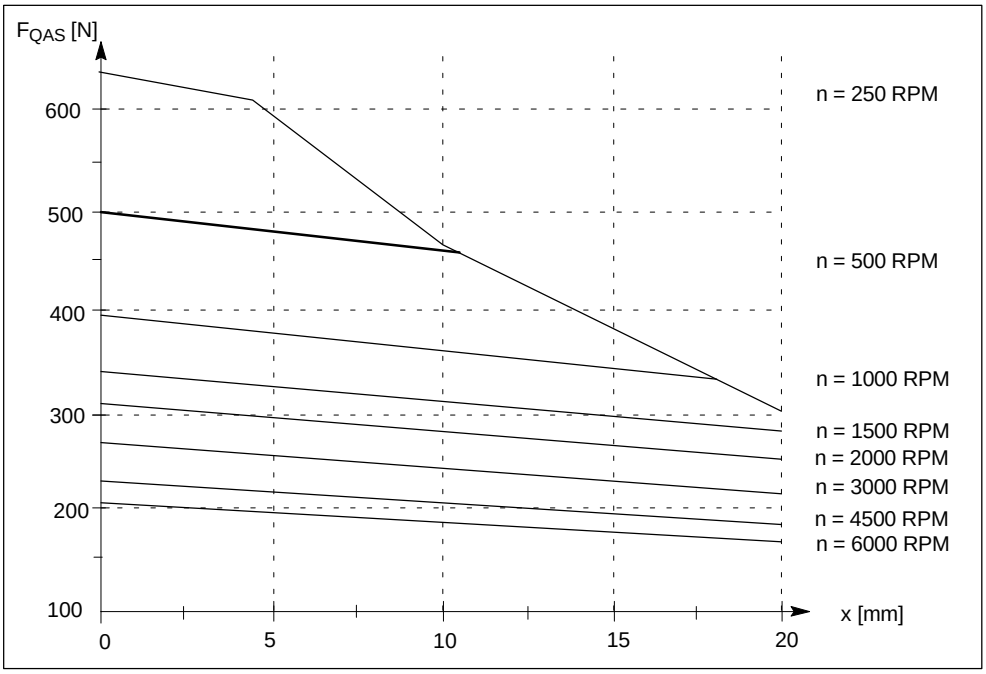


Fig. 2-20 Cantilever force F_Q at a distance x from the shaft shoulder for a nominal bearing lifetime of 20 000 h.

Cantilever force 1FK703□

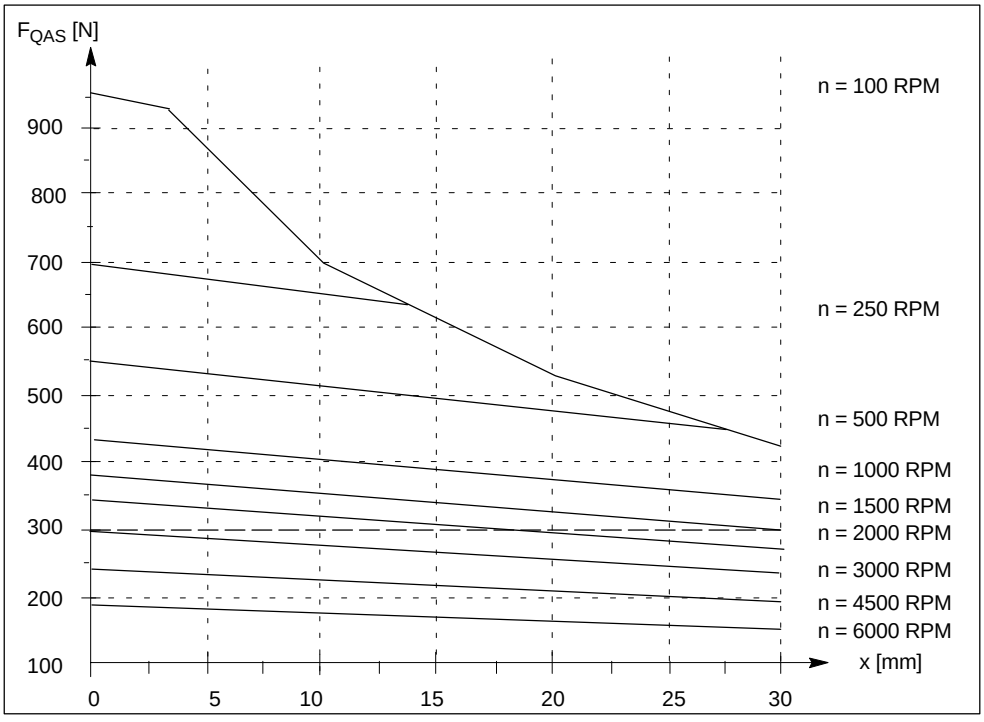


Fig. 2-21 Cantilever force F_Q at a distance x from the shaft shoulder for a nominal bearing lifetime of 20 000 h.

Cantilever force 1FK704□

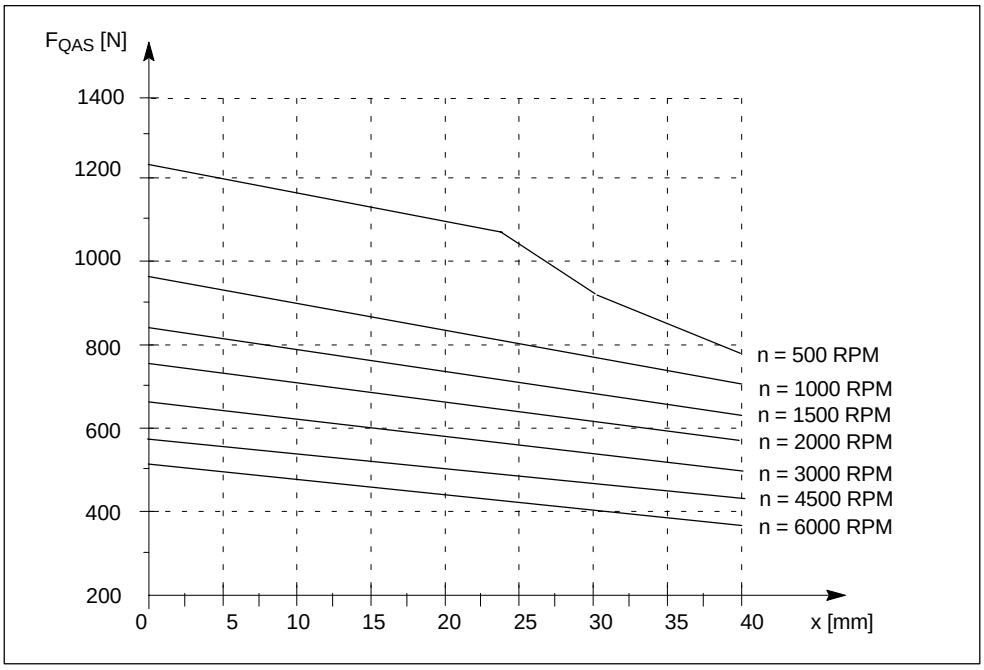


Fig. 2-22 Cantilever force F_Q at a distance x from the shaft shoulder for a nominal bearing lifetime of 20 000 h.

Cantilever force 1FK706□

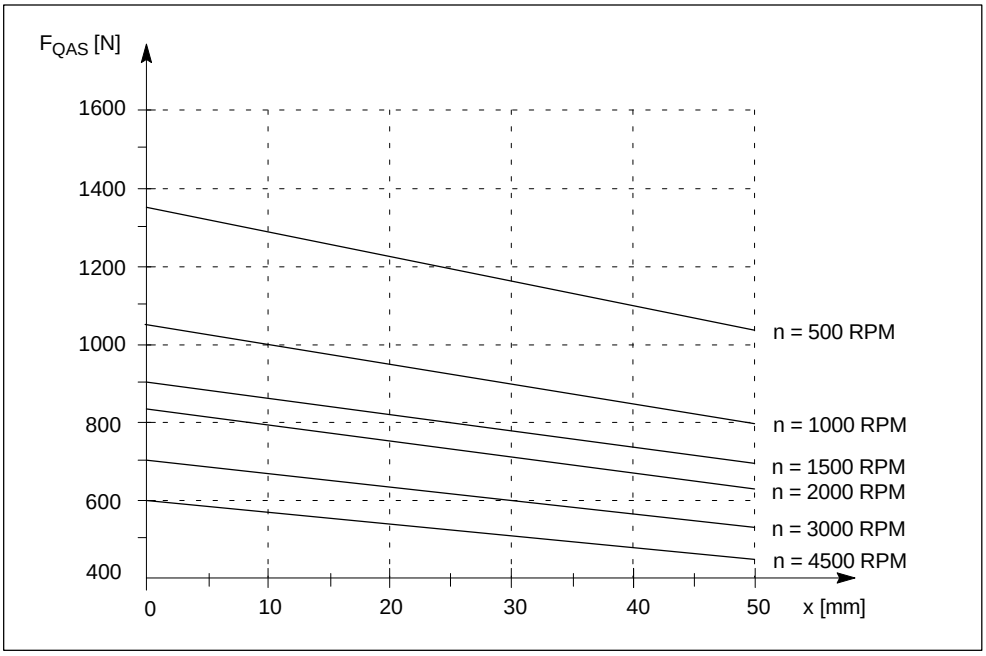


Fig. 2-23 Cantilever force F_Q at a distance x from the shaft shoulder for a nominal bearing lifetime of 20 000 h.

Cantilever force 1FK708□

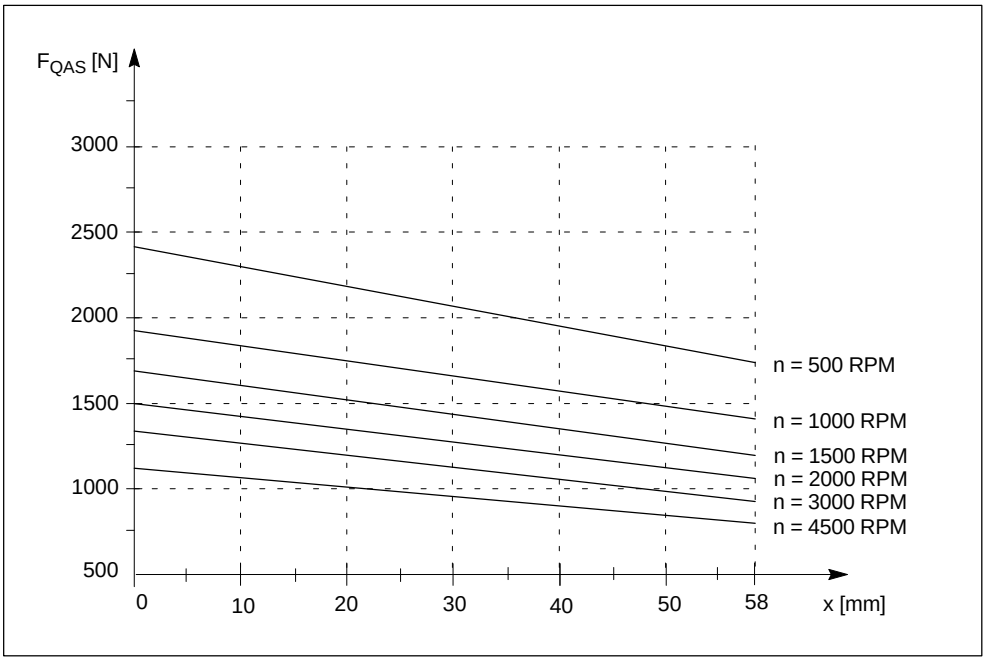


Fig. 2-24 Cantilever force F_Q at a distance x from the shaft shoulder for a nominal bearing lifetime of 20 000 h.

Cantilever force 1FK710□

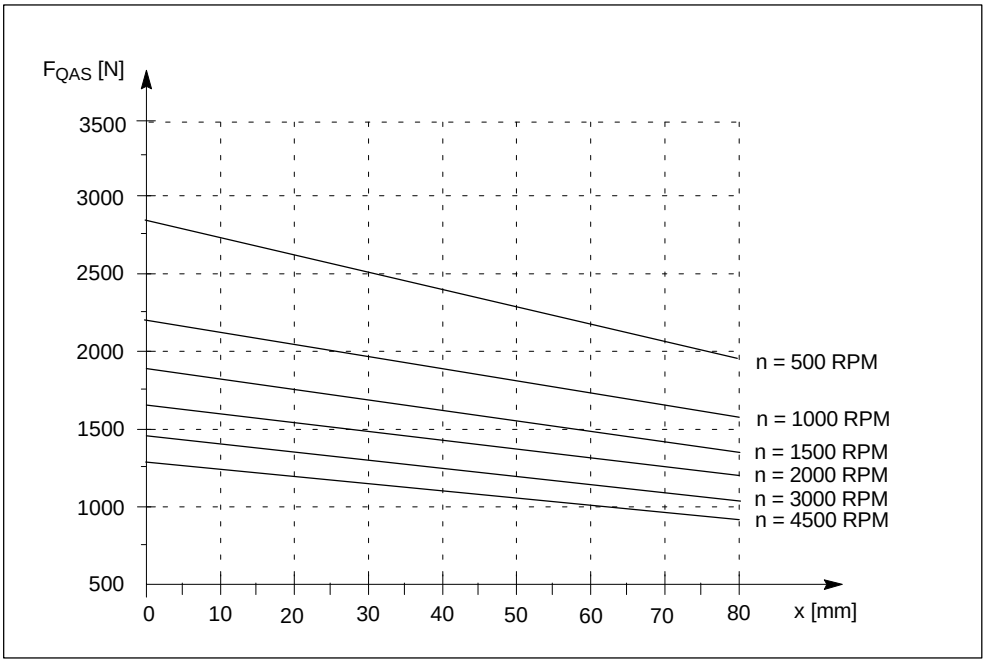


Fig. 2-25 Cantilever force F_Q at a distance x from the shaft shoulder for a nominal bearing lifetime of 20 000 h.

2.4 Axial forces

Axial force stressing

Warning

Axial forces are not permissible for motors with integrated holding brake!

When using, for example, helical toothed wheels as drive element, in addition to the radial force, there is also an axial force on the motor bearings. For axial forces, the bearing pre–stressing can be exceeded so that the rotor moves corresponding to the existing bearing axial play (to 0.2 mm).

The approximate permissible axial force can be calculated using the following formula:

$$F_A = 0.35 \bullet F_Q$$

■

Motor Components (Options) 3

3.1 Thermal motor protection

A temperature–dependent resistor is integrated in the stator winding as temperature sensor. This temperature sensor monitors the motor temperature.

Type:	KTY 84 (PTC thermistor)
Resistance when cold (20° C):	approx. 580 Ω
Resistance when warm (100° C):	approx. 1000 Ω
Response temperature:	Pre–alarm at 120° C Trip at 155° C ± 5° C
Connection:	Through the encoder cable

The resistance of the KTY 84 thermistor changes proportionally to the winding temperature change (refer to Fig. 3-1).

The temperature signal is sensed and evaluated in the drive converter whose closed–loop control takes into account the temperature characteristic of the motor resistances.

When a fault occurs, an appropriate message is output at the drive converter. When the motor temperature increases, a ”pre–warning, motor overtemperature” signal is output which can be externally evaluated. If this signal is not observed, the drive converter shuts down with the appropriate fault message when the motor limiting temperature or the shutdown temperature is exceeded.

Warning

If the user carries–out an additional high–voltage test, then the ends of the temperature sensor cables must be short–circuited before the test is carried–out!

If the test voltage is connected to a temperature sensor terminal, then it will be destroyed.

The polarity must be carefully observed.

The temperature sensor is designed so that the DIN/EN requirement for ”safe electrical separation” is fulfilled.

Caution

The integrated temperature sensor protects the servomotors against overload conditions up to $4 * I_{0\ 60K}$ and speed <> 0.

There is no adequate protection at thermally critical load situations, e.g. a high overload at motor standstill. This is the reason that, for example, a thermal overcurrent relay must be provided as additional protection.

If an overload condition of $4 * M_0$ lasts for longer than 4s, then additional motor protection should be provided.

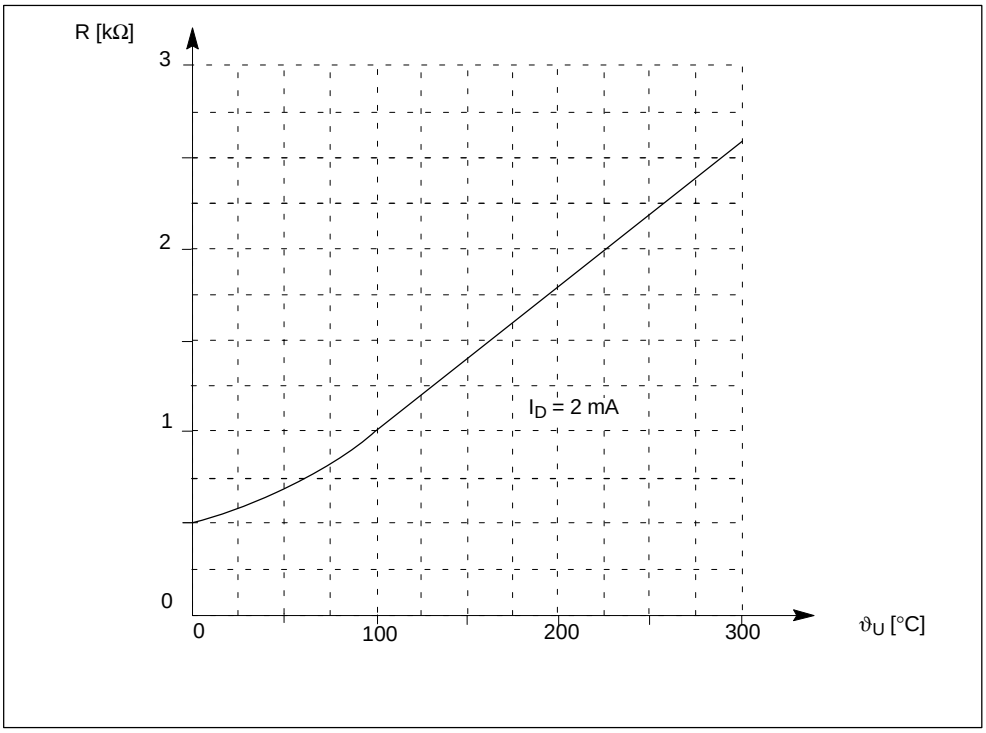


Fig. 3-1 Resistance characteristic of the KTY 84 as a function of the temperature

3.2 Encoder

Table 3-1 Overview of the encoders used

Motor types	Incremental encoders sin/cos 1 Vpp (for low shaft heights) (I–2048)	Incremental encoders sin/cos 1 Vpp (I–2048)	Absolute value encoder EnDat (A–2048)	Single absolute value encoder (A–32)	Absolute value encoder EnDat (A–512)	Resolver 2–pole or multi–pole
Order No. 14th position	A	A	E	G	H	S, T
1FK7 02□	X				X	X
1FK7 03□	X				X	X
1FK7 04□		X	X	X		X
1FK7 06□		X	X	X		X
1FK7 08□		X	X	X		X
1FK7 10□		X	X	X		X

Notice

When the encoder is replaced, the position of the encoder system with respect to the motor EMF must be adjusted. Only qualified personnel may replace an encoder.

3.2.1 Incremental encoders

Function:

- Angular measuring system for commutation
- Speed actual value sensing
- Indirect incremental meas. system for the pos. contr. loop
- One zero pulse (reference mark) per revolution

Table 3-2 Technical data, incremental encoders sin/cos $1V_{pp}$

Characteristics	**Incremental encoders sin/cos 1Vpp (2048 pulses)**	**Incremental encoders sin/cos 1Vpp (low shaft height) (2048 pulses)**
Mech. limiting speed	15000 RPM	12000 RPM
Operating voltage	5V ± 5%	5V ± 5%
Current drain	max. 150 mA	max. 150 mA
Incremental resolution	2048	2048
Incremental signals	1 Vpp	1 Vpp
Angular error	± 40''	± 80''
C–D track (rotor position)	exists	exists

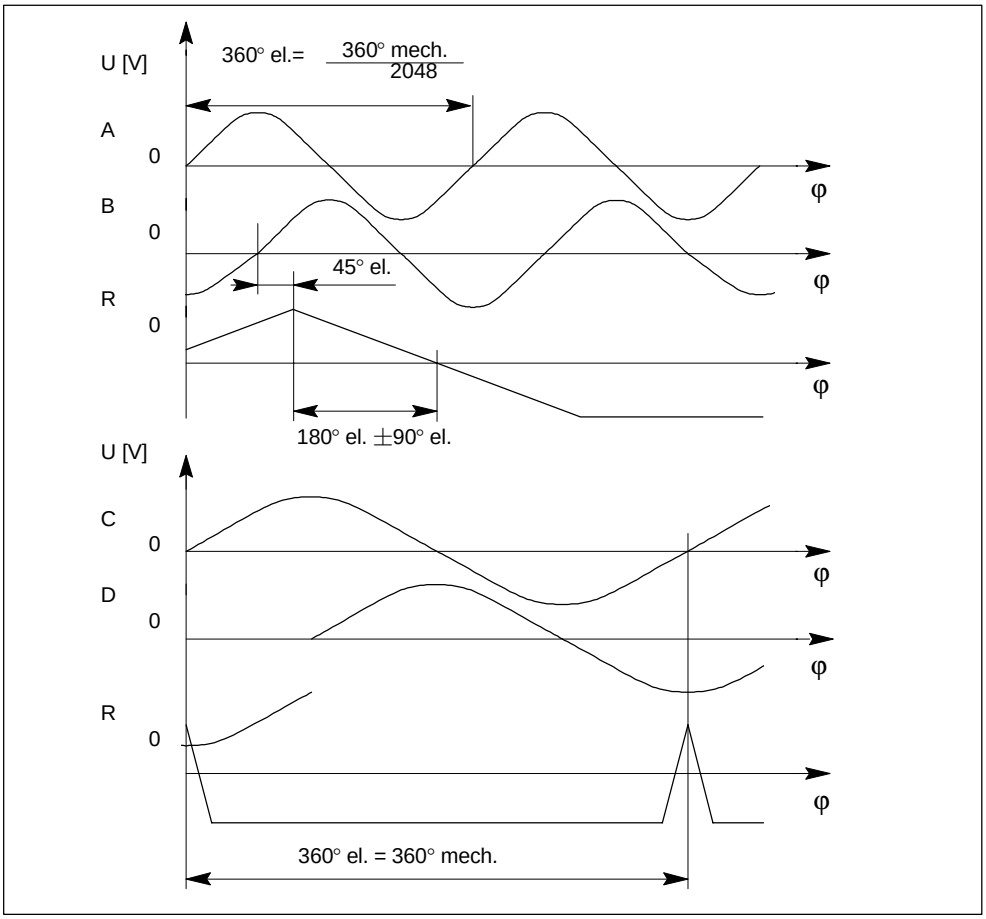
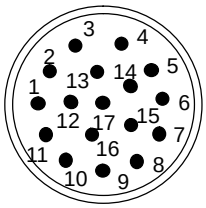


Fig. 3-2 Signal timing and assignment for a positive direction of rotation (clockwise rotation when viewing the drive end)

Connector assignment for a 17–pin flange–mounted socket with plug contacts

PIN No.	Signal
1	A+
2	A–
3	R+
4	D–
5	C+
6	C–
7	M–Encoder
8	+Temp
9	–Temp
10	P–Encoder
11	B+
12	B–
13	R–
14	D+
15	0 V Sense
16	5 V Sense
17	not connected



When viewing the connector side (plug contacts)

Connector and cables

Mating connector: 6FX2003–0CE17 (socket)

Pre–assembled cable: 6FX□002–2CA31–□□□0

Length 2)

5 = MOTION–CONNECT® 500 1)
8 = MOTION–CONNECT® 800 1)

Cable length: max. 50 m

1) Technical data of the MOTION–CONNECT series, refer to Catalog NC Z

2) Length code, refer to Catalog NC Z

3.2.2 Absolute value encoder

Function:

- Angular measuring system to impress the current
- Speed actual value sensing
- Absolute measuring system for the position control loop

Table 3-3

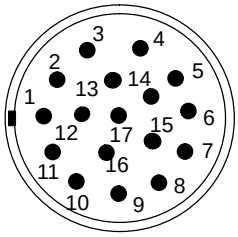
Characteristic	Absolute value encoders EnDat (A–2048)	Absolute value encoders EnDat (A–512)	Single absolute value encoders (A–32)
Mech. limiting speed	12000 RPM	12000 RPM	12000 RPM
Operating voltage	5V ± 5%	5V ± 5%	5V ± 5%
Current drain	max. 300 mA	max. 200 mA	max. 300 mA
Incremental resolution (periods per revolution)	2048	512	32
Absolute resolution (coded revolutions)	4096	4096	4096
Incremental signals	1 Vpp	1 Vpp	1 Vpp
Serial absolute position interface	EnDat	EnDat	EnDat
Angular error	± 40”	± 80”	± 400”

Note

The thermally permissible motor rated torque is reduced by 10% as a result of the reduced maximum operating temperature of the absolute value encoder with respect to incremental encoders.

Connector assignment for a 17–pin flange–mounted socket with plug contacts

PIN No.	Signal
1	A+
2	A–
3	+data
4	not connected
5	+clock
6	not connected
7	M–Encoder
8	+Temp
9	–Temp
10	P–Encoder
11	B+
12	B–
13	–data
14	–clock
15	0 V Sense
16	5 V Sense
17	not connected



When viewing the connector side (pins)

Connector and cables

Mating connector: 6FX2003–0CE17 (socket)

Pre–assembled cable: 6FX□002–2EQ10–□□□0

Length 2)

5 = MOTION–CONNECT® 500 1)
8 = MOTION–CONNECT® 800 1)

Cable length: max. 50 m

1) Technical data of the MOTION–CONNECT series, refer to Catalog NC Z

2) Length code, refer to Catalog NC Z

3.2.3 Resolver

Function:
- Angular measuring system to impress the current
- Speed actual value sensing
- Indirect incremental meas. system for the pos. contr. loop

Note

The limiting frequency of the drive converter must be carefully observed.
- SIMODRIVE 611U: Limiting frequency 432 Hz (before software release 4.1: 375 Hz)
- SIMODRIVE 611A: Only 2–pole resolvers are possible

Table 3-4 Technical data, resolvers

Mech. limiting speed	15 000 RPM
Excitation voltage Excitation frequency Current drain	5 V (rms) to 13 V (rms) 4 kHz to 10 kHz < 80 mA (rms)
Angular accuracy (bandwidth) 2-pole multi–pole	 < 14’ < 4’
Pole number Ratio	2, 4, 6 or 8 1) 0.5

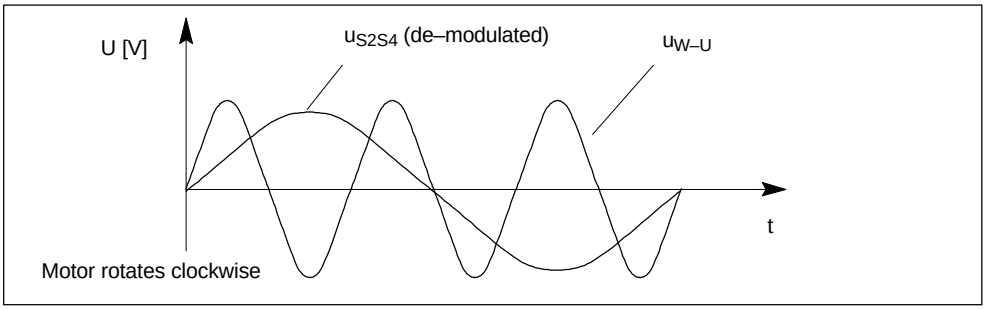
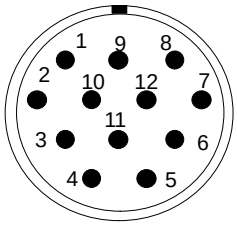


Fig. 3-3 Signal timing and assignment for a positive direction of rotation (clockwise direction of rotation when viewing the drive end)

1) The pole number is identical to the motor pole number

Connector assignment for a 12–pin flange–mounted socket with plug contacts

PIN No.	Signal
1	S2
2	S4
3	not connected
4	not connected
5	not connected
6	not connected
7	R3
8	+Temp
9	–Temp
10	R1
11	S1
12	S3



When viewing the connector side (pins)

Connector and cables

Mating connector: 6FX2003–0CE12 (socket)

Pre–assembled cable: 6FX□002–2CF02–□□□0

Length 2)

5 = MOTION–CONNECT® 500 1)
8 = MOTION–CONNECT® 800 1)

Cable length: max. 50 m

1) Technical data of the MOTION–CONNECT series, refer to Catalog NC Z

2) Length code, refer to Catalog NC Z

3.3 Holding brake

Function description, refer to Section AL.

Table 3-5 Technical data of the holding brakes used for 1FK7 motors

Motor type	Brake type	Holding torque M_4 1)	DC current	Opening time with varistor	Closing time with varistor	Highest switching work
		[Nm]	[A]	[ms]	[ms]	[J]
1FK7 CT						
1FK7022	EBD 0.11 BN	1.1	0.3	25	15	8
1FK7032	EBD 0.13 BN	1.3	0.4	45	25	17
1FK704□	EBD 0.3 BV	3.8	0.6	70	20	74
1FK706□	EBD 0.8 BK	13	0.8	90	20	350
1FK7080	EBD 1.5 BN	10	0.7	90	20	400
1FK7083	EBD 2 BY	22	0.9	100	30	1400
1FK7100	EBD 2 BY	22	0.9	100	30	1400
1FK7101	EBD 3.5 BV	41	1.0	140	50	3000
1FK7103	EBD 3.5 BV	41	1.0	140	50	3000
1FK7 HD						
1FK7033	1EB 14–30	1.3	0.45	70	35	14
1FK704□	1EB 20–40	4.0	0.60	110	40	96
1FK706□	1EB 28–60	12.0	0.80	150	45	230
1FK708□	1EB 35–80	22.0	1.20	190	50	700

Holding torque

The holding torque M_4 is the minimum brake torque in steady–state operation (when the motor is at a standstill).

3.4 Gearboxes

Planetary gearboxes (alpha company, LP series) – selection table for 1FK7 motors

Table 3-6 Technical data of the planetary gearboxes which can be used for 1FK7 CT and 1FK7 HD motors

Servo-motor, non-ventilated Type	Planetary gearbox 1 stage torsional play ≤12 arcmin Type	Gearbox weight approx.	Available gearbox ratios		Max. perm. incoming speed 1)	Max. perm. output torque 1)		Max. perm. drive–out shaft load 2)	Moment of inertia, gearbox
		[kg]	i = 5	i = 10	n_{G1} [RPM]	M_{G2} at i = 5 [Nm]	M_{G2} at i = 10 [Nm]	F_r [N]	J_G at i = 5/10 [10^{-4} kgm^2]
1FK7022	LP050–M01	0.77	X	–	8000	11.5	10.5	650	0.059
1FK7022	LP070–M01	1.9	–	X	6000	32	29	1450	0.28
1FK7032	LP070–M01	1.9	X	X	6000	32	29	1450	0.28
1FK7033	LP070–M01	1.9	X	X	6000	32	29	1450	0.28
1FK7040	LP090–M01	4.1	X	X	6000	80	72	2400	1.77
1FK7042	LP090–M01	4.1	X	X	6000	80	72	2400	1.77
1FK7043	LP090–M01	4.1	X	X	6000	80	72	2400	1.77
1FK7044	LP090–M01	4.1	X	X	6000	80	72	2400	1.77
1FK7060	LP120–M01	9	X	X	4800	200	180	4600	5.42
1FK7061	LP120–M01	9	X	X	4800	200	180	4600	5.42
1FK7063	LP120–M01	9	X	X	4800	200	180	4600	5.42
1FK7064	LP120–M01	9	X	X 3)	4800	200	180	4600	5.42
1FK7080	LP155–M01	17.5	X	X	3600	400	320	7500	25.73
1FK7082	LP155–M01	17.5	X	X	3600	400	320	7500	25.73
1FK7083	LP155–M01	17.5	X	X	3600	400	320	7500	25.73
1FK7085	LP155–M01	17.5	X	X 3)	3600	400	320	7500	25.73
1FK7100	LP155–M01	17.5	X	–	3600	400	320	7500	25.73
1FK7101	LP155–M01	17.5	X	–	3600	400	320	7500	25.73
1FK7103	LP155–M01	17.5	X	–	3600	400	320	7500	25.73
Code: Gearbox shaft with key			**V40**	**V42**					

1) Values for positioning duty S5
2) Referred to the drive–out shaft center at 100 RPM
3) It is necessary to reduce the max. motor torque

Continuous duty S1

Continuous duty is permissible at the rated speed and rated torque. It is not permissible to exceed a gearbox temperature of 90° C.

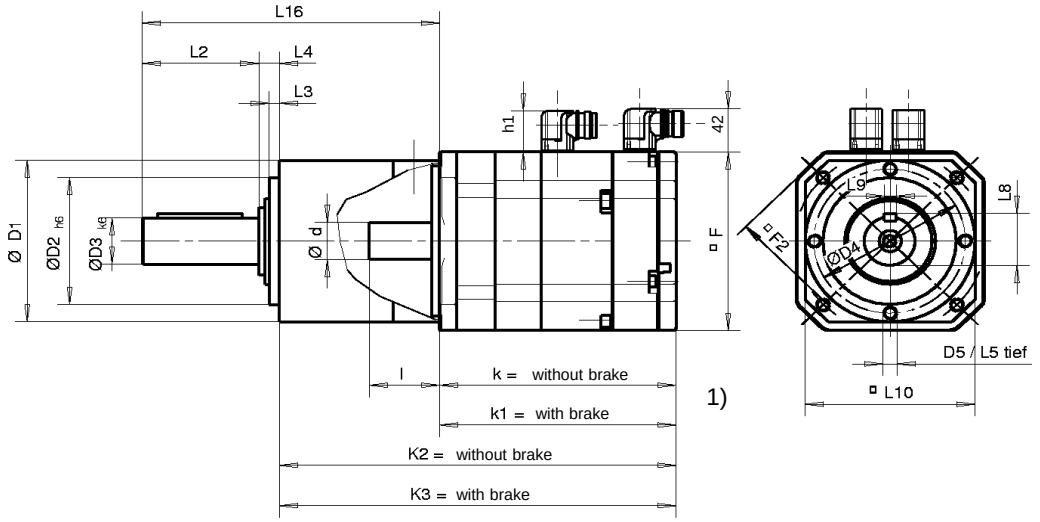
Table 3-7 Continuous duty S1

Planetary gearbox 1–stage Torsional play ≤12 arcmin	Rated speed [RPM]	Max. perm. output torque 1) [Nm]	
Type	n_{N1}	M_{N2} **at i = 5**	M_{N2} **at i = 10**
LP50–M01	4000	5.7	5.2
LP070–M01	3700	16	15
LP090–M01	3400	40	35
LP120–M01	2600	100	90
LP155–M01	2000	290	170

The gearboxes can be mounted in any position.
The gearboxes have degree of protection IP 64.
It is not possible to supply gearbox versions without key.

1) Value for positioning duty S5

Dimensions of 1FK7 CT/HD with planetary gearbox from the alpha company, series LP



1) Dimensions for k and k1, refer to Chapter 4, Dimension Diagrams

Fig. 3-4 Dimensions 1FK7 CT and 1FK7 HD motor with planetary gearbox

Table 3-8 Dimensions **1FK7 CT** motor with planetary gearbox (refer to Fig. 3-4)

Servo-motor	Dimen-sions [mm]		Planetary gearbox, 1–stage	Dimensions [mm]													without brake Dimensions [mm]			with brake Dimensions [mm]		
	h1	□F		∅ D1	∅ D2	∅ D3	∅ D4	D5	L16	L2	L3	L4	L5	L8	L9	L10	K2 2)	K2 3)	K2 4)	K3 2)	K3 3)	K3 4)
1FK7022 1FK7022	42	55	LP050–M01 LP070–M01	50 70	35 52	12 16	44 62	M4 M5	88 119	18 28	4 5	7 8	8 10	14 18	4 5	50 70	216 236	241 261	241 261	238 258	263 283	263 283
1FK7032	42	72	LP070–M01	70	52	16	62	M6	126	28	5	8	10	18	5	70	240	265	265	265	290	290
1FK7040 1FK7042	42	96	LP090–M01	90	68	22	80	M6	158	36	5	10	12	25	6	90	247 274	267 295	276 303	276 303	296 324	305 332
1FK7060 1FK7063	42	126	LP120–M01	120	90	32	108	M8	210	58	6	12	16	35	10	120	297 342	320 365	328 373	340 385	363 408	371 416
1FK7080 1FK7083	42	155	LP155–M01	155	120	40	140	M10	266	82	8	15	20	43	12	150	325 363	347 385	355 393	353 414	375 436	384 444
1FK7100	42	192	LP155–M01	155	120	40	140	M10	266	82	8	15	20	43	12	150	374	396	404	393	415	423
1FK7101 1FK7103	64	192	LP155–M01	155	120	40	140	M10	266	82	8	15	20	43	12	150	400 426	422 448	430 456	429 455	452 478	460 486

Table 3-9 Dimensions **1FK7 HD** motor with planetary gearbox (refer to Fig. 3-4)

Servo-motor	Dimen-sions [mm]		Planetary gearbox, 1–stage	Dimensions [mm]													without brake Dimensions [mm]			with brake Dimensions [mm]		
	h1	□F		∅ D1	∅ D2	∅ D3	∅ D4	D5	L16	L2	L3	L4	L5	L8	L9	L10	K2 2)	K2 3)	K2 4)	K3 2)	K3 3)	K3 4)
1FK7033	42	72	LP070–M01	70	52	16	62	M5	126	28	5	8	10	18	5	70	260	285	285	285	310	310
1FK7043 1FK7044	42	96	LP090–M01	90	68	22	80	M6	158	36	5	10	12	25	6	90	303 328	324 349	332 357	332 357	352 377	361 386
1FK7061 1FK7064	42	126	LP120–M01	120	90	32	108	M8	210	58	6	12	16	35	10	120	325 389	348 412	357 421	368 432	391 455	400 464
1FK7082 1FK7085	42 64	155	LP155–M01	155	120	40	140	M10	266	82	8	15	20	43	12	150	370 430	393 453	401 461	423 473	445 495	454 504

2) with resolver
3) with simple absolute value encoder (not for 1FK7022, 1FK7032) or incremental encoders sin/cos $1V_{PP}$
4) with absolute value encoder EQN opt.

■

Dimension Drawings

4

Note

Siemens AG reserves the right to change the dimensions of the motors as part of mechanical design improvements without prior notice. This means that dimension drawings can go out of date.

Current dimension drawings can be requested at no change from your local SIEMENS office.

1FK7 CT series

1FK7 HD series

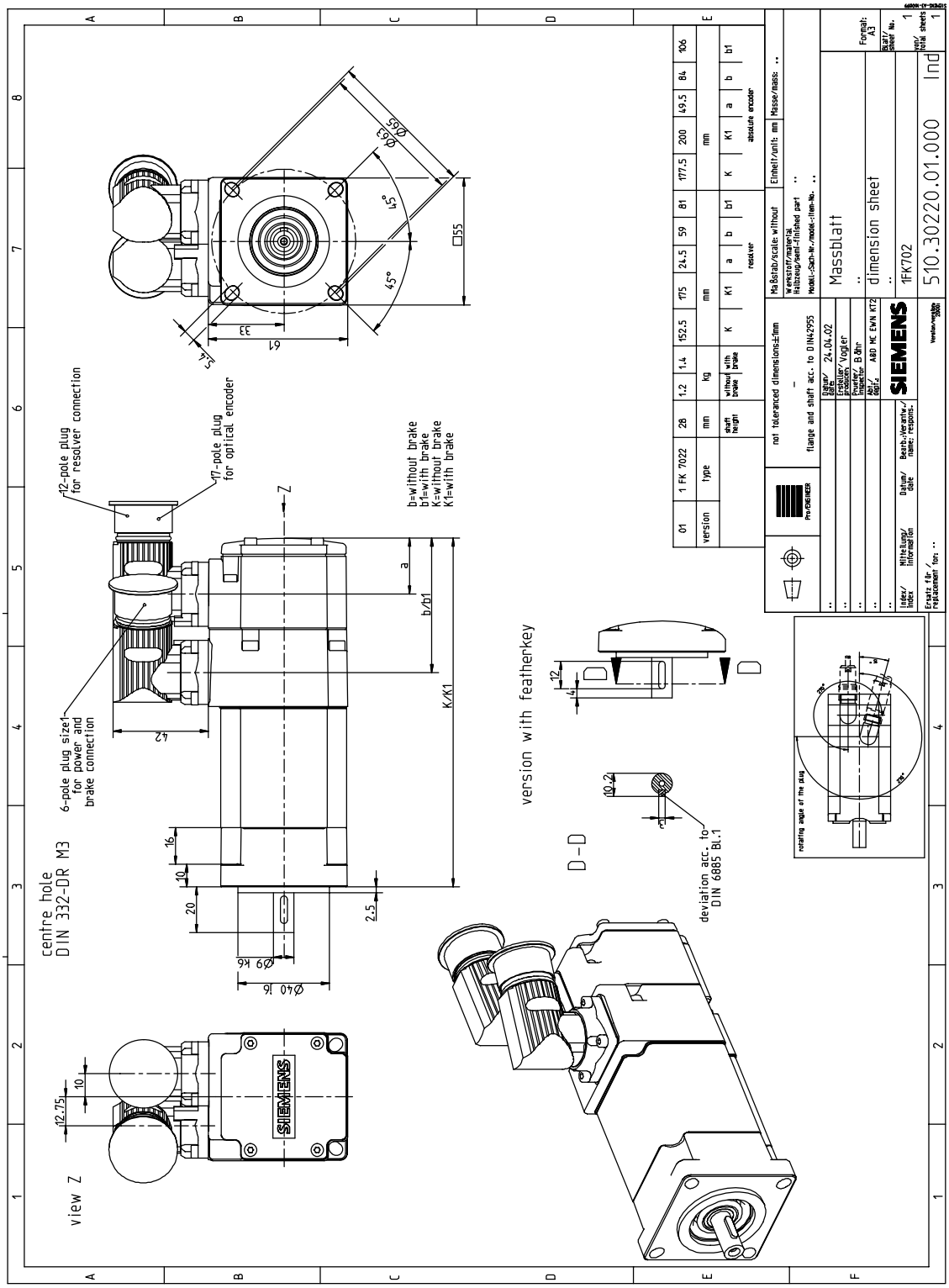


Fig. 4-1 1FK702□–5

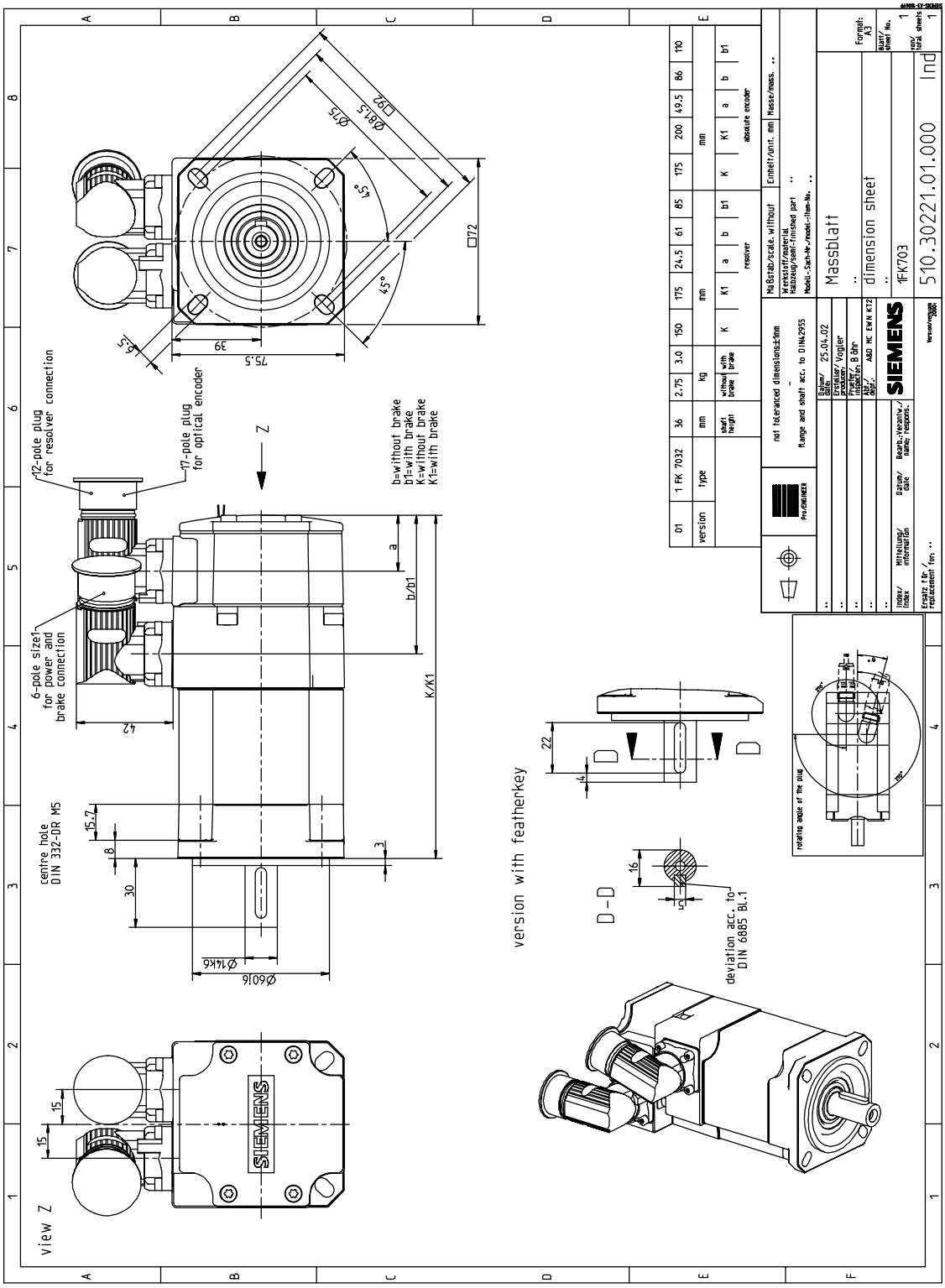


Fig. 4-2 1FK703□–5

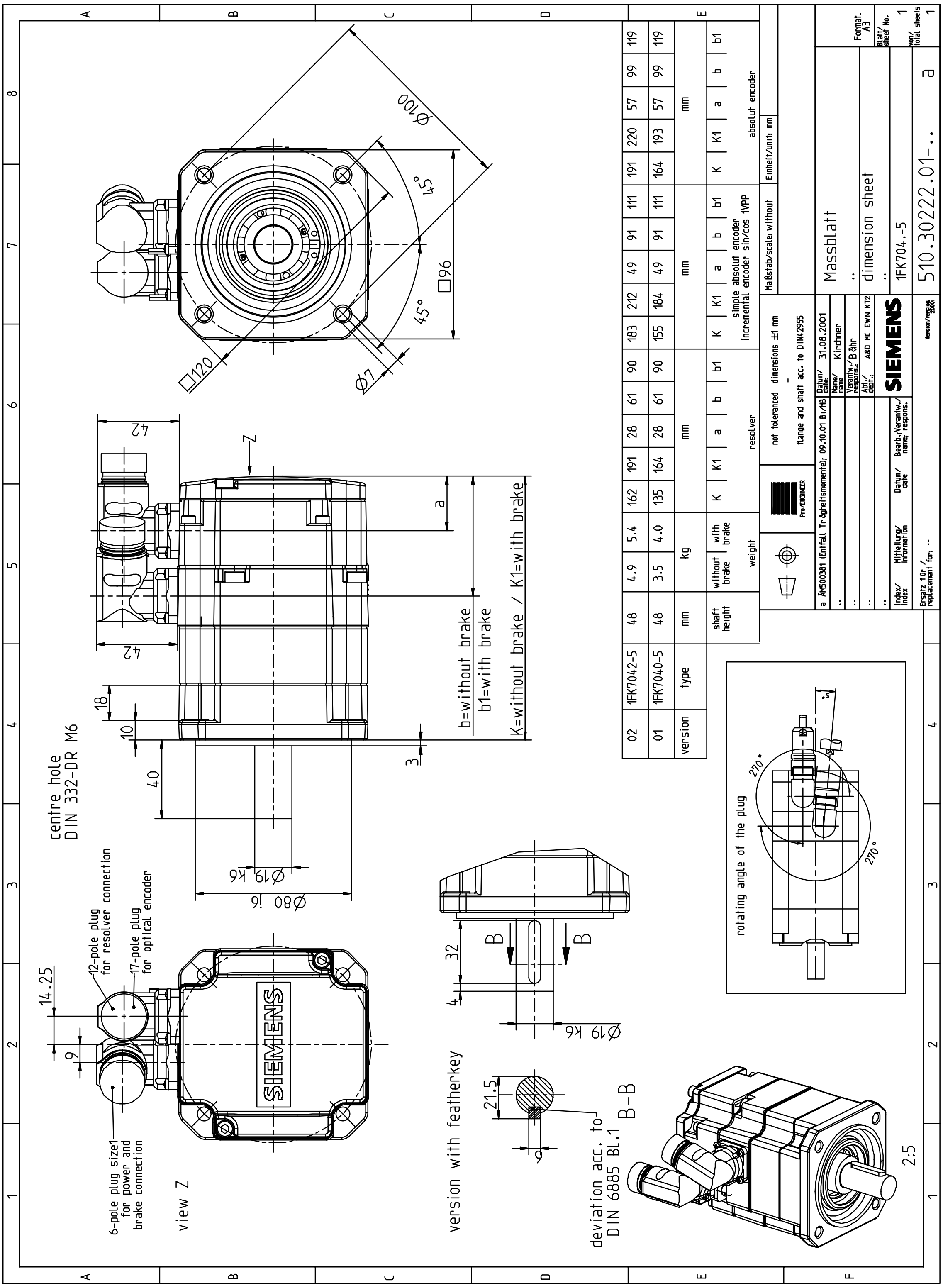


Fig. 4-3 1FK704□–5, non–ventilated with angled connector, Size 1

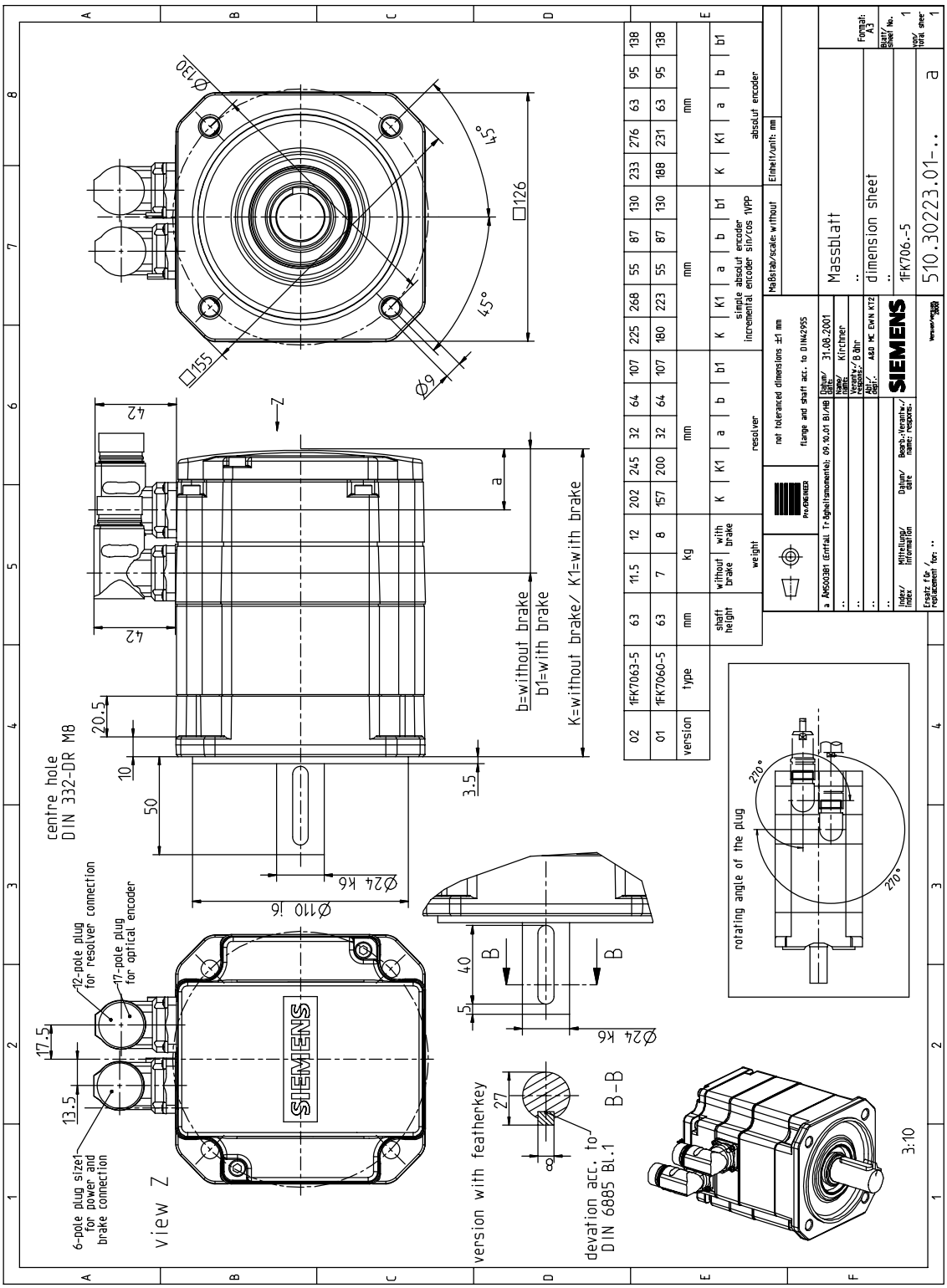


Fig. 4-4 1FK706□–5, non–ventilated with angled connector, Size 1

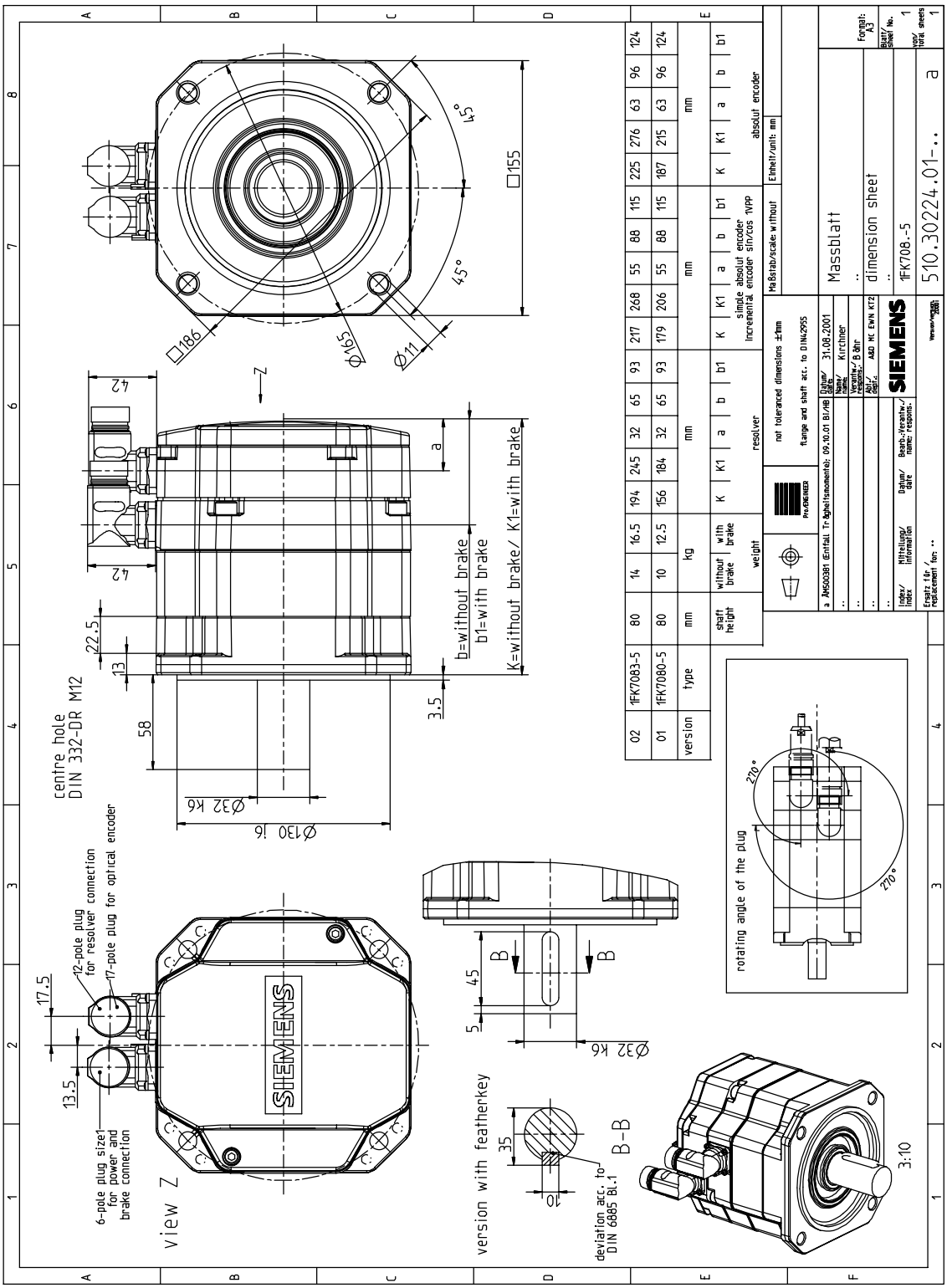


Fig. 4-5 1FK708□–5, non–ventilated with angled connector, Size 1

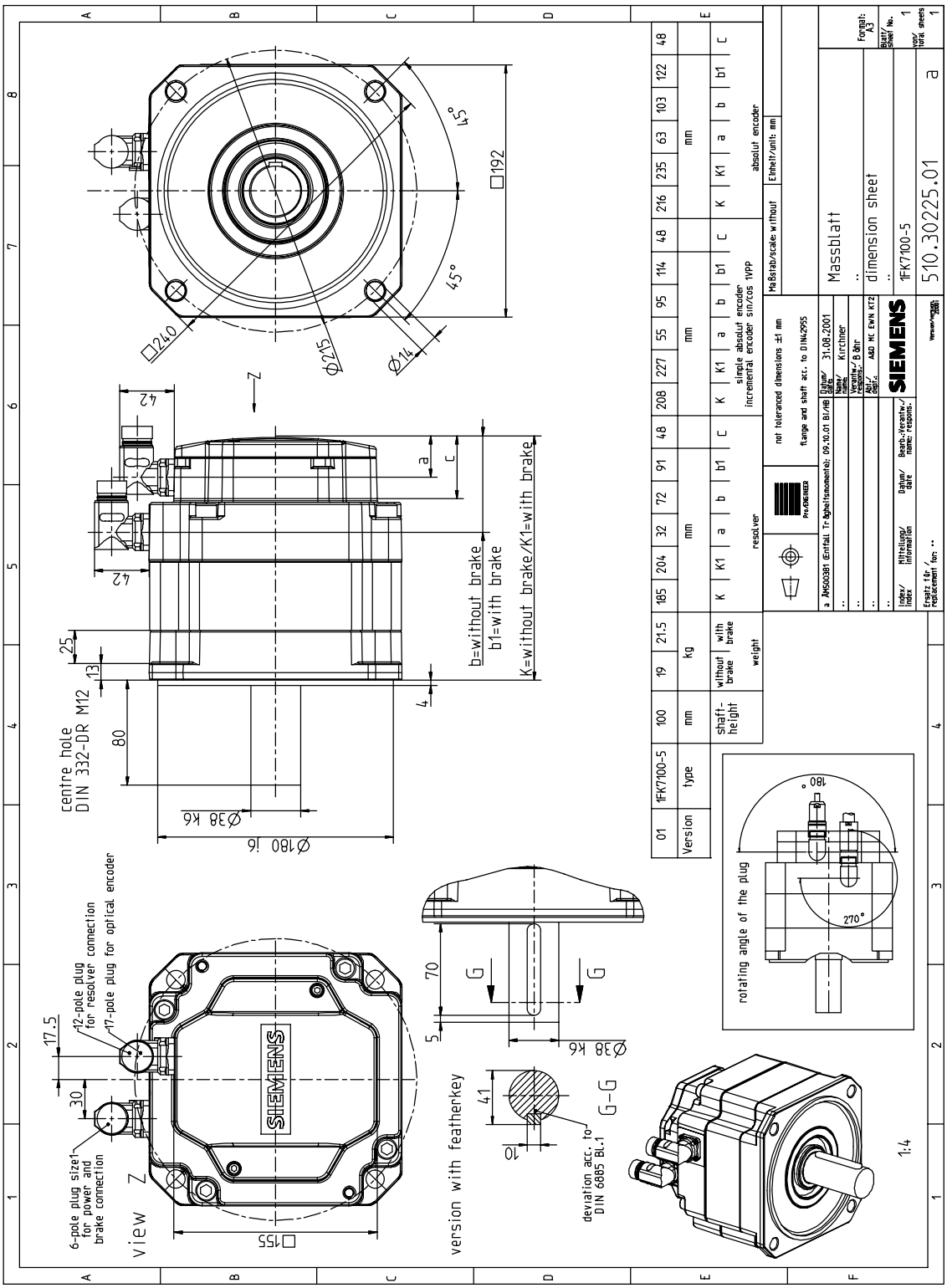


Fig. 4-6 1FK7100–5, non–ventilated with angled connector, Size 1

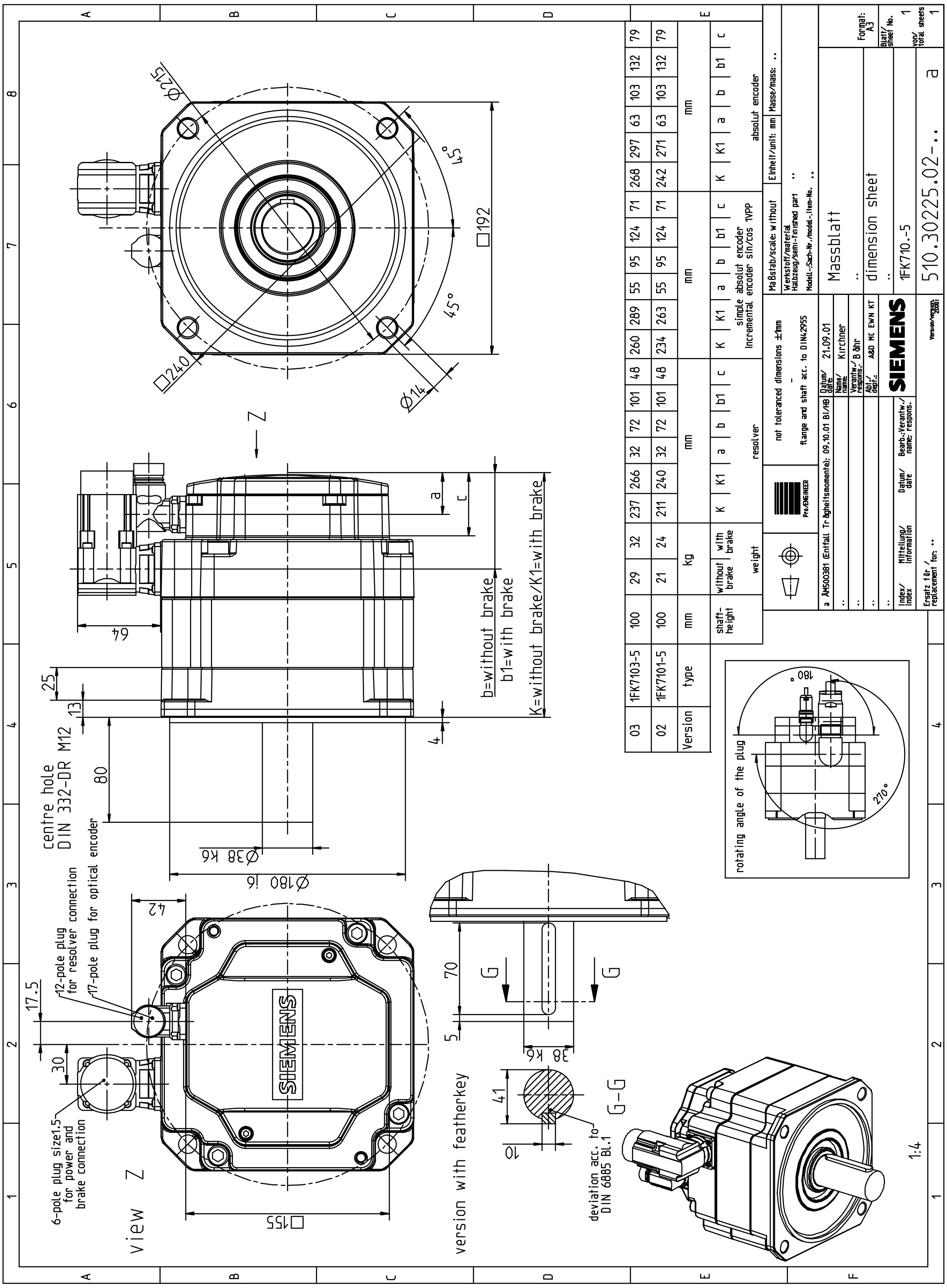


Fig. 4-7 1FK710□–5, non–ventilated with angled connector, Size 1.5

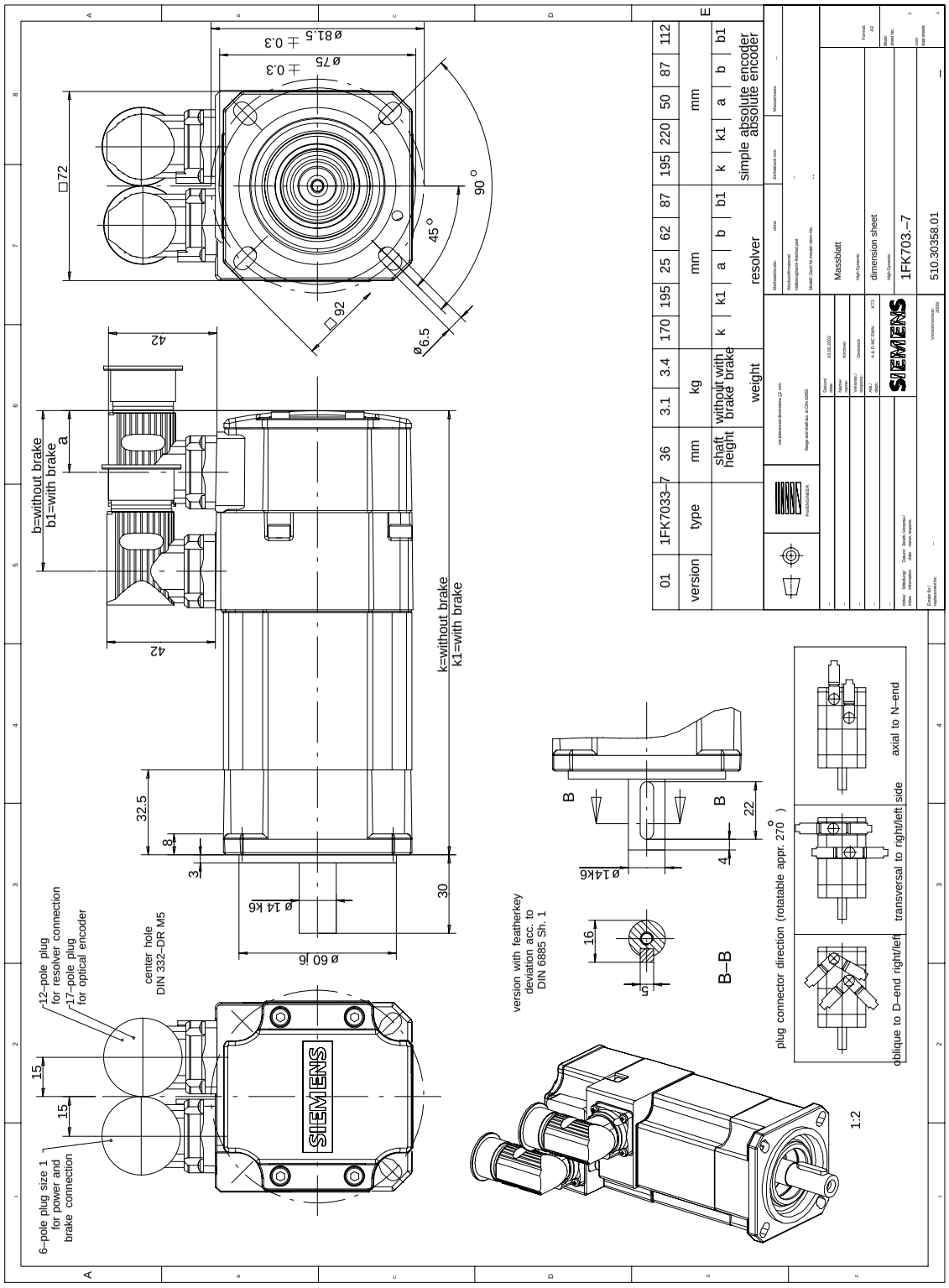


Fig. 4-8 1FK703□ –7

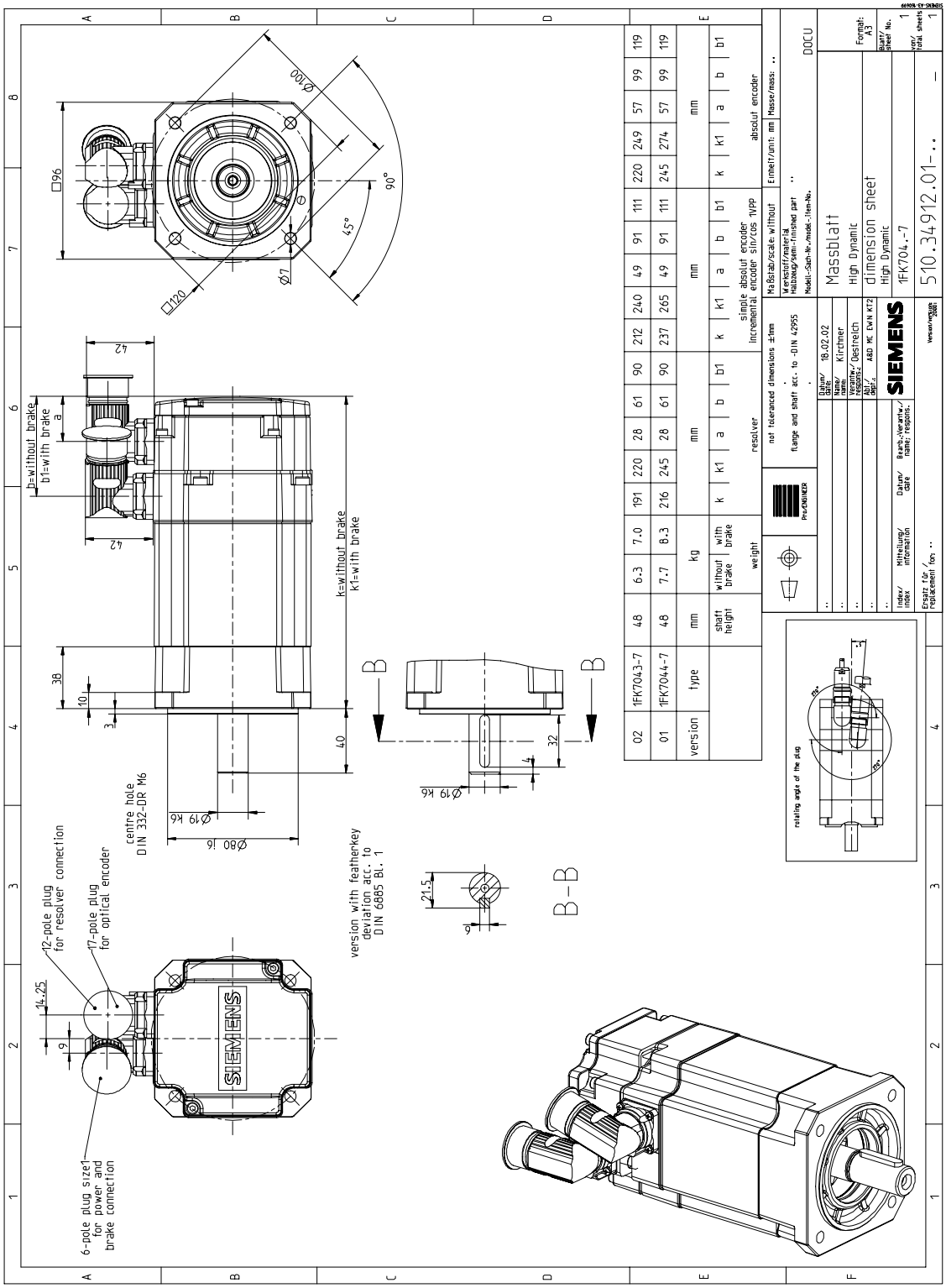


Fig. 4-9 1FK704□ –7

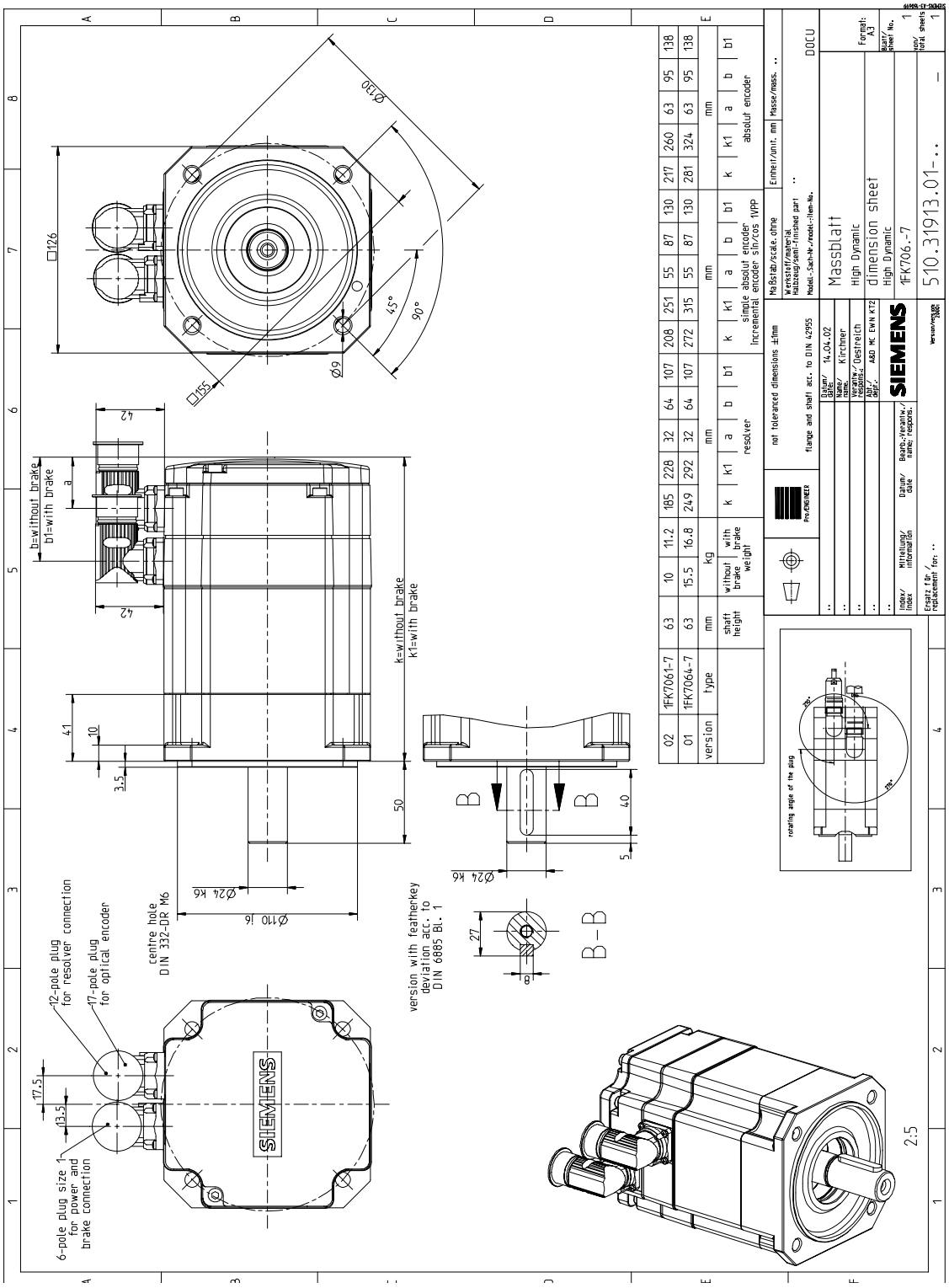


Fig. 4-10 1FK706□ –7

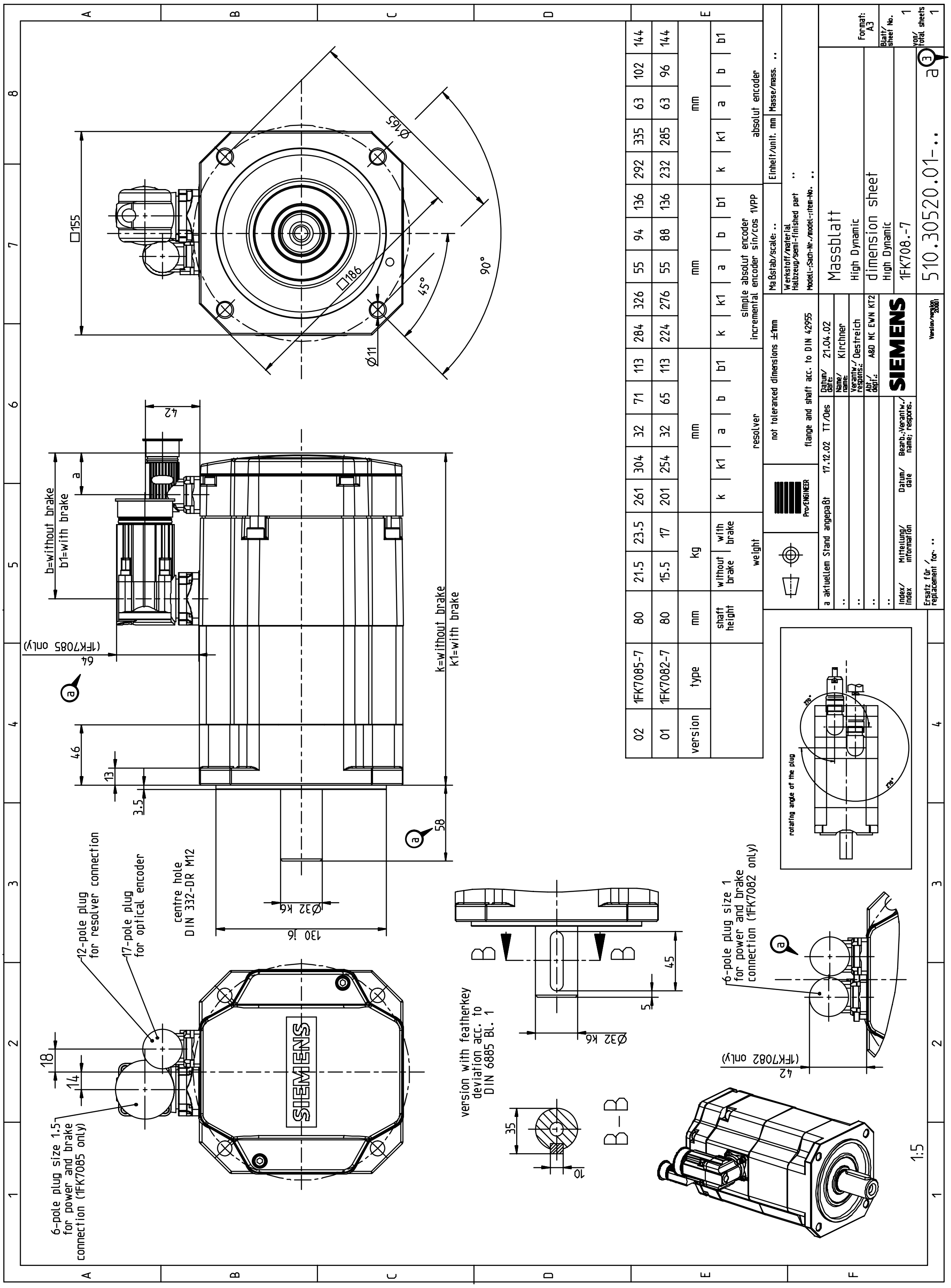


Fig. 4-11 1FK708□–7

■

References

General Documentation

/BU/ **Catalog NC 60**

Automation Systems for Machine Tools
Ordering document
Order No.: E86060–K4460–A101–A8
Order No.: E86060–K4460–A101–A8–7600 (English)

/Z/ **Catalog NC Z**

SINUMERIK, SIMODRIVE & SIMOVERT MASTERDRIVES
Connection Technology & System Components
Order No.: E86060–K4490–A001–A7
Order No.: E86060–K4490–A001–A7–7600 (English)

Electronic Documentation

/CD1/ **DOC ON CD**

The SINUMERIK System
(includes all SINUMERIK 840D/810D and SIMODRIVE 611D documents)
Order No.: 6FC5 298–6CA00–0BG2

Manufacturer/Service Documentation

/PJM/ **Planning Guide, AC Servomotors**

SIMODRIVE 611, MASTERDRIVES MC
General Section, 1FT5, 1FT6, 1FK6, 1FK7
Order No.: 6SN1 197–0AC20–0BP0

/PJAL/ **Planning Guide, AC Servomotors**

SIMODRIVE 611, MASTERDRIVES MC
AC Servomotors, General Section
Order No.: 6SN1 197–0AD07–0BP0

/PFK7/ Planning Guide, AC Servomotors

SIMODRIVE 611, MASTERDRIVES MC
AC Servomotors 1FK7
Order No.: 6SN1 197–0AD06–0BP0

/PFK6/ Planning Guide, AC Servomotors

SIMODRIVE 611, MASTERDRIVES MC
AC Servomotors 1FK6
Order No.: 6SN1 197–0AD05–0BP0

/PFT5/ Planning Guide, AC Servomotors

SIMODRIVE
AC Servomotors 1FT5
Order No.: 6SN1 197–0AD01–0BP0

/PFT6/ Planning Guide, AC Servomotors

SIMODRIVE 611, MASTERDRIVES MC
AC Servomotors 1FT6
Order No.: 6SN1 197–0AD02–0BP0

/PPH/ Planning Guide, AC Induction Motors

SIMODRIVE
AC Induction Motors for Main Spindle Drives
1PH2, 1PH4, 1PH7
Order No.: 6SN1 197–0AC60–0BP0

/PPM/ Planning Guide, Hollow Shaft Motors

SIMODRIVE
Hollow Shaft Motors for Main Spindle Drives
1PM6 and 1PM4
Order No.: 6SN1 197–0AD03–0BP0

/PJFE/ Planning Guide, Synchronous Build–in Motors

SIMODRIVE
AC Motors for Main Spindle Drives
Synchronous Build–in Motors 1FE1
Order No.: 6SN1 197–0AC00–0BP1

/PTM/ Planning Guide, Build–in Torque Motors

SIMODRIVE
Build–in Torque Motors 1FW6
Order No.: 6SN1 197–0AD00–0BP1

/PJLM/ Planning Guide, Linear Motors

SIMODRIVE
Linear Motors 1FN1 and 1FN3
Order No.: 6SN1 197–0AB70–0BP3

/PJU/ Planning Guide, Drive Converters

SIMODRIVE 611
Transistor PWM Inverters for AC Feed and AC Main Spindle Drives
Order No.: 6SN1 197–0AA00–0BP5

/EMV/ Planning Guide, EMC Design Guidelines

SINUMERIK, SIROTEC, SIMODRIVE
Order No.: 6FC5 297–0AD30–0BP1

Operating Instructions 1FT5062 – 1FT5138

Order No. / Bestell–Nr.: 610.41199.21

Operating Instructions 1FT5020 – 1FT5046

Order No. / Bestell–Nr.: 610.42078.21

Operating Instructions 1FT6

Order No. / Bestell–Nr.: 610.43410.21

Operating Instructions 1FK6

Order No. / Bestell–Nr.: 610.43430.21

Operating Instructions 1FK7

Order No. / Bestell–Nr.: 610.40700.21

■

Space for your notes

Index

T

V

To
SIEMENS AG
A&D MC BMS
Postfach 3180

D-91050 Erlangen

Tel.: +49 (0)180 / 5050 – 222 [Service Support]
Fax: +49 (0)9131 / 98 – 2176 [Documentation]
email: motioncontrol.docu@erlf.siemens.de

Recommendations

Corrections

For documentation:

AC Servomotors
1FK7

Manufacturer/Service Documentation

Planning Guide

Order No.: 6SN1197-0AD06-0BP0
Edition: 01.2003

From

Name

Company address/Dept.

Street

Postal code: City:

Telephone: /

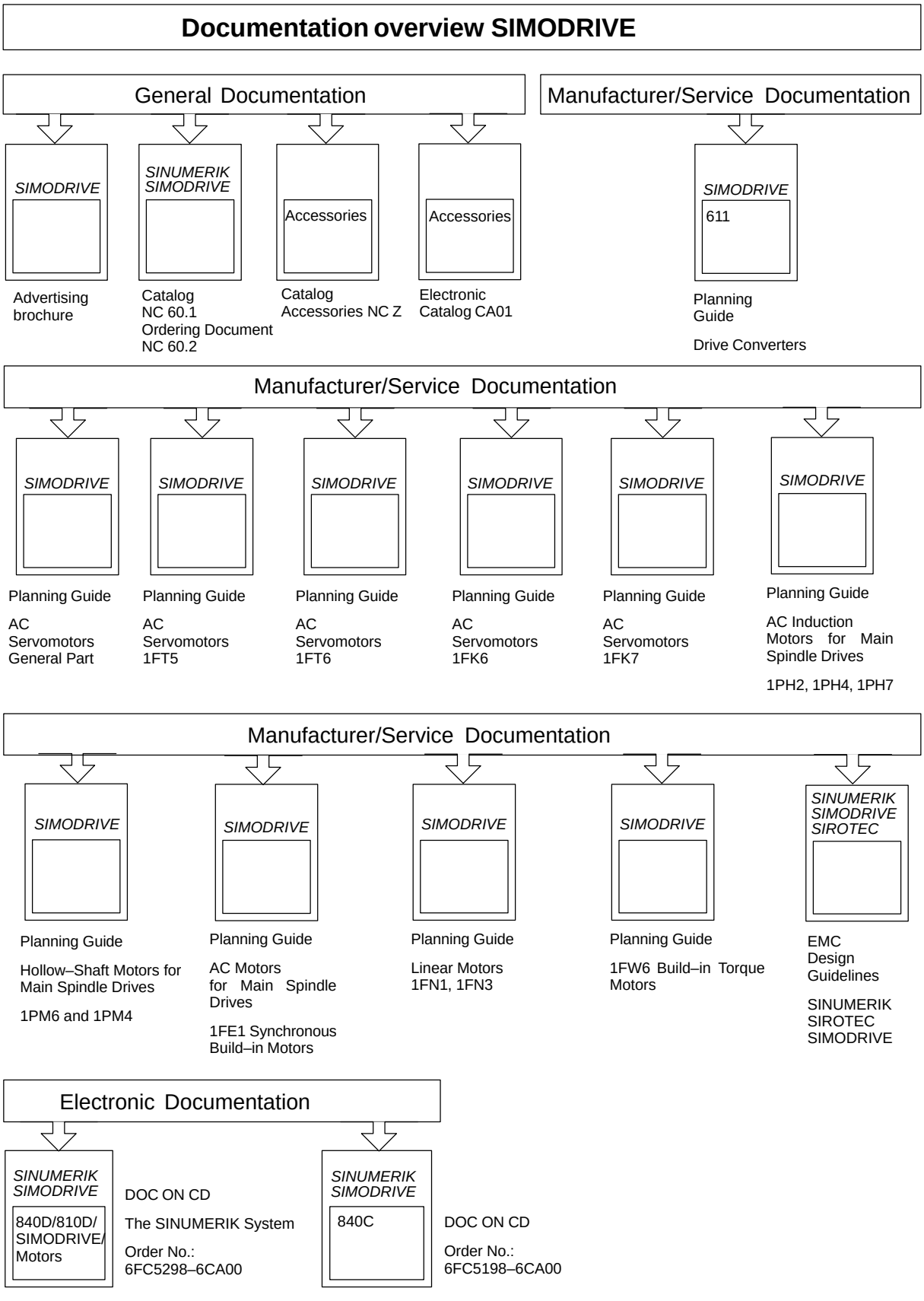
Telefax: /

If you come across any printing errors in this document, please let us know using this form.

We would also be grateful for any suggestions and recommendations for improvement.

Recommendations and/or corrections

Documentation overview SIMODRIVE



Siemens AG
Automatisierungs- und Antriebstechnik
Motion Control Systems
Postfach 3180, D – 91050 Erlangen
Bundesrepublik Deutschland

www.ad.siemens.de

Order No.: 6SN1197-0AD06-0BP0

Printed in the Federal Republic of Germany