

masterdrives

AC Servomotors
1FS6, Explosion-Protected
Masterdrives MC

SIEMENS

SIEMENS

MASTERDRIVES MC

AC Servomotors 1FS6, Explosion-protected

Planning Guide

Motor Description	1
Technical Data and Characteristics	2
Motor Components (Options)	3
Dimension Drawings	4
References	A
Index	B
EC Declaration of Conformity	C

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. for 1FS6	Remark
07.03	6SN1197-0AD08-0BP0	A

This Manual is included in the documentation available on CD-ROM (**DOCONCD**)

Edition	Order No.	Remark
11.03	6FC5 298-6CA00-0BG4	C

Trademarks

SIMATIC®, SIMATIC HMI®, SIMATIC NET®, SIROTEC®, SINUMERIK®, SIMODRIVE®, MASTERDRIVES® and MOTION-CONNECT® are registered trademarks of Siemens AG. Other names in this publication might be trademarks whose use by a third party for his own purposes may violate the rights of the registered holder.

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

This publication was produced with Interleaf V 7

The reproduction, transmission or use of this document or its contents is not permitted without express written authority. Offenders will be liable for damages. All rights, including rights created by patent grant or registration of a utility model or design, are reserved.

© Siemens AG 2003. All rights reserved.

Other functions not described 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 reviewed regularly and any necessary changes will be included in the next edition. We welcome suggestions for improvement.

We reserve the right to make technical changes.

Foreword

Information on SIMODRIVE/MASTERDRIVES documentation

This document is part of the Technical Customer Documentation which has been developed for SIMODRIVE/MASTERDRIVES. All of the documents are available individually. You can obtain the complete list of documentation encompassing all Advertising Brochures, Catalogs, Overviews, Short Descriptions, Operating Instructions and Technical Descriptions with Order No., ordering address and price from your local Siemens office.

For reasons of transparency, this document does not include detailed information about all of the product types. Further, it cannot take into account every conceivable installation, operation or service/maintenance situation.

We would also like to point-out that the contents of this document are neither part of nor modify any prior or existing agreement, commitment or contractual 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.

Hotline

If you have any questions, please contact the following Hotline:

A&D Technical Support Tel.: +49 (180) 5050-222
Fax: +49 (180) 5050-223
eMail: adsupport@siemens.com

If you have any questions regarding the documentation (suggestions, corrections) then please send a fax to the following number:

+49 (9131) 98-2176

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

Definition of qualified personnel

For the purpose of this document and warning information on the product itself, "Qualified personnel" are those who are familiar with the installation, mounting, start-up and operation of the equipment and are appropriately qualified and trained for the function which they perform.

- Trained and authorized to energize/de-energize, 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 is always used if death, severe or substantial property **will** result if proper precautions are not taken.



Warning

This symbol is always used if death, severe or substantial property **can** result if proper precautions are not taken.



Caution

This symbol is always used if minor personal injury or material damage **can** result if proper precautions are not taken.

Caution

The warning note (without a warning triangle) means that material damage **can** occur if proper precautions are not taken.

Notice

This warning note indicates that an undesirable result or an undesirable status **can** occur if the appropriate information is not observed.

Note

In the sense of this document there is a possible advantage/benefit if the note text is observed.

Danger and warning information



Danger

- It is not permissible to commission the equipment until it has been clearly identified that the machine, in which the described components are to be installed, is in full compliance with the specifications in Directive 98/37/EC.
- Only appropriately qualified and trained personnel may commission SIMODRIVE/MASTERDRIVES drive units and the AC motors.
- This personnel must take into account the technical customer documentation belonging to the product and be knowledgeable and observe the specified information and instructions on the hazard and warning labels.
- When electrical equipment and motors are operated, the associated electrical circuits are at hazardous voltage levels.
- When the machine or system is operated, hazardous axis movements can occur.
- All of the work carried-out in the electrical machine or system must be carried-out with it in a no-voltage condition.
- SIMODRIVE/MASTERDRIVES drive units have been designed for operation on low-ohmic grounded line supplies (TN line supplies).



Warning

- The successful and safe operation of this equipment and motors is dependent on proper transport, storage, installation and mounting as well as careful operator control, service and maintenance.
- For special versions of the drive units and motors, information and data in the catalogs and quotations additionally apply.
- In addition to the information and instructions on hazards and warnings in the technical customer documentation supplied, the applicable national, local and machine/system-specific regulations and requirements must be carefully taken into consideration.



Caution

- The motors can have surface temperatures of over +80° C.
- This is the reason that it is not permissible that temperature-sensitive parts and components – e.g. cables or electrical components – are in contact with the motor or fastened to the motor.
- When connecting and routing connecting cables, the following must be carefully observed:
 - they may not be damaged
 - they may not be strained, and
 - they may not be able to be touched by rotating components.

Caution

- SIMODRIVE/MASTERDRIVES drive units with AC motors are subject to a voltage test in compliance with EN 50178 as part of the routine test. According to EN 60204-1, Section 19.4, while electrical equipment of industrial machines are being subject to a voltage test, all of the SIMODRIVE/MASTERDRIVES drive unit connections must be disconnected/withdrawn in order to avoid damaging the SIMODRIVE/MASTERDRIVES drive units.
 - Motors should be connected-up according to the circuit diagram supplied. It is not permissible to directly connect the motors to the three-phase line supply. Motors will be destroyed if they are connected directly to the three-phase line supply.
-

Note

- SIMODRIVE/MASTERDRIVES drive units with AC motors fulfill, in the operational state and in dry operating areas, the Low-Voltage Directive 73/23/EEC.
 - SIMODRIVE/MASTERDRIVES drive units with AC motors fulfill, in the configurations which are specified in the associated EC Declaration of Conformity, the EMC Directive 89/336/EEC.
-

ESDS information and instructions



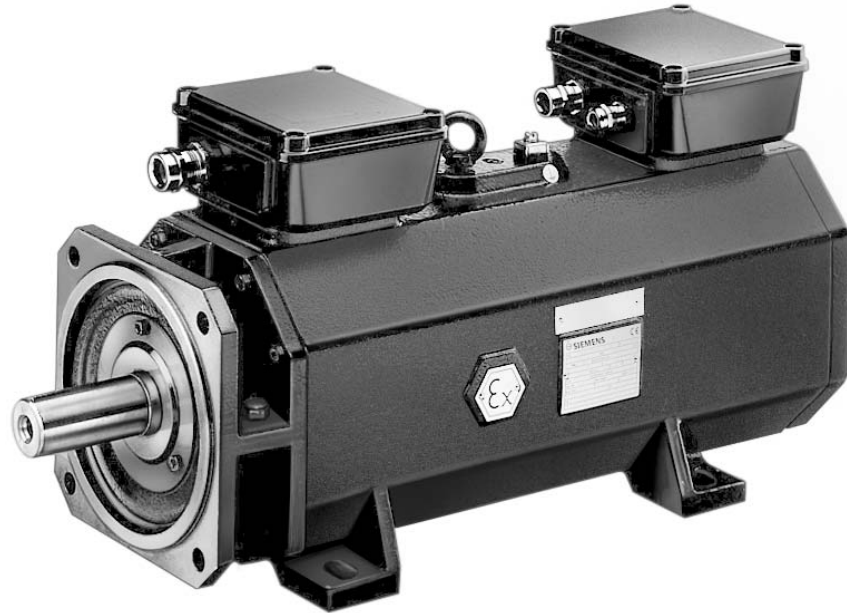
Caution

ElectroStatic Discharge Sensitive devices (ESDS) are individual components, integrated circuits or modules which could be damaged as a result of electrostatic fields or electrostatic discharge.

Handling ESDS boards:

- The human body, working area and packaging should be well grounded when handling ESDS components!
 - Electronic components may only be touched by people in ESDS areas with conductive flooring if
 - they are grounded through an ESDS wrist strap
 - 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 synthetic materials and clothing manufactured out of man-made fibers.
 - Electronic boards may only be placed down 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).
-

1FS6 Table of Contents



1	Motor Description	1FS6/1-13
1.1	Applications and features	1FS6/1-13
1.2	Order designation	1FS6/1-15
1.3	Versions	1FS6/1-16
1.4	Technical information, options	1FS6/1-17
1.5	Rating plate data	1FS6/1-17
1.6	Electrical connections	1FS6/1-18
1.6.1	Power connection	1FS6/1-18
1.6.2	Signal connection	1FS6/1-20
1.7	Drive-out coupling	1FS6/1-21
2	Technical Data and Characteristics	1FS6/2-23
2.1	Definitions	1FS6/2-23
2.2	Selecting motors	1FS6/2-32
2.3	Technical data	1FS6/2-34
2.4	Armature short-circuit braking	1FS6/2-34
2.5	Speed-torque diagrams	1FS6/2-35
2.6	Cantilever force diagrams	1FS6/2-49
2.7	Axial forces	1FS6/2-52
3	Motor Components	1FS6/3-53
3.1	Thermal motor protection	1FS6/3-53
3.1.1	KTY-thermistor	1FS6/3-53
3.1.2	PTC-thermistor	1FS6/3-55
3.2	Encoders	1FS6/3-56
3.2.1	Incremental encoders	1FS6/3-57
3.2.2	Absolute value encoders	1FS6/3-59
3.3	Holding brake	1FS6/3-60
3.4	Gearbox	1FS6/3-60
4	Dimension Drawings	1FS6/4-61
A	References	1FS6/A-67
B	Index	1FS6/B-71
C	EC Declaration of Conformity	1FS6/C-65



Motor Description

1.1 Applications and features

Applications

The applications include all electric drives in hazardous areas, Zone 1.

The 1FS6 series can, for example, be used in the following areas:

- Chemical industry
- Painting systems
- Filling plants with liquids which can explode
- Gravure printing machines

Features

1FS6 motors are permanent-magnet three-phase synchronous motors for operation in potentially hazardous areas.

The motors have type of protection EEx de IIC T3.

The inside of the motor is a flameproof enclosure (EEx d) and the connection spaces (terminal boxes) have type of protection increased safety (EEx e).

Standards, Regulations

The motors conform with the regulations laid-down in the European Directive 94/9/EG (ATEX 95). The fact that these motors completely conform with the following standards proves that they are in line with the regulations laid-down in this Directive:

EN 60 204-1, EN 60 034, EN 50 014, EN 50 018 and EN 50 019.

The motors have been accepted and certified by the "TÜV NORD CERT GmbH & Co. KG" a notified body in Hanover.

The EC type examination certificates have the following certification number:

TÜV 02 ATEX 1891, 1892, 1893 and 1894.

The manufacturer "SIEMENS AG, Group A&D MC" has, based on these documents, generated the EC Declaration of Conformance and attached the CE marking to the motor.

1.1 Applications and features

Note

The company operating the plant or system is exclusively responsible in classifying the potentially hazardous areas into the various zones (e.g. Zone 1 or Zone 2). The classification depends on the probability that there is a potential hazard due to explosion.

Drive converters

1FS6 motors have been released for the following drive converters:

SIMOVERT MASTERDRIVES Motion Control



Caution

These motors may not be fed from SIMOVERT MASTERDRIVES Vector Control drive converters.

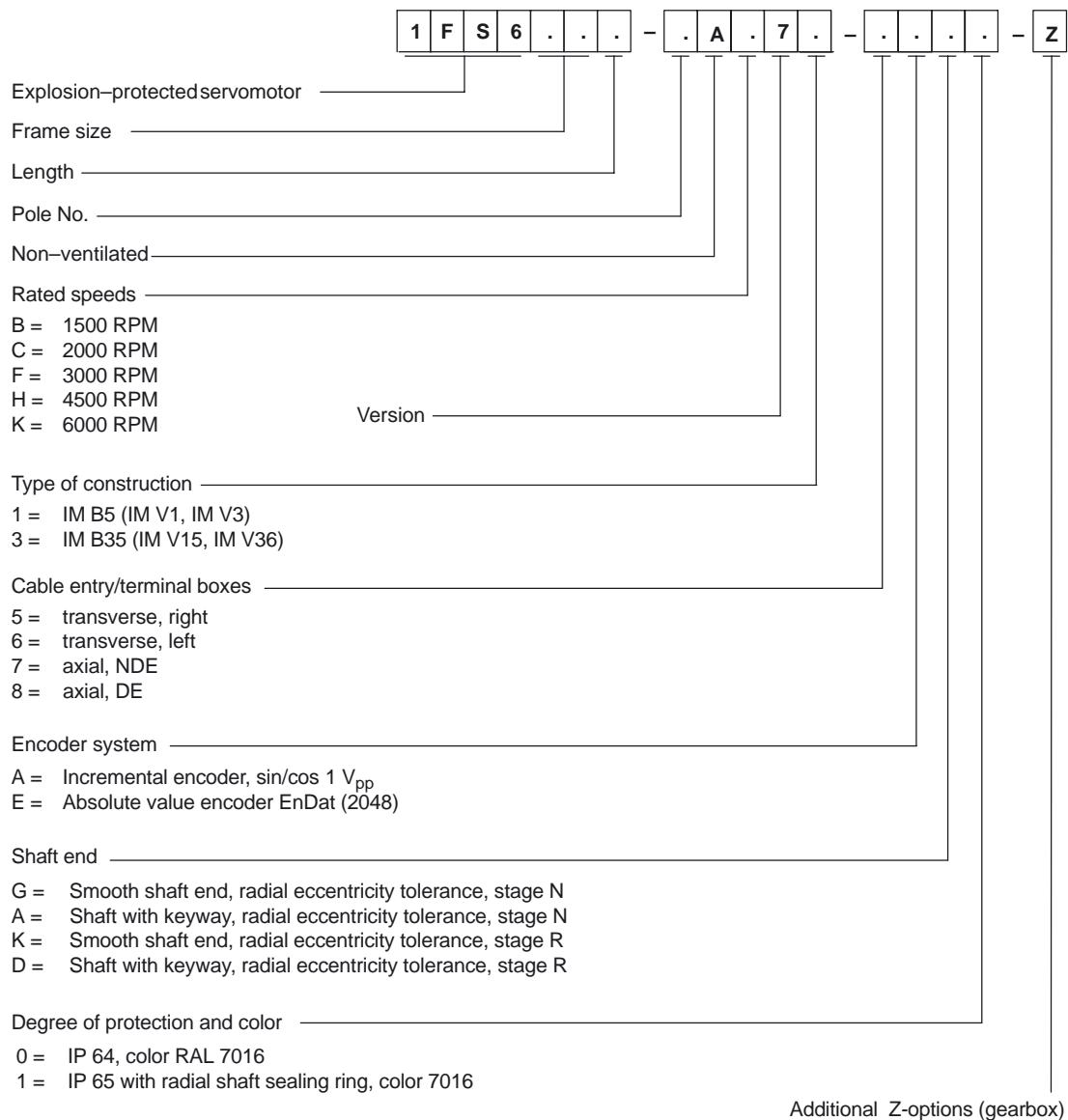
1.2 Order designation

Structure of the order designation

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

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

Explanation of order designation



1.3 Versions

1.3 Versions

Table 1-1 Features of the 1FS6 series

Technical features	Version
Motor type	Permanent-magnet synchronous motor; AC servomotor
Type of construction (acc. to EN 60034-7; IEC 60034-7)	1FS6074 and 1FS6096: IM B5 (IM V1, IM V3) 1FS6115 and 1FS6134: IM B35 (IM V15, IM V36)
Degree of protection (acc. to EN 60034-5; IEC 60034-5)	IP 64 (Option, refer to Table 1-2)
Type of protection (acc. to EN 50014)	EEx de IIC T3
Cooling (acc. to EN 60034-6; IEC 60034-6)	Non-ventilated
Thermal motor protection (acc. to IEC and EN 60034-11)	Temperature sensor KTY84 and 1xPTC triplet 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) Option, refer to Table 1-2)
Vibration severity (acc. to EN 60034-14; IEC 60034-14)	Stage N (normal)
Induced oscillations, balancing	When mounted, the following acceleration levels may not be exceeded: axial 1 g, radial 5 g
Bearings	Permanently lubricated deep-groove ball bearings, locating bearing on the drive end
Sound pressure level, max. EN 21680	1FS6074: 55 dB (A) 1FS6096: 55 dB (A) 1FS6115: 65 dB (A) 1FS6134: 70 dB (A)
Stator winding insulation (acc. to EN 60034-1; IEC 60034-1)	Insulating class H
Ambient temperature	-15 °C to +40 °C, otherwise, de-rating is required to +45 °C factor 0.96 to +50 °C factor 0.92 to +55 °C factor 0.87
Installation altitude above sea level (acc. to IEC and EN 60034-1)	≤ 1,000 m above sea level, otherwise power de-rating 1,500 m factor 0.97 2,000 m factor 0.94 2,500 m factor 0.9
Magnetic materials	Rare earth materials
Electrical connection	Terminal box for the power connection at the drive end Terminal box for encoder and temperature sensor at the non-drive end
Speed encoder	Optical encoder: Incremental encoder, sin/cos 1 V _{pp} (I-2048) (Option, refer to Table 1-2) For more detailed information, refer to the Chapter, Encoders
Rating plate	Metal rating plate is attached to the side of the motor
Paint finish	Normal paint finish, anthracite (RAL 7016)

1.4 Technical information, options

Table 1-2 Options

Technical features	Version
Degree of protection (acc. to EN 60034-5; IEC 60034-5)	IP 65 with radial shaft sealing ring
Shaft end (acc. to EN and IEC 60034-14)	with keyway, halfkey balancing
Radial eccentricity, concentricity and axial eccentricity (acc. to DIN 42955, IEC 60072-1)	Tolerance R (reduced)
Integrated/mounted components	Planetary gear on request
Speed encoder	Absolute value encoder ¹⁾ (EnDat) with 2048 pulses/rev.

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

1.5 Rating plate data

SIEMENS	
3 ~ Brushless Servomotor ①	
1FS6115-8AB73-8AD3 ②	
No. YF PD3100531 01 001 ③	
DIN EN 60034	
$M_N = 41$ ④ Nm $I_N = 14.5$ ⑤ A $n_N = 1500$ ⑥ /min $U_N = 3 \times 380$ V ⑦	
S1 $n_{max} =$ /min IP 64 ⑧	
IEC IM B35 ⑨ Ex II 2G EEx de IIC T3 ⑩	
Encoder ERN 1387.001 ⑪ $I_{limit} =$ A	
Tripping unit ⑫ PTB 3.53-PTC/A EWH-No.	
EC-Certification-No. PTB 00 ATEX 1122 ⑬	
Temp. sensor KTY 84-130 and PTC thermistor ⑭ TH.CL.H. ⑮	
Connecting cable ⑯ -20 ... +100°C temperature-resistant	
Made in Germany Made by EW Hof	

① Motor type: Three-phase servomotor	⑨ IM type of construction
② Order No. (MLFB)	⑩ Type of protection
③ Ident.No., production number	⑪ Encoder type
④ Rated torque M_N [Nm]	⑫ Ex-certification of the PTC thermistor evaluation unit
⑤ Rated current I_N [A]	⑬ EC type test certificate No.
⑥ Rated speed n_N [RPM]	⑭ Coding, temperature sensor
⑦ Rated voltage U_N [V]	⑮ Temperature class
⑧ Degree of protection	⑯ Temp. durability of the connecting cable

Fig. 1-1 Example: Motor rating plate for 1FS6

1.6 Electrical connections

1.6 Electrical connections

2 terminal boxes are provided at the top of the motor to establish the electrical connections:

- 1 terminal box for the power connection (A side)
- 1 terminal box for encoder signals and temperature monitoring (B side)

Both terminal boxes can be subsequently rotated through 4 x 90 degrees.

**Warning**

These motors may only be fed from a drive converter. They are not suitable for direct connection to a line supply.

Cables which are designed for temperatures of 100°C must be used to connect the motors.

1.6.1 Power connection

The terminal box for the power connection is located at the top of the motor on the drive end (A end). This terminal box has 4 terminals (U1, V1, W1, Y–P, ground) and an explosion–proof cable entry gland acc. to DIN EN 60423 with metric thread.

Table 1-3 Maximum cross-section which can be connected

Motor type	Gland	Max. cross-section which can be connected
1FS6074	M25 x 1.5	4 x 1.5 mm ²
1FS6096	M25 x 1.5	4 x 4 mm ²
1FS6115	M32 x 1.5	4 x 6 mm ²
1FS6134	M32 x 1.5	4 x 10 mm ²

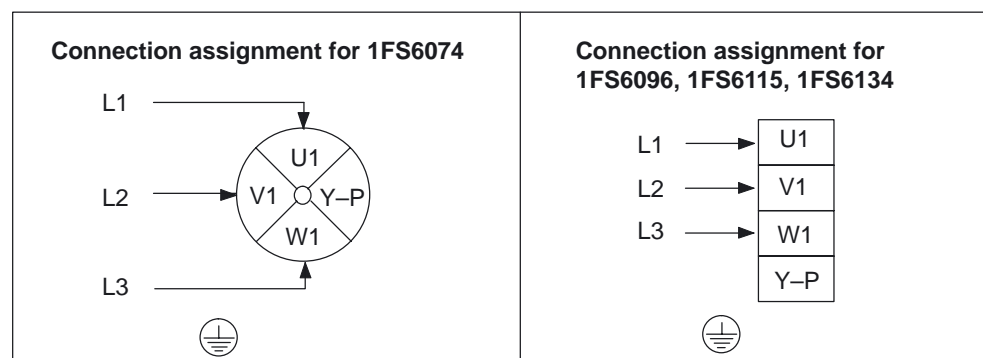


Fig. 1-2 Power connection

Power cables

Table 1-4 Pre-assembled power cables

Cross-section	Order No. (MLFB)
4 x 1.5 mm ²	6FX5002-5XA00-□□□0
4 x 2.5 mm ²	6FX5002-5XA10-□□□0
4 x 4 mm ²	6FX5002-5XA20-□□□0
4 x 6 mm ²	6FX5002-5XA30-□□□0

Length code

Ordering data	Order No.
Cable, pre-assembled	6FX5002-5XA□0-□□□0
Length code:	
1 m to 99 m	1
100 m to 199 m	2
200 m to 299 m	3
0 m	A
10 m	B
20 m	C
30 m	D
40 m	E
50 m	F
60 m	G
70 m	H
80 m	J
90 m	K
0 m	A
1 m	B
2 m	C
3 m	D
4 m	E
5 m	F
6 m	G
7 m	H
8 m	J
9 m	K

1.6 Electrical connections

1.6.2 Signal connection

The terminal box for the encoder and the temperature monitoring signals is located on the top of the motor at the non-drive end (B end). This terminal box has 19 terminals and a ground connection:

- 17 terminals for encoder and KTY
- 2 terminals for PTC thermistor

The terminal box has, for all motor types, 2 glands:

- One explosion-proof cable entry gland M20 x 1.5 for encoders and KTY
- One explosion-proof cable entry gland M12 x 1.5 for PTC thermistors

Refer to Chapter 3.2 for the connection assignment and order designation of the pre-assembled cables.

1.7 Drive-out coupling

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

Motor type	Drive-out coupling, Rotex GS	Torques which can be transferred with 92 Sh-A-GS pinion	
		T_{KN} [Nm]	T_{Kmax} [Nm]
1FS6074	24/28	35	70
1FS6096	28/38	95	190
1FS6115	38/45	190	380
1FS6134	42/55	265	560

It may be necessary to use other pinions (e.g. Shore hardness 80 SH-A). This must be optimally harmonized together with the mounted mechanical system.



Warning

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

For additional information refer to the Internet www.ktr.com



2.1 Definitions

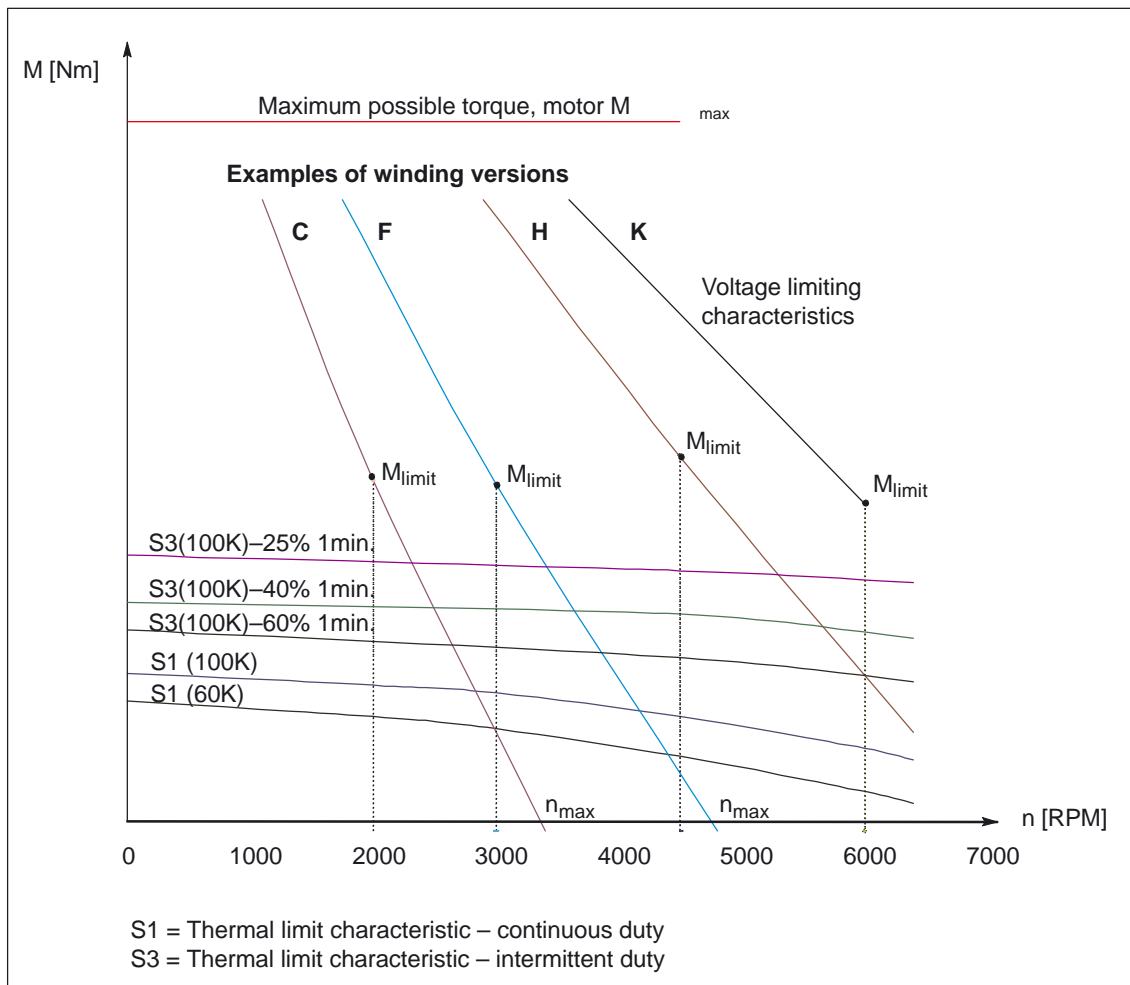


Fig. 2-1 Speed-torque diagram, examples for various winding versions

2.1 Definitions

100 K, 60 K values

100 K or 60 K is the average winding temperature rise.

105 K corresponds to a utilization in accordance with temperature rise Class F.

60 K lies in the utilization within temperature rise Class B. The 60 K utilization must be used if,

- for safety reasons, the motor enclosure temperature must remain below 90 °C,
- or if a temperature increase of the shaft has a negative impact on the mounted machine.

A permissible ambient temperature or cooling–medium temperature of 40 °C applies for all specified data.

Torque characteristics

Several armature circuit versions are possible within a particular frame size. There is a high overload capability of the complete speed control range.

The following limits apply for all servomotor-drive converter module combinations.

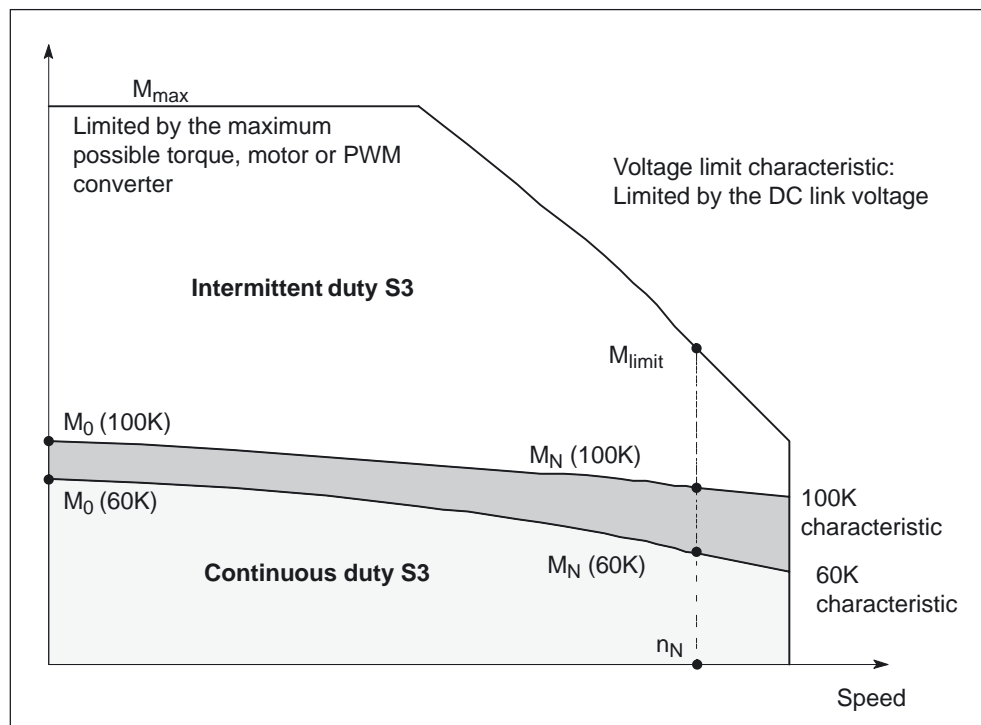


Fig. 2-2 Torque characteristics of three-phase servomotors

Thermal limit characteristic

Corresponds to the S1 (100 K) characteristic in the diagrams. Also in intermittent duty, the geometrical average may not be exceeded.

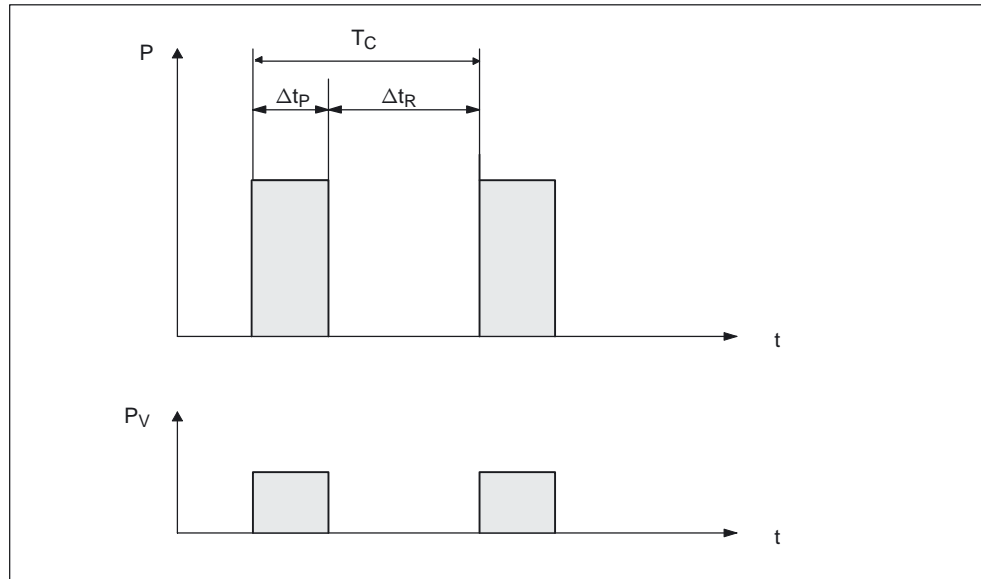


Fig. 2-3 Periodic intermittent duty – duty type S3

- P = load
- P_V = electrical losses
- t = time
- T_C = duty duration (1 min)
- Δt_P = operating time with constant load
- Δt_R = standstill time with the windings in a no-current condition
- Relative power-on duration = $\Delta t_P/T_C = 15\%, 25\%, 40\%, 60\%$

Voltage limit characteristics

The motor counter-voltage increases proportionally with increasing speed. Only the difference between the DC link voltage and the increasing motor counter voltage is available to impress the current. This limits the magnitude of the current which can be impressed at high speeds.



Warning

It is not thermally permissible for the motor to be continuously operated at the voltage limit characteristic in the range above the S1 characteristic.

2.1 Definitions

The voltage limit characteristic of a motor with a rated speed of 6000 RPM lies far above that of the same motor type with 2000 RPM. However, this motor requires a significantly higher current to provide the same torque. This is the reason that it is practical to select the rated speed so that this does not lie too far above the maximum speed required for the particular application. The drive converter module size (current requirement) can be minimized in this fashion.

Table 2-1 Code letter, winding version

Rated speed n_N [RPM]	Winding version (10th position of the Order No.[MLFB])
1200	A
1500	B
2000	C
3000	F
4000	G
4500	H
6000	K

Rated speed n_N

The characteristic speed range for the motor is defined in the speed–torque diagram using the rated speed.

The motors can be operated above and beyond the rated speed range. The speed range where the technical data is guaranteed lies between 0 and $1.1 \cdot n_N$.

Shift of the voltage limit characteristic

In order to know the motor limits at a DC link voltage which is not equal to 600 V, then the voltage limit characteristic, shown in the diagram, must be shifted for the particular armature circuit. A lower DC link voltage is obtained, e.g. when operated with an uncontrolled line infeed. A higher DC link voltage can occur, for example, when the drive converter is connected to a 480 V line supply.

The degree of shift is obtained as follows:

For a DC link voltage of $V_{DC \text{ link}(\text{new})}$ the shift along the x axis (speed) is obtained when applying the following factor: $V_{DC \text{ link}(\text{new})}/600 \text{ V}$

Example:

If a point (P1) of the specified voltage limit characteristic is at 3000 RPM, then the new voltage limit characteristic for 490 V is at (P2):

$$\frac{490 \text{ V}}{600 \text{ V}} = 0.82 \quad 3000 \text{ RPM} \cdot 0.82 = 2460 \text{ RPM}$$

The new voltage limit characteristic must be drawn in at $n = 2460$ RPM, parallel to the existing one.

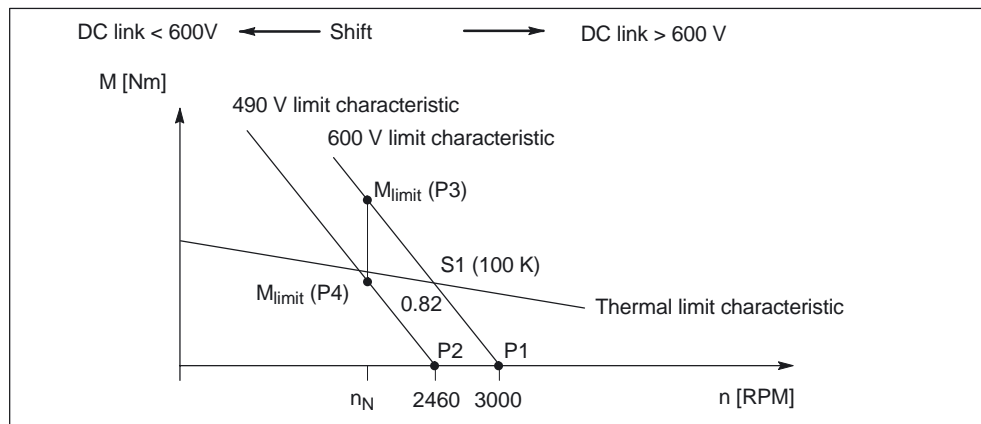


Fig. 2-4 Shift in the voltage limit characteristics

The new limit torque with the new limit characteristic can be calculated according to the following formula:

$$1\text{FS6:} \quad M_{\text{limit}(\text{new})} = \frac{V_{\text{DC link}(\text{new})} - \sqrt{2} \cdot k_E \cdot n_N / 1000}{600 \text{ V} - \sqrt{2} \cdot k_E \cdot n_N / 1000} \cdot M_{\text{limit}}$$

M_{limit} = limit torque from the data sheet (P3)

$M_{\text{limit}(\text{new})}$ = new limit torque at n_N (P4)

n_N = rated speed from the data sheet

Check: P4 must lie on the new limit characteristic which has been drawn-in.

Standstill torque M_0

Thermal limit torque when the motor is stationary corresponding to a utilization acc. to 100 K or 60 K. It can be output at $n = 0$ for an unlimited time. M_0 is always greater than the rated torque M_N .

Standstill current I_0

Motor phase current required to generate the particular standstill torque.

The 1FS6 series is supplied with sinusoidal RMS currents.

Rated torque M_N

Thermally permissible continuous torque at the motor rated speed.

Rated current I_N

RMS motor phase current in order to generate the particular rated torque.

2.1 Definitions

Limit torque M_{limit} ¹⁾

Maximum torque which is still available for acceleration at the rated speed.

Limit current I_{limit} ¹⁾

RMS motor phase current required to generate the limit torque.

Optimum speed n_{opt}

Speed at which the optimum motor power is output.

Optimum power P_{opt}

Power at which the optimum speed is reached.

Maximum current I_{max} (rms)¹⁾

This current limit is defined by the magnetic circuit. If this is even briefly exceeded it can result in an irreversible de-magnetization of the magnetic materials.

Maximum speed n_{max}

The maximum permissible mechanical operating speed is n_{max} . It is defined by the centrifugal force and frictional force in the bearings.

Maximum torque M_{max} ¹⁾

This is the torque which is generated at the maximum permissible current.

The maximum torque is briefly available for high speed operations.

The maximum torque is limited by control parameters. The rotor will be de-magnetized if the current is increased.

1) referred to 20 °C

Typical M/I characteristics

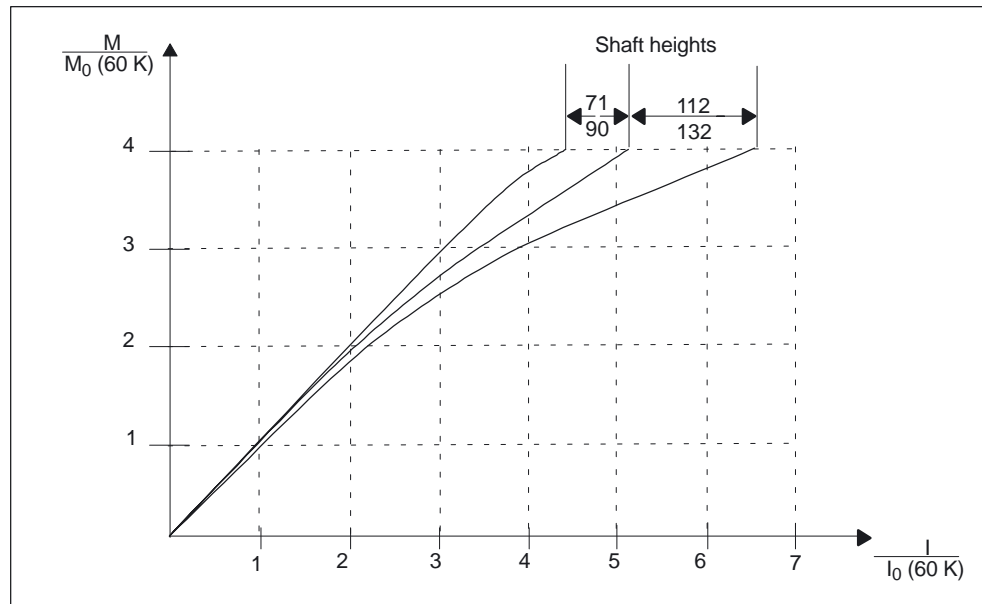


Fig. 2-5 Current–torque characteristic for various shaft heights for non–ventilated motors

The individual characteristics of the 1FS6 motor series are summarized in "typical shaft height ranges". The lefthand characteristic can be considered as "best case" and the righthand as "worst case".

Torque constant k_T

Quotient of the standstill torque and standstill current.

Calculation: $k_T = M_0/I_0$. The constant applies up to approx. $2 * M_0$.

Note

This constant does not apply when configuring the rated and accelerating currents required (motor losses).

Further, the static load and the frictional torques must be included in the calculation.

Voltage constant k_E

Value of the induced motor voltage at a speed of 1000 RPM.

For the 1FS6 motor series, the phase–to–phase RMS motor terminal voltage is specified.

2.1 Definitions

Winding resistance R_{pf}

The phase resistance of a phase at a room temperature of 20 °C is specified.
The winding has a star circuit configuration.

Inductance L_D

The rotating field inductance is specified.

Electrical time constant T_{el}

Quotient of the rotating field inductance and winding resistance. $T_{el} = L_D/R_{ph}$.

Mechanical time constant T_{mech}

The mechanical time constant is give by a tangent along a theoretical run-up function through the origin.

$$1FS6: \quad T_{mech} = 3 * R_{ph} * J_{mot}/k_T^2 [s]$$

J_{mot} = moment of inertia of the servomotor [kgm²]
 R_{ph} = resistance of a stator winding phase [Ohm]
 k_T = Torque constant [Nm/A]

Torsional shaft stiffness C_T

The shaft torsional stiffness is specified from the center of the rotor core assembly to the center of the shaft end.

Thermal time constant T_{th}

Defines the increase in the temperature of the motor frame when the motor load is suddenly increased (step function) to the permissible S1 torque. The motor reaches 63% of its final temperature after T_{th} .

Brake resistance R_{opt}

R_{opt} corresponds to the external optimum resistance value per phase, connected in series to the motor winding, for armature short-circuit braking.

Braking torque $M_{b opt}$

$M_{b opt}$ corresponds to the average optimum braking torque which is achieved using the series brake resistor R_{opt} .

Tolerance data

(data which go beyond this are subject to the appropriate measuring accuracy)

Table 2-2 Tolerance data of the motor list data

Motor list data		Typ. value	Theoretical value
Standstill current	I_0	± 3 %	± 7.5 %
Electrical time constant	T_{el}	± 5 %	± 10 %
Torque constant	k_T	± 3 %	± 7.5 %
Voltage constant	k_E	± 3 %	± 7.5 %
Winding resistance	$R_{ph.}$	± 5 %	± 10 %
Moment of inertia	J_{mot}	± 2 %	± 10 %

2.2 Selecting motors

Synchronous servomotors are generally selected according to the following criteria:

- Maintaining the dynamic limits; this means that all of the speed–torque points of the load duty cycle must lie below the limit characteristic (refer to Chapter 1, Fig. 2-2).
- The maximum motor speed is specified in the speed–torque diagram.
- Maintaining the thermal limits; this means that the RMS motor torque at the average motor speed obtained from the load duty cycle must be below the S1 characteristic.
- It should be noted that the maximum permissible motor torque at higher speeds is reduced as a result of the voltage limit characteristic.

Step 1

Calculating the maximum motor torque $M_{\text{mot max}}$

The maximum motor torque must be calculated to check the dynamic limits.

Generally, the maximum motor torque is required while accelerating. In addition to the max. torques, specified by the load, when accelerating, there is also the torque required to accelerate the rotor moment of inertia $M_{\text{b mot}}$.

The following is obtained for the maximum motor torque:

$$M_{\text{mot max}} = M_{\text{b mot}} + M_{\text{load max}}^*$$

$$\text{with } M_{\text{b mot}} = J_{\text{mot}} * \alpha_{\text{b mot}}$$

The following applies:

$$M_{\text{b mot}} = \text{accelerating torque, motor rotor}$$

$$M_{\text{load max}}^* = \text{maximum load torque referred to the motor speed while accelerating including the referred, frictional and machining forces.}$$

$$\alpha_{\text{b mot}} = \text{angular motor acceleration}$$

Select the matching motor by calculating and comparing the characteristics where the max. motor torque is reached in the required speed range. These calculations can be simply carried–out using the "SIDIM" and "PATH" tools.

The component of the accelerating torque for the motor rotor at the maximum motor torque depends on the motor of inertia and the angular acceleration. It also depends on the load moment of inertia, the gearbox ratio and the steady-state load torque.

Secondly, a check is made as to whether the thermal limits are maintained.

Step 2 Calculating the motor RMS torque

In order to calculate the RMS torque, the motor torque must be determined at all sectors of the motion characteristic, taking into account the average motor speed. The following applies for the RMS torque and the average motor speed ¹⁾:

$$M_{\text{rms}} = \sqrt{\frac{\sum M_{\text{mot } i}^2 * t_i}{T}}$$

$$n_{\text{average}} = \frac{\sum \frac{|n_{\text{mot } A} + n_{\text{mot } E}|}{2} * t_i}{T}$$

$M_{\text{mot } i}$ = motor torque in time slice Δt_i

T = cycle time, clock cycle time

$$\frac{|n_{\text{mot } A} + n_{\text{mot } E}|}{2} = \text{Average motor speed in time slice } \Delta t_i$$

(A: initial value, E: final value) ¹⁾

The selected synchronous servomotor can be used, if

- the dynamic limits are maintained
- the RMS torque at the average motor speed lies below the S1 characteristic

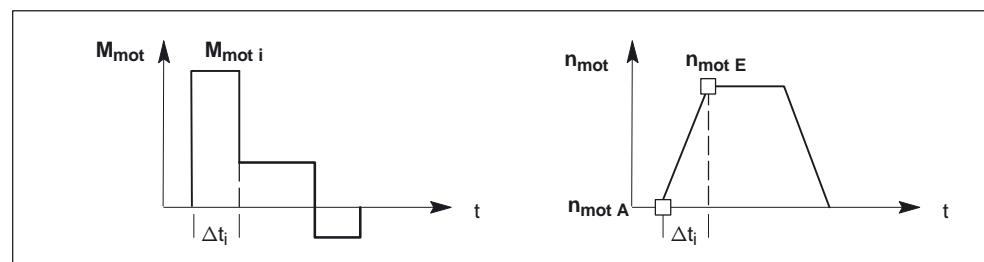


Fig. 2-6 Example for motor torque and motor speed in a time slice Δt_i

1) An operating point must always be provided at the speed zero crossover.
An RMS speed should be defined for speeds $> 2/3 n_N$ (square of the average value).

2.3 Technical data

2.3 Technical data

100 K values are specified in the table.

Table 2-3 Technical data, 1FK6

Rated speed [RPM]	M ₀ [Nm]	M _N [Nm]	M _N ⁴⁾ [Nm]	Motor type	Rated power P _N [kW]	Motor current I ₀ ³⁾ [A]	Rated motor current I _N ³⁾ [A]	Weight [kg]	Cross-section ¹⁾ [mm ²]	Cable type 6FX5002- ⁵⁾
1500	40	37	33	1FS6115-8AB73	5.8	13	13	87	4 x 1.5	5XA00-1□□0
1500	76	68	61	1FS6134-6AB73	10.7	22	22	149	4 x 4	5XA20-1□□0
2000	7.6	7.2	6.5	1FS6074-6AC71	1.5	3.4	3.4	29	4 x 1.5	5XA00-1□□0
2000	22	20	18	1FS6096-8AC71	4.2	9.2	9.8	55	4 x 1.5	5XA00-1□□0
2000	40	34	31	1FS6115-8AC73	7.1	18	16	87	4 x 2.5	5XA10-1□□0
2000	76	59	53	1FS6134-6AC73	12.4	29	24	149	4 x 4	5XA20-1□□0
3000	7.6	6.3	5.6	1FS6074-6AF71	2.0	4.8	4.4	29	4 x 1.5	5XA00-1□□0
3000	22	17	15	1FS6096-8AF71	5.3	14	12	55	4 x 1.5	5XA00-1□□0
3000	40	28	25	1FS6115-8AF73	8.8	26	20	87	4 x 4	5XA20-1□□0
4500	7.6	4.5	4	1FS6074-6AH71	2.1	7.2	5	29	4 x 1.5	5XA00-1□□0
4500	22	11	9.9	1FS6096-8AH71	5.2	19	11.5	55	4 x 2.5	5XA10-1□□0
6000	7.6	1.9	1.7	1FS6074-6AK71	1.2	9.6	3.2	29	4 x 1.5	5XA00-1□□0

Cables are not included with the motors – they must be separately ordered.

Lengths²⁾ (examples)

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

Max. cable length ≤ 100 m

- 1) Designed for I_{rms} (100 K); ambient temperature 40 °C; PVC insulated cable
- 2) Cables are sold by the meter; length code, refer to the Documentation "General Part"
- 3) The specified values are RMS values
- 4) With absolute value encoder (due to the max. encoder temperature)
- 5) 6FX5 = MOTION-CONNECT 500 (temperature resistant up to 100°C); refer to Catalog NC Z for technical data

2.4 Armature short-circuit braking

Armature short-circuit braking cannot be used for the 1FS6 series. If you require this function, please contact your local Siemens office.

2.5 Speed–torque diagrams

Note

- DC link voltages > 600 V occur when the motors are fed from voltages > 600 V.
- For a description of the shift in the voltage limit characteristics, refer to the documentation "General Section".
- The specified thermal S3 limit characteristics are referred to $\Delta T = 100$ K for a 1 min. duty cycle.

Table 2-4 1FS6074

1FS6074					
Technical data	Code	Units	–6AC71	–6AF71	
Engineering data					
Rated speed	n_N	RPM	2000	3000	
Pole number	2p		6	6	
Rated torque (100K)	M_N (100 K)	Nm	7.2	6.3	
Rated current	I_N	A	3.4	4.4	
Standstill torque (60K)	M_0 (60 K)	Nm	6.3	6.3	
Standstill torque (100K)	M_0 (100 K)	Nm	7.6	7.6	
Standstill current (60K)	I_0 (60 K)	A	2.7	3.9	
Standstill current (100K)	I_0 (100 K)	A	3.4	4.8	
Moment of inertia (without brake)	J_{mot}	10^{-4} kgm ²	13	13	
Optimum operating point					
Optimum speed	n_{opt}	RPM	2000	3000	
Optimum power	P_{opt}	kW	1.5	2.0	
Limiting data					
Max. permissible speed (mech.)	n_{max}	RPM	9100	9100	
Maximum torque	M_{max}	Nm	38	38	
Max. current	I_{max}	A	23	33	
Physical constants					
Torque constant	k_T	Nm/A	2.26	1.57	
Voltage constant	k_E	V/1000 RPM	144	100	
Winding resistance at 20°C	$R_{ph.}$	Ohm	2.93	1.40	
Rotating field inductance	L_D	mH	28	13.5	
Electrical time constant	T_{el}	ms	9.6	9.6	
Shaft torsional stiffness	C_t	Nm/rad	27000	27000	
Mechanical time constant	T_{mech}	ms	2.2	2.2	
Thermal time constant	T_{th}	min	35	35	
Weight (without brake)	m	kg	29	29	

2.5 Speed–torque diagrams

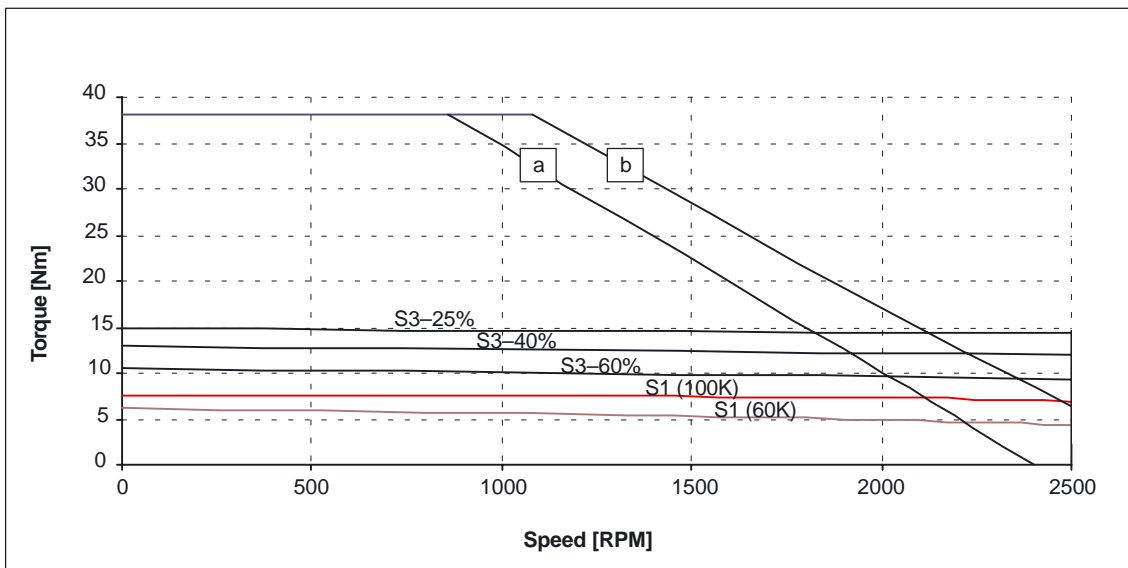


Fig. 2-7 Speed–torque diagram 1FS6074–6AC71

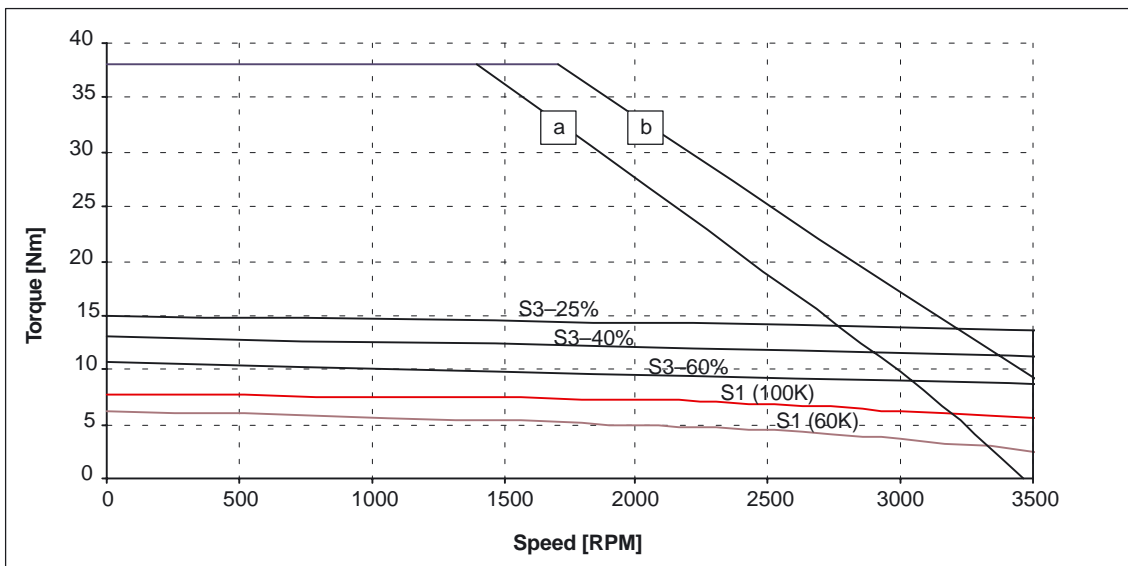


Fig. 2-8 Speed–torque diagram 1FS6074–6AF71

- [a] MASTERDRIVES MC, $V_{DC\ link}=540V\ (DC)$, $V_{mot}=340V_{rms}$
- [b] MASTERDRIVES MC (AFE), $V_{DC\ link}=600V\ (DC)$, $V_{mot}=380V_{rms}$

Table 2-5 1FS6074

1FS6074					
Technical data	Code	Units	–6AH71	–6AK71	
Engineering data					
Rated speed	n_N	RPM	4500	6000	
Pole number	$2p$		6	6	
Rated torque (100K)	$M_N (100 K)$	Nm	4.5	1.9	
Rated current	I_N	A	5.0	3.2	
Standstill torque (60K)	$M_0 (60 K)$	Nm	6.3	6.3	
Standstill torque (100K)	$M_0 (100 K)$	Nm	7.6	7.6	
Standstill current (60K)	$I_0 (60 K)$	A	5.9	7.9	
Standstill current (100K)	$I_0 (100 K)$	A	7.2	9.6	
Moment of inertia (without brake)	J_{mot}	10^{-4} kgm^2	13	13	
Optimum operating point					
Optimum speed	n_{opt}	RPM	4500	6000	
Optimum power	P_{opt}	kW	2.1	1.2	
Limiting data					
Max. permissible speed (mech.)	n_{max}	RPM	9100	9100	
Maximum torque	M_{max}	Nm	38	38	
Max. current	I_{max}	A	49	66	
Physical constants					
Torque constant	k_T	Nm/A	1.05	0.79	
Voltage constant	k_E	V/1000 RPM	67	50	
Winding resistance at 20°C	$R_{ph.}$	Ohm	0.63	0.35	
Rotating field inductance	L_D	mH	6	3.4	
Electrical time constant	T_{el}	ms	9.5	9.5	
Shaft torsional stiffness	c_t	Nm/rad	27000	27000	
Mechanical time constant	T_{mech}	ms	2.2	2.2	
Thermal time constant	T_{th}	min	35	35	
Weight (without brake)	m	kg	29	29	

2.5 Speed–torque diagrams

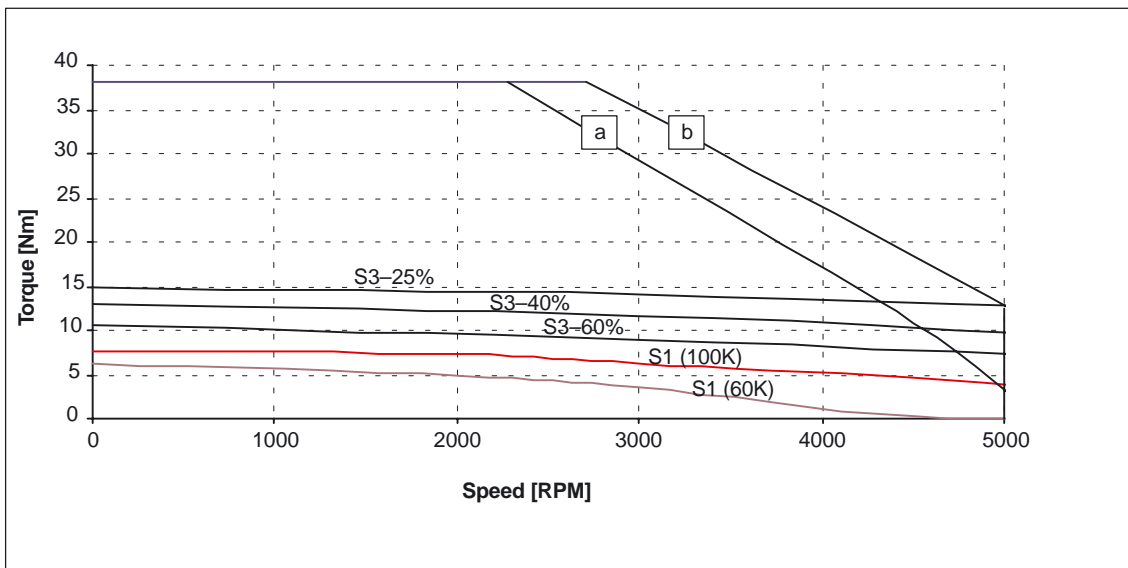


Fig. 2-9 Speed–torque diagram 1FS6074–6AH71

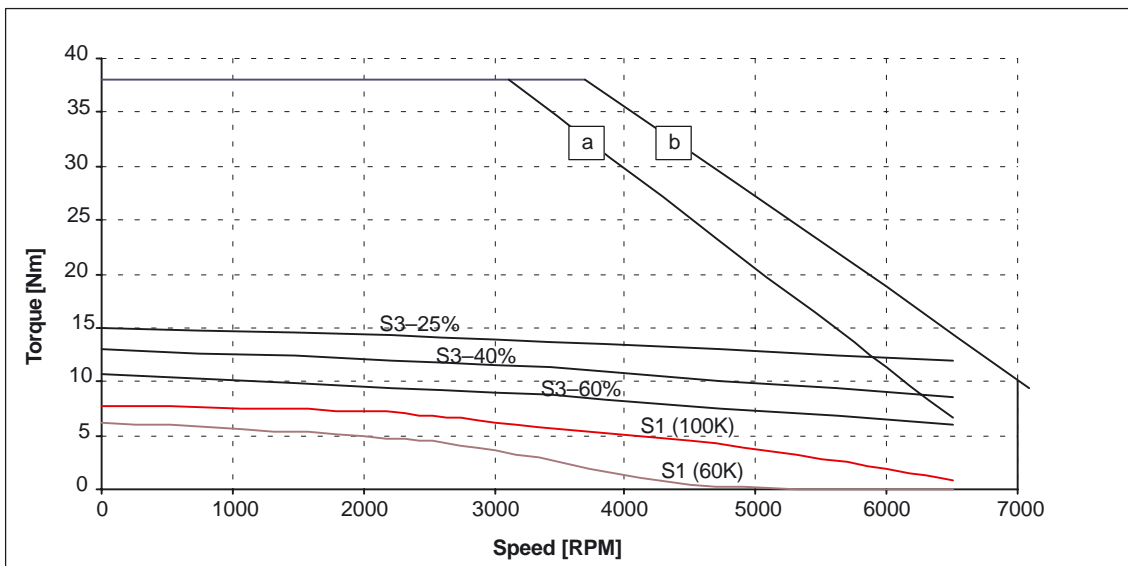


Fig. 2-10 Speed–torque diagram 1FS6074–6AK71

- [a] MASTERDRIVES MC, $V_{DC\ link}=540V\ (DC)$, $V_{mot}=340V_{rms}$
- [b] MASTERDRIVES MC (AFE), $V_{DC\ link}=600V\ (DC)$, $V_{mot}=380V_{rms}$

Table 2-6 1FS6096

1FS6096				
Technical data	Code	Units	-8AC71	
Engineering data				
Rated speed	n_N	RPM	2000	
Pole number	$2p$		8	
Rated torque (100K)	M_N (100 K)	Nm	20	
Rated current	I_N	A	9.8	
Standstill torque (60K)	M_0 (60 K)	Nm	18	
Standstill torque (100K)	M_0 (100 K)	Nm	22	
Standstill current (60K)	I_0 (60 K)	A	7.4	
Standstill current (100K)	I_0 (100 K)	A	9.2	
Moment of inertia (without brake)	J_{mot}	10^{-4} kgm ² ₂₃	66.5	
Optimum operating point				
Optimum speed	n_{opt}	RPM	2000	
Optimum power	P_{opt}	kW	4.2	
Limiting data				
Max. permissible speed (mech.)	n_{max}	RPM	7900	
Maximum torque	M_{max}	Nm	90	
Max. current	I_{max}	A	48	
Physical constants				
Torque constant	k_T	Nm/A	2.39	
Voltage constant	k_E	V/1000 RPM	152	
Winding resistance at 20°C	$R_{ph.}$	Ohm	0.65	
Rotating field inductance	L_D	mH	8	
Electrical time constant	T_{el}	ms	12.3	
Shaft torsional stiffness	C_t	Nm/rad	65000	
Mechanical time constant	T_{mech}	ms	2.3	
Thermal time constant	T_{th}	min	50	
Weight (without brake)	m	kg	55	

2.5 Speed-torque diagrams

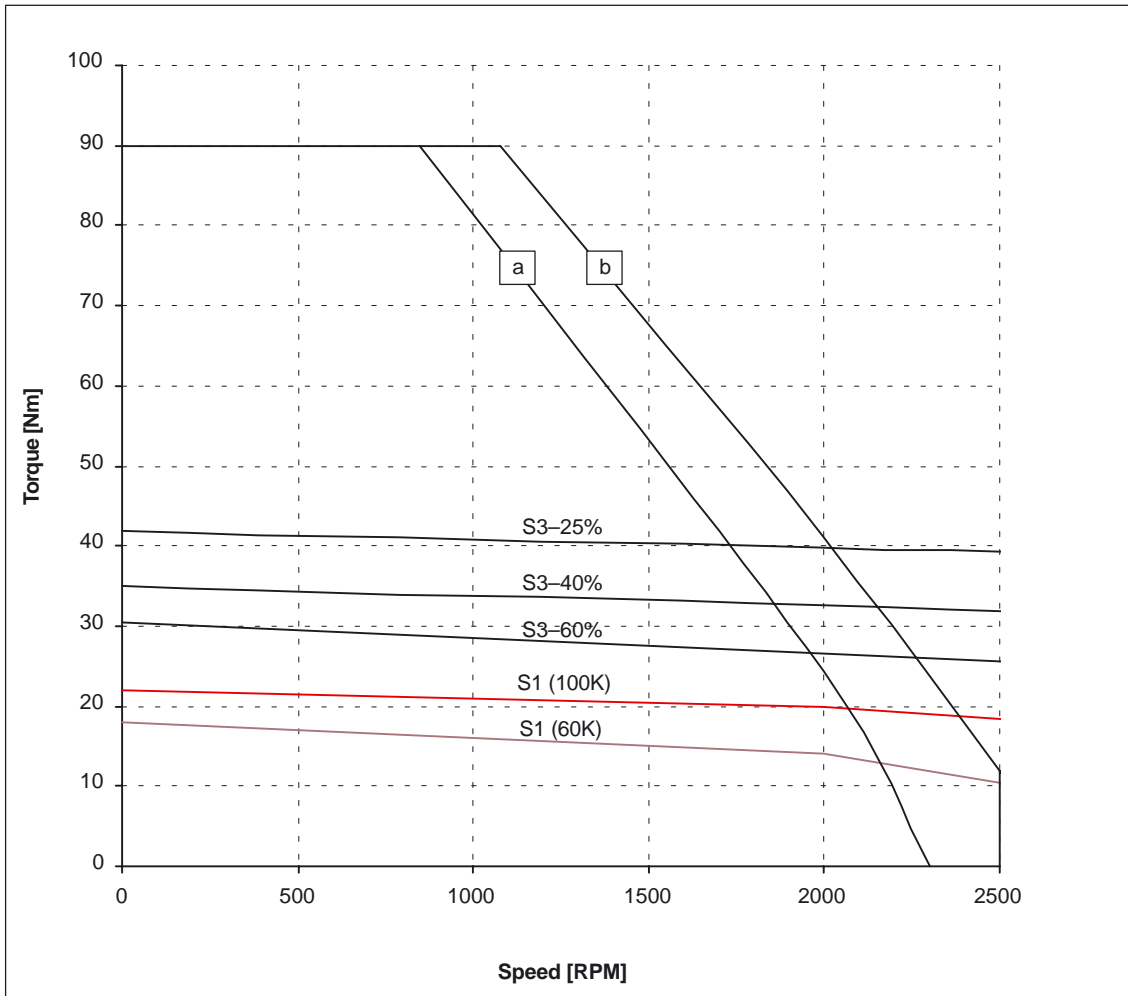


Fig. 2-11 Speed torque diagram 1FS6096-8AC71

- [a] MASTERDRIVES MC, $V_{DC\ link}=540V\ (DC)$, $V_{mot}=340V_{rms}$
- [b] MASTERDRIVES MC (AFE), $V_{DC\ link}=600V\ (DC)$, $V_{mot}=380V_{rms}$

Table 2-7 1FS6096

1FS6096					
Technical data	Code	Units	–8AF71	–8AH71	
Engineering data					
Rated speed	n_N	RPM	3000	4500	
Pole number	$2p$		8	8	
Rated torque (100K)	M_N (100 K)	Nm	17	11	
Rated current	I_N	A	12	11.5	
Standstill torque (60K)	M_0 (60 K)	Nm	18	18	
Standstill torque (100K)	M_0 (100 K)	Nm	22	22	
Standstill current (60K)	I_0 (60 K)	A	11	15	
Standstill current (100K)	I_0 (100 K)	A	14	19	
Moment of inertia (without brake)	J_{mot}	10^{-4} kgm ²	66.5	66.5	
Optimum operating point					
Optimum speed	n_{opt}	RPM	3000	4500	
Optimum power	P_{opt}	kW	5.3	5.2	
Limiting data					
Max. permissible speed (mech.)	n_{max}	RPM	7900	7900	
Maximum torque	M_{max}	Nm	90	90	
Max. current	I_{max}	A	71	102	
Physical constants					
Torque constant	k_T	Nm/A	1.65	1.16	
Voltage constant	k_E	V/1000 RPM	105	74	
Winding resistance at 20°C	$R_{ph.}$	Ohm	0.31	0.15	
Rotating field inductance	L_D	mH	3.8	1.8	
Electrical time constant	T_{el}	ms	12.2	12	
Shaft torsional stiffness	C_t	Nm/rad	65000	65000	
Mechanical time constant	T_{mech}	ms	2.3	2.2	
Thermal time constant	T_{th}	min	50	50	
Weight (without brake)	m	kg	55	55	

2.5 Speed-torque diagrams

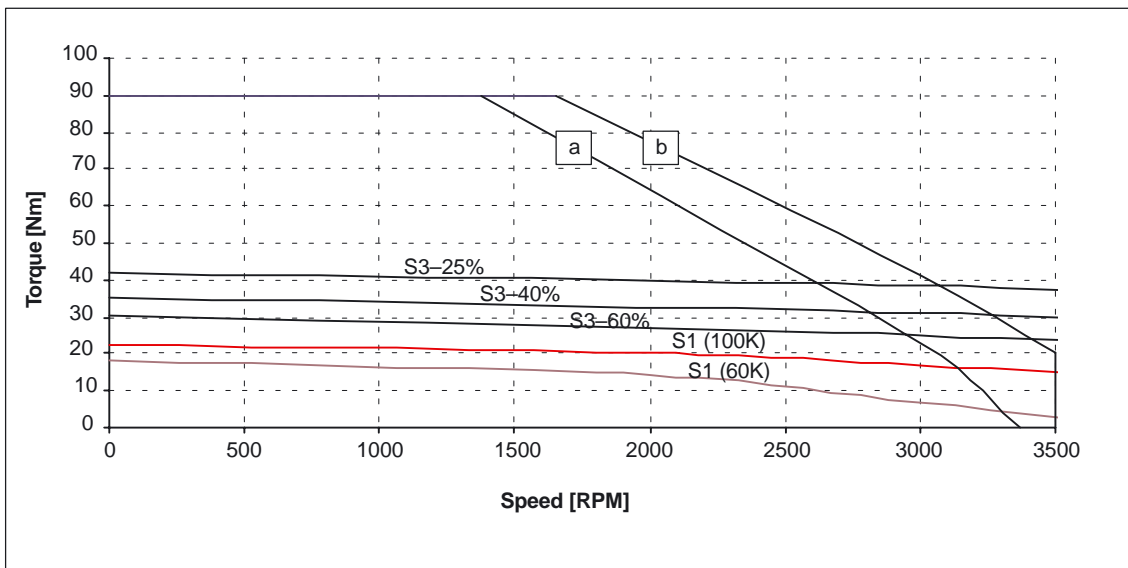


Fig. 2-12 Speed-torque diagram 1FS6096-8AF71

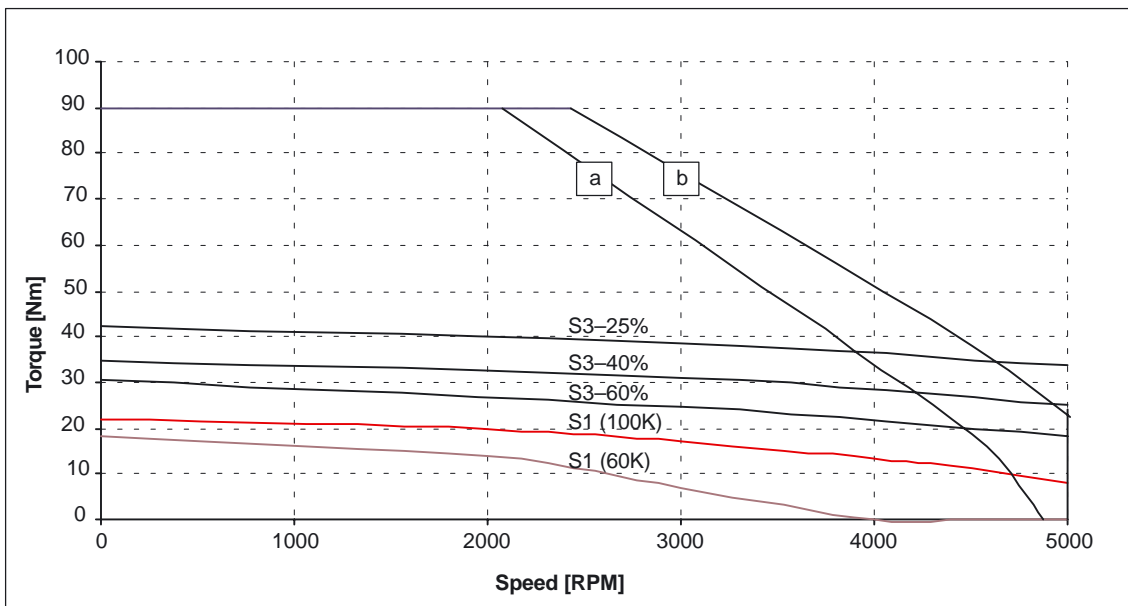


Fig. 2-13 Speed-torque diagram 1FS6096-8AH71

- [a] MASTERDRIVES MC, $V_{DC\ link}=540V\ (DC)$, $V_{mot}=340V_{rms}$
- [b] MASTERDRIVES MC (AFE), $V_{DC\ link}=600V\ (DC)$, $V_{mot}=380V_{rms}$

Table 2-8 1FS6115

1FS6115					
Technical data	Code	Units	-8AB73	-8AC73	
Engineering data					
Rated speed	n_N	RPM	1500	2000	
Pole number	$2p$		8	8	
Rated torque (100K)	M_N (100 K)	Nm	37	34	
Rated current	I_N	A	13	16	
Standstill torque (60K)	M_0 (60 K)	Nm	34	34	
Standstill torque (100K)	M_0 (100 K)	Nm	40	40	
Standstill current (60K)	I_0 (60 K)	A	11	14	
Standstill current (100K)	I_0 (100 K)	A	13	18	
Moment of inertia (without brake)	J_{mot}	10^{-4} kgm ²	168	168	
Optimum operating point					
Optimum speed	n_{opt}	RPM	1500	2000	
Optimum power	P_{opt}	kW	5.8	7.1	
Limiting data					
Max. permissible speed (mech.)	n_{max}	RPM	5600	5600	
Maximum torque	M_{max}	Nm	140	140	
Max. current	I_{max}	A	77	103	
Physical constants					
Torque constant	k_T	Nm/A	3.13	2.34	
Voltage constant	k_E	V/1000 RPM	199	149	
Winding resistance at 20°C	$R_{ph.}$	Ohm	0.39	0.22	
Rotating field inductance	L_D	mH	8.4	4.7	
Electrical time constant	T_{el}	ms	21.5	21.4	
Shaft torsional stiffness	C_t	Nm/rad	113000	113000	
Mechanical time constant	T_{mech}	ms	2.0	2.0	
Thermal time constant	T_{th}	min	50	50	
Weight (without brake)	m	kg	87	87	

2.5 Speed–torque diagrams

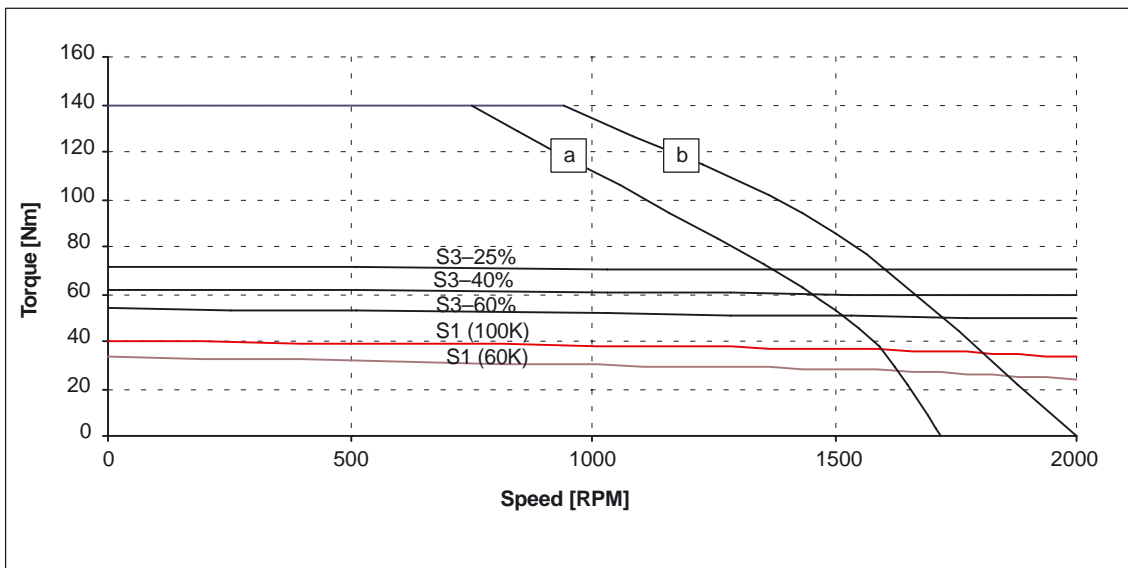


Fig. 2-14 Speed–torque diagram 1FS6115–8AB73

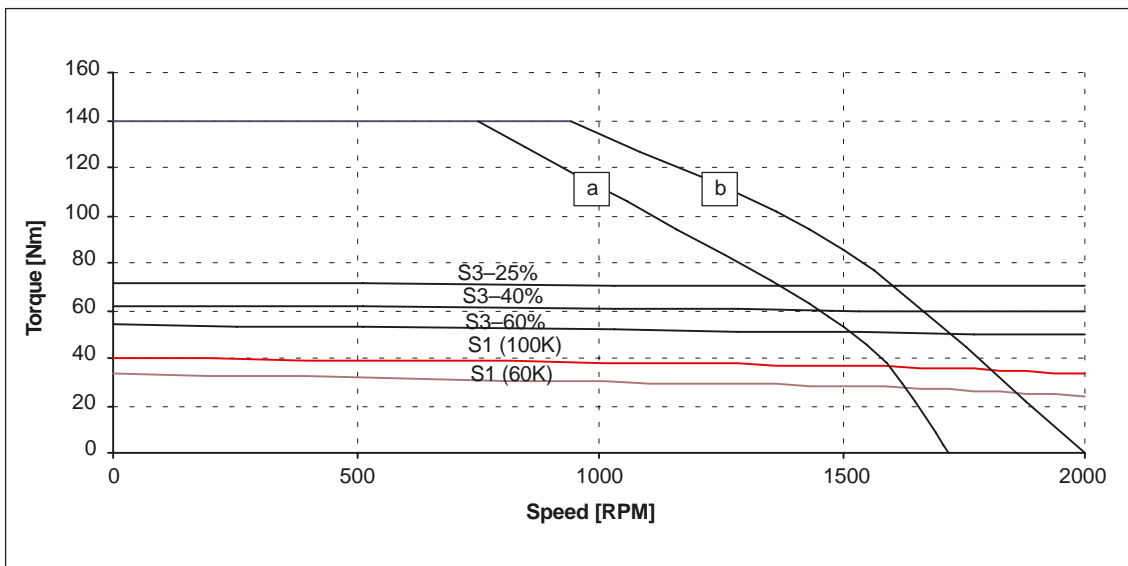


Fig. 2-15 Speed–torque diagram 1FS6115–8AC73

- [a] MASTERDRIVES MC, $V_{DC\ link}=540V\ (DC)$, $V_{mot}=340V_{rms}$
- [b] MASTERDRIVES MC (AFE), $V_{DC\ link}=600V\ (DC)$, $V_{mot}=380V_{rms}$

Table 2-9 1FS6115

1FS6115				
Technical data	Code	Units	-8AF73	
Engineering data				
Rated speed	n_N	RPM	3000	
Pole number	$2p$		8	
Rated torque (100K)	$M_N (100 K)$	Nm	28	
Rated current	I_N	A	20	
Standstill torque (60K)	$M_0 (60 K)$	Nm	34	
Standstill torque (100K)	$M_0 (100 K)$	Nm	40	
Standstill current (60K)	$I_0 (60 K)$	A	21	
Standstill current (100K)	$I_0 (100 K)$	A	26	
Moment of inertia (without brake)	J_{mot}	10^{-4} kgm^2	168	
Optimum operating point				
Optimum speed	n_{opt}	RPM	3000	
Optimum power	P_{opt}	kW	8.8	
Limiting data				
Max. permissible speed (mech.)	n_{max}	RPM	5600	
Maximum torque	M_{max}	Nm	140	
Max. current	I_{max}	A	155	
Physical constants				
Torque constant	k_T	Nm/A	1.56	
Voltage constant	k_E	V/1000 RPM	99	
Winding resistance at 20°C	$R_{ph.}$	Ohm	0.098	
Rotating field inductance	L_D	mH	2.1	
Electrical time constant	T_{el}	ms	21.4	
Shaft torsional stiffness	C_t	Nm/rad	113000	
Mechanical time constant	T_{mech}	ms	2.0	
Thermal time constant	T_{th}	min	50	
Weight (without brake)	m	kg	87	

2.5 Speed–torque diagrams

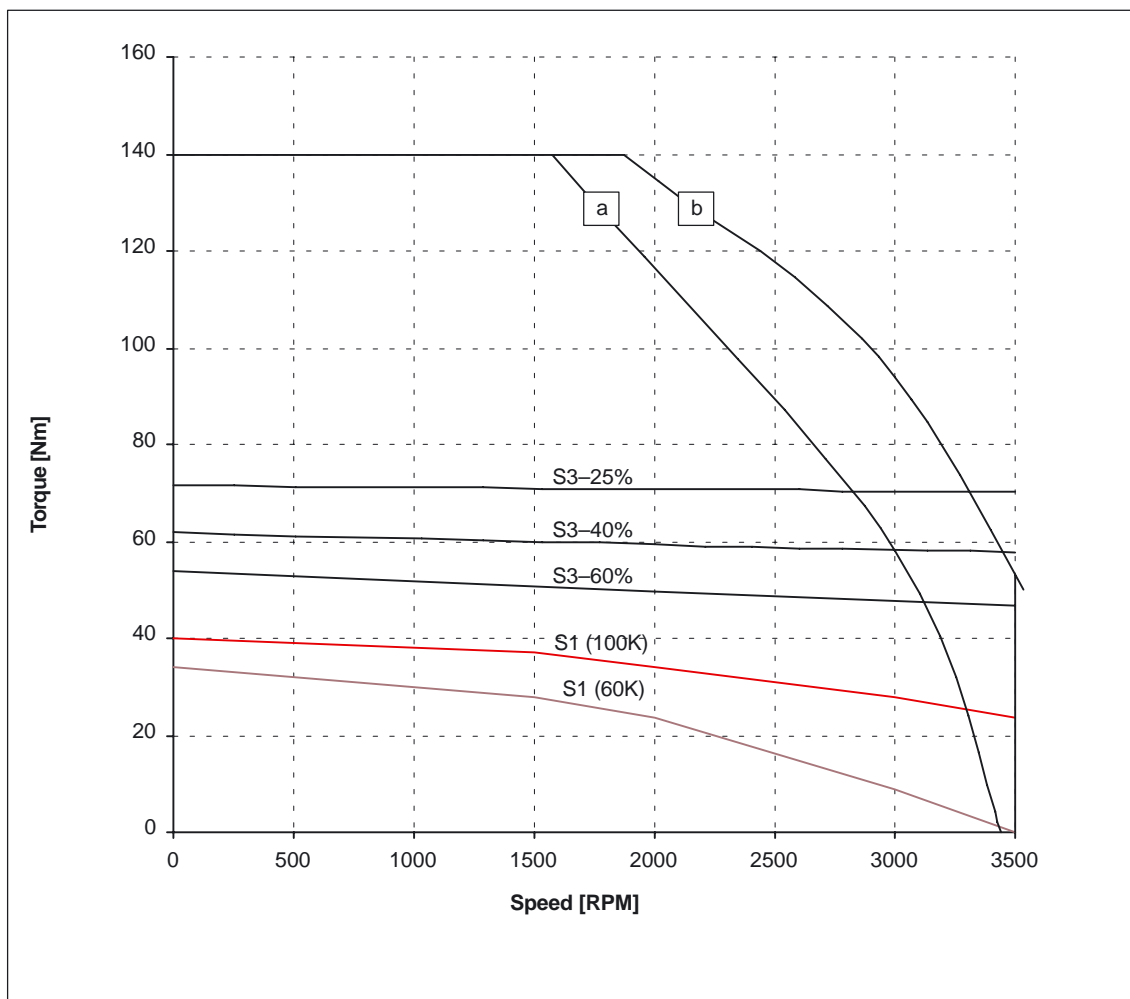


Fig. 2-16 Speed–torque diagram 1FS6115–8AF73

- [a] MASTERDRIVES MC, $V_{DC\ link}=540V\ (DC)$, $V_{mot}=340V_{rms}$
- [b] MASTERDRIVES MC (AFE), $V_{DC\ link}=600V\ (DC)$, $V_{mot}=380V_{rms}$

Table 2-10 1FS6134

1FS6134					
Technical data	Code	Units	-6AB73	-6AC73	
Engineering data					
Rated speed	n_N	RPM	1500	2000	
Pole number	$2p$		6	6	
Rated torque (100K)	M_N (100 K)	Nm	68	59	
Rated current	I_N	A	22	24	
Standstill torque (60K)	M_0 (60 K)	Nm	63	63	
Standstill torque (100K)	M_0 (100 K)	Nm	76	76	
Standstill current (60K)	I_0 (60 K)	A	17	23	
Standstill current (100K)	I_0 (100 K)	A	22	29	
Moment of inertia (without brake)	J_{mot}	10^{-4} kgm ²	547	547	
Optimum operating point					
Optimum speed	n_{opt}	RPM	1500	2000	
Optimum power	P_{opt}	kW	10.7	12.4	
Limiting data					
Max. permissible speed (mech.)	n_{max}	RPM	3600	3600	
Maximum torque	M_{max}	Nm	316	316	
Max. current	I_{max}	A	125	170	
Physical constants					
Torque constant	k_T	Nm/A	3.54	2.61	
Voltage constant	k_E	V/1000 RPM	228	168	
Winding resistance at 20°C	$R_{ph.}$	Ohm	0.17	0.094	
Rotating field inductance	L_D	mH	5.8	3.1	
Electrical time constant	T_{el}	ms	34	33	
Shaft torsional stiffness	c_t	Nm/rad	92000	92000	
Mechanical time constant	T_{mech}	ms	2.3	2.3	
Thermal time constant	T_{th}	min	85	85	
Weight (without brake)	m	kg	149	149	

2.5 Speed–torque diagrams

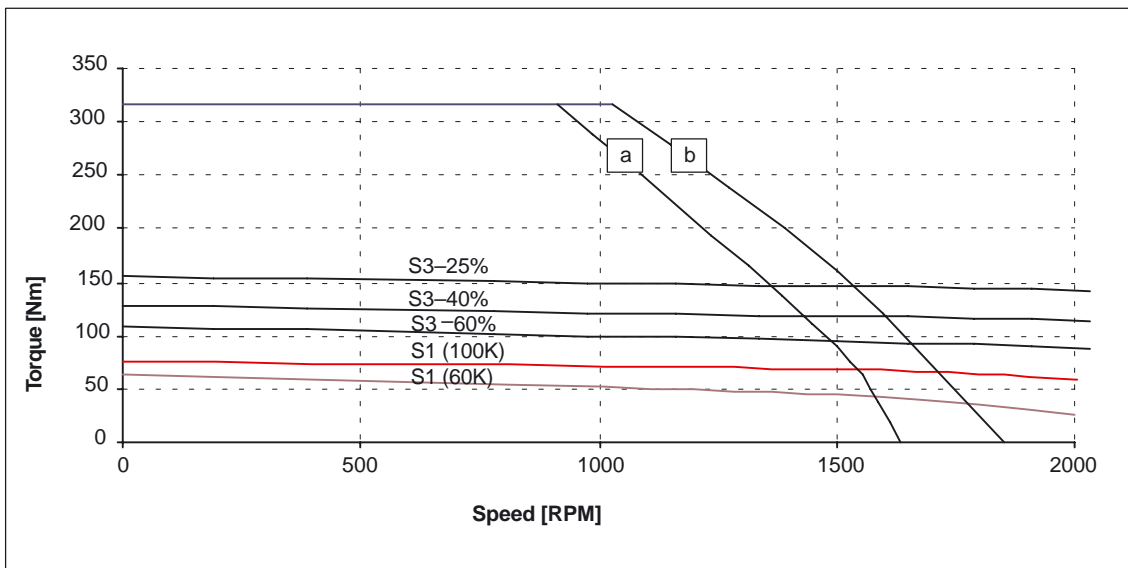


Fig. 2-17 Speed–torque diagram 1FS6134–6AB73

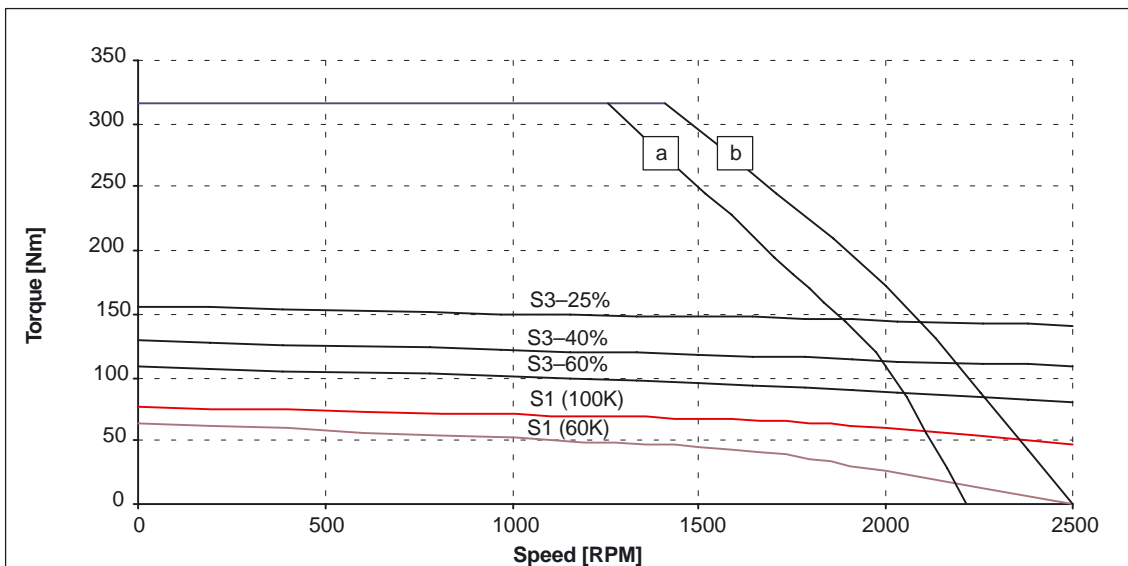


Fig. 2-18 Speed–torque diagram 1FS134–6AC71

- [a] MASTERDRIVES MC, $V_{DC\ link}=540V\ (DC)$, $V_{mot}=340V_{rms}$
- [b] MASTERDRIVES MC (AFE), $V_{DC\ link}=600V\ (DC)$, $V_{mot}=380V_{rms}$

2.6 Cantilever force diagrams

Cantilever force stressing

Point of application of cantilever forces F_Q at the shaft end

- for average operating speeds
- for a nominal bearing lifetime of 20000 h

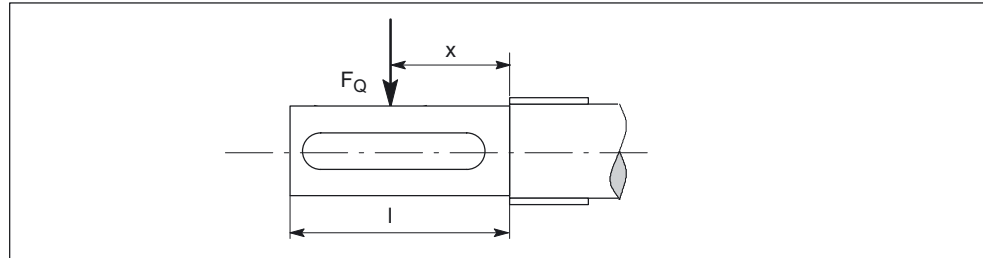


Fig. 2-19 Point of application of the force at the DE shaft end

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-tensioned belt force

$$F_R = 2 * M_0 * c/d_R$$

F_R [N]	Belt pre-tensioning force
M_0 [Nm]	Motor standstill torque
d_R	Effective diameter of the belt pulley
c	Pre-tension 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

When using other configurations, the actual forces, generated from the torque being transferred, must be taken into account.

$$F_R \leq F_{QAS}$$

2.6 Cantilever force diagrams

Cantilever force 1FS6074

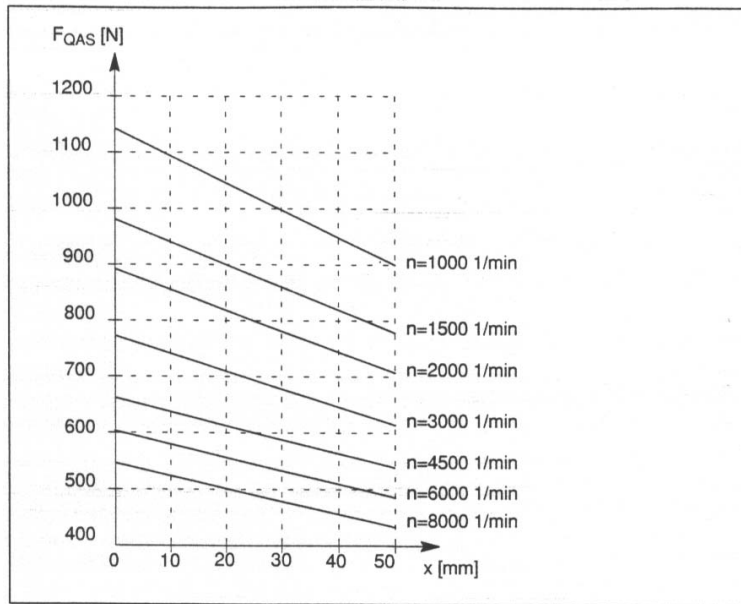


Fig. 2-20 Cantilever force F_Q at a distance x from the shaft shoulder for a nominal bearing lifetime of 20000 h.

Cantilever force 1FS6096

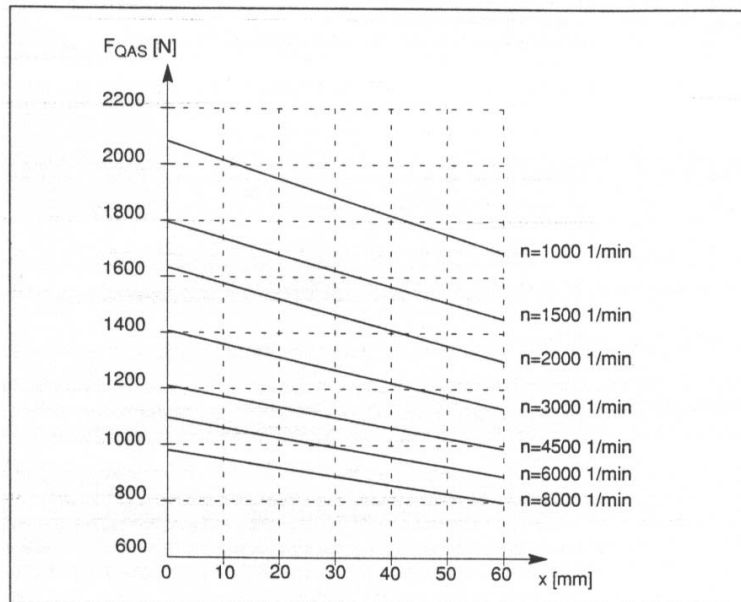


Fig. 2-21 Cantilever force F_Q at a distance x from the shaft shoulder for a nominal bearing lifetime of 20000 h.

Cantilever force 1FS6115

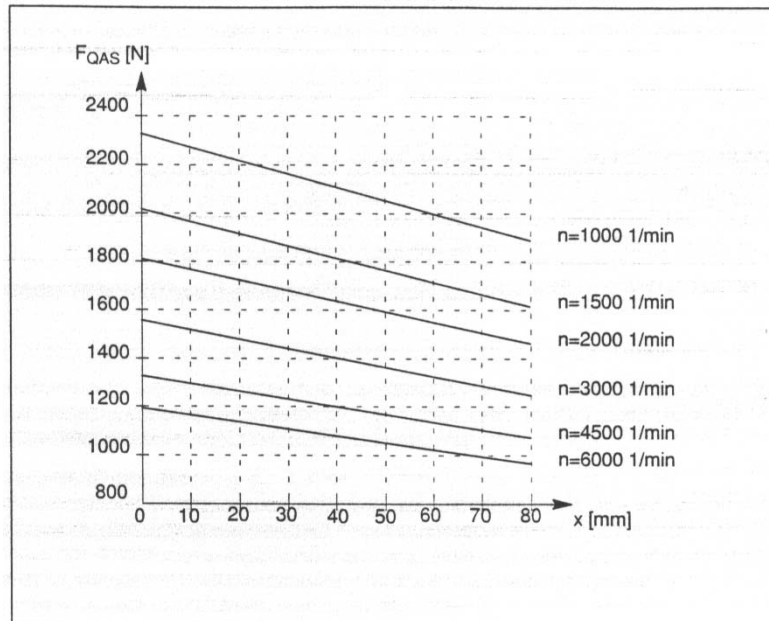


Fig. 2-22 Cantilever force F_Q at a distance x from the shaft shoulder for a nominal bearing lifetime of 20000 h.

Cantilever force 1FS6134

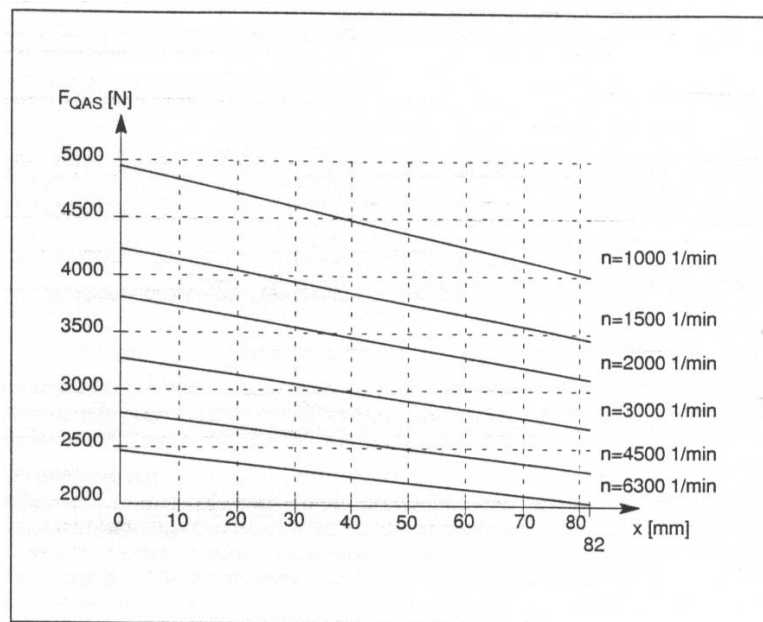


Fig. 2-23 Cantilever force F_Q at a distance x from the shaft shoulder for a nominal bearing lifetime of 20000 h.

2.7 Axial forces

2.7 Axial forces

When using, for example, helical geared wheels as drive-out element, in addition to the radial force, the motor bearings are also subject to an axial force. When axial forces are applied, the spring loading of the bearing can be overcome so that the rotor moves corresponding to the axial bearing play (0.2 mm).

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

$$F_A = 0.35 * F_{QAS}$$



Motor Components

3.1 Thermal motor protection

3.1.1 KTY-thermistor

A temperature-dependent resistor is integrated as temperature sensor to monitor the motor temperature.

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

The change in the resistance of the KTY 84 is proportional to the winding temperature change (refer to Fig. 3-1).

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

If a fault condition develops, an appropriate signal is output at the drive converter. When the motor temperature increases, a "Pre-alarm, motor overtemperature" signal is output which can be externally evaluated. If this signal is not observed, when the motor limiting temperature or the shutdown temperature is exceeded, the drive converter shuts down with the appropriate fault signal.



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!

The temperature sensor will be destroyed if the test voltage is connected to only one terminal of the temperature sensor.

The polarity must be carefully observed.

The temperature sensor is designed so that the DIN/EN requirement for "Protective separation" is fulfilled.

3.1 Thermal motor protection

**Caution**

The integrated temperature sensor protects the servomotors against overload up to $4 \cdot I_{0\ 60K}$ and speed $\leftrightarrow 0$.

For thermally critical load situations, e.g. high overload when the motor is stationary, then the KTY does not provide sufficient protection. PTC thermistor provides this protection (refer to Chapter 3.1.2).

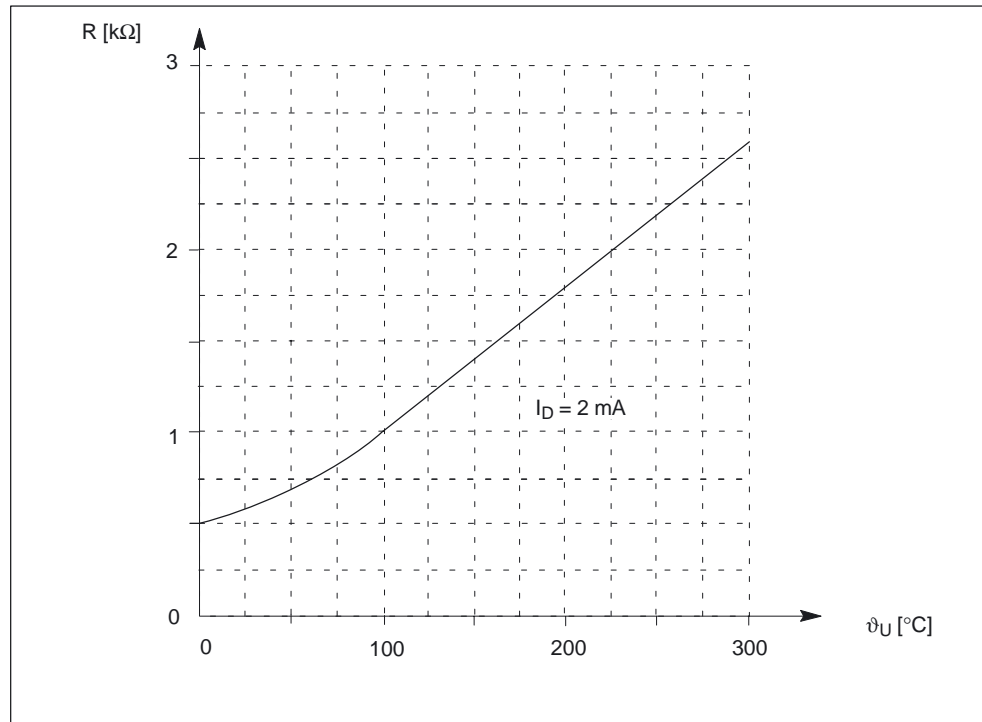


Fig. 3-1 Resistance characteristic of the KTY 84 as a function of the temperature

3.1.2 PTC-thermistor

In addition, 3 PTC thermistors, connected in series are integrated in the motor stator winding. These are used for monitoring and thermal protection.

Type:	PTC triplet
Resistance when cold:	< 250 Ω (below the response temperature)
Resistance when warm:	1330 Ω (at the response temperature)
Response temperature:	Depending on the motor type, between 120° C to 150° C
Connection:	Via a separate temperature sensor cable (the same terminal box as encoder signals and KTY-connection)

The PTC thermistor has a resistance which depends on the temperature and has a positive temperature characteristic. The resistance changes quickly from 250 Ω to > 1330 Ω in the range around the nominal response temperature (NAT –5% to NAT +5%).



Caution

The PTC triplet thermistor **must** be connected to an external evaluation unit, which is certified for explosion protection applications.

The 3RN10 SIMIREL thermistor motor protection–relay can be used for PTC temperature sensors. It has the test mark "PTB 01 ATEX 3218". Refer to Catalog NS K for detailed information on the 3RN10.

Connection assignment and signal cable

Table 3-1 Connection assignment for PTC thermistors

PIN	Assignment
19	PTC thermistor
18	PTC thermistor
	Ground

Table 3-2 Pre-assembled signal cables

Signal cable	Order No. (MLFB)
For PTC thermistors (2 x 2 x 0.18 mm ²)	6FX5002-1XA04-1□□0

Cables are not included with the motors – they must be separately ordered.	Lengths	5 m	AF
	(examples)	10 m	BA
		15 m	BF
		18 m	BJ
		25 m	CF

Maximum cable length < 100 m.

Technical data of the MOTION-CONNECT series, refer to Catalog NC Z.

3.2 Encoders

3.2 Encoders

The following encoders can be used:

- Incremental encoder sin/cos 1Vpp (I-2048)
- Absolute value encoder EnDat (A-2048)

The encoder is located in the flameproof enclosure of the explosion-protected motor.

Special tools are required in order to open this explosion-proof space. Only special workshops which have been certified for working on explosion-protected motors are permitted to carry-out this work.

**Danger**

Only authorized workshops are permitted to replace the encoder.

Signal cables

The following pre-assembled signal cables can be ordered (refer to Table 3-3).

Table 3-3 Pre-assembled signal cables

	Order No. (MLFB)
For incremental encoders 1 Vpp with 2048 S/R	6FX5002-2XA00-1□□0
For absolute value encoders (EnDat) with 2048 S/R	6FX5002-2XQ10-1□□0

Cables are not included with the motors – they must be separately ordered.

Lengths (examples)	5 m	10 m	15 m	18 m	25 m
	AF	BA	BF	BJ	CF

Maximum cable length < 100 m.

Technical data of the MOTION-CONNECT series, refer to Catalog NC Z.

3.2.1 Incremental encoders

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

Table 3-4 Technical data, incremental encoder sin/cos 1V_{pp}

Features	Incremental encoders sin/cos 1V _{pp}
Mech. limiting speed	15,000 RPM
Operating voltage	5V ± 5%
Current drain	max. 150 mA
Resolution, incremental	2048
Incremental signals	1 V _{pp}
Accuracy	± 40"
C-D track (rotor position)	Available

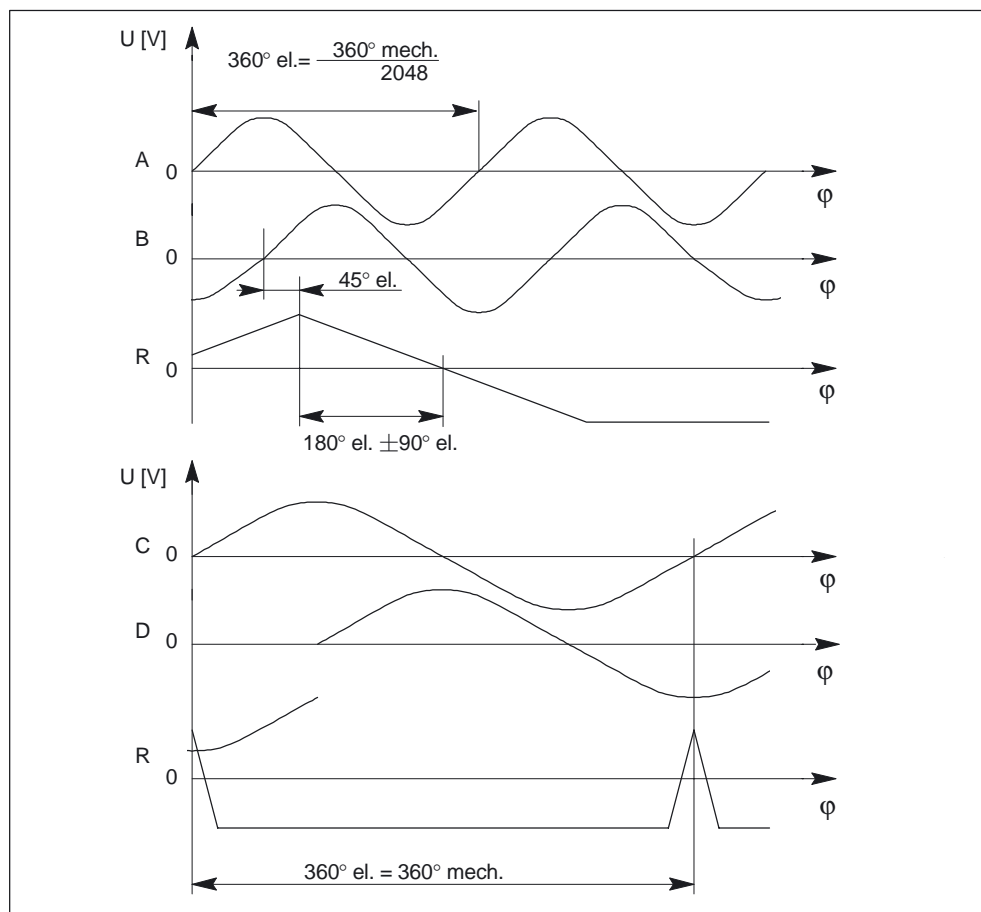


Fig. 3-2 Signal sequence and assignment for a positive direction of rotation (clockwise direction rotation when viewing the drive end)

3.2 Encoders

Connection assignment for 17-pin terminal strip in the terminal box

Table 3-5 Connection assignment for incremental encoders 1Vpp with 2048 S/R

Motor side (terminal box) with end sleeves			Sub-D-connector on the drive converter side	
PIN	Assignment		PIN	Assignment
17	+Temp		13	+Temp
16	-Temp		25	-Temp
15	0V Sense		16	0V Sense
14	5V Sense		14	5V Sense
13	Inner shield		5, 8, 24	Inner shield
12	M encoder		2	M encoder
11	P encoder		1	P encoder
10	R*		18	R*
9	R		17	R
8	D*		22	D*
7	D		21	D
6	C*		20	C*
5	C		19	C
4	B*		7	B*
3	B		6	B
2	A*		4	A*
1	A		3	A

3.2.2 Absolute value encoders

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

Table 3-6 Technical data, incremental encoder sin/cos 1V_{pp}

Features	Absolute value encoder EnDat (A-2048)
Mech. limiting speed	12,000 RPM
Operating voltage	5V ± 5%
Current drain	max. 300 mA
Incremental resolution (periods per revolution)	2048
Absolute resolution (coded revolutions)	4096
Incremental signals	1 V _{pp}
Serial absolute position interface	EnDat
Accuracy	± 40"

Note

As a result of the reduced maximum operating temperature of absolute value encoders with respect to incremental encoders, the thermally permissible motor torque is reduced (refer to the technical data of the motors)!

3.3 Holding brake

Connection assignment for the 17-pin terminal strip in the terminal box

Table 3-7 Connection assignment for EnDat absolute value encoders with 2048 S/R

Motor side (terminal box) with end sleeves			Sub-D-connector on the drive converter side	
PIN	Assignment		PIN	Assignment
17	+Temp		13	+Temp
16	-Temp		25	-Temp
15	0V Sense		16	0V Sense
14	5V Sense		14	5V Sense
13	Inner shield		5, 8, 24	Inner shield
12	M encoder		2	M encoder
11	P encoder		1	P encoder
10			24	
9			14	
8	Clock*		12	Clock*
7	Clock		10	Clock
6	Data*		23	Data*
5	Data		15	Data
4	B*		7	B*
3	B		6	B
2	A*		4	A*
1	A		3	A

3.3 Holding brake

1FS6 motors have no mounted holding brake.

3.4 Gearbox

Gearboxes are available on request. Please contact your local Siemens office. ■

Dimension Drawings

4

Note

Siemens AG reserves the right to change the dimensions of motors without prior notice as part of ongoing improvements to the mechanical design. Dimensions drawings can go out-of-date.

Up-to-date dimension drawings can be requested at no charge from your local SIEMENS sales department.

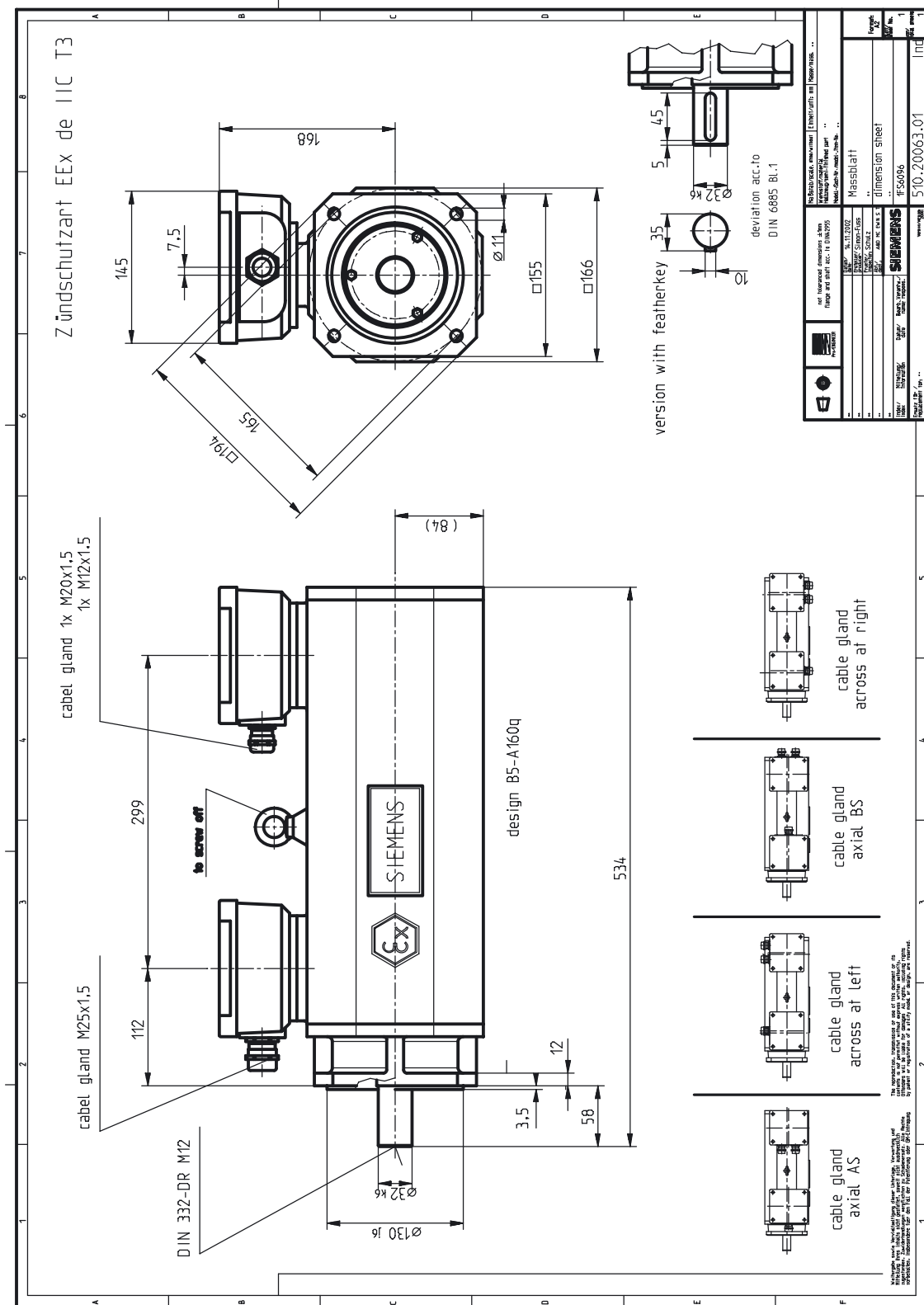


Fig. 4-2 1F5096-8A□71-□□□□

References

General Documentation

/BU/ Catalog NC 60

Automation Systems for Machine Tools

Order No.: E86060–K4460–A101–A9

Order No.: E86060–K4460–A101–A9–7600 (English)

/ZI/ Catalog NC Z

Connection Technology and System Components for SIMATIC, SINUMERIK, MASTERDRIVES and SIMOTION

Order No.: E86060–K4490–A101–B1

Order No.: E86060–K4490–A101–B1–7600 (English)

Electronic Documentation

/CD1/ DOC ON CD

The SINUMERIK System

(includes all SINUMERIK 840D/810D and SIMODRIVE 611D documents)

Order No.: 6FC5298–6CA00–0BG3

Manufacturer/Service Documentation

/PJM/ Planning Guide, AC Servomotors

SIMODRIVE 611, MASTERDRIVES MC

General Section, 1FT5, 1FT6, 1FK6, 1FK7

Order No.: 6SN1197–0AC20–0BP0

/PJAL/ Planning Guide, AC Servomotors

SIMODRIVE 611, MASTERDRIVES MC

AC servomotors, General Section

Order No.: 6SN1197–0AD07–0BP0

- /PFK7/ Planning Guide, AC Servomotors**
SIMODRIVE 611, MASTERDRIVES MC
AC Servomotors 1FK7
Order No.: 6SN1197-0AD06-0BP0
- /PFK6/ Planning Guide, AC Servomotors**
SIMODRIVE 611, MASTERDRIVES MC
AC Servomotors 1FK6
Order No.: 6SN1197-0AD05-0BP0
- /PFT5/ Planning Guide, AC Servomotors**
SIMODRIVE
AC Servomotors 1FT5
Order No.: 6SN1197-0AD01-0BP0
- /PFT6/ Planning Guide, AC Servomotors**
SIMODRIVE 611, MASTERDRIVES MC
AC Servomotors 1FT6
Order No.: 6SN1197-0AD02-0BP0
- /PFS6/ Planning Guide, AC Servomotors**
MASTERDRIVES MC
AC Servomotors 1FS6, Explosion-Protected
Order No.: 6SN1197-0AD08-0BP0
- /PPH/ Planning Guide, AC Induction Motors**
SIMODRIVE
AC Induction Motors for Main Spindle Drives
1PH2, 1PH4, 1PH7
Order No.: 6SN1197-0AC60-0BP0
- /PPM/ Planning Guide, Hollow Shaft Motors**
SIMODRIVE
Hollow Shaft Motors for Main Spindle Drives
1PM6 and 1PM4
Order No.: 6SN1197-0AD03-0BP0

/PJFE/ Planning Guide, Synchronous Build-in Motors

SIMODRIVE
AC Motors for Main Spindle Drives
Synchronous Build-in Motors 1FE1
Order No.: 6SN1197-0AC00-0BP4

/PJTM/ Planning Guide, Build-in Torque Motors

SIMODRIVE
Build-in Torque Motors 1FW6
Order No.: 6SN197-0AD00-0BP0

/PJLM/ Planning Guide, Motor Spindles

SIMODRIVE
ECO-Motor Spindle 2SP1
Order No.: 6SN1197-0AD04-0BP0

/PJLM/ Planning Guide, Linear Motors

SIMODRIVE
Linear Motors 1FN1 and 1FN3
Order No.: 6SN1197-0AB70-0BP3

/PJU/ Planning Guide, Drive Converters

SIMODRIVE 611
Drive Converters
Order No.: 6SN1197-0AA00-0BP5

/EMV/ Planning Guide, EMC Design Guidelines

SINUMERIK, SIROTEC, SIMODRIVE
Order No.: 6FC5297-0AD30-0BP1

Operating Instructions 1FS6

Order No.: 610.40068.11



Index

A

Absolute value encoders, 1FS6/3-59
Armature short-circuit braking, 1FS6/2-34
Axial forces, 1FS6/2-52

B

Brake resistance, 1FS6/2-30
Braking torque, 1FS6/2-30

C

Calculation
 Motor RMS torque, 1FS6/2-33
 Motor torque, 1FS6/2-32
Cantilever force diagrams, 1FS6/2-49
Cantilever force stressing, 1FS6/2-49
Characteristic, Current-torque, 1FS6/2-29
Characteristics, 1FS6/2-23

D

Danger and warning information, vi
Dimension Drawings, 1FS6/4-61
Drive-out coupling, 1FS6/1-21

E

Electrical connection, 1FS6/1-18
Electrical time constant, 1FS6/2-30
Encoders, 1FS6/3-56
ESDS information and instructions, ix

G

Gearboxes, 1FS6/3-60

H

Holding brake, 1FS6/3-60
Hotline, v

I

Incremental encoder, 1FS6/3-57
Inductance, 1FS6/2-30

L

Limit current, 1FS6/2-28
Limit torque, 1FS6/2-28

M

Maximum current, 1FS6/2-28
Maximum speed, 1FS6/2-28
Maximum torque, 1FS6/2-28
Mechanical time constant, 1FS6/2-30
Motor rating plate, 1FS6/1-17
Motor RMS torque, 1FS6/2-33
Motor torque, 1FS6/2-32

O

Optimum speed, 1FS6/2-28
Options, 1FS6/1-17
Order designation, 1FS6/1-15

P

PTC thermistor, 1FS6/3-55

R

Rated current, 1FS6/2-27
Rated speed, 1FS6/2-26
Rated torque, 1FS6/2-27
Rating plate data, 1FS6/1-17
Resistance characteristic, KTY84, 1FS6/3-54

S

Shaft torsional stiffness, 1FS6/2-30
Signal cables, 1FS6/3-56

Speed–torque diagrams, 1FS6/2-35
Standstill current, 1FS6/2-27
Standstill torque, 1FS6/2-27

T

Technical Data, 1FS6/2-23
Technical data, 1FS6/1-16, 1FS6/2-34
Temperature sensor, KTY 84, 1FS6/3-53
Thermal limit characteristic, 1FS6/2-25
Thermal motor protection
 KTY thermistor, 1FS6/3-53
 PTC thermistor, 1FS6/3-55
Thermal motor protection relay, 1FS6/3-55
Thermal time constant, 1FS6/2-30

Tolerance data, 1FS6/2-31
Torque characteristics, 1FS6/2-24
Torque constant, 1FS6/2-29

V

Voltage constant, 1FS6/2-29
Voltage limit characteristic, 1FS6/2-26
Voltage limit characteristics, 1FS6/2-25

W

Winding resistance, 1FS6/2-30

EC Declaration of Conformity

C

EG-Konformitätserklärung


No. 664.20027.01/09.02

Hersteller: Siemens Aktiengesellschaft
Bereich Automatisierungs- und Antriebstechnik
Motion Control Systeme

Anschrift: Industriestraße 1
97615 Bad Neustadt a. d. Saale
Bundesrepublik Deutschland

Produktbezeichnung: **Drehstrom – Synchronmotoren der Zündschutzart:
Druckfeste Kapselung „d“
Typ 1FS6074- ..., 1FS6096- ..., 1FS6115- ..., 1FS6134- ...,
in der Kühlart Selbstkühlung**

Prüfstelle: TÜV Nord Cert GmbH & Co. KG, am TÜV1, D-30519 Hannover
Kennnummer: 0032
Zulassungsnummern: TÜV 02 ATEX 1891, 1892, 1893, 1894

Kennzeichnung: CE 0032  II 2G EEx de IIc T3

Das bezeichnete Produkt stimmt mit den Vorschriften folgender Europäischer Richtlinie überein:

94/9/EG Richtlinie des Europäischen Parlaments und des Rates zur Angleichung der Rechtsvorschriften der Mitgliedstaaten für Geräte und Schutzsysteme zur bestimmungsgemäßen Verwendung in explosionsgefährdeten Bereichen.

Die Übereinstimmung mit den Vorschriften dieser Richtlinien wird nachgewiesen durch die vollständige Einhaltung folgender Normen:

EN 60 204-1, EN 60 034, EN 50 014, EN 50 018, EN 50 019

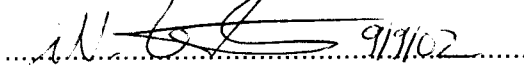
Die Sicherheitshinweise der Produktdokumentation sind zu beachten.

Das Produkt ist für den Ein- oder Anbau an ein Gerät nach der EG-Richtlinie 94/9/EG bestimmt .

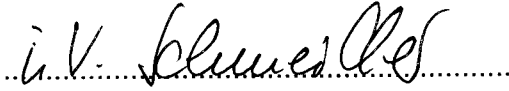
Bevor das Endprodukt (Gerät) in Betrieb genommen wird, muß sichergestellt sein, daß es mit der Richtlinie 94/9/EG konform ist.

Das Produkt ist auch eine Komponente nach Artikel 4(2) der EG-Maschinenrichtlinie 98/37/EG. Nach der Maschinenrichtlinie sind wir verpflichtet darauf hinzuweisen, daß das bezeichnete Produkt zum An- oder Einbau in eine Maschine bestimmt ist. Bevor das Endprodukt in Betrieb genommen wird, muß sichergestellt sein, daß es mit der Richtlinie 98/37/EG konform ist.

Bad Neustadt, den
Siemens Aktiengesellschaft


..... 9/19/02

Dr. Hans Peter Zerbes,
Leiter Elektromotorenwerk Bad Neustadt


.....

Wolfgang Schneider,
Leiter der Abt. Technik (ST) Elektromotorenwerk Bad Neustadt

Diese Erklärung bescheinigt die Übereinstimmung mit der genannten Richtlinie, ist jedoch keine Zusicherung von Eigenschaften im Sinne der Produkthaftung.



(1) **EG-Baumusterprüfbescheinigung**

(2) Geräte und Schutzsysteme zur bestimmungsgemäßen Verwendung in explosionsgefährdeten Bereichen - **Richtlinie 94/9/EG**

(3) EG Baumusterprüfbescheinigungsnummer



TÜV 02 ATEX 1891

(4) Gerät: Synchronmotor Typ 1FS6 074-...

(5) Hersteller: Siemens AG A&D MC EWN

(6) Anschrift: D-97616 Bad Neustadt, Industriestr. 1

(7) Die Bauart dieses Gerätes sowie die verschiedenen zulässigen Ausführungen sind in der Anlage zu dieser Baumusterprüfbescheinigung festgelegt.

(8) Die TÜV NORD CERT GmbH & Co. KG, TÜV CERT-Zertifizierungsstelle, bescheinigt als benannte Stelle Nr. 0032 nach Artikel 9 der Richtlinie des Rates der Europäischen Gemeinschaften vom 23. März 1994 (94/9/EG) die Erfüllung der grundlegenden Sicherheits- und Gesundheitsanforderungen für die Konzeption und den Bau von Geräten und Schutzsystemen zur bestimmungsgemäßen Verwendung in explosionsgefährdeten Bereichen gemäß Anhang II der Richtlinie.

Die Ergebnisse der Prüfung sind in dem vertraulichen Prüfbericht Nr. 02 YEX 187216 festgelegt.

(9) Die grundlegenden Sicherheits- und Gesundheitsanforderungen werden erfüllt durch Übereinstimmung mit

EN 50014:1997

EN 50018:2000

EN 50019:2000

(10) Falls das Zeichen "X" hinter der Bescheinigungsnummer steht, wird auf besondere Bedingungen für die sichere Anwendung des Gerätes in der Anlage zu dieser Bescheinigung hingewiesen.

(11) Diese EG-Baumusterprüfbescheinigung bezieht sich nur auf Konzeption und Prüfung des festgelegten Gerätes gemäß Richtlinie 94/9/EG. Weitere Anforderungen dieser Richtlinie gelten für die Herstellung und das Inverkehrbringen dieses Gerätes. Diese Anforderungen werden nicht durch diese Bescheinigung abgedeckt.

(12) Die Kennzeichnung des Gerätes muss die folgenden Angaben enthalten:

 **II 2 G EEx de IIC T3**

TÜV NORD CERT GmbH & Co. KG
TÜV CERT-Zertifizierungsstelle
Am TÜV 1
D-30519 Hannover
Tel.: 0511 986-1470
Fax: 0511 986-2555

Hannover, 07.10.2002

Der Leiter



TÜV NORD CERT

(13)

ANLAGE

(14) **EG-Baumusterprüfbescheinigung Nr. TÜV 02 ATEX 1891**

(15) Beschreibung des Gerätes

Der permanenterrechte elektronisch kommutierte Synchronmotor Typ 1FS6 074-... in der Zündschutzart Druckfeste Kapselung besteht aus einem Gußgehäuse, welches durch ein Lagerschild (A-Seite) und einem Abschlußdeckel (B-Seite) abgeschlossen wird. Die Welle, ausgerüstet mit Wälzlagern, bildet mit dem Lagerschild einen zünddurchschlagsicheren Spalt. Der Synchronmotor wird über die Oberfläche gekühlt. Der elektrische Anschluss erfolgt über zwei Anschlusskästen in der Zündschutzart Erhöhte Sicherheit. Die elektrische Verbindung zwischen den Anschlusskästen und dem Motorraum wird mittels teilbescheinigter Durchführungen hergestellt. Der Synchronmotor wird am Umrichter betrieben. Die Einhaltung der Temperaturklasse erfolgt über drei in die Wicklung eingebaute Kaltleiter und einem passenden Abschaltgerät.

Die folgenden Werte sind die technischen Bemessungsgrößen des Synchronmotors:

Bereich der zulässigen Umgebungstemperatur	-20 bis 40 °C			
Betriebsart nach EN 60034	S1			
Eisenbreite [mm]	125			
Bemessungsspannung [V]	3 × 425 V AC			
Bemessungsleistung [kW]	1,7	2,2	2,3	1,4
Bemessungsdrehzahl [1/min]	2000	3000	4500	6000
Bemessungsdrehmoment [Nm]	8,0	7,0	4,8	2,1
Bemessungsstrom [A]	3,8	4,9	5,5	3,5
Nennabschalttemperatur der Temperatursensoren	130 bis 150 °C			

(16) Prüfungsunterlagen sind im Prüfbericht Nr. 02 YEX 187216 aufgelistet.

(17) Besondere Bedingung

keine;

die folgenden Hinweise sind bei der Installation zu beachten:

- Zur Einhaltung der Temperaturklasse muss der Synchronmotor mit einem Abschaltgerät, das von einer benannten Prüfstelle funktionsgeprüft worden ist, betrieben werden.
- Die Anschlusskästen sind mit Leitungseinführungen und Blindstopfen auszustatten, die mindestens nach EN 50 014:1992 und EN 50019:1994 bescheinigt worden sind.
- Der Hersteller teilt dem Betreiber die notwendige Temperaturbeständigkeit der Anschlussleitungen, der Leitungseinführungen und der Blindstopfen mit, wenn der Betreiber Eigene einsetzen will.

(18) Grundlegende Sicherheits- und Gesundheitsanforderungen
keine zusätzlichen



Translation

(1) **EC TYPE-EXAMINATION CERTIFICATE**

- (2) Equipment or protective system intended for use in potentially explosive atmospheres - **Directive 94/9/EC**
- (3) EC-Type Examination Certificate Number



TÜV 02 ATEX 1891

- (4) Equipment: Synchronous motor Type 1FS6 074-...
- (5) Manufacturer: Siemens AG A&D MC EWN
- (6) Address: D-97616 Bad Neustadt, Industriestr. 1
- (7) This equipment or protective system and any acceptable variation thereto is specified in the schedule to this certificate and the documents therein referred to.
- (8) The TÜV NORD CERT GmbH & Co. KG, TÜV CERT-Certification Body, notified body number N° 0032 in accordance with Article 9 of the Council Directive of the EC of March 23, 1994 (94/9/EC), certifies that this equipment or protective system has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of equipment and protective systems intended for use in potentially explosive atmospheres given in Annex II to the Directive.

The examination and test results are recorded in the confidential report N° 02 YEX 187216.

- (9) Compliance with the Essential Health and Safety Requirements has been assured by compliance with:

EN 50 014: 1997

EN 50 018: 2000

EN 50 019: 2000

- (10) If the sign "X" is placed after the certificate number, it indicates that the equipment or protective system is subject to special conditions for safe use specified in the schedule to this certificate.
- (11) This EC-type examination certificate relates only to the design, examination and tests of the specified equipment in accordance to the Directive 94/9/EC. Further requirements of the Directive apply to the manufacturing process and supply of this equipment. These are not covered by this certificate.
- (12) The marking of the equipment or protective system must include the following:

 **II 2 G EEx de IIC T3**

TÜV NORD CERT GmbH & Co. KG
TÜV CERT-Certification Body
Am TÜV 1
D-30519 Hannover
Tel.: 0511 986-1470
Fax: 0511 986-2555

Hanover, 2002-10-07



TÜV NORD CERT


Head of the
Certification Body

(13)

SCHEDULE

(14) **EC-TYPE EXAMINATION CERTIFICATE N° TÜV 02 ATEX 1891**

(15) Description of equipment

The permanent-field, electronically commutated synchronous motor type 1FS6 074-... of the type of protection flameproof enclosure consists of a cast-iron enclosure by an end shield (drive end) and an end cover (non-drive end). Together with the end shield, the shaft, provided with roller bearings, forms a flameproof joint.

The synchronous motor is cooled through the surface. Two terminal boxes of the type of protection increased safety are used for electrical connection. Electrical connection between the terminal boxes and the motor compartment is made by bushings for which a component certificate has been issued. The synchronous motor is operated at the converter. Compliance with the temperature class is ensured by three PTC resistors installed in the winding and a suitable cut-off device.

The following values are the technical rated quantities of the synchronous motor:

Range of the permissible ambient temperature	-20 to 40 °C			
Duty acc. EN 60034	S1			
Core length [mm]	125			
Rated voltage up to [V]	3 × 425 V AC			
Rated power [kW]	1.7	2.2	2.3	1.4
Rated speed [1/min]	2000	3000	4500	6000
Rated torque [Nm]	8.0	7.0	4.8	2.1
Rated current [A]	3.8	4.9	5.5	3.5
Nominal cut temperature of the temperature sensors	130 to 150 °C			

16) Test documents are listed in the test report No.: 02 YEX 187216.

(17) Special conditions for safe use

None;

the following must be taken in account for installation and operation:

- To guarantee compliance with the temperature class, the synchronous motor must be operated with a cut-off device whose function has been tested by a notified body.
- The terminal boxes must be provided with cable entries and filler plugs which have at least been certified according to EN 50014:1992 and EN 50019:1994.
- The manufacturer informs the user about the thermal stability of the connecting cable, cable entries and filler plugs if the user wants to use owns.

(18) Essential Health and Safety Requirements

No additional ones



(1) EG-Baumusterprüfbescheinigung

(2) Geräte und Schutzsysteme zur bestimmungsgemäßen Verwendung in explosionsgefährdeten Bereichen - **Richtlinie 94/9/EG**

(3) EG Baumusterprüfbescheinigungsnummer



TÜV 02 ATEX 1892

(4) Gerät: Synchronmotor Typ 1FS6 096-...

(5) Hersteller: Siemens AG A&D MC EWN

(6) Anschrift: D-97616 Bad Neustadt, Industriestr. 1

(7) Die Bauart dieses Gerätes sowie die verschiedenen zulässigen Ausführungen sind in der Anlage zu dieser Baumusterprüfbescheinigung festgelegt.

(8) Die TÜV NORD CERT GmbH & Co. KG, TÜV CERT-Zertifizierungsstelle, bescheinigt als benannte Stelle Nr. 0032 nach Artikel 9 der Richtlinie des Rates der Europäischen Gemeinschaften vom 23. März 1994 (94/9/EG) die Erfüllung der grundlegenden Sicherheits- und Gesundheitsanforderungen für die Konzeption und den Bau von Geräten und Schutzsystemen zur bestimmungsgemäßen Verwendung in explosionsgefährdeten Bereichen gemäß Anhang II der Richtlinie.

Die Ergebnisse der Prüfung sind in dem vertraulichen Prüfbericht Nr. 02 YEX 187216 festgelegt.

(9) Die grundlegenden Sicherheits- und Gesundheitsanforderungen werden erfüllt durch Übereinstimmung mit

EN 50014:1997

EN 50018:2000

EN 50019:2000

(10) Falls das Zeichen "X" hinter der Bescheinigungsnummer steht, wird auf besondere Bedingungen für die sichere Anwendung des Gerätes in der Anlage zu dieser Bescheinigung hingewiesen.

(11) Diese EG-Baumusterprüfbescheinigung bezieht sich nur auf Konzeption und Prüfung des festgelegten Gerätes gemäß Richtlinie 94/9/EG. Weitere Anforderungen dieser Richtlinie gelten für die Herstellung und das Inverkehrbringen dieses Gerätes. Diese Anforderungen werden nicht durch diese Bescheinigung abgedeckt.

(12) Die Kennzeichnung des Gerätes muss die folgenden Angaben enthalten:

 **II 2 G EEx de IIC T3**

TÜV NORD CERT GmbH & Co. KG
TÜV CERT-Zertifizierungsstelle
Am TÜV 1
D-30519 Hannover
Tel.: 0511 986-1470
Fax: 0511 986-2555

Hannover, 07.10.2002


Der Leiter



TÜV NORD CERT

(13)

ANLAGE

(14) **EG-Baumusterprüfbescheinigung Nr. TÜV 02 ATEX 1892**

(15) Beschreibung des Gerätes

Der permanenterregete elektronisch kommutierte Synchronmotor Typ 1FS6 096-... in der Zündschutzart Druckfeste Kapselung besteht aus einem Gußgehäuse, welches durch ein Lagerschild (A-Seite) und einem Abschlußdeckel (B-Seite) abgeschlossen wird. Die Welle, ausgerüstet mit Wälzlagern, bildet mit dem Lagerschild einen zünddurchschlagsicheren Spalt. Der Synchronmotor wird über die Oberfläche gekühlt. Der elektrische Anschluss erfolgt über zwei Anschlusskästen in der Zündschutzart Erhöhte Sicherheit. Die elektrische Verbindung zwischen den Anschlusskästen und dem Motorraum wird mittels teilbescheinigter Durchführungen hergestellt. Der Synchronmotor wird am Umrichter betrieben. Die Einhaltung der Temperaturklasse erfolgt über drei in die Wicklung eingebaute Kaltleiter und einem passenden Abschaltgerät.

Die folgenden Werte sind die technischen Bemessungsgrößen des Synchronmotors:

Bereich der zulässigen Umgebungstemperatur	-20 bis 40 °C		
Betriebsart nach EN 60034	S1		
Eisenbreite [mm]	175		
Bemessungsspannung [V]	3 × 425 V AC		
Bemessungsleistung [kW]	4,7	5,8	5,7
Bemessungsdrehzahl [1/min]	2000	3000	4500
Bemessungsdrehmoment [Nm]	22,5	18,5	12,0
Bemessungsstrom [A]	10,9	13,0	12,6

(16) Prüfungsunterlagen sind im Prüfbericht Nr. 02 YEX 187216 aufgelistet.

(17) Besondere Bedingung

keine;

die folgenden Hinweise sind bei der Installation zu beachten:

- Zur Einhaltung der Temperaturklasse muss der Synchronmotor mit einem Abschaltgerät, das von einer benannten Prüfstelle funktionsgeprüft worden ist, betrieben werden.
- Die Anschlusskästen sind mit Leitungseinführungen und Blindstopfen auszustatten, die mindestens nach EN 50 014:1992 und EN 50019:1994 bescheinigt worden sind.
- Der Hersteller teilt dem Betreiber die notwendige Temperaturbeständigkeit der Anschlussleitungen, der Leitungseinführungen und der Blindstopfen mit, wenn der Betreiber Eigene einsetzen will.

(18) Grundlegende Sicherheits- und Gesundheitsanforderungen
keine zusätzlichen



Translation

(1) **EC TYPE-EXAMINATION CERTIFICATE**

- (2) Equipment or protective system intended for use in potentially explosive atmospheres - **Directive 94/9/EC**
(3) EC-Type Examination Certificate Number



TÜV 02 ATEX 1892

- (4) Equipment: Synchronous motor Type 1FS6 096-...
(5) Manufacturer: Siemens AG A&D MC EWN
(6) Address: D-97616 Bad Neustadt, Industriestr. 1
(7) This equipment or protective system and any acceptable variation thereto is specified in the schedule to this certificate and the documents therein referred to.
(8) The TÜV NORD CERT GmbH & Co. KG, TÜV CERT-Certification Body, notified body number N° 0032 in accordance with Article 9 of the Council Directive of the EC of March 23, 1994 (94/9/EC), certifies that this equipment or protective system has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of equipment and protective systems intended for use in potentially explosive atmospheres given in Annex II to the Directive.

The examination and test results are recorded in the confidential report N° 02 YEX 187216.

- (9) Compliance with the Essential Health and Safety Requirements has been assured by compliance with:

EN 50 014: 1997

EN 50 018: 2000

EN 50 019: 2000

- (10) If the sign "X" is placed after the certificate number, it indicates that the equipment or protective system is subject to special conditions for safe use specified in the schedule to this certificate.
(11) This EC-type examination certificate relates only to the design, examination and tests of the specified equipment in accordance to the Directive 94/9/EC. Further requirements of the Directive apply to the manufacturing process and supply of this equipment. These are not covered by this certificate.
(12) The marking of the equipment or protective system must include the following:

 **II 2 G EEx de IIC T3**

TÜV NORD CERT GmbH & Co. KG
TÜV CERT-Certification Body
Am TÜV 1
D-30519 Hannover
Tel.: 0511 986-1470
Fax: 0511 986-2555

Hanover, 2002-10-07



TÜV NORD CERT


Head of the
Certification Body



(13)

SCHEDULE

(14) **EC-TYPE EXAMINATION CERTIFICATE N° TÜV 02 ATEX 1892**

(15) Description of equipment

The permanent-field, electronically commutated synchronous motor type 1FS6 096-... of the type of protection flameproof enclosure consists of a cast-iron enclosure by an end shield (drive end) and an end cover (non-drive end). Together with the end shield, the shaft, provided with roller bearings, forms a flameproof joint.

The synchronous motor is cooled through the surface. Two terminal boxes of the type of protection increased safety are used for electrical connection. Electrical connection between the terminal boxes and the motor compartment is made by bushings for which a component certificate has been issued. The synchronous motor is operated at the converter. Compliance with the temperature class is ensured by three PTC resistors installed in the winding and a suitable cut-off device.

The following values are the technical rated quantities of the synchronous motor:

Range of the permissible ambient temperature	-20 to 40 °C		
Duty acc. EN 60034	S1		
Core length [mm]	175		
Rated voltage up to [V]	3 × 425 V AC		
Rated power [kW]	4.7	5.8	5.7
Rated speed [1/min]	2000	3000	4500
Rated torque [Nm]	22.5	18.5	12.0
Rated current [A]	10.9	13.0	12.6

(16) Test documents are listed in the test report No.: 02 YEX 187216.

(17) Special conditions for safe use

None;

the following must be taken in account for installation and operation:

- To guarantee compliance with the temperature class, the synchronous motor must be operated with a cut-off device whose function has been tested by a notified body.
- The terminal boxes must be provided with cable entries and filler plugs which have at least been certified according to EN 50014:1992 and EN 50019:1994.
- The manufacturer informs the user about the thermal stability of the connecting cable, cable entries and filler plugs if the user wants to use owns.

(18) Essential Health and Safety Requirements

No additional ones



(1) **EG-Baumusterprüfbescheinigung**

- (2) Geräte und Schutzsysteme zur bestimmungsgemäßen Verwendung in explosionsgefährdeten Bereichen - **Richtlinie 94/9/EG**
- (3) EG Baumusterprüfbescheinigungsnummer



TÜV 02 ATEX 1893

- (4) Gerät: Synchronmotor Typ 1FS6 115-...
- (5) Hersteller: Siemens AG A&D MC EWN
- (6) Anschrift: D-97616 Bad Neustadt, Industriestr. 1
- (7) Die Bauart dieses Gerätes sowie die verschiedenen zulässigen Ausführungen sind in der Anlage zu dieser Baumusterprüfbescheinigung festgelegt.
- (8) Die TÜV NORD CERT GmbH & Co. KG, TÜV CERT-Zertifizierungsstelle, bescheinigt als benannte Stelle Nr. 0032 nach Artikel 9 der Richtlinie des Rates der Europäischen Gemeinschaften vom 23. März 1994 (94/9/EG) die Erfüllung der grundlegenden Sicherheits- und Gesundheitsanforderungen für die Konzeption und den Bau von Geräten und Schutzsystemen zur bestimmungsgemäßen Verwendung in explosionsgefährdeten Bereichen gemäß Anhang II der Richtlinie.

Die Ergebnisse der Prüfung sind in dem vertraulichen Prüfbericht Nr. 02 YEX 187216 festgelegt.

- (9) Die grundlegenden Sicherheits- und Gesundheitsanforderungen werden erfüllt durch Übereinstimmung mit

EN 50014:1997

EN 50018:2000

EN 50019:2000

- (10) Falls das Zeichen "X" hinter der Bescheinigungsnummer steht, wird auf besondere Bedingungen für die sichere Anwendung des Gerätes in der Anlage zu dieser Bescheinigung hingewiesen.
- (11) Diese EG-Baumusterprüfbescheinigung bezieht sich nur auf Konzeption und Prüfung des festgelegten Gerätes gemäß Richtlinie 94/9/EG. Weitere Anforderungen dieser Richtlinie gelten für die Herstellung und das Inverkehrbringen dieses Gerätes. Diese Anforderungen werden nicht durch diese Bescheinigung abgedeckt.
- (12) Die Kennzeichnung des Gerätes muss die folgenden Angaben enthalten:

 **II 2 G EEx de IIC T3**

TÜV NORD CERT GmbH & Co. KG
TÜV CERT-Zertifizierungsstelle
Am TÜV 1
D-30519 Hannover
Tel.: 0511 986-1470
Fax: 0511 986-2555

Hannover, 07.10.2002


Der Leiter



(13)

A N L A G E

(14) **EG-Baumusterprüfbescheinigung Nr. TÜV 02 ATEX 1893**

(15) Beschreibung des Gerätes

Der permanenterrechte elektronisch kommutierte Synchronmotor Typ 1FS6 115-... in der Zündschutzart Druckfeste Kapselung besteht aus einem Gußgehäuse, welches durch ein Lagerschild (A-Seite) und einem Abschlußdeckel (B-Seite) abgeschlossen wird. Die Welle, ausgerüstet mit Wälzlagern, bildet mit dem Lagerschild einen zünddurchschlagsicheren Spalt. Der Synchronmotor wird über die Oberfläche gekühlt. Der elektrische Anschluss erfolgt über zwei Anschlusskästen in der Zündschutzart Erhöhte Sicherheit. Die elektrische Verbindung zwischen den Anschlusskästen und dem Motorraum wird mittels teilbescheinigter Durchführungen hergestellt. Der Synchronmotor wird am Umrichter betrieben. Die Einhaltung der Temperaturklasse erfolgt über drei in die Wicklung eingebaute Kaltleiter und einem passenden Abschaltgerät.

Die folgenden Werte sind die technischen Bemessungsgrößen des Synchronmotors:

Bereich der zulässigen Umgebungstemperatur	-20 bis 40 °C		
Betriebsart nach EN 60034	S1		
Bemessungsspannung [V]	3 × 425 V AC		
Eisenbreite [mm]	175		
Bemessungsleistung [kW]	6,6	8,0	9,7
Bemessungsdrehzahl [1/min]	1500	2000	3000
Bemessungsdrehmoment[Nm]	42	38	31
Bemessungsstrom [A]	14,5	17,6	22,5
Nennabschalttemperatur der Temperatursensoren	130 bis 150 °C		

(16) Prüfungsunterlagen sind im Prüfbericht Nr. 02 YEX 187216 aufgelistet.

(17) Besondere Bedingung

keine;

die folgenden Hinweise sind bei der Installation zu beachten:

- Zur Einhaltung der Temperaturklasse muss der Synchronmotor mit einem Abschaltgerät, das von einer benannten Prüfstelle funktionsgeprüft worden ist, betrieben werden.
- Die Anschlusskästen sind mit Leitungseinführungen und Blindstopfen auszustatten, die mindestens nach EN 50 014:1992 und EN 50019:1994 bescheinigt worden sind.
- Der Hersteller teilt dem Betreiber die notwendige Temperaturbeständigkeit der Anschlussleitungen, der Leitungseinführungen und der Blindstopfen mit, wenn der Betreiber Eigene einsetzen will.

(18) Grundlegende Sicherheits- und Gesundheitsanforderungen
keine zusätzlichen



Translation

(1) **EC TYPE-EXAMINATION CERTIFICATE**

- (2) Equipment or protective system intended for use in potentially explosive atmospheres - **Directive 94/9/EC**
(3) EC-Type Examination Certificate Number



TÜV 02 ATEX 1893

- (4) Equipment: Synchronous motor Type 1FS6 115-...
(5) Manufacturer: Siemens AG A&D MC EWN
(6) Address: D-97616 Bad Neustadt, Industriestr. 1
(7) This equipment or protective system and any acceptable variation thereto is specified in the schedule to this certificate and the documents therein referred to.
(8) The TÜV NORD CERT GmbH & Co. KG, TÜV CERT-Certification Body, notified body number N° 0032 in accordance with Article 9 of the Council Directive of the EC of March 23, 1994 (94/9/EC), certifies that this equipment or protective system has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of equipment and protective systems intended for use in potentially explosive atmospheres given in Annex II to the Directive.

The examination and test results are recorded in the confidential report N° 02 YEX 187216.

- (9) Compliance with the Essential Health and Safety Requirements has been assured by compliance with:

EN 50 014: 1997

EN 50 018: 2000

EN 50 019: 2000

- (10) If the sign "X" is placed after the certificate number, it indicates that the equipment or protective system is subject to special conditions for safe use specified in the schedule to this certificate.
(11) This EC-type examination certificate relates only to the design, examination and tests of the specified equipment in accordance to the Directive 94/9/EC. Further requirements of the Directive apply to the manufacturing process and supply of this equipment. These are not covered by this certificate.
(12) The marking of the equipment or protective system must include the following:

 **II 2 G EEx de IIC T3**

TÜV NORD CERT GmbH & Co. KG
TÜV CERT-Certification Body
Am TÜV 1
D-30519 Hannover
Tel.: 0511 986-1470
Fax: 0511 986-2555

Hanover, 2002-10-07



TÜV NORD CERT


Head of the
Certification Body



(13)

SCHEDULE

(14) **EC-TYPE EXAMINATION CERTIFICATE N° TÜV 02 ATEX 1893**

(15) Description of equipment

The permanent-field, electronically commutated synchronous motor type 1FS6 115-... of the type of protection flameproof enclosure consists of a cast-iron enclosure by an end shield (drive end) and an end cover (non-drive end). Together with the end shield, the shaft, provided with roller bearings, forms a flameproof joint.

The synchronous motor is cooled through the surface. Two terminal boxes of the type of protection increased safety are used for electrical connection. Electrical connection between the terminal boxes and the motor compartment is made by bushings for which a component certificate has been issued. The synchronous motor is operated at the converter. Compliance with the temperature class is ensured by three PTC resistors installed in the winding and a suitable cut-off device.

The following values are the technical rated quantities of the synchronous motor:

Range of the permissible ambient temperature	-20 to 40 °C		
Duty acc. EN 60034	S1		
Rated voltage up to [V]	3 × 425 V AC		
Core length [mm]	175		
Rated power [kW]	6.6	8.0	9.7
Rated speed [1/min]	1500	2000	3000
Rated torque [Nm]	42	38	31
Rated current [A]	14.5	17.6	22.5
Nominal cut temperature of the temperature sensors	130 to 150 °C		

(16) Test documents are listed in the test report No.: 02 YEX 187216.

(17) Special conditions for safe use

None;

the following must be taken in account for installation and operation:

- To guarantee compliance with the temperature class, the synchronous motor must be operated with a cut-off device whose function has been tested by a notified body.
- The terminal boxes must be provided with cable entries and filler plugs which have at least been certified according to EN 50014:1992 and EN 50019:1994.
- The manufacturer informs the user about the thermal stability of the connecting cable, cable entries and filler plugs if the user wants to use owns.

(18) Essential Health and Safety Requirements

No additional ones



(1) **EG-Baumusterprüfbescheinigung**

(2) Geräte und Schutzsysteme zur bestimmungsgemäßen Verwendung in explosionsgefährdeten Bereichen - **Richtlinie 94/9/EG**

(3) EG Baumusterprüfbescheinigungsnummer



TÜV 02 ATEX 1894

(4) Gerät: Synchronmotor Typ 1FS6 134-...

(5) Hersteller: Siemens AG A&D MC EWN

(6) Anschrift: D-97616 Bad Neustadt, Industriestr. 1

(7) Die Bauart dieses Gerätes sowie die verschiedenen zulässigen Ausführungen sind in der Anlage zu dieser Baumusterprüfbescheinigung festgelegt.

(8) Die TÜV NORD CERT GmbH & Co. KG, TÜV CERT-Zertifizierungsstelle, bescheinigt als benannte Stelle Nr. 0032 nach Artikel 9 der Richtlinie des Rates der Europäischen Gemeinschaften vom 23. März 1994 (94/9/EG) die Erfüllung der grundlegenden Sicherheits- und Gesundheitsanforderungen für die Konzeption und den Bau von Geräten und Schutzsystemen zur bestimmungsgemäßen Verwendung in explosionsgefährdeten Bereichen gemäß Anhang II der Richtlinie.

Die Ergebnisse der Prüfung sind in dem vertraulichen Prüfbericht Nr. 02 YEX 187216 festgelegt.

(9) Die grundlegenden Sicherheits- und Gesundheitsanforderungen werden erfüllt durch Übereinstimmung mit

EN 50014:1997

EN 50018:2000

EN 50019:2000

(10) Falls das Zeichen "X" hinter der Bescheinigungsnummer steht, wird auf besondere Bedingungen für die sichere Anwendung des Gerätes in der Anlage zu dieser Bescheinigung hingewiesen.

(11) Diese EG-Baumusterprüfbescheinigung bezieht sich nur auf Konzeption und Prüfung des festgelegten Gerätes gemäß Richtlinie 94/9/EG. Weitere Anforderungen dieser Richtlinie gelten für die Herstellung und das Inverkehrbringen dieses Gerätes. Diese Anforderungen werden nicht durch diese Bescheinigung abgedeckt.

(12) Die Kennzeichnung des Gerätes muss die folgenden Angaben enthalten:

 **II 2 G EEx de IIC T3**

TÜV NORD CERT GmbH & Co. KG
TÜV CERT-Zertifizierungsstelle
Am TÜV 1
D-30519 Hannover
Tel.: 0511 986-1470
Fax: 0511 986-2555

Hannover, 07.10.2002



Der Leiter



TÜV NORD CERT

(13)

ANLAGE

(14) **EG-Baumusterprüfbescheinigung Nr. TÜV 02 ATEX 1894**

(15) Beschreibung des Gerätes

Der permanenterregete elektronisch kommutierte Synchronmotor Typ 1FS6 134-... in der Zündschutzart Druckfeste Kapselung besteht aus einem Gußgehäuse, welches durch ein Lagerschild (A-Seite) und einem Abschlußdeckel (B-Seite) abgeschlossen wird. Die Welle, ausgerüstet mit Wälzlagern, bildet mit dem Lagerschild einen zünddurchschlagsicheren Spalt. Der Synchronmotor wird über die Oberfläche gekühlt. Der elektrische Anschluss erfolgt über zwei Anschlusskästen in der Zündschutzart Erhöhte Sicherheit. Die elektrische Verbindung zwischen den Anschlusskästen und dem Motorraum wird mittels teilbescheinigter Durchführungen hergestellt. Der Synchronmotor wird am Umrichter betrieben. Die Einhaltung der Temperaturklasse erfolgt über drei in die Wicklung eingebaute Kaltleiter und einem passenden Abschaltgerät.

Die folgenden Werte sind die technischen Bemessungsgrößen des Synchronmotors:

Bereich der zulässigen Umgebungstemperatur	-20 bis 40 °C		
Betriebsart nach EN 60034	S1		
Eisenbreite [mm]	225		
Bemessungsspannung [V]	3 × 425 V AC		
Bemessungsleistung [kW]	11,8	13,6	9,5
Bemessungsdrehzahl [1/min]	1500	2000	3000
Bemessungsdrehmoment [Nm]	75	65	30,2
Bemessungsstrom [A]	24	27	20
Nennabschalttemperatur der Temperatursensoren	130 bis 150 °C		

(16) Prüfungsunterlagen sind im Prüfbericht Nr. 02 YEX 187216 aufgelistet.

(17) Besondere Bedingung

keine;

die folgenden Hinweise sind bei der Installation zu beachten:

- Zur Einhaltung der Temperaturklasse muss der Synchronmotor mit einem Abschaltgerät, das von einer benannten Prüfstelle funktionsgeprüft worden ist, betrieben werden.
- Die Anschlusskästen sind mit Leitungseinführungen und Blindstopfen auszustatten, die mindestens nach EN 50 014:1992 und EN 50019:1994 bescheinigt worden sind.
- Der Hersteller teilt dem Betreiber die notwendige Temperaturbeständigkeit der Anschlussleitungen, der Leitungseinführungen und der Blindstopfen mit, wenn der Betreiber Eigene einsetzen will.

(18) Grundlegende Sicherheits- und Gesundheitsanforderungen
keine zusätzlichen



Translation

EC TYPE-EXAMINATION CERTIFICATE

- (1)
- (2) Equipment or protective system intended for use in potentially explosive atmospheres - **Directive 94/9/EC**
- (3) EC-Type Examination Certificate Number



TÜV 02 ATEX 1894

- (4) Equipment: Synchronous motor Type 1FS6 134-...
- (5) Manufacturer: Siemens AG A&C MC EWN
- (6) Address: D-97616 Bad Neustadt, Industriestr. 1
- (7) This equipment or protective system and any acceptable variation thereto is specified in the schedule to this certificate and the documents therein referred to.
- (8) The TÜV NORD CERT GmbH & Co. KG, TÜV CERT-Certification Body, notified body number N° 0032 in accordance with Article 9 of the Council Directive of the EC of March 23, 1994 (94/9/EC), certifies that this equipment or protective system has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of equipment and protective systems intended for use in potentially explosive atmospheres given in Annex II to the Directive.

The examination and test results are recorded in the confidential report N° 02 YEX 187216.

- (9) Compliance with the Essential Health and Safety Requirements has been assured by compliance with:

EN 50 014: 1997

EN 50 018: 2000

EN 50 019: 2000

- (10) If the sign "X" is placed after the certificate number, it indicates that the equipment or protective system is subject to special conditions for safe use specified in the schedule to this certificate.
- (11) This EC-type examination certificate relates only to the design, examination and tests of the specified equipment in accordance to the Directive 94/9/EC. Further requirements of the Directive apply to the manufacturing process and supply of this equipment. These are not covered by this certificate.
- (12) The marking of the equipment or protective system must include the following:

 **II 2 G EEx de IIC T3**

TÜV NORD CERT GmbH & Co. KG
TÜV CERT-Certification Body
Am TÜV 1
D-30519 Hannover
Tel.: 0511 986-1470
Fax: 0511 986-2555

Hanover, 2002-10-07


Head of the
Certification Body



TÜV NORD CERT



(13)

SCHEDULE

(14) **EC-TYPE EXAMINATION CERTIFICATE N° TÜV 02 ATEX 1894**

(15) Description of equipment

The permanent-field, electronically commutated synchronous motor type 1FS6 134-... of the type of protection flameproof enclosure consists of a cast-iron enclosure by an end shield (drive end) and an end cover (non-drive end). Together with the end shield, the shaft, provided with roller bearings, forms a flameproof joint.

The synchronous motor is cooled through the surface. Two terminal boxes of the type of protection increased safety are used for electrical connection. Electrical connection between the terminal boxes and the motor compartment is made by bushings for which a component certificate has been issued. The synchronous motor is operated at the converter. Compliance with the temperature class is ensured by three PTC resistors installed in the winding and a suitable cut-off device.

The following values are the technical rated quantities of the synchronous motor:

Range of the permissible ambient temperature	-20 to 40 °C		
Duty acc. EN 60034	S1		
Core length [mm]	175		
Rated voltage up to [V]	3 × 425 V AC		
Rated power [kW]	11.8	13.6	9.5
Rated speed [1/min]	1500	2000	3000
Rated torque [Nm]	75	65	30.2
Rated current [A]	24	27	20
Nominal cut temperature of the temperature sensors	130 to 150 °C		

(16) Test documents are listed in the test report No.: 02 YEX 187216.

(17) Special conditions for safe use

None;

the following must be taken in account for installation and operation:

- To guarantee compliance with the temperature class, the synchronous motor must be operated with a cut-off device whose function has been tested by a notified body.
- The terminal boxes must be provided with cable entries and filler plugs which have at least been certified according to EN 50014:1992 and EN 50019:1994.
- The manufacturer informs the user about the thermal stability of the connecting cable, cable entries and filler plugs if the user wants to use owns.

(18) Essential Health and Safety Requirements

No additional ones

To
SIEMENS AG
A&D MC BMS
Postfach 3180
D-91050 Erlangen

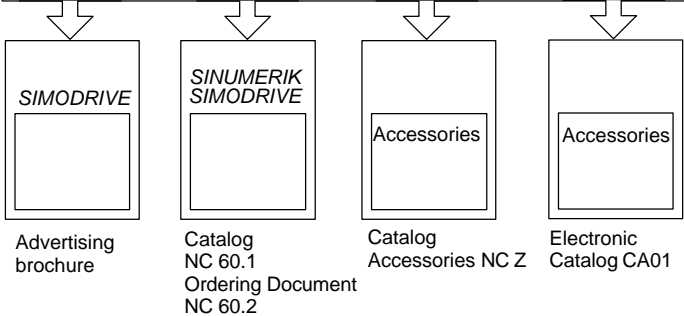
Tel.: +49 (0)180 / 5050 – 222 [Service Support]
Fax: +49 (0)9131 / 98 – 2176 [Documentation]
email: motioncontrol.docu@erlf.siemens.de

From Name _____ Company address/Dept. Street _____ Postal code: City: _____ Telephone: / _____ Telefax: / _____	Recommendations
	Corrections For documentation: AC Servomotors 1FS6, Explosion-Protected Manufacturer/Service Documentation
	Planning Guide Order No.: 6SN1197-0AD08-0BP0 Edition: 07.2003
	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.

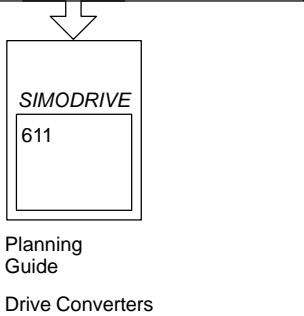
Recommendations and/or corrections

Documentation overview SIMODRIVE

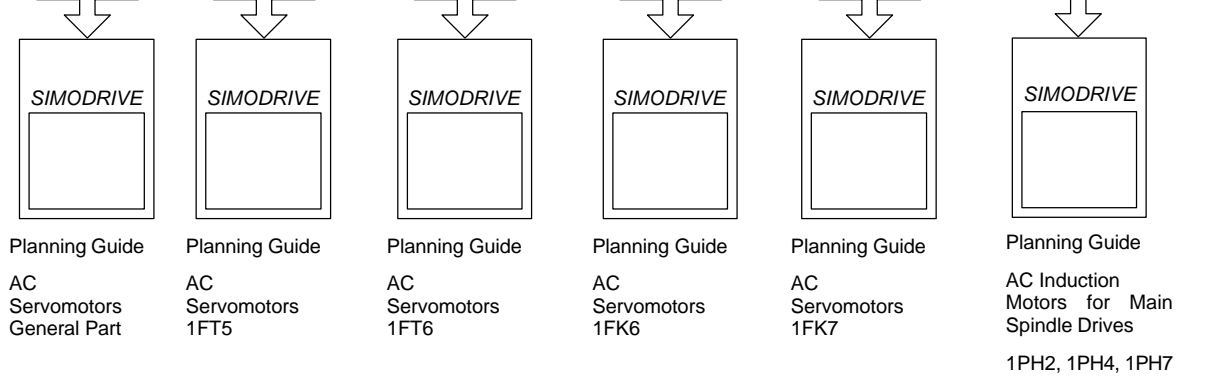
General Documentation



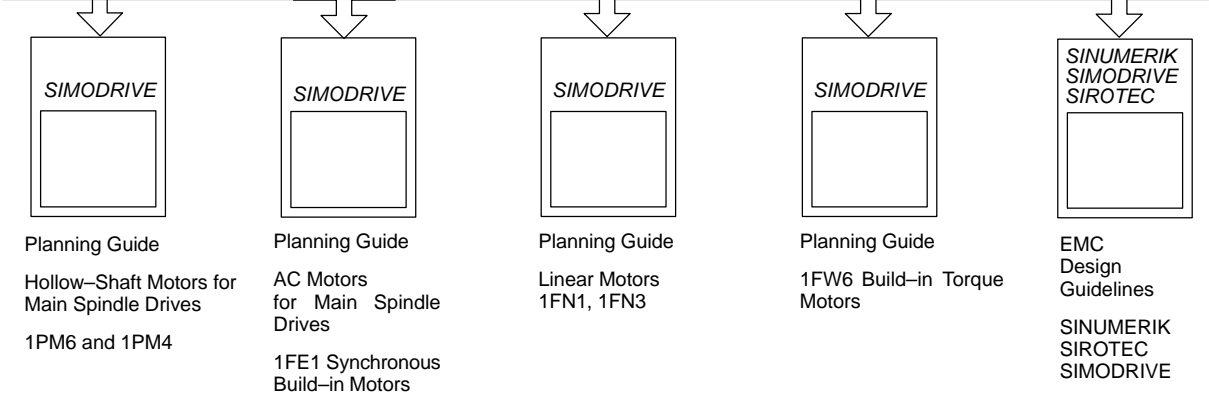
Manufacturer/Service Documentation



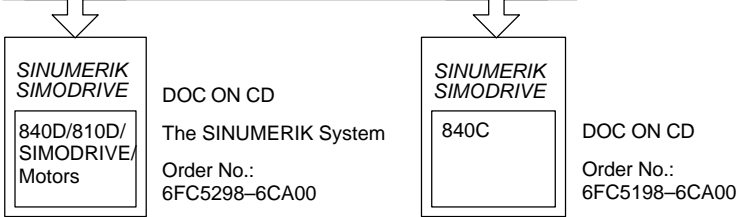
Manufacturer/Service Documentation



Manufacturer/Service Documentation



Electronic Documentation



Siemens AG

Automatisierungs- und Antriebstechnik

Motion Control Systems

Postfach 3180, D – 91050 Erlangen

Bundesrepublik Deutschland

www.ad.siemens.de

© Siemens AG 2003
Subject to change without prior notice
Order No.: 6SN1197-0AD08-0BP0

Printed in the Federal Republic of Germany