SIEMENS

Configuration Manual

SIMOTICS

Synchronous motors
SIMOTICS S-1FK7 Generation 2

For SINAMICS S120

Edition 02/2018

www.siemens.com

SIEMENS

SIMOTICS

Drive technology
1FK7 G2 synchronous motors

Configuration Manual

Edition 02/2018

6SN1197-0AD16-0BP5

Legal information

Warning notice system

This manual contains notices you have to observe in order to ensure your personal safety, as well as to prevent damage to property. The notices referring to your personal safety are highlighted in the manual by a safety alert symbol, notices referring only to property damage have no safety alert symbol. These notices shown below are graded according to the degree of danger.

⚠DANGER

indicates that death or severe personal injury **will** result if proper precautions are not taken.

⚠WARNING

indicates that death or severe personal injury **may** result if proper precautions are not taken.

⚠CAUTION

indicates that minor personal injury can result if proper precautions are not taken.

NOTICE

indicates that property damage can result if proper precautions are not taken.

If more than one degree of danger is present, the warning notice representing the highest degree of danger will be used. A notice warning of injury to persons with a safety alert symbol may also include a warning relating to property damage.

Qualified Personnel

The product/system described in this documentation may be operated only by **personnel qualified** for the specific task in accordance with the relevant documentation, in particular its warning notices and safety instructions. Qualified personnel are those who, based on their training and experience, are capable of identifying risks and avoiding potential hazards when working with these products/systems.

Proper use of Siemens products

Note the following:

⚠WARNING

Siemens products may only be used for the applications described in the catalog and in the relevant technical documentation. If products and components from other manufacturers are used, these must be recommended or approved by Siemens. Proper transport, storage, installation, assembly, commissioning, operation and maintenance are required to ensure that the products operate safely and without any problems. The permissible ambient conditions must be complied with. The information in the relevant documentation must be observed.

Trademarks

All names identified by ® are registered trademarks of Siemens AG. The remaining trademarks in this publication may be trademarks whose use by third parties for their own purposes could violate the rights of the owner.

Disclaimer of Liability

We have reviewed the contents of this publication to ensure consistency with the hardware and software described. Since variance cannot be precluded entirely, we cannot guarantee full consistency. However, the information in this publication is reviewed regularly and any necessary corrections are included in subsequent editions.

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Introduction

Additional documents

For configuring, you require Catalog D 21.4 (https://support.industry.siemens.com/cs/document/109747019/) as print version or online.

Target group

This documentation addresses project planners and project engineers as well as machine manufacturers and commissioning engineers.

Benefits

The Configuration Manual enables the target group to apply the rules and guidelines to be observed when configuring products and systems.

The Configuration Manual supports you with selecting motors, calculating the drive components, and selecting the required accessories. The Configuration Manual helps the target group to create a system or plant configuration.

Utilization phase

Planning and configuration phase

More information

Information on the following topics is available at:

- Ordering documentation / overview of documentation
- Additional links to download documents
- Using documentation online (find and search in manuals / information)

More information (https://support.industry.siemens.com/cs/de/en/view/108998034)

If you have any questions regarding the technical documentation (e.g. suggestions, corrections), please send an e-mail to the following address E-mail (mailto:docu.motioncontrol@siemens.com).

My support

The following link provides information on how to create your own individual documentation based on Siemens content, and adapt it for your own machine documentation:

My support (https://support.industry.siemens.com/My/de/en/documentation)

Note

If you want to use this function, you must first register.

Later, you can log on with your login data.

Training

The following link provides information on SITRAIN - training from Siemens for products, systems and automation engineering solutions:

SITRAIN (http://siemens.com/sitrain)

Technical Support

Country-specific telephone numbers for technical support are provided on the Internet under Contact:

Technical Support (https://support.industry.siemens.com)

Internet address for products

Products (http://www.siemens.com/motioncontrol)

Websites of third parties

This publication contains hyperlinks to websites of third parties. Siemens does not take any responsibility for the contents of these websites or adopt any of these websites or their contents as their own, because Siemens does not control the information on these websites and is also not responsible for the contents and information provided there. Use of these websites is at the risk of the person doing so.

Information regarding third-party products

Note

Recommendation relating to third-party products

This document contains recommendations relating to third-party products. Siemens accepts the fundamental suitability of these third-party products.

You can use equivalent products from other manufacturers.

Siemens does not accept any warranty for the properties of third-party products.

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Fundamental safety instructions for the SIMOTICS documentation

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1.1 Fundamental safety instructions

1.1.1 General safety instructions

⚠WARNING

Electric shock and danger to life due to other energy sources

Touching live components can result in death or severe injury.

- Only work on electrical devices when you are qualified for this job.
- Always observe the country-specific safety rules.

Generally, the following six steps apply when establishing safety:

1. Prepare for disconnection. Notify all those who will be affected by the procedure.
2. Isolate the drive system from the power supply and take measures to prevent it being switched back on again.
3. Wait until the discharge time specified on the warning labels has elapsed.
4. Check that there is no voltage between any of the power connections, and between any of the power connections and the protective conductor connection.
5. Check whether the existing auxiliary supply circuits are de-energized.
6. Ensure that the motors cannot move.
7. Identify all other dangerous energy sources, e.g. compressed air, hydraulic systems, or water. Switch the energy sources to a safe state.
8. Check that the correct drive system is completely locked.

After you have completed the work, restore the operational readiness in the inverse sequence.

⚠WARNING

Electric shock due to connection to an unsuitable power supply

When equipment is connected to an unsuitable power supply, exposed components may carry a hazardous voltage that might result in serious injury or death.

- Only use power supplies that provide SELV (Safety Extra Low Voltage) or PELV-(Protective Extra Low Voltage) output voltages for all connections and terminals of the electronics modules.

⚠ WARNING

Electric shock due to damaged motors or devices

Improper handling of motors or devices can damage them.

Hazardous voltages can be present at the enclosure or at exposed components on damaged motors or devices.

- Ensure compliance with the limit values specified in the technical data during transport, storage and operation.
- Do not use any damaged motors or devices.

⚠ WARNING

Electric shock due to unconnected cable shield

Hazardous touch voltages can occur through capacitive cross-coupling due to unconnected cable shields.

- As a minimum, connect cable shields and the conductors of power cables that are not used (e.g. brake cores) at one end at the grounded housing potential.

⚠ WARNING

Electric shock if there is no ground connection

For missing or incorrectly implemented protective conductor connection for devices with protection class I, high voltages can be present at open, exposed parts, which when touched, can result in death or severe injury.

- Ground the device in compliance with the applicable regulations.

⚠ WARNING

Arcing when a plug connection is opened during operation

Opening a plug connection when a system is operation can result in arcing that may cause serious injury or death.

- Only open plug connections when the equipment is in a voltage-free state, unless it has been explicitly stated that they can be opened in operation.

NOTICE

Property damage due to loose power connections

Insufficient tightening torques or vibration can result in loose power connections. This can result in damage due to fire, device defects or malfunctions.

- Tighten all power connections to the prescribed torque.
- Check all power connections at regular intervals, particularly after equipment has been transported.

⚠ WARNING

Unexpected movement of machines caused by radio devices or mobile phones

When radio devices or mobile phones with a transmission power > 1 W are used in the immediate vicinity of components, they may cause the equipment to malfunction. Malfunctions may impair the functional safety of machines and can therefore put people in danger or lead to property damage.

- If you come closer than around 2 m to such components, switch off any radios or mobile phones.
- Use the "SIEMENS Industry Online Support app" only on equipment that has already been switched off.

⚠ WARNING

Unrecognized dangers due to missing or illegible warning labels

Dangers might not be recognized if warning labels are missing or illegible. Unrecognized dangers may cause accidents resulting in serious injury or death.

- Check that the warning labels are complete based on the documentation.
- Attach any missing warning labels to the components, where necessary in the national language.
- Replace illegible warning labels.

WARNING

Unexpected movement of machines caused by inactive safety functions

Inactive or non-adapted safety functions can trigger unexpected machine movements that may result in serious injury or death.

- Observe the information in the appropriate product documentation before commissioning.
- Carry out a safety inspection for functions relevant to safety on the entire system, including all safety-related components.
- Ensure that the safety functions used in your drives and automation tasks are adjusted and activated through appropriate parameterizing.
- Perform a function test.
- Only put your plant into live operation once you have guaranteed that the functions relevant to safety are running correctly.

Note

Important safety notices for Safety Integrated functions

If you want to use Safety Integrated functions, you must observe the safety notices in the Safety Integrated manuals.

WARNING

Active implant malfunctions due to electromagnetic fields

Electromagnetic fields (EMF) are generated by the operation of electrical power equipment, such as transformers, converters, or motors. People with pacemakers or implants are at particular risk in the immediate vicinity of this equipment.

- If you have a heart pacemaker or implant, maintain the minimum distance specified in chapter "Correct usage" from such motors.

WARNING

Active implant malfunctions due to permanent-magnet fields

Even when switched off, electric motors with permanent magnets represent a potential risk for persons with heart pacemakers or implants if they are close to converters/motors.

- If you have a heart pacemaker or implant, maintain the minimum distance specified in chapter "Correct usage".
- When transporting or storing permanent-magnet motors always use the original packing materials with the warning labels attached.
- Clearly mark the storage locations with the appropriate warning labels.
- IATA regulations must be observed when transported by air.

⚠ WARNING

Injury caused by moving or ejected parts

Contact with moving motor parts or drive output elements and the ejection of loose motor parts (e.g. feather keys) out of the motor enclosure can result in severe injury or death.

- Remove any loose parts or secure them so that they cannot be flung out.
- Do not touch any moving parts.
- Safeguard all moving parts using the appropriate safety guards.

⚠ WARNING

Fire due to inadequate cooling

Inadequate cooling can cause the motor to overheat, resulting in death or severe injury as a result of smoke and fire. This can also result in increased failures and reduced service lives of motors.

- Comply with the specified cooling requirements for the motor.

⚠ WARNING

Fire due to incorrect operation of the motor

When incorrectly operated and in the case of a fault, the motor can overheat resulting in fire and smoke. This can result in severe injury or death. Further, excessively high temperatures destroy motor components and result in increased failures as well as shorter service lives of motors.

- Operate the motor according to the relevant specifications.
- Only operate the motors in conjunction with effective temperature monitoring.
- Immediately switch off the motor if excessively high temperatures occur.

⚠ CAUTION

Burn injuries caused by hot surfaces

In operation, the motor can reach high temperatures, which can cause burns if touched.

- Mount the motor so that it is not accessible in operation.

Measures when maintenance is required:

- Allow the motor to cool down before starting any work.
- Use the appropriate personnel protection equipment, e.g. gloves.

1.1.2 Equipment damage due to electric fields or electrostatic discharge

Electrostatic sensitive devices (ESD) are individual components, integrated circuits, modules or devices that may be damaged by either electric fields or electrostatic discharge.

NOTICE

Equipment damage due to electric fields or electrostatic discharge

Electric fields or electrostatic discharge can cause malfunctions through damaged individual components, integrated circuits, modules or devices.

- Only pack, store, transport and send electronic components, modules or devices in their original packaging or in other suitable materials, e.g conductive foam rubber of aluminum foil.
- Only touch components, modules and devices when you are grounded by one of the following methods:
  - Wearing an ESD wrist strap
  - Wearing ESD shoes or ESD grounding straps in ESD areas with conductive flooring
- Only place electronic components, modules or devices on conductive surfaces (table with ESD surface, conductive ESD foam, ESD packaging, ESD transport container).

1.1.3 Industrial security

Note

Industrial security

Siemens provides products and solutions with industrial security functions that support the secure operation of plants, systems, machines and networks.

In order to protect plants, systems, machines and networks against cyber threats, it is necessary to implement – and continuously maintain – a holistic, state-of-the-art industrial security concept. Siemens' products and solutions constitute one element of such a concept.

Customers are responsible for preventing unauthorized access to their plants, systems, machines and networks. Such systems, machines and components should only be connected to an enterprise network or the Internet if and to the extent such a connection is necessary and only when appropriate security measures (e.g. firewalls and/or network segmentation) are in place.

For additional information on industrial security measures that may be implemented, please visit:

Industrial security (http://www.siemens.com/industrialsecurity)

Siemens' products and solutions undergo continuous development to make them more secure. Siemens strongly recommends that product updates are applied as soon as they are available and that the latest product versions are used. Use of product versions that are no longer supported, and failure to apply the latest updates may increase customer's exposure to cyber threats.

To stay informed about product updates, subscribe to the Siemens Industrial Security RSS Feed at:

Industrial security (http://www.siemens.com/industrialsecurity)

Further information is provided on the Internet:

Industrial Security Configuration Manual
(https://support.industry.siemens.com/cs/ww/en/view/108862708)

⚠ WARNING

Unsafe operating states resulting from software manipulation

Software manipulations (e.g. viruses, trojans, malware or worms) can cause unsafe operating states in your system that may lead to death, serious injury, and property damage.

- Keep the software up to date.
- Incorporate the automation and drive components into a holistic, state-of-the-art industrial security concept for the installation or machine.
- Make sure that you include all installed products into the holistic industrial security concept.
- Protect files stored on exchangeable storage media from malicious software by with suitable protection measures, e.g. virus scanners.
- Protect the drive against unauthorized changes by activating the "know-how protection" drive function.

1.1.4 Residual risks of power drive systems

When assessing the machine- or system-related risk in accordance with the respective local regulations (e.g., EC Machinery Directive), the machine manufacturer or system installer must take into account the following residual risks emanating from the control and drive components of a drive system:

1. Unintentional movements of driven machine or system components during commissioning, operation, maintenance, and repairs caused by, for example,
   - Hardware and/or software errors in the sensors, control system, actuators, and cables and connections
   - Response times of the control system and of the drive
   - Operation and/or environmental conditions outside the specification
   - Condensation/conductive contamination
   - Parameterization, programming, cabling, and installation errors
   - Use of wireless devices/mobile phones in the immediate vicinity of electronic components
   - External influences/damage
   - X-ray, ionizing radiation and cosmic radiation
2. Unusually high temperatures, including open flames, as well as emissions of light, noise, particles, gases, etc., can occur inside and outside the components under fault conditions caused by, for example:
   - Component failure
   - Software errors
   - Operation and/or environmental conditions outside the specification
   - External influences/damage
3. Hazardous shock voltages caused by, for example:
   - Component failure
   - Influence during electrostatic charging
   - Induction of voltages in moving motors
   - Operation and/or environmental conditions outside the specification
   - Condensation/conductive contamination
   - External influences/damage
4. Electrical, magnetic and electromagnetic fields generated in operation that can pose a risk to people with a pacemaker, implants or metal replacement joints, etc., if they are too close
5. Release of environmental pollutants or emissions as a result of improper operation of the system and/or failure to dispose of components safely and correctly
6. Influence of network-connected communication systems, e.g. ripple-control transmitters or data communication via the network

For more information about the residual risks of the drive system components, see the relevant sections in the technical user documentation.

Description of the motors

2

2.1 Highlights and benefits

Overview

1FK7 motors are compact permanent-magnet synchronous motors. The available options, gear units and encoders, together with the expanded product range, mean that the 1FK7 motors can be optimally adapted to any application. They therefore also satisfy the permanently increasing demands of state-of-the-art machine generations.

1FK7 motors can be combined with the SINAMICS S110 / S120 drive system to create a powerful system with high functionality. The integrated encoder systems for speed and position control can be selected depending on the application.

The motors are designed for operation without external cooling and the heat is dissipated through the motor surface. 1FK7 motors have a high overload capability.

Figure 2-1 1FK7 with DRIVE-CLiQ

Advantages

1FK7 Compact: Compact motor for applications requiring precision and a high dynamic performance

- Space-saving installation thanks to extremely high power/weight ratio
- Can be universally used for many applications
- Wide range of motors

1FK7 High Dynamic: Low intrinsic moment of inertia for applications demanding a high dynamic performance

- very high acceleration values

1FK7 High Inertia: High intrinsic moment of inertia for applications demanding high precision with high or variable external moments of inertia

- Rugged closed-loop control properties for high or variable load moments of inertia
- Low optimization and commissioning overhead to compensate disturbances

2.2 Motors used for the intended purpose

⚠ WARNING

Motors not used for the intended purpose

If you do not use the motors correctly, there is a risk of death, severe injury and/or material damage.

- Only use the motors for their intended purpose.
- Make sure that the conditions at the location of use comply with all the rating plate data.
- Make sure that the conditions at the location of use comply with the conditions specified in this documentation. When necessary, take into account deviations regarding approvals or country-specific regulations.

⚠ WARNING

Malfunctions of active active implants due to magnetic and electrical fields

Electric motors endanger people with active implants, for example heart pacemakers, who come close to the motors.

- If you are an affected person, maintain a minimum distance of 300 mm from the motors.

If you wish to use special versions and design variants whose specifications vary from the motors described in this document, then contact your local Siemens office.

If you have any questions regarding the intended usage, please contact your local Siemens office.

The 1FK7 motor is intended for industrial or commercial plants.

The motor is designed for operation in sheltered areas under normal climatic conditions, such as those found on shop floors.

More detailed information is provided in Chapter "Environmental conditions (Page 26)".

The 1FK7 motor is certified only for operation through a converter.

Any other use of the motor is considered to be incorrect use.

Compliance with all specifications in the Configuration Manual is part of correct usage.

Observe the details on the rating plate.

Typical applications

The 1FK7 synchronous motors have the following typical application areas:

- Machine tools (e.g. auxiliary axes, feed drives)
- Robots and handling systems
- Packaging, plastics and textile machines
- Wood, glass, ceramics and stone working machines

2.3 Technical features and ambient conditions

2.3.1 Directives and standards

Standards that are complied with

The motors of the series SIMOTICS S, SIMOTICS M, SIMOTICS L, SIMOTICS T, SIMOTICS A, called "SIMOTICS motor series" below, fulfill the requirements of the following directives and standards:

- EN 60034-1 - Rotating electrical machines – Dimensioning and operating behavior
- EN 60204-1 - Safety of machinery – Electrical equipment of machines; general requirements

Where applicable, the SIMOTICS motor series are in conformance with the following parts of IEC / EN 60034:

Feature	Standard
Degree of protection	IEC / EN 60034-5
Cooling [1)]	IEC / EN 60034-6
Type of construction	IEC / EN 60034-7
Connection designations	IEC / EN 60034-8
Noise levels [1)]	IEC / EN 60034-9
Temperature monitoring	IEC / EN 60034-11
Vibration severity levels [1)]	IEC / EN 60034-14

[1)] Standard component, e.g. cannot be applied to built-in motors

Relevant directives

The following directives are relevant for SIMOTICS motors.

European Low-Voltage Directive

CE

SIMOTICS motors comply with the Low-Voltage Directive 2014/35/EU.

European Machinery Directive

SIMOTICS motors do not fall within the area of validity covered by the Machinery Directive.

However, the use of the products in a typical machine application has been fully assessed for compliance with the main regulations in this directive concerning health and safety.

European EMC Directive

SIMOTICS motors do not fall within the area of validity covered by the EMC Directive. The products are not considered as devices in the sense of the directive. Installed and operated with a converter, the motor - together with the Power Drive System - must comply with the requirements laid down in the applicable EMC Directive.

Eurasian conformity

SIMOTICS motors comply with the requirements of the customs union Russia/Belarus/Kazakhstan (EAC).

China Compulsory Certification

SIMOTICS motors do not fall within the area of validity covered by the China Compulsory Certification (CCC).

CCC negative certification:

CCC product certification (https://support.industry.siemens.com/cs/products?search=CCC&dtp=Certificate&o=DefaultRankingDesc&pnid=13347&lc=de-WW // XmlEditor.InternalXmlClipboard:65c36f4c-2e8c-d8c9-ae3f-9d6074d36b88)

Underwriters Laboratories

SIMOTICS motors are generally in compliance with UL and cUL as components of motor applications, and are appropriately listed.

Specifically developed motors and functions are the exceptions in this case. Here, it is important that you carefully observe the contents of the quotation and that there is a cUL mark on the rating plate!

Quality systems

Siemens AG employs a quality management system that meets the requirements of ISO 9001 and ISO 14001.

Certificates for SIMOTICS motors can be downloaded from the Internet at the following link:

Certificates for SIMOTICS motors (https://support.industry.siemens.com/cs/products?dtp=Certificate&pnid=13347&lc=de-WW // XmlEditor.InternalXmlClipboard:8c9b08a9-3f1f-5513-8cf9-8dce082595ac)

European RoHS Directive

The SIMOTICS motor series complies with the Directive 2011/65/EU regarding limiting the use of certain hazardous substances.

2.3.2 Technical features

Table 2- 1 Technical features

Type of motor	Permanent-magnet synchronous motor
Magnet material	Rare-earth magnetic material
Cooling	Natural cooling, forced ventilation
Insulation of the stator winding according to EN 60034-1 (IEC 60034-1)	Temperature class 155 °C (F) for a winding temperature of ΔT = 100 K at an ambient temperature of +40 °C
Impulse voltage insulation class according to EN 60034-18-41 (IEC 60034-18-41)	IVIC: C
Operating range	-15° to +40° C, derating at higher temperatures
Installation altitude (according to EN 60034–1 and IEC 60034–1)	≤ 1000 m above sea level, otherwise power derating
Type of construction according to EN 60034-7 (IEC 60034-7)	IM B5 (IM V1, IM V3)
Degree of protection according to EN 60034-5 (IEC 60034-5)	IP64; optional IP65 or IP65 + IP67 at the shaft gland Motors with forced ventilation IP54
Temperature monitoring	Temperature sensor in the stator winding
Paint finish	Anthracite (RAL 7016)
Shaft extension according to DIN 748-3 (IEC 60072-1)	Plain shaft, optional shaft with fitted key and keyway (half-key balancing)
Radial eccentricity, concentricity, and axial eccentricity according to DIN 42955 (IEC 60072–1) [1)]	Tolerance N (normal)
Vibration severity grade according to EN 60034-14 (IEC 60034-14)	Grade A is maintained up to rated speed
Sound pressure level L_{pA} (1 m) according to DIN EN ISO 1680, max. tolerance + 3 dB(A)	Natural cooling: • 1FK703□ to 1FK704□: 55 dB(A) • 1FK706□: 65 dB(A) • 1FK708□ to 1FK710□: 70 dB(A) Forced ventilation: • 1FK708□: 73 dB(A)
Built-in encoder systems for motors without DRIVE-CLiQ interface	• IC2048S/R incremental encoder, sin/cos 1 Vpp, 2048 S/R [2)] with C and D tracks for SH 36 to SH 100 • AM2048S/R absolute encoder 2048 S/R [2)], 4096 revolutions Multiturn, with EnDat interface for SH 36 to SH 100 • Resolver, multipole (number of pole pairs corresponds to number of pole pairs of the motor) • 2-pole resolver

Integrated encoder systems for motors with DRIVE-CLiQ interface	• AS24DQI absolute encoder singleturn 24-bit, for SH 36 to SH 100 • AM24DQI absolute encoder 24-bit + 12-bit multi-turn, for SH 36 to SH 100 • AS20DQI absolute encoder singleturn 20-bit, for SH 36 to SH 100 • AM20DQI absolute encoder 20-bit + 12-bit multi-turn, for SH 36 to SH 100 • IC22DQ incremental encoder 22-bit for SH 36 to SH 100 • AM16DQ absolute encoder 16-bit + 12-bit multi-turn, for SH 48 to SH 100 • AM20DQ absolute encoder 20-bit + 12-bit multi-turn, for SH 63 to SH 100 • AM22DQI absolute encoder 22-bit + 12-bit multi-turn, for SH 36 to SH 100 • R15DQ resolver 15-bit • R14DQ resolver 14-bit
Connection	Connectors for signals and power, can be rotated Plug connector for an external fan, rotatable
Holding brake	Optional integrated holding brake (free of backlash, 24 V)

1) Radial eccentricity of the shaft extension, concentricity of centering edge, and axial eccentricity of the mounting flange to the axis of the shaft extension.

2) S/R = Signals/Revolution

2.3.3 Torque overview

1FK7 Compact

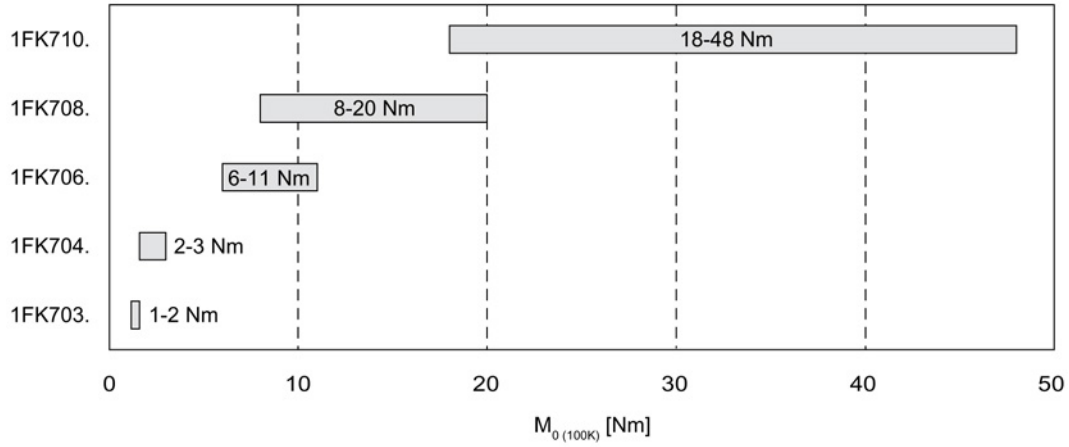


Figure 2-2 Static torques 1FK7 Compact

1FK7 High Dynamic

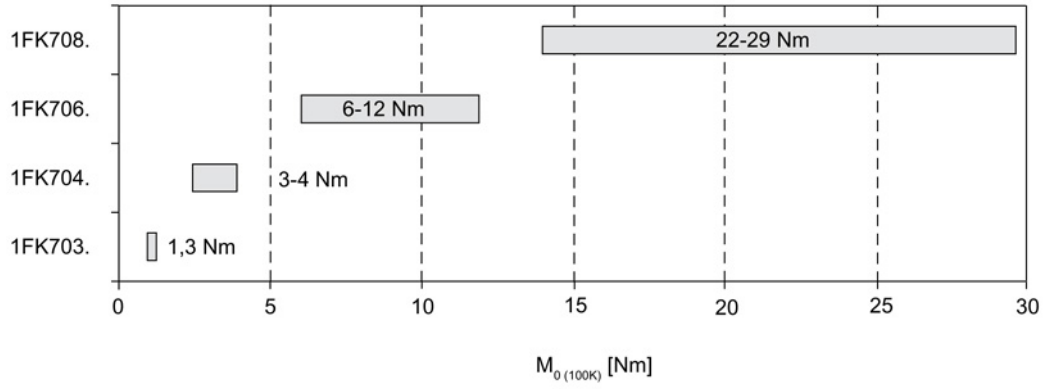


Figure 2-3 Static torques 1FK7 High Dynamic

1FK7 High Inertia

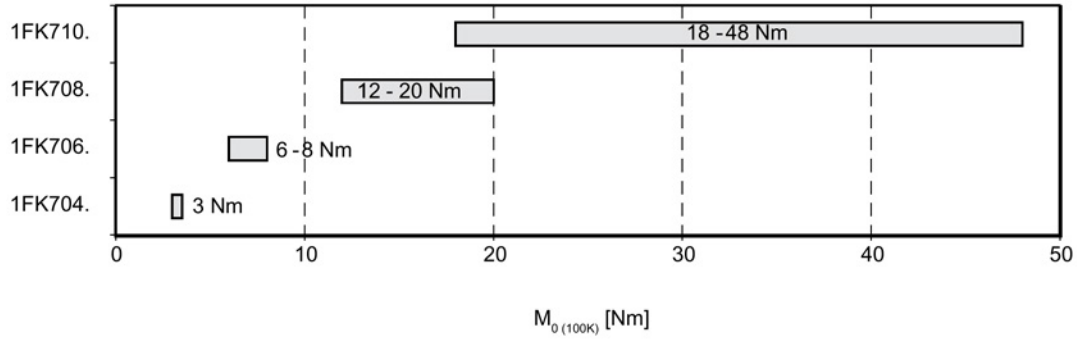


Figure 2-4 Static torques 1FK7 High Inertia

2.3.4 Environmental conditions

You can classify the environmental conditions according to standard DIN EN 60721-3-3 for fixed installation locations that are weather protected. The environmental effects and their limit values are defined in various classes in this standard.

With the exception of environmental influences "Condensation", "Low air temperature" and "Low air pressure", you can assign SIMOTICS S servomotors to climate class 3K4.

The following temperature ranges apply for natural-cooled and forced-ventilation motors.

Table 2- 2 **Environmental conditions are based on climate class 3K4**

Influencing environmental variables		Unit	Value
a)	Low air temperature	°C	- 15
b)	High air temperature	°C	+ 40
c)	Low relative humidity	%	5
d)	High relative humidity	%	95
e)	Low absolute humidity	g/m^3	1
f)	High absolute humidity	g/m^3	29
g)	Rate of temperature change[1)]	°C/min	0.5
h)	Low air pressure[4)]	kPa	89
i)	High air pressure[2)]	kPa	106
j)	Solar radiation	W/m^2	700
k)	Thermal radiation	-	-
l)	Air movement[3)]	m/s	1.0
m)	Condensation	-	Not permissible
n)	Wind-driven precipitation (rain, snow, hail, etc.)	-	-
o)	Water (other than rain)	-	See protection class
p)	Formation of ice	-	-

1) *Averaged over a period of 5 min*

2) *Conditions in mines are not considered.*

3) *A cooling system based on natural convection can be disturbed by unforeseen air movements.*

4) *The limit value of 89 kPa covers applications at altitudes up to 1000 m.*

Note

Installation instructions

SIMOTICS S motors are not suitable for operation

- In salt-laden or aggressive atmospheres
- Outdoors

You find additional data on the environmental conditions, such as ambient temperatures or conditions for transport and storage of the motors, in the relevant chapters of this documentation.

2.4 Derating factors

Under conditions other than those specified above (ambient temperature > 40° C or installation altitude > 1000 m above sea level), the permissible torques/powers are shown in the following table.

Ambient temperatures and installation altitudes are rounded off to 5° C or 500 m respectively.

Table 2- 3 Power de-rating depending on the installation altitude and the ambient temperature

Installation altitude above sea level in m	Ambient temperature in °C					
	30	35	40	45	50	55
1000	1.05	1.02	1.00	0.97	0.95	0.92
1500	1.02	1.00	0.97	0.95	0.92	0.89
2000	1.00	0.97	0.95	0.92	0.89	0.87
2500	0.97	0.95	0.92	0.89	0.87	0.84
3000	0.95	0.92	0.89	0.87	0.84	0.81
3500	0.92	0.89	0.87	0.84	0.81	0.77
4000	0.89	0.87	0.84	0.81	0.77	0.74

Factors x_D refer to static torque M_0.

Determine the reduced torque using the following formula:

$M_{red} = M_N - (M_0 - (M_0 \cdot x_D))$

M_{red} / Nm = reduced torque at rated speed
M_N / Nm = rated torque S1 (100K)
M_0 / Nm = static torque (100K)
x_D = derating factor

You shift the S1 characteristic curve in parallel.

At installation altitudes of 2000 m above sea level or higher, the voltage stress on the motors must be reduced accordingly based on the "Factors for reducing the maximum DC-link voltage" table (reciprocal values from EN 60664-1 Table A. 2).

Table 2- 4 Factors for reducing the maximum DC-link voltage

Installation altitude up to [m] above mean sea level	Factor
2000	1
3000	0.877
4000	0.775
5000	0.656
6000	0.588
7000	0.513
8000	0.444

As the DC-link voltage is reduced, the converter output voltage also decreases. This reduces the operating range in the M-n diagram.

The M-n diagrams are contained in the associated Configuration Manual.

Operation in a vacuum is not permissible because of the low dielectric strength and poor heat dissipation.

2.5 Selection based on the article number

The article number comprises a combination of digits and letters. It is divided into three hyphenated blocks.

You can find possible combinations in Chapter "SIMOTICS Servomotors" in Catalog D 21.4 (https://support.industry.siemens.com/cs/document/109747019/).
Please note that not every theoretical combination is possible.

Description		Position of the article number																		
		1	2	3	4	5	6	7	-	8	9	10	11	12	-	13	14	15	16	-	Z
SIMOTICS M-1FK7 synchronous servomotors		1	F	K	7																
Frame size / shaft height		SH 36				0	3														
		SH 48				0	4														
		SH 63				0	6														
		SH 80				0	8														
		SH 100				1	0														
Overall length								0													
								1													
								2													
								3													
								4													
								5													
								6													
Feature	Compact									2											
	High Inertia									3											
	High Dynamic									4											
Cooling	Natural cooling										A										
											B										
											C										
	Forced ventilation										S										
Rated speeds	(3 AC 380 V ... 480 V)	2,000 rpm										C									
		3,000 rpm										F									
		4,500 rpm										H									
		6,000 rpm										K									
DC-link voltage	270 V ... 330 V												2								
	510 V ... 720 V												7								
Type of construction	IM B5 with a KTY84-130 or Pt1000 temperature sensor (see Chapter "Thermal motor protection" (Page 51))													1							
	IM B5 with Pt1000 temperature sensor													4							
Connector outlet direction	Plug connector sizes 1 and 1.5; connector can be rotated															1					
Encoder	With DRIVE-CLiQ	AS24DQI															B				
		AM24DQI															C				
		IC22DQ															D				

Description				Position of the article number																	
				1	2	3	4	5	6	7	-	8	9	10	11	12	-	13	14	15	16	-	Z
		AM22DQ																	F				
		AM16DQ																	K				
		AM20DQ																	L				
		R14DQ resolver																	P				
		AS20DQI																	Q				
		AM20DQI																	R				
		R15DQ resolver																	U				
	without DRIVE-CLiQ	IC2048S/R																	A				
		AM2048S/R																	E				
		Resolver, multi-pole																	S				
		Resolver, 2-pin																	D				
Shaft extension	Fitted key and keyway		**Shaft and flange accuracy**	Tolerance N										**Holding brake**		None			A			
																With			B			
	Plain shaft															None			G			
																With			H			
Vibration severity grade	Grade A		**Degree of protection**	IP64																0		
				IP65																1		
				IP65 with IP67 DE-flange																2		
Options [1]	**Mounting of SP+ planetary gearbox**																					J□□
	Mounting of planetary gearbox LP+																					V□□
	Version for potentially explosive atmospheres Zone 2																					M03
	Version for potentially explosive atmospheres Zone 22																					M39
	Alternative shaft geometry																					N05
	Version for increased chemical resistance																					N16
	Reinforced brake																					N24
	Metal rating plate instead of adhesive label																					Q31
	Factory certificate																					B02
	Reference mark on the motor shaft																					R06
	Customer data on the rating plate																					Y84
	Connection to equalize pressure																					Q20
	Special paint finish for environmental conditions according to climate Group 3K4																					K23
	Special paint finish for environmental conditions according to climate Group 3K4, primer and additional paint finish																					K23+ X..
	Primed (unpainted)																					K24
	Paint finish [2]			Jet black matt														RAL 9005				X01
				Cream														RAL 9001				X02
				Reseda green														RAL 6011				X03
				Pebble gray														RAL 7032				X04
				Sky blue														RAL 5015				X05
				Light ivory														RAL 1015				X06
				White aluminum														RAL 9006				X08

1) More detailed information is provided in Chapter "SIMOTICS Servomotors" in Catalog D 21.4 (https://support.industry.siemens.com/cs/document/109747019/).

2) You can order the motors with additional special colors. You can find information on this topic in Chapter "Special paint finish (K23 and K24, X..) (Page 80) " and in Chapter "SIMOTICS Servomotors" in Catalog D 21.4 (https://support.industry.siemens.com/cs/document/109747019/).

2.6 Rating plate data

The rating plate contains the technical data applicable to the delivered motor. A second rating plate is provided with the motor, and this should be used for documentation purposes.

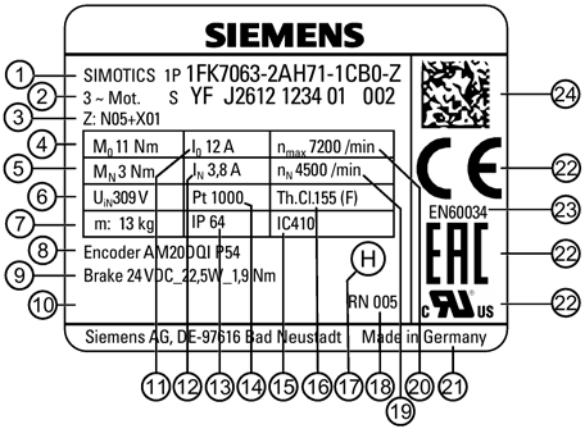


Figure 2-5 1FK7 G2 rating plate content

Table 2- 5 Description of the rating plate data

Position	Description / technical data
1	Motor type: Synchronous motors; motor type / order number
2	ID No., serial number
3	Display of Z option
4	Static torque M_0 / Nm
5	Rated torque M_N / Nm
6	Induced voltage at rated speed U_N / V
7	Motor weight m / kg
8	Code, encoder type
9	Holding brake data: Typical, voltage, power consumption, holding torque
10	Space for customer information
11	Stall current I_0 / A
12	Rated current I_N / A
13	Degree of protection
14	Temperature sensor
15	Cooling method
16	Cooling method according to EN 60034-6:1993
17	Balancing type (only for motors with fitted key)
18	Revision status
19	Rated speed n_N / rpm
20	Maximum speed n_{max} / rpm
21	Production address
22	Certifications
23	Product standard
24	2D code

Mechanical properties

3

3.1 Cooling

3.1.1 Natural cooling

For naturally cooled motors, the power loss is dissipated through thermal conduction, thermal radiation and natural convection.

Some of the thermal losses are dissipated through the mounting surface of the motor. On large motors, heat is dissipated via the base frame (steel plate).

Note the specifications on thermally non-insulated mounting and on thermally insulated mounting.

Note

To ensure adequate heat dissipation, a minimum clearance to adjacent components of 100 mm must be maintained on three sides of the motor.

- Mount the motor so that that is enough clearance around it for the power loss to be thermally radiated.

The motor ratings apply in an ambient temperature of 40° C (104° F). If the ambient temperature exceeds 40° C (104° F), you must adjust the torque and power of the motor accordingly.

Additional information is provided in Chapter Derating factors (Page 27).

- Observe the information provided in the converter operating instructions.

Non-thermally insulated mounting

Observe the following mounting conditions for the specified motor data:

Table 3- 1 Non-thermally insulated mounting conditions

Shaft height	Steel plate, width x height x thickness [mm]	Mounting surface[m^2]
1FK703□ to 1FK704□	120 x 100 x 40	0.012
1FK706□ to 1FK710□	450 x 370 x 30	0.17

For larger mounting surfaces, the heat dissipation conditions improve.

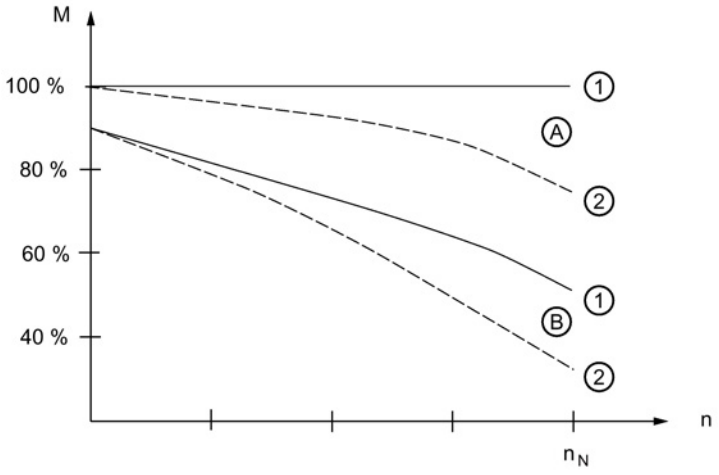
Thermally insulated mounting without additional mounted components

For non-ventilated motors, the motor torque must be reduced by between 5% and 10%. Configure the motor using the $M_{0\ (60\ K)}$ values. As the speed increases, the reduction factor rises, see figure "Effect of the mounting conditions on the S1 characteristic curve".

Thermally insulated mounting with additional mounted components

- Holding brake (integrated in the motor):
  No additional torque reduction required
- Gearboxes:
  The torque must be reduced. See figure "Effect of the mounting conditions on the S1 characteristic curve"

Effect of thermally insulated/non-insulated mounting without and with gearbox



A Characteristics for non-thermally insulated mounting
  1 Characteristic without mounted gearbox
  2 Characteristic with mounted gearbox
B Characteristics for thermally insulated mounting
  1 Characteristic without mounted gearbox
  2 Characteristic with mounted gearbox

Figure 3-1 Effect of the mounting conditions on the S1 characteristic curve

3.1.2 Forced ventilation

This cooling method is achieved using a separate ventilation unit with a fan that is driven independently of the motor.

The fan has degree of protection IP54.

⚠WARNING

Risk of explosion when operated in hazardous environments

Operating the fan in an environment with inflammable, chemically corrosive, electrically conductive, or explosive dust or gases can cause explosions and result in death or serious injury.

- Operate the motor with forced ventilation only in an environment that is free of inflammable, chemically corrosive, electrically conductive, or explosive dust or gases.

⚠WARNING

Hair, clothing and other objects can be drawn in

For example, hair, neckties, loose objects can be sucked into the air intake and cause death or serious injury.

- Take measures to prevent objects from being sucked in, e.g.
  - Wear a head covering or hair net,
  - Remove any neckties or similar,
  - Keep the air intake area free.

Note

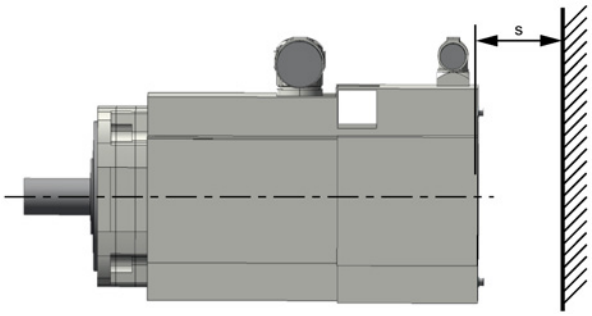
Ensure that the motor is only operated when the external fan is running.

Operate the fan only with normal ambient air.

The direction of air flow is from the non-drive end (NDE) to the drive end (DE).

Deposits of contaminated air can impair the heat dissipation of the motor or block the cooling duct and overheat the motor.

- Position the motor so that the cooling air can freely flow in and out.
- Make sure that no heated discharged air is drawn in.
- Maintain the minimum clearance between the air intake and discharge openings and adjacent components (see the "Minimum clearance" figure).
- To remove the fan cover and connect the signal connector when the motor is installed, maintain a minimum clearance of 125 mm.



s A minimum clearance of 30 mm applies for SH 80

Figure 3-2 Minimum clearance s

3.2 Degree of protection

The degree of protection designation in accordance with EN 60034-5 (IEC 60034-5) is described using the letters "IP" and two digits, e.g. IP64.

IP = International Protection
1. digit = protection against the ingress of foreign bodies
2. digit = protection against water

The validity of DIN 60034-5 refers to water as medium that can potentially enter, and not oil.

Note

1FK7 motors are not suitable for use in environments where fluid mediums capable of creep are used.

Configure the motor with the appropriate degree of protection.

Table 3- 2 Specified degrees of protection as a function of the environmental conditions

Effect/environment	General workshop environment	Water, general cooling lubricant (95 % water, 5 % oil), oil
Dry	IP64	-
Environment with liquids	-	IP64
Mist	-	IP65
Spray	-	IP65

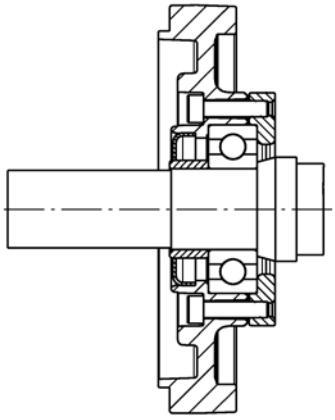
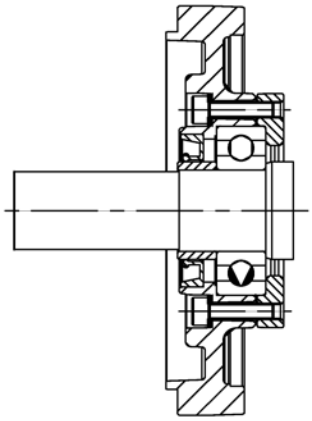
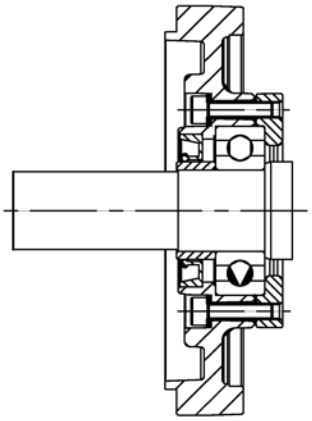
Available degrees of protection

1FK7 motors are available with degrees of protection IP64, IP65 or IP65 + IP67 at the shaft output according to EN 60034-5 (IEC 60034-5).

1FK7 motors with forced ventilation are available with degrees of protection IP54 or IP55 according to EN 60034-5 (IEC 60034-5).

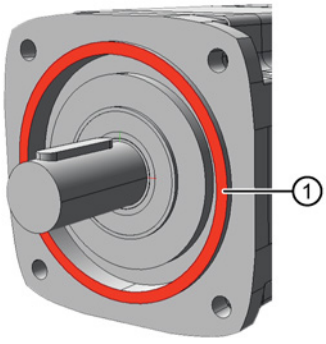
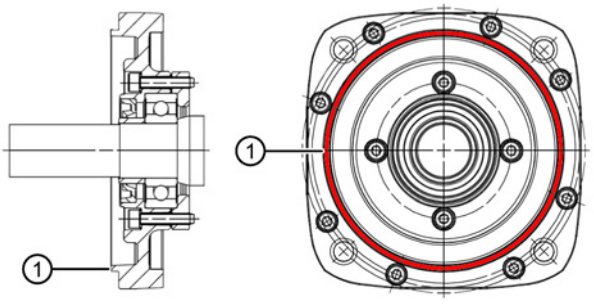
The motor shafts are sealed according to the degree of protection that is ordered.

Sealing of the motor shaft

IP64	IP65	IP67
		
Labyrinth seal It is not permissible that there is any moisture in the area around the shaft and the flange. Note: For IP 64 degree of protection it is not permissible that liquid collects in the flange.	Radial shaft sealing ring without annular spring Sealing of the shaft exit against splashwater or coolant. It is permissible that the radial shaft sealing ring runs dry. Lifetime approx. 25000 h (nominal value). With degree of protection IP65, it is not permissible for liquid to collect in the flange.	Radial shaft sealing ring For gearbox mounting (for gearboxes that are not sealed) to seal against oil. The sealing lip must be adequately cooled and lubricated by the gearbox oil in order to guarantee reliable function. Lifetime approx. 10000 h (nominal value). If a radial shaft sealing ring runs dry, then this has a significant negative impact on the functionality and the lifetime.

Sealed through the motor flange

You can additionally seal motors at the flange

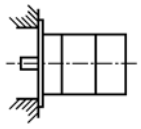
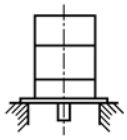
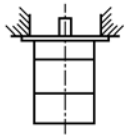
	
1 flat contact surface for the O ring	

The motor is sealed using an O ring on a flat machined contact surface of the centering edge at the DE flange. The whole circumference is sealed.

The flange surface of the motor is not used to establish the seal.

3.3 Types of construction

Table 3- 3 Designation of types of construction (acc. to IEC 60034-7)

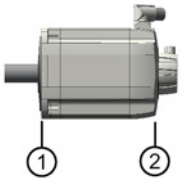
Designation	Representation	Description
IM B5		Standard
IM V1		The motors can be used in types of construction IM V1 and IM V3 without having to order anything special. Note: When configuring the IM V3 type of construction, attention must be paid to the permissible axial forces (force due to the weight of the drive elements) and especially to the necessary degree of protection.
IM V3		

3.4 Bearing versions

The motors have rolling bearings with permanent grease lubrication (greased for a lifetime).

The bearing arrangement is a typical fixed-floating design with the fixed bearing at the DE.

The bearing arrangement is for the load case " Circumferential load at the inner ring, point-type load at the outer ring".



1 DE

2 NDE

3.5 Shaft extension

The drive shaft end is cylindrical in accordance with DIN 748 Part 3, IEC 60072-1.

Note

Magnetized shaft extension

SIMOTICS S-1FK7 G2 motors with integrated holding brake have a magnetic field at the shaft extension.

If you operate the motor as rack and pinion drive fed from a third-party converter the axis can also lead at standstill.

For fast acceleration levels and reversing operation, we recommend that you use friction-locked shaft-hub coupling.

Standard: plain shaft

Option: Shaft with keyway and fitted key (half key balancing)

3.6 Radial and axial forces

As a result of the bearing arrangement, as described in Chapter "Bearing versions (Page 38)", the 1FK7 G2 is designed for vectored forces. Forces such as these occur, e.g. for a belt drive.

All radial forces always involve vectored forces.

NOTICE
Motor damage caused by rotating forces Rotating forces can result in bearing motion and in turn damage the motor. • Rotating forces are not permissible.

3.6.1 Sample calculation of the belt pre-tension

Note

Carefully comply with the guidelines provided by the belt manufacturer

- Carefully comply with the guidelines provided by the belt manufacture when configuring the motor for radial forces at the shaft extension.
- Adjust the belt tension using the appropriate measuring instruments.

$F_V = 2 \cdot M_0 \cdot c / d_R$ $F_V \leq F_{R,\,perm}$

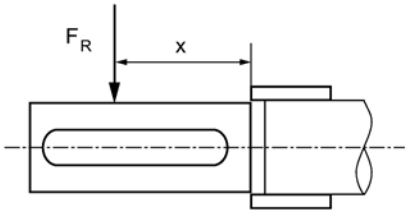
Table 3- 4 Explanation of the formula abbreviations

Formula abbreviations	Unit	Description
F_V	N	Belt pretension
M_0	Nm	Motor static torque
c	——	Pre-tensioning factor; this factor is an empirical value provided by the belt manufacturer. It can be assumed as follows: for toothed belts: c = 1.5 to 2.2 for flat belts c = 2.2 to 3.0
d_R	m	Effective diameter of the belt pulley
$F_{R,\,perm}$	N	Permissible radial force

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

3.6.2 Radial force diagrams

The following diagram shows the maximum permissible radial force of the corresponding motor frame size. It depends on the point of application of the force, and the average speed for the nominal bearing service life (L10h) of 25000 h.



F_R Point of application of the radial force

x Distance between where the radial force is applied and the shaft shoulder in mm

Figure 3-3 Force application point at DE

Radial force, 1FK703

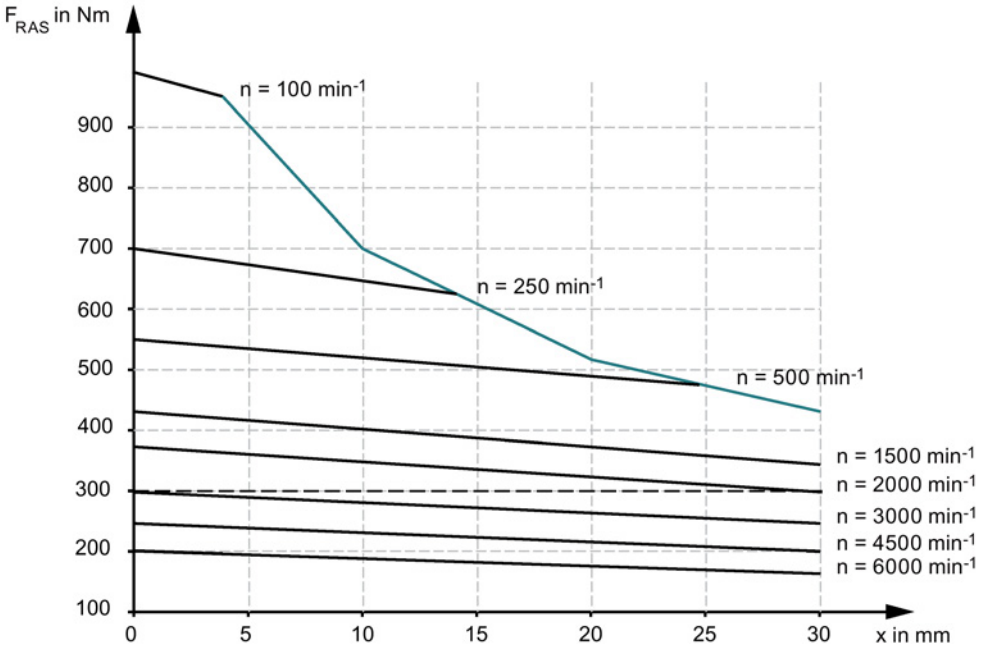


Figure 3-4 Maximum permissible radial force F_R at a distance x from the shaft shoulder for a nominal bearing lifetime of 25 000 h.

Radial force, 1FK704

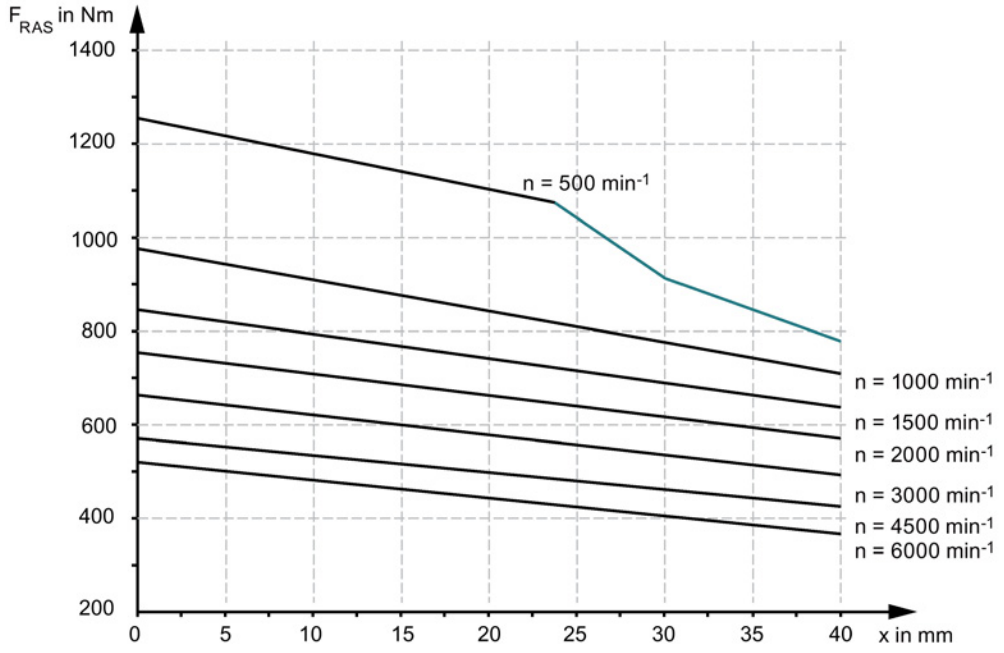


Figure 3-5 Maximum permissible radial force F_R at a distance x from the shaft shoulder for a nominal bearing lifetime of 25 000 h.

Radial force, 1FK706

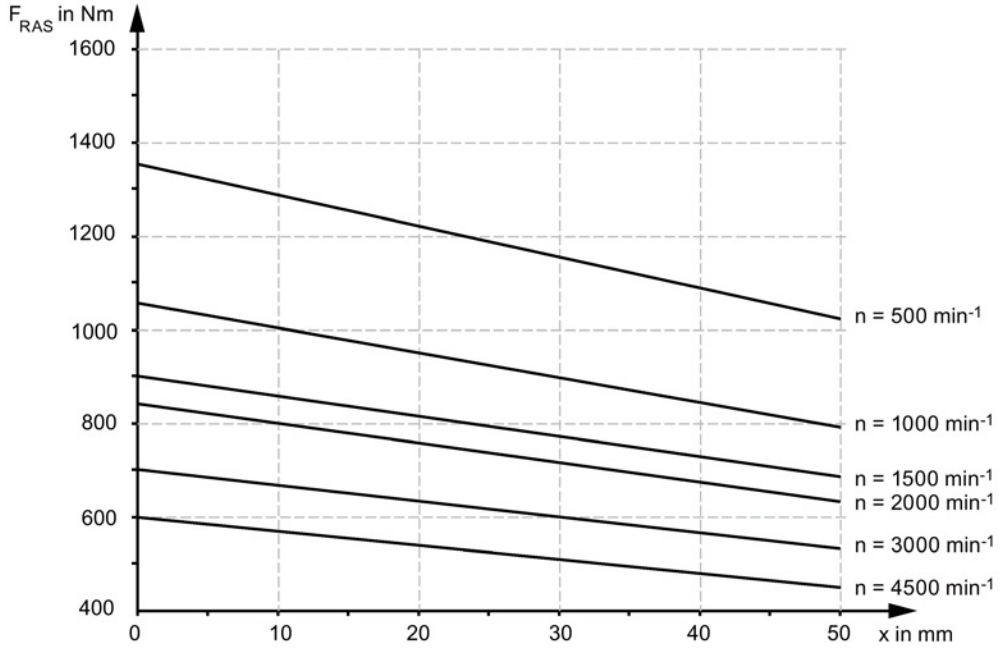


Figure 3-6 Maximum permissible radial force F_R at a distance x from the shaft shoulder for a nominal bearing lifetime of 25 000 h.

Radial force, 1FK708

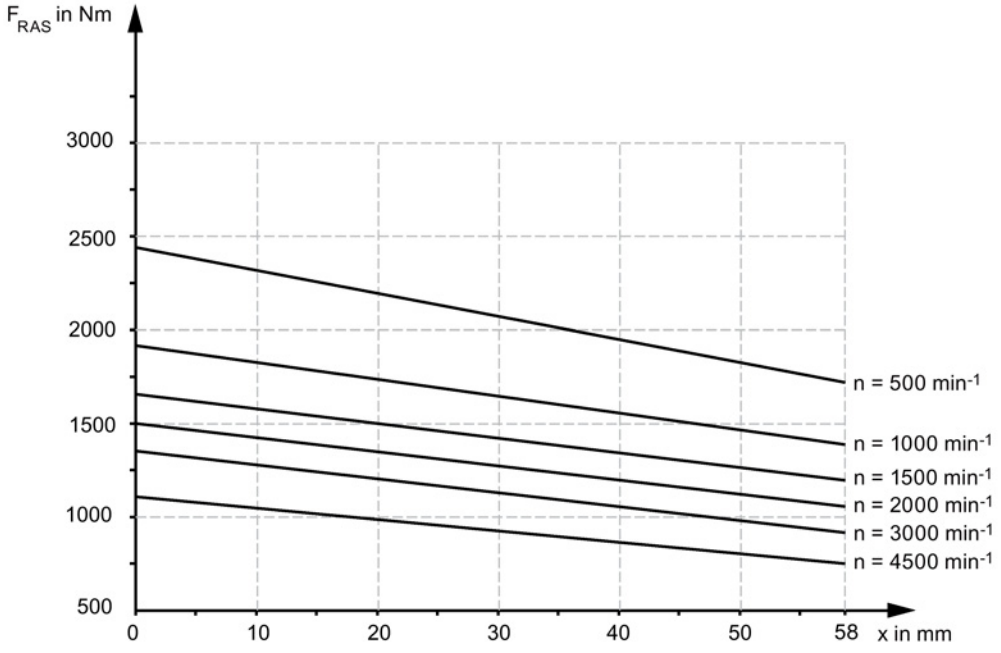


Figure 3-7 Maximum permissible radial force F_R at a distance x from the shaft shoulder for a nominal bearing lifetime of 25 000 h.

Radial force, 1FK710

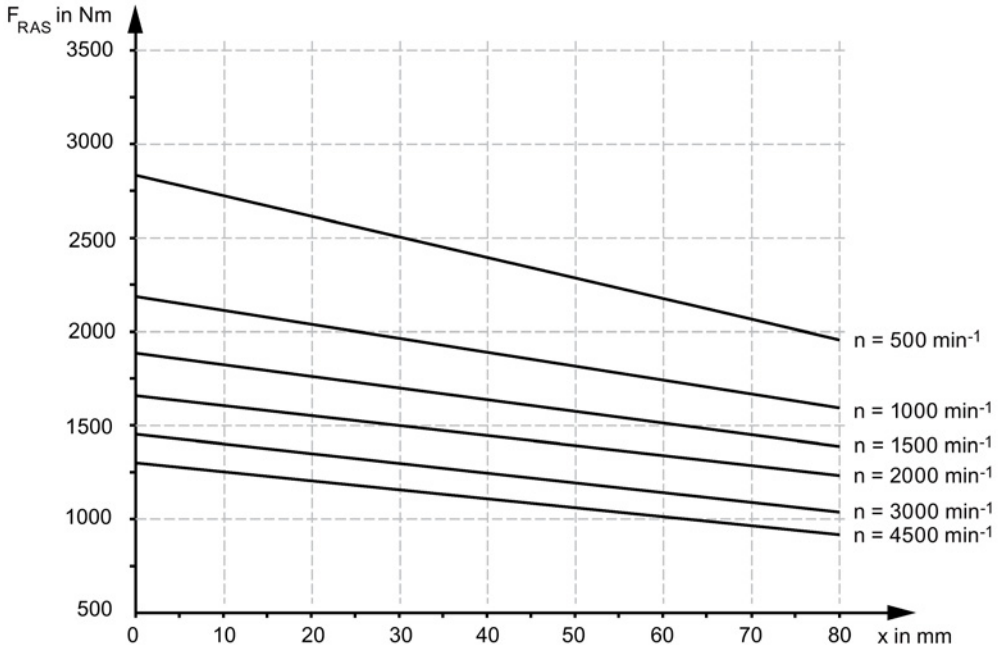


Figure 3-8 Maximum permissible radial force F_R at a distance x from the shaft shoulder for a nominal bearing lifetime of 25 000 h.

3.6.3 Axial force stressing

When using, for example, helical toothed wheels as drive element, in addition to the radial force, there is also an axial force on the motor bearings.

The axial forces can overcome the spring loading of the bearings so that the rotor is shifted corresponding to the bearing axial play that exists.

Table 3- 5 Permissible axial rotor shift

Shaft height	Displacement
36 and 48	approx. 0.2 mm
63 to 100	approx. 0.35 mm

NOTICE

Motor damage as a result of bearings that are not pretensioned

Bearings that are not pretensioned can result in premature failure of the motor. An axial force as large as the spring-loading is not permitted (100 ... 500 N).

- Comply with the permissible axial force.

Calculating the permissible axial force: $F_{A\,perm} = F_R \bullet 0.35$

NOTICE

Motor damage caused by axial force for motors with integrated holding brake

It is not permissible that motors with integrated holding brake are subject to axial forces.

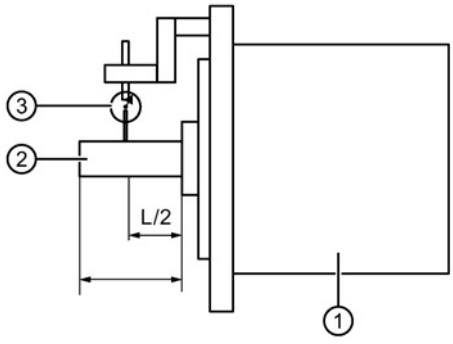
- For motors with integrated holding brake ensure that no axial forces are applied to the shaft extension.

3.7 Radial eccentricity, concentricity and axial eccentricity

The shaft and flange accuracies are checked according to DIN 42955, IEC 60072-1. Any specifications deviating from these values are stated on the dimension drawings.

Table 3- 6 Radial eccentricity tolerance of the shaft to the frame axis (referred to cylindrical shaft ends)

Motor	Standard N
1FK703	0.035 mm
1FK704/1FK706	0.04 mm
1FK708/1FK710	0.05 mm

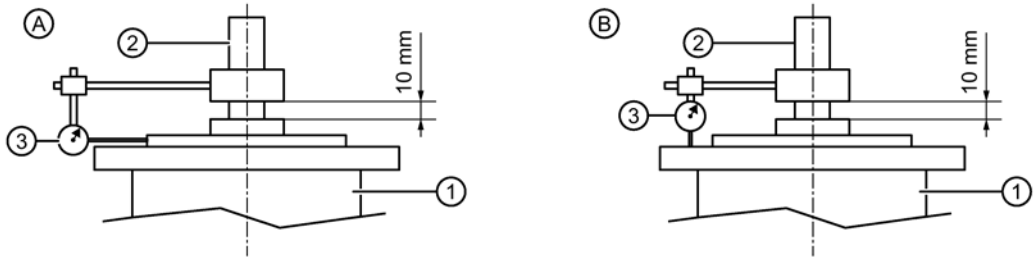


① Motor
② Motor shaft
③ Dial gauge

Figure 3-9 Checking the radial eccentricity

Table 3- 7 Concentricity and axial eccentricity tolerance of the flange surface to the shaft axis (referred to the centering diameter of the mounting flange)

Motor	Standard N
1FK703/1FK704	0.08 mm
1FK706/1FK708/1FK710	0.1 mm



A Checking the concentricity
B Checking the axial eccentricity
① Motor
② Motor shaft
③ Dial gauge

Figure 3-10 Checking the concentricity and axial eccentricity

3.8 Balancing

The motors are balanced according to DIN ISO 8821.

Motors with featherkey in the shaft are half-key balanced.

A mass equalization for the protruding half key must be taken into account for the output elements.

3.9 Vibrational behavior

Vibration severity grade

Motors with a keyway are balanced with a half fitted key by the manufacturer. The vibration response of the system at the location of use is influenced by output elements, any built-on parts, the alignment, the installation, and external vibrations. This can change the vibration values of the motor.

The motors conform to vibration severity grade A according to EN 60034-14 (IEC 60034-14).

The specified values refer only to the motor. The installation-dependent system vibration behavior can increase these values at the motor.

The vibration severity grade is maintained up to the rated speed (n_N).

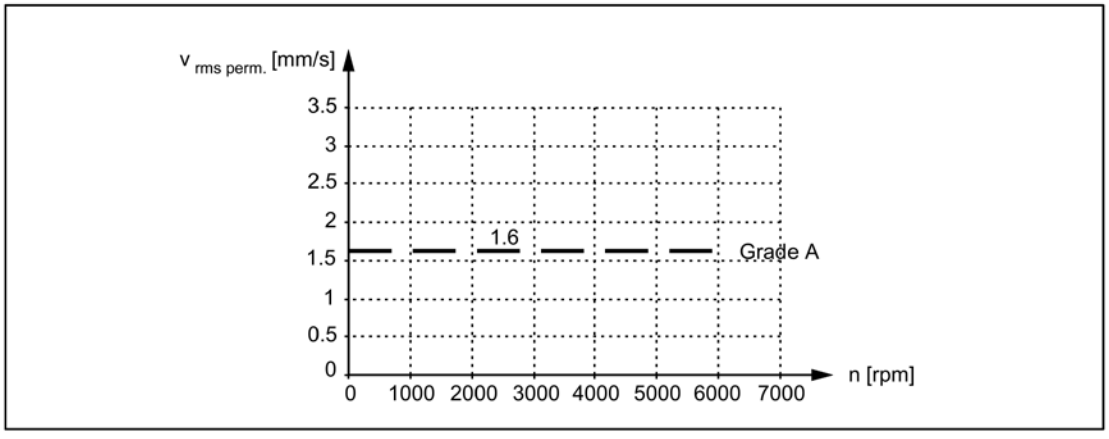


Figure 3-11 Vibration severity grades

Vibration response

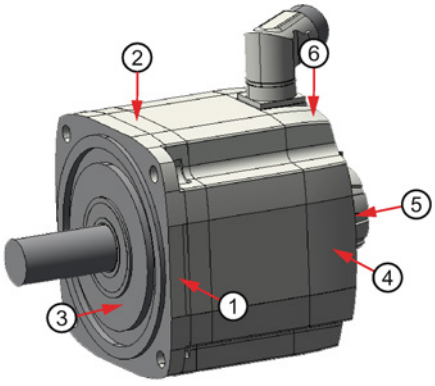
For perfect function and to comply with the motor specification (in particular, the bearing service life) the vibration values specified in the following table must be observed.

Table 3- 8 Vibration values

Vibration speed v_{rms} according to ISO 10816	max. 4.5 mm/s
Vibration acceleration a_{peak} axial 1)	25 m/s^2
Vibration acceleration a_{peak} radial 1)	50 m/s^2

1) For motors with separately driven fans, the limit value for axial and radial vibration acceleration is limited to 10 m/s^2 .

Select the measuring locations according to ISO 10816-1, Section 3.2. The vibration values must not exceed the specified limits at any measuring location.



1	End shield DE radial	4	End shield NDE radial
2	End shield DE radial	5	End shield NDE axial
3	End shield DE axial	6	End shield NDE radial

Figure 3-12 Measuring points for vibration values

The vibration acceleration is evaluated in the frequency band from 10 to 2000 Hz. Whereby, the maximum peak value in the time range is considered.

To evaluate the vibration velocity, the measuring equipment must fulfill the requirements of ISO 2954.

3.10 Noise emission

When operated in the speed range 0 to rated speed, 1FK7 motors can reach the following measuring-surface sound pressure level Lp(A):

Table 3- 9 Sound pressure level

Cooling method	Shaft height	Measuring-surface sound pressure level Lp(A)
Naturally cooled	1FK703 to 1FK704	55 dB(A) + 3 dB tolerance
	1FK706	65 dB(A) + 3 dB tolerance
	1FK708 to 1FK710	70 dB(A) + 3 dB tolerance
Forced-ventilated	1FK708	73 dB(A) + 3 dB tolerance

The motors are certified for a wide range of installation and operating conditions. These conditions such as rigid or vibration-isolated foundation design influence noise emission, sometimes significantly.

3.11 Bearing change interval

The bearings are subject to wear and must be replaced after a defined number of operating hours.

For average load levels, the bearings must be replaced after approx. 25,000 hours.

Bearing replacement intervals can be extended if the motor is operated under favorable conditions, e.g. low average speeds, low radial forces (cantilever forces), vibration load.

Note

Harsh operating conditions

If the motor is subject to harsh operating conditions (e.g. continuous operation at n_{max}, high vibration/shock loads, frequent reversing duty etc.), the bearing replacement intervals t_{LW} can decrease by up to 50%.

3.12 Service and inspection intervals

General

Carry out maintenance work, inspections and revisions at regular intervals in order to be able to identify faults at an early stage and remove them.

Note

Inspection if there are faults or unusual conditions

Unusual conditions or faults that place undue stress on a three-phase motor - e.g. overload, short-circuit - can cause consequential damage to the machine.

Immediately perform an inspection when faults or exceptional conditions occur.

Maintenance measures, inspection/maintenance times intervals

The maintenance intervals depend on the operating conditions.

- Adapt the maintenance intervals to match the local conditions, such as pollution/dirt, switching frequency, load, etc.

NOTICE
Improper maintenance Service and maintenance must only be performed by properly authorized qualified personnel. Only use original SIEMENS parts.

Siemens Service Centers distributed around the globe can maintain and repair the motor. To do this, contact your local Siemens representative.

- Perform the following maintenance measures as listed in the table.

Table 3- 10 Maintenance measures after operating times or intervals

Operating times and intervals	Measure
Operation	
Daily; if possible, more frequently during operation.	Monitor and check the motor for unusual noise, vibrations, and changes.
After approx. 10,000 operating hours, at the latest after two years	If oil-lubricated, replace the radial shaft seal rings
as required - or after 25 000 operating hours	Replace the motor bearings

Motor components and options

4

4.1 Motor components

4.1.1 Thermal motor protection

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

- From October 2017, all 1FK7 motors with integrated DRIVE-CLiQ interface will be switched over to Pt1000. The motor revision number indicates the type of temperature sensor installed. The order number remains the same. Details are provided in a separate notification in SIOS.
- The installed temperature sensor (KTY84-130 or Pt1000) is explicitly specified on the standard rating plate of the 1FK7, see Chapter "Rating plate data (Page 31)".
- Motors without integrated DRIVE-CLiQ interface must be switched over to the new Pt1000 temperature sensor. The motor order number changes.
- For new plants and systems always configure a motor with Pt1000 temperature sensor.

Note

Ensure that the converter used supports the evaluation of the Pt1000.

- The order number for motors without integrated DRIVE-CLiQ interface changes at the 12th position when a Pt1000 temperature sensor is installed.
  This applies to motors with the following encoders:

1FK7 2nd generation motors without DRIVE-CLiQ interface:	Old order number with KTY 84	New order number with Pt1000
IC2048 S/R incremental encoder	1FK7□□□-□□□□1-□A□□	1FK7□□□-□□□□4-□A□□
AM2048 S/R absolute encoder	1FK7□□□-□□□□1-□E□□	1FK7□□□-□□□□4-□E□□
Multi-pole resolver	1FK7□□□-□□□□1-□S□□	1FK7□□□-□□□□4-□S□□
2-pole resolver	1FK7□□□-□□□□1-□T□□	1FK7□□□-□□□□4-□T□□

Table 4- 1 Features and technical data

Type	KTY 84-130	Pt1000
	ESD component	Not an ESD component
Resistance when cold (20° C)	Approx. 580 Ω	Approx. 1090 Ω
Resistance when hot (100° C)	Approx. 1000 Ω	Approx. 1390 Ω
Connection	Via signal cable	Via signal cable
Response temperature	Prewarning < 135 °C Alarm / shutdown at max. 145 °C	Prewarning < 135 °C Alarm / shutdown at max. 145 °C

The following figure shows the resistance characteristic as a function of the temperature for KTY 84-130 and Pt1000 temperature sensors.

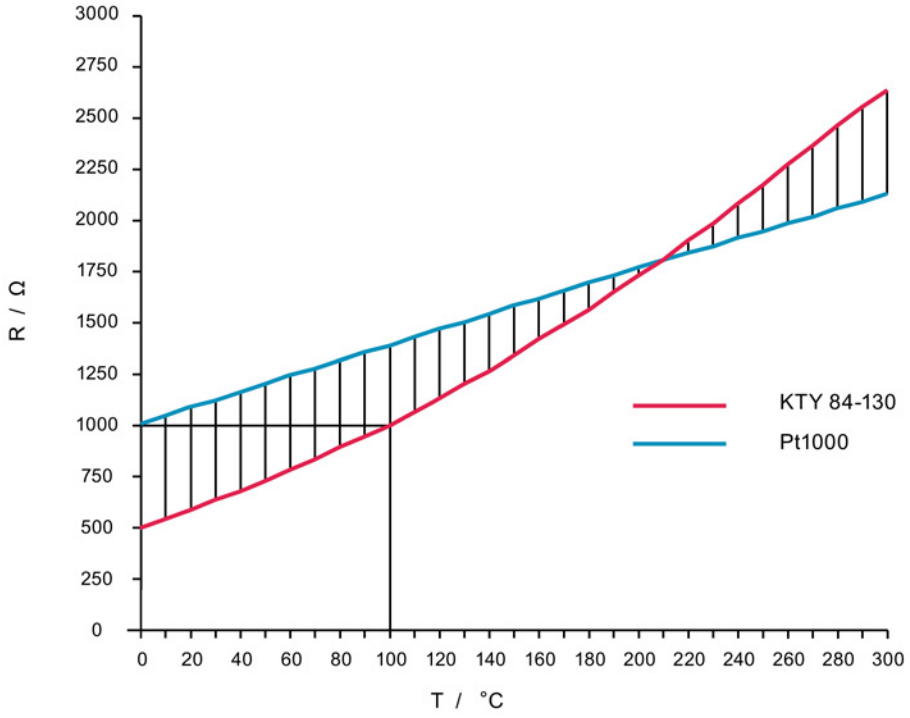


Figure 4-1 Comparison of KTY 84-130 and Pt1000 temperature sensors

The winding temperature is evaluated in the converter. When a fault occurs, an appropriate message is output at the converter. When the motor temperature increases, a message "Alarm motor overtemperature" is output. The message can be evaluated externally.

If this message is ignored, the converter shuts down with the appropriate fault message after a preset time period or when the motor limiting temperature or the shutdown temperature is exceeded.

The integrated temperature sensor protects the synchronous motors only to a certain extent against overloads:

1FK703 to 1FK704: up to 2 • $I_{0\,(60\,K)}$ and speed ≠ 0
1FK706 to 1FK710: up to 4 • $I_{0\,(60\,K)}$ and speed ≠ 0

NOTICE
Destruction of the motor for a thermal critical load
For load applications that are critical from a thermal perspective, e.g. overload when the motor is stationary or an overload of M_{max} longer than 4 s, adequate protection is no longer available. • Activate the "thermal motor model i^2t monitoring" function in the converter.

The temperature sensor is part of an SELV circuit. Connecting a high voltage can destroy the temperature sensor. The temperature sensor is designed so that the DIN/EN requirement for "protective separation" is fulfilled.

4.1.2 Encoder

NOTICE
Destruction of the encoder when incorrectly handling ESD parts and components
Encoders are ESD components. • Carefully comply with the regulations for handling parts and components that can be destroyed by electrostatic discharge. See Equipment damage due to electric fields or electrostatic discharge (Page 14)

The following encoders can be used with the 1FK7.

	Encoders with DRIVE-CLiQ interface: For SINAMICS drive systems		
	Single-turn absolute encoders	**Multiturn absolute encoders**	
High resolution, suitable for Safety Integrated Extended Functions			
Encoder designation	**AS24DQI**	**AM24DQI**	
Identification in the article number	B	C	
Resolution	16,777,216 = 24 bits	16,777,216 = 24 bits	
Absolute position	Yes, one revolution	Yes, 4096 revolutions (12 bits)	
Max. angular error	± 40"	± 40"	
Average resolution, suitable for Safety Integrated Extended Functions			
Encoder designation	**AS20DQI**	**AM20DQI**	
Identification in the article number	Q	R	
Resolution	1,048,576 = 20 bits	1,048,576 = 20 bits	
Absolute position	Yes, one revolution	Yes, 4096 revolutions (12 bits)	
Max. angular error	± 120"	± 120"	
	Incremental encoder	**Multiturn absolute encoders**	
Encoder designation	**IC22DQ**	**AM20DQ**	**AM22DQ**
Identification in the article number	D	L	F
Resolution	4,194,304 =22 bits	1,048,576 = 20 bits	4,194,304 =22 bits
Absolute position	No	Yes, 4096 revolutions (12 bits)	Yes, 4096 revolutions (12 bits)
Max. angular error	± 40"	± 120"	± 40"
Simple resolution, not suitable for Safety Integrated Extended Functions			
Encoder designation	**R15DQ resolver R14DQ resolver**		**AM16DQ**
Identification in the article number	U, P		K
Resolution	32,768 = 15 bits or 16,384 = 14 bits		65,536 = 16 bits
Absolute position	only for R14DQ: 1 revolution		Yes, 4096 revolutions (12 bits)
Max. angular error	±240" to ±840" depending on the type and motor		± 280"

	Encoder without DRIVE-CLiQ interface: EnDat 2.1 or Sin/Cos 1Vpp or resolver	
	Incremental encoder	**Multiturn absolute encoders**
Suitable for Safety Integrated Extended Functions		
Encoder designation	**IC2048S/R**	**AM2048S/R**
Identification in the article number	A	E
Resolution	2048 Sin/Cos 1Vpp	2048 Sin/Cos 1Vpp
Absolute position	No	Yes, 4096 revolutions
Max. angular error	± 40"	± 40"
Simple resolution, not suitable for Safety Integrated Extended Functions		
Encoder designation	**R2P resolver** **RMP resolver**	
Identification in the article number	T, S	
Resolution	32,768 = 15 bits or 16,384 = 14 bits	
Absolute position	only for R2P: 1 revolution	
Max. angular error	240" to 840" depending on the type and motor	

Encoder systems with DRIVE-CLiQ interface

Motors with DRIVE-CLiQ encoder interface are designed to operate with the SINAMICS S110 / S120 converter system. Signal transmission to the converter is performed digitally. They have an electronic rating plate that simplifies commissioning and diagnostics. The motor and encoder system are automatically identified and all motor parameters are automatically set, see SINAMICS Equipment Manual.

Encoder systems without a DRIVE-CLiQ interface

For motors without an integrated DRIVE-CLiQ interface, the analog encoder signal is first converted to a digital signal in the drive system. For these motors, the encoder signals for SINAMICS S110 / S120 must be transferred via Sensor Modules.

4.1.2.1 Technical data of the incremental encoder for 1FK7 motors

Description

This encoder senses relative movements and does not supply absolute position information. In combination with an evaluation logic, a zero point can be determined using the integrated reference mark, which can be used to calculate the absolute position.

The encoder outputs sine and cosine signals. These signals can be interpolated using evaluation logic (usually 2048x) and the direction of rotation can be determined. In the version with a DRIVE-CLiQ interface, this evaluation logic is already integrated in the encoder.

Function and technical data

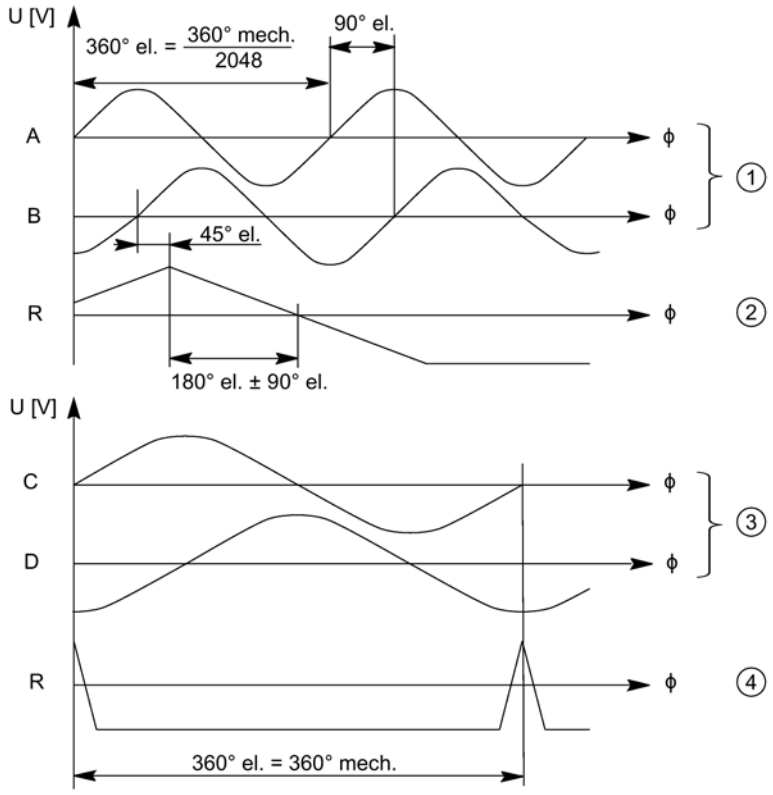
- Angular measuring system for commutation
- Speed actual value sensing
- Indirect incremental measuring system for the position control loop
- One zero pulse (reference mark) per revolution

Table 4- 2 Technical data for incremental encoders

Encoders	Code	Operating voltage	Max. current drain	A-B track: Resolution incremental (sin/cos periods per revolution)	C-D track: Rotor/commutation position (sin/cos periods per revolution)	Angular error
without DRIVE-CLiQ interface						
1FK703 to 1FK710: Incremental encoder sin/cos 1 Vpp, 2048 S/R with C and D tracks	IC2048S/R	5 V ±5%	140 mA	2048 S/R (1 Vpp)	1 S/R (1 Vpp)	±40"
with DRIVE-CLiQ interface						
1FK703 to 1FK710: Incremental encoder 22-bit (4,194,304 resolution, 2048 S/R encoder-internal) + 11-bit commutation position	IC22DQ	24 V	180 mA	4,194,304 (=22 bits)	2048 (=11 bits)	±40"

Mech. speed limit for all incremental encoders: 12000 rpm

Note: The "Singleturn absolute value encoders" are other encoders which can be used as incremental encoders in the SINAMICS drive system.



1 Incremental signals A/B track
2 Zero pulse/reference signal
3 Incremental signals C/D track
4 Zero pulse/reference signal

Figure 4-2 Signal sequence and assignment for encoder IC2048S/R without DRIVE-CLiQ interface for a positive direction of rotation

Information on the encoder connection, pin assignment and cables is provided in Chapter "Motors without DRIVE-CLiQ interface (Page 278).

4.1.2.2 Technical data of the absolute encoder for 1FK7 motors

Description, multiturn absolute encoder

This encoder outputs an absolute angular position between 0° and 360° in the specified resolution. An internal measuring gearbox enables it to differentiate between 4096 rotations. For a ballscrew spindle, over a longer distance, the encoder can determine the absolute position of the slide, for example.

Description, absolute value singleturn

This encoder outputs an absolute angular position between 0° and 360° in the specified resolution. Contrary to a multiturn absolute encoder, the singleturn absolute encoder has no measuring gear, which means that it can only supply position values within just one revolution. The singleturn absolute encoder has no traversing range.

Function and technical data

- Angular measuring system for commutation
- Speed actual value sensing
- Indirect measuring system for absolute position determination within a revolution
- Indirect measuring system for determining the absolute position within a traversing range of 4096 revolutions
- For multiturn encoders: Indirect measuring system for absolute position determination within a traversing range
- Indirect incremental measuring system for position control loop

Table 4- 3 Technical data, absolute value encoder without DRIVE-CLiQ interface

Designation	Code	Operating voltage	Max. current drain	Absolute resolution (singleturn)	Traversing-range (multiturn)	A-B track: Resolution incremental (sin/cos periods per revolution)	Angular error
Serial absolute position interface: EnDat 2.1							
Absolute value encoder 2048 S/R, (4096 revolutions, multiturn, with EnDat interface)	AM2048S/R	5 V ±5%	200 mA	8192 (=13 bits)	4096 (=12 bits)	2048 S/R (1 Vpp)	±40"

Table 4- 4 Technical data, absolute value encoder with DRIVE-CLiQ interface

Designation	Code	Operating voltage	Max. current drain	Absolute resolution (singleturn)	Traversing-range (multiturn)	Angle error
Serial absolute position interface: DRIVE-CLiQ						
Absolute encoder, singleturn 24 bit	AS24DQI	24 V	110 mA	16,777,216 (= 24 bits)	-	±40"

Designation	Code	Operating voltage	Max. current drain	Absolute resolution (singleturn)	Traversing-range (multiturn)	Angle error
Absolute encoder 24 bit + 12 bit multiturn	AM24DQI	24 V	110 mA	16,777,216 (= 24 bits)	4096 (=12 bits)	±40"
Absolute encoder, singleturn 20 bit	AS20DQI	24 V	110 mA	1,048,576 (=20 bits)	-	±120"
Absolute encoder 20 bit + 12 bit multiturn	AM20DQI	24 V	110 mA	1,048,576 (=20 bits)	4096 (=12 bits)	±120"
Absolute encoder 22 bit + 12 bit multiturn	AM22DQ	24 V	210 mA	4,194,304 (=22 bits)	4096 (=12 bits)	±40"
Absolute encoder 20 bit + 12 bit multiturn	AM20DQ	24 V	210 mA	1,048,576 (=20 bits)	4096 (=12 bits)	±120"
Absolute encoder 16 bit + 12 bit multiturn	AM16DQ	24 V	210 mA	65,536 (=16 bits)	4096 (=12 bits)	±280"

Mech. speed limit for all absolute value encoders: 12000 rpm

The signal sequence and assignment A/B track is provided in Chapter Technical data of the incremental encoder for 1FK7 motors (Page 56), Fig "Signal sequence and assignment for encoders IC2048S/R without DRIVE-CLiQ interface for a positive direction of rotation".

Information on the encoder connection, pin assignment and cables is provided in Chapter "Motors with DRIVE-CLiQ interface (Page 276).

4.1.2.3 Technical data of the resolver

Description

The number of sine and cosine periods per revolution corresponds to the number of pole pairs of the resolver. In the case of a 2-pole resolver, the evaluation electronics may output an additional zero pulse per encoder revolution. This zero pulse ensures a unique assignment of the position information in relation to an encoder revolution. A 2-pole resolver can therefore be used as a singleturn encoder. 2-pole resolvers can be used for motors with any number of pole pairs. With multi-pole resolvers, the pole pair numbers of the motor and the resolver are always identical. The resolution is correspondingly higher than for 2-pole resolvers.

Function and technical data

- Angular measuring system for commutation
- Speed actual value sensing
- Indirect incremental measuring system for the position control loop

Table 4- 5 Technical data, resolver without DRIVE-CLiQ interface

Designation	Short designation	Excitation voltage rms, excitation frequency	Angle error
2-pole resolver	Resolver p=1	2 ... 8 V, 5 ... 10 kHz	840"
6-pole resolver	Resolver p=3	2 ... 8 V, 5 ... 10 kHz	420"

Designation	Short designation	Excitation voltage rms, excitation frequency	Angle error
8-pole resolver	Resolver p=4	2 ... 8 V, 5 ... 10 kHz	240"
Calculation of the output signals	Transformation ratio $\ddot{U}$ = 0.5 ± 5 % $U_{\text{Sinusoidal track}} = \ddot{U} \cdot U_{\text{Excitation}} \cdot \sin \alpha$ $U_{\text{Cosinusoidal track}} = \ddot{U} \cdot U_{\text{Excitation}} \cdot \cos \alpha$ $\alpha = \arctan (U_{\text{Sinusoidal track}} / U_{\text{Cosinusoidal track}})$		

Table 4- 6 Technical data, resolver with DRIVE-CLiQ interface

Designation	Short designation	Supply voltage	Resolution	Angle error
Resolver 15-bit resolution 32768, internal, multi-pole	R15DQ	24 V	32,768 (= 15 bit)	for 6-pole and 8-pole 240"
Resolver 14-bit resolution 16384, internal, 2-pole	R14DQ	24 V	16,384 (= 14 bit)	840"

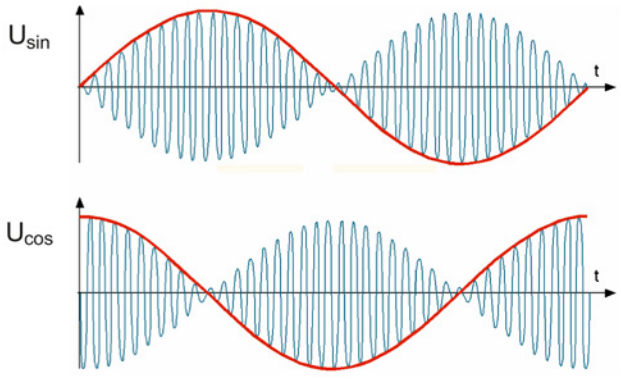


Figure 4-3 Output signals, resolver

4.2 Options

4.2.1 Holding brake

4.2.1.1 Type of holding brake

The holding brake is implemented as a permanent-magnet brake.

The magnetic field of the permanent magnets exerts a pulling force on the brake armature disk. This means that in the no-current condition, the brake is closed and the motor shaft is held.

When 24 V DC rated voltage is applied to the brake, the current-carrying coil produces an opposing field. This neutralizes the force of the permanent magnets and the brake opens without any residual torque.

NOTICE
Damage to the motor due to axial forces on the shaft extension
Axial forces on the shaft extension can damage motors with an integrated permanent-magnet holding brake. • Avoid axial forces on the shaft extension.

4.2.1.2 Properties

The holding brake is used to lock the motor shaft when the motor is at a standstill. The holding brake is not a working brake to brake a spinning motor.

The holding brake is designed for 5 million switching cycles when the motor is at a standstill.

A limited number of EMERGENCY STOP operations is permissible. The holding brake can perform up to 2000 EMERGENCY STOP braking operations with the specified highest braking energy. In so doing, the holding brake is subject to permissible wear.

- Comply with the specified highest braking energy for each emergency braking operation.

Formula to calculate the braking energy for each braking operation

W_{Br} / J	Braking energy for each braking operation
n_{Mot} / rpm	Speed at which the brake is closed
$J_{Mot\ Br}$ / kgm²	Motor rotor moment of inertia with brake → see Chapter "Technical data and characteristics (Page 105)"
J_{Load} / kgm²	Load moment of inertia of the mounted part at the motor with brake is assumed 3 x motor rotor moment of inertia with brake → see Chapter "Technical data and characteristics (Page 105)" (kgm²)
182.4	Constant to calculate the angular frequency and SI units

Example for calculating the highest braking energy for braking the 1FK7062-2AC71-□□□□ from 3000 rpm with three times the rotor moment of inertia as load moment of inertia:

$W_{BR} = (J_{Mot\ Br} + J_{Last}) \cdot n_{Mot}^2 / 182.4$

$W_{BR} = (1.22 \cdot 10^{-3} + 3 \cdot 1.22 \cdot 10^{-3}) \cdot 9 \cdot 10^6\ s^{-2} \cdot kgm^2 / 182.4$

$W_{BR} = 4.88\ kgm^2 \cdot 9000\ s^{-2} / 182.4$

$W_{BR} = 240.79\ J$

$W_{BR} = 240.79\ J < 380\ J \rightarrow W_{Br} = ok$

380 J is the highest braking work for this brake. See "Technical data (Page 63)"

- The holding brake is designed so that it has a torsionally stiff connection to the motor rotor - and therefore has no place/backlash.
- The holding brake opens so that it has no residual torque.
- The rated voltage of the holding brake is 24 V DC, with a permissible tolerance range of ± 10 %, measured at the motor plug connector. Take into account the voltage drop along the supply cable, see Chapter "Connecting the holding brake (Page 273)".

WARNING

Inadvertent motion as a result of reduced braking effect

If you use the holding brake incorrectly, e.g. as safety brake, or you do not comply with the number of permissible brake closing operations, then the effect of the holding brake can be irreversibly reduced. This can result in inadvertent motion of your machine or system - and in turn can cause death or severe injury.

- Comply with the permissible number of EMERGENCY STOP braking operations with the specified highest braking energy.
- Avoid that the motor repeatedly and briefly accelerates with the brake still closed.
- Take into account the brake switching times and relay switching times for the brake control and/or release.
- Only operate the motor with an intact brake that is operating perfectly.

Note

Motors with or without holding brake cannot be subsequently retrofitted.

Motors with holding brake are longer by the installation space required (see the dimension drawings).

Note

It is not permissible that motors with integrated permanent magnet excited holding brake are subject to axial forces.

4.2.1.3 Technical data

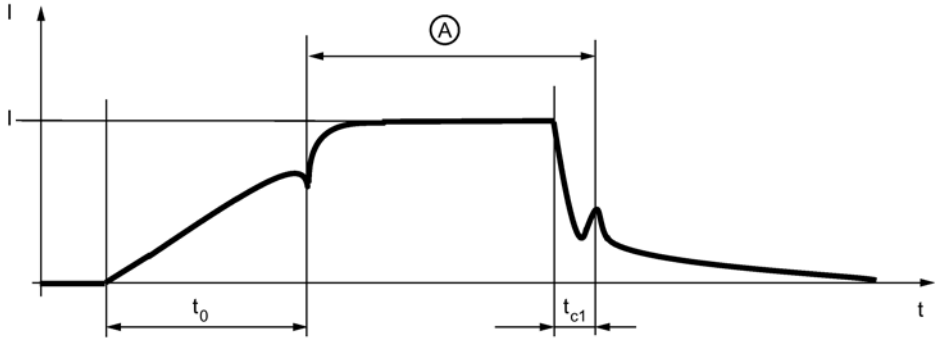
Table 4- 7 Technical data of the holding brakes used for 1FK7 motors

Motor type	Holding torque at 120 °C M_4 / Nm	Dyn. braking torque $M_{1(m)}$ 1) / Nm	DC current at 20 °C I / A	Opening time with varistor T_0 / ms	Closing time with varistor t_{c1} / ms	Highest braking energy W / J
1FK703□	1.9	1	0.3	50	30	40
1FK704□	4	3	0.5	70	30	150
1FK706□	13	8.5	0.8	100	50	380
1FK708□	22	11	0.9	200	60	1400
1FK7100	23	11	1.0	300	70	3380
1FK7101 1FK7103 1FK7105	43	25	1.0	300	70	3380

*) (m) = averaged value

Note

If the brake is switched in two stages ("click" twice), then when opening, the first switching point is decisive, and when closing, the second switching point.



I Current magnitude
t Time
t_0 Opening time
t_{c1} Closing time
A Brake open

Figure 4-4 Time-related terminology for holding operation

Holding torque M_4

The holding torque M_4 is the highest possible torque that can be applied to the closed brake in steady-state operation without slip (holding function in a no-current state).

Dynamic braking torque $M_{1\,m}$

The dynamic braking torque M_1 is the lowest average dynamic braking torque that can occur for EMERGENCY STOP operation.

4.2.2 Motors with planetary gearboxes

4.2.2.1 Properties

Overview

1FK7 motors can be simply combined with planetary gearboxes to create compact drive units with a coaxial design. The gearboxes are directly flanged to the motor DE.

- When selecting, carefully ensure that the maximum motor speed does not exceed the permissible gearbox input speed.
- At high switching frequencies, you must take into account an additional factor f_2.
- Take this into account when configuring the friction losses of the gearbox.

The gearboxes are only available unbalanced. While the gearbox shaft of the SP+ series is available with and without feather key, the LP+ series is only available with feather key.

Benefits

Property	SP+ series	LP+ series
High efficiency	> 97 % 1-stage > 94 % 2-stage	> 97 % 1-stage
Minimum torsional play	≤ 4 arcmin 1-stage ≤ 6 arcmin 2-stage	≤ 10 arcmin 1-stage
Power distribution	Power is distributed from the central sun wheel to the planet wheels	
No shaft bending	No shaft bending occurs in the planetary wheel set as a result of the symmetrical force distribution.	
Moment of inertia	Very low moment of inertia and thus short motor acceleration times	
High cantilever and axial load	Output bearings for high cantilever and axial load levels using pretensioned tapered rolling bearings	
Gearbox mounting	The gearboxes are connected to the motor shaft through an integrated clamping hub. A plain motor shaft extension is required. Radial eccentricity tolerance N according to DIN 42955 and vibration severity level A according to EN 60034-14 are sufficient. The motor flange is adapted using adapter plates.	
Gearbox output	The gearbox output is precisely coaxial to the motor	
Gearbox design	The gearboxes are enclosed (the gearbox seal to the motor is integrated in the gearbox). They are lubricated and sealed for their service life. The gearboxes are suitable for all mounting positions.	
Lubricant	Filled with oil in the factory	Filled with grease in the factory
Degree of protection	IP65	IP64
Dimensions	Small	
Weight	Low	

4.2.2.2 Selection and ordering data for the planetary gearboxes

The selection and ordering data for the gearboxes is provided in Chapter "SIMOTICS Servomotors" in Catalog D 21.4 (https://support.industry.siemens.com/cs/document/109747019/) in the print version - or online.

Note

When selecting the motor-gearbox combination, ensure that the maximum permissible gearbox input speed is not exceeded. It must be greater than or equal to the maximum motor speed.

The motor-gearbox combinations listed in the selection tables are predominantly for cyclic duty S3-60 % (ON duration ≤ 60 % and ≤ 20 min) .

For use in continuous duty S1 (ON duration> 60 % or> 20 min) reduced maximum motor speeds and output torques apply.

The maximum gearbox temperature is 90 °C.

- For mounting the gearbox, select the following motor options:
  - Smooth motor shaft extension
  - Degree of protection IP65 (design SP+) or IP64 (design LP+)
  - Paint finish

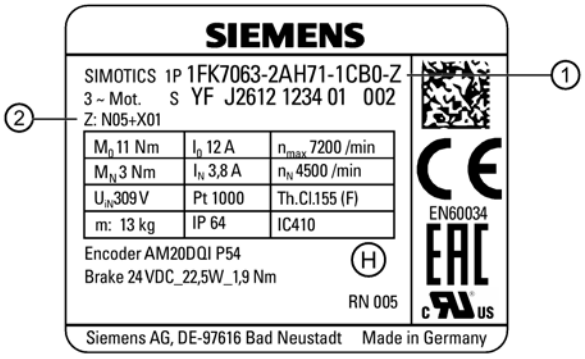
Additional information for configuring the motor-gearbox combination is provided in ChapterConfiguring the gearbox (Page 94).

4.2.3 Special options

4.2.3.1 Introduction

The following options are available for 1FK7 motors.

You can identify the selected options at the rating plate at the following positions.



1 A "-Z" at the end of the article number indicates that the motor is equipped with options. In addition, the options are defined using a three-digit article designation.

2 Three-digit article designation for special motor options. Several options are separated by a "+".

Note

Several options

A maximum of 7 options can be stamped on the rating plate.

If the motor has more options, then no option is stamped on the rating plate.

- In this case, when reordering, specify the motor serial number (No. YF).

Additional information is provided in Chapter "Selection based on the article number (Page 28)".

4.2.3.2 Acceptance test certificate (option B02)

Note

Option B02 is not stamped on the motor rating plate.

When ordering this option, a separate acceptance test certificate according to DIN EN 10204:2004 is generated and supplied together with the motor.

This acceptance test certificate includes the following values:

- The voltage induced at 1000 rpm
- The winding resistances (Ohm)

The acceptance test certificate certifies that the high-voltage test was successfully completed.

Note

A general test certificate according to DIN EN10204 is provided at Certificate of compliance with order 2.1 (https://support.industry.siemens.com/cs/ww/de/view/92603789).

4.2.3.3 Use in hazardous zones (options M03 and M39)

⚠ WARNING

Risk of explosion if the motor is incorrectly installed and incorrectly handled

If the motor is incorrectly installed and incorrectly handled, this can result in explosions and cause death or severe injury.

- Read and comply with the documentation for the motor and the "Product memorandum 1FK7 G2 with options M03 and M39 (https://support.industry.siemens.com/cs/ww/de/view/63629892)".
- Carefully observe the information in Chapter "Use in hazardous zones with a risk of gas explosion (option M03)" and "Use in hazardous zones with a risk of dust explosion (Option M39)".

By ordering options M03 or M39, 1FK7 motors are supplied in a version for use in hazardous zones.

Use in hazardous zones with a risk of gas explosion (option M03)

If you order 1FK7 motors with option M03, and the application conditions listed below are complied with, then 1FK7 motors are suitable for use in hazardous zones with a risk of gas explosion Group II, Category 3G (Zone 2), temperature classes T1 to T3. When these specific application conditions are fulfilled, then 1FK7 motors comply with the regulations of the European Directive 2014/34/EU.

These specific application conditions are listed in Supplement to the operating instructions and attachment to the EC Declaration of Conformity (https://support.industry.siemens.com/cs/ww/de/view/61185424) - or can be obtained from your local Siemens office.

Marking on the motors: EEx II 3 G Ex nA IIB T3 Gc -15 °C ≤ Ta ≤ +40 °C

Note

The motors may only be operated up to the subsequently specified speed.

Motor type	Max. operating speed in rpm	Motor type	Max. operating speed in rpm	Motor type	Max. operating speed in rpm
Compact		High Dynamic		High Inertia	
1FK7032-2	5500	1FK7033-4	4500	1FK7042-3	6000
1FK7034-2	4000	1FK7043-4	4000	1FK7060-3	3000
1FK7040-2	6000	1FK7061-4	4500	1FK7062-3	3000
1FK7042-2	6000	1FK7064-4	4500	1FK7081-3	3000
1FK7060-2	4500	1FK7085-4	3000	1FK7084-3	3000
1FK7062-2	4500	1FK7086-4	3000	1FK7100-3	3000
1FK7063-2	4500			1FK7101-3	3000
1FK7080-2	4500			1FK7103-3	3000
1FK7081-2	4500			1FK7105-3	3000
1FK7083-2	4500				
1FK7084-2	3000				
1FK7100-2	3000				
1FK7101-2	3000				
1FK7103-2	3000				
1FK7105-2	3000				

Use in hazardous zones with a risk of dust explosion (option M39)

If you order 1FK7 motors with option M39, and the application conditions listed below are complied with, then 1FK7 motors are suitable for use in hazardous zones with a risk of dust explosion Group II, Category 3D (Zone 22), maximum surface temperature of 160 °C. When these specific application conditions are fulfilled, then 1FK7 motors comply with the regulations of the European Directive 2014/34/EU.

These specific application conditions are listed in Supplement to the operating instructions and attachment to the EC Declaration of Conformity (https://support.industry.siemens.com/cs/ww/de/view/61182051) - or can be obtained from your local Siemens office.

Marking on the motors: EEx II 3 D Ex tc IIIB T160 °C Dc IP64 -15 °C ≤ + 40 °C

Note

The motors may only be operated up to the subsequently specified speed.

Motor type	Max. operating speed in rpm	Motor type	Max. operating speed in rpm	Motor type	Max. operating speed in rpm
Compact		High Dynamic		High Inertia	
1FK7032-2	6000	1FK7033-4	6000	1FK7042-3	6000
1FK7034-2	6000	1FK7043-4	6000	1FK7060-3	3000
1FK7040-2	6000	1FK7044-4	4500	1FK7062-3	3000
1FK7042-2	6000	1FK7061-4	4500	1FK7081-3	3000
1FK7060-2	4500	1FK7064-4	4500	1FK7084-3	3000
1FK7062-2	4500	1FK7085-4	3000	1FK7100-3	3000
1FK7063-2	4500	1FK7086-4	3000	1FK7101-3	3000
1FK7080-2	4500			1FK7103-3	3000
1FK7081-2	4500			1FK7105-3	3000
1FK7083-2	4500				
1FK7084-2	3000				
1FK7100-2	3000				
1FK7101-2	3000				
1FK7103-2	3000				
1FK7105-2	3000				

Restricted number of options for 1FK7 motors when operated in hazardous zones

For motors equipped with option M03 or M39, there are restrictions when combining with other options and motor versions.

Cooling

Options M03 and M39 are only available for naturally ventilated motors.

Encoder versions

Only the following encoders are permissible:

Encoder designation	ID at the 14th position in the Article No. 1FK7□□□-□□□□□-□X□□
IC2048S/R	A
AS24DQI	B
AM24DQI	C
AM2048S/R	E
AS20DQI	Q
AM20DQI	R
Multipole resolver	S
Resolver, 2-pole	T

Degree of protection

1FK7 motors with option M03 or M39 can only be ordered with degree of protection IP64 (Article No. 1FK7□□□-□□□□□-□□□0).

Permissible combination with options

Only the combination with the following options is permissible:

Designation	Option
Acceptance test certificate	B02
Primed	K23, K24
Alternative shaft extension	N05
Quantity packaging	P90, P98
Metal rating plate	Q31
Special paint finish	X□□
Customer data on the rating plate	Y84

4.2.3.4 Alternative shaft geometry (option N05)

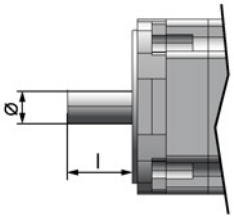
The 1FK7 motors are available with an alternative shaft geometry. If required, select this via option N05.

Note

1FK7 motors with alternative shaft geometry are always shaft- compatible and flange-compatible to the corresponding 1FT5 motors.

Exception: 1FK706□.... motors are only shaft-compatible to 1FT506□... Motors.

	As standard without option N05 (Ø x length)	Shaft dimension with option N05 (Ø x length)
1FK703□...	14 x 30 mm	11 x 23 mm
1FK704□...	19 x 40 mm	14 x 30 mm
1FK706□...	24 x 50 mm	19 x 40 mm
1FK708□...	32 x 58 mm	24 x 50 mm
1FK710□...	38 x 80 mm	32 x 58 mm



Ø Diameter

l Length

Configuration/documentation

You can find dimension drawings in the DT CONFIGURATOR (http://siemens.de/dt-konfigurator).
The cantilever force diagrams listed in the configuration manual are also valid for 1FK7 servomotors with option N05.

4.2.3.5 Version for increased resistance to chemicals (option N16)

By ordering option N16, certain 1FK7 motors have an increased resistance to chemicals.

The motors that are available in this specific version are listed under Product notification SIMOTICS S with option N16 (https://support.industry.siemens.com/cs/document/58657336).

Additional characteristics of the motor with option N16

- 4-layer paint system (PS Premium paint system)
- Nickel-plated plug connectors
- Encoder with round plug connector M17

Motor applications

Typical applications for these versions are for plants and systems in the foodstuff industry - as well as machine tools, for example.

The paint system for these motors is resistant to a wide range of common cleaning and disinfecting agents.

Note

The ECOLAB Deutschland GmbH company verified the resistance to cleaning and disinfecting agents based on a material resistance test. The certificate is available at Product notification SIMOTICS S with option N16 (https://support.industry.siemens.com/cs/document/58657336).

- Check the resistance of your complete system comprising motor, connections and cables before use.

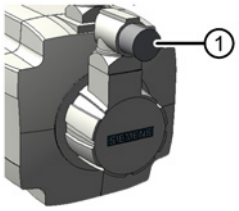
For 1FK7 motors, option N16 is only available in combination with the following encoders:

- AM20DQI DRIVE-CLiQ absolute encoder 20 bit + 12 bit multiturn
- AS24DQI DRIVE-CLiQ absolute encoder 24 bit singleturn
- AM24DQI DRIVE-CLiQ absolute encoder 24 bit + 12 bit multiturn
- AM2048S/R absolute encoder 2048 S/R, 4096 revolutions multiturn with EnDat interface
- Multi-pole resolver (without DRIVE-CLiQ interface)
- 2-pole resolver (without DRIVE-CLiQ interface)

Connection system

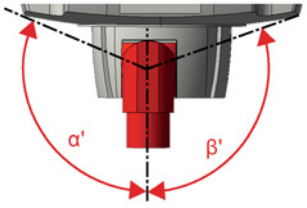
Motors with a DRIVE-CLiQ interface have a DQI encoder with angled connector that can be rotated.

The angled connector is an M17 round connector.



1 M17 round connector

Rotation range of the M17 round connector

Motor	M17 round connector		Drawing
	Angle α'	Angle β'	
1FK703	125°	135°	
1FK704	125°	145°	
1FK706	125°	120°	
1FK708	110°	105°	
1FK710	100°		

Rotation range of the M17 round connector

- The motor is 5 mm longer.
- The height of the disturbing contour referred to the center of the motor is 82 mm.

Note

Use the DT Configurator (http://siemens.de/dt-konfigurator) to generate a dimension drawing.

The modified signal connector applies to the following types:

- 1FK7□□□-□□□□□-□B□□
- 1FK7□□□-□□□□□-□C□□
- 1FK7□□□-□□□□□-□R□□

Additional information is provided at Product notification SIMOTICS S with option N16 (https://support.industry.siemens.com/cs/document/58657336).

DRIVE-CLiQ signal cables with round M17 connector on the motor side for 1FK7 with option N16

Additional information on DRIVE-CLiQ signal cables with round M17 connector on the motor side is available at DRIVE-CLiQ cables for motors equipped with option N16 (https://support.industry.siemens.com/cs/document/109478937)

Recommendations for cleaning

Cleaning recommendations for motors equipped with option N16 are provided in Appendix A1 and under the Product notification SIMOTICS S with option N16 (https://support.industry.siemens.com/cs/document/58657336).

4.2.3.6 Reinforced brake (option N24)

With option "Reinforced brake", 1FK7 motors are equipped with a holding brake that has a higher rating than the standard brake.

For the higher-rating brake, the description and specification of the holding brake according to Chapter "Holding brake (Page 61)" apply.

The following technical data apply to the higher-rating brake when compared to the standard version.

Table 4- 8 Technical data of the holding brakes used

Motor type	Holding torque M_4 at 120 °C	Dyn. braking torque M_1	Direct current at 20 °C	Opening time with varistor	Closing time with varistor	Moment of inertia 1)	Maximum operating energy
	[Nm]	[Nm]	[A]	[ms]	[ms]	[10^{-4} kgm^2]	[J]
1FK703□	3	1.5	0.3	60	25	0.12	30
1FK704□	8	5	0.6	90	30	0.87	270
1FK706□	18	11	0.8	150	50	2.84	880
1FK708□	48	25	1.0	220	65	15.4	1900
1FK7101 1FK7103 1FK7105	85	35	1.6	250	70	27.6	5300

1) Additional moment of inertia to the motor without brake

Note

Before using motors equipped with the higher-rating brake, carefully check the mechanical system of the customer's machine to ensure that it can withstand the increased forces and torques for an "EMERGENCY OFF".

Electrical connection of the higher-rating brake

The higher-rating brake is connected just like a holding brake.

Information on the electrical connection of the higher-rating brake is provided in Chapter "Connecting the holding brake (Page 273)".

Option "Higher-rating brake" can only be ordered for motors with holding brake.

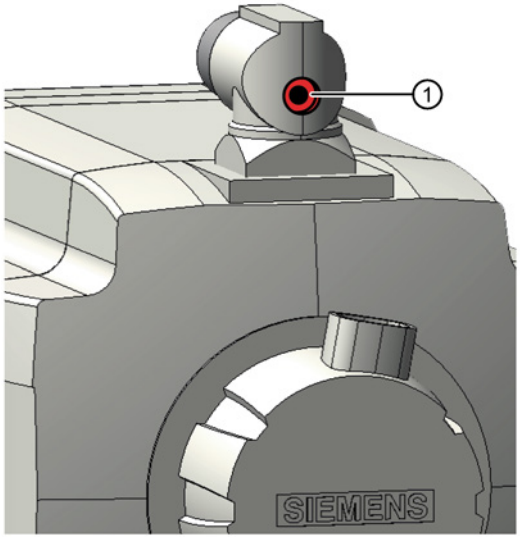
1FK7 with holding brake have, at the 15th position of the Article number, a "B" or "H", e.g. 1FK7□□□-□□□□□-□□B□ or 1FK7□□□-□□□□□-□□H□.

Option "Higher-rating brake" is only available for the following 1FK7 motors:

1FK703□-2□□□□-□□□□
1FK704□-2□□□□-□□□□
1FK706□-2□□□□-□□□□
1FK708□-2□□□□-□□□□
1FK7101-2□□□□-□□□□
1FK7103-2□□□□-□□□□
1FK7105-2□□□□-□□□□
1FK704□-3□□□□-□□□□
1FK706□-3□□□□-□□□□
1FK708□-3□□□□-□□□□
1FK7101-3□□□□-□□□□
1FK7103-3□□□□-□□□□
1FK7105-3□□□□-□□□□
1FK7086-4□□□□-□□□□

4.2.3.7 Pressure equalizing connection (option Q20)

With option Q20, 1FK7 motors are equipped with a connection to equalize the pressure.



1 Connection to equalize pressure

Figure 4-5 Connection to equalize pressure

A connection with M5 thread is provided in the power connector.

When supplied, the M5 thread is sealed with an Allen screw with flat head, sealed with FluidD. The FluidD remains pasty and does not harden.

When required, you can remove the FluidD using a non-lint dry cloth, possibly with some ethyl alcohol (spirit).

If you do not use another seal, e.g. a flat seal, then you can again seal the connection using FluidD.

Table 4- 9 Intake air quality

Max. residual water content (g/m³)	0.12
Max. residual oil content (g/m³)	0.01
Max. residual dust (mg/m³)	0.1
Particle size (µm)	< 3

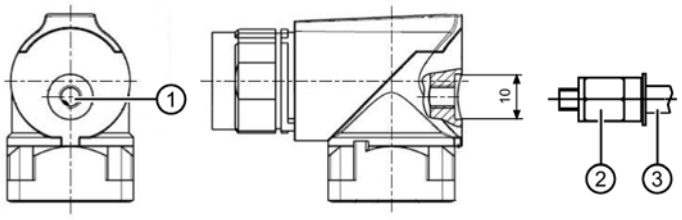
Use for the pressure equalization:

When cooling down after being operated, a vacuum condition can occur inside the motor. In a moist and humid environment, a defined pressure equalization can be realized to prevent that liquid from being drawn in.

- In power connector ①, connect a hose for the pressure equalization through a hose sleeve.

Note

This hose must be routed to an area in which clean and dry air is drawn in. If this is not possible, ensure that dirt and pollution cannot enter the motor by using a suitable filter.



1 M5 connection for pressure equalization
2 Connecting nipple, e.g. Festo QSM-B-M5-4-20
3 Hose, outer diameter 4 mm, inner diameter 2.5 mm

Connection tightening torque: 3.5 Nm to 5 Nm

NOTICE

Motor damage due to continuous overpressure condition

As a result of its degree of protection, the 1FK7 motor cannot continually tolerate an overpressure condition. When subject to continuous overpressure, pressurized air can leak with an associated damaging airflow through the motor - thus causing damage to the motor.

- Only use the connection to equalize the pressure in the motor.

Option "Pressure equalizing connection" is only available for the following 1FK7 motors:

1FK703□-□□□□□-□□□1	1FK703□-□□□□□-□□□2
1FK704□-□□□□□-□□□1	1FK704□-□□□□□-□□□2
1FK706□-□□□□□-□□□1	1FK706□-□□□□□-□□□2
1FK708□-□□□□□-□□□1	1FK708□-□□□□□-□□□2
1FK710□-□□□□□-□□□1	1FK710□-□□□□□-□□□2

4.2.3.8 Metal motor rating plate (option Q31)

The regular rating plate is a plastic adhesive label. With option Q31, instead, you can order a metal rating plate.

4.2.3.9 Reference mark on the motor shaft (option R06)

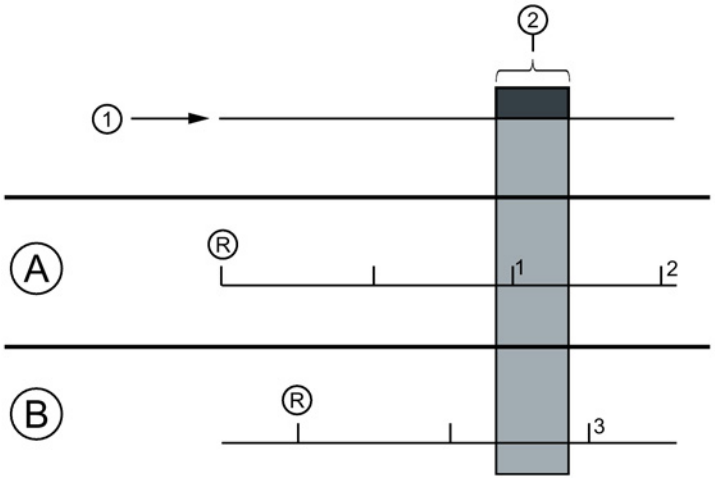
Note

The description of option R06 supplements the operating instructions of the corresponding motor type.

Problem

For reference travel when commissioning applications such as rotary indexing table, ballscrews, tooth belts etc., the absolute position must be determined.

If the reference point of the sensor (e.g. Bero) and the zero point of the angular position encoder are located very close together, errors as a result of the mechanical system can occur when determining the absolute position. Whether the zero point or the reference point initiated the switching signal cannot be clearly determined.



① Traversing distance of the spindle for reference point approach

② Range, in which the sensor (Bero) can switch, depending on the operating conditions. Different temperatures can cause quantities to change in the mechanical system.

R R signal of the incremental encoder (Bero)

1, 2, 3 Positions, which depending on the sensor switching point, are approached.

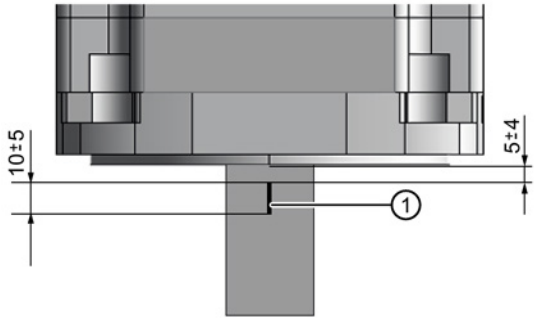
A Unfavorable position of the R signal, so that depending on the switching point, position 1 or position 2 is approached.

B Using the reference mark on the shaft, the mechanical system is installed so that for reference point approaches, position 3 is always reliably approached.

Figure 4-6 Sketch for option R06

Solution

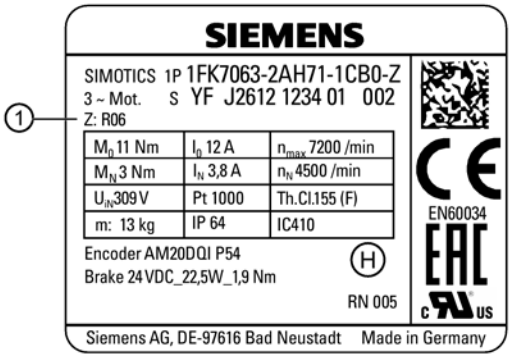
Using the reference mark on the shaft, the motor shaft is installed so that the reference mark on the shaft is located opposite to the reference mark on the sensor. For a reference approach, the zero point is uniquely approached.



1 Reference marking using an electroplotter

Figure 4-7 Reference mark drawing

Motor marking



1 Option marking

Note

The reference mark is only available for motors with plain shaft extension without feather key.

Note

When mounted onto a planetary gearbox, a reference mark is not engraved on the motor shaft.

4.2.3.10 Customer data on the rating plate (option Y84)

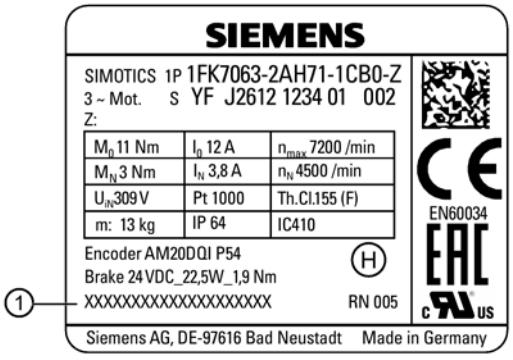
Option Y84 - allows customer's data to be stamped on the motor rating plate When ordering electronically, when selecting option Y84, you can enter the required text.

Note

The required text may be a maximum of 20 characters long. Additional characters are cut off. Option Y84 does not impact the delivery time.

Option identifier Y84 is not shown as Z option on the rating plate.

Customer data is printed on the rating plate and on the adhesive label showing the type for the product packaging.



1 Customer data, maximum 20 characters

4.2.3.11 Special paint finish (K23 and K24, X..)

If a specific color and paint/coating data is not specified when ordering, 1FK7 motors are painted in the standard anthracite color (RAL 7016).

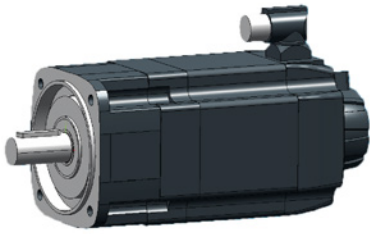


Figure 4-8 1FK7 standard color

1FK7 is available in various colors.

You can select between additional standard colors and special colors.

The standard and special paint finishes comply with the requirements for environmental conditions, climatic Class 3K4 according to IEC 60721-3-3 - with exceptions relating to influencing environmental variables "Low air temperature", "Condensation" and "Low air pressure".

Note

Additional information is provided in Chapter "Environmental conditions (Page 26)". Additional data relating to environmental conditions for "Transporting (Page 251)" and "Storage (Page 256)" of the motors is provided in the appropriate chapters in this documentation.

Standard colors are available in the standard delivery time.

Special colors can extend the delivery time.

Standard colors (option X..)

Designation	3-digit article designation	Color pattern
RAL 9005, jet black, matt	X01	
RAL 9001, cream	X02	
RAL 6011, reseda green	X03	
RAL 7032, pebble gray	X04	
RAL 5015, sky blue	X05	
RAL 1015, light ivory	X06	
RAL 9006, white aluminum	X08	

Special colors (option X..)

Designation	3-digit article designation	Color pattern
RAL 6019, pastel green	X11	
RAL 5010, gentian blue	X12	
RAL 5024, pastel blue	X13	
RAL 5017, traffic blue	X14	
RAL 9010, pure white	X15	
RAL 6018, yellow green	X16	
RAL 5014, pigeon blue	X17	
RAL 9018, papyrus white	X18	
RAL 2004, pure orange	X19	
RAL 9003, signal white	X21	
RAL 9002, gray white	X22	
RAL 5005, signal blue	X23	
RAL 7001, silver gray	X24	
RAL 1000, green beige	X25	
RAL 6017, may green	X26	
RAL 9023, dark pearl gray	X27	
RAL 5009, azure blue	X28	
RAL 7005, mouse gray	X29	
RAL 1014, ivory	X30	
RAL 5007, brilliant blue	X31	
RAL 3004, purple red	X50	
RAL 2003, pastel orange	X51	
RAL 3000, flame red	X52	
RAL 7035, light gray	X53	
RAL 7004, signal gray	X54	
RAL 7038, agate gray	X55	
RAL 1013, oyster white	X56	

Designation	3-digit article designation	Color pattern
RAL 5012, light blue	X57	
RAL 2001, red orange	X58	
RAL 7030, stone gray	X59	
RAL 7031, blue gray	X60	
RAL 7011, iron gray	X91	

Primer and special paint finish for worldwide climatic Group (options K23 and K24)

1FK7 motors can be supplied with primer finish.

The following versions are possible.

Description	3-digit article designation	Color pattern
Primer without additional paint finish in RAL 6021, pale green When the customer subsequently paints the motor, a maximum of two paint coatings are permissible.	K24	
Special paint finish corresponding to the environmental conditions for the standard paint finish - and for condensation on the outer motor surfaces. Primer and additional paint finish in RAL 7016, anthracite gray	K23	
Special paint finish like K23; however, standard or special color as listed in the color table	K23 + X...	

Configuration 5

5.1 Configuring software

5.1.1 SIZER configuration tool

Overview

The SIZER calculation tool supports you in the technical dimensioning of the hardware and firmware components required for a drive task.

SIZER supports the following configuration steps:

- Configuring the power supply
- Designing the motor and gearbox, including calculation of mechanical transmission elements
- Configuring the drive components
- Compiling the required accessories
- Selection of the line-side and motor-side power options

The configuration process produces the following results:

- A parts list of components required (Export to Excel)
- Technical specifications of the system
- Characteristic curves
- Comments on system reactions
- Installation information of the drive and control components
- Energy considerations of the configured drive systems

You can find additional information that you can download in the Internet at SIZER (https://support.industry.siemens.com/cs/document/54992004/sizer-for-siemens-drives?dti=0&pnid=13434&lc=en-WW).

5.1.2 STARTER drive/commissioning software

The STARTER commissioning tool offers

- Commissioning
- Optimization
- Diagnostics

Table 5- 1 Article number for STARTER

Commissioning tool	Article no. of the DVD
STARTER German, English, French, Italian, Spanish	6SL3072-0AA00-0AG0

5.2 Configuring procedure

Motion control

Drives are optimized for motion control applications. They execute linear or rotary movements within a defined movement cycle. All movements should be optimized in terms of time.

As a result, drives must meet the following requirements:

- High dynamic response, i.e. short rise times
- Capable of overload, i.e. a high reserve for accelerating
- Wide control range, i.e. high resolution for precise positioning.

The following table "Configuring procedure" is valid for synchronous and induction motors.

General configuring procedure

The function description of the machine provides the basis when configuring the drive application. The definition of the components is based on physical interdependencies and is usually carried out as follows:

Table 5- 2 Configuring procedure

step	Description of the configuring activity	
1.	Clarification of the type of drive	Refer to the next chapter
2.	Definition of supplementary conditions and integration into an automation system	
3.	Definition of the load, calculation of the maximum load torque and selection of the motor	
4.	Selection of the SINAMICS Motor Module	Refer to catalog
5.	Steps 3 and 4 are repeated for additional axes	
6.	Calculation of the required DC link power and selection of the SINAMICS Line Module	
7.	Selection of the line-side options (main switch, fuses, line filters, etc.)	
8.	Specification of the required control performance and selection of the Control Unit, definition of component cabling	
9.	Definition of other system components (e.g. braking resistors)	
10.	Calculation of the current demand of the 24 V DC supply for the components and specification of the power supplies (SITOP devices, Control Supply Modules)	
11.	Selection of the components for the connection system	
12.	Configuration of the drive line-up components	
13.	Calculation of the required cable cross sections for power supply and motor connections	
14.	Inclusion of mandatory installation clearances	

5.2.1 1. Clarification of the drive type

Select the motor on the basis of the required torque (load torque), which is defined by the application, e.g. traveling drives, hoisting drives, test stands, centrifuges, paper and rolling mill drives, feed drives or main spindle drives.

Gearboxes to convert motion or to adapt the motor speed and motor torque to the load conditions must also be taken into account when selecting the motor.

You must know the following mechanical data in order to determine the torque to be supplied by the motor:

- The load torque specified by the application
- Masses to be moved
- Diameter of the drive wheel
- Leadscrew pitch, gear ratios
- Frictional resistance data
- Mechanical efficiency
- Traversing distances
- Maximum velocity
- Maximum acceleration and maximum deceleration
- Cycle time

5.2.2 2. Specification of the supplementary conditions and integration into the automation system

Take the following into account during the confguration:

- The line system configuration when using specific motor types and/or line filters
- The utilization of the motor rated values for winding overtemperatures of 60 K or 100 K (for synchronous motors)
- The ambient temperatures and the installation altitude of the motors and drive components
- The heat dissipation from the motors through natural ventilation, forced ventilation or water cooling

Other conditions apply when integrating the drives into an automation environment such as SINUMERIK or SIMOTION.

For motion control and technology functions (e.g. positioning), as well as for synchronous operation functions, the corresponding automation system, e.g. SIMATIC S7-1500 or SIMOTION D is used.

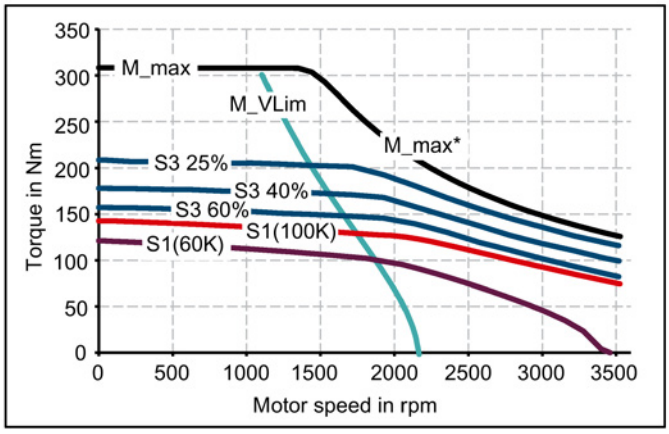
5.2.3 3. Definition of the load, calculation of the maximum load torque and determination of the motor

The motors are defined bases on the motor type-specific limiting characteristic curves.

The limiting characteristic curves describe the torque or power curve over the speed.

The limiting characteristic curves take the limits of the motor into account on the basis of the DC-link voltage. The DC-link voltage is dependent on the line voltage.

In the case of torque drive the DC-link voltage is dependent on the type of Line Module and the type of infeed module or infeed/regenerative feedback module.



M_max	Curve of the maximum torque	S3 25%	S3 characteristic curve for 25%
M_max*	Curve of the maximum torque with field weakening	S3 40%	S3 characteristic curve for 40%
S1 (100K)	S1 characteristic curve for 100 K = M_0 (100K)	S3 60%	S3 characteristic curve for 60%
S1 (60K)	S1 characteristic curve for 60 K	M_VLim	Voltage limiting characteristic curve

Figure 5-1 Limiting characteristic curve for synchronous motors

Procedure

1. Determine the load which is specified by the application.

   Use different characteristics for the different loads.
   The following operating scenarios have been defined:

   – Duty cycle with constant ON duration
   – Duty cycle with varying ON duration
   – Free duty cycle

2. Determine the characteristic torque and speed operating points of the motor for the defined load.
3. Calculate the acceleration torque of the motor.
   Add the load torque and the acceleration torque to obtain the maximum required torque.
4. Verify the maximum motor torque with the limiting characteristic curves of the motors.

   The following criteria must be taken into account when selecting the motor:

   – Compliance with the dynamic limits.
     All speed-torque points of the load must be below the relevant limiting characteristic curve.
   – Compliance with the thermal limits.
     At average speed, the effective motor torque must be below the S1 characteristic curve (continuous operation) during the load.

☐ You have specified a motor.

Duty cycles with constant ON duration

For duty cycles with constant ON duration, there are specific requirements for the torque characteristic curve as a function of the speed, for example:

M = constant, M ~ n^2, M ~ n or P = constant.

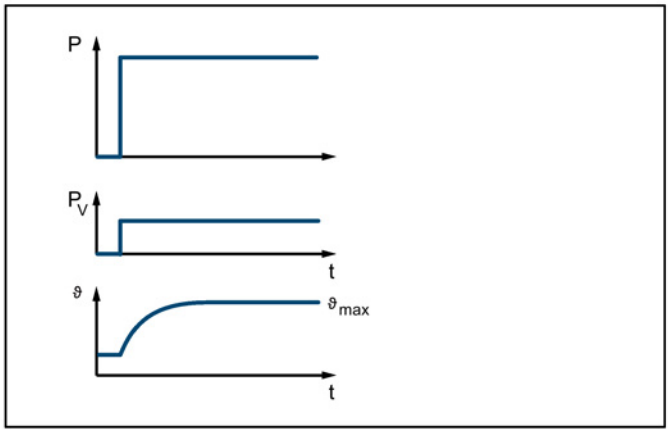


Figure 5-2 S1 duty (continuous operation)

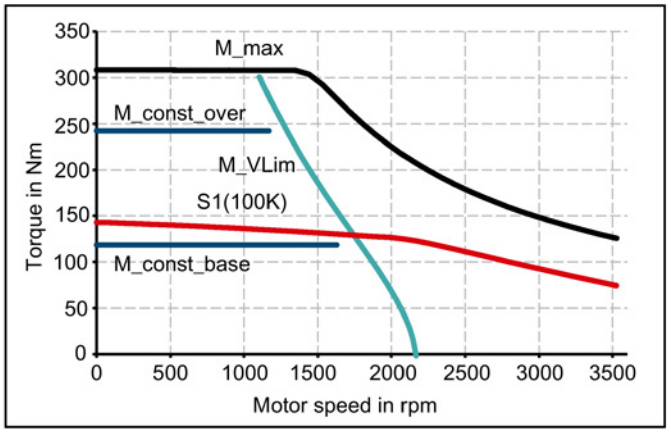
These drives typically operate at a specific operating point.

Procedure

1. 2.

1. Configure a base load for the stationary operating point. The base load torque must lie below the S1 characteristic curve.
2. In the event of transient overloads (e.g. during acceleration), configure an overload. Calculate the overload current in relation to the required overload torque. The overload torque must lie below the voltage limiting characteristic curve.

   In summary, the motor is configured as follows:



M_max	Curve of the maximum torque	M_const_over	Curve of the overload torque
M_VLim	Voltage limiting characteristic curve	M_const_base	Curve of the base load torque
S1 (100K)	S1 characteristic curve		

Figure 5-3 Motor selection for duty cycle with constant ON duration (example)

3. Select a motor that satisfies the requirements of S1 duty.

Duty cycles with varying ON duration

Standardized intermittent duties (S3) are specified for duty cycles with varying ON durations Each intermittent duty (S3) is made up of a sequence of duty cycles of the same type. Each duty cycle encompasses a time with constant load and a pause.

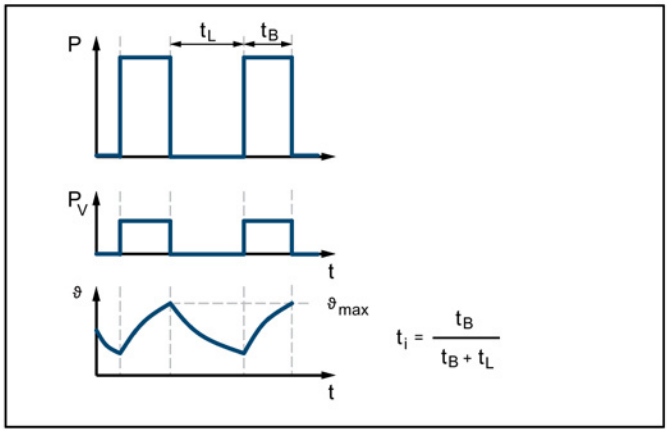


Figure 5-4 S3 duty (intermittent operation without influencing starting)

Fixed variables are generally used for the relative ON duration:

- S3 – 60%
- S3 – 40%
- S3 – 25%

The corresponding motor characteristics are provided for these specifications.
The load torque must lie below the corresponding thermal limiting characteristic curve of the motor. An overload is taken into account for duty cycles with varying ON duration.

Free duty cycle

A free duty cycle defines the curve of the motor speed and the torque over time.

n	Speed	T	Cycle time
M	Torque	Δt_i	Time interval
t	Time		

Figure 5-5 Example of free duty cycle

Procedure

1.
2.

Determine the required motor torque as follows:

- Define a load torque for each time slice. Also take the average load moment of inertia and motor moment of inertia into account for acceleration operations. If required, take a frictional torque into account that opposes the direction of motion.
- With mounted gearbox:
  Determine the load torque and the acceleration torque that must be supplied by the motor. Take the gear ratio and gear efficiency into account.

Note

A higher gear ratio increases positioning accuracy in terms of encoder resolution. For any given motor encoder resolution, as the gear ratio increases, so does the resolution of the machine position to be detected.

The following formulas can be used for duty cycles outside the field weakening range. For duty cycles in the field weakening range, the drive system must be configured using the SIZER configuration tool.

For the motor torque in a time slice Δt_i the following applies:

$$M_{Mot,\,i} = \left(J_M + J_G\right) \bullet \frac{2\pi}{60} \bullet \frac{\Delta n_{Last,\,i}}{\Delta t_i} \bullet i + \left(J_{Last} \bullet \frac{2\pi}{60} \bullet \frac{\Delta n_{Last,\,i}}{\Delta t_i} + M_{Last,\,i} + M_R\right) \bullet \frac{1}{i \bullet \eta_G}$$

The motor speed is:

$$n_{Mot,\,i} = n_{Last,\,i} \bullet i$$

The effective torque is obtained as follows:

$$M_{Mot,\,eff} = \sqrt{\frac{\sum M_{Mot,\,i}^2 \bullet \Delta t_i}{T}}$$

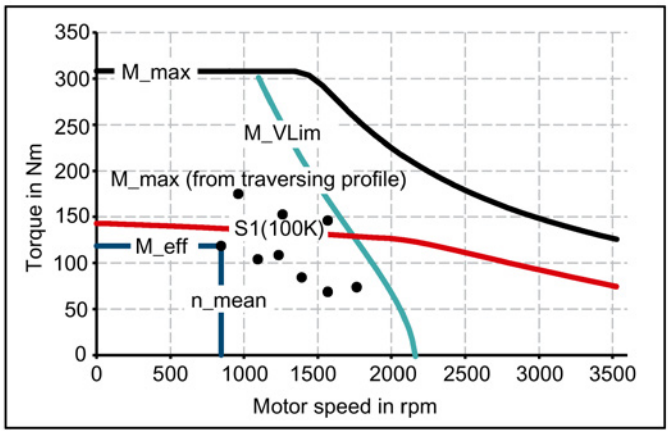
The average motor speed is calculated as follows:

$$n_{Mot,\,mittel} = \frac{\sum \frac{n_{Mot,\,i,\,A} + n_{Mot,\,i,\,E}}{2} \bullet \Delta t_i}{T}$$

J_M	Motor moment of inertia
J_G	Gearbox moment of inertia
J_{load}	Load moment of inertia
n_{load}	Load speed
i	Gear ratio
η_G	Gearbox efficiency
M_{load}	Load torque
M_R	Frictional torque
T	Cycle time
A; E	Initial value, final value in time slice Δt_i
t_e	ON duration
Δt_i	Time interval

The effective torque M_{eff} must lie below the S1 characteristic curve.

The maximum torque M_{max} is produced during the acceleration operation. M_{max} must lie below the voltage limiting characteristic curve. In summary, the motor is configured as follows:



M_max	Curve of the maximum torque	S1 (100K)	S1 characteristic curve for 100 K = M_0 (100K)
M_eff	Effective torque	•	Points from the traversing profile
n_mean	Mean speed	M_VLim	Voltage limiting characteristic curve

Figure 5-6 Motor selection for duty cycle (example)

☐ You have defined the characteristic motor values corresponding to the duty cycle.

Specification of the motor

By varying, you can find the motor that satisfies the conditions of the operating mode (duty cycle).

- Determine the motor current at base load. The calculation depends on the type of motor (synchronous motor or induction motor) and the operating mode (duty cycle) used.

  Note

  When configuring according to duty cycle with constant ON duration with overload, the overload current is calculated in relation to the required overload torque.

- Comply with the thermal limits of the motor.
- Configure the other properties of the motor through the available motor options.

5.3 Configuring the gearbox

Overview

- Take into account the following influencing variables when configuring the gearbox:
  - Accelerating torque
  - Continuous torque
  - Number of cycles
  - Cycle type
  - Permissible input speed
  - Mounting position
  - Torsional play
  - Torsional stiffness
  - Radial and axial forces

Note

For reversing operation for servo applications, worm gearboxes are only conditionally suitable.

- Refer to the catalogs from the gearbox manufacturer for technical data.
- Suitable shaft and flange seals must be selected if gearbox oil is in contact with the motor flange.

Dimensioning for S3 duty

When engineering geared drive systems you can use the motor characteristic without reduction. In so doing, take into account the permissible maximum torque and the permissible input speed of the gearbox.

$M_{Mot} = M_{out} / (i \bullet \eta_G)$

Motor and gearbox are assigned as follows: $M_{max, gear} \geq M_{0\ (100\ K)} \bullet i \bullet f$

$M_{max, gear}$	Max. permissible drive torque
$M_{0\ (100\ K)}$	Motor static torque
i	Gear ratio
f	Additional factor $f = f_1 \bullet f_2$

$f_1 = 2$ for motor accelerating torque

$f_2 = 1$ for ≤1000 gearbox switching cycles / h

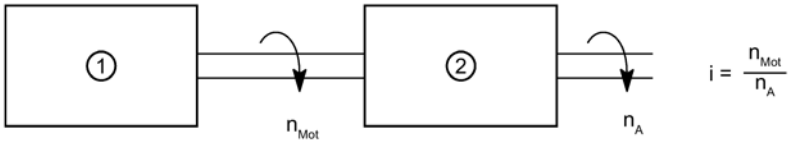
$f_2 > 1$ for > 1000 switching cycles / h (see the gearbox catalog)

e. g. $f_2 = 1.5$ for 3000 switching cycles / h

$f_2 = 1.8$ for 5000 switching cycles / h

$f_2 = 2.0$ for 8000 switching cycles / h

NOTICE
Gearbox failures as a result of superimposed oscillations Switching cycles can also be superimposed oscillations. The safety factor (f_2) is then not adequately dimensioned. This can result in gearbox failures. • Optimize the overall system so that the superimposed oscillations are minimized.



1 Motor
2 Gearbox

Figure 5-7 Configuring the gearbox

The load torque and required starting speed define the gearbox output torque and the output speed - and in turn, the output power.

The required drive power is calculated from this:

P_{Out} /W = P_{Mot} /W • η_G = (π/30) • M_{Mot} /Nm • n_{Mot} /rpm • η_G

Dimensioning for S1 duty

The gearbox itself generates heat due to friction and acts as a thermal barrier preventing heat from being dissipated through the motor flange. This is the reason that you must reduce the torque for S1 duty.

The required motor torque is calculated as follows:

$$M_{Mot} = \sqrt{\left(\frac{M_{ab}}{i \cdot \eta_G} + M_V\right)^2 - M_V^2} \quad \text{mit} \quad M_V = a \cdot b \cdot \frac{n_{Mot}}{60}\left(1 - \eta_G\right) \cdot \frac{k_T^2}{R_{Strw}}$$

M_{Mot} / Nm	Motor torque
M_V / Nm	Theoretical "Torque loss"
a	π/3 for 1FT7/1FK7 motors supplied with sinusoidal current
b	Weighting factor for gearbox losses (without dimensions); b = 0.5
η_G	Gearbox efficiency
i	Gearbox ratio (i > 1)
k_T / Nm/A	Torque constant
M_{Out} / Nm	Gearbox output torque
n_{Out} / rpm	Gearbox output speed

n_{Mot} / rpm	Motor speed
R_{Phw} / Ω	Motor phase resistance when warm; R_{Phw} = 1.4 • R_{Ph} (see Chapter "Technical data and characteristics")
P_{Out} / W	Gearbox output power
P_{Mot} / W	Motor power
π	pi = 3.1416

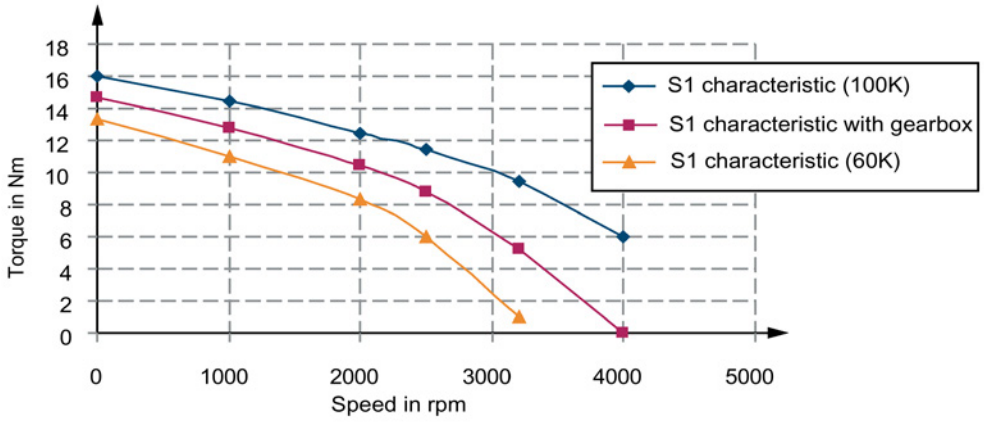


Figure 5-8 Example: 1FK7083 with angled gearbox (characteristic)

Note relating to additional characteristics: $S1_{gearbox} = S1_{100K} - (S1_{100K} - S1_{60K}) / 2$

Starting response of a motor with mounted gearbox

Note

When commissioning, increased currents can be drawn as a result of the lubricating characteristics (inadequate distribution of oil or grease) - and the running-in behavior of the shaft sealing rings.

5.4 Output coupling

NOTICE
Motor damage caused by rotating forces Output couplings, especially stiff metal bellows-type couplings can exercise rotating forces on the shaft. These forces can result in bearing motion and in turn damage the motor. • Rotating forces are not permissible.

To achieve optimum output characteristics, we recommend ROTEX® GS couplings from the KTR company.

The advantages of ROTEX® GS couplings are as follows:

- 2 to 4x torsional stiffness of a belt gearbox
- No teeth meshing (when compared to a belt gearbox)
- Low moment of inertia
- Good closed-loop control response

KTR can provide support when selecting the coupling, see http://www.ktr.com

5.5 Brake resistances (armature short-circuit braking)

5.5.1 Description of function braking resistor

The motor cannot be electrically braked if, for converters

- The permissible DC link voltage values are exceeded
- The electronics fails

Then, the motor that is coasting down can only be braked using an armature short circuit.

You can switch the armature short-circuit braking internally via the Motor Module or externally using a contactor circuit with braking resistors.

Armature short-circuit braking must be initiated at the latest by the limit switch in the traversing range of the feed axis.

NOTICE
Damage to the drive at the end of the traversing range
To avoid mechanical damage, mount mechanical stops at the end of the absolute traversing range.

NOTICE
Destruction of the converter as the armature short-circuit contactor incorrectly switches
Incorrect switching of the armature short-circuiting contactor can erode the contactor contacts and destroy the converter. • Program the converter so that pulses are first canceled and this is actually implemented before an armature short-circuit contactor is closed or opened.

In servo motors with an integrated holding brake, you can produce additional braking torque with the holding brake.

Note

The holding brake is not a working brake to brake a spinning motor. A limited number of EMERGENCY STOP operations is permissible.

Additional information is provided in Chapter "Holding brake (Page 61)".

Note

Braking under normal operating conditions must always be performed via the setpoint input.

For further information, see the configuration manual of the converter.

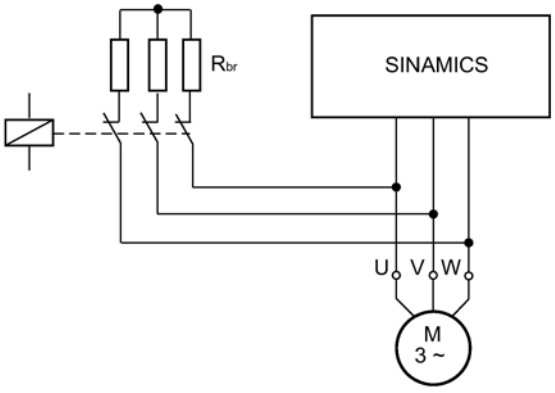


Figure 5-9 Circuit (schematic) with brake resistors

Rating

NOTICE
Destruction of the braking resistors Braking from the rated speed is not permitted any more frequently than every 2 minutes; otherwise the resistors will be destroyed. • Maintain a time interval of at least 2 minutes or longer between braking operations. • When required, specify other braking cycles when ordering.

You can dimension the braking resistor so that a surface temperature of 300 °C can occur briefly (max. 500 ms).

The external moment of inertia and the intrinsic motor moment of inertia are decisive when dimensioning the braking resistors.

When ordering the braking resistors, determine the kinetic energy involved.

Kinetic energy	$W = (\omega^2 \cdot J) / 2$	W / Ws = kinetic energy J / kgm² = moment of inertia
Angular velocity	$\omega = (2 \cdot \pi / 60) \cdot n$	ω / 1/s = angular velocity n / rpm = speed

Coordinate the braking resistor ratings to the I^2t load capability.

Calculating the braking time

The values for calculation are provided in Chapter "Data sheets and characteristics (Page 121)".

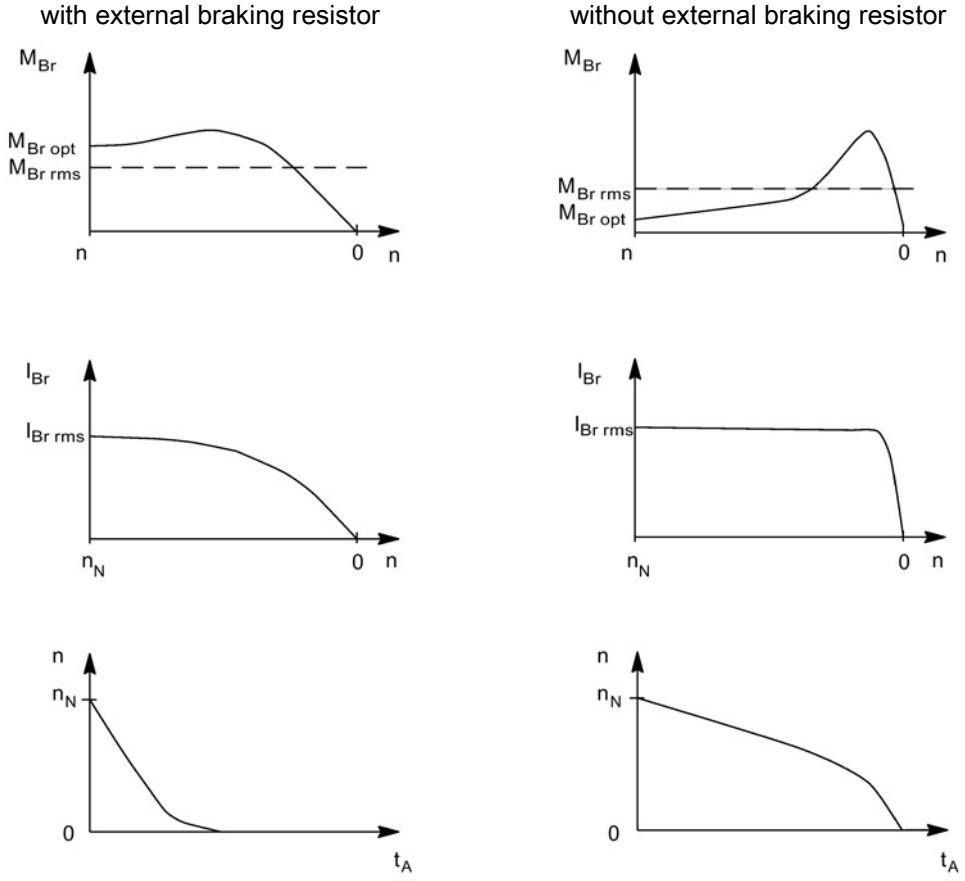
Braking time	$t_B = J_{Tot} \cdot n / 9.55 \cdot M_{Br}$	t_B / s = braking time n / rpm = operating speed M_{Br} / Nm = average braking torque
Moment of inertia	$J_{Tot} = J_{Mot} + J_{Ext}$	J_{Tot} / kgm² = moment of inertia J_{Mot} / kgm² = motor moment of inertia J_{Ext} / kgm² = external moment of inertia

Note

In determining the run-on distance, consider the friction of the mechanical transmission elements (included in the calculation as an allowance in M_B) and the switching delay times of the contactors.

To avoid mechanical damage to the drive, mount mechanical stops at the end of the absolute traversing range of the machine axes.

Armature short-circuit braking



M_{Br} = braking torque
$M_{Br\ rms}$ = average braking torque
$M_{Br\ opt}$ = optimum braking torque
I_{Br} = braking current
$I_{Br\ rms}$ = rms braking current
t_R = run-out time
n = speed
n_N = rated speed

5.5.2 Dimensioning of braking resistors

Dimensioning braking resistors

The correct dimensioning ensures an optimum braking time. The braking torques which are obtained are also listed in the tables. The data is applicable for braking operations from the rated speed and moment of inertia $J_{Ext} = J_{Mot}$.

If the drive is braked from another speed, then the braking time cannot be proportionally reduced.
In this case, calculate the braking time using the formula provided in Chapter "Description of function braking resistor (Page 98)".

If the speed at the start of braking is less than the rated speed, then the braking times are either shorter or remain the same.

The data in the following table is calculated for rated values according to the data sheet. The variance during production as well as iron saturation have not been taken into account here. Higher currents and torques can occur than those calculated as a result of the saturation.

1FK7 Compact

Table 5- 3 Dynamic braking for 1FK7 Compact

Motor type	Braking resistor, external	Average braking torque		Maximum braking torque	rms braking current	
		Without external	With external		Without external	With external
	R_{Opt} / Ω	Braking resistor $M_{br\ rms}$ / Nm	Braking resistor $M_{br\ rms}$ (R_{opt}) / Nm	$M_{br\ max}$ / Nm	Braking resistor $I_{br\ rms}$ / A	Braking resistor $I_{br\ rms}$ (R_{opt}) / A
1FK7032-2AK71	11.3	1.0	1.4	1.8	4.7	4.3
1FK7034-2AK71	11.8	1.5	2.2	2.7	5.8	5.3
1FK7040-2AK71	17.9	0.5	1.0	1.3	3.6	3.2
1FK7042-2AC71	18.2	1.6	2.1	2.7	2.6	2.4
1FK7042-2AF71	17.3	1.3	2.1	2.6	3.5	3.2
1FK7042-2AK71	9.7	0.8	2.1	2.6	7.1	6.4
1FK7060-2AC71	10.0	2.6	4.4	5.5	5.4	4.9
1FK7060-2AF71	8.2	2.1	4.4	5.5	7.7	6.9
1FK7060-2AH71	6.5	1.6	4.4	5.5	11.0	9.8
1FK7062-2AC71	15.5	3.6	6.6	8.2	5.4	4.9
1FK7062-2AF71	8.0	2.8	6.6	8.2	9.7	8.7
1FK7062-2AH71	5.5	2.1	6.5	8.1	14.5	13.0
1FK7063-2AC71	6.7	4.7	8.8	10.9	9.7	8.7
1FK7063-2AF71	4.7	3.7	8.8	11.0	14.6	13.1
1FK7063-2AH71	3.3	2.8	8.7	10.8	21.7	19.5
1FK7080-2AF71	9.8	2.1	5.9	7.3	8.4	7.5
1FK7080-2AH71	6.5	1.6	5.9	7.3	12.9	11.6
1FK7081-2AC71	8.6	4.1	9.3	11.6	9.0	8.1
1FK7081-2AF71	4.4	3.2	9.3	11.6	15.8	14.2
1FK7081-2AH71	3.0	2.4	9.4	11.7	23.9	21.4
1FK7083-2AC71	4.7	5.9	13.7	17.1	14.9	13.3
1FK7083-2AF71	4.0	4.6	13.8	17.1	20.2	18.1
1FK7083-2AH71	2.9	3.3	13.6	17.0	29.7	26.6
1FK7084-2AC71	4.4	7.3	17.7	21.9	17.4	15.6
1FK7084-2AF71	3.4	5.5	17.6	21.9	24.9	22.3
1FK7100-2AC71	4.8	5.2	13.8	17.1	15.0	13.4
1FK7100-2AF71	4.3	4.0	13.7	17.1	19.7	17.6
1FK7101-2AC71	3.2	8.2	22.5	28.0	23.4	21.0
1FK7101-2AF71	2.1	6.1	22.4	27.9	36.4	32.6
1FK7103-2AC71	3.0	10.3	30.5	37.9	28.2	25.3
1FK7103-2AF71	1.4	7.9	30.6	38.0	51.4	46.0
1FK7105-2AC71	1.7	17.9	50.6	62.8	48.2	43.1
1FK7105-2AF71	1.1	13.3	50.2	62.4	70.0	66.2

Table 5- 4 Dynamic braking for 1FK7 Compact connected to a Power Module 1 AC 230 V

Motor type	Braking resistor, external	Average braking torque		Maximum braking torque	rms braking current	
		Without external Braking resistor	With external Braking resistor		Without external Braking resistor	With external Braking resistor
	R_{Opt} / Ω	$M_{br\ rms}$ / Nm	$M_{br\ rms}$ (R_{opt}) / Nm	$M_{br\ max}$ / Nm	$I_{br\ rms}$ / A	$I_{br\ rms}$ (R_{opt}) / A
1FK7032-2AF21	3.5	1.2	1.3	1.7	4.3	4.0
1FK7034-2AF21	3.3	2.1	2.2	2.8	5.9	5.5
1FK7042-2AF21	3.6	1.9	2.8	3.4	8.4	7.6

1FK7 High Dynamic

Table 5- 5 Dynamic braking for 1FK7 High Dynamic

Motor type	Braking resistor, external	Average braking torque		Maximum braking torque	rms braking current	
		Without external Braking resistor	With external Braking resistor		Without external Braking resistor	With external Braking resistor
	R_{Opt} / Ω	$M_{br\ rms}$ / Nm	$M_{br\ rms}$ (R_{opt}) / Nm	$M_{br\ max}$ / Nm	$I_{br\ rms}$ / A	$I_{br\ rms}$ (R_{opt}) / A
1FK7033-4CK71	17.2	0.5	0.9	1.1	3.3	3.0
1FK7043-4CH71	8.4	1.1	2.6	3.3	7.3	6.5
1FK7043-4CK71	6.3	0.9	2.6	3.3	9.9	8.8
1FK7044-4CF71	7.4	1.7	3.4	4.2	7.0	6.3
1FK7044-4CH71	6.4	1.4	3.4	4.2	9.5	8.5
1FK7061-4CF71	9.7	0.7	2.5	3.1	5.6	5.0
1FK7061-4CH71	7.2	0.5	2.5	3.1	8.1	7.2
1FK7064-4CC71	6.2	1.7	5.0	6.2	8.0	7.2
1FK7064-4CF71	5.3	1.3	5.1	6.3	10.8	9.7
1FK7064-4CH71	4.2	1.0	5.0	6.3	15.0	13.4
1FK7085-4CC71	3.8	3.2	10.3	12.8	14.8	13.2
1FK7085-4CF71	2.2	2.4	10.3	12.8	24.0	21.5
1FK7086-4CC71	3.1	7.4	21.3	26.5	23.2	20.7
1FK7086-4CF71	1.8	5.6	21.1	26.3	37.6	33.6

Table 5- 6 Dynamic braking for 1FK7 High Dynamic connected to a Power Module 1 AC 230 V

Motor type	Braking resistor, external	Average braking torque		Maximum braking torque	rms braking current	
		Without external Braking resistor	With external Braking resistor		Without external Braking resistor	With external Braking resistor
	R_{Opt} / Ω	$M_{br\ rms}$ / Nm	$M_{br\ rms}$ (R_{opt}) / Nm	$M_{br\ max}$ / Nm	$I_{br\ rms}$ / A	$I_{br\ rms}$ (R_{opt}) / A
1FK7033-4CF21	6.9	0.7	0.9	1.1	3.3	3.0
1FK7043-4CF21	5.2	1.4	2.6	3.3	7.3	6.5

1FK7 High Inertia

Table 5- 7 Dynamic braking for 1FK7 High Inertia

Motor type	Braking resistor, external	Average braking torque		Maximum braking torque	rms braking current	
		Without external Braking resistor	With external Braking resistor		Without external Braking resistor	With external Braking resistor
	R_{Opt} / Ω	$M_{br\ rms}$ / Nm	$M_{br\ rms}$ (R_{opt}) / Nm	$M_{br\ max}$ / Nm	$I_{br\ rms}$ / A	$I_{br\ rms}$ (R_{opt}) / A
1FK7042-3BK71	9.7	0.8	2.1	2.6	7.1	6.4
1FK7060-3BF71	8.2	2.1	4.4	5.5	7.7	6.9
1FK7062-3BF71	8.0	2.8	6.6	8.2	9.7	8.7
1FK7081-3BF71	4.4	3.2	9.3	11.6	15.8	14.2
1FK7084-3BC71	4.4	7.3	17.7	21.9	17.4	15.6
1FK7084-3BF71	3.4	5.5	17.6	21.9	24.9	22.3
1FK7100-3BC71	4.8	5.2	13.8	17.1	15.0	13.4
1FK7101-3BC71	3.2	8.2	22.5	28.0	23.4	21.0
1FK7101-3BF71	2.1	6.1	22.4	27.9	36.4	32.6
1FK7103-3BC71	3.0	10.3	30.5	37.9	28.2	25.3
1FK7103-3BF71	1.4	7.9	30.6	38.0	51.4	46.0
1FK7105-3BC71	1.7	17.9	50.6	62.8	48.2	43.1

Technical data and characteristics

6

6.1 Explanations

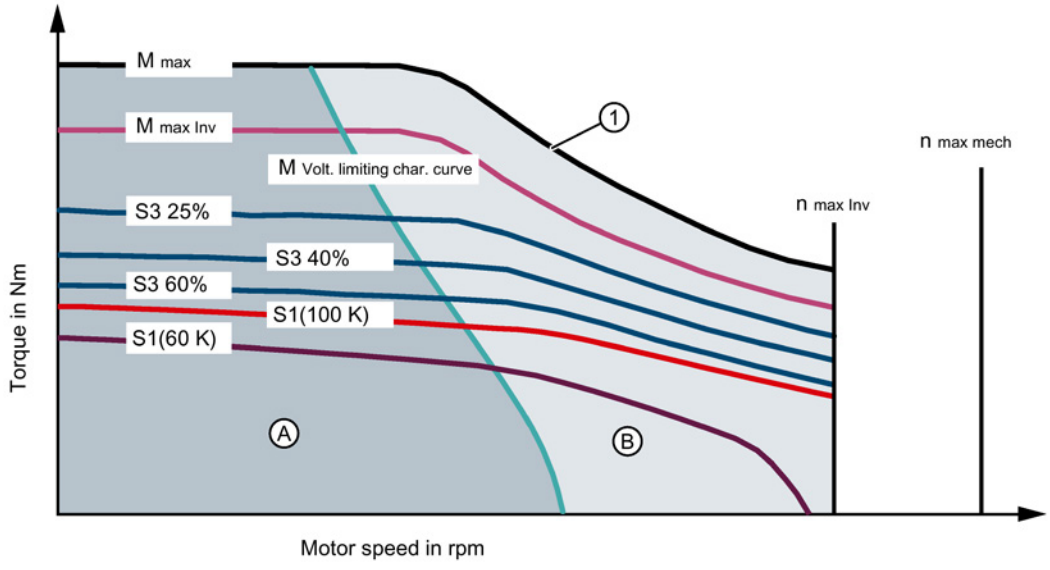
Permissible operating range

The permissible operating range is limited by thermal, mechanical, and electromagnetic boundaries. The data in this documentation is valid for self-cooled motors up to an ambient temperature of 40 °C.

The temperature rise of the motor is caused by the losses generated in the motor (current-dependent losses, no-load losses, friction losses). The utilization of the motor depends on the cooling method (naturally cooled, forced ventilation, liquid-cooled). To maintain the temperature limits, the permissible torque – starting from static torque M_0 – decreases as the speed increases.

Permissible temperature range, characteristics S1(100 K) and S1(60 K)

1FK7 motors can be operated up to an average winding temperature of 145 °C.



$M_{Volt\ lim}$	Voltage limit characteristic without field weakening
1	Voltage limit characteristic with field weakening
A	Without field weakening
B	Field weakening range

Figure 6-1 Torque characteristics of synchronous motors

The S1(100K) characteristic indicates the limits of the permissible temperature range for continuous operation. This corresponds to a utilization according to thermal Class F (155 °C).

A lower thermal class can be necessary, if for example

- The enclosure temperature, for safety reasons must be below 90 °C
- The motor temperature rise has a negative impact on the machine

In this case, select the S1(60K) characteristic. The motor now corresponds to thermal class B (130 °C).

NOTICE
Motor damage due to overheating
Continuous operation in the area above the S1 characteristic results in motor overheating and subsequent damage. • Operate the motor within the values of the S1(100K) characteristic).

Periodic intermittent duty, characteristics S3 25 %, S3 40 %, S3 60 % and M_{max}

In periodic intermittent duty, you can apply a higher load to the motor, depending on the ON duration, see also Chapter "Configuring procedure (Page 85)".

Review the S3 characteristics with the 25 %, 40 % and 60 % ON durations.

The cycle time is always 10 minutes. The overtemperature is 100 K.

The exception are small motors, for which a cycle time of one minute is specified and noted in the characteristic curves.

A transient, high overload capacity up to characteristic M_{max} is available over the complete speed range.

Recommended Motor Module

A Motor Module is recommended in Chapter "Motor overview / Assignment Motor modules / Power cables (Page 116)" for each motor in accordance with its stall current. The maximum achievable torque is shown in the characteristic $M_{max\ conv}$.

- When configuring intermittent or overload operation, check whether a larger Motor Module is required to provide the necessary peak current.

Speed limits $n_{max\ mech}$ and $n_{max\ conv}$

The speed range is limited by the following variables:

- The mechanical speed limit $n_{max\ mech}$ (rotor centrifugal forces, bearing service life)
- The electrical speed limit $n_{max\ conv}$ (voltage strength of the converter and/or max. frequency of the converter)

It is not permissible that the maximum permissible speed n_{max} exceeds the mechanical speed limit $n_{max\ mech}$ nor the electrical speed limit $n_{max\ conv}$.

Note

Operating the motors in hazardous zones

Different maximum permissible speeds apply when operated in hazardous zones.

Additional information is provided in Chapter "Use in hazardous zones (options M03 and M39) (Page 67)".

NOTICE

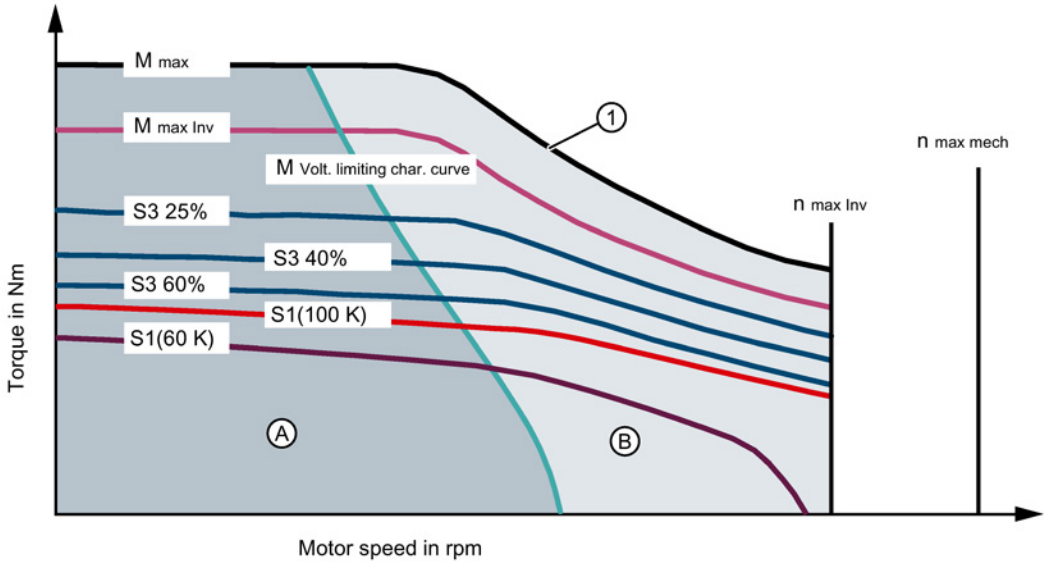
Damage to the converter due to excessively high speeds

A motor speed greater than $n_{max\ conv}$ can induce a voltage in the winding, which is higher than the permissible voltage at the converter. This induced voltage can destroy the converter.

- Run the motor at speeds $n_{max\ conv}$.

Torque limit when operating on a SINAMICS S110 / S120 with field weakening

The field weakening function is active as standard for the SINAMICS S110 / S120 drive system. A field-weakening current is injected in such a way as to enable operation to the right of or above the voltage limiting characteristic. The shape of the voltage limiting characteristic for field weakening is determined by the winding version (armature circuit) and the magnitude of the converter output voltage.



$M_{Volt\ lim}$ Voltage limit characteristic without field weakening

1 Voltage limit characteristic with field weakening

A Range without field weakening

B Field weakening range

Figure 6-2 Shape of the voltage limiting characteristic with/without field weakening

The characteristics for each winding version are shown in a separate data sheet.

The torque-speed diagrams for different converter output voltages are then assigned to each data sheet:

Table 6- 1 Converter output voltages

Drive system	Infeed module	Line supply voltage	DC link voltage	Output voltage
		U_{Line}	$U_{DC\ link}$	U_{Mot}
SINAMICS S110 / S120 3 AC 380 - 480 V	ALM ALM BLM/SLM BLM/SLM	400 V 480 V 400 V 480 V	600 V 720 V 540 V 650 V	425 V 510 V 380 V 460 V
SINAMICS S110 / S120 1 AC 230 V	AC/AC device	230 V	300 V	180 V

Torque limit when operating on a SINAMICS S110 / S120 without field weakening

It is possible to deactivate the field weakening function with the SINAMICS S110 / S120 drive system. This therefore reduces the operating range that is available.

The shape of the voltage limiting characteristic is determined by the winding version (armature circuit) and the magnitude of the converter output voltage.

The voltage induced in the motor winding increases as the speed increases. The difference between the DC link voltage of the converter and the induced motor voltage can be used to apply the current.

This limits the magnitude of the current that can be impressed. This causes the torque to drop off quickly at high speeds. All operating points that can be achieved with the motor lie to the left of the voltage limiting characteristic curve shown as a dashed line.

The characteristic curve is shown for each winding version in a separate data sheet. The torque-speed diagrams for different converter output voltages are assigned to each data sheet:

Table 6- 2 Converter output voltages

Drive system	Infeed module	Line supply voltage	DC link voltage	Output voltage
		U_{line}	$U_{DC\ link}$	U_{mot}
SINAMICS S110 / S120 3 AC 380 - 480 V	ALM ALM SLM SLM	400 V 480 V 400 V 480 V	600 V 720 V 540 V 650 V	425 V 510 V 380 V 460 V
SINAMICS S110 / S120 1 AC 230 V	AC/AC device	230 V	300 V	180 V

For different converter output voltages the voltage limiting characteristic curve must be shifted (offset) accordingly. See "Offset of the voltage limit characteristic"

Winding versions

Several winding versions (armature circuits) for different rated speeds n_N are possible within a motor frame size.

Table 6- 3 Code letter, winding version

Rated speed n_N [RPM]	Winding version (10th position of the Article number)
2000	C
3000	F
4500	H
6000	K

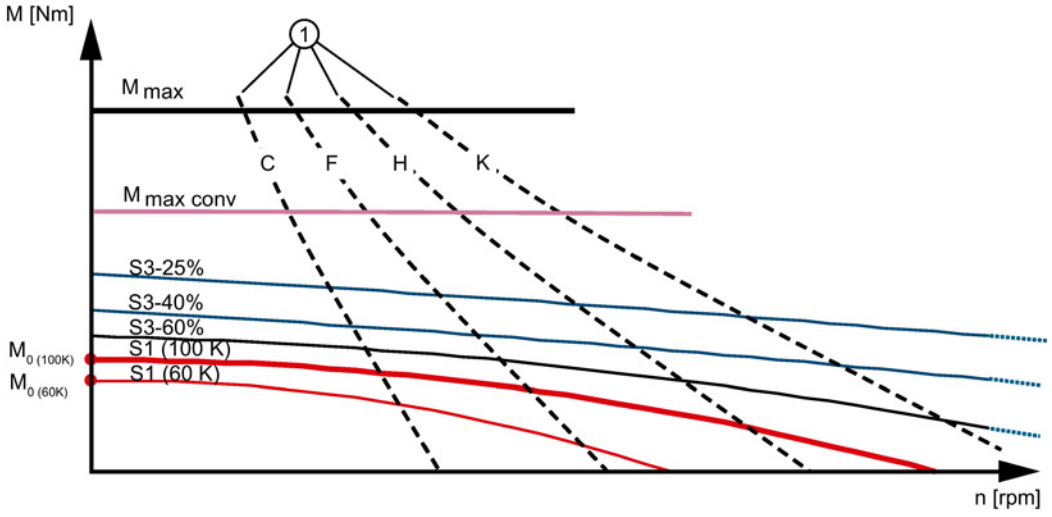


Figure 6-3 Speed-torque diagram

Note

The voltage limit characteristic of a motor with a 6000 rpm rated speed lies far above that of the same motor type with 2000 rpm. However, for the same torque, this motor requires a significantly higher current.

For this reason, you should select the rated speed such that it does not lie too far above the maximum speed required for the application.

The size (rating) of the Motor Module (output current) can be minimized in this fashion

Shift of the voltage limiting characteristic (only relevant when field weakening is deactivated)

The voltage limiting characteristic can only be shifted:

- For approximately linear limiting characteristics
- For $U_{Mot\ new} > U_{IN}$

Determining the induced voltage U_{IN}

You can read-off the induced voltage U_{IN} from the motor rating plate - or you can calculate it using the following formula.

$U_{IN} = k_E \cdot n_N / 1000$

Rated speed n_N / rpm
Voltage constant k_E / V/1000 rpm
U_{IN} / V

Shifting the voltage limiting characteristic by a factor x

If the converter output voltage (U_{Mot}) is not equal to 380 V, 425 V, 460 V or 510 V, then you must shift the voltage limiting characteristic involved for the new output voltage ($U_{Mot, new}$).

$x = U_{Mot\ new} / U_{mot}$

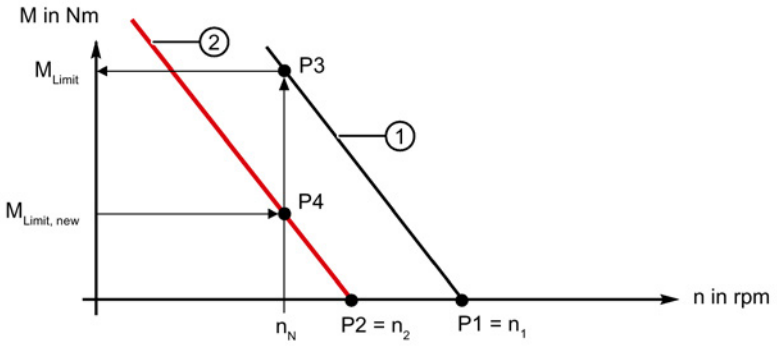
$U_{Mot, new}$ = new converter output voltage / V
U_{Mot} = converter output voltage from the characteristic for 380 V, 425 V, 460 V or 510 V, see Chapter "Explanations (Page 105)"

- Shift the voltage limiting characteristic for an output voltage of $U_{Mot, new}$ on the x axis (speed) by factor x.

Calculating the new torque limit with the new limiting characteristic

Procedure

The variables are graphically shown in the following diagram.



1 Voltage limiting line U_{Mot}

2 New voltage limiting line $U_{Mot\ new}$

Figure 6-4 Shifting the voltage limiting line

Take the values for the variables from the "Technical data" tables for the individual motors, or determine these as described below.

1. Determine P1, the point of intersection of the voltage limiting characteristic on the x axis.
   P1 corresponds to n_1.
   n_1 - calculate this as follows:

$n_1 = U_{Mot} \cdot 1000 / k_E \cdot 0.95$	n_1 / rpm;
	Voltage constant k_E / V/1000 rpm
	Converter output voltage U_{Mot} / V

2. Determine P2, the new point of intersection of the voltage limiting characteristic on the x axis.
   P2 corresponds to n_2.
   n_2 - calculate this as follows:

$n_2 = n_1 \cdot U_{Mot\ new} / U_{Mot}$	n_2 / rpm;
	Converter output voltage $U_{Mot\ new}$ / V

3. Determine P3.
   At rated speed n_N, draw a vertical line upwards to the voltage limiting characteristic.
   P3 is the point of intersection.
4. From point P3, draw a horizontal line to the vertical torque axis.
   At the point of intersection with the vertical torque axis, read-off the torque limit M_{Limit} .
5. Calculate $M_{Limit,\ new}$.

$M_{Limit,\ new} = ((U_{Mot\ new} - U_N) / (U_{Mot} - U_N)) \cdot M_{Limit}$	$M_{Limit,\ new}$ / Nm

   Enter $M_{Limit,\ new}$ on the vertical torque axis.
6. Determine P4.
   Draw a horizontal line from $M_{Limit,\ new}$ to the vertical line from n_N.
   The point of intersection of $M_{Limit,\ new}$ and n_N is P4.
7. You obtain a new voltage limiting characteristic by drawing a straight line through points P2 and P4.

Example for calculating the shift of the voltage limiting characteristic without field weakening

Procedure

For example, motor 1FK7032-2AK71

n_N = 6000 rpm	$U_{Mot\ new}$ = 290 V
k_E = 45 V/1000 rpm	U_{Mot} = 425 V

Determining the condition

$U_{iN} = k_E \bullet n_N/1000$

$U_{iN} = 45 \bullet 6000/1000$

$U_{iN} = 270$ V

$U_{iN} = 270$ V < $U_{Mot\ new} = 290$ V

The condition to shift the voltage limiting characteristic is fulfilled.

Calculating and determining points P1, P2, P3 and P4

P1	n_1 = 425 V • 1000 / 45 • 0.95	n_1 = 9945 rpm
P2	n_2 = 9945 rpm • 290 V / 425 V	n_2 = 6783.6 rpm
P3	Read-off M_{Limit} at n_N = 6000 rpm and U_{Mot} = 425 V: M_{Limit} = approx. 4.9 Nm	
P4	$M_{Limit\ new}$ = ((290 V - 270 V) / (425 V - 270 V)) • 4.9 Nm	$M_{Limit\ new}$ = 0.63 Nm

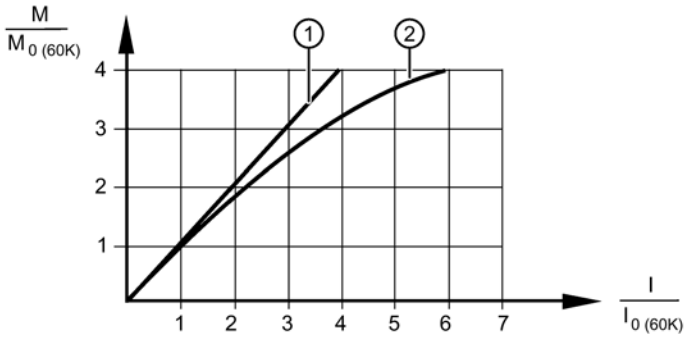
P4 is the point of intersection of $M_{Limit,\ new}$ and n_N. The new voltage limiting characteristic is obtained by connecting P2 and P4.

Enter and connect points P2 and P4.

This line is the new voltage limiting characteristic for $U_{mot,\ new}$ = 290 V.

Typical M/I characteristic

Because of saturation effects, the achievable torque cannot be calculated linearly from the current (particularly at high currents).



1 Best case

2 Worst case

Figure 6-5 Torque-current characteristic curve for self-cooled motors

From M_0 (or I_0), you can calculate the torque or the torque constant as a function of the current using the following formulas:

$k_T(I) = M / I$

Torque constant $k_T(I)$ / Nm/A
Torque M / Nm
Current I / A

$k_T(I) = (M_0 / I_0) + ((I - I_0) / (I_{max} - I_0)) \bullet ((M_{max} / I_{max}) - (M_0 / I_0))$

Static torque M_0 / Nm
Stall current I_0 / A
Maximum torque M_{max} / Nm
Maximum current I_{max} / A

Tolerance data

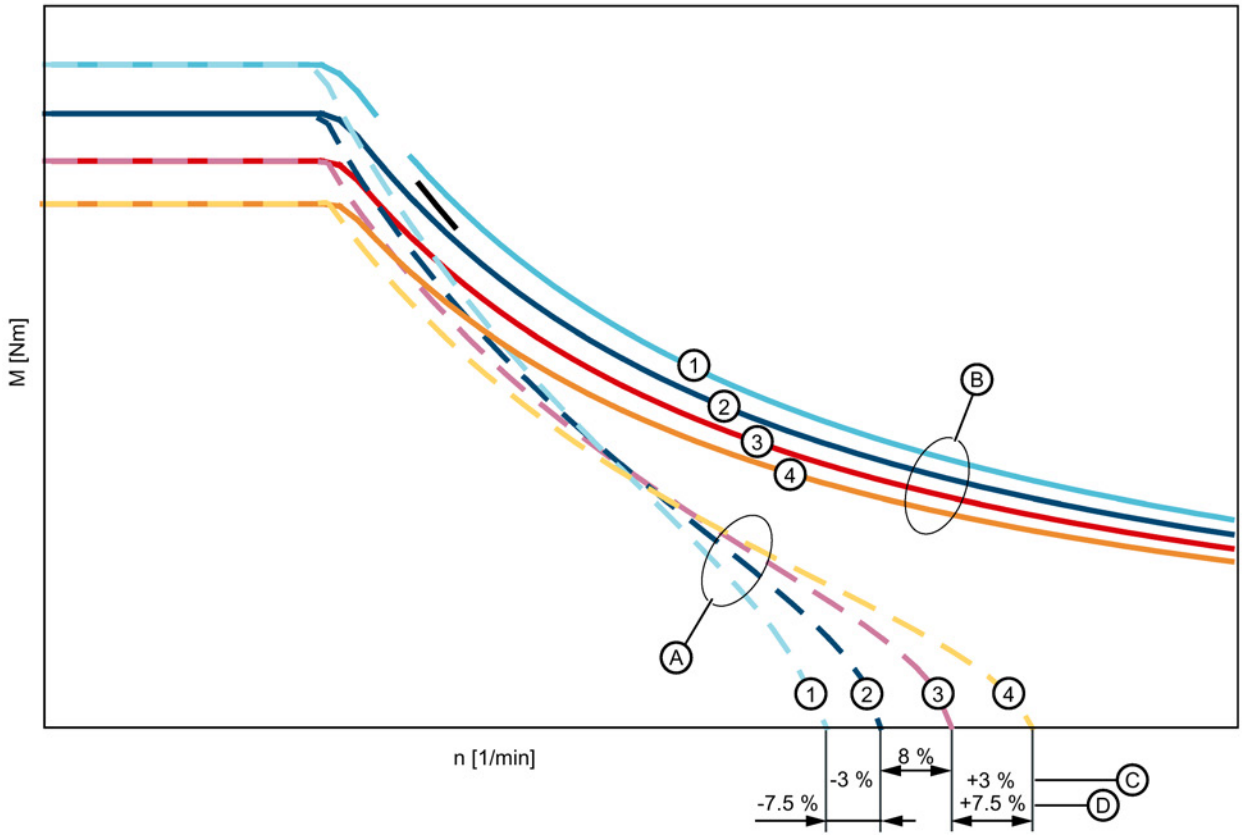
The characteristic data listed in the data sheets are subject to a certain amount of scatter. The following tolerances apply to the characteristic data:

Motor list data		Typ. value	Max. value
Stall 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 %

Tolerance data in the motor list data

Effects of the temperature influence and parameter scatter on the characteristic

The torque-speed characteristics specified in the following chapter relate to the nominal values in the cold state (shown as characteristic 2 in the following diagram).



A	Characteristics without field weakening	1	k_E and k_T - upper tolerance limit (nominal value +7.5 %)
B	Characteristics with field weakening	2	k_E and k_T - nominal value, cold
C	Typical scatter	3	k_E and k_T - nominal value, warm
D	Maximum tolerances	4	k_E and k_T - upper tolerance limit (nominal value -+7.5 %)

Figure 6-6 Effect of scatter

Note

The motor temperature results in a clear displacement of the voltage limiting characteristic in the upper speed range.

- Take into account this shift when engineering your drive (especially for applications in which the cold motor has to operate at maximum speeds) with converter systems without field weakening.

6.2 Motor overview / Assignment Motor modules / Power cables

You can find the matching SINAMICS Motor Modules and MOTION-CONNECT power cables for the 1FK7 on the following pages.

You can find additional information in the "Chapter, "MOTION-CONNECT connection systems" in Catalog D 21.4 (https://intranet.for.siemens.com/org/i-dt-mc/de/motion-control/support/infomaterial/kataloge/d-21-4-sinamics-s120-simotics/Seiten/d-21-4.aspx)".

1FK7 for SINAMICS S120 Booksize, DC link voltage 510 V to 720 V DC, (line voltage 380 V to 480 V, 3 AC)

Example of an Article number (order number) for a SINAMICS Motor Module

The following table describes the options that can be selected for the SINAMICS Motor Module.

Description	Position in the Article number																
	1	2	3	4	5	6	7	-	8	9	10	11	12	-	13	14	15	16
SINAMICS Motor Modules S120 Booksize (example)	6	S	L	3	1	2	0	-										
	Single Motor Module								1									
	Double Motor Module								2									
										T	E	2	1	-	0	A	D	
											Version release							❑

Example of an Article number (order number) for a MOTION-CONNECT power cable

The following table describes the options that can be selected for a MOTION-CONNECT power cable between the motor and the converter.

Description	Position in the Article number																	
	1	2	3	4	5	6	7	-	8	9	10	11	12	-	13	14	15	16
MOTION-CONNECT power cable (example)	6	F	X															
MOTION-CONNECT 500				5														
MOTION-CONNECT 800 PLUS				8														
					0	0	2	-	5									
	Without brake cables									C								
	With brake cables									D								
											N	0	6	-				
									Length codes						❑	❑	❑	❑

You can find additional information on the length codes in Chapter, "MOTION-CONNECT connection systems" in Catalog D 21.4 (https://intranet.for.siemens.com/org/i-dt-mc/de/motion-control/support/infomaterial/kataloge/d-21-4-sinamics-s120-simotics/Seiten/d-21-4.aspx).

SINAMICS S120 Booksize, DC link voltages 510 V to 720 V DC, (line voltages, 3 AC 380 V to 480 V)

You can find the matching SINAMICS Motor Modules and MOTION-CONNECT power cables in the following tables.

Table 6- 4 1FK7 Compact

Motor			Converter: SINAMICS S120 Booksize			Power cable
Order number	$M_{0\,(100K)}$ / Nm	Plug connector size / cable cross-section	Order number	Base load current I_H / A	$M_{max\,(100K)}$ / Nm	Order number
1FK7032-2AK7	1.15	1 / 4x1.5	6SL3120-❑TE13-0AD❑	3	4.5	6FX❑002-5❑N06-❑❑❑❑
1FK7034-2AK7	1.6	1 / 4x1.5	6SL3120-❑TE13-0AD❑	3	6.5	6FX❑002-5❑N06-❑❑❑❑
1FK7040-2AK7	1.6	1 / 4x1.5	6SL3120-❑TE13-0AD❑	3	5.1	6FX❑002-5❑N06-❑❑❑❑
1FK7042-2AC7	3	1 / 4x1.5	6SL3120-❑TE13-0AD❑	3	10.5	6FX❑002-5❑N06-❑❑❑❑
1FK7042-2AF7	3	1 / 4x1.5	6SL3120-❑TE13-0AD❑	3	10.5	6FX❑002-5❑N06-❑❑❑❑
1FK7042-2AK7	3	1 / 4x1.5	6SL3120-❑TE15-0AD❑	5	10.3	6FX❑002-5❑N06-❑❑❑❑
1FK7060-2AC7	6	1 / 4x1.5	6SL3120-❑TE13-0AD❑	3	15.9	6FX❑002-5❑N06-❑❑❑❑
1FK7060-2AF7	6	1 / 4x1.5	6SL3120-❑TE15-0AD❑	5	18	6FX❑002-5❑N06-❑❑❑❑
1FK7060-2AH7	6	1 / 4x1.5	6SL3120-❑TE21-0AD❑	9	18	6FX❑002-5❑N06-❑❑❑❑
1FK7062-2AC7	8.5	1 / 4x1.5	6SL3120-❑TE13-0AD❑	3	22.9	6FX❑002-5❑N06-❑❑❑❑
1FK7062-2AF7	8.5	1 / 4x1.5	6SL3120-❑TE15-0AD❑	5	22.1	6FX❑002-5❑N06-❑❑❑❑
1FK7062-2AH7	8.5	1 / 4x1.5	6SL3120-❑TE21-0AD❑	9	24.8	6FX❑002-5❑N06-❑❑❑❑
1FK7063-2AC7	11	1 / 4x1.5	6SL3120-❑TE15-0AD❑	5	29.5	6FX❑002-5❑N06-❑❑❑❑
1FK7063-2AF7	11	1 / 4x1.5	6SL3120-❑TE21-0AD❑	9	34	6FX❑002-5❑N06-❑❑❑❑
1FK7063-2AH7	11	1 / 4x1.5	6SL3120-❑TE21-8AD❑	18	35	6FX❑002-5❑N06-❑❑❑❑
1FK7080-2AF7	8	1 / 4x1.5	6SL3120-❑TE15-0AD❑	5	22.1	6FX❑002-5❑N06-❑❑❑❑
1FK7080-2AH7	8	1 / 4x1.5	6SL3120-❑TE21-0AD❑	9	24.7	6FX❑002-5❑N06-❑❑❑❑
1FK7081-2AC7	12	1 / 4x1.5	6SL3120-❑TE15-0AD❑	5	33.3	6FX❑002-5❑N06-❑❑❑❑
1FK7081-2AF7	12	1 / 4x1.5	6SL3120-❑TE21-0AD❑	9	34.1	6FX❑002-5❑N06-❑❑❑❑
1FK7081-2AH7	12	1 / 4x1.5	6SL3120-❑TE21-8AD❑	18	37	6FX❑002-5❑N06-❑❑❑❑
1FK7083-2AC7	16	1 / 4x1.5	6SL3120-❑TE21-0AD❑	9	49.3	6FX❑002-5❑N06-❑❑❑❑
1FK7083-2AF7	16	1 / 4x1.5	6SL3120-❑TE21-8AD❑	18	40	6FX❑002-5❑N06-❑❑❑❑
1FK7083-2AH7	16	1 / 4x1.5	6SL3120-❑TE21-8AD❑	18	49.3	6FX❑002-5❑N06-❑❑❑❑
1FK7084-2AC7	20	1 / 4x1.5	6SL3120-❑TE21-0AD❑	9	58.4	6FX❑002-5❑N06-❑❑❑❑
1FK7084-2AF7	20	1 / 4x1.5	6SL3120-❑TE21-8AD❑	18	61	6FX❑002-5❑N06-❑❑❑❑
1FK7100-2AC7	18	1 / 4x1.5	6SL3120-❑TE21-0AD❑	9	53.4	6FX❑002-5❑N06-❑❑❑❑
1FK7100-2AF7	18	1 / 4x1.5	6SL3120-❑TE21-8AD❑	18	55	6FX❑002-5❑N06-❑❑❑❑
1FK7101-2AC7	27	1.5 / 4x1.5	6SL3120-❑TE21-8AD❑	18	80	6FX❑002-5❑N26-❑❑❑❑
1FK7101-2AF7	27	1.5 / 4x2.5	6SL3120-❑TE21-8AD❑	18	72	6FX❑002-5❑N36-❑❑❑❑
1FK7103-2AC7	36	1.5 / 4x1.5	6SL3120-❑TE21-8AD❑	18	108	6FX❑002-5❑N26-❑❑❑❑
1FK7103-2AF7	36	1.5 / 4x4	6SL3120-1TE23-0AD❑	30	77	6FX❑002-5❑N46-❑❑❑❑
1FK7105-2AC7	48	1.5 / 4x2.5	6SL3120-1TE23-0AD❑	30	126	6FX❑002-5❑N36-❑❑❑❑
1FK7105-2AF7	48	1.5 / 4x6	6SL3120-1TE23-0AD❑	30	87	6FX❑002-5❑N56-❑❑❑❑

Table 6- 5 1FK7 High Inertia

Motor			Converter: SINAMICS S120 Booksize			Power cable
Order number	$M_{0\,(100K)}$ / Nm	Plug connector size / cable cross-section	Order number	Base load current I_H / A	$M_{max\,(100K)}$ / Nm	Order number
1FK7042-3BK7	3	1 / 4x1.5	6SL3120-❑TE15-0AD❑	5	10.3	6FX❑002-5❑N06-❑❑❑❑
1FK7060-3BF7	6	1 / 4x1.5	6SL3120-❑TE15-0AD❑	5	18	6FX❑002-5❑N06-❑❑❑❑
1FK7062-3BF7	8.5	1 / 4x1.5	6SL3120-❑TE15-0AD❑	5	22.1	6FX❑002-5❑N06-❑❑❑❑
1FK7081-3BF7	12	1 / 4x1.5	6SL3120-❑TE21-0AD❑	9	34.1	6FX❑002-5❑N06-❑❑❑❑
1FK7084-3BC7	20	1 / 4x1.5	6SL3120-❑TE21-0AD❑	9	58.4	6FX❑002-5❑N06-❑❑❑❑
1FK7084-3BF7	20	1 / 4x1.5	6SL3120-❑TE21-8AD❑	18	61	6FX❑002-5❑N06-❑❑❑❑
1FK7100-3BC7	18	1 / 4x1.5	6SL3120-❑TE21-0AD❑	9	53.4	6FX❑002-5❑N06-❑❑❑❑
1FK7101-3BC7	27	1.5 / 4x1.5	6SL3120-❑TE21-8AD❑	18	80	6FX❑002-5❑N26-❑❑❑❑
1FK7101-3BF7	27	1.5 / 4x2.5	6SL3120-❑TE21-8AD❑	18	72	6FX❑002-5❑N36-❑❑❑❑
1FK7103-3BC7	36	1.5 / 4x1.5	6SL3120-❑TE21-8AD❑	18	108	6FX❑002-5❑N26-❑❑❑❑
1FK7103-3BF7	36	1.5 / 4x4	6SL3120-1TE23-0AD❑	30	77	6FX❑002-5❑N46-❑❑❑❑
1FK7105-3BC7	48	1.5 / 4x2.5	6SL3120-1TE23-0AD❑	30	126	6FX❑002-5❑N36-❑❑❑❑

Table 6- 6 1FK7 High Dynamic

Motor			Converter: SINAMICS S120 Booksize			Power cable
Order number	$M_{0\,(100K)}$ / Nm	Plug connector size / cable cross-section	Order number	Base load current I_H / A	$M_{max\,(100K)}$ / Nm	Order number
1FK7033-4CK7	1.3	1 / 4x1.5	6SL3120-❑TE13-0AD❑	3	4.3	6FX❑002-5❑N06-❑❑❑❑
1FK7043-4CH7	3.5	1 / 4x1.5	6SL3120-❑TE15-0AD❑	5	10	6FX❑002-5❑N06-❑❑❑❑
1FK7043-4CK7	3.5	1 / 4x1.5	6SL3120-❑TE21-0AD❑	9	10	6FX❑002-5❑N06-❑❑❑❑
1FK7044-4CF7	4.5	1 / 4x1.5	6SL3120-❑TE15-0AD❑	5	13	6FX❑002-5❑N06-❑❑❑❑
1FK7044-4CH7	4.5	1 / 4x1.5	6SL3120-❑TE21-0AD❑	9	13	6FX❑002-5❑N06-❑❑❑❑
1FK7061-4CF7	6.4	1 / 4x1.5	6SL3120-❑TE21-0AD❑	9	17.3	6FX❑002-5❑N06-❑❑❑❑
1FK7061-4CH7	6.4	1 / 4x1.5	6SL3120-❑TE21-0AD❑	9	17.3	6FX❑002-5❑N06-❑❑❑❑
1FK7064-4CC7	12	1 / 4x1.5	6SL3120-❑TE21-0AD❑	9	32	6FX❑002-5❑N06-❑❑❑❑
1FK7064-4CF7	12	1 / 4x1.5	6SL3120-❑TE21-8AD❑	18	32	6FX❑002-5❑N06-❑❑❑❑
1FK7064-4CH7	12	1 / 4x1.5	6SL3120-❑TE21-8AD❑	18	32	6FX❑002-5❑N06-❑❑❑❑
1FK7085-4CC7	22	1 / 4x1.5	6SL3120-❑TE21-8AD❑	18	65	6FX❑002-5❑N06-❑❑❑❑
1FK7085-4CF7	22	1.5 / 4x4	6SL3120-1TE23-0AD❑	30	51	6FX❑002-5❑N46-❑❑❑❑
1FK7086-4CC7	28	1 / 4x1.5	6SL3120-❑TE21-8AD❑	18	90	6FX❑002-5❑N06-❑❑❑❑
1FK7086-4CF7	28	1.5 / 4x4	6SL3120-1TE23-0AD❑	30	66	6FX❑002-5❑N46-❑❑❑❑

Table 6- 7 1FK7 High Dynamic, force ventilated

Motor			Converter: SINAMICS S120 Booksize			Power cable
Order number	$M_{0\,(100K)}$ / Nm	Plug connector size / cable cross-section	Order number	Base load current I_H / A	$M_{max\,(100K)}$ / Nm	Order number
1FK7086-4SF7	38	1.5 / 4x6	6SL3120-1TE23-0AD❑	30	66	6FX❑002-5❑N56-❑❑❑❑

1FK7 for SINAMICS S120 Blocksize, PM240-2 Power Modules, DC link voltage 270 V to 330 V DC, (line voltage, 1 AC 200 V to 240 V)

Example of an Article number (order number) for a SINAMICS Motor Module

The following table describes the options that can be selected for the SINAMICS Motor Module.

Description	Position in the Article number																
	1	2	3	4	5	6	7	-	8	9	10	11	12	-	13	14	15	16
SINAMICS S120 Blocksize / PM 240-2 (example)	6	S	L	3	2	1	0	-										
									1	P	B	1	3	-	0			
	Line filter								Without							U		
									Integrated							A		
																	L	
											Version release							❑

Example of an Article number (order number) for a MOTION-CONNECT power cable

The following table describes the options that can be selected for a MOTION-CONNECT power cable between the motor and the converter.

Description	Position in the Article number																	
	1	2	3	4	5	6	7	-	8	9	10	11	12	-	13	14	15	16
MOTION-CONNECT power cable (example)	6	F	X															
MOTION-CONNECT 500				5														
MOTION-CONNECT 800 PLUS				8														
					0	0	2	-	5									
	Without brake cables									C								
	With brake cables									D								
	Connector size, connector type (SPEED-CONNECT / full thread), conductor cross-section										G	1	0	-				
									Length codes						❑	❑	❑	❑

You can find additional information on the length codes in Chapter, "MOTION-CONNECT connection systems" in Catalog D 21.4 (https://intranet.for.siemens.com/org/i-dt-mc/de/motion-control/support/infomaterial/kataloge/d-21-4-sinamics-s120-simotics/Seiten/d-21-4.aspx).

SINAMICS S120 Blocksize, PM240-2 Power Modules, DC link voltage 270 V to 330 V DC, (line voltage 1 AC 200 V to 240 V)

You can find the matching SINAMICS Motor Modules and MOTION-CONNECT power cables in the following tables.

Table 6- 8 1FK7 Compact

Motor			Converter: SINAMICS S120 Blocksize PM240-2 Power Modules			Power cable
Order number	$M_{0\,(100K)}$ / Nm	Plug connector size / cable cross-section	Order number	Base load current I_H / A	$M_{max\,(100K)}$ / Nm	Order number
1FK7032-2AF2	1.15	1 / 4x1.5	6SL3210-1PB13-0❑L0	3	4.2	6FX❑002-5❑G10-❑❑❑❑
1FK7034-2AF2	1.6	1 / 4x1.5	6SL3210-1PB13-0❑L0	3	5.2	6FX❑002-5❑G10-❑❑❑❑
1FK7042-2AF2	3	1 / 4x1.5	6SL3210-1PB15-5❑L0	5.5	8.3	6FX❑002-5❑G10-❑❑❑❑

Table 6- 9 1FK7 High Dynamic

Motor			Converter: SINAMICS S120 Blocksize PM240-2 Power Modules			Power cable
Order number	$M_{0\,(100K)}$ / Nm	Plug connector size / cable cross-section	Order number	Base load current I_H / A	$M_{max\,(100K)}$ / Nm	Order number
1FK7033-4CF2	1.3	1 / 4x1.5	6SL3210-1PB13-0❑L0	3	3.7	6FX❑002-5❑G10-❑❑❑❑
1FK7043-4CF2	3.3	1 / 4x1.5	6SL3210-1PB15-5❑L0	5.5	9.3	6FX❑002-5❑G10-❑❑❑❑

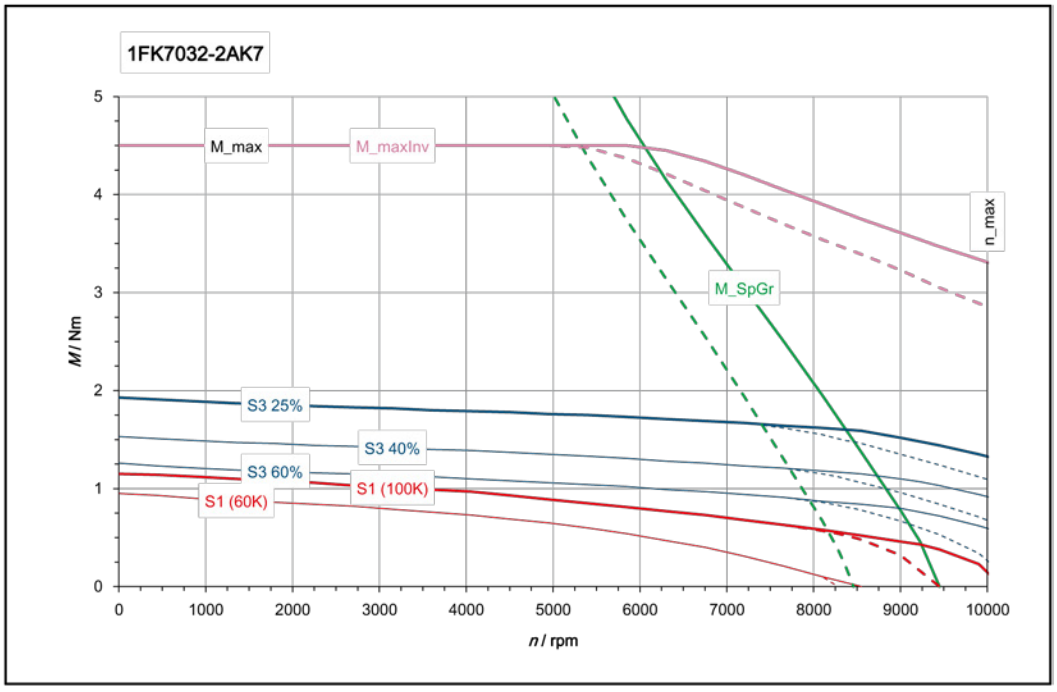
6.3 Data sheets and characteristics

6.3.1 1FK7 Compact - naturally cooled

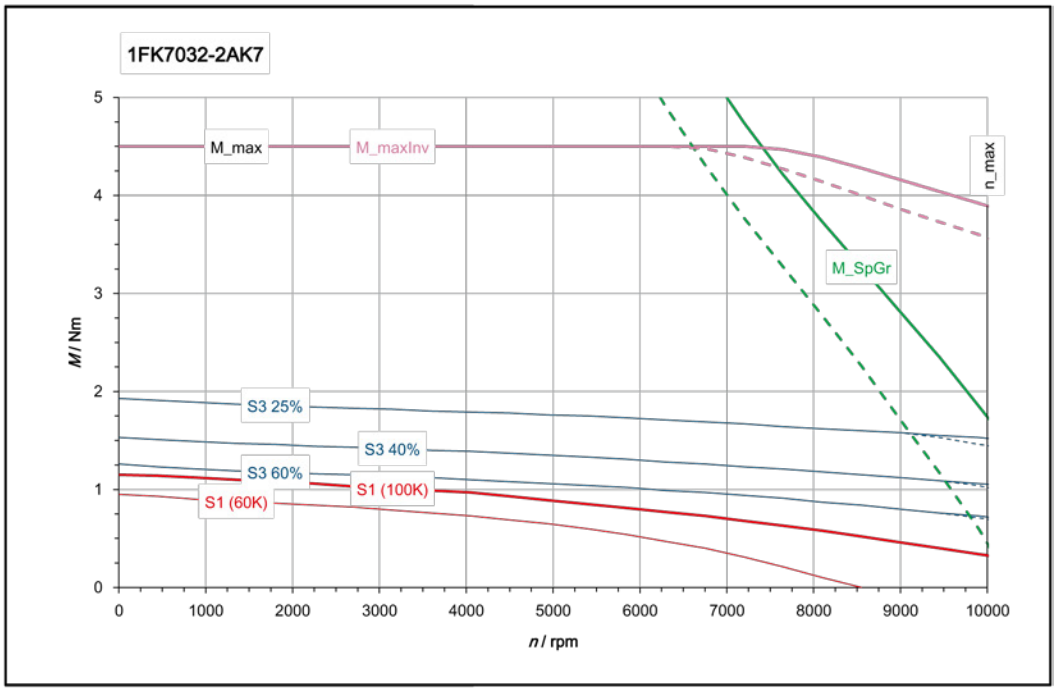
6.3.1.1 1FK7032-2A_

1FK7032-2AK7 three-phase servomotor			
Technical data	**Symbol**	**Unit**	**Value**
Configuration data:			
Rated speed	n_N	rpm	6000
Rated torque (100 K)	$M_{N(100K)}$	Nm	0.8
Rated current (100 K)	$I_{N(100K)}$	A	1.3
Static torque (100 K)	$M_{0(100K)}$	Nm	1.15
Stall current (100 K)	$I_{0(100K)}$	A	1.7
Static torque (60 K)	$M_{0(60K)}$	Nm	0.95
Stall current (60 K)	$I_{0(60K)}$	A	1.4
Optimum operating point:			
Optimum speed	n_{opt}	rpm	6000
Optimum power	P_{opt}	kW	0.5
Limit data:			
Max. permissible speed (mech.)	$n_{max\ mech}$	rpm	10000
Maximum torque	M_{max}	Nm	4.5
Maximum current	I_{max}	A	7
Motor data:			
Number of poles	2p		6
Torque constant (100K)	k_T	Nm/A	0.67
Voltage constant (at 20°C)	k_E	V/1000rpm	45
Winding resistance (at 20°C)	R_{ph}	Ω	5.05
Rotating field inductance	L_D	mH	17.3
Electrical time constant	T_{el}	ms	3.45
Mechanical time constant	T_{mech}	ms	2.2
Thermal time constant	T_{th}	min	25
Moment of inertia	J_{Mot}	10^{-4} kgm²	0.65
Shaft torsional stiffness	c_t	Nm/rad	6000
Weight	m_{Mot}	kg	2.7
Motor data with integrated brake:			
Moment of inertia (with brake)	$J_{Mot\ withBr}$	10^{-4} kgm²	0.75
Shaft torsional stiffness (with brake)	$c_{t\ withBr}$	Nm/rad	4100
Weight (with brake)	$m_{Mot\ withBr}$	kg	3.1
Recommended Motor Module:			
Rated converter current	$I_{N\ conv}$	A	3
Maximum converter current	$I_{max\ conv}$	A	9
Max. torque (converter operation)	$M_{max\ conv}$	Nm	4.5
Max. permissible speed (converter operation)	$n_{max\ conv}$	rpm	10000

The rated data are valid for a 600 V DC link voltage



[———] SINAMICS ALM 400 V (600 V DC)
[- - - - - -] SINAMICS BLM/SLM 400 V (540 V DC)

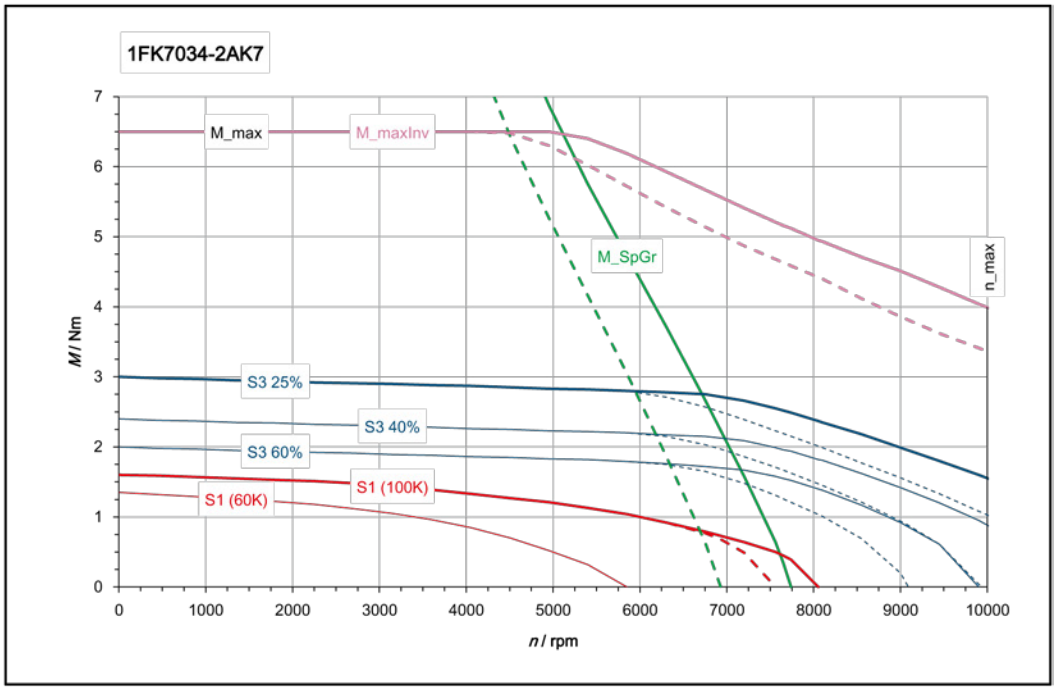


[———] SINAMICS ALM 480 V (720 V DC)
[- - - - - -] SINAMICS BLM/SLM 480 V (650 V DC)

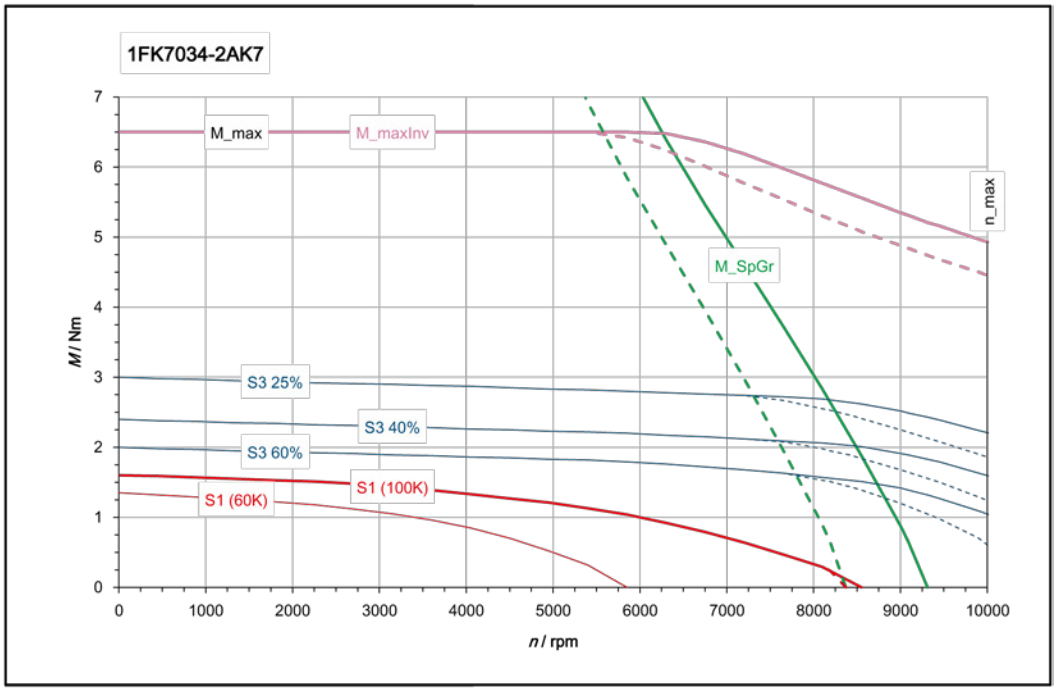
6.3.1.2 1FK7034-2A_

1FK7034-2AK7 three-phase servomotor			
Technical data	**Symbol**	**Unit**	**Value**
Configuration data:			
Rated speed	n_N	rpm	6000
Rated torque (100 K)	$M_{N(100K)}$	Nm	1
Rated current (100 K)	$I_{N(100K)}$	A	1.3
Static torque (100 K)	$M_{0(100K)}$	Nm	1.6
Stall current (100 K)	$I_{0(100K)}$	A	1.9
Static torque (60 K)	$M_{0(60K)}$	Nm	1.35
Stall current (60 K)	$I_{0(60K)}$	A	1.55
Optimum operating point:			
Optimum speed	n_{opt}	rpm	6000
Optimum power	P_{opt}	kW	0.63
Limit data:			
Max. permissible speed (mech.)	$n_{max\ mech}$	rpm	10000
Maximum torque	M_{max}	Nm	6.5
Maximum current	I_{max}	A	8
Motor data:			
Number of poles	2p		6
Torque constant (100K)	k_T	Nm/A	0.84
Voltage constant (at 20°C)	k_E	V/1000rpm	55
Winding resistance (at 20°C)	R_{ph}	Ω	4.46
Rotating field inductance	L_D	mH	17.2
Electrical time constant	T_{el}	ms	3.85
Mechanical time constant	T_{mech}	ms	1.71
Thermal time constant	T_{th}	min	30
Moment of inertia	J_{Mot}	10^{-4} kgm^2	0.9
Shaft torsional stiffness	c_t	Nm/rad	5300
Weight	m_{Mot}	kg	3.5
Motor data with integrated brake:			
Moment of inertia (with brake)	$J_{Mot\ withBr}$	10^{-4} kgm^2	1
Shaft torsional stiffness (with brake)	$c_{t\ withBr}$	Nm/rad	3750
Weight (with brake)	$m_{Mot\ withBr}$	kg	3.9
Recommended Motor Module:			
Rated converter current	$I_{N\ conv}$	A	3
Maximum converter current	$I_{max\ conv}$	A	9
Max. torque (converter operation)	$M_{max\ conv}$	Nm	6.5
Max. permissible speed (converter operation)	$n_{max\ conv}$	rpm	10000

The rated data are valid for a 600 V DC link voltage



[———] SINAMICS ALM 400 V (600 V DC)
[- - - - - -] SINAMICS BLM/SLM 400 V (540 V DC)

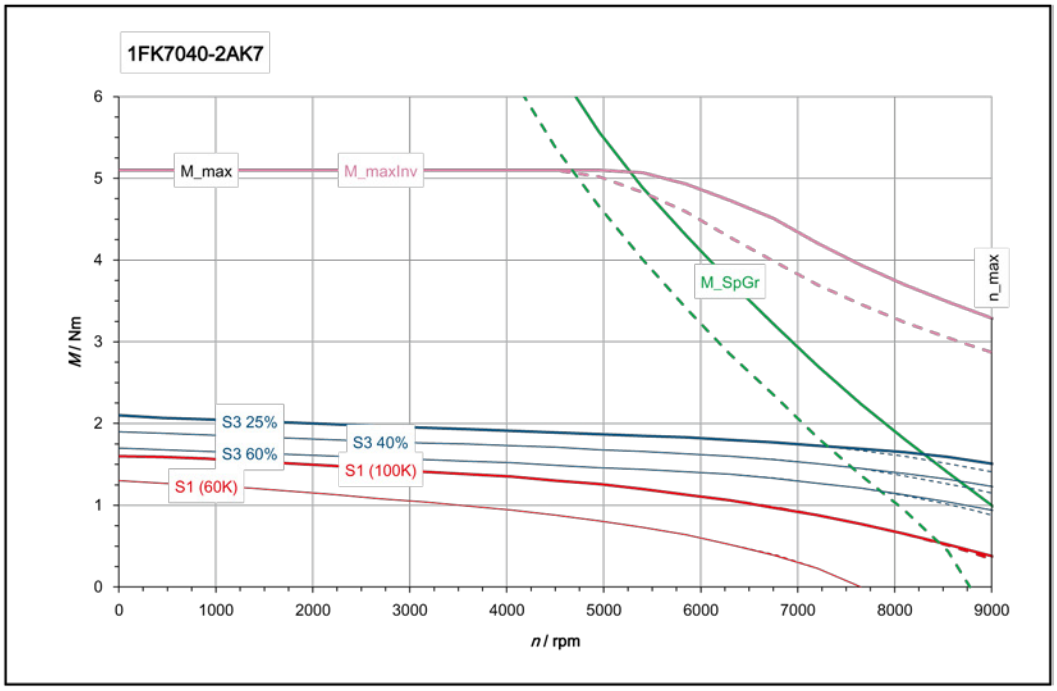


[———] SINAMICS ALM 480 V (720 V DC)
[- - - - - -] SINAMICS BLM/SLM 480 V (650 V DC)

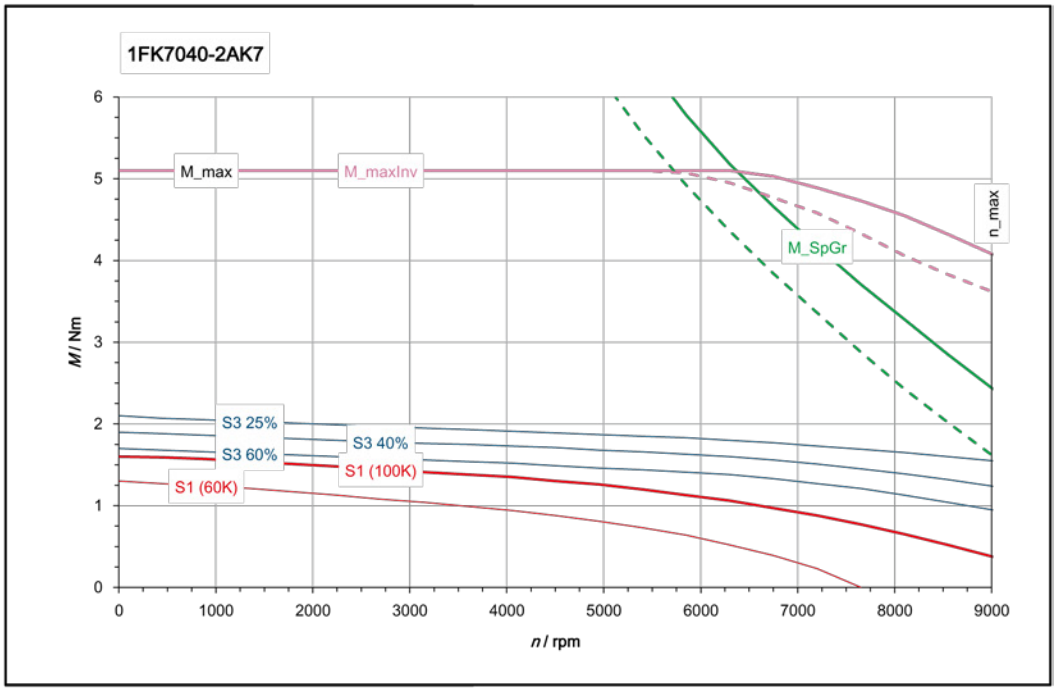
6.3.1.3 1FK7040-2A_

1FK7040 - 2AK7 three-phase servomotor			
Technical data	**Symbol**	**Unit**	**Value**
Configuration data:			
Rated speed	n_N	rpm	6000
Rated torque (100 K)	$M_{N(100K)}$	Nm	1.1
Rated current (100 K)	$I_{N(100K)}$	A	1.85
Static torque (100 K)	$M_{0(100K)}$	Nm	1.6
Stall current (100 K)	$I_{0(100K)}$	A	2.35
Static torque (60 K)	$M_{0(60K)}$	Nm	1.3
Stall current (60 K)	$I_{0(60K)}$	A	1.9
Optimum operating point:			
Optimum speed	n_{opt}	rpm	6000
Optimum power	P_{opt}	kW	0.69
Limit data:			
Max. permissible speed (mech.)	$n_{max\ mech}$	rpm	9000
Maximum torque	M_{max}	Nm	5.1
Maximum current	I_{max}	A	7.7
Motor data:			
Number of poles	2p		8
Torque constant (100K)	k_T	Nm/A	0.68
Voltage constant (at 20°C)	k_E	V/1000rpm	43.4
Winding resistance (at 20°C)	R_{ph}	Ω	2.87
Rotating field inductance	L_D	mH	16.5
Electrical time constant	T_{el}	ms	5.7
Mechanical time constant	T_{mech}	ms	3
Thermal time constant	T_{th}	min	25
Moment of inertia	J_{Mot}	10^{-4} kgm^2	1.6
Shaft torsional stiffness	c_t	Nm/rad	18700
Weight	m_{Mot}	kg	3.2
Motor data with integrated brake:			
Moment of inertia (with brake)	$J_{Mot\ withBr}$	10^{-4} kgm^2	1.92
Shaft torsional stiffness (with brake)	$c_{t\ withBr}$	Nm/rad	13000
Weight (with brake)	$m_{Mot\ withBr}$	kg	3.9
Recommended Motor Module:			
Rated converter current	$I_{N\ conv}$	A	3
Maximum converter current	$I_{max\ conv}$	A	9
Max. torque (converter operation)	$M_{max\ conv}$	Nm	5.1
Max. permissible speed (converter operation)	$n_{max\ conv}$	rpm	9000

The rated data are valid for a 600 V DC link voltage



[———] SINAMICS ALM 400 V (600 V DC)
[- - - - - -] SINAMICS BLM/SLM 400 V (540 V DC)

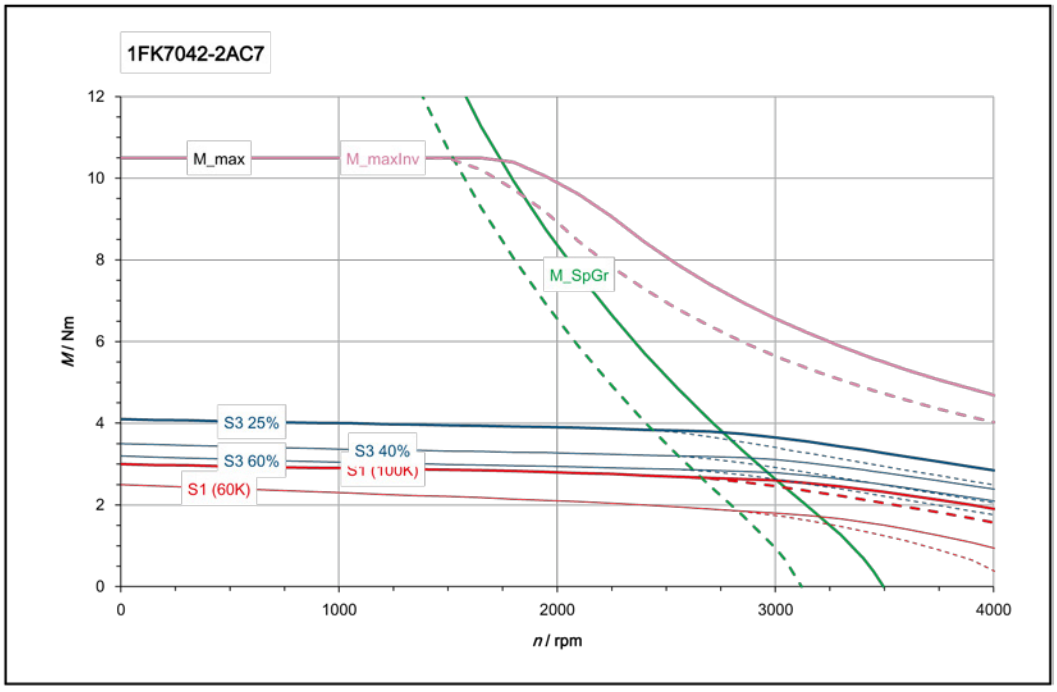


[———] SINAMICS ALM 480 V (720 V DC)
[- - - - - -] SINAMICS BLM/SLM 480 V (650 V DC)

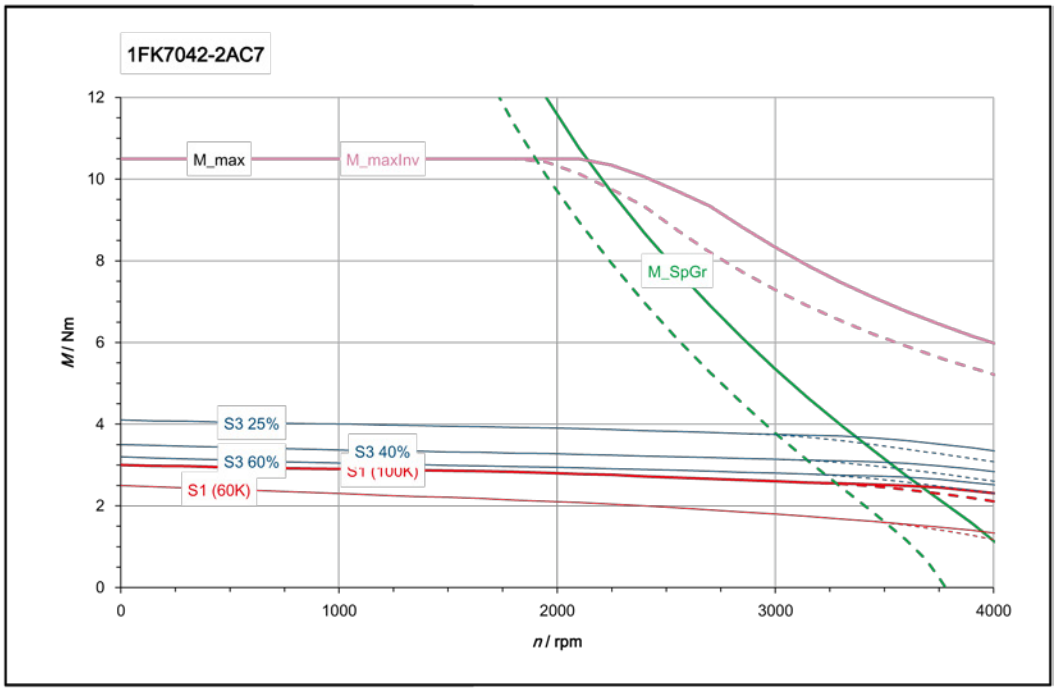
6.3.1.4 1FK7042-2A_

1FK7042 - 2AC7 three-phase servomotor			
Technical data	**Character**	**Unit**	**Value**
Configuration data:			
Rated speed	n_N	rpm	2000
Rated torque (100 K)	$M_{N(100K)}$	Nm	2.8
Rated current (100 K)	$I_{N(100K)}$	A	1.55
Static torque (100 K)	$M_{0(100K)}$	Nm	3
Stall current (100 K)	$I_{0(100K)}$	A	1.61
Static torque (60 K)	$M_{0(60K)}$	Nm	2.5
Stall current (60 K)	$I_{0(60K)}$	A	1.3
Optimum operating point:			
Optimum speed	n_{opt}	rpm	2000
Optimum power	P_{opt}	kW	0.59
Limit data:			
Max. permissible speed (mech.)	$n_{max\ mech}$	rpm	9000
Maximum torque	M_{max}	Nm	10.5
Maximum current	I_{max}	A	5.6
Motor data:			
Number of poles	2p		8
Torque constant (100K)	k_T	Nm/A	1.865
Voltage constant (at 20°C)	k_E	V/1000rpm	122
Winding resistance (at 20°C)	R_{ph}	Ω	8.6
Rotating field inductance	L_D	mH	64
Electrical time constant	T_{el}	ms	7.4
Mechanical time constant	T_{mech}	ms	2.15
Thermal time constant	T_{th}	min	30
Moment of inertia	J_{Mot}	10^{-4} kgm^2	2.9
Shaft torsional stiffness	c_t	Nm/rad	15500
Weight	m_{Mot}	kg	4.6
Motor data with integrated brake:			
Moment of inertia (with brake)	$J_{Mot\ withBr}$	10^{-4} kgm^2	3.2
Shaft torsional stiffness (with brake)	$c_{t\ withBr}$	Nm/rad	11400
Weight (with brake)	$m_{Mot\ withBr}$	kg	5.3
Recommended Motor Module:			
Rated converter current	$I_{N\ conv}$	A	3
Maximum converter current	$I_{max\ conv}$	A	9
Max. torque (converter operation)	$M_{max\ conv}$	Nm	10.5
Max. permissible speed (converter operation)	$n_{max\ conv}$	rpm	4750

The rated data are valid for a 600 V DC link voltage



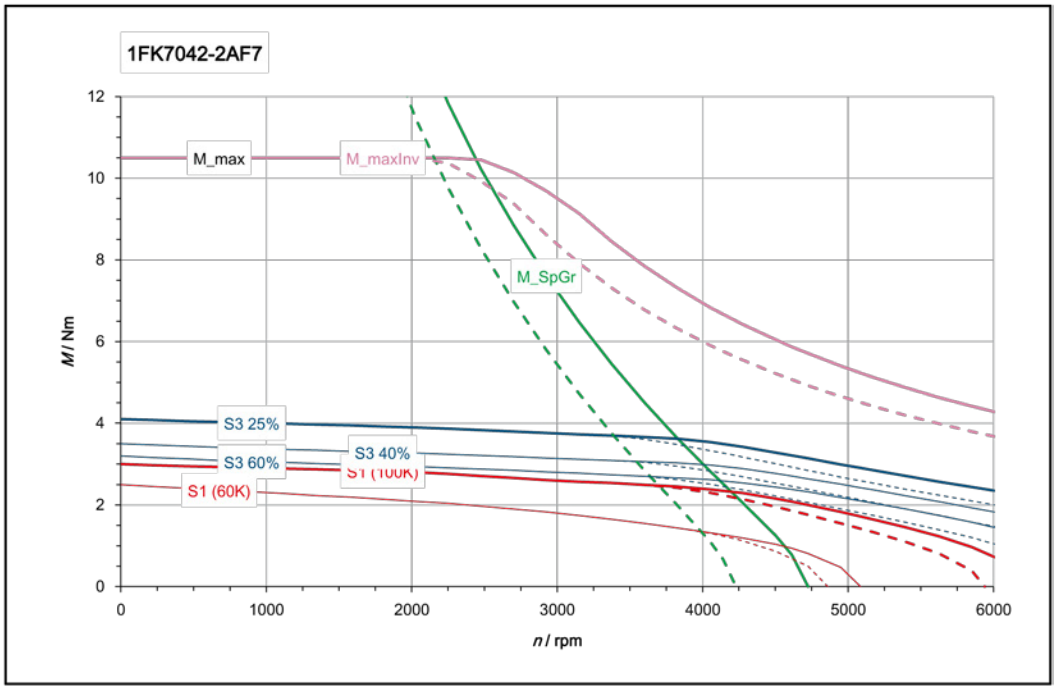
[———] SINAMICS ALM 400 V (600 V DC)
[- - - - - -] SINAMICS BLM/SLM 400 V (540 V DC)



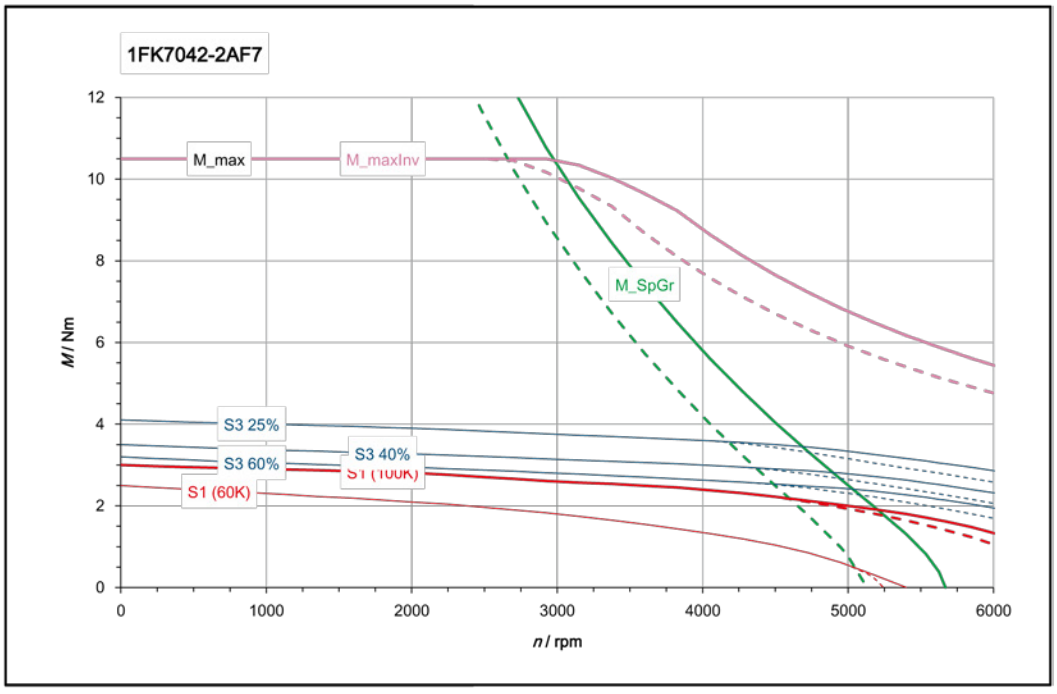
[———] SINAMICS ALM 480 V (720 V DC)
[- - - - - -] SINAMICS BLM/SLM 480 V (650 V DC)

1FK7042 - 2AF7 three-phase servomotor			
Technical data	**Character**	**Unit**	**Value**
Configuration data:			
Rated speed	n_N	rpm	3000
Rated torque (100 K)	$M_{N(100K)}$	Nm	2.6
Rated current (100 K)	$I_{N(100K)}$	A	2
Static torque (100 K)	$M_{0(100K)}$	Nm	3
Stall current (100 K)	$I_{0(100K)}$	A	2.2
Static torque (60 K)	$M_{0(60K)}$	Nm	2.5
Stall current (60 K)	$I_{0(60K)}$	A	1.8
Optimum operating point:			
Optimum speed	n_{opt}	rpm	3000
Optimum power	P_{opt}	kW	0.82
Limit data:			
Max. permissible speed (mech.)	$n_{max\ mech}$	rpm	9000
Maximum torque	M_{max}	Nm	10.5
Maximum current	I_{max}	A	7.6
Motor data:			
Number of poles	2p		8
Torque constant (100K)	k_T	Nm/A	1.375
Voltage constant (at 20°C)	k_E	V/1000rpm	90
Winding resistance (at 20°C)	R_{ph}	Ω	4.67
Rotating field inductance	L_D	mH	35
Electrical time constant	T_{el}	ms	7.5
Mechanical time constant	T_{mech}	ms	2.15
Thermal time constant	T_{th}	min	30
Moment of inertia	J_{Mot}	10^{-4} kgm^2	2.9
Shaft torsional stiffness	c_t	Nm/rad	15500
Weight	m_{Mot}	kg	4.6
Motor data with integrated brake:			
Moment of inertia (with brake)	$J_{Mot\ withBr}$	10^{-4} kgm^2	3.2
Shaft torsional stiffness (with brake)	$c_{t\ withBr}$	Nm/rad	11400
Weight (with brake)	$m_{Mot\ withBr}$	kg	5.3
Recommended Motor Module:			
Rated converter current	$I_{N\ conv}$	A	3
Maximum converter current	$I_{max\ conv}$	A	9
Max. torque (converter operation)	$M_{max\ conv}$	Nm	10.5
Max. permissible speed (converter operation)	$n_{max\ conv}$	rpm	6400

The rated data are valid for a 600 V DC link voltage



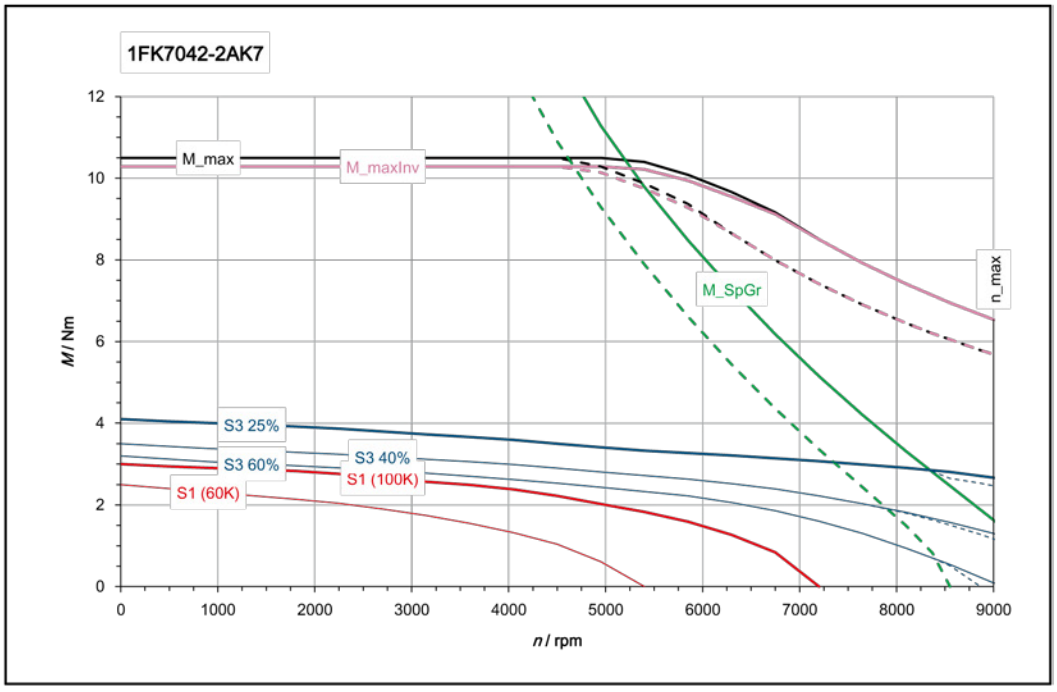
[———] SINAMICS ALM 400 V (600 V DC)
[- - - - - -] SINAMICS BLM/SLM 400 V (540 V DC)



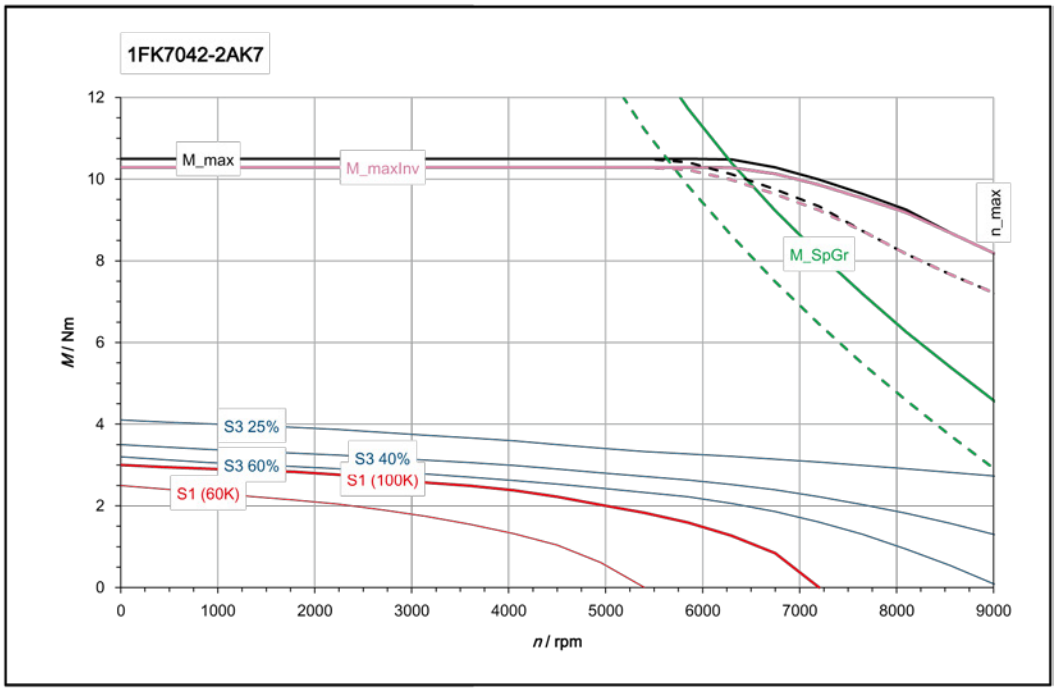
[———] SINAMICS ALM 480 V (720 V DC)
[- - - - - -] SINAMICS BLM/SLM 480 V (650 V DC)

1FK7042 - 2AK7 three-phase servomotor			
Technical data	**Character**	**Unit**	**Value**
Configuration data:			
Rated speed	n_N	rpm	6000
Rated torque (100 K)	$M_{N(100K)}$	Nm	1.5
Rated current (100 K)	$I_{N(100K)}$	A	2.5
Static torque (100 K)	$M_{0(100K)}$	Nm	3
Stall current (100 K)	$I_{0(100K)}$	A	4.4
Static torque (60 K)	$M_{0(60K)}$	Nm	2.5
Stall current (60 K)	$I_{0(60K)}$	A	3.55
Optimum operating point:			
Optimum speed	n_{opt}	rpm	5000
Optimum power	P_{opt}	kW	1.02
Limit data:			
Max. permissible speed (mech.)	$n_{max\ mech}$	rpm	9000
Maximum torque	M_{max}	Nm	10.5
Maximum current	I_{max}	A	15.3
Motor data:			
Number of poles	2p		8
Torque constant (100K)	k_T	Nm/A	0.68
Voltage constant (at 20°C)	k_E	V/1000rpm	44.5
Winding resistance (at 20°C)	R_{ph}	Ω	1.145
Rotating field inductance	L_D	mH	8.6
Electrical time constant	T_{el}	ms	7.5
Mechanical time constant	T_{mech}	ms	2.15
Thermal time constant	T_{th}	min	30
Moment of inertia	J_{Mot}	10^{-4} kgm^2	2.9
Shaft torsional stiffness	c_t	Nm/rad	15500
Weight	m_{Mot}	kg	4.6
Motor data with integrated brake:			
Moment of inertia (with brake)	$J_{Mot\ withBr}$	10^{-4} kgm^2	3.2
Shaft torsional stiffness (with brake)	$c_{t\ withBr}$	Nm/rad	11400
Weight (with brake)	$m_{Mot\ withBr}$	kg	5.3
Recommended Motor Module:			
Rated converter current	$I_{N\ conv}$	A	5
Maximum converter current	$I_{max\ conv}$	A	15
Max. torque (converter operation)	$M_{max\ conv}$	Nm	10.3
Max. permissible speed (converter operation)	$n_{max\ conv}$	rpm	9000

The rated data are valid for a 600 V DC link voltage



[———] SINAMICS ALM 400 V (600 V DC)
[– – – – – –] SINAMICS BLM/SLM 400 V (540 V DC)

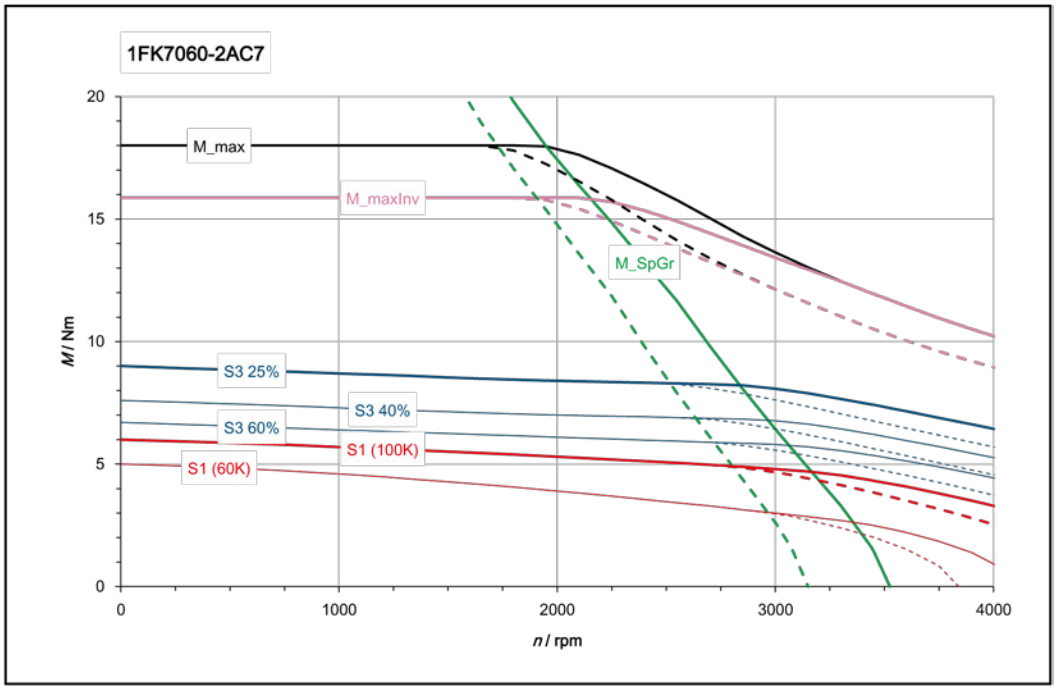


[———] SINAMICS ALM 480 V (720 V DC)
[– – – – – –] SINAMICS BLM/SLM 480 V (650 V DC)

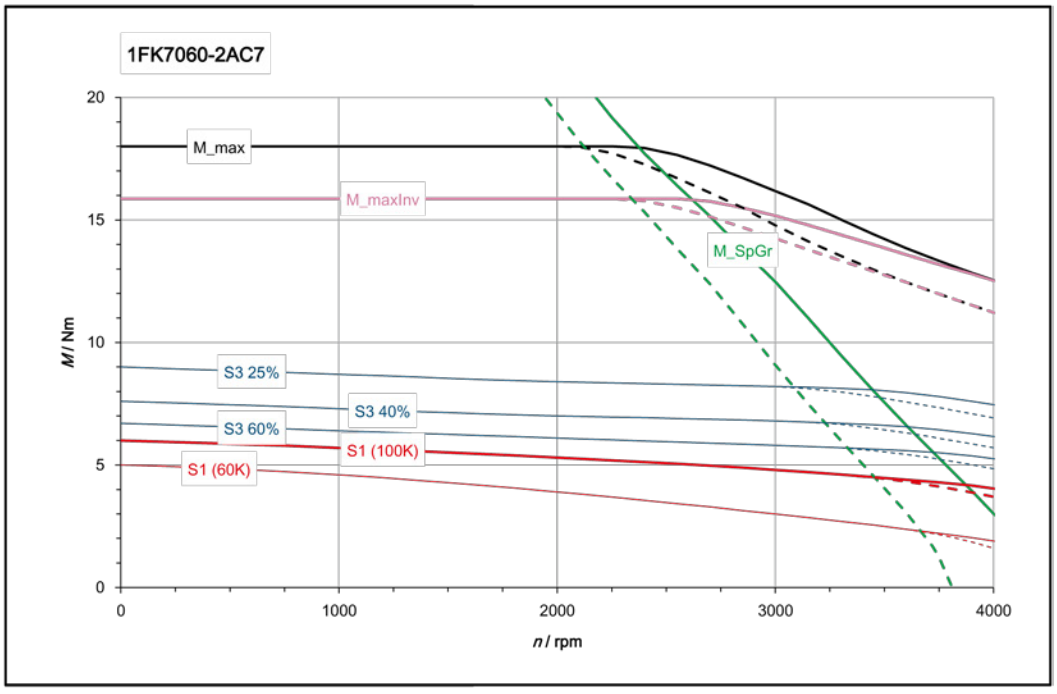
6.3.1.5 1FK7060-2A_

1FK7060 - 2AC7 three-phase servomotor			
Technical data	**Character**	**Unit**	**Value**
Configuration data:			
Rated speed	n_N	rpm	2000
Rated torque (100 K)	$M_{N(100K)}$	Nm	5.3
Rated current (100 K)	$I_{N(100K)}$	A	2.95
Static torque (100 K)	$M_{0(100K)}$	Nm	6
Stall current (100 K)	$I_{0(100K)}$	A	3.15
Static torque (60 K)	$M_{0(60K)}$	Nm	5
Stall current (60 K)	$I_{0(60K)}$	A	2.55
Optimum operating point:			
Optimum speed	n_{opt}	rpm	2000
Optimum power	P_{opt}	kW	1.11
Limit data:			
Max. permissible speed (mech.)	$n_{max\ mech}$	rpm	7200
Maximum torque	M_{max}	Nm	18
Maximum current	I_{max}	A	10.7
Motor data:			
Number of poles	2p		8
Torque constant (100K)	k_T	Nm/A	1.905
Voltage constant (at 20°C)	k_E	V/1000rpm	121
Winding resistance (at 20°C)	R_{ph}	Ω	2.75
Rotating field inductance	L_D	mH	30.5
Electrical time constant	T_{el}	ms	11.1
Mechanical time constant	T_{mech}	ms	1.75
Thermal time constant	T_{th}	min	30
Moment of inertia	J_{Mot}	10^{-4} kgm^2	7.7
Shaft torsional stiffness	c_t	Nm/rad	40500
Weight	m_{Mot}	kg	7.1
Motor data with integrated brake:			
Moment of inertia (with brake)	$J_{Mot\ withBr}$	10^{-4} kgm^2	8.7
Shaft torsional stiffness (with brake)	$c_{t\ withBr}$	Nm/rad	28500
Weight (with brake)	$m_{Mot\ withBr}$	kg	8.5
Recommended Motor Module:			
Rated converter current	$I_{N\ conv}$	A	3
Maximum converter current	$I_{max\ conv}$	A	9
Max. torque (converter operation)	$M_{max\ conv}$	Nm	15.9
Max. permissible speed (converter operation)	$n_{max\ conv}$	rpm	4750

The rated data are valid for a 600 V DC link voltage



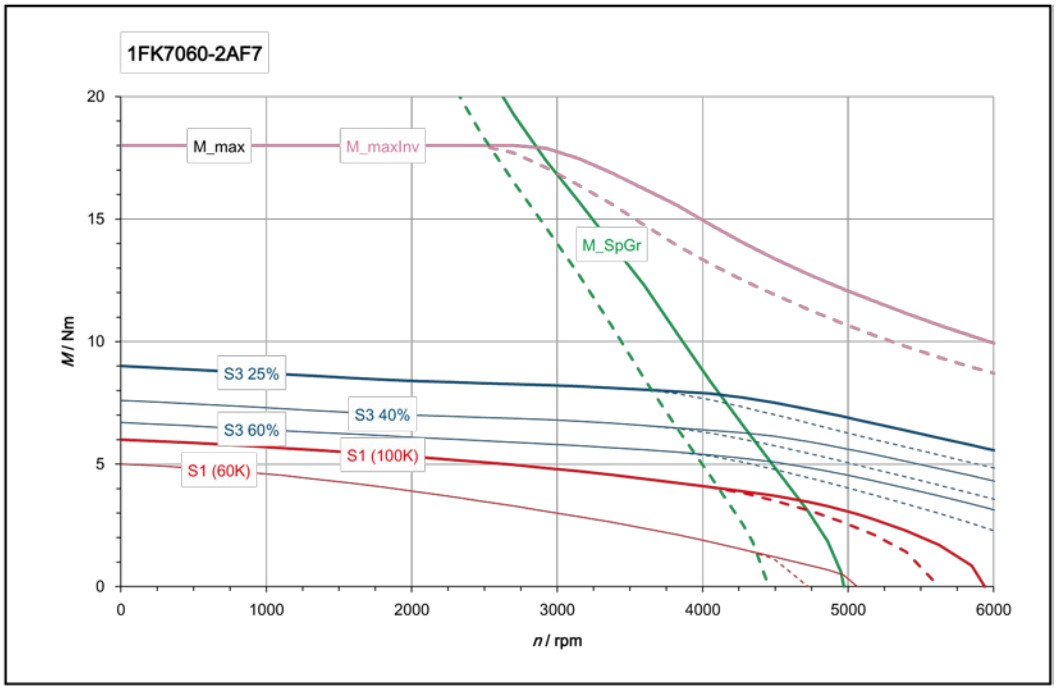
[———] SINAMICS ALM 400 V (600 V DC)
[- - - - - -] SINAMICS BLM/SLM 400 V (540 V DC)



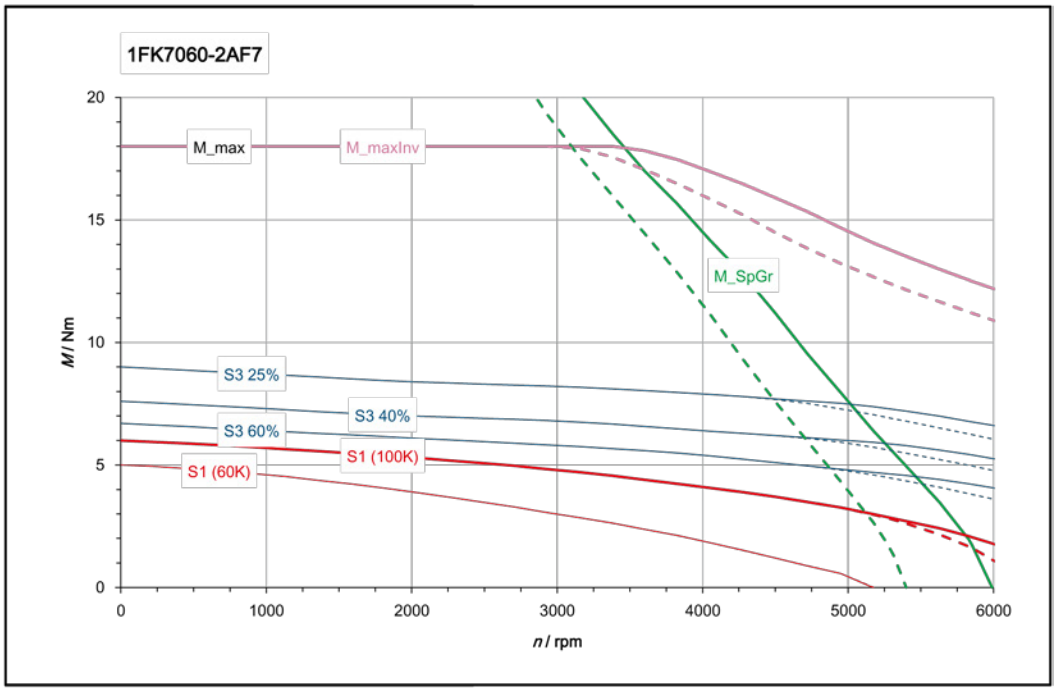
[———] SINAMICS ALM 480 V (720 V DC)
[- - - - - -] SINAMICS BLM/SLM 480 V (650 V DC)

1FK7060 - 2AF7 three-phase servomotor			
Technical data	**Character**	**Unit**	**Value**
Configuration data:			
Rated speed	n_N	rpm	3000
Rated torque (100 K)	$M_{N(100K)}$	Nm	4.7
Rated current (100 K)	$I_{N(100K)}$	A	3.7
Static torque (100 K)	$M_{0(100K)}$	Nm	6
Stall current (100 K)	$I_{0(100K)}$	A	4.45
Static torque (60 K)	$M_{0(60K)}$	Nm	5
Stall current (60 K)	$I_{0(60K)}$	A	3.6
Optimum operating point:			
Optimum speed	n_{opt}	rpm	3000
Optimum power	P_{opt}	kW	1.48
Limit data:			
Max. permissible speed (mech.)	$n_{max\ mech}$	rpm	7200
Maximum torque	M_{max}	Nm	18
Maximum current	I_{max}	A	15
Motor data:			
Number of poles	2p		8
Torque constant (100K)	k_T	Nm/A	1.33
Voltage constant (at 20°C)	k_E	V/1000rpm	85.5
Winding resistance (at 20°C)	R_{ph}	Ω	1.35
Rotating field inductance	L_D	mH	15.2
Electrical time constant	T_{el}	ms	11.3
Mechanical time constant	T_{mech}	ms	1.71
Thermal time constant	T_{th}	min	30
Moment of inertia	J_{Mot}	10^{-4} kgm^2	7.7
Shaft torsional stiffness	c_t	Nm/rad	40500
Weight	m_{Mot}	kg	7.1
Motor data with integrated brake:			
Moment of inertia (with brake)	$J_{Mot\ withBr}$	10^{-4} kgm^2	8.7
Shaft torsional stiffness (with brake)	$c_{t\ withBr}$	Nm/rad	28500
Weight (with brake)	$m_{Mot\ withBr}$	kg	8.5
Recommended Motor Module:			
Rated converter current	$I_{N\ conv}$	A	5
Maximum converter current	$I_{max\ conv}$	A	15
Max. torque (converter operation)	$M_{max\ conv}$	Nm	18
Max. permissible speed (converter operation)	$n_{max\ conv}$	rpm	6700

The rated data are valid for a 600 V DC link voltage



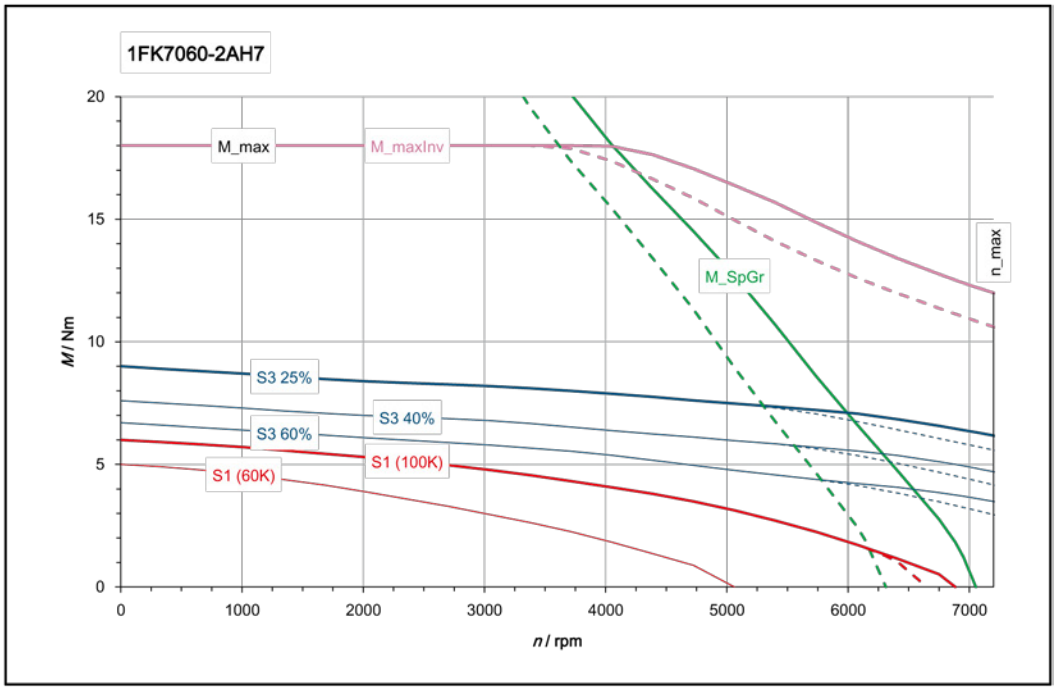
[———] SINAMICS ALM 400 V (600 V DC)
[- - - - - -] SINAMICS BLM/SLM 400 V (540 V DC)



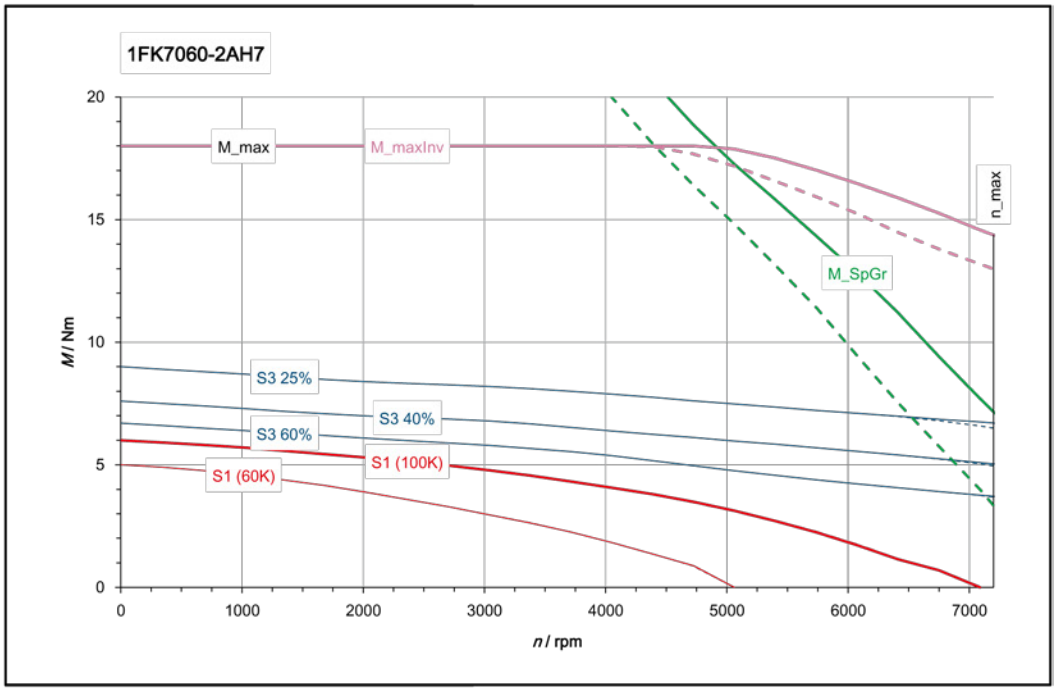
[———] SINAMICS ALM 480 V (720 V DC)
[- - - - - -] SINAMICS BLM/SLM 480 V (650 V DC)

1FK7060 - 2AH7 three-phase servomotor			
Technical data	**Character**	**Unit**	**Value**
Configuration data:			
Rated speed	n_N	rpm	4500
Rated torque (100 K)	$M_{N(100K)}$	Nm	3.7
Rated current (100 K)	$I_{N(100K)}$	A	4.3
Static torque (100 K)	$M_{0(100K)}$	Nm	6
Stall current (100 K)	$I_{0(100K)}$	A	6.3
Static torque (60 K)	$M_{0(60K)}$	Nm	5
Stall current (60 K)	$I_{0(60K)}$	A	5.1
Optimum operating point:			
Optimum speed	n_{opt}	rpm	4500
Optimum power	P_{opt}	kW	1.74
Limit data:			
Max. permissible speed (mech.)	$n_{max\ mech}$	rpm	7200
Maximum torque	M_{max}	Nm	18
Maximum current	I_{max}	A	21.5
Motor data:			
Number of poles	2p		8
Torque constant (100K)	k_T	Nm/A	0.95
Voltage constant (at 20°C)	k_E	V/1000rpm	60.5
Winding resistance (at 20°C)	R_{ph}	Ω	0.695
Rotating field inductance	L_D	mH	7.6
Electrical time constant	T_{el}	ms	10.9
Mechanical time constant	T_{mech}	ms	1.78
Thermal time constant	T_{th}	min	30
Moment of inertia	J_{Mot}	10^{-4} kgm^2	7.7
Shaft torsional stiffness	c_t	Nm/rad	40500
Weight	m_{Mot}	kg	7.1
Motor data with integrated brake:			
Moment of inertia (with brake)	$J_{Mot\ withBr}$	10^{-4} kgm^2	8.7
Shaft torsional stiffness (with brake)	$c_{t\ withBr}$	Nm/rad	28500
Weight (with brake)	$m_{Mot\ withBr}$	kg	8.5
Recommended Motor Module:			
Rated converter current	$I_{N\ conv}$	A	9
Maximum converter current	$I_{max\ conv}$	A	27
Max. torque (converter operation)	$M_{max\ conv}$	Nm	18
Max. permissible speed (converter operation)	$n_{max\ conv}$	rpm	7200

The rated data are valid for a 600 V DC link voltage



[———] SINAMICS ALM 400 V (600 V DC)
[- - - - - -] SINAMICS BLM/SLM 400 V (540 V DC)

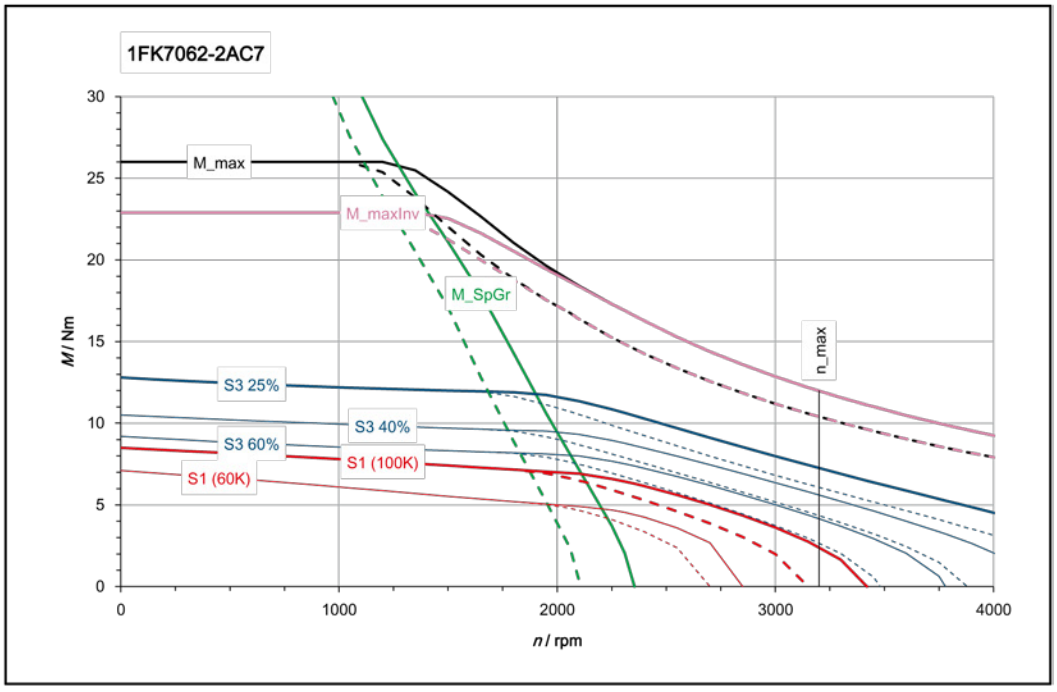


[———] SINAMICS ALM 480 V (720 V DC)
[- - - - - -] SINAMICS BLM/SLM 480 V (650 V DC)

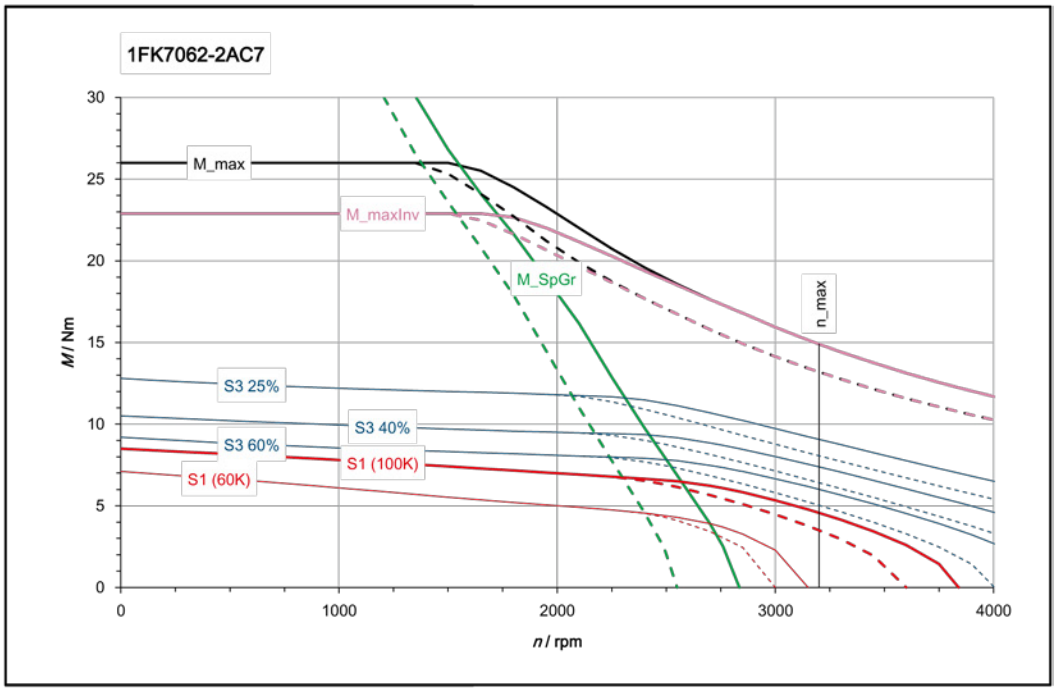
6.3.1.6 1FK7062-2A_

1FK7062 - 2AC7 three-phase servomotor			
Technical data	**Character**	**Unit**	**Value**
Configuration data:			
Rated speed	n_N	rpm	2000
Rated torque (100 K)	$M_{N(100K)}$	Nm	7
Rated current (100 K)	$I_{N(100K)}$	A	2.65
Static torque (100 K)	$M_{0(100K)}$	Nm	8.5
Stall current (100 K)	$I_{0(100K)}$	A	3
Static torque (60 K)	$M_{0(60K)}$	Nm	7.1
Stall current (60 K)	$I_{0(60K)}$	A	2.45
Optimum operating point:			
Optimum speed	n_{opt}	rpm	2000
Optimum power	P_{opt}	kW	1.47
Limit data:			
Max. permissible speed (mech.)	$n_{max\ mech}$	rpm	7200
Maximum torque	M_{max}	Nm	26
Maximum current	I_{max}	A	10.9
Motor data:			
Number of poles	2p		8
Torque constant (100K)	k_T	Nm/A	2.83
Voltage constant (at 20°C)	k_E	V/1000rpm	180.5
Winding resistance (at 20°C)	R_{ph}	Ω	3.59
Rotating field inductance	L_D	mH	45.5
Electrical time constant	T_{el}	ms	12.7
Mechanical time constant	T_{mech}	ms	1.51
Thermal time constant	T_{th}	min	35
Moment of inertia	J_{Mot}	10^{-4} kgm^2	11.2
Shaft torsional stiffness	c_t	Nm/rad	37000
Weight	m_{Mot}	kg	9.1
Motor data with integrated brake:			
Moment of inertia (with brake)	$J_{Mot\ withBr}$	10^{-4} kgm^2	12.2
Shaft torsional stiffness (with brake)	$c_{t\ withBr}$	Nm/rad	26500
Weight (with brake)	$m_{Mot\ withBr}$	kg	10.5
Recommended Motor Module:			
Rated converter current	$I_{N\ conv}$	A	3
Maximum converter current	$I_{max\ conv}$	A	9
Max. torque (converter operation)	$M_{max\ conv}$	Nm	22.9
Max. permissible speed (converter operation)	$n_{max\ conv}$	rpm	3200

The rated data are valid for a 600 V DC link voltage



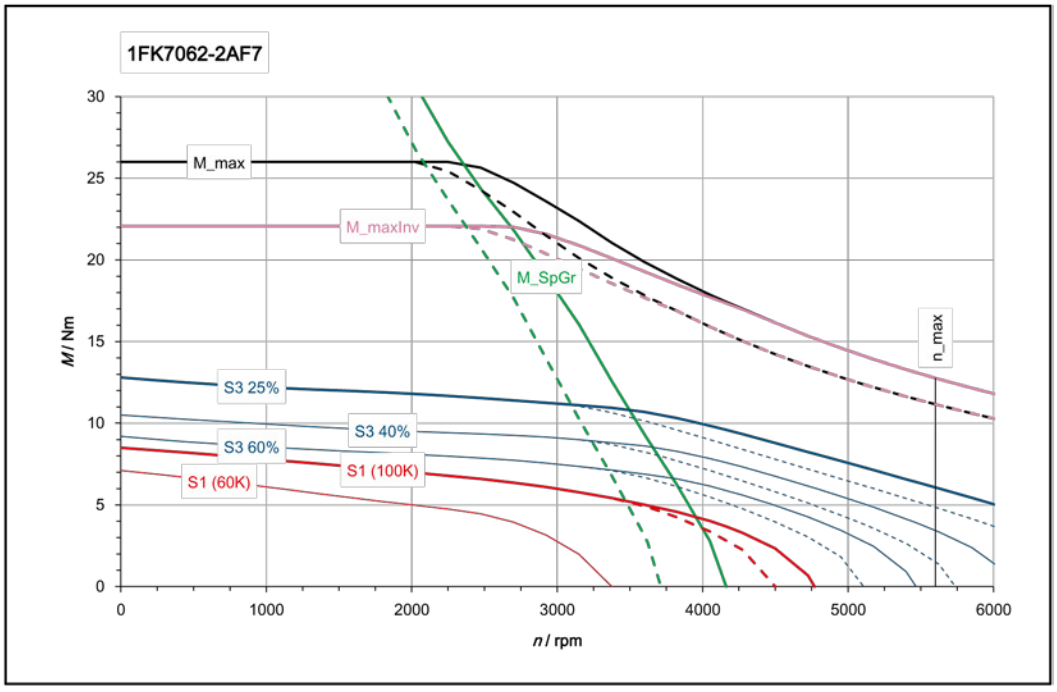
[———] SINAMICS ALM 400 V (600 V DC)
[– – – – – –] SINAMICS BLM/SLM 400 V (540 V DC)



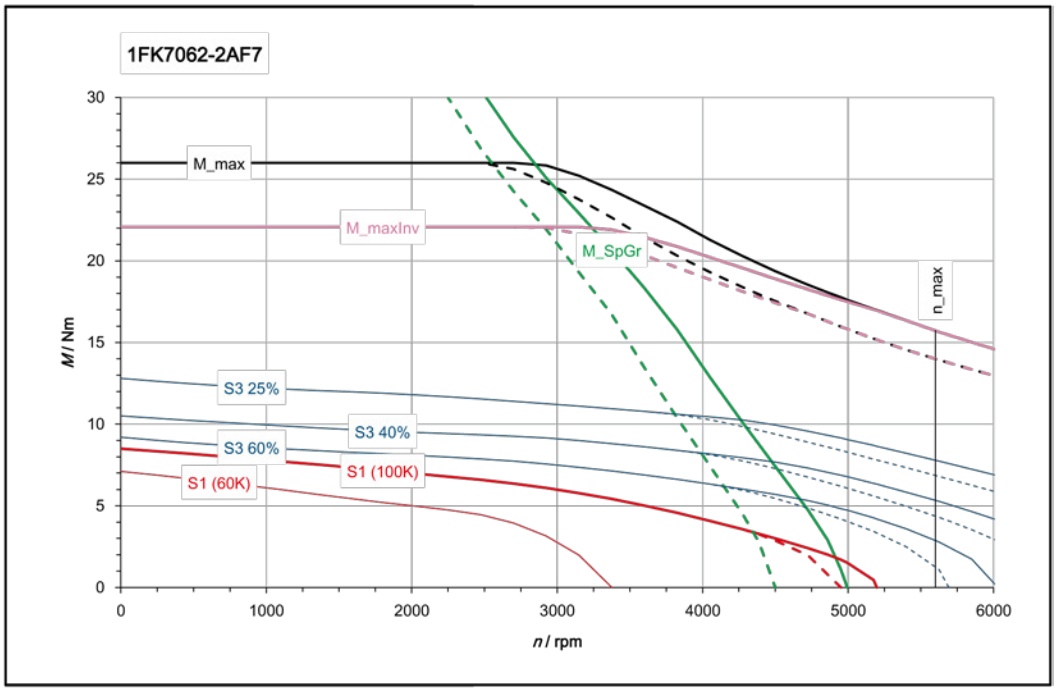
[———] SINAMICS ALM 480 V (720 V DC)
[– – – – – –] SINAMICS BLM/SLM 480 V (650 V DC)

1FK7062 - 2AF7 three-phase servomotor			
Technical data	**Character**	**Unit**	**Value**
Configuration data:			
Rated speed	n_N	rpm	3000
Rated torque (100 K)	$M_{N(100K)}$	Nm	6
Rated current (100 K)	$I_{N(100K)}$	A	4
Static torque (100 K)	$M_{0(100K)}$	Nm	8.5
Stall current (100 K)	$I_{0(100K)}$	A	5.3
Static torque (60 K)	$M_{0(60K)}$	Nm	7.1
Stall current (60 K)	$I_{0(60K)}$	A	4.3
Optimum operating point:			
Optimum speed	n_{opt}	rpm	3000
Optimum power	P_{opt}	kW	1.88
Limit data:			
Max. permissible speed (mech.)	$n_{max\ mech}$	rpm	7200
Maximum torque	M_{max}	Nm	26
Maximum current	I_{max}	A	19.2
Motor data:			
Number of poles	2p		8
Torque constant (100K)	k_T	Nm/A	1.605
Voltage constant (at 20°C)	k_E	V/1000rpm	102.5
Winding resistance (at 20°C)	R_{ph}	Ω	1.145
Rotating field inductance	L_D	mH	14.6
Electrical time constant	T_{el}	ms	12.8
Mechanical time constant	T_{mech}	ms	1.49
Thermal time constant	T_{th}	min	35
Moment of inertia	J_{Mot}	10^{-4} kgm^2	11.2
Shaft torsional stiffness	c_t	Nm/rad	37000
Weight	m_{Mot}	kg	9.1
Motor data with integrated brake:			
Moment of inertia (with brake)	$J_{Mot\ withBr}$	10^{-4} kgm^2	12.2
Shaft torsional stiffness (with brake)	$c_{t\ withBr}$	Nm/rad	26500
Weight (with brake)	$m_{Mot\ withBr}$	kg	10.5
Recommended Motor Module:			
Rated converter current	$I_{N\ conv}$	A	5
Maximum converter current	$I_{max\ conv}$	A	15
Max. torque (converter operation)	$M_{max\ conv}$	Nm	22.1
Max. permissible speed (converter operation)	$n_{max\ conv}$	rpm	5600

The rated data are valid for a 600 V DC link voltage



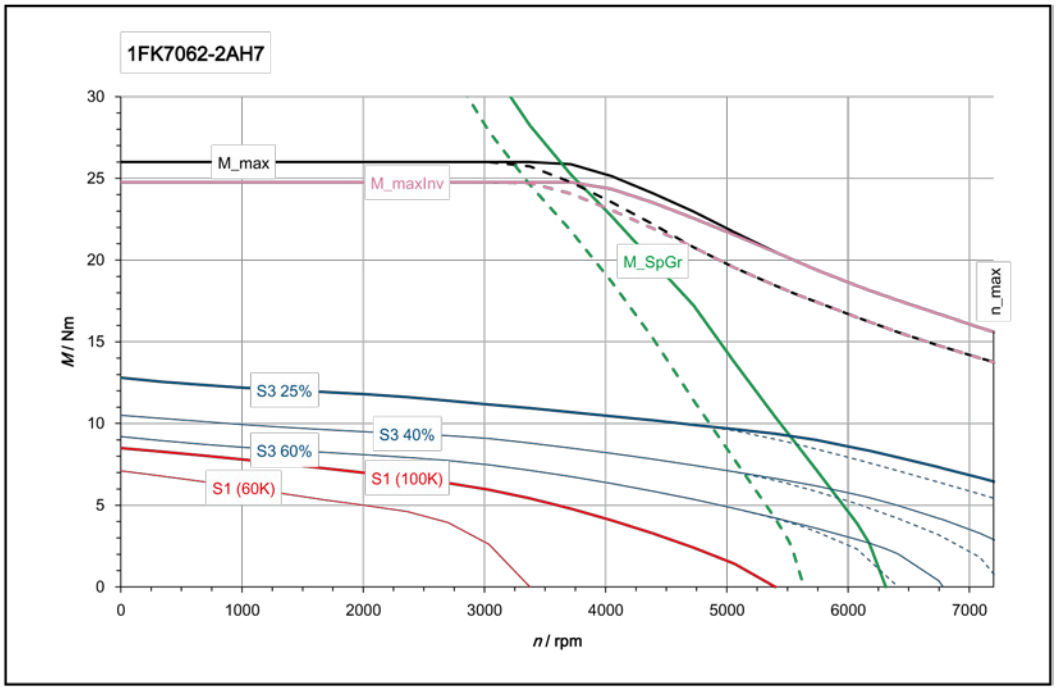
[———] SINAMICS ALM 400 V (600 V DC)
[- - - - - -] SINAMICS BLM/SLM 400 V (540 V DC)



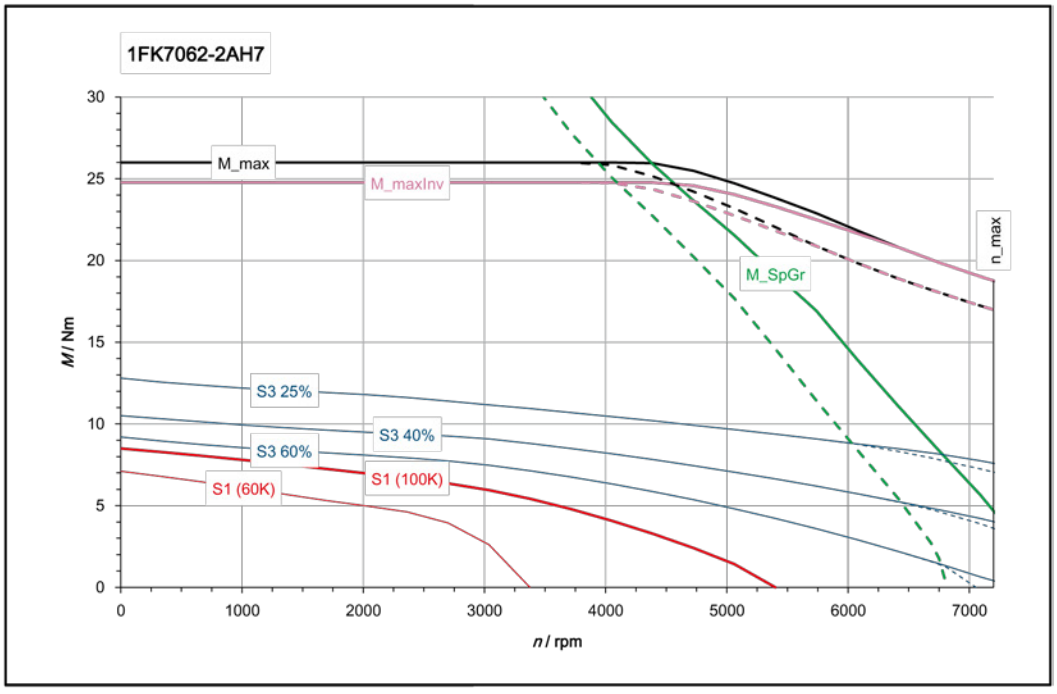
[———] SINAMICS ALM 480 V (720 V DC)
[- - - - - -] SINAMICS BLM/SLM 480 V (650 V DC)

1FK7062 - 2AH7 three-phase servomotor			
Technical data	**Character**	**Unit**	**Value**
Configuration data:			
Rated speed	n_N	rpm	4500
Rated torque (100 K)	$M_{N(100K)}$	Nm	3
Rated current (100 K)	$I_{N(100K)}$	A	3.3
Static torque (100 K)	$M_{0(100K)}$	Nm	8.5
Stall current (100 K)	$I_{0(100K)}$	A	8
Static torque (60 K)	$M_{0(60K)}$	Nm	7.1
Stall current (60 K)	$I_{0(60K)}$	A	6.5
Optimum operating point:			
Optimum speed	n_{opt}	rpm	3500
Optimum power	P_{opt}	kW	1.95
Limit data:			
Max. permissible speed (mech.)	$n_{max\ mech}$	rpm	7200
Maximum torque	M_{max}	Nm	26
Maximum current	I_{max}	A	29
Motor data:			
Number of poles	2p		8
Torque constant (100K)	k_T	Nm/A	1.065
Voltage constant (at 20°C)	k_E	V/1000rpm	67.5
Winding resistance (at 20°C)	R_{ph}	Ω	0.485
Rotating field inductance	L_D	mH	6.4
Electrical time constant	T_{el}	ms	13.2
Mechanical time constant	T_{mech}	ms	1.44
Thermal time constant	T_{th}	min	35
Moment of inertia	J_{Mot}	10^{-4} kgm^2	11.2
Shaft torsional stiffness	c_t	Nm/rad	37000
Weight	m_{Mot}	kg	9.1
Motor data with integrated brake:			
Moment of inertia (with brake)	$J_{Mot\ withBr}$	10^{-4} kgm^2	12.2
Shaft torsional stiffness (with brake)	$c_{t\ withBr}$	Nm/rad	26500
Weight (with brake)	$m_{Mot\ withBr}$	kg	10.5
Recommended Motor Module:			
Rated converter current	$I_{N\ conv}$	A	9
Maximum converter current	$I_{max\ conv}$	A	27
Max. torque (converter operation)	$M_{max\ conv}$	Nm	24.8
Max. permissible speed (converter operation)	$n_{max\ conv}$	rpm	7200

The rated data are valid for a 600 V DC link voltage



[———] SINAMICS ALM 400 V (600 V DC)
[- - - - - -] SINAMICS BLM/SLM 400 V (540 V DC)

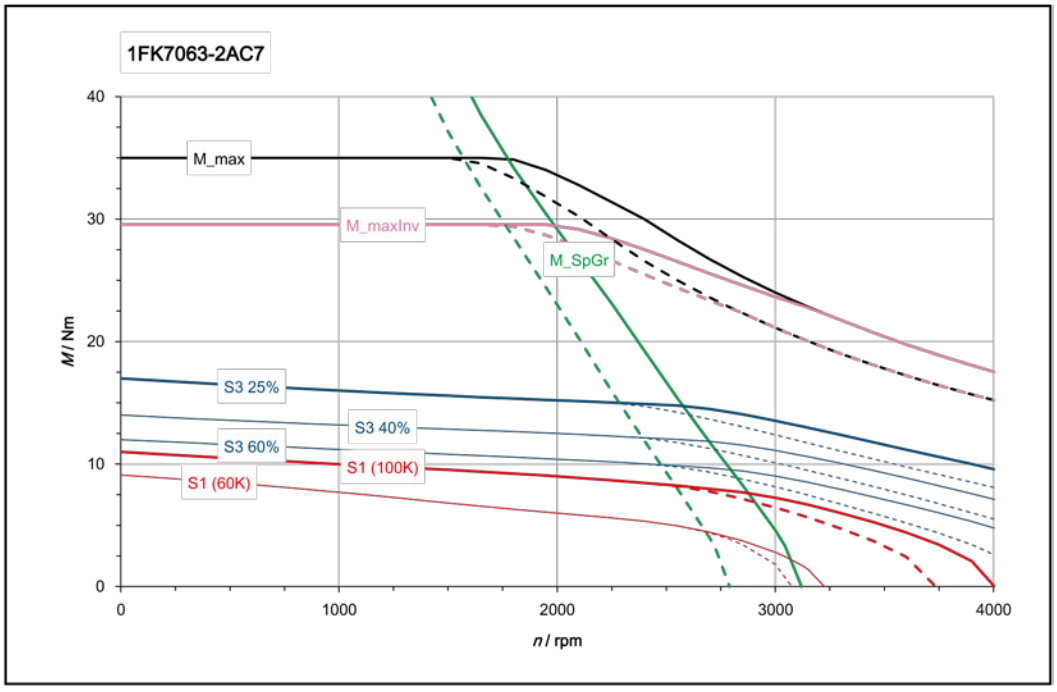


[———] SINAMICS ALM 480 V (720 V DC)
[- - - - - -] SINAMICS BLM/SLM 480 V (650 V DC)

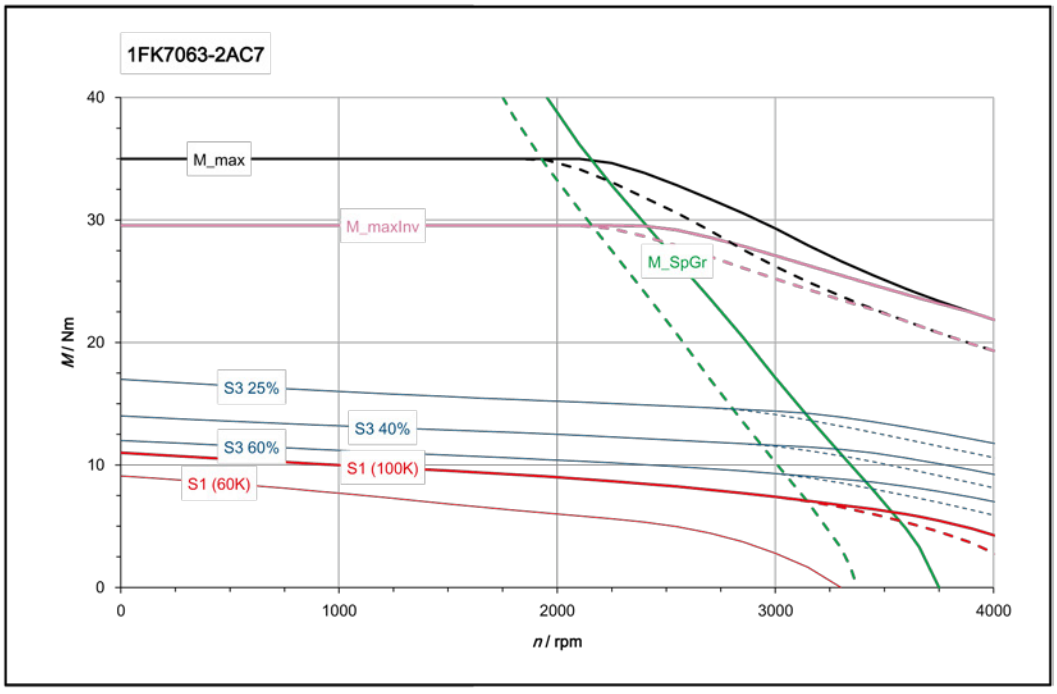
6.3.1.7 1FK7063-2A_

1FK7063 - 2AC7 three-phase servomotor			
Technical data	**Character**	**Unit**	**Value**
Configuration data:			
Rated speed	n_N	rpm	2000
Rated torque (100 K)	$M_{N(100K)}$	Nm	8.9
Rated current (100 K)	$I_{N(100K)}$	A	4.4
Static torque (100 K)	$M_{0(100K)}$	Nm	11
Stall current (100 K)	$I_{0(100K)}$	A	5.3
Static torque (60 K)	$M_{0(60K)}$	Nm	9.1
Stall current (60 K)	$I_{0(60K)}$	A	4.3
Optimum operating point:			
Optimum speed	n_{opt}	rpm	2000
Optimum power	P_{opt}	kW	1.86
Limit data:			
Max. permissible speed (mech.)	$n_{max\ mech}$	rpm	7200
Maximum torque	M_{max}	Nm	35
Maximum current	I_{max}	A	18.5
Motor data:			
Number of poles	2p		8
Torque constant (100K)	k_T	Nm/A	2.08
Voltage constant (at 20°C)	k_E	V/1000rpm	136.5
Winding resistance (at 20°C)	R_{ph}	Ω	1.445
Rotating field inductance	L_D	mH	19.4
Electrical time constant	T_{el}	ms	13.4
Mechanical time constant	T_{mech}	ms	1.47
Thermal time constant	T_{th}	min	40
Moment of inertia	J_{Mot}	10^{-4} kgm^2	14.7
Shaft torsional stiffness	c_t	Nm/rad	34000
Weight	m_{Mot}	kg	11.1
Motor data with integrated brake:			
Moment of inertia (with brake)	$J_{Mot\ withBr}$	10^{-4} kgm^2	15.7
Shaft torsional stiffness (with brake)	$c_{t\ withBr}$	Nm/rad	25000
Weight (with brake)	$m_{Mot\ withBr}$	kg	12.5
Recommended Motor Module:			
Rated converter current	$I_{N\ conv}$	A	5
Maximum converter current	$I_{max\ conv}$	A	15
Max. torque (converter operation)	$M_{max\ conv}$	Nm	29.5
Max. permissible speed (converter operation)	$n_{max\ conv}$	rpm	4200

The rated data are valid for a 600 V DC link voltage



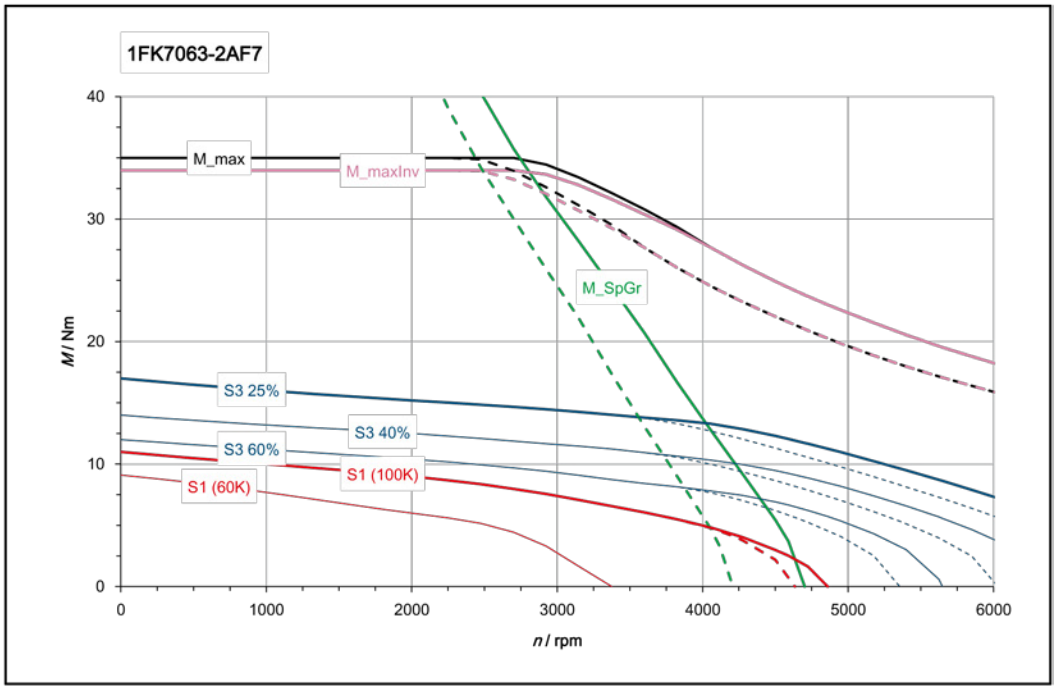
[———] SINAMICS ALM 400 V (600 V DC)
[- - - - - -] SINAMICS BLM/SLM 400 V (540 V DC)



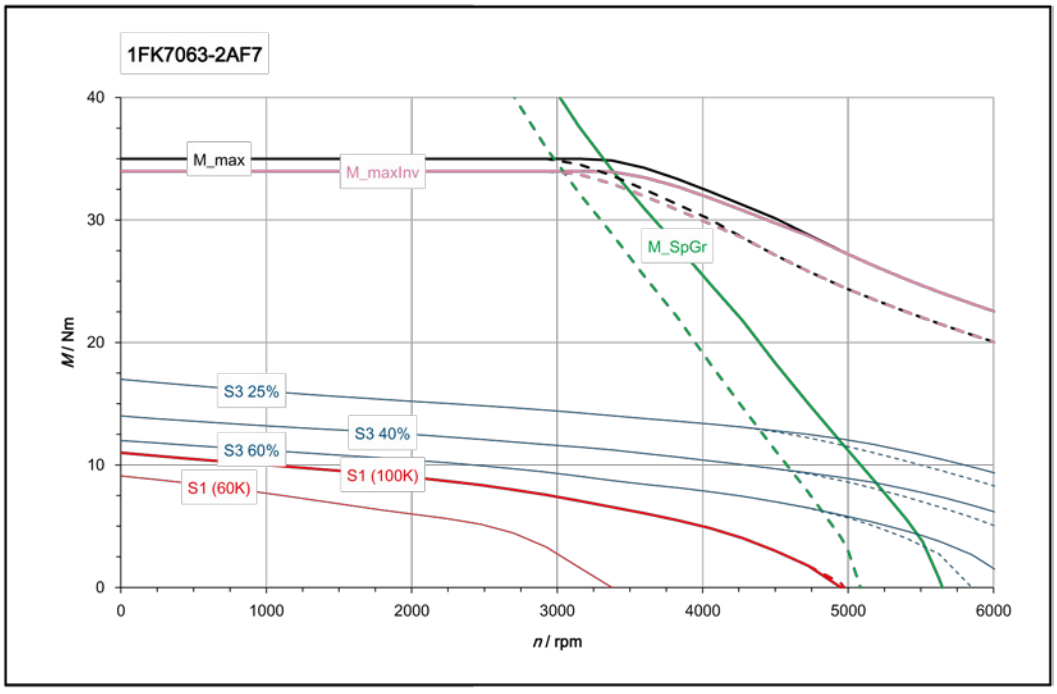
[———] SINAMICS ALM 480 V (720 V DC)
[- - - - - -] SINAMICS BLM/SLM 480 V (650 V DC)

1FK7063 - 2AF7 three-phase servomotor			
Technical data	**Character**	**Unit**	**Value**
Configuration data:			
Rated speed	n_N	rpm	3000
Rated torque (100 K)	$M_{N(100K)}$	Nm	7.3
Rated current (100 K)	$I_{N(100K)}$	A	5.6
Static torque (100 K)	$M_{0(100K)}$	Nm	11
Stall current (100 K)	$I_{0(100K)}$	A	8
Static torque (60 K)	$M_{0(60K)}$	Nm	9.1
Stall current (60 K)	$I_{0(60K)}$	A	6.5
Optimum operating point:			
Optimum speed	n_{opt}	rpm	3000
Optimum power	P_{opt}	kW	2.3
Limit data:			
Max. permissible speed (mech.)	$n_{max\ mech}$	rpm	7200
Maximum torque	M_{max}	Nm	35
Maximum current	I_{max}	A	28
Motor data:			
Number of poles	2p		8
Torque constant (100K)	k_T	Nm/A	1.37
Voltage constant (at 20°C)	k_E	V/1000rpm	90.5
Winding resistance (at 20°C)	R_{ph}	Ω	0.635
Rotating field inductance	L_D	mH	8.5
Electrical time constant	T_{el}	ms	13.4
Mechanical time constant	T_{mech}	ms	1.48
Thermal time constant	T_{th}	min	40
Moment of inertia	J_{Mot}	10^{-4} kgm^2	14.7
Shaft torsional stiffness	c_t	Nm/rad	34000
Weight	m_{Mot}	kg	11.1
Motor data with integrated brake:			
Moment of inertia (with brake)	$J_{Mot\ withBr}$	10^{-4} kgm^2	15.7
Shaft torsional stiffness (with brake)	$c_{t\ withBr}$	Nm/rad	25000
Weight (with brake)	$m_{Mot\ withBr}$	kg	12.5
Recommended Motor Module:			
Rated converter current	$I_{N\ conv}$	A	9
Maximum converter current	$I_{max\ conv}$	A	27
Max. torque (converter operation)	$M_{max\ conv}$	Nm	34
Max. permissible speed (converter operation)	$n_{max\ conv}$	rpm	6400

The rated data are valid for a 600 V DC link voltage



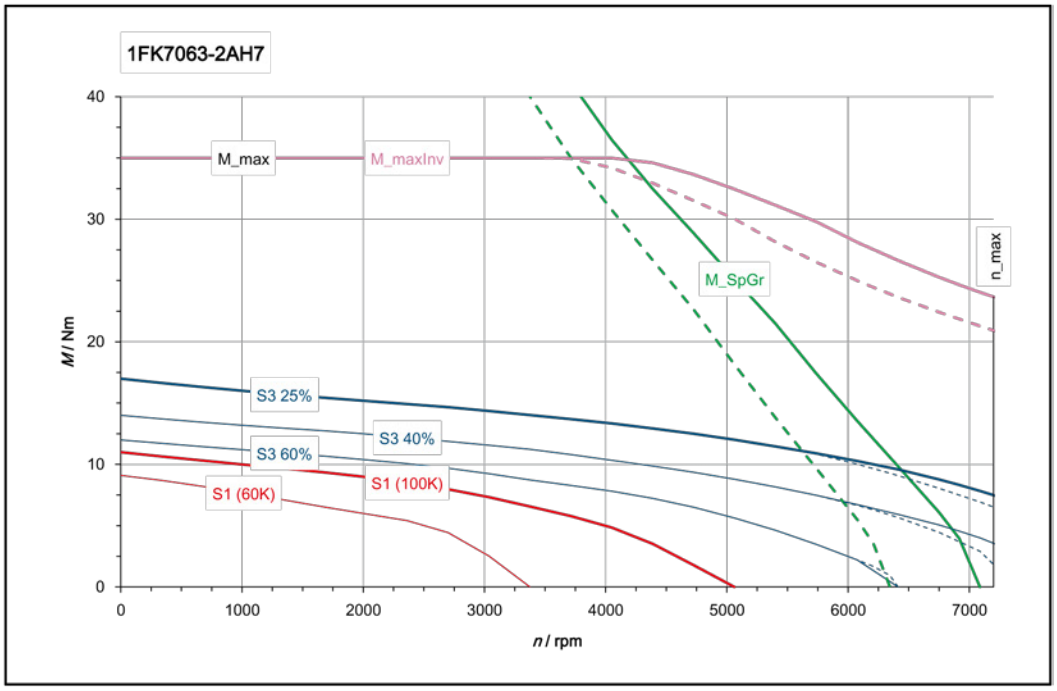
[———] SINAMICS ALM 400 V (600 V DC)
[– – – – – –] SINAMICS BLM/SLM 400 V (540 V DC)



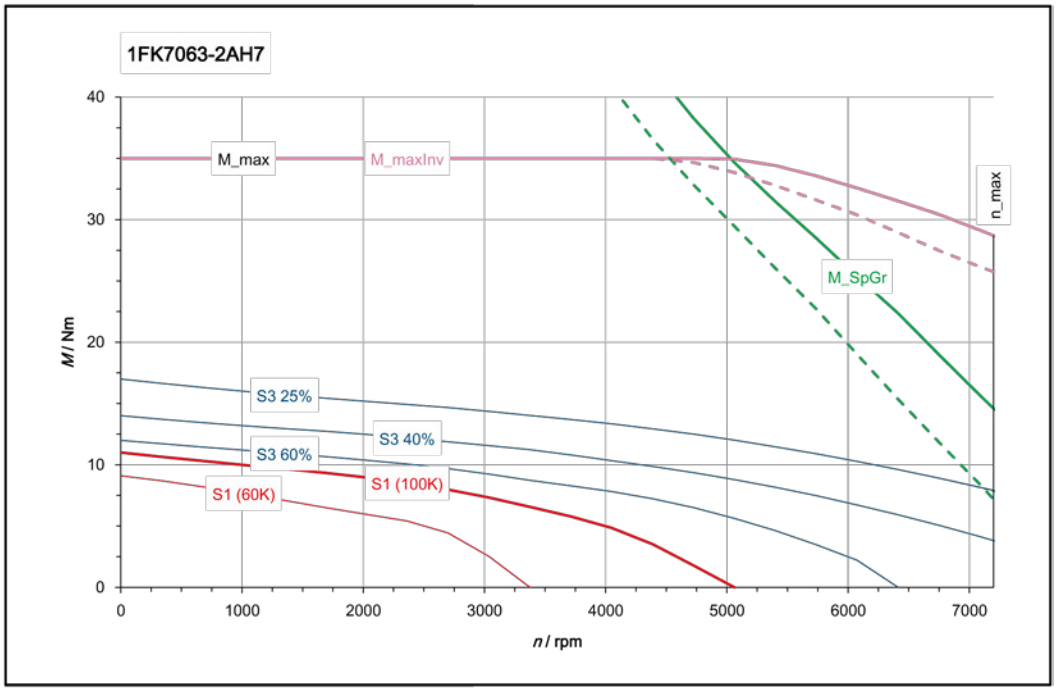
[———] SINAMICS ALM 480 V (720 V DC)
[– – – – – –] SINAMICS BLM/SLM 480 V (650 V DC)

1FK7063 - 2AH7 three-phase servomotor			
Technical data	**Character**	**Unit**	**Value**
Configuration data:			
Rated speed	n_N	rpm	4500
Rated torque (100 K)	$M_{N(100K)}$	Nm	3
Rated current (100 K)	$I_{N(100K)}$	A	3.8
Static torque (100 K)	$M_{0(100K)}$	Nm	11
Stall current (100 K)	$I_{0(100K)}$	A	12
Static torque (60 K)	$M_{0(60K)}$	Nm	9.1
Stall current (60 K)	$I_{0(60K)}$	A	9.7
Optimum operating point:			
Optimum speed	n_{opt}	rpm	3300
Optimum power	P_{opt}	kW	2.3
Limit data:			
Max. permissible speed (mech.)	$n_{max\ mech}$	rpm	7200
Maximum torque	M_{max}	Nm	35
Maximum current	I_{max}	A	42
Motor data:			
Number of poles	2p		8
Torque constant (100K)	k_T	Nm/A	0.915
Voltage constant (at 20°C)	k_E	V/1000rpm	60
Winding resistance (at 20°C)	R_{ph}	Ω	0.287
Rotating field inductance	L_D	mH	3.8
Electrical time constant	T_{el}	ms	13.2
Mechanical time constant	T_{mech}	ms	1.51
Thermal time constant	T_{th}	min	40
Moment of inertia	J_{Mot}	10^{-4} kgm^2	14.7
Shaft torsional stiffness	c_t	Nm/rad	34000
Weight	m_{Mot}	kg	11.1
Motor data with integrated brake:			
Moment of inertia (with brake)	$J_{Mot\ withBr}$	10^{-4} kgm^2	15.7
Shaft torsional stiffness (with brake)	$c_{t\ withBr}$	Nm/rad	25000
Weight (with brake)	$m_{Mot\ withBr}$	kg	12.5
Recommended Motor Module:			
Rated converter current	$I_{N\ conv}$	A	18
Maximum converter current	$I_{max\ conv}$	A	54
Max. torque (converter operation)	$M_{max\ conv}$	Nm	35
Max. permissible speed (converter operation)	$n_{max\ conv}$	rpm	7200

The rated data are valid for a 600 V DC link voltage



[———] SINAMICS ALM 400 V (600 V DC)
[- - - - - -] SINAMICS BLM/SLM 400 V (540 V DC)

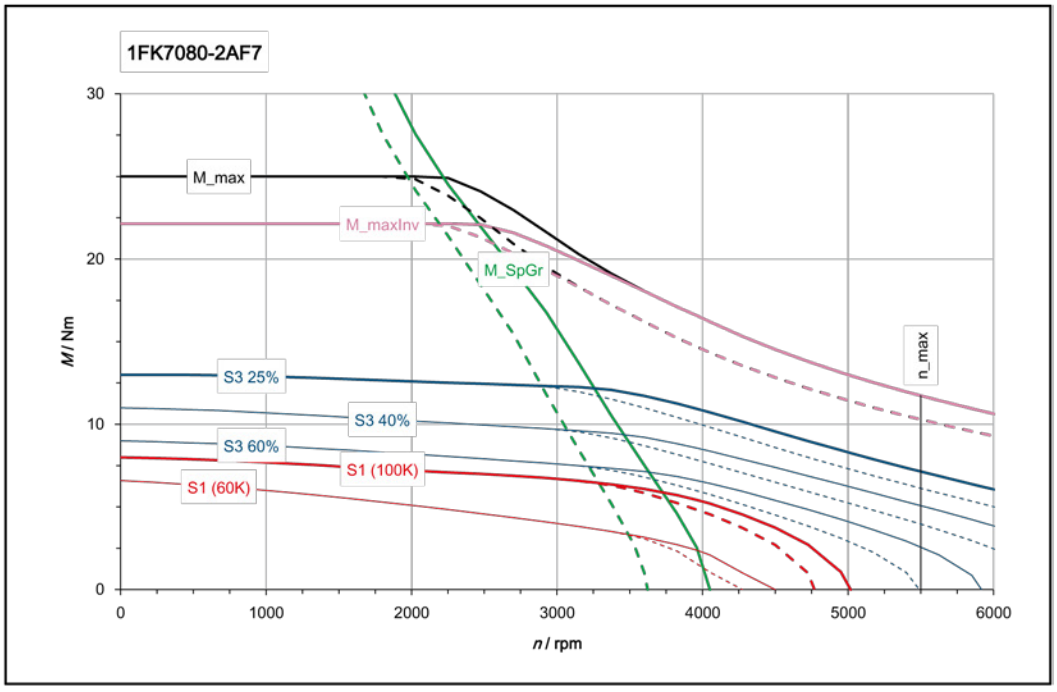


[———] SINAMICS ALM 480 V (720 V DC)
[- - - - - -] SINAMICS BLM/SLM 480 V (650 V DC)

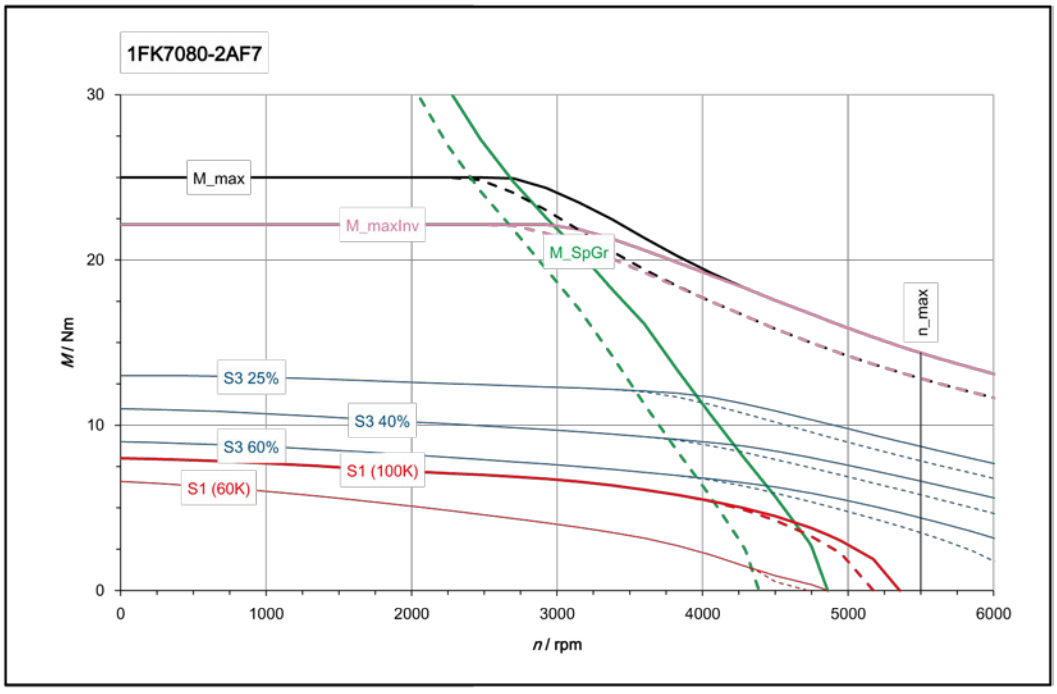
6.3.1.8 1FK7080-2A_

1FK7080 - 2AF7 three-phase servomotor			
Technical data	**Character**	**Unit**	**Value**
Configuration data:			
Rated speed	n_N	rpm	3000
Rated torque (100 K)	$M_{N(100K)}$	Nm	6.8
Rated current (100 K)	$I_{N(100K)}$	A	4.4
Static torque (100 K)	$M_{0(100K)}$	Nm	8
Stall current (100 K)	$I_{0(100K)}$	A	4.9
Static torque (60 K)	$M_{0(60K)}$	Nm	6.6
Stall current (60 K)	$I_{0(60K)}$	A	4
Optimum operating point:			
Optimum speed	n_{opt}	rpm	3000
Optimum power	P_{opt}	kW	2.15
Limit data:			
Max. permissible speed (mech.)	$n_{max\ mech}$	rpm	6000
Maximum torque	M_{max}	Nm	25
Maximum current	I_{max}	A	18
Motor data:			
Number of poles	2p		8
Torque constant (100K)	k_T	Nm/A	1.61
Voltage constant (at 20°C)	k_E	V/1000rpm	105
Winding resistance (at 20°C)	R_{ph}	Ω	0.985
Rotating field inductance	L_D	mH	17.2
Electrical time constant	T_{el}	ms	17.5
Mechanical time constant	T_{mech}	ms	1.52
Thermal time constant	T_{th}	min	40
Moment of inertia	J_{Mot}	10^{-4} kgm^2	14.2
Shaft torsional stiffness	c_t	Nm/rad	120000
Weight	m_{Mot}	kg	10.3
Motor data with integrated brake:			
Moment of inertia (with brake)	$J_{Mot\ withBr}$	10^{-4} kgm^2	17.5
Shaft torsional stiffness (with brake)	$c_{t\ withBr}$	Nm/rad	81000
Weight (with brake)	$m_{Mot\ withBr}$	kg	13.3
Recommended Motor Module:			
Rated converter current	$I_{N\ conv}$	A	5
Maximum converter current	$I_{max\ conv}$	A	15
Max. torque (converter operation)	$M_{max\ conv}$	Nm	22.1
Max. permissible speed (converter operation)	$n_{max\ conv}$	rpm	5500

The rated data are valid for a 600 V DC link voltage



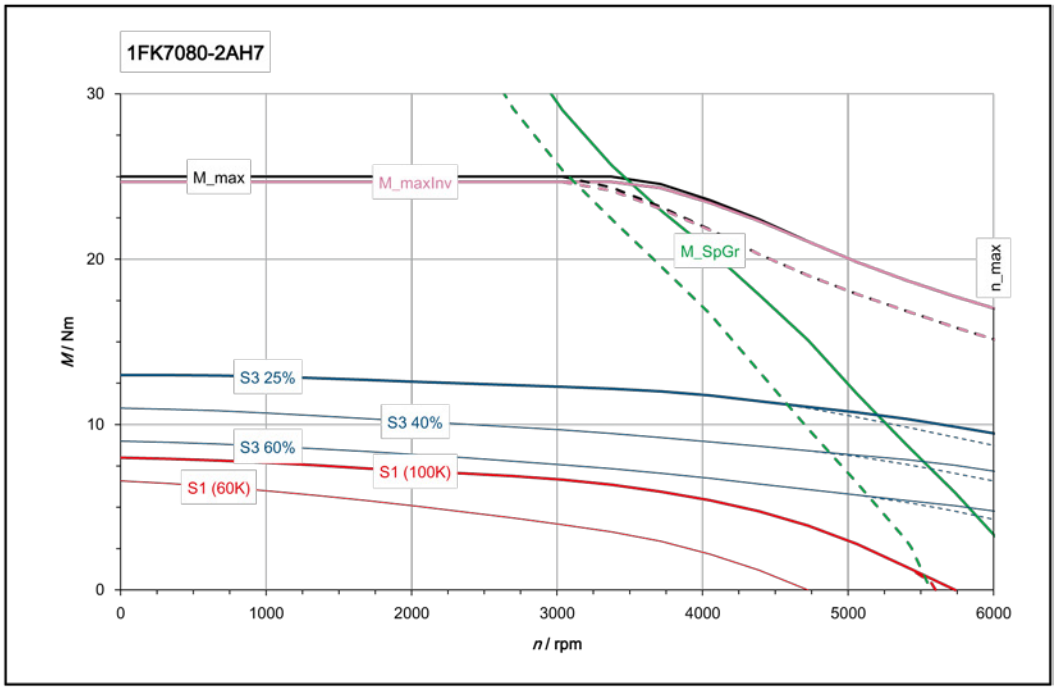
[———] SINAMICS ALM 400 V (600 V DC)
[– – – – – –] SINAMICS BLM/SLM 400 V (540 V DC)



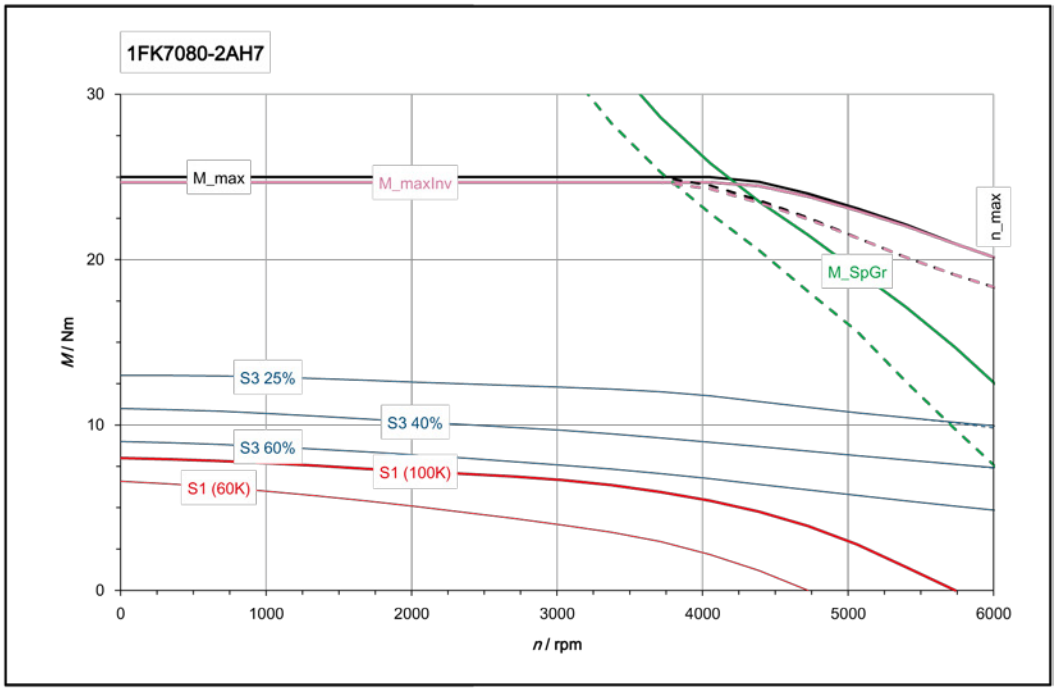
[———] SINAMICS ALM 480 V (720 V DC)
[– – – – – –] SINAMICS BLM/SLM 480 V (650 V DC)

1FK7080 - 2AH7 three-phase servomotor			
Technical data	**Character**	**Unit**	**Value**
Configuration data:			
Rated speed	n_N	rpm	4500
Rated torque (100 K)	$M_{N(100K)}$	Nm	4.5
Rated current (100 K)	$I_{N(100K)}$	A	4.8
Static torque (100 K)	$M_{0(100K)}$	Nm	8
Stall current (100 K)	$I_{0(100K)}$	A	7.4
Static torque (60 K)	$M_{0(60K)}$	Nm	6.6
Stall current (60 K)	$I_{0(60K)}$	A	6
Optimum operating point:			
Optimum speed	n_{opt}	rpm	4000
Optimum power	P_{opt}	kW	2.4
Limit data:			
Max. permissible speed (mech.)	$n_{max\ mech}$	rpm	6000
Maximum torque	M_{max}	Nm	25
Maximum current	I_{max}	A	27.5
Motor data:			
Number of poles	2p		8
Torque constant (100K)	k_T	Nm/A	1.08
Voltage constant (at 20°C)	k_E	V/1000rpm	68.5
Winding resistance (at 20°C)	R_{ph}	Ω	0.421
Rotating field inductance	L_D	mH	7.3
Electrical time constant	T_{el}	ms	17.3
Mechanical time constant	T_{mech}	ms	1.54
Thermal time constant	T_{th}	min	40
Moment of inertia	J_{Mot}	10^{-4} kgm^2	14.2
Shaft torsional stiffness	c_t	Nm/rad	120000
Weight	m_{Mot}	kg	10.3
Motor data with integrated brake:			
Moment of inertia (with brake)	$J_{Mot\ withBr}$	10^{-4} kgm^2	17.5
Shaft torsional stiffness (with brake)	$c_{t\ withBr}$	Nm/rad	81000
Weight (with brake)	$m_{Mot\ withBr}$	kg	13.3
Recommended Motor Module:			
Rated converter current	$I_{N\ conv}$	A	9
Maximum converter current	$I_{max\ conv}$	A	27
Max. torque (converter operation)	$M_{max\ conv}$	Nm	24.7
Max. permissible speed (converter operation)	$n_{max\ conv}$	rpm	6000

The rated data are valid for a 600 V DC link voltage



[———] SINAMICS ALM 400 V (600 V DC)
[- - - - - -] SINAMICS BLM/SLM 400 V (540 V DC)

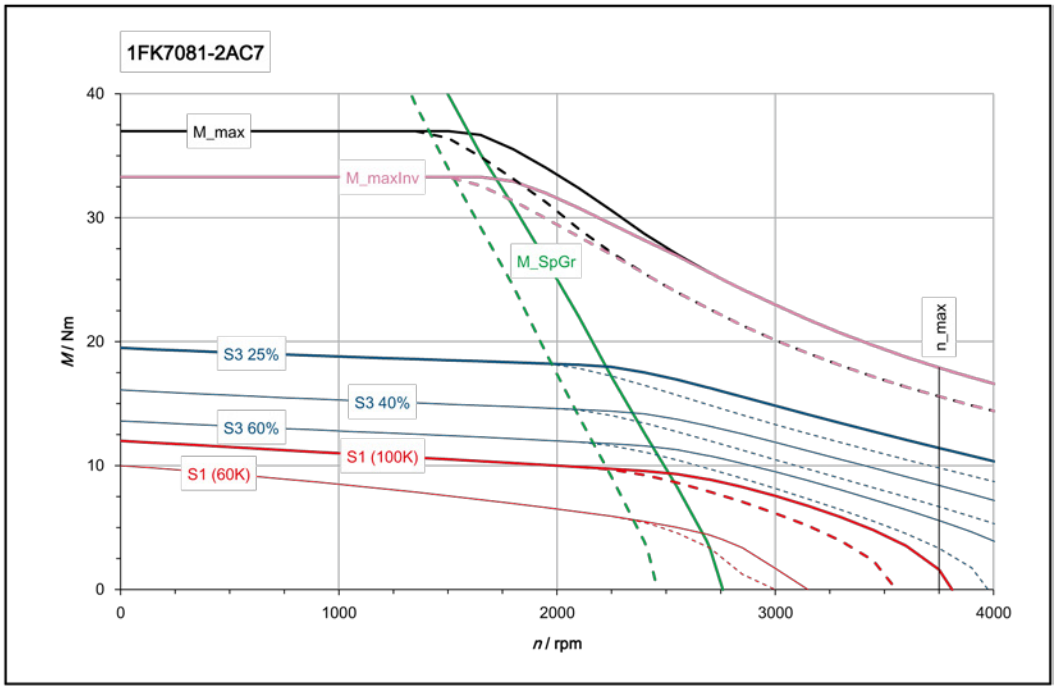


[———] SINAMICS ALM 480 V (720 V DC)
[- - - - - -] SINAMICS BLM/SLM 480 V (650 V DC)

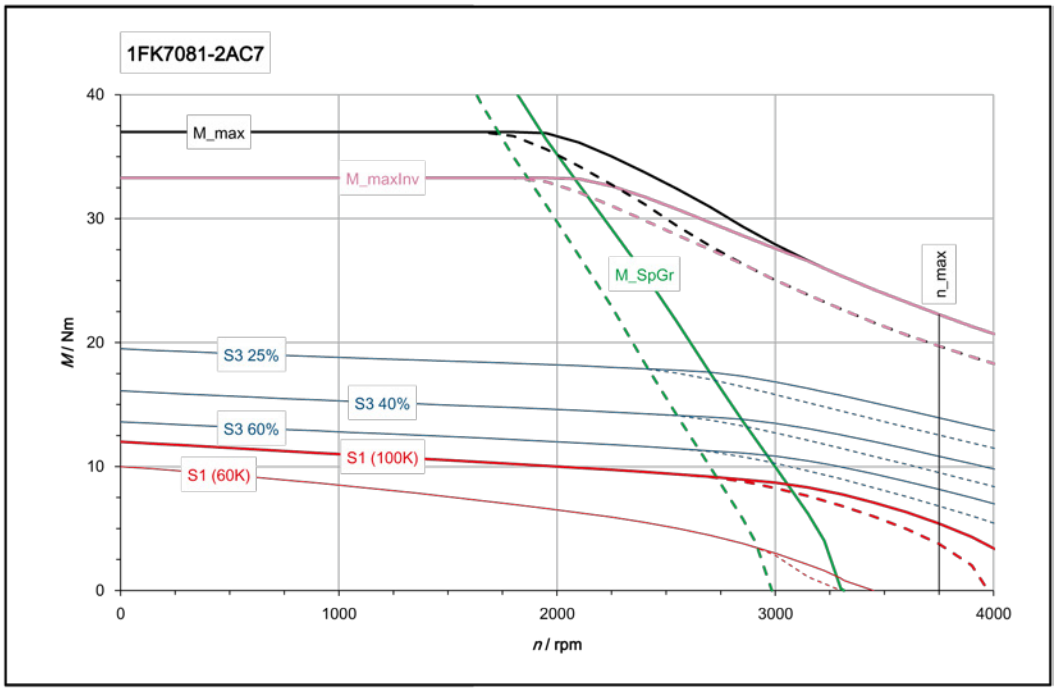
6.3.1.9 1FK7081-2A_

1FK7081 - 2AC7 three-phase servomotor			
Technical data	**Character**	**Unit**	**Value**
Configuration data:			
Rated speed	n_N	rpm	2000
Rated torque (100 K)	$M_{N(100K)}$	Nm	10
Rated current (100 K)	$I_{N(100K)}$	A	4.4
Static torque (100 K)	$M_{0(100K)}$	Nm	12
Stall current (100 K)	$I_{0(100K)}$	A	5
Static torque (60 K)	$M_{0(60K)}$	Nm	10
Stall current (60 K)	$I_{0(60K)}$	A	4.05
Optimum operating point:			
Optimum speed	n_{opt}	rpm	2000
Optimum power	P_{opt}	kW	2.1
Limit data:			
Max. permissible speed (mech.)	$n_{max\ mech}$	rpm	6000
Maximum torque	M_{max}	Nm	37
Maximum current	I_{max}	A	17.2
Motor data:			
Number of poles	2p		8
Torque constant (100K)	k_T	Nm/A	2.4
Voltage constant (at 20°C)	k_E	V/1000rpm	154.5
Winding resistance (at 20°C)	R_{ph}	Ω	1.275
Rotating field inductance	L_D	mH	23.5
Electrical time constant	T_{el}	ms	18.4
Mechanical time constant	T_{mech}	ms	1.33
Thermal time constant	T_{th}	min	45
Moment of inertia	J_{Mot}	10^{-4} kgm^2	20
Shaft torsional stiffness	c_t	Nm/rad	109000
Weight	m_{Mot}	kg	12.9
Motor data with integrated brake:			
Moment of inertia (with brake)	$J_{Mot\ withBr}$	10^{-4} kgm^2	23.5
Shaft torsional stiffness (with brake)	$c_{t\ withBr}$	Nm/rad	76000
Weight (with brake)	$m_{Mot\ withBr}$	kg	15.9
Recommended Motor Module:			
Rated converter current	$I_{N\ conv}$	A	5
Maximum converter current	$I_{max\ conv}$	A	15
Max. torque (converter operation)	$M_{max\ conv}$	Nm	33.3
Max. permissible speed (converter operation)	$n_{max\ conv}$	rpm	3750

The rated data are valid for a 600 V DC link voltage



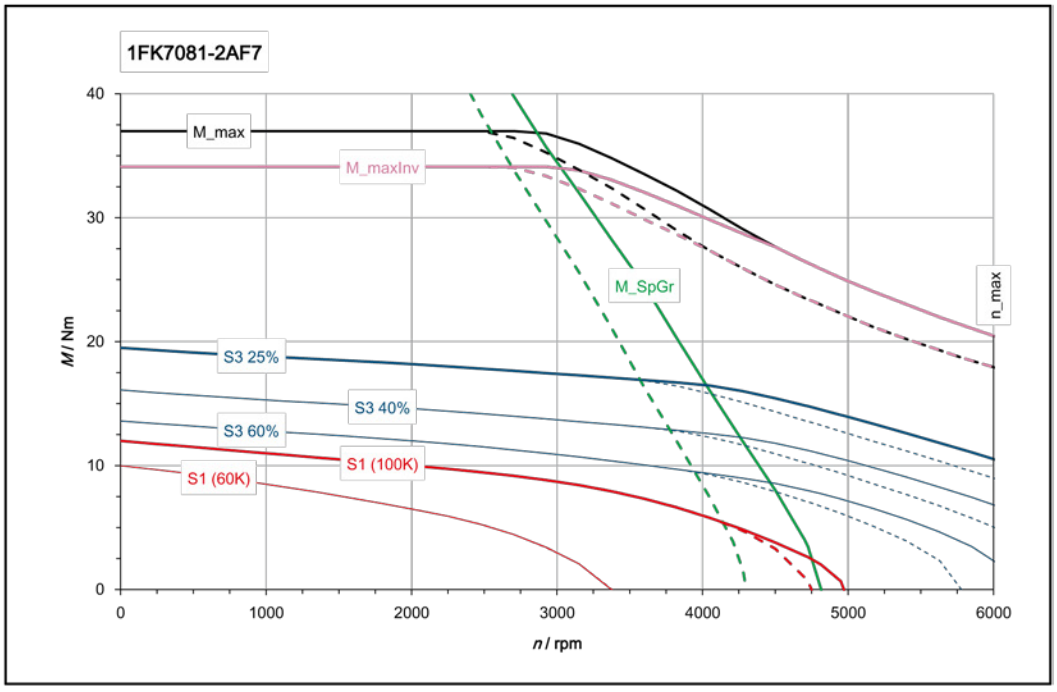
[———] SINAMICS ALM 400 V (600 V DC)
[- - - - - -] SINAMICS BLM/SLM 400 V (540 V DC)



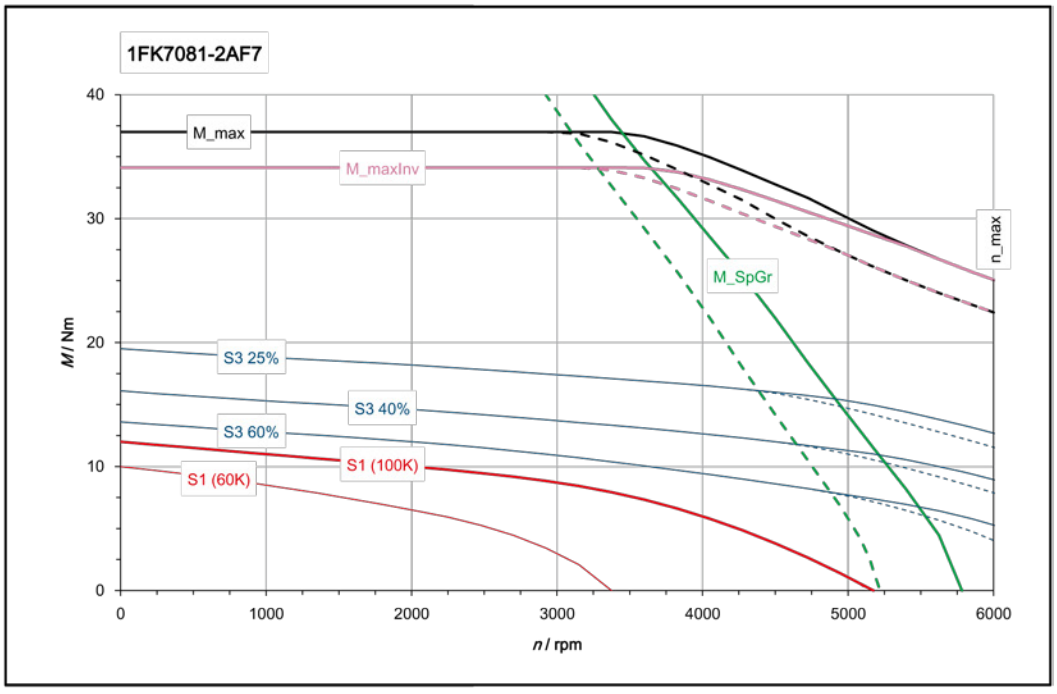
[———] SINAMICS ALM 480 V (720 V DC)
[- - - - - -] SINAMICS BLM/SLM 480 V (650 V DC)

1FK7081 - 2AF7 three-phase servomotor			
Technical data	**Character**	**Unit**	**Value**
Configuration data:			
Rated speed	n_N	rpm	3000
Rated torque (100 K)	$M_{N(100K)}$	Nm	8.7
Rated current (100 K)	$I_{N(100K)}$	A	6.8
Static torque (100 K)	$M_{0(100K)}$	Nm	12
Stall current (100 K)	$I_{0(100K)}$	A	8.7
Static torque (60 K)	$M_{0(60K)}$	Nm	10
Stall current (60 K)	$I_{0(60K)}$	A	7.1
Optimum operating point:			
Optimum speed	n_{opt}	rpm	3000
Optimum power	P_{opt}	kW	2.75
Limit data:			
Max. permissible speed (mech.)	$n_{max\ mech}$	rpm	6000
Maximum torque	M_{max}	Nm	37
Maximum current	I_{max}	A	30
Motor data:			
Number of poles	2p		8
Torque constant (100K)	k_T	Nm/A	1.375
Voltage constant (at 20°C)	k_E	V/1000rpm	88.5
Winding resistance (at 20°C)	R_{ph}	Ω	0.424
Rotating field inductance	L_D	mH	7.7
Electrical time constant	T_{el}	ms	18.2
Mechanical time constant	T_{mech}	ms	1.35
Thermal time constant	T_{th}	min	45
Moment of inertia	J_{Mot}	10^{-4} kgm^2	20
Shaft torsional stiffness	c_t	Nm/rad	109000
Weight	m_{Mot}	kg	12.9
Motor data with integrated brake:			
Moment of inertia (with brake)	$J_{Mot\ withBr}$	10^{-4} kgm^2	23.5
Shaft torsional stiffness (with brake)	$c_{t\ withBr}$	Nm/rad	76000
Weight (with brake)	$m_{Mot\ withBr}$	kg	15.9
Recommended Motor Module:			
Rated converter current	$I_{N\ conv}$	A	9
Maximum converter current	$I_{max\ conv}$	A	27
Max. torque (converter operation)	$M_{max\ conv}$	Nm	34.1
Max. permissible speed (converter operation)	$n_{max\ conv}$	rpm	6000

The rated data are valid for a 600 V DC link voltage



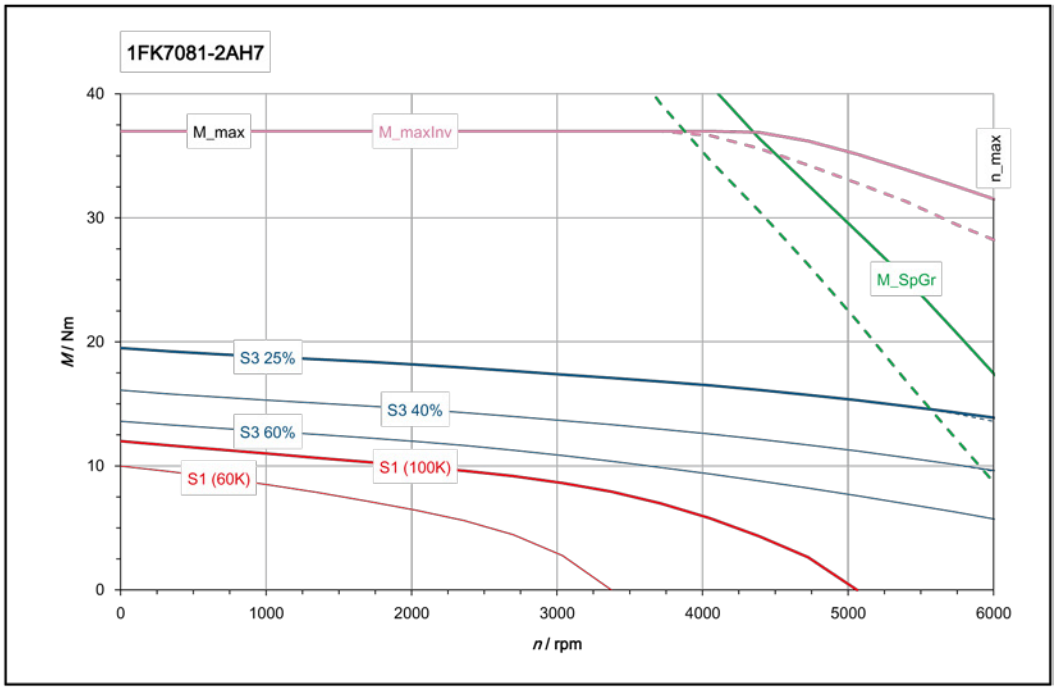
[———] SINAMICS ALM 400 V (600 V DC)
[- - - - - -] SINAMICS BLM/SLM 400 V (540 V DC)



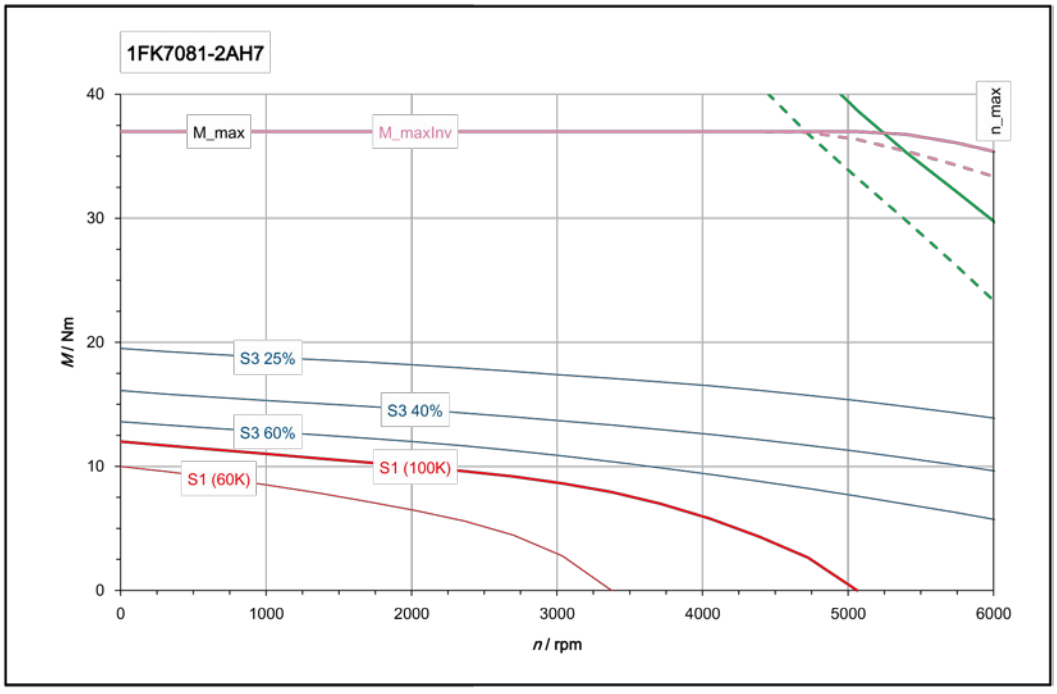
[———] SINAMICS ALM 480 V (720 V DC)
[- - - - - -] SINAMICS BLM/SLM 480 V (650 V DC)

1FK7081 - 2AH7 three-phase servomotor			
Technical data	**Character**	**Unit**	**Value**
Configuration data:			
Rated speed	n_N	rpm	4500
Rated torque (100 K)	$M_{N(100K)}$	Nm	3.8
Rated current (100 K)	$I_{N(100K)}$	A	4.9
Static torque (100 K)	$M_{0(100K)}$	Nm	12
Stall current (100 K)	$I_{0(100K)}$	A	13.1
Static torque (60 K)	$M_{0(60K)}$	Nm	10
Stall current (60 K)	$I_{0(60K)}$	A	10.6
Optimum operating point:			
Optimum speed	n_{opt}	rpm	3000
Optimum power	P_{opt}	kW	2.75
Limit data:			
Max. permissible speed (mech.)	$n_{max\ mech}$	rpm	6000
Maximum torque	M_{max}	Nm	37
Maximum current	I_{max}	A	45
Motor data:			
Number of poles	2p		8
Torque constant (100K)	k_T	Nm/A	0.915
Voltage constant (at 20°C)	k_E	V/1000rpm	59
Winding resistance (at 20°C)	R_{ph}	Ω	0.1895
Rotating field inductance	L_D	mH	3.4
Electrical time constant	T_{el}	ms	17.9
Mechanical time constant	T_{mech}	ms	1.36
Thermal time constant	T_{th}	min	45
Moment of inertia	J_{Mot}	10^{-4} kgm^2	20
Shaft torsional stiffness	c_t	Nm/rad	109000
Weight	m_{Mot}	kg	12.9
Motor data with integrated brake:			
Moment of inertia (with brake)	$J_{Mot\ withBr}$	10^{-4} kgm^2	23.5
Shaft torsional stiffness (with brake)	$c_{t\ withBr}$	Nm/rad	76000
Weight (with brake)	$m_{Mot\ withBr}$	kg	15.9
Recommended Motor Module:			
Rated converter current	$I_{N\ conv}$	A	18
Maximum converter current	$I_{max\ conv}$	A	54
Max. torque (converter operation)	$M_{max\ conv}$	Nm	37
Max. permissible speed (converter operation)	$n_{max\ conv}$	rpm	6000

The rated data are valid for a 600 V DC link voltage



[———] SINAMICS ALM 400 V (600 V DC)
[- - - - - -] SINAMICS BLM/SLM 400 V (540 V DC)

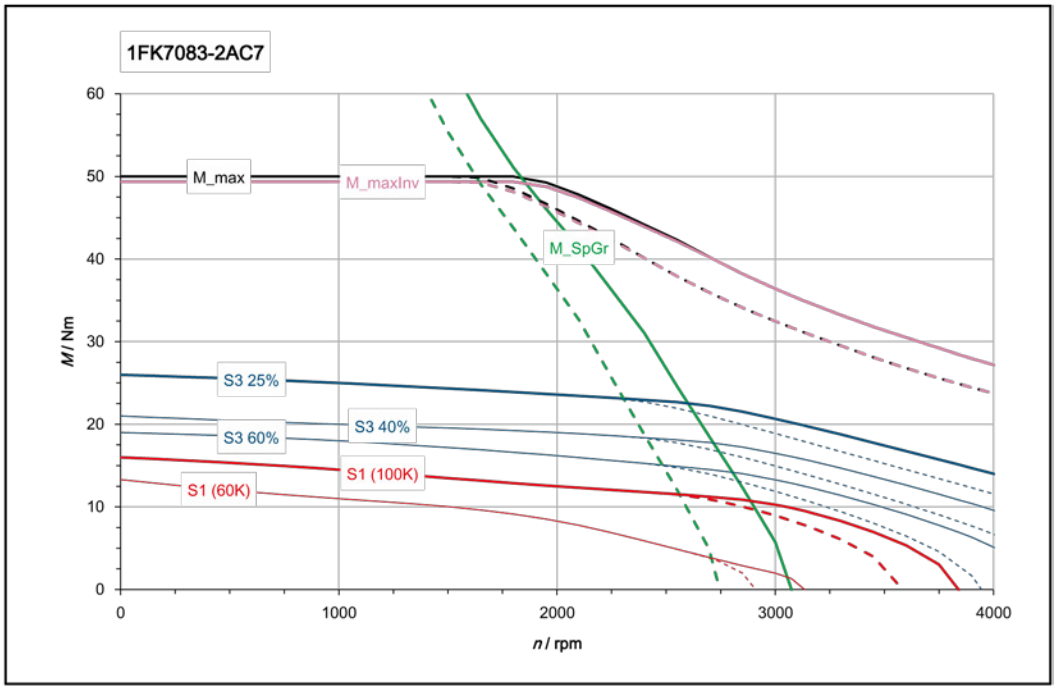


[———] SINAMICS ALM 480 V (720 V DC)
[- - - - - -] SINAMICS BLM/SLM 480 V (650 V DC)

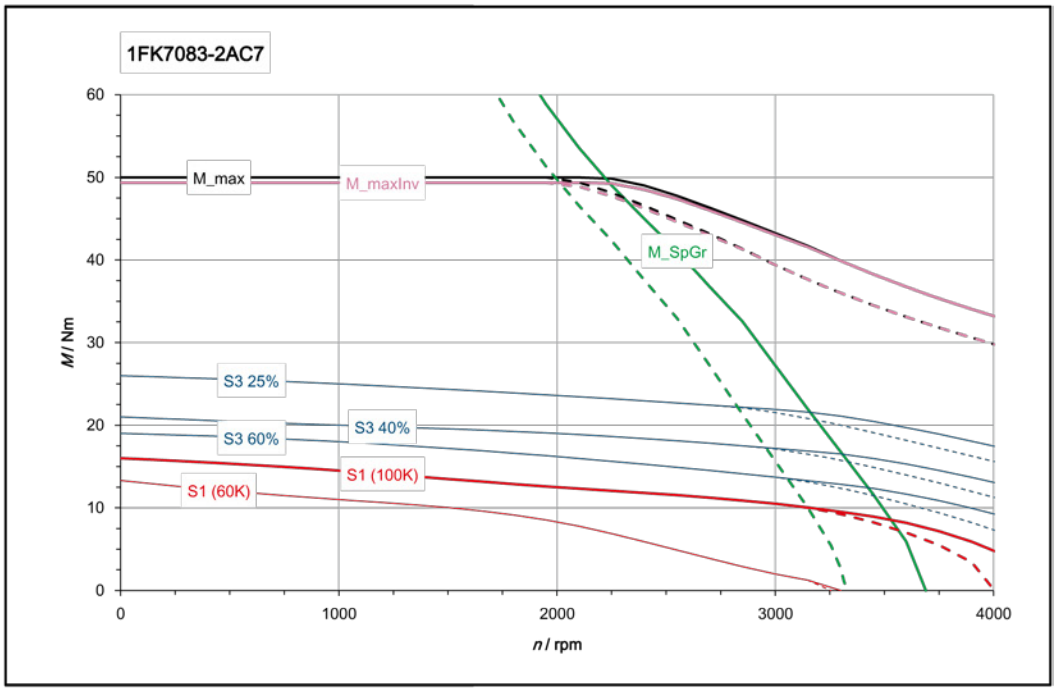
6.3.1.10 1FK7083-2A_

1FK7083 - 2AC7 three-phase servomotor			
Technical data	**Character**	**Unit**	**Value**
Configuration data:			
Rated speed	n_N	rpm	2000
Rated torque (100 K)	$M_{N(100K)}$	Nm	12.5
Rated current (100 K)	$I_{N(100K)}$	A	6.3
Static torque (100 K)	$M_{0(100K)}$	Nm	16
Stall current (100 K)	$I_{0(100K)}$	A	7.5
Static torque (60 K)	$M_{0(60K)}$	Nm	13.3
Stall current (60 K)	$I_{0(60K)}$	A	6.1
Optimum operating point:			
Optimum speed	n_{opt}	rpm	2000
Optimum power	P_{opt}	kW	2.6
Limit data:			
Max. permissible speed (mech.)	$n_{max\ mech}$	rpm	6000
Maximum torque	M_{max}	Nm	50
Maximum current	I_{max}	A	27.5
Motor data:			
Number of poles	2p		8
Torque constant (100K)	k_T	Nm/A	2.13
Voltage constant (at 20°C)	k_E	V/1000rpm	138.5
Winding resistance (at 20°C)	R_{ph}	Ω	0.66
Rotating field inductance	L_D	mH	12.8
Electrical time constant	T_{el}	ms	19.4
Mechanical time constant	T_{mech}	ms	1.13
Thermal time constant	T_{th}	min	50
Moment of inertia	J_{Mot}	10^{-4} kgm^2	26
Shaft torsional stiffness	c_t	Nm/rad	101000
Weight	m_{Mot}	kg	15.6
Motor data with integrated brake:			
Moment of inertia (with brake)	$J_{Mot\ withBr}$	10^{-4} kgm^2	29.5
Shaft torsional stiffness (with brake)	$c_{t\ withBr}$	Nm/rad	72000
Weight (with brake)	$m_{Mot\ withBr}$	kg	18.6
Recommended Motor Module:			
Rated converter current	$I_{N\ conv}$	A	9
Maximum converter current	$I_{max\ conv}$	A	27
Max. torque (converter operation)	$M_{max\ conv}$	Nm	49.3
Max. permissible speed (converter operation)	$n_{max\ conv}$	rpm	4150

The rated data are valid for a 600 V DC link voltage



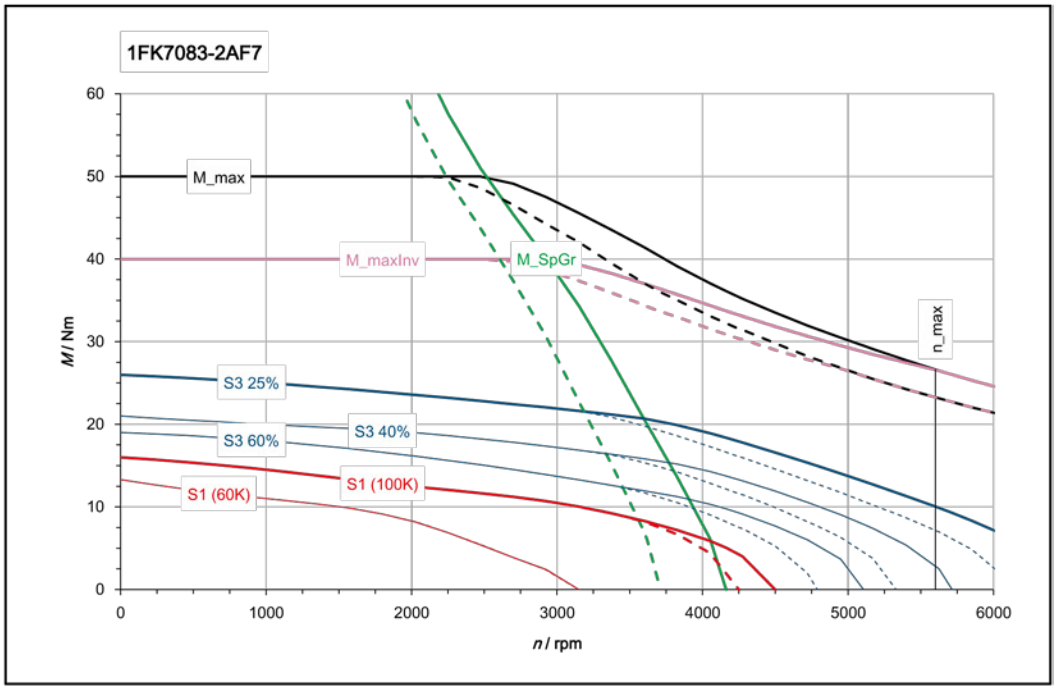
[———] SINAMICS ALM 400 V (600 V DC)
[- - - - - -] SINAMICS BLM/SLM 400 V (540 V DC)



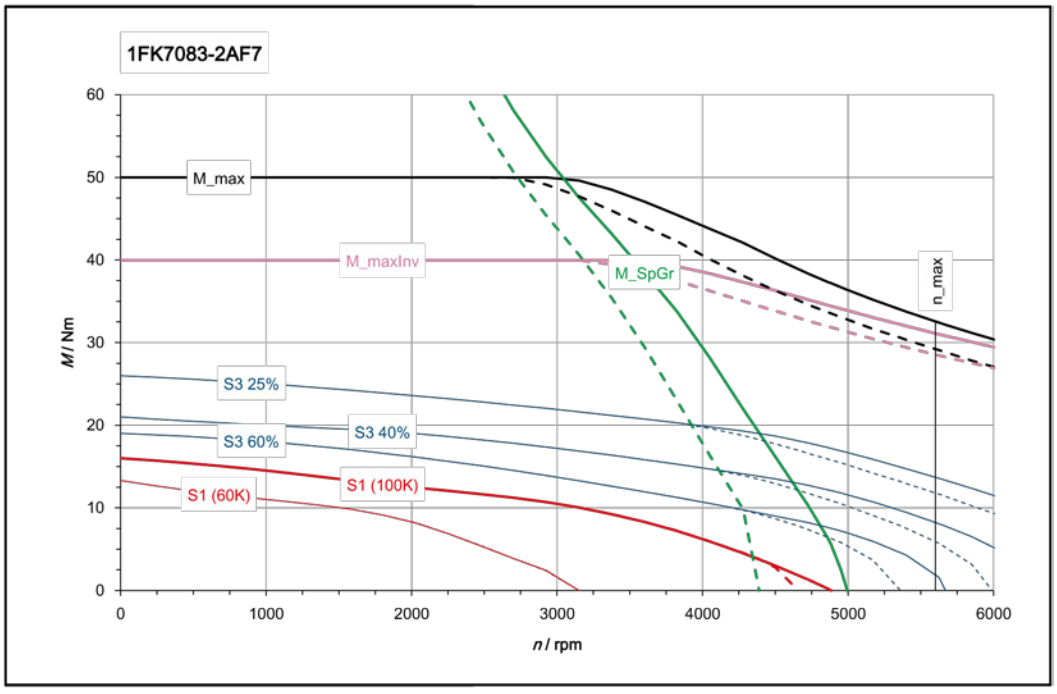
[———] SINAMICS ALM 480 V (720 V DC)
[- - - - - -] SINAMICS BLM/SLM 480 V (650 V DC)

1FK7083 - 2AF7 three-phase servomotor			
Technical data	**Character**	**Unit**	**Value**
Configuration data:			
Rated speed	n_N	rpm	3000
Rated torque (100 K)	$M_{N(100K)}$	Nm	10.5
Rated current (100 K)	$I_{N(100K)}$	A	7.2
Static torque (100 K)	$M_{0(100K)}$	Nm	16
Stall current (100 K)	$I_{0(100K)}$	A	10.1
Static torque (60 K)	$M_{0(60K)}$	Nm	13.3
Stall current (60 K)	$I_{0(60K)}$	A	8.2
Optimum operating point:			
Optimum speed	n_{opt}	rpm	3000
Optimum power	P_{opt}	kW	3.3
Limit data:			
Max. permissible speed (mech.)	$n_{max\ mech}$	rpm	6000
Maximum torque	M_{max}	Nm	50
Maximum current	I_{max}	A	37
Motor data:			
Number of poles	2p		8
Torque constant (100K)	k_T	Nm/A	1.58
Voltage constant (at 20°C)	k_E	V/1000rpm	102.5
Winding resistance (at 20°C)	R_{ph}	Ω	0.377
Rotating field inductance	L_D	mH	7
Electrical time constant	T_{el}	ms	18.6
Mechanical time constant	T_{mech}	ms	1.18
Thermal time constant	T_{th}	min	50
Moment of inertia	J_{Mot}	10^{-4} kgm^2	26
Shaft torsional stiffness	c_t	Nm/rad	101000
Weight	m_{Mot}	kg	15.6
Motor data with integrated brake:			
Moment of inertia (with brake)	$J_{Mot\ withBr}$	10^{-4} kgm^2	29.5
Shaft torsional stiffness (with brake)	$c_{t\ withBr}$	Nm/rad	72000
Weight (with brake)	$m_{Mot\ withBr}$	kg	18.6
Recommended Motor Module:			
Rated converter current	$I_{N\ conv}$	A	9
Maximum converter current	$I_{max\ conv}$	A	27
Max. torque (converter operation)	$M_{max\ conv}$	Nm	40
Max. permissible speed (converter operation)	$n_{max\ conv}$	rpm	5600

The rated data are valid for a 600 V DC link voltage



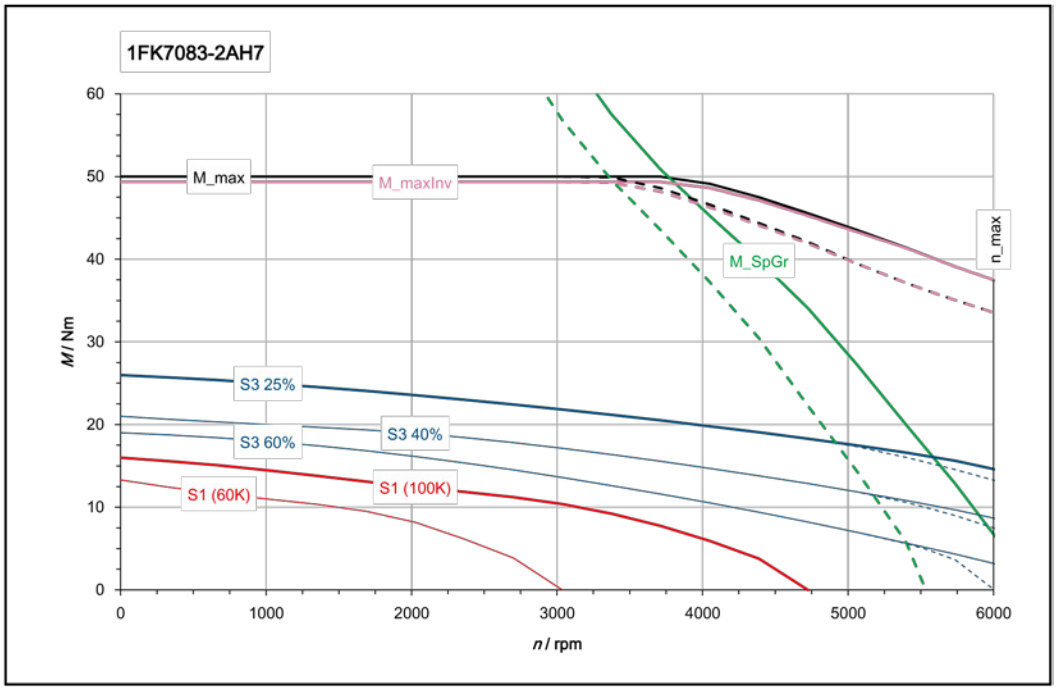
[———] SINAMICS ALM 400 V (600 V DC)
[- - - - - -] SINAMICS BLM/SLM 400 V (540 V DC)



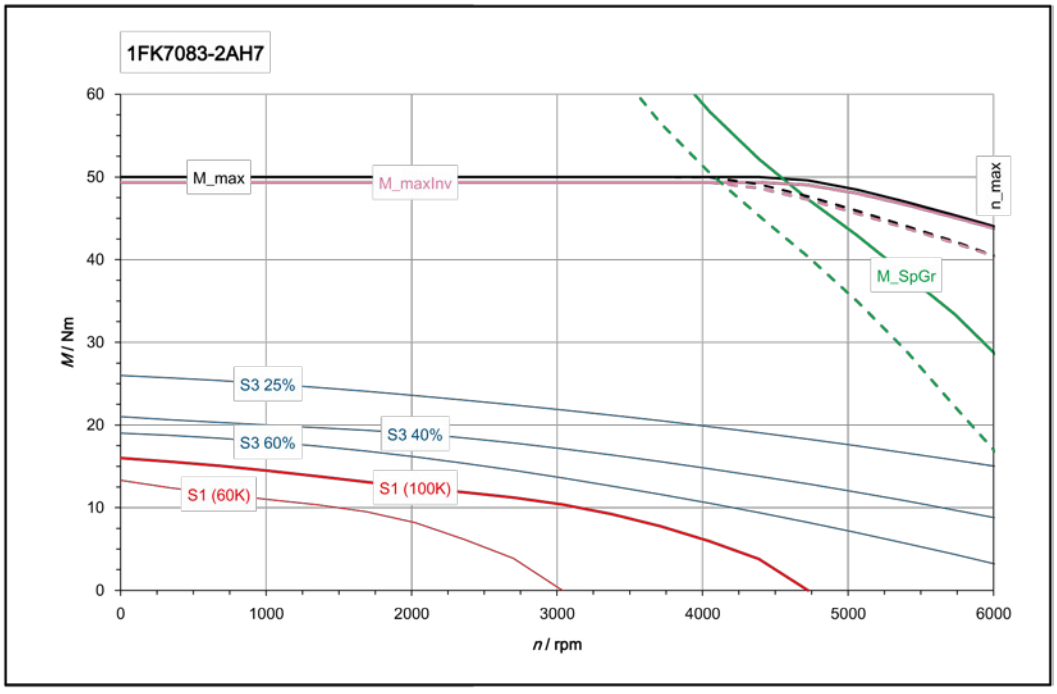
[———] SINAMICS ALM 480 V (720 V DC)
[- - - - - -] SINAMICS BLM/SLM 480 V (650 V DC)

1FK7083 - 2AH7 three-phase servomotor			
Technical data	**Character**	**Unit**	**Value**
Configuration data:			
Rated speed	n_N	rpm	4500
Rated torque (100 K)	$M_{N(100K)}$	Nm	3
Rated current (100 K)	$I_{N(100K)}$	A	3.6
Static torque (100 K)	$M_{0(100K)}$	Nm	16
Stall current (100 K)	$I_{0(100K)}$	A	15
Static torque (60 K)	$M_{0(60K)}$	Nm	13.3
Stall current (60 K)	$I_{0(60K)}$	A	12.2
Optimum operating point:			
Optimum speed	n_{opt}	rpm	3000
Optimum power	P_{opt}	kW	3.3
Limit data:			
Max. permissible speed (mech.)	$n_{max\ mech}$	rpm	6000
Maximum torque	M_{max}	Nm	50
Maximum current	I_{max}	A	55
Motor data:			
Number of poles	2p		8
Torque constant (100K)	k_T	Nm/A	1.065
Voltage constant (at 20°C)	k_E	V/1000rpm	69
Winding resistance (at 20°C)	R_{ph}	Ω	0.1655
Rotating field inductance	L_D	mH	3.2
Electrical time constant	T_{el}	ms	19.3
Mechanical time constant	T_{mech}	ms	1.14
Thermal time constant	T_{th}	min	50
Moment of inertia	J_{Mot}	10^{-4} kgm^2	26
Shaft torsional stiffness	c_t	Nm/rad	101000
Weight	m_{Mot}	kg	15.6
Motor data with integrated brake:			
Moment of inertia (with brake)	$J_{Mot\ withBr}$	10^{-4} kgm^2	29.5
Shaft torsional stiffness (with brake)	$c_{t\ withBr}$	Nm/rad	72000
Weight (with brake)	$m_{Mot\ withBr}$	kg	18.6
Recommended Motor Module:			
Rated converter current	$I_{N\ conv}$	A	18
Maximum converter current	$I_{max\ conv}$	A	54
Max. torque (converter operation)	$M_{max\ conv}$	Nm	49.3
Max. permissible speed (converter operation)	$n_{max\ conv}$	rpm	6000

The rated data are valid for a 600 V DC link voltage



[———] SINAMICS ALM 400 V (600 V DC)
[- - - - - -] SINAMICS BLM/SLM 400 V (540 V DC)

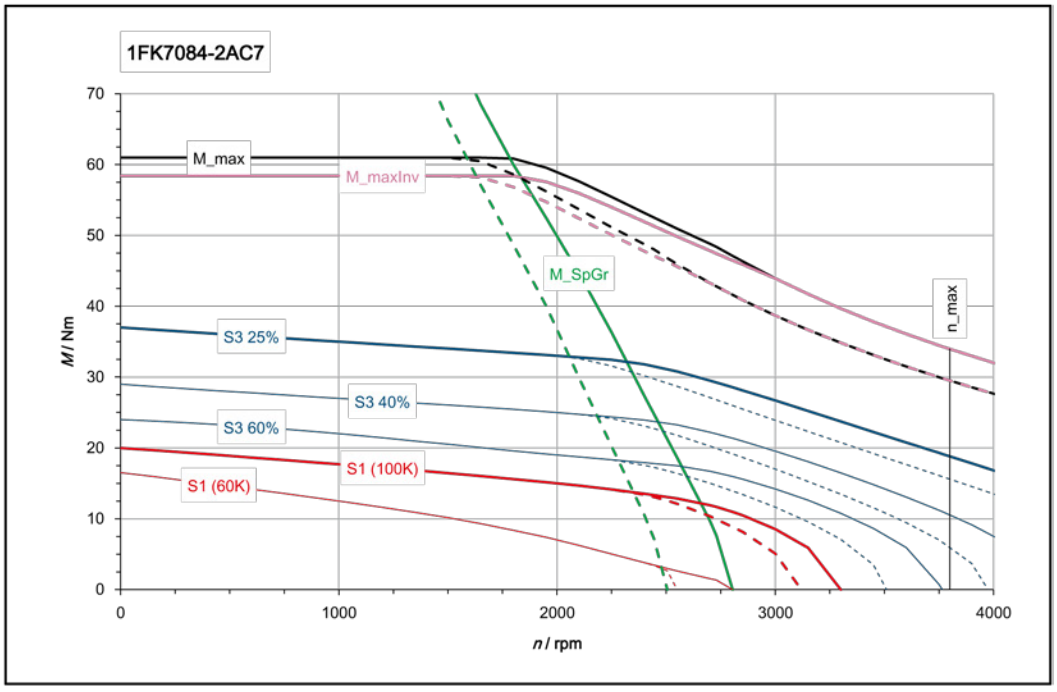


[———] SINAMICS ALM 480 V (720 V DC)
[- - - - - -] SINAMICS BLM/SLM 480 V (650 V DC)

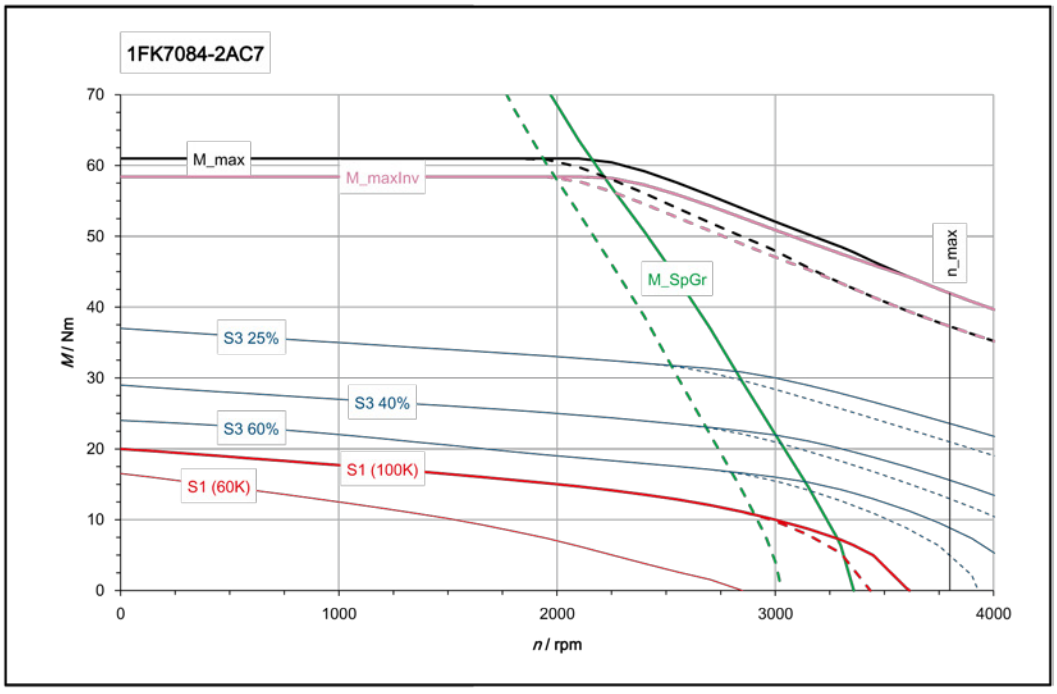
6.3.1.11 1FK7084-2A_

1FK7084 - 2AC7 three-phase servomotor			
Technical data	**Character**	**Unit**	**Value**
Configuration data:			
Rated speed	n_N	rpm	2000
Rated torque (100 K)	$M_{N(100K)}$	Nm	15
Rated current (100 K)	$I_{N(100K)}$	A	6.7
Static torque (100 K)	$M_{0(100K)}$	Nm	20
Stall current (100 K)	$I_{0(100K)}$	A	8.5
Static torque (60 K)	$M_{0(60K)}$	Nm	16.6
Stall current (60 K)	$I_{0(60K)}$	A	6.9
Optimum operating point:			
Optimum speed	n_{opt}	rpm	2000
Optimum power	P_{opt}	kW	3.15
Limit data:			
Max. permissible speed (mech.)	$n_{max\ mech}$	rpm	6000
Maximum torque	M_{max}	Nm	61
Maximum current	I_{max}	A	28.5
Motor data:			
Number of poles	2p		8
Torque constant (100K)	k_T	Nm/A	2.36
Voltage constant (at 20°C)	k_E	V/1000rpm	152
Winding resistance (at 20°C)	R_{ph}	Ω	0.585
Rotating field inductance	L_D	mH	12
Electrical time constant	T_{el}	ms	20.5
Mechanical time constant	T_{mech}	ms	1.02
Thermal time constant	T_{th}	min	55
Moment of inertia	J_{Mot}	10^{-4} kgm^2	32.5
Shaft torsional stiffness	c_t	Nm/rad	93000
Weight	m_{Mot}	kg	18.3
Motor data with integrated brake:			
Moment of inertia (with brake)	$J_{Mot\ withBr}$	10^{-4} kgm^2	35.5
Shaft torsional stiffness (with brake)	$c_{t\ withBr}$	Nm/rad	68000
Weight (with brake)	$m_{Mot\ withBr}$	kg	21.3
Recommended Motor Module:			
Rated converter current	$I_{N\ conv}$	A	9
Maximum converter current	$I_{max\ conv}$	A	27
Max. torque (converter operation)	$M_{max\ conv}$	Nm	58.4
Max. permissible speed (converter operation)	$n_{max\ conv}$	rpm	3800

The rated data are valid for a 600 V DC link voltage



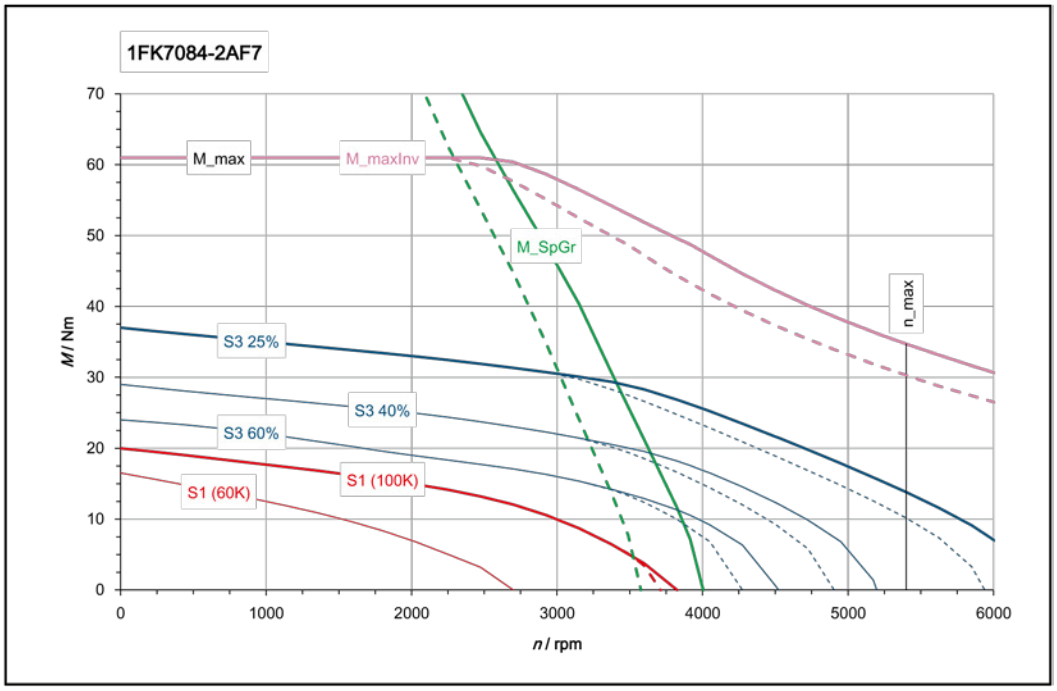
[———] SINAMICS ALM 400 V (600 V DC)
[- - - - - -] SINAMICS BLM/SLM 400 V (540 V DC)



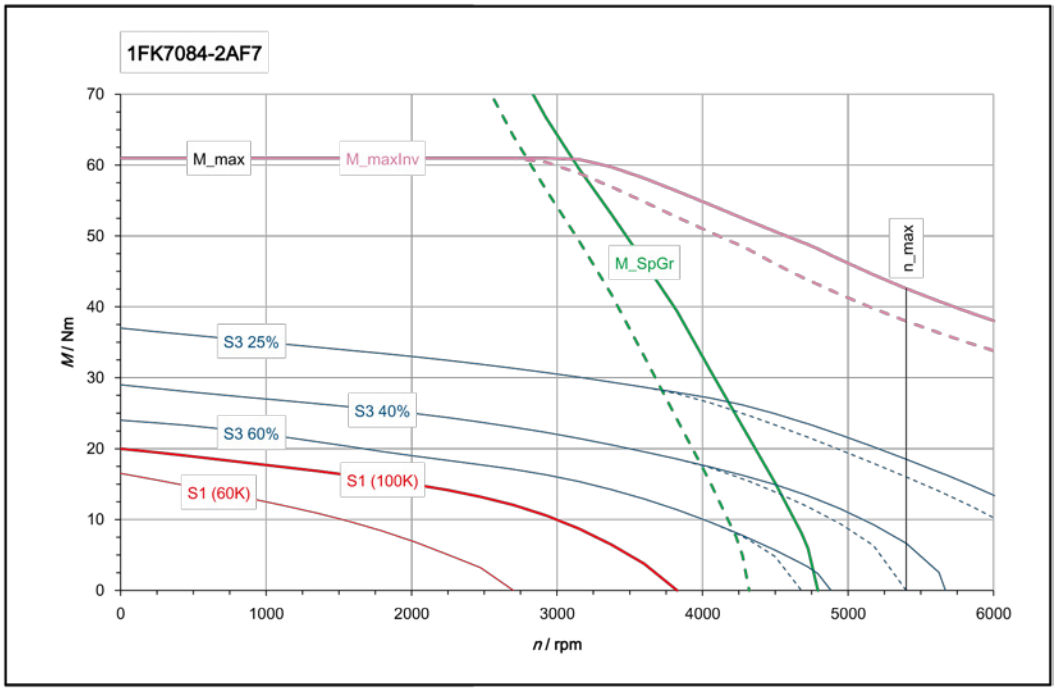
[———] SINAMICS ALM 480 V (720 V DC)
[- - - - - -] SINAMICS BLM/SLM 480 V (650 V DC)

1FK7084 - 2AF7 three-phase servomotor			
Technical data	**Character**	**Unit**	**Value**
Configuration data:			
Rated speed	n_N	rpm	3000
Rated torque (100 K)	$M_{N(100K)}$	Nm	10
Rated current (100 K)	$I_{N(100K)}$	A	6.5
Static torque (100 K)	$M_{0(100K)}$	Nm	20
Stall current (100 K)	$I_{0(100K)}$	A	12.1
Static torque (60 K)	$M_{0(60K)}$	Nm	16.6
Stall current (60 K)	$I_{0(60K)}$	A	9.8
Optimum operating point:			
Optimum speed	n_{opt}	rpm	2500
Optimum power	P_{opt}	kW	3.25
Limit data:			
Max. permissible speed (mech.)	$n_{max\ mech}$	rpm	6000
Maximum torque	M_{max}	Nm	61
Maximum current	I_{max}	A	41
Motor data:			
Number of poles	2p		8
Torque constant (100K)	k_T	Nm/A	1.655
Voltage constant (at 20°C)	k_E	V/1000rpm	106.5
Winding resistance (at 20°C)	R_{ph}	Ω	0.284
Rotating field inductance	L_D	mH	5.9
Electrical time constant	T_{el}	ms	21
Mechanical time constant	T_{mech}	ms	1.01
Thermal time constant	T_{th}	min	55
Moment of inertia	J_{Mot}	10^{-4} kgm^2	32.5
Shaft torsional stiffness	c_t	Nm/rad	93000
Weight	m_{Mot}	kg	18.3
Motor data with integrated brake:			
Moment of inertia (with brake)	$J_{Mot\ withBr}$	10^{-4} kgm^2	35.5
Shaft torsional stiffness (with brake)	$c_{t\ withBr}$	Nm/rad	68000
Weight (with brake)	$m_{Mot\ withBr}$	kg	21.3
Recommended Motor Module:			
Rated converter current	$I_{N\ conv}$	A	18
Maximum converter current	$I_{max\ conv}$	A	54
Max. torque (converter operation)	$M_{max\ conv}$	Nm	61
Max. permissible speed (converter operation)	$n_{max\ conv}$	rpm	5400

The rated data are valid for a 600 V DC link voltage



[———] SINAMICS ALM 400 V (600 V DC)
[- - - - - -] SINAMICS BLM/SLM 400 V (540 V DC)

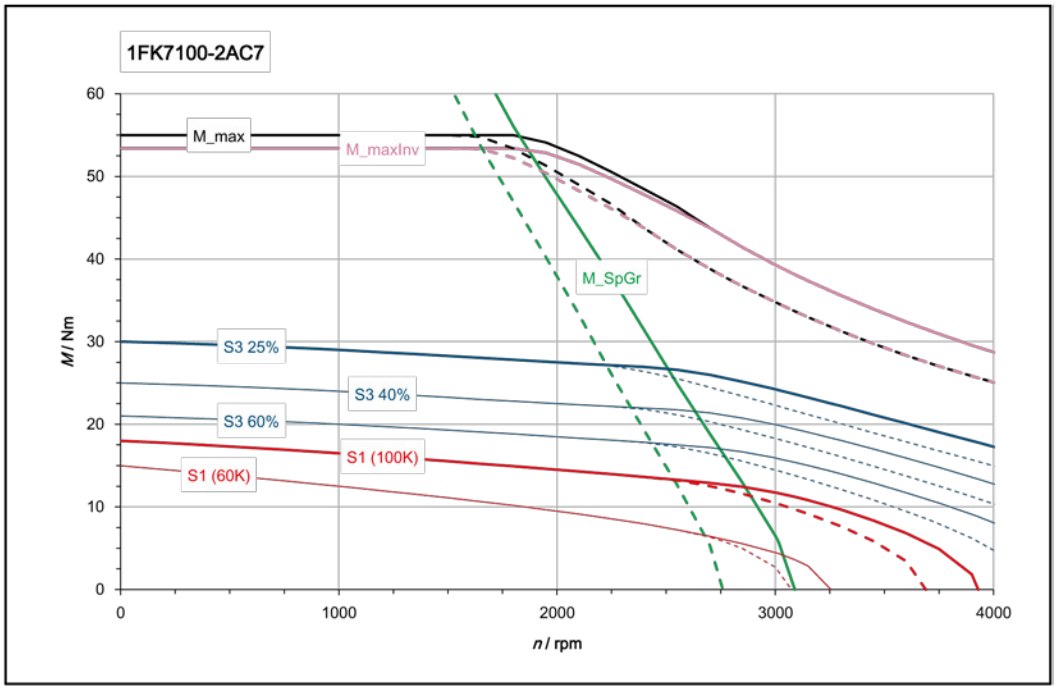


[———] SINAMICS ALM 480 V (720 V DC)
[- - - - - -] SINAMICS BLM/SLM 480 V (650 V DC)

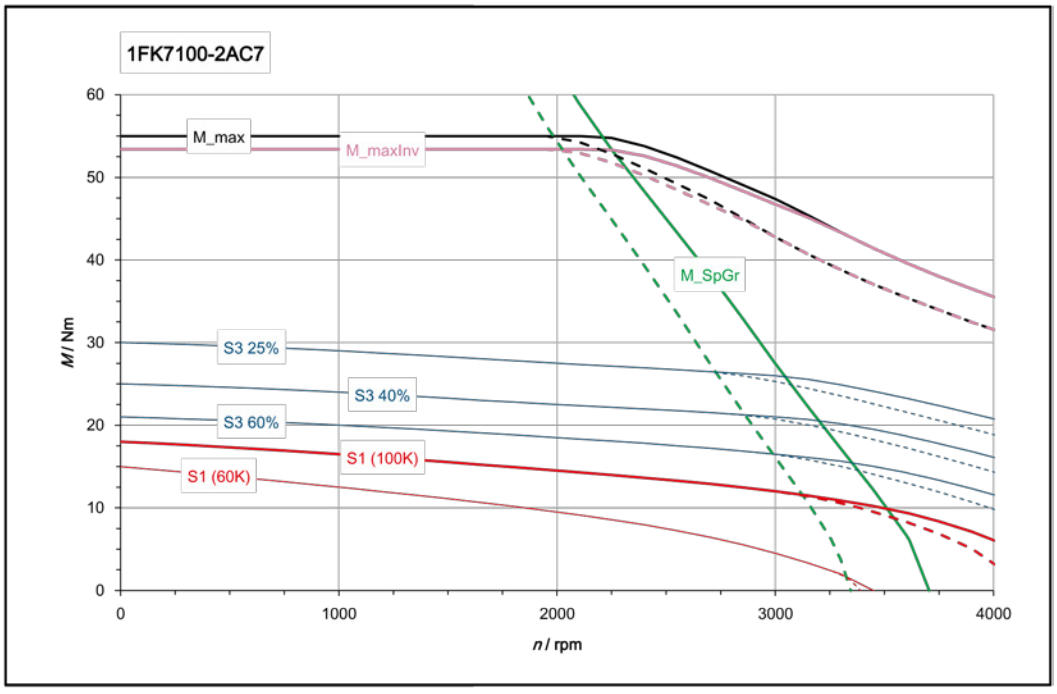
6.3.1.12 1FK7100-2A_

1FK7100 - 2AC7 three-phase servomotor			
Technical data	**Character**	**Unit**	**Value**
Configuration data:			
Rated speed	n_N	rpm	2000
Rated torque (100 K)	$M_{N(100K)}$	Nm	14.5
Rated current (100 K)	$I_{N(100K)}$	A	7.1
Static torque (100 K)	$M_{0(100K)}$	Nm	18
Stall current (100 K)	$I_{0(100K)}$	A	8.4
Static torque (60 K)	$M_{0(60K)}$	Nm	14.9
Stall current (60 K)	$I_{0(60K)}$	A	6.8
Optimum operating point:			
Optimum speed	n_{opt}	rpm	2000
Optimum power	P_{opt}	kW	3.05
Limit data:			
Max. permissible speed (mech.)	$n_{max\ mech}$	rpm	5000
Maximum torque	M_{max}	Nm	55
Maximum current	I_{max}	A	28
Motor data:			
Number of poles	2p		8
Torque constant (100K)	k_T	Nm/A	2.14
Voltage constant (at 20°C)	k_E	V/1000rpm	138
Winding resistance (at 20°C)	R_{ph}	Ω	0.55
Rotating field inductance	L_D	mH	12.7
Electrical time constant	T_{el}	ms	23
Mechanical time constant	T_{mech}	ms	1.95
Thermal time constant	T_{th}	min	55
Moment of inertia	J_{Mot}	10^{-4} kgm^2	54
Shaft torsional stiffness	c_t	Nm/rad	183000
Weight	m_{Mot}	kg	17.6
Motor data with integrated brake:			
Moment of inertia (with brake)	$J_{Mot\ withBr}$	10^{-4} kgm^2	62
Shaft torsional stiffness (with brake)	$c_{t\ withBr}$	Nm/rad	135000
Weight (with brake)	$m_{Mot\ withBr}$	kg	21
Recommended Motor Module:			
Rated converter current	$I_{N\ conv}$	A	9
Maximum converter current	$I_{max\ conv}$	A	27
Max. torque (converter operation)	$M_{max\ conv}$	Nm	53.4
Max. permissible speed (converter operation)	$n_{max\ conv}$	rpm	4200

The rated data are valid for a 600 V DC link voltage



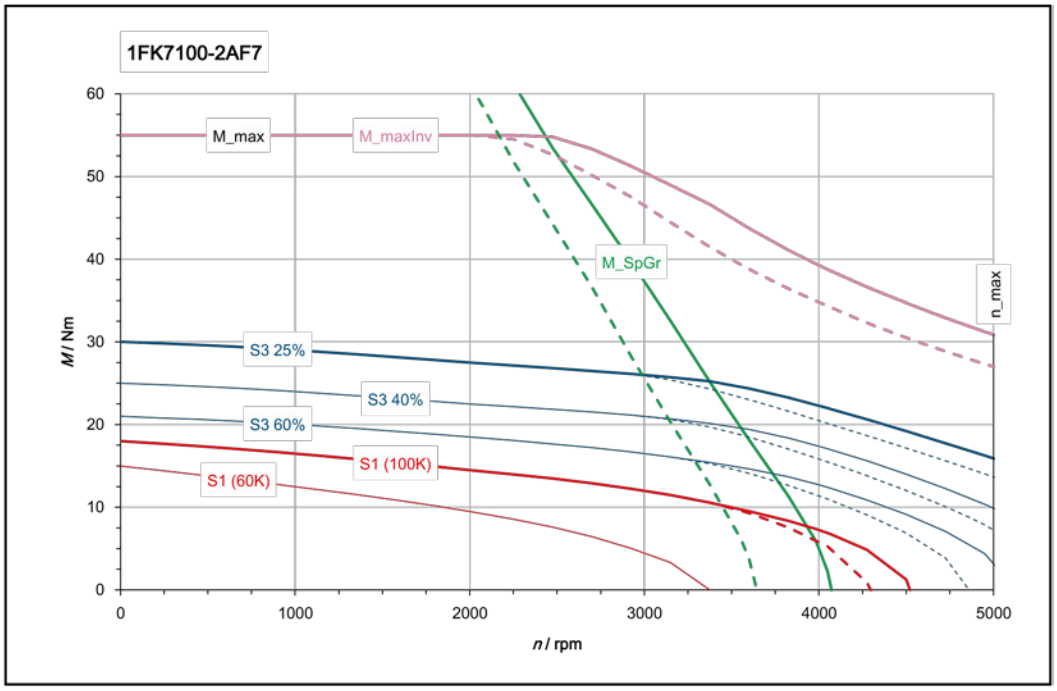
[———] SINAMICS ALM 400 V (600 V DC)
[- - - - - -] SINAMICS BLM/SLM 400 V (540 V DC)



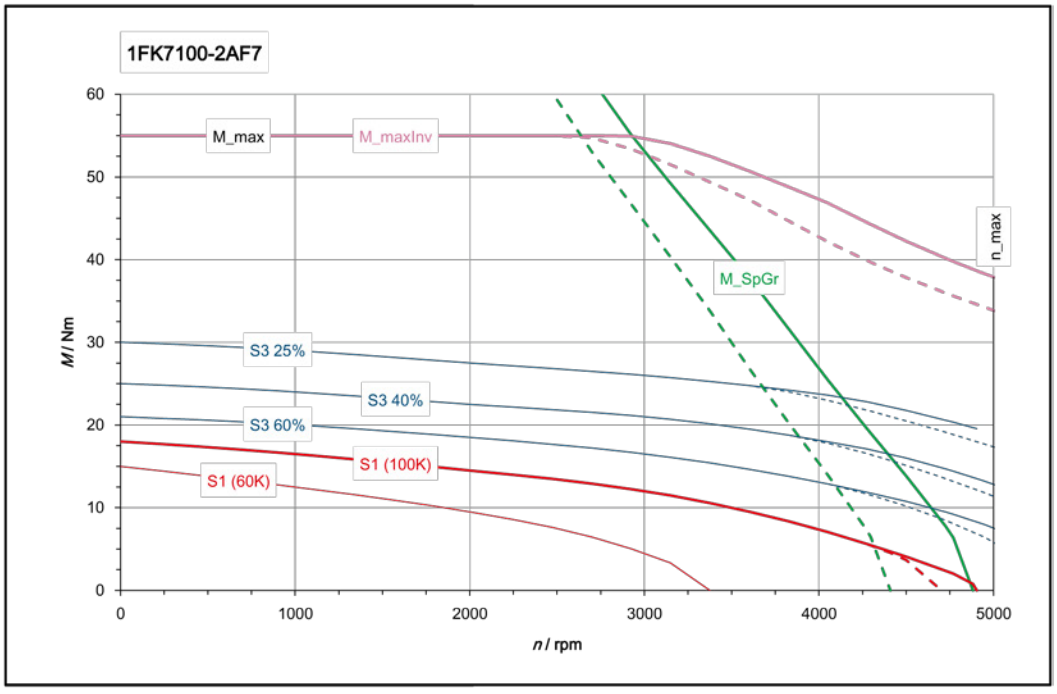
[———] SINAMICS ALM 480 V (720 V DC)
[- - - - - -] SINAMICS BLM/SLM 480 V (650 V DC)

1FK7100 - 2AC7 three-phase servomotor			
Technical data	**Character**	**Unit**	**Value**
Configuration data:			
Rated speed	n_N	rpm	3000
Rated torque (100 K)	$M_{N(100K)}$	Nm	12
Rated current (100 K)	$I_{N(100K)}$	A	8
Static torque (100 K)	$M_{0(100K)}$	Nm	18
Stall current (100 K)	$I_{0(100K)}$	A	11.1
Static torque (60 K)	$M_{0(60K)}$	Nm	14.9
Stall current (60 K)	$I_{0(60K)}$	A	9
Optimum operating point:			
Optimum speed	n_{opt}	rpm	3000
Optimum power	P_{opt}	kW	3.75
Limit data:			
Max. permissible speed (mech.)	$n_{max\ mech}$	rpm	5000
Maximum torque	M_{max}	Nm	55
Maximum current	I_{max}	A	37
Motor data:			
Number of poles	2p		8
Torque constant (100K)	k_T	Nm/A	1.62
Voltage constant (at 20°C)	k_E	V/1000rpm	104.5
Winding resistance (at 20°C)	R_{ph}	Ω	0.324
Rotating field inductance	L_D	mH	7.3
Electrical time constant	T_{el}	ms	22.5
Mechanical time constant	T_{mech}	ms	2
Thermal time constant	T_{th}	min	55
Moment of inertia	J_{Mot}	10^{-4} kgm^2	54
Shaft torsional stiffness	c_t	Nm/rad	183000
Weight	m_{Mot}	kg	17.6
Motor data with integrated brake:			
Moment of inertia (with brake)	$J_{Mot\ withBr}$	10^{-4} kgm^2	62
Shaft torsional stiffness (with brake)	$c_{t\ withBr}$	Nm/rad	135000
Weight (with brake)	$m_{Mot\ withBr}$	kg	21
Recommended Motor Module:			
Rated converter current	$I_{N\ conv}$	A	18
Maximum converter current	$I_{max\ conv}$	A	54
Max. torque (converter operation)	$M_{max\ conv}$	Nm	55
Max. permissible speed (converter operation)	$n_{max\ conv}$	rpm	5000

The rated data are valid for a 600 V DC link voltage



[———] SINAMICS ALM 400 V (600 V DC)
[- - - - - -] SINAMICS BLM/SLM 400 V (540 V DC)

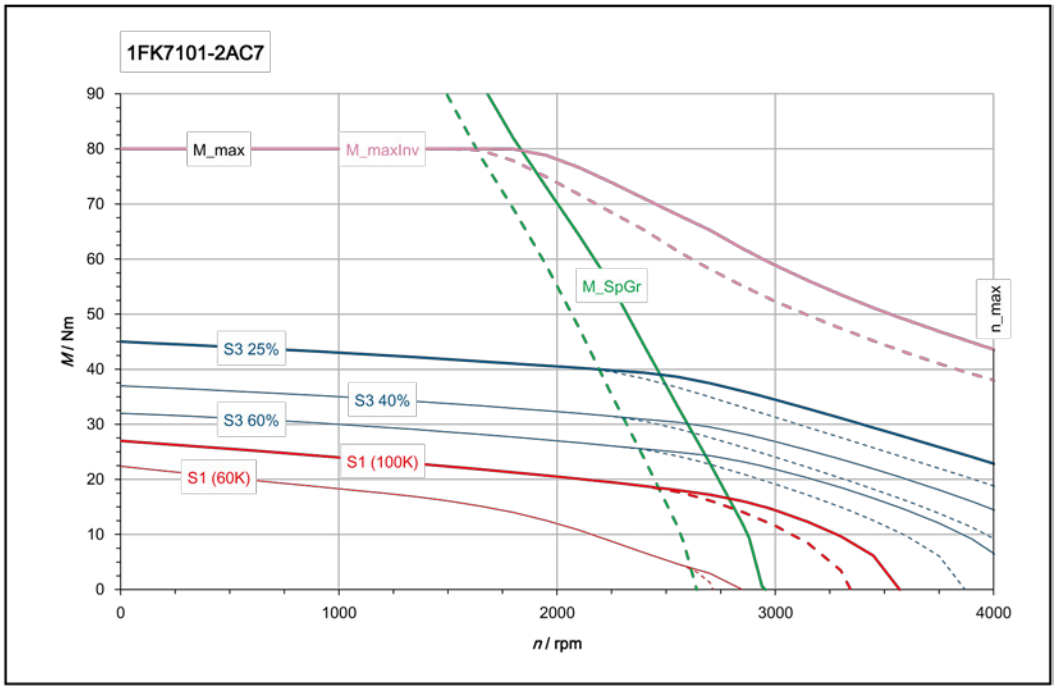


[———] SINAMICS ALM 480 V (720 V DC)
[- - - - - -] SINAMICS BLM/SLM 480 V (650 V DC)

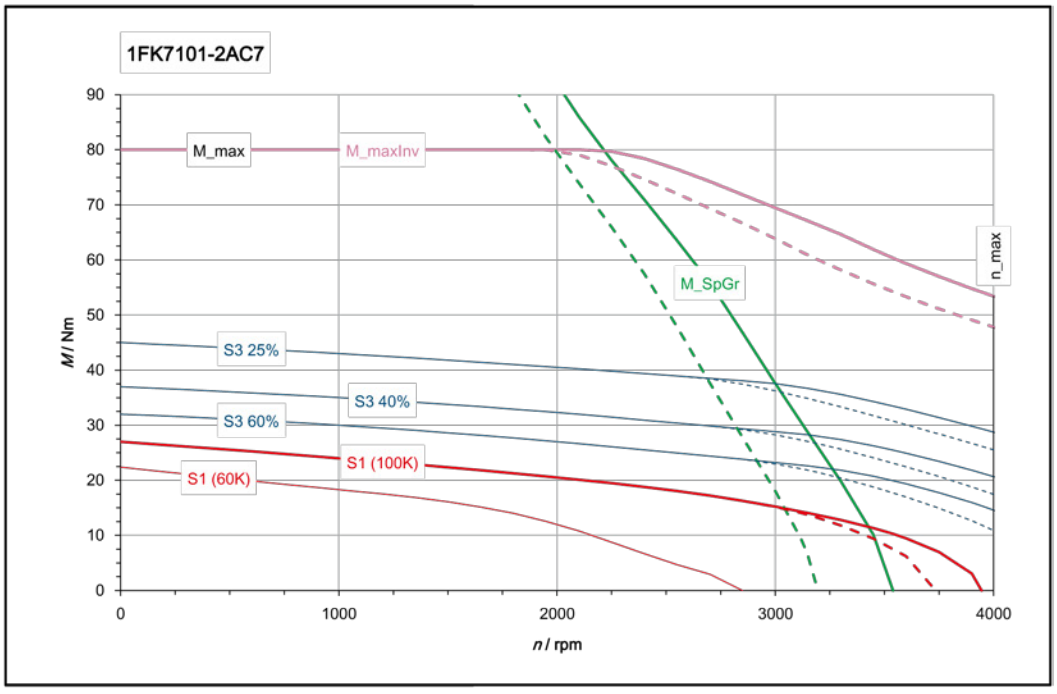
6.3.1.13 1FK7101-2A_

1FK7101 - 2AC7 three-phase servomotor			
Technical data	**Character**	**Unit**	**Value**
Configuration data:			
Rated speed	n_N	rpm	2000
Rated torque (100 K)	$M_{N(100K)}$	Nm	20.5
Rated current (100 K)	$I_{N(100K)}$	A	9.7
Static torque (100 K)	$M_{0(100K)}$	Nm	27
Stall current (100 K)	$I_{0(100K)}$	A	12.3
Static torque (60 K)	$M_{0(60K)}$	Nm	22.5
Stall current (60 K)	$I_{0(60K)}$	A	10
Optimum operating point:			
Optimum speed	n_{opt}	rpm	2000
Optimum power	P_{opt}	kW	4.3
Limit data:			
Max. permissible speed (mech.)	$n_{max\ mech}$	rpm	5000
Maximum torque	M_{max}	Nm	80
Maximum current	I_{max}	A	40.5
Motor data:			
Number of poles	2p		8
Torque constant (100K)	k_T	Nm/A	2.15
Voltage constant (at 20°C)	k_E	V/1000rpm	144.5
Winding resistance (at 20°C)	R_{ph}	Ω	0.343
Rotating field inductance	L_D	mH	8.5
Electrical time constant	T_{el}	ms	25
Mechanical time constant	T_{mech}	ms	1.62
Thermal time constant	T_{th}	min	60
Moment of inertia	J_{Mot}	10^{-4} kgm^2	79
Shaft torsional stiffness	c_t	Nm/rad	164000
Weight	m_{Mot}	kg	23
Motor data with integrated brake:			
Moment of inertia (with brake)	$J_{Mot\ withBr}$	10^{-4} kgm^2	87
Shaft torsional stiffness (with brake)	$c_{t\ withBr}$	Nm/rad	116000
Weight (with brake)	$m_{Mot\ withBr}$	kg	27.5
Recommended Motor Module:			
Rated converter current	$I_{N\ conv}$	A	18
Maximum converter current	$I_{max\ conv}$	A	54
Max. torque (converter operation)	$M_{max\ conv}$	Nm	80
Max. permissible speed (converter operation)	$n_{max\ conv}$	rpm	4000

The rated data are valid for a 600 V DC link voltage



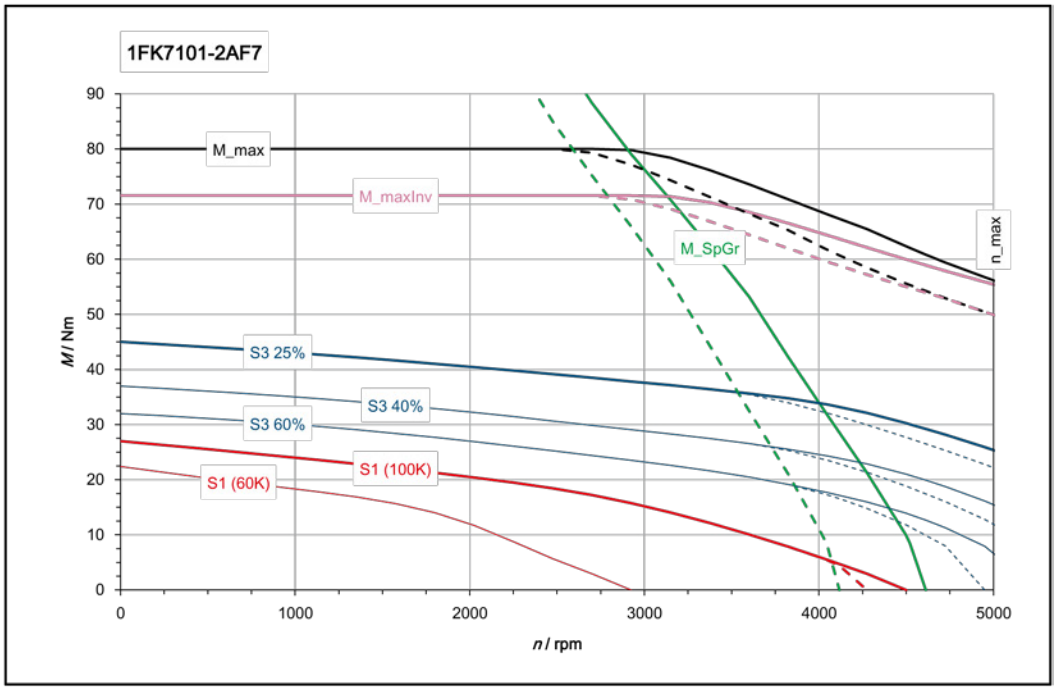
[———] SINAMICS ALM 400 V (600 V DC)
[- - - - - -] SINAMICS BLM/SLM 400 V (540 V DC)



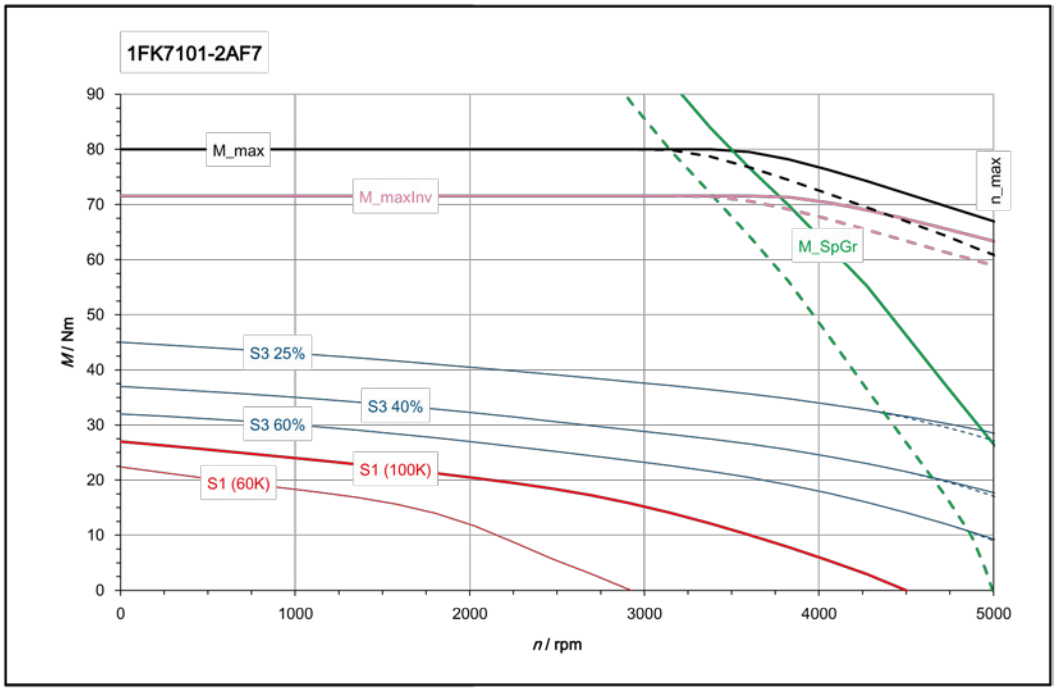
[———] SINAMICS ALM 480 V (720 V DC)
[- - - - - -] SINAMICS BLM/SLM 480 V (650 V DC)

1FK7101 - 2AF7 three-phase servomotor			
Technical data	**Character**	**Unit**	**Value**
Configuration data:			
Rated speed	n_N	rpm	3000
Rated torque (100 K)	$M_{N(100K)}$	Nm	15.5
Rated current (100 K)	$I_{N(100K)}$	A	11.6
Static torque (100 K)	$M_{0(100K)}$	Nm	27
Stall current (100 K)	$I_{0(100K)}$	A	18.8
Static torque (60 K)	$M_{0(60K)}$	Nm	22.5
Stall current (60 K)	$I_{0(60K)}$	A	15.2
Optimum operating point:			
Optimum speed	n_{opt}	rpm	3000
Optimum power	P_{opt}	kW	4.85
Limit data:			
Max. permissible speed (mech.)	$n_{max\ mech}$	rpm	5000
Maximum torque	M_{max}	Nm	80
Maximum current	I_{max}	A	63
Motor data:			
Number of poles	2p		8
Torque constant (100K)	k_T	Nm/A	1.435
Voltage constant (at 20°C)	k_E	V/1000rpm	92.5
Winding resistance (at 20°C)	R_{ph}	Ω	0.141
Rotating field inductance	L_D	mH	3.5
Electrical time constant	T_{el}	ms	25
Mechanical time constant	T_{mech}	ms	1.62
Thermal time constant	T_{th}	min	60
Moment of inertia	J_{Mot}	10^{-4} kgm^2	79
Shaft torsional stiffness	c_t	Nm/rad	164000
Weight	m_{Mot}	kg	23
Motor data with integrated brake:			
Moment of inertia (with brake)	$J_{Mot\ withBr}$	10^{-4} kgm^2	87
Shaft torsional stiffness (with brake)	$c_{t\ withBr}$	Nm/rad	116000
Weight (with brake)	$m_{Mot\ withBr}$	kg	27.5
Recommended Motor Module:			
Rated converter current	$I_{N\ conv}$	A	18
Maximum converter current	$I_{max\ conv}$	A	54
Max. torque (converter operation)	$M_{max\ conv}$	Nm	72
Max. permissible speed (converter operation)	$n_{max\ conv}$	rpm	5000

The rated data are valid for a 600 V DC link voltage



[———] SINAMICS ALM 400 V (600 V DC)
[- - - - - -] SINAMICS BLM/SLM 400 V (540 V DC)

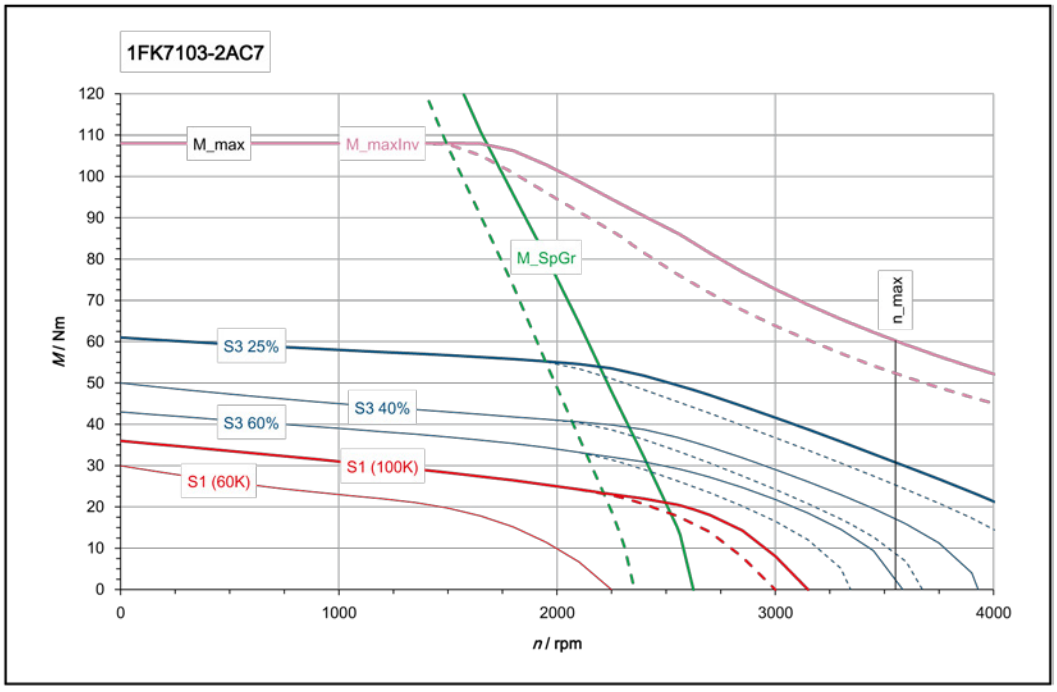


[———] SINAMICS ALM 480 V (720 V DC)
[- - - - - -] SINAMICS BLM/SLM 480 V (650 V DC)

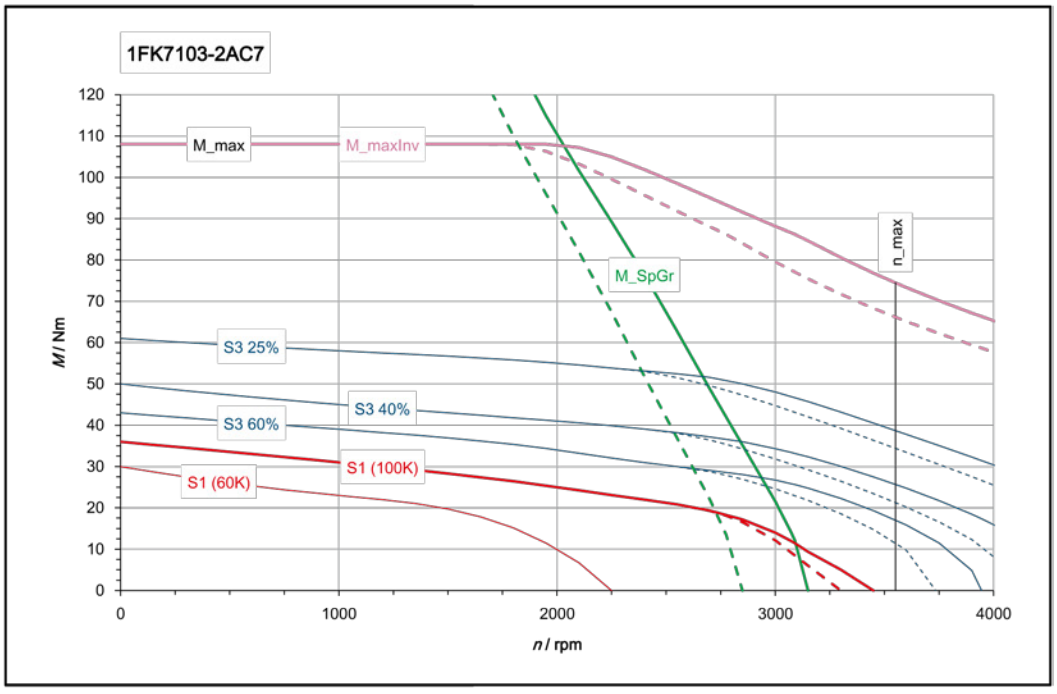
6.3.1.14 1FK7103-2A_

1FK7103 - 2AC7 three-phase servomotor			
Technical data	**Character**	**Unit**	**Value**
Configuration data:			
Rated speed	n_N	rpm	2000
Rated torque (100 K)	$M_{N(100K)}$	Nm	25
Rated current (100 K)	$I_{N(100K)}$	A	11
Static torque (100 K)	$M_{0(100K)}$	Nm	36
Stall current (100 K)	$I_{0(100K)}$	A	14.4
Static torque (60 K)	$M_{0(60K)}$	Nm	30
Stall current (60 K)	$I_{0(60K)}$	A	11.6
Optimum operating point:			
Optimum speed	n_{opt}	rpm	2000
Optimum power	P_{opt}	kW	5.2
Limit data:			
Max. permissible speed (mech.)	$n_{max\ mech}$	rpm	5000
Maximum torque	M_{max}	Nm	108
Maximum current	I_{max}	A	46.5
Motor data:			
Number of poles	2p		8
Torque constant (100K)	k_T	Nm/A	2.45
Voltage constant (at 20°C)	k_E	V/1000rpm	162
Winding resistance (at 20°C)	R_{ph}	Ω	0.288
Rotating field inductance	L_D	mH	7.9
Electrical time constant	T_{el}	ms	27.5
Mechanical time constant	T_{mech}	ms	1.43
Thermal time constant	T_{th}	min	65
Moment of inertia	J_{Mot}	10^{-4} kgm^2	104
Shaft torsional stiffness	c_t	Nm/rad	148000
Weight	m_{Mot}	kg	28.5
Motor data with integrated brake:			
Moment of inertia (with brake)	$J_{Mot\ withBr}$	10^{-4} kgm^2	112
Shaft torsional stiffness (with brake)	$c_{t\ withBr}$	Nm/rad	108000
Weight (with brake)	$m_{Mot\ withBr}$	kg	33
Recommended Motor Module:			
Rated converter current	$I_{N\ conv}$	A	18
Maximum converter current	$I_{max\ conv}$	A	54
Max. torque (converter operation)	$M_{max\ conv}$	Nm	108
Max. permissible speed (converter operation)	$n_{max\ conv}$	rpm	3550

The rated data are valid for a 600 V DC link voltage



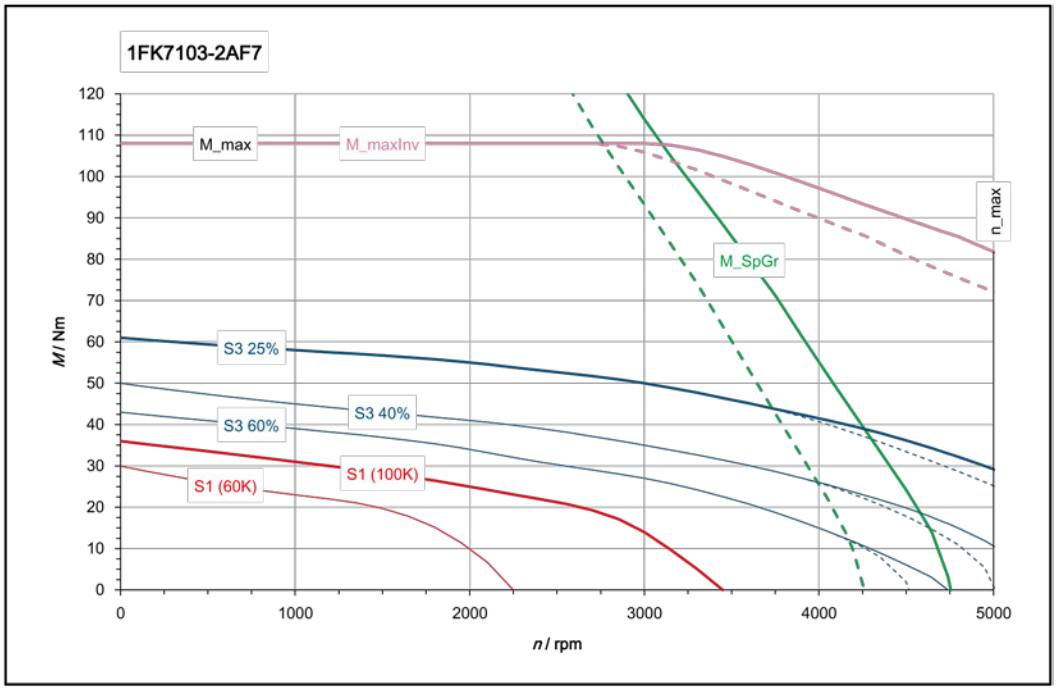
[———] SINAMICS ALM 400 V (600 V DC)
[- - - - - -] SINAMICS BLM/SLM 400 V (540 V DC)



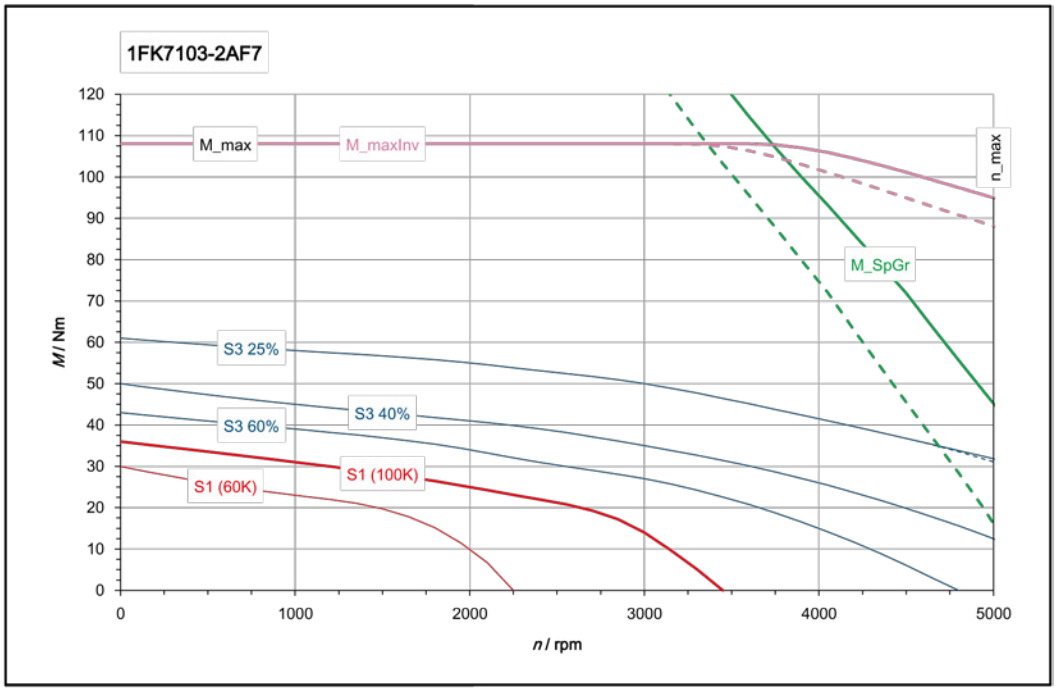
[———] SINAMICS ALM 480 V (720 V DC)
[- - - - - -] SINAMICS BLM/SLM 480 V (650 V DC)

1FK7103 - 2AF7 three-phase servomotor			
Technical data	**Character**	**Unit**	**Value**
Configuration data:			
Rated speed	n_N	rpm	3000
Rated torque (100 K)	$M_{N(100K)}$	Nm	14
Rated current (100 K)	$I_{N(100K)}$	A	11.5
Static torque (100 K)	$M_{0(100K)}$	Nm	36
Stall current (100 K)	$I_{0(100K)}$	A	26
Static torque (60 K)	$M_{0(60K)}$	Nm	30
Stall current (60 K)	$I_{0(60K)}$	A	21
Optimum operating point:			
Optimum speed	n_{opt}	rpm	2500
Optimum power	P_{opt}	kW	5.4
Limit data:			
Max. permissible speed (mech.)	$n_{max\ mech}$	rpm	5000
Maximum torque	M_{max}	Nm	108
Maximum current	I_{max}	A	84
Motor data:			
Number of poles	2p		8
Torque constant (100K)	k_T	Nm/A	1.385
Voltage constant (at 20°C)	k_E	V/1000rpm	89.5
Winding resistance (at 20°C)	R_{ph}	Ω	0.0895
Rotating field inductance	L_D	mH	2.4
Electrical time constant	T_{el}	ms	27
Mechanical time constant	T_{mech}	ms	1.46
Thermal time constant	T_{th}	min	65
Moment of inertia	J_{Mot}	10^{-4} kgm^2	104
Shaft torsional stiffness	c_t	Nm/rad	148000
Weight	m_{Mot}	kg	28.5
Motor data with integrated brake:			
Moment of inertia (with brake)	$J_{Mot\ withBr}$	10^{-4} kgm^2	112
Shaft torsional stiffness (with brake)	$c_{t\ withBr}$	Nm/rad	108000
Weight (with brake)	$m_{Mot\ withBr}$	kg	33
Recommended Motor Module:			
Rated converter current	$I_{N\ conv}$	A	30
Maximum converter current	$I_{max\ conv}$	A	90
Max. torque (converter operation)	$M_{max\ conv}$	Nm	108
Max. permissible speed (converter operation)	$n_{max\ conv}$	rpm	5000

The rated data are valid for a 600 V DC link voltage



[———] SINAMICS ALM 400 V (600 V DC)
[- - - - - -] SINAMICS BLM/SLM 400 V (540 V DC)

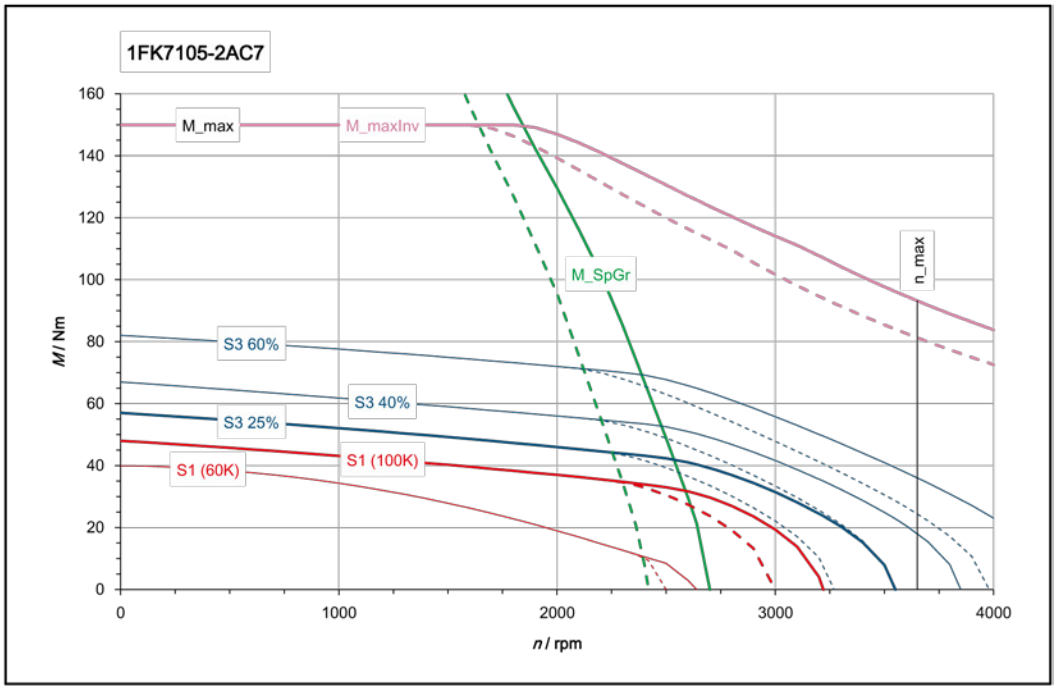


[———] SINAMICS ALM 480 V (720 V DC)
[- - - - - -] SINAMICS BLM/SLM 480 V (650 V DC)

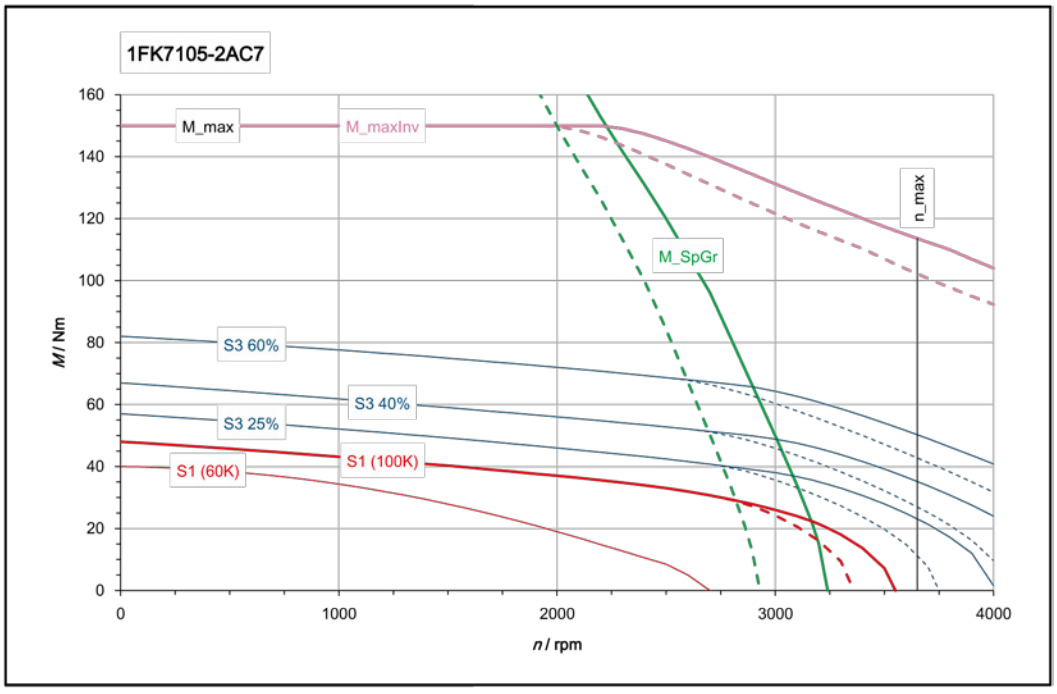
6.3.1.15 1FK7105-2A_

1FK7105 - 2AC7 three-phase servomotor			
Technical data	**Character**	**Unit**	**Value**
Configuration data:			
Rated speed	n_N	rpm	2000
Rated torque (100 K)	$M_{N(100K)}$	Nm	37
Rated current (100 K)	$I_{N(100K)}$	A	16
Static torque (100 K)	$M_{0(100K)}$	Nm	48
Stall current (100 K)	$I_{0(100K)}$	A	20
Static torque (60 K)	$M_{0(60K)}$	Nm	40
Stall current (60 K)	$I_{0(60K)}$	A	16.2
Optimum operating point:			
Optimum speed	n_{opt}	rpm	2000
Optimum power	P_{opt}	kW	7.7
Limit data:			
Max. permissible speed (mech.)	$n_{max\ mech}$	rpm	5000
Maximum torque	M_{max}	Nm	150
Maximum current	I_{max}	A	71
Motor data:			
Number of poles	2p		8
Torque constant (100K)	k_T	Nm/A	2.37
Voltage constant (at 20°C)	k_E	V/1000rpm	157.5
Winding resistance (at 20°C)	R_{ph}	Ω	0.175
Rotating field inductance	L_D	mH	4.5
Electrical time constant	T_{el}	ms	25.5
Mechanical time constant	T_{mech}	ms	1.4
Thermal time constant	T_{th}	min	70
Moment of inertia	J_{Mot}	10^{-4} kgm^2	154
Shaft torsional stiffness	c_t	Nm/rad	125000
Weight	m_{Mot}	kg	39
Motor data with integrated brake:			
Moment of inertia (with brake)	$J_{Mot\ withBr}$	10^{-4} kgm^2	162
Shaft torsional stiffness (with brake)	$c_{t\ withBr}$	Nm/rad	95000
Weight (with brake)	$m_{Mot\ withBr}$	kg	43.5
Recommended Motor Module:			
Rated converter current	$I_{N\ conv}$	A	24
Maximum converter current	$I_{max\ conv}$	A	72
Max. torque (converter operation)	$M_{max\ conv}$	Nm	150
Max. permissible speed (converter operation)	$n_{max\ conv}$	rpm	3600

The rated data are valid for a 600 V DC link voltage



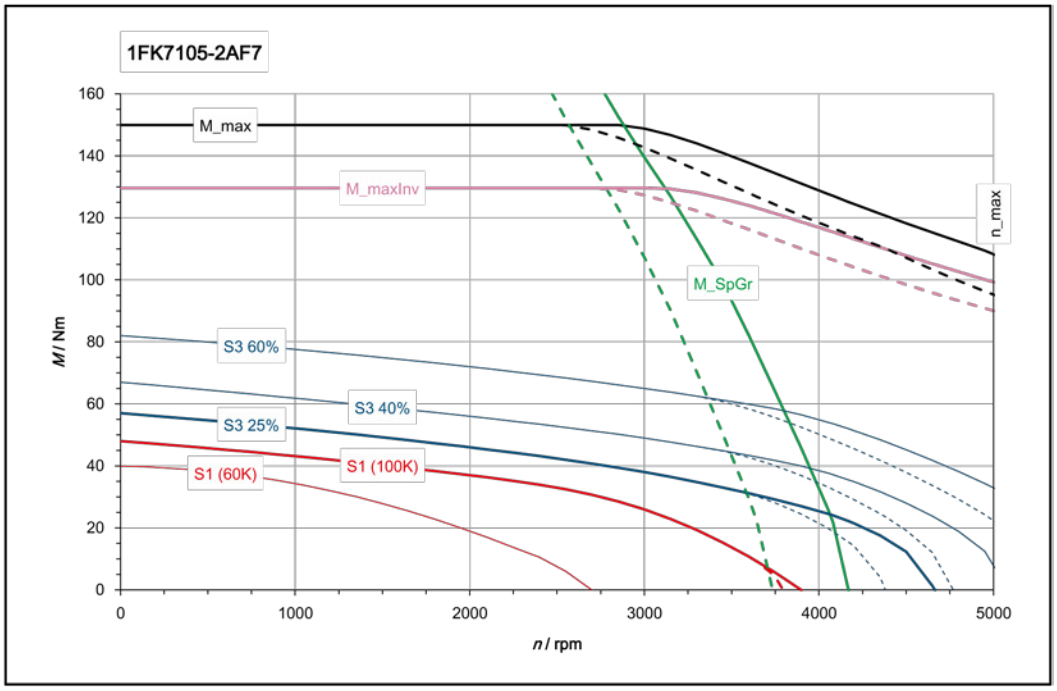
[———] SINAMICS ALM 400 V (600 V DC)
[– – – – – –] SINAMICS BLM/SLM 400 V (540 V DC)



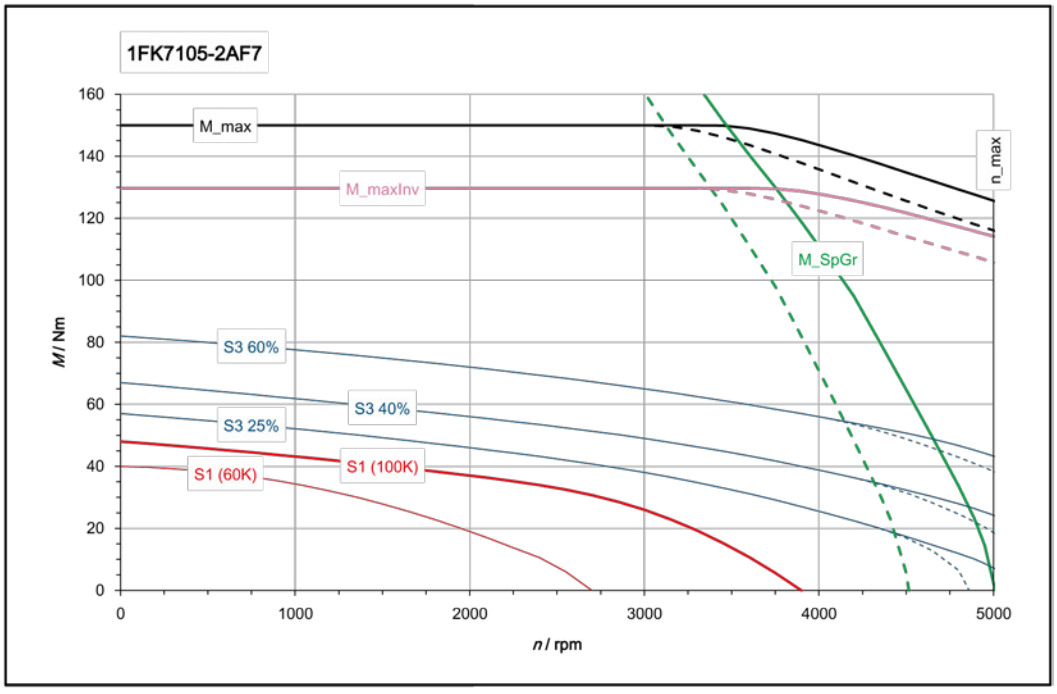
[———] SINAMICS ALM 480 V (720 V DC)
[– – – – – –] SINAMICS BLM/SLM 480 V (650 V DC)

1FK7105 - 2AF7 three-phase servomotor			
Technical data	**Character**	**Unit**	**Value**
Configuration data:			
Rated speed	n_N	rpm	3000
Rated torque (100 K)	$M_{N(100K)}$	Nm	26
Rated current (100 K)	$I_{N(100K)}$	A	18
Static torque (100 K)	$M_{0(100K)}$	Nm	48
Stall current (100 K)	$I_{0(100K)}$	A	31
Static torque (60 K)	$M_{0(60K)}$	Nm	40
Stall current (60 K)	$I_{0(60K)}$	A	25
Optimum operating point:			
Optimum speed	n_{opt}	rpm	3000
Optimum power	P_{opt}	kW	8.2
Limit data:			
Max. permissible speed (mech.)	$n_{max\ mech}$	rpm	5000
Maximum torque	M_{max}	Nm	150
Maximum current	I_{max}	A	109
Motor data:			
Number of poles	2p		8
Torque constant (100K)	k_T	Nm/A	1.55
Voltage constant (at 20°C)	k_E	V/1000rpm	102
Winding resistance (at 20°C)	R_{ph}	Ω	0.073
Rotating field inductance	L_D	mH	1.9
Electrical time constant	T_{el}	ms	26
Mechanical time constant	T_{mech}	ms	1.4
Thermal time constant	T_{th}	min	70
Moment of inertia	J_{Mot}	10^{-4} kgm^2	154
Shaft torsional stiffness	c_t	Nm/rad	125000
Weight	m_{Mot}	kg	39
Motor data with integrated brake:			
Moment of inertia (with brake)	$J_{Mot\ withBr}$	10^{-4} kgm^2	162
Shaft torsional stiffness (with brake)	$c_{t\ withBr}$	Nm/rad	95000
Weight (with brake)	$m_{Mot\ withBr}$	kg	43.5
Recommended Motor Module:			
Rated converter current	$I_{N\ conv}$	A	30
Maximum converter current	$I_{max\ conv}$	A	90
Max. torque (converter operation)	$M_{max\ conv}$	Nm	129.7
Max. permissible speed (converter operation)	$n_{max\ conv}$	rpm	5000

The rated data are valid for a 600 V DC link voltage



[———] SINAMICS ALM 400 V (600 V DC)
[- - - - - -] SINAMICS BLM/SLM 400 V (540 V DC)



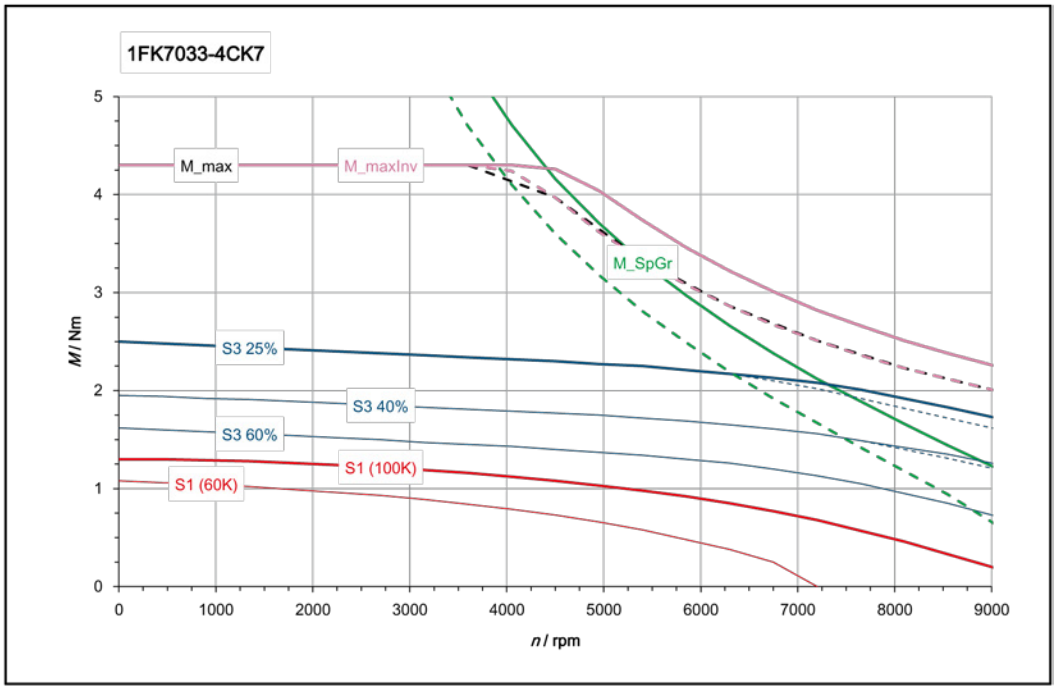
[———] SINAMICS ALM 480 V (720 V DC)
[- - - - - -] SINAMICS BLM/SLM 480 V (650 V DC)

6.3.2 1FK7 High Dynamic - naturally cooled

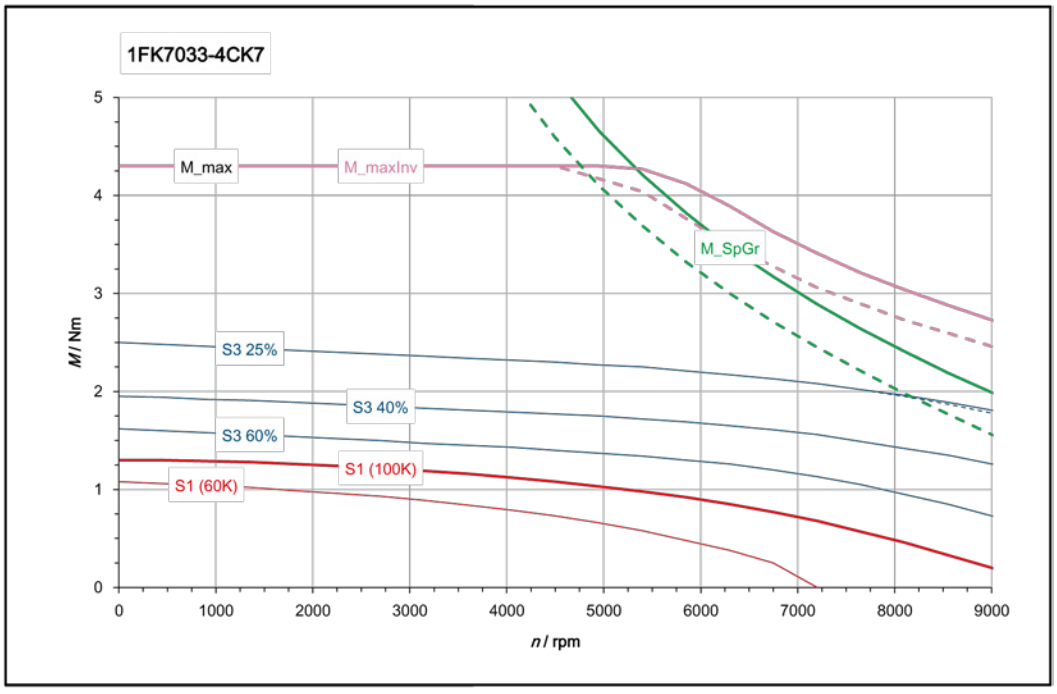
6.3.2.1 1FK7033-4C_

1FK7033 - 4CK7 three-phase servomotor			
Technical data	**Character**	**Unit**	**Value**
Configuration data:			
Rated speed	n_N	rpm	6000
Rated torque (100 K)	$M_{N(100K)}$	Nm	0.9
Rated current (100 K)	$I_{N(100K)}$	A	1.6
Static torque (100 K)	$M_{0(100K)}$	Nm	1.3
Stall current (100 K)	$I_{0(100K)}$	A	2.1
Static torque (60 K)	$M_{0(60K)}$	Nm	1.08
Stall current (60 K)	$I_{0(60K)}$	A	1.7
Optimum operating point:			
Optimum speed	n_{opt}	rpm	6000
Optimum power	P_{opt}	kW	0.57
Limit data:			
Max. permissible speed (mech.)	$n_{max\ mech}$	rpm	10000
Maximum torque	M_{max}	Nm	4.3
Maximum current	I_{max}	A	7.6
Motor data:			
Number of poles	2p		6
Torque constant (100K)	k_T	Nm/A	0.62
Voltage constant (at 20°C)	k_E	V/1000rpm	39.5
Winding resistance (at 20°C)	R_{ph}	Ω	3.51
Rotating field inductance	L_D	mH	22
Electrical time constant	T_{el}	ms	6.3
Mechanical time constant	T_{mech}	ms	0.68
Thermal time constant	T_{th}	min	25
Moment of inertia	J_{Mot}	10^{-4} kgm^2	0.25
Shaft torsional stiffness	c_t	Nm/rad	7300
Weight	m_{Mot}	kg	3
Motor data with integrated brake:			
Moment of inertia (with brake)	$J_{Mot\ withBr}$	10^{-4} kgm^2	0.35
Shaft torsional stiffness (with brake)	$c_{t\ withBr}$	Nm/rad	4700
Weight (with brake)	$m_{Mot\ withBr}$	kg	3.4
Recommended Motor Module:			
Rated converter current	$I_{N\ conv}$	A	3
Maximum converter current	$I_{max\ conv}$	A	9
Max. torque (converter operation)	$M_{max\ conv}$	Nm	4.3
Max. permissible speed (converter operation)	$n_{max\ conv}$	rpm	10000

The rated data are valid for a 600 V DC link voltage



[———] SINAMICS ALM 400 V (600 V DC)
[– – – – – –] SINAMICS BLM/SLM 400 V (540 V DC)

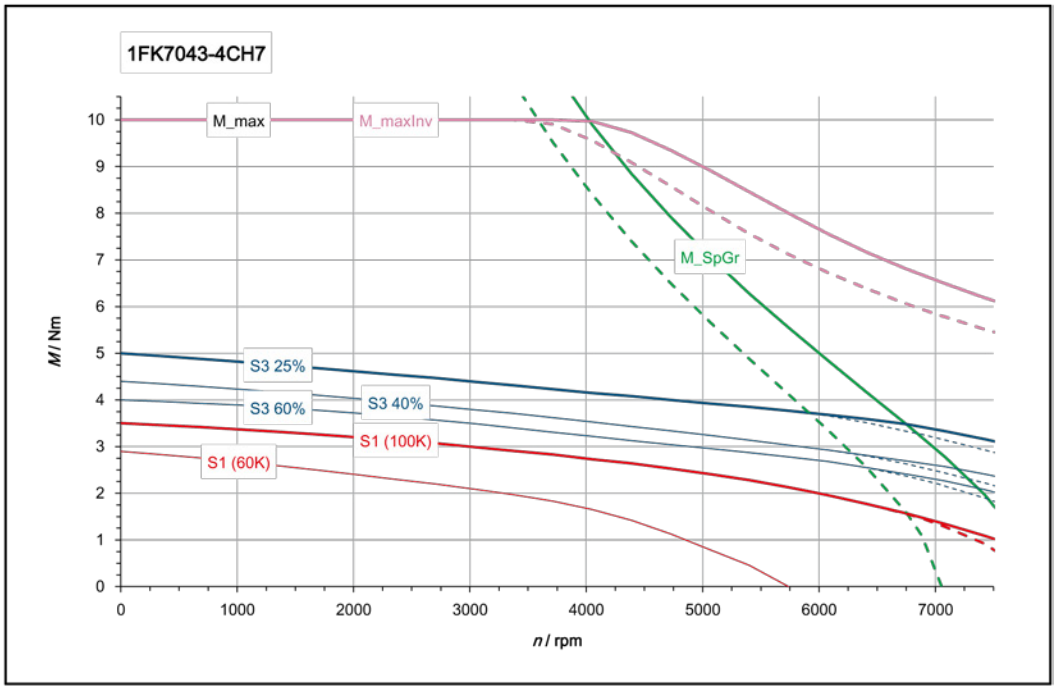


[———] SINAMICS ALM 480 V (720 V DC)
[– – – – – –] SINAMICS BLM/SLM 480 V (650 V DC)

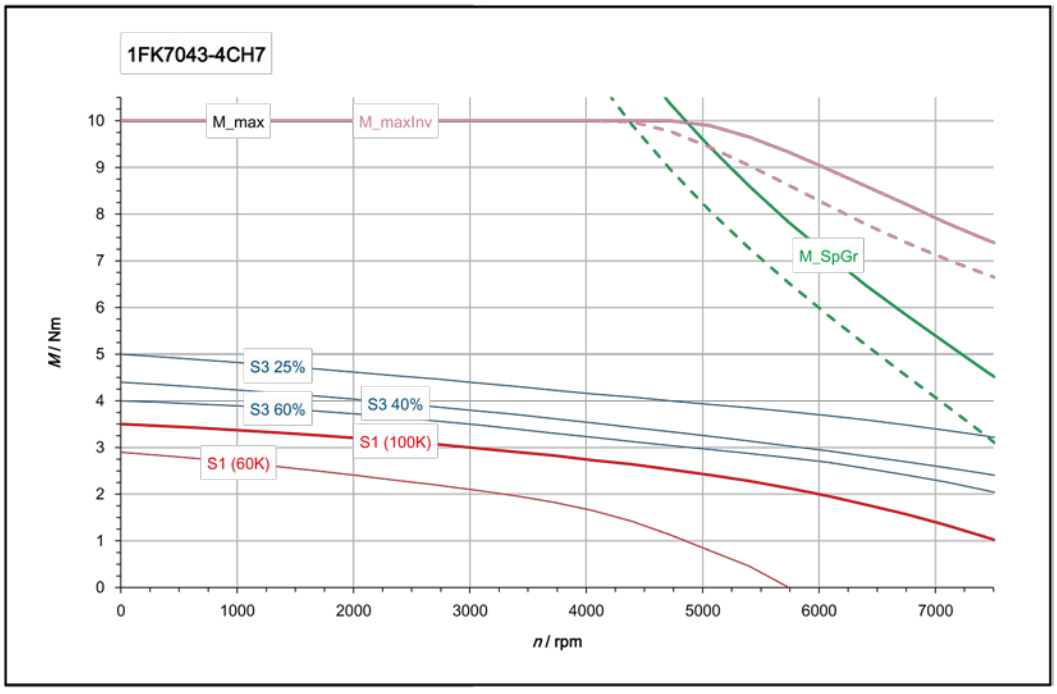
6.3.2.2 1FK7043-4C_

1FK7043 - 4CH7 three-phase servomotor			
Technical data	**Character**	**Unit**	**Value**
Configuration data:			
Rated speed	n_N	rpm	4500
Rated torque (100 K)	$M_{N(100K)}$	Nm	2.6
Rated current (100 K)	$I_{N(100K)}$	A	3.3
Static torque (100 K)	$M_{0(100K)}$	Nm	3.5
Stall current (100 K)	$I_{0(100K)}$	A	4.1
Static torque (60 K)	$M_{0(60K)}$	Nm	2.9
Stall current (60 K)	$I_{0(60K)}$	A	3.3
Optimum operating point:			
Optimum speed	n_{opt}	rpm	4500
Optimum power	P_{opt}	kW	1.23
Limit data:			
Max. permissible speed (mech.)	$n_{max\ mech}$	rpm	9000
Maximum torque	M_{max}	Nm	10
Maximum current	I_{max}	A	12.5
Motor data:			
Number of poles	2p		6
Torque constant (100K)	k_T	Nm/A	0.855
Voltage constant (at 20°C)	k_E	V/1000rpm	54
Winding resistance (at 20°C)	R_{ph}	Ω	1.2
Rotating field inductance	L_D	mH	13.6
Electrical time constant	T_{el}	ms	11.3
Mechanical time constant	T_{mech}	ms	0.49
Thermal time constant	T_{th}	min	40
Moment of inertia	J_{Mot}	10^{-4} kgm^2	10
Shaft torsional stiffness	c_t	Nm/rad	11400
Weight	m_{Mot}	kg	6
Motor data with integrated brake:			
Moment of inertia (with brake)	$J_{Mot\ withBr}$	10^{-4} kgm^2	13.6
Shaft torsional stiffness (with brake)	$c_{t\ withBr}$	Nm/rad	9000
Weight (with brake)	$m_{Mot\ withBr}$	kg	6.6
Recommended Motor Module:			
Rated converter current	$I_{N\ conv}$	A	5
Maximum converter current	$I_{max\ conv}$	A	15
Max. torque (converter operation)	$M_{max\ conv}$	Nm	10
Max. permissible speed (converter operation)	$n_{max\ conv}$	rpm	9000

The rated data are valid for a 600 V DC link voltage



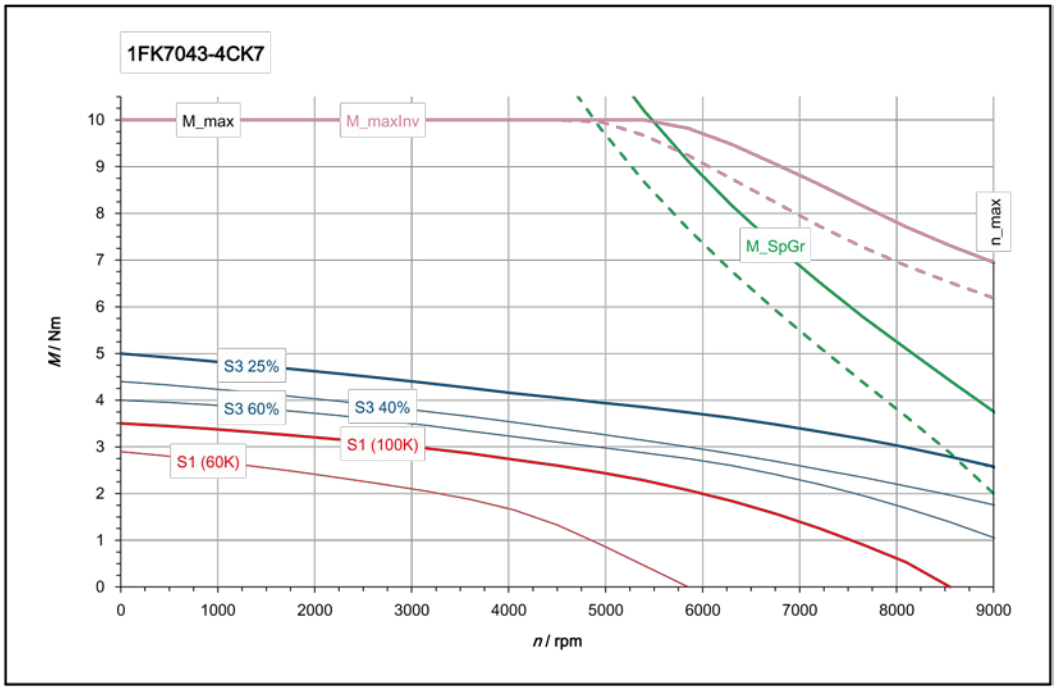
[———] SINAMICS ALM 400 V (600 V DC)
[- - - - - -] SINAMICS BLM/SLM 400 V (540 V DC)



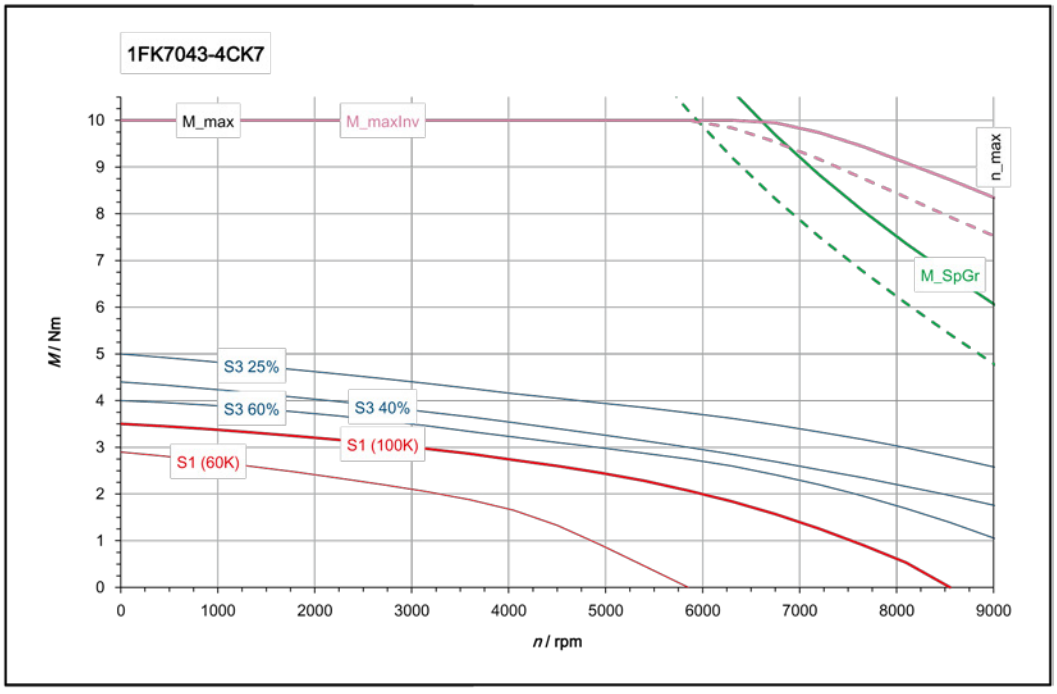
[———] SINAMICS ALM 480 V (720 V DC)
[- - - - - -] SINAMICS BLM/SLM 480 V (650 V DC)

1FK7043 - 4CK7 three-phase servomotor			
Technical data	**Character**	**Unit**	**Value**
Configuration data:			
Rated speed	n_N	rpm	6000
Rated torque (100 K)	$M_{N(100K)}$	Nm	2
Rated current (100 K)	$I_{N(100K)}$	A	3.5
Static torque (100 K)	$M_{0(100K)}$	Nm	3.5
Stall current (100 K)	$I_{0(100K)}$	A	5.6
Static torque (60 K)	$M_{0(60K)}$	Nm	2.9
Stall current (60 K)	$I_{0(60K)}$	A	4.5
Optimum operating point:			
Optimum speed	n_{opt}	rpm	6000
Optimum power	P_{opt}	kW	1.26
Limit data:			
Max. permissible speed (mech.)	$n_{max\ mech}$	rpm	9000
Maximum torque	M_{max}	Nm	10
Maximum current	I_{max}	A	17
Motor data:			
Number of poles	2p		6
Torque constant (100K)	k_T	Nm/A	0.63
Voltage constant (at 20°C)	k_E	V/1000rpm	39.8
Winding resistance (at 20°C)	R_{ph}	Ω	0.645
Rotating field inductance	L_D	mH	7.4
Electrical time constant	T_{el}	ms	11.5
Mechanical time constant	T_{mech}	ms	0.49
Thermal time constant	T_{th}	min	40
Moment of inertia	J_{Mot}	10^{-4} kgm^2	10
Shaft torsional stiffness	c_t	Nm/rad	11400
Weight	m_{Mot}	kg	6
Motor data with integrated brake:			
Moment of inertia (with brake)	$J_{Mot\ withBr}$	10^{-4} kgm^2	13.6
Shaft torsional stiffness (with brake)	$c_{t\ withBr}$	Nm/rad	9000
Weight (with brake)	$m_{Mot\ withBr}$	kg	6.6
Recommended Motor Module:			
Rated converter current	$I_{N\ conv}$	A	9
Maximum converter current	$I_{max\ conv}$	A	27
Max. torque (converter operation)	$M_{max\ conv}$	Nm	10
Max. permissible speed (converter operation)	$n_{max\ conv}$	rpm	9000

The rated data are valid for a 600 V DC link voltage



[———] SINAMICS ALM 400 V (600 V DC)
[- - - - - -] SINAMICS BLM/SLM 400 V (540 V DC)

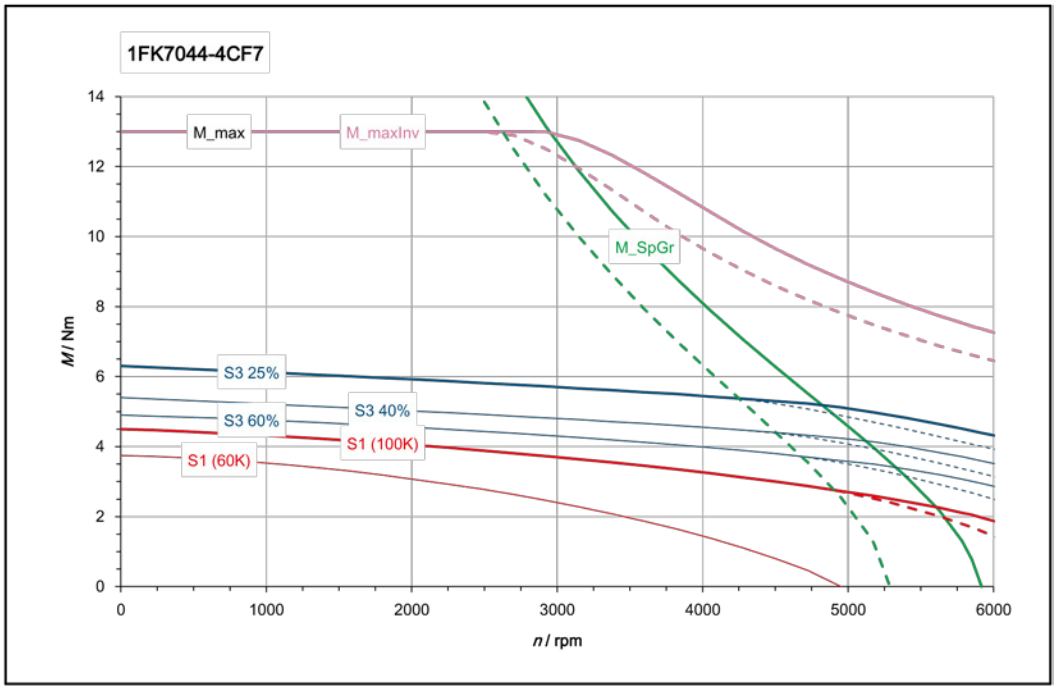


[———] SINAMICS ALM 480 V (720 V DC)
[- - - - - -] SINAMICS BLM/SLM 480 V (650 V DC)

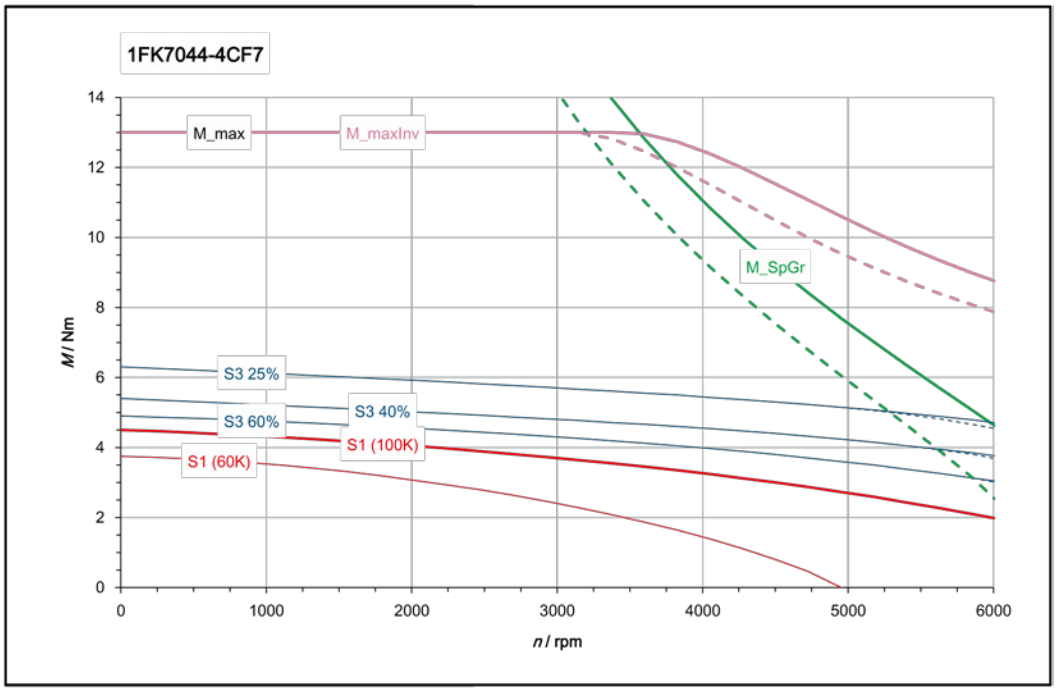
6.3.2.3 1FK7044-4C_

1FK7044 - 4CF7 three-phase servomotor			
Technical data	**Character**	**Unit**	**Value**
Configuration data:			
Rated speed	n_N	rpm	3000
Rated torque (100 K)	$M_{N(100K)}$	Nm	3.7
Rated current (100 K)	$I_{N(100K)}$	A	3.45
Static torque (100 K)	$M_{0(100K)}$	Nm	4.5
Stall current (100 K)	$I_{0(100K)}$	A	4
Static torque (60 K)	$M_{0(60K)}$	Nm	3.75
Stall current (60 K)	$I_{0(60K)}$	A	3.2
Optimum operating point:			
Optimum speed	n_{opt}	rpm	3000
Optimum power	P_{opt}	kW	1.16
Limit data:			
Max. permissible speed (mech.)	$n_{max\ mech}$	rpm	9000
Maximum torque	M_{max}	Nm	13
Maximum current	I_{max}	A	12.1
Motor data:			
Number of poles	2p		6
Torque constant (100K)	k_T	Nm/A	1.13
Voltage constant (at 20°C)	k_E	V/1000rpm	72
Winding resistance (at 20°C)	R_{ph}	Ω	1.49
Rotating field inductance	L_D	mH	18.8
Electrical time constant	T_{el}	ms	12.6
Mechanical time constant	T_{mech}	ms	0.44
Thermal time constant	T_{th}	min	45
Moment of inertia	J_{Mot}	10^{-4} kgm^2	12.6
Shaft torsional stiffness	c_t	Nm/rad	9800
Weight	m_{Mot}	kg	7.4
Motor data with integrated brake:			
Moment of inertia (with brake)	$J_{Mot\ withBr}$	10^{-4} kgm^2	16.2
Shaft torsional stiffness (with brake)	$c_{t\ withBr}$	Nm/rad	7900
Weight (with brake)	$m_{Mot\ withBr}$	kg	8
Recommended Motor Module:			
Rated converter current	$I_{N\ conv}$	A	5
Maximum converter current	$I_{max\ conv}$	A	15
Max. torque (converter operation)	$M_{max\ conv}$	Nm	13
Max. permissible speed (converter operation)	$n_{max\ conv}$	rpm	8050

The rated data are valid for a 600 V DC link voltage



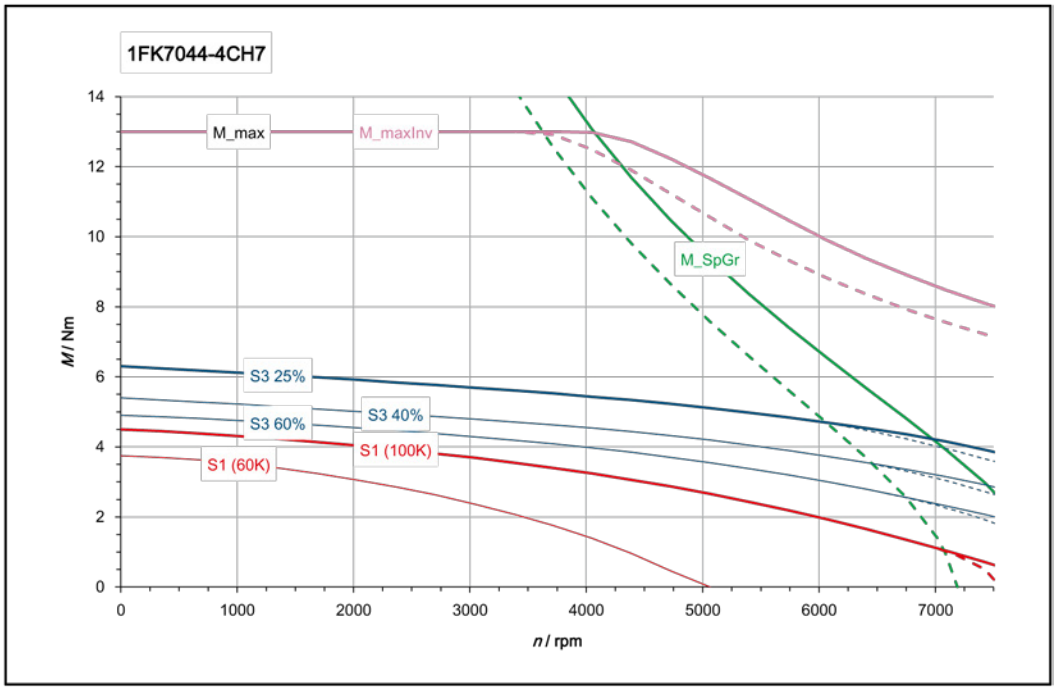
[———] SINAMICS ALM 400 V (600 V DC)
[- - - - - -] SINAMICS BLM/SLM 400 V (540 V DC)



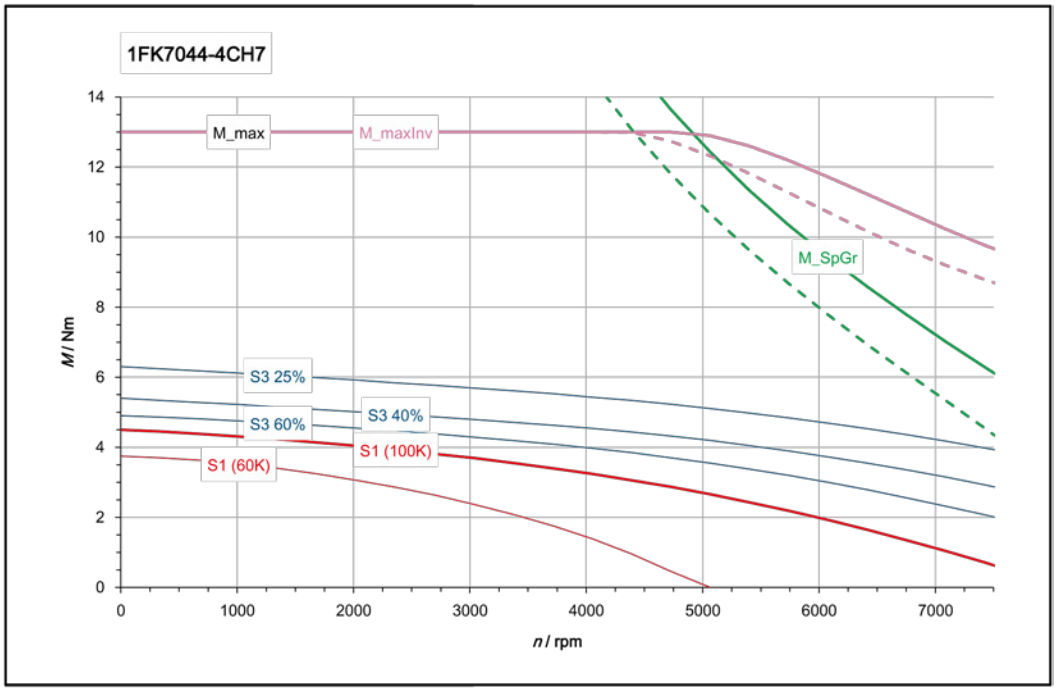
[———] SINAMICS ALM 480 V (720 V DC)
[- - - - - -] SINAMICS BLM/SLM 480 V (650 V DC)

1FK7044 - 4CH7 three-phase servomotor			
Technical data	**Character**	**Unit**	**Value**
Configuration data:			
Rated speed	n_N	rpm	4500
Rated torque (100 K)	$M_{N(100K)}$	Nm	3
Rated current (100 K)	$I_{N(100K)}$	A	3.9
Static torque (100 K)	$M_{0(100K)}$	Nm	4.5
Stall current (100 K)	$I_{0(100K)}$	A	5.4
Static torque (60 K)	$M_{0(60K)}$	Nm	3.75
Stall current (60 K)	$I_{0(60K)}$	A	4.35
Optimum operating point:			
Optimum speed	n_{opt}	rpm	4500
Optimum power	P_{opt}	kW	1.41
Limit data:			
Max. permissible speed (mech.)	$n_{max\ mech}$	rpm	9000
Maximum torque	M_{max}	Nm	13
Maximum current	I_{max}	A	16.4
Motor data:			
Number of poles	2p		6
Torque constant (100K)	k_T	Nm/A	0.835
Voltage constant (at 20°C)	k_E	V/1000rpm	53
Winding resistance (at 20°C)	R_{ph}	Ω	0.815
Rotating field inductance	L_D	mH	10.2
Electrical time constant	T_{el}	ms	12.5
Mechanical time constant	T_{mech}	ms	0.44
Thermal time constant	T_{th}	min	45
Moment of inertia	J_{Mot}	10^{-4} kgm^2	12.6
Shaft torsional stiffness	c_t	Nm/rad	9800
Weight	m_{Mot}	kg	7.4
Motor data with integrated brake:			
Moment of inertia (with brake)	$J_{Mot\ withBr}$	10^{-4} kgm^2	16.2
Shaft torsional stiffness (with brake)	$c_{t\ withBr}$	Nm/rad	7900
Weight (with brake)	$m_{Mot\ withBr}$	kg	8
Recommended Motor Module:			
Rated converter current	$I_{N\ conv}$	A	9
Maximum converter current	$I_{max\ conv}$	A	27
Max. torque (converter operation)	$M_{max\ conv}$	Nm	13
Max. permissible speed (converter operation)	$n_{max\ conv}$	rpm	9000

The rated data are valid for a 600 V DC link voltage



[———] SINAMICS ALM 400 V (600 V DC)
[- - - - - -] SINAMICS BLM/SLM 400 V (540 V DC)

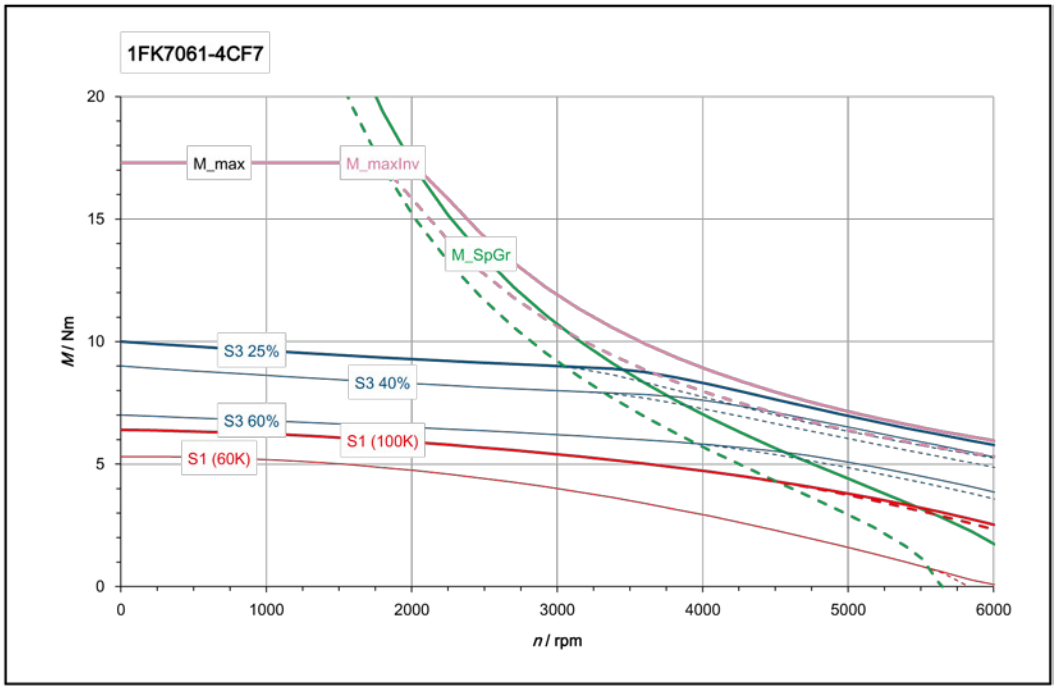


[———] SINAMICS ALM 480 V (720 V DC)
[- - - - - -] SINAMICS BLM/SLM 480 V (650 V DC)

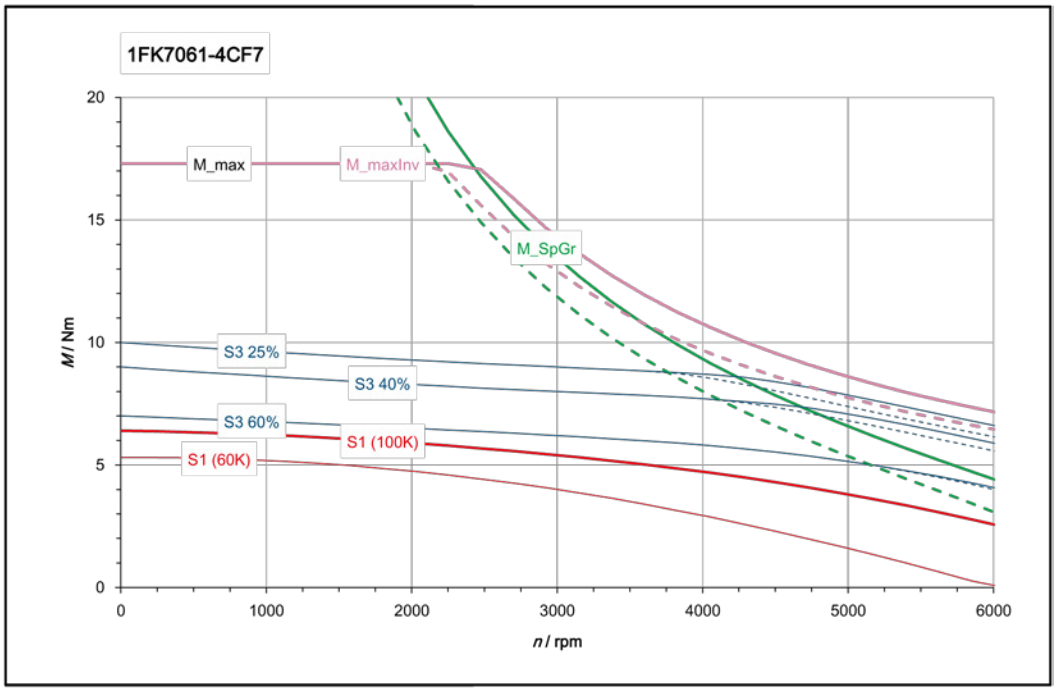
6.3.2.4 1FK7061-4C_

1FK7061 - 4CF7 three-phase servomotor			
Technical data	**Character**	**Unit**	**Value**
Configuration data:			
Rated speed	n_N	rpm	3000
Rated torque (100 K)	$M_{N(100K)}$	Nm	5.4
Rated current (100 K)	$I_{N(100K)}$	A	5.3
Static torque (100 K)	$M_{0(100K)}$	Nm	6.4
Stall current (100 K)	$I_{0(100K)}$	A	6.1
Static torque (60 K)	$M_{0(60K)}$	Nm	5.3
Stall current (60 K)	$I_{0(60K)}$	A	4.95
Optimum operating point:			
Optimum speed	n_{opt}	rpm	3000
Optimum power	P_{opt}	kW	1.7
Limit data:			
Max. permissible speed (mech.)	$n_{max\ mech}$	rpm	7500
Maximum torque	M_{max}	Nm	17.3
Maximum current	I_{max}	A	18.5
Motor data:			
Number of poles	2p		6
Torque constant (100K)	k_T	Nm/A	1.05
Voltage constant (at 20°C)	k_E	V/1000rpm	67.5
Winding resistance (at 20°C)	R_{ph}	Ω	0.715
Rotating field inductance	L_D	mH	22
Electrical time constant	T_{el}	ms	31
Mechanical time constant	T_{mech}	ms	0.79
Thermal time constant	T_{th}	min	45
Moment of inertia	J_{Mot}	10^{-4} kgm^2	4.1
Shaft torsional stiffness	c_t	Nm/rad	36500
Weight	m_{Mot}	kg	9.5
Motor data with integrated brake:			
Moment of inertia (with brake)	$J_{Mot\ withBr}$	10^{-4} kgm^2	5.1
Shaft torsional stiffness (with brake)	$c_{t\ withBr}$	Nm/rad	26500
Weight (with brake)	$m_{Mot\ withBr}$	kg	11
Recommended Motor Module:			
Rated converter current	$I_{N\ conv}$	A	9
Maximum converter current	$I_{max\ conv}$	A	27
Max. torque (converter operation)	$M_{max\ conv}$	Nm	17.3
Max. permissible speed (converter operation)	$n_{max\ conv}$	rpm	7500

The rated data are valid for a 600 V DC link voltage



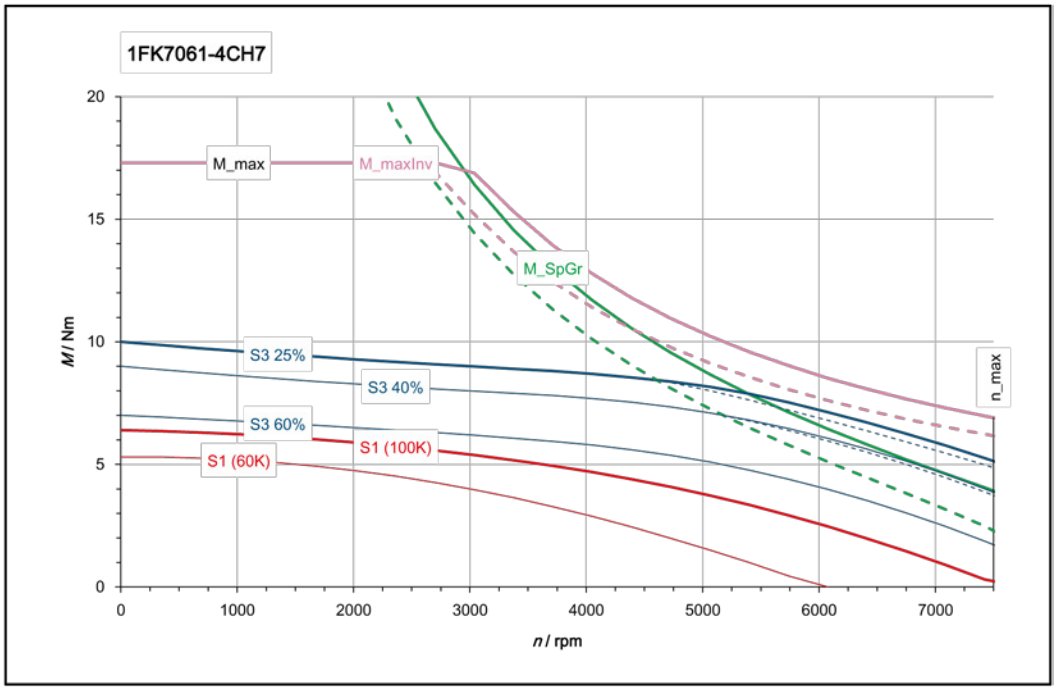
[———] SINAMICS ALM 400 V (600 V DC)
[- - - - - -] SINAMICS BLM/SLM 400 V (540 V DC)



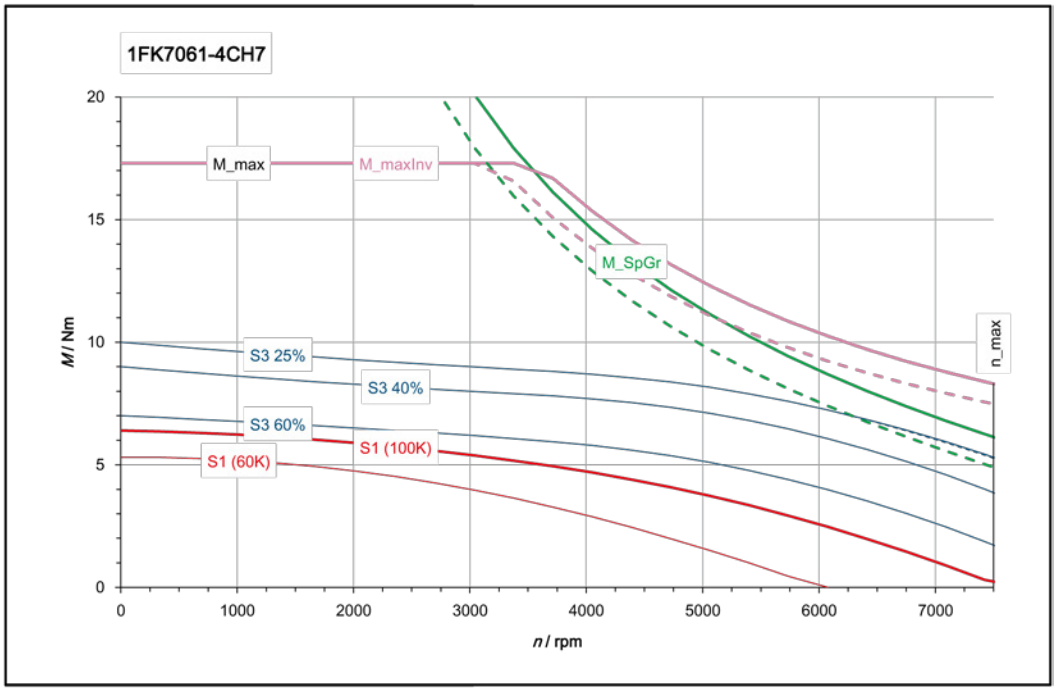
[———] SINAMICS ALM 480 V (720 V DC)
[- - - - - -] SINAMICS BLM/SLM 480 V (650 V DC)

1FK7061 - 4CH7 three-phase servomotor			
Technical data	**Character**	**Unit**	**Value**
Configuration data:			
Rated speed	n_N	rpm	4500
Rated torque (100 K)	$M_{N(100K)}$	Nm	4.3
Rated current (100 K)	$I_{N(100K)}$	A	6.2
Static torque (100 K)	$M_{0(100K)}$	Nm	6.4
Stall current (100 K)	$I_{0(100K)}$	A	8.7
Static torque (60 K)	$M_{0(60K)}$	Nm	5.3
Stall current (60 K)	$I_{0(60K)}$	A	7.1
Optimum operating point:			
Optimum speed	n_{opt}	rpm	4500
Optimum power	P_{opt}	kW	2.05
Limit data:			
Max. permissible speed (mech.)	$n_{max\ mech}$	rpm	7500
Maximum torque	M_{max}	Nm	17.3
Maximum current	I_{max}	A	26.5
Motor data:			
Number of poles	2p		6
Torque constant (100K)	k_T	Nm/A	0.73
Voltage constant (at 20°C)	k_E	V/1000rpm	47
Winding resistance (at 20°C)	R_{ph}	Ω	0.348
Rotating field inductance	L_D	mH	10.7
Electrical time constant	T_{el}	ms	30.5
Mechanical time constant	T_{mech}	ms	0.79
Thermal time constant	T_{th}	min	45
Moment of inertia	J_{Mot}	10^{-4} kgm^2	4.1
Shaft torsional stiffness	c_t	Nm/rad	36500
Weight	m_{Mot}	kg	9.5
Motor data with integrated brake:			
Moment of inertia (with brake)	$J_{Mot\ withBr}$	10^{-4} kgm^2	5.1
Shaft torsional stiffness (with brake)	$c_{t\ withBr}$	Nm/rad	26500
Weight (with brake)	$m_{Mot\ withBr}$	kg	11
Recommended Motor Module:			
Rated converter current	$I_{N\ conv}$	A	9
Maximum converter current	$I_{max\ conv}$	A	27
Max. torque (converter operation)	$M_{max\ conv}$	Nm	17.3
Max. permissible speed (converter operation)	$n_{max\ conv}$	rpm	7500

The rated data are valid for a 600 V DC link voltage



[———] SINAMICS ALM 400 V (600 V DC)
[- - - - - -] SINAMICS BLM/SLM 400 V (540 V DC)

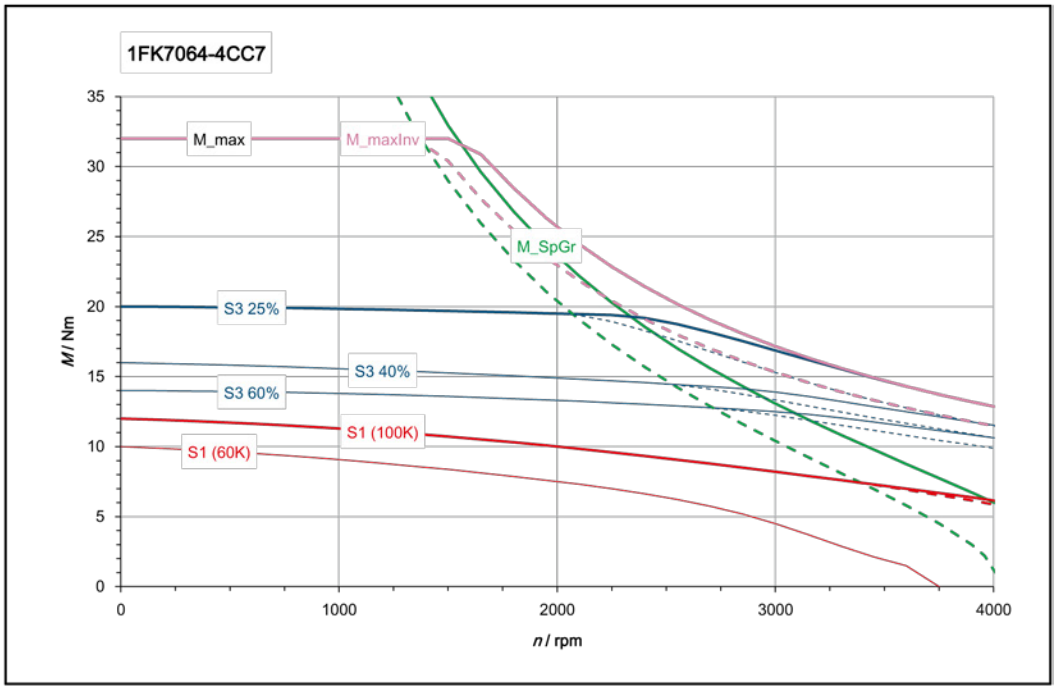


[———] SINAMICS ALM 480 V (720 V DC)
[- - - - - -] SINAMICS BLM/SLM 480 V (650 V DC)

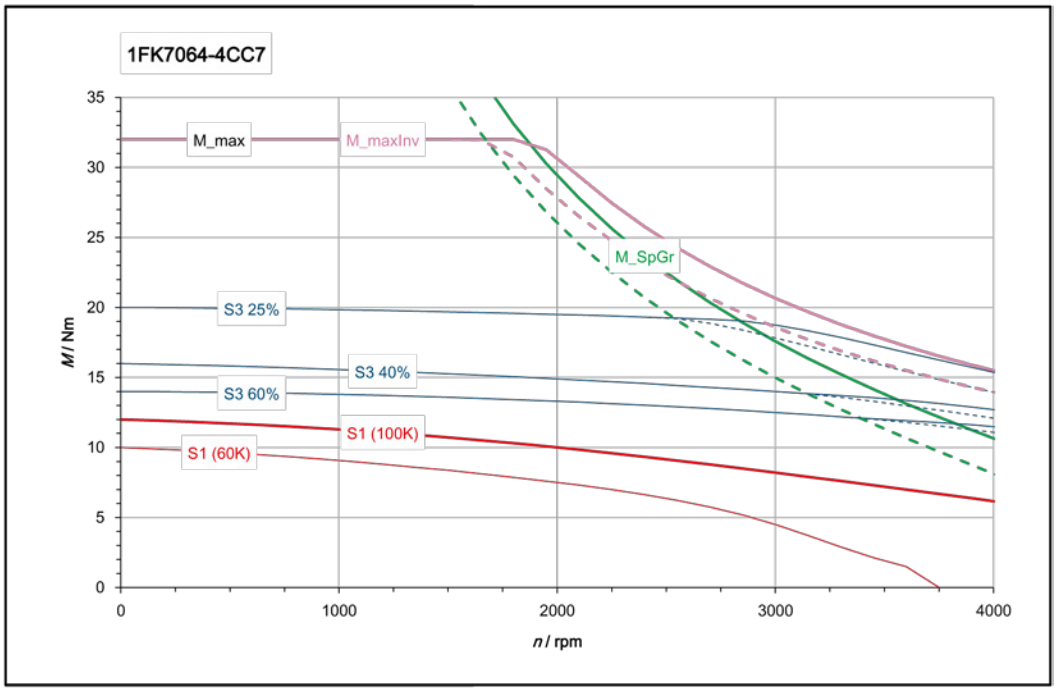
6.3.2.5 1FK7064-4C_

1FK7064 - 4CC7 three-phase servomotor			
Technical data	**Character**	**Unit**	**Value**
Configuration data:			
Rated speed	n_N	rpm	2000
Rated torque (100 K)	$M_{N(100K)}$	Nm	10
Rated current (100 K)	$I_{N(100K)}$	A	7.1
Static torque (100 K)	$M_{0(100K)}$	Nm	12
Stall current (100 K)	$I_{0(100K)}$	A	8.1
Static torque (60 K)	$M_{0(60K)}$	Nm	10
Stall current (60 K)	$I_{0(60K)}$	A	6.6
Optimum operating point:			
Optimum speed	n_{opt}	rpm	2000
Optimum power	P_{opt}	kW	2.1
Limit data:			
Max. permissible speed (mech.)	$n_{max\ mech}$	rpm	7500
Maximum torque	M_{max}	Nm	32
Maximum current	I_{max}	A	25
Motor data:			
Number of poles	2p		6
Torque constant (100K)	k_T	Nm/A	1.48
Voltage constant (at 20°C)	k_E	V/1000rpm	94
Winding resistance (at 20°C)	R_{ph}	Ω	0.585
Rotating field inductance	L_D	mH	21.5
Electrical time constant	T_{el}	ms	37
Mechanical time constant	T_{mech}	ms	0.6
Thermal time constant	T_{th}	min	55
Moment of inertia	J_{Mot}	10^{-4} kgm^2	7.5
Shaft torsional stiffness	c_t	Nm/rad	29500
Weight	m_{Mot}	kg	15.4
Motor data with integrated brake:			
Moment of inertia (with brake)	$J_{Mot\ withBr}$	10^{-4} kgm^2	8.5
Shaft torsional stiffness (with brake)	$c_{t\ withBr}$	Nm/rad	22500
Weight (with brake)	$m_{Mot\ withBr}$	kg	16.8
Recommended Motor Module:			
Rated converter current	$I_{N\ conv}$	A	9
Maximum converter current	$I_{max\ conv}$	A	27
Max. torque (converter operation)	$M_{max\ conv}$	Nm	32
Max. permissible speed (converter operation)	$n_{max\ conv}$	rpm	6150

The rated data are valid for a 600 V DC link voltage



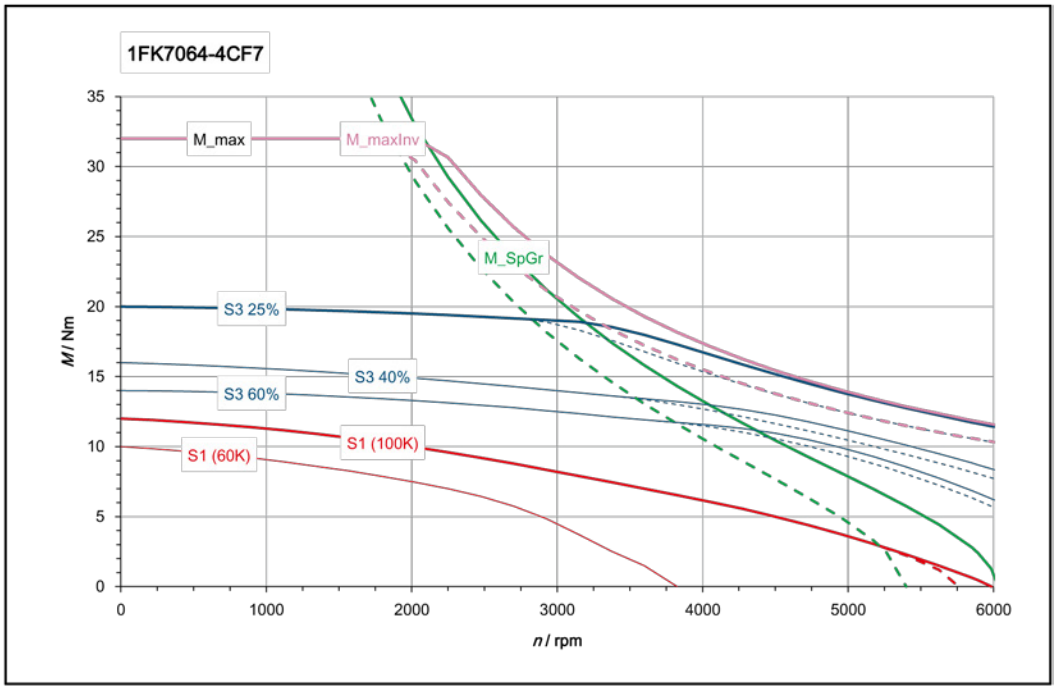
[———] SINAMICS ALM 400 V (600 V DC)
[- - - - - -] SINAMICS BLM/SLM 400 V (540 V DC)



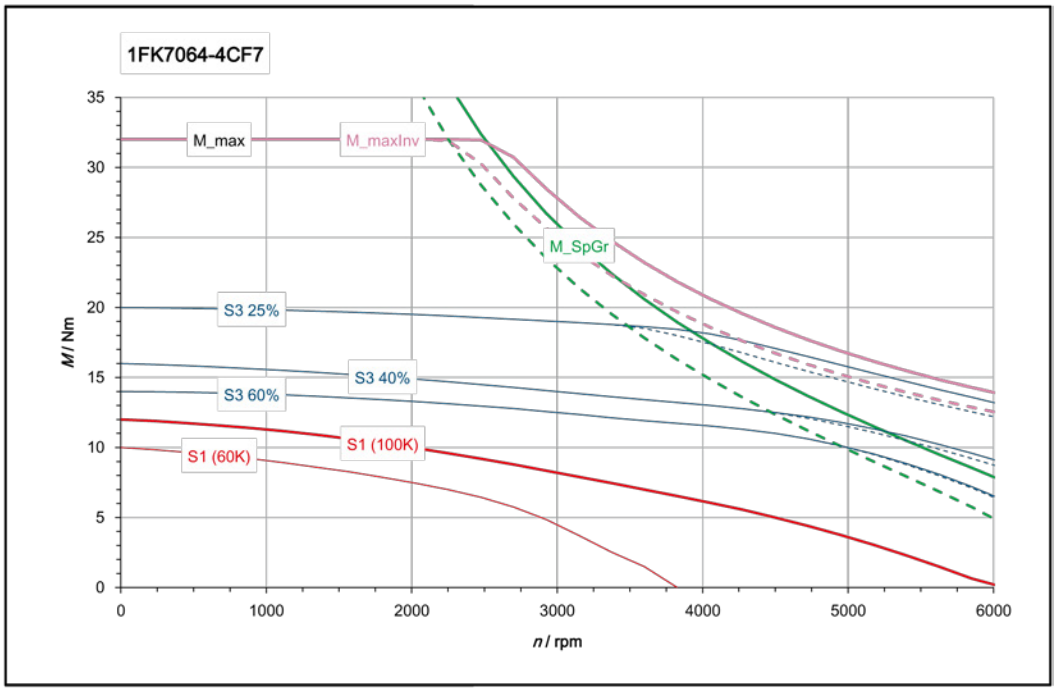
[———] SINAMICS ALM 480 V (720 V DC)
[- - - - - -] SINAMICS BLM/SLM 480 V (650 V DC)

1FK7064 - 4CF7 three-phase servomotor			
Technical data	**Character**	**Unit**	**Value**
Configuration data:			
Rated speed	n_N	rpm	3000
Rated torque (100 K)	$M_{N(100K)}$	Nm	8
Rated current (100 K)	$I_{N(100K)}$	A	7.6
Static torque (100 K)	$M_{0(100K)}$	Nm	12
Stall current (100 K)	$I_{0(100K)}$	A	10.8
Static torque (60 K)	$M_{0(60K)}$	Nm	10
Stall current (60 K)	$I_{0(60K)}$	A	8.7
Optimum operating point:			
Optimum speed	n_{opt}	rpm	3000
Optimum power	P_{opt}	kW	2.5
Limit data:			
Max. permissible speed (mech.)	$n_{max\ mech}$	rpm	7500
Maximum torque	M_{max}	Nm	32
Maximum current	I_{max}	A	33
Motor data:			
Number of poles	2p		6
Torque constant (100K)	k_T	Nm/A	1.11
Voltage constant (at 20°C)	k_E	V/1000rpm	70.5
Winding resistance (at 20°C)	R_{ph}	Ω	0.348
Rotating field inductance	L_D	mH	12
Electrical time constant	T_{el}	ms	34.5
Mechanical time constant	T_{mech}	ms	0.64
Thermal time constant	T_{th}	min	55
Moment of inertia	J_{Mot}	10^{-4} kgm^2	7.5
Shaft torsional stiffness	c_t	Nm/rad	29500
Weight	m_{Mot}	kg	15.4
Motor data with integrated brake:			
Moment of inertia (with brake)	$J_{Mot\ withBr}$	10^{-4} kgm^2	8.5
Shaft torsional stiffness (with brake)	$c_{t\ withBr}$	Nm/rad	22500
Weight (with brake)	$m_{Mot\ withBr}$	kg	16.8
Recommended Motor Module:			
Rated converter current	$I_{N\ conv}$	A	18
Maximum converter current	$I_{max\ conv}$	A	54
Max. torque (converter operation)	$M_{max\ conv}$	Nm	32
Max. permissible speed (converter operation)	$n_{max\ conv}$	rpm	7500

The rated data are valid for a 600 V DC link voltage



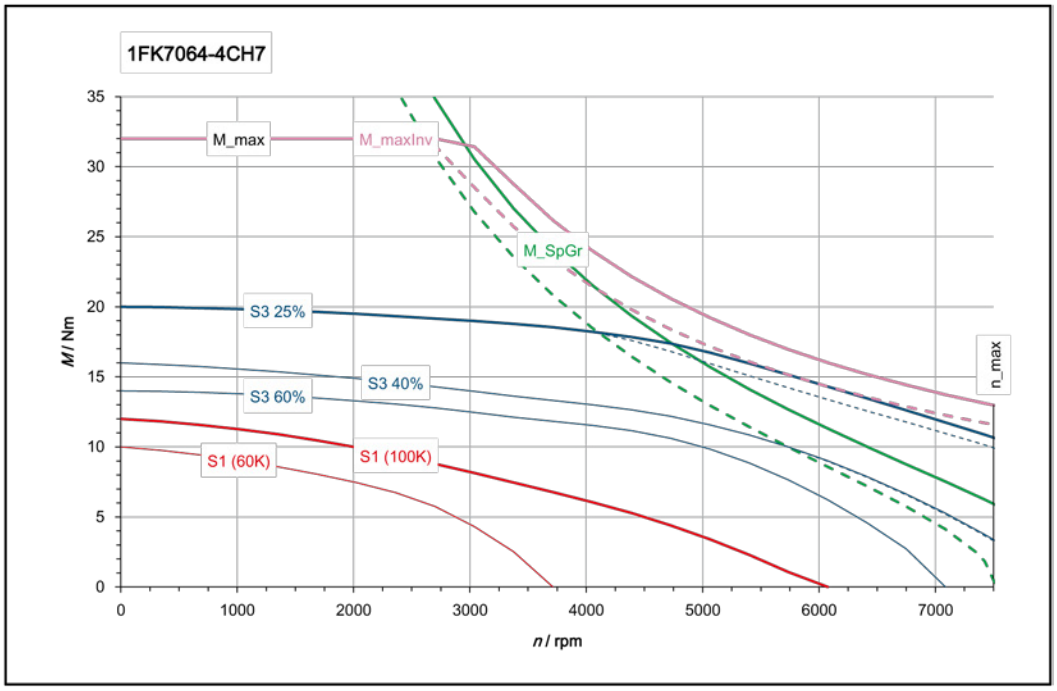
[———] SINAMICS ALM 400 V (600 V DC)
[- - - - - -] SINAMICS BLM/SLM 400 V (540 V DC)



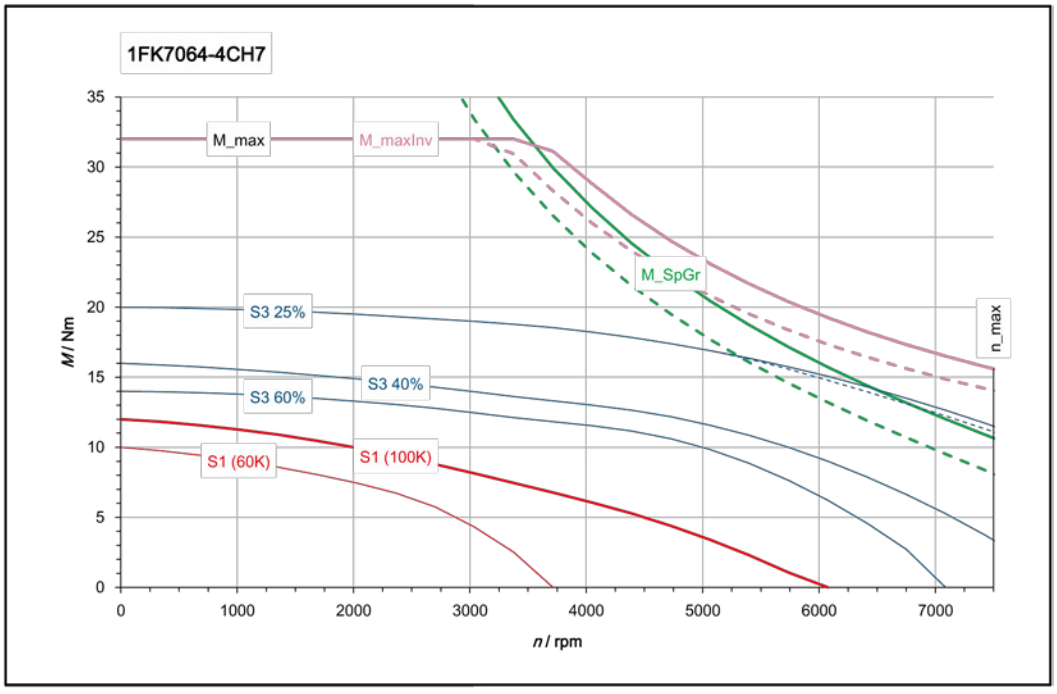
[———] SINAMICS ALM 480 V (720 V DC)
[- - - - - -] SINAMICS BLM/SLM 480 V (650 V DC)

1FK7064 - 4CH7 three-phase servomotor			
Technical data	**Character**	**Unit**	**Value**
Configuration data:			
Rated speed	n_N	rpm	4500
Rated torque (100 K)	$M_{N(100K)}$	Nm	5
Rated current (100 K)	$I_{N(100K)}$	A	7
Static torque (100 K)	$M_{0(100K)}$	Nm	12
Stall current (100 K)	$I_{0(100K)}$	A	15
Static torque (60 K)	$M_{0(60K)}$	Nm	10
Stall current (60 K)	$I_{0(60K)}$	A	12.2
Optimum operating point:			
Optimum speed	n_{opt}	rpm	3500
Optimum power	P_{opt}	kW	2.75
Limit data:			
Max. permissible speed (mech.)	$n_{max\ mech}$	rpm	7500
Maximum torque	M_{max}	Nm	32
Maximum current	I_{max}	A	46
Motor data:			
Number of poles	2p		6
Torque constant (100K)	k_T	Nm/A	0.8
Voltage constant (at 20°C)	k_E	V/1000rpm	50.5
Winding resistance (at 20°C)	R_{ph}	Ω	0.17
Rotating field inductance	L_D	mH	6.2
Electrical time constant	T_{el}	ms	36.5
Mechanical time constant	T_{mech}	ms	0.6
Thermal time constant	T_{th}	min	55
Moment of inertia	J_{Mot}	10^{-4} kgm^2	7.5
Shaft torsional stiffness	c_t	Nm/rad	29500
Weight	m_{Mot}	kg	15.4
Motor data with integrated brake:			
Moment of inertia (with brake)	$J_{Mot\ withBr}$	10^{-4} kgm^2	8.5
Shaft torsional stiffness (with brake)	$c_{t\ withBr}$	Nm/rad	22500
Weight (with brake)	$m_{Mot\ withBr}$	kg	16.8
Recommended Motor Module:			
Rated converter current	$I_{N\ conv}$	A	18
Maximum converter current	$I_{max\ conv}$	A	54
Max. torque (converter operation)	$M_{max\ conv}$	Nm	32
Max. permissible speed (converter operation)	$n_{max\ conv}$	rpm	7500

The rated data are valid for a 600 V DC link voltage



[———] SINAMICS ALM 400 V (600 V DC)
[- - - - - -] SINAMICS BLM/SLM 400 V (540 V DC)

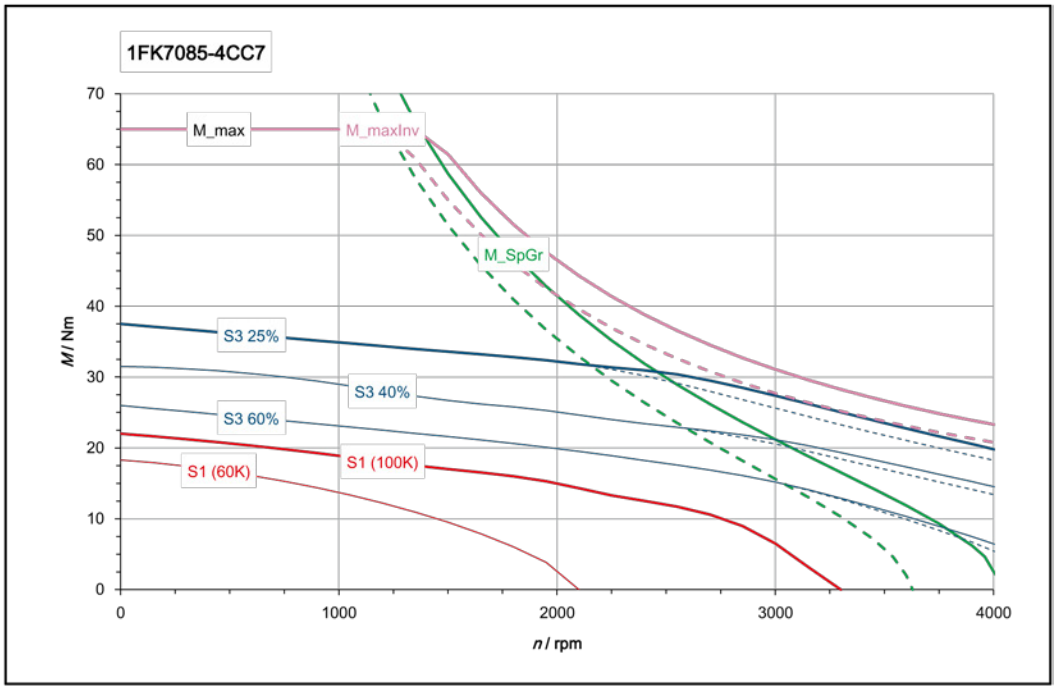


[———] SINAMICS ALM 480 V (720 V DC)
[- - - - - -] SINAMICS BLM/SLM 480 V (650 V DC)

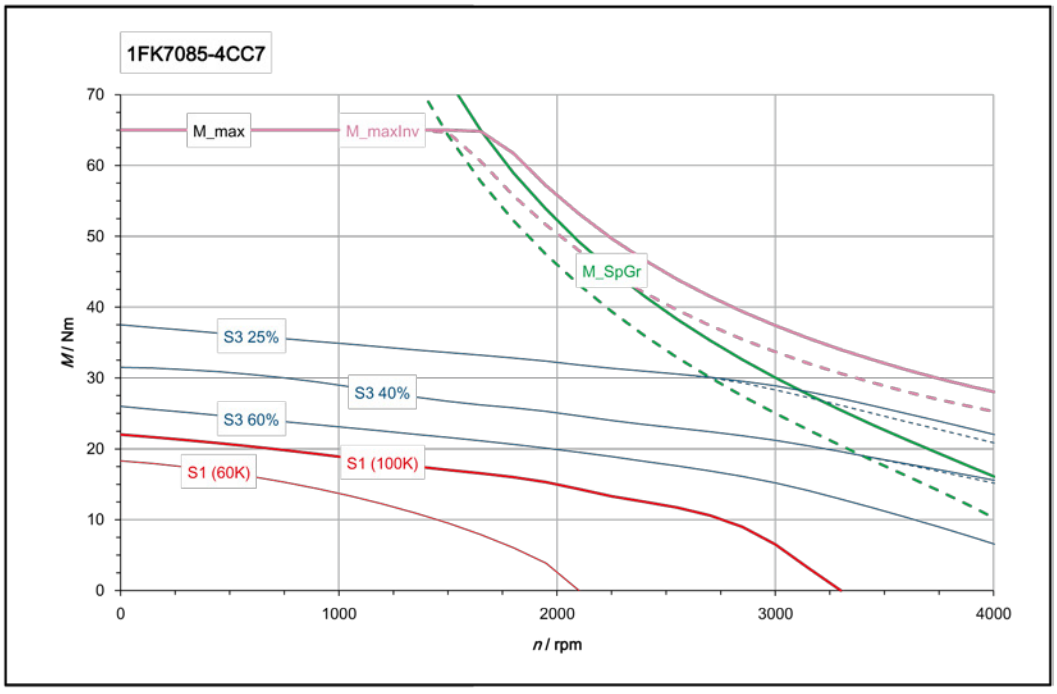
6.3.2.6 1FK7085-4C_

1FK7085 - 4CC7 three-phase servomotor			
Technical data	**Character**	**Unit**	**Value**
Configuration data:			
Rated speed	n_N	rpm	2000
Rated torque (100 K)	$M_{N(100K)}$	Nm	15
Rated current (100 K)	$I_{N(100K)}$	A	10
Static torque (100 K)	$M_{0(100K)}$	Nm	22
Stall current (100 K)	$I_{0(100K)}$	A	13.5
Static torque (60 K)	$M_{0(60K)}$	Nm	18.3
Stall current (60 K)	$I_{0(60K)}$	A	10.9
Optimum operating point:			
Optimum speed	n_{opt}	rpm	2000
Optimum power	P_{opt}	kW	3.15
Limit data:			
Max. permissible speed (mech.)	$n_{max\ mech}$	rpm	6000
Maximum torque	M_{max}	Nm	65
Maximum current	I_{max}	A	51
Motor data:			
Number of poles	2p		8
Torque constant (100K)	k_T	Nm/A	1.63
Voltage constant (at 20°C)	k_E	V/1000rpm	105
Winding resistance (at 20°C)	R_{ph}	Ω	0.309
Rotating field inductance	L_D	mH	9.8
Electrical time constant	T_{el}	ms	31.5
Mechanical time constant	T_{mech}	ms	0.77
Thermal time constant	T_{th}	min	45
Moment of inertia	J_{Mot}	10^{-4} kgm^2	22
Shaft torsional stiffness	c_t	Nm/rad	84000
Weight	m_{Mot}	kg	23
Motor data with integrated brake:			
Moment of inertia (with brake)	$J_{Mot\ withBr}$	10^{-4} kgm^2	25.5
Shaft torsional stiffness (with brake)	$c_{t\ withBr}$	Nm/rad	63000
Weight (with brake)	$m_{Mot\ withBr}$	kg	26
Recommended Motor Module:			
Rated converter current	$I_{N\ conv}$	A	18
Maximum converter current	$I_{max\ conv}$	A	54
Max. torque (converter operation)	$M_{max\ conv}$	Nm	65
Max. permissible speed (converter operation)	$n_{max\ conv}$	rpm	5500

The rated data are valid for a 600 V DC link voltage



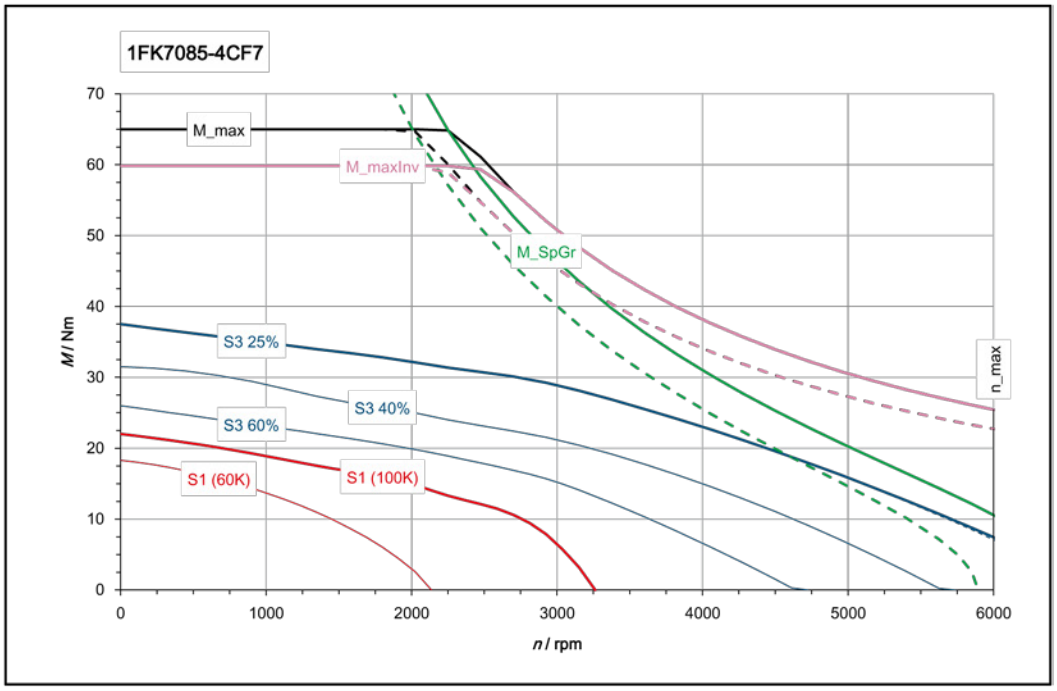
[———] SINAMICS ALM 400 V (600 V DC)
[– – – – – –] SINAMICS BLM/SLM 400 V (540 V DC)



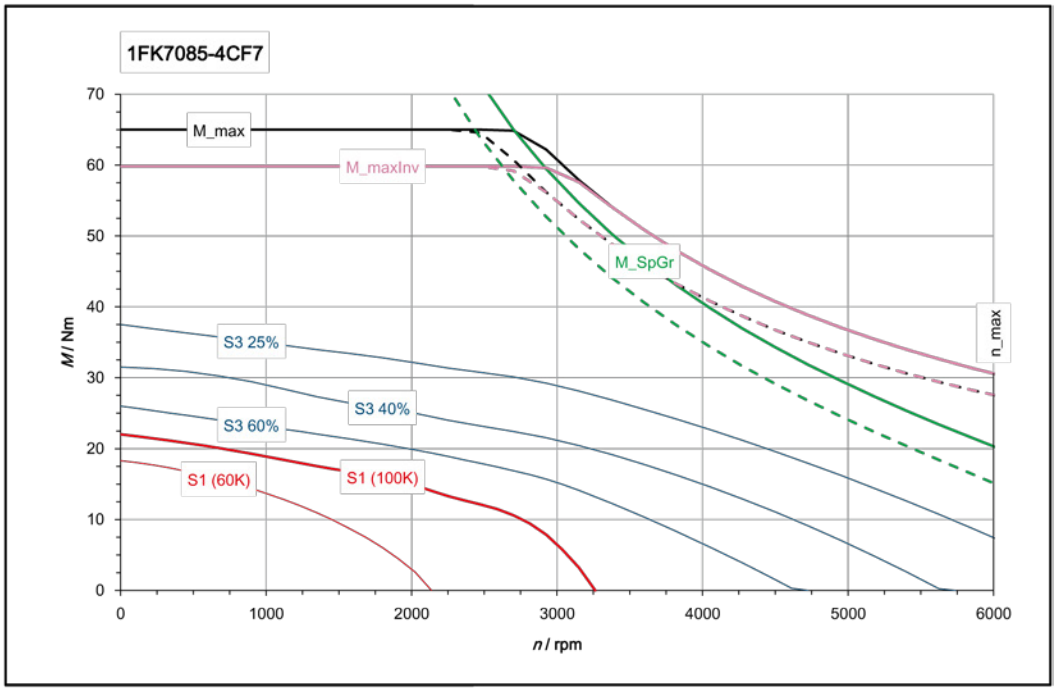
[———] SINAMICS ALM 480 V (720 V DC)
[– – – – – –] SINAMICS BLM/SLM 480 V (650 V DC)

1FK7085 - 4CF7 three-phase servomotor			
Technical data	**Character**	**Unit**	**Value**
Configuration data:			
Rated speed	n_N	rpm	3000
Rated torque (100 K)	$M_{N(100K)}$	Nm	6.5
Rated current (100 K)	$I_{N(100K)}$	A	7
Static torque (100 K)	$M_{0(100K)}$	Nm	22
Stall current (100 K)	$I_{0(100K)}$	A	22
Static torque (60 K)	$M_{0(60K)}$	Nm	18.3
Stall current (60 K)	$I_{0(60K)}$	A	17.8
Optimum operating point:			
Optimum speed	n_{opt}	rpm	2500
Optimum power	P_{opt}	kW	3.15
Limit data:			
Max. permissible speed (mech.)	$n_{max\ mech}$	rpm	6000
Maximum torque	M_{max}	Nm	65
Maximum current	I_{max}	A	84
Motor data:			
Number of poles	2p		8
Torque constant (100K)	k_T	Nm/A	1
Voltage constant (at 20°C)	k_E	V/1000rpm	64.5
Winding resistance (at 20°C)	R_{ph}	Ω	0.118
Rotating field inductance	L_D	mH	3.7
Electrical time constant	T_{el}	ms	31.5
Mechanical time constant	T_{mech}	ms	0.78
Thermal time constant	T_{th}	min	65
Moment of inertia	J_{Mot}	10^{-4} kgm^2	22
Shaft torsional stiffness	c_t	Nm/rad	84000
Weight	m_{Mot}	kg	23
Motor data with integrated brake:			
Moment of inertia (with brake)	$J_{Mot\ withBr}$	10^{-4} kgm^2	25.5
Shaft torsional stiffness (with brake)	$c_{t\ withBr}$	Nm/rad	63000
Weight (with brake)	$m_{Mot\ withBr}$	kg	26
Recommended Motor Module:			
Rated converter current	$I_{N\ conv}$	A	24
Maximum converter current	$I_{max\ conv}$	A	72
Max. torque (converter operation)	$M_{max\ conv}$	Nm	59.8
Max. permissible speed (converter operation)	$n_{max\ conv}$	rpm	6000

The rated data are valid for a 600 V DC link voltage



[———] SINAMICS ALM 400 V (600 V DC)
[- - - - - -] SINAMICS BLM/SLM 400 V (540 V DC)

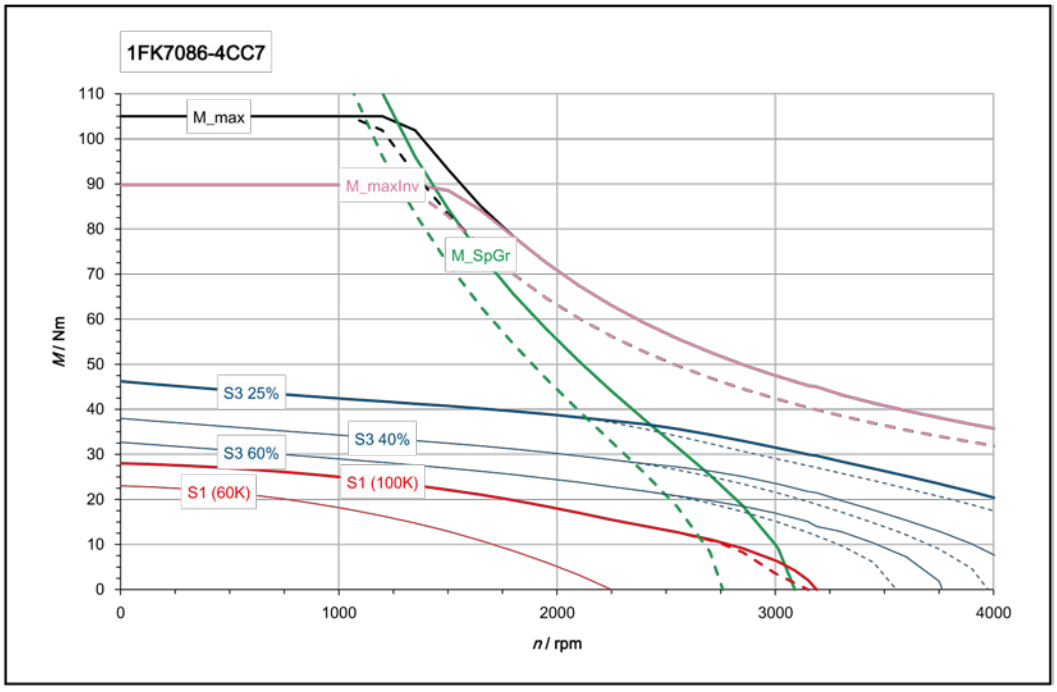


[———] SINAMICS ALM 480 V (720 V DC)
[- - - - - -] SINAMICS BLM/SLM 480 V (650 V DC)

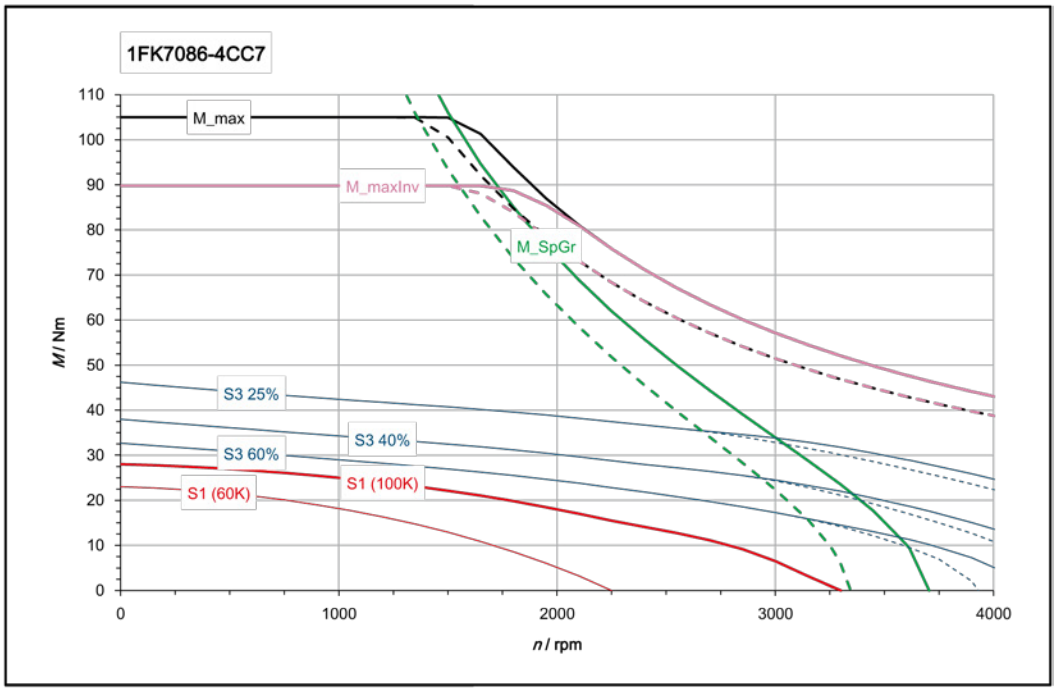
6.3.2.7 1FK7086-4C_

1FK7086 - 4CC7 three-phase servomotor			
Technical data	**Character**	**Unit**	**Value**
Configuration data:			
Rated speed	n_N	rpm	2000
Rated torque (100 K)	$M_{N(100K)}$	Nm	18
Rated current (100 K)	$I_{N(100K)}$	A	9
Static torque (100 K)	$M_{0(100K)}$	Nm	28
Stall current (100 K)	$I_{0(100K)}$	A	13.2
Static torque (60 K)	$M_{0(60K)}$	Nm	23
Stall current (60 K)	$I_{0(60K)}$	A	10.7
Optimum operating point:			
Optimum speed	n_{opt}	rpm	2000
Optimum power	P_{opt}	kW	3.75
Limit data:			
Max. permissible speed (mech.)	$n_{max\ mech}$	rpm	6000
Maximum torque	M_{max}	Nm	105
Maximum current	I_{max}	A	71
Motor data:			
Number of poles	2p		8
Torque constant (100K)	k_T	Nm/A	2.12
Voltage constant (at 20°C)	k_E	V/1000rpm	138
Winding resistance (at 20°C)	R_{ph}	Ω	0.309
Rotating field inductance	L_D	mH	8.2
Electrical time constant	T_{el}	ms	26.5
Mechanical time constant	T_{mech}	ms	0.455
Thermal time constant	T_{th}	min	65
Moment of inertia	J_{Mot}	10^{-4} kgm^2	22
Shaft torsional stiffness	c_t	Nm/rad	84000
Weight	m_{Mot}	kg	23
Motor data with integrated brake:			
Moment of inertia (with brake)	$J_{Mot\ withBr}$	10^{-4} kgm^2	25.5
Shaft torsional stiffness (with brake)	$c_{t\ withBr}$	Nm/rad	63000
Weight (with brake)	$m_{Mot\ withBr}$	kg	26
Recommended Motor Module:			
Rated converter current	$I_{N\ conv}$	A	18
Maximum converter current	$I_{max\ conv}$	A	54
Max. torque (converter operation)	$M_{max\ conv}$	Nm	90
Max. permissible speed (converter operation)	$n_{max\ conv}$	rpm	4200

The rated data are valid for a 600 V DC link voltage



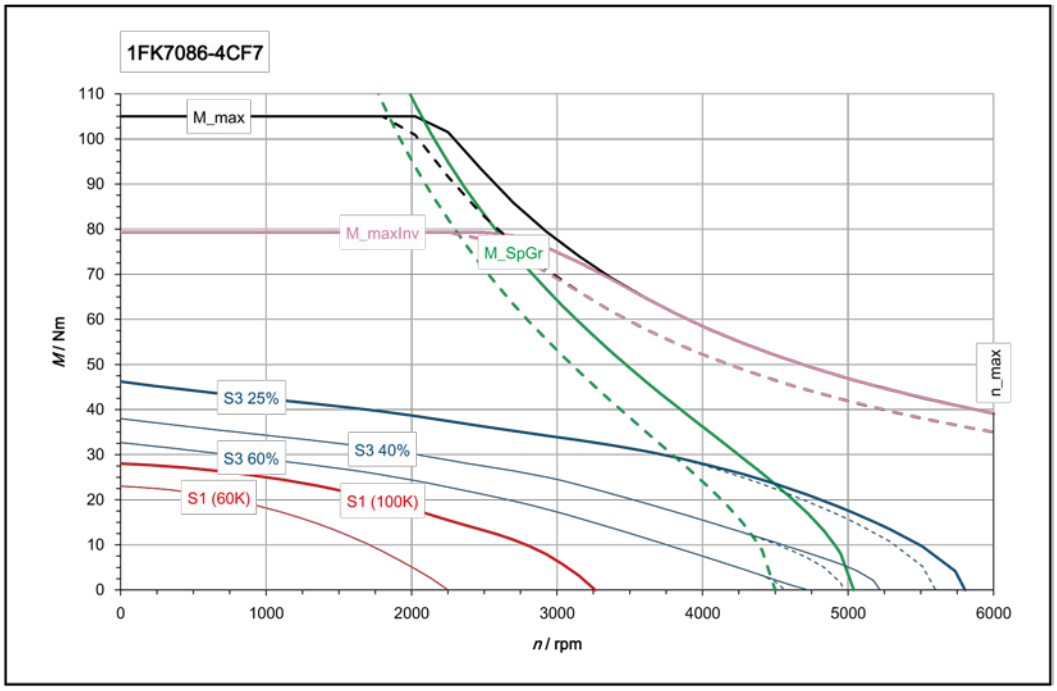
[———] SINAMICS ALM 400 V (600 V DC)
[- - - - - -] SINAMICS BLM/SLM 400 V (540 V DC)



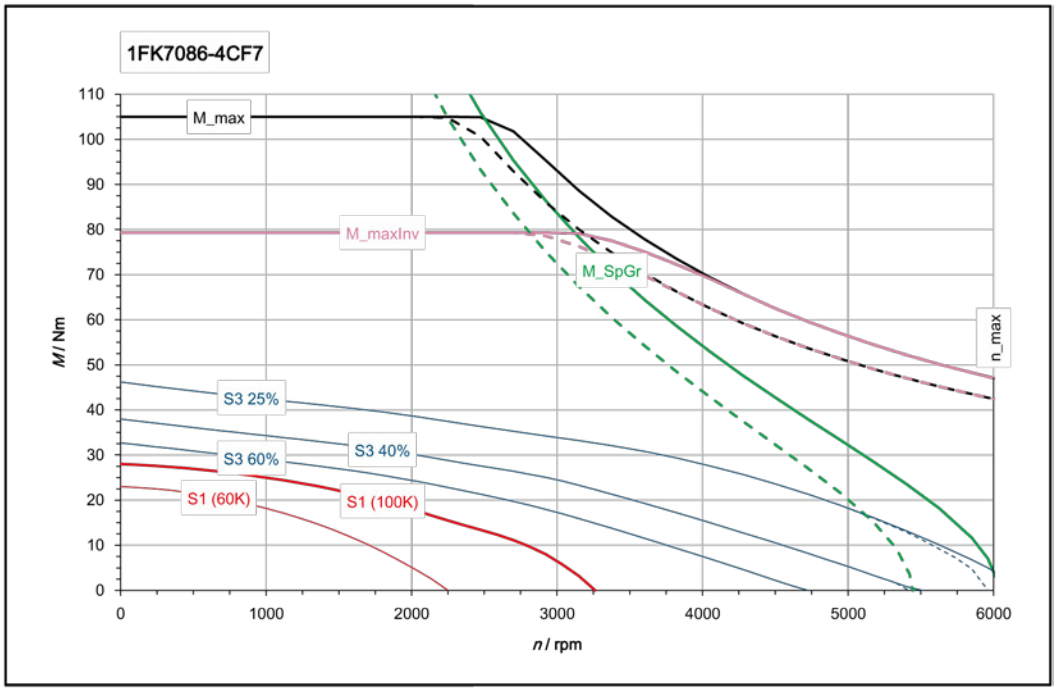
[———] SINAMICS ALM 480 V (720 V DC)
[- - - - - -] SINAMICS BLM/SLM 480 V (650 V DC)

1FK7086 - 4CF7 three-phase servomotor			
Technical data	**Character**	**Unit**	**Value**
Configuration data:			
Rated speed	n_N	rpm	3000
Rated torque (100 K)	$M_{N(100K)}$	Nm	6.5
Rated current (100 K)	$I_{N(100K)}$	A	5.7
Static torque (100 K)	$M_{0(100K)}$	Nm	28
Stall current (100 K)	$I_{0(100K)}$	A	21.5
Static torque (60 K)	$M_{0(60K)}$	Nm	23
Stall current (60 K)	$I_{0(60K)}$	A	17.4
Optimum operating point:			
Optimum speed	n_{opt}	rpm	2000
Optimum power	P_{opt}	kW	3.75
Limit data:			
Max. permissible speed (mech.)	$n_{max\ mech}$	rpm	6000
Maximum torque	M_{max}	Nm	105
Maximum current	I_{max}	A	115
Motor data:			
Number of poles	2p		8
Torque constant (100K)	k_T	Nm/A	1.3
Voltage constant (at 20°C)	k_E	V/1000rpm	84.5
Winding resistance (at 20°C)	R_{ph}	Ω	0.118
Rotating field inductance	L_D	mH	3.1
Electrical time constant	T_{el}	ms	26.5
Mechanical time constant	T_{mech}	ms	0.46
Thermal time constant	T_{th}	min	65
Moment of inertia	J_{Mot}	10^{-4} kgm^2	22
Shaft torsional stiffness	c_t	Nm/rad	84000
Weight	m_{Mot}	kg	23
Motor data with integrated brake:			
Moment of inertia (with brake)	$J_{Mot\ withBr}$	10^{-4} kgm^2	25.5
Shaft torsional stiffness (with brake)	$c_{t\ withBr}$	Nm/rad	63000
Weight (with brake)	$m_{Mot\ withBr}$	kg	26
Recommended Motor Module:			
Rated converter current	$I_{N\ conv}$	A	24
Maximum converter current	$I_{max\ conv}$	A	72
Max. torque (converter operation)	$M_{max\ conv}$	Nm	79.3
Max. permissible speed (converter operation)	$n_{max\ conv}$	rpm	6000

The rated data are valid for a 600 V DC link voltage



[———] SINAMICS ALM 400 V (600 V DC)
[- - - - - -] SINAMICS BLM/SLM 400 V (540 V DC)



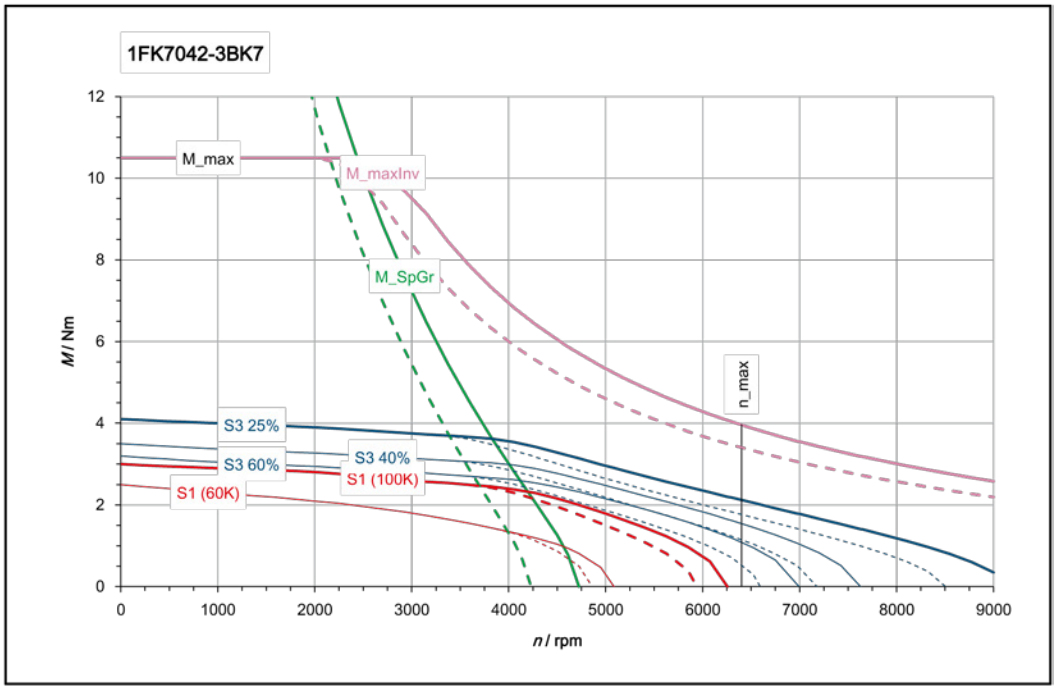
[———] SINAMICS ALM 480 V (720 V DC)
[- - - - - -] SINAMICS BLM/SLM 480 V (650 V DC)

6.3.3 1FK7 High Inertia - naturally cooled

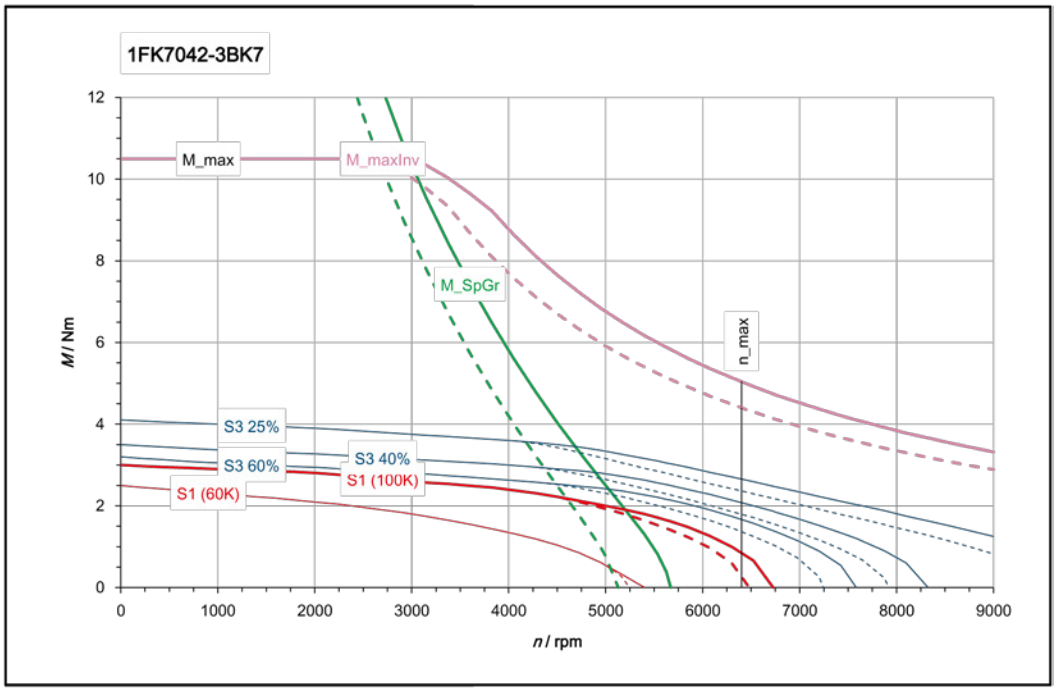
6.3.3.1 1FK7042-3B_

1FK7042 - 3BK71 three-phase servomotor			
Technical data	**Character**	**Unit**	**Value**
Configuration data:			
Rated speed	n_N	rpm	6000
Rated torque (100 K)	$M_{N(100K)}$	Nm	1.5
Rated current (100 K)	$I_{N(100K)}$	A	2.5
Static torque (100 K)	$M_{0(100K)}$	Nm	3
Stall current (100 K)	$I_{0(100K)}$	A	4.4
Static torque (60 K)	$M_{0(60K)}$	Nm	2.5
Stall current (60 K)	$I_{0(60K)}$	A	3.55
Optimum operating point:			
Optimum speed	n_{opt}	rpm	5000
Optimum power	P_{opt}	kW	1.02
Limit data:			
Max. permissible speed (mech.)	$n_{max\ mech}$	rpm	9000
Maximum torque	M_{max}	Nm	10.5
Maximum current	I_{max}	A	15.3
Motor data:			
Number of poles	2p		8
Torque constant (100K)	k_T	Nm/A	0.68
Voltage constant (at 20°C)	k_E	V/1000rpm	44.5
Winding resistance (at 20°C)	R_{ph}	Ω	1.145
Rotating field inductance	L_D	mH	8.6
Electrical time constant	T_{el}	ms	7.5
Mechanical time constant	T_{mech}	ms	3.8
Thermal time constant	T_{th}	min	30
Moment of inertia	J_{Mot}	10^{-4} kgm^2	5.1
Shaft torsional stiffness	c_t	Nm/rad	14600
Weight	m_{Mot}	kg	5.1
Motor data with integrated brake:			
Moment of inertia (with brake)	$J_{Mot\ withBr}$	10^{-4} kgm^2	5.4
Shaft torsional stiffness (with brake)	$c_{t\ withBr}$	Nm/rad	10900
Weight (with brake)	$m_{Mot\ withBr}$	kg	5.8
Recommended Motor Module:			
Rated converter current	$I_{N\ conv}$	A	5
Maximum converter current	$I_{max\ conv}$	A	15
Max. torque (converter operation)	$M_{max\ conv}$	Nm	10.3
Max. permissible speed (converter operation)	$n_{max\ conv}$	rpm	9000

The rated data are valid for a 600 V DC link voltage



[———] SINAMICS ALM 400 V (600 V DC)
[- - - - - -] SINAMICS BLM/SLM 400 V (540 V DC)

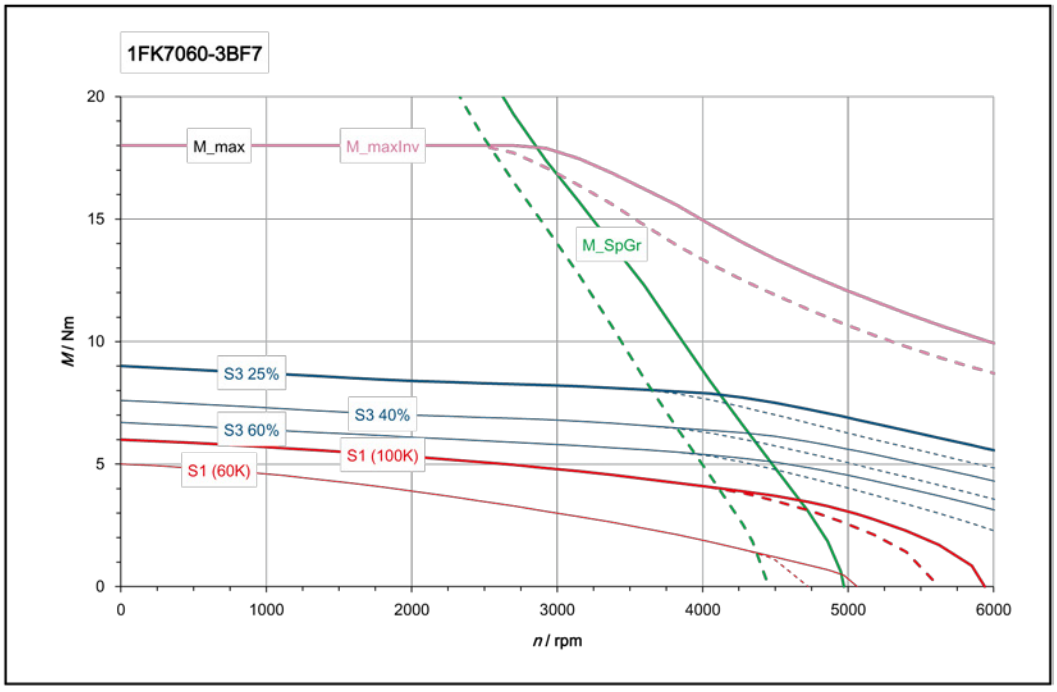


[———] SINAMICS ALM 480 V (720 V DC)
[- - - - - -] SINAMICS BLM/SLM 480 V (650 V DC)

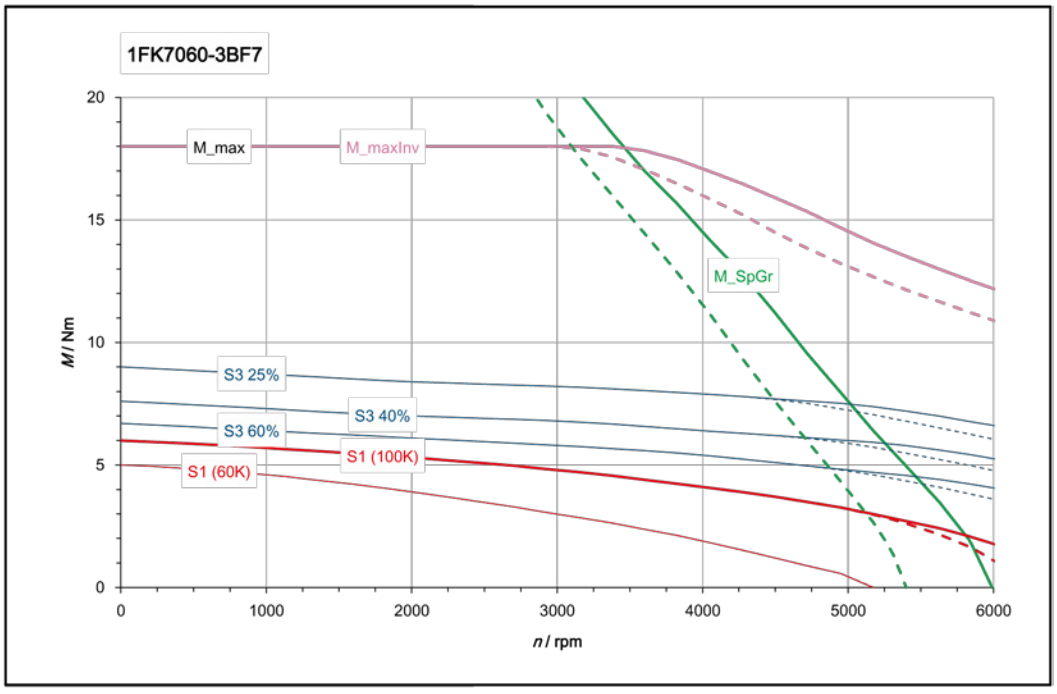
6.3.3.2 1FK7060-3B_

1FK7060 - 3BF7 three-phase servomotor			
Technical data	**Character**	**Unit**	**Value**
Configuration data:			
Rated speed	n_N	rpm	3000
Rated torque (100 K)	$M_{N(100K)}$	Nm	4.7
Rated current (100 K)	$I_{N(100K)}$	A	3.7
Static torque (100 K)	$M_{0(100K)}$	Nm	6
Stall current (100 K)	$I_{0(100K)}$	A	4.45
Static torque (60 K)	$M_{0(60K)}$	Nm	5
Stall current (60 K)	$I_{0(60K)}$	A	3.6
Optimum operating point:			
Optimum speed	n_{opt}	rpm	3000
Optimum power	P_{opt}	kW	1.48
Limit data:			
Max. permissible speed (mech.)	$n_{max\ mech}$	rpm	7200
Maximum torque	M_{max}	Nm	18
Maximum current	I_{max}	A	15
Motor data:			
Number of poles	2p		8
Torque constant (100K)	k_T	Nm/A	1.33
Voltage constant (at 20°C)	k_E	V/1000rpm	85.5
Winding resistance (at 20°C)	R_{ph}	Ω	1.35
Rotating field inductance	L_D	mH	15.2
Electrical time constant	T_{el}	ms	11.3
Mechanical time constant	T_{mech}	ms	2.8
Thermal time constant	T_{th}	min	30
Moment of inertia	J_{Mot}	10^{-4} kgm^2	12.5
Shaft torsional stiffness	c_t	Nm/rad	38500
Weight	m_{Mot}	kg	7.9
Motor data with integrated brake:			
Moment of inertia (with brake)	$J_{Mot\ withBr}$	10^{-4} kgm^2	13.5
Shaft torsional stiffness (with brake)	$c_{t\ withBr}$	Nm/rad	27500
Weight (with brake)	$m_{Mot\ withBr}$	kg	9.3
Recommended Motor Module:			
Rated converter current	$I_{N\ conv}$	A	5
Maximum converter current	$I_{max\ conv}$	A	15
Max. torque (converter operation)	$M_{max\ conv}$	Nm	18
Max. permissible speed (converter operation)	$n_{max\ conv}$	rpm	6700

The rated data are valid for a 600 V DC link voltage



[———] SINAMICS ALM 400 V (600 V DC)
[- - - - - -] SINAMICS BLM/SLM 400 V (540 V DC)

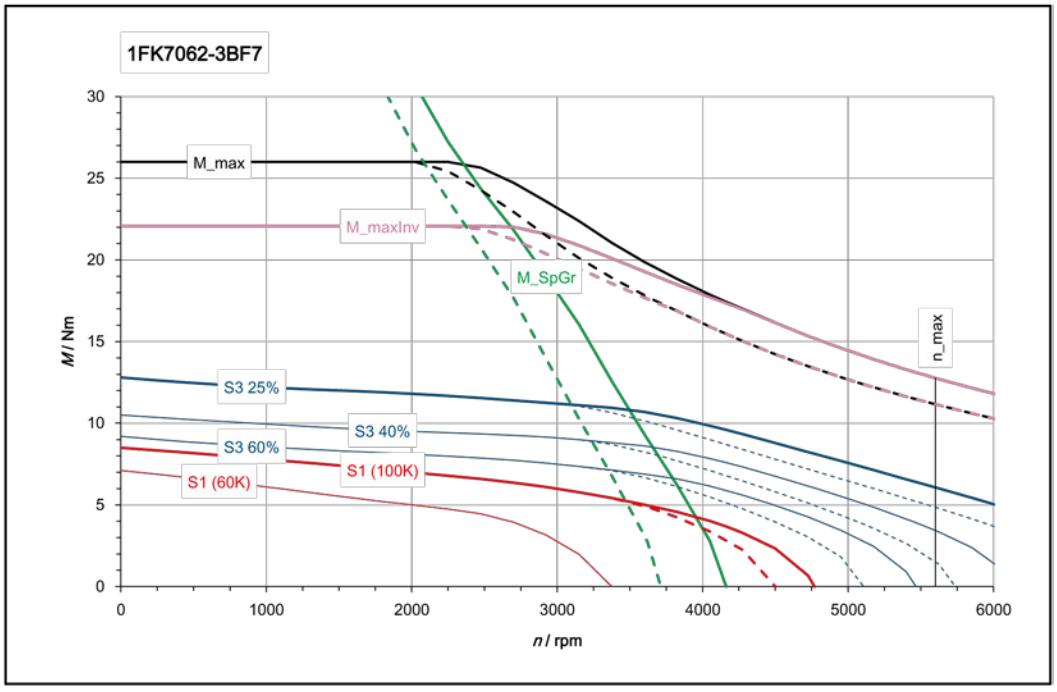


[———] SINAMICS ALM 480 V (720 V DC)
[- - - - - -] SINAMICS BLM/SLM 480 V (650 V DC)

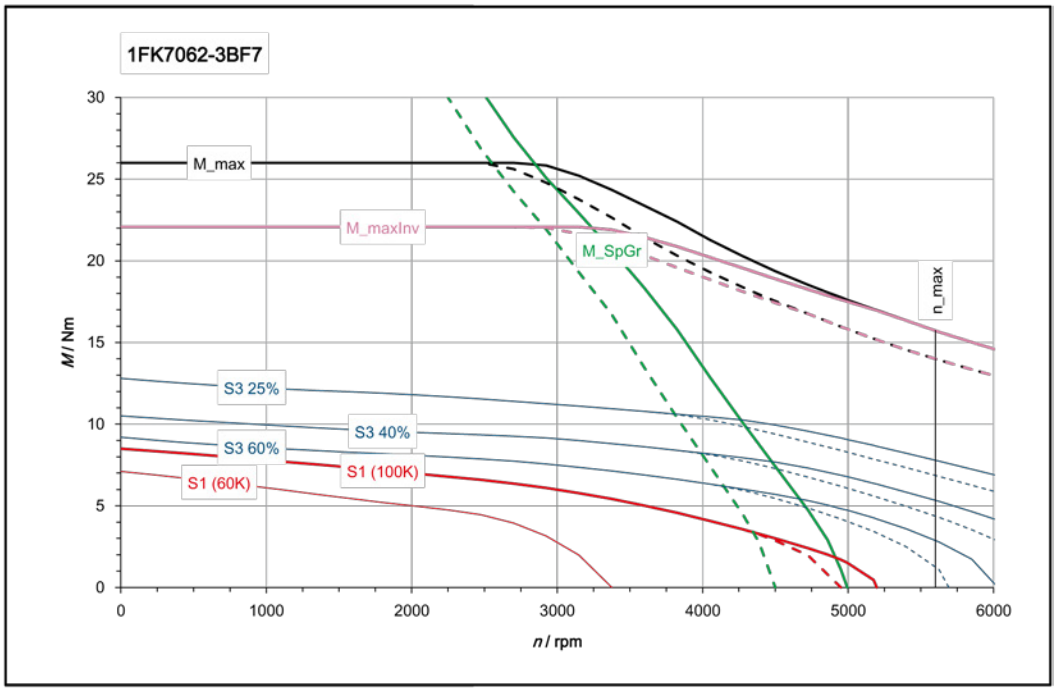
6.3.3.3 1FK7062-3B_

1FK7062 - 3BF7 three-phase servomotor			
Technical data	**Character**	**Unit**	**Value**
Configuration data:			
Rated speed	n_N	rpm	3000
Rated torque (100 K)	$M_{N(100K)}$	Nm	6
Rated current (100 K)	$I_{N(100K)}$	A	4
Static torque (100 K)	$M_{0(100K)}$	Nm	8.5
Stall current (100 K)	$I_{0(100K)}$	A	5.3
Static torque (60 K)	$M_{0(60K)}$	Nm	7.1
Stall current (60 K)	$I_{0(60K)}$	A	4.3
Optimum operating point:			
Optimum speed	n_{opt}	rpm	3000
Optimum power	P_{opt}	kW	1.88
Limit data:			
Max. permissible speed (mech.)	$n_{max\ mech}$	rpm	7200
Maximum torque	M_{max}	Nm	26
Maximum current	I_{max}	A	19.2
Motor data:			
Number of poles	2p		8
Torque constant (100K)	k_T	Nm/A	1.605
Voltage constant (at 20°C)	k_E	V/1000rpm	102.5
Winding resistance (at 20°C)	R_{ph}	Ω	1.145
Rotating field inductance	L_D	mH	14.6
Electrical time constant	T_{el}	ms	12.8
Mechanical time constant	T_{mech}	ms	3.15
Thermal time constant	T_{th}	min	35
Moment of inertia	J_{Mot}	10^{-4} kgm^2	23.5
Shaft torsional stiffness	c_t	Nm/rad	34500
Weight	m_{Mot}	kg	10.7
Motor data with integrated brake:			
Moment of inertia (with brake)	$J_{Mot\ withBr}$	10^{-4} kgm^2	24.5
Shaft torsional stiffness (with brake)	$c_{t\ withBr}$	Nm/rad	25000
Weight (with brake)	$m_{Mot\ withBr}$	kg	12.1
Recommended Motor Module:			
Rated converter current	$I_{N\ conv}$	A	5
Maximum converter current	$I_{max\ conv}$	A	15
Max. torque (converter operation)	$M_{max\ conv}$	Nm	22.1
Max. permissible speed (converter operation)	$n_{max\ conv}$	rpm	5600

The rated data are valid for a 600 V DC link voltage



[———] SINAMICS ALM 400 V (600 V DC)
[- - - - - -] SINAMICS BLM/SLM 400 V (540 V DC)

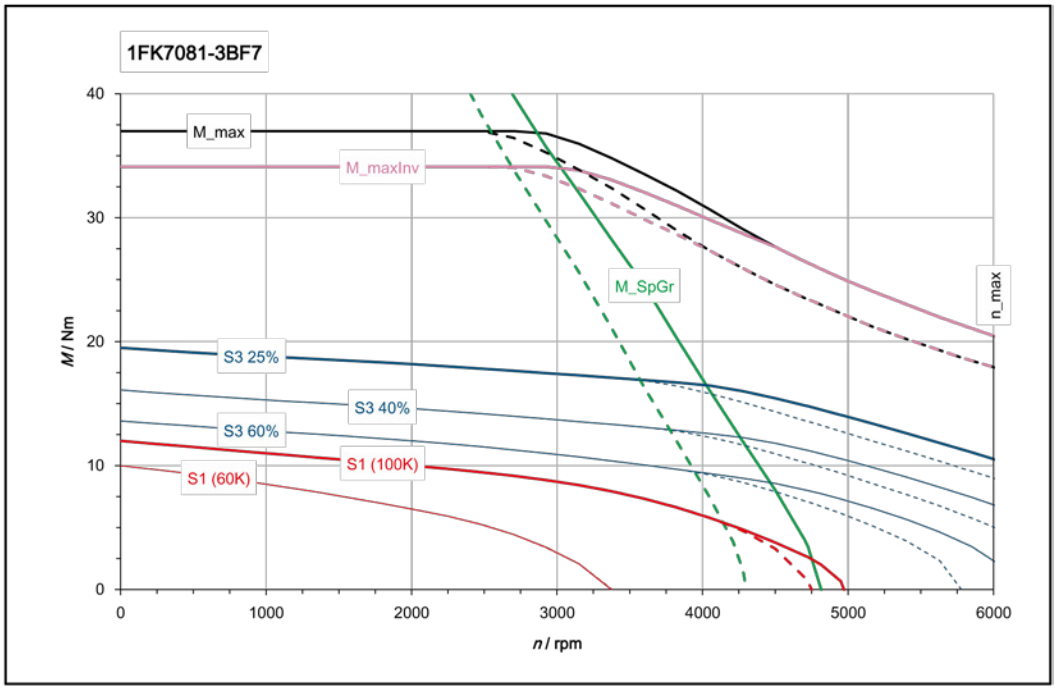


[———] SINAMICS ALM 480 V (720 V DC)
[- - - - - -] SINAMICS BLM/SLM 480 V (650 V DC)

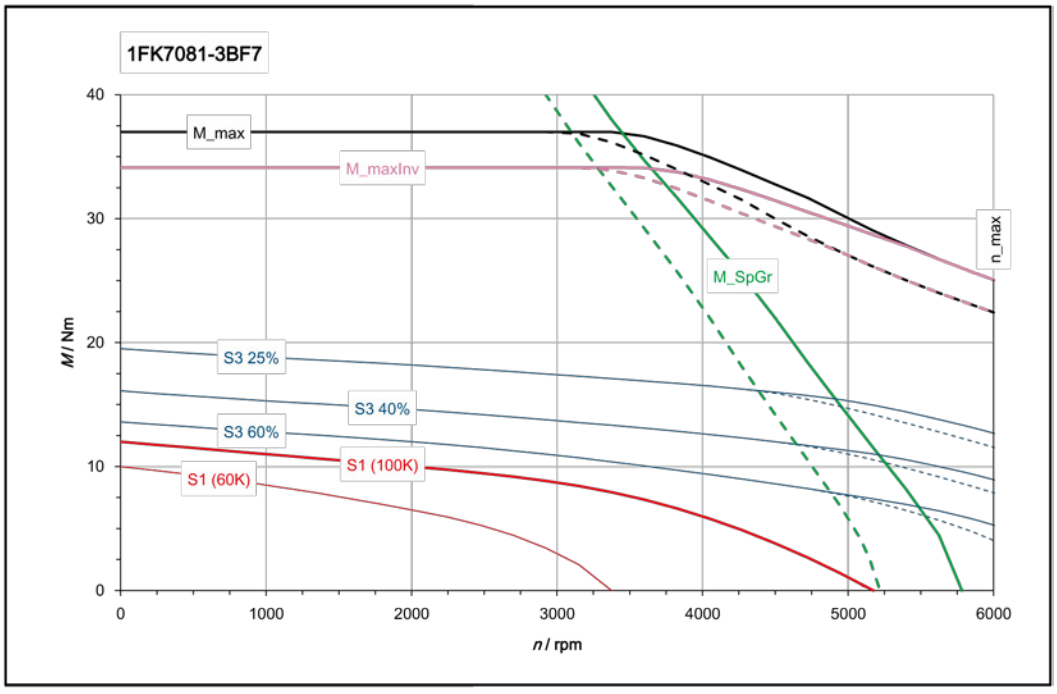
6.3.3.4 1FK7081-3B_

1FK7081 - 3BF71 three-phase servomotor			
Technical data	**Character**	**Unit**	**Value**
Configuration data:			
Rated speed	n_N	rpm	3000
Rated torque (100 K)	$M_{N(100K)}$	Nm	8.7
Rated current (100 K)	$I_{N(100K)}$	A	6.8
Static torque (100 K)	$M_{0(100K)}$	Nm	12
Stall current (100 K)	$I_{0(100K)}$	A	8.7
Static torque (60 K)	$M_{0(60K)}$	Nm	10
Stall current (60 K)	$I_{0(60K)}$	A	7.1
Optimum operating point:			
Optimum speed	n_{opt}	rpm	3000
Optimum power	P_{opt}	kW	2.75
Limit data:			
Max. permissible speed (mech.)	$n_{max\ mech}$	rpm	6000
Maximum torque	M_{max}	Nm	37
Maximum current	I_{max}	A	30
Motor data:			
Number of poles	2p		8
Torque constant (100K)	k_T	Nm/A	1.375
Voltage constant (at 20°C)	k_E	V/1000rpm	88.5
Winding resistance (at 20°C)	R_{ph}	Ω	0.424
Rotating field inductance	L_D	mH	7.7
Electrical time constant	T_{el}	ms	18.2
Mechanical time constant	T_{mech}	ms	3.3
Thermal time constant	T_{th}	min	45
Moment of inertia	J_{Mot}	10^{-4} kgm^2	49
Shaft torsional stiffness	c_t	Nm/rad	100000
Weight	m_{Mot}	kg	15.2
Motor data with integrated brake:			
Moment of inertia (with brake)	$J_{Mot\ withBr}$	10^{-4} kgm^2	52
Shaft torsional stiffness (with brake)	$c_{t\ withBr}$	Nm/rad	71000
Weight (with brake)	$m_{Mot\ withBr}$	kg	18.2
Recommended Motor Module:			
Rated converter current	$I_{N\ conv}$	A	9
Maximum converter current	$I_{max\ conv}$	A	27
Max. torque (converter operation)	$M_{max\ conv}$	Nm	34.1
Max. permissible speed (converter operation)	$n_{max\ conv}$	rpm	6000

The rated data are valid for a 600 V DC link voltage



[———] SINAMICS ALM 400 V (600 V DC)
[- - - - - -] SINAMICS BLM/SLM 400 V (540 V DC)

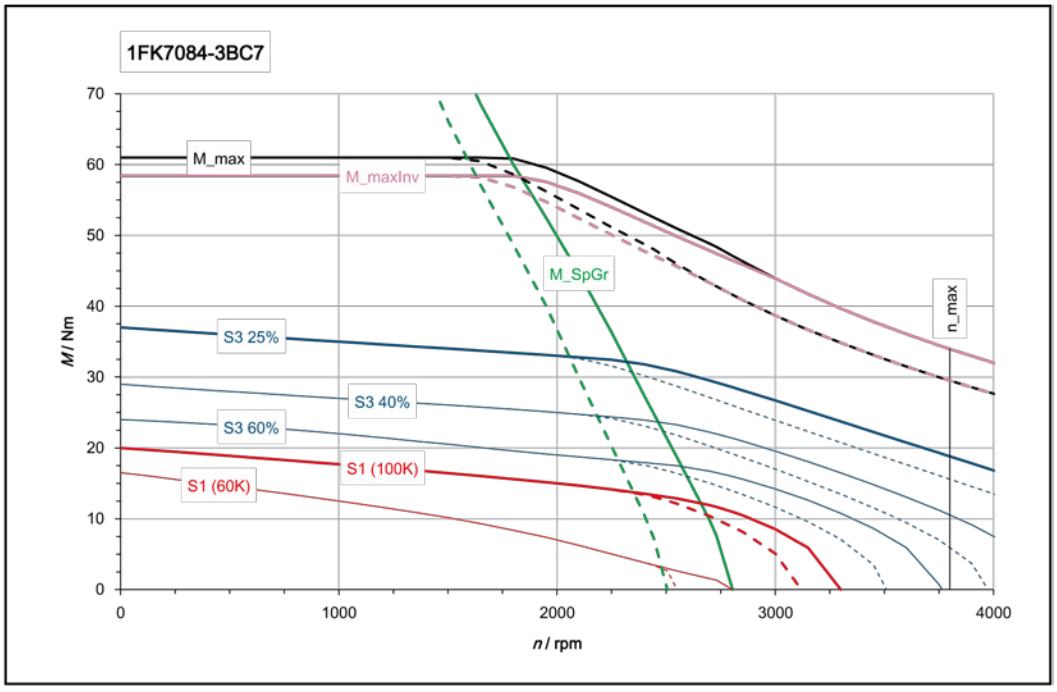


[———] SINAMICS ALM 480 V (720 V DC)
[- - - - - -] SINAMICS BLM/SLM 480 V (650 V DC)

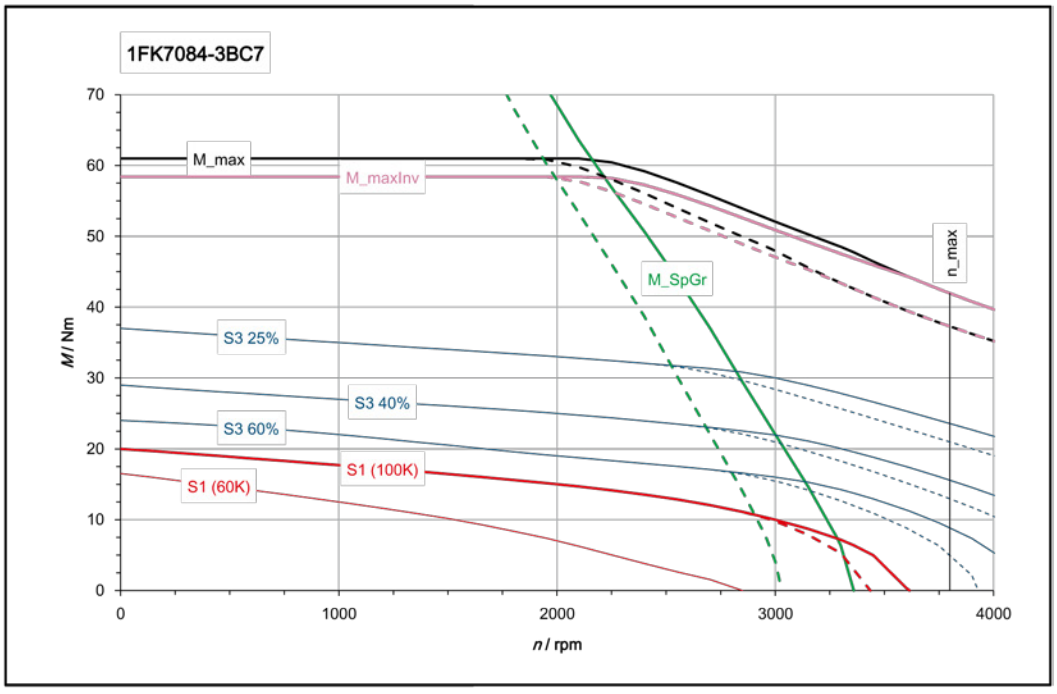
6.3.3.5 1FK7084-3B_

1FK7084 - 3BC7 three-phase servomotor			
Technical data	**Character**	**Unit**	**Value**
Configuration data:			
Rated speed	n_N	rpm	2000
Rated torque (100 K)	$M_{N(100K)}$	Nm	15
Rated current (100 K)	$I_{N(100K)}$	A	6.7
Static torque (100 K)	$M_{0(100K)}$	Nm	20
Stall current (100 K)	$I_{0(100K)}$	A	8.5
Static torque (60 K)	$M_{0(60K)}$	Nm	16.6
Stall current (60 K)	$I_{0(60K)}$	A	6.9
Optimum operating point:			
Optimum speed	n_{opt}	rpm	2000
Optimum power	P_{opt}	kW	3.15
Limit data:			
Max. permissible speed (mech.)	$n_{max\ mech}$	rpm	6000
Maximum torque	M_{max}	Nm	61
Maximum current	I_{max}	A	28.5
Motor data:			
Number of poles	2p		8
Torque constant (100K)	k_T	Nm/A	2.36
Voltage constant (at 20°C)	k_E	V/1000rpm	152
Winding resistance (at 20°C)	R_{ph}	Ω	0.585
Rotating field inductance	L_D	mH	12
Electrical time constant	T_{el}	ms	20.5
Mechanical time constant	T_{mech}	ms	3.1
Thermal time constant	T_{th}	min	55
Moment of inertia	J_{Mot}	10^{-4} kgm^2	99
Shaft torsional stiffness	c_t	Nm/rad	82000
Weight	m_{Mot}	kg	23
Motor data with integrated brake:			
Moment of inertia (with brake)	$J_{Mot\ withBr}$	10^{-4} kgm^2	102
Shaft torsional stiffness (with brake)	$c_{t\ withBr}$	Nm/rad	62000
Weight (with brake)	$m_{Mot\ withBr}$	kg	26
Recommended Motor Module:			
Rated converter current	$I_{N\ conv}$	A	9
Maximum converter current	$I_{max\ conv}$	A	27
Max. torque (converter operation)	$M_{max\ conv}$	Nm	58.4
Max. permissible speed (converter operation)	$n_{max\ conv}$	rpm	3800

The rated data are valid for a 600 V DC link voltage



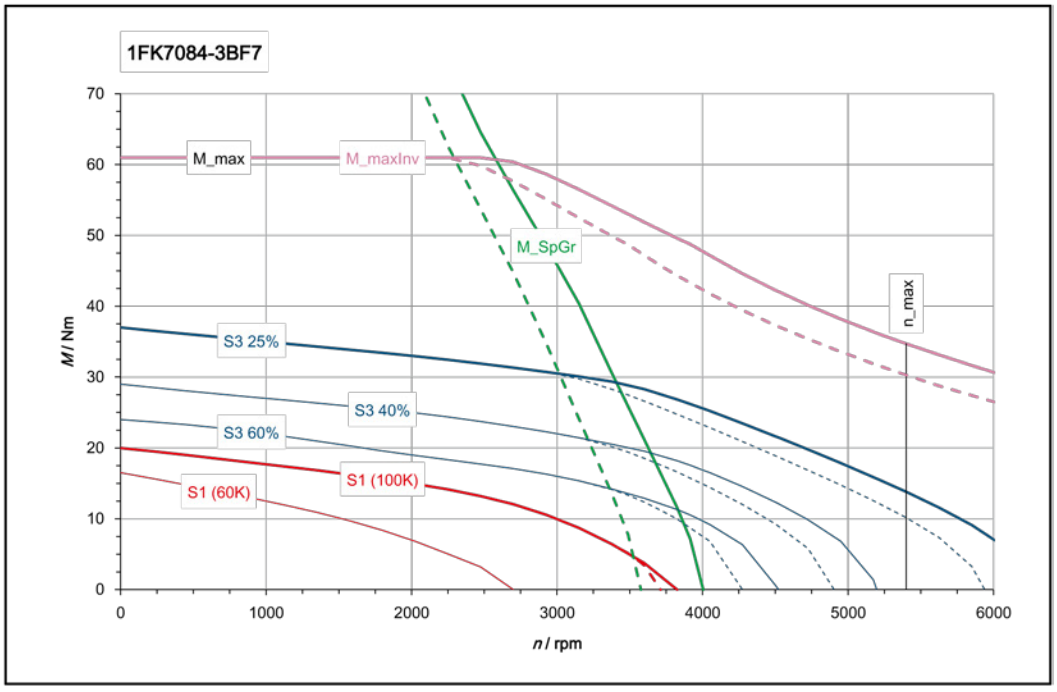
[———] SINAMICS ALM 400 V (600 V DC)
[– – – – – –] SINAMICS BLM/SLM 400 V (540 V DC)



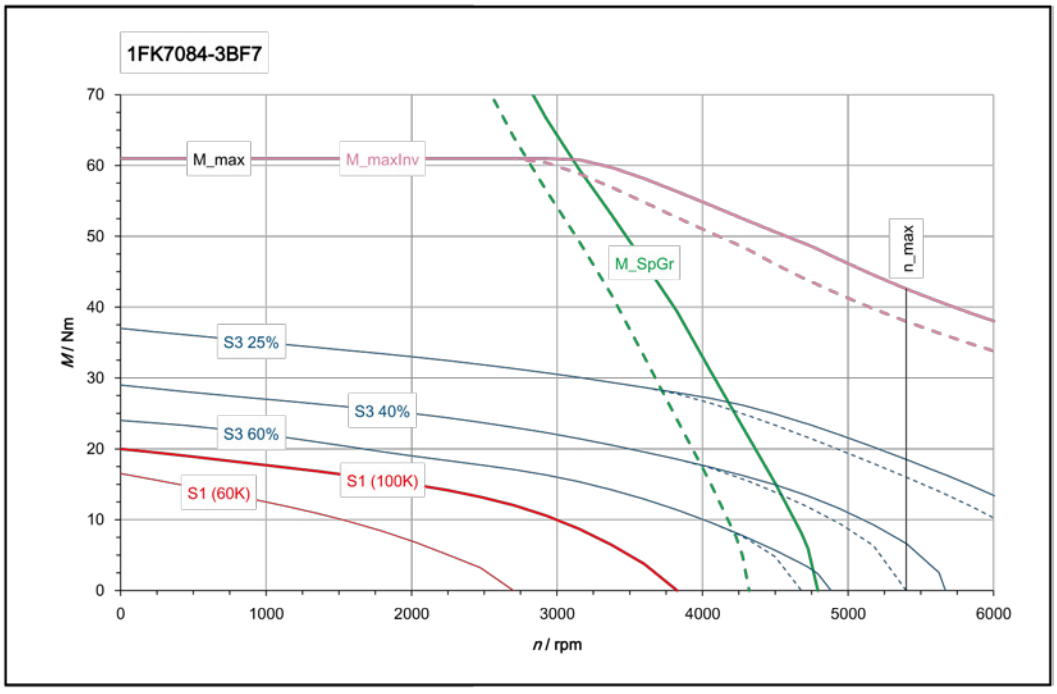
[———] SINAMICS ALM 480 V (720 V DC)
[– – – – – –] SINAMICS BLM/SLM 480 V (650 V DC)

1FK7084 - 3BF7 three-phase servomotor			
Technical data	**Character**	**Unit**	**Value**
Configuration data:			
Rated speed	n_N	rpm	3000
Rated torque (100 K)	$M_{N(100K)}$	Nm	10
Rated current (100 K)	$I_{N(100K)}$	A	6.5
Static torque (100 K)	$M_{0(100K)}$	Nm	20
Stall current (100 K)	$I_{0(100K)}$	A	12.1
Static torque (60 K)	$M_{0(60K)}$	Nm	16.6
Stall current (60 K)	$I_{0(60K)}$	A	9.8
Optimum operating point:			
Optimum speed	n_{opt}	rpm	2500
Optimum power	P_{opt}	kW	3.25
Limit data:			
Max. permissible speed (mech.)	$n_{max\ mech}$	rpm	6000
Maximum torque	M_{max}	Nm	61
Maximum current	I_{max}	A	41
Motor data:			
Number of poles	2p		8
Torque constant (100K)	k_T	Nm/A	1.655
Voltage constant (at 20°C)	k_E	V/1000rpm	106.5
Winding resistance (at 20°C)	R_{ph}	Ω	0.284
Rotating field inductance	L_D	mH	5.9
Electrical time constant	T_{el}	ms	21
Mechanical time constant	T_{mech}	ms	3.1
Thermal time constant	T_{th}	min	55
Moment of inertia	J_{Mot}	10^{-4} kgm^2	99
Shaft torsional stiffness	c_t	Nm/rad	82000
Weight	m_{Mot}	kg	23
Motor data with integrated brake:			
Moment of inertia (with brake)	$J_{Mot\ withBr}$	10^{-4} kgm^2	102
Shaft torsional stiffness (with brake)	$c_{t\ withBr}$	Nm/rad	62000
Weight (with brake)	$m_{Mot\ withBr}$	kg	26
Recommended Motor Module:			
Rated converter current	$I_{N\ conv}$	A	18
Maximum converter current	$I_{max\ conv}$	A	54
Max. torque (converter operation)	$M_{max\ conv}$	Nm	61
Max. permissible speed (converter operation)	$n_{max\ conv}$	rpm	5400

The rated data are valid for a 600 V DC link voltage



[———] SINAMICS ALM 400 V (600 V DC)
[- - - - - -] SINAMICS BLM/SLM 400 V (540 V DC)

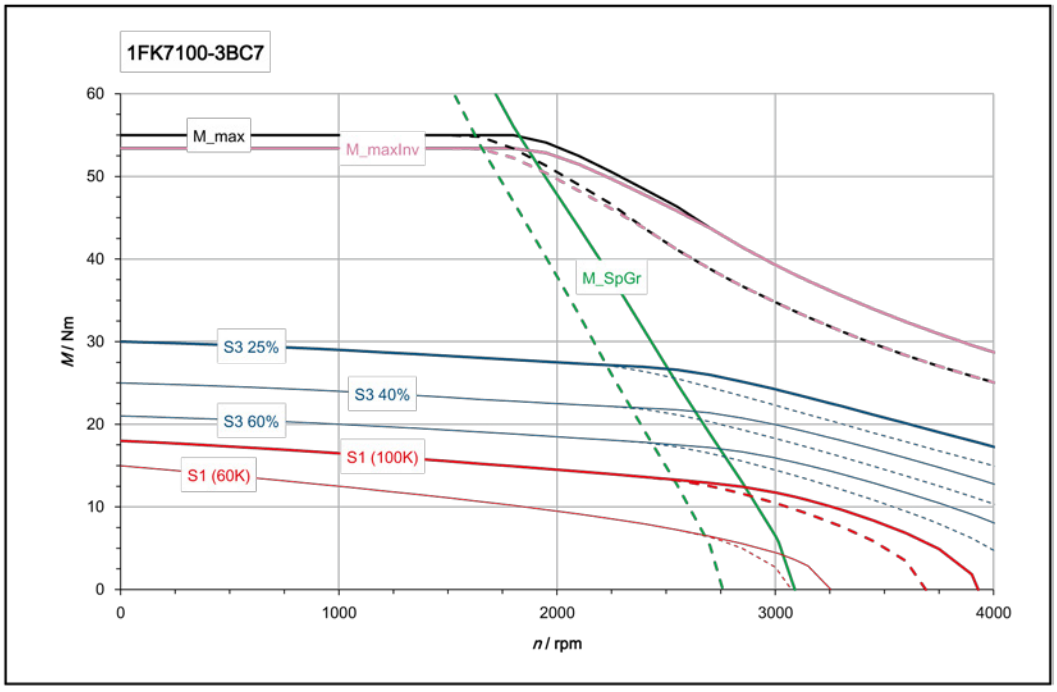


[———] SINAMICS ALM 480 V (720 V DC)
[- - - - - -] SINAMICS BLM/SLM 480 V (650 V DC)

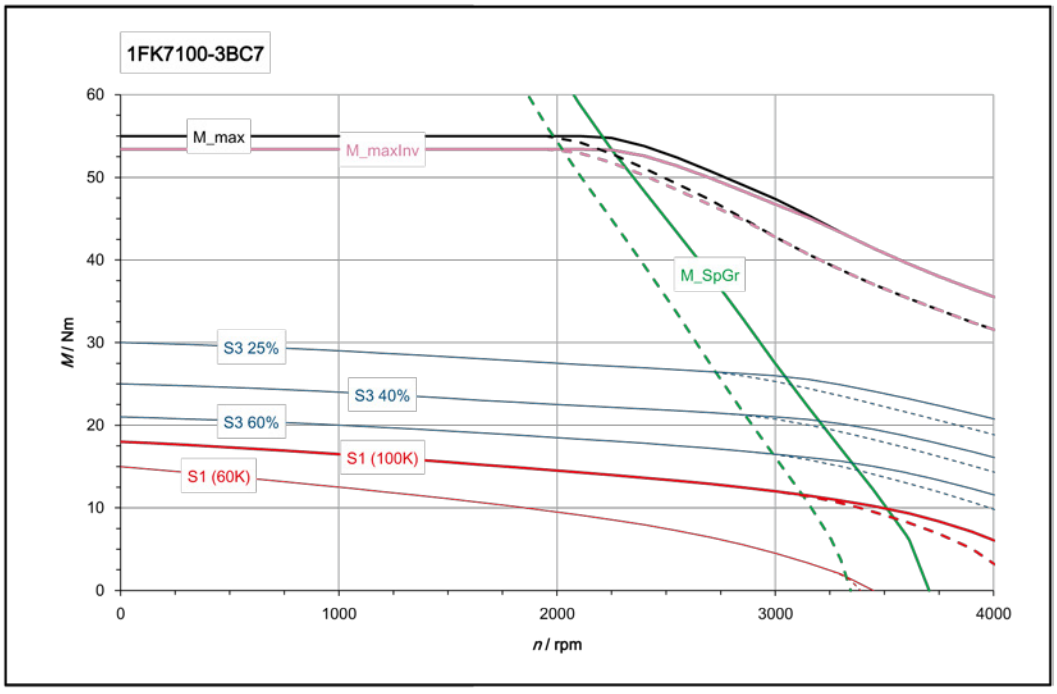
6.3.3.6 1FK7100-3B_

1FK7100 - 3BC7 three-phase servomotor			
Technical data	**Character**	**Unit**	**Value**
Configuration data:			
Rated speed	n_N	rpm	2000
Rated torque (100 K)	$M_{N(100K)}$	Nm	14.5
Rated current (100 K)	$I_{N(100K)}$	A	7.1
Static torque (100 K)	$M_{0(100K)}$	Nm	18
Stall current (100 K)	$I_{0(100K)}$	A	8.4
Static torque (60 K)	$M_{0(60K)}$	Nm	14.9
Stall current (60 K)	$I_{0(60K)}$	A	6.8
Optimum operating point:			
Optimum speed	n_{opt}	rpm	2000
Optimum power	P_{opt}	kW	3.05
Limit data:			
Max. permissible speed (mech.)	$n_{max\ mech}$	rpm	5000
Maximum torque	M_{max}	Nm	55
Maximum current	I_{max}	A	28
Motor data:			
Number of poles	2p		8
Torque constant (100K)	k_T	Nm/A	2.14
Voltage constant (at 20°C)	k_E	V/1000rpm	138
Winding resistance (at 20°C)	R_{ph}	Ω	0.55
Rotating field inductance	L_D	mH	12.7
Electrical time constant	T_{el}	ms	23
Mechanical time constant	T_{mech}	ms	3.15
Thermal time constant	T_{th}	min	55
Moment of inertia	J_{Mot}	10^{-4} kgm^2	87
Shaft torsional stiffness	c_t	Nm/rad	183000
Weight	m_{Mot}	kg	19.4
Motor data with integrated brake:			
Moment of inertia (with brake)	$J_{Mot\ withBr}$	10^{-4} kgm^2	95
Shaft torsional stiffness (with brake)	$c_{t\ withBr}$	Nm/rad	135000
Weight (with brake)	$m_{Mot\ withBr}$	kg	22.8
Recommended Motor Module:			
Rated converter current	$I_{N\ conv}$	A	9
Maximum converter current	$I_{max\ conv}$	A	27
Max. torque (converter operation)	$M_{max\ conv}$	Nm	53.4
Max. permissible speed (converter operation)	$n_{max\ conv}$	rpm	4200

The rated data are valid for a 600 V DC link voltage



[———] SINAMICS ALM 400 V (600 V DC)
[– – – – – –] SINAMICS BLM/SLM 400 V (540 V DC)

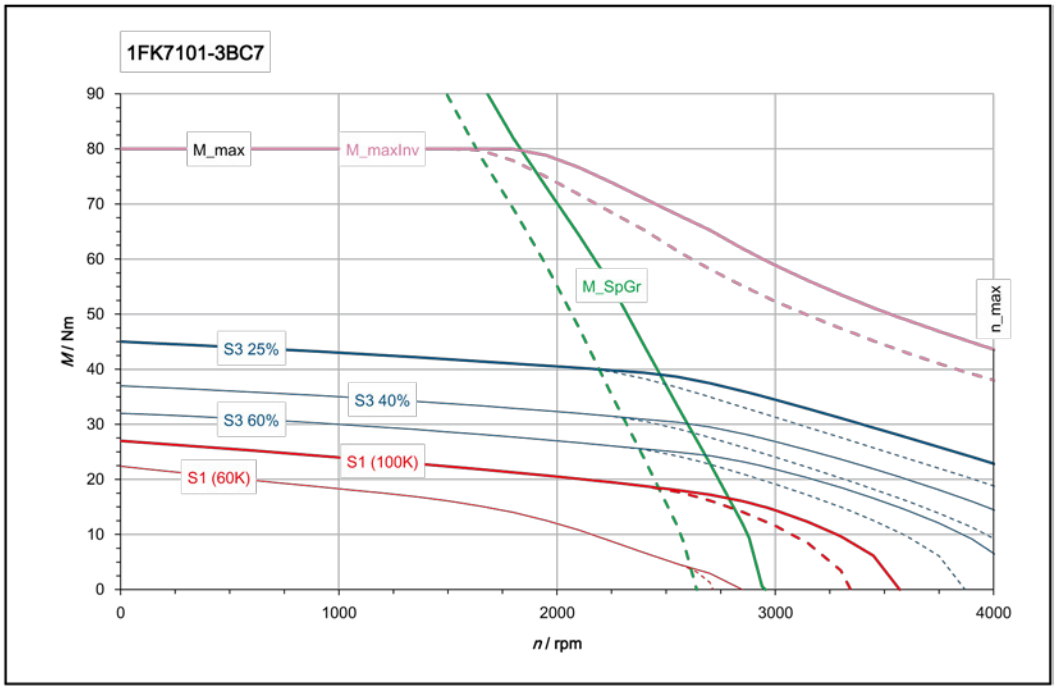


[———] SINAMICS ALM 480 V (720 V DC)
[– – – – – –] SINAMICS BLM/SLM 480 V (650 V DC)

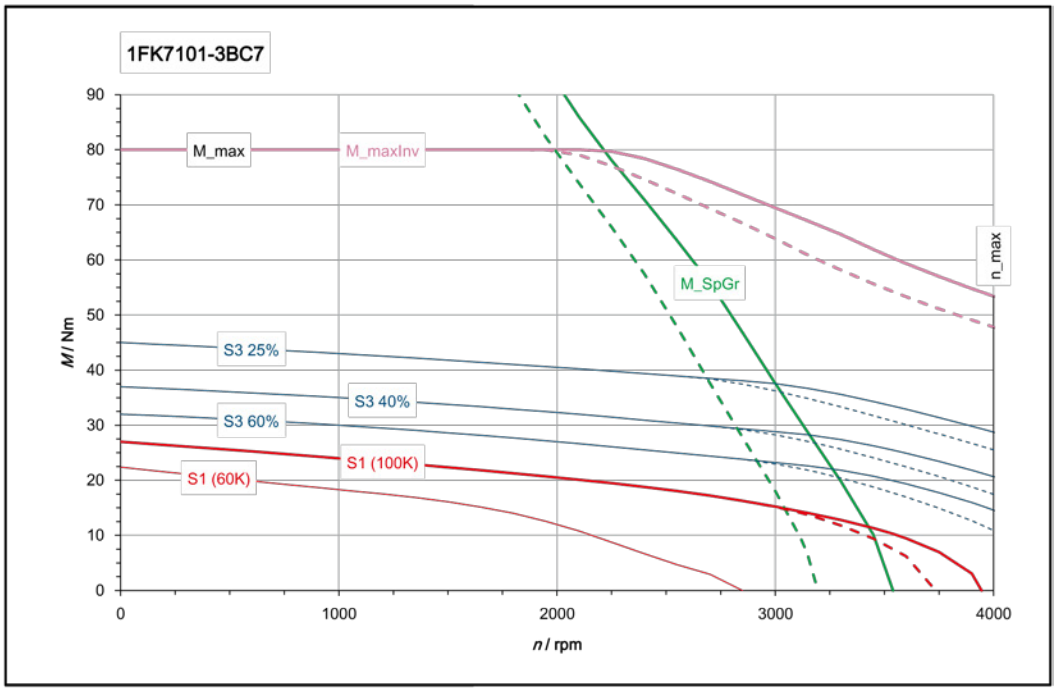
6.3.3.7 1FK7101-3B_

1FK7101 - 3BC7 three-phase servomotor			
Technical data	**Character**	**Unit**	**Value**
Configuration data:			
Rated speed	n_N	rpm	2000
Rated torque (100 K)	$M_{N(100K)}$	Nm	20.5
Rated current (100 K)	$I_{N(100K)}$	A	9.7
Static torque (100 K)	$M_{0(100K)}$	Nm	27
Stall current (100 K)	$I_{0(100K)}$	A	12.3
Static torque (60 K)	$M_{0(60K)}$	Nm	22.5
Stall current (60 K)	$I_{0(60K)}$	A	10
Optimum operating point:			
Optimum speed	n_{opt}	rpm	2000
Optimum power	P_{opt}	kW	4.3
Limit data:			
Max. permissible speed (mech.)	$n_{max\ mech}$	rpm	5000
Maximum torque	M_{max}	Nm	80
Maximum current	I_{max}	A	40.5
Motor data:			
Number of poles	2p		8
Torque constant (100K)	k_T	Nm/A	2.15
Voltage constant (at 20°C)	k_E	V/1000rpm	144.5
Winding resistance (at 20°C)	R_{ph}	Ω	0.343
Rotating field inductance	L_D	mH	8.5
Electrical time constant	T_{el}	ms	25
Mechanical time constant	T_{mech}	ms	2.6
Thermal time constant	T_{th}	min	60
Moment of inertia	J_{Mot}	10^{-4} kgm^2	127
Shaft torsional stiffness	c_t	Nm/rad	164000
Weight	m_{Mot}	kg	25.7
Motor data with integrated brake:			
Moment of inertia (with brake)	$J_{Mot\ withBr}$	10^{-4} kgm^2	136
Shaft torsional stiffness (with brake)	$c_{t\ withBr}$	Nm/rad	116000
Weight (with brake)	$m_{Mot\ withBr}$	kg	30.2
Recommended Motor Module:			
Rated converter current	$I_{N\ conv}$	A	18
Maximum converter current	$I_{max\ conv}$	A	54
Max. torque (converter operation)	$M_{max\ conv}$	Nm	80
Max. permissible speed (converter operation)	$n_{max\ conv}$	rpm	4000

The rated data are valid for a 600 V DC link voltage



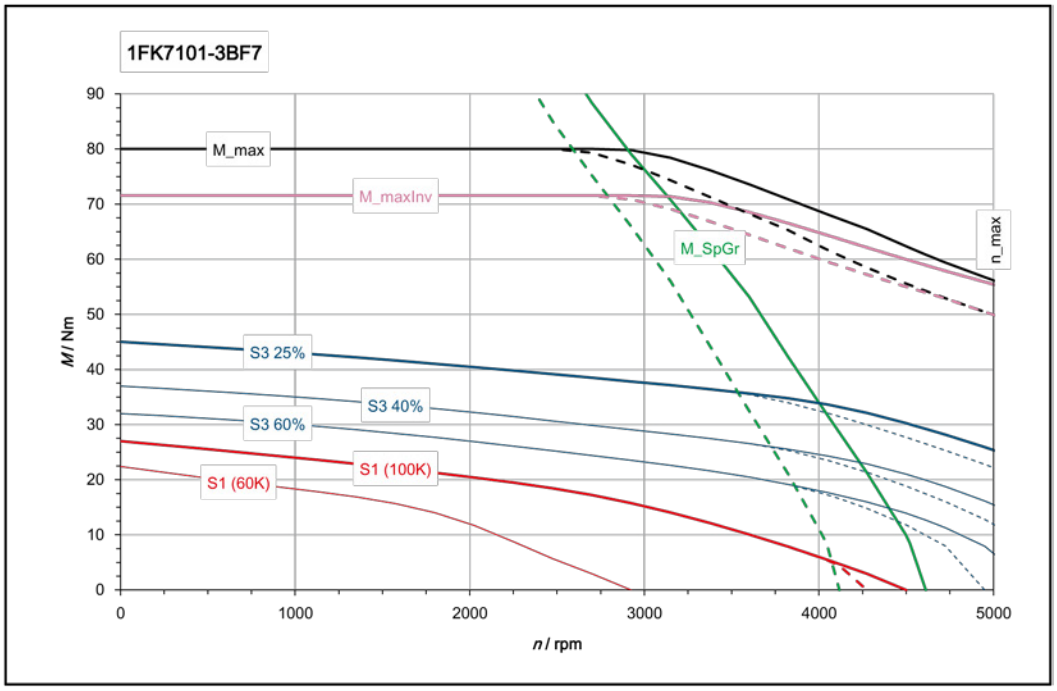
[———] SINAMICS ALM 400 V (600 V DC)
[- - - - - -] SINAMICS BLM/SLM 400 V (540 V DC)



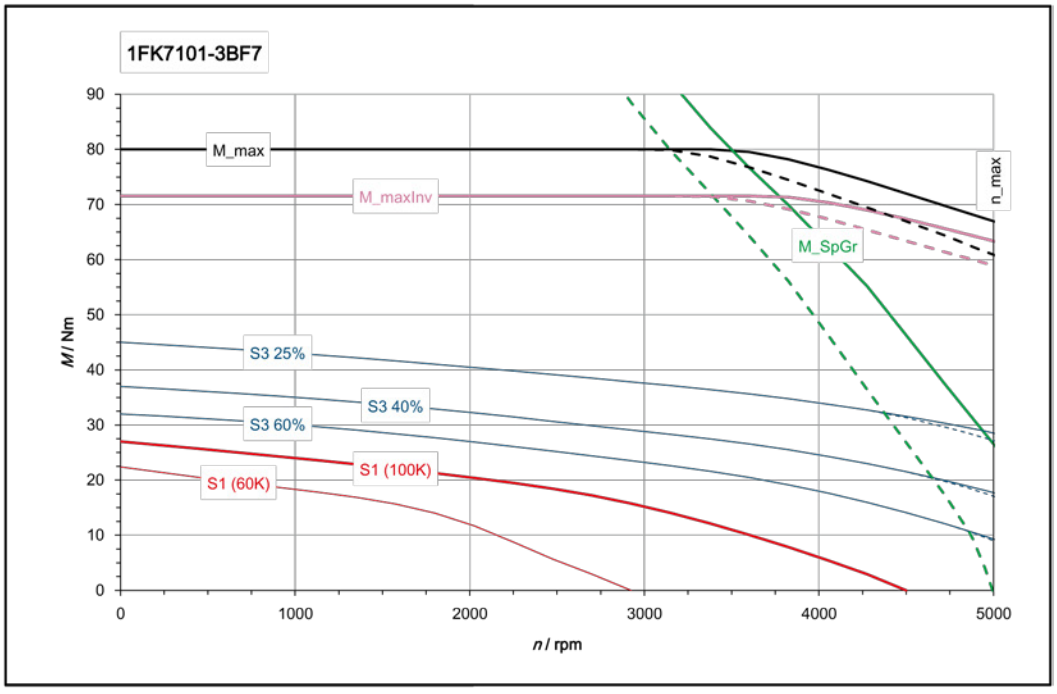
[———] SINAMICS ALM 480 V (720 V DC)
[- - - - - -] SINAMICS BLM/SLM 480 V (650 V DC)

1FK7101 - 3BF7 three-phase servomotor			
Technical data	**Character**	**Unit**	**Value**
Configuration data:			
Rated speed	n_N	rpm	3000
Rated torque (100 K)	$M_{N(100K)}$	Nm	15.5
Rated current (100 K)	$I_{N(100K)}$	A	11.6
Static torque (100 K)	$M_{0(100K)}$	Nm	27
Stall current (100 K)	$I_{0(100K)}$	A	18.8
Static torque (60 K)	$M_{0(60K)}$	Nm	22.5
Stall current (60 K)	$I_{0(60K)}$	A	15.2
Optimum operating point:			
Optimum speed	n_{opt}	rpm	3000
Optimum power	P_{opt}	kW	4.85
Limit data:			
Max. permissible speed (mech.)	$n_{max\ mech}$	rpm	5000
Maximum torque	M_{max}	Nm	80
Maximum current	I_{max}	A	63
Motor data:			
Number of poles	2p		8
Torque constant (100K)	k_T	Nm/A	1.435
Voltage constant (at 20°C)	k_E	V/1000rpm	92.5
Winding resistance (at 20°C)	R_{ph}	Ω	0.141
Rotating field inductance	L_D	mH	3.5
Electrical time constant	T_{el}	ms	25
Mechanical time constant	T_{mech}	ms	2.61
Thermal time constant	T_{th}	min	60
Moment of inertia	J_{Mot}	10^{-4} kgm^2	127
Shaft torsional stiffness	c_t	Nm/rad	164000
Weight	m_{Mot}	kg	25.7
Motor data with integrated brake:			
Moment of inertia (with brake)	$J_{Mot\ withBr}$	10^{-4} kgm^2	136
Shaft torsional stiffness (with brake)	$c_{t\ withBr}$	Nm/rad	116000
Weight (with brake)	$m_{Mot\ withBr}$	kg	30.2
Recommended Motor Module:			
Rated converter current	$I_{N\ conv}$	A	18
Maximum converter current	$I_{max\ conv}$	A	54
Max. torque (converter operation)	$M_{max\ conv}$	Nm	72
Max. permissible speed (converter operation)	$n_{max\ conv}$	rpm	5000

The rated data are valid for a 600 V DC link voltage



[———] SINAMICS ALM 400 V (600 V DC)
[– – – – – –] SINAMICS BLM/SLM 400 V (540 V DC)

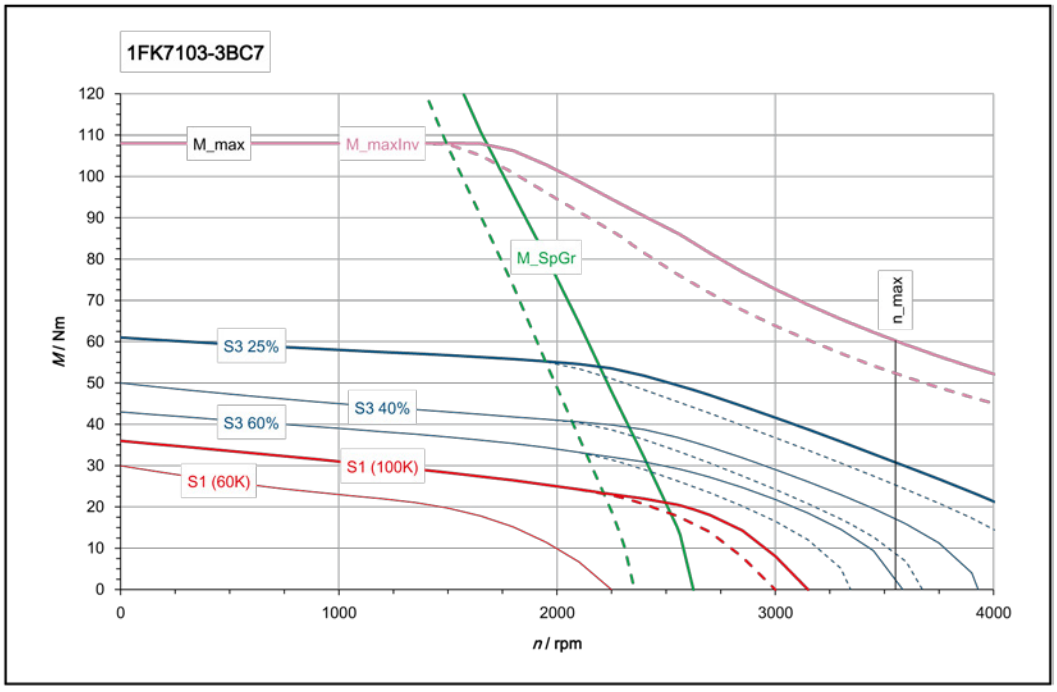


[———] SINAMICS ALM 480 V (720 V DC)
[– – – – – –] SINAMICS BLM/SLM 480 V (650 V DC)

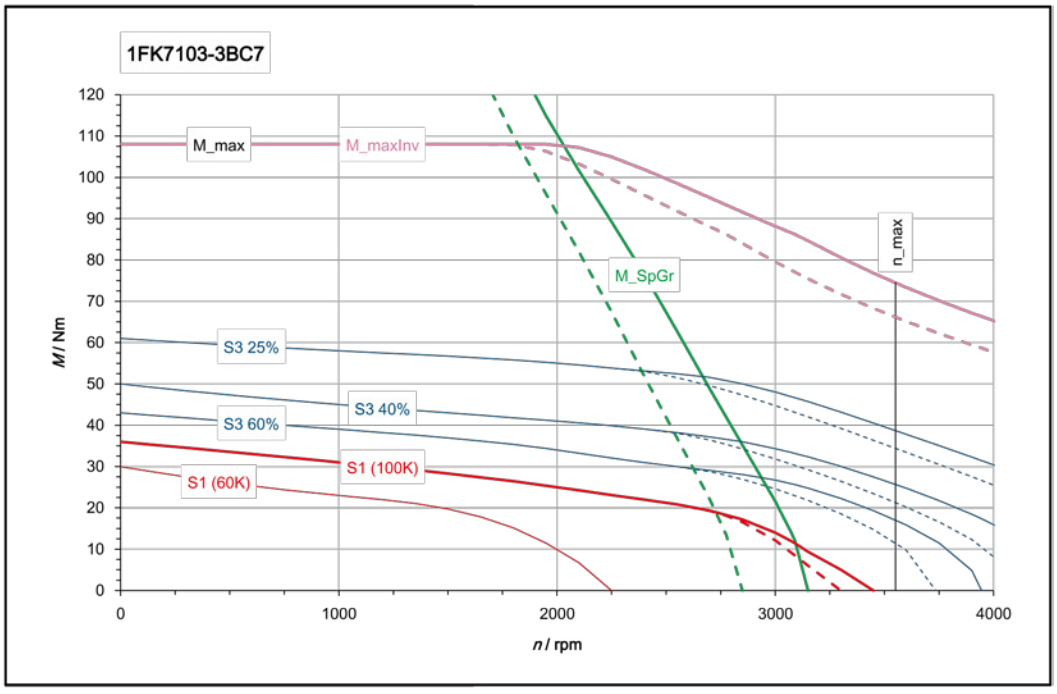
6.3.3.8 1FK7103-3B_

1FK7103 - 3BC7 three-phase servomotor			
Technical data	**Character**	**Unit**	**Value**
Configuration data:			
Rated speed	n_N	rpm	2000
Rated torque (100 K)	$M_{N(100K)}$	Nm	25
Rated current (100 K)	$I_{N(100K)}$	A	11
Static torque (100 K)	$M_{0(100K)}$	Nm	36
Stall current (100 K)	$I_{0(100K)}$	A	14.4
Static torque (60 K)	$M_{0(60K)}$	Nm	30
Stall current (60 K)	$I_{0(60K)}$	A	11.6
Optimum operating point:			
Optimum speed	n_{opt}	rpm	2000
Optimum power	P_{opt}	kW	5.2
Limit data:			
Max. permissible speed (mech.)	$n_{max\ mech}$	rpm	5000
Maximum torque	M_{max}	Nm	108
Maximum current	I_{max}	A	46.5
Motor data:			
Number of poles	2p		8
Torque constant (100K)	k_T	Nm/A	2.45
Voltage constant (at 20°C)	k_E	V/1000rpm	162
Winding resistance (at 20°C)	R_{ph}	Ω	0.288
Rotating field inductance	L_D	mH	7.9
Electrical time constant	T_{el}	ms	27.5
Mechanical time constant	T_{mech}	ms	2.42
Thermal time constant	T_{th}	min	65
Moment of inertia	J_{Mot}	10^{-4} kgm^2	168
Shaft torsional stiffness	c_t	Nm/rad	148000
Weight	m_{Mot}	kg	32.1
Motor data with integrated brake:			
Moment of inertia (with brake)	$J_{Mot\ withBr}$	10^{-4} kgm^2	176
Shaft torsional stiffness (with brake)	$c_{t\ withBr}$	Nm/rad	108000
Weight (with brake)	$m_{Mot\ withBr}$	kg	36.6
Recommended Motor Module:			
Rated converter current	$I_{N\ conv}$	A	18
Maximum converter current	$I_{max\ conv}$	A	54
Max. torque (converter operation)	$M_{max\ conv}$	Nm	108
Max. permissible speed (converter operation)	$n_{max\ conv}$	rpm	3550

The rated data are valid for a 600 V DC link voltage



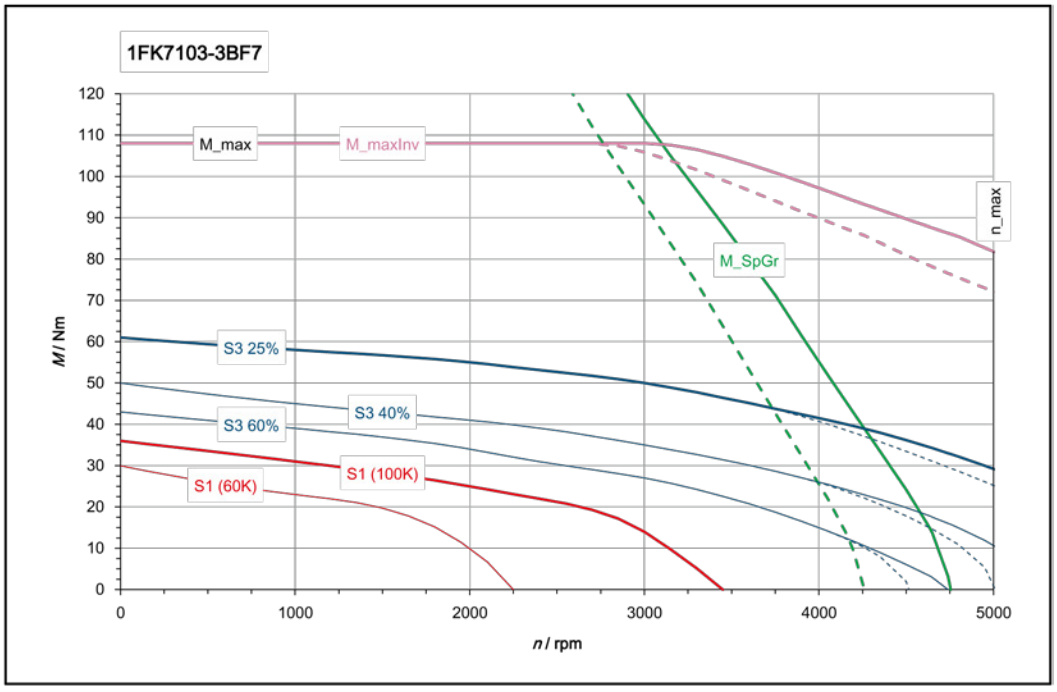
[———] SINAMICS ALM 400 V (600 V DC)
[– – – – – –] SINAMICS BLM/SLM 400 V (540 V DC)



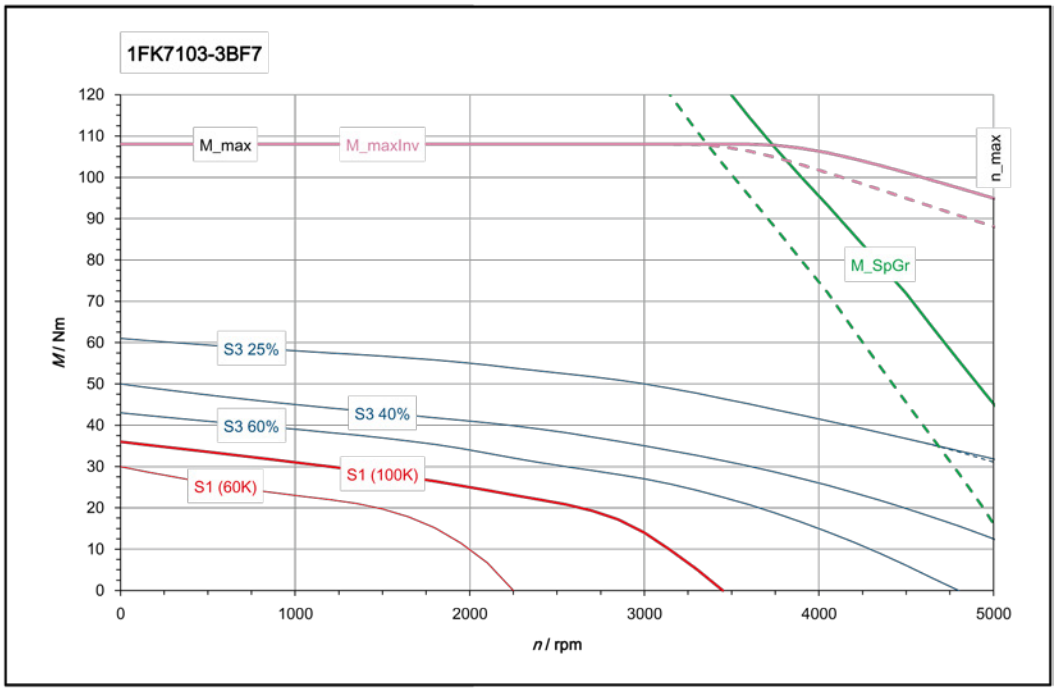
[———] SINAMICS ALM 480 V (720 V DC)
[– – – – – –] SINAMICS BLM/SLM 480 V (650 V DC)

1FK7103 - 3BF7 three-phase servomotor			
Technical data	**Character**	**Unit**	**Value**
Configuration data:			
Rated speed	n_N	rpm	3000
Rated torque (100 K)	$M_{N(100K)}$	Nm	14
Rated current (100 K)	$I_{N(100K)}$	A	11.5
Static torque (100 K)	$M_{0(100K)}$	Nm	36
Stall current (100 K)	$I_{0(100K)}$	A	26
Static torque (60 K)	$M_{0(60K)}$	Nm	30
Stall current (60 K)	$I_{0(60K)}$	A	21
Optimum operating point:			
Optimum speed	n_{opt}	rpm	2500
Optimum power	P_{opt}	kW	5.4
Limit data:			
Max. permissible speed (mech.)	$n_{max\ mech}$	rpm	5000
Maximum torque	M_{max}	Nm	108
Maximum current	I_{max}	A	84
Motor data:			
Number of poles	2p		8
Torque constant (100K)	k_T	Nm/A	1.385
Voltage constant (at 20°C)	k_E	V/1000rpm	89.5
Winding resistance (at 20°C)	R_{ph}	Ω	0.0895
Rotating field inductance	L_D	mH	2.4
Electrical time constant	T_{el}	ms	27
Mechanical time constant	T_{mech}	ms	2.35
Thermal time constant	T_{th}	min	65
Moment of inertia	J_{Mot}	10^{-4} kgm^2	168
Shaft torsional stiffness	c_t	Nm/rad	148000
Weight	m_{Mot}	kg	32.1
Motor data with integrated brake:			
Moment of inertia (with brake)	$J_{Mot\ withBr}$	10^{-4} kgm^2	176
Shaft torsional stiffness (with brake)	$c_{t\ withBr}$	Nm/rad	108000
Weight (with brake)	$m_{Mot\ withBr}$	kg	36.6
Recommended Motor Module:			
Rated converter current	$I_{N\ conv}$	A	30
Maximum converter current	$I_{max\ conv}$	A	90
Max. torque (converter operation)	$M_{max\ conv}$	Nm	108
Max. permissible speed (converter operation)	$n_{max\ conv}$	rpm	5000

The rated data are valid for a 600 V DC link voltage



[———] SINAMICS ALM 400 V (600 V DC)
[– – – – – –] SINAMICS BLM/SLM 400 V (540 V DC)

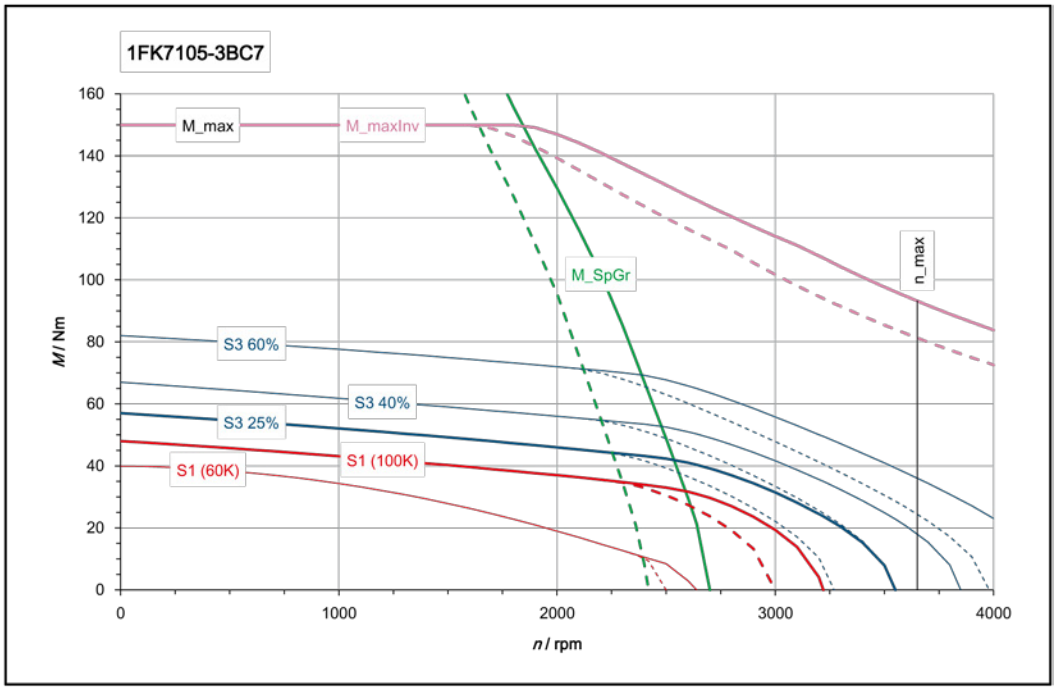


[———] SINAMICS ALM 480 V (720 V DC)
[– – – – – –] SINAMICS BLM/SLM 480 V (650 V DC)

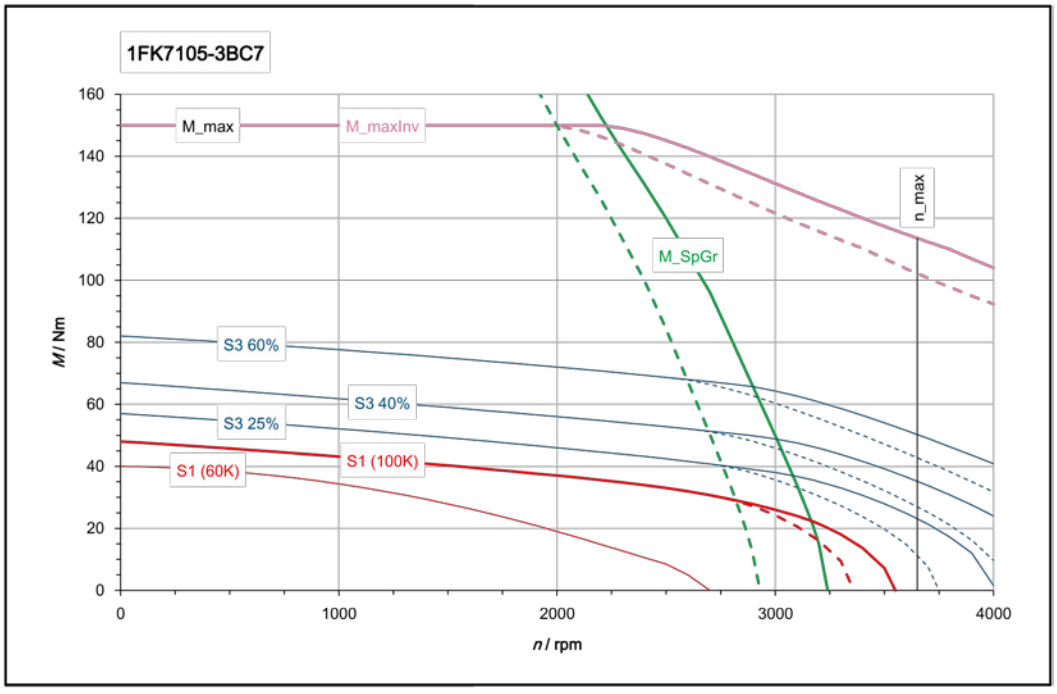
6.3.3.9 1FK7105-3B_

1FK7105 - 3BC7 three-phase servomotor			
Technical data	**Character**	**Unit**	**Value**
Configuration data:			
Rated speed	n_N	rpm	2000
Rated torque (100 K)	$M_{N(100K)}$	Nm	37
Rated current (100 K)	$I_{N(100K)}$	A	16
Static torque (100 K)	$M_{0(100K)}$	Nm	48
Stall current (100 K)	$I_{0(100K)}$	A	20
Static torque (60 K)	$M_{0(60K)}$	Nm	40
Stall current (60 K)	$I_{0(60K)}$	A	16.2
Optimum operating point:			
Optimum speed	n_{opt}	rpm	2000
Optimum power	P_{opt}	kW	7.7
Limit data:			
Max. permissible speed (mech.)	$n_{max\ mech}$	rpm	5000
Maximum torque	M_{max}	Nm	150
Maximum current	I_{max}	A	71
Motor data:			
Number of poles	2p		8
Torque constant (100K)	k_T	Nm/A	2.37
Voltage constant (at 20°C)	k_E	V/1000rpm	157.5
Winding resistance (at 20°C)	R_{ph}	Ω	0.175
Rotating field inductance	L_D	mH	4.5
Electrical time constant	T_{el}	ms	25.5
Mechanical time constant	T_{mech}	ms	2.33
Thermal time constant	T_{th}	min	70
Moment of inertia	J_{Mot}	10^{-4} kgm^2	249
Shaft torsional stiffness	c_t	Nm/rad	125000
Weight	m_{Mot}	kg	44.4
Motor data with integrated brake:			
Moment of inertia (with brake)	$J_{Mot\ withBr}$	10^{-4} kgm^2	258
Shaft torsional stiffness (with brake)	$c_{t\ withBr}$	Nm/rad	95000
Weight (with brake)	$m_{Mot\ withBr}$	kg	48.9
Recommended Motor Module:			
Rated converter current	$I_{N\ conv}$	A	24
Maximum converter current	$I_{max\ conv}$	A	72
Max. torque (converter operation)	$M_{max\ conv}$	Nm	150
Max. permissible speed (converter operation)	$n_{max\ conv}$	rpm	3650

The rated data are valid for a 600 V DC link voltage



[———] SINAMICS ALM 400 V (600 V DC)
[- - - - - -] SINAMICS BLM/SLM 400 V (540 V DC)



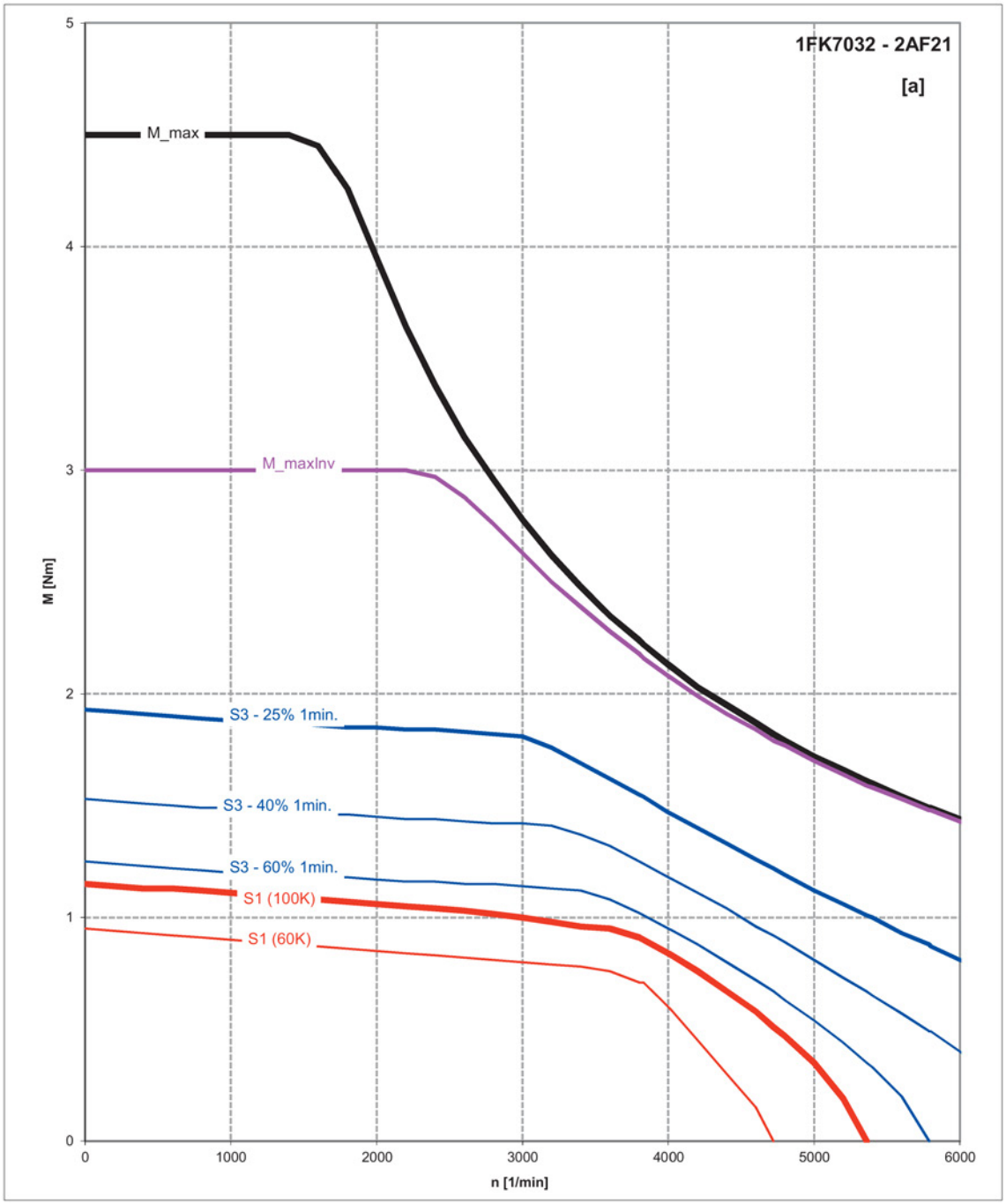
[———] SINAMICS ALM 480 V (720 V DC)
[- - - - - -] SINAMICS BLM/SLM 480 V (650 V DC)

6.3.4 1FK7 Compact for 1 AC 230 V Power Modules - naturally cooled

6.3.4.1 1FK7032-2A_

1FK7032 - 2AF2 three-phase servomotor			
Technical data	**Character**	**Unit**	**Value**
Configuration data:			
Rated speed	n_N	rpm	3000
Rated torque (100 K)	$M_{N(100K)}$	Nm	1
Rated current (100 K)	$I_{N(100K)}$	A	1.6
Static torque (100 K)	$M_{0(100K)}$	Nm	1.15
Stall current (100 K)	$I_{0(100K)}$	A	1.7
Static torque (60 K)	$M_{0(60K)}$	Nm	0.95
Stall current (60 K)	$I_{0(60K)}$	A	1.4
Optimum operating point:			
Optimum speed	n_{opt}	rpm	3000
Optimum power	P_{opt}	kW	0.315
Limit data:			
Max. permissible speed (mech.)	$n_{max\ mech}$	rpm	10000
Maximum torque	M_{max}	Nm	4.5
Maximum current	I_{max}	A	7
Motor data:			
Number of poles	2p		6
Torque constant (100K)	k_T	Nm/A	0.67
Voltage constant (at 20°C)	k_E	V/1000 rpm	45
Winding resistance (at 20°C)	R_{ph}	W	5.05
Rotating field inductance	L_D	mH	17.3
Electrical time constant	T_{el}	ms	3.45
Mechanical time constant	T_{mech}	ms	2.2
Thermal time constant	T_{th}	min	25
Moment of inertia	J_{Mot}	$kgm^2 \cdot 10^{-4}$	0.65
Shaft torsional stiffness	c_t	Nm/rad	6000
Weight	m_{Mot}	kg	2.7
Motor data with integrated brake:			
Moment of inertia (with brake)	$J_{Mot\ withBr}$	$kgm^2 \cdot 10^{-4}$	0.75
Shaft torsional stiffness (with brake)	c_t	Nm/rad	4100
Weight (with brake)	$m_{Mot\ withBr}$	kg	3.1
Data with SINAMICS S120 Booksize / S120 Booksize Compact			
Rated converter current	$I_{N\ conv}$	A	2.3
Maximum converter current	$I_{max\ conv}$	A	4.6
Max. torque (converter operation)	$M_{max\ conv}$	Nm	3
Max. permissible speed (converter operation)	$n_{max\ conv}$	rpm	6400

The rated data are valid for a 600 V DC link voltage

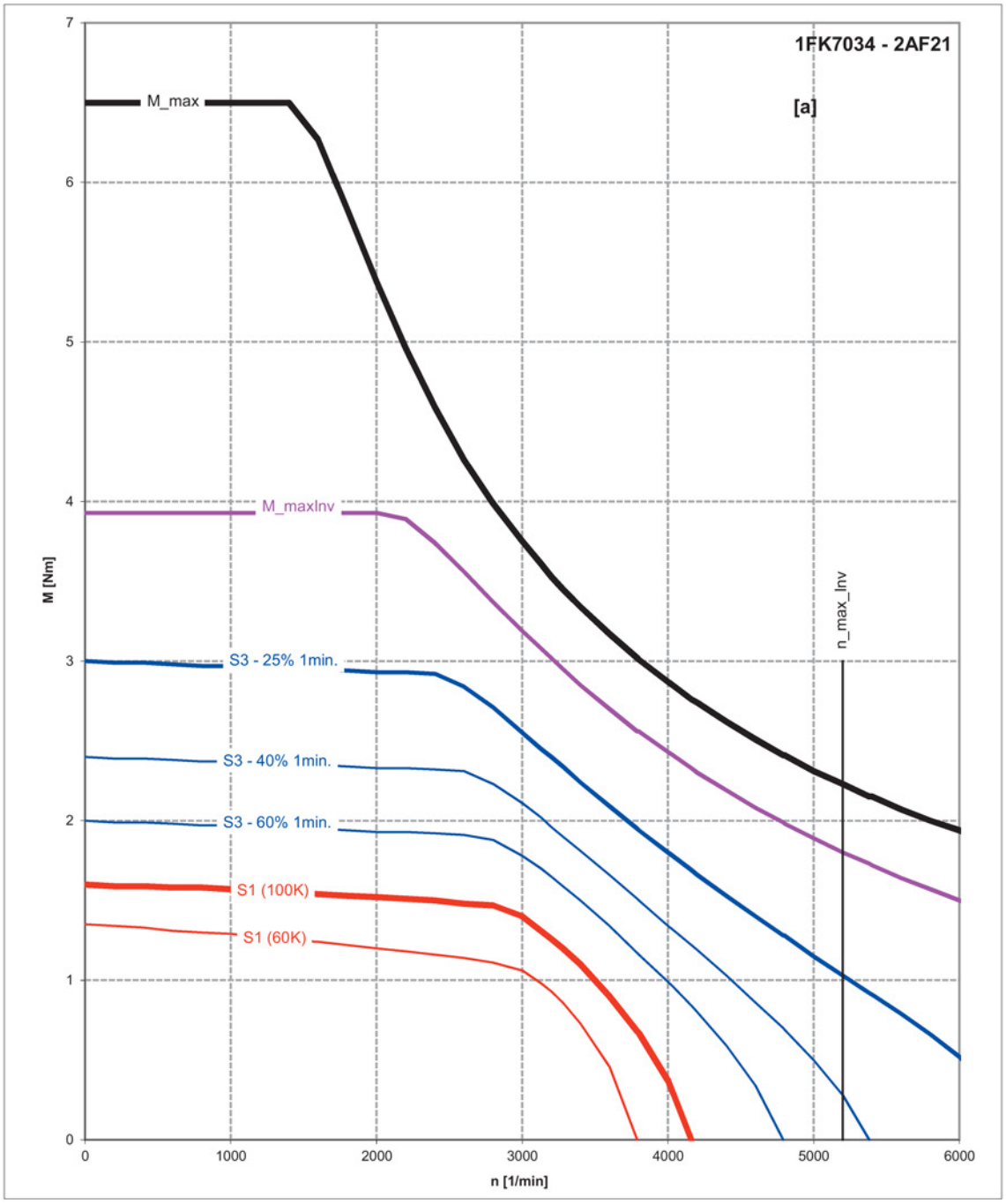


[a] SINAMICS 1AC230V

6.3.4.2 1FK7034-2A_

1FK7034 - 2AF2 three-phase servomotor			
Technical data	**Character**	**Unit**	**Value**
Configuration data:			
Rated speed	n_N	rpm	3000
Rated torque (100 K)	$M_{N(100K)}$	Nm	1.45
Rated current (100 K)	$I_{N(100K)}$	A	1.8
Static torque (100 K)	$M_{0(100K)}$	Nm	1.6
Stall current (100 K)	$I_{0(100K)}$	A	1.9
Static torque (60 K)	$M_{0(60K)}$	Nm	1.35
Stall current (60 K)	$I_{0(60K)}$	A	1.55
Optimum operating point:			
Optimum speed	n_{opt}	rpm	3000
Optimum power	P_{opt}	kW	0.455
Limit data:			
Max. permissible speed (mech.)	$n_{max\ mech}$	rpm	10000
Maximum torque	M_{max}	Nm	6.5
Maximum current	I_{max}	A	8
Motor data:			
Number of poles	2p		6
Torque constant (100K)	k_T	Nm/A	0.84
Voltage constant (at 20°C)	k_E	V/1000 rpm	55
Winding resistance (at 20°C)	R_{ph}	W	4.46
Rotating field inductance	L_D	mH	17.2
Electrical time constant	T_{el}	ms	3.85
Mechanical time constant	T_{mech}	ms	1.71
Thermal time constant	T_{th}	min	30
Moment of inertia	J_{Mot}	$kgm^2 \cdot 10^{-4}$	0.9
Shaft torsional stiffness	c_t	Nm/rad	5300
Weight	m_{Mot}	kg	3.5
Motor data with integrated brake:			
Moment of inertia (with brake)	$J_{Mot\ withBr}$	$kgm^2 \cdot 10^{-4}$	1
Shaft torsional stiffness (with brake)	c_t	Nm/rad	3750
Weight (with brake)	$m_{Mot\ withBr}$	kg	3.9
Data with SINAMICS S120 Booksize / S120 Booksize Compact			
Rated converter current	$I_{N\ conv}$	A	2.3
Maximum converter current	$I_{max\ conv}$	A	4.6
Max. torque (converter operation)	$M_{max\ conv}$	Nm	3.9
Max. permissible speed (converter operation)	$n_{max\ conv}$	rpm	5200

The rated data are valid for a 600 V DC link voltage

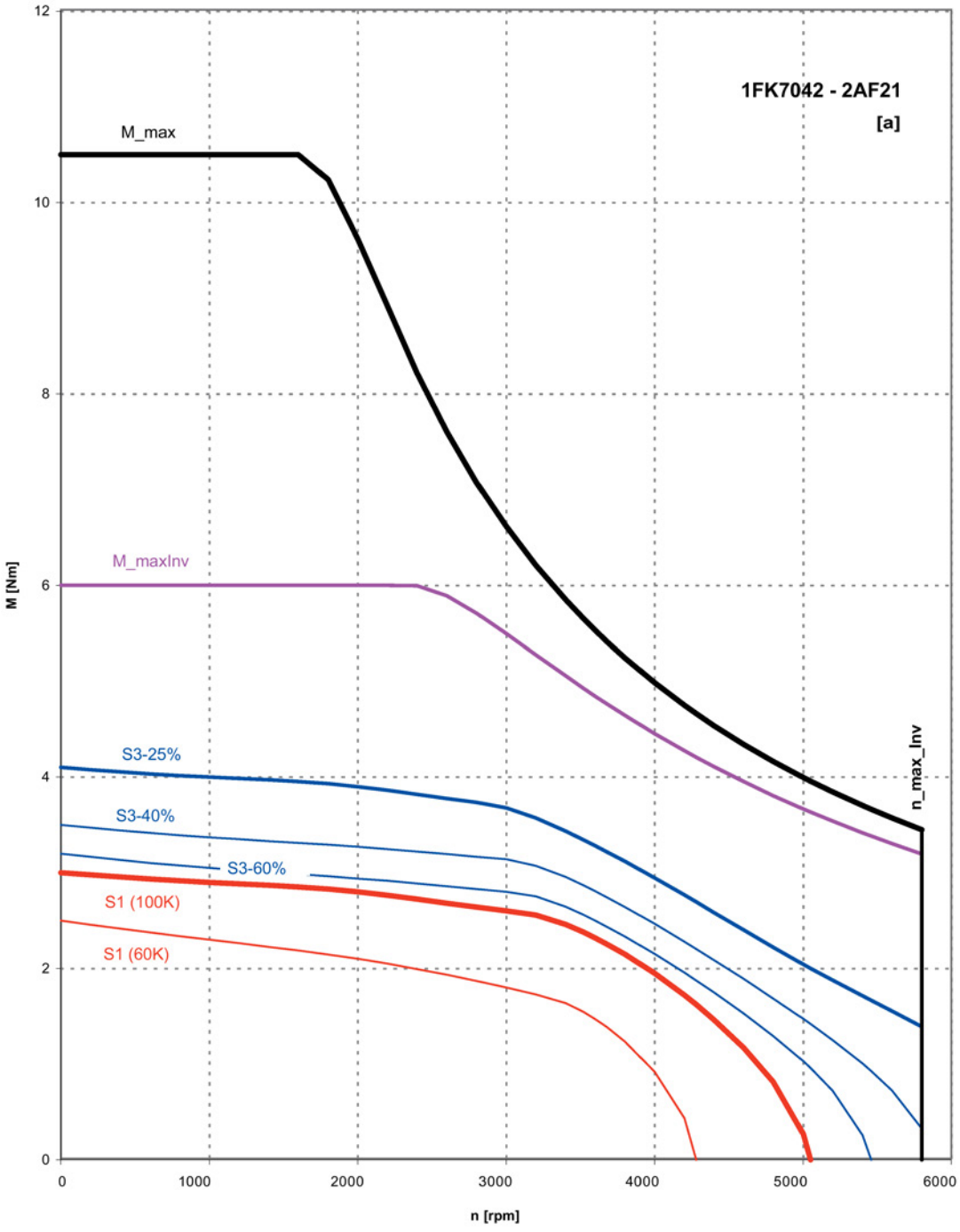


[a] SINAMICS 1AC230V

6.3.4.3 1FK7042-2A_

1FK7042 - 2AF2 three-phase servomotor			
Technical data	**Character**	**Unit**	**Value**
Configuration data:			
Rated speed	n_N	rpm	3000
Rated torque (100 K)	$M_{N(100K)}$	Nm	2.6
Rated current (100 K)	$I_{N(100K)}$	A	3.5
Static torque (100 K)	$M_{0(100K)}$	Nm	3
Stall current (100 K)	$I_{0(100K)}$	A	3.95
Static torque (60 K)	$M_{0(60K)}$	Nm	2.5
Stall current (60 K)	$I_{0(60K)}$	A	3.2
Optimum operating point:			
Optimum speed	n_{opt}	rpm	3000
Optimum power	P_{opt}	kW	0.82
Limit data:			
Max. permissible speed (mech.)	$n_{max\ mech}$	rpm	9000
Maximum torque	M_{max}	Nm	10.5
Maximum current	I_{max}	A	13.8
Motor data:			
Number of poles	2p		8
Torque constant (100K)	k_T	Nm/A	0.76
Voltage constant (at 20°C)	k_E	V/1000 rpm	49.6
Winding resistance (at 20°C)	R_{ph}	W	1.435
Rotating field inductance	L_D	mH	10.6
Electrical time constant	T_{el}	ms	7.4
Mechanical time constant	T_{mech}	ms	2.15
Thermal time constant	T_{th}	min	30
Moment of inertia	J_{Mot}	$kgm^2 \cdot 10^{-4}$	2.9
Shaft torsional stiffness	c_t	Nm/rad	15500
Weight	m_{Mot}	kg	4.6
Motor data with integrated brake:			
Moment of inertia (with brake)	$J_{Mot\ withBr}$	$kgm^2 \cdot 10^{-4}$	3.2
Shaft torsional stiffness (with brake)	c_t	Nm/rad	11400
Weight (with brake)	$m_{Mot\ withBr}$	kg	5.3
Data with SINAMICS S120 Booksize / S120 Booksize Compact			
Rated converter current	$I_{N\ conv}$	A	3.9
Maximum converter current	$I_{max\ conv}$	A	7.8
Max. torque (converter operation)	$M_{max\ conv}$	Nm	6
Max. permissible speed (converter operation)	$n_{max\ conv}$	rpm	5800

The rated data are valid for a 600 V DC link voltage



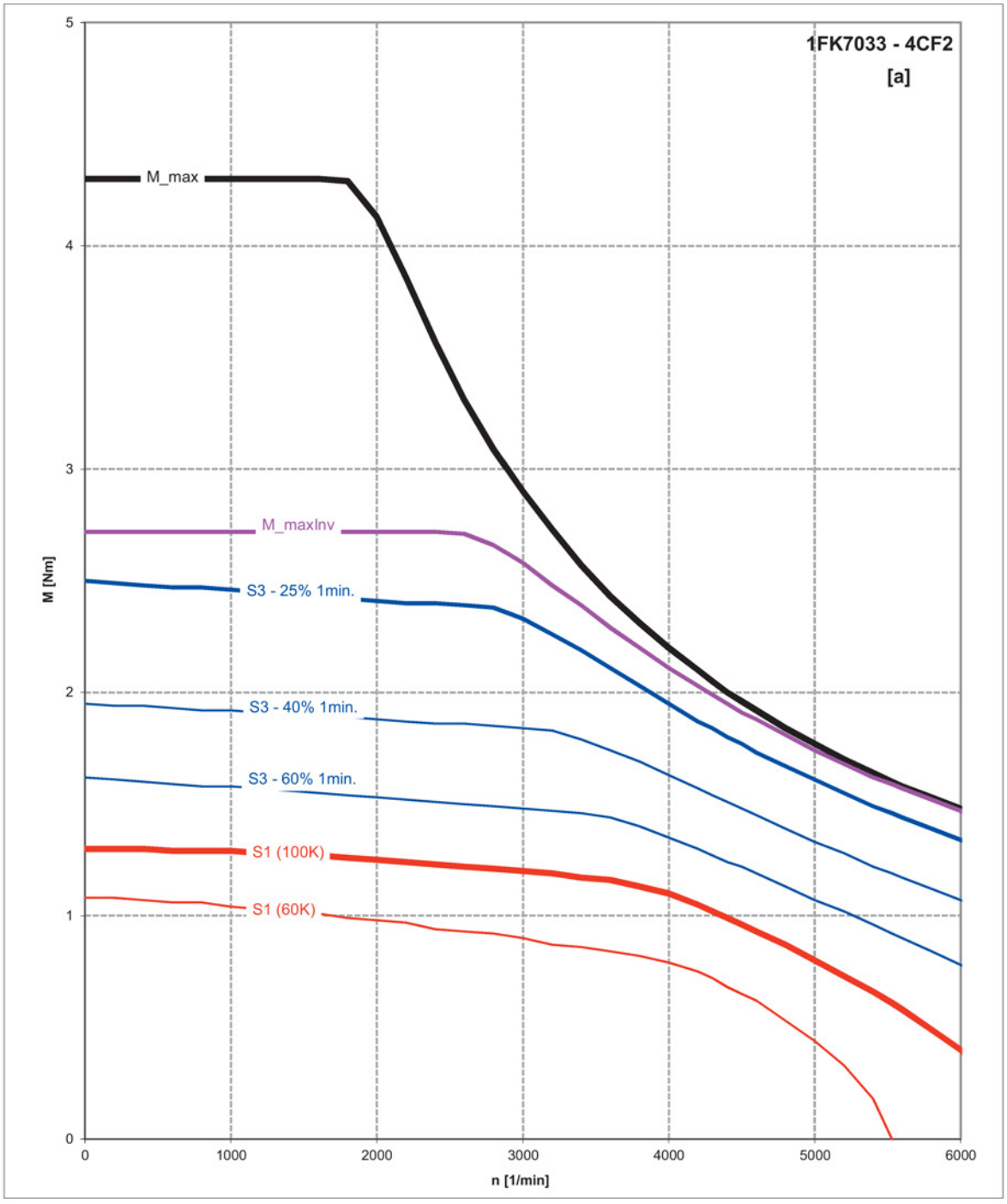
[a] SINAMICS 1AC230V

6.3.5 1FK7 High Dynamic for 1 AC 230 V Power Modules - naturally cooled

6.3.5.1 1FK7033-4C_

1FK7033 - 4CF2 three-phase servomotor			
Technical data	**Character**	**Unit**	**Value**
Configuration data:			
Rated speed	n_N	rpm	3000
Rated torque (100 K)	$M_{N(100K)}$	Nm	1.2
Rated current (100 K)	$I_{N(100K)}$	A	2.05
Static torque (100 K)	$M_{0(100K)}$	Nm	1.3
Stall current (100 K)	$I_{0(100K)}$	A	2.1
Static torque (60 K)	$M_{0(60K)}$	Nm	1.08
Stall current (60 K)	$I_{0(60K)}$	A	1.7
Optimum operating point:			
Optimum speed	n_{opt}	rpm	3000
Optimum power	P_{opt}	kW	0.375
Limit data:			
Max. permissible speed (mech.)	$n_{max\ mech}$	rpm	10000
Maximum torque	M_{max}	Nm	4.3
Maximum current	I_{max}	A	7.6
Motor data:			
Number of poles	2p		6
Torque constant (100K)	k_T	Nm/A	0.62
Voltage constant (at 20°C)	k_E	V/1000 rpm	39.5
Winding resistance (at 20°C)	R_{ph}	W	3.51
Rotating field inductance	L_D	mH	22
Electrical time constant	T_{el}	ms	6.3
Mechanical time constant	T_{mech}	ms	0.68
Thermal time constant	T_{th}	min	25
Moment of inertia	J_{Mot}	$kgm^2 \cdot 10^{-4}$	0.25
Shaft torsional stiffness	c_t	Nm/rad	7300
Weight	m_{Mot}	kg	3
Motor data with integrated brake:			
Moment of inertia (with brake)	$J_{Mot\ withBr}$	$kgm^2 \cdot 10^{-4}$	0.35
Shaft torsional stiffness (with brake)	c_t	Nm/rad	4700
Weight (with brake)	$m_{Mot\ withBr}$	kg	3.4
Data with SINAMICS S120 Booksize / S120 Booksize Compact			
Rated converter current	$I_{N\ conv}$	A	2.3
Maximum converter current	$I_{max\ conv}$	A	4.6
Max. torque (converter operation)	$M_{max\ conv}$	Nm	2.7
Max. permissible speed (converter operation)	$n_{max\ conv}$	rpm	7150

The rated data are valid for a 600 V DC link voltage



[a] SINAMICS 1AC230V
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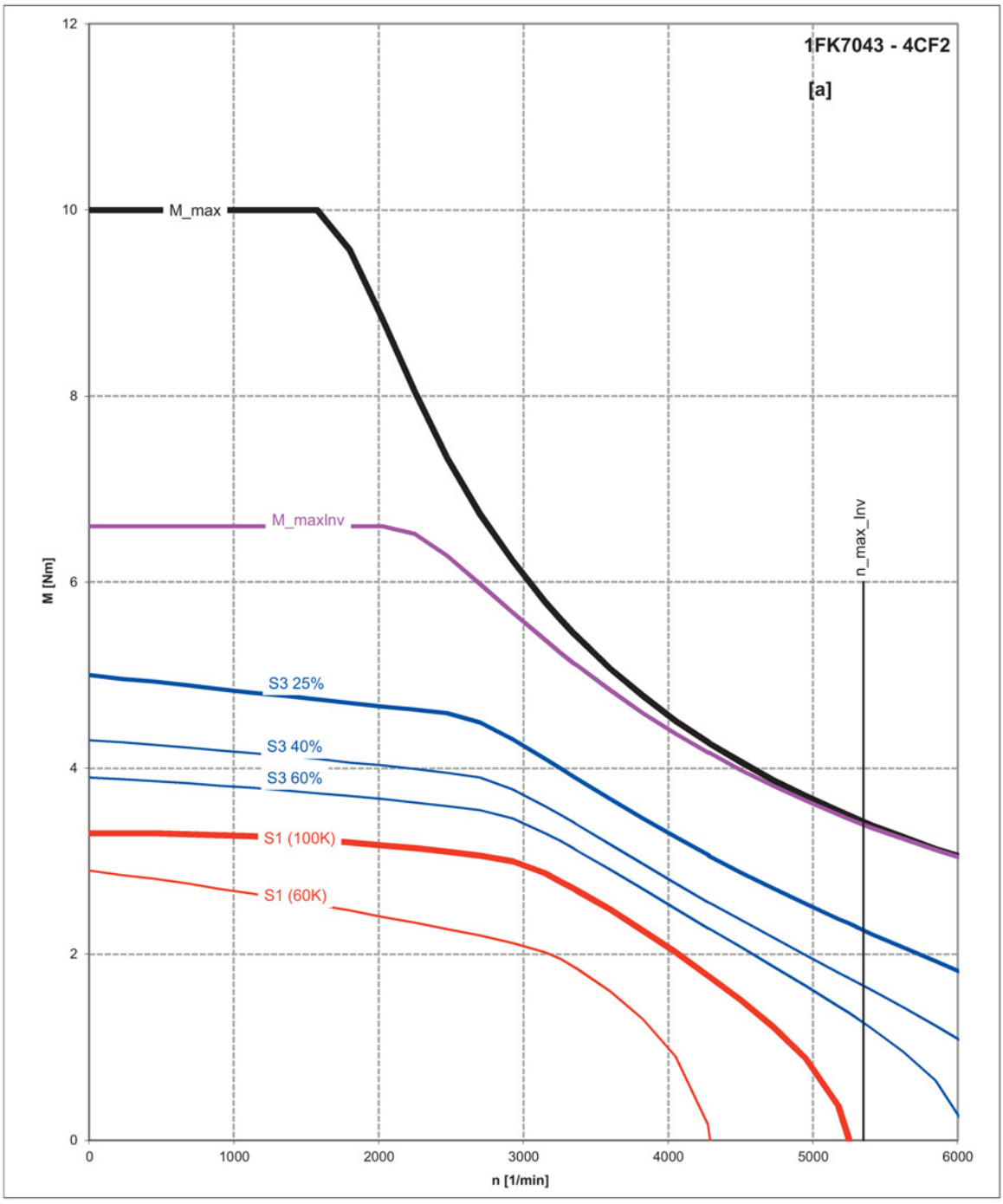
6.3.5.2 1FK7043-4C_

1FK7043 - 4CF2 three-phase servomotor			
Technical data	**Character**	**Unit**	**Value**
Configuration data:			
Rated speed	n_N	rpm	3000
Rated torque (100 K)	$M_{N(100K)}$	Nm	3
Rated current (100 K)	$I_{N(100K)}$	A	3.7
Static torque (100 K)	$M_{0(100K)}$	Nm	3.3
Stall current (100 K)	$I_{0(100K)}$	A	3.9
Static torque (60 K)	$M_{0(60K)}$	Nm	2.9
Stall current (60 K)	$I_{0(60K)}$	A	3.3
Optimum operating point:			
Optimum speed	n_{opt}	rpm	3000
Optimum power	P_{opt}	kW	0.94
Limit data:			
Max. permissible speed (mech.)	$n_{max\ mech}$	rpm	9000
Maximum torque	M_{max}	Nm	10
Maximum current	I_{max}	A	12.5
Motor data:			
Number of poles	2p		6
Torque constant (100K)	k_T	Nm/A	0.845
Voltage constant (at 20°C)	k_E	V/1000 rpm	54
Winding resistance (at 20°C)	R_{ph}	W	1.2
Rotating field inductance	L_D	mH	13.6
Electrical time constant	T_{el}	ms	11.3
Mechanical time constant	T_{mech}	ms	0.5
Thermal time constant	T_{th}	min	40
Moment of inertia	J_{Mot}	$kgm^2 \cdot 10^{-4}$	1
Shaft torsional stiffness	c_t	Nm/rad	11400
Weight	m_{Mot}	kg	6
Motor data with integrated brake:			
Moment of inertia (with brake)	$J_{Mot\ withBr}$	$kgm^2 \cdot 10^{-4}$	1.36
Shaft torsional stiffness (with brake)	c_t	Nm/rad	9000
Weight (with brake)	$m_{Mot\ withBr}$	kg	6.6
Data with SINAMICS S120 Booksize / S120 Booksize Compact			
Rated converter current	$I_{N\ conv}$	A	3.9
Maximum converter current	$I_{max\ conv}$	A	7.8
Max. torque (converter operation)	$M_{max\ conv}$	Nm	6.6
Max. permissible speed (converter operation)	$n_{max\ conv}$	rpm	5350

The rated data are valid for a 600 V DC link voltage



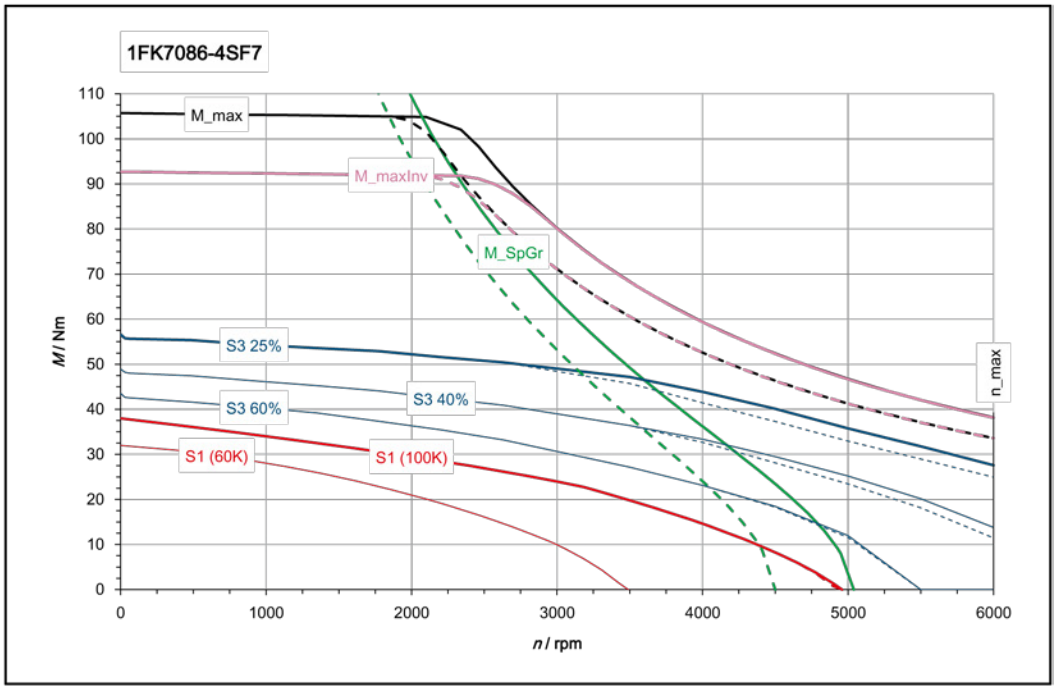
[a] SINAMICS 1AC230V

6.3.6 1FK7 High Dynamic - force ventilated

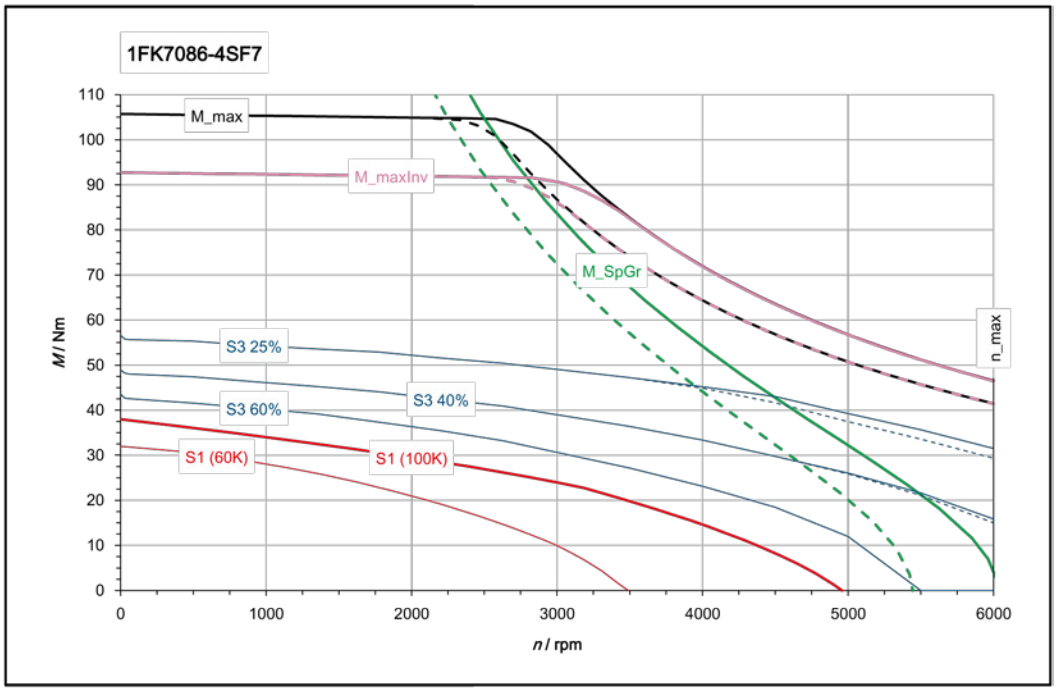
6.3.6.1 1FK7086-4S_

1FK7086 - 4SF7 three-phase servomotor			
Technical data	**Character**	**Unit**	**Value**
Configuration data:			
Rated speed	n_N	rpm	3000
Rated torque (100 K)	$M_{N(100K)}$	Nm	24
Rated current (100 K)	$I_{N(100K)}$	A	20
Static torque (100 K)	$M_{0(100K)}$	Nm	38
Stall current (100 K)	$I_{0(100K)}$	A	29
Static torque (60 K)	$M_{0(60K)}$	Nm	31.5
Stall current (60 K)	$I_{0(60K)}$	A	23
Optimum operating point:			
Optimum speed	n_{opt}	rpm	3000
Optimum power	P_{opt}	kW	7.5
Limit data:			
Max. permissible speed (mech.)	$n_{max\ mech}$	rpm	6000
Maximum torque	M_{max}	Nm	105
Maximum current	I_{max}	A	112
Motor data:			
Number of poles	2p		8
Torque constant (100K)	k_T	Nm/A	1.33
Voltage constant (at 20°C)	k_E	V/1000rpm	84.5
Winding resistance (at 20°C)	R_{ph}	Ω	0.118
Rotating field inductance	L_D	mH	3.1
Electrical time constant	T_{el}	ms	27
Mechanical time constant	T_{mech}	ms	0.46
Thermal time constant	T_{th}	min	35
Moment of inertia	J_{Mot}	10^{-4} kgm²	22
Shaft torsional stiffness	c_t	Nm/rad	84000
Weight	m_{Mot}	kg	27
Motor data with integrated brake:			
Moment of inertia (with brake)	$J_{Mot\ withBr}$	10^{-4} kgm²	25.5
Shaft torsional stiffness (with brake)	$c_{t\ withBr}$	Nm/rad	63000
Weight (with brake)	$m_{Mot\ withBr}$	kg	30
Recommended Motor Module:			
Rated converter current	$I_{N\ conv}$	A	30
Maximum converter current	$I_{max\ conv}$	A	90
Max. torque (converter operation)	$M_{max\ conv}$	Nm	92.7
Max. permissible speed (converter operation)	$n_{max\ conv}$	rpm	6000

The rated data are valid for a 600 V DC link voltage



[———] SINAMICS ALM 400 V (600 V DC)
[- - - - - -] SINAMICS BLM/SLM 400 V (540 V DC)



[———] SINAMICS ALM 480 V (720 V DC)
[- - - - - -] SINAMICS BLM/SLM 480 V (650 V DC)

Preparation for use

7

7.1 Transporting

Note

Comply with the local national regulations for the transportation of motors.

Note

Observe the information on the original packaging when transporting and setting down the motor.

Transporting the motor

- Transport the motor in its original packaging.
- Use suitable load suspension devices when transporting the motor.
- Transport the motor carefully.

Environmental conditions for transporting the motor in the transport packaging according to Class 2K3 to EN 60721-3-2 - with the exception of environmental influencing quantities "Air temperature" and "Condensation"

Climatic ambient conditions	- 15 °C … + 70 °C,
Highest relative humidity	< 95 % at 40 °C, condensation not permissible
Mechanical ambient conditions	Shock and vibration permissible according to 3M8 to EN 60721-3-3: Individual shocks (6 ms) max. 250 m/s²
Protection against chemical substances	Protected in acc. with Class 2C2
Biological ambient conditions	Suitable in acc. with Class 2B2

Setting down the motor

1. Set the motor down on a hard, level surface.
2. Secure the motor against unintentional movements.

Transporting the unpacked motor

- Use suitable load suspension devices when transporting and installing the motor.

Lifting and transporting the motor with lifting straps

You can lift and transport the motor using lifting straps.

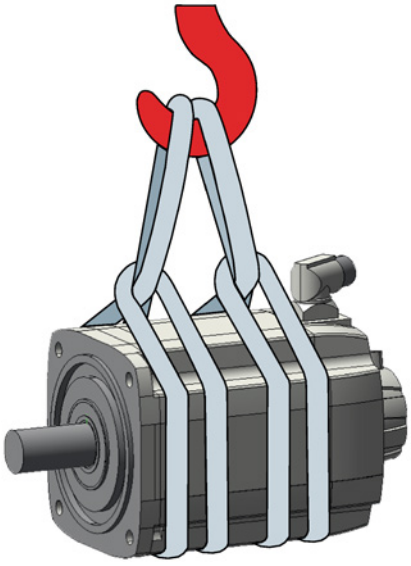
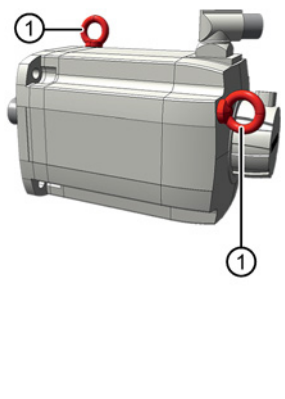
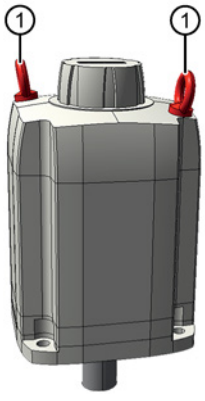
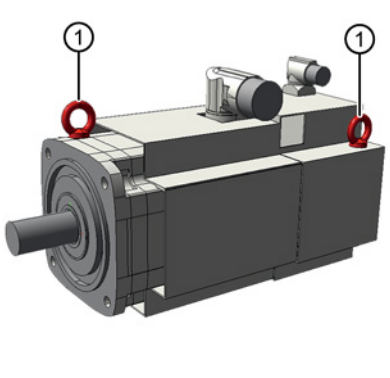
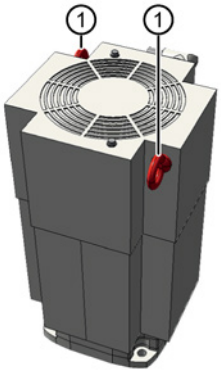


Figure 7-1 Transporting with slings

Lifting and transporting the motor with eyebolts

Above a shaft height of 80 mm, you can lift and transport the motor with eyebolts and a crossbeam.

The motors have M8 eyebolt threads.

 	 
1FK7 with natural cooling	**1FK7 with forced ventilation**
① Lifting eyes	

Example for attaching a cross beam

Position of the eyebolts

The eyebolts are attached to the motor at the positions subsequently shown.

Eyebolts for naturally cooled 1FK7

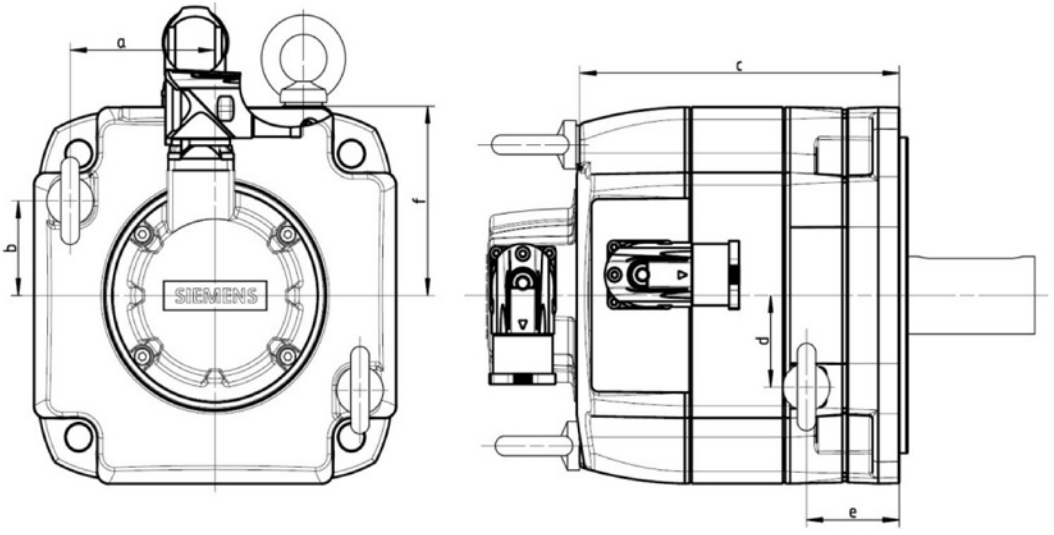


Figure 7-2 Position of the eyebolts for naturally cooled 1FK7

Dynamic response	Shaft height / length	a	b	c		d	e		f	Dimensions of the tapped hole
				without brake	with brake		without brake	with brake		
		mm	mm	mm	mm	mm	mm	mm	mm	
Compact	80	61	38	137	189	38	40	92	78	M8 x min. 15 mm
	81			156	208					
	83			175	227					
	84			194	246					
	100	80	52	146	184	51	34	72	96	
	101			172	224			86		
	103			198	250					
	105			250	302					
High Inertia	81	61	38	177	230	38	61	113	78	
	84			216	268					
	100	80	52	146	184	51	34	72	96	
	101			172	224			86		
	103			198	250					
	105			250	302					
High Dynamic	85	61	38	222	275	38	40	92	78	
	86									

Eyebolts for force ventilated 1FK7

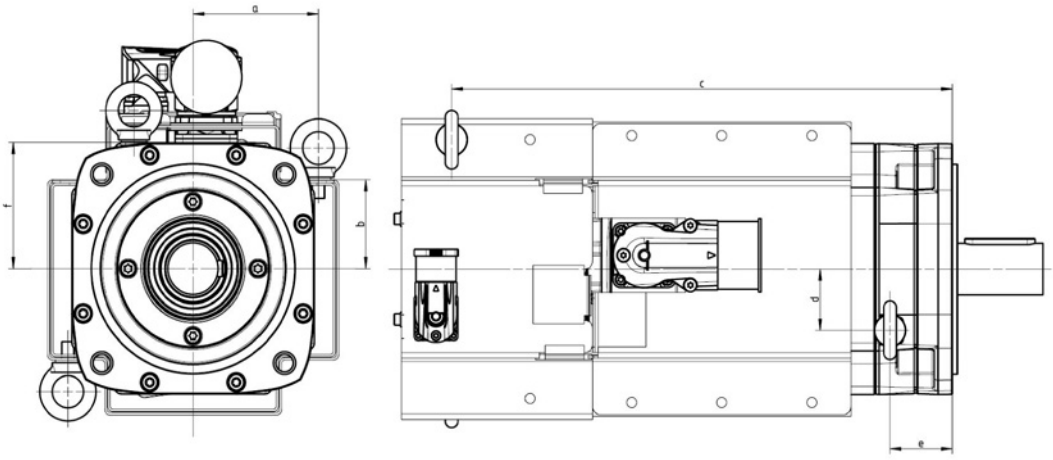


Figure 7-3 Position of the eyebolts for force-ventilated 1FK7

Dynamic response	Shaft height / length	a	b	c		d	e		f	Dimensions of the tapped hole
				without brake	with brake		without brake	with brake		
		mm	mm	mm	mm	mm	mm	mm	mm	
High Dynamic	86	80	55	320	372	38	40	92	78	M8 x min. 15 mm

7.2 Storage

Note

If possible, store the motor in its original packaging.

Preserve the free shaft extensions, sealing elements, and flange surfaces with a protective coating.

NOTICE

Seizure damage to bearings

If the motors are stored incorrectly, bearing seizure damage can occur, e.g. brinelling, as a result of vibration.

- Comply with the storage conditions.

Storage conditions

Please observe the warning instructions on the packaging and labels.

Store the motor in a dry, dust-free, and vibration-free indoor storage facility.

Adhere to the following values:

- v_{rms} < 0.2 mm/s
- Max. temperatures: -15° C to 55° C
- Mean relative humidity < 75%

Long-term storage

Note

Storage time up to two years

The storage time affects the properties of the roller bearing grease.

- Store the motor for up to two years at -15° C to 55° C.

If you intend to place the motor in storage for longer than six months, you must ensure that the storage area satisfies the following conditions.

Table 7- 1 **Environmental conditions for long-term storage in the product packaging according to Class 1K3 to EN 60721-3-1 - with the exception of influencing environmental variables "Air temperature", "Highest relative humidity" and "Condensation"**

Climatic ambient conditions	- 15 °C … + 55 °C
Highest relative humidity	< 60 %, condensation not permissible
Mechanical ambient conditions	vibration-free storage room v_{rms} < 0.2 mm/s
Protection against chemical substances	Protected in acc. with Class 1C2
Biological ambient conditions	Suitable in acc. with Class 1B2
Duration	• Six months for the conditions listed above. • Special preservation measures are required for storage times of 6 months up to maximum of two years.

Check the correct state of the motor every six months.

- Check the motor for any damage.
- Perform any necessary maintenance work.
- Check the state of the dehydrating agent and replace when necessary.
- Record the preservation work so that all preservation coating can be removed prior to the commissioning.

Condensation

The following ambient conditions encourage the formation of condensation:

- Large fluctuations of the ambient temperature
- Direct sunshine
- High air humidity during storage.

Avoid these ambient conditions.

Use a dehydrating agent in the packaging.

Electrical connection

8

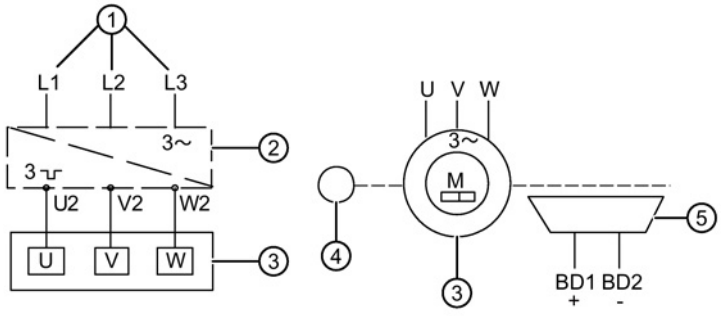
8.1 Permissible line system types

In combination with the drive system, the motors are generally approved for operation on TN and TT systems with **grounded neutral** and on IT systems.

In operation on IT systems, the occurrence of a first fault between an active part and ground must be signaled by a monitoring device. According to IEC 60364-4-41, it is recommended that the first fault is removed as quickly as is practically possible.

In systems with a **grounded external conductor**, an isolating transformer with grounded neutral (secondary side) must be connected between the line supply and the drive system to protect the motor insulation from excessive stress. The majority of TT systems have a grounded external conductor, so in this case an isolating transformer must be used.

8.2 Circuit diagram of the motor



1	Feeder cable	4	Encoder
2	Power Module	5	Brake
3	Motor		

Figure 8-1 Circuit diagram

8.3 System integration

8.3.1 Connecting-up information

NOTICE
Destruction of the motor if it is directly connected to the three-phase line supply
The motor will be destroyed if it is directly connected to the three-phase line supply. • Only operate the motors with the appropriately configured converters.

NOTICE
Damage to electronic components as a result of electrostatic discharge
Electrostatically sensitive devices (ESD) can be damaged or destroyed by electrostatic discharge. • Observe the ESD protection measures. • Only grounded personnel with grounded tools may touch the component connections. • Heed the EMC information provided by the manufacturer of the converter.

- Use prefabricated cables from SIEMENS (not in the scope of delivery). These cables reduce installation costs and increase the operational reliability, see Chapter, "MOTION-CONNECT connection systems" in Catalog D 21.4 (https://intranet.for.siemens.com/org/i-dt-mc/de/motion-control/support/infomaterial/kataloge/d-21-4-sinamics-s120-simotics/Seiten/d-21-4.aspx).
- The manufacturer of the system/machine is responsible for the proper installation.
- Observe the data on the rating plate and the circuit diagrams.
- Adapt the connecting cables to the type of use and the voltages and currents that occur.
- When fed from a converter, high-frequency current and voltage oscillations in the motor feeder cables can cause electromagnetic interference. Therefore, use shielded power cables.
- Make sure that the inside of the connector is clean and free of cable cuttings and moisture.
- Avoid protruding wire ends.
- Check that the degree of protection is complied with at the seals and sealing surfaces of the connectors.
- Secure connecting cables against torsion, tensile and compressive strain, and protect them against kinking. It is not permissible to subject the connector to continuous force.

Current-carrying capacity for power and signal cables

The current-carrying capacity of PVC/PUR-insulated copper cables is specified for routing types B1, B2 and C under continuous operating conditions in the table with reference to an ambient air temperature of 40° C. For other ambient temperatures, the values must be corrected by the factors from the "Derating factors" table.

Cable cross-section and current-carrying capacity

Cross-section	Current-carrying capacity rms; AC 50/60 Hz or DC for routing type		
mm²	*B1* / A	*B2* / A	*C* / A
Electronics (according to EN 60204-1)			
0.20	-	4.3	4.4
0.50	-	7.5	7.5
0.75	-	9	9.5
Power (according to EN 60204-1)			
0.75	8.6	8.5	9.8
1.00	10.3	10.1	11.7
1.50	13.5	13.1	15.2
2.50	18.3	17.4	21
4	24	23	28
6	31	30	36
10	44	40	50
16	59	54	66
25	77	70	84
35	96	86	104
50	117	103	125

Cable cross-section and current-carrying capacity

Derating factors for power and signal cables

Ambient air temperature [°C]	Derating factor according to EN 60204-1 Table D1
30	1.15
35	1.08
40	1.00
45	0.91
50	0.82
55	0.71
60	0.58

Derating factors for power and signal cables

8.3.1.1 Rotating the connector at the motor

Power connectors and signal connectors can be rotated to a different angle to a limited extent.

Use a suitable socket connector to rotate the angle plug.

Unscrew and open the socket connector completely to avoid damaging the pin contacts.

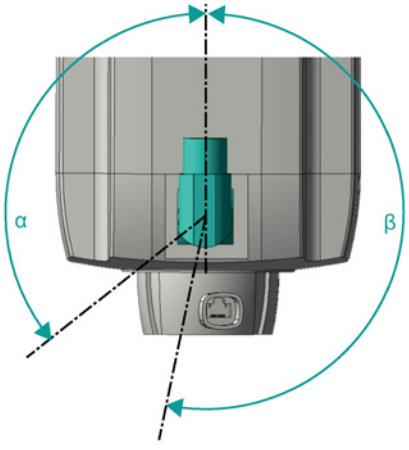
On encoders with an integrated Sensor Module (DQI), the cable outlet toward the top is fixed and cannot be changed. The M17 encoder connector for option N16 can be rotated.

Note

Rotating the connectors

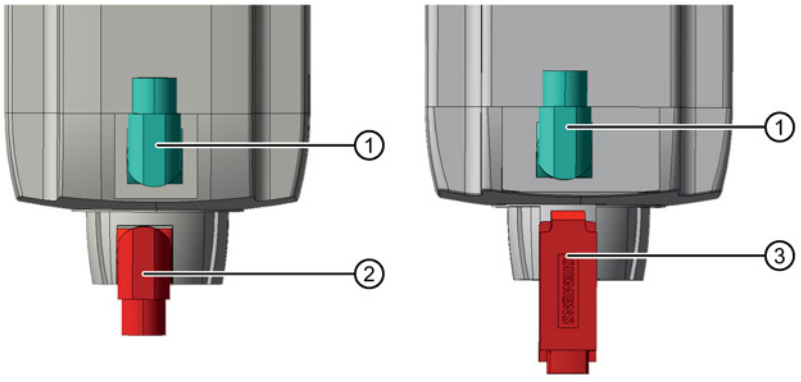
- Do not exceed the permissible range of rotation.
- To ensure the degree of protection, do not rotate more than 10 times.
- Rotate the connector using a mating connector that matches the connector thread. Only rotate Sensor Modules by hand. Use of tools is not permissible.

Twistability of the power connector for motors with DRIVE-CLiQ interface 1FK7□□□-□□□□□-□X□□; X = B, C, Q, R

Motor	Angle α	Angle β	Connector size	Drawing
1FK703	122°	208°	1	
1FK704 1FK706 1FK708 1FK710	135°	195°	1	
1FK708 1FK710	195°	140°	1.5	

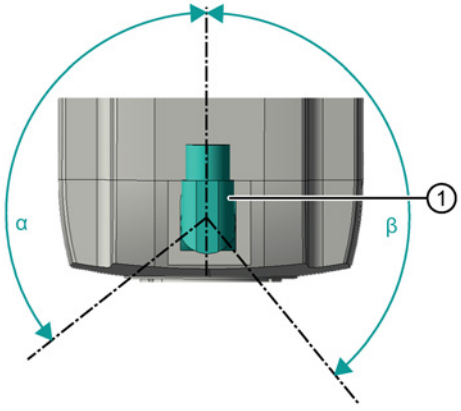
Rotation range of the power connector

Rotatability of the connectors for motors without DRIVE-CLiQ interface and for motors with DRIVE-CLiQ interface via Sensor Modules 1FK7□□□-□□□□□-□X□□; X = A, D, E, F, K, L



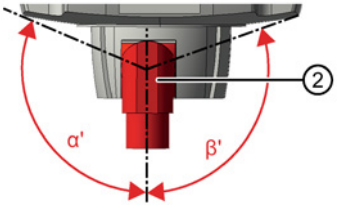
1 Power connector, size 1 or 1.5
2 Signal connector without DRIVE-CLiQ
3 Signal connector with DRIVE-CLiQ and Sensor Module (SMI)

Rotation range of the power connector ①

Motor	Connector size	Angle α	Angle β	Drawing
1FK703	1	122°	158°	
1FK704 1FK706 1FK708	1	135°	140°	
1FK710	1	135°	195°	
1FK708 1FK710	1.5	195°	140°	

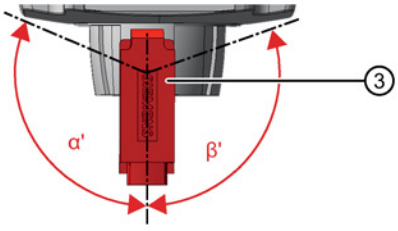
Range of rotation of the power connector ①

Rotation range of the signal connector ②

Motor	Signal connector without DRIVE-CLiQ ②		Drawing
	Angle α´	Angle β´	
1FK703	160°	135°	
1FK704	145°	130°	
1FK706	150°	135°	
1FK708 1FK710	105°	105°	

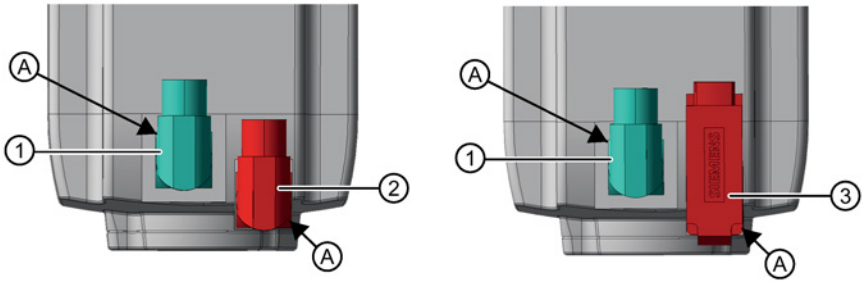
Range of rotation of the signal connector ②

Rotation range of the signal connector ③

Motor	Signal connector with DRIVE-CLiQ via Sensor Modules (SMI) ③		Drawing
	Angle α´	Angle β´	
1FK703	160°	130°	
1FK704	145°	140°	
1FK706	140°	145°	
1FK708 1FK710	105°	100°	

Range of rotation of the signal connector ③

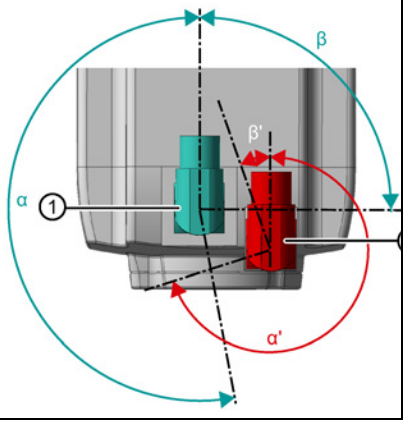
Twistability of the connectors for motors with Resolver 1FK7□□□-□□□□□-□X□□; X = S, T, U, P



1 Power connector, size 1 and 1.5
2 Signal connector M23
3 Signal connector with SMI
A Output cam on the connector foot to limit the twistability

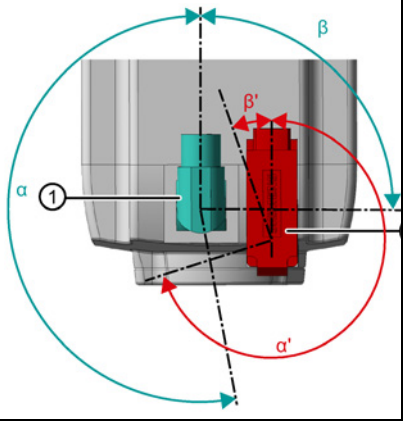
Figure 8-2 Twistability of the resolver variants

Rotation range of the power connector ① and the M23 signal connector ②

Motor	Power connector, size 1 and 1.5 ①			M23 signal connector ②		Drawing
	Connector size	Angle α	Angle β	Angle α´	Angle β´	
1FK703	1	170°	70°	250°	20°	
1FK704		190°	80°	255°	5°	
1FK706		185°	90°	255°	10°	
1FK708		205°	75°	260°	25°	
1FK708	1.5	190°	70°	245°	15°	
1FK710	1	205°	85°	265°	30°	
1FK710	1.5	195°	80°	260°	25°	

Range of rotation of the power connector ① and M23 signal connector ②

Rotation range of the power connector ① and the signal connector with SMI ③

Motor	Power connector, size 1 and 1.5 ①			Signal connector with SMI ③		Drawing
	Connector size	Angle α	Angle β	Angle α´	Angle β´	
1FK703	1	200°	70°	240°	5°	
1FK704		175°	80°	255°	5°	
1FK706		185°	85°	255°	5°	
1FK708		205°	75°	255°	5°	
1FK708	1.5	190°	70°	235°	5°	
1FK710	1	205°	85°	265°	5°	
1FK710	1.5	195°	80°	255°	5°	

Range of rotation of the power connector ① and signal connector with SMI ③

Maximum rotating torque for the connectors

Connectors	Max. torque when rotating
Power connector, size 1	12 Nm
Power connector, size 1.5	20 Nm
Signal connector (without DRIVE-CLiQ)	12 Nm
Signal connector (with DRIVE-CLiQ)	8 Nm

Maximum rotational connector torque

8.3.1.2 Routing cables in a damp environment

Note

If the motor is mounted in a humid environment, the power and signal cables must be routed as shown in the following figure.

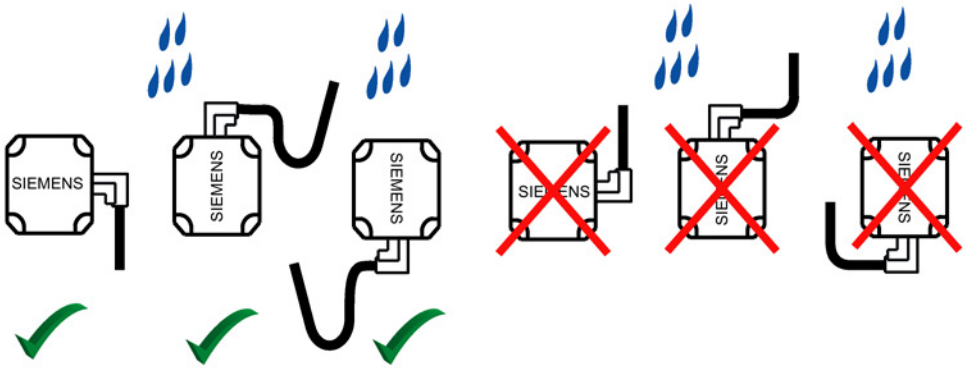


Figure 8-3 Routing cables in a damp environment

The motors are equipped with SPEED-CONNECT connectors.

You can also connect quick-connection cables with SPEED-CONNECT to motor connectors as conventional cables with screw locks (fully threaded).

Note

We recommend cables equipped with SPEED-CONNECT connectors.

Handling plug-in connections

The following information on the handling of plug-in connections applies for power connectors and signal connectors as round connector in the SPEED-CONNECT version and fully threaded.

The figures show the connecting and disconnecting of the power connector in the SPEED-CONNECT version.

Connecting

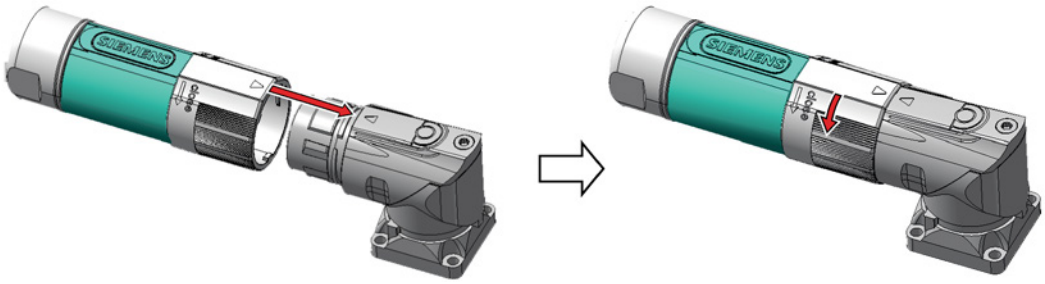


Figure 8-4 Connecting the SPEED-CONNECT plug-in connection

1. Make sure that the SIEMENS logo on the connector enclosure is at the top or that the arrows on both connectors are opposite to each other. This ensures that the pins and coding keys of the connector and motor connector are aligned.
2. Push the connector into the motor connector up to the endstop.
3. Tighten the fastener or the screw cap per hand in a clockwise direction.

Disconnecting

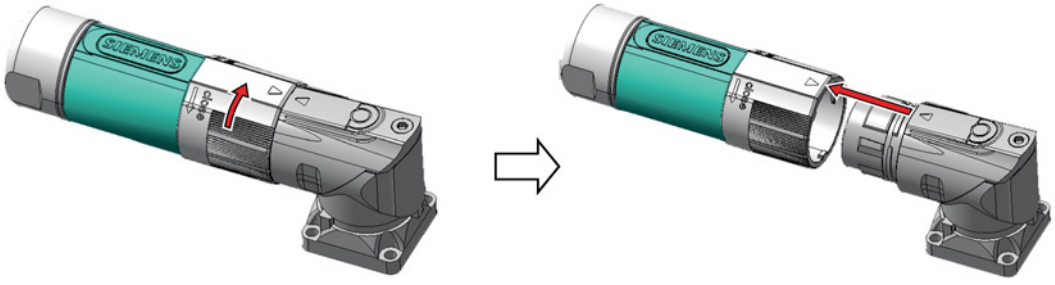


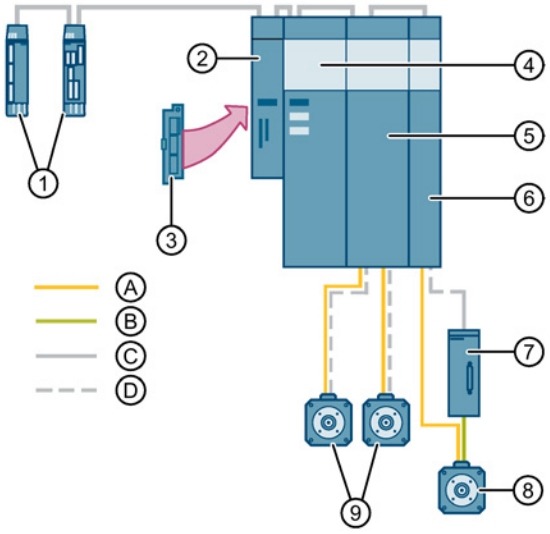
Figure 8-5 Disconnecting the SPEED-CONNECT plug-in connection

1. Turn the fastener or the screw cap per hand in an anticlockwise direction up to the endstop.
2. Pull the connector out of the motor connector.

Note

To disconnect the plug-in connection, always pull the cable connector and not the cable.

8.3.2 Connecting to a converter



1	Terminal Module	8	Motors without DRIVE-CLiQ interface
2	Control Unit	9	Motors with DRIVE-CLiQ interface
3	Operator control unit	A	MOTION-CONNECT power cable
4	Smart Line or Active Line Module	B	MOTION-CONNECT signal cable
5	Double Motor Module	C	DRIVE-CLiQ signal cable
6	Motor Module	D	MOTION-CONNECT DRIVE-CLiQ signal cable
7	Sensor Module		

Figure 8-6 SINAMICS S120 system overview

Selecting and connecting the cables

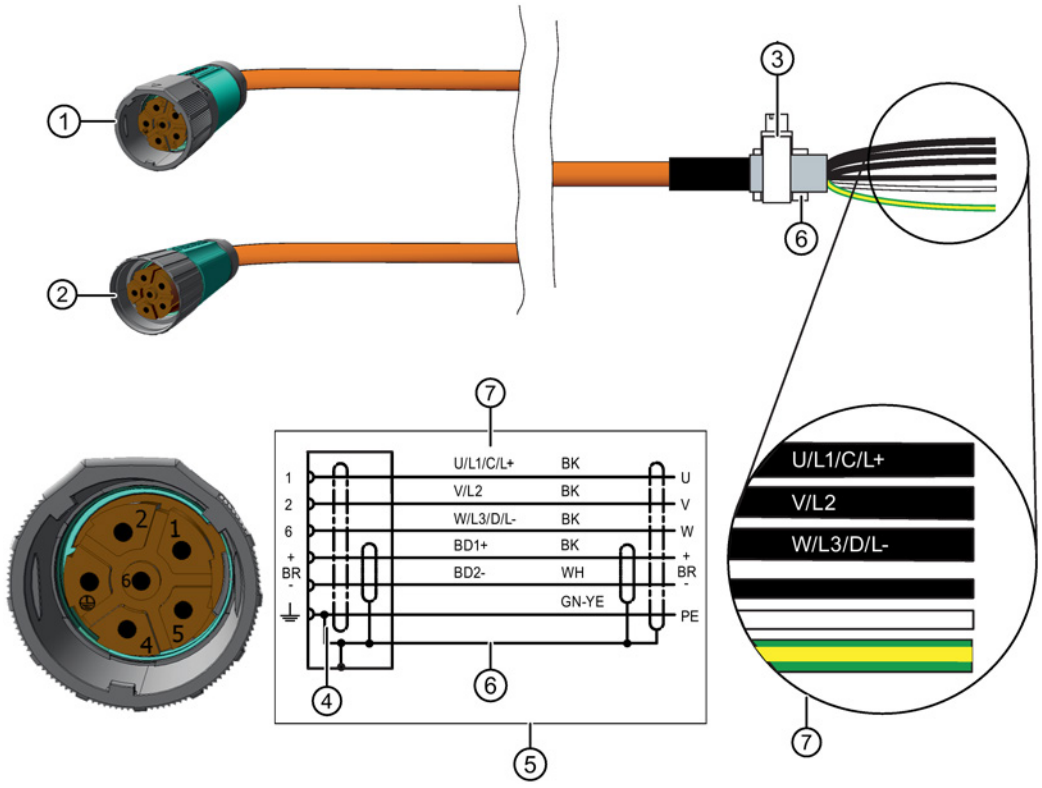
- To connect the motor to a converter, use MOTION-CONNECT cables or shielded connecting cables.

Note

The cable shielding, made up of as many strands as possible, must have a high electrical conductivity. Braided shields made of copper or aluminum are well suited.

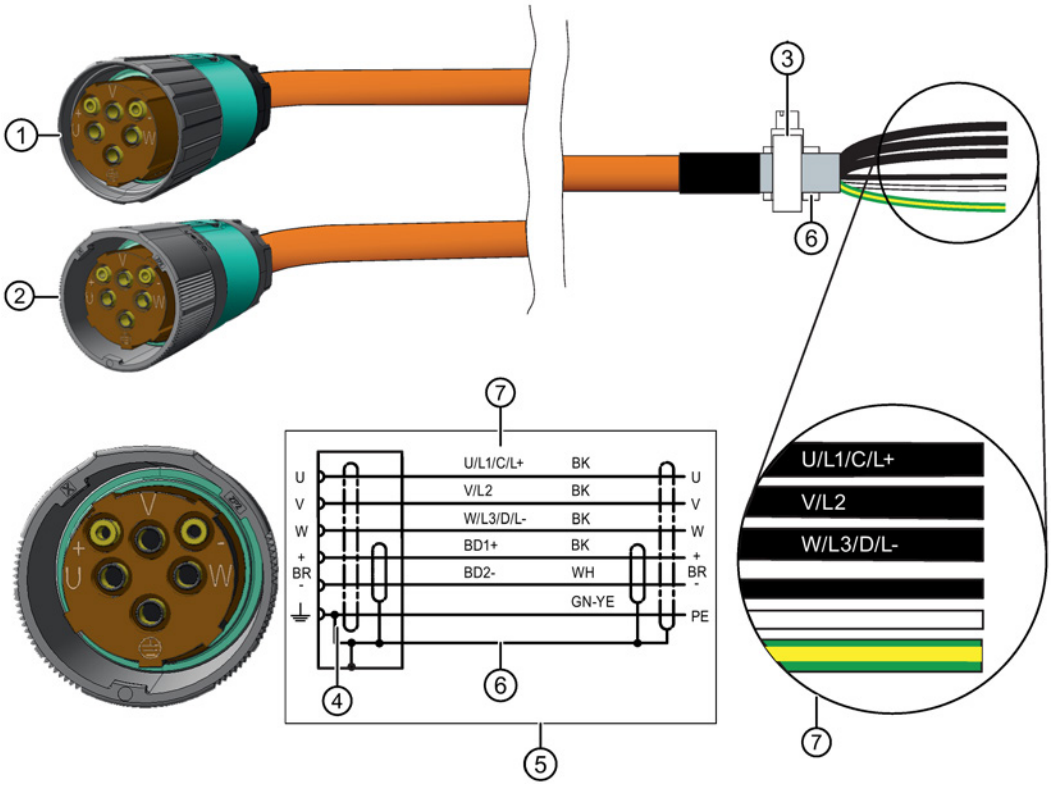
Connection scheme for the motor to the S120 Power Module and Motor Module Booksize and Compact with a MOTION CONNECT cable

For connector size 1



1 Connector, size 1
2 SPEED CONNECT connector, size 1
3 Terminal for the cable shield
4 Pin assignment
5 Circuit diagram
6 Cable shield
7 Conductor designation:
U, V, W = power cables, 1.5 mm^2, each cable separately shielded
BD1+ and BD2- = brake cable without lettering, 1.5 mm^2, shared shield
PE = protective conductor

For connector size 1.5



1 Connector, size 1.5
2 SPEED CONNECT connector, size 1.5
3 Terminal for the cable shield
4 Pin assignment
5 Circuit diagram
6 Cable shield
7 Conductor designation:
U; V; W = power cables, each cable separately shielded
BD1+ and BD2- = brake cable without lettering, 1.5 mm^2, shared shield
PE = protective conductor

- Connect the shield at both ends at the motor and at the converter.
- Keep unshielded cable ends as short as possible.
- Establish the connection through a larger surface area so that high-frequency currents are suitably discharged. Establish a 360° connection at the converter and at the motor, for instance using EMC cable glands at the cable entries.

8.3.3 Connecting an external fan

The fan connection is a size 1 power connector.

Table 8- 1 Connection data for external fans for 1FK7

Shaft height	Max. current consumption at	
	230 V / 50 Hz (±10 %) in A	230 V / 60 Hz (±10 %) in A
80	0.40	0.40

Note the following information regarding connections:

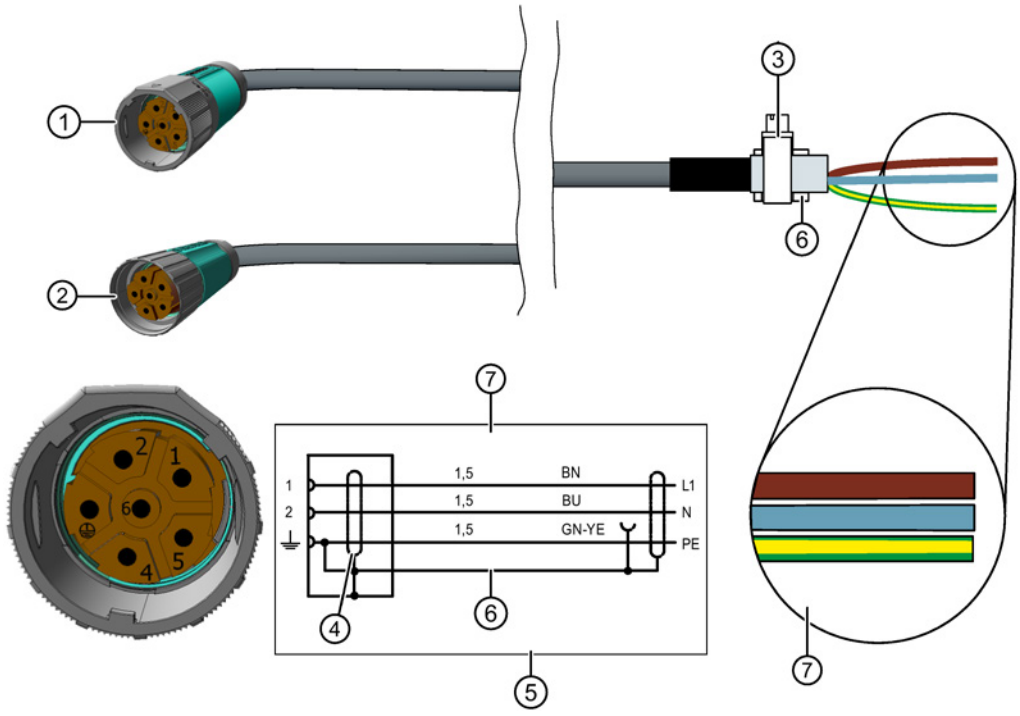
- Only use cables that comply with the relevant installation regulations regarding voltage, current, insulation material, and load-carrying capacity.
- Before connecting the device, make sure that the line voltage matches the device voltage.
- Check whether the data on the fan rating plate matches the connection data.
- Connection cables must not be subjected to excessive tensile stress.

NOTICE

Damage to the fan when inappropriately operated

The fan can be destroyed if inappropriately operated.

- Use blocking protection (stall protection) to protect the fan against inappropriate operation. To do this, use a suitable circuit-breaker where all poles can be opened. Operate the fan using this circuit-breaker.
- Provide an interlocking circuit that prevents the main motor from being switched on when the fan unit is not operational.



1 Connection plug size 1 (with full thread)
2 SPEED CONNECT connection plug size 1
3 Terminal for the cable shield
4 Pin assignment
5 Circuit diagram
6 Cable shield
7 Conductor designation:
L1, N = power cable, 1.5 mm^2
PE = protective conductor

Figure 8-7 1-phase connection of external fan

Table 8- 2 Order numbers

	Order number (article number)
Connector size 1 with full thread	6FX2003-0LU00
Connector size 1 with SPEED-CONNECT	6FX2003-0LU30
Prefabricated cable with full thread	6FX5001-5CG10-□□□□[1)]
Prefabricated cable with SPEED-CONNECT	6FX5002-5CG10-□□□□[1)] 6FX8002-5CG10-□□□□[1)]

[1)] The last 4 positions are the length code.

You can find additional information in Catalog Chapter, "MOTION-CONNECT connection systems" in Catalog D 21.4 (https://intranet.for.siemens.com/org/i-dt-mc/de/motion-control/support/infomaterial/kataloge/d-21-4-sinamics-s120-simotics/Seiten/d-21-4.aspx), Chapter "MOTION-CONNECT connection system" in the print version or online.

8.3.4 Connecting the holding brake

Direct connection

The holding brake in the motor is directly connected to the SINAMICS converter using MOTION-CONNECT power cables with integrated brake connecting cable. See Chapter "Connecting to a converter (Page 268)"

Connection to external power supply

You can also control the holding brake via an external power supply.

The external power supply can be a PELV (PELV = Protective Extra Low Voltage) power supply, if:

- Protective separation from the motor winding is guaranteed for the brake cable in the motor
- The power cable has reinforced insulation

Note

The relay K1, located between coil and contact, must also have reinforced insulation to protect the internal logic voltage.

If you control the holding brake via an external power supply, you must protect the holding brake from voltage peaks with a protective circuit. See figure "Suggested circuit for the external power supply"

The protective circuit also guarantees the specified switching times, see Chapter "Technical data (Page 63)".

The motor holding brake requires 24 V ± 10 % at the motor connection in order to reliably open.

- Take into account the voltage drops along the supply cable.
- Use a Control Supply Module (CSM) or a regulated DC power supply, whose setpoint is set to 26 V.
- Use power supply cables with a minimum cross-section of 1.5 mm².
- Calculate the maximum permissible cable length using the following formula.

If the maximum voltage of 24 V DC +10 % is exceeded, then the brake can close again.

You can approximately calculate the voltage drop ΔU for copper cables as follows:

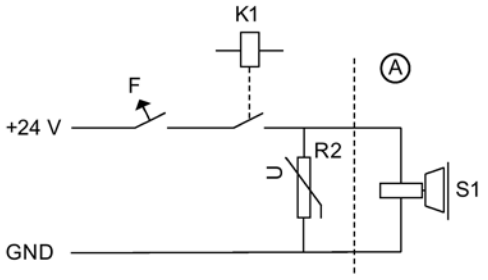
ΔU / V = 0.042 • x • I_{Brake} — l / m = cable length

$x = l / q$ — q / mm² = brake conductor cross-section

I_{Brake} / A = brake DC current

Note

Integrate a protective circuit into the incoming cable. In this way, you avoid switching overvoltages and possible influence of the installation environment. See the figure below



A Motor
K1 Contactor
F Circuit-breaker
S1 Holding brake
R2 Varistors

Figure 8-8 Suggested circuit for the external power supply with protective circuit

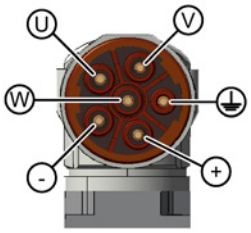
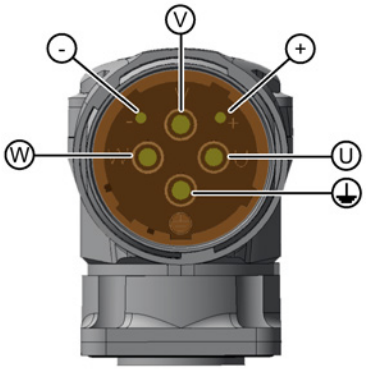
Table 8- 3 Example: Electrical components for the suggested circuit

Electrical component	Examples		
F	3RV10 circuit-breaker with current paths connected in series (if required with mounted auxiliary contact 3RV1901 to provide a feed-back signal for the drive).	or	Miniature circuit-breaker 5SX21 (if required with mounted auxiliary contact to provide a feedback signal for the drive).
K1	Auxiliary contactor 3RH11	or	Contactor 3RT10
R2	Varistor SIOVS14K30 (EPCOS)		

8.3.5 Power connection

Connector types

Table 8- 4 Line connection

Connector size 1	Connector size 1.5
	
+ = BD1+; - = BD2-	

8.3.6 Signal connection / motor protection

8.3.6.1 Signal connection

The motors can be connected to the converter system as follows.

Via the DRIVE-CLiQ interface	Without DRIVE-CLiQ	
RJ45 connector	M23 12-pin round connector	M23 17-pin round connector
Identifier at the 14th Position of the Article number		
B, C, D, F, K, L, P, Q, R or U	S or T	A or E

The connection is established using a MOTION-CONNECT cable.

Additional information on connecting signals with DRIVE-CLiQ is provided at "Motors with DRIVE-CLiQ interface (Page 276)".

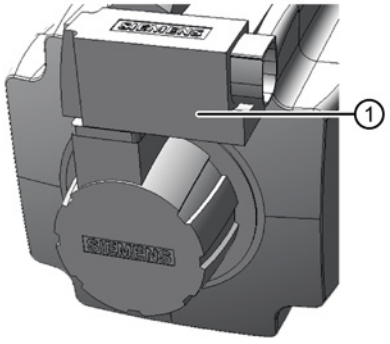
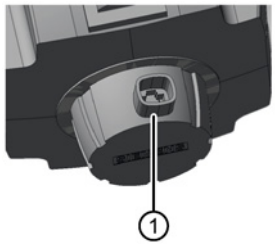
Additional information on connecting signals without DRIVE-CLiQ is provided at "Motors without DRIVE-CLiQ interface (Page 278)".

8.3.6.2 Motors with DRIVE-CLiQ interface

Motors designed for SINAMICS drive systems have an integrated encoder and temperature evaluation system as well as an electronic rating plate.

The motors are connected to the converter system via a DRIVE-CLiQ interface.

The following versions are possible for the DRIVE-CLiQ connection:

10-pin RJ45 socket (SMI)	10-pin RJ45 socket (DQI)
	
1 SMI with 10-pin RJ45 socket	1 10-pin RJ45 socket

The DRIVE-CLiQ interface supplies the motor encoder with power via the integrated 24 VDC power supply. The DRIVE-CLiQ interface transfers the motor encoder and temperature signals and the electronic rating plate data, e.g. a unique identification number, rating data (voltage, current, torque) to the Control Unit.

Motors with a DRIVE-CLiQ interface can be connected to the associated Motor Module via a MOTION-CONNECT cable.

NOTICE
Damage to electronic components as a result of electrostatic discharge The Sensor Module has direct contact with electrostatic sensitive devices that can be damaged or destroyed by electrostatic discharge (ESD). • Note the ESD protective measures. See Chapter "Equipment damage due to electric fields or electrostatic discharge (Page 14)" • Only grounded personnel with grounded tools may touch the component connections. • Heed the EMC information provided by the manufacturer of the converter.

The motor and the Motor Module are connected via a MOTION-CONNECT cable. See Chapter "Motors with DRIVE-CLiQ interface (Page 276)"

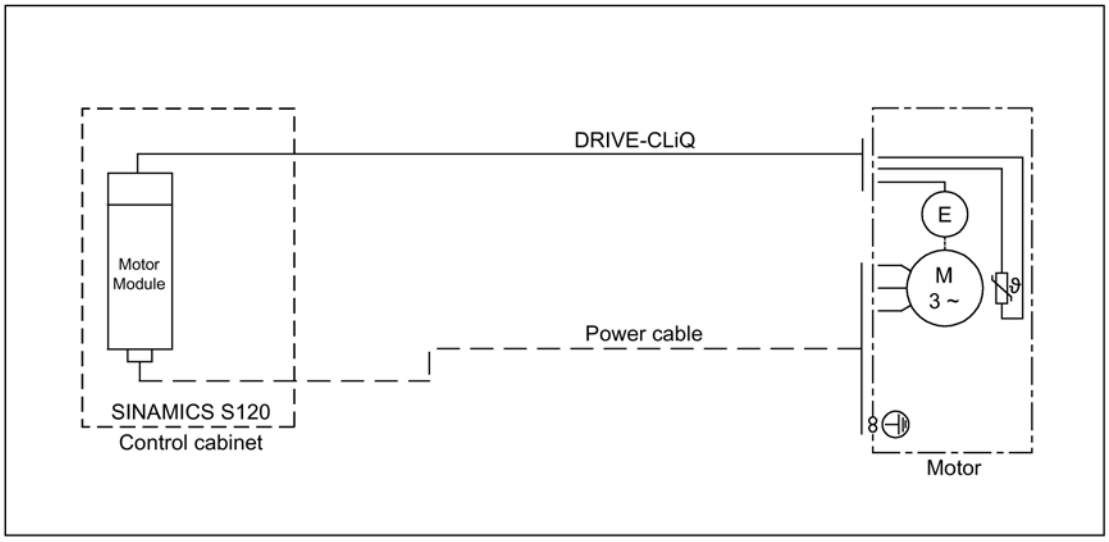


Figure 8-9 Encoder interface with DRIVE-CLiQ

Information on the connector pin assignment is provided in Chapter "PIN assignment of the signal connector (Page 279) ".

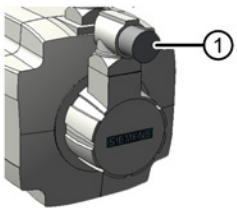
Signal cables for motors with DRIVE-CLiQ

Use MOTION-CONNECT cables when connecting motors with DRIVE-CLiQ interface.

Detailed information is provided in Chapter "SIMOTICS Servomotors" in Catalog D 21.4 (https://support.industry.siemens.com/cs/document/109747019/) in the print version or online.

8.3.6.3 Motors without DRIVE-CLiQ interface

If a motor is not equipped with a DRIVE-CLiQ interface, the speed encoder and temperature sensor are connected via a signal connector.



1 17-pin M23 signal connector

Figure 8-10 Motor with a signal connector

Motors without DRIVE-CLiQ require a Sensor Module Cabinet (SMC) for operation with a SINAMICS S120 drive system. The motor is connected with the SMC using a MOTION-CONNECT signal cable.

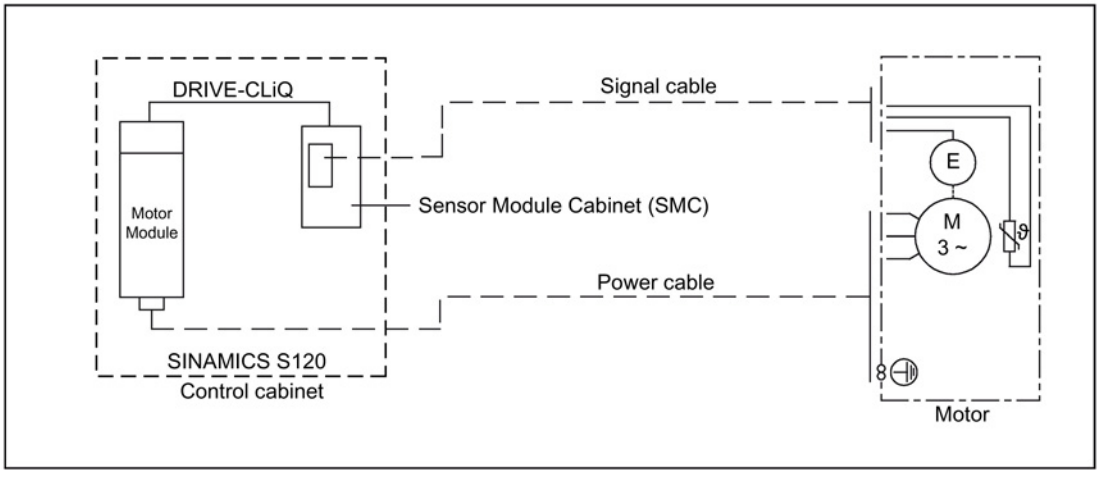


Figure 8-11 Encoder interface without DRIVE-CLiQ

Information on the connector pin assignment is provided in Chapter "PIN assignment of the signal connector (Page 279)".

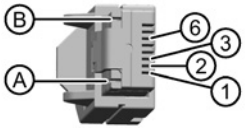
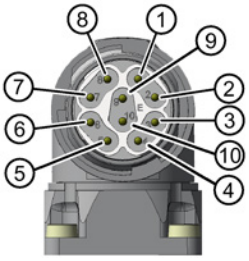
Signal cables for motors without DRIVE-CLiQ

Use MOTION-CONNECT cables. These offer many advantages over cables made by other manufacturers in terms of operational reliability, quality, and cost.

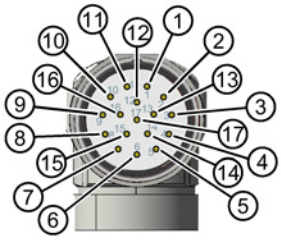
Detailed information is provided in the Chapter, "MOTION-CONNECT connection systems" in Catalog D 21.4 (https://intranet.for.siemens.com/org/i-dt-mc/de/motion-control/support/infomaterial/kataloge/d-21-4-sinamics-s120-simotics/Seiten/d-21-4.aspx) in the print version or online.

8.3.6.4 PIN assignment of the signal connector

PIN assignment of the signal connector for DRIVE-CLiQ

Pin assignment, RJ45 signal connector, cable connector	Pin assignment M17 signal connector, 10-pin, encoder connector, for option N16
	
1 = TX-P	1 = TX-P
2 = TX-N	2 = TX-N
3 = RX-P	3 = not connected
4 = not connected	4 = not connected
5 = not connected	5 = RX-P
6 = RX-N	6 = RX-N
7 = not connected	7 = not connected
8 = not connected	8 = not connected
A = P 24 V	9 = 24 V
B = M 0 V	10 = 0 V

PIN assignment of the signal connector without DRIVE-CLiQ

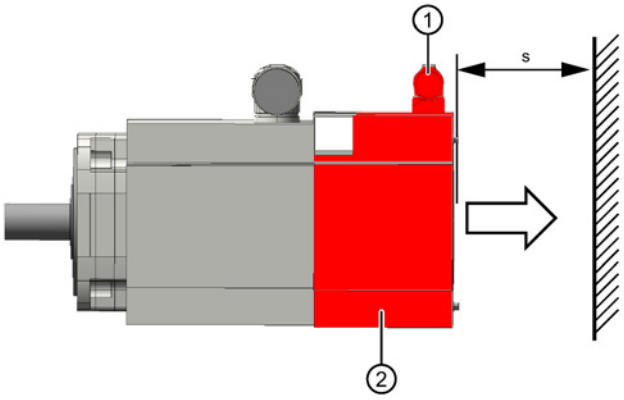
Pin assignment, 12-pin signal connector, encoder connector	**Pin assignment 17-pin signal connector, encoder connector**	
		
Resolvers	Incremental encoder sin/cos 1Vpp	Absolute encoder
1 = S2	1 = A	1 = A
2 = S4	2 = A*	2 = A*
3 = not connected	3 = R	3 = data
4 = not connected	4 = D*	4 = not connected
5 = not connected	5 = C	5 = clock
6 = not connected*	6 = C*	6 = not connected
7 = R2	7 = M encoder	7 = M encoder
8 = +1R1	8 = +1R1	8 = +1R1
9 = -1R2	9 = -1R2	9 = -1R2
10 = R1	10 = P encoder	10 = P encoder
11 = S1	11 = B	11 = B
12 = S3	12 = B*	12 = B*
	13 = R*	13 = data*
	14 = D	14 = clock*
	15 = M sense	15 = M sense
	16 = P sense	16 = P sense
	17 = not connected	17 = not connected

8.3.6.5 Connecting the signal cables for a force-ventilated motor

The signal connection of the force-ventilated motor is located under the fan cover and cannot be seen.

You must remove the fan cover to connect the signal cable. To remove the fan cover when the motor is installed, you need a minimum clearance s at the NDE

For 1FK7



1 Fan plug connector
2 Fan cover
s Minimum clearance 125 mm

Assembly drawings/dimension sheets

9

Current dimension drawings are provided in the DT-KONFIGURATOR or in Chapter "SIMOTICS Servomotors" in Catalog D 21.4 (https://support.industry.siemens.com/cs/document/109747019/) as print version or online.

DT CONFIGURATOR

In the DT CONFIGURATOR - you can simply and quickly find

- dimension drawings
- 2D/3D CAD data

The DT CONFIGURATOR supports you when generating plant/system documentation regarding project-specific information.

Note

The 3D model in the DT CONFIGURATOR is a simplified representation that does not show all of the details.

You can find further information on the Internet at DT CONFIGURATOR (http://siemens.de/dt-konfigurator):

Recency of dimension drawings

Note

Changing motor dimensions

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

Appendix A

A.1 Glossary

Rated torque M_N

Thermally permissible continuous torque in S1 duty at the rated motor speed.

Rated speed n_N

The characteristic speed range for the motor is defined in the speed-torque diagram by the rated speed.

Rated current I_N

RMS motor phase current for generating the particular rated torque. Specification of the RMS value of a sinusoidal current.

Rated converter current $I_{N\ conv}$

RMS converter output current (per phase) that can be supplied on a continuing basis by the recommended Motor Module The recommended Motor Module is determined with the stall current $I_{0\ (100K)}$.

Braking torque $M_{br\ eff}$

$M_{br\ eff}$ corresponds to the average braking torque for armature short-circuit braking that is achieved through the upstream braking resistor R_{opt}.

Braking resistance R_{opt}

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

DE

Drive end = Drive end of the motor

Cyclic inductance L_D

The cyclic inductance is the sum of the air gap inductance and leakage inductance relative to the single-strand equivalent circuit diagram. It consists of the self-inductance of a phase and the coupled inductance to other phases.

Torque constant k_T (value for a 100 K average winding temperature rise)

Quotient obtained from the static torque and stall current.

Calculation: $k_T = M_{0,\ 100\ K} / I_{0,\ 100\ K}$

The constant applies up to approx. 2 • $M_{0,\ 60\ K}$ in the case of self-cooled motors

Note

This constant is not applicable when configuring the necessary rated and acceleration currents (motor losses!).

The steady-state load and the frictional torques must also be included in the calculation.

Electrical time constant T_{el}

Quotient obtained from the rotating field inductance and winding resistance. $T_{el} = L_D/R_{Str}$

Maximum speed n_{max}

The maximum mechanically permissible operating speed n_{max} is the lesser of the maximum mechanically permissible speed and the maximum permissible speed at the converter.

Maximum torque M_{max}

Torque that is generated at the maximum permissible current. The maximum torque is briefly available for high-speed operations (dynamic response to quickly changing loads).

The maximum torque is limited by the closed-loop control parameters.

Maximum torque (limited by converter) $M_{max\ conv}$

The maximum torque that can be applied (temporarily) for operation on the recommended motor module.

Max. current I_{max}

This current limit is only determined by the magnetic circuit. Even if this is briefly exceeded, it can result in an irreversible de-magnetization of the magnetic material. Specification of the RMS value of a sinusoidal current.

Maximum converter current $I_{max\ conv}$

RMS converter output current (per phase) that can be supplied temporarily by the recommended motor module

Maximum permissible speed (mechanical) n_{max}.

The maximum mechanically permissible speed is $n_{max\ mech}$. It is obtained from the centrifugal forces and friction forces in the bearings.

Maximum permissible speed at converter $n_{max\ conv}$

The maximum permissible operating speed for operation at a converter is $n_{max\ conv}$ (e.g. limited by withstand voltage, maximum frequency).

Mechanical time constant T_{mech}

The mechanical time constant is obtained from the tangent at a theoretical ramp-up function through the origin.

$T_{mech} = 3 \bullet R_{Str} \bullet J_{Mot}/k_T^2$ [s]

J_{Mot} = Servomotor moment of inertia [kgm^2]

R_{Str} = Phase resistance of the stator winding [Ohm]

k_T = Torque constant [Nm/A]

NDE

Non-drive end = Non-drive end of the motor

Optimum operating point

Operating point at which the maximum continuous output of the motor is normally provided at high efficiency (see figure below).

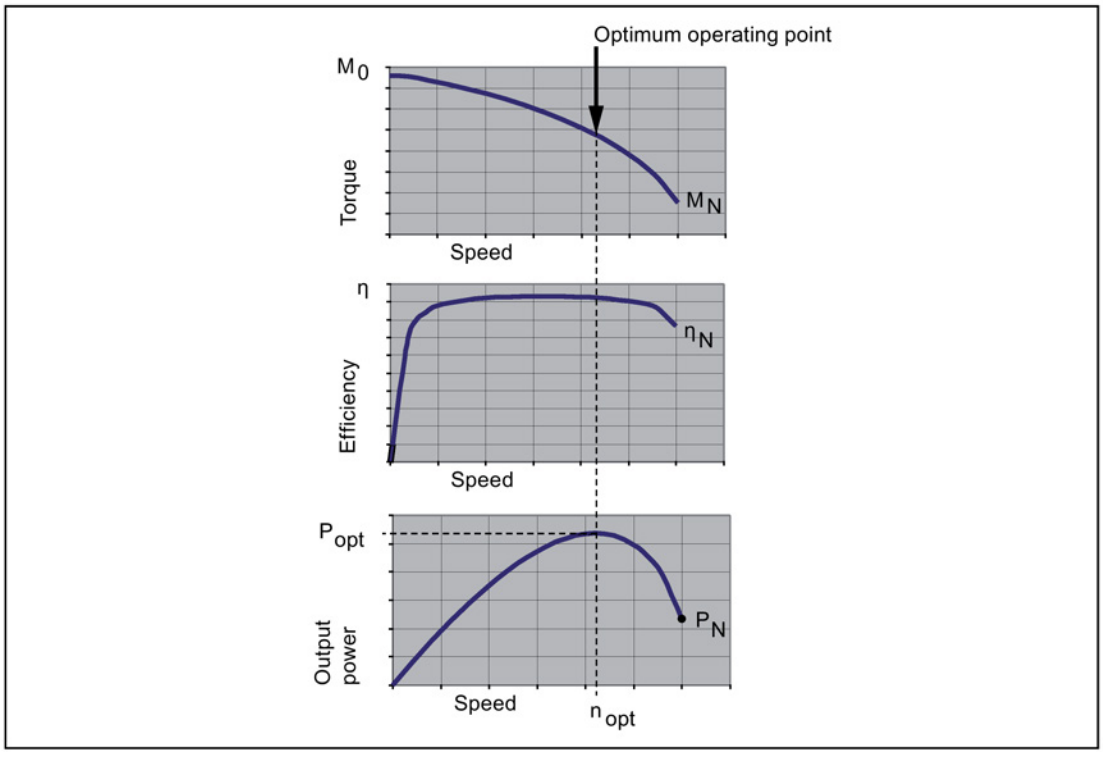


Figure A-1 Optimum operating point

Optimum speed n_{opt}

Speed at which the optimum motor power is output.

If the rated speed is less than the optimum speed, the rated speed is indicated.

Optimum power P_{opt}

Power achieved at the optimum speed.

The rated speed is the optimum speed (see optimum speed), the optimum power corresponds to the rated power.

Number of poles 2p

Number of magnetic north and south poles on the rotor. p is the number of pole pairs.

Voltage constant k_E (value at 20° C rotor temperature)

Rms value of the induced motor voltage at a speed of 1000 rpm and a rotor temperature of 20 °C.

Static torque M_0

Thermal limit torque at motor standstill corresponding to a utilization according to 100 K or 60 K. M_0 is always higher than the rated torque M_N.

Stall current I_0

Motor phase current to generate the particular stall torque ($M_0 = k_T \bullet I_0$). Specification of the RMS value of a sinusoidal current.

Thermal time constant T_{th}

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

Moment of inertia J_{Mot}

Moment of inertia of rotating motor parts. J_{Mot} = without brake, J_{MotBr} = with brake.

Shaft torsional stiffness $c_{t\,Mot}$

This specifies the shaft torsional stiffness from the center of the rotor laminated core to the center of the shaft end. $c_{t\,Mot}$ = without brake, $c_{t\,MotBr}$ = with brake.

Winding resistance R_{Str} at 20 °C winding temperature

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

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