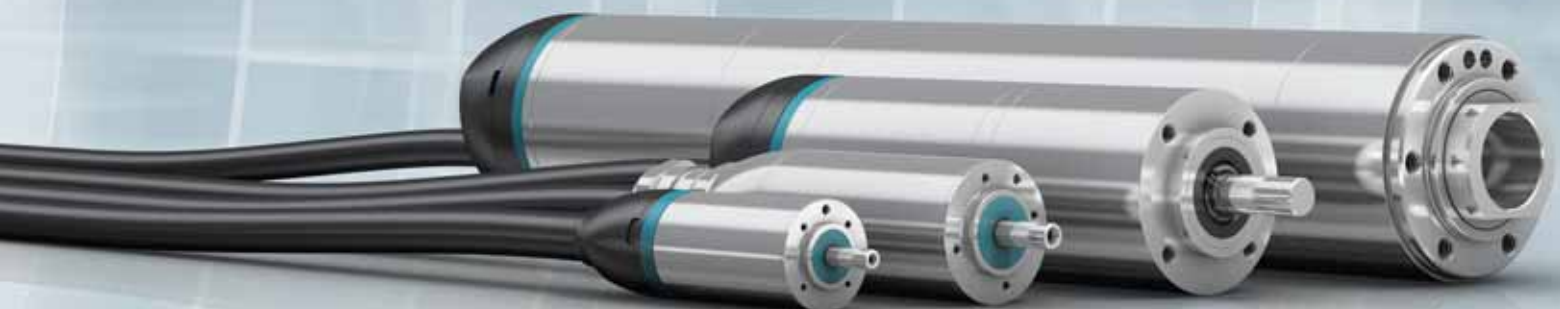


cyber[®] dynamic line

Rotating / linear electrical machine with inner rotor

Operating Manual



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This operating manual may be obtained from **WITTENSTEIN cyber motor GmbH** by specifying article number **50014370**. Alternatively, it is available to download at: <http://wittenstein-cyber-motor.de>

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1 About this manual

This manual contains the necessary information to safely operate the rotating / linear electric motor cyber[®] dynamic line, referred to as motor in the following.

If this manual is supplied with an amendment (e.g. for special applications), then the information in the amendment is valid. Contradictory specifications in this manual thereby become obsolete.

The operator must ensure that these instructions are read through by all persons assigned to install, operate, or maintain the motor, and that they fully comprehend them.

Store these instructions within reach of the motor.

These **safety instructions** should be shared with colleagues working in the vicinity of the device to ensure individual safety.

The original instructions were prepared in German; all other language versions are translations of these instructions.

1.1 Signal words

The following signal words are used to bring your attention to dangers, prohibitions, and important information:

	⚠ DANGER
	This signal word points to an imminent danger that can cause serious injuries and even death.
	⚠ WARNING
	This signal word points to a possible danger that can cause serious injuries and even death.
	⚠ CAUTION
	This signal word points to a possible danger that can cause slight to serious injuries.
	NOTICE
	This signal word points to a possible danger that can cause material damage.
	A note without signal word draws your attention to application tips or especially important information when handling the motor.

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1.2 Safety symbols

The following safety symbols are used to bring your attention to dangers, prohibitions, and important information:



General danger



Hot surface



Suspended loads



Danger of being pulled in



Magnetic field



Information



Electric voltage



Electrostatic discharge sensitive component



Crushing hazard



Pacemaker ban

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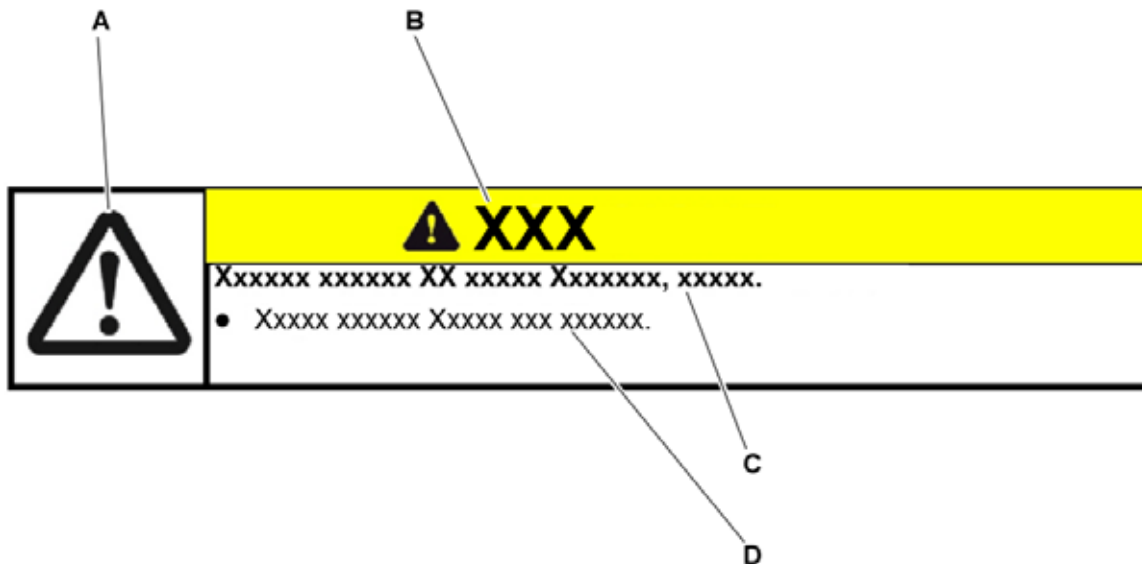
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1.3 Design of the safety instructions

The safety instructions of these instructions are designed according to the following pattern:



- A = Safety symbol (see Chapter 1.2 "Safety symbols")
- B = Signal word (see Chapter 1.1 "Signal words")
- C = Type and consequence of the danger
- D = Prevention of the danger

1.4 Information symbols

The following information symbols are used:

- Indicates an action to be performed
- ➔ Indicates the results of an action
- ⓘ Provides additional information on handling

2 Safety

This instruction, in particular the safety notes, and the rules and regulations applicable at the usage site are to be observed by all individuals working with the motor.

In addition to the safety instructions in this manual, also observe any (legal and otherwise) applicable environmental and accident prevention rules and regulations (e.g. personal safety equipment).

2.1 EC/EU Directive

The motor has been constructed in accordance with EC Directive 2009/125/EG in combination with Regulation 640/2009. The motor is – if it is not a special motor – EC compliant and therefore carries the CE mark. Observe applicable regulations for electrical installation (e.g. wire gauge, fuses).

It is the responsibility of the plant builder to ensure that all requirements that apply to the entire system are fulfilled.

The EC Declaration of Conformity can be found in the download area of our website <http://wittenstein-cyber-motor.de>. Please contact our sales department if you have any questions. Always provide the product identification number (PIN) in such cases.

2.2 Dangers

The motor has been built in accordance with the current state of the art and the generally accepted safety engineering practice.

The motor may be used for its intended purpose (ref. chapter 2.4 "Intended use") and in a flawless condition with regard to safety only in order to avoid danger to the user or damage to the machine.

- Read the general safety instructions before beginning work (see Chapter 2.7 "General safety instructions").

2.3 Personnel

Only persons who have read and understood these instructions may carry out work on the motor.

2.4 Intended use

The motor is designed for use in industrial systems.

2.5 Guarantee and liability

Guarantee and liability claims are excluded for personal injury and material damage in case of

- Ignoring the information on transport and storage
- Improper use (misuse)
- Improper or neglected maintenance and repair
- Improper assembly / disassembly or improper operation
- Operation of the motor with defective protection devices and mechanisms
- Operation of a severely soiled motor
- Changes or modifications that have been realized without the written approval of **WITTENSTEIN cyber motor GmbH**

2.6 Other applicable documents


You have already received the following documents for your specific motor:

- Dimensional drawing (5007–...)
- Motor speed and torque characteristics (5012–...)
- Data sheet – Encoder system (5093–...)


For additional information, please contact our sales department. Always provide the product identification number (PIN) in such cases.

2.7 General safety instructions


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	⚠ DANGER
	<p>Faulty electrical connections or unapproved, current-carrying components can cause serious injuries and even death.</p> <ul style="list-style-type: none"> • Have all electrical connection work performed by trained technicians only. The valid standards and directives must be observed for this. • Immediately replace damaged cables or plugs.

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	⚠ WARNING
	<p>When the motor shaft is still turning or when the motor is externally driven (generator operation), voltage is induced. This can lead to lethal current surges.</p> <ul style="list-style-type: none"> • Ensure that no plugs and connections are exposed.



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	⚠ WARNING
	<p>Components equipped with permanent magnets and components that feature magnetic fields can influence/impede the function of active medical implants (e.g. pacemakers, defibrillators). This can lead to severe injuries or even death.</p> <ul style="list-style-type: none"> • Keep a sufficient distance to these components (stator, rotor) during assembly. • If there are concerns, contact the manufacturer of the active medical implants or consult WITTENSTEIN cyber motor GmbH.

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	⚠ WARNING
	<p>Objects flung out by moving components can cause serious injuries and death.</p> <ul style="list-style-type: none"> • Remove objects and tools from the motor prior to starting it up.

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 	⚠ WARNING
	<p>Moving components on the motor can pull in or crush parts of the body and cause serious injuries and even death.</p> <ul style="list-style-type: none"> • Keep a sufficient distance to moving machine components when the motor is running. • Secure the machine against restarting and unintentional movements during assembly and maintenance work.

	<p style="text-align: center;">⚠ WARNING</p> <p>A wrong direction of rotation or direction of movement may result in serious injury or death.</p> <p>The direction of rotation or movement may differ from the standard IEC 60034-8.</p> <ul style="list-style-type: none"> • Before and during startup, ensure that the motor has the correct direction of rotation or movement. • Be sure to avoid collision (caused e.g. by crashing against an end stop). • With the danger area secured, check the direction of rotation or movement in a slow motion, ideally by limiting the current and torque.
	<p style="text-align: center;">⚠ WARNING</p> <p>A damaged motor can cause accidents with the risk of injury.</p> <ul style="list-style-type: none"> • Never operate a motor that has been overloaded due to misuse or a machine crash. • Replace the affected motors, even if no external damage is visible.
	<p style="text-align: center;">⚠ CAUTION</p> <p>A hot motor housing may cause severe burns.</p> <ul style="list-style-type: none"> • Touch the motor housing with protective gloves or after a longer standstill of the motor only.

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3 Description of the motor

3.1 General information

All motors are brushless electrical machines and conform to the following standards and regulations, in particular:

- **DIN EN 60034-1:2011** (VDE 0530) Rotating electrical machinery

The motors are therefore suitable for use in machines and systems in accordance with **DIN EN 60204-1:2007** "(VDE 0113) Safety of Machinery – Electrical Equipment of Machines".

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		Designation
	A	optional: - Connection line with plug-in connection for motor (= separately available accessory) - Connection line integrated on the motor side (INOX design)
	B	Motor housing
	C	Hole for orientation
	D	Shaft pinion / thrust tube
	E	Motor flange (output side)
	F	Fastening screw thread
	G	Identification plate

Tbl-1: Motor overview

3.2 Identification plate

The identification plate consists of a laser inscription on the motor housing. It depends on the version of the motor.

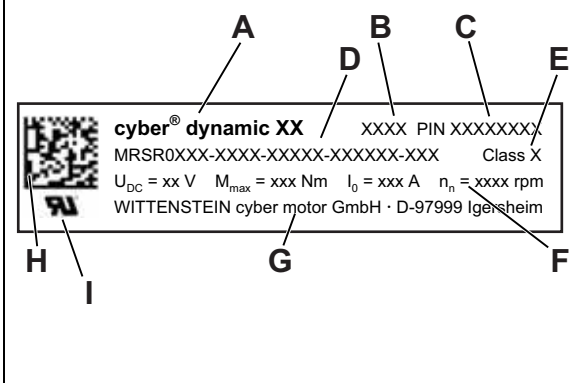
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		Designation
	A	Product name
	B	Type identification (TID)
	C	Product identification number (PIN)
	D	Technical specifications
	E	Manufacturer information
	F	Data matrix code (DMC)

Tbl-2: Identification plate, version 1 (example values)

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		Designation
	A	Product name
	B	Type identification (TID)
	C	Product identification number (PIN)
	D	Type key
	E	Insulation class
	F	Technical specifications
	G	Manufacturer information
	H	Data matrix code (DMC)
	I	UL label

Tbl-3: Identification plate, version 2 (example values)

Customer-specific deviations are permissible.

The data matrix code (DMC) is in the format C18x18 according to ECC200. It contains the following data in ASCII code:

- Digits 1-4: Type identification (TID, hexadecimal code)
- Digits 5-12: Product identification number (PIN, hexadecimal code)
- Digits 13-15: Manufacturer information ("WCM")
- Digits 16-19: Production week (calendar week/year, format: WWYY)

3.3 Performance statistics

Refer to the motor speed and torque characteristics (5012–...) for the maximum permissible technical data.

For additional information, please contact our sales department. Always provide the product identification number (PIN) in such cases.

3.4 Position encoder

- ① The information about the position encoder can be found in the additional documentation, "Data sheet - encoder system" (5093–...), which was already delivered with the documents contained in the offer.

3.5 Weight

The weight of the motor depends on the product size and design. The maximum weight is 3 kg.

4 Transport and storage

4.1 Scope of delivery



- Check the completeness of the delivery against the delivery note.
 - ① Immediately notify the carrier, the insurance company, or **WITTENSTEIN cyber motor GmbH** in writing of any missing parts or damage.

4.2 Packaging

The motor is delivered packed in foil and cardboard boxes.

- Dispose of the packaging materials at the recycling sites intended for this purpose. Observe the locally valid regulations for disposals.

4.3 Transport

	⚠ WARNING
	<p>Suspended loads can fall and can cause injuries.</p> <ul style="list-style-type: none"> • Do not stand under suspended loads. • Secure the motor with suitable fasteners (e.g. belts) before transport.
	NOTICE
	<p>Hard shocks caused by harsh handling during transportation (e.g. falling, hard dropping) can damage the motor.</p> <ul style="list-style-type: none"> • Only use hoisting equipment and transports with sufficient capacity. • The maximum permitted lift capacity of a hoist may not be exceeded. • Slowly put down the motor.

Note the weight of the payload and use an appropriate transport device.

Specifications on the weights, refer to Chapter 3.5 "Weight".

4.4 Storage

- Store the motor in a horizontal position at a temperature of 0 °C to + 40 °C in the original packaging. The ambient conditions must be dry, dust-free, and not subjected to vibrations (see Chapter 6.1 "Safety instructions and operating conditions").
- Store the motor for a maximum of 2 years.

For storage logistics, we recommend the "first in - first out" method.

The storage time can exceed the warranty period of the motor.

A warranty extension cannot be granted because of this.

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5 Assembly

- Read the general safety instructions before beginning work (see Chapter 2.7 "General safety instructions").


5.1 Preparations


	NOTICE
	<p>Pressurized air may damage the seals of the motor.</p> <ul style="list-style-type: none"> • Do not use pressurized air for cleaning the motor.

	NOTICE
	<p>If present, the temperature sensors and rotor position encoders, particularly Hall Effect sensors and encoders, can be damaged by electrostatic discharge.</p> <ul style="list-style-type: none"> • Observe the directives concerning ESD protection.

- Clean/de-grease the output shaft / thrust tube of the motor with a clean, lint-free cloth moistened with a suitable grease-dissolving but non-aggressive cleaning agent.
- Dry all fitting surfaces to neighboring components in order to achieve the proper friction values of the screw connections.
- Check the fitting surfaces additionally for damage and impurities.
- For all motors, use screws with property class A2-70.
- Do **not** use washers.

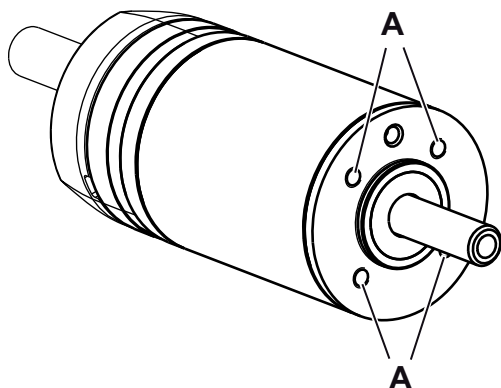
5.1.1 Preparations for ALxx series (linear actuators)

	NOTICE
	<p>Improper assembly can damage the linear actuator.</p> <ul style="list-style-type: none"> • Only install the linear actuator on level, no-vibration, rigid structures. • Ensure freedom of motion of the customer application. • Arrange the linear actuator and the application optimally with respect to one other to avoid lateral forces and thus premature wear of the threaded spindle. • Avoid lateral forces and bending torques on the screw. • Avoid banging and knocking the screw.

	NOTICE
	<p>Moving outside the permissible stroke path, at both the minimum and maximum position, will damage the threaded spindle.</p> <ul style="list-style-type: none"> • Limit the stroke of the linear actuator using appropriate measures (e.g. stops, buffers) for the extended and retracted end position. <ul style="list-style-type: none"> ① These end stops must be dimensioned appropriately and be capable of absorbing the kinetic energy of the moving parts, which may be moving at high speeds.

5.2 Attaching motor to a machine

	<ul style="list-style-type: none"> ● Observe the safety and processing instructions for the threadlocker to be used.
--	---



- Coat the fastening screws with a threadlocker.
- Fasten the motor to the machine with the fastening screws through the through-holes (A).
 - ① Mount the motor in such a way that the identification plate remains legible.
 - ① Only use washers for motors that have an aluminum flange.
 - ① For specified tightening torques for screws of property class A2-70, see section 9.1 "Tightening torques for common thread sizes in general mechanical engineering", Table "Tbl-9".

	NOTICE
	<p>Fastening screws that are screwed in too far can damage the motor.</p> <ul style="list-style-type: none"> ● Screw in the screws only up to their maximum depth. ① See dimensional drawing (5007–...)

5.3 Mounted components on the gear output side

	NOTICE
	<p>Tensions during the assembly may damage the motor.</p> <ul style="list-style-type: none"> ● Assemble the gears and the toothed belt pulleys without force on the output shaft. ● Do not on any account attempt an assembly by force or hammering! ● Only use suitable tools and equipment for assembly.

For additional information, please contact our sales department. Always provide the product identification number (PIN) in such cases.

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5.4 Installing electrical connections

	⚠ DANGER
	<p>Electrically live parts cause electric shocks if touched, leading to serious injuries and even death.</p> <ul style="list-style-type: none"> ● Observe the five safety rules of electrical engineering before starting electrical installation work: <ul style="list-style-type: none"> - Disconnect. - Secure against being switched on again. - Check that there is no voltage. - Ground and short-circuit. - Cover neighboring and electrified parts. ● Before switching the voltage back on, check that all electrified parts are equipped with suitable and undamaged contact protection. ● Check that protective caps are on the plugs. If protective caps are missing, check the plugs for damage and soiling.

	⚠ DANGER
	<p>Electric operation during moisture may result in electric shocks and can cause serious injuries and even death.</p> <ul style="list-style-type: none"> ● Execute the electric assembly only in dry areas.

	<p>Improperly routed cables can get damaged.</p> <ul style="list-style-type: none"> ● Route the feed line of the motor in such a way that a minimum bending radius of 10 x outer diameter (mobile) or 5 x outer diameter (rigid) is observed. ● The cable specifications can be found in the dimensional drawing (5007-...). ● Avoid twisting the cable by more than ±30° over a length of 1 meter. ● The maximum permissible tensile strain of the feed line can be found in Table "Tbl-4".
--	---

Size	F _{max} [N]
cyber [®] dynamic 17	10
cyber [®] dynamic 22	15
cyber [®] dynamic 32	17
cyber [®] dynamic 40	20

Tbl-4: Maximum permissible tensile strain

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6 Startup and operation

6.1 Safety instructions and operating conditions

- Read the general safety instructions before beginning work (see Chapter 2.7 "General safety instructions").

	<p>Improper use can cause damage to the motor.</p> <ul style="list-style-type: none"> • Ensure that the limit values from the following sub-chapters are observed. • If this requirement cannot be fulfilled, please contact our sales department. Always provide the product identification number (PIN) in such cases. • Operate the motor only when it is firmly mounted.
--	--

6.1.1 Humidity / Temperature

For continuous operation of motors, the limit values are valid according to the classification 3K4 acc. to DIN EN 60721-3-3:1995, Table 1 (see Table "Tbl-5").

Temperature range	Relative humidity	Absolute humidity	Temperature change speed
0 ... 40°C ^a	5 ... 95%	1 ... 29 g/m ³	0.5 °C/min
^a extended in comparison to standard value			

Tbl-5: Limit values for temperature and humidity

6.1.2 Vibration

Based on sinusoidal vibrations in the stationary area of application, the limit value is valid in compliance with DIN EN 60721-3-3:1995 and DIN EN 60068-2-6:2007.

Maximum permissible vibration load (55-2000 Hz)
10 m/s ²

Tbl-6: Limit value for vibration load


6.1.3 Shock

For the maximum permissible shock load (brief acceleration), the limit values are valid in compliance with DIN EN 60721-3-3:1995 and DIN EN 60068-2-27:2009.

Direction	Maximum permissible shock load (11 ms)
axial	10 m/s ²
radial	150 m/s ²


Tbl-7: Limit values for shock load

6.2 Data for the electrical startup

	NOTICE
	<p>The servo controllers of the different manufacturers generally have their proprietary data specifications.</p> <p>If the data is disregarded, the motor and/or the servo controller may be damaged.</p> <ul style="list-style-type: none"> ● Observe the listed units precisely and check their conformance with the units of the servo controller. ● If the units differ, make the necessary adjustment accordingly.

- ① In some servo controllers, there is a dependence between the individual parameters. We would be glad to assist you in finding the correct entries.
- For additional information, please contact our sales department. Always provide the product identification number (PIN) in such cases.

6.3 Operation

	NOTICE
	<p>Due to oxygen in the air, UV rays, and cable movements, the bearing grease and the insulation materials age.</p> <ul style="list-style-type: none"> ● Consult our sales department in case of excessive wear.

Circumferential radial forces on the shaft are not permitted.

- ① If this requirement cannot be fulfilled, please contact our sales department. Always provide the product identification number (PIN) in such cases.

7 Maintenance and disposal

- Read the general safety instructions before beginning work (see Chapter 2.7 "General safety instructions").

7.1 Maintenance work

7.1.1 Cleaning

Clean the motor with a grease-dissolving, non-aggressive detergent.

7.1.2 Visual inspection

Perform a **monthly** visual inspection:

- Check the motor and moving cables for damage.
- Check whether the cables are completely labeled.

The motor can be optionally equipped with a felt ring.

- Check the felt ring for damage every 4000 hours.
 - ① Replacing the felt ring is recommended every 8000 hours.

7.2 Start-up after maintenance work

- Attach all safety devices.

7.3 Information on the lubricant used




A change of lubricant in motors of this design is not necessary. All motor bearings, gearheads and threaded spindles are permanently lubricated at the factory.

7.4 Disposal

- Dispose of the motor at the recycling sites intended for this purpose.
- Observe the applicable national regulations concerning disposal.

8 Malfuncions

	NOTICE
	<p>Changed operational behavior can be an indication of existing damage to the motor or cause damage to the motor.</p> <ul style="list-style-type: none"> Do not put the motor back into operation until the cause of the malfunction has been rectified.

Fault	Possible cause	Solution
Motor does not start	Incorrectly connected	Check the connections using the signal list
	Contact pin of the plug is bent	Check the connections
	Parameter set does not correspond to motor	Check the motor data record in the power electronics
Increased operating temperature	Motor is heavily soiled	Clean the outside of the motor
	Ambient temperature too high/low air pressure due to altitude	Ensure adequate cooling.
	Motor becomes very hot	Check the power electronics of the motor and the power supply or consult our Customer Service department.
	Threaded spindle heavily worn	Consult our Customer Service department.
Increased operating noises	Damaged bearings	Consult our Customer Service department.
	Threaded spindle or gearhead damage	
Sporadic failure	Cable break	Consult our Customer Service department.

Tbl-8: Malfuncions

The contact information of our Customer Service department can be found at the beginning of this manual (inside cover page). Always provide the product identification number (PIN).

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9 Appendix

9.1 Tightening torques for common thread sizes in general mechanical engineering

The specified tightening torques for headless screws and nuts are calculated values and are based on the following conditions:

- Calculation in accordance with VDI 2230 (February 2003 version)
- Friction value for thread and contact surfaces $\mu=0.10$
- Exploitation of the yield stress 90%
- Torque tools type II classes A and D in accordance with ISO 6789

The settings are values rounded to usual commercial scale gradations or setting possibilities.

- Set these values **precisely** on the scale.

	Tightening torque [Nm] with thread					
Property class Screw / Nut	M1.6	M2	M2.5	M3	M4	M5
A2-70	0.109	0.227	0.460	0.806	1.86	3.68

Tbl-9: Tightening torques for headless screws and nuts

Revision history

Revision	Date	Comment	Chapter
01	23.08.13	New version	All
02	26.02.15	Technical data, Tightening torques, Layout	3, 5, 9.3, All
03	08.08.17	Safety, Technical data	2 3, 4, 5, 7, 8, 9



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