

# cyber<sup>®</sup> dynamic line

Rotating / linear electrical machine

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 information which is necessary for the safe use of the electromagnetic actuator of the cyber<sup>®</sup> dynamic line. The electromagnetic actuator (including motors, motor-gearbox combinations and linear actuators) will be referred to simply as the motor in the following. Each motor is technically clearly described by its material number (MN, current designation) or its article code (AC, earlier designation) and its serial number (SN, current designation) or its product identification number (PIN, earlier designation) (see also chapter 3.2 "Name plate").

In case of conflict between this general operating manual and the material-specific documentation, the material-specific documentation applies. This operating manual is valid for the product (motor) unless another, material-specific documentation exists.

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 void.

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.

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## 1.1 Signal words

The following signal words are used to indicate possible hazards, prohibitions, and important information:

	<b>⚠ DANGER</b>
	This signal word indicates an imminent danger that will cause serious injuries or even death.
	<b>⚠ WARNING</b>
	This signal word indicates a potential hazard that could cause serious injuries and even death.
	<b>⚠ CAUTION</b>
	This signal word indicates a potential hazard that could cause minor or serious injuries.
	<b>NOTICE</b>
	This signal word indicates a potential hazard that could lead to 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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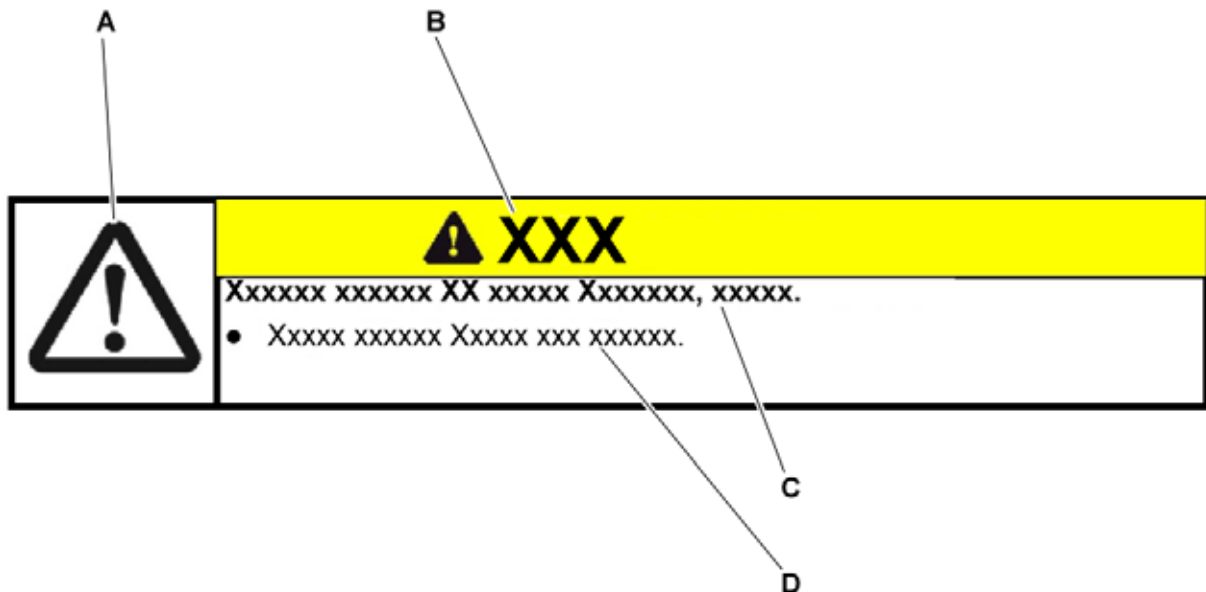
### 1.2 Safety symbols

The following safety symbols are used to indicate possible hazards, prohibitions, and important information:



### 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 conjunction 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 is in the download area of our website <http://wittenstein-cyber-motor.de>. Please contact our sales department if you have any questions. Always enter the serial number (SN, current designation) or the product identification number (PIN, previous designation).

The motor and all its individual components are RoHS compliant according to the Directive 2011/65 / EU, unless customer specific requirements make this directive void.

### 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–...)

Please contact our Sales department for additional information. Always enter the serial number (SN, current designation) or the product identification number (PIN, previous designation).





2.7 General safety instructions


	<b>⚠ DANGER</b>
	<p><b>Faulty electrical connections or not approved, current-carrying components can cause serious injuries and even death.</b></p> <ul style="list-style-type: none"> <li>● Have all electrical connection work performed by trained technicians only. The valid standards and directives must be observed for this.</li> <li>● Only suitable tools may be used for connection work.</li> <li>● Immediately replace damaged cables or plugs.</li> </ul>


① Electrical connection work refers to all work on the electrical circuit for which faults and associated hazards cannot be excluded.

Typically, plugging motor connectors into power electronics sockets in a voltage-free state is not part of this electrical connection work.

	<b>⚠ WARNING</b>
	<p><b>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 pulses.</b></p> <ul style="list-style-type: none"> <li>● Ensure that no plugs or connections are exposed.</li> </ul>

	<b>⚠ WARNING</b>
	<p><b>Connecting the power and signal leads under voltage (e.g. plugging the motor connectors into the live sockets of the power electronics) is not permitted and can lead to machine damage, serious injury or even death.</b></p> <ul style="list-style-type: none"> <li>● Make sure that the motor and the motor connections of the electronics (for power and signal) are always in a voltage-free state before connecting.</li> </ul>

	<b>⚠ WARNING</b>
	<p><b>Separation of the power and signal supply lines under voltage is not permitted and can lead to machine damage, serious injury or even death.</b></p> <ul style="list-style-type: none"> <li>● Make sure that the drive is always in a voltage-free state before disconnecting its power and signal supply (e.g. disconnecting the motor connectors).</li> </ul>

	<b>⚠ WARNING</b>
	<p><b>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.</b></p> <ul style="list-style-type: none"> <li>● Keep a sufficient distance to these components (stator, rotor) during assembly.</li> <li>● If permanent magnets or permanent magnetic fields are directly accessible (especially with rotary kit motors or the primary and secondary parts of linear motors), you are prohibited from approaching these motor parts.</li> <li>● If there are concerns, contact the manufacturer of the active medical implants or consult <b>WITTENSTEIN cyber motor GmbH</b>.</li> </ul>

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	<p style="text-align: center;"><b>⚠ WARNING</b></p> <p><b>Objects flung out by moving components can cause serious injuries and death.</b></p> <ul style="list-style-type: none"> <li>• Remove objects and tools from the motor prior to starting it up.</li> </ul>
 	<p style="text-align: center;"><b>⚠ WARNING</b></p> <p><b>Moving components on the motor can pull in or crush parts of the body and cause serious injuries and even death.</b></p> <ul style="list-style-type: none"> <li>• Keep a sufficient distance to moving machine components when the motor is running.</li> <li>• Secure the higher-level machine against restarting and unintentional movements during assembly and maintenance work (e.g. uncontrolled lowering of lifting axes).</li> </ul>
	<p style="text-align: center;"><b>⚠ WARNING</b></p> <p><b>A wrong direction of rotation or direction of movement may result in serious injury or death.</b></p> <p><b>The direction of rotation or movement may differ from the standard IEC 60034-8.</b></p> <ul style="list-style-type: none"> <li>• Before and during startup, ensure that the motor has the correct direction of rotation or movement.</li> <li>• Be sure to avoid collision (caused e.g. by crashing against an end stop).</li> <li>• With the danger area secured, check the direction of rotation or movement in a slow motion, ideally by limiting the current and torque.</li> </ul>
	<p style="text-align: center;"><b>⚠ WARNING</b></p> <p><b>A damaged motor can cause accidents with the risk of injury.</b></p> <ul style="list-style-type: none"> <li>• Never operate a motor that has been overloaded due to misuse or a machine crash.</li> <li>• Replace the affected motors, even if no external damage is visible.</li> </ul>
	<p style="text-align: center;"><b>⚠ CAUTION</b></p> <p><b>A hot motor housing may cause severe burns.</b></p> <ul style="list-style-type: none"> <li>• Touch the motor housing with protective gloves or after a longer standstill of the motor only.</li> </ul>
	<p style="text-align: center;"><b>⚠ CAUTION</b></p> <p><b>During the mechanical assembly of the motors onto the application, and during mechanical maintenance work, handling errors can lead to severe crushing injuries as well as to damage to the motor or the application.</b></p> <ul style="list-style-type: none"> <li>• Have all mechanical assembly and maintenance work carried out by trained personnel only.</li> <li>• Only use suitable tools for assembly and maintenance work.</li> </ul>

	<b>⚠ CAUTION</b>
	<p><b>During the mechanical assembly and maintenance of kit motors (rotary motors without housings or linearly moving primary and secondary parts), the attractive forces of the permanent magnets can cause severe crushing injuries and damage to the motor or the application.</b></p> <ul style="list-style-type: none"><li>• Have all mechanical assembly and maintenance work carried out by trained personnel only.</li><li>• Only use suitable (e.g. non-ferromagnetic) tools for assembly and maintenance work.</li></ul>

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### 3 Description of the motor

#### 3.1 General information

All motors are brushless electrical machines and conform to the applicable 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".

In general, the **ALxx series motors (linear actuators)** consist of a synchronous servo motor with integrated threaded spindle and bearings:

- The rotation of the motor is transformed into a linear movement of the tappet via the threaded spindle. Ball screws are used as threaded spindles.

		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	Name plate

Tbl-1: Motor overview

#### 3.2 Name plate

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

Customer-specific deviations from these are permissible.

The Data Matrix Code (DMC) corresponds to the format C18x18 according to ECC200. It contains the service portal address including the service portal code.

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### 3.2.1 MRxx identification plate (motor)

		Designation
	A	Product designation
	B	Type key
	C	Material number
	D	Insulation class
	E	Protection class
	F	Calendar week and year of production
	G	Serial number
	H	CE marking
	I	Service Portal Code
	J	Data matrix code (DMC)
	K	Intermediate voltage $U_{DC}$
	L	Continuous stall torque $M_0$
	M	Continuous stall current $I_0$
	N	No-load speed $n_0$
	O	Manufacturer
	P	UL label

Tbl-2: MRSR identification plate

### 3.2.2 ARxx identification plate (motor-gearbox combination)

		Designation
	A	Product designation
	B	Type key
	C	Material number
	D	Insulation class
	E	Protection class
	F	Calendar week and year of production
	G	Serial number
	H	CE marking
	I	Service Portal Code
	J	Data matrix code (DMC)
	K	Intermediate voltage $U_{DC}$
	L	Continuous stall torque $M_0$
	M	Continuous stall current $I_0$
	N	Maximum permissible speed $n_{max}$
	O	Manufacturer
	P	Gear ratio
Q	UL label	

Tbl-3: ARSQ identification plate

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**3.2.3 ALxx identification plate (linear actuator)**

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		Designation
	A	Product designation
	B	Type key
	C	Material number
	D	Insulation class
	E	Protection class
	F	Calendar week and year of production
	G	Serial number
	H	CE marking
	I	Service Portal Code
	J	Data matrix code (DMC)
	K	Intermediate voltage $U_{DC}$
	L	Continuous standstill force $F_0$
	M	Continuous stall current $I_0$
	N	Maximum speed $v_{max}$
	O	Manufacturer
	P	Pitch
Q	UL label	

Tbl-4: ALSR identification plate

**3.3 Performance data**

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

Please contact our Sales department for additional information. Always enter the serial number (SN, current designation) or the product identification number (PIN, previous designation).

**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 Missing parts or damage must be notified immediately in writing to the carrier, the insurance company, or **WITTENSTEIN cyber motor GmbH**.

### 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 applicable national regulations concerning disposal.

### 4.3 Transport

	⚠ WARNING
	<p><b>Suspended loads can fall and can cause injuries.</b></p> <ul style="list-style-type: none"> <li>• Do not stand under suspended loads.</li> <li>• Secure the motor with suitable fasteners (e.g. belts) before transport.</li> </ul>
	NOTICE
	<p><b>Hard shocks caused by harsh handling during transportation (e.g. falling, hard dropping) can damage the motor.</b></p> <ul style="list-style-type: none"> <li>• Only use hoisting equipment and lifting accessories with sufficient capacity.</li> <li>• Never exceed the maximum permissible load for hoisting equipment.</li> <li>• Slowly put down the motor.</li> </ul>

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

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

Ambient temperatures between -20 °C and +50 °C are permissible for transport only.

### 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 information and environmental 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.

## 5 Assembly

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


### 5.1 Preparations


	<p><b>Pressurized air may damage the seals of the motor.</b></p> <ul style="list-style-type: none"> <li>• Do not use pressurized air for cleaning the motor.</li> </ul>
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	<p><b>If present, the temperature sensors and rotor position encoders, particularly Hall Effect sensors and encoders, can be damaged by electrostatic discharge.</b></p> <ul style="list-style-type: none"> <li>• Observe the directives concerning ESD protection.</li> </ul>
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- 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)

	<p style="text-align: center;"><b>NOTICE</b></p> <p><b>Improper assembly can damage the linear actuator.</b></p> <ul style="list-style-type: none"> <li>• Only install the linear actuator on level, no-vibration, rigid structures.</li> <li>• Ensure freedom of motion of the customer application.</li> <li>• 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.</li> <li>• Avoid lateral forces and bending torques on the screw.</li> <li>• Avoid banging and knocking the screw.</li> </ul>
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	<p style="text-align: center;"><b>NOTICE</b></p> <p><b>Moving outside the permissible stroke path, at both the minimum and maximum position, will damage the threaded spindle.</b></p> <ul style="list-style-type: none"> <li>• 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"> <li>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.</li> </ul> </li> </ul>
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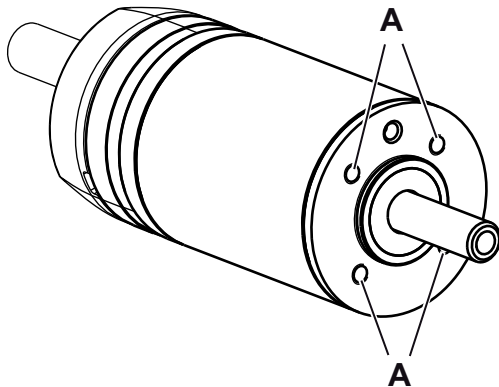
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### 5.2 Attaching motor to a machine


	<ul style="list-style-type: none"> <li>● Observe the safety and processing instructions for the threadlocker to be used.</li> </ul>
	<p>① Installation examples for reaching specific IP protection classes 10 "Appendix II".</p>



- Coat the fastening screws with a threadlocker.
- Fasten the motor to the machine with the fastening screws through the threaded 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 "TbI-8".

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

### 5.3 Components mounted to the output side

	NOTICE
	<p><b>Tensions during the assembly may damage the motor.</b></p> <ul style="list-style-type: none"> <li>● Assemble the gears and the toothed belt pulleys without force on the output shaft.</li> <li>● Never attempt to assemble by force or hammering!</li> <li>● Only use suitable tools and devices for assembly.</li> </ul>

Please contact our Sales department for additional information. Always enter the serial number (SN, current designation) or the product identification number (PIN, previous designation).

5.4 Installing electrical connections

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

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

français

	<p><b>Improperly routed cables can get damaged.</b></p> <ul style="list-style-type: none"> <li>● Make sure that the maximum power length of the power-carrying connecting cable between motor and power electronics does not exceed 25m.</li> <li>● Route the feed line of the motor in such a way that a minimum bending radius of 10 x outer diameter (mobile) or 3 x outer diameter (rigid) is observed.</li> <li>● The cable specifications can be found in the dimensional drawing (5007-...).</li> <li>● Avoid twisting the cable by more than <math>\pm 30^\circ</math> over a length of 1 meter.</li> <li>● The maximum permissible tensile strain of the feed line can be found in Table "Tbl-5".</li> </ul>
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español

Size	$F_{max}$ [N]
cyber <sup>®</sup> dynamic 17	10
cyber <sup>®</sup> dynamic 22	15
cyber <sup>®</sup> dynamic 32	17
cyber <sup>®</sup> dynamic 40	20

Tbl-5: Maximum permissible tensile strain

日本語

## 6 Startup and operation

### 6.1 Safety information and environmental conditions

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

	<p><b>Improper use can cause damage to the motor.</b></p> <ul style="list-style-type: none"> <li>• Ensure that the limit values in the following sub-chapters are observed.</li> <li>• If this requirement cannot be fulfilled, please contact our sales department. Always enter the serial number (SN, current designation) or the product identification number (PIN, previous designation).</li> <li>• Only operate the motor when it is firmly mounted.</li> </ul>
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#### 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-6").

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

Tbl-6: Limit values for temperature and humidity

#### 6.1.2 Environmental conditions for vibration/shock

The drive system fulfills the following specifications:

- Vibration according to DIN EN 60068-2-6:2008
  - Frequency range 10 Hz –150 Hz
  - Acceleration: 5 g
- Shock according to DIN EN 60068-2-27:2010
  - Shock form: semi-sinusoidal
  - Acceleration: 50 g
  - Shock duration: 11 ms

### 6.2 Holding brake

The following instructions apply exclusively to **electrical** holding brakes.

- If the motor is equipped with a holding brake, ensure that this brake is vented during startup, and that the motor is never operated with the brake applied.
  - ① The brake is applied in a currentless state. Control of the brake is performed by the customer using the regulating device. Technical data on the brake can be found on the name plate and in the technical documentation.
  - ① A holding brake is no safety brake, as defined by DIN EN 13849-1 or by the German BGHM regarding hanging axes (only available in German), and is therefore not intended to be used as a brake for the protection of persons or as a dynamic brake.

#### 6.2.1 Emergency stop

The effective braking torques of a holding brake differ due to physical factors, and it is necessary to consider use during a malfunction as well as normal operation:

- In normal use, the operating principle when using the holding brake to clamp / secure an axle in standstill is a static friction with the friction coefficient  $\mu_H$ . This means the "static holding torque"  $M_4$  as specified in the specification sheets is reached.

- In the case of a malfunction, the operating principle when using the holding brake to shut down a moving axle (emergency stop) is a dynamic friction with the friction coefficient  $\mu_G$ . This means the "dynamic braking torque" is reached. The dynamic braking torque is lower than the static holding torque  $M_4$ .
- Observe the design of the axle to ascertain if the holding brake may be used for an emergency stop:
  - The maximum occurring load torque,
  - The maximum distance available,
  - The moment of inertia of the entire axle, and
  - The maximum energy in the entire axle.
- ① Otherwise the delay effect of the brake may not be enough to stop the axle.

**The holding brake may become worn if used for emergency stop. For this reason, it is recommended that the required holding torque for the axle is at most 60% of the static holding torque  $M_4$  of the holding brake used.**

### 6.2.2 Running in the holding brake

The holding brake may no longer reach the specified holding torque  $M_4$  due to the effects of storage, conditions or type of use, overvoltage or high temperature, combined with ambient conditions (soiling, humidity, etc.).

Use of the following data is recommended if no data is available for the motor regarding the run-in process:

- Within 24 h **of the first startup**, grind in the brake as follows:
  - The brake is applied
  - At a speed of  $100 \text{ min}^{-1}$
  - Once for 5 revolutions
  - Ambient temperature between  $0 \text{ °C}$  and  $+40 \text{ °C}$
- Grind in the brake **after startup** as follows:
  - Apply and release every 500 ms
  - At a speed of  $100 \text{ min}^{-1}$
  - For a duration of 30 s
  - Ambient temperature between  $0 \text{ °C}$  and  $+40 \text{ °C}$
- To restore the holding power, perform the following run-in procedure:
  - Apply the brake briefly for a defined time (at the specified speed of the motor and for a defined number of runs) and then release it again.
  - Or, drive the motor against the applied brake for a defined number of revolutions at a specified speed.
- ① For additional information and for correct data on the grinding-in process, contact our Sales department. Always state the serial number (SN) when doing so.

### 6.2.3 Commissioning the holding brake

To make sure the holding brake is functioning, it has to be tested during startup.

- If the regulating device has a function for integrated testing of the holding torque during secure limited movement and secure limited speed, then use this function and observe the instructions from the regulating device's manufacturer.

If no such function is present, we recommend that the user proceeds as follows:

- Limit the permitted range of movement and the maximum speed using the parameters in the regulating device so that no danger to persons or property can arise from movement of the axle.

- Calculate the power of the motor  $I_{M4}$  required to achieve the holding torque  $M_4$  with the torque constant, and limit the maximum current of the regulating device to this value.
- Apply current to the motor with the holding brake applied, gradually increasing the current to  $I_{M4}$ . During this, the motor must not move. Observe the permitted time for applying current of  $I_{M4}$  to the motor.
- If movement does occur, the user should ideally switch off the current supply automatically to avoid uncontrolled movement of the axle.
- If the holding torque  $M_4$  is not reached, perform the grinding-in process described by the brake manufacturer.
- After the grinding-in process check again the holding torque  $M_4$ .

If the holding torque  $M_4$  specified in the brake's technical data is reached, then the holding brake is ready for operation.

If the holding torque  $M_4$  specified in the brake's technical data is **not** reached then:

- Repeat the grinding-in procedure.
  - ① The grinding-in process may only be repeated twice during a testing procedure for the holding torque  $M_4$ .

If the holding torque  $M_4$  is not reached after the third grinding-in process then the holding brake is **not functioning properly**:


- Do **not** start up the drive. Contact our sales department.
  - ① Always state the serial number (SN) when doing so.

#### 6.2.4 Testing the holding brake regularly

To ensure the permanent functioning of the holding brake, it has to be regularly applied and checked.

- It is recommended that the holding brake is released and applied at least twice daily by deactivating the controller.
- It is recommended that the holding torque  $M_4$  of the brake is checked at least once a day.

### 6.3 Data for the electrical startup

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

- ① In some servo controllers, there are dependencies between individual parameters. We would be glad to assist you in finding the correct entries.



## NOTICE

**Moving the motor during the switch-on process of the encoder system can lead to malfunctions.**

- When commissioning the motor, make sure that the motor is not moved during the switch-on process of the encoder system.
- The switch-on process is completed as soon as the encoder system supplies valid position data.
- The motor may be moved.

- Please contact our Sales department for additional information. Always enter the serial number (SN, current designation) or the product identification number (PIN, previous designation).

### 6.4 Operation



## NOTICE

**Due to oxygen in the air, UV rays, and cable movements, the bearing grease and the insulation materials age.**

- 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 enter the serial number (SN, current designation) or the product identification number (PIN, previous designation).



## NOTICE

**Due to various components and seals, a new drive can be noticeably more difficult to move. To ensure optimum grease distribution and running-in of the moving components, the drive should run in as follows:**

- 15 min at slow speed load-free (approx. 10% v<sub>max</sub>)
- 10 min at medium speed load-free (approx. 30% v<sub>max</sub>)
- 5 min with increased speed load-free (approx. 60% v<sub>max</sub>)

- ① If a stop occurs as a result of the switch-off due to excessive heating, a pause between the individual stroke cycles is recommended.



Due to the stroke movement of the piston rod, a certain amount of lubricant leakage is possible with the ALxx version.

## 7 Maintenance and disposal

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

### 7.1 Maintenance

#### 7.1.1 Cleaning

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

#### 7.1.2 Checking the holding brake

The motor can be optionally equipped with a holding brake.

To ensure the permanent functioning of the holding brake, it has to be regularly applied and checked.

- It is recommended that the holding brake is released and applied at least twice daily by deactivating the controller.
  - It is recommended that the holding torque  $M_4$  of the brake is checked at least once a day.
- ① Details can be found in chapter 6.2 "Holding brake".

#### 7.1.3 Visual inspection

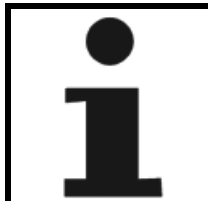
Perform a **monthly** visual inspection:

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

### 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 Malfunctions

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

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 gearbox damage	
Sporadic failure	Cable break	Consult our Customer Service department.

Tbl-7: Malfunctions

The contact information of our Customer Service department can be found at the beginning of this manual (inside cover page). Always enter the serial number (SN, current designation) or the product identification number (PIN, previous designation).





## 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 according to VDI 2230 (edition 11/2015)
- Friction value for thread and contact surfaces  $\mu=0.10$
- Utilization 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 settings.

- Use the **exact** values in this table to set your tools.

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

Tbl-8: Tightening torques for headless screws and nuts

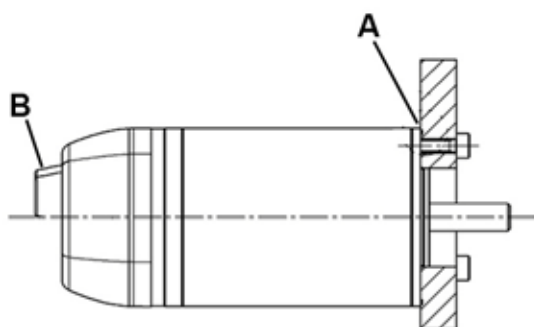
## 10 Appendix II

### 10.1 Attachment recommendation

As the specific installation situation at the customer site is not known, the following attachment recommendations are only to be regarded as examples.

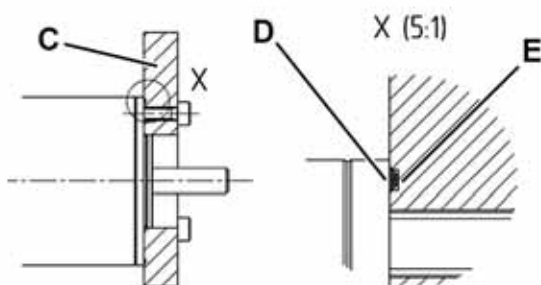
**WITTENSTEIN cyber motor GmbH** does not assume any liability for constructive integration by the customer.

#### 10.1.1 Attachment recommendation: Standard (IP54)



By default, **cyber<sup>®</sup> dynamic line Standard** features

- protection class IP54 on the cable outlet side (B),
- protection class IP20 on the customer outlet side (A).



To also achieve protection class IP54 at the connection to the application, the following steps are recommended:

- Incorporate a circular groove (E) into the mountable flange (C).
- Insert an O-ring into the circular groove.
- Screw the **cyber<sup>®</sup> dynamic line Standard** to the mountable flange.
  - By tightening the screws, the O-ring is squeezed and protection class IP54 is ensured.

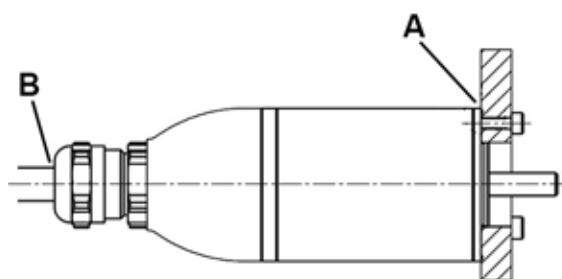
① Dimensions and tightening torques can be found in table "Tbl-1".

	cyber <sup>®</sup> dynamic line, Standard			
Size	17	22	32	40
O-ring [mm]	15 x 0.5	20 x 0.5	30 x 0.5	38 x 1.0
Screws	4 x M1.6	4 x M2	4 x M2.5	4 x M3
Tightening torque (A2-70) [Nm]	0.11	0.23	0.46	0.81

Tbl-1: Attachment of cyber<sup>®</sup> dynamic line, Standard

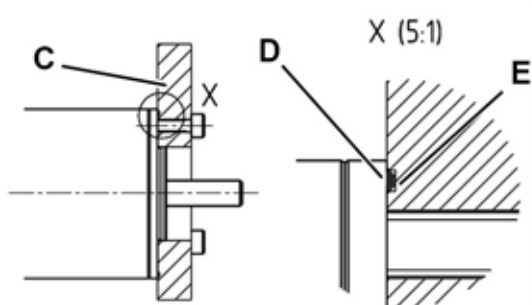
① As the shaft end has a lower protection class (IP20), design measures should be implemented in the unit to protect it from dust and spraying water (e.g. encapsulation in the unit). If this is not possible, it is recommended that you use a drive with a higher protection class.

### 10.1.2 Attachment recommendation: Inox Design (IP66/67)



By default, **cyber<sup>®</sup> dynamic line Inox Design** features

- protection class IP66/67 on the cable outlet side (B),
- protection class IP20 on the customer outlet side (A).



To also achieve protection class IP66/67 at the connection to the application, the following steps are recommended:

- Incorporate a circular groove (E) into the mountable flange (C).
- Insert an O-ring into the circular groove.
- Screw the **cyber<sup>®</sup> dynamic line Inox Design** to the mountable flange.
  - ➡ By tightening the screws, the O-ring is squeezed and protection class IP66/67 is ensured.

① Dimensions and tightening torques can be found in table "Tbl-2".

	<b>cyber<sup>®</sup> dynamic line, Inox Design</b>			
<b>Size</b>	<b>17</b>	<b>22</b>	<b>32</b>	<b>40</b>
<b>O-ring [mm]</b>	15 x 0.5	20 x 0.5	30 x 0.5	38 x 1.0
<b>Screws</b>	4 x M1.6	4 x M2	4 x M2.5	4 x M3
<b>Tightening torque (A2-70) [Nm]</b>	0.11	0.23	0.46	0.81

Tbl-2: Attachment of cyber<sup>®</sup> dynamic line, Inox Design

① As the shaft end has a lower protection class (IP20), design measures should be implemented in the unit to protect it from dust and spraying water (e.g. encapsulation in the unit). If this is not possible, it is recommended that you use a drive with a higher protection class.

### 10.1.3 Attachment recommendation: Hygienic Design (IP69K)

deutsch

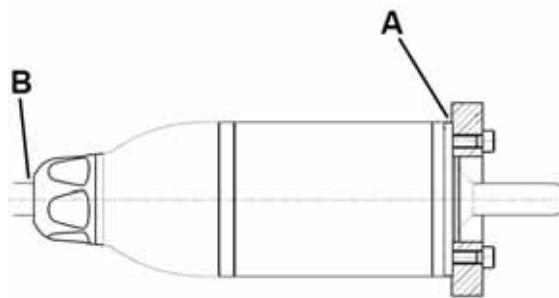
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français

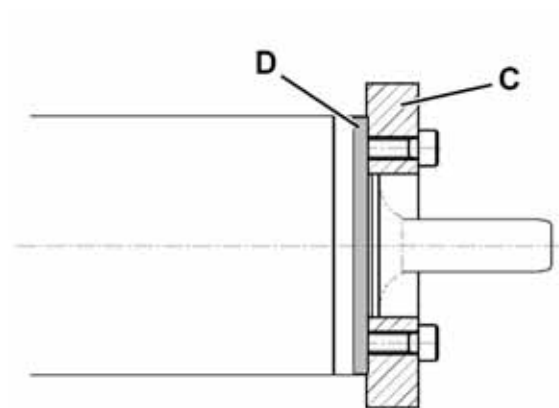
español

日本語



By default, **cyber<sup>®</sup> dynamic line Hygienic Design** features

- protection class IP69K on the cable outlet side (B),
- protection class IP67 on the customer outlet side (A).



To also achieve protection class IP69K at the connection to the application, a sealing ring (D) is integrated by default into the **cyber<sup>®</sup> dynamic line Hygienic Design**. The following steps are recommended:

- Screw the **cyber<sup>®</sup> dynamic line Hygienic Design** to the mountable flange (C).
  - ➔ By tightening the screws, the sealing ring is squeezed and protection class IP69K is ensured.

① Dimensions and tightening torques can be found in table "Tbl-3".

	<b>cyber<sup>®</sup> dynamic line, Hygienic Design</b>
<b>Size</b>	<b>40</b>
<b>Screws</b>	4 x M3
<b>Tightening torque (A2-70) [Nm]</b>	0.81

Tbl-3: Attachment of cyber<sup>®</sup> dynamic line, Hygienic Design

① Additional sealing of the shaft end is not required.

## 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
04	06.05.20	Safety, Technical data, Identification plate Attachment recommendation	2 3, 4, 5, 6 3 10



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