

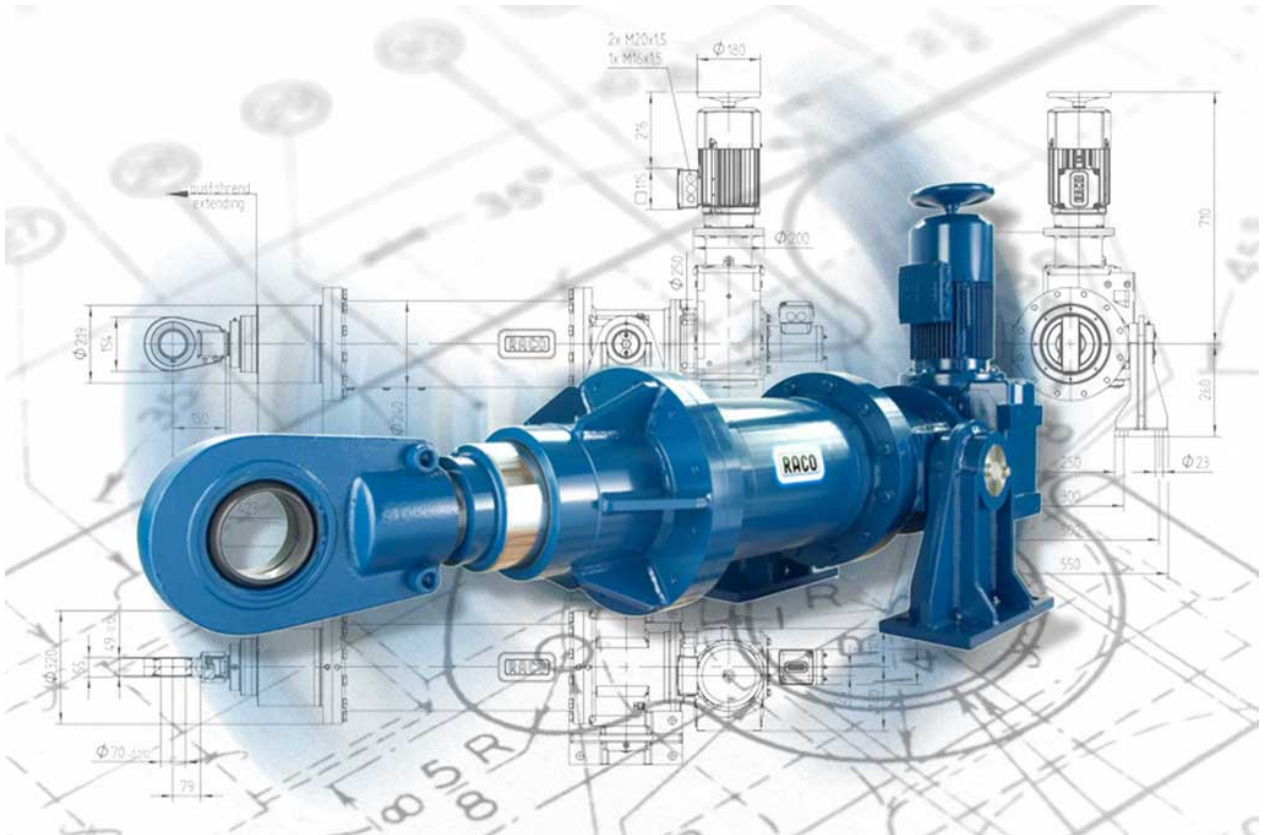
TECHNICAL DOCUMENTATION

Translation of the original instruction

Order : 1250208-0010

Part No.: 165-654-6

Actuator Type: T1A2



RACO-ELEKTRO-MASCHINEN GmbH
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1.0 Contents and technical data

Technical Data

Voltage [V] :	3x400
Frequency [Hz] :	50
Power [kW] :	0.090
Motor Protection :	IP 54
Isolation Class :	F
Winding Protection :	thermal contact
Speed [mm/s] :	40.0
Force [kN] :	0.80
Stroke [mm] :	300

DANGER: The force can rise up to 2.5 times during a blockade!

Contents

Pos.	Document	Doc.-No.
1.0	Contents and technical data	
2.2	Operating Instructions Compact 2-7 + Size 2+ T5A1	154-457-8
3.2	Maintenance Instruction Compact 2-7 + Size 2+ T5A1	154-539-6
4.2	RACO - Motor Size 2	154-546-9
5.2	Position Sensoric EPS02	154-625-2
5.2.1	Wiring Example EPS 02	160-545-3
8.1	EC Declaration of Incorporation	160-841-0



2.2

Operating Instructions Compact 2-7 + Size 2+ T5A1

2.2 Operating Instructions

The operating instructions refer to RACO-Elektrozylinder® type 6 / Compact series in size 2 – 7, for the type 1 T1A2 / T1B2 or K1A2 / K1B2 and type 5 T5A1.

Table of content

2.2.1	General Information	2
2.1.1.1	Proper Use	4
2.1.1.2	Obligations of the Operator	5
2.2.2	Safety and Security	6
2.2.2.1	Explanation of Safety and Warning Instructions	6
2.2.2.2	Qualifications	7
2.2.2.3	Safety Instructions	8
2.2.2.4	Safety Symbols on a RACO-Elektrozylinder®	10
2.2.3	Technical Information	12
2.2.3.1	Technical Data	12
2.2.3.2	Scope of Delivery	14
2.2.3.3	Functional Description	15
2.2.3.4	Transport	18
2.2.3.5	Storage	21
2.2.4	Installation	22
2.2.4.1	Preparation	22
2.2.4.2	Mechanical Installation	25
2.2.4.3	Electrical Installation	29
2.2.4.4	Aligning the RACO-Elektrozylinder®	32
2.2.4.5	Commissioning	35
2.2.5	Operation and Malfunction	39
2.2.5.1	Operation	39
2.2.5.2	Malfunction and Troubleshooting	43
2.2.6	Maintenance, Cleaning and Care	47
2.2.7	Unauthorized Modifications	50
2.2.8	Disassembly	51
2.2.9	Waste disposal	53
2.2.10	Accessories / Service	55

2.2.1 General Information

Please read documentation first!

Translation of the original instruction

This documentation contains important instructions for the safe and efficient operation of a RACO-Elektrozylinder® and is an integral part of the product. Keep this documentation accessible in a suitable manner.

All information, drawings and other content in this manual were carefully developed, compiled and reproduced in compliance with effective measures of control. RACO does not assume responsibility for errors and inaccuracies that may appear in this manual but is asking for feedback should such deficits be detected.

Strict adherence to all safety warnings and other instructions is a prerequisite for occupational health and safety. In addition, the local safety and accident prevention guidelines must be observed!

Please read these operating instructions thoroughly and carefully. This document addresses assembler's operators and plant operators. Observance of the operating instructions and the safety instructions is an essential requirement for smooth operation of the machine and for the fulfilment of any possible guarantee claims.

Make these operating instructions available to all responsible persons!

This product was developed and tested according to applicable safety standards (or draft norms) and regulations. The product is conform to the most state-of-the-art technology. Changes in technical data and constructions, which reflect the technological progress, are reserved.

The RACO-Elektrozylinder® is a partly complete machine. If you install this machine in another machine or system, you are responsible for:

- making a risk analysis of the entire machine,
- ensuring complete technical documentation including the operating instructions,
- issuing a conformity declaration if bringing the machine into circulation on the European market,
- ensuring that the CE symbol is applied to the complete machine (control cabinet or control panel).

Please check if further instructions in your documentation are required when installing this machine into another machine.

A special qualification is required for some activities. This qualification is specified in the instructions for these activities. Perform these activities only if you have the necessary qualifications.

If faults or problems still occur, please refer to:

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Internet	www.raco.de

Warranty claims

Observe the instructions in this documentation. This is a prerequisite for trouble-free operation and the fulfilment of any warranty claims. Read the documentation first before working with the RACO-Elektrozylinder®.

Disclaimer

Observe the instructions in this documentation. This is the basic requirement for safe operation. Only under these conditions will the RACO-Elektrozylinder® incl. accessories achieve the specified product characteristics and performance features. RACO-ELEKTRO-MASCHINEN GmbH accepts no liability for personal injury, property damage or financial loss resulting from failure to observe the operating instructions. RACO-ELEKTRO-MASCHINEN GmbH excludes liability for material defects in such cases.

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The right to circulate and reproduce this documentation or excerpts of it is restricted to an eligible group of clients. All technical detail is meant for service purposes only. Replication of the RACO-Elektrozylinder® is prohibited. Abuse will be prosecuted.

Trademarks, names or patents may be mentioned in this text while potentially existing property rights are not. The lack of such information does not infer that the respective product is unprotected by such rights.

2.2.1.1 Proper use

RACO-Elektrozylinder® are intended for use in commercial and industrial applications, in machines and plants or for driving or adjusting moving parts by generating a linear movement with an associated driving force in accordance with national/regional regulations for safety and accident prevention.

If RACO-Elektrozylinder® are used for lifting and transporting persons or are installed in machines and plants which fulfil this purpose, the plant manufacturer is responsible for compliance with the special regulations for such plants. This also applies to the stay under suspended loads or lifting platforms.

It should be noted that the RACO-Elektrozylinder® is not self-locking, depending on the design, installation position and the effects of vibration, and therefore, depending on the application, measures must be taken to prevent unintentional adjustment of the push-pull unit.

Intended use also includes:

- observing and following the information in these operating instructions, especially the safety instructions,
- operation within the technical limits (check Technical Data on page 2 of this documentation),
- the performance data (adjustment force, speed, adjustment travel etc.) stated on the type plate or in the order confirmation must not be exceeded,
- observance of the instructions for commissioning, installation, maintenance etc.,
- avoidance of abrupt starting and braking with heavy loads at high travel speeds,
- avoidance of impermissible shear and torsion forces on the RACO-Elektrozylinder®,
- the use in EX areas is only permitted if the device is expressly intended for this purpose (observe marking),
- for extreme loads, such as high switching frequencies, all fastening elements must be designed for fatigue strength.

2.2.1.2 Obligations of the operator

The information given in the operating order or on the nameplate serves solely to describe the product. A statement about a certain quality or suitability for a certain application cannot be derived from these details. This information does not release the user from his own assessments and tests.

It must be noted that RACO delivers an incomplete machine in the sense of the Machinery Directive and that commissioning is not permitted until the incomplete machine has been installed as a component of a machine and this machine complies with the provisions of the EC Machinery Directive!

All relevant installation regulations, safety regulations, accident prevention regulations as well as local, plant-specific regulations and requirements must be observed when using RACO-Elektrozylinder® according to their intended purpose.

The installer or operator of the system is responsible for the fulfilment and observance of these technical and safety regulations. When used in non-industrial areas, there are sometimes more stringent safety requirements.

Safety devices must not be removed, safety switches must not be used improperly, bridged or covered. Danger areas must not be entered or made accessible.

The user is responsible for ensuring that the machine is only operated when in proper working order. The operator must secure danger points that arise between a RACO-Elektrozylinder® and customer facilities.

The operator must have protection devices, locking devices and couplings to RACO-Elektrozylinder® checked at least once per year by a specialist technician for their safe condition.

When used as a lifting device, the entire system must be checked by a competent person before commissioning!

2.2.2 Safety and Security

2.2.2.1 Explanation of safety and warning notes

Always observe the safety and warning notes in these operating instructions!

The following types of safety and warning notes are used in this operating instruction:

DANGER!



Here you will find a description of consequences to life or limb of persons. The text describes what action should be taken to avoid such dangers.

DANGER!

WARNING!



Here you will find a description of possible consequences to life or limb of persons. The text describes what action should be taken to avoid such dangers.

WARNING!

CAUTION!



Here you will find a description of possible consequences to limb of persons. The text describes what action should be taken to avoid such dangers.

CAUTION!

NOTICE!



Here you will find information on possible hazards that can lead to material damage. The text, describes how to behave to avoid the damage.

NOTE!



Here you will find useful information regarding the RACO-Elektrozylinder[®] or RACO-Control.

2.2.2.2 Qualification

Only qualified person (according to TRBS, Technical Rules for Operational Safety, 1203; "qualified person") may carry out all work on RACO-Elektrozylinder®. Such persons must be authorised by the system operator, must have read and understood the operating instructions, and must follow these instructions.

2.2.2.3 Safety instructions

The safety instructions in this operating instruction manual are intended to protect persons and equipment from damage and hazards that may result from improper use, incorrect operation, inadequate maintenance or other incorrect handling by a RACO-Elektrozylinder®.

In order to avoid physical injury or equipment damage, work such as transport, installation, commissioning and repairs may only be carried out by qualified staff (e.g., qualified electricians), who are familiar with electrical equipment.

NOTICE!



Opening the RACO-Elektrozylinder® will invalidate the guarantee claims and can lead to damage. In case of problems or damage, only the manufacturer may open and repair the RACO-Elektrozylinder®.

The thrust tube of a RACO-Elektrozylinder® can develop considerable pulling and pushing forces during operation. Hazards caused directly or indirectly by possible shearing or crushing spots must be avoided by sufficient clearance distances to stationary equipment near the thrust tube, the actuating element and the driven element.

During operation, a RACO-Elektrozylinder® and its components have dangerous live, moving or rotating parts inside. When open, rotating shaft ends can pose particular dangers. Inserted feather keys must be removed or secured against loosening by suitable measures.

Before the device is set up, installed and put into operation, the technical instructions (or the part related to the work to be done) must be read and heeded. This also applies to configuration, programming, modification of conditions of use and modes of operation as well as for servicing. The technical instructions must be available near the device whenever work is being carried out.

DANGER!



DANGER!

Danger from electric current or voltage!

Severe injuries up to death.

The drive unit, device add-ons, control units and converters contain electrostatically sensitive components, which may be damaged through improper handling. Above all, avoid touching the contacts of the connectors with fingers and tools of any kind.

Even when the motor is not rotating, control and power connections on the motor, device attachments, control units and converters can still be live and hazardous.

Never disconnect the electrical connections when the unit is powered. In unfavourable cases, electric arcs may occur, causing damage to persons and contacts. Wait at least two minutes after switching off the supply voltages and disconnecting the connectors before touching live parts of the unit or connections: e.g. the connection terminals of the intermediate circuit on inverters carry dangerous voltages for up to two minutes.

Perceptible changes compared with normal operation in terms of increased temperatures, vibrations, noise and so on are an indication that function is impaired. To avoid problems that can lead directly or indirectly to personal and property damage, the servicing staff responsible must be informed.

If in doubt, switch off the RACO-Elektrozylinder[®] immediately.

CAUTION!



CAUTION!

Risk of burns!

Burning.

During operation, the drive unit may have hot surfaces. The surface temperature may become as hot as 100°C. Measure the temperature before touching the surface; if necessary, wait until it has dropped to 40°C.

2.2.2.4 Safety Symbols on the RACO-Elektrozylinder®

The following safety symbols can be found on the RACO-Elektrozylinder®:

Safety Symbol	Explanation
Pos. 2 157-061-7	Spring elements This RACO-Elektrozylinder® contains spring elements that can only be dismantled with the help of a device!
Pos. 3 157-060-9	Ball screw drive / multiple acme screw This RACO-Elektrozylinder® contains a screw drive without self-locking. Before dismantling the gear unit, motor or brake, make sure that the RACO-Elektrozylinder® does not start to move by itself. Loads must be supported or secured!
Pos. 4 157-050-1	Maintenance During assembly and service work uncontrolled movements of the RACO-Elektrozylinder® may occur. Loads and RACO-Elektrozylinder® must be secured against falling!
Pos. 5 157-054-4	Handwheel With RACO-Elektrozylinder®, the motor may start without warning. Before using the handwheel, disconnect RACO-Elektrozylinder® from the mains!
Pos. 7 157-057-9	Risk of breakage Do not step on the marked components or use as attachment points! There is a risk that these components may break off!

 Pos. 14 139-778-8	Long Life Lubrication Greases for RACO-Elektrozylinder® with the marking "Long Life lubrication" are selected so that RACO-Elektrozylinder® can provide optimum performance under the required conditions. They are designed for theoretical life under normal operating conditions of the RACO-Elektrozylinder®. Re-lubrication is normally not necessary.
 Pos. 16 160-790-1	Crash hazard If the load is not guided, the front connection of the RACO-Elektrozylinder® can become loose if it is not secured against rotation by gluing or locking!
 Pos. 19 161-762-1	IP class The specified protection class is only guaranteed if a cable gland suitable for the protection class and for the cable has been selected.

Further stickers are possible from a RACO-Elektrozylinder® depending on the version.

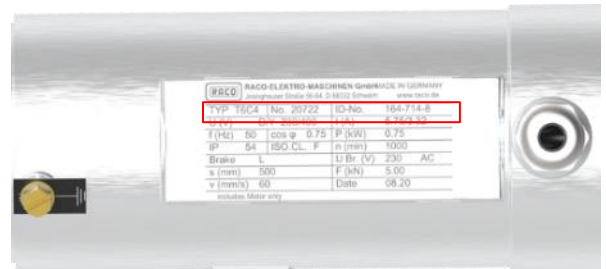
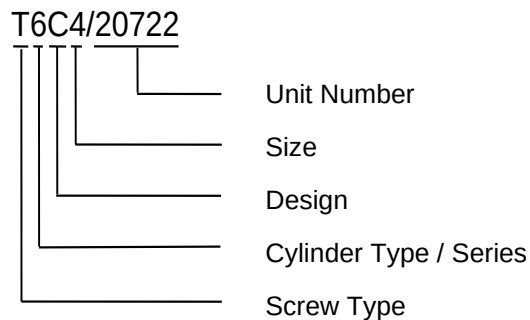
If dangers arise from the installation of a RACO-Elektrozylinder®, the plant manufacturer is obliged to indicate this by means of pictograms and to supplement his operating instructions.

If the safety symbol on the RACO-Elektrozylinder® is covered or becomes illegible due to dirt or weather effects, clean the safety symbol or apply a new one.

2.2.3 Technical Information

2.2.3.1 Technical Data

The technical data and further information of the RACO-Elektrozylinder® can be found on the nameplate, on pages 1 and 2 of this operating manual and in all documents relating to this order. Make sure that the ID number on the cover page of these operating instructions corresponds with the ID number on the type plate. Use these operating instructions only for the RACO-Elektrozylinder® indicated on the nameplate.



Always state the type and unit number when contacting RACO for queries!

RACO-ELEKTRO-MASCHINEN GmbH

Jesinghauser Straße 56-64, D-58332 Schwelm

MADE IN GERMANY

www.raco.de

TYP	No.	ID-No.
U (V)		I (A)
f (Hz)	cos φ	P (kW)
IP *	ISO.CL.	n (min)
Brake		U Br. (V)
s (mm)		F (kN)
v (mm/s)		Date

* includes Motor only

Pos. 15 159-776-0

Motor nameplate

The nameplate contains all-important data of the RACO-Motor and the RACO-Elektrozylinder®.

RACO-ELEKTRO-MASCHINEN GmbH

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MADE IN GERMANY

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Motorheizung / motor heater

U (V)	P (W)
-------	-------

Bremsheizung / brake heating

U (V)	P (W)
-------	-------

Zusatzheizung / additional heating

U (V)	P (W)
-------	-------

Heizung im Gehäuse / heating in the housing

U (V)	P (W)
-------	-------

Pos. 20 163-876-9

Heater nameplate (optional)

The heater nameplate is located on the housing behind the motor. It contains the important data for heaters.

Unless otherwise specified in the operating order, the following operating conditions apply:

- Ambient temperatures -20°C to +70°C
- Installation altitude under 1000 m a.s.l.
- Max. relative air humidity (without condensation) 95%
- Shock-, vibration-free and aligned installation
- protect against adverse weather conditions

Further data can be found on the type plate.

The technical data are for product description purposes only. A suitability for a certain application or a statement about a certain condition cannot be derived from these data. The information does not release the user from the obligation to make his own assessment and tests.

This product is subject to a natural wear and aging process.

In the event of failure to observe the notes and instructions in these operating instructions, the manufacturer accepts no liability for any resulting damages.

By following these operating instructions you will

- avoid danger to yourself and others,
- reduce repair costs and stoppage times,
- increase the reliability and working life of the machine.

The following should also be observed in addition to these operating instructions:

- the applicable accident prevention regulations,
- the accepted specialist rules for safe and proper working practices.

The operating instructions must be augmented by the operator in individual cases by operating instructions based on existing national regulations on accident prevention and environmental protection.

Keep these operating instructions somewhere where they are accessible to all users at all times.

2.2.3.2 Scope of Delivery

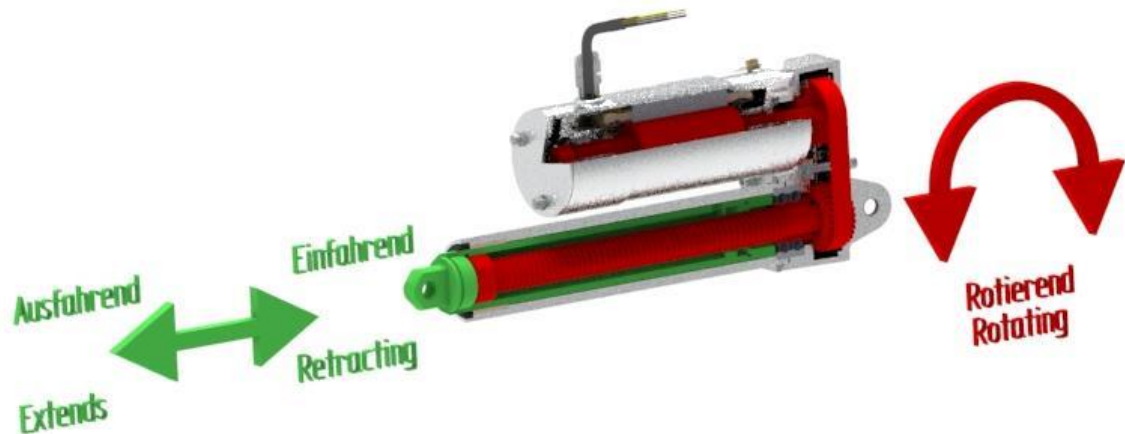
Immediately check the scope of delivery according to the order confirmation and delivery note, also for separately supplied accessories (e.g. brake rectifier for control cabinet installation, ...).

RACO supplies its products in accordance with agreed delivery conditions by means of drawings, specifications and other datas.

RACO only checks the suitability of the product for the purpose intended by the purchaser if this has been expressly agreed upon and provided that the purchaser provides the necessary written information. The performance of operating and movement trials and the technical approval of the product in regard to the purpose intended by the purchaser is in the responsibility of the purchaser.

2.2.3.3 Functional Description

In order to understand the general functional principle of the RACO-Elektrozylinder®, a description of the complete process, when operating, is given below.



Section through a RACO-Elektrozylinder® Type 6 "Compact"

The RACO-Elektrozylinder® is used for the moving and positioning of a mass. When power is fed to the motor, the rotary movement of the motor is converted into a linear movement of the thrust tube by means of the spindle/nut system.

NOTICE!



The RACO-Elektrozylinder® must not be put into operation without connected end position limiters!

NOTICE!



Hits and collisions to the thrust tube must be avoided at all costs. Damage can occur to the spindle nut system and the roller bearings!

NOTICE!



The operating instructions for the RACO electric motor or the installed motor contain further information regarding the electric motor.

The linear movement of the thrust tube must be stopped by the control system on the plant side:

- In the end position.

End position limit switches (e.g. EPS02) can be integrated in the RACO-Elektrozylinder® (optionally available). They signal to the control unit on the system side when the end position is reached.

If you have not ordered end position limiters, you must set external limit switches on the system. The controls must always stop the axial movement before the mechanical end-stops in the RACO-Elektrozylinder® are reached.

The overrun of the RACO-Elektrozylinder® must be taken into account.

The RACO-Elektrozylinder® must not be put into operation without connected end position limit switches!

- In intermediate positions.

By means of additional switches in the RACO-Elektrozylinder® (e.g. EPS06) the RACO-Elektrozylinder® can also be stopped at defined intermediate positions.

- In case of overload.

The RACO-Elektrozylinder® and its drive unit must be protected against overload.

Overload cut-offs can optionally be realised electronically (e.g. EPS06, RACOMATIC®).

Motors must be thermally protected in case of overload. RACO electric motors are equipped with thermal contact as standard. PTC thermistor temperature sensors are optionally available.

Self-locking

Self-locking on an acme screw occurs when the angle of friction is greater than the lead angle of the acme screw. A distinction is made between dynamic and static self-locking. RACO-Elektrozylinder® acme screws are generally statically self-locking, i.e. RACO-Elektrozylinder® EZ2, C2 to C7 with a single-start acme screw remain in the rest position when no external forces (e.g. vibrations) act on them. If the RACO-Elektrozylinder® with attached load is in motion and the motor is switched off, the standstill position is undefined. There are many factors (temperature, grease, wear of the spindle, switch-on frequency, ...) that influence the self-locking effect and very different friction values are given in the literature.

**If persons are endangered, a brake must always be used!
Self-locking cannot be guaranteed by RACO-Elektrozylinder®!**

For worm gear units the same conditions apply as for acme screws.

When self-locking occurs in a worm gearbox depends on the manufacturer, the gearbox and the transmission ratio ($i = 30$ to 50).

Ball screw and multiturn acme screw have no self-locking effect!

DANGER!**DANGER!****Overtravel due to lack of self-locking**

Severe injuries.

In areas where the load can cause danger to persons, e.g. inserting and removing parts, serious injuries or even the loss of limbs can occur.

The RACO-Elektrozylinder® must be equipped with a brake (with tension release), if necessary with a safety brake.

Safety nut

RACO safety nuts are used in combination with ball screws but also with acme screws. They are installed as trailing nuts and are only effective under pushing force.

In combination with a ball nut, the safety nut has a negative profile. In case of loss of function of the ball nut, the thread of the safety nut comes into contact with the spindle. This results a seizure between spindle and safety nut. This prevents an uncontrolled fall of the nut.

In combination with an acme nut, the safety nut has the same profile as the acme nut. The safety nut has considerably more play and is made of special steel. If the acme nut is too worn, the safety nut is gradually used. This is first noticed by grinding noises. If the wear of the acme nut increases, there will also be seizing between the safety nut and the spindle.

Safety nuts are not safety components within the meaning of the European Machinery Directive!

The responsibility for the safe design / safe application remains with the machine manufacturer / operator. It must also be ensured that no dangers to persons arise. Particularly with vertically loaded axes, an additional safety gear must therefore constructively secure the failure of a drive component! Failure of the acme or ball nut must be prevented in any case.

2.2.3.4 Transport

Check the delivered goods immediately upon receipt for potential transport damage and completeness. In the event of damage, notify the transport company immediately.

- Attach the slings for lifting RACO-Elektrozylinder® only at the appropriate points as shown in the figure „Attachment points“.
- Make sure that the slings are suitable!
- Never mount eyebolts on the motor, gearbox or other components, as any threads are only intended for the individual part and not for the whole RACO-Elektrozylinder®!
- Note the centre of gravity!

Use only suitable transport equipment of adequate size and capacity!

DANGER!



DANGER!

Falling of the product due to insufficient load handling devices!

Severe injuries including death.

Only use tested and appropriate load handling devices.

Load handling devices should only be carefully attached to the main body or to the designated points.

Pay attention to the centre of gravity!

Do not stay under floating loads.

DANGER!



DANGER!

Danger from falling parts

Severe injuries including death.

Only remove the transport locks at the installation site!

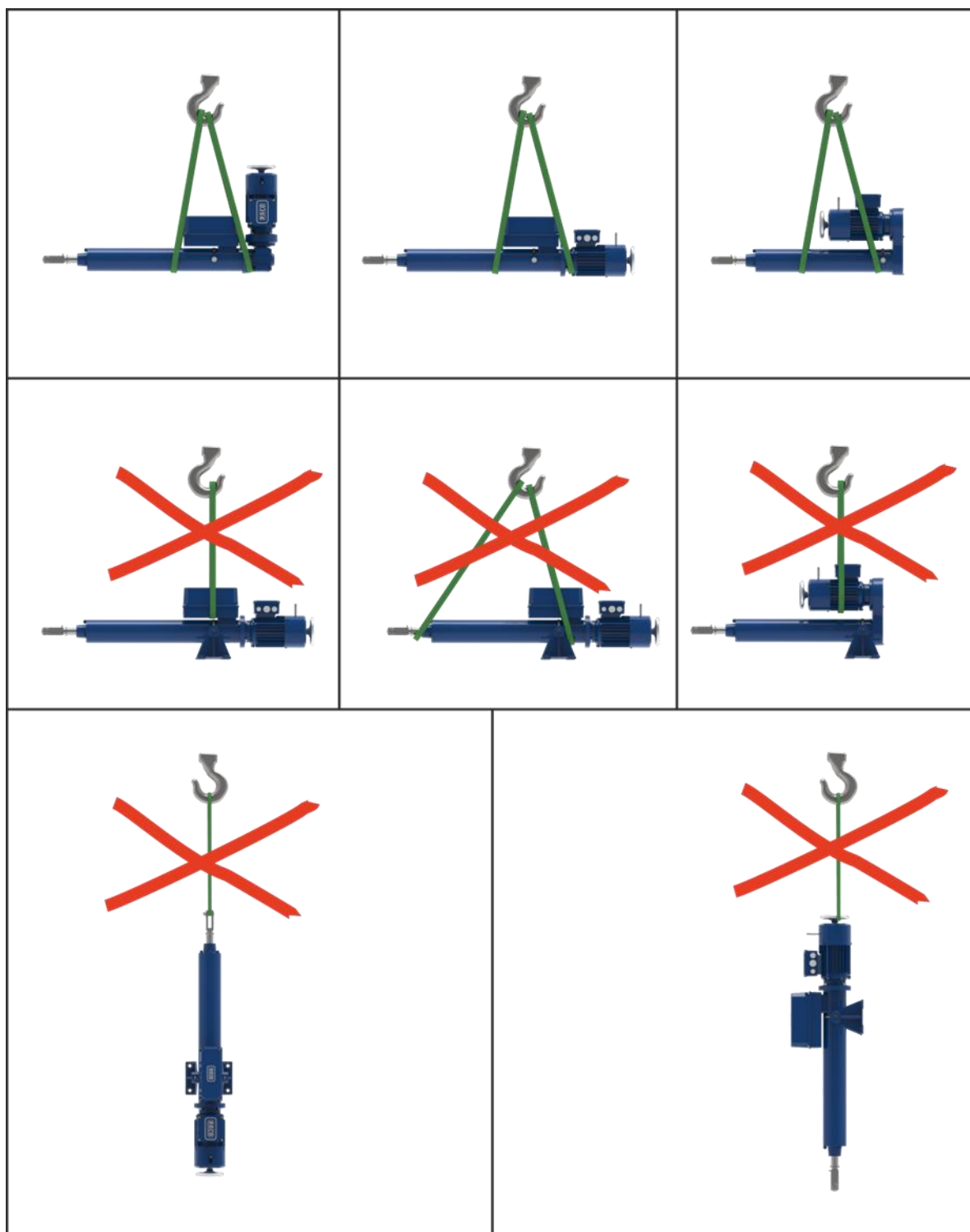
NOTICE!



Transport to the installation site should take place in the original packaging provided.

NOTICE!**Risk of Damage!**

Secure the RACO-Elektrozylinder® during transport and lifting against impacts especially to the thrust tube and the terminal boxes. Such impacts can lead to damages or destruction of the RACO-Elektrozylinder®.

Attachment Points

Extraction**WARNING!****WARNING!****Falling parts!**

Remove loose parts and unsecured brackets before lifting out the RACO-Elektrozylinder®.

Removal only by trained personnel.

CAUTION!**CAUTION!**

Injuries to hands and face!

Due to the weight of the packaging, steel straps may be required. Steel straps are under high tension!

CAUTION!**CAUTION!****Observe the load-bearing capacity of the substrate.**

Injuries due to crushing and impact

Due to the yielding of the base, unpredictable movements of the RACO-Elektrozylinder® can occur.

Removal only by instructed personnel.

2.2.3.5 Storage

If the RACO-Elektrozylinder® is not mounted immediately, it is important to store it horizontally in a dry, vibration-free environment and protected against environmental influences. The storage temperature should be between -10°C to $+40^{\circ}\text{C}$. Bare metallic surfaces must be preserved with grease or oil and the thrust tube must be retracted.

A complete replacement of the standard lubricant is recommended for storage periods of more than two years. Only install the RACO-Elektrozylinder® right before commissioning.

Please conduct a running check ahead of commissioning including measurement of the non-load current and nominal current in loaded condition. Please document the resulting data and forward to us, we will check it.

When storing a RACO-Elektrozylinder® with frequency inverter, the following must be observed:

The frequency inverter, the 24V mains unit modules and the electronic brake rectifier must be connected to the supply network at regular intervals, at least once a year, for at least 60 minutes. If this is not carried out, there is a danger that the devices may be destroyed.

If a device is to be stored for longer than one year, it must be recommissioned with the aid of an adjustable transformer before normal connection to the mains.

Long-term storage for 1 - 3 years

30 min with 25% mains voltage
30 min with 50% mains voltage
30 min with 75% mains voltage
30 min with 100% mains voltage

Long-term storage for >3 years or if the storage period is not known:

120 min with 25% mains voltage
120 min with 50% mains voltage
120 min with 75% mains voltage
120 min with 100% mains voltage

The device must not be subject to load during the regeneration process.
After the regeneration process, the regulations described above apply again (at least 60 min on the mains 1x per year).

NOTICE!



Risk of Damage!

With the frequency inverters, the control voltage must also be connected!

NOTICE!



If the frequency inverters is not regularly connected to the supply network, there is a danger that the device may be destroyed.

2.2.4 Installation

2.2.4.1 Preparation

Before starting the installation, check the suitability of the RACO-Elektrozylinder® for the function and environmental conditions. The mounting points for the brackets and connection head must also be checked for suitability and position. The RACO-Elektrozylinder® must be installed in alignment. Select the correct size and strength of the fixing screws. Check the engagement of the clevis and rod eye including the bolt.

All RACO-Elektrozylinder® are delivered with the thrust tube extended around 10 mm to allow for checking of movement in the anticipated direction after the motor has been wired for the first time.

Make sure that the application does not require a longer stroke than indicated on the type plate. Pay attention to the stroke position of the RACO-Elektrozylinder®, this should be as central as possible to the actuator stroke.

Remove all transport equipment prior to installation.
(e.g. BG 9 to 12 bracket protection on the pivots, if brackets are present).

DANGER!



DANGER!

For vertical or suspended installation, uncontrolled falling due to missing fall protection during installation!

Severe injuries or even death.

Please secure product against falling.

Avoid the danger area below the product.

Close the brakes!

DANGER!



DANGER!

Crash of the load

Severe injuries or even death.

When working under loads and/or on the RACO-Elektrozylinder®, the load must be secured against falling or movement.

WARNING!



WARNING!

Do not step on the RACO-Elektrozylinder® or its attachments!

Injuries to the point of death!

Parts may break off and fall down. Danger of injury from knocking, crushing, falling, falling objects.

CAUTION!**CAUTION!****Danger of crushing!**

There is a danger of crushing when installing an RACO-Elektrozylinder®. Make sure that the unit is securely fixed and that there is sufficient space for installation. Support the weight of an RACO-Elektrozylinder® with suitable lifting gear if necessary.

NOTICE!**Risk of damage due to improper installation!**

Do not expose the RACO-Elektrozylinder® to lateral impacts or lever forces during installation

NOTICE!**Danger of damage due to loose or missing screws or nuts**

Missing or loose screws or nuts on the RACO-Elektrozylinder® can cause damage during operation.

Do not loosen or remove screws and nuts!

Do not attach any additional components to the RACO-Elektrozylinder®!

NOTICE!**Welding work.**

When carrying out welding work in the vicinity of a RACO-Elektrozylinder®, make sure that it is properly earthed. Welding work on the RACO-Elektrozylinder® itself is prohibited!

NOTICE!**Rod eye**

When using a rod eye, the load must be guided in case of pushing forces.

General Installation Sequence

In order to ensure the long working life and smooth operation of the RACO-Elektrozylinder®, care must be taken to follow the installation instructions exactly. The installation sequence is extremely important and must be followed.

Checklist of installation sequence:

- Installing the RACO-Elektrozylinder® at its place of work.
- Installation of the electrical connections for the motor, thermo-contact, and end-position switches (limit switches, position sensors, encoders, ...).
- Alignment of the RACO-Elektrozylinder® and tightening of all attachment screws.
- Setting the end-position switches.
- Test run.
- Inspection of all screwed connections.

2.2.4.2 Mechanical Installation

The thrust tube of a RACO-Elektrozylinder® is designed to absorb and transmit push and pull forces in the axial direction up to the specified maximum force. When mechanically installing a RACO-Elektrozylinder®, make sure that the installation is exactly **aligned** with the construction. Transverse forces and moments acting on the thrust tube are not permissible.

NOTICE!



The RACO-Elektrozylinder® may only be installed in one plane to the load, on a vibration-free and torsion-resistant substructure.

To ensure torque-free installation, the RACO-Elektrozylinder® must be fastened in the intended arrangement on the appropriate mounting points (front eye, clevis, rod eye or trunnion). Mounting equipment and support structure must be dimensioned to accommodate the expected forces occurring in operation and sufficiently protected against loosening.

The parts to be moved, which are coupled directly or via a junction piece on the thrust tube, must be supported or guided and run exactly in alignment with the RACO-Elektrozylinder®.

The mounting points such as rod eye, trunnion, trunnion pin receptacle in the brackets, connecting pins in front clevis/ rod eye etc. must be lubricated with grease before installation.

DANGER!



DANGER!

Crash of the load!

Severe injuries or even death.

For non-guided loads, the connection head must be secured against twisting to secure.

If the load is not guided, the connector is subjected to a torque, especially during the acceleration and deceleration phases. If the connection head is not properly secured, it can become loose and fall off during operation. The connection head is always delivered secured ex works. If the locking device is loosened or a separate connection head is fitted, it must be secured against rotation!

DANGER!**DANGER!****Crash of the load**

Severe injuries or even death.

If the connecting bolt is not properly secured or the connecting bolt between the connector and the load is too small, the connecting bolt may be lost.

Always secure the connecting bolt! Always use the right connecting bolt for the connection piece!

RACO-Elektrozylinder® which is supplied with connecting bolts are always supplied with the appropriate safety elements. These must be used during assembly.

WARNING!**WARNING!****Tear off the connection head!**

Injuries up to death.

Do not unscrew the connection head more than one turn from the thrust tube. If the position of the connection head changes, secure it again with the lock nut.

NOTICE!

Damage to the internal mechanics by applying a torque to the thrust tube. When loosening the lock nut, make sure that you hold the spanner flat of the connection head against it so that no torque is introduced into the interior!

Do not unscrew the connection head more than one turn, as the load-bearing thread portion may become too small. The threaded connection between the connection head and the connection piece / thrust tube can then fail during operation and the load can fall off. A screwing in is possible if the thread offers enough space. After adjusting the connection head, it is essential to retighten the lock nut or clamp!

Make sure that you hold the key area of the connection head against the key to avoid damage inside.

Front eye clevis does not change the look, they are glued. Here the position of the Front eye clevis must be specified when the order is placed.

WARNING!**WARNING!****Danger of damage and injury due to insufficient fixing material**

Severe injuries or even death.

Use suitable screw connections!

Fasten screw connections with pretensioning forces or tightening torques according to VDI 2230!

Secure fastening bolts to prevent them from falling out!.

NOTE!

Note the position of the lubricating nipples and terminal boxes (if existent) when installing the RACO-Elektrozylinder® so that they are always easily accessible for maintenance of the machine or system.

Table 1: Recommended screws for bracket and swivel foot bracket

Actuator	dynamic force max	static force max.	number of screw	Nominal size
	kN	kN	piece	
bracket				
EZ 1/2	0,8	1,5	2x2	M 8
C 2	2,0	2,0	2x2	M12
C 4 C 4-105 C 4-140	7,5	7,5	2x2	M12
C 6	15	20	2x2	M12
C 7	40	40	2x2	M16
swivel foot bracket				
C 2	2,0	2,0	1x4	M 8
C 4 C 4-105	7,5	7,5	1x4	M 8
C 4-140	7,5	7,5	1x4	M12
C 6	15	20	1x4	M12

All indicated forces are nominal forces of the RACO-Elektrozylinder®. Actual forces that occur can be greater in the event of malfunctions and may even damage RACO-Elektrozylinder®!

The specified screw sizes must be used in strength class 8.8 at least. Pre-tensioning forces or tightening torques are to be tightened according to VDI 2230, at least with the help of a torque wrench!

Manually operator**DANGER!****DANGER!****Risk of injury from rotating parts**

With a RACO-Elektrozylinder®, depending on the higher-level control system, the motor can start without warning. Before using the manually operator, the RACO-Elektrozylinder® must be disconnected and secured against being switched on again. Check that the motor is de-energised. (DIN VDE 0105-100)

The manual operator is used for manual adjustment of one RACO-Elektrozylinder® when the motor is without power.

It is **not permitted** to apply a force/torque to the manual operator by means of electrical aids, which exceeds the nominal actuator force or the nominal motor torque!

Rough calculation of the nominal motor torque:

$$9550 \times \text{motor power} / \text{nominal speed} = \text{nominal motor torque}$$

Non-observance can lead to the destruction of a RACO-Elektrozylinder®!

2.2.4.3 Electrical Installation

The voltage connection must be made according to the information on the nameplate, only by a competent person (according to TRBS, Technical Rules for Operational Safety, 1203; "qualified person") and in accordance with the relevant regulations.

DANGER!



DANGER!

Danger from electric current or voltage!

Severe injuries or even death.

Before working on the electric installation, interrupt electric power supply and secure it against reconnection. Make sure that the system is de-energised. (DIN VDE 0105-100).

The electrical connection may only be carried out by qualified person (according to Technical Rules for Operational Safety (TRBS) 1203; "qualified person"). The terminal box may only be opened if it is ensured that no voltage is applied.

CAUTION!



CAUTION!

Uncontrolled start-up

Risk of injury from crushing, impact, breakage and ejected parts

Incorrect wiring or failure of the limit position switches or errors in the higher-level control system can lead to incorrect behaviour and unexpected movements of a RACO-Elektrozylinder®.

Under certain circumstances / settings in the frequency inverter, the RACO-Elektrozylinder® can start automatically after power-on. A connected machine can thus initiate an unexpected movement process. As a result, various injuries to third parties are possible.

Before switching on the mains, secure the danger area by warning and removing all persons from the danger area!

CAUTION!



CAUTION!

Wrong direction of rotation of the motor!

Risk of injury due to crushing, impact, breakage and ejected parts

Please check the direction of movement in inching mode.

The connection must be established as a safe electrical connection, a safe protective earth connection must be established. During connection work, it is essential to observe the safety instructions and also to follow the documentation supplied with the device.

NOTICE!

The RACO-Elektrozylinder® may be mounted and connected only when the information regarding voltage and frequency on the type plate matches the mains supply and the RACO-Elektrozylinder® is intact.

The proper protection class must be verified when setting up the unit in wet rooms or outside. Use fitting cable glands; check the terminal box seals.

For RACO three-phase motors, the RACO-Elektrozylinder® extends when a clockwise field is connected to U1/V1/W1. The control of the direction of movement is to be carried out in jog mode. RACO special motors are made for operation with a frequency inverter. Cooling air must be able to flow freely in and out of the motor and, if necessary, the frequency inverter.

The setting of the bimetallic release in the reversing contactor combination must be made according to the type plate information. This is the only way to ensure that the RACO-Elektrozylinder® is triggered in time and protects the motor winding even without additional overload protection (e.g., EPS06 with overload detection).

If a different motor version has been installed in lieu of the RACO three-phase motor, then the appropriate separate technical description must be observed.

The connection and adjustment of the different add-ons (mechanical limit switch, proximity switch, potentiometer, position emitter / type DMU, travel sensors / type EPS, pulse transmitter / type DIG) must be made according to the associated documentation. Consider sufficient stroke reserves when switching off in end position by reaction time, over travel, mass inertia etc.

To ensure interference-free operation, EMC-compliant wiring must be observed (shielding, twisting, cables routed separately from lines with faults).

The separate earth conductor connection must be used for potential equalisation.

NOTICE!

The device may not be started without the end position limiter (limit switch) connected. If the scope of delivery did not include an end position limiter, it must be installed onsite through external limit switches.

NOTICE!**Risk of Damage!**

Mechanical end positions must not be approached even in jog mode!
Ensure that the RACO-Elektrozylinder® is switched off at the plant when reaching the limit switches.

The function test must be run in jogging mode to prevent damages in case of faulty adjustment of the limit switches.

DANGER!**DANGER!****Danger from electric current or voltage!**

Severe injuries up to death.

A competent person (according to Technical Rules for Operational Safety (TRBS) 1203; „qualified person“) may only carry out the connection for potential equalisation. The operator for the locally applicable regulations must provide further protective measures.

In the event of a fault, insufficient earthing can lead to an electric shock with fatal consequences if it comes into contact with a RACO-Elektrozylinder®.

The RACO Elektrozylinder® is only intended for permanent connection and may only be operated with effective earthing connections that comply with local regulations for large leakage currents (> 3.5 mA).

EN 50178 / VDE 0160 prescribes the installation of a second earth cable or an earth conductor cross-section of at least 10 mm².

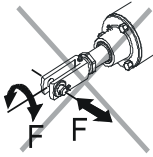
NOTICE!**Risk of Damage!**

Do not use RACO Elektrozylinder® in plants that are protected by “cathodic electrochemical corrosion protection.” Exceptions are possible only upon consulting RACO.

2.2.4.4 Aligning the RACO-Elektrozylinder®

Following successful electrical installation, the RACO-Elektrozylinder® might need adjusting for true alignment and shear force free installation.

NOTICE!



Risk of Damage!

Radial forces and torsion forces acting on the axis of the RACO-Elektrozylinder® are not permitted.

Align the RACO-Elektrozylinder® so that radial or torsion forces can't act on the axis.

When mounting, make sure that the line of movement is exactly aligned with the load direction within the mounting structure.. Only axial pull and push loads may act on the RACO-Elektrozylinder®. No transverse forces may act on the thrust tube. The motion sequence in both axes perpendicular to the thrust tube must be considered over the entire stroke of the RACO-Elektrozylinder® and aligned carefully.

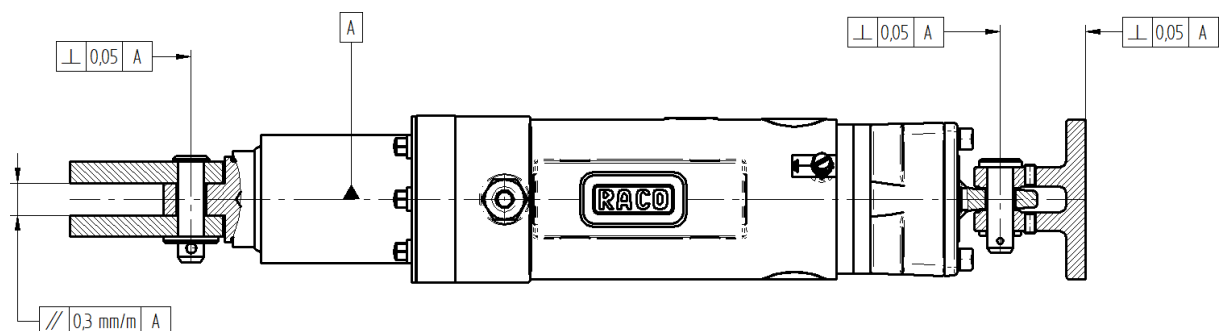
RACO offers corresponding brackets, swivel foot brackets or rod eyes to maintain the degrees of freedom.

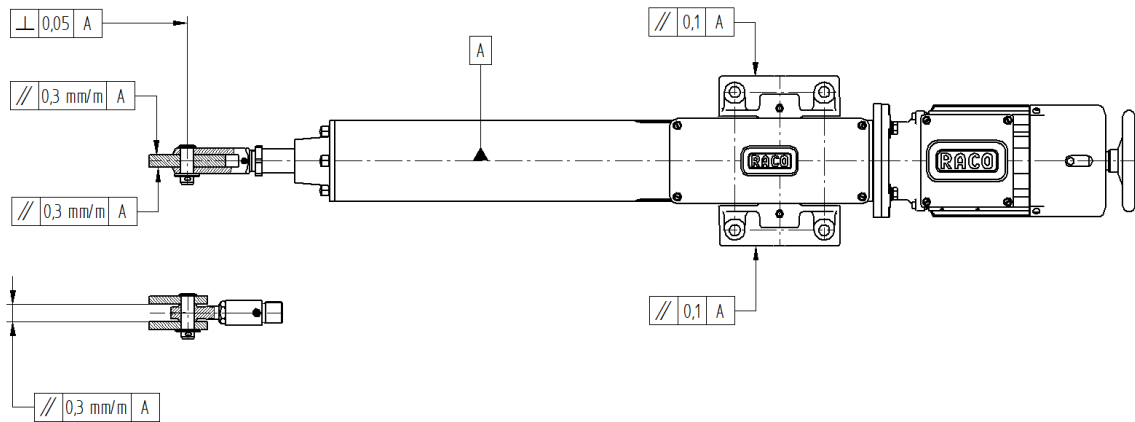
The RACO-Elektrozylinder® must be precisely aligned!

Align the RACO-Elektrozylinder®

- Align the RACO-Elektrozylinder® with a parallelism to the centre axis of the line of movement up to 0.3 mm per metre.
- Align the brackets with a parallelism of up to 0.1 mm to the central axis (in the case of a flange connection, a perpendicularity to the central axis must be maintained with a tolerance of 0.1 mm)
- Move the RACO-Elektrozylinder® out and in again several times in jog mode. Ensure that the RACO-Elektrozylinder® has sufficient clearance and does not collide with housings or similar. The counterpart to the RACO-Elektrozylinder® must have sufficient space and must under no circumstances collide with the fork head / rod end when the actuator is fully extended or retracted.

Installation Tolerances





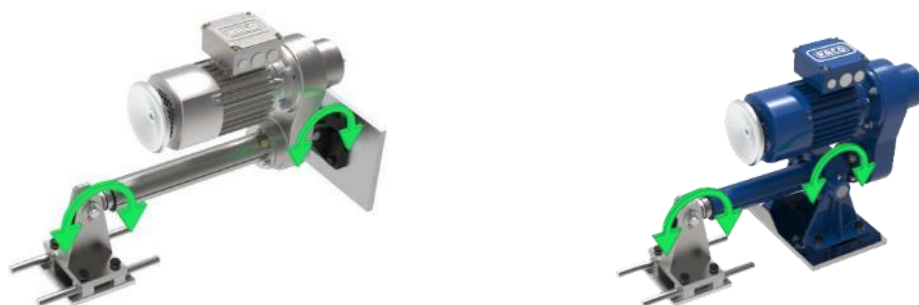
Installation Situations

Swivel foot bracket or brackets - guided counter bearing



In the case of a guided counter bearing, the system must be aligned in such a way that there is no misalignment of the components over the entire stroke and thus no lateral forces can occur. See installation tolerances.

Swivel foot bracket or brackets - pivoting counter bearing



Hinges must be kept free and must not be strained!

RACO-Elektrozylinder®

No radial force must be applied to the thrust tube.



No moments and forces may be introduced via the cover eye or the brackets or front eye clevis, rod eye / front clevis.



No torques may be introduced into the thrust tube!

2.2.4.5 Commissioning

Only operate the product when it is established that the final product (e.g. a machine or construction) in which the RACO product is assembled corresponds to the country-specific regulations, safety instructions, and application norms.

DANGER!



DANGER!

Moving Parts Cause Risk of Injury

Severe injuries including death.

Do not reach into moving parts during operation.

Do not stay in the danger zone of the thrust tube.

Before commissioning, ensure that no persons are in front of the thrust tube.

DANGER!



DANGER!

Missing brake function

Severe injuries or even death.

Incorrect or missing actuation of the brake in case of missing self-locking of the push-pull unit leads to overrun of the RACO-Elektrozylinder®.

A released brake cancels the function of the brake. Keep manual release closed.

DANGER!



DANGER!

Incorrect programming

Severe injuries or even death.

Incorrect programming of the connected sensors (e.g. EPS 06 bzw. RACOMATIC®) can lead to unexpected and uncontrolled movements that can cause damage to a RACO-Elektrozylinder® and/or the installation.

Operation by qualified personnel only!

For more information on the sensors that may be connected, see the following chapters.

CAUTION!



CAUTION!

Incorrect or missing brake control

Burns.

Incorrect or missing control of the brake can lead to overload and thus to overheating of the motor.

Check brake function before commissioning.

CAUTION!**CAUTION!****Missing monitoring of the winding temperature**

Burns

Failure to use or incorrect connection of the thermal contacts/ PTC thermistor/etc. for monitoring the winding temperature may result in overheating of the motor and high temperatures on the motor surface.

CAUTION!**CAUTION!****Overload from a RACO-Elektrozylinder®**

Burns

The motor can overheat due to an overload of one RACO-Elektrozylinder®. Observe the information on the type plate and in this operating manual!

CAUTION!**CAUTION!****Uncontrolled start-up**

Risk of injury from crushing, impact, breakage and ejected parts

Incorrect wiring or failure of the limit position switches or errors in the higher-level control system can lead to incorrect behavior and unexpected movements of a RACO-Elektrozylinder®.

CAUTION!**CAUTION!****Motor with rotating hand wheel**

Capture

Motors with a rotating hand wheel on RACO-Elektrozylinder®, hand wheel can cause parts of the body to be caught!

Before commissioning, make sure that there are no persons in the motor area.

NOTICE!**Risk of Damage!**

Avoid traveling against the mechanical end stops of the RACO-Elektrozylinder®. At commissioning, all functions must first be tested over the entire travel range while in jogging mode and if possible, at low speed.

Before commissioning, please note that the RACO-Elektrozylinder® must not be put into operation without the end position limiter connected. If no end position limiting is included in the scope of delivery, this must be carried out on the system side. Commissioning may only take place if:

- The RACO-Elektrozylinder® was properly installed within the application and the internal or external end position limit switches are assembled and adjusted.
- The RACO-Elektrozylinder® is properly flush-aligned.
- The swivelfoot bracket/trunnion brackets and the rod eye of the RACO-Elektrozylinder® were greased during mounting.
- The entire stroke was tested in jog mode or – if possible – at a slow speed.
- The proper condition of the RACO electric was tested with regards to its assembly.
- All transport securing means were removed from the RACO-Elektrozylinder®.
- All plugs and screw plugs in the terminal boxes of the RACO-Elektrozylinder® have been replaced with suitable cable glands and screw plugs.
- It is ensured that the nominal current in loaded condition is not exceeded (refer to name plate), please consider duty cycle/operating mode.
- All plugs and terminal boxes were closed.
- Potential equalization was installed at the RACO-Elektrozylinder®.

It is essential to avoid approaching the mechanical end positions from a RACO-Elektrozylinder®. This can lead to blocking or damage to the drive. The unit may only be commissioned with limit switches (internal or external) connected.

A RACO-Elektrozylinder® with ball screw system must never be driven against a fixed stop, whether internal or external. This will damage the ball screw drive and destroy it permanently.

The limit switches must be set in such a way that the thrust tube comes to a stop at max. speed before the mechanical end position. When adjusting the limit switches, the overtravel according to the table "stroke reserves" must be taken into account, so that the drive stops safely before reaching the mechanical end positions.

Usable stroke = nominal stroke – reserve!

Stroke reserve for retraction and extraction

Stroke reserve in dependence of linear speed					
 Caution!	Linear Speed	10 - 20 mm/s	2 x 5 mm	Stroke reserve for retraction and extraction	 Caution!
		20 - 40 mm/s	2 x 10 mm		
		40 - 60 mm/s	2 x 15 mm		
		60 - 90 mm/s	2 x 20 mm		
		90 - 120 mm/s	2 x 25 mm		

At high regulating speeds the devices are usually equipped with a brake. Nevertheless, aftertravel must be taken into account due to the switching time of the brake (depending on the size, 90 to 500 milliseconds when AC current controls the brake).

At high travel speeds and large masses, abrupt acceleration and slowing (e.g. with brake) must always be avoided. An inverter must be used to realise the acceleration and slowing process through ramps.

During commissioning care must be taken that the motor current consumption under load does not exceed the rated current specified on the type plate for any length of time. Heed the switch-on duration/mode of operation.

In the case of RACO-Elektrozylinder® with built-on gears or gear motors, particularly worm and flat gears, the installation position specified in the order must always be heeded. If no specifications were made or a different installation position is necessary, please contact our technicians at RACO.

Position accuracy

Please note that due to the physical circumstances, the position accuracy of spindle systems depends on the relevant load and operating conditions, and is therefore not always identical or reproducible. Differences ranging from millimetres up to centimetre are possible, depending on the condition of the spindle and nut, the condition of the grease and the size of the load.

With a RACO-Elektrozylinder® however, you have the possibility, by means of relevant accessories in the RACO-Elektrozylinder® and associated controls, of achieving reproducible position accuracies of up to 0.05 mm.

Ensure that the RACO-Elektrozylinder® cannot run on and butt up against the mechanical end-stop in the actuator.

If an accurate position is to be reached by the end-position switch, a stop or similar device must be used. Care must be taken here to ensure that this mechanical stop cannot be approached at full travel speed.

You have the possibility to order one of our experienced technicians for supervision while commissioning or/and service at your site. Therefore please get in contact with us via telephone +49 (0)2336-4009-40 or the e-mail address service@raco.de by mentioning the type of actuator and its unit number (e.g. T6C4/20722).

2.2.5 Operation and Malfunction

2.2.5.1 Operation

During operation it must be ensured that the technical data such as adjustment forces, adjustment speed, switch-on frequency, duty cycle and ambient temperatures will be not exceeded.

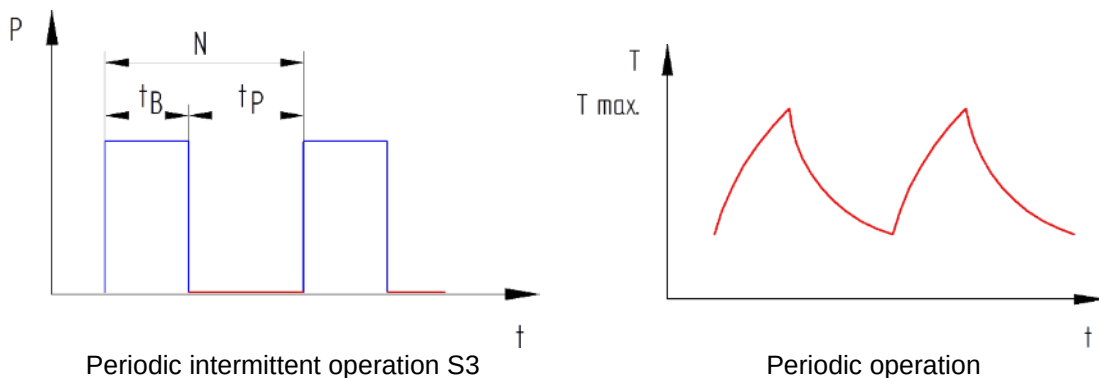
Duty cycle

The relative duty cycle (ED) is the time during which a RACO-Elektrozylinder® is in operation. After this operating time, a rest phase has to take place. The figures are in percent and refer to a period of 10 minutes. I.e. with a specification of 30% duty cycle, the RACO-Elektrozylinder® may be in operation for three minutes within a period of 10 minutes. These three minutes can be distributed differently within this period. The considered time period must not end with a full operating time and the next time period must not start with a full operating time. There must always be a break between the operating times! For example: one minute operation, three minutes break, two minutes operation, four minutes break.

The operating mode is also specified. RACO-Elektrozylinder® are designed for periodic intermittent operation S3 as standard.

Periodic operation means that no thermal steady state is reached during the load period. This means that the various components can cool down sufficiently without reaching the critical temperature of the components in the next operating time.

Further information can be found in DIN EN 60034-1 (VDE 0530-1)



- P = power
- N = useful time
- t = time
- t_B = operating time
- t_P = pause time
- T = temperature

Possible damages caused by non-compliance are overheating of the motor (winding short circuit), overheating of the acme nut (loss of grease between spindle and nut), ...

If a higher duty cycle is required, appropriate measures must be taken.

The motor can be equipped with a forced cooling fan, which continues to run and cool even when the motor is at a standstill.

Instead of an acme screw drive, a ball screw drive can be used. Due to the better efficiency a ball screw drive generates less heat.

Acme screws in general have a duty cycle of approx. 15% at medium speed and medium force.

RACO motors have a standard duty cycle of 30%.

Exact data can be obtained from RACO, as there are a multitude of influencing variables (e.g. force, stroke, speed, temperature, grease type, ...).

Brakes

It must be ensured that the hand releases of the brakes are closed during operation!

Temperature

The operating temperatures are between -20°C and $+70^{\circ}\text{C}$, unless otherwise stated on the type plate. Optionally, the motor can be equipped with a motor heater (MH) and the brake (if present) with a brake heater (BH). Heating of the limit switches is also possible. In extreme cases the gearbox can also be heated. The heaters serve as protection against the effects of cold (frost) and moisture (condensation). Heaters are recommended for large temperature fluctuations and sub-zero temperatures below -10°C . Large temperature differences within a RACO-Elektrozylinder[®] can occur if the actuator is used e.g. above a body of water and one-sided exposure to sunlight. In case of large temperature fluctuations, especially outdoors, the heaters should be switched on permanently at temperatures below $+5^{\circ}\text{C}$ and at temperatures above $+5^{\circ}\text{C}$ for at least 60 minutes a day.

DANGER!



DANGER!

Moving Parts Cause Risk of Injury

Severe injuries including death.

Do not reach into moving parts during operation.

Do not stay in the danger zone of the thrust tube.

Before commissioning, ensure that no persons are in front of the thrust tube.

DANGER!



DANGER!

Overtravel due to lack of self-locking

Severe injuries.

In areas where the load can cause danger to persons, e.g. inserting and removing parts, serious injuries or even the loss of limbs can occur.

The RACO-Elektrozylinder[®] must be equipped with a brake (with tension release), if necessary with a safety brake.

CAUTION!



CAUTION!

Danger of crushing!

During operation there is a danger of crushing in the area of the cardan ring due to movements of a RACO-Elektrozylinder[®].

During operation, ensure that there are no persons in the working area.

CAUTION!**CAUTION!****Motor with rotating hand wheel**

Capture.

Motors with a rotating hand wheel on RACO-Elektrozylinder®, hand wheel can cause parts of the body to be caught!

During operation, make sure that there are no persons in the motor area.

CAUTION!**CAUTION!****Overheating of the motor due to overload!**

Burning.

During operation, do not exceed technical data such as adjustment force, adjustment speed, switch-on frequency, duty cycle, torques, maximum speeds, motor data, etc. motor can overheat due to overload.

Monitor the temperature of the electric motor and switch off in case of overheating.

CAUTION!**CAUTION!****Overheating of the motor due to insufficient cooling**

Burning.

Overheating due to dirt, covered fan cowl, due to unfavourable installation situation,...

Monitor the temperature of the electric motor and switch off in case of overheating. Ensure good ventilation.

If the RACO-Elektrozylinder® is operated in a dusty environment, the cooling surfaces of the motor must be cleaned regularly. Cooling air must be able to flow in and out of the motor unhindered. Ventilation grilles and external fans must be cleaned regularly if they are heavily soiled. Regularly service the entire system in order to avoid overloading the RACO-Elektrozylinder®.

Regular maintenance and cleaning increases the service life of the RACO-Elektrozylinder®.

NOTICE!

During operation, observe technical data such as max. adjustment force, adjustment speed, switch-on frequency, duty cycle, torques, maximum speeds, motor data, etc. Exceeding them will lead to increased wear and failure of the components

NOTICE!



INFO! Pollution of Environment

Outpouring lubrication!

Take appropriate measures in order to absorb outpouring lubrication and depollute properly.

2.2.5.2 Malfunction and Troubleshooting

Error

In case of error RACO-Elektrozylinder® switch off immediately!

DANGER!



DANGER!

Failure of the timing belt

Severe injuries or even death.

Toothed belt wear, toothed belt tear can cause the load to fall if there is no self-locking device.

Prevent access to the danger area during operation. In case of danger to persons (permissible stay) under a suspended load, the use of a toothed belt drive is not permitted.

DANGER!



DANGER!

Overrun due to power failure

Severe injuries.

In areas where the load can endanger people if the load runs after a power failure, e.g. inserting and removing parts, serious injuries or even the loss of limbs can occur.

In this case, the RACO-Elektrozylinder® must be equipped with a brake (voltage releasing), if necessary with a safety brake.

In the event of a power failure, a RACO-Elektrozylinder® must not pose any danger. In case of suspended / pulling loads and / or RACO-Elektrozylinder® with ball screws, the RACO-Elektrozylinder® must always be equipped with a brake type L (with voltage release) in case of danger. In the event of a power failure, the brake engages and the system stops with a possible over travel.

DANGER!



DANGER!

Overrun due to brake failure

Severe injuries.

In areas where the load can endanger people, e.g. inserting and removing parts, serious injuries or even loss of limbs can occur.

The brake must be checked regularly for proper condition.

DANGER!**DANGER!****Crash of the load**

Severe injuries or even death.

Breakage of the thrust tube, nut breakage, loss of toothed belt, extreme wear of the acme nut due to permanent extreme overload.

Overloads are not permitted!

Special precautions must be taken with suspended / pulling loads in case a component on RACO-Elektrozylinder® fails. Due to improper handling, overload, transverse forces, etc., various components such as brakes, clutches, toothed belts or spindle systems could fail despite the most careful design of the RACO-Elektrozylinder®. In such cases, it is to be expected that the coupled load will crash. Special precautions must be taken here for personal protection. Regular maintenance and checks can reduce the risk of component failure. In such cases brakes are to be designed as safety brakes. Maximum specified forces (see order, operating instructions, type plate) must not be exceeded!

CAUTION!**CAUTION!****Break off the anti-rotation protection**

Grasping, friction, abrasions, impact, crushing

If the anti-rotation protection breaks off, e.g. due to overload or travel to the end position (actuator or machine), the thrust tube may rotate if the load is not guided.

RACO-Elektrozylinder® do not overload!

CAUTION!**CAUTION!****Failure of a guard device**

Grasping, friction, abrasions, impact, crushing

Due to the failure of the protective device (force / speed limitation / force limit switch, motor current monitoring ...) the RACO-Elektrozylinder® can apply a much greater force than its nominal force.

Design of the system at least to 2.5 times the maximum force of the RACO-Elektrozylinder®.

Regular inspection of the safety devices.

Troubleshooting

When eliminating the error, it is essential to observe chapter 3.1 "Maintenance instruction".

DANGER!



DANGER!

Crash of the load

Severe injuries or even death.

Before checking the RACO Elektrozyylinder®, secure the load and uncouple it if necessary.

When working under loads and/or on the RACO-Elektrozyylinder®, the load must be secured against falling or movement.

DANGER!



DANGER!

Danger from electric current or voltage!

Severe injuries up to death.

Before working on the electric installation, interrupt electric power supply and secure it against reconnection. Make sure that there is no voltage. (DIN VDE 0105-100).

The electrical connection must only be provided by qualified person (according to Technical Rules for Operational Safety (TRBS) 1203; "qualified person"). The terminal box may be opened only if there is no voltage.

WARNING!



WARNING!

Risk of burns!

During operation, the drive unit may have hot surfaces. The surface temperature may become as hot as 100°C. Measure the temperature before touching the surface; if necessary, wait until it has dropped to 40°C.

Heat sinks (motor and frequency converter) and motor housing as well as the surrounding metallic parts can heat up to temperatures of up to 100°C.

Touching such parts can cause localised burns to the parts of the body concerned (hands, fingers, ...) To avoid such injuries, a sufficient cooling time is required before starting work. The surface temperature must be checked with a suitable measuring device. In addition, sufficient distance to adjacent components must be maintained during installation or contact protection must be provided.

NOTICE!**Pollution of the environment by lubricants!**

Skin irritation, harmful to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

Avoid skin contact!

Take suitable measures to catch and properly dispose of leaked lubricant.

Release the hand release that has been used after the fault has been rectified and remove the mounted hand wheel!

Please also observe chapter 2.2.4.4 "Commissioning".

2.2.6 Maintenance, Cleaning and Care

Customers will choose their RACO-Elektrozylinder® according to their conditions; therefore, both the operational demands (switching cycle, dynamic, position accuracy) and the technical design according to the environmental conditions on site (corrosion protection, explosion protection, damping of vibrations and shocks) are key determinants of the actuator type.

Although many different designs and features are available for the RACO-Elektrozylinder®, we hold the relevant component parts in our stock.

All electric actuators are subject to a natural wear and aging process!

General Remark

Regular maintenance will increase the lifetime of the RACO-Elektrozylinder®. The level of maintenance depends on usage and environmental conditions.

To avoid malfunctions, hazards and damage, the RACO-Elektrozylinder® must be checked at regular intervals, depending on the conditions of use, to ensure that it is functioning properly. In particular, the area between the wiper (front cap) and the thrust tube that moves in relation to it must be cleaned to allow a visual inspection for damages.

DANGER!



DANGER!

Crash of the load

Severe injuries or even death.

Before checking the RACO Elektrozylinder®, secure the load and uncouple it if necessary.

When working under loads and/or on the RACO-Elektrozylinder®, the load must be secured against falling or movement.

DANGER!



DANGER!

Danger from electric current or voltage!

Severe injuries up to death.

Before working on the electric installation, interrupt electric power supply and secure it against reconnection. Make sure that there is no voltage. (DIN VDE 0105-100).

The electrical connection must only be provided by qualified person (according to Technical Rules for Operational Safety (TRBS) 1203; "qualified person"). The terminal box may be opened only if there is no voltage.

WARNING!**WARNING!****Risk of burns!**

During operation, the drive unit may have hot surfaces. The surface temperature may become as hot as 100°C. Measure the temperature before touching the surface; if necessary, wait until it has dropped to 40°C.

Heat sinks (motor and frequency converter) and motor housing as well as the surrounding metallic parts can heat up to temperatures of up to 100°C.

Touching such parts can cause localised burns to the parts of the body concerned (hands, fingers, ...) To avoid such injuries, a sufficient cooling time is required before starting work. The surface temperature must be checked with a suitable measuring device. In addition, sufficient distance to adjacent components must be maintained during installation or contact protection must be provided.

NOTICE!**Pollution of the environment by lubricants!**

Skin irritation, harmful to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

Avoid skin contact!

Take suitable measures to catch and properly dispose of leaked lubricant.

NOTICE!**Damage due to improper maintenance!**

Maintenance and servicing work may only be carried out by a competent person (according to Technical Rules for Operational Safety (TRBS) 1203; "qualified person") authorised by the manufacturer.

NOTICE!**RACO original parts**

Only use RACO original parts. RACO accepts no liability for damage caused by the fitting or installation of non RACO parts. All warranty claims are void.

Further information please refer to Chapter 3.2 “Maintenance Instruction”

You are welcome to send the RACO-Elektrozylinder® to our head office for service. We will provide you with a cost estimate for a repair or, if necessary, an offer for a new unit.

You have the possibility to order one of our experienced technicians for supervision while commissioning or/and service at your site. Therefore please get in contact with us via telephone +49 (0)2336-4009-40 or the e-mail address service@raco.de by mentioning the type of actuator and its unit number (e.g. T6C4/20722).

Please also observe chapter 2.2.10 Accessories / Service „Reshipment“

2.2.7 Unauthorized Modifications

Unauthorized modifications to the RACO-Elektrozylinder® are prohibited. Such modifications will invalidate all guarantee claims.

NOTICE!



Property damage!

Welding work.

Please ensure proper grounding. The RACO-Elektrozylinder® may not be used for the grounding of the welding unit. Welding operations on the RACO-Elektrozylinder® are prohibited!

NOTICE!



Opening a RACO-Elektrozylinder® leads to the loss of warranty claims and can cause damage to the RACO-Elektrozylinder®. In the event of a malfunction or damage, the RACO-Elektrozylinder® should only be opened and repaired by the manufacturer.

NOTICE!



RACO accepts no liability for damage caused by the attachment or installation of third-party parts. This invalidates all warranty claims.

2.2.8 Disassembly

The basic removal of a RACO-Elektrozylinder® from the application is described. The disassembly of a RACO-Elektrozylinder® by unauthorised persons is not permitted and leads to the loss of warranty claims.

A competent person (according to Technical Rules for Operational Safety (TRBS) 1203; „qualified person“ may only carry out dismantling.

A qualified electrician must carry out all work on the electrical system.

Use only suitable transport equipment of adequate size and capacity!

DANGER!



DANGER!

Danger from electric current or voltage!

Severe injuries up to death.

Before working on the electric installation, interrupt electric power supply and secure it against reconnection. Make sure that there is no voltage. (DIN VDE 0105-100).

The electrical connection must only be provided by qualified person (according to Technical Rules for Operational Safety (TRBS) 1203; "qualified person"). The terminal box may be opened only if there is no voltage.

DANGER!



DANGER!

Crash of the load!

Severe injuries or even death.

For non-guided loads, the connection head must be secured against twisting.

DANGER!



DANGER!

Crash of the Product Due to Insufficient Load Handling Device!

Severe injuries including death.

Only use tested and appropriate load handling devices.

Load handling device only to be connected carefully on the main chassis or on the intended spots.

Pay attention to the centre of gravity!

Do not stay under floating loads.

WARNING!**WARNING!**

Do not step on the RACO Elektrozyylinder® or its attachments!

Injuries to the point of death!

Parts may break off and fall down. Danger of injury from knocking, crushing, falling, falling objects.

NOTICE!

Opening a RACO-Elektrozyylinder® leads to the loss of warranty claims and can cause damage to the RACO-Elektrozyylinder®. In the event of a malfunction or damage, the RACO-Elektrozyylinder® should only be opened and repaired by the manufacturer.

General procedure for dismantling:

1. Switch off the voltage supply and check that no voltage is present!
2. Before dismantling, make room for stability and for storing the RACO Elektrozyylinder®
3. Secure loads in such a way that there is no longer any load on the front eye clevis, clevis or rod eye.
4. Secure the RACO Elektrozyylinder® or larger equipment parts (e.g. brackets) so that they cannot fall or tip over.
5. Remove the bolt from the clevis or rod eye.
6. Loose fixing screws at the brackets or remove bolts from the swivel foot bracket.
7. Lift the RACO Elektrozyylinder® out of the system
8. Pack RACO Elektrozyylinder® ready for transport

If you have any questions or uncertainties, please contact RACO.

Please also observe chapter 2.2.3.4 "Transport" and Chapter 2.2.10 Accessories / Service "Reshipment"

2.2.9 Waste disposal

Please comply to the regional and national regulations when disposing of a RACO-Elektrozylinder®. For further recycling, reusable materials should be separated.

NOTICE!



Pollution of the environment

The RACO-Elektrozylinder® contain the following materials: steel, aluminium, grey cast iron, copper, bronze, plastic, grease and possibly electronic components.

Environmentally harmful materials can lead to pollution if not disposed of correctly.

Please collect expiring lubricants and dispose them with care.

Dispose the product and its parts in a proper manner and in accordance with national and international regulations and laws.

NOTICE!



Pollution of the environment by lubricants!

Skin irritation, harmful to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

Avoid skin contact!

Take suitable measures to catch and properly dispose of leaked lubricant.

NOTICE!**Portable battery**

Parts, that are marked with this symbol, cannot be disposed with residual waste.

As a consumer, you are required to return batteries and rechargeable batteries.

Please dispose of batteries at public waste collection stations or recycling centers, as requested by official regulations.

NOTICE!**Disposal information for lithium cells**

Lithium batteries have to be empty or may otherwise not be placed in the containers for used batteries accessible at retail stores or public disposal providers.

If batteries are not fully discharged, please take appropriate precautions. The electrical poles must be safely insulated.

Further information on proper disposal can be obtained from the responsible waste disposal company.

2.2.10 Accessories / Service

Accessories

The RACO-Elektrozylinder® can be augmented in many different ways by using accessory parts:

- Trunnion brackets
- Swivel foot brackets
- Cardanic ring mounting
- Front clevis
- Rod eye
- Rod cover
- Dust protection tube
- Front flange
- Limit switches
- Absorbers
- Brake
- Hand wheel...

Further information about our accessory parts is available online at www.raco.de or by telephone at +49 (0)2336/4009-0

Device-specific documentation, circuit diagrams and software

As an extension of our support, we offer you the specific documentation on RACO products in our online archive for download.

Via the QR code or the download link in the cover of the terminal boxes, you have direct access to all important information on the device in case of maintenance on site.



**If you have any questions, please contact RACO-Service
telephone: +49 (0)2336/4009-40 or e-mail: service@raco.de**

Commissioning support / On-site service

You have the possibility to order one of our experienced technicians for supervision while commissioning or/and service at your site. Therefore please get in contact with us via telephone +49 (0)2336-4009-40 or the e-mail address service@raco.de by mentioning the type of actuator and its unit number (e.g. T6C4/20722).

**Reshipment**

When shipping the device, please note the following:

All equipment delivered to RACO must be free of hazardous substances (acids, alkalis, solutions, etc.) and must therefore be cleaned before returning. To return the unit, use the original packaging or suitable transport packaging.

Please also use our repair questionnaire for faster processing in our company. You will find the questionnaire on our homepage under Inhouse-Service.

Return address:

RACO-ELEKTRO-MASCHINEN GmbH
Repair-Center
Steinwegstraße 25-33
58332 Schwelm
Germany

Tel.	+49 (0) 2336 / 4009-40
E-Mail	service@raco.de

RACO-ELEKTRO-MASCHINEN GmbH
Jesinghauser Str. 56-64
58332 Schwelm
Germany

Tel.	+49 (0) 2336 / 4009-0
Fax	+49 (0) 2336 / 4009-10
E-Mail	RACO@raco.de
Internet	www.raco.de



3.2

Maintenance Instruction Compact 2-7 + Size 2+ T5A1

3.2 Maintenance Instructions

The maintenance instructions refer to RACO-Elektrozylinder® type 6 / Compact series in size 2-7, for the type 1 T1A2 / T1B2 or K1A2 / K1B2 and type 5 T5A1.

Table of content

3.2.1	General Information	2
3.2.2	Regular Maintenance Work	5
3.2.3	Lubrication	8
3.2.4	Front eye / Clevis / Rod eye	11
3.2.5	Trunnions / Brackets / Swivel foot bracket	12
3.2.6	Wipers, Seals and Bushings of the Front Cap	13
3.2.7	Motor, and Gearboxes	14
3.2.8	Brakes	15
3.2.9	Timing Belt	20
3.2.10	Drive Screw	23
3.2.11	Frequency Inverters	24
3.2.12	Batteries (Position Sensor EPS / PLC)	25
3.2.13	Air Filters	26
3.2.14	Cleaning	27
3.2.15	Service	29

3.2.1 General Remark

The safe operation of the RACO-Elektrozylinder® requires regular maintenance, at the same time increasing the service life of your RACO-Elektrozylinder®. The level of maintenance depends on usage and environmental conditions.

To prevent malfunctions, hazards, and damages, RACO-Elektrozylinder® must be regularly checked for proper functioning; the intervals depend on the operating conditions. In particular, the area between the stripper (front cap) and the relative movement of the thrust tube must be cleaned and a visual inspection for damages must be carried out.

The maintenance intervals must be shortened if a higher level of wear is found.

Please note that spare parts and accessories not supplied by us have not been tested and approved by us. RACO accepts no liability or warranty for damage caused by the use of non-original spare parts and accessories.

When ordering spare parts, please state the type of unit, the unit number and the RACO identification number.

DANGER!



DANGER!

Crash of the load

Severe injuries or even death.

Before checking the RACO-Elektrozylinder®, secure the load and uncouple it if necessary.

When working under loads and/or on the RACO-Elektrozylinder®, the load must be secured against falling or movement.

DANGER!



DANGER!

Danger from electric current or voltage!

Severe injuries up to death.

Before working on the electric installation, interrupt electric power supply and secure it against reconnection. Make sure that there is no voltage (DIN VDE 0105-100).

The electrical connection must only be provided by qualified person (according to Technical Rules for Operational Safety (TRBS) 1203; "qualified person"). The terminal box may be opened only if there is no voltage.

DANGER!**DANGER!****Danger from pretensioned systems!**

Severe injuries or even death.

RACO-Elektrozylinder® contain pretensioned spring systems. Without specialist knowledge, nut housing and RACO-Elektrozylinder® with mechanical thrust limit switch cannot be dismantled without risk.

Disassembly is not permitted!

Disassembly on pretensioned systems may only be carried out at RACO!

WARNING!**WARNING!****Risk of burns!**

During operation, the drive unit may have hot surfaces. The surface temperature may become as hot as 100°C. Measure the temperature before touching the surface; if necessary, wait until it has dropped to 40°C.

Heat sinks (motor and frequency converter) and motor housing as well as the surrounding metallic parts can heat up to temperatures of up to 100°C.

Touching such parts can cause localised burns to the parts of the body concerned (hands, fingers, ...)

To avoid such injuries, a sufficient cooling time is required before starting work. The surface temperature must be checked with a suitable measuring device. In addition, sufficient distance to adjacent components must be maintained during installation or contact protection must be provided.

NOTICE!**Pollution of the environment by lubricants!**

Skin irritation, harmful to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

Avoid skin contact!

Take suitable measures to catch and properly dispose of leaked lubricant.

NOTICE!**Damage due to improper maintenance!**

Maintenance and servicing work may only be carried out by a competent person (according to Technical Rules for Operational Safety (TRBS) 1203; "qualified person") authorised by the manufacturer.

NOTICE!**RACO original parts**

Only use RACO original parts. RACO accepts no liability for damage caused by the fitting or installation of non RACO parts. All warranty claims are void.

All disassembly and assembly work must be carried out in accordance with the corresponding chapter in Operating Instructions 2.2!

3.2.2 Regular Maintenance Work

The frequency of visual and functional tests depends on the operating conditions and local conditions and is determined by the customer!

RACO recommends:

Daily

Can be performed by operator:

- RACO-Elektrozylinder® check for visual external damage and clean the thrust tube end motor off dust and dirt if necessary.

This work is recommended to increase the service life. It has no influence on the function of the RACO-Elektrozylinder®.

Monthly

To be performed by qualified personnel:

- Check the mounting parts of the RACO-Elektrozylinder®.
- If necessary, relubricate (see chapter 3.2.3).

WARNING!



WARNING!

Danger of damage and injury due to insufficient fixing material

Severe injuries or even death.

Use suitable screw connections!

Fasten screw connections with pretensioning forces or tightening torques according to VDI 2230!

Secure fastening bolts to prevent them from falling out!

Annually

Must be performed by qualified personnel (according to TRBS 1203):

Visual inspection:

- General condition of the RACO-Elektrozylinder®, it must not show any cracks or deformations. The thrust tube and the shield tube must not have any dents or deformations.
- Check the timing belt for cracks on the back of the belt and for heavy abrasion.
- Heavily soiled RACO-Elektrozylinder® must be cleaned to extend seal life. After cleaning, apply some lubricant to the thrust tube near the seal.
- Check readability of signs and stickers.
- Ensure that all seals and wipers in the guide cap to the thrust tube and in the terminal boxes are in good condition to prevent moisture from penetrating. Defective seals must be replaced.
- In the event of corrosion, these areas must be repaired by suitable measures.

Functional test

- Check fastenings, screw and bolt connections for tightness and retighten if necessary.
- For non-guided loads, check whether the connection head is secured against twisting. If it is loose, fasten it again and secure it accordingly.
- Check cable inlets, cable glands, sealing plug etc. to confirm that they are still tight and sealed.
- Grease RACO-Elektrozylinder® if necessary, see chapter 3.2.3
- For seldom operation: If possible, move RACO-Elektrozylinder® several times over the entire stroke (lubrication stroke).
- Check drive, limit switch and brake for function.

During maintenance work, the regulations for mechanical and electrical installation must be observed.

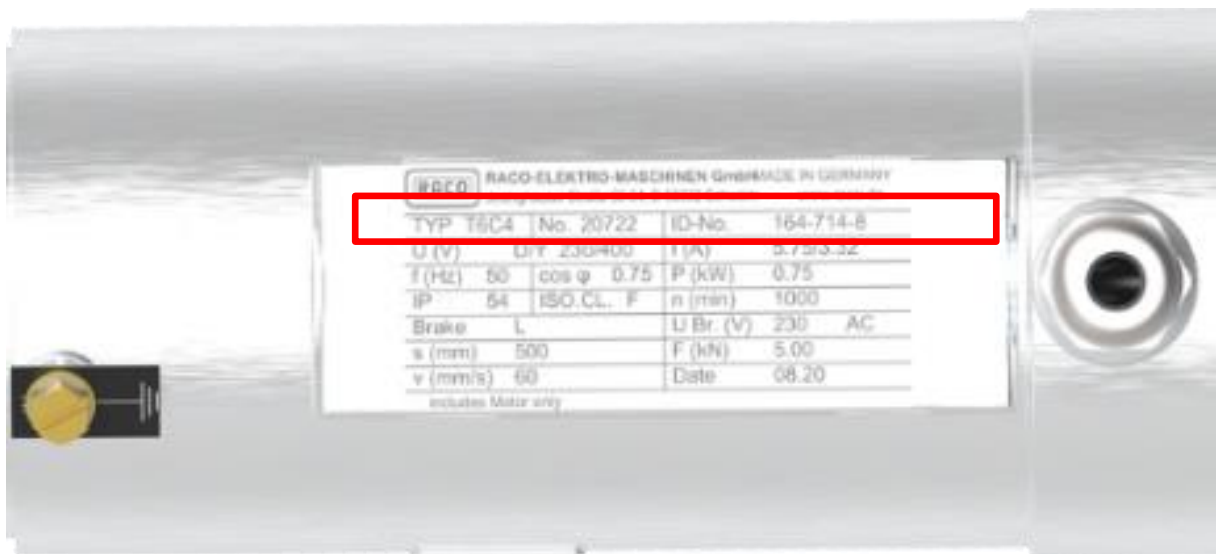
These can be found in the individual chapters of the operating instructions 2.2.

In case of a necessary repair, we recommend to send the RACO-Elektrozylinder® to the RACO service base Schwelm for inspection and repair of damage.

You have the possibility to order one of our experienced technicians for supervision while commissioning or/and service at your site. Therefore please get in contact with us via telephone +49 (0)2336-4009-40 or the e-mail address service@raco.de by mentioning the type of actuator and its serial number (e.g. T6C4/20722).

Please also observe chapter 2.2.10 Accessories / Service „Reshipment “

When making an enquiry, always state the type of device, the RACO serial number and the RACO identification number so that we can help you as quickly as possible.



NOTICE!



Damages Resulting from Improper Maintenance!

If the RACO-Elektrozylinder® is operated outside the specified ambient conditions, RACO accepts no liability or warranty. It is necessary to check for visible changes at least once a month!

3.2.3 Lubrication

The RACO-Elektrozylinder® type 6 (compact series) in size 2, 4 & 6, especially the spindle-nut system is equipped with a long life lubrication and thus maintenance-free over the expected service life. A Relubrication of the spindle-nut system is not necessary for the estimated operation period. The service life of the spindle-nut system can be increased by relubrication (grease exchange), however. The old grease is removed, the spindle and nut are washed out and the RACO-Elektrozylinder® re-greased.

Only for the RACO-Elektrozylinder® type 6 (compact series) in size 7 and type 1 size T1A2 / T1B2 or K1A2 / K1B2, the spindle-nut system must be relubricated.

For the lubrication of the spindle-nut system, various greases are available which are selected depending on the conditions of use (temperature range, media resistance, food compatibility, etc.).

Normal operating conditions:

Temperature range: -20°C to +70°C

No shocks and vibrations

No environmental influences (operation in roofed rooms with normal atmosphere)

Relubrication

The screw system is equipped with a grease depot and can be refilled with the following grease type:

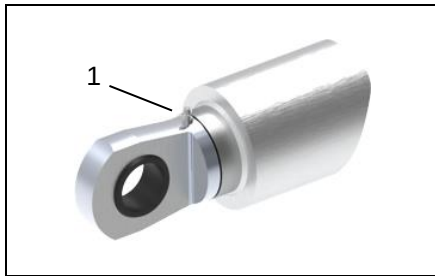
Use	Normal Load and Heavy Load
Grease type	standard grease
Description	KP 2K 30 DIN 51502
Temperature in usage range	-30°C to +130°C
Thickening agent	Lithium (Li)
NGLI class (DIN 51818)	2
Additive	EP-materials molybdenum disulphide

Table 1: Grease types

NOTICE!

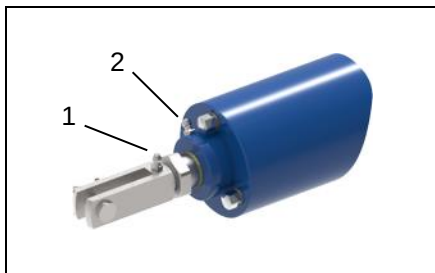


Only regrease with greases from the same base oil and thickener according to Table 1! Otherwise, the lubricating effect may be lost and the RACO-Elektrozylinder® may be destroyed!

Type 6 „Compact“ C 7

Position of the grease nipple

1 nipple for screw system

Type 1 size T1A2 / T1B2 or K1A2 / K1B2

Position of the grease nipples

- 1 Nipple for screw system
- 2 Nipple for thrust tube (optional). Only enough grease should be lubricated to form a slight film of grease on the thrust tube.

If the RACO-Elektrozylinder® is not moved over the entire useful stroke during normal operation, less than 80% of the stroke, a grease stroke should be carried out occasionally so that the nut can extract new grease from the screw.

NOTICE!



For short-stroke applications (alternating stroke movements of less than 50 mm), a lubrication stroke should be carried out after 10000 double strokes or 1 km of running!

Size	Until stroke in mm				
	300	400	500	800	1000
2	10				
7	30	40	40	50	60

Register 2: Refill quantities acme screw in grams [g].

Size	Until stroke in mm				
	300	400	500	800	1000
2	10				
7	40	40	40	50	60

Register 3: Refill quantities ball screw in grams [g].

Relubrication should take place, depending on what occurs beforehand, once a year or:

- with acme screw drive EZ 2 to 7 after approx. 5 km of operation.
- with ball screw EZ 2 to 7 after approx. 15 km of operation.

At high loads or high switching frequencies, the lubrication intervals are shortened.

With low loads or low switching frequencies, the lubrication intervals can be extended.

Relubricate before longer standstill or interruption of operation (longer than 2 months up to 24 months)!

Regreasing

Depending on the switching frequency, force and stroke as well as other environmental influences (vibrations, ambient conditions, ...) we recommend cleaning and regreasing (i.e. grease exchange), depending on what occurs before, after approx. 7-10 years or:

- with acme screw drive EZ 2 to 7 after approx. 50 km of operation.
- with ball screw EZ 2 to 7 after approx. 150 km of operation.

The old grease is removed, the spindle and nut are washed out and the Die RACO-Elektrozylinder® is regreased.

After a longer standstill or interruption of operation (more than 2 years), the grease must be replaced completely!

NOTE!



Important!

To increase the service life, we recommend regular re-greasing.

When changing the grease, we also recommend replacing the sealing elements.

3.2.4 Front eye / Clevis / Rod eye

Front eye / Clevis

Front eyes and Clevises are maintenance-free.

Rod eye

Requires maintenance

Rod eyes requiring maintenance are made of the following material combinations:

Steel/Steel; Steel/Bronze; Stainless Steel/Bronze. They are equipped with a grease nipple above the spherical bearing.

Regular lubrication of these bearings is necessary to ensure proper functioning. This should be done once a year.

Maintenance-free

Maintenance-free rod ends are made of the following material combinations:

Hard chrome/PTFE; stainless steel/PTFE; stainless steel/composite.

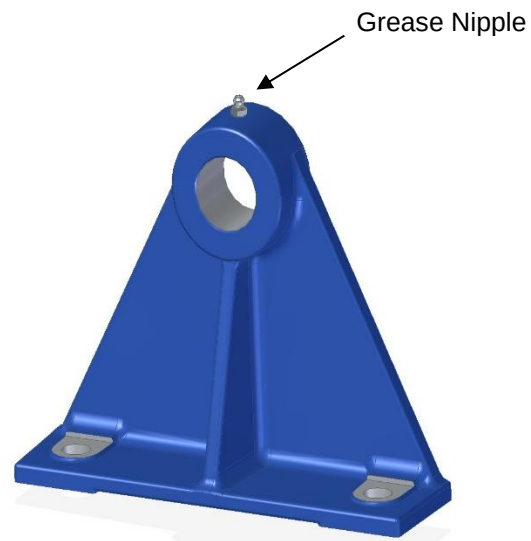
These bearings must **not** be lubricated. Lubrication reduces the service life of the spherical plain bearing!

3.2.5 Trunnion / Brackets / Swivel foot bracket

Trunnion / Brackets

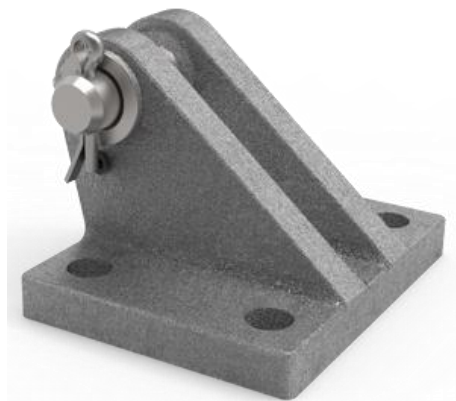
The trunnion pins are made of stainless steel as standard. The associated brackets from RACO are equipped with a corresponding bushing / bore, which must be lubricated with grease during assembly.

Depending on the application and ambient conditions, it is recommended to relubricate the brackets at least once a year via the grease nipple. The brackets of cylinder type 1 T1A2 / T1B2 or K1A2 / K1B2 and type 5 T5A1 are maintenance-free.



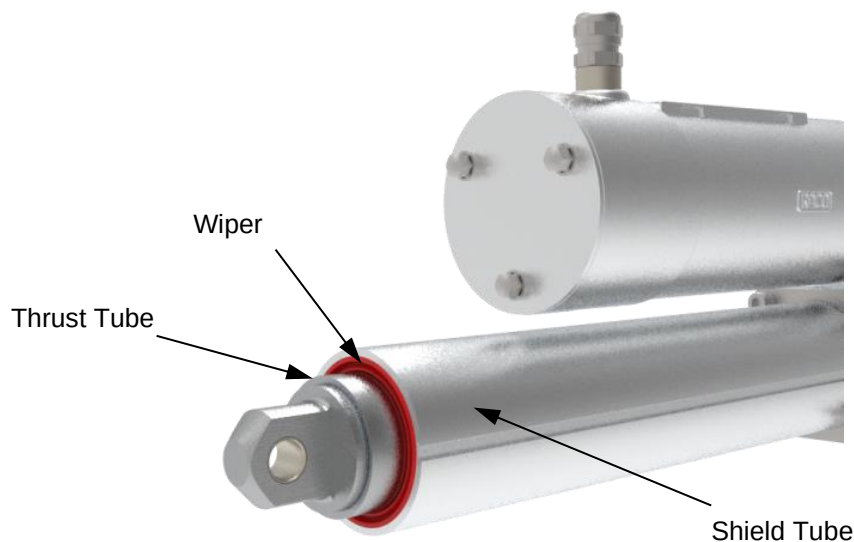
Swivel foot bracket

The swivel foot bracket is maintenance-free. The pin must be provided with a film of grease once during assembly.



3.2.6 Wipers, Seals and Bushings of the Front Cap

The RACO-Elektrozylinder® is fitted with wipers and guide bushes on the centrally exiting the guide cap with wipers, lip seals and guide bushes. The wipers and seals protect the guide bushes from increased wear and prevent the ingress of dust, moisture or even water if the seal is adequate. To ensure proper function, these seals must be checked regularly. If damage to the wiper is detected, it must be replaced immediately to protect the other elements and the RACO-Elektrozylinder®.



It is not possible to replace the wipers on Compact actuators on site. Due to the sealed design with pressed-in elements, the sealing elements and guide bushes can only be replaced at RACO. During this maintenance, a grease change is carried out at the same time and, if necessary, defective and worn components are replaced.

After 8 years, the wipers and the seals must be replaced, otherwise they become brittle and no longer function.

NOTICE!



Here you will find information on possible hazards that can lead to material damage. The text, describes how to behave to avoid the damage.

3.2.7 Motor, Brakes and Gearboxes

RACO Three-Phase Motor

The RACO special motors are maintenance-free. For attached third-party motors, the maintenance instructions of the motor supplier must be observed.

RACO DC motor

RACO recommends an initial inspection of the brushes and the collectors after 1500 operating hours. Depending on the test results, the intervals of the further checks are to be determined. The brushes should be replaced, the motor cleaned and the collector checked after 3000 operating hours at the latest. If third-party motors are fitted, the maintenance instructions of the motor supplier must be observed.

Motor and gearbox bearings should be replaced after 10,000 to 20,000 operating hours, but at the latest after 8 to 10 years.

Gearbox

The RACO gearboxes are maintenance-free. If third-party gearboxes are fitted, the maintenance instructions of the gearbox supplier must be observed.

NOTE!



Maintenance information from other producer of motors and gears are in the additional instructions information.

Motors Protection class IP 68 or higher

After flooding, the motor and the enclosures for the controls and switches must be checked for water ingress. If water has entered, the leak must be located and repaired. The motor and the housing must be professionally drained and checked for function.

3.2.8 Brakes

Electromechanical spring-applied brakes are usually used in a RACO-Elektrozylinder®. The brakes are mechanically dimensioned so that they can take over the torque of the RACO motor when switched off.

There are basically two types of electromagnetic brakes:

Type "L" (braking effect off = Open when voltage is applied).

Type "B" (braking effect activated = Closed when voltage is applied).

Both types of brakes are located on the second shaft end of the RACO motor.

Double brakes or theatre brakes are two type "L" brakes mounted one behind the other and must be maintained accordingly.

Spring-applied brakes are largely maintenance-free, but RACO recommends checking them regularly.

Before working on a brake, make sure that the RACO-Elektrozylinder® is uncoupled or the loads are secured!

DANGER!



DANGER!

Crash of the load

Severe injuries or even death.

Before checking the brake of a RACO Elektrozylinder®, secure the load and uncouple it if necessary.

DANGER!



DANGER!

Danger due to overrunning or sinking!

Serious injuries or even death.

In areas where overrunning of the load leads to a hazard to persons, e.g. when inserting and removing parts, serious injuries or even loss of limbs may occur.

The brake must be checked regularly for proper condition.

DANGER!



DANGER!

Danger due to overrunning or sinking!

Serious injuries or even death.

The friction lining and the friction surfaces must be carefully protected from dirt. Under no circumstances should they come into contact with oils and greases. Minor impurities of this kind can greatly reduce the braking torque.

Brake type “L”

The brake discs are dimensioned for the service life of the RACO-Elektrozylinder® and are therefore maintenance-free over the expected service life. RACO recommends checking the dust protection ring, the air gap and the rotor thickness at least once a year, depending on the application or the switching frequency.

Brake size	Nominal air gap	max. air gap	max. air gap *	Rotor size new	Rotor size min	Fastening screws	Quantity	Tightening torque
	mm	mm	mm	mm	mm		Stk	Nm
	a_{nenn}	a_{max}	a_{max}	s_{neu}	s_{min}			M_A
8	$0,2^{+0,15}$	0,6	0,45	$7,5_{-0,1}$	4,5	M4	3	3
10	$0,2^{+0,15}$	0,7	0,45	$8,5_{-0,1}$	5,5	M5	3	6
13	$0,3^{+0,15}$	0,8	0,55	$10,3_{-0,1}$	7,5	M6	3	10
15	$0,3^{+0,15}$	0,9	0,60	$12,5_{-0,1}$	9,5	M6	3	10
17	$0,3^{+0,15}$	1,0	0,60	$14,5_{-0,1}$	11,5	M8	3	25
20	$0,4^{+0,15}$	1,1	0,80	$16,0_{-0,1}$	12,5	M8	3	25

* Holding brakes with emergency-stop properties

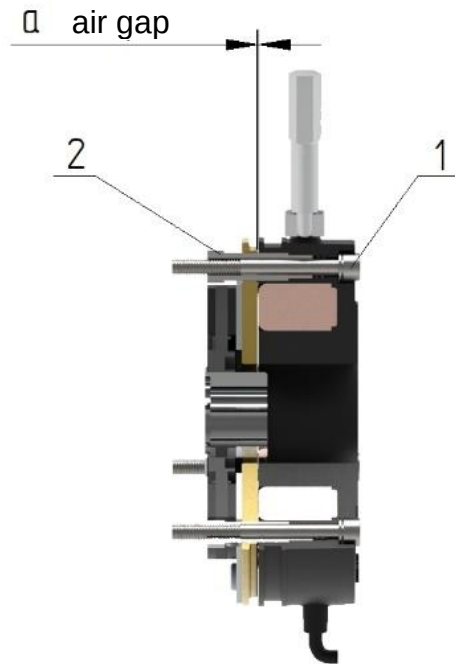
Table 4: Air gaps, Rotor values end Fastening of RACO Standard Brake

When the maximum air gap a_{max} specified in Table 4 is reached, the air gap a must be readjusted to ensure safe operation of the brake. If the brake functions beyond the maximum air gap in individual cases, this does not change anything, the brake is then no longer operated as intended. In any case, further wear will impair the functionality and safety function of the brake.

When the minimum rotor thickness s_{min} according to Table 4 is reached, readjustment of the air gap a is no longer possible and replacement of the rotor is necessary. If the brake functions beyond the minimum rotor thickness in individual cases, this does not change anything; the brake is then no longer operated as intended. In any case, further wear will impair the functionality and safety function of the brake.

Adjusting the air gap:

- Loosen all fastening screws (pos. 1) by turning them **half a turn** counter-clockwise.
- Screw the banjo bolts (pos. 2) into the magnet body, also by turning them anti-clockwise.
- Screw the fixing screws (clockwise) into the motor flange until the nominal air gap (measured with feeler gauges) is present at three points on the circumference.
- Reposition the banjo bolts, i.e. unscrew them from the magnet body (clockwise) until they are firmly in contact with the counter friction surface.
- Tighten the fastening screws with the tightening torque according to Table 4.
- Re-check the air gap, readjust the setting if necessary



Defective dust protection rings must be replaced.

If present, check the function of the switch for manual release and the switch for brake function monitoring.

Brake L (holding brake) IP 65

RACO-Elektrozylinder® with brakes in IP65 cannot be checked on site and must be sent in. The shaft seal between the shaft and the brake housing must be replaced if it is defective

Brake malfunction

Table 5 lists typical faults during operation (in some cases also during commissioning), their possible causes and information on how to rectify them.

Malfunction	Possible cause	Trouble shooting
Brake does not release	Air gap too large	Check and adjust air gap
	Brake is not supplied with voltage	Check electrical connection
	Voltage at coil too low	Check coil connection voltage
	Armature plate mechanically blocked	Remove mechanical blockage
Brake releases with delay	Air gap too large	Check and adjust air gap
	Voltage at coil too low	Check coil connection voltage
Brake does not engage	Coil voltage too high	Check coil connection voltage
	Armature plate mechanically blocked	Remove mechanical blockage
Brake engages with delay	Coil voltage too high	Check coil connection voltage

Table 5: Brake malfunctions

Brake type "B"

RACO type "B" brakes are normally maintenance-free. Due to a special surface hardening, the armature disk is extremely wear-resistant. Only asbestos-free and very wear-resistant organic friction linings are used.

However, it is recommended to check the brakes every 3000 operating hours. The brake must be inspected with regard to the working air gap and the visual appearance of the armature plate, driver and pressure ring. The brake must be cleaned of abrasion.

However, if the working air gap reaches the permissible dimension "a" max. (Table 6), the correct air gap "a" can be set as described under brake type "L" and the full functionality of the brake can be restored.

Brake size	65	80	100	125
air gap "a" min	0,2	0,2	0,2	0,3
air gap "a" max	0,6	0,8	1,0	1,2

Table 6: Air gap "a" brake B

For applications that require a particularly high load on the brake, the time interval for checking should be shortened accordingly.

In applications where the brake is relevant to safety, the maintenance intervals should be at least halved.

3.2.9 Timing Belt

The timing belts used by RACO are maintenance-free over the expected service life of the RACO-Elektrozylinder®. Nevertheless, a visual inspection of the toothed belt must be carried out.

DANGER!



DANGER!

Failure of the timing belt

Severe injuries or even death.

Toothed belt wear, toothed belt tear can cause the load to fall if there is no self-locking device.

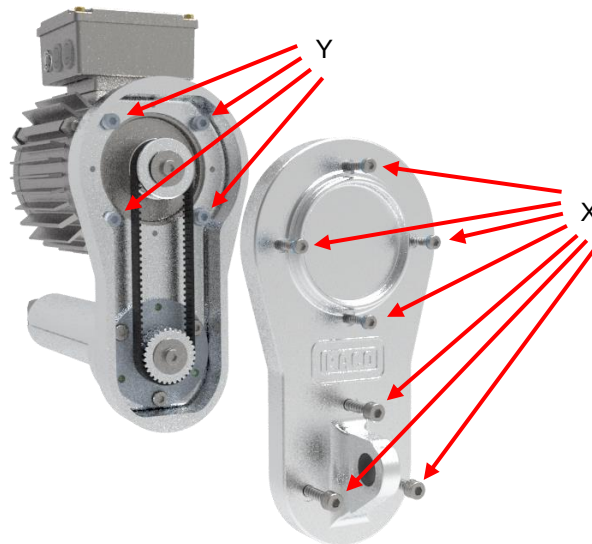
Prevent access to the danger area during operation. In case of danger to persons (permissible stay) under a suspended load, the use of a toothed belt drive is not permitted.

Toothed belts must be checked for signs of fatigue, e.g. wear of the fabric on the teeth, cracks in the outer surface, detachment from the outer surface after 250,000 double strokes. If wear is detected, the toothed belt must be replaced immediately.

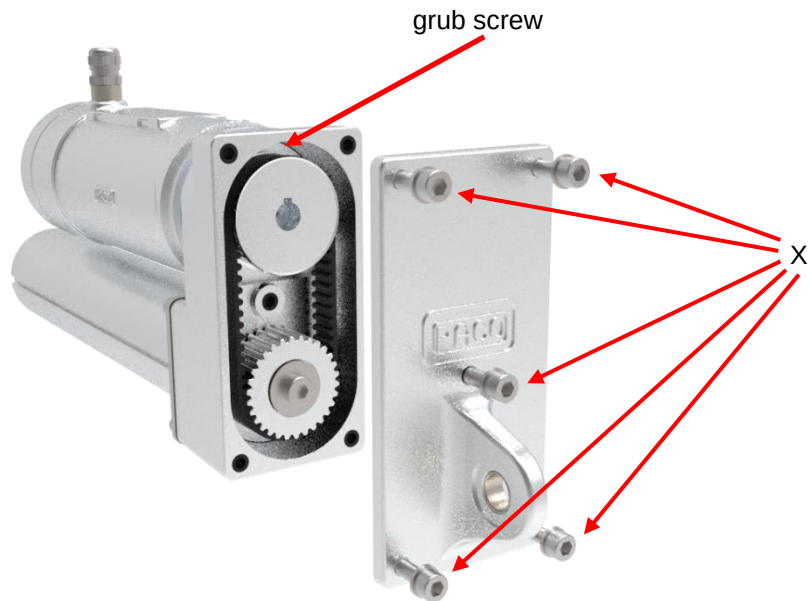
Timing belts should generally be replaced after 500,000 double strokes or 8 years, regardless of wear.

For the visual inspection, remove the rear end cover of the idler housing.

Changing the timing belt on C4-105; C4-140, C6



- 1 Remove the cover (6 or 7 screws on the outside of the cover (X)).
- 2 Dismantle the (gearbox) motor (4 screws in the belt drive housing at the top (Y))
- 3 Remove old timing belt
- 4 Insert new timing belt (Attention! Make sure that the toothed belt engages correctly in the toothing).
- 5 Mount the (gearbox) motor
- 6 Mount the cover
- 7 If necessary, readjust the mechanical limit switches

Changing the timing belt on C2/C4

- 1 Remove the cover (5 to 6 screws on the outside of the cover).
- 2 Separate and remove the old timing belt
- 3 Insert the new timing belt into the upper belt wheel on the motor. Make sure that the timing belt engages correctly in the toothing).
- 4 Engage the timing belt in the toothing of the lower toothed wheel. Using an Allen key (SW6), turn the fastening screw clockwise while pushing the belt onto the belt wheel.
- 5 Then check the running of the timing belt. Make sure that the timing belt does not run in front of the flanged wheel of the upper timing belt wheel. To correct the running of the toothed belt, the upper timing belt wheel can be moved on the motor shaft. To do this, loosen the grub screw (SW2) on the rear collar of the timing belt wheel.
- 6 Fit the cover (apply new sealant if necessary).
- 7 If necessary, readjust the mechanical limit switches

NOTICE!

The belt wheels must be aligned one above the other. The timing belt must not run against a flanged wheel.

If the motor or the idler housing has a RACO displacement sensor (e.g. type EPS), the positions are still stored even after a belt change. At the RACO-Elektrozylinder®, however, the zero point must be reset (see the corresponding EPS operating instructions).

If malfunctions or problems still occur, please contact service@raco.de.

3.2.10 Drive Screw

The drive spindle in a RACO-Elektrozylinder® is subject to wear. To minimise wear, regular lubrication is necessary (see chapter 3.1.3). If the wear is too big, the drive nut and, if necessary, the drive spindle must be replaced.

Acme srew

With an acme screw, this can be determined if the thrust tube has too much axial play. The maximum axial play can be found in the table below.

actuator size	EZ2/C2	C 4	C 6	C 7
max. axial play	0,4 mm	0,8 mm	0,8 mm	1,0 mm

Table 7: axial play

Ball screw

With a ball screw, increased running noise, increased vibration in the running behaviour, sluggishness partially or over the entire travel path and, as a result, increased current consumption and increased heating of the RACO-Elektrozylinder® can occur.

DANGER!



DANGER!

Crash of the load

Severe injuries or even death.

If the nuts and/or the drive screw are worn out, the drive system may fail completely and the nut may slip over the entire stroke.

3.2.11 Frequency Inverters

RACO Frequency inverters are maintenance-free when operated correctly. If the frequency converter is being used in a dusty environment, the cooling-vane surfaces should be regularly cleaned with compressed air. If air intake filters have been built into the control cabinet, then these should also be regularly cleaned or replaced.

If the frequency converter is not used for a long time, it must be connected to the supply network for at least 60 min minimum once a year (see chapter 2.2.2.4 Storage).

WARNING!



WARNING!

Risk of burns!

During operation, the drive unit may have hot surfaces. The surface temperature may become as hot as 100°C. Measure the temperature before touching the surface; if necessary, wait until it has dropped to 40°C.

NOTICE!



If the frequency converter not regularly connected to the supply network, there is a danger that the device may be destroyed.

3.2.12 Batteries (Position Sensor EPS / PLC)

The battery life is about 10 years. We highly recommend replacing the battery on time.

NOTICE!



If the lifetime of the battery is exceeded, a complete data loss might happen if no 24V supply is present.

NOTICE!



Portable battery

Parts, that are marked with this symbol, cannot be disposed with residual waste.

As a consumer, you are required to return batteries and rechargeable batteries.

Please dispose of batteries at public waste collection stations or recycling centers, as requested by official regulations.

NOTICE!



Disposal information for lithium cells

Lithium batteries have to be empty or may otherwise not be placed in the containers for used batteries accessible at retail stores or public disposal providers.

If batteries are not fully discharged, please take appropriate precautions. The electrical poles must be safely insulated.

3.2.13 Air Filters

Standard

Due to the design of each electric actuator, there is an exchange of air with each stroke. The ingress of dust into the unit would lead to increased wear in the RACO-Elektrozylinder®. For this reason, an air filter is installed in most RACO-Elektrozylinder®. It is located on the underside of the bearing housing. This air filter is maintenance-free.

NOTICE!



Make sure that the air filter is not covered with paint or dirt.

3.2.14 Cleaning

DANGER!



DANGER!

Danger from electric current or voltage!

Do not clean the RACO-Elektrozylinder® with liquids during operation. Interrupt electric power supply and secure it against reconnection. Make sure that there is no voltage. (DIN VDE 0105-100).

CAUTION!



CAUTION!

Clean thrust tube

Squeezing, pulling in, bumping

Do not clean the thrust tube during operation. Interrupt electric power supply and secure it against reconnection. Make sure that there is no voltage. (DIN VDE 0105-100).

CAUTION!



CAUTION!

Clean fan

Retracting, cutting off

Do not clean the motor fan during operation, switch off the RACO-Elektrozylinder®!

NOTICE!



Do not use a high-pressure cleaner or steam to clean the RACO-Elektrozylinder®, as this will destroy the seals and water may enter the RACO-Elektrozylinder®.

NOTICE!



The use of solvents and aggressive cleaning agents leads to the destruction of seals and to the functional failure of the product.

Use only water and, if necessary, a mild cleaning agent for cleaning. The water, including all chemical additives, must be pH-neutral.

Close all openings with suitable protective caps/ devices and ensure that all seals and closures are tight so that no moisture can penetrate during cleaning.

Do not make any lifting movements of the RACO-Elektrozylinder® during cleaning, as there is a risk of cleaning fluids penetrating the inside of the RACO-Elektrozylinder®.

Cleaning agents and cleaning equipment are only permitted with the approval of RACO!

Clean the RACO-Elektrozylinder® with a damp cloth.

To prolong the life of the seal, apply a little lubricant to the thrust tube near the seal after cleaning.

3.2.15 Service

Device-specific documentation, circuit diagrams and software

As an extension of our support, we offer you the specific documentation on RACO products in our online archive for download.

Via the QR code or the download link in the cover of the terminal boxes, you have direct access to all important information on the device in case of maintenance on site.



If you have any questions, please contact RACO-Service
telephone: +49 (0)2336/4009-40 or e-mail: service@raco.de

Commissioning support / On-site service

You have the possibility to order one of our experienced technicians for supervision while commissioning or/and service at your site. Therefore please get in contact with us via telephone +49 (0)2336-4009-40 or the e-mail address service@raco.de by mentioning the type of actuator and its unit number (e.g. T6C4/20722).

Reshipment

When shipping the device, please note the following:

All equipment delivered to RACO must be free of hazardous substances (acids, alkalis, solutions, etc.) and must therefore be cleaned before returning. To return the unit, use the original packaging or suitable transport packaging.

Please also use our repair questionnaire for faster processing in our company. You will find the questionnaire on our homepage under Inhouse-Service.

Return address:

RACO-ELEKTRO-MASCHINEN GmbH
Repair-Center
Steinwegstraße 25-33
58332 Schwelm
Germany

Tel.	+49 (0) 2336 / 4009-40
Fax	+49 (0) 2336 / 4009-10
E-Mail	service@raco.de
Internet	www.raco.de



4.2

RACO - Motor Size 2

4.2 RACO – Motor size 2

The operating instruction refers to RACO-Elektrozylinder® with RACO motor size 2 of cylinder type 6 / Compact series in size 2-4, for the type 1 T1A2 / T1B2 or K1A2 / K1B2 and type 5 T5A1.

Table of content

4.2.1	General Information	2
4.2.2	Motor-Connection Samples	4
4.2.3	Technical description	5
4.2.4	Installation	6
4.2.5	Options	9
4.2.5.1	Gear	9
4.2.5.2	Brake	10
4.2.5.3	Manual adjustment	13
4.2.6	Mounting orientations	14
4.2.7	Protection classes	15

4.2.1 General Information

RACO offers three-phase motors, in 2- or 4-pole design with a power from 0,09 kW up to 0,21 kW. Every RACO motor is equipped with thermal contact (optional with thermistor) and can be used limited in combination with a frequency inverter. See description further down in the text.

The technical data for this motor can be found on the motor's nameplate.

Motor sizes and design

RACO provide its motors with following performance data in one motor size according RACO works standard specification.

Performance characteristics	RACO motor
Power supply	3x230VD/400VY/50 Hz 3x277VD/480VY/60 Hz Special voltages up to 3x690V/AC are possible
Rated power	0,09 kW – 0,21 kW
Rated voltage range	50 Hz, 2/4 pole (3000/1500 1/min) 60 Hz, 2/4 pole (3600/1800 1/min)
Type of protection	IP54 (optional IP 65) according to DIN EN 60034-5
ISO class	F
Cooling type	IC 410 (TENV) according to DIN EN 60034-6
Ambient temperature	-20°C to +40°C max. +70°C in S3 cycle mode

Protection class

In the standard version, the RACO motors have protection class IP 54, i.e. according to DIN EN 60034-5, the motors are dust-proof and splash-proof.

Optionally, the RACO motors are also available in IP 65, i.e. the motors are dust-tight and protected against water jets according to DIN EN 60034-5.

Insulation class (heat class)

The motors are offered according to DIN EN 60085 VDE 0301-1 (IEC 60085) in heat class F (155°C) or optionally in heat class H (180°C).

Operating temperature

All RACO motors are designed in the basic version for ambient temperatures from -20°C to +70°C in S3 operation.

Installation altitude

If the customer provides no other information, it is assumed that the installation site is not above 1000 m a.s.l..

Cooling and ventilation

The RACO motors do not have a fan as standard. Sufficient cooling air must be provided. If the RACO-Elektrozylinder® is operated in a dusty environment, the cooling surfaces of the motor must be cleaned regularly. Cooling air must be able to flow unhindered to and from the motor. Ventilation grilles and external fans should be cleaned regularly depending on the degree of contamination.

CAUTION!



CAUTION!

Overheating of the motor due to insufficient cooling

Burning.

Overheating due to dirt, covered fan cowl, due to unfavourable installation situation, ...

Monitor the temperature of the electric motor and switch off in case of overheating. Ensure good ventilation.

Inverter operation

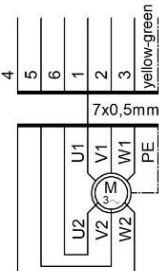
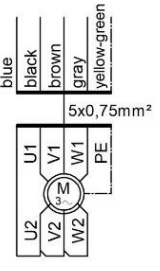
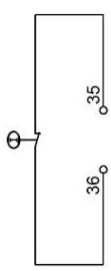
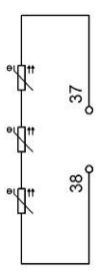
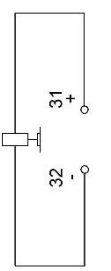
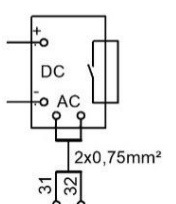
In inverter operation, it should be noted, that, as a result of the upper wave content of the voltage, the frequency inverter leads to increased losses in the motor.

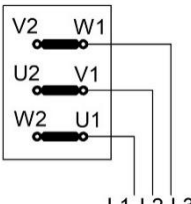
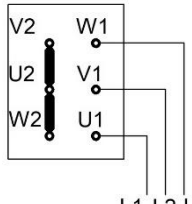
Depending on the speed setting range, counter-torque progression, load play and inverter type, the possible performance reduction and choice of cooling method must be taken into account. RACO motors should basically be operated as a maximum from 500 V power supply systems, taking into account the voltage load on the insulation system by the inverter.

The operating method of the motors in inverter operation must be adapted to the non-ventilated design, i.e. higher load torques at low speeds can in the case of long running times lead to impermissible heating and actuation of the thermo-switch. The use of an optionally available thermistor is recommended. The corresponding type of operation should be taken into account in the form of higher designed performance or a ventilated version.

4.2.2 Motor-Connection Samples

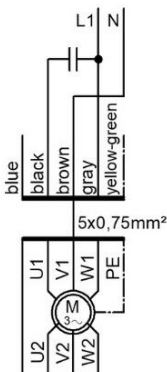
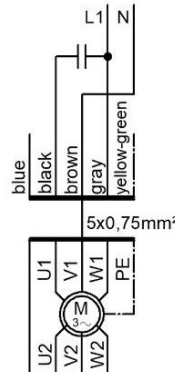
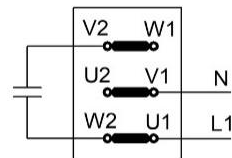
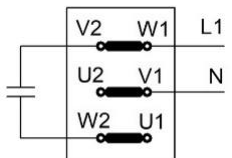
Wiring Diagram for the RACO 3-phase motor

Motor		Thermal contact	PTC-thermistor	Brake	Brake rectifier
M	M (Y)	F1	B2 (optional)	Y (optional)	U (optional)
					

Motor with terminal board (optional)	
M (Δ)	M (Y)
	

Wiring Diagram for the RACO 1-phase motor

The RACO Motor can be operated via condensator in 1 phase AC (Steinmetz).

Steinmetz Circuit			
Motor		Motor with terminal board (optional)	
Direction of rotation 1	Direction of rotation 2	Direction of rotation 1	Direction of rotation 2
			

Please note that in this mode only a small number of starts and a significant reduction of power is expected. This mode should only be used with consultation of the manufacturer. For operation on a.c. system, we recommend using a frequency inverter. We can project the correct frequency inverter size.

4.2.3 Technical description

For the specifications of the motor please refer to the nameplate. The motor currents indicated on the nameplate and the $\cos \varphi$ refer to the rated load of the device.

Since RACO-Elektrozylinder® are operated in operating mode S3 as standard, the specified motor current at this operating point may be higher than the current rating of the motor in continuous operation (S1) due to the design.

Motor protection

1. Motor protection switch (by customer)

The motor protection switch is the basic motor protection that trips when the set current value is exceeded. The design of a motor starter is based on the current value for the service S1. This current value must be asked separately from RACO!

Due to the motor characteristics, the motor protection switch is not suitable as the sole motor protection.

2. Monitoring of the motor winding temperature (thermal contact or PTC thermistor)

A thermal contact or a PTC thermistor is used to protect the motor against overheating in the event of medium or long-term monitoring, e.g. due to too high load and too many cycles and/or too high ambient temperature. This monitoring serves to protect the motor getting too hot.

Thermal contact (F1) and thermistor temperature sensor (B2)

The thermocouple contact is a switching contact that is used directly in a control/disconnection circuit (without auxiliary relay up to 24 VDC). PTC thermistors change their resistance depending on the temperature, therefore an additional evaluation device is required (usually already integrated in frequency inverters). The RACO EPS position sensor can monitor both PTC thermistors and a thermal contact and internally switch off the relay outputs for contactor control of the motor.

The temperature monitoring is not sufficient protection in the event of incorrect operation. Due to a blockage of the RACO-Elektrozylinder® (e.g. incorrectly set or missing or not connected end position sensors and when moving to the end position of the RACO-Elektrozylinder® or the mechanics), the winding can burn due to the rapid current rise. The temperature rise is slower than the current rise and the thermal monitoring then detects the overheating too late.

3. Overload/blockade shutdown

This additional motor protection to the two above only provides complete motor protection. Either the speed monitoring (UPM function) of the RACO displacement sensor EPS06 or a $\cos \varphi$ relay protects the motor in the case of incorrect operation, travel in the mechanical end position or blockage. This is the only way to ensure that the motor of the RACO-Elektrozylinder® and the motor winding are protected in time.

The $\cos \varphi$ relays must be selected according to the nameplate specification. Like the speed monitoring, the $\cos \varphi$ reacts very quickly to a change in load and blockage. The tripping point can therefore be set precisely.

4.2.4 Installation

The exact observance of the safety instructions is again expressly pointed out. All work must only be carried out with the motor disconnected from the power supply. Suitably trained personnel in accordance with the applicable regulations must carry out installation.

DANGER!



DANGER!

Danger because of electric current or voltage!

Severe injuries up to death.

Before working on the electric installation, disconnect from the mains and secure against reconnection. Determine voltage free status. (DIN VDE 0105-100)

The electrical connection must be provided by qualified person only (according to TRBS, Technical Rules for Operational Safety, 1203; "qualified person"). The terminal box may be opened only if there is no voltage.

The motor is supplied with a 1 m cable as standard.

For the electrical installation please connect the cables according to the wiring diagram.

In the case of the optional variant with terminal box, remove the base of the terminal box on the motor for the electrical installation. Do not damage the cover seal.

Qualified personnel in accordance with the relevant regulations as indicated on the nameplate must only carry out the voltage connection.

Compare the mains conditions (voltage and frequency) with the specifications on the nameplate of the motor.

The cable cross-sections must be designed in accordance with DIN VDE 0298-4 and depend, among other things, on the current load, the cable length, the number of cores, the ambient temperature and the installation location.

It is recommended to check the insulation resistances between winding, ground and phases before switching on for the first time. After prolonged storage, it is essential to measure the insulation resistance.

Motors with PTC thermistors

A continuity test with a test lamp, crank inductor etc. is prohibited, as this will result in the immediate destruction of the sensors. If the cold resistance of the sensor circuit has to be re-measured (at approx. 20°C), the measuring voltage must not exceed 2.5 V DC voltage – e.g. with multimeter/resistance measurement. The cold resistance of the sensor circuit must not exceed 810 Ohm.

The motor current indicated on the nameplate does not necessarily correspond to the rated power of the motor, but to the power of the RACO-Elektrozylinder® at its rated force. When parameterising a vector-controlled frequency inverter, you should ask RACO for the "rated current of the motor".

The connection must be established as a secure electrical connection; safe protective earth connections must be established. Make sure to follow the safety information and the supplied documentation when performing the connection tasks.

NOTICE!

The RACO-Elektrozylinder® may be mounted and connected only when the information regarding voltage and frequency on the nameplate matches the mains supply and the RACO-Elektrozylinder® is intact.

When installing in damp rooms or outdoors, check whether the suitable protection class is available. Use suitable cable glands / screw plugs and check the terminal box for tightness. Make sure that no standing water can form on the connections or on the cover. This can be prevented by orienting the cable glands downwards or by looping the connection cables.

For RACO three-phase motors, the RACO-Elektrozylinder® extends when a clockwise field is connected to U1/V1/W1.

Observe motor direction of rotation!

Carry out the control of the direction of movement in the inching mode.

DANGER!**DANGER!**

Before installation observe the safety instruction!

WARNING!**WARNING!**

When connecting the motor, consider the movement direction of the thrust tube, as this may damage the RACO-Elektrozylinder®. Test the movement direction in inching mode / operation.

CAUTION!**CAUTION!**

The failure of a protective device or the operation of the engine up to its tilting moment can cause the RACO-Elektrozylinder® to exert a much greater force than its nominal force. This can lead to an overload of the system.

WARNING!

On the cable no forces act! The cable must not be kinked or crushed by the movement of RACO-Elektrozylinder®! Sizing the cable length must be sufficient!

WARNING!

With the terminal box variant, it is essential to check the following before closing the terminal box:

- All terminal box connections are firmly tightened.
- All minimum clearance values must be observed (greater than 8 mm to 500 V, greater than 14 mm to 1000 V).
- The inside of the terminal box is clean, dry and free of foreign bodies.

Install the cover after installation of the terminal box again. Make sure that the seal of the cover is not damaged and the cable glands surround the cable tight. Depending on the protection class, the cable glands must be selected accordingly.

4.2.5 Options

4.2.5.1 Gear

If applicable, the drive has a gearbox. The gearbox with the appropriate reduction ratio and its grease are matched to the application and the other components of the RACO-Elektrozylinder®, as far as RACO has been informed in advance of the project. There are no restrictions for the mounting position. The gearbox is completely enclosed and maintenance-free.

4.2.5.2 Brake

The motor is optionally equipped with a brake. Electromechanical spring-applied brakes are usually used in a RACO-Elektrozylinder®. The brakes are mechanically dimensioned so that they can take over the torque of the RACO motor when switched off.

There are basically two types of electromagnetic brakes:

Type "L" (braking effect off = Open when voltage is applied).

Type "B" (braking effect activated = Closed when voltage is applied).

Both types of brakes are located on the second shaft end of the RACO motor.

DANGER!



DANGER!

Missing brake function

Severe injuries or even death.

Incorrect or missing actuation of the brake in case of missing self-locking of the push-pull unit leads to overrun of the RACO-Elektrozylinder®.

A released brake cancels the function of the brake. Keep the manual release (if present) closed.

DANGER!



DANGER!

Danger due to overrunning or sinking!

Serious injuries or even death.

In areas where overrunning of the load leads to a hazard to persons, e.g. when inserting and removing parts, serious injuries or even loss of limbs may occur.

The brake must be subjected to a regular function and wear check depending on the switching frequency (but at least once a year)!

DANGER!



DANGER!

Danger due to overrunning or sinking!

Serious injuries or even death.

The friction lining and the friction surfaces must be carefully protected from dirt. Under no circumstances should they come into contact with oils and greases. Minor impurities of this kind can greatly reduce the braking torque.

DANGER!**DANGER!****Crash of the load**

Severe injuries or even death.

Before checking the brake of a RACO Elektrozyylinder®, secure the load and uncouple it if necessary.

CAUTION!**CAUTION!****Incorrect or missing brake control**

Burns.

Incorrect or missing control of the brake can lead to overload and thus to overheating of the motor.

Check brake function before commissioning.

Brake type “L”

The electromagnetically released spring-applied brakes of type “L” are closed-circuit brakes, i.e. the braking torque is generated by spring force in modulating operation and released by magnetic force. During the braking process, the built-in compression springs press the rotor, which is positively connected to the motor shaft, against the counter friction surface via the axially movable armature disk. The friction between the linings of the rotor and the armature disk or the counter friction surface generates the braking torque.

During the release process, a magnetic force is generated by applying a DC voltage via the excitation winding in the magnet body. This force pulls the armature disk to the magnet body and releases the brake rotor.

With DC voltage, the voltage dimensioned according to the electrical design is applied directly to the brake coil (Y). With AC voltage, a brake rectifier (U) is connected upstream.

If the brake is wired directly, the braking power is tapped from the motor terminal board. In case of external wiring of the brake the connection must be done by the customer. Please note the voltage indicated on the nameplate of the motor and in the order text.

With regard to the reaction time of the brake, it should be noted that an application time of up to 300 ms must be taken into account when the brake is applied directly to the motor terminal board. This can become problematic at high adjustment speeds, e.g. in order to avoid travel to the end position in the event of an emergency stop. A drastic reduction of the application time results from DC-side switching at the brake rectifier. Here the brake application times can be reduced to < 80 ms.

The brake must be subjected to a regular function and wear check depending on the switching frequency (but at least once a year)!

Please also observe chapter 3.2.8 "Maintenance instructions - brakes"

Brake type "B"

After switching on the current, the force effect of a magnetic field is used for the braking effect. The armature disk is pulled in axial direction against the friction lining carrier (rotor or brake magnet). The braking torque is transmitted by a torsion spring. The transmission is free of play and wear. Due to a special machining of the friction surfaces, the characteristic torques are already achieved in the new condition or after a few switching operations. After switching off the current, the armature disk is separated from the friction lining carrier by the steel spring.

DANGER!



DANGER!

If the RACO-Elektrozylinder[®] has a type "B" brake, this brake is **open** when the power is off. Before mounting the load, the brake must be energised! Pay attention to the operating voltage of the brake according to the operating instructions/nameplate!

Before disassembling/assembling the RACO-Elektrozylinder[®] or the gear or motor, make sure that the RACO-Elektrozylinder[®] does not start moving on its own. Loads must be supported or secured!

4.2.5.3 Manual adjustment

The manual override is used to move a RACO-Elektrozylinder® manually when the motor is de-energised. It is mounted on the second shaft of the motor.

Rotating handwheel

The rotating handwheel consists of a balanced, closed disc handwheel without handle. It rotates when the RACO-Elektrozylinder® is adjusted.

CAUTION!



CAUTION!

Motor with rotating hand wheel

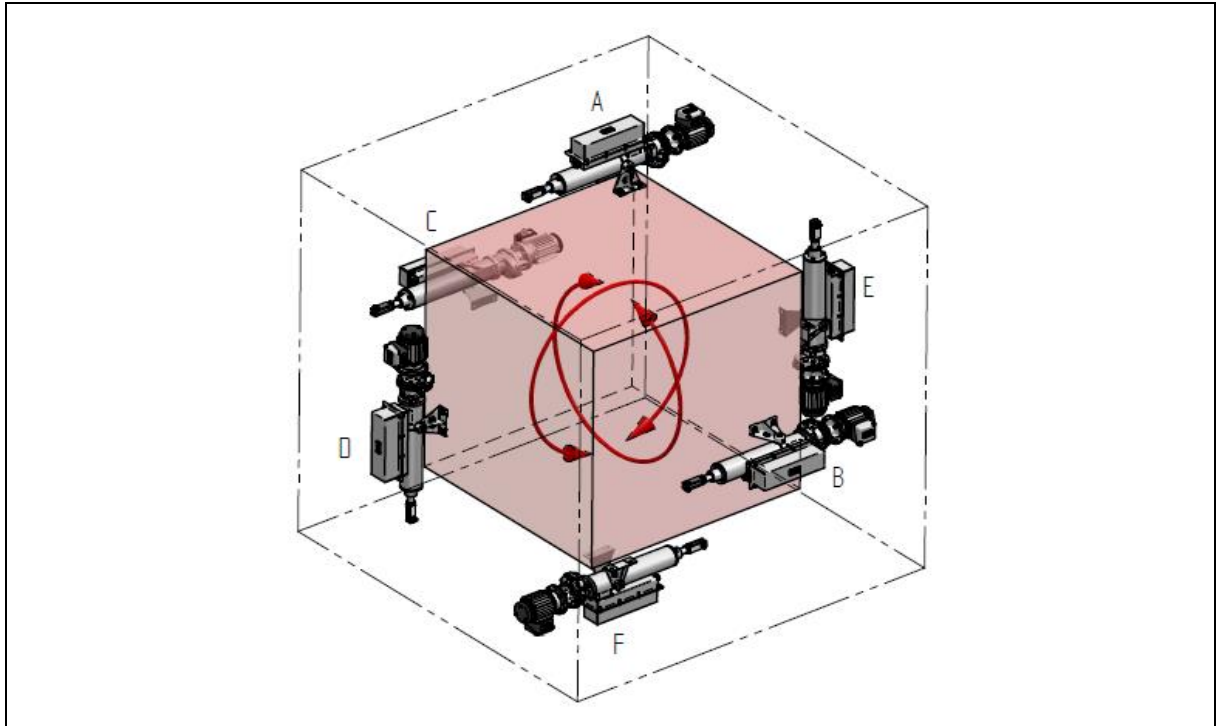
Capture.

Motors with a rotating hand wheel on RACO-Elektrozylinder®, hand wheel can cause parts of the body to be caught!

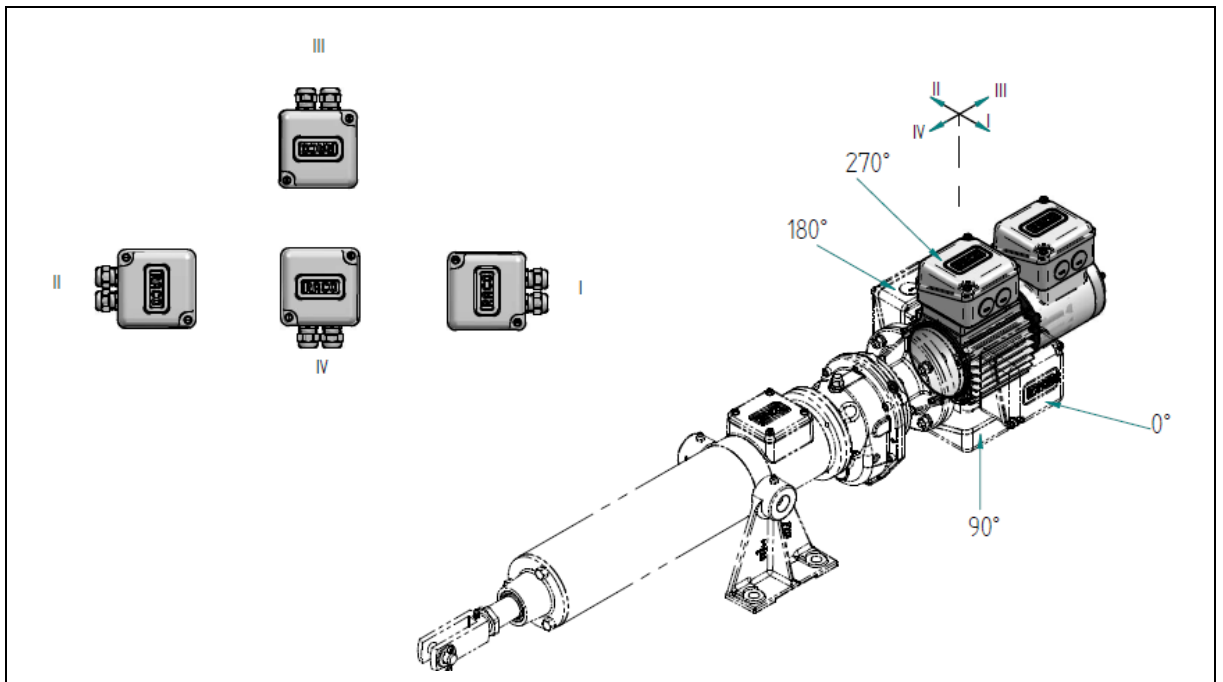
During operation, make sure that there are no persons in the motor area.

4.2.6 Mounting orientations

Fitting orientation of the RACO-Elektrozylinder®



Orientation of the terminal box / accessory housing



Standard motor terminal box: I; 270°
 Standard accessory housing: I; 270°

The installation position is required in order to supply the RACO-Elektrozylinder® with the appropriate quantities of lubricant and to correctly provide the positions of the ventilation and exhaust for safe operation. The installation position must be specified when ordering.

4.2.7 Protection classes

RACO offers the three phase motors and electric equipment in different protection classes according to DIN EN 60529 (VDI 0470-1; IEC 60529) of the norm protection classes.

The RACO – DC-Motors are serially provided in protection class IP40. If required, a higher protection class can be provided, too.

The RACO – three phase motors are serially provided in protection class IP54. If required, protection class IP65 can be provided, too.

The degree of protection indicated on the nameplate refers only to the motor!

The protection class is indicated by a short character.

The short character is composed as follows:

- | | |
|-----------------|-------------------------------|
| 1. Code-Letter | IP (International Protection) |
| 2. first digit | 1-6 |
| 3. second digit | 1-9 |

Example: IP54 5 = Protection against access to dangerous parts with a wire
 Dust protected
 4 = Protection against splash water

IP	1. Digit		2. Digit
	Contact protection	Foreign matter protection	Water protection
0	No protection	No protection	No protection
1	Protection against access to dangerous parts with the back of the hand	Protection against firm foreign matters Ø 50 mm and bigger	Protection against dripping water (vertically falling drops)
2	Protection against access to dangerous parts with the finger	Protection against firm foreign matters Ø 12,5 mm and bigger	Protection against dripping water when housing is drifted up to 15°
3	Protection against access to dangerous parts with a tool	Protection against firm foreign matters Ø 2,5 mm and bigger	Protection against spray water
4	Protection against access to dangerous parts with a wire	Protection against firm foreign matters Ø 1 mm and bigger	Protection against splash water
5	Protection against access to dangerous parts with a wire	Dust protected	Protection against water jets
6	Protection against access to dangerous parts with a wire	Dustproof	Protection against strong water jets
7	--	--	Protection against temporary immersion in water
8	--	--	Protection against continuous immersion in water
9	--	--	Protection against high pressure and high temperature with strong water jets



5.2

Position Sensoric EPS02

5.2 RACO Path Sensors technology

Electronic position sensor type: EPS02

The operating instruction refers to RACO-Elektrozylinder® type in which an EPS02 with a software version from 1.8.7 is available.

Table of content

5.2.1	General Information	2
5.2.2	Heater in the additional accessory housing	6
5.2.3	Function / Equipment	7
5.2.3.1	Limit Switches	7
5.2.3.2	Motor temperature switch or PTC thermistor evaluation	7
5.2.4	Electric Connection	8
5.2.4.1	Power Supply Connector plug X 1	8
5.2.4.2	Relay Contact plug X 2	8
5.2.5	Technical Data	9
5.2.6	LED display	10
5.2.7	Adjustment distances adjust	11
5.2.7.1	Manual adjustment	11
5.2.7.2	Setting with the RACO Setup Tools (Windows® Software)	14
5.2.7.3	Installation and Connection Help	19
5.2.8	Waste disposal	22

5.2.1 General Information

The RACO positioning system has been designed especially for positioning electromechanical actuators for carrying out linear movements, it is realised inductively through magnetic field coupling.

The electronic position sensor EPS02 is integrated in the additional device housing at the second end of the motor shaft of the RACO motor or in the lateral additional box on the coupling housing (when using RACO motors with a handwheel or motors from other manufacturers).

With type: EPS02 the two end positions are set via the push button or optionally with the RACO Setup Tool. In addition, the use of an external reference switch (optional) can be activated. An LED display supports easy setup and provides control options during initialisation.

Mounting installation examples:



EPS02 in rear housing type A1



EPS02 in rear housing type DOM

DANGER!



DANGER!

Incorrect programming

Severe injuries or even death.

Incorrect programming of the connected sensors can lead to unexpected and uncontrolled movements that can cause damage to a RACO-Elektrozylinder® and/or the installation.

Operation by qualified personnel only!

DANGER!



DANGER!

Modification of parameters other than those described in the RACO Operating Instructions, as well as the use of software other than those provided by RACO, is at the customers own responsibility.

Incorrect settings lead to the exclusion from warranty and liability claims to the manufacturer RACO Schwelm

DANGER!**DANGER!****Danger because of electric current or voltage!**

Severe injuries up to death.

Before working on the electric installation, disconnect from the mains and secure against reconnection. Determine voltage free status. (DIN VDE 0105-100)

The electrical connection must be provided by qualified person only (according to TRBS, Technical Rules for Operational Safety, 1203; "qualified person"). The terminal box may be opened only if there is no voltage.

DANGER!**DANGER!****Danger from electric current or voltage!**

Severe injuries up to death.

Check that the connected wires are firmly seated. Only permanently connected cables guarantee full functionality. Carry out assembly work in a deenergised state. Operation with a defective power supply unit (e.g. short circuit from mains voltage to output voltage) can result life-threatening voltages on the unit!

General connection information

The connection must be established as a safe electrical connection, a safe protective earth connection must be established. During connection work, it is essential to observe the safety instructions and to follow the documentation supplied with the device.

The cable cross-sections are to be dimensioned according to DIN VDE 0298-4 and depend, among other things, on the current load, the cable length, the number of cores, the ambient temperature and the installation location.

To ensure interference-free operation, EMC-compliant wiring must be observed (shielding, twisting, cables routed separately from lines with faults, ...).

DANGER!**DANGER!****Danger from electric current or voltage!**

Severe injuries up to death.

A competent person (according to Technical Rules for Operational Safety (TRBS) 1203; „qualified person“) may only carry out the connection for potential equalisation. The operator for the locally applicable regulations must provide further protective measures.

The separate earth conductor connection must be used for potential equalisation.

In the event of a fault, insufficient earthing can lead to an electric shock with fatal consequences if it comes into contact with a RACO-Elektrozylinder®.

The RACO-Elektrozylinder® is only intended for permanent connection and may only be operated with effective earthing connections that comply with local regulations for large leakage currents (> 3.5 mA).

EN 50178 / VDE 0160 prescribes the installation of a second earth cable or an earth conductor cross-section of at least 10 mm².

WARNING!



WARNING!

On the cable no forces act! The cable must not be kinked or crushed by the movement of RACO-Elektrozylinder®! Sizing the cable length must be sufficient!

Connection at the terminal box

For the electrical installation, please remove the cover from the terminal box. Do not damage the sealing of the terminal box.

When installing on site, ensure that suitable cable glands and, if necessary, screw plugs are used.

When installing in damp rooms or outdoors, check whether the suitable protection class is available. Use suitable cable glands / screw plugs and check the terminal box for tightness. Make sure that no standing water can form on the connections or on the cover. This can be prevented by orienting the cable glands downwards or by looping the connection cables.

The protection class (see technical data) according to EN 60529 is only guaranteed if suitable cable glands are used.

The following must be checked before closing the terminal box:

- All terminal box connections are firmly tightened.
- All minimum clearance values must be observed (greater than 8 mm to 500 V, greater than 14 mm to 1000 V).
- The inside of the terminal box is clean, dry and free of foreign bodies.

Install the cover after installation of the terminal box again. Make sure that the seal of the cover is not damaged and the cable glands surround the cable tight.

NOTICE!



Risk of Damage!

Mechanical end positions must not be approached even in jog mode!
Ensure that the RACO Elektrozyylinder® is switched when reaching the limit switches.

The function test must be run in jogging mode to prevent damages in case of faulty adjustment of the limit switches.

It is essential to avoid approaching the mechanical end positions from a RACO-Elektrozyylinder®. This can lead to blocking or damage to the drive. The unit may only be commissioned with limit switches (internal or external) connected.

A RACO-Elektrozyylinder® with ball screw system must never be driven against a fixed stop, whether internal or external. This will damage the ball screw drive and destroy it permanently.

The limit switches must be set in such a way that the thrust tube comes to a stop at max. speed before the mechanical end position. When adjusting the limit switches, the overtravel according to the table "stroke reserves" must be taken into account, so that the drive stops safely before reaching the mechanical end positions.

Usable stroke = nominal stroke – reserve!

Stroke reserve for retraction and extraction

Stroke reserve in dependence of linear speed					
 Caution!	Linear Speed	10 - 20 mm/s	2 x 5 mm	Stroke reserve for retraction and extraction	 Caution!
		20 - 40 mm/s	2 x 10 mm		
		40 - 60 mm/s	2 x 15 mm		
		60 - 90 mm/s	2 x 20 mm		
		90 - 120 mm/s	2 x 25 mm		

At high regulating speeds the devices are usually equipped with a brake. Nevertheless, aftertravel must be taken into account due to the switching time of the brake (depending on the size, 90 to 500 milliseconds when AC current controls the brake).

At high travel speeds and large masses, abrupt acceleration and decelerating (e.g. with brake) must always be avoided. An inverter must be used to realise the acceleration and decelerating process through ramps.

5.2.2 Heater in the additional accessory housing

Depending on the ambient conditions (especially outdoors), additional equipment can be provided in the accessory housing for the limit switches, position sensor EPS, etc. to protect against the effects of cold (frost) and moisture (condensation). Depending on the requirements, different heaters can be used on a RACO-Elektrozylinder®.

Supply voltage: 24 V DC; 120 V 50/60 Hz; 230 V 50/60 Hz; 400 V 50/60 Hz.

Heating power: 18 to 24 Watt

For the exact technical data, please refer to the separate heater type plate at the RACO-Elektrozylinder®.

NOTICE!



The heating should be switched on permanently at temperatures below +5° C and for at least 60 minutes a day at temperatures above +5° C.

NOTICE!



The operator is responsible for switching the heating on and off!

NOTICE!



Deviating heating voltage or temperature control are named in the order.

NOTE!



Supply voltage and power are indicated on a separate type plate.

5.2.3 Function / Equipment

In the version "EPS02", the board has two potential-free relay contacts, an input for motor temperature protection and an input for optional reference limit switch.

5.2.3.1 Limit Switches

Two relay outputs (relay contact normally open) are available for setting two positions. Relay output 1 is for the retracted position and relay output 2 for the extended position. The switching hysteresis can be set uniformly for all limit switches.

5.2.3.2 Motor temperature switch or PTC thermistor evaluation

For the evaluation of the temperature contact (NC contact) or the cold conductor (PTC) when the motor is overheated, the two end position relay contacts (OUTPUT1 and OUTPUT2) on the EPS02 are directly deactivated via the input signal at PIN 5 (See circuit diagram). In this case the red LED is on to signal the over temperature status.

If no thermal winding protection is connected, a jumper must be set at connector X1, PIN 4 to X1, Pin 5.

5.2.4 Electric connection

The module has a four-pin connection plug for the relay contacts (right-hand plug X2) and a five-pin connection plug for voltage and signal connection (left-hand plug X1).

Further information can be found in the wiring diagram.

5.2.4.1 Voltage plug X1

The supply voltage, temperature protection and optional reference switch are connected here.

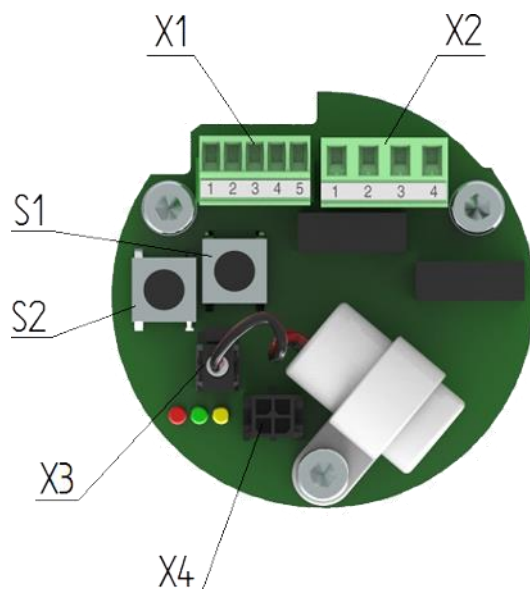
5.2.4.2 Relay plug X2

There are two potential-free relay switch contacts available which can be used to switch off the drive. The contacts are switched in series to the motor control loop or routed to an PLC input. In the RACO-Elektrozylinder® normal working range, the contacts are closed.

The "Retract" contact is opened when the RACO-Elektrozylinder® has reached its programmed "Retract" position.

The "Extend" contact is opened when the RACO-Elektrozylinder® has reached its programmed "Extended" position.

EPS02



Plug connection EPS02

Plug X1

- Pin 1: GND
- Pin 2: +24V DC Power supply
- Pin 3: External ref. switch
- Pin 4: +24V DC Output
- Pin 5: Thermal contact / PTC

Plug X2

- Pin1+2 (Output 1): switch-off retracted position (Status: LED yellow)
- Pin3+4 (Output 2): switch-off extended position (Status: LED green)

X3, Battery

X4, Service-interface

Note:

When the operating voltage is switched off, both contacts are opened independently of the cylinder position. Independent of the wiring of the thermal contact (red LED), the yellow LED indicates whether the "current position" > "programmed retracted position" (yellow LED: on) and the green LED whether the "current position" < "programmed extended position" (green LED: on).

5.2.5 Technical data

Technical data EPS

Supply voltage UB:	24V DC +20 –30%
Relay outputs direction A/B:	250V AC/5A, 30VDC/5A
Temperature monitor:	on board
Digital inputs, 1 psc.:	24V DC +20 – 30%
Pulses per turn:	1024 ppr (10 bit)
Number of turns:	65535 Turns (16 Bit)
Accuracy:	±1%
Data stored using Li battery 1.2 Ah:	10 years lifetime at +20°C
Temperature range:	(-40°C) -30°C to +75°C
Protective rating:	IP00 (PCBs sealed)
Housing:	Without
Connection:	Plug-in screw-type terminals (Phoenix system)

Technical data power-supply unit (optional):

Input voltage:	85- 264 V/AC, 47 - 63 Hz
Input current max. (full load):	115 VAC – 500 mA / 230 VAC 340 mA.
External input fuse required (recommended value):	2,0 A, slow blow type.
Output:	24 V/DC; 750 mA
Output Power max.:	18 W
Operating temperature:	-20 - +70 °C
Connection:	screw-type terminal
Electromagnetic compatibility (EMC), emissions:	EN 55032, class B EN 61000-3-2 class A and EN 61000-3-3
Electromagnetic compatibility (EMC), immunity:	EN 55024, EN 61000-6-2
Degree of protection:	Class I with connection to PE
Safety standards:	UL 62368-1, IEC/EN 62368-1

5.2.6 LED display

LED	Operating Status	
Output1 (yellow LED) Relay contacts on terminals X2:1 and 2	Current position > programmed "retracted position ". Relay contact X2:1 and X2:2 = closed (yellow LED: on) Current position < programmed "retracted position ". Relay contact X2:1 and X2:2 = open (yellow LED: off)	
Output2 (green LED) Relay contacts on terminals X2:3 and 4	Current position < programmed "extended position ". Relay contact X2:3 and X2:4 = closed (green LED: on) Current position > programmed "extended position ". Relay contact X2:3 and X2:4 = open (green LED: off)	
red off green on yellow off	Retracted position Current position < programmed retracted position. - yellow LED = off ⇒ Output 1 = off ⇒ Terminal strip X2, terminal 1+2 has no contact. (Reverse logic ⇒ wire-break-proof)	
red off green off yellow on	Extended position Current position > programmed extended position. - green LED = off ⇒ Output 2 = off ⇒ Terminal strip X2, terminal 3+4 has no contact. (Reverse logic ⇒ wire-break-proof)	
red off green on yellow on	The actuator thrust tube is in the allowable stroke range. Programmed retracted position < Current position < Programmed extended position. - yellow LED = on ⇒ Output 1 = on ⇒ Terminal strip X2, terminal 1+2 has contact. - green LED = on ⇒ Output 2 = on ⇒ Terminal strip X2, terminal 3+4 has no contact.	
LED	Error	Measure
red on green * yellow * (* ≙ according to current position (see above))	The thermal winding protection has tripped. - Output 1 = off (independent of the position) ⇒ Terminal strip X2, terminal 1+2 has no contact - Output 2 = off (independent of the position) ⇒ Terminal strip X2, terminal 3+4 has no contact	
red/green flashing alternate with yellow flashing	Incorrect actual position value or low battery level	Download corrected parameter set or change battery
red/green/yellow running sequence	Reposition the sensor board. Distance between the board and the magnet is too long or too short, skewed sensor board The board was dismantled	Check the assembly of the board parameterize new
red flashing	Incorrect positioning to the magnet.	Check positioning of the sensor board. Check that the magnet holder is running straight

Further flashing combinations are explained under set-up mode.

5.2.7 Limit switch setting

5.2.7.1 Manual setting by on-board buttons.

NOTE!



In the delivery condition, the rotation, the activation of the external reference limit switch and the switching points for EPS systems mounted on RACO-Elektrozylinder® have already been set at the factory.

The module can be configured by using the two buttons on the board. This is only necessary if there are changes to the RACO-Elektrozylinder®, the installation situation or the area of application, or during repairs and maintenance.

The two buttons basically have a fixed function.

Button S1 (situated towards the centre of the module) is used for switching to the next setting step, Button S2 (situated on the outside of the module) is used to set a value.

Two settings can be made independently of one another:

1. Setting the switch-off position for retracted state
2. Setting the switch-off position for extended state

Setting manual:

To activate set-up mode, keep both buttons pressed simultaneously for more than 8 seconds. All three LEDs then flash simultaneously to confirmation. Now both buttons must be released at the same time. The yellow LED flashes, the other two are off.

Set-up mode 1: Switch-off position in the retracted state

In this state (green LED flashes), the switch-off position in the retracted state can be set. This is only necessary if an external reference switch is not used.

NOTE!



If new installation or module replacement is carried out, the retracted switch-off position must always be approached first to provide a reference point for position measurement.

The RACO-Elektrozylinder® must now be moved to the required retracted position and the outer button S2 pressed to confirmation for at least 1 second. If switch-off values which lead to the drive switching off when retracted are already present in the module, this can be bridged by keeping button S2 pressed for longer than one second. This means that the cylinder can be retracted without limits.

NOTICE!



The mechanical end positions of the RACO-Elektrozylinder® must not be approached in the setting mode, since the possibility of blockage or damage is caused by a counter situation.

Press button S2 for longer than 1 second at the required position (if not yet done as previously described).

If you do not require any change to the switch-off position for "retracted state", the button S2 does **not** need to be pressed.

Now press button S1 for longer than 1 second. The mode then changes from set-up mode for switch-off position for the retracted state to mode 2, switch-off position "extended state".

Set-up mode 2: Switch-off position in the extended state

The green and yellow LED will flash until the retracted position is exited.
The yellow and red LEDs are off, the green LED flashes.

In this mode (green LED flashes), the limit switch position for the extended state can be set.

The RACO-Elektrozylinder® must now be moved to the required extended position and the outer button S2 pressed to confirmation for at least 1 second. If switch-off values which lead to the drive switching off when extended are already present in the module, this can be bridged by keeping button S2 pressed for longer than one second.

If you do not require any change to the position for switch-off extended state, button S2 does **not** need to be pressed.

Now keep button S1 pressed for longer than 1 second. You will now leave the set-up mode completely and change to normal operation mode.

Notice:

A Windows-based RACO Setup Tool is optionally available to configure all functions of the EPS02. This software tool is available from RACO on data carriers (143-833-6) or in the download area of our website. The optional interface converter with the part number 149-769-3 or 161-904-7 is required for the parameterization. We recommend an additional USB isolator to avoid earth loops, compensating currents and to protect against overvoltage. The parameter kit EPS02 (162-149-1) includes the CD with the software tool (143-833-6) as well as the interface-converter (161-904-7).

5.2.7.2 Setting with the RACO Setup Tool (Windows® software)

DANGER!



DANGER!

Caution when changing parameters, especially system-dependent parameters (stroke, number of revolutions, torque, ...) to avoid malfunctions and damage!

NOTE!



The EPS02 is factory set when delivered enclosed at an RACO-Elektrozylinder® (unless otherwise specified in the order, the final positions are usually set on both sides for maximum stroke length minus a stroke reserve), including the system-dependent rotation and the transmission ratio.

Before changing the original parameter data, save the data file and store it at a save place for using this file in an emergency case to get the original state again. In a further file save the data set with the changes which were made at site.

Procedure for saving data sets:

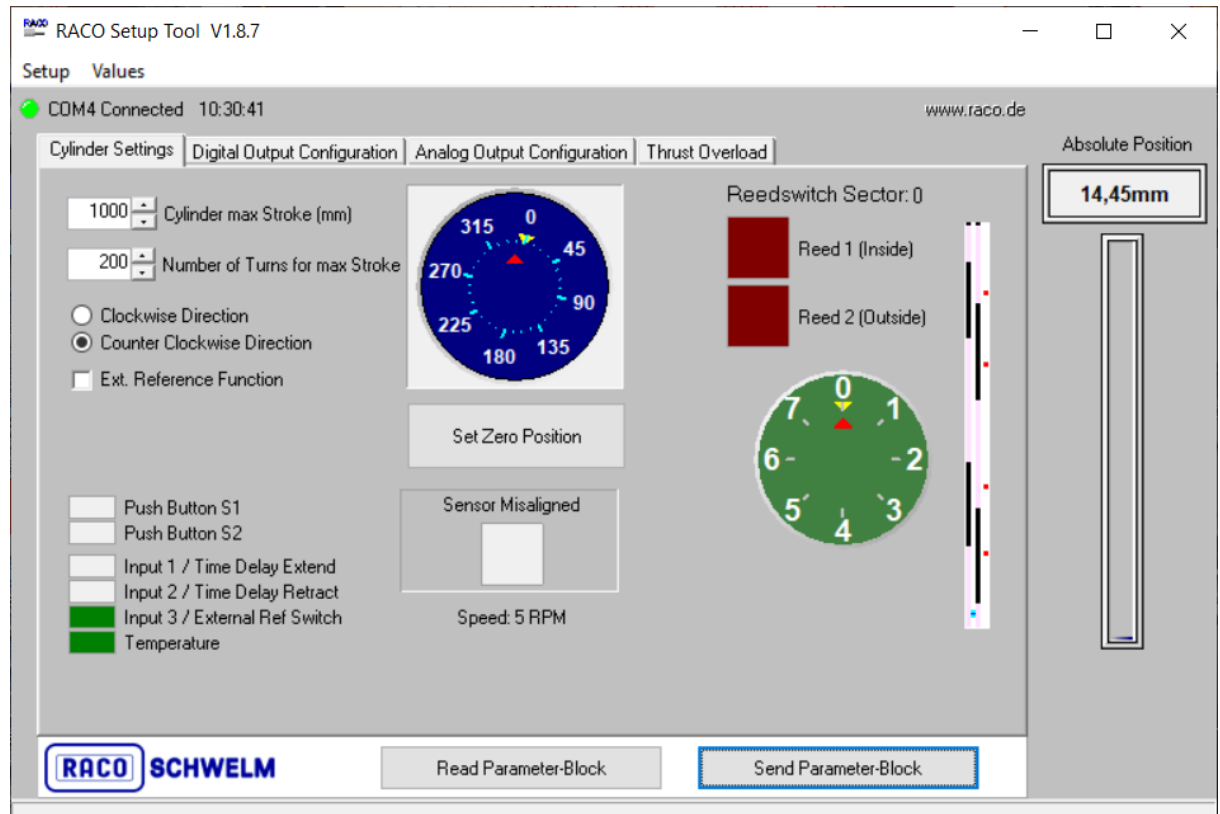
- Over the button "Read Parameter Block" read the parameters into the RACO Setup Tool.
- Select in the menu bar under "Values", "Save to File".
- Assign a file name and save the file.

To restore a saved data set, proceed as follows:

- Select in the menu bar under "Values" "Read from file".
- Select the desired parameter data set and open it.
- Over the button "Send Parameter Block", the parameters will be written to the EPS02.

To change the parameters, after a successful connection to the PC, the parameters are first read from the EPS02 via the button "Read parameter block" in the RACO Setup Tool. Modified parameters are restored via the "Send parameter block" in the EPS02.

Cylinder Settings:



Cylinder max. Stroke (mm):

Nominal stroke length of the purchased actuator in millimeters.

Number of Turns for max Stroke:

Here the number of revolutions of the sensor is entered in order to travel through the stroke of the cylinder. The pitch of the spindle and, if applicable, the reduction gear (between spindle and encoder) are taken into account.

Example: Working stroke 1000 mm, spindle pitch 5 mm (no reduction gear between spindle and sensor) results in a number of 200 revolutions.

Clockwise or Counter Clockwise direction:

Indicates the direction of rotation of the sensor.

External Reference Function:

If an external reference switch is used, this selector box will be enabled. The positive edge of the external reference switch will set the absolute position to 0 mm. The states for the respective inputs are displayed in the control fields for Push Button, Input 1 to Input 3 and Temperature.

Set zero position:

The absolute position will be set to 0mm.

Read Parameter Block:

Parameters from the EPS02 will be send to the RACO Tool.

Send Parameter Block:

Parameters from the RACO Tool will be saved in the EPS02.

Absolute position:

The actual position of the actuator is shown.

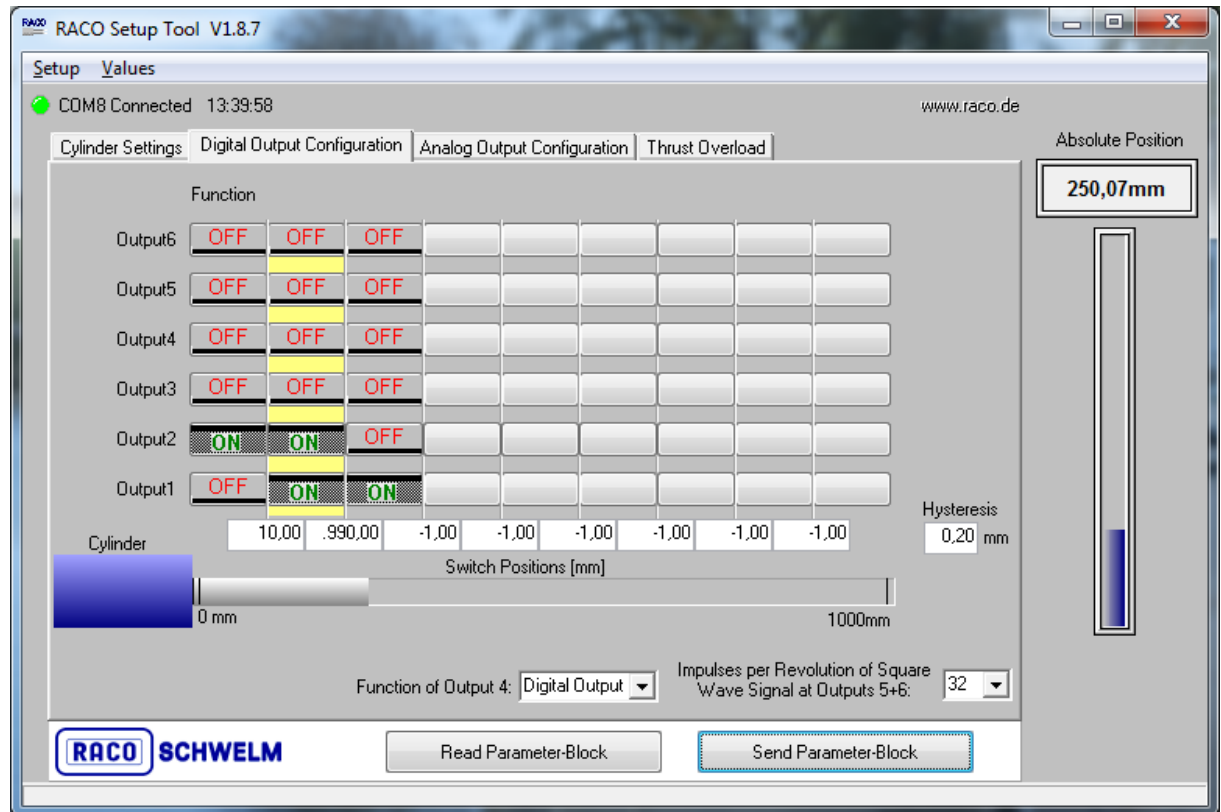
Reed switch sector:

The reed switch sector display block is for diagnostic and functional supervision of the imbedded reed switches.

Speed:

Displays the RPM value on the sensor head.

Digital Output Configuration:



Output 1 + 2 (X2.1 - X2.4):

Up to 8 switching cams can be set here for each switching output (OUT1 – OUT2) (10 and 990 mm in the example). With the buttons (ON/OFF), the desired states of the respective switching outputs can be switched on or off in the desired position range.

Hysteresis:

Setting the hysteresis suppresses to avoid Jittering of the contacts outputs when the respective switching position is reached. The switching hysteresis is set for all switching outputs (Output1 – Output2) together.

Output 3 - 6:

These outputs are not available for EPS02.

Analog Output Configuration:

This function is not available for EPS02.

Thrust Overload:

This function is not available for EPS02.

Setting of a position in the EPS02:

This is only necessary in case of an incorrect activation of the **Set Zero Position** button.
Determine the current position from the position of the thrust tube and the manufacturers a3.dimension (mounting dimension). If in doubt keep always consult with the manufacturer.

WARNING!



WARNING!

Risk of damage!

Entering incorrect position values may lead to serious errors in the RACO-Elektrozylinder® or in the system!

Specialist personnel may only perform the parameterization.

WARNING!



WARNING!

Risk of damage!

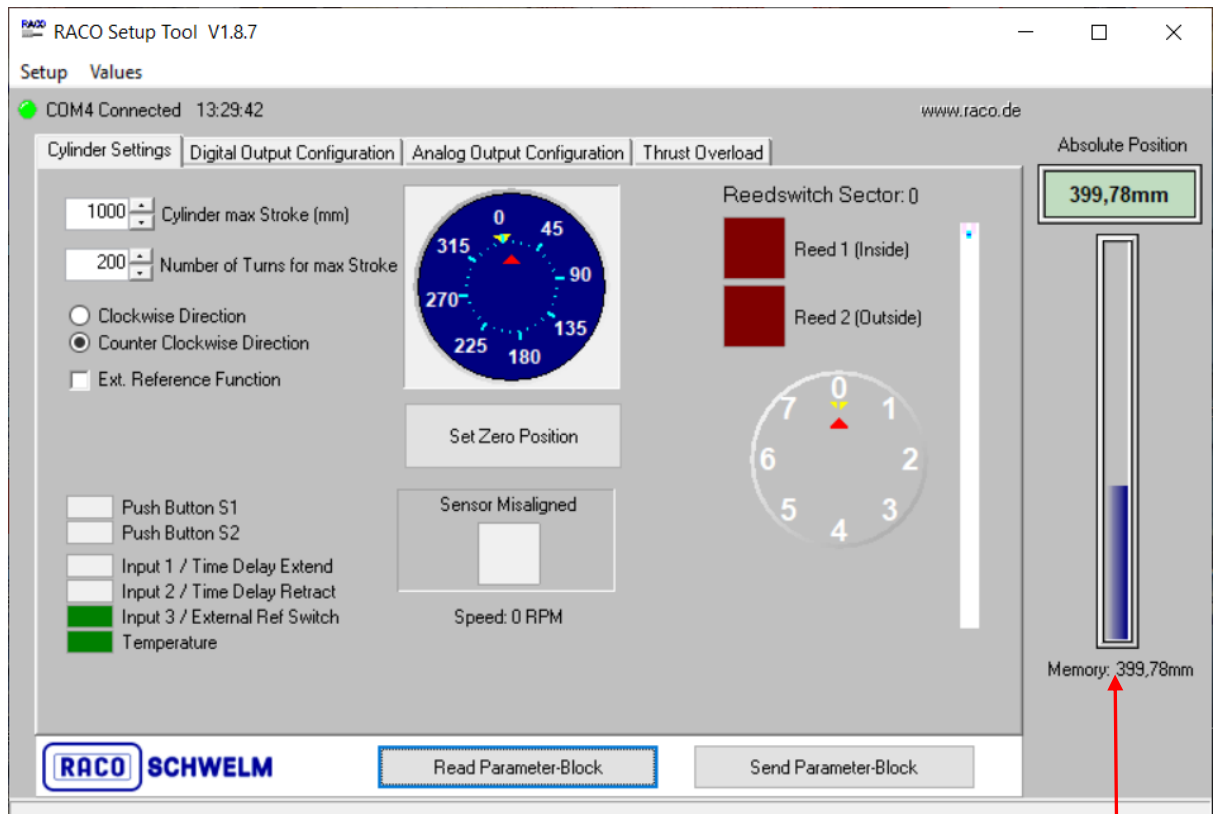
Incorrect setting of the zero position (set-zero position) can lead to serious faults/damage to the RACO-Elektrozylinder® or the system, as all switching positions refer to the zero point. If you are unsure, it is essential to consult the manufacturer!

The parameterisation may only be carried out by qualified personnel!

Indirect setting of the zero point

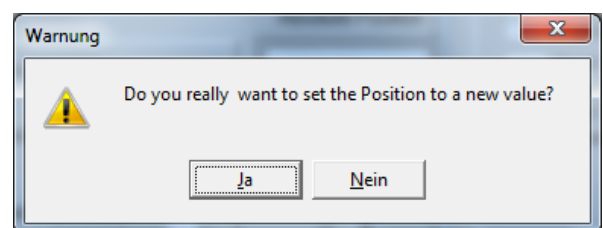
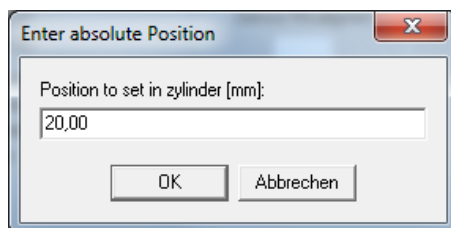
Under certain circumstances, the RACO-Elektrozylinder® cannot be moved to its zero position to reset the zero point due to the system. In this case, the "Set Zero Position" must not be used, as the current position of the electric cylinder would be set. In this case, indirect setting of the zero point via the "Memory" entry in "Cylinder Settings" can help. In this dialogue, the measured distance from the current position to the actual zero point is entered and thus the zero point is set indirectly.

First, the current position of the RACO-Elektrozylinder® in the RACO Tool has to be stored. Therefore, press in the "Setup" menu the function „Memory Position (old module)“.



The position will be stored.

Point the cursor to the headword „Memory“ and by right-clicking on the mouse a popup box will appear on the screen:



Here the current position of the cylinder can be stored in the memory storage by hand. With the function in the "Setup" menu "Set Position (new/spare modules)" and the subsequent security check the new position can be stored in the EPS02.

NOTICE!



The values for "Cylinder max Stroke" and "Number of Turns for max Stroke" must be set correctly before setting the new position value.

5.2.7.3 Installation and Connection Help

The Windows® configuration software RACO Setup Tool is delivered on CD or available as download on the RACO website www.raco.de in the service area after registration. The downloaded ZIP archive has to be unpacked before installation in a folder including the subdirectory structure (WinZip: "Extract to folder ..."). For installation the SETUP program has to be started in administrator mode at the PC. Note that for Windows® Vista and Windows® 7, the user policies were changed. For a correct installation, the program has to be started in administrator mode and with administrator privileges. Click therefore the file "Setup" with the right mouse button and choose the option "open as administrator". Then the installation will start automatically.

After installation, establish a connection to the path sensor EPS using the optionally supplied programming cable. Start the configuration program RACO Setup Tool from the Windows® start menu.

Once connected, the LED "COM ... Connected" will turn to green. If the LED stays red no connection could be established.

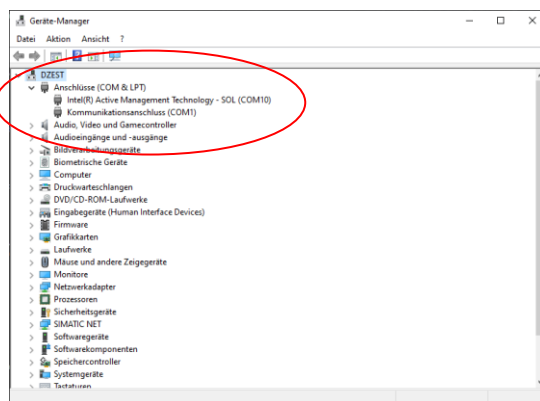
Trouble shooting in case of connection problems:

The most common cause is an incorrectly set COM port in the RACO Setup Tool software.

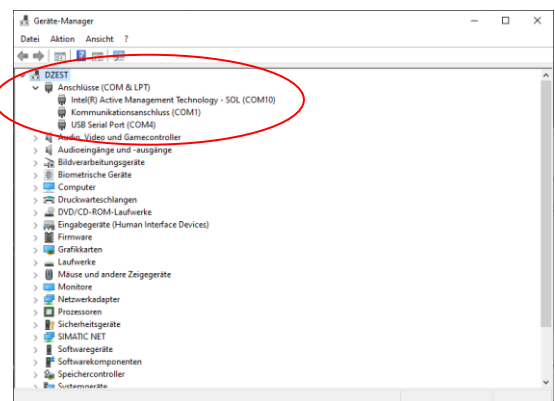
Windows automatically sets up a virtual COM port after plugging in the USB programming cable. The number of the COM port is assigned by Windows and cannot be predicted.

Vérifie les connexions (COM et LPT) dans le système Windows sous Paramètres système / Gestionnaire de périphériques.

1. Open the device manager of your Windows® system without having connected the USB adapter. All currently available connections are now displayed in the field "Connections COM and LPT". If no connection is available, the menu item "Connections (COM & LPT)" may also not be available.



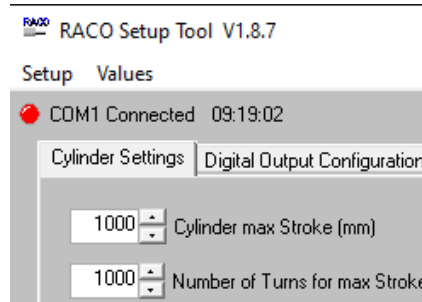
Without USB adapter



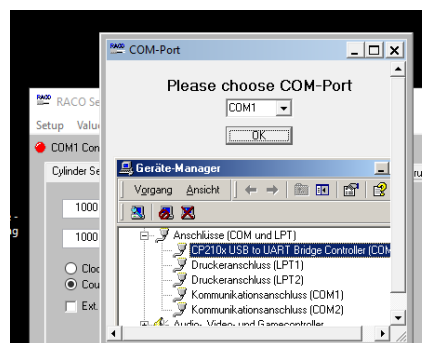
With USB adapter

2. Connect the USB adapter to your computer. The device manager adds the new adapter to the entries in the "COM and LPT ports" field and shows you the corresponding COM port. (In this example COM4).
3. Make a note of this COM port and close the device manager.

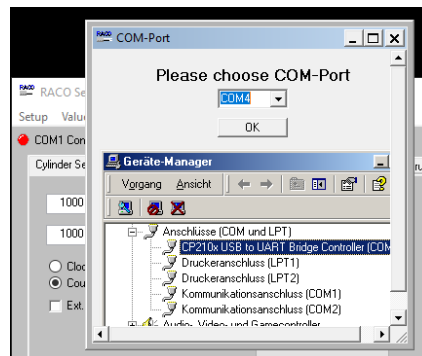
- 4 Start the programme „RACO Setup Tool “.



- 5 Open "Setup" and then "COM Port “.



- 6 Select the COM port determined in the device manager (in this example "COM4")

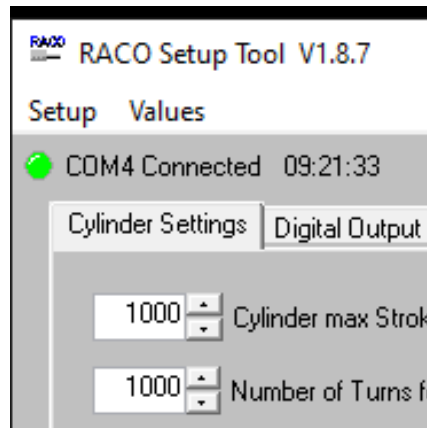


NOTE!



If the entry "COM4" cannot be selected in the pull-down menu ("arrow down" to the right of the field), click with the mouse in the input field and enter the value manually. In this example: "COM4". Confirm in both cases with the "OK" button.

- 7 This establishes the connection, which is signalled by a green dot.



NOTE!



Depending on the Windows® version used, only COM ports from "COM1" to "COM9" are accepted. If this is the case and the COM port is > than COM9, please set the COM port in the Windows® device manager to one of the permitted COM ports and start again at point 3.

5.2.8 Waste disposal

Please comply to the regional and national regulations when disposing of RACO electric actuators. For further recycling, reusable materials should be separated.

NOTICE!



Pollution of the environment.

The RACO Sensors contains plastic and electronic components.

Environmentally harmful components may discharge and damage the environment if disposed of inappropriately.

Disposal of product and its components must be done appropriately and in accordance with national and international laws and regulations.

NOTICE!



Portable battery

Parts that are marked with this symbol cannot be disposed with residual waste.

As a consumer, you are required to return batteries and rechargeable batteries.

Please dispose of batteries at public waste collection stations or recycling centres, as requested by official regulations.

NOTICE!



Disposal information for lithium cells

Lithium batteries have to be empty or may otherwise not be placed in the containers for used batteries accessible at retail stores or public disposal providers.

If batteries are not fully discharged, please take appropriate precautions.

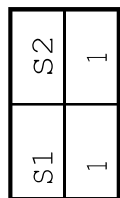
Further information on proper disposal can be obtained from the responsible waste disposal company.



5.2.1

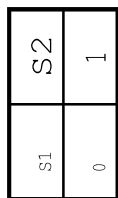
Wiring Example EPS 02

Start
8 sec. S1+S2 push

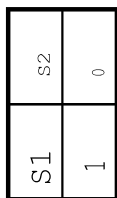


LED yellow flashes

Switch off position run in
bring actuator in position in
push S2 for 1/2 sec.
Position is saved

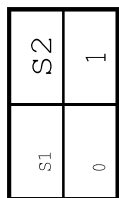


push S1 1/2 sec.

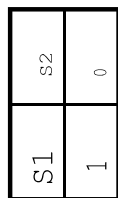


LED green flashes

Switch off position run out
bring actuator in position out
push S2 for 1/2 sec.
Position is saved



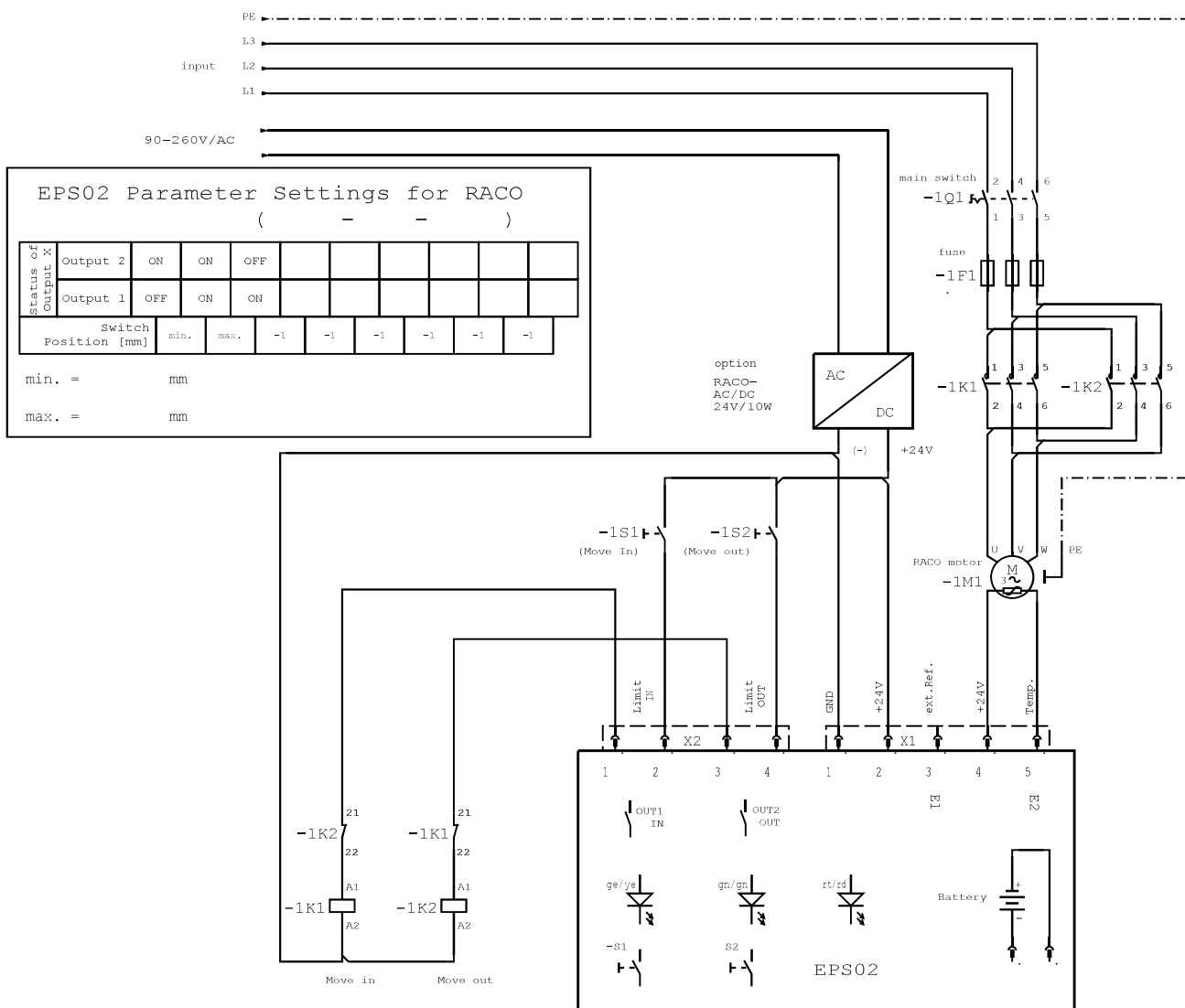
push S1 for 1/2 sec.



finish

Operation displays

LED yellow lights: actuator in normal operation position
LED yellow out: Actuator in position in
LED green lights: actuator in normal operation position
LED green out: actuator in position out
LED red light: temperature contact actuated
LED red flashes: check the axis to the sensor
LED run light: red, green, yellow: adjust the board
LED red + green alternately with LED yellow flashing
Failure actual value or battery empty (ab Version 2.5)



EPS02 Parameter Settings for RACO

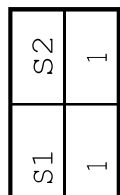
Status of Output X	Output 2	ON	ON	OFF						
Output 1	OFF	ON	ON							
Switch Position [mm]	min.	max.	-1	-1	-1	-1	-1	-1	-1	-1

min. = mm
max. = mm

Datum	Name	Index	Änderung	Datum	Name
22.02.2016	R.Muhs	3	7108	20.12.23	A.Kramm
		2	6988	10.02.23	A.Kramm
		1	6451	03.12.18	R.Muhs
Zchnng.Nr.			Position Sensor		
160-337-0			EPS 02		
			Klass.		
			D24-000		

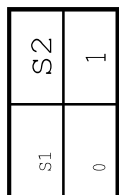


Start
8 sec. S1+S2 push

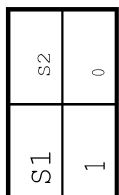


LED yellow flashes

Switch off position run in
bring actuator in position in
push S2 for 1/2 sec.
Position is saved

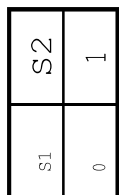


push S1 1/2 sec.

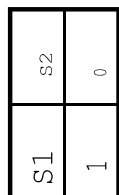


LED green flashes

Switch off position run out
bring actuator in position out
push S2 for 1/2 sec.
Position is saved



push S1 for 1/2 sec.



finish

Operation displays

LED yellow lights: actuator in normal operation position

LED yellow out: Actuator in position in

LED green lights: actuator in normal operation position

LED green out: actuator in position out

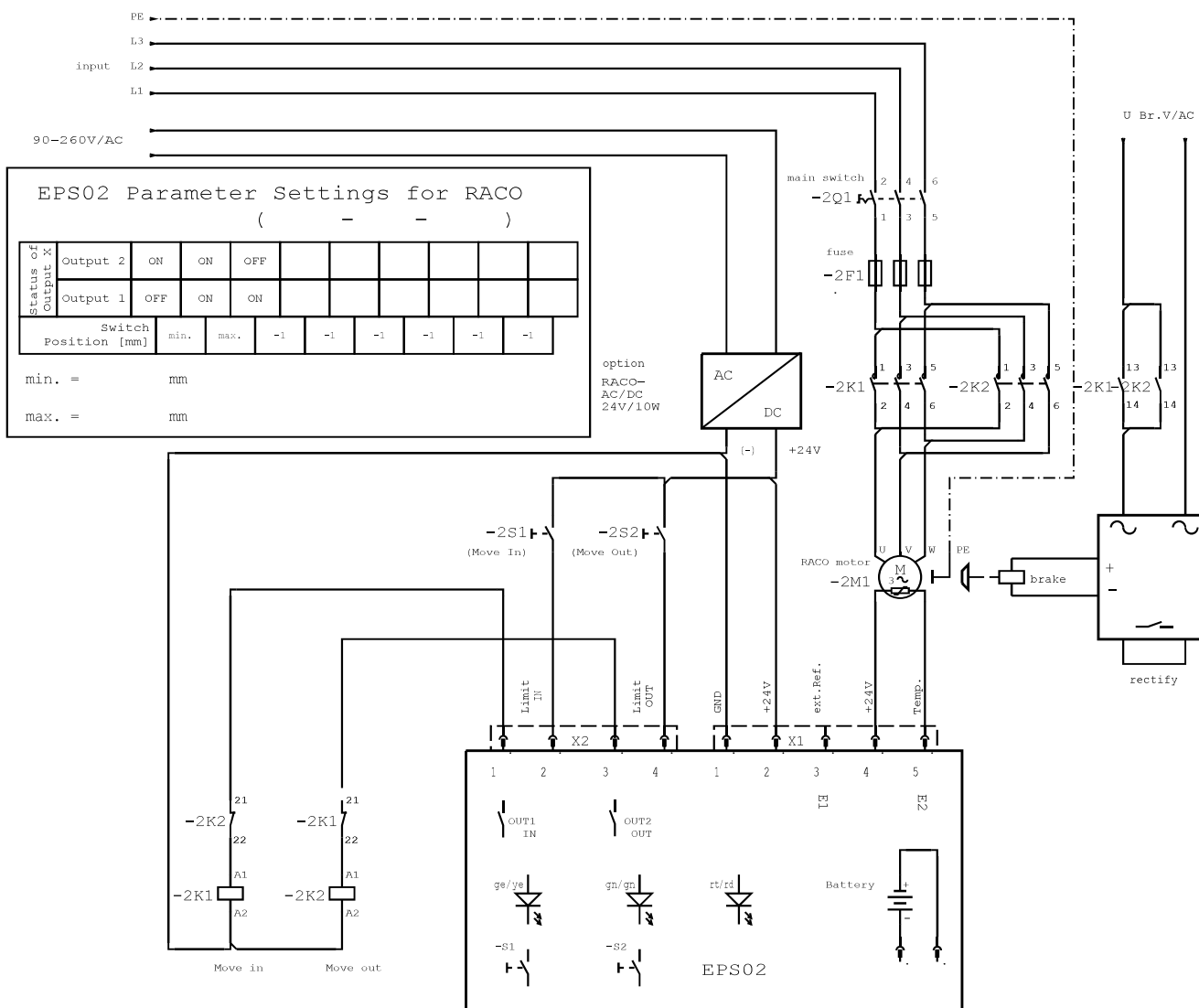
LED red light: temperature contact actuated

LED red flashes: check the axis to the sensor

LED run light: red, green, yellow: adjust the board

LED red + green alternately with LED yellow flashing

Failure actual value or battery empty (ab Version 2.5)

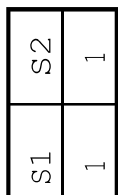


Datum	Name	Index	Änderung	Datum	Name
22.02.2016	R.Muhs	3	7108	20.12.23	A.Kramm
		2	6988	10.02.23	A.Kramm
		1	6451	03.12.18	R.Muhs

Zchnng.Nr.	Position Sensor		Klass.
160-337-0	EPS 02		
			D24-000

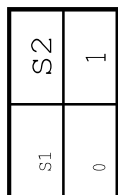
Page 2

Start
8 sec. S1+S2 push

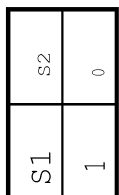


LED yellow flashes

Switch off position run in
bring actuator in position in
push S2 for 1/2 sec.
Position is saved

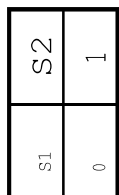


push S1 1/2 sec.

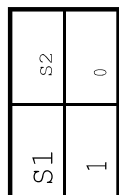


LED green flashes

Switch off position run out
bring actuator in position out
push S2 for 1/2 sec.
Position is saved



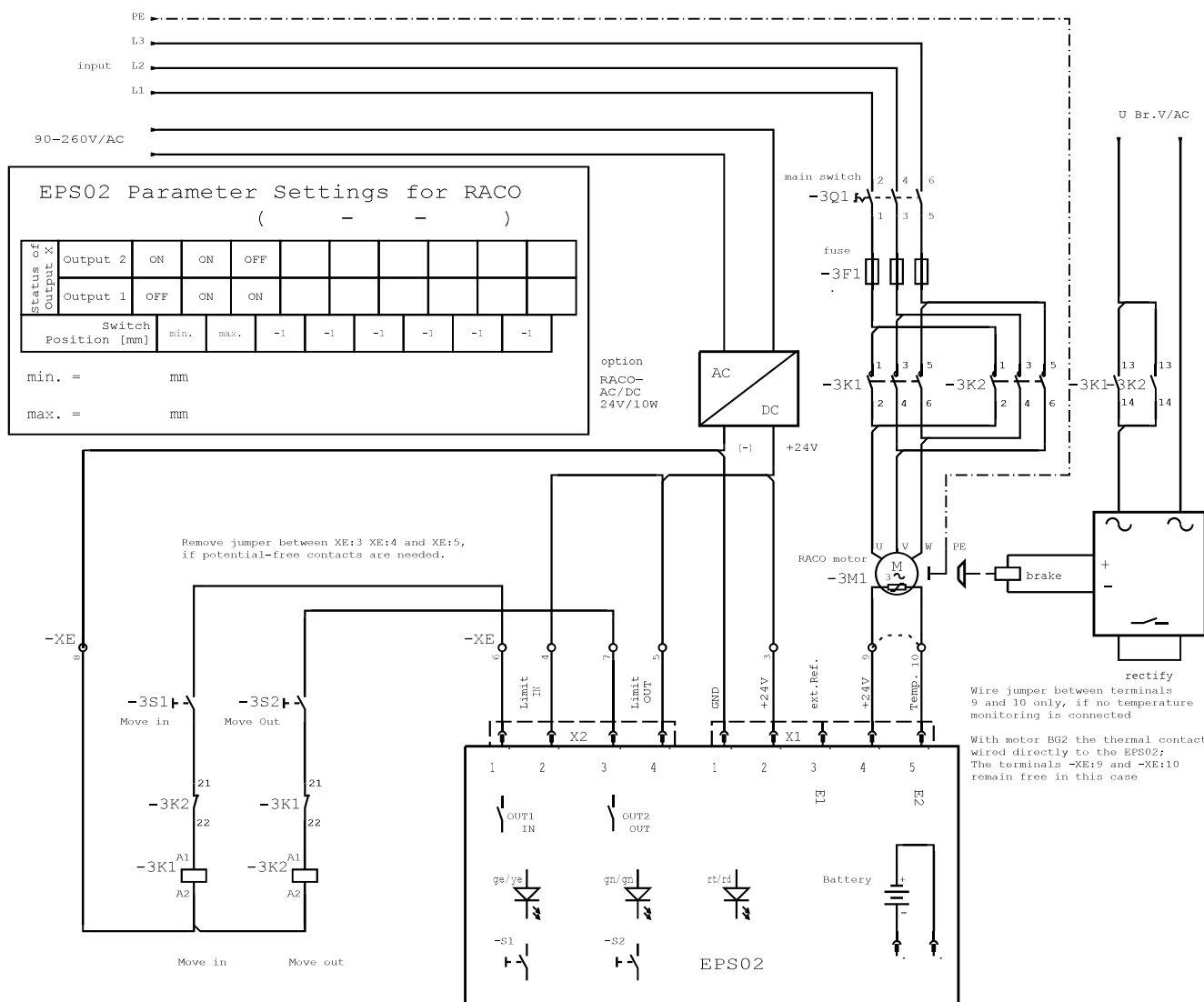
push S1 for 1/2 sec.

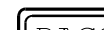


finish

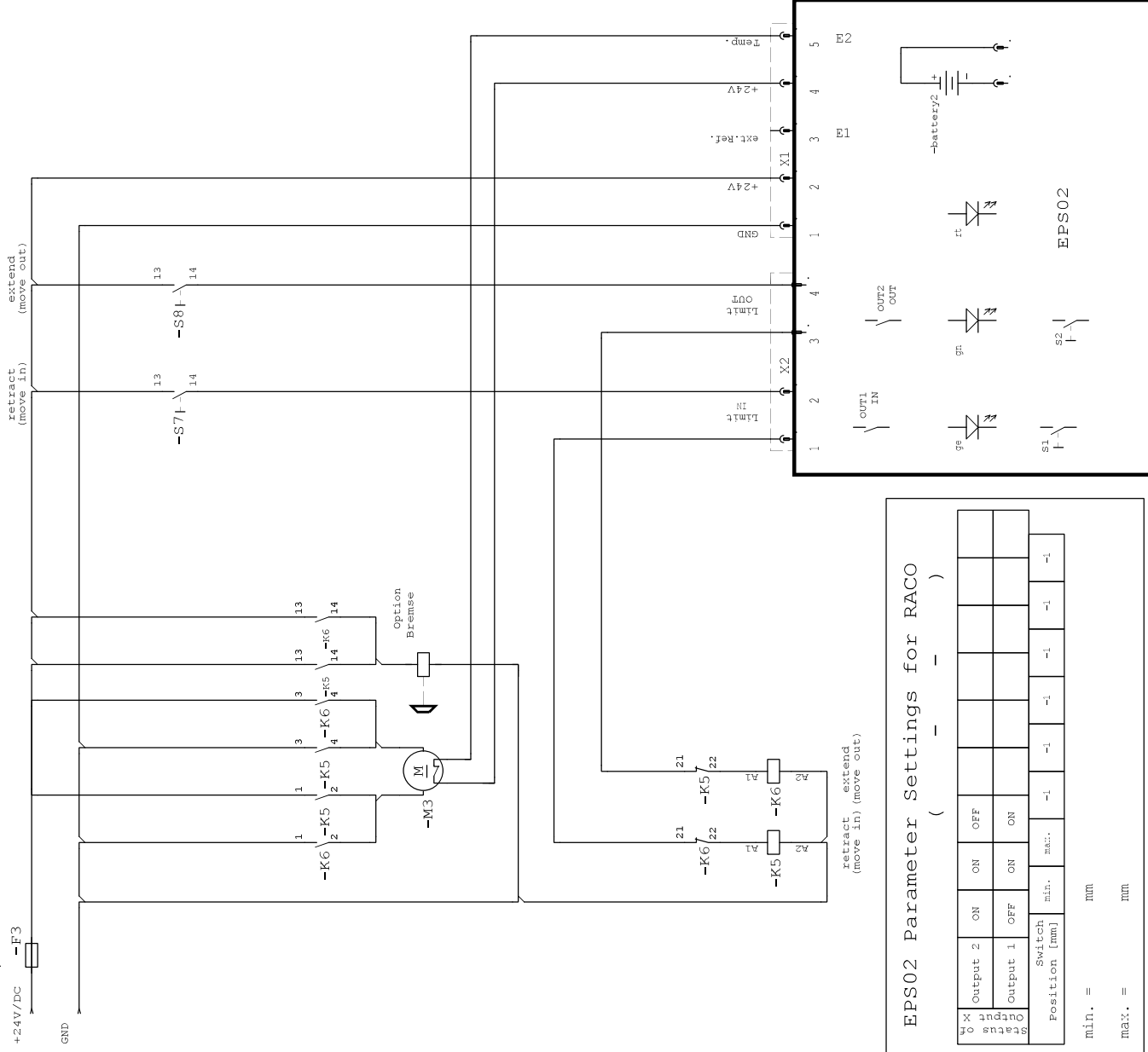
Operation displays

LED yellow lights: actuator in normal operation position
LED yellow out: Actuator in position in
LED green lights: actuator in normal operation position
LED green out: actuator in position out
LED red light: temperature contact actuated
LED red flashes: check the axis to the sensor
LED run light: red, green, yellow: adjust the board
LED red + green alternately with LED yellow flashing
Failure actual value or battery empty (ab Version 2.5)



Datum	Name	Index	Änderung	Datum	Name	Page 3
22.02.2016	R.Muhs	3	7108	20.12.23	A.Kramm	
		2	6988	10.02.23	A.Kramm	
Zchnng.Nr. 160-337-0		1	6451	03.12.18	R.Muhs	Klass. D24-000
		Position Sensor EPS 02				

connection example

[illegible]

Start
8 sec. S1+S2 push

S1	S2
1	1

LED yellow flashes

Switch off position
bring actuator in position
push S2 for 1/2 sec.
Position is saved

S1	S2
0	1

push S1 1/2 sec.

LED green flashes

Switch off position
bring actuator in position
push S2 for 1/2 sec.
Position is saved

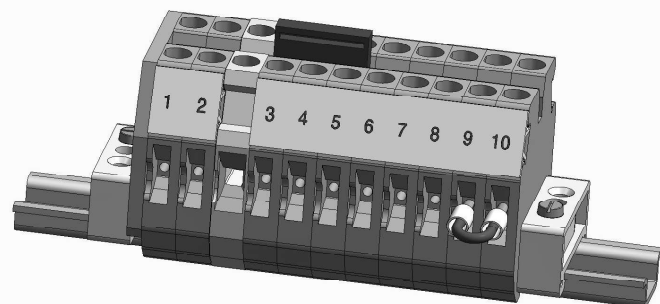
S1	S2
1	0

push S1 for 1/2 sec.

finish

Operation displays

- LED yellow lights: actuator in normal operation position
- LED yellow out: Actuator in position in
- LED green lights: actuator in normal operation position
- LED green out: actuator in position out
- LED red light: temperature contact actuated
- LED red flashes: check the axis to the sensor
- LED run light: red, green, yellow: adjust the board
- LED red + green alternately with LED yellow flashing
- Failure actual value or battery empty



Falls der Thermokontakt des Motors angeschlossen wird,
die Brücke -XE:9 und -XE:10 entfernen

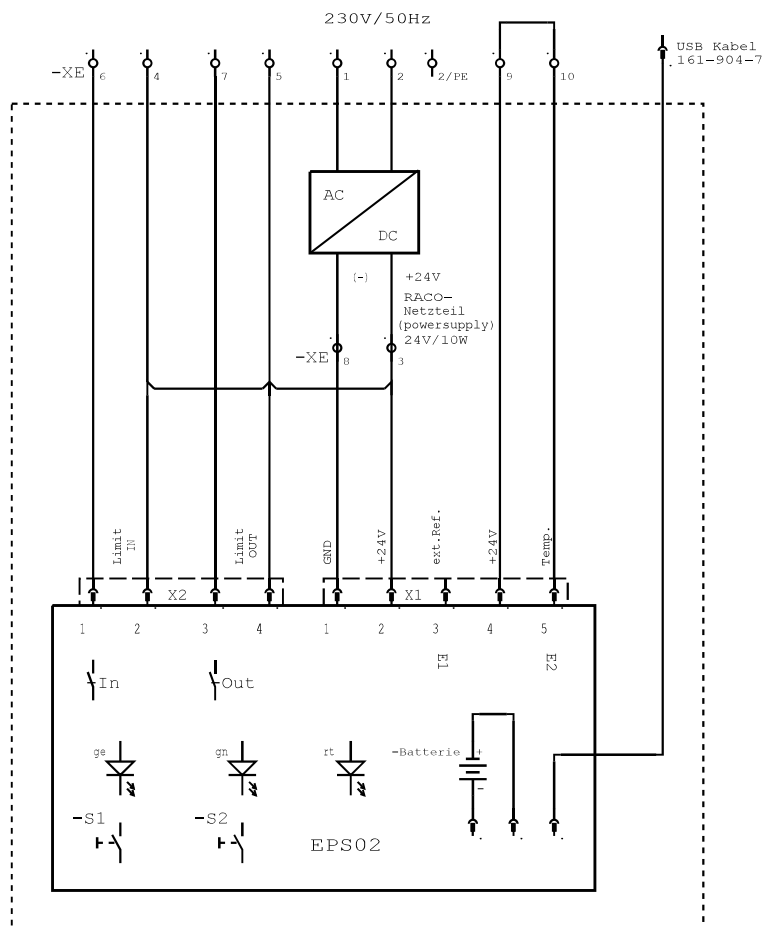
Achtung:
Bei BG2-Motoren wird der Thermokontakt (wenn vorhanden)
direkt auf die EPS02 Klemme X1:4 und X1:5 verdrahtet
Klemmen -XE:9 und -XE:10 bleiben dann ungenutzt

If the thermal contact of the motor is connected,
remove the jumper -XE:9 and -XE:10

Attention:
With BG2 motors, the thermal contact (if present)
wired directly to the EPS02 terminal X1:4 and X1:5
Terminals -XE:9 and -XE:10 then remain unused

Um potentialfreie Kontakte zu erhalten,
Brücke zwischen -XE:3, -XE:4 und -XE:5 entfernen

To get potential-free contacts,
remove jumper between -XE:3, -XE:4 and -XE:5



Rev.	Datum	Name	Positioniersensor EPS 02 mit Netzteil und USB Adapter Absolute encoder EPS 02 with power supply and USB-adapter	Seite 1
	09.05.2017	R.Muhs		
1/6909	08.06.2022	A.Kramm		
2/7013	04.04.2023	A.Kramm		
	Zchnng.Nr. 162-882-8			Klass. D24-000



8.1

EC Declaration of Incorporation

RACO-ELEKTRO-MASCHINEN GmbH

Jesinghauser Str. 56-64
D-58332 Schwelm / Germany

EC declaration of incorporation

Translation of the original EC declaration of incorporation

We hereby declare that the partly complete machine

RACO-Elektrozylinder[®], cylinder type 1 and 6

with options:

Position Sensor EPS, RACOMATIC[®], Control Components PLC/MMI

– as far as possible in terms of the scope of supply – complies with the following basic requirements of **directive 2006/42/EC** of 17.05.2006 (Machine Directive):

Annex I, Sections 1.1.2, 1.1.3, 1.1.5, 1.3.2, 1.3.4, 1.5.1

The partly complete machine also complies with the provisions of the **directive 2014/35/EU** of 26.02.2014 (Low Voltage Directive) and **2014/30/EU** of 26.02.2014 (EMC Directive).

We also declare that the special technical documents for partly complete machines according to Annex VII Part B were prepared. We are obliged to submit the special technical documents to the supervisory authorities through our documentation department following reasonable request. Commissioning is forbidden until the machine in which this partly complete machine is incorporated complies with the provisions of EC Directive 2006/42/EC. Before bringing into service, this must comply with EC directives, including documentation.

The following harmonising standards (or parts thereof) were applied:

DIN EN ISO 12100:2011-03	Safety of machines – General principles for design Risk assessment and risk reduction
DIN EN 60204-1:2019-06	Safety of machines - electrical machine equipment Part 1: General requirements
DIN EN 60034-1:2011-02	Rotating electrical machines - Part 1: Rating and performance
DIN EN 60034-5:2021-05	Rotating electrical machines - Part 5: Degrees of protection provided by integral design of rotating electrical machines

To comply with the regulations observe all information in the operating instructions. These include correct EMC installation and cabling and necessary shutoff device according DIN EN 60204.

Authorized to compile the technical documents:
Mr. Bernd Hase (Dipl.-Ing.)

Place, date: Schwelm 01.06.2023


Dipl.-Wi.-Ing. Sebastian Wilke
Management


Dipl.-Ing Bernd Hase
Technical Design Manager