



**PHOENIX MECANO**

**EN Assembly Instruction**

Linear actuator LD75E+P .....2



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# 1 Installation Declaration

## 1.1 Installation Declaration LD75E+P

within the meaning of the Machinery Directive 2006/42/EC, Annex II, 1.B for incomplete machines

The Manufacturer:

**Phoenix Mecano Solutions AG**

Hofwisenstrasse 6  
CH-8260 Stein am Rhein

confirms that the product named therein

Product designation: *LD75E+P*  
Type designation: *LD75E+P*  
Trade name: *LD75E+P*  
Function: *Electromotive extension and retraction of the pushrod for creation of linear motion*

meets the requirements for an **incomplete machine** according to the Machinery Directive 2006/42/EC.

The following essential requirements of the Machinery Directive 2006/42/EC according to Annex I have been applied and fulfilled:

1.1.5.; 1.3.2.; 1.3.3.; 1.3.4.; 1.3.7.; 1.5.1.; 4.1.2.1.; 4.1.2.3.

It is also declared herewith that the special technical documentation according to Annex VII Part B has been compiled.

It is expressly stated that the **incomplete machine** complies with all applicable provisions of the following EC guidelines:

2011/65/EU	Directive 2011/65/EU of the European Parliament and the Council dd. 8 June 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment
IEC 60601-1-2:2014	Medical Electrical Equipment – Part 1-2: General requirements for basic safety and Essential performance – Collateral standard: Electromagnetic disturbances – Requirements and test (IEC 60601-1-2:2014); German version EN 60601-1-2:2015

Phoenix Mecano Solutions AG undertakes to submit technical documentation for the incomplete machine upon substantiated request of the national competent bodies in electronic format.

A person established within the Community and authorised to draw up the relevant technical documentation:

**Timo Fluck**

Phoenix Mecano Solutions AG  
Hofwisenstrasse 6  
CH-8260 Stein am Rhein

**Setting into operation is forbidden until it is established that the machine, into which this incomplete machine is installed, complies with the provisions of the EC Directive 2006/42/EC.**

It must comply with the CE guidelines prior to marketing, including with regard to documentation.

Stein am Rhein / 18.06.2019

Mechanical components  
(place/date)

(signature)

Timo Fluck  
Technical supervision

(identification of the signatory)

## **2 General information**

### **2.1 Notes on these assembly instructions**

These assembly instructions are only applicable for the electric cylinder described and intended as documentation for the manufacturer of the final product, into which this incomplete machine will be installed.

We herewith particularly emphasize that the operating instruction containing description of all functions and safety notes for the final product must be compiled for the end customer by the manufacturer of the final product.

This also applies to the installation into a machine. The machine manufacturer is responsible for the respective safety equipment, inspections, documentation and monitoring of pinch and shear points that may potentially arise.

This assembly instructions help

- avoid hazards
- and downtime,
- and guarantee and/or extend the lifetime of the product.

Hazard warnings, safety recommendations and data in these assembly instructions shall be adhered to with no exception.

The assembly instructions must be read and used by each person, who works with the product.

Setting into operation is forbidden until it is established that the machine complies with the provisions of the EC Guidelines 2006/42/EC (Machinery Directive). It must comply with the CE guidelines prior to marketing, including with regard to documentation.

We expressly draw the attention of the re-user of this incomplete machine / partial machine / machine part to the duty of extension and complementation of this documentation. In particular, a CE Declaration of Conformity must be drawn up by the re-user in case of fitting or mounting of electric elements and/or drives.

Our Installation Declaration will automatically become void.



## **3 Liability / warranty**

### **3.1 Liability**

Phoenix Mecano Solutions AG assumes no liability for damages or impairments resulting from structural modifications by a third party or modifications of the safety devices of this electric cylinder.

Phoenix Mecano Solutions AG assumes no responsibility for the spare parts that have not been tested and authorised by Phoenix Mecano Solutions AG.

Otherwise, the EC Installation Declaration becomes void.

The safety-related devices must be regularly tested for operability, damage and integrity.

We reserve the right to make technical modifications of the electric cylinder and changes of its assembly instructions.

Advertising materials, product leaflets on sales activities, public statements or similar notices may not be taken as basis for suitability and quality of the product, for which purpose a detailed technical advice is strongly recommended. No claims can be asserted against Phoenix Mecano Solutions AG as to availability of previous versions or adjustments to the current version of the electric cylinder.

In case of any inquiries please specify the type plate data.

Our address:

**Phoenix Mecano Solutions AG**  
Hofwisenstrasse 6  
CH-8260 Stein am Rhein

Tel.: +41 (0)52 742 75 00

Fax: +41 (0)52 742 75 90

### **3.2 Product monitoring**

Phoenix Mecano Solutions AG offers products with highest possible technical level, adapted to the latest safety standards. Inform us please immediately of any recurrent failures or malfunctions.

### **3.3 Language of the operating instructions**

The original version of these assembly instructions was drawn up in the EU official language of the manufacturer of this incomplete machine. Translations into other languages are translations of the original version subject to the legal requirements of the machinery directive.

### **3.4 Copyright**

Individual copies, e.g. copies and printouts, may only be made for private use. Production and dissemination of other reproductions is only permitted with the express consent of Phoenix Mecano Solutions AG. Users themselves are responsible for compliance with legal regulations and can be held liable in the event of misuse. The copyright owner of these assembly instructions is Phoenix Mecano Solutions AG.

## **4 Use / operating personnel**

### **4.1 Intended use**

The electric cylinder shall be used exclusively for the adjustment of the guided components or other comparable adjustment tasks. The electric cylinder may not be used in potentially explosive atmosphere as well as in direct contact with food, pharmaceutical or cosmetic products. Catalogue information, content of these assembly instructions and / or conditions specified in the order must be taken into account. The values specified in these assembly instructions are maximum values and may not be exceeded.

### **4.2 Unintended use**

“Unintended use” means that the information given in section 4.1 *Intended use* is not being observed. Unintended use and improper handling, as well as operating, installing or handling this electric cylinder by untrained personnel may result in hazards to the personnel. Moving persons with this electric cylinder, for example, is an example of an unintended use and is forbidden. Phoenix Mecano Solutions AG is released of liability and general operating licence of this electric cylinder becomes void in case of unintended use.

### **4.3 Reasonably foreseeable misuse**

- Overloading the device by exceeding the weight or duty cycle
- Use in the environments outside the specified IP protection class
- Use in the environment with high humidity > dew point
- Use in the premises with potentially explosive atmosphere as defined in ATEX Directive
- Operating in damage to the mains supply, housing, motor cable, manual switch or other control lines (SPS, PC, etc.) → Attention: Accessories (power supply, manual switch, etc.) have protection class IP40
- Use when incompletely assembled or insufficiently fixed
- Stroking out (moving up to a stop)
- Use in applications with lateral forces and torques

When unplugged, no hazard may arise.

### **4.4 Who may use, install and operate this electric cylinder?**

Individuals, who have fully read and understood the assembly instructions, may use, install and operate this electric cylinder. The responsibilities associated with handling this electric cylinder must be clearly defined and observed.



## 5 Safety

### 5.1 Safety instructions

Phoenix Mecano Solutions AG has constructed this electric cylinder according to the current state of the art and existing safety regulations. However, if the electric cylinder is misused and/or operated in the manner inconsistent with the intended use or if the safety instructions are not observed, this may result in hazards to personnel and property. Competent handling guarantees high performance and availability of the electric cylinder. Faults or conditions, which may impair the safety, must be rectified immediately.

Every person involved in the assembly, use or operation of this electric cylinder, must have read and understood the assembly instructions.

This includes:

- understanding the safety instructions in the text, and
- being familiar with the configuration and functioning of various options of operation and application.

The electric cylinder may only be used, installed and operated by the designated, trained personnel. Any works on and with the electric cylinder may only be carried out according to this instruction. This instruction needs therefore be kept safe and close at hand in the vicinity of the electric cylinder.

The general, national or operational safety instructions shall be observed. Responsibilities for the use, installation and operation of this electric cylinder must be unequivocally stipulated and observed so that no unclear situation may arise with regard to safety aspects. Before every commissioning, the user must ensure that no persons or objects remain in the danger area of the electric cylinder. The user may only operate the electric cylinder if it is in a faultless condition. Any change must be immediately reported to the nearest person responsible.

### 5.2 Special safety instructions

- Any works with the electric cylinder may only be carried out according to this instruction.
- The device may only be opened (installed / dismantled) by authorised specialist personnel. In case of any defect of the electric cylinder, we recommend to contact the manufacturer and/or send this electric cylinder for repair.
- Power supply must be disconnected before installation, dismantling, maintenance or troubleshooting.
- The re-user must prevent pinching between guiding tube and the front suspension by means of design.
- A proper installation of the supply lines prevents the hazards posed by this application.
- Only use original accessories and spare parts.
- The re-user must prevent potential damages caused by the failure of the end position switch-off or nut breakage by means of design.
- The electric cylinder may not be exposed to lateral forces or torques.
- Only use suitable screws (no shoulder screws). Note the hole-  $\emptyset$  of the cylinder mounts!
- Tighten the screws so firmly that they cannot loosen - but not too tight, as otherwise high forces would act on the mounts and safe operation would no longer be ensured! The drive must be freely rotatable in the suspensions - tension would result in immediate destruction of the drive!
- Loss of connection between the thrust rod and guiding tube in case of a tensile load must be prevented by means of design. It means that, especially with suspended loads, additional safety devices (e.g.: cable, chain, etc.) must be affixed!
- During maintenance, only original parts must be used and installed by trained specialist personnel.
- For safety reasons, unauthorised modifications or changes of the electric cylinder are prohibited.
- The performance data of this electric cylinder determined by Phoenix Mecano Solutions AG may not be exceeded (see 6.6 *Performance diagram*).
- The type plate must remain legible. The data must be retrievable without effort at any time.
- Safety-relevant hazard signs identify danger areas on the product.
- Safety-relevant devices must be tested for operability, damage and integrity on a regular basis, at least once a year.
- In case of an overhead installation of the electric cylinder, the fastened loads must be secured onsite against dropping. The danger area under the application must be marked in the documentation of the final product.
- The electric cylinder must immediately be put out of operation if the mains cable and/or supply line is damaged.
- Higher-level safety circuits (emergency stop, etc.) are required for safe operation of the electric cylinders and must be provided and installed on site by the subsequent user / user.

### 5.3 Safety signs

These warning and mandatory actions signs are the safety symbols which warn of risk or hazard.

Data of these assembly instructions regarding special hazards or situations with electric cylinder must be complied with, while non-observance increases the risk of an accident.



The "General mandatory action sign" indicates the necessity to exercise caution.

Data marked with this sign in these assembly instructions require your particular attention.

These contain important information on functions, settings and procedures.

Failure to observe may lead to personal injuries, disturbances of the electric cylinder or the environment.



## 6 Product information

### 6.1 Mode of operation

The electric cylinder serves for adjustment of the guided components or other similar adjustment tasks. It is driven by a low voltage motor.

#### 6.1.1 Variants of power supply

Power supply 12 / 24 VDC

#### 6.1.2 Variants of force / speed

The following basic executions in terms of force / travel speed of the electric cylinder LD75E+P are available:

Executions	Voltage	Push force	Pull force	Max. Self-locking (pressure)	Max. Self-locking (tension)	E+P variant	
						No-load	Rated load
Execution 1	12 VDC	750 N	750 N	750 N	400 N	14 mm/s	≤ 11 mm/s
Execution 2	12 VDC	750 N	750 N	750 N	400 N	24 mm/s	≤ 17 mm/s
Execution 3	12 VDC	300 N	300 N	160 N	150 N	24 mm/s	≤ 21 mm/s
Execution 4	12 VDC	300 N	300 N	160 N	150 N	48 mm/s	≤ 39 mm/s
Execution 5	24 VDC	750 N	750 N	750 N	400 N	15 mm/s	≤ 13 mm/s
Execution 6	24 VDC	750 N	750 N	750 N	400 N	25 mm/s	≤ 19 mm/s
Execution 7	24 VDC	300 N	300 N	160 N	150 N	25 mm/s	≤ 23 mm/s
Execution 8	24 VDC	300 N	300 N	160 N	150 N	50 mm/s	≤ 44 mm/s

(Table 1)

The stated values were determined under optimum conditions (room temperature) and may differ as a result of friction loss, temperature changes or external disturbances.

Self-locking force:

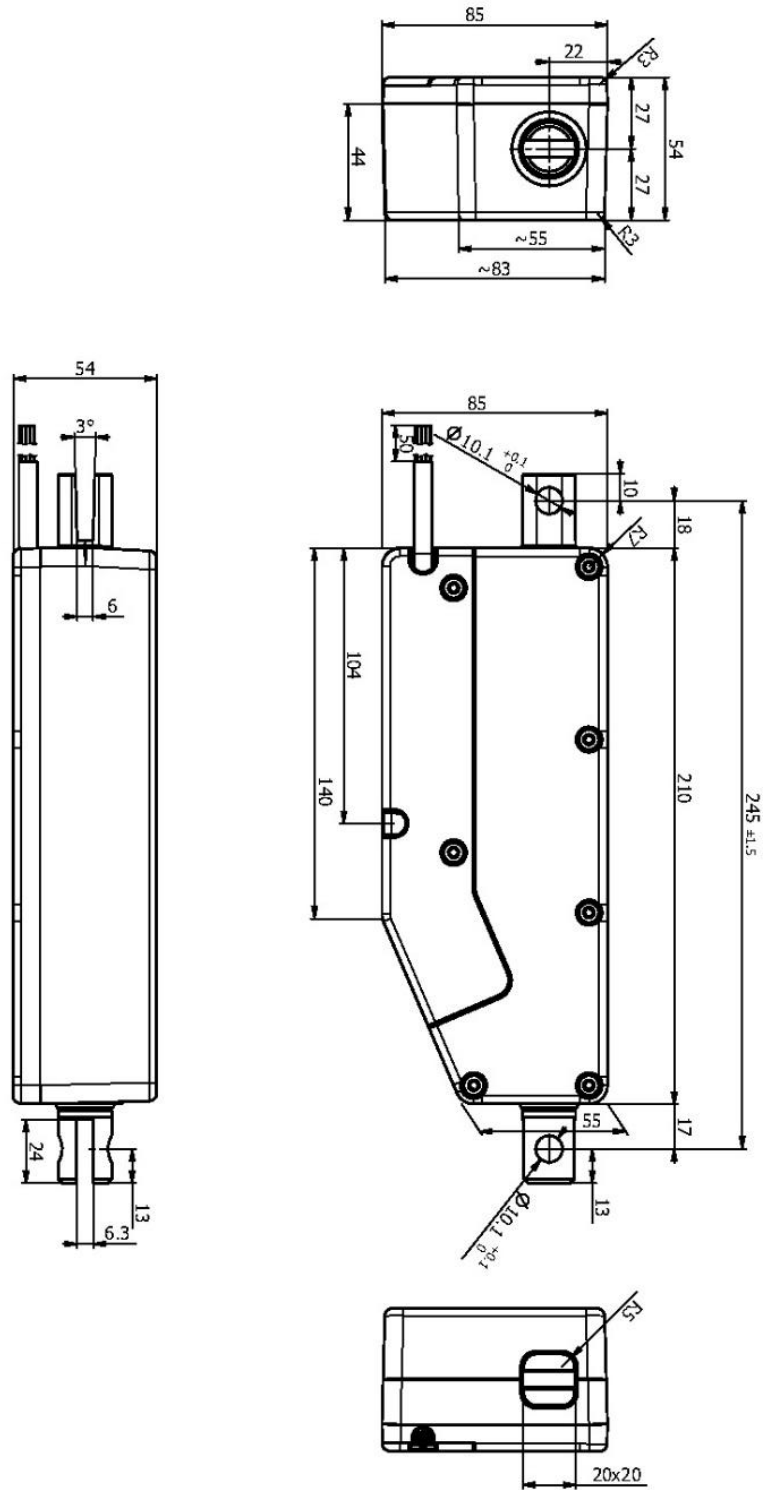


Ensure that the motor is short-circuited after stopping, in order to achieve the maximum self-locking effect (see Table 1). Actuators with integrated control provide this feature as long as the actuator is supplied with power.

Emission:

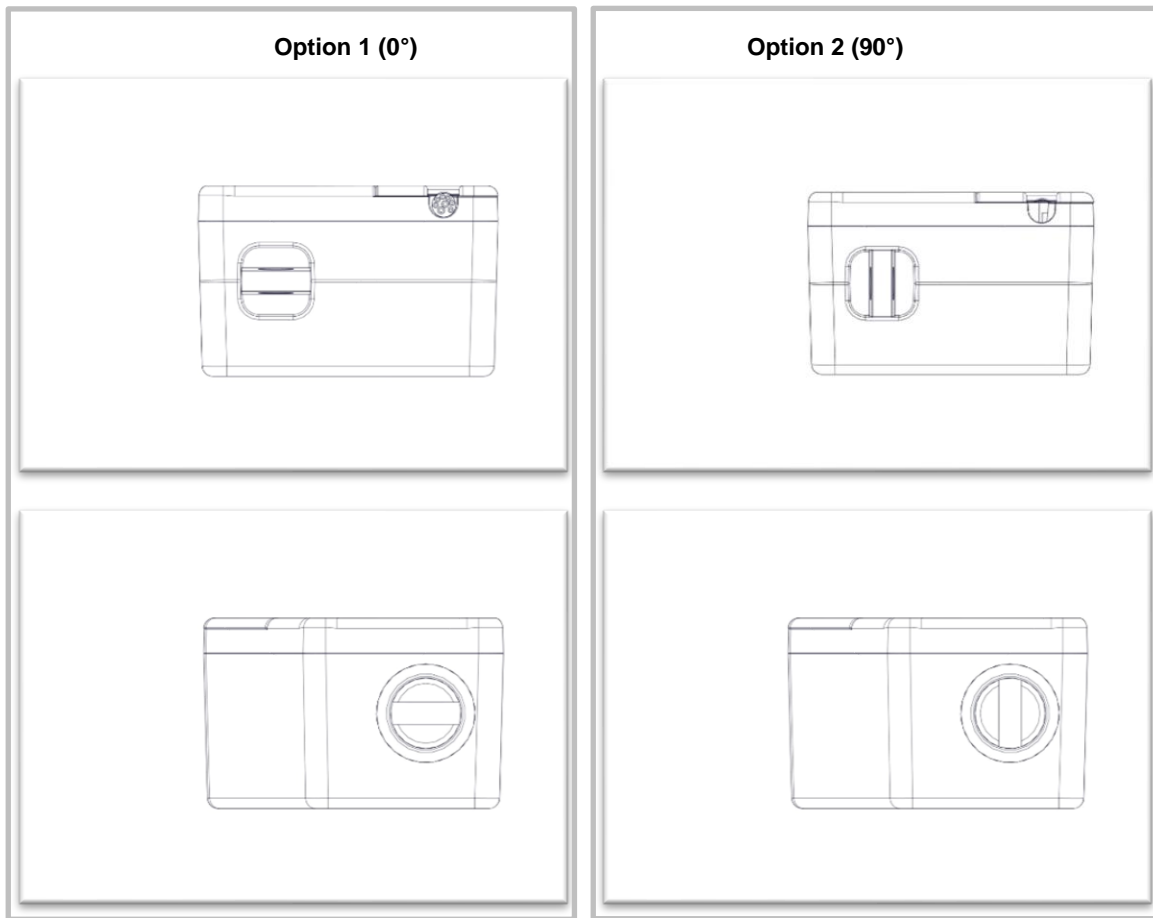
The A-weighted equivalent continuous sound pressure level of these linear units is approx. 65 dB(A) at a microphone distance of 50 cm.

## 6.2 Dimensions of geometry





### 6.3 Variants of suspension



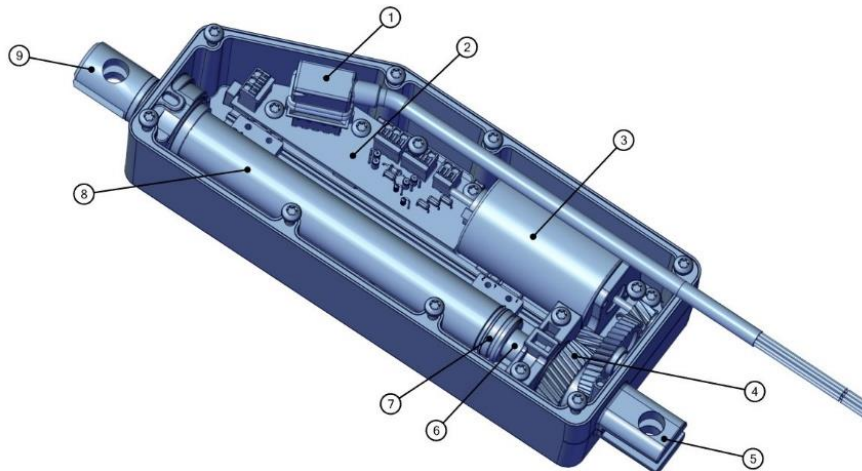
(The rear view of the drive is shown in the top picture and the front view in the bottom picture)

## 6.4 Technical data

<b>Stroke length</b>	Up to 130 mm
<b>Dimension A (installation dimension)</b>	245 ± 1.5 mm
<b>Special stroke lengths / installation lengths</b>	Customisation possible on request
<b>Mounting position</b>	any desired, without cross forces
<b>Lifting force</b>	Up to 750 N pull / push (depending on gear ratio and spindle pitch)
<b>Lifting speed</b>	11 – 50 mm/s (depending on load / spindle)
<b>Protection class</b>	IP 69k static (≅ IP 65 dynamic)
<b>Operating voltage</b>	12 VDC, max. 7 A)** 24 VDC, max. 4 A)**
<b>Storage temperature</b>	–40 °C to +85 °C
<b>Operating temperature</b>	–20 °C to +65 °C (full power +5 °C to +40 °C)
<b>Self-locking</b>	Yes (depending on gear ratio and spindle pitch)
<b>Stroke tube guide</b>	Slide bearing
<b>Operating mode</b>	750N ON-time 20 % (2 min. operation / 8 min. pause at rated load) 300N ON-time 30 % (3 min. operation / 7 min. pause at rated load)
<b>Maintenance</b>	maintenance-free up to (min. 20000 cycles, max. 60000 cycles depend on Execution)
<b>Colour</b>	Black powder coated RAL7024 / other colours on request
<b>Electrical connection</b>	Connection cable with plug
<b>Control options</b>	Supply voltage polarity / PLC

\*\* Measured with a stable power supply at room temperature and under laboratory conditions

## 6.5 Overview diagram of the electric cylinder



- |                              |                          |                           |
|------------------------------|--------------------------|---------------------------|
| ① Connection cable with plug | ④ Transmission           | ⑦ Guide nut               |
| ② Control board              | ⑤ Mounting adapter, rear | ⑧ Pushrod                 |
| ③ Motor                      | ⑥ Spindle                | ⑨ Mounting adapter, front |

## 6.6 Connection cable with plug / connection diagrams

A connection cable with a compatible plug is supplied as standard for electric cylinders of the LD75E+P series.

Please note that the specified protection class IP69k (static), resp. IP65 (dynamic) for the electric cylinder LD75E+P is only provided with a correctly mounted connection cable with plug! In order to guarantee a high IP protection class, we recommend that the free cable end is laid and connected in such a way that it is inside a protected area (e.g. junction box, switch cabinet, machine enclosure, etc.).



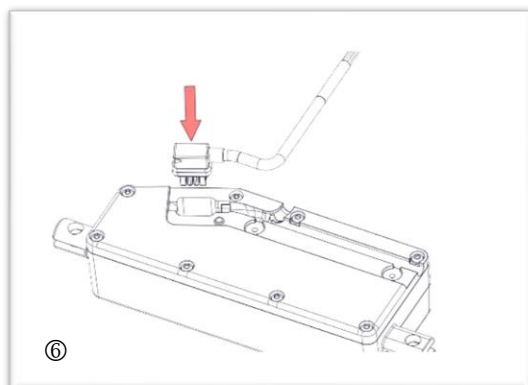
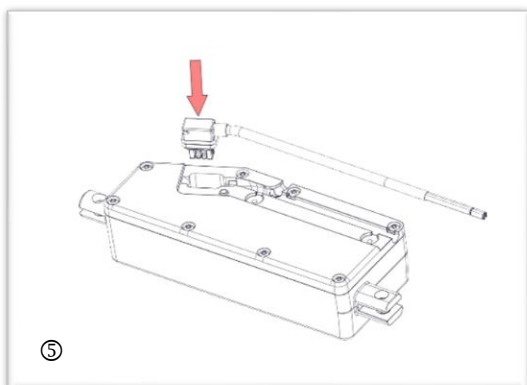
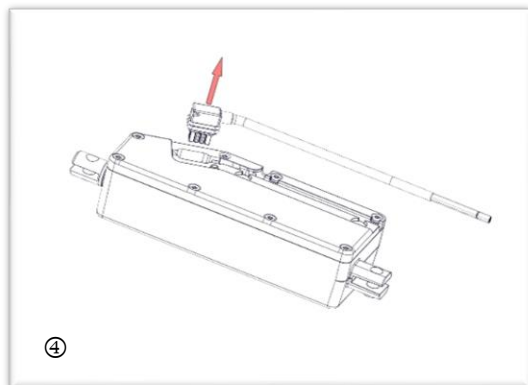
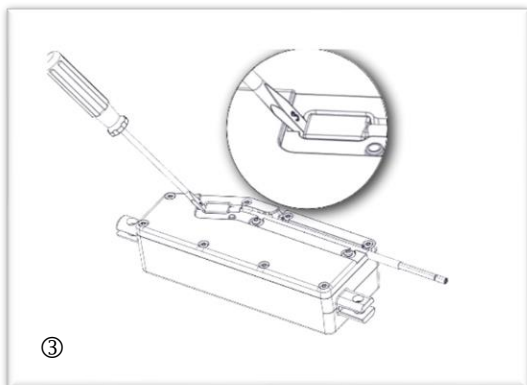
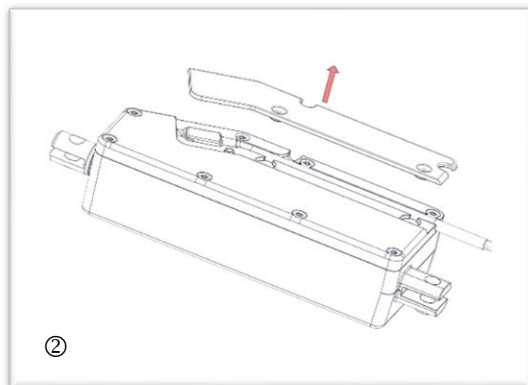
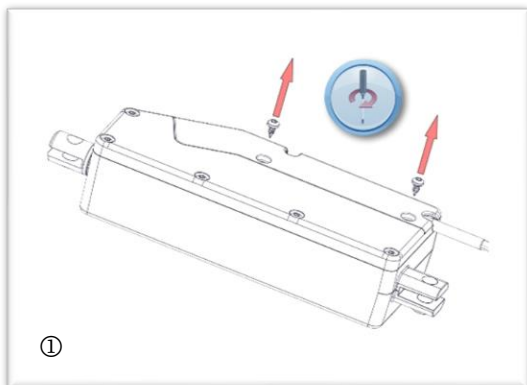
The connection cable with plug is available in the following lengths (measured from the edge of the housing with a tolerance of  $\pm 150\text{mm}$ ):

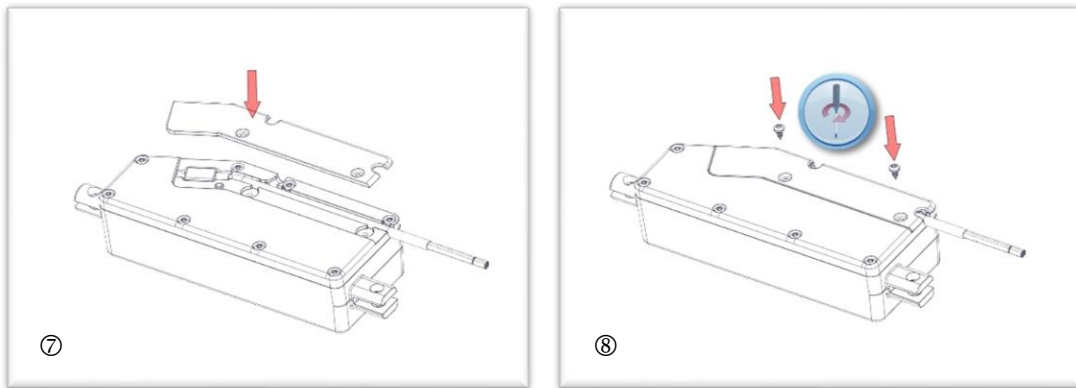
- Total cable length L = 1500 mm
- Total cable length L = 3000 mm
- Total cable length L = 5000 mm



When assembling/disassembling the connection cable, please ensure that the plug is correctly inserted in the plug socket provided for this purpose and avoid using undue force (**Recommendation:** lightly grease the seal). Ensure that the connecting cables are laid correctly, in order to eliminate trip hazards.

**6.6.1 Assembly /disassembly of the connection cable with plug**



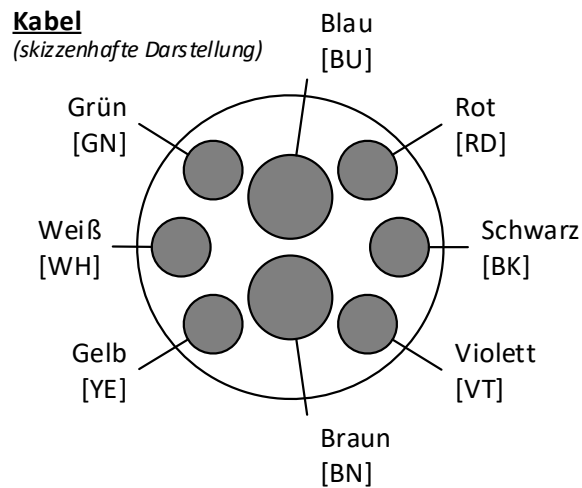


The basic execution of the LD75E+P series electric cylinders is available in two different variants:

- Variant 1:
  - Supply voltage polarity  
(Switch-off at limit in retracted / extended position)
- Variant 2:
  - Supply voltage polarity + potentiometer  
(Switch-off at limit in retracted / extended position + potentiometer (connections brought out as a position feedback))

### 6.6.2 Connection diagram for variant 1 (AP.4.017 661)

(supply voltage polarity)

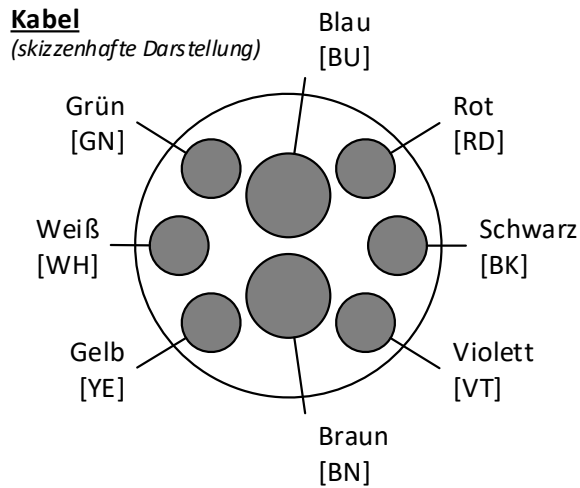


Input / Output	Description
<b>Blue</b> (BU)	<b>Supply voltage</b> 12V execution: $\pm 12\text{Vdc} \pm 20\%$ 24V execution: $\pm 24\text{Vdc} \pm 10\%$  <b>Control</b>

<b>Brown</b> (BN)	The cylinder extends or retracts according to the polarity of the power supply. <table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td></td> <td style="text-align: center;"><b>Blue</b></td> <td style="text-align: center;"><b>Brown</b></td> </tr> <tr> <td style="text-align: center;"><b>Retraction</b></td> <td style="text-align: center;">Minus</td> <td style="text-align: center;">Plus</td> </tr> <tr> <td style="text-align: center;"><b>Extension</b></td> <td style="text-align: center;">Plus</td> <td style="text-align: center;">Minus</td> </tr> </table>		<b>Blue</b>	<b>Brown</b>	<b>Retraction</b>	Minus	Plus	<b>Extension</b>	Plus	Minus
	<b>Blue</b>	<b>Brown</b>								
<b>Retraction</b>	Minus	Plus								
<b>Extension</b>	Plus	Minus								
<b>Red</b> (RD)	<b>Do not connect</b> This line must not be connected.									
<b>Black</b> (BK)										
<b>Violet</b> (VT)										
<b>Yellow</b> (YE)										
<b>White</b> (WH)										
<b>Green</b> (GN)										

**6.6.3 Connection diagram for variant 2 (AP.4.017 662)**

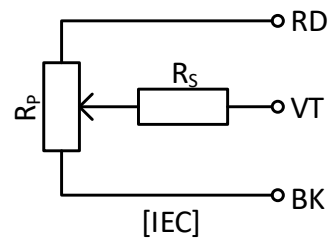
(Supply voltage polarity, 100 and 130mm potentiometer)



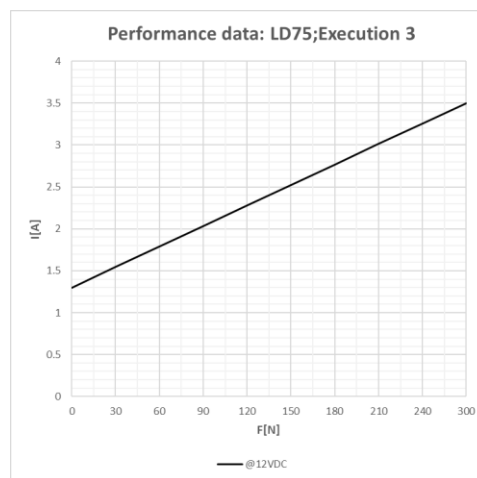
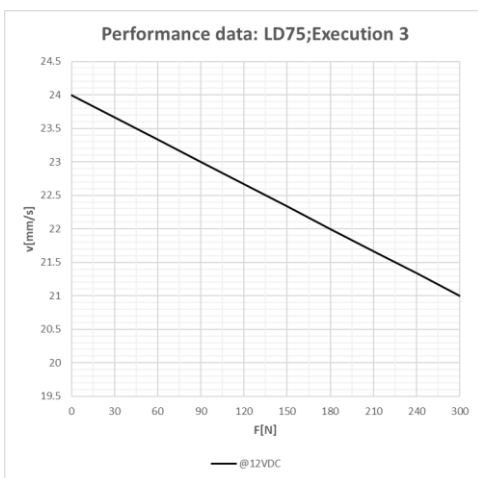
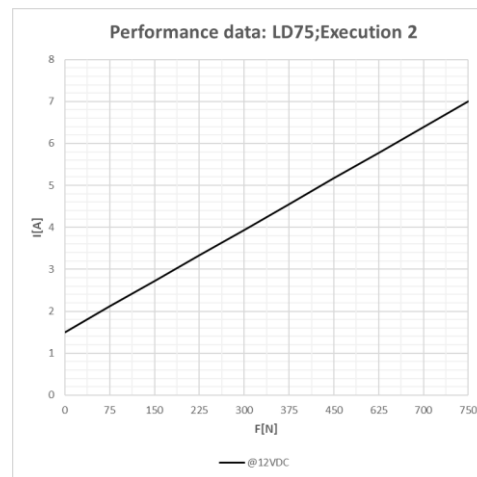
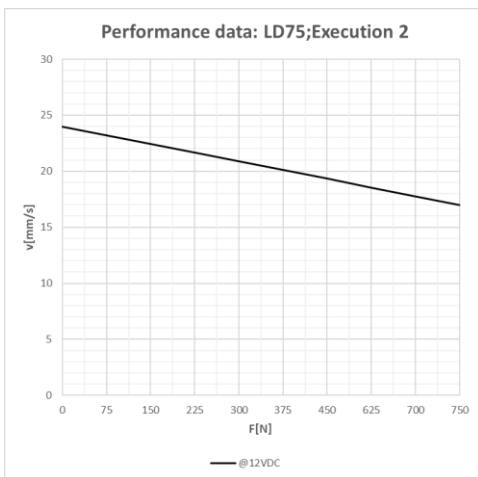
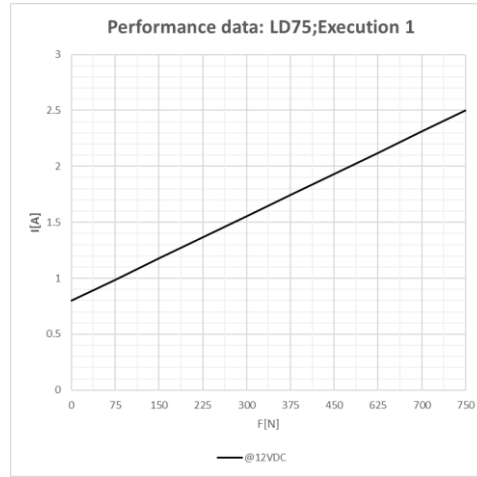
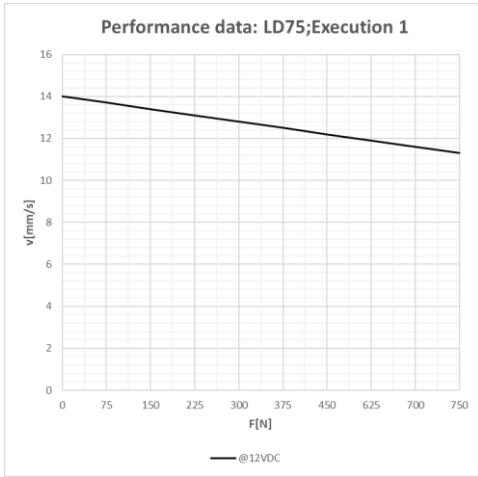
Input / Output	Description
<b>Blue</b> (BU)	<b>Supply voltage</b> 12V execution: $\pm 12V_{dc} \pm 20\%$ 24V execution: $\pm 24V_{dc} \pm 10\%$  <b>Control</b>

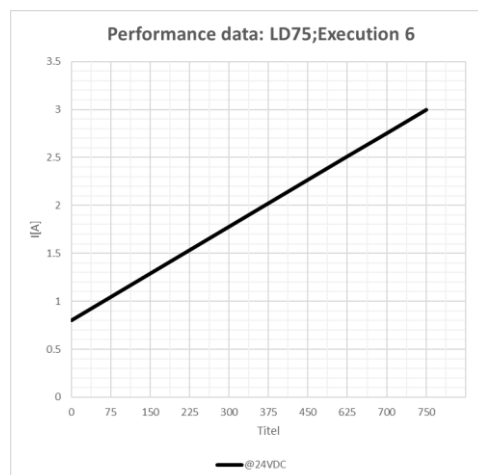
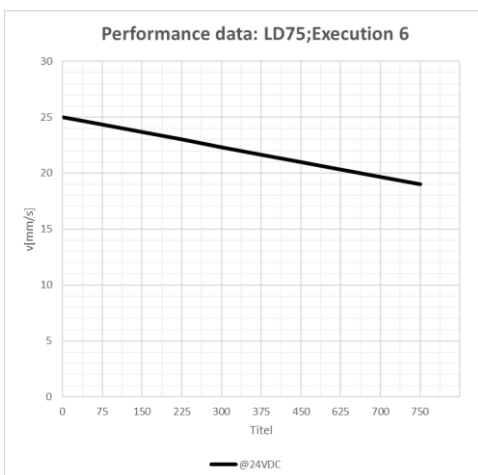
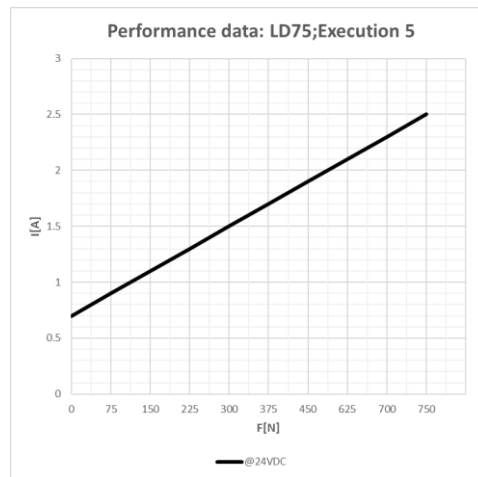
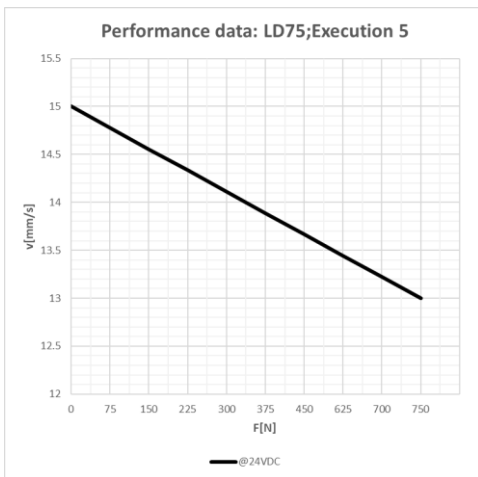
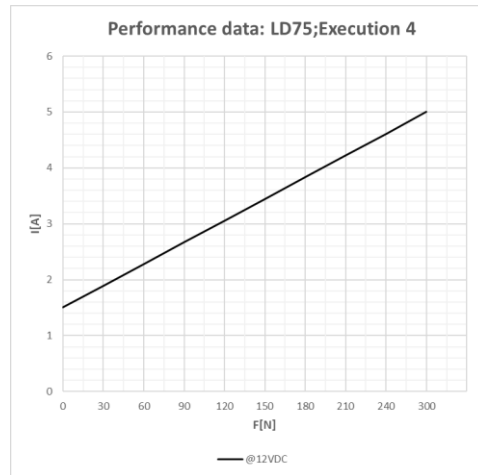
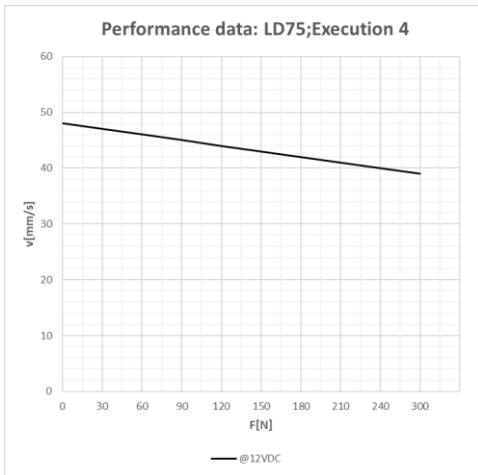


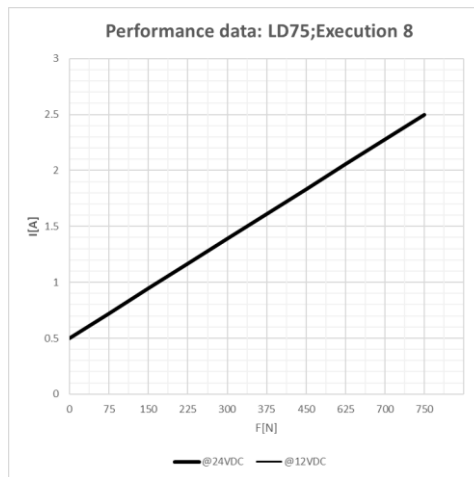
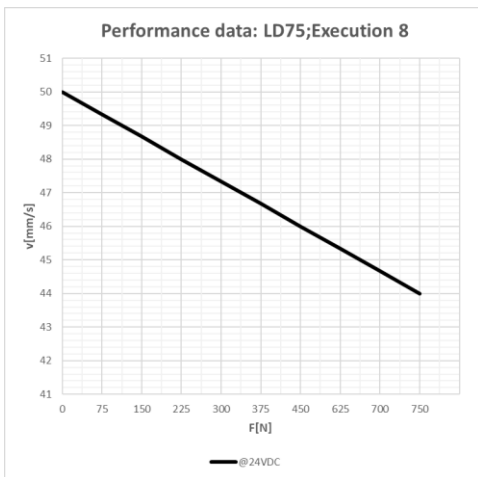
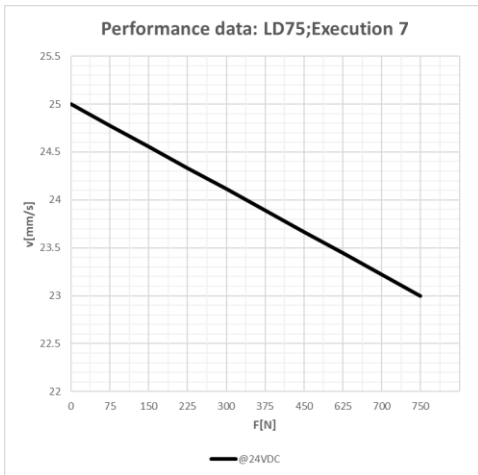
<p><b>Brown</b> (BN)</p>	<p>The cylinder extends or retracts according to the polarity of the power supply.</p> <table border="1" data-bbox="510 331 911 450"> <thead> <tr> <th></th> <th>Blue</th> <th>Brown</th> </tr> </thead> <tbody> <tr> <th>Retraction</th> <td>Minus</td> <td>Plus</td> </tr> <tr> <th>Extension</th> <td>Plus</td> <td>Minus</td> </tr> </tbody> </table>		Blue	Brown	Retraction	Minus	Plus	Extension	Plus	Minus
	Blue	Brown								
Retraction	Minus	Plus								
Extension	Plus	Minus								
<p><b>Red</b> (RD)</p>	<p><b>Mechanical potentiometer</b></p> <p>The potentiometer generates an analogue position signal. Depending on the execution, you can resolve a stroke of 100 or 130mm.</p> <ul style="list-style-type: none"> <li>• Red: Plus (e.g. 12V)</li> <li>• Black: Minus</li> <li>• Violet: Output signal</li> </ul>									
<p><b>Black</b> (BK)</p>	<p><b>Electrical values</b></p> <p>Potentiometer: <math>R_p = 10k\Omega</math></p> <p>Series resistance: <math>R_s = 1k\Omega</math></p> <p>Maximum power: <math>P_{tot} = 0.1W</math></p>									
<p><b>Violet</b> (VT)</p>	<p>Retracted: <math>1k\Omega^*</math></p> <p>Extended: <math>11k\Omega^*</math></p> <p>*Measurement reference: Violet (VT) against black (BK)</p>									
<p><b>Yellow</b> (YE)</p>	<p><b>Do not connect</b></p> <p>This line must not be connected.</p>									
<p><b>White</b> (WH)</p>										
<p><b>Green</b> (GN)</p>										



## 6.7 Performance charts







All values in the performance charts are typical values measured under optimal conditions (stabilised power source and room temperature).

These values may vary due to components which are subject to tolerances such as the leading spindle, guide nut and gear wheels as well as tribological influences.

## **7 Life phases**

### **7.1 Electric cylinder scope of delivery**

The electric cylinder is delivered as an individual component (incomplete machine). The controls and manual switches and/or accessories are not included in scope of delivery.

### **7.2 Transport and storage**

The product is to be checked by suitable personnel for visible and functional damage. Damage caused by transport and storage must be reported to the responsible person and Phoenix Mecano Solutions AG immediately.

Commissioning damaged electric cylinders is forbidden.

The ambient conditions for the storage of the electric cylinder are prescribed as follows:

- air must not contain oils
- contact with solvent-based paints must be avoided
- lowest / highest ambient temperature: -40 °C to +85 °C
- air pressure: from 700 to 1060 hPa

Divergent ambient factors must be approved by Phoenix Mecano Solutions AG.

### **7.3 Important information on installation and commissioning**



It is essential that you note and follow the following instructions. Otherwise persons can be injured or the electric cylinder and/or other components damaged.

- It is essential to implement an emergency stop onsite, which could interrupt reliably the operating voltage in the event of a failure or malfunction of the incomplete machine!
- No additional holes may be made in the electric cylinder.
- After setting up and commissioning, it is essential that the plug of the power supply is freely accessible.
- The electric cylinder must not be moved to "Stop". Risk of mechanical damage.
- The electric cylinder may not be opened.
- The user must ensure that there is no danger when the power supply is active.
- Pinch and shear points must be avoided in the design of the applications with this electric cylinder. These must be secured and marked correspondingly.
- Automatic start-up of the electric cylinder caused by a defect is to be stopped immediately by disconnecting the power supply (see EMERGENCY STOP above).
- If the supply line is damaged, the electric cylinder must be taken out of operation immediately.
- The pushrod with suspension must be secured against twisting. Non-observance leads to the adjustment of the stroke end position.
- The electric cylinder has not been designed for continuous operation. The number of starts per hour determined for your application may not be exceeded.

## 7.4 Assembly

After the receipt of the electric cylinder, check the device for any damage. The electric cylinder is delivered ready for operation without a controller.

The installation of the LD75E+P consists in fixing the electric cylinder using the rear and front suspensions. The cross bores of both suspensions measure 10.1 0/+0.1 mm according to the standard. The fastening bolts are not included in the scope of delivery.

The following instructions must be observed during installation:

Stroke end positions are set with the pushrod. The pushrod is not secured against twisting. This means that a turning (rotation) of the pushrod - or the fixed swivel head - is equal to an adjustment of the end positions!

Attention: The attachment points for installation of the electric cylinder must be aligned flawlessly to ensure the safe and flawless operation!

Action of lateral forces on the pushrod must be excluded!

- When a swivel head or clevis is used/assembled, the head must be correctly locked using the lock nut supplied.
- Test or trial run must be performed.



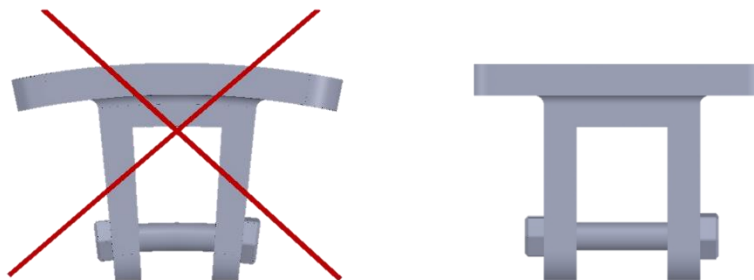
Non-observance of this procedure will cause damage to the electric cylinder!  
This nullifies the guarantee!

Installation positions of the components must ensure avoiding pinch and shear points, in particular taking into consideration any future applications.

Make sure to exclude the tripping hazard by proper and safe laying of the supply lines / cables!

**It is very important to ensure that the mounted electric cylinder can move freely in the attachment points / that the electric cylinder is neither strained nor buckled. Improper assembly and any emergency situation associated with it would damage the drive and prevent it from operating smoothly!**

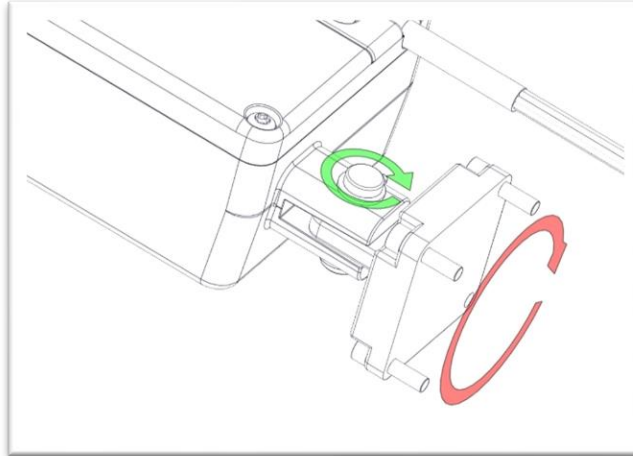
- The assembly bolts or fastening screws (no shoulder set screws) must be available in the correct size (pay attention to the hole diameter of the cylinder uptakes).
- The bolts and nuts must be manufactured of high-quality steel (for example, 10.8). There may not be any threads on the nuts in the rear uptake nor at the piston rod eye.
- The screws and nuts must be tightened tight enough that they cannot come loose.
- However, do not use too high a torque on the screws in the rear uptake since otherwise the uptakes will be unnecessarily strained.



### 7.4.1 Installation procedure

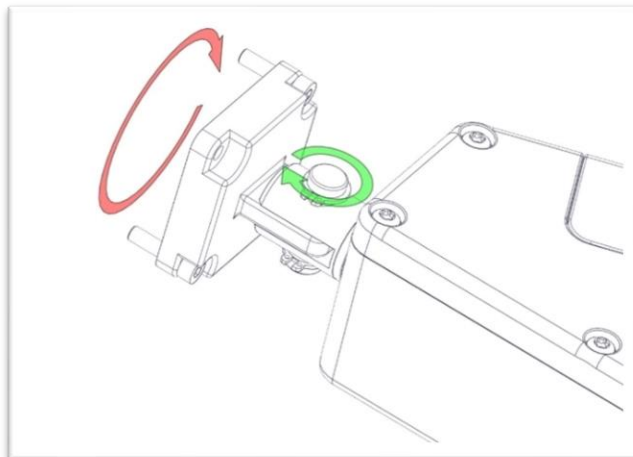
1. Hang the rear suspension onto the counterpart piece.

Attention: The counterpart piece may not be able to rotate. The electric cylinder must be able to be rotated in the direction of the arrow (see figure).



2. Fix the suspension at the front.

Attention: The counterpart piece may not be able to rotate. The electric cylinder must be able to be rotated in the direction of the arrow (see figure).

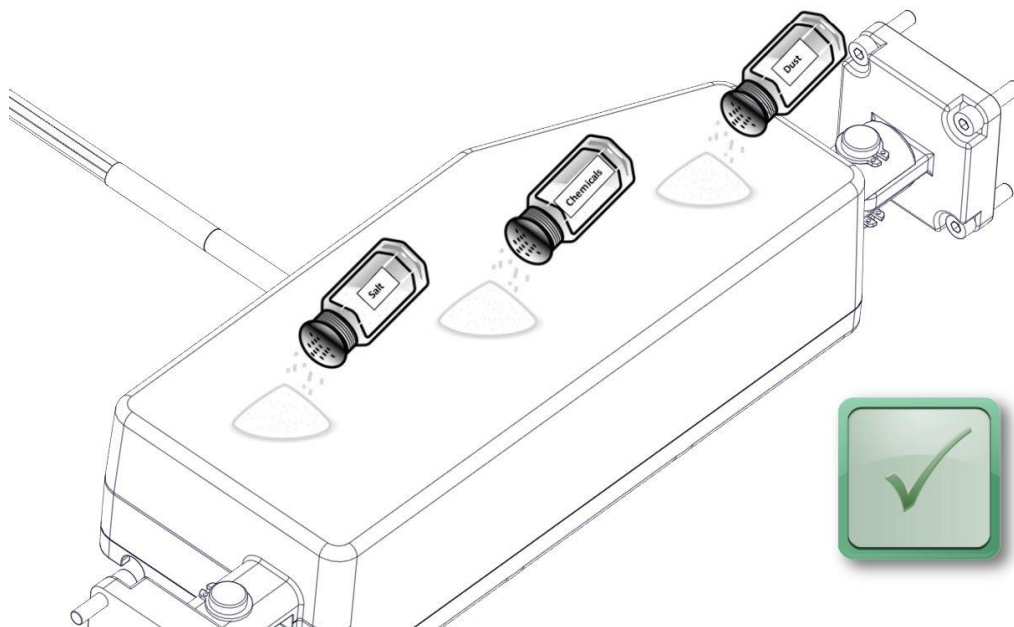
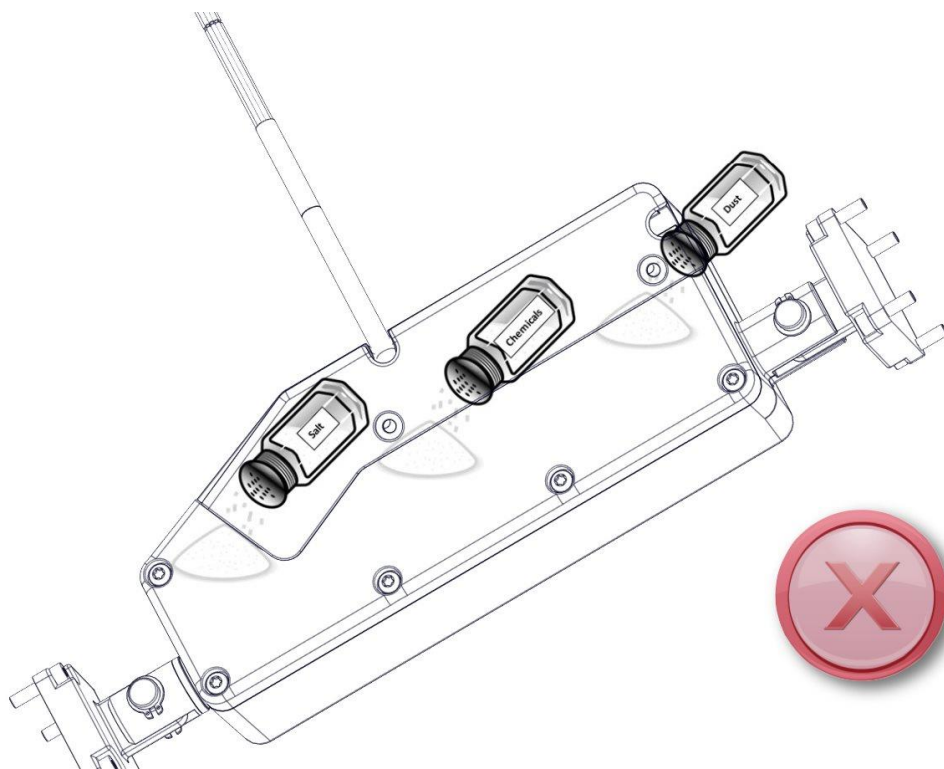


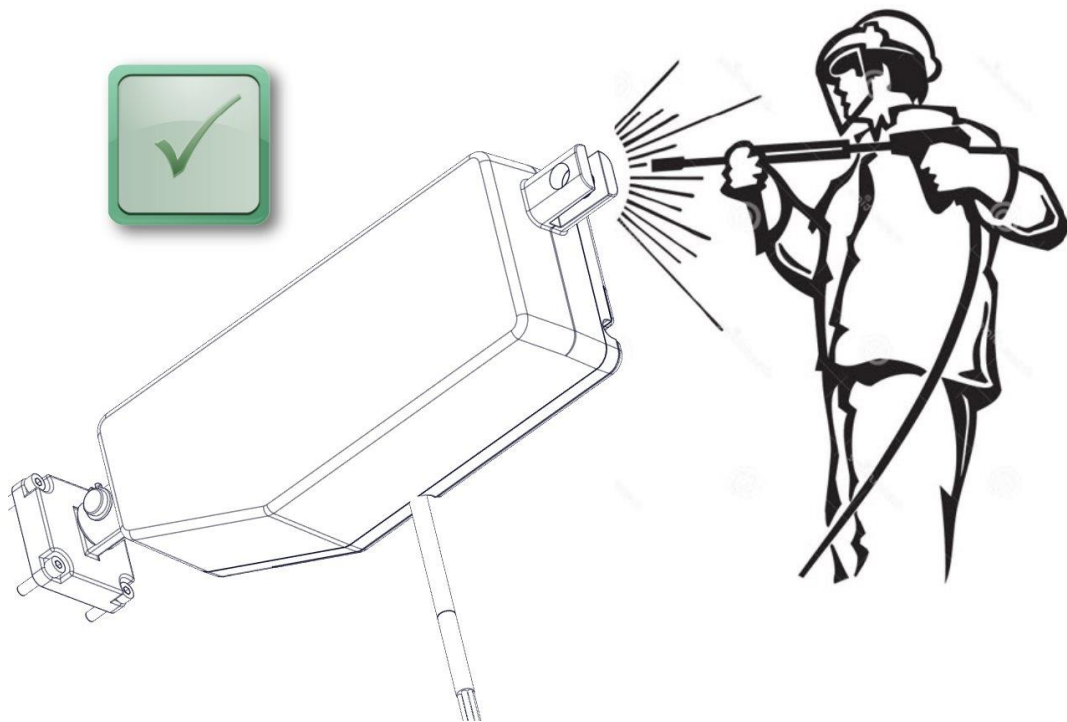
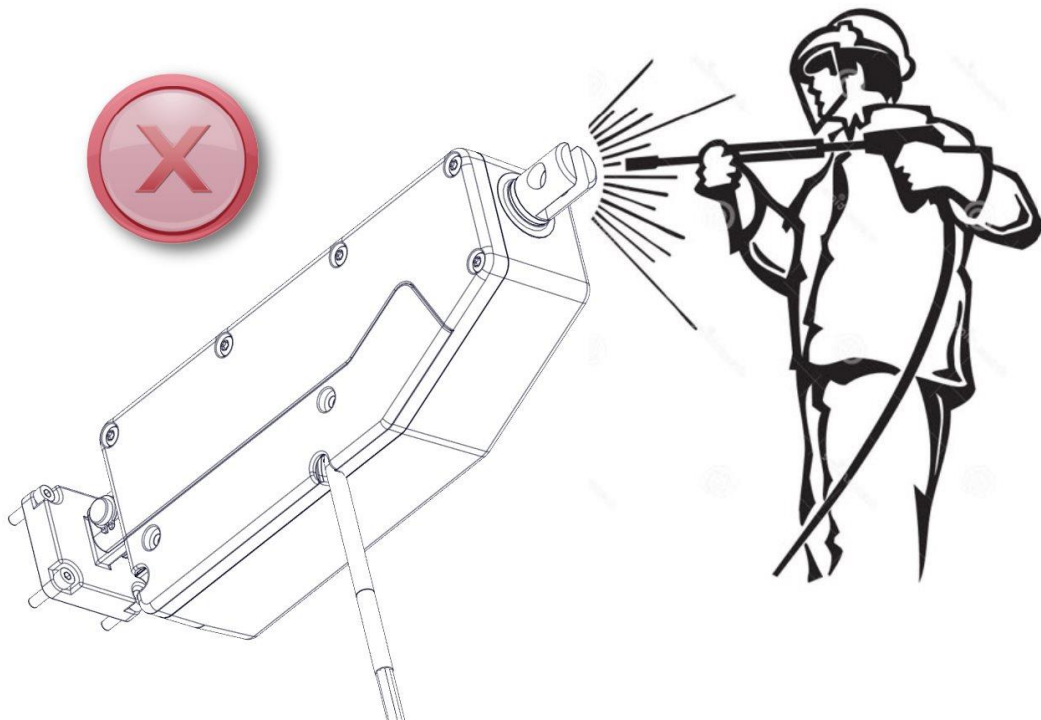
Additional installation-recommendations:



When using our products in rough environments, we recommend adhering to the following specifications to ensure a long service life:

Whenever possible, make sure that the more critical areas (piston rod outlet, insertion openings of the connector plug, etc.) are protected from heavy contamination by dirt, salt, chemicals or other strong environmental influences (possibly water jets, etc.). This can be achieved relatively easily by cleverly choosing the installation position:





3. Connect the connection cables in accordance with the connection diagrams **AP.4.017 661** and **AP.4.017 661** (see Chap.: 6.6)
4. Perform the test run / initial run without load and check operability of the system.

## 7.5 Maintenance

The electric cylinder is basically maintenance-free, but is not wear-free.

Faulty functioning, excessive play of the movable parts or unusual sounds generated by the electric cylinder can be the signs of wear.

Worn parts of the product must only be replaced by the manufacturer. The electric cylinder must be sent to the manufacturer for these works. In the case of wear without replacement of the worn product parts, the safety of the product cannot be guaranteed.

Any works with the electric cylinder may only be carried out according to this instruction . The device may only be opened by authorised and trained specialist personnel.

In case of any defect of the drive, we recommend to contact the manufacturer and/or send this electric cylinder for repair.

- When working on electric circuits or elements, these must first be disconnected from the supply to prevent the risk of injury.
- For safety reasons, unauthorised modifications or changes of the electric cylinder are prohibited .
- Safety-related devices must be tested on a regular basis depending on the frequency of use, however at least once a year for integrity and operability.

## 7.6 Cleaning

You can clean the manual switch and the external surface of the electric cylinder profile using a lint-free, clean cloth.



Solvent-based cleaners attack and can damage the material.

Attention: Protection class of the manual switch is not IP69K, but IP40, and therefore may not be washed using the high-pressure cleaner and exposed to moisture, which would immediately lead to damage!

## 7.7 Disposal and return

The electric cylinder must either be disposed of in accordance with the applicable regulations and guidelines, or returned to the manufacturer.

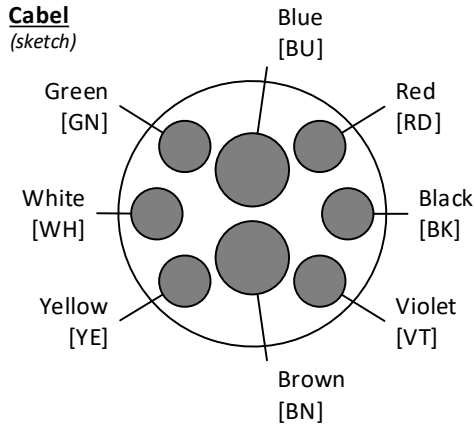
The manufacturer reserves the right to charge for the disposal of these drives.

The electric cylinder contains electronic components, cables, metals, plastics etc. and is to be disposed of in accordance with the applicable environmental regulations of the respective country.

In the European Economic Area, the disposal of the product is governed by the EU Directive 2002/95/EC or the relevant national legislation.

# Connection plan AP.4.017661

## Cabel



**Cabel (8pol)**

\*\*\* **Control cable** \*\*\*

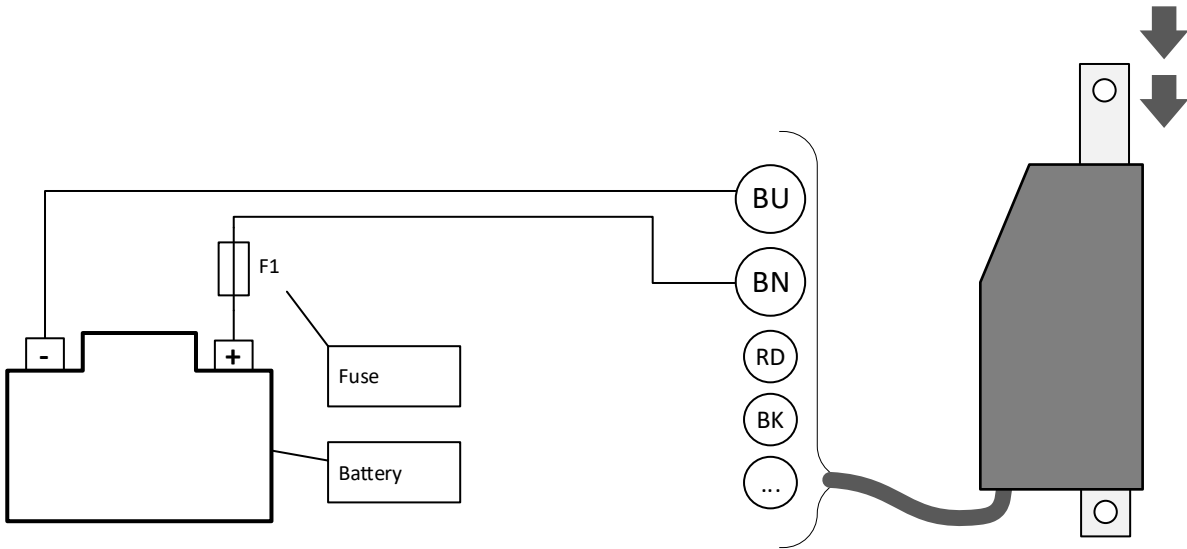
**1.0mm<sup>2</sup> (AWG18):** BU, BN;

**0.5mm<sup>2</sup> (AWG20):** RD, BK, VT, YE, WH, GN

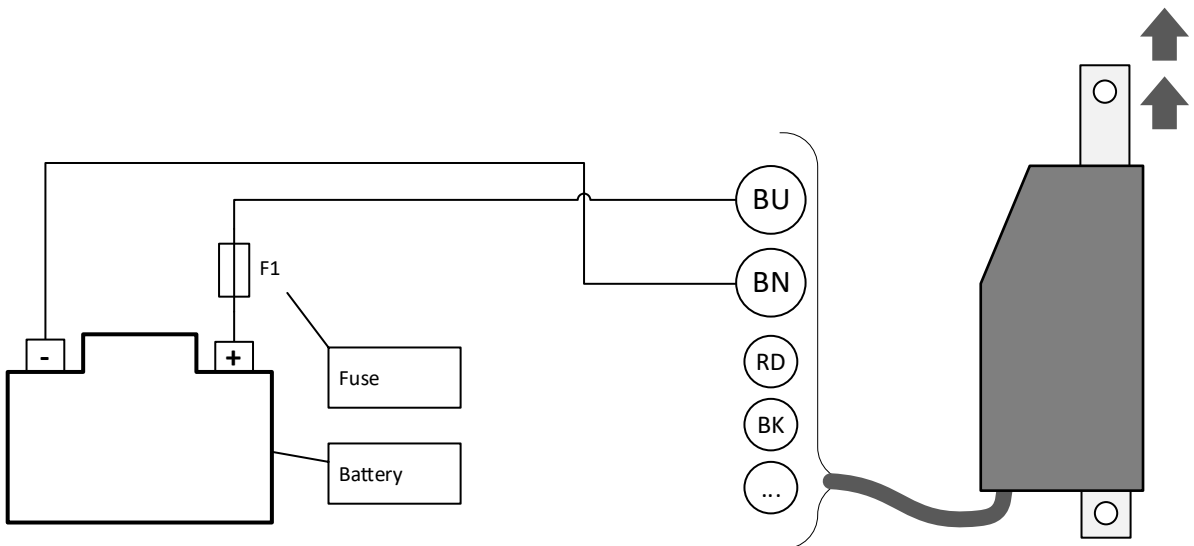
Ader	Beschreibung									
<b>Blue</b> (BU)	<p><b>Motor</b></p> <p>The actuator can be extended and retracted with the blue and brown stranded wires. Please refer to the nameplate for the voltage the power parameter.</p> <p><b>Direction</b></p> <p>The actuator extends or retracts according to the polarity of the power supply. The actuator stops automatically in the end positions.</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th></th> <th>Blue</th> <th>Brown</th> </tr> </thead> <tbody> <tr> <td><b>Retract</b></td> <td>Minus</td> <td>Plus</td> </tr> <tr> <td><b>Extend</b></td> <td>Plus</td> <td>Minus</td> </tr> </tbody> </table>		Blue	Brown	<b>Retract</b>	Minus	Plus	<b>Extend</b>	Plus	Minus
		Blue	Brown							
<b>Retract</b>	Minus	Plus								
<b>Extend</b>	Plus	Minus								
<b>Brown</b> (BN)										
<b>Yellow</b> (YE)	<p><b>Do not connect</b></p> <p>Leave unconnected</p>									
<b>White</b> (WH)										
<b>Green</b> (GN)										
<b>Red</b> (RD)										
<b>Black</b> (BK)										
<b>Violette</b> (VT)										

## Example

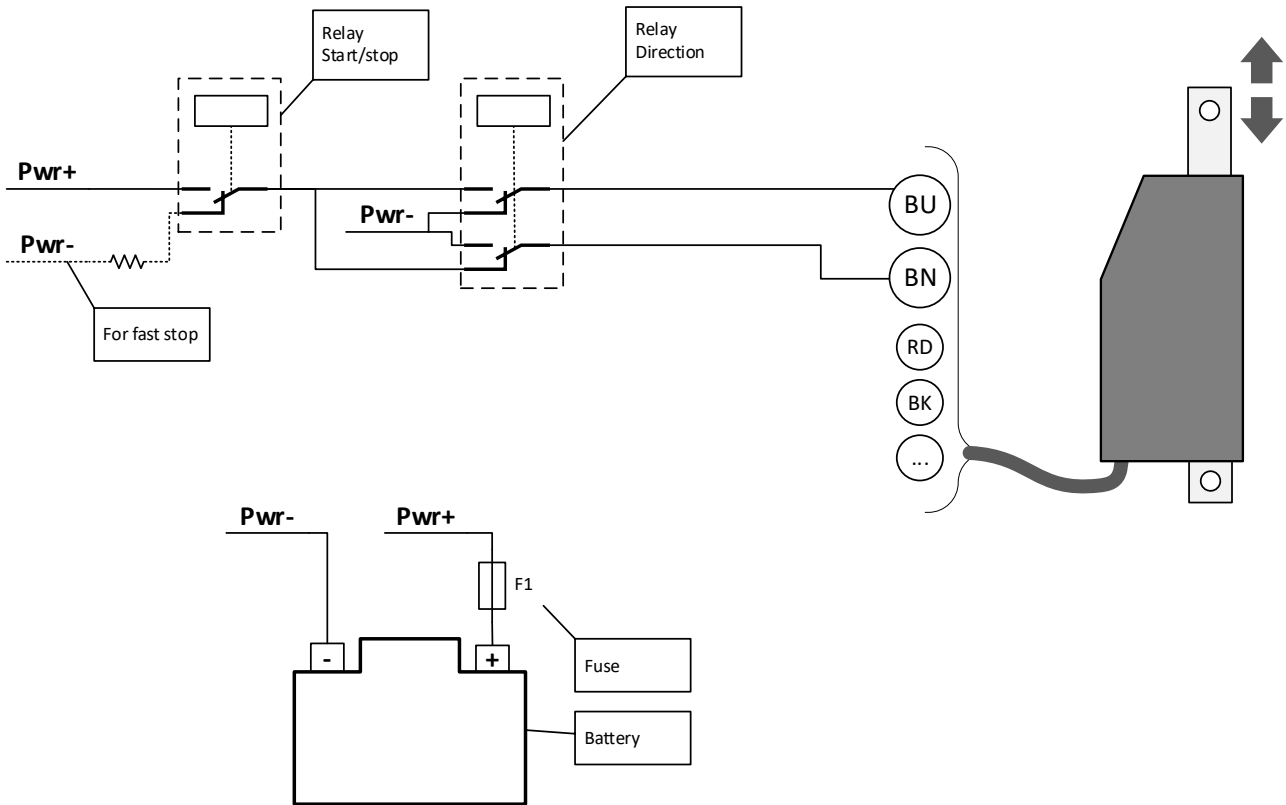
### Connection example – Retract



### Connection example – Extend



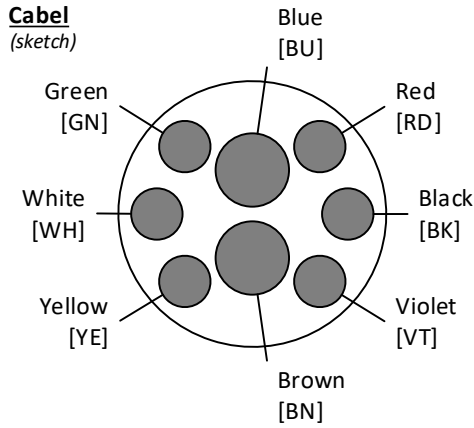
### Connection example – Relay



**Note:** Do not change the direction during travel. Always stop the travel via K1 before changing the direction with K2.

# Connection plan AP.4.017662

## Cabel



**Cabel (8pol)**

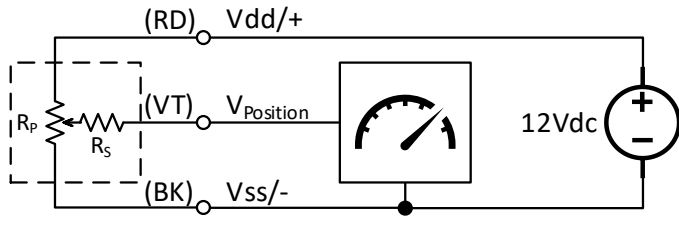
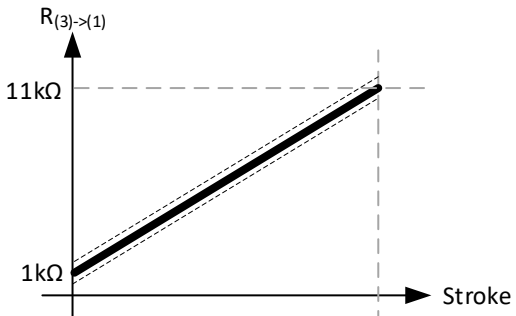
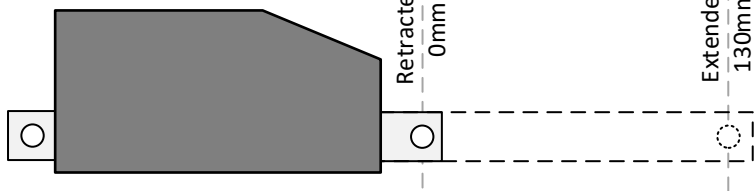
\*\*\* **Control cable** \*\*\*

**1.0mm<sup>2</sup> (AWG18):** BU, BN;

**0.5mm<sup>2</sup> (AWG20):** RD, BK, VT, YE, WH, GN

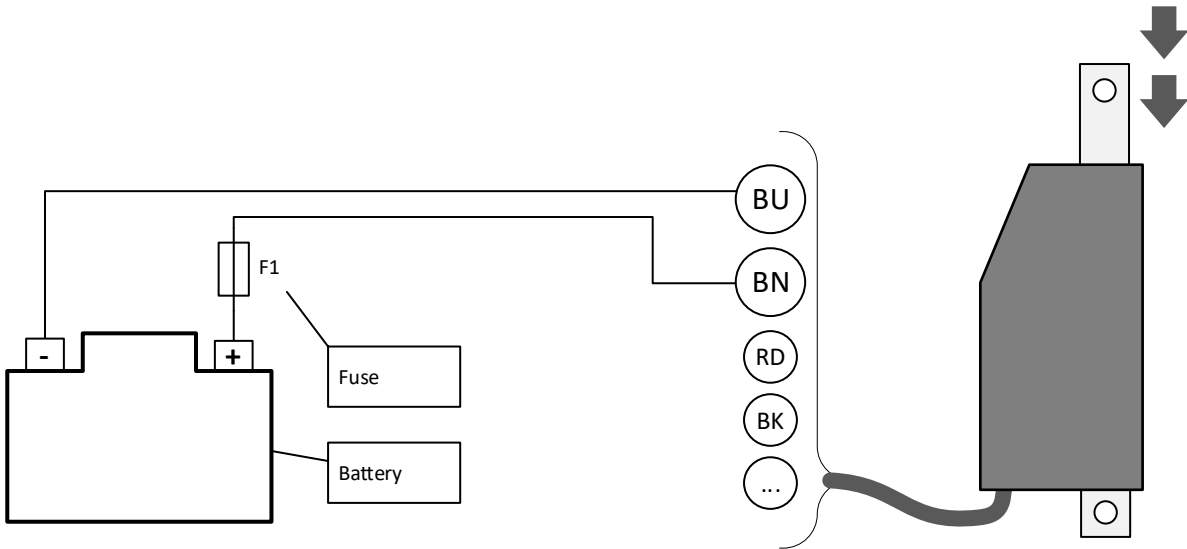
Ader	Beschreibung									
<b>Blue</b> (BU)	<p><b>Motor</b></p> <p>The actuator can be extended and retracted with the blue and brown stranded wires. Please refer to the nameplate for the voltage the power parameter.</p> <p><b>Direction</b></p> <p>The actuator extends or retracts according to the polarity of the power supply. The actuator stops automatically in the end positions.</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th></th> <th>Blue</th> <th>Brown</th> </tr> </thead> <tbody> <tr> <td><b>Retract</b></td> <td>Minus</td> <td>Plus</td> </tr> <tr> <td><b>Extend</b></td> <td>Plus</td> <td>Minus</td> </tr> </tbody> </table>		Blue	Brown	<b>Retract</b>	Minus	Plus	<b>Extend</b>	Plus	Minus
		Blue	Brown							
<b>Retract</b>	Minus	Plus								
<b>Extend</b>	Plus	Minus								
<b>Brown</b> (BN)										
<b>Yellow</b> (YE)	<p><b>Do not connect</b></p> <p>Leave unconnected</p>									
<b>White</b> (WH)										
<b>Green</b> (GN)										
<i>Continued on next page</i>										

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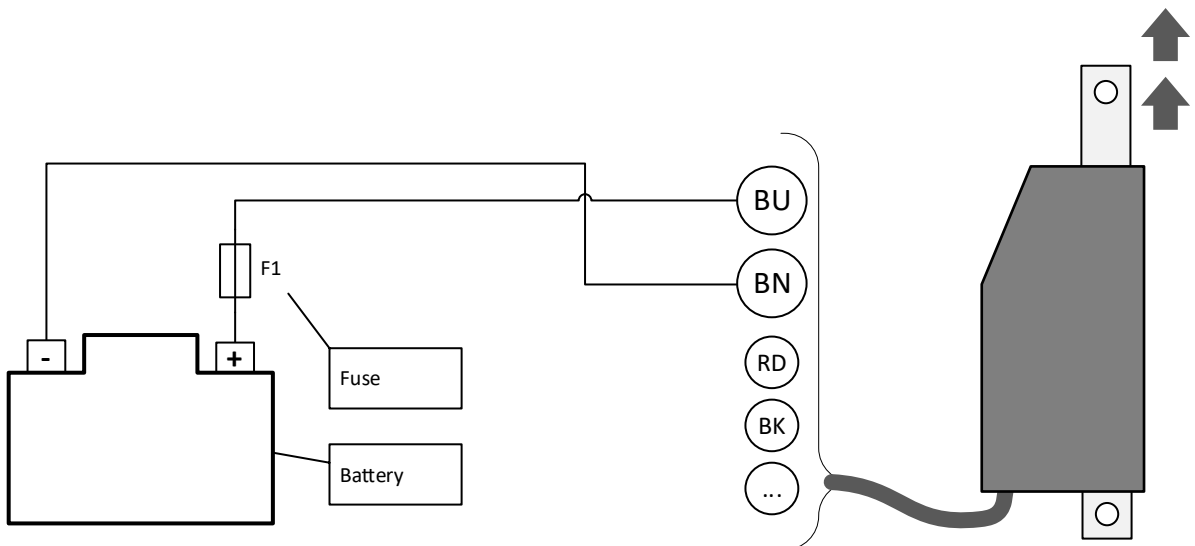
<p><b>Red</b> (RD)</p>	<p><b>Mechanical potentiometer</b></p> <p>The potentiometer generates an analog position signal across the complete stroke of 130mm.</p> <ul style="list-style-type: none"> <li>• Red: Plus (e.g. 12V)</li> <li>• Black: Minus</li> <li>• Violette: Signal <math>V_{Position}</math></li> </ul> <p><b>Specification</b></p> <p>Potentiometer: <math>R_P = 10k\Omega</math></p> <p>Resistor <math>R_S</math>: <math>R_S = 1k\Omega</math></p> <p>Maximum power: <math>P_{tot} = 0.1W</math></p> <p>Maximum voltage: <math>V_{dd}-V_{ss} = 30V</math></p> <p>Retracted: <math>1k\Omega</math></p> <p>Extended: <math>11k\Omega</math></p> <p>*Reference: Violette (VT) with respect to black (BK)</p>
<p><b>Black</b> (BK)</p>	<p><b>Connection example</b></p>  <p><b>Position (Resistance between VT and BK)</b></p> 
<p><b>Violette</b> (VT)</p>	

## Example

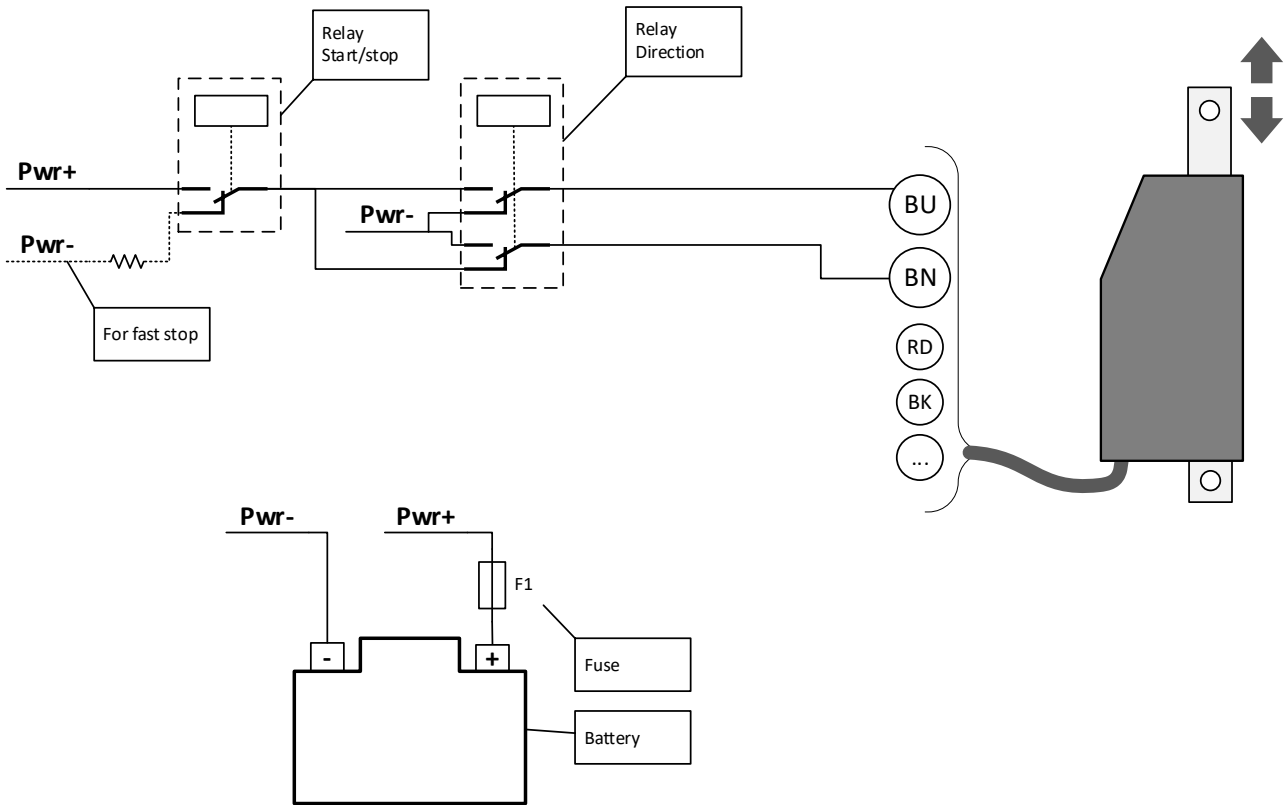
### Connection example – Retract



### Connection example – Extend



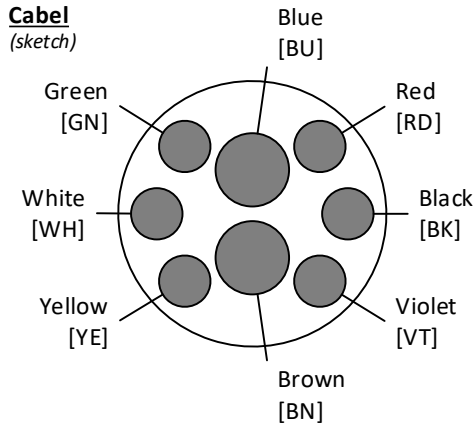
### Connection example – Relay



**Note:** Do not change the direction during travel. Always stop the travel via K1 before changing the direction with K2.

# Connection plan AP.4.018049

## Cabel



**Cabel (8pol)**

\*\*\* **Control cable** \*\*\*

**1.0mm<sup>2</sup> (AWG18):** BU, BN;

**0.5mm<sup>2</sup> (AWG20):** RD, BK, VT, YE, WH, GN

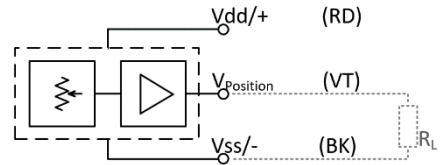
Ader	Beschreibung									
<b>Blue</b> (BU)	<p><b>Motor</b></p> <p>The actuator can be extended and retracted with the blue and brown stranded wires. Please refer to the nameplate for the voltage the power parameter.</p> <p><b>Direction</b></p> <p>The actuator extends or retracts according to the polarity of the power supply. The actuator stops automatically in the end positions.</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th></th> <th>Blue</th> <th>Brown</th> </tr> </thead> <tbody> <tr> <td><b>Retract</b></td> <td>Minus</td> <td>Plus</td> </tr> <tr> <td><b>Extend</b></td> <td>Plus</td> <td>Minus</td> </tr> </tbody> </table>		Blue	Brown	<b>Retract</b>	Minus	Plus	<b>Extend</b>	Plus	Minus
		Blue	Brown							
<b>Retract</b>	Minus	Plus								
<b>Extend</b>	Plus	Minus								
<b>Brown</b> (BN)										
<b>Yellow</b> (YE)	<p><b>Do not connect</b></p> <p>Leave unconnected</p>									
<b>White</b> (WH)										
<b>Green</b> (GN)										
Continued on next page										

Continued from previous page

**Red**  
(RD)

**Active position feedback 0.5 - 4.5V**

Depending on the set stroke, the output voltage  $V_{Position}$  will generate a voltage between 0.5 and 4.5V. 0.5V corresponds to the retracted end position and 4.5V to the extended end position. By the active output voltage the influence of different loads ( $R_L$ ), as for example from controllers and PLC, can be almost neglected.



**Specification**

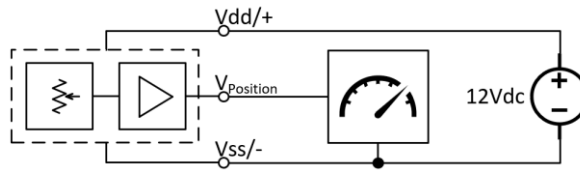
Power supply $V_{dd}-V_{ss}$	12Vdc $\pm 20\%$ 24Vdc $\pm 10\%$
Load $R_L$	$\geq 1k\Omega$
Retracted position $V_{Position}$	$0.5 V^{1,2}$
Extended position $V_{Position}$	$4.5 V^{1,2}$

<sup>1</sup>With respect to  $V_{ss}/-$

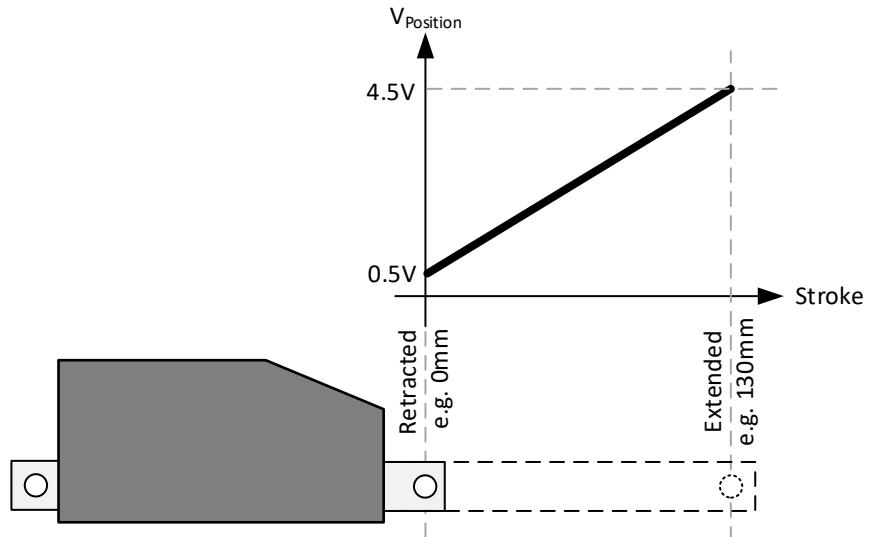
<sup>2</sup>The voltage  $V_{Position}$  is adjusted to the specified stroke at the factory.

**Black**  
(BK)

**Connection example**



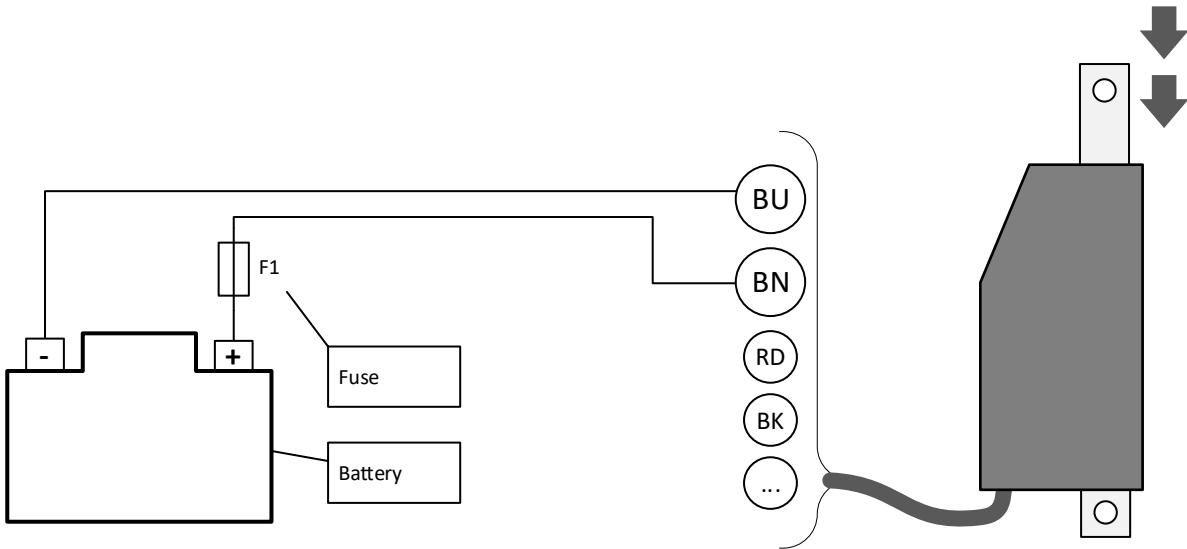
**Output voltage  $V_{Position} - V_{ss}$**



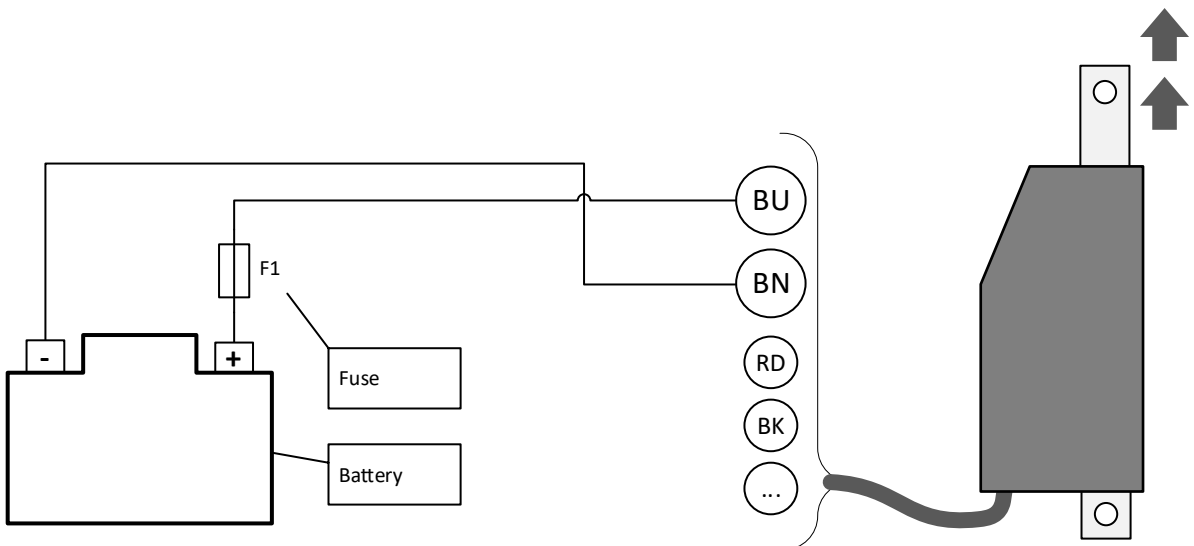
**Violette**  
(VT)

## Example

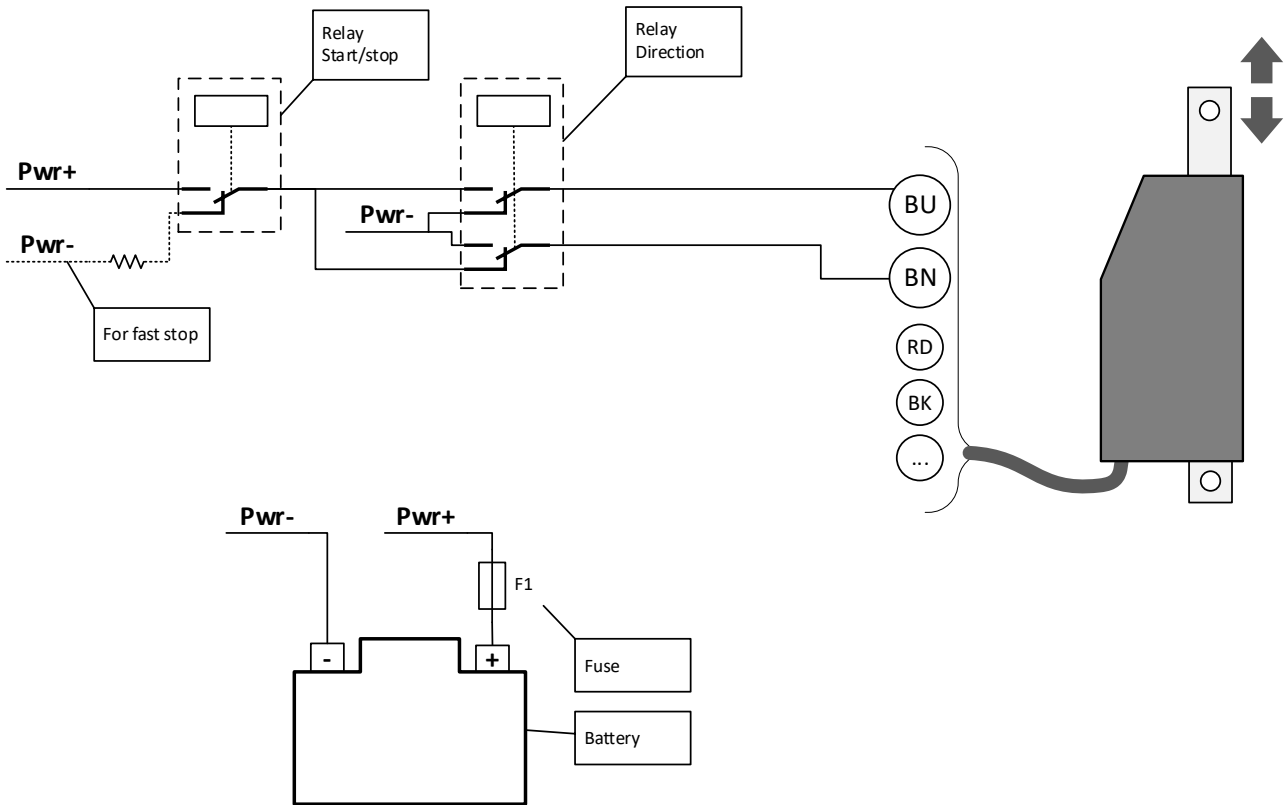
### Connection example – Retract



### Connection example – Extend



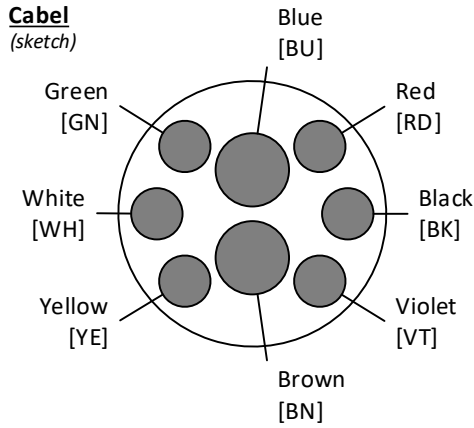
### Connection example – Relay



**Note:** Do not change the direction during travel. Always stop the travel via K1 before changing the direction with K2.

# Connection plan AP.4.018315

## Cabel



**Cabel (8pol)**

\*\*\* **Control cable** \*\*\*

**1.0mm<sup>2</sup> (AWG18):** BU, BN;

**0.5mm<sup>2</sup> (AWG20):** RD, BK, VT, YE, WH, GN

<i>Ader</i>	<i>Beschreibung</i>									
<b>Blue</b> (BU)	<p><b>Motor</b></p> <p>The actuator can be extended and retracted with the blue and brown stranded wires. Please refer to the nameplate for the voltage the power parameter.</p> <p><b>Direction</b></p> <p>The actuator extends or retracts according to the polarity of the power supply. The actuator stops automatically in the end positions.</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th></th> <th>Blue</th> <th>Brown</th> </tr> </thead> <tbody> <tr> <th>Retract</th> <td>Minus</td> <td>Plus</td> </tr> <tr> <th>Extend</th> <td>Plus</td> <td>Minus</td> </tr> </tbody> </table>		Blue	Brown	Retract	Minus	Plus	Extend	Plus	Minus
		Blue	Brown							
Retract	Minus	Plus								
Extend	Plus	Minus								
<b>Brown</b> (BN)										
<b>Yellow</b> (YE)	<p><b>Do not connect</b></p> <p>Leave unconnected</p>									
<b>White</b> (WH)										
<b>Green</b> (GN)										
<b>Black</b> (BK)										
<i>Continued on next page</i>										

Continued from previous page

**Red**  
(RD)

**End position feedback**

Signal feedback on reaching the corresponding end position.

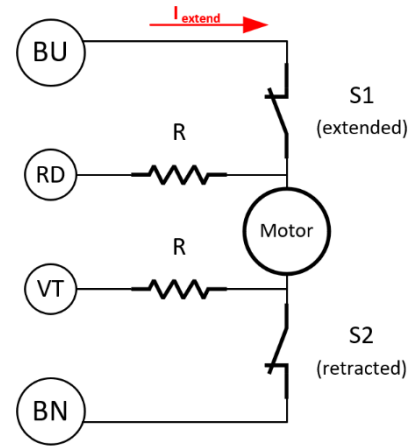
**Functional description**

The motor of the actuator is operated via the wires BU and BN. The end position feedback is provided by the wires RD and VT, each of which is connected to the motor voltage via the resistor R. The motor is switched off by a limit switch S when the end position is reached. When the end position is reached, the motor is disconnected from the power supply via a limit switch S, which cuts the motor voltage at RD or VT.

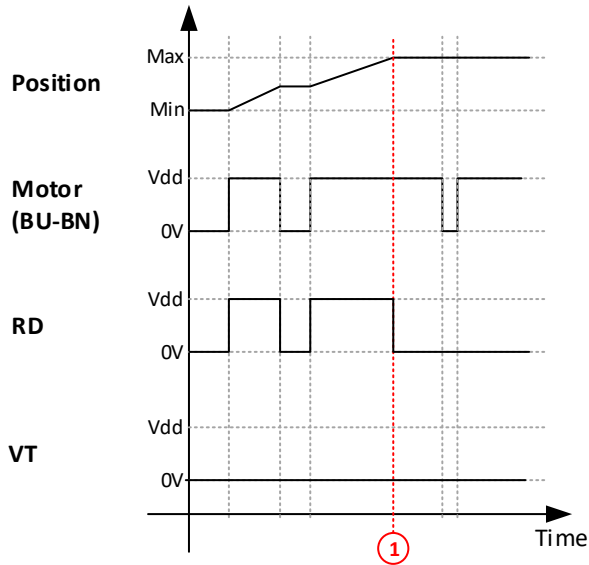
**Definition**

- **Rot (RD)** Extended
- **Violette (VT)** Retracted
- **R** 1k  $\Omega$

**Overview – Extend**



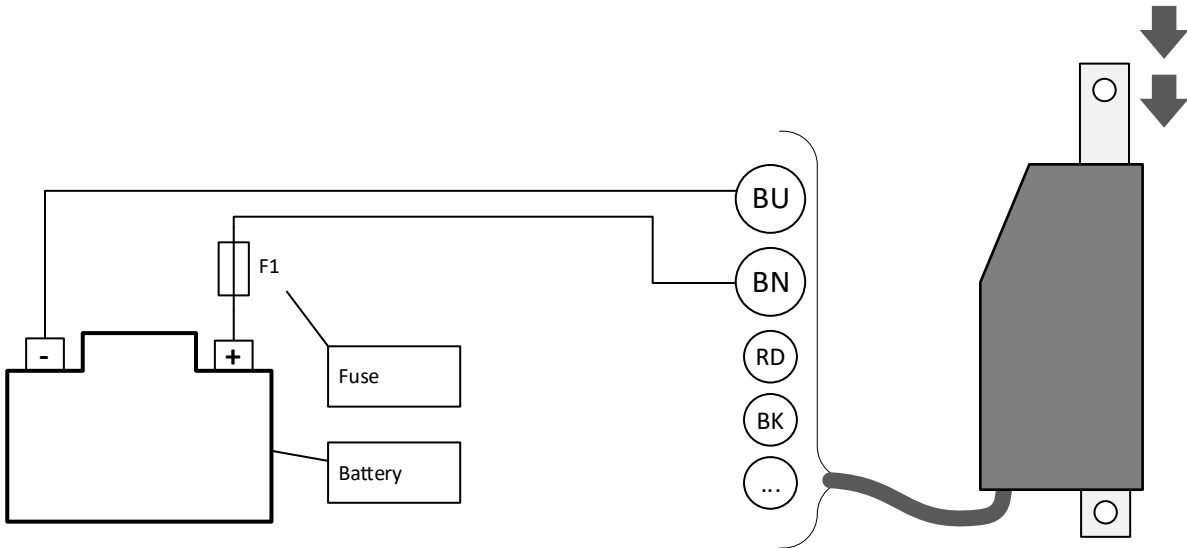
**Violette**  
(VT)



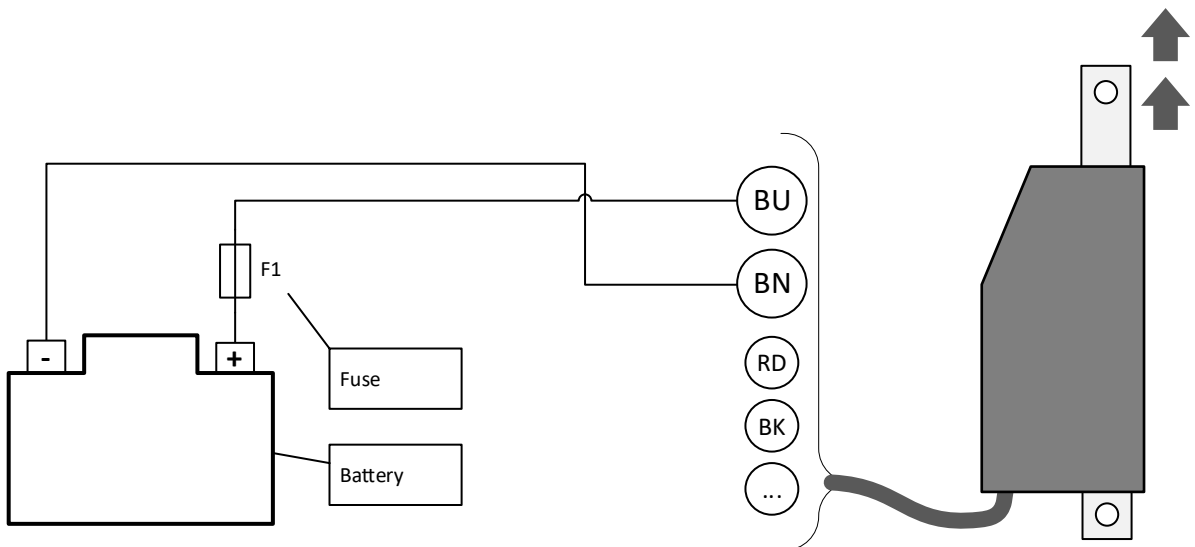
Position (1): Reaching the extended end position

## Example

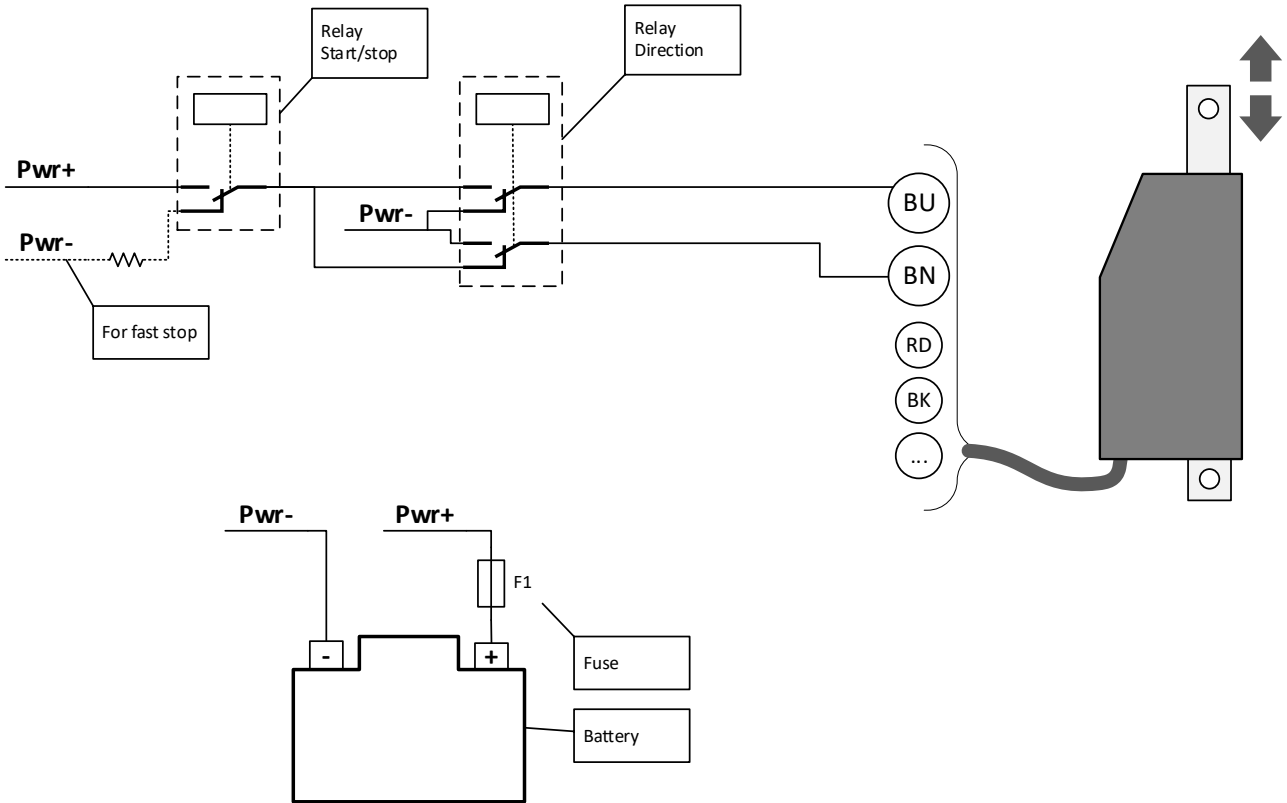
### Connection example – Retract



### Connection example – Extend



Connection example – Relay



**Note:** Do not change the direction during travel. Always stop the travel via K1 before changing the direction with K2.

Connection example – PLC

