

Baelz-electrodyn
Actuator for modulating duty
Motorized linear actuator baelz 373-E65-D/Z-20

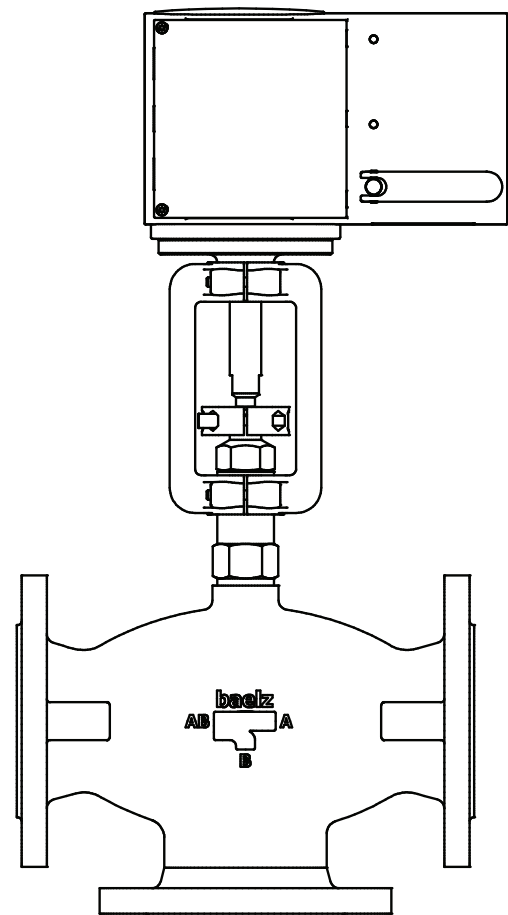
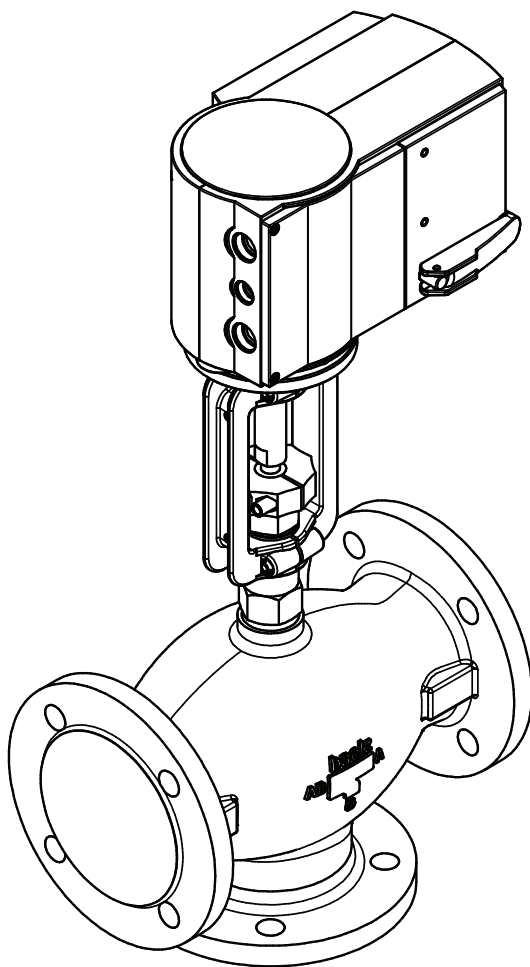


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Operating Instructions**OI 373-E65-D/Z-20****1. SAFETY**

Carefully read the present Operating Instructions, especially the following safety precautions prior to installation and operation.

1.1 Intended use

This product is only suitable for the purpose intended by the manufacturer, as described in the chapter «Functional description 4.3».

All related product documents must also be adhered to. Modifications or alterations are prohibited.

1.2 For the operator

Make sure the Operating Instructions are kept permanently available and easily accessible at the site of operation of the linear actuators!

During set-up, operation and when performing maintenance procedures on the device, observe the applicable occupational safety regulations, accident prevention regulations and the DIN VDE standards of the German Institute for Standardization and the Association for Electrical, Electronic & Information Technologies. Observe compliance with any possibly applicable additional regional, local or in-house safety regulations.

Make sure that any person assigned by you to perform the activities described in the present Operating Instructions, has read and understood these instructions.

1.3 Before starting work

Prior to starting any kind of work, check if the types specified here are identical with the specifications on the identification label on the linear actuator:

baelz 373-E65-D-20	(pushing / 2 kN)
baelz 373-E66-Z-20	(pulling / 2 kN)

1.4 Personnel

Only qualified personnel may operate these linear actuators or work in their vicinity. Qualified persons are persons who are familiar with the set-up, installation, commissioning, operation and maintenance of the linear actuators and possess the required qualification for their activity. The required or prescribed qualifications include amongst others:

- Training / instruction and the authorization to switch electric circuits and devices / systems on and off in accordance with EN 60204 (DIN VDE 0100 / 0113) and the technical safety standards.
- Training or instruction in accordance with the technical safety standards for the maintenance and use of appropriate safety equipment and personal protective equipment.
- First aid training.

Always work safely and never perform any work which might present a hazard to persons or damage the linear actuator or other property in any way.

Operating Instructions**OI 373-E65-D/Z-20****1.5 Engineering and mounting instructions**

Condensate, drip water, etc. must be prevented from entering the actuator along the valve spindle. The actuator is mounted directly onto the valve and fixed with screws (no further adjustments required). The actuator is automatically connected with the valve spindle. Depending on the type and setting upon delivery, the stroke of the actuator spindle is 0% or 100%. The housing contains three knockout cable entries which are knocked out automatically when the cable gland is screwed in. The DC motor/electronics concept ensures parallel operation of multiple valve actuators of the same type. The cross-section of the power cable must be selected based on the cable length and the number of actuators. With five actuators connected in parallel and a cable length of 50 m, we recommend a cable cross-section of 1.5 mm² (power consumption of the actuator × 5).

The maximum equipment for the actuator is one 230 V module and 2 auxiliary contacts.

1.6 During operation

Safe operation can only be ensured if transport, storage, assembly, operation and maintenance procedures are performed in compliance with the safety requirements, and are performed properly and competently.

1.6.1 Transport, installation and mounting

Observe the general installation and safety regulations for heating, ventilating, air conditioning and piping. Use tools properly and competently. Wear the required personal and other protective equipment.

1.6.2 Service and maintenance

Prior to maintenance or repair, make sure that the linear actuator is disconnected from power by qualified personnel in accordance with DIN VDE standards.

2. PRODUCT DESCRIPTION**2.1 Identification**

Each actuator has an identification label. This label includes specifications regarding the maximum operating conditions of the device.

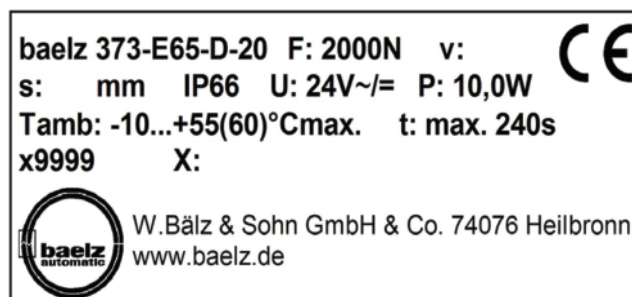


Figure 1: Baelz identification label for motorized actuators

Info: matching operating time = $\frac{s \cdot 60}{v}$

Operating Instructions

OI 373-E65-D/Z-20

2.2 Specifications

Type	baelz 373-E65-D-20	Baelz 373-E65-Z-20
Version	pushing	pulling
Actuating force	2000 N	
Positioning speed	10 / 15 / 30 mm/min	
Spring run time	15...30 s	
Power consumption	7.5 W, 20 VA	
Type of motor	BLDC	
Max. stroke	40 mm	
Supply voltage	24 V~ AC 50...60 Hz +/-20% 24 V= DC +/-15%	
Type of duty acc. to IEC 34-1	S1 – 100% ED	
Cable gland	2 x M20x1. , 1 x M16x1.5	
Control signal 1	0...10 V, Ri = 100 kΩ	
Control signal 2	4...20 mA, Ri = 50 Ω	
Position transmitter	0...10 V, load > 2.5 kΩ	
Electrical connection	Inside terminal board, terminal assignment see connection diagram	
Switch-off in end position	Electronic, load-dependent switch-off	
Mounting position	As desired, but not in downward position	
Ambient temperature	-10 °C to +55 °C	
Ambient humidity	< 95% rF non-condensing	
Position indicator	By anti-rotation fixture	
Manual adjustment	Hand crank	
Enclosure protection acc. to EN 60529	IP 66	
Protection class as defined by IEC 60730	III	
EMC directives 2004/108/EC	EN 61000-6-2, EN61000-6-4	
Housing material	Flame-retardant plastic	
Connection type	Yoke S21 or S21-L from Baelz	
Weight	6 kg	

Figure 2: Specifications table

2.4 Accessories

Actuator accessories	
Voltage module	For voltage 230V AC +/-15% For voltage 100-110V AC +/-15%
Auxiliary change-over contacts	Switch rating max. 250 V~, current min. 250 mA at 12 V (or 20 A at 20 V) Switch rating max. 12...30 V=, current max. 100 mA

Figure 3: Accessories table

2.5 Type name

baelz	373	-	E65	-	D/Z	-	20	-	30	-	S21
	↑		↑		↑		↑		↑		↑
	Motorized linear actuator		Actuator type		Spring action		Thrust		max. positioning speed		Yoke type

Operating Instructions**OI 373-E65-D/Z-20****2.6 Operating conditions****Attention**

For use outdoors or in an environment with a high pollutant concentration, such as heavy traffic areas, industrial areas (chemical plants, sewage plants, etc.), coastal areas and the open sea, the actuators must have external parts made of non-corrosive material.

When used outdoors, the actuator must be protected with an additional cover against

- rain
- direct sunlight
- strong draught
- dust

2.7 Warnings**Warning**

- In case of a high media temperature in the valve, the actuator columns and the spindle can attain similarly high temperatures.
- Actuators with safety functions must be regularly checked for proper operation (test run).
- If damage can occur due to the failure of the actuator, additional protective measures must be implemented.
- Due to the high risk of injury, never remove the spring from the device.

2.8 Additional technical information

The yellow housing, consisting of the front part, rear part and connecting lid, only serves as a cover.

The hand crank for manual adjustment is located on the front. The DC motor, electronic control unit, load-bearing section and maintenance-free gear unit are located in the housing.

The actuator spindle and the column are made of rust-proof material. The inner printed circuit boards, the gear unit and the spring are made of steel.

The valve spindle guide and the valve neck coupling are made of diecast aluminium.

Note on ambient temperatures:

With a media temperature of up to 110°C in the valve, an ambient temperature of up to 60°C is permitted. With a media temperature above 110°C, the ambient temperature must not exceed 55°C.

3. TRANSPORT AND STORAGE**Caution**

Risk of injury caused by failure to observe the safety regulations!

- Wear the required personal and other protective equipment.
- Protect the linear actuator from impacts, shock, vibration and similar influences.
- Store the linear actuator (and, if necessary, the complete actuator) in a dry place.
- Observe the transport and storage temperature of -10 to +55°C.

4. MOUNTING

4.1 Mounting position

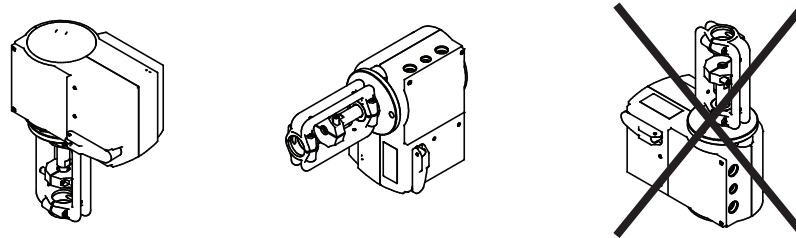


Figure 4: Mounting positions

4.2 Assembling valve and actuator

Prior to assembly check that:

- the specifications of the linear actuator comply with the operating conditions.
- the valve is complete (yoke on actuator or on valve).
- the connections on valve and actuator match.

If necessary, retract the spindle using the manual operation mode

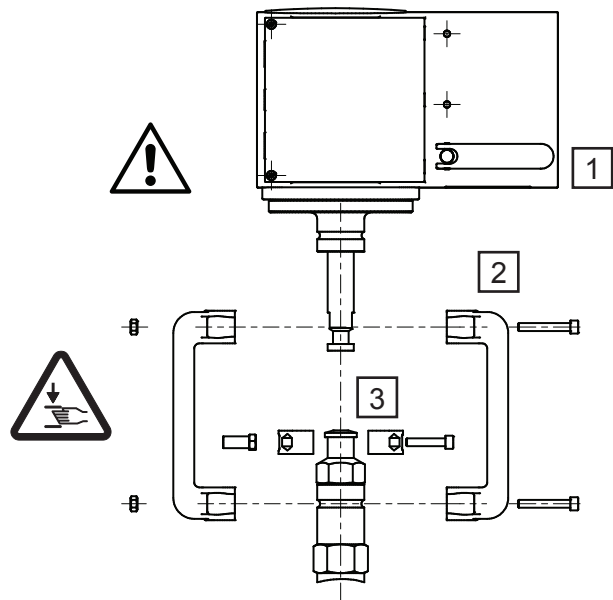


Figure 5: Assembling valve and actuator

4.3 Functional description

After a restart or a start after triggering of the emergency function (terminal 21), a **waiting time of up to 45 s** will elapse before the actuator is available again. Depending on the type of connection (see connection diagram), the actuator can be used as a continuous (0...10 V or 4...20 mA), 2-point (OPEN/CLOSE) or 3-point (OPEN/STOP/CLOSE) actuator.

The **run time** of the actuator can be set with switches S1 and S2 to match the respective requirements. Switches S3 and S4 are used to configure the **characteristic** (equal-percentage, linear or quadratic).

The external hand crank permits manual positioning. When folding out the hand crank, the motor is switched off. After folding the hand crank back, the spring function is reactivated and the actuator moves to the target position (without initialisation). When folding the hand crank out, the actuator remains in this position.

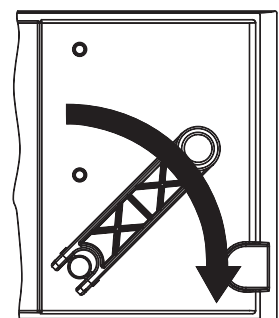


Figure 6: Hand crank

Operating Instructions**OI 373-E65-D/Z-20****4.4 Electrical connection****Risk of electric shock!****Danger**

Make sure to use an appropriate power supply to ensure that no dangerous voltage will enter the device during normal operation or in the event of a system failure or failure of system components.

Failure to heed this warning may result in death, serious injury or substantial material damage.

For short-circuit protection and disconnection of the actuator from the power supply, fuses and switch disconnectors must be provided on site. The current values for the rating depend on the operating current of the motor (refer to the identification label).

The electrical connection may only be made by trained, qualified personnel.

- Prior to connection, observe the basic information provided in this chapter.
- When making the electrical connection, make sure that the power supply is turned OFF! Ensure protection against unintentional reconnection to power!
- For wiring and connection, observe the regulations for the erection of electric power installations and the regulations of the local energy supplier!
- Check compliance of the line voltage and the line frequency with the specifications on the identification label of the actuator and on the identification label of the actuator motor.
- Always select the line cross section so as to match the actuator's power consumption and the required line length.

4.4.1 Connection as 2-point valve actuator (24 V)

This activation (OPEN/CLOSE) can be performed via two wires. The voltage is applied to terminals 1, 2a and 21. When voltage (24 V) is applied to terminal 2b, the actuator spindle extends. After this voltage is switched off, the actuator moves to the opposite end position. In the end positions (valve limit stop or maximum stroke reached) or in case of an overload, the electronic motor cut-off is activated (no limit switches).

The run times can be set using the coding switch. The characteristic cannot be selected here (the characteristic is the resulting valve characteristic). The feedback signal is active as soon as the initialisation has been performed and a voltage has been applied to terminal 21. Terminals 3i and 3u must not be connected.

4.4.2 Connection as 3-point valve actuator (24 V)

If voltage is applied to terminals 2b (or 2a) and 21, the valve can be moved to any desired position. If voltage is applied to terminals 1 and 2b, the actuator spindle extends and opens the valve. It retracts and closes the valve when the electrical circuit is closed via terminals 1 and 2a.

In the end positions (valve limit stop or maximum stroke reached) or in case of an overload, the electronic motor cut-off is activated (no limit switches). The direction of the stroke can be changed by reversing the connections.

The run times are set using the coding switch. The characteristic cannot be selected here (the characteristic is the resulting valve characteristic). The feedback signal is active as soon as the initialisation has been performed and a voltage is present at terminal 21. Terminals 3i and 3u must not be connected.

Operating Instructions**OI 373-E65-D/Z-20****4.4.3 Connection with 230 V or 100...110 V as 2-point / 3-point or for continuous activation**

The accessory module is plugged into the connection area and then connected as required. During commissioning, the actuator must be initialised manually together with the valve. The run times can be selected using the coding switch on the baseboard. The characteristic can only be selected for continuous activation. The decisive factor is the characteristic of the valve.

The module has an integrated switch which is automatically moved to the correct position when the module is being installed.

In this application, the switch lever is in the top position.

The accessory module is not suitable for 2-point actuation.

4.4.4 Connection to a control voltage (0...10 V or 4...20 mA)

The built-in positioner controls the actuator depending on the output signal y.

A voltage signal (0...10 V) at terminal 3u or a current signal at terminal 3i is used as control signal. If a control signal is present at both terminals simultaneously (3u (0...10 V) and 3i (4...20 mA)), the input with the higher value has priority.

Direction of operation 1 (*mains voltage on internal connector 2a, with jumper*):

With increasing positioning signal, the actuator spindle extends.

Direction of operation 2 (*mains voltage on internal connector 2b, with jumper*):

With increasing positioning signal, the actuator spindle retracts.

The starting point and control span are fixed.

After connection of the power supply and initialisation, the actuator moves to every valve stroke between 0% and 100%, depending on the control signal. Thanks to the electronics and the travel measurement system, no stroke is lost, and the actuator does not require periodic re-initialisation. When the end positions are reached, this position is checked, corrected if necessary, and saved again. This ensures operation of multiple actuators of the same type in parallel. The feedback signal $y_0 = 0...10\text{ V}$ corresponds to the effective valve stroke of 0 to 100%.

If the control signal 0...10 V or 4...20 mA is interrupted with direction of operation 1, the actuator spindle retracts completely, or, with direction of operation 2, extends completely.

The coding switch can be used to set the characteristic of the valve: Linear, equal-percentage or quadratic. This characteristic can only be generated when the actuator is used as a continuous actuator.

Additional switches can be used to select the run times (for 2-point, 3-point or continuous function). Continuous activation can also be used with a 230 V or 110 V power supply (accessory required).

It **must be ensured** that the neutral wire of the controller is connected to the control voltage. The neutral wire of the power supply may only be used for the module.

5. COMMISSIONING

Compare the thrust of the actuator and the set travel with the valve data. Overload can result in severe damage to the valve.

Pay attention to moving parts during mounting and adjustment. Risk of injury and or substantial material damage.

5.1 Initialization and feedback signal

Before applying the voltage, the valve spindle must be coupled to the actuator spindle!

The actuator *is self-initialising*, whether continuous, 2-point or 3-point control. Once **a voltage has been applied to the actuator for the first time** and the waiting time has elapsed, the actuator moves to the lower limit stop of the valve. It then moves to the upper stop and the value is detected and saved via a travel measurement system. The control signal and the feedback are adjusted to this effective stroke. No re-initialisation will be performed after a power failure or a spring return. The values remain saved.

For a re-initialisation, the actuator must be connected to the power supply and a constant input signal must be present at 3u or 3i. **A re-initialisation is initiated** by folding the hand crank out and back twice within 4 s. The two LEDs will then flash red.

During initialisation, the feedback signal is inactive or equal to the value «0». Initialisation is done with the shortest run time. The initialisation will not be valid before the whole process has been completed without interruption. Folding the hand crank out again, will interrupt this process.

If the actuator **detects a blockage**, the actuator will indicate this condition by setting the feedback signal to 0 V after about 90 s. During this time, the actuator tries to clear the blockage. If the blockage can be cleared, the normal control function will be reactivated. The feedback signal is present again.

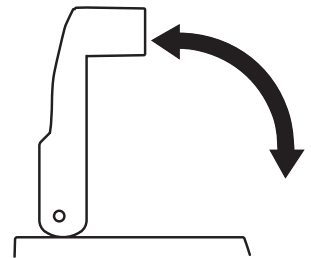


Figure 7: Initialisation

5.2 Spring return

If the supply voltage fails or is switched off, or if a monitoring contact at terminal 21 is activated, the brushless DC motor releases the gear unit and the preloaded spring moves the actuator to the respective end position (depending on the model).

During this process, the control function of the actuator is **locked for 45 s** (both LEDs light up green) to ensure that the end position can be reached. The reset speed is controlled using the motor so that no pressure surges can occur in the supply line.

The brushless DC motor has three functions: As a magnet to maintain the position. As a brake, by operating as a generator, and as a motor for the control function. After a spring return function, the actuator does not re-initialise.

6. ACCESSORIES



Disconnect the actuator from power before starting any work!

6.1 Voltage module 230V~ / 100-110V~

1. General information:

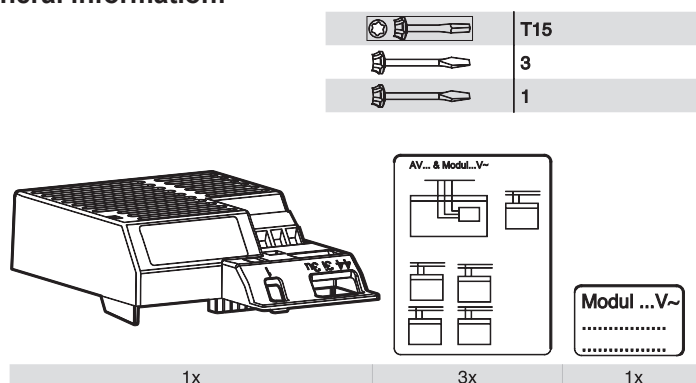


Figure 8: Voltage module kit

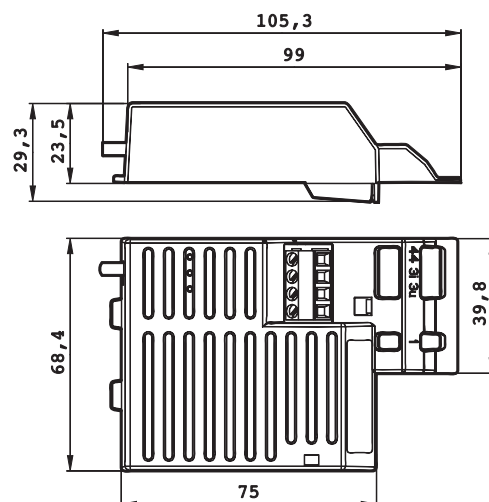


Figure 9: Voltage module dimensions

2. Opening the cover / inserting the voltage module:

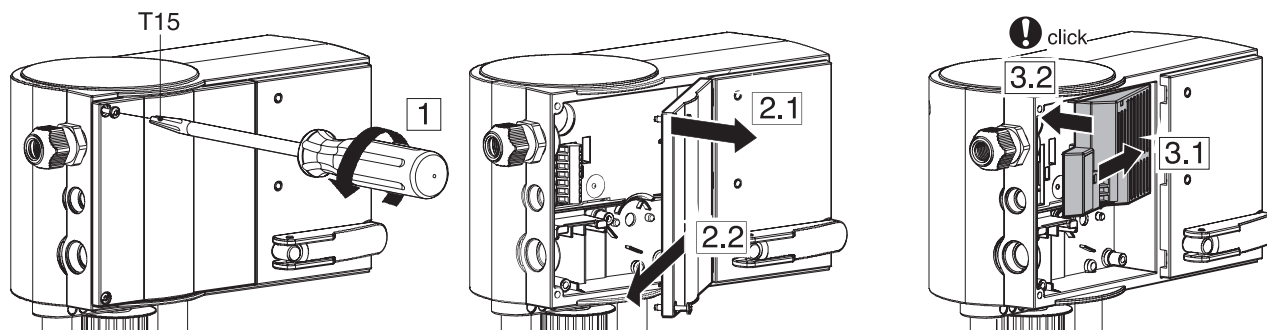


Figure 10: Voltage module installation

3. Affixing the new circuit diagram / affixing the module label:

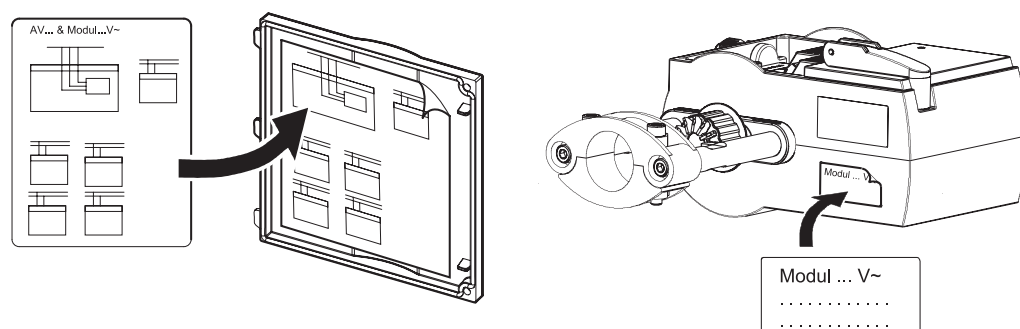


Figure 11: Affixing the labels

Operating Instructions

OI 373-E65-D/Z-20

4. Cable connection

⚠ DANGER Danger of electrocution

- Do not make a connection between terminal blocks X and Y.

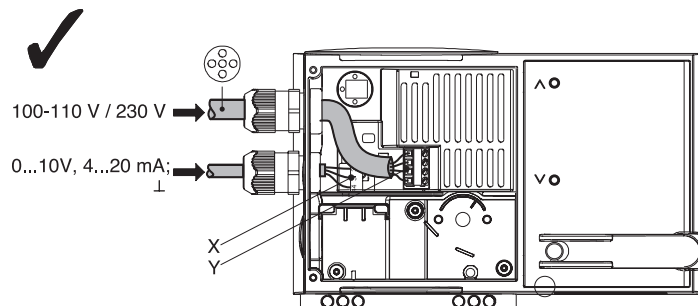
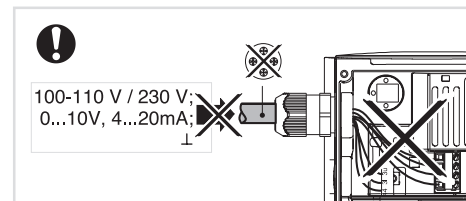


Figure 12: Connection

5. Connection diagram 230V~ and connection diagram 100-110V~

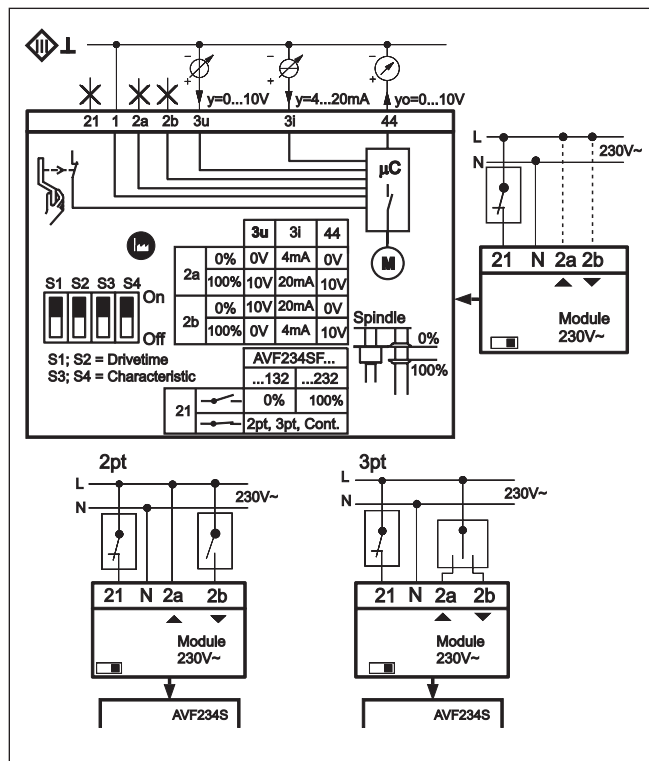


Figure 13: Connection diagram 230V

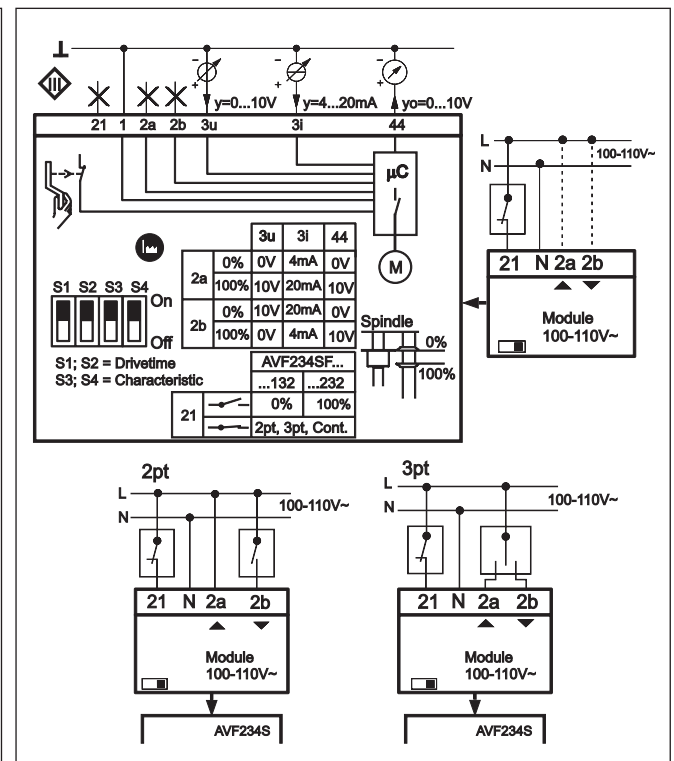


Figure 14: Connection diagram 100-110V

6. Removal

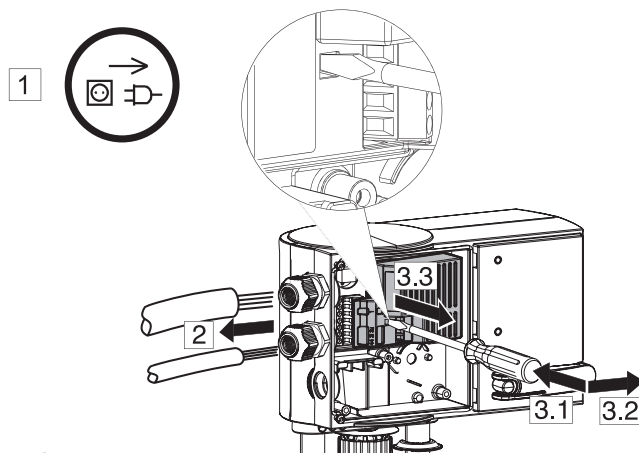


Figure 15: Removal

6.5 Auxiliary switch unit

1. General information

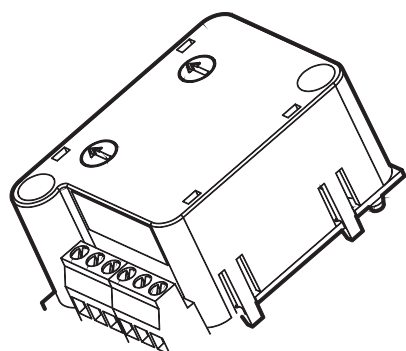


Figure 16: Auxiliary switch unit

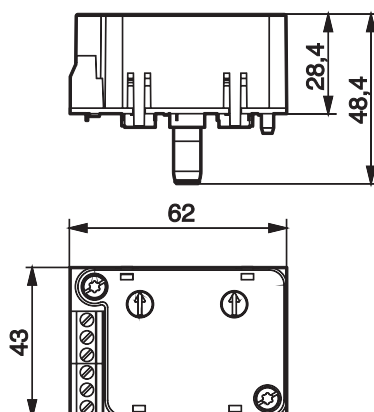


Figure 17: Auxiliary switch unit dimensions

	T15
	1
	3
	s24 (1x)

Figure 18: Tools
Auxiliary switch unit

2. Opening the cover

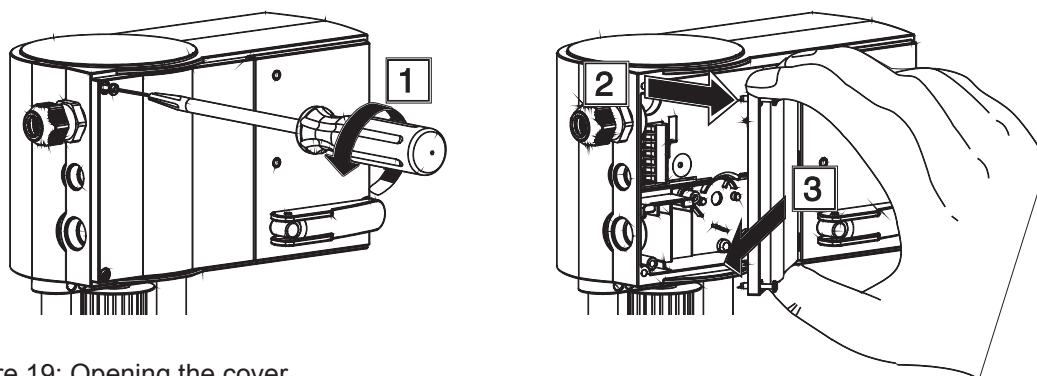


Figure 19: Opening the cover

Operating Instructions

OI 373-E65-D/Z-20

3. Installing the auxiliary switch unit

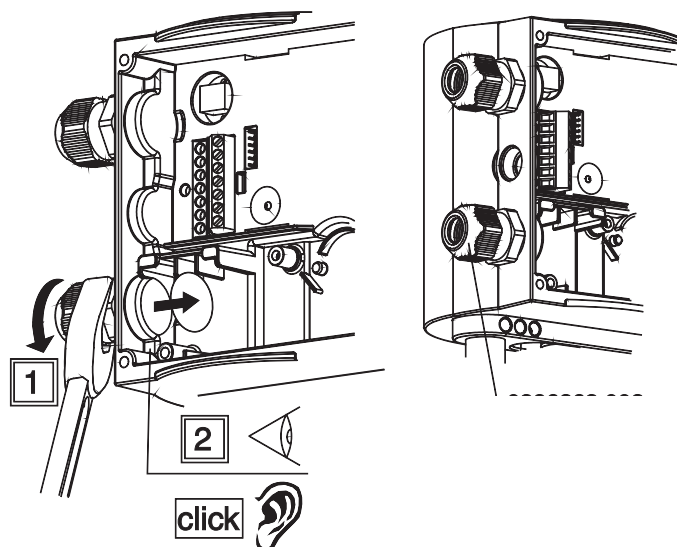


Figure 20: Installing the cable gland

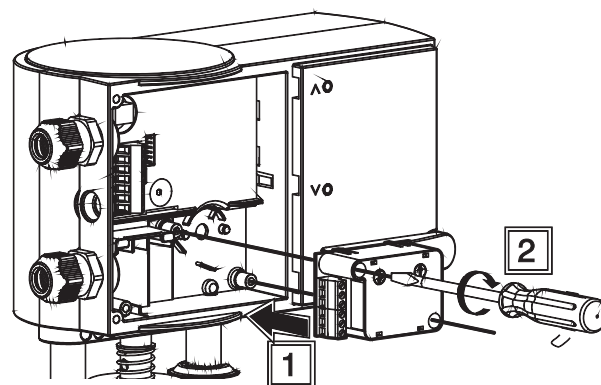


Figure 21: Screwing in the auxiliary switch unit

4. Moving the actuator to the defined position (0% / 100% / as desired)

5. Setting the auxiliary switches

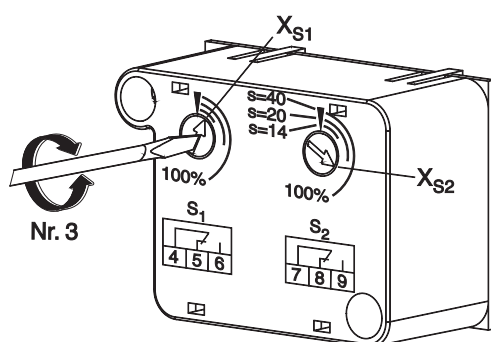


Figure 22: Setting the auxiliary switch unit

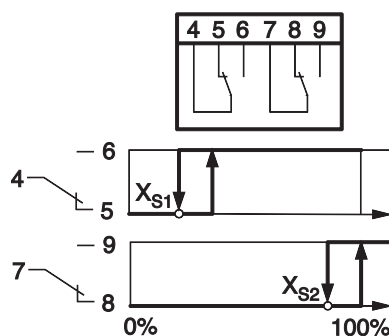


Figure 23: Switching hysteresis

6. Mounting / closing the cover

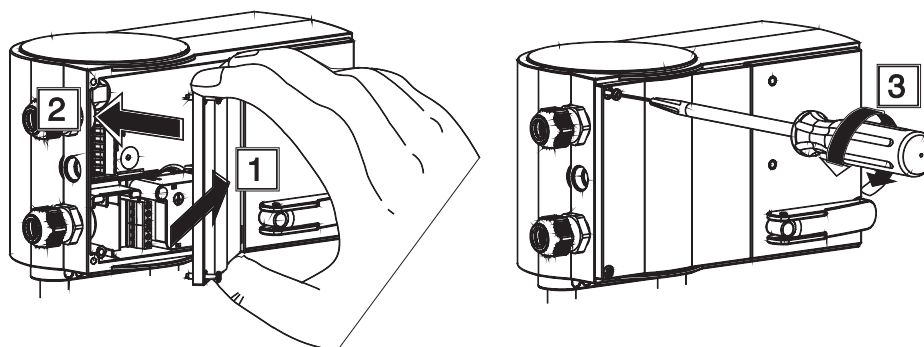


Figure 24: Mounting the cover

Operating Instructions

OI 373-E65-D/Z-20

7. SWITCH CODING

7.1 Valve characteristic

Desired Characteristic	Switch coding	Characteristic for valve	Characteristic for actuator	Effective on valve
Equal percentage	<div> <div>1 2 3 4</div> <div> <div></div> <div></div> <div>On</div> <div>Off</div> </div> <div> <div></div> <div></div> <div></div> <div></div> </div> </div>			
Quadratic	<div> <div>1 2 3 4</div> <div> <div></div> <div></div> <div>On</div> <div>Off</div> </div> <div> <div></div> <div></div> <div></div> <div></div> </div> </div>			
Linear	<div> <div>1 2 3 4</div> <div> <div></div> <div></div> <div>On</div> <div>Off</div> </div> <div> <div></div> <div></div> <div></div> <div></div> </div> </div>			
Equal percentage	<div> <div>1 2 3 4</div> <div> <div></div> <div></div> <div>On</div> <div>Off</div> </div> <div> <div></div> <div></div> <div></div> <div></div> </div> </div>			
Linear	<div> <div>1 2 3 4</div> <div> <div></div> <div></div> <div>On</div> <div>Off</div> </div> <div> <div></div> <div></div> <div></div> <div></div> </div> </div>			
= factory setting				

Figure 25: Valve characteristics

7.2 Speed

Run time per mm	Switch coding	Run time for 12 mm stroke	Run time for 16 mm stroke	Run time for qq mm stroke	Run time for 40 mm stroke
2s	<div> <div>1 2 3 4</div> <div> <div></div> <div></div> <div>On</div> <div>Off</div> </div> <div> <div></div> <div></div> <div></div> <div></div> </div> </div>	24s ± 1	32s ± 1	44s ± 1	80s ± 4
4s	<div> <div>1 2 3 4</div> <div> <div></div> <div></div> <div>On</div> <div>Off</div> </div> <div> <div></div> <div></div> <div></div> <div></div> </div> </div>	48s ± 2	64s ± 4	88s ± 4	160s ± 4
6s	<div> <div>1 2 3 4</div> <div> <div></div> <div></div> <div>On</div> <div>Off</div> </div> <div> <div></div> <div></div> <div></div> <div></div> </div> </div>	72s ± 4	96s ± 4	132s ± 4	240s ± 8
= factory setting					

Figure 26: Speed

Operating Instructions**OI 373-E65-D/Z-20****8. LED INDICATOR**

The indicator consists of two-colour LEDs (red / green)

8.1 In automatic mode

Both LEDs flash red	Initialisation
Upper LED lights up red	Upper limit stop or «CLOSED» position reached
Lower LED lights up red	Lower limit stop or «OPEN» position reached
Upper LED flashes green	Actuator is running, moving to «CLOSED» position
Upper LED lights up green	Actuator stopped, last direction of travel «CLOSED»
Lower LED flashes green	Actuator is running, moving to «OPEN» position
Upper LED lights up green	Actuator stopped, last direction of travel «OPEN»
Both LEDs light up green	Waiting time after switching on or after the emergency function
No LED lights up	No power supply (terminal 21)
Both LEDs flash red/green	Actuator is in manual mode

9. CONNECTION DIAGRAM 24V

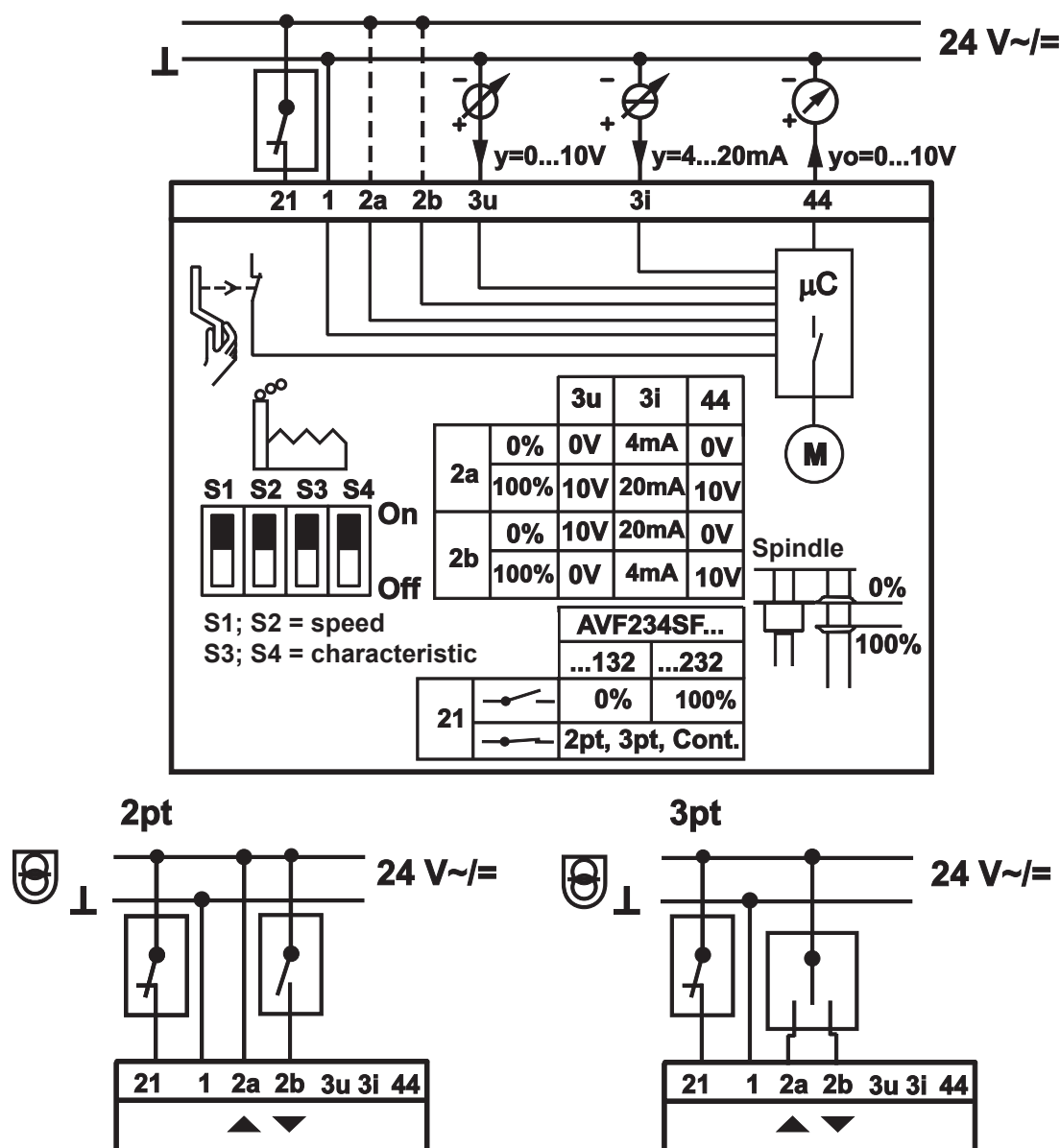


Figure 27: Connection diagram 24V

10. SPARE PARTS

When ordering accessories or spare parts, make sure to observe the specifications on the identification label of your actuator. The actual technical data of the linear actuators and the power supply requirements are the specifications indicated on the identification label.



Damage to the device caused by non-conforming spare parts!

Spare parts must comply with the technical requirements specified by the manufacturer.

- Always use original spare parts.

11. DECOMMISSIONING AND DISPOSAL

Dispose of the actuator in accordance with applicable, country-specific regulations and laws.

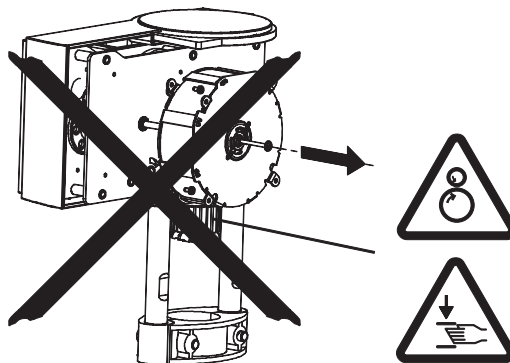


Figure 28: Decommissioning

12. TROUBLESHOOTING

If the actuator does not work properly, proceed as follows to correct the problem:

- 1 Check that the actuator is correctly installed.
- 2 Check the linear actuator settings and the specifications on the identification label.
- 3 Correct the problems as specified in the check list.
(see 12.1 Check list for operational malfunctions on page 20)
- 4 If the problem cannot be corrected, contact the manufacturer.
- 5 When sending inquiries to the manufacturer or when returning the device, always provide the following information:

F no. (factory number = order number)
Type identification
Supply voltage and frequency
Additional equipment
Failure report

- 6 If, after the inquiry, the problem still cannot be corrected, the device can be returned to the manufacturer.

Operating Instructions
OI 373-E65-D/Z-20
12.1 Check list for operational malfunctions

Malfunction	Cause	Action required
Actuator will not operate.	Power failure	Determine the cause and correct the problem.
	Defective fuse (in control cabinet)	Determine the cause and correct the problem, replace the fuse.
	Linear actuator incorrectly connected	Re-connect as specified on circuit diagram (on the cover).
	Short-circuit caused by humidity	Determine the cause, dry the linear actuator, replace cover seal and screw joints, and /or attach protective cover, as required.
	Short-circuit caused by incorrect connection	Connect correctly.
	Defective electronics	Determine the cause, measure current data, compare with identification label and table, remove linear actuators and return for repair.
	Voltage drop due to connecting cables being too long and / or with insufficient cross-section	Measure current data with linear actuator, recalculate connecting cables and replace, as applicable.
Unsteady actuator movement, i.e. moves between OPEN and CLOSED.	Power fluctuations exceed permissible tolerance.	Improve power supply conditions.
	Loose contact in supply line	Check and tighten connections (terminal strips).
Linear actuator stops temporarily.	Valve jammed	Ensure smooth valve movement.
Linear actuator does not move to the end position. Valve fails to open / close.	System pressure too high	Adjust system pressure.
	Poor input signal - Interfering signals - Signal variations	Check input signal at linear actuator, correct the problem causing the malfunction.
Linear actuator fails to move or does not move correctly to the position defined by the input signal.	Main board defective	Replace main board, if necessary remove actuator and return for repair.

Figure 29: Check list for operational malfunctions

13. DIMENSION SPECIFICATIONS

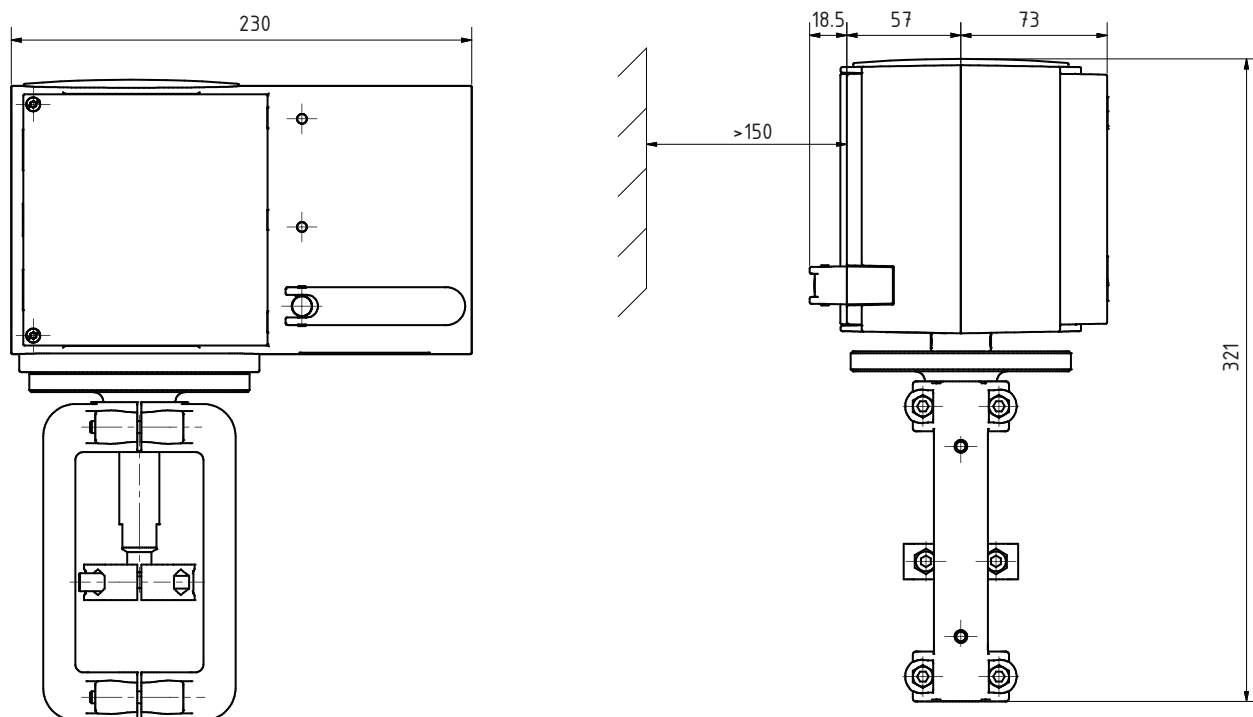


Figure 30: Dimension specifications E65

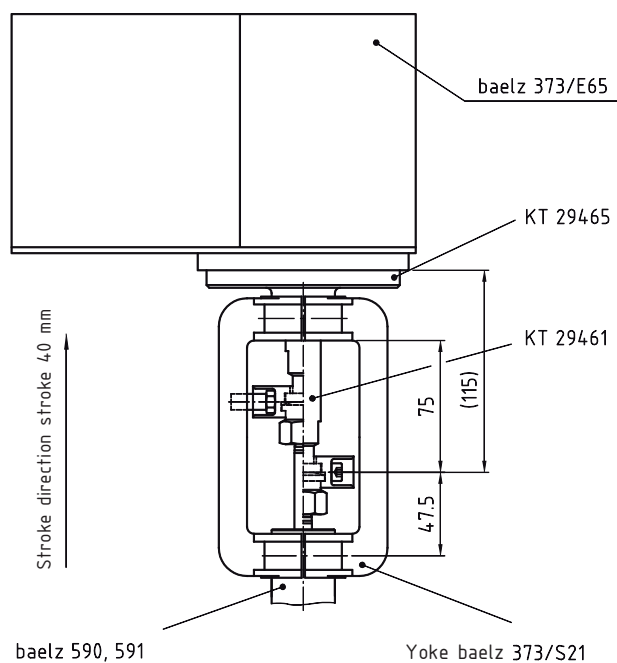


Figure 31: Actuator with yoke S21

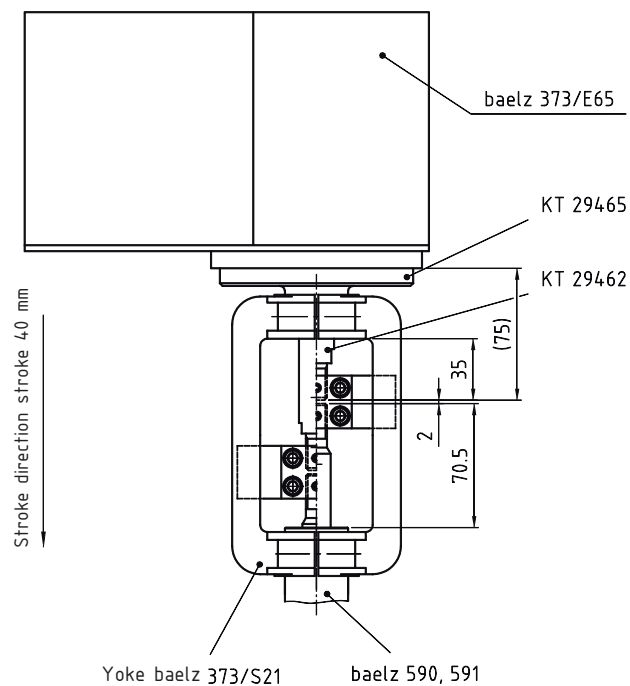


Figure 32: Actuator with yoke S21-L