

Type 227

Actuator with rotation drive

5 Nm
8 Nm

For the application with

Room ventilation techniques
VAV
Valves








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24	Your way to Gruner



GRUNER - the friendly alternative

	without spring return			with spring return		
● = Standard ○ = Optional						
Type	227	232	231	228	238	
Torque	5 Nm (appr.1 m ²) 8 Nm (appr.1.6 m ²)	15 Nm (appr.3 m ²)	20 Nm (appr.4 m ²) 30 Nm (appr.6 m ²)	5 Nm (appr.1 m ²)	15 Nm (appr.3 m ²)	
Control						
Tri-state	●	●	●	●	●	
On / Off	●	●	●	●	●	
Continuous (0) 2...10 VDC or (0) 4...20 mA with 500Ω	●	●	●	●	●	
Power supply						
24 VAC/DC	●	●	●	●	●	
230 VAC	●	●	●	●	●	
Options						
Potentiometer	○	○	○			
Auxiliary switch(es)	○	○	○	○	○	
LON interface			○			
VAV interface	○	○	○	○	○	
Universal locking clamp	●	●	●	●	●	
Form locking	○			○	○	

Applications

Motorised control of dampers, ball and butterfly valves. Application in mixed air and shut-off damper control. For primary HVAC air-handling and zone units.

Smoke and air isolation shut-off damper control for ventilation systems Ball valve control for domestic and drinking water, condensation water, air (i.e. zone units).

The actuator 231L has digital communication capabilities and can be networked with a LON-Bus system. All actuators correspond to the UL, CSA & DIN-VDE standards, CE guidelines.

▶ ▶ ▶ SUMMARY TYPE 227, 5 Nm + 8 Nm

● = Standard
○ = Optional

Type	227-024-05	227-024-05-P5	227-024-05-S1	227-230-05	227-230-05-P5	227-230-05-S1	227-3-230-05	227-3-230-05-P5	227-3-230-05-S1	227C-024-05
Torque	5 Nm	5 Nm	5 Nm	5 Nm	5 Nm	5 Nm	5 Nm	5 Nm	5 Nm	5 Nm
Control Tri-state	●	●	●				●	●	●	
On / Off	●	●	●	●	●	●	●	●	●	
Continuous-Control (0) 2...10 VDC or (0) 4...20 mA w/ 500Ω										●
Power supply										
24 VAC/DC	●	●	●							●
230 VAC				●	●	●	●	●	●	
Options										
Potentiometer		●		●			●			
Feedback signal										●
Auxiliary switch(es)			●			●			●	
Page	4	4	4	6	6	6	8	8	8	10

Standard version with universal locking clamp and anti torsion bow. Also available with concentric form locking for shaft (□ 8 mm) and flange fixing. All actuators dispose of manual override button, a mechanical limitation of the angle of rotation and setting button for the rotation direction (cw/ccw). Actuators according to US-standards available upon demand.

● = Standard
○ = Optional

Type	227-024-08	227-024-08-P5	227-024-08-S1	227-230-08	227-230-08-P5	227-230-08-S1	227-3-230-08	227-3-230-08-P5	227-3-230-08-S1	227C-024-08
Torque	8 Nm	8 Nm	8 Nm	8 Nm	8 Nm	8 Nm	8 Nm	8 Nm	8 Nm	8 Nm
Control Tri-state	●	●	●				●	●	●	
On / Off	●	●	●	●	●	●	●	●	●	
Continuous-Control (0) 2...10 VDC or (0) 4...20 mA w/ 500Ω										●
Power supply										
24 VAC/DC	●	●	●							●
230 VAC				●	●	●	●	●	●	
Options										
Potentiometer		●		●			●			
Feedback signal										●
Auxiliary switch(es)			●			●			●	
Page	12	12	12	14	14	14	16	16	16	18

Standard version with universal locking clamp and anti torsion bow. Also available with concentric form locking for shaft (□ 8 mm) and flange fixing. All actuators dispose of manual override button, a mechanical limitation of the angle of rotation and setting button for the rotation direction (cw/ccw). Actuators according to US-standards available upon demand.



Applications

To regulate dampers, valves or other regulatory functions:

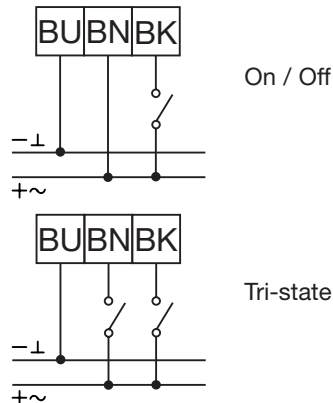
- sturdy drive
- maintenance-free
- torque 5 Nm
- position indication
- angle of rotation changeable from outside
- direction of rotation changeable from outside
- auxiliary switch adjustable from outside
- electromagnetic compatibility controlled

Technical characteristics

Control	On / Off + Tri-state
Connecting voltage	24 VAC (50/60 Hz) / DC $\pm 20\%$
Power consumption	2.0 W / 3.0 VA
Angle of rotation	max. 95° (changeable from outside)
Direction of Rotation	changeable from outside
Running time	60...120 s @ 90°
Torque	5 Nm
Auxiliary switch	max. 1, adjustable from outside
Switching power auxiliary switch	250 VAC / 5 (2.5) A, change-over switch
Potentiometer	4.7 k Ω
Connection	cable 900 mm / 0.75 mm ²
Safety class	III
Protection	IP54 (cable downwards)
Dimensions	115 x 65 x 61 mm
Ambient temperature	-20...+50°C
Maintenance	maintenance-free
CE	73/23 EWG, 89/336 EWG
Weight	530 g

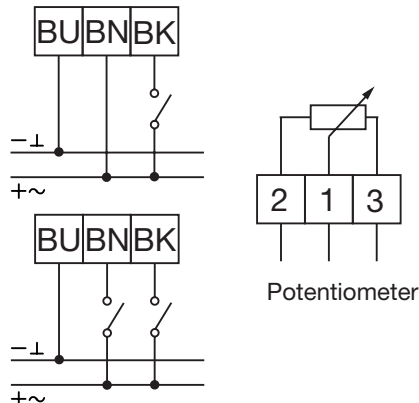
227-024-05

Connection scheme



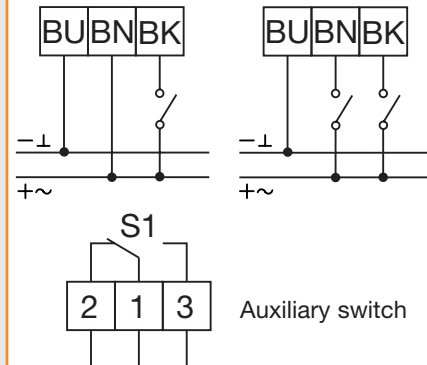
227-024-05-P5

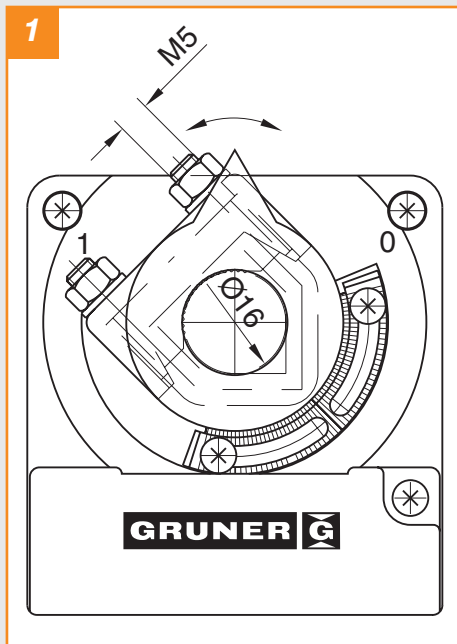
Connection scheme



227-024-05-S1

Connection scheme



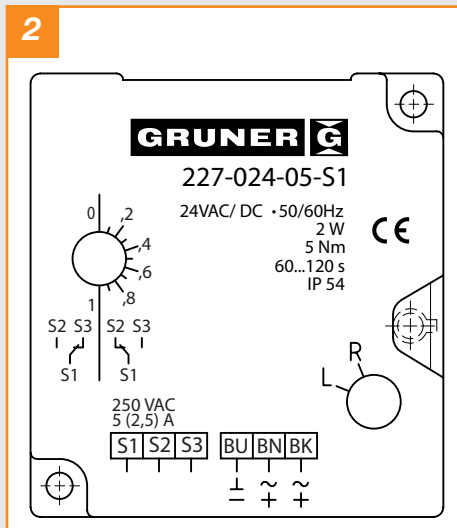


Adjustment of the angle of rotation (fig. 1)

Both end stops are adjusted to 0° and 90°. For smaller rotation angles, loosen the screws at the metal end stop, adjust the end stops as requested, and fasten the screws again.

Fixing of the shaft (fig. 1)

by the locking clamp to the damper shaft: □ 8...12 mm
 ∅ 8...16 mm



Adjustment of the direction of rotation (fig. 2)

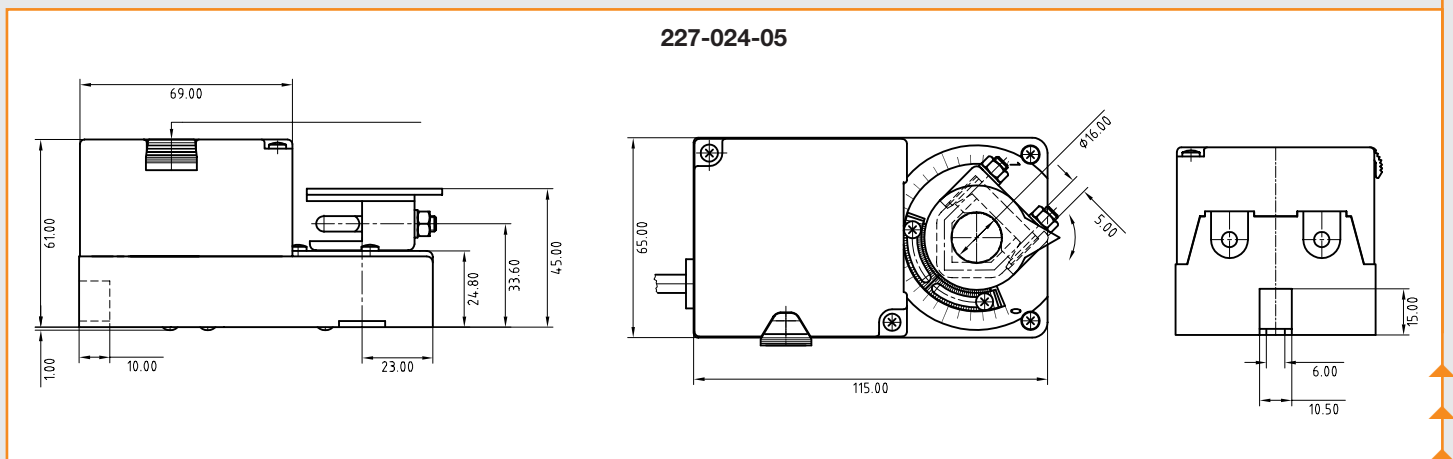
The actuator is adjusted to clockwise direction by the factory => "R". For changing the direction of rotation, turn the adjusting knob to "L".

Adjustment of the auxiliary switch (fig. 2)

The scale at the adjusting knob corresponds to a percentage graduation, related to 0° - 90°.

- 1) End stop is set to "0": Switch off the motor and choose the requested switching position by turning the knob to the right, i.e. ".2" = 20%.
- 2) End stop is set to "1": Switch off the motor and choose the requested switching position by turning the knob to the left, i.e. ".8" = 20%.

Technical drawing





Applications

To regulate dampers, valves or other regulatory functions:

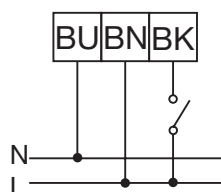
- sturdy drive
- maintenance-free
- torque 5 Nm
- position indication
- angle of rotation changeable from outside
- direction of rotation changeable from outside
- auxiliary switch adjustable from outside
- electromagnetic compatibility controlled

Technical characteristics

Control	On / Off
Connecting voltage	230 VAC (50/60 Hz) $\pm 15\%$
Power consumption	1.0 W / 12.0 VA
Angle of rotation	max. 95° (changeable from outside)
Direction of Rotation	changeable from outside
Running time	60...120 s @ 90°
Torque	5 Nm
Auxiliary switch	max. 1, adjustable from outside
Switching power auxiliary switch	250 VAC / 5 (2.5) A, change-over switch
Potentiometer	4.7 k Ω
Connection	cable 900 mm / 0.75 mm ²
Safety class	II
Protection	IP54 (cable downwards)
Dimensions	115 x 65 x 61 mm
Ambient temperature	-20...+50°C
Maintenance	maintenance-free
CE	73/23 EWG, 89/336 EWG
Weight	530 g

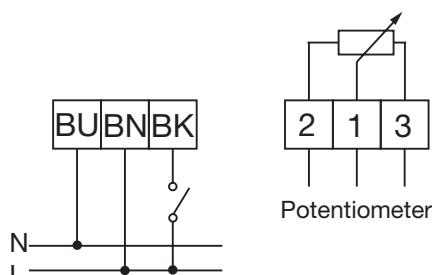
227-230-05

Connection scheme
(On / Off)



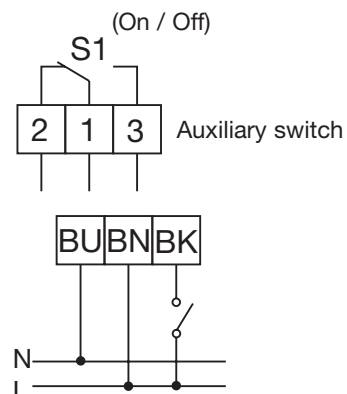
227-230-05-P5

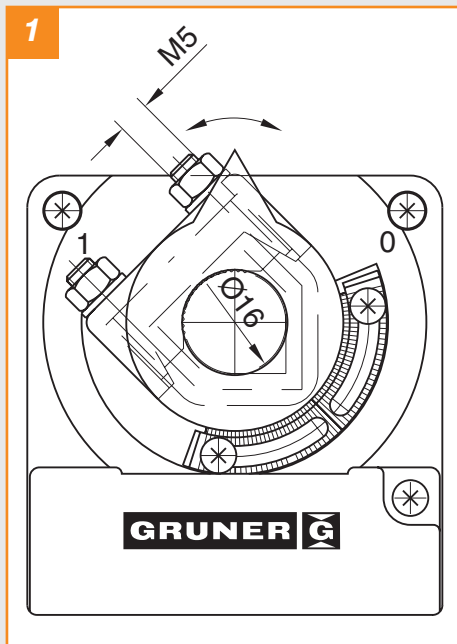
Connection scheme
(On / Off)



227-230-05-S1

Connection scheme
(On / Off)



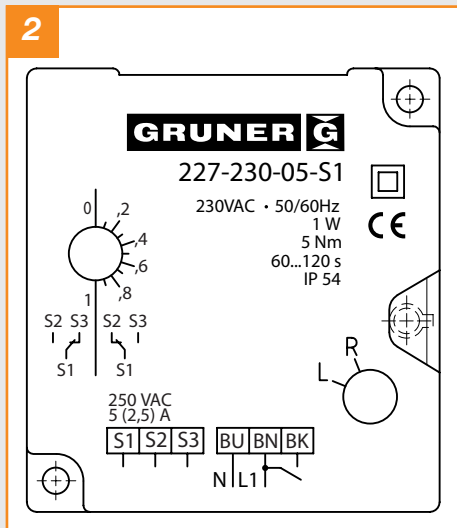


Adjustment of the angle of rotation (fig. 1)

Both end stops are adjusted to 0° and 90°. For smaller rotation angles, loosen the screws at the metal end stop, adjust the end stops as requested, and fasten the screws again.

Fixing of the shaft (fig. 1)

by the locking clamp to the damper shaft: □ 8...12 mm
 ∅ 8...16 mm



Adjustment of the direction of rotation (fig. 2)

The actuator is adjusted to clockwise direction by the factory => "R". For changing the direction of rotation, turn the adjusting knob to "L".

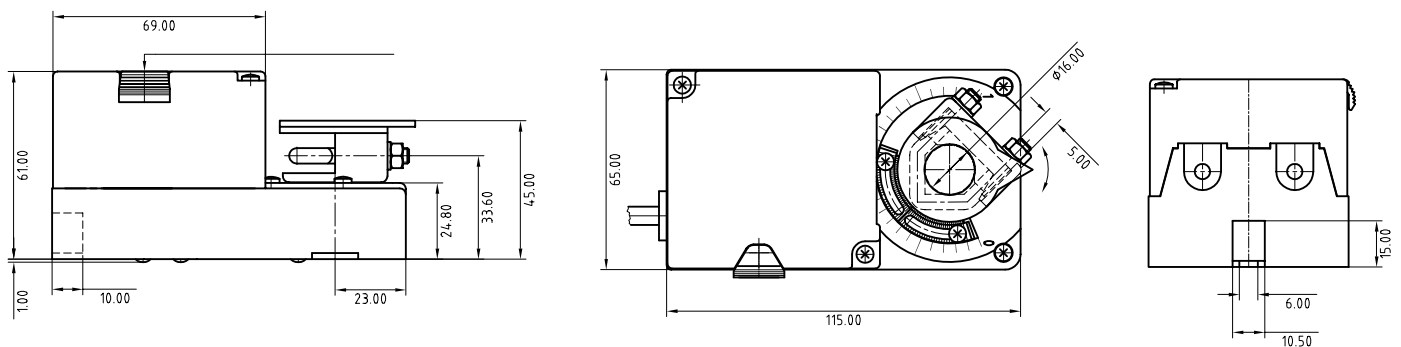
Adjustment of the auxiliary switch (fig. 2)

The scale at the adjusting knob corresponds to a percentage graduation, related to 0° - 90°.

- 1) End stop is set to "0": Switch off the motor and choose the requested switching position by turning the knob to the right, i.e. ".2" = 20%.
- 2) End stop is set to "1": Switch off the motor and choose the requested switching position by turning the knob to the left, i.e. ".8" = 20%.

Technical drawing

227-230-05





Applications

To regulate dampers, valves or other regulatory functions:

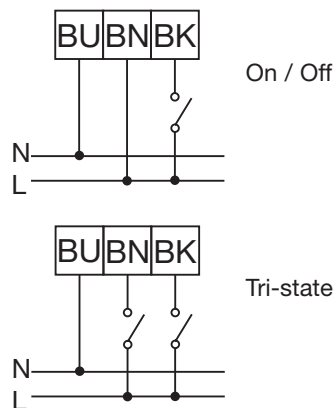
- sturdy drive
- maintenance-free
- torque 5 Nm
- position indication
- angle of rotation changeable from outside
- direction of rotation changeable from outside
- auxiliary switch adjustable from outside
- electromagnetic compatibility controlled

Technical characteristics

Control	On / Off + Tri-state
Connecting voltage	230 VAC (50/60 Hz) ±15%
Power consumption	1.0 W / 12.0 VA
Angle of rotation	max. 95° (changeable from outside)
Direction of Rotation	changeable from outside
Running time	60...120 s @ 90°
Torque	5 Nm
Auxiliary switch	max. 1, adjustable from outside
Switching power auxiliary switch	250 VAC / 5 (2.5) A, change-over switch
Potentiometer	4.7 kΩ
Connection	cable 900 mm / 0.75 mm ²
Safety class	II
Protection	IP54 (cable downwards)
Dimensions	115 x 65 x 61 mm
Ambient temperature	-20...+50°C
Maintenance	maintenance-free
CE	73/23 EWG, 89/336 EWG
Weight	530 g

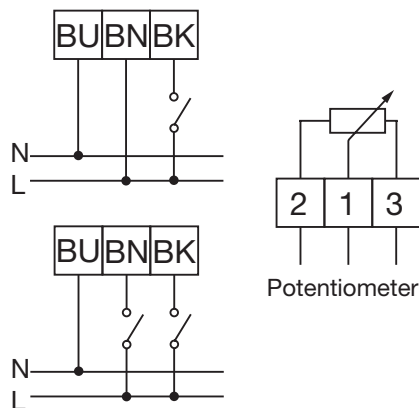
227-3-230-05

Connection scheme



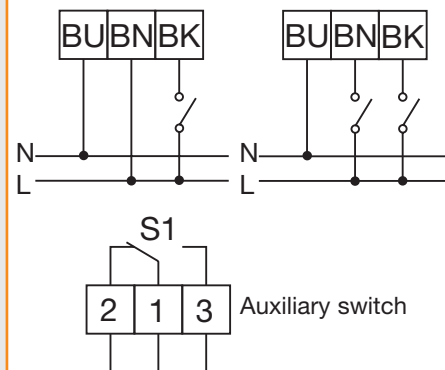
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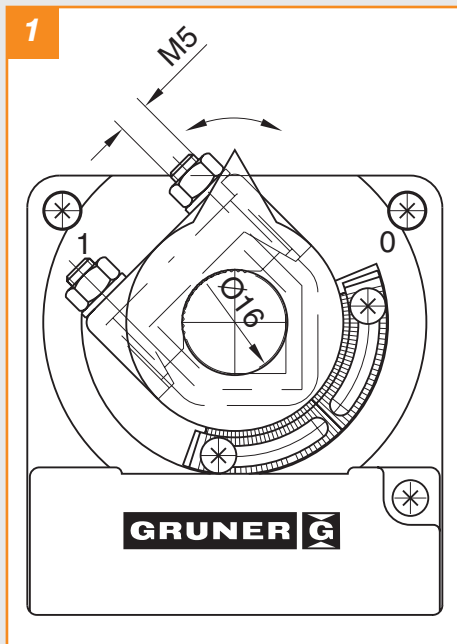
Connection scheme



227-3-230-05-S1

Connection scheme



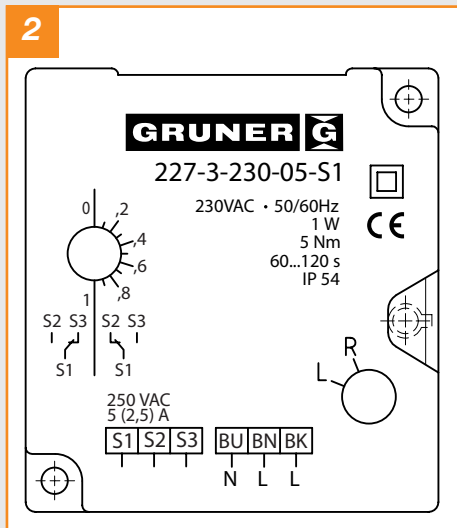


Adjustment of the angle of rotation (fig. 1)

Both end stops are adjusted to 0° and 90°. For smaller rotation angles, loosen the screws at the metal end stop, adjust the end stops as requested, and fasten the screws again.

Fixing of the shaft (fig. 1)

by the locking clamp to the damper shaft: □ 8...12 mm
 ∅ 8...16 mm



Adjustment of the direction of rotation (fig. 2)

The actuator is adjusted to clockwise direction by the factory => "R". For changing the direction of rotation, turn the adjusting knob to "L".

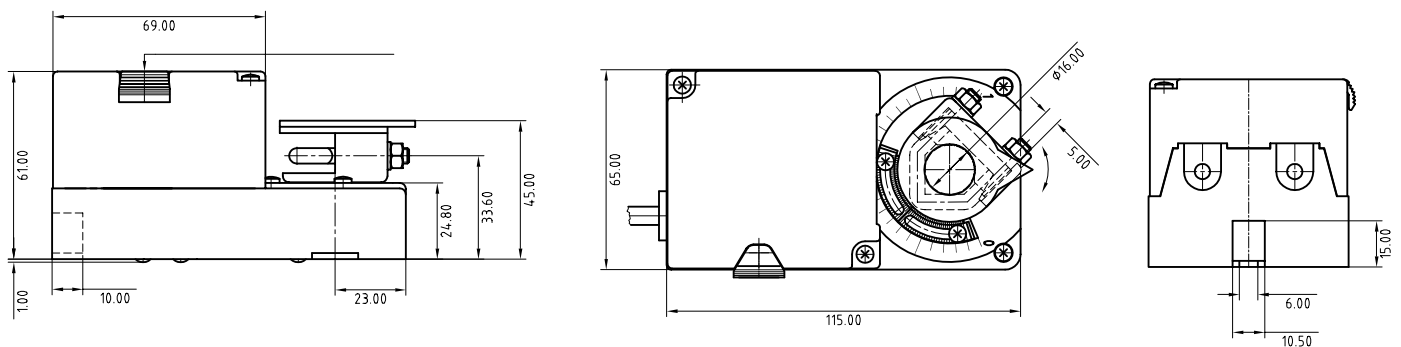
Adjustment of the auxiliary switch (fig. 2)

The scale at the adjusting knob corresponds to a percentage graduation, related to 0° - 90°.

- 1) End stop is set to "0": Switch off the motor and choose the requested switching position by turning the knob to the right, i.e. ".2" = 20%.
- 2) End stop is set to "1": Switch off the motor and choose the requested switching position by turning the knob to the left, i.e. ".8" = 20%.

Technical drawing

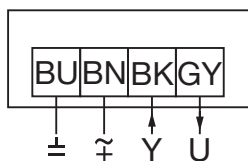
227-3-230-05





227C-024-05

Connection scheme (Continuous control)



Applications

To regulate dampers, valves or other regulatory functions:

- sturdy drive
- maintenance-free
- torque 5 Nm
- position indication
- angle of rotation changeable from outside
- direction of rotation changeable from outside
- auxiliary switch adjustable from outside
- electromagnetic compatibility controlled

Technical characteristics

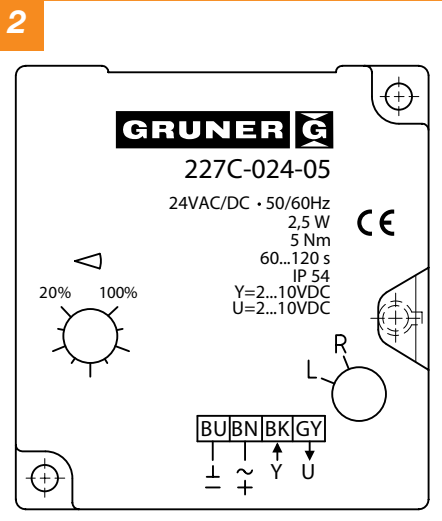
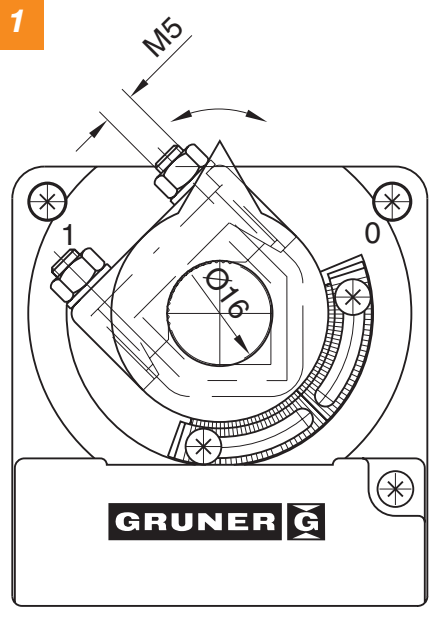
Control	Continuous control
Sollwertsignal Y	0...10 VDC or 2...10 VDC (Standard) or 0...20 mA @ 500Ω or 4...20 mA @ 500Ω
Feedback signal U	0...10 VDC or 2...10 VDC (Standard)
Connecting voltage	24 VAC (50/60 Hz) / DC ±20%
Power consumption	2.5 W / 4.5 VA
Angle of rotation	max. 95° (changeable from outside)
Direction of Rotation	changeable from outside
Running time	60...120 s @ 90°
Torque	5 Nm
Connection	cable 900 mm / 0.75 mm ²
Safety class	III
Protection	IP54 (cable downwards)
Dimensions	115 x 65 x 61 mm
Ambient temperature	-20...+50°C
Maintenance	maintenance-free
CE	73/23 EWG, 89/336 EWG
Weight	530 g

Adjustment of the angle of rotation (fig. 1)

Both end stops are adjusted to 0° and 90°. For smaller rotation angles, loosen the screws at the metal end stop, adjust the end stops as requested, and fasten the screws again.

Fixing of the shaft (fig. 1)

by the locking clamp to the damper shaft: □ 8...12 mm
 ∅ 8...16 mm



Adjustments (fig. 2)

Angle of rotation:

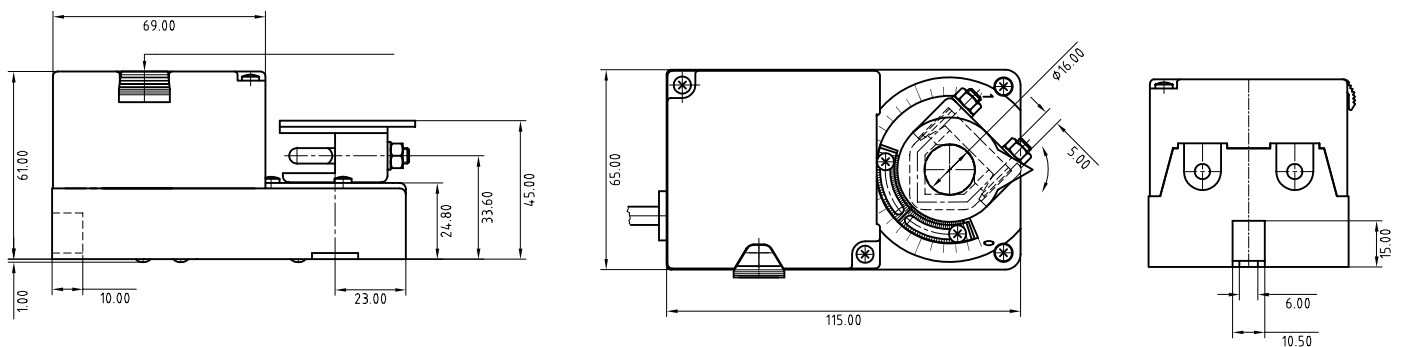
The actuator is adjusted to clockwise direction by the factory => "R". For changing the direction of rotation, turn the adjusting knob to "L".

Regulation range:

The actuators are supplied with the (0) 2...10 VDC for the regulation range 0° to 90°. A smaller angle (proportional) can be chosen, where the regulation range (0) 2...10 VDC goes for. The actuator must be switched off for doing so.

Technical drawing

227C-024-05





Applications

To regulate dampers, valves or other regulatory functions:

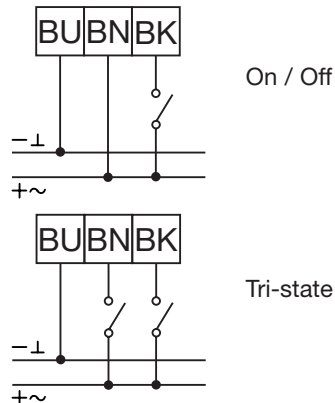
- sturdy drive
- maintenance-free
- torque 8 Nm
- position indication
- angle of rotation changeable from outside
- direction of rotation changeable from outside
- auxiliary switch adjustable from outside
- electromagnetic compatibility controlled

Technical characteristics

Control	On / Off + Tri-state
Connecting voltage	24 VAC (50/60 Hz) / DC $\pm 20\%$
Power consumption	2.0 W / 3.0 VA
Angle of rotation	max. 95° (changeable from outside)
Direction of Rotation	changeable from outside
Running time	60...120 s @ 90°
Torque	8 Nm
Auxiliary switch	max. 1, adjustable from outside
Switching power auxiliary switch	250 VAC / 5 (2.5) A, change-over switch
Potentiometer	4.7 k Ω
Connection	cable 900 mm / 0.75 mm ²
Safety class	III
Protection	IP54 (cable downwards)
Dimensions	115 x 65 x 61 mm
Ambient temperature	-20...+50 °C
Maintenance	maintenance-free
CE	73/23 EWG, 89/336 EWG
Weight	530 g

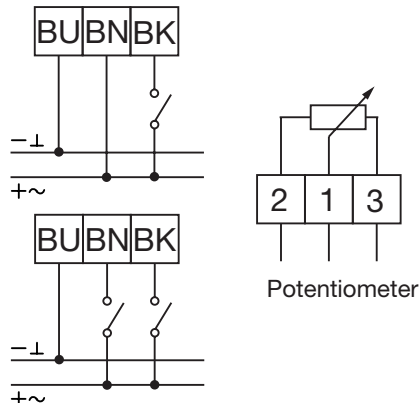
227-024-08

Connection scheme



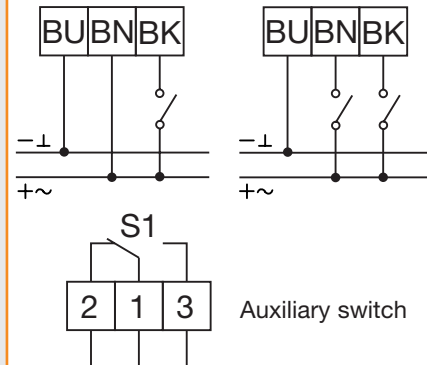
227-024-08-P5

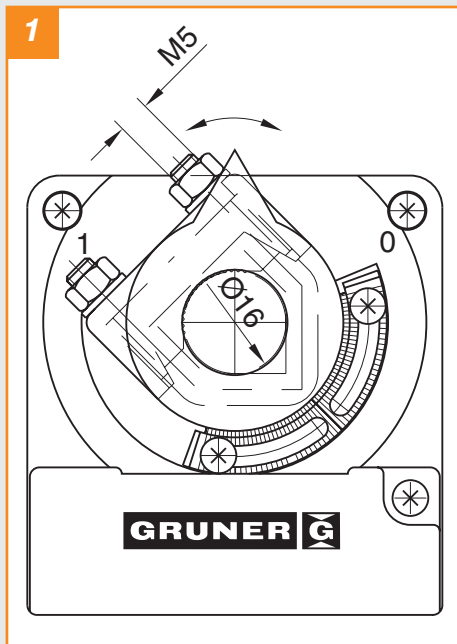
Connection scheme



227-024-08-S1

Connection scheme



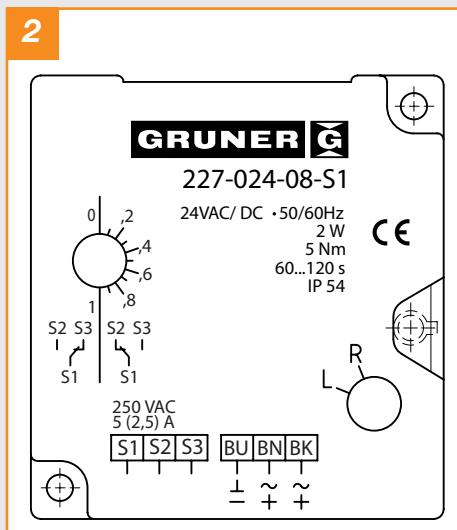


Adjustment of the angle of rotation (fig. 1)

Both end stops are adjusted to 0° and 90°. For smaller rotation angles, loosen the screws at the metal end stop, adjust the end stops as requested, and fasten the screws again.

Fixing of the shaft (fig. 1)

by the locking clamp to the damper shaft: □ 8...12 mm
 ∅ 8...16 mm



Adjustment of the direction of rotation (fig. 2)

The actuator is adjusted to clockwise direction by the factory => "R". For changing the direction of rotation, turn the adjusting knob to "L".

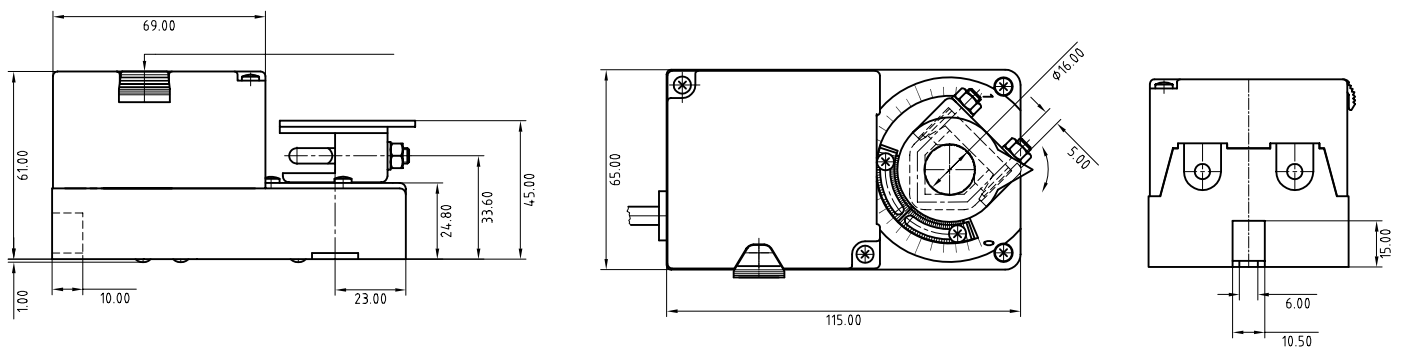
Adjustment of the auxiliary switch (fig. 2)

The scale at the adjusting knob corresponds to a percentage graduation, related to 0° - 90°.

- 1) End stop is set to "0": Switch off the motor and choose the requested switching position by turning the knob to the right, i.e. ".2" = 20%.
- 2) End stop is set to "1": Switch off the motor and choose the requested switching position by turning the knob to the left, i.e. ".8" = 20%.

Technical drawing

227-024-08





Applications

To regulate dampers, valves or other regulatory functions:

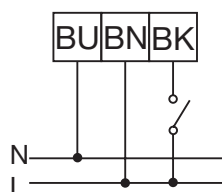
- sturdy drive
- maintenance-free
- torque 8 Nm
- position indication
- angle of rotation changeable from outside
- direction of rotation changeable from outside
- auxiliary switch adjustable from outside
- electromagnetic compatibility controlled

Technical characteristics

Control	On / Off
Connecting voltage	230 VAC (50/60 Hz) $\pm 15\%$
Power consumption	1.0 W / 12.0 VA
Angle of rotation	max. 95° (changeable from outside)
Direction of Rotation	changeable from outside
Running time	60...120 s @ 90°
Torque	8 Nm
Auxiliary switch(es)	max. 1, adjustable from outside
Switching power auxiliary switch	250 VAC / 5 (2.5) A, change-over switch
Potentiometer	4.7 k Ω
Connection	cable 900 mm / 0.75 mm ²
Safety class	II
Protection	IP54 (cable downwards)
Dimensions	115 x 65 x 61 mm
Ambient temperature	-20...+50 °C
Maintenance	maintenance-free
CE	73/23 EWG, 89/336 EWG
Weight	530 g

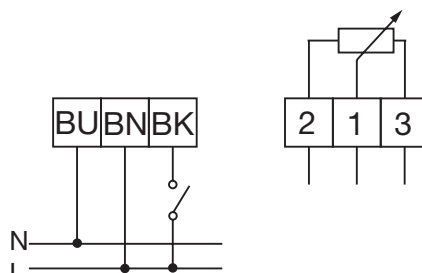
227-230-08

Connection scheme
(On / Off)



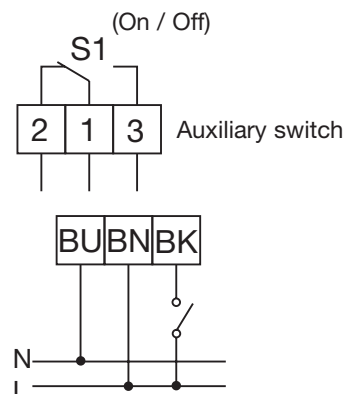
227-230-08-P5

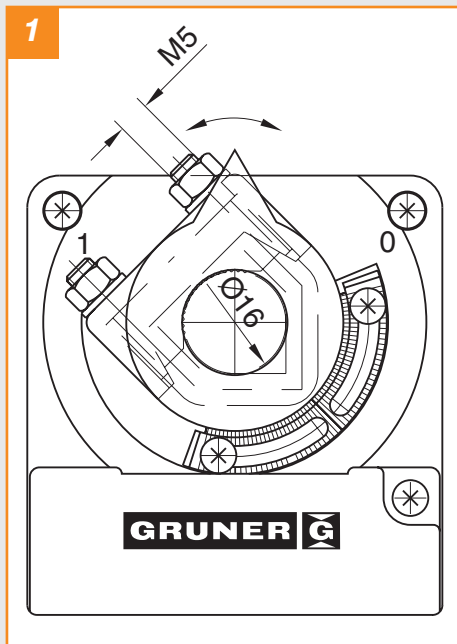
Connection scheme
(On / Off)



227-230-08-S1

Connection scheme
(On / Off)



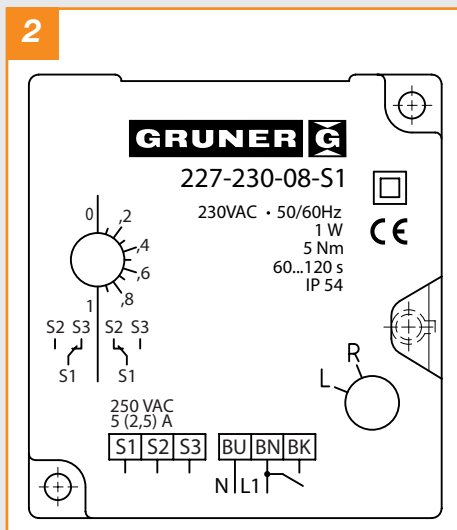


Adjustment of the angle of rotation (fig. 1)

Both end stops are adjusted to 0° and 90°. For smaller rotation angles, loosen the screws at the metal end stop, adjust the end stops as requested, and fasten the screws again.

Fixing of the shaft (fig. 1)

by the locking clamp to the damper shaft: □ 8...12 mm
 ∅ 8...16 mm



Adjustment of the direction of rotation (fig. 2)

The actuator is adjusted to clockwise direction by the factory => "R". For changing the direction of rotation, turn the adjusting knob to "L".

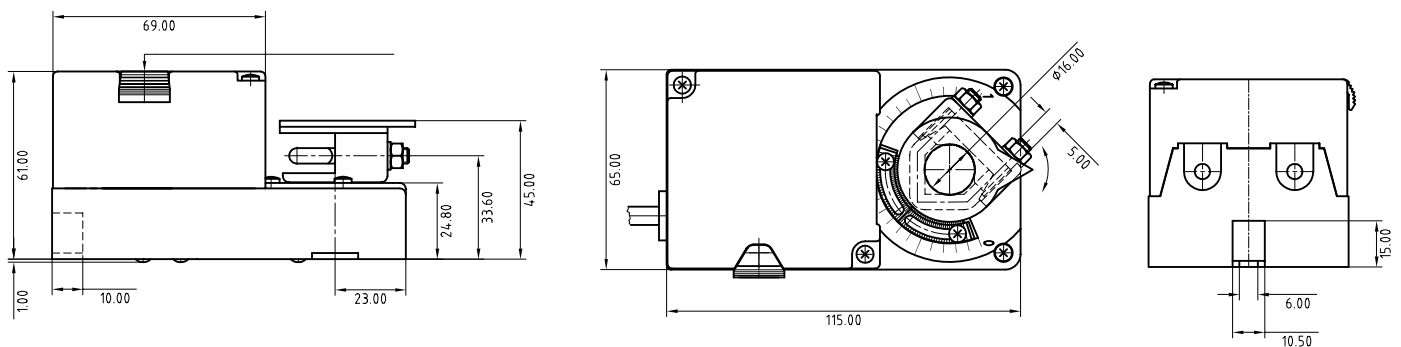
Adjustment of the auxiliary switch (fig. 2)

The scale at the adjusting knob corresponds to a percentage graduation, related to 0° - 90°.

- 1) End stop is set to "0": Switch off the motor and choose the requested switching position by turning the knob to the right, i.e. ".2" = 20%.
- 2) End stop is set to "1": Switch off the motor and choose the requested switching position by turning the knob to the left, i.e. ".8" = 20%.

Technical drawing

227-230-08





Applications

To regulate dampers, valves or other regulatory functions:

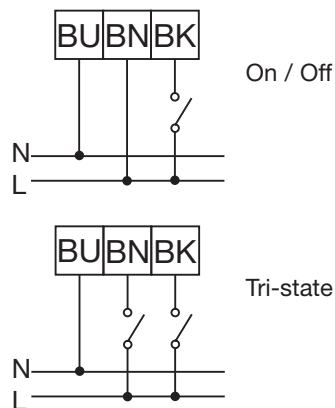
- sturdy drive
- maintenance-free
- torque 8 Nm
- position indication
- angle of rotation changeable from outside
- direction of rotation changeable from outside
- auxiliary switch adjustable from outside
- electromagnetic compatibility controlled

Technical characteristics

Control	On / Off + Tri-state
Connecting voltage	230 VAC (50/60 Hz) $\pm 15\%$
Power consumption	1.0 W / 12.0 VA
Angle of rotation	max. 95° (changeable from outside)
Direction of Rotation	changeable from outside
Running time	60...120 s @ 90°
Torque	8 Nm
Auxiliary switch	max. 1, adjustable from outside
Switching power auxiliary switch	250 VAC / 5 (2.5) A, change-over switch
Potentiometer	4.7 k Ω
Connection	cable 900 mm / 0,75 mm ²
Safety class	II
Protection	IP54 (cable downwards)
Dimensions	115 x 65 x 61 mm
Ambient temperature	-20...+50°C
Maintenance	maintenance-free
CE	73/23 EWG, 89/336 EWG
Weight	530 g

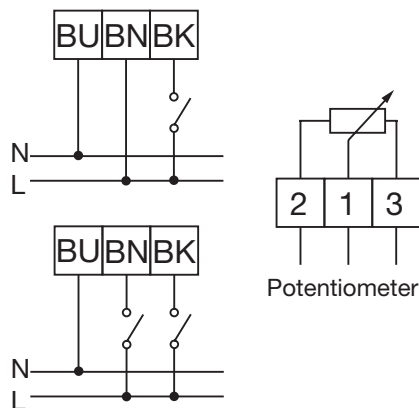
227-3-230-08

Connection scheme



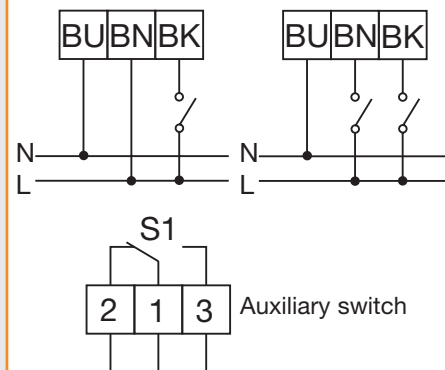
227-3-230-08-P5

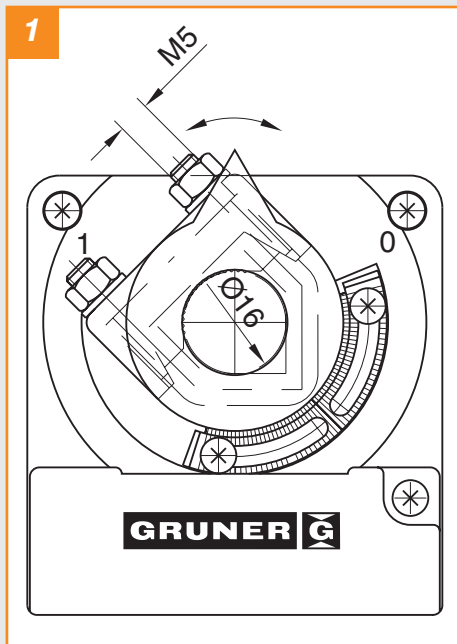
Connection scheme



227-3-230-08-S1

Connection scheme



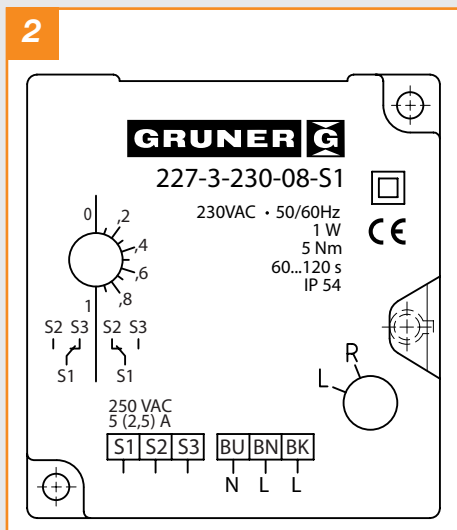


Adjustment of the angle of rotation (fig. 1)

Both end stops are adjusted to 0° and 90°. For smaller rotation angles, loosen the screws at the metal end stop, adjust the end stops as requested, and fasten the screws again.

Fixing of the shaft (fig. 1)

by the locking clamp to the damper shaft: □ 8...12 mm
 ∅ 8...16 mm



Adjustment of the direction of rotation (fig. 2)

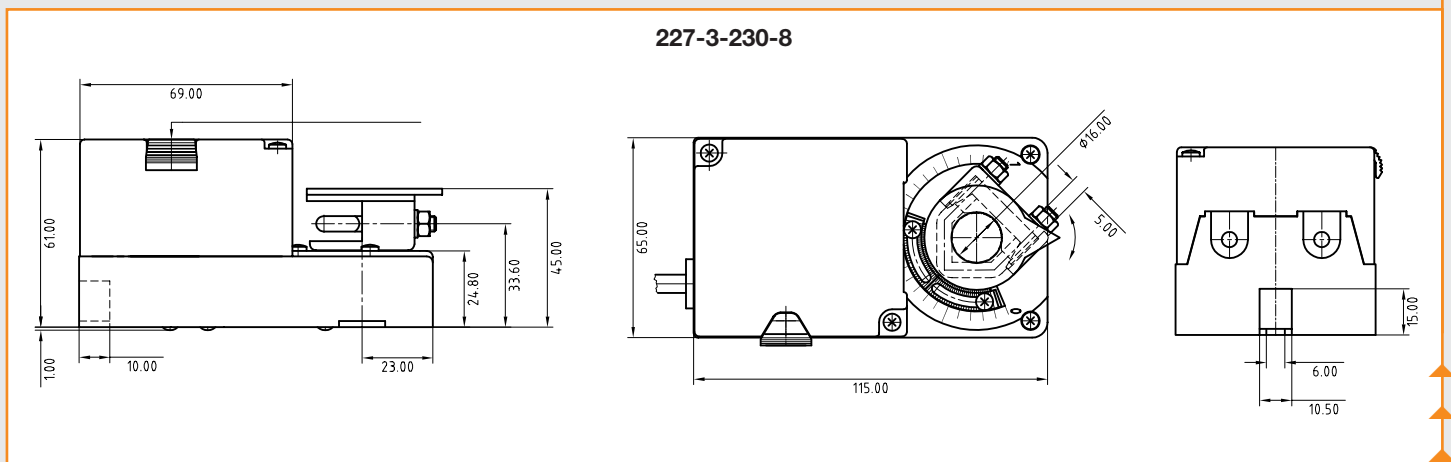
The actuator is adjusted to clockwise direction by the factory => "R". For changing the direction of rotation, turn the adjusting knob to "L".

Adjustment of the auxiliary switch (fig. 2)

The scale at the adjusting knob corresponds to a percentage graduation, related to 0° - 90°.

- 1) End stop is set to "0": Switch off the motor and choose the requested switching position by turning the knob to the right, i.e. ".2" = 20%.
- 2) End stop is set to "1": Switch off the motor and choose the requested switching position by turning the knob to the left, i.e. ".8" = 20%.

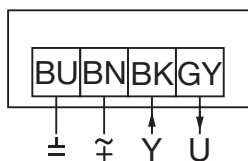
Technical drawing





227C-024-08

Connection scheme (Continuous control)



Applications

To regulate dampers, valves or other regulatory functions:

- sturdy drive
- maintenance-free
- torque 8 Nm
- position indication
- angle of rotation changeable from outside
- direction of rotation changeable from outside
- auxiliary switch adjustable from outside
- electromagnetic compatibility controlled

Technical characteristics

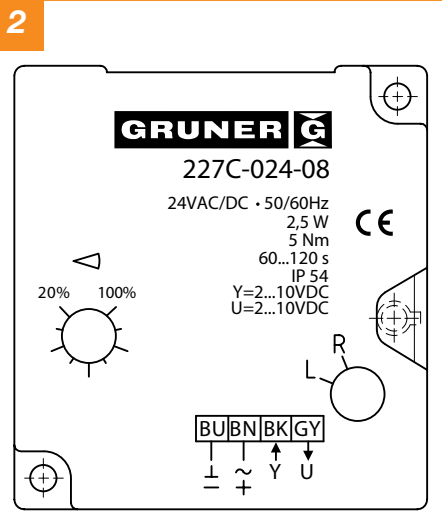
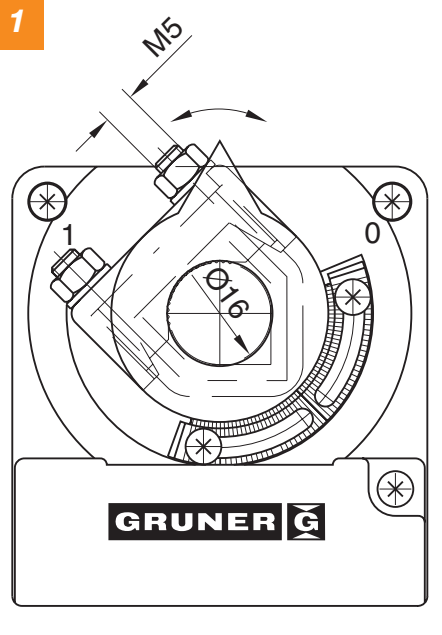
Control	Continuous control
Sollwertsignal Y	0...10 VDC or 2...10 VDC (standard) or 0...20 mA @ 500Ω or 4...20 mA @ 500Ω
Feedback signal U	0...10 VDC or 2...10 VDC (standard)
Connecting voltage	24 VAC (50/60 Hz) / DC ±20%
Power consumption	2.5 W / 4.5 VA
Angle of rotation	max. 95° (changeable from outside)
Direction of Rotation	changeable from outside
Running time	60...120 s @ 90°
Torque	8 Nm
Connection	cable 900 mm / 0.75 mm ²
Safety class	III
Protection	IP54 (cable downwards)
Dimensions	115 x 65 x 61 mm
Ambient temperature	-20...+50°C
Maintenance	maintenance-free
CE	73/23 EWG, 89/336 EWG
Weight	530 g

Adjustment of the angle of rotation (fig. 1)

Both end stops are adjusted to 0° and 90°. For smaller rotation angles, loosen the screws at the metal end stop, adjust the end stops as requested, and fasten the screws again.

Fixing of the shaft (fig. 1)

by the locking clamp to the damper shaft: □ 8...12 mm
 ∅ 8...16 mm



Adjustments (fig. 2)

Angle of rotation :

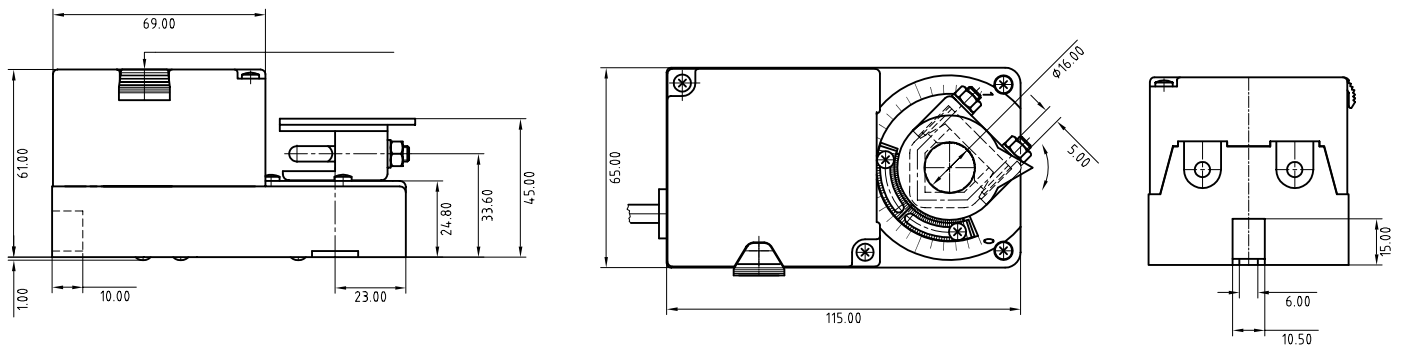
The actuator is adjusted to clockwise direction by the factory => "R". For changing the direction of rotation, turn the adjusting knob to "L".

Regulation range :

The actuators are supplied with the (0) 2...10 VDC for the regulation range 0° to 90°. A smaller angle (proportional) can be chosen, where the regulation range (0) 2...10 VDC goes for. The actuator must be switched off for doing so.

Technical drawing

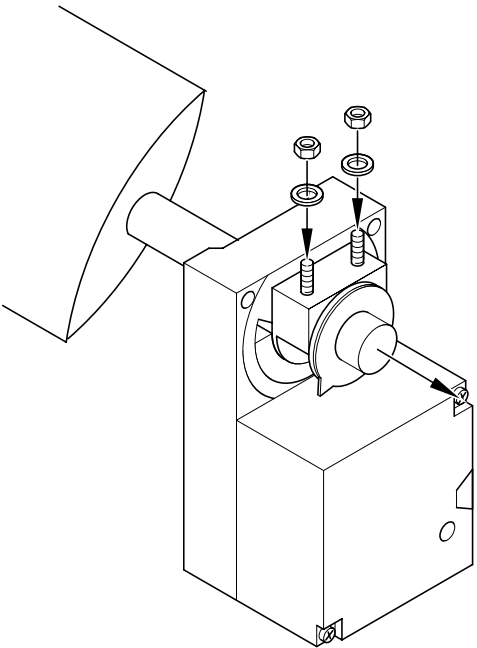
227C-024-08



Fixing by the locking clamping

Figure 1

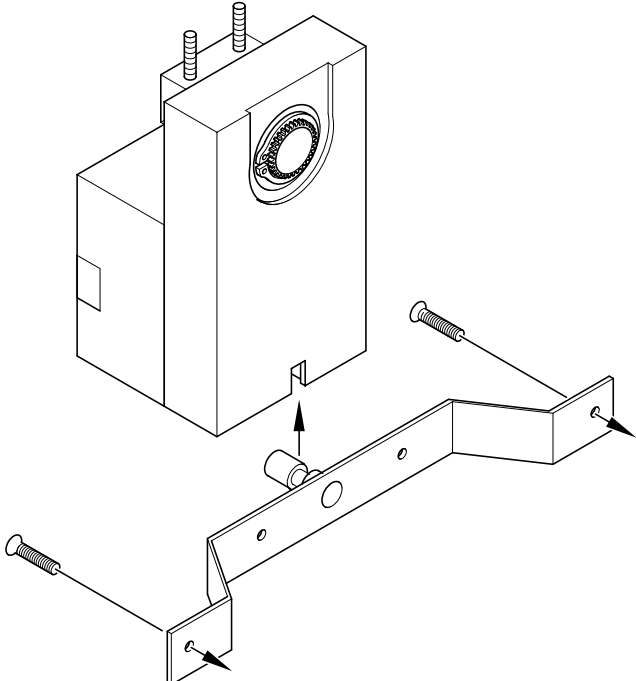
Direct mounting by the locking clamp to the damper shaft
(shaft: □ 8 - 16 mm or ∅ 8 - 12 mm)



Fixing by the anti-torsion bow

Figure 2

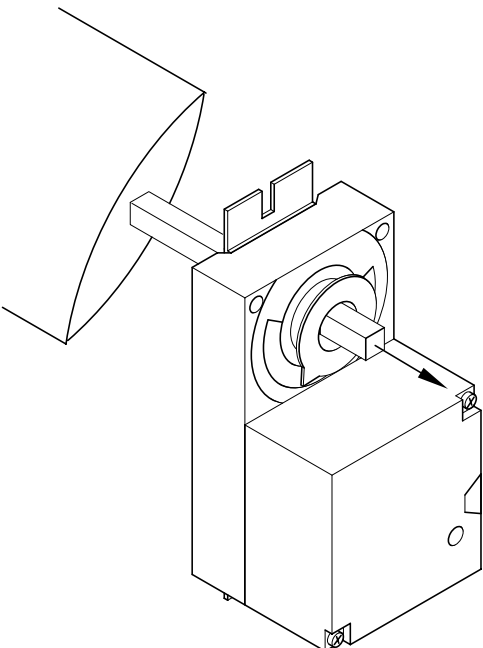
Fixing by the enclosed anti-torsion bow.



Form locking shaft and flange fixing

Figure 3

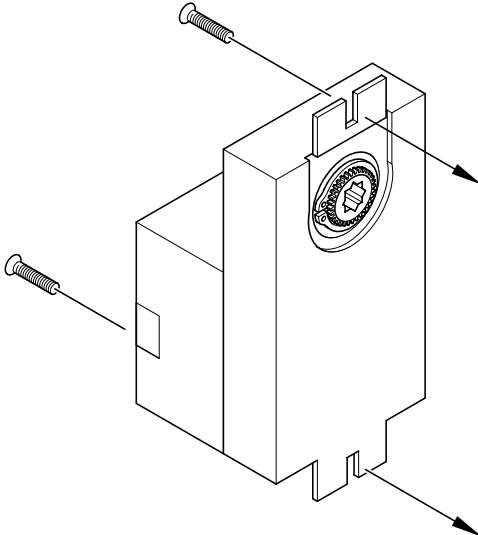
Direct mounting by plug-on to the damper shaft
(shaft: □ 8 mm)



Form locking shaft and flange fixing

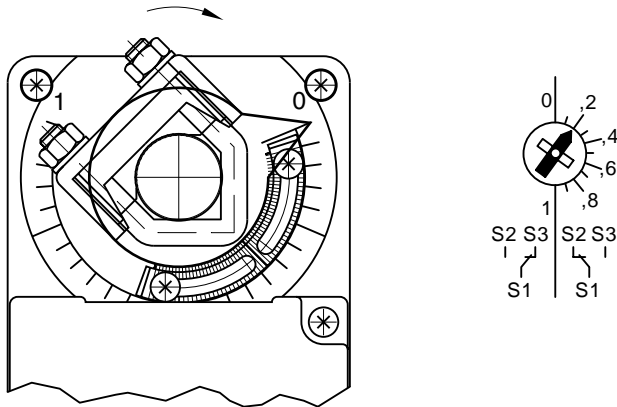
Figure 4

Fixing of the 2 flanges by screws M5.



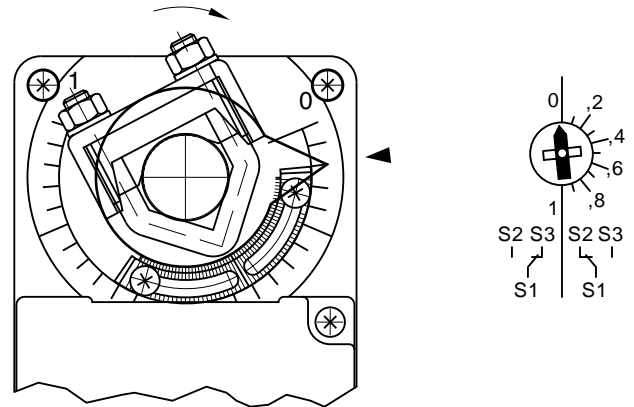
Actuator is placed at 0° on the end stop

Turn the adjusting knob from 0 to the right until the tip indicates the requested switching position ".2" (20% of the angle of rotation). The actuator turns to the right and the switch switches at 20% of the angle of rotation (operating position S1-S3).



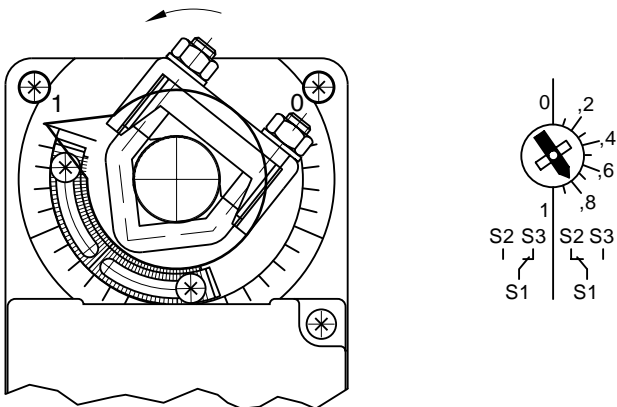
Actuator at operating position

Press the unlocking button and turn the drive to the requested operating position, i.e. 20% of the angle of rotation. Turn the adjusting knob to "0" and pass with the tip slightly. As a result, 20% of the angle of rotation are adjusted (operating position S1-S3).



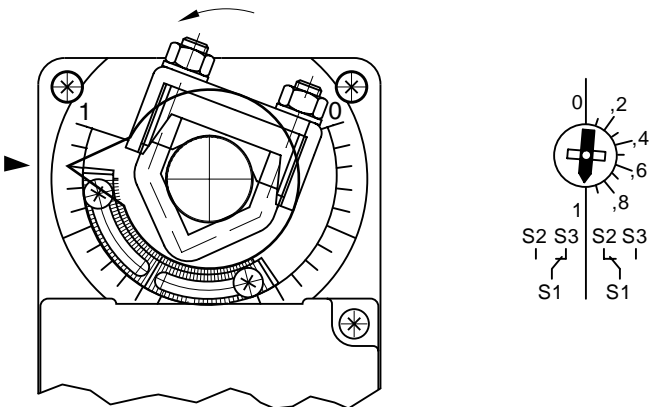
Actuator is placed at 90° on the end stop

Turn the adjusting knob from 1 to the left until the tip indicated the requested switching position, i.e. ".8" (20% of the angle of rotation). The actuator turns to the left and the switch switches at 20% of the angle of rotation (operating position S1-S3).

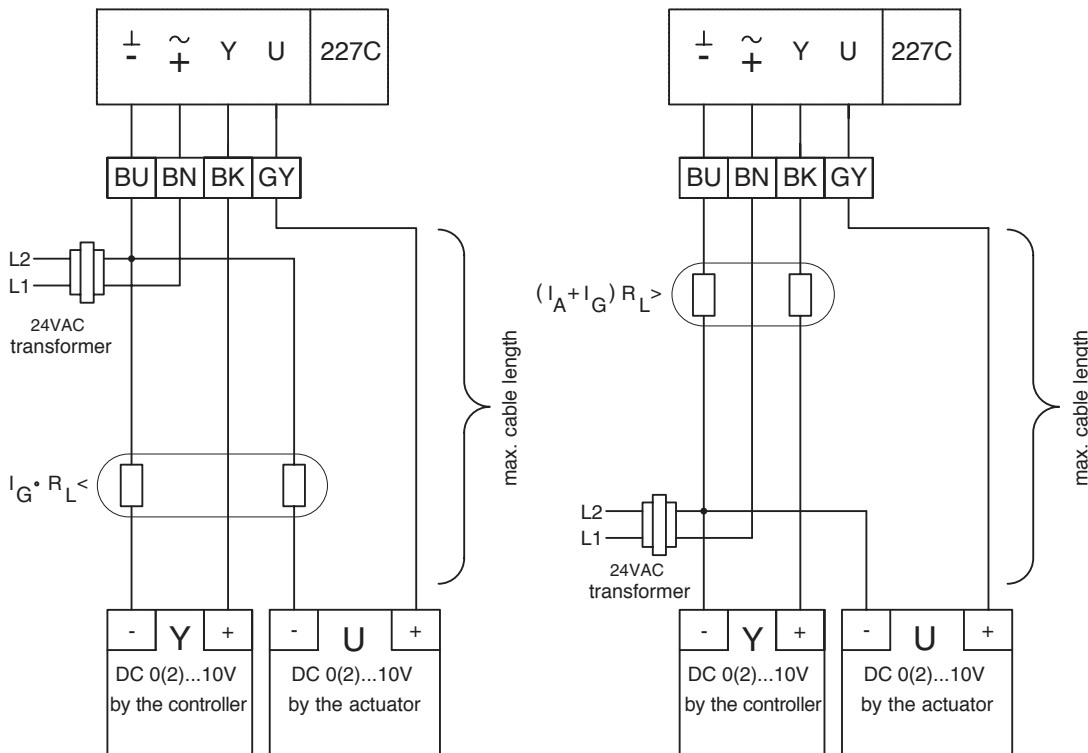


Actuator at operating position

Press the unlocking button and turn the drive to the requested operating position, i.e. 20% of the angle of rotation. Turn the adjusting knob to "1" and pass with the tip slightly. As a result, 20% of the angle of rotation are adjusted (operating position S1-S3).



Wiring configuration and recommended cable length



I_G ... current of set valve selector

I_A ... actuator current

$I_G \ll I_A$

R_L ... cable resistance

$$R_L = \frac{1}{\sigma} \times \frac{L}{A}$$

L ... cable length

A ... cable cross section

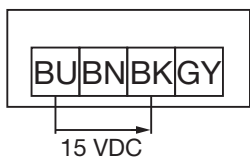
σ ... $56,2 \times 10^6 \text{ S/m}$

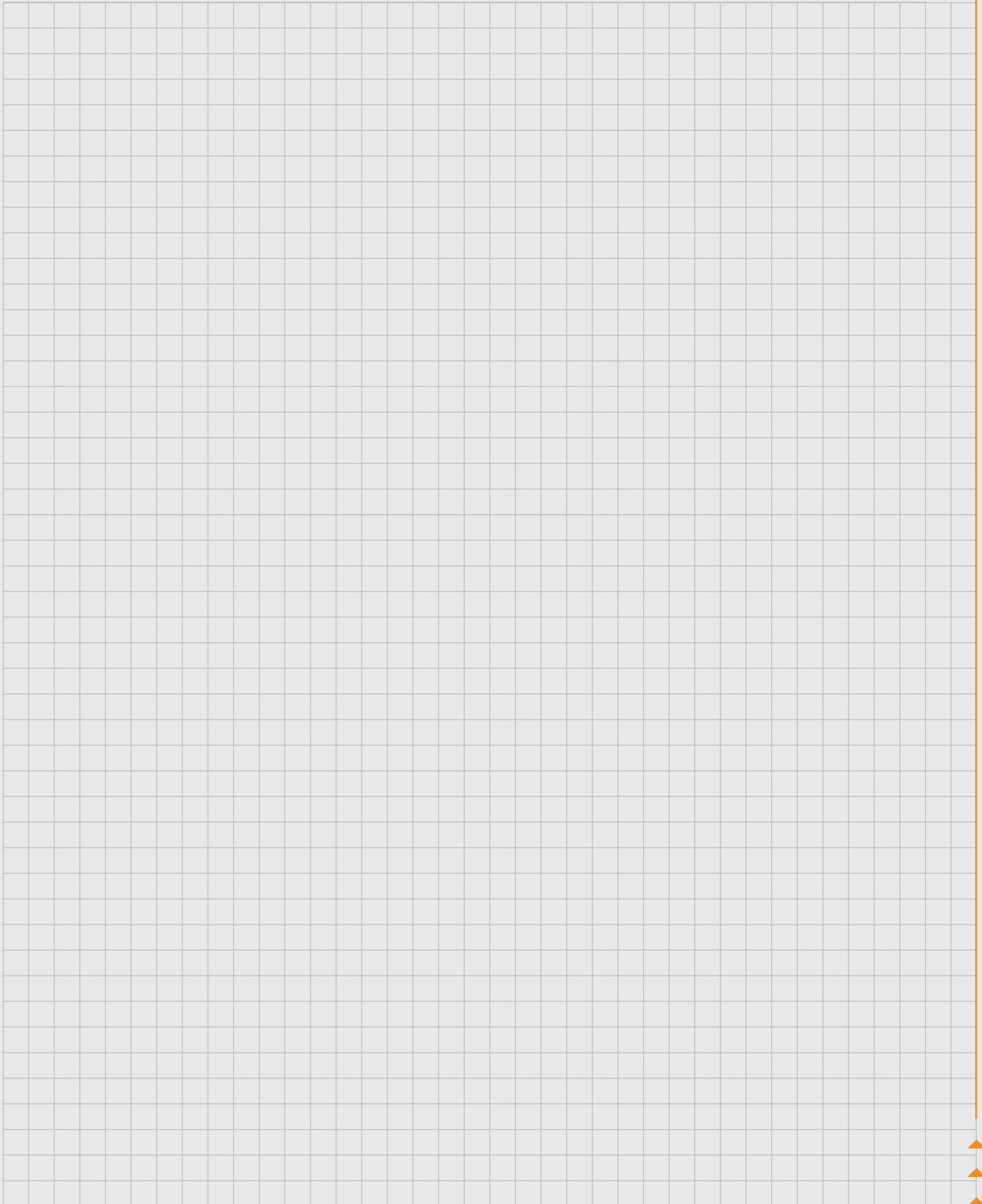
cable cross section	max. cable length
0,75 mm ²	23 m
1 mm ²	31 m
1,5 mm ²	46 m
2,5 mm ²	76 m

For several actuators switched in parallel the max. cable length must be divided by the number of actuators.

Teach-in of range of angle > 30°

1. Actuator stand by
2. Adjusting mechanical endstops
3. 15 VDC at Y
4. Power on actuator
5. Actuator starts teach-in process of range of angle (60...120 s)
6. Remove 15 VDC at Y





▶ ▶ ▶ YOUR WAY TO GRUNER

