

CAV controllers

RN

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Product overview

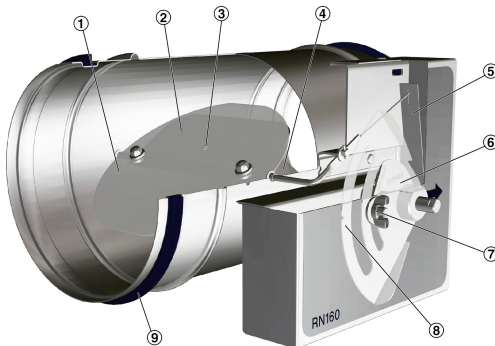


Fig. 1: RN

- ① Damper blade
- ② Bellows
- ③ Bellows inlet
- ④ Crossbar
- ⑤ Leaf spring
- ⑥ Cam plate
- ⑦ Volume flow rate scale lock
- ⑧ Scale
- ⑨ Lip seal

V_{\min} / V_{\max} actuator (optional)

Switching between two volume flow setpoint values,
e.g. for daytime and night-time operation

Fig. 2: V_{\min} / V_{\max} actuator

- 1 V_{\min} travel stop
- 2 V_{\max} travel stop

Important notes

Information on the installation manual

This manual enables operating or service personnel to correctly install the product described below and to use it safely and efficiently.

It is essential that these individuals read and fully understand this manual before starting any work. The basic prerequisite for safe working is to comply with the safety notes and all instructions in this manual.

The local regulations for health and safety at work and general safety regulations also apply.

Correct use

CAV controllers of the type RN are used for constant volume flow control in supply and extract air ducts of ventilation and ventilation systems.

Do not use CAV controllers in extract air systems in commercial kitchens unless the extract air has been cleaned as much as possible with high-sufficiency aerosol separators; see VDI 2052.

The installation of air terminal devices in humid rooms, areas with potentially explosive atmospheres or rooms with dust-laden or aggressive air has to be assessed for each individual case.

TROX Technical Service

To ensure that your request is processed as quickly as possible, please keep the following information ready:

- Product name
- TROX order number
- Delivery date
- Brief description of the fault

Online	www.troxtechnik.com
Phone	+49 2845 202-400

Qualified staff

HVAC technician

HVAC technicians are individuals who have sufficient professional or technical training in the field they are working in to enable them to carry out their assigned duties at the level of responsibility allocated to them and in compliance with the relevant guidelines, safety regulations and instructions. HVAC technicians are individuals who have in-depth knowledge and skills related to HVAC systems; they are also responsible for the professional completion of the work under consideration.

HVAC technicians are individuals who have sufficient professional or technical training, knowledge and actual experience to enable them to work on HVAC systems, understand any potential hazards related to the work under consideration, and recognise and avoid any risks involved.

Skilled qualified electrician

Skilled qualified electricians are individuals who have sufficient professional or technical training, knowledge and actual experience to enable them to work on electrical systems, understand any potential hazards related to the work under consideration, and recognise and avoid any risks involved.

Personal protective equipment

Personal protective equipment must be worn for any work in order to reduce health or safety hazards to the minimum.

The appropriate protective equipment for a job must be worn for as long as the job takes.

Industrial safety helmet



Industrial safety helmets protect the head from falling objects, suspended loads, and the effects of striking the head against stationary objects.

Protective gloves



Protective gloves protect hands from friction, abrasions, punctures, deep cuts, and direct contact with hot surfaces.

Safety shoes



Safety shoes protect the feet against crushing, falling parts, and slipping on slippery ground.

Limitation of liability

The information in this manual has been compiled with reference to the applicable standards and guidelines, the state of the art, and our expertise and experience of many years.

The manufacturer does not accept any liability for damages resulting from:

- Non-compliance with this manual
- Incorrect use
- Operation or handling by untrained individuals
- Unauthorised modifications

The actual scope of delivery may differ from the information in this manual for special constructions, additional order options or as a result of recent technical changes.

Transport and storage

Delivery check

Upon delivery, carefully remove the packaging and check the unit for transport damage and completeness. In case of any damage or an incomplete shipment, contact the shipping company and your supplier immediately. Put the product back into its packaging after the delivery check to protect it from dust and contamination.



Fixing and installation material

Fixing and installation material is not part of the supply package (unless stated otherwise), but has to be provided by others; it has to be suitable for the installation situation.

Transport on site



CAUTION!

Danger of injury from sharp edges, sharp corners and thin sheet metal parts!

Sharp edges, sharp corners and thin sheet metal parts may cause cuts or grazes.

- Be careful when carrying out any work.
- Wear protective gloves, safety shoes and a hard hat.

Please note:

- Be careful when unloading or moving the product, and pay attention to the symbols and information on the packaging.
- If possible, take the product in its transport packaging up to the installation location.
- Use only lifting and transport gear designed for the required load.
- Always secure the load against tipping and falling.
- Do not move bulky items just by yourself. Get help to prevent injuries and damage.
- Only lift or hold the control unit at the housing, not at the damper blade, at the flow rate adjustment or at the actuator.

Storage

Please note:

- Store the product only in its original packaging
- Protect the product from the effects of weather
- Protect the product from humidity, dust and contamination
- Storage temperature: -10 °C to 50 °C.
- Relative humidity: 95% max., no condensation

Packaging

Properly dispose of packaging material.

Technical data

Nominal sizes	∅ 80 – 400 mm
Volume flow rate range	11– 1400 l/s or 40 – 5040 m³/h
Volume flow rate control range	Approx. 25 to 100% of the nominal volume flow rate
Scale accuracy	± 4%
Minimum differential pressure	50 Pa (nominal size 80: 100 Pa)
Maximum differential pressure	1000 Pa
Operating temperature	10 – 50 °C

Technical data actuator

Actuator	B50/B52	B60/B62	B70/B72
	LM24A-F	LM230A-F	LM24A-SR-F
Supply voltage	24 V AC/DC	230 V AC/DC	24 V AC/DC
Mains frequency	AC: 50/60 Hz		
Power consumption – when running	1 W	1.5 W	1 W
Power consumption – when idle	0.2 W	0.5 W	0.4 W
Power rating	1.5 VA	3.5 VA	2 VA
Protection level	IP54		
IEC protection class	III	II	III
Setpoint value signal input	–	–	2 – 10 V DC, Ra > 100 kΩ
Actual value signal output	–	–	2 – 10 V DC, max. 1mA
Auxiliary switch S2A	B52	B62	B72
Ambient temperature	-30-50 °C		
Ambient humidity	5-90% rF		

Technical data on auxiliary switch S2A

Auxiliary switch	2 x EPU, 0...100%, adjustable
Switch rating	1 mA...3 (0.5 inductive) A, 250 V AC (II reinforced insulation), 1 mA...0.5 (0.2 inductive; L/R = 3.4 ms) A, 110 V DC (II reinforced insulation)
Switching points	Adjustable via the turning range 0...1 of the actuator. Pre-setting with scale possible.
Connection for auxiliary switch	Cable 1 m, 6 x 0.75 mm ²
Protection level	IP54
Ambient temperature	-30...50 °C
Ambient humidity	Max. 95% rh, no condensation

Dimensions and weight

Variant RN-S

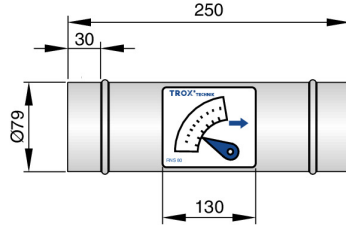


Fig. 3: RN-S, nominal size 80

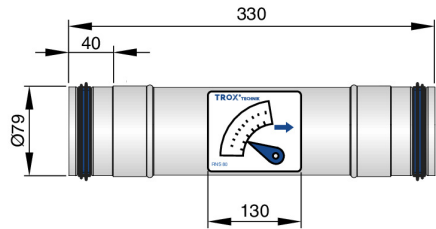


Fig. 4: RN-S-D2, nominal size 80 (with lip seal)

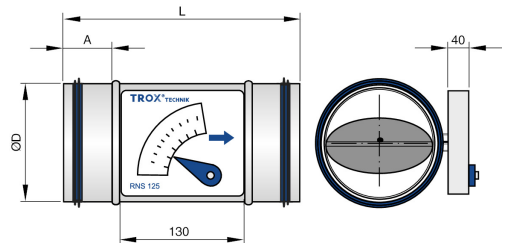


Fig. 5: RN-S nominal size 100,125

Nominal-size	ØD	L	A	RN
	[mm]			[kg]
80				1.4
100	99	250	50	1.8
125	124			2.0

Variant RN (only nominal size 80)

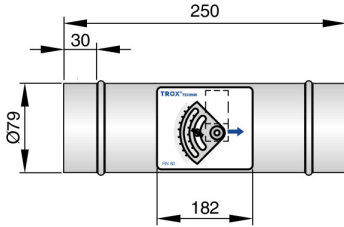


Fig. 6: RN, nominal size 80

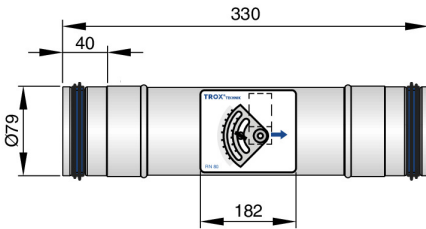


Fig. 7: RN-D2, nominal size 80, with lip seal

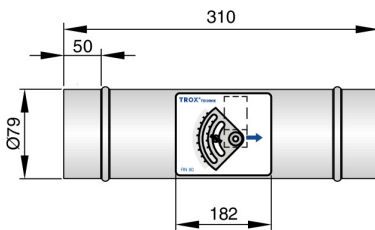


Fig. 8: RN-A2 nominal size 80, stainless steel

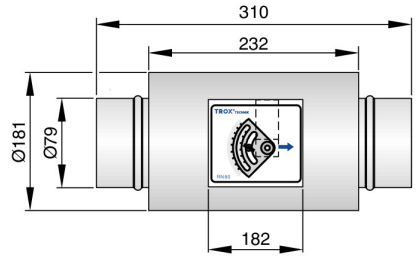


Fig. 9: RN-D, nominal size 80, with acoustic cladding

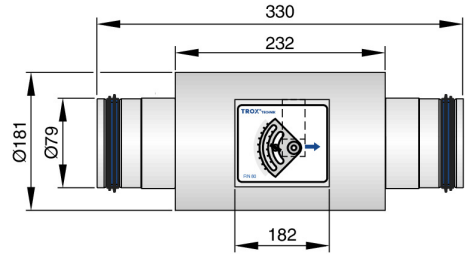


Fig. 10: RN-D, nominal size 80, with acoustic cladding and lip seal

Nominalsize	RN	RN-D
	[kg]	
80	1.4	2.2

Variant RN (nominal size 100-400)

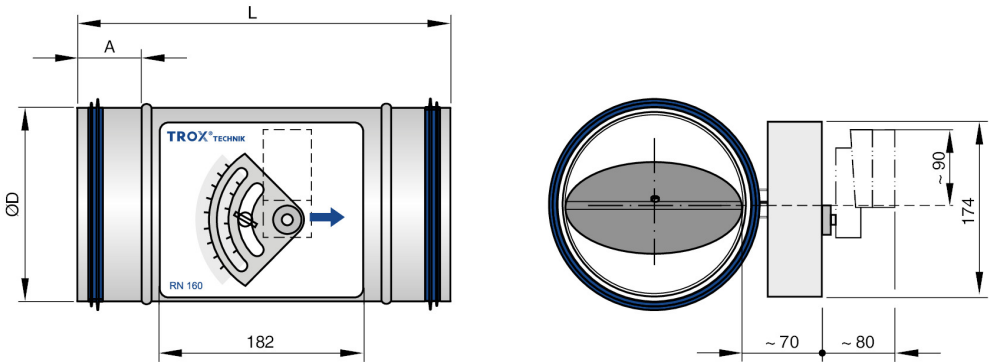


Fig. 11: Variant RN

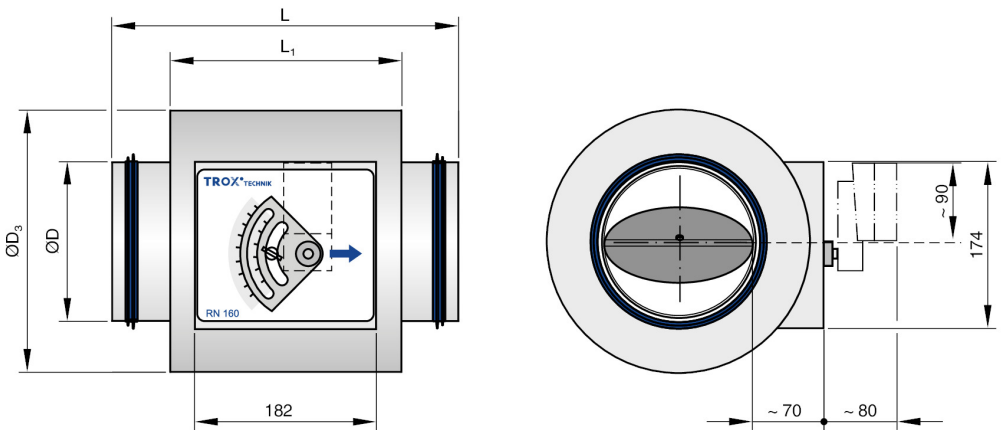


Fig. 12: Variant RN-D (with acoustic cladding)

Nominalsize	ØD	D ₃	L	L ₁	A	RN	RN-D
	[mm]					[kg]	
80	79	181	310	232	50	1.4	2.2
100	99	200				1.8	3.6
125	124	220				2.0	4.0
160	159	262	2.5	5.0			
200	199	300	3.0	6.0			
250	249	356	400	312		3.5	7.3

Nominalsize	ØD	D ₃	L	L ₁	A	RN	RN-D
	[mm]					[kg]	
315	314	418				4.8	9.8
400	399	500				5.7	11.8

Variant RN-FL and RN-D-FL

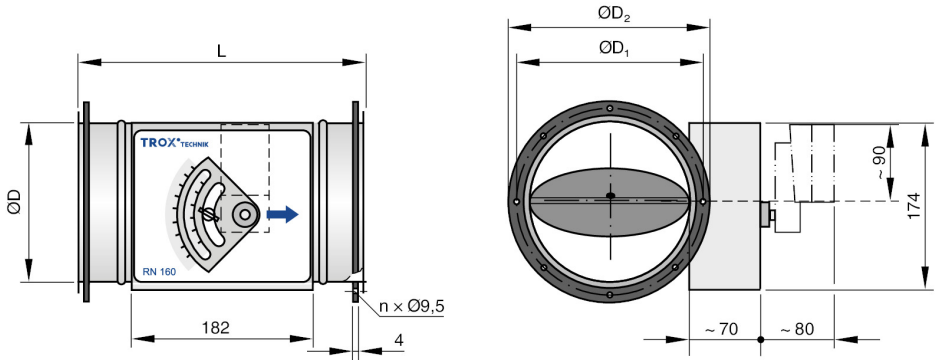


Fig. 13: Variant RN-FL (with flange)

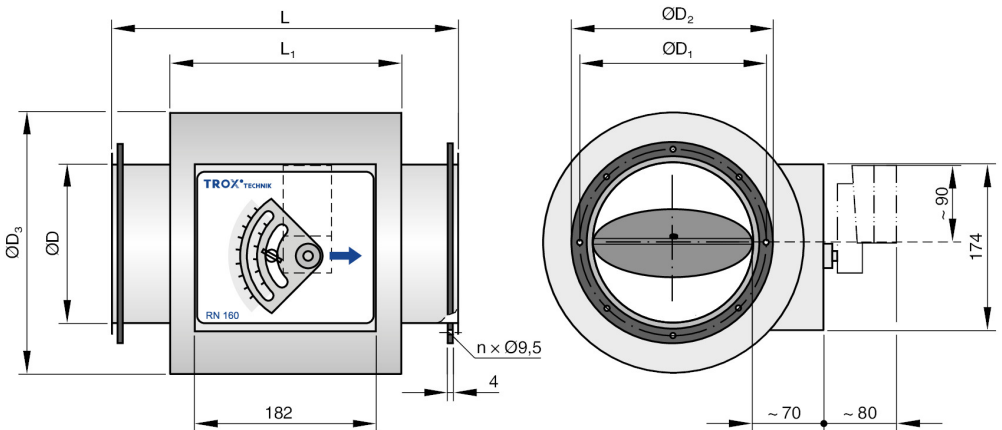


Fig. 14: Variant RN-D-FL (with acoustic cladding and flange)

Nominalsize	ØD	D ₁	D ₂	D ₃	L (RN-FL)	L (RN-D-FL)	L ₁	n	RN-FL	RN-D-FL
	[mm]							Number	[kg]	
100	99	132	152	200	290	370	232	4	2.4	4.2
125	124	157	177	220					2.7	4.7

Nom- inalsize	ØD	D ₁	D ₂	D ₃	L (RN-FL)	L (RN-D-FL)	L ₁	n	RN-FL	RN-D-FL
	[mm]							Number	[kg]	
160	159	192	212	262				6	3.5	6.0
200	199	233	253	300					4.4	7.4
250	249	283	303	356					5.3	9.1
315	314	352	378	418	380	460	312	8	7.3	12.3
400	399	438	464	500					9.6	15.7

Installation

Installation orientation

Any installation orientation.

When installing in horizontal ducting, the operating side (rotary knob) must be arranged laterally (right/left) or below.

Observe airflow direction!

Upstream conditions

The volume flow rate accuracy of CAV controllers applies to a straight upstream section of the duct. Bends, junctions or a narrowing or widening of the duct cause turbulence that may affect volume flow rate measurement. Depending on the respective installation situation, information on the straight duct section upstream of the control unit must be observed.

Duct connections, e.g. branches off the main duct, must comply with EN 1506.

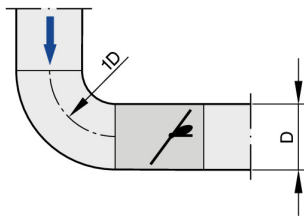


Fig. 15: Bend

A bend with a curvature radius of at least $1D$ – without an additional straight duct section upstream of the CAV controller – has only a negligible effect on the volume flow rate accuracy.

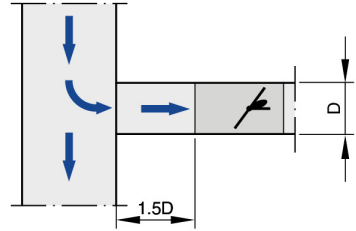


Fig. 16: Junction

A junction causes strong turbulence. The stated volume flow rate accuracy ΔV can only be achieved with a straight duct section of at least $1.5D$ upstream. If there is no straight upstream section at all, the control will not be stable, even with a perforated plate.

Note: if there is a shut-off damper installed in the flow direction upstream of the RN controller, ensure that the shut-off damper is installed so that its damper blade shaft is located opposite the damper blade shaft of the RN and rotated by 90° .

Installing the CAV controller

Personnel:

- HVAC technician

Protective equipment:

- Industrial safety helmet
- Protective gloves
- Safety shoes

Before you install the product, take suitable precautions to protect air distribution components from contamination during installation (VDI 6022). If this is not possible, at least cover the product or take other precautions to protect it from contamination. In this case you have to ensure that the product cannot be started. Ensure that all components are clean before you install them. If necessary, clean them thoroughly. If you have to interrupt the installation procedure, protect all openings from the ingress of dust or moisture.

For installation please note:

- Fix the product only to load-bearing structural elements.
- Load suspension systems only with the weight of the product. Adjacent components and connecting ducts must be supported separately.
- Use only approved and adequately sized fixing material (fixing material is not included in the supply package).
- The product must remain accessible for maintenance even after installation.
- **Important:** If there is a risk that the controller could be subject to mechanical impact during operation, protect it accordingly; protection has to be provided by others.

Be careful to not damage the controller accidentally:

- Handle the unit with care.
- Lift the unit only by lifting the entire casing.

- Do not lift the unit or device by holding the damper blade only.

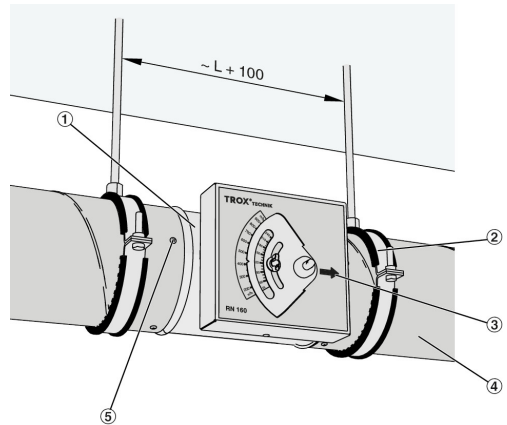


Fig. 17: Installation example

1. ▶ Pre-assemble suspensions (Fig. 17/2) at the installation location, at a distance of approx. $L+100$ mm.
2. ▶ Assemble the duct (Fig. 17/4) and lead it up to the installation location of the controller.
3. ▶ Push the spigot of the CAV controller (Fig. 17/1) into the duct; note the airflow direction marked by the arrow (Fig. 17/3).
4. ▶ Push the duct (Fig. 17/4) onto the other spigot.
5. ▶ Fix the ducts and the controller to the suspension system.
6. ▶ Fix the controller to the duct using screws or rivets (Fig. 17/5).

For version with acoustic cladding (RN-D)

- Insulate ducts up to the acoustic cladding of the control unit (on-site).

Wiring

The CAV controller is equipped with mechanically adjustable volume flow rate setpoint value adjustment. In the standard construction, the controller is operated without an external power supply, the desired volume flow rate setpoint value is manually adjusted on the scale. This setpoint value adjustment can optionally be electrified with one of the following attachments.

Attachments

- B50/B60 - Min-max actuator
- B52/62 - Min-max actuator with auxiliary switch
- B70 - Modulating actuator
- B72 - Modulating actuator with auxiliary switch

The attachments are available as a factory standard option or as a retrofit.

The actuators enable electrical control of recurring setpoint value adjustments, e.g. for day/night switchover or for a temperature-based setpoint value adjustment. Volume flow rate actual value feedback or a shut-off function is not principally available with CAV controllers, as the volume flow rate is regulated but not measured and there is no shut-off position.



DANGER!

Danger of electric shock! Do not touch any live components! Electrical equipment carries a dangerous electrical voltage.

- Only skilled qualified electricians are allowed to work on the electrical system.
- Switch off the power supply before working on any electrical equipment.

Installation instructions

For installation, the supply voltage and, if necessary, signal lines, must be connected for electrical actuators.

The connection is made according to the information given on the actuators or connection diagrams in this manual. These must be observed for project-specific wiring diagrams. The voltage ranges and the terminal connections specified on the actuators must be observed!

Personnel:

- Skilled qualified electrician

Please note during installation:

- Legal and official regulations, in particular VDE guidelines.
- Consideration of the technical connection rules (TCR) of the local network operators.
- Wiring work for supply voltage and signal lines on site.
- The rating and manufacture of customer-side connections and wiring must be carried out in accordance with the recognised rules of electrical engineering.
- Observe wiring guidelines and project-specific circuit diagrams of the actuators.
- The electrical connection to the actuator may only be made if the installation has been carried out correctly.
- The 24 V supply voltage may only be supplied with a safety transformer.
- If several actuators are connected to a 24 V mains supply, it must be ensured that a common zero or ground line is defined and not interchanged.
- The actuator contains no parts that can be replaced or repaired by the user and may only be opened by the manufacturer.
- Lay connecting cables in such a way that they cannot be accidentally damaged by mechanical impact or by heat.

Strain relief

Devices that are permanently installed in buildings are stationary electrical equipment for which no strain relief on the connecting cables is prescribed.

Connection diagram V_{min} - V_{max} switchover B50/52, B60/62

Typical area of application:

- Use of two volume flow rate setpoint values, e.g. for day/night switchover
- Basic ventilation + temporary shock ventilation

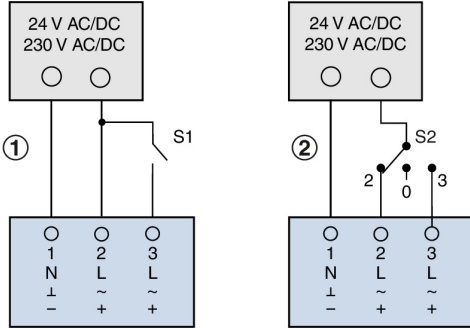


Fig. 18: Connection diagrams actuator B50/52, B60/62

- 1-wire control
- 3-point control

S1	S2	Function
-	Pos. 0	Actuator has stopped (undefined position)
open	Pos. 2	V_{min}
Closed	Pos. 3	V_{max}

Colour assignment of the connecting cables B50/52, B60/62

Item	Colour	Connection	AC	DC
1	BU	Supply	N	GND
2	BN	Supply	L	+
3	BK	Switch input	L	+

Connection diagram variable volume flow B70/72

Typical area of application:

- Use of various volume flow rate setpoint values, e.g. via a control input signal from a temperature controller.

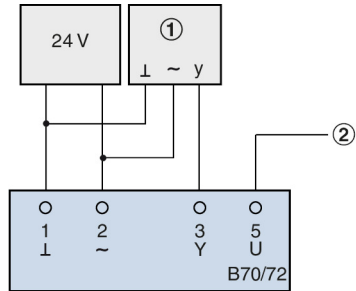


Fig. 19: Constant control input signal B70/72

- Room temperature controller
- Actual value output (value to be set on scale)

Colour assignment of the connecting cables B70/72

Item	Colour	Connection	AC	DC
1	BK	Supply	N	GND
2	RD	Supply	L	+
3	WH	Signal Y (setpoint value)		
5	OG	Signal U (actual value)		

Room temperature control Fig. 19

A suitable room temperature controller or a DDC outstation with 2-10 V DC output is connected with 2 wires (wire 1 and 3). With a common supply voltage of 24 V, note that wire 1 is also ground for the control signal.

Override control: with 24 V DC on wire 3, the volume flow rate is set at the V_{max} stop.

Connection for auxiliary switch

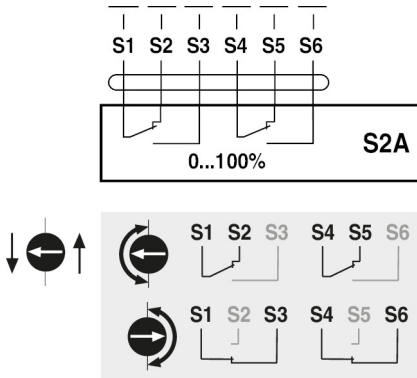


Fig. 20: Connection

Cable colours:

- S1 = violet
- S2 = red
- S3 = white
- S4 = orange
- S5 = pink
- S6 = grey

Initial commissioning

Before you start commissioning:

- Ensure that the device or unit has been correctly fixed and connected to the ducting.
- Ensure that the devices or units as well as the ventilation system are clean and that there are no residual matter and foreign objects.
- **Important:** If there is a risk that the controller could be subject to mechanical impact during operation, protect it accordingly; protection has to be provided by others.

For commissioning see also VDI 6022, part 1 – 'Hygiene requirements for ventilation and air-conditioning systems and units'.

Volume flow rate setting ranges

Nominal size	\dot{V} [l/s]		\dot{V} (m³/h)	
	min	max	min	max
80	11	45	40	162
100	22	90	79	324
125	35	140	126	504
160	60	240	216	864
200	90	360	324	1296
250	145	580	522	2088
315	230	920	828	3312
400	350	1400	1260	5040

Setting the volume flow rate

Sufficient duct pressure must be ensured for all operating conditions and for all control units. The measurement points for fan speed control must be selected accordingly.

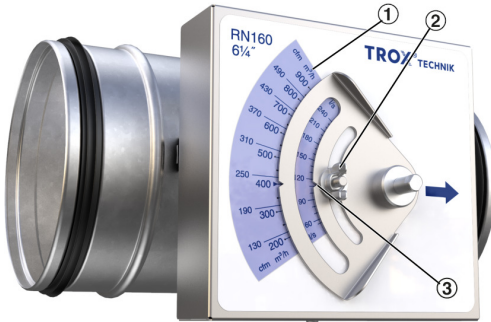


Fig. 21: Setting the volume flow rate

1. ▶ Loosen the wing screw (Fig. 21/2).
2. ▶ Set the notch on the adjustment scale to the desired value on the volume flow rate scale (Fig. 21/3) and fix with the wing screw (Fig. 21/2).

No further measurement or adjustment is necessary.

Electrical adjustment of the target volume flow rate

V_{min} / V_{max} actuator (B50/B52/B60/B62)

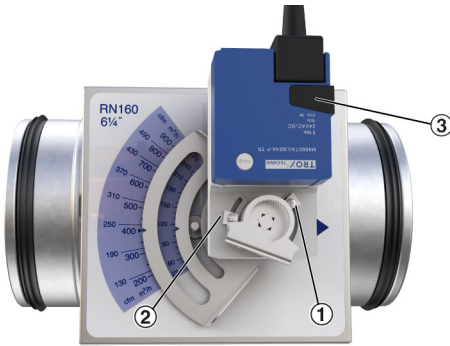


Fig. 22: Setting the volume flow rate

When ordering the volume flow controller RN with actuator, the volume flow rate values specified in the order code V_{min} and V_{max} are set in the factory on the rotation stops (Fig. 22/1) and (Fig. 22/2). Subsequent changes are possible by moving the rotation stops. To turn the adjustment scale, the drive of the actuator can be disengaged via push button (fig. (Fig. 22/3)). Set the value for V_{min} (Fig. 22/1) and V_{max} (Fig. 22/2) with the aid of the stops.

Modulating actuators B70/72

The actuator's complete rotation angle of 95° is then shown in the control area with the Y signal of 2-10 V. The voltage range belonging to the requested scale range V_{min} .. V_{max} can be determined using the following table. Control signal and the corresponding volume flow rate scale value must be checked on the RN and the scale specific to the nominal width.

Control signal	Angle position setpoint value
0 V	0°
1 V	0°
2 V	0°
3 V	≈ 12°

Control signal	Angle position setpoint value
4 V	≈ 24°
5 V	≈ 36°
6 V	≈ 48°
7 V	≈ 59°
8 V	≈ 71°
9 V	≈ 83°
10 V	≈ 95°

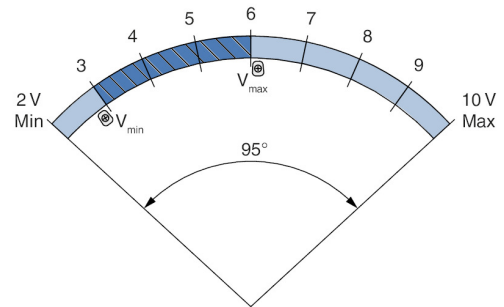


Fig. 23

- Mechanical setting range 2...10 V
- The operating range is a sub-section of the setting range
- The electrical voltage signal 2...10 V corresponds to the setting range of 95°, in this example $V_{min} = 3 V$ and $V_{max} = 6 V$.
 - 0...3 V ⇒ V_{min} (mechanical stop)
 - 3...6 V ⇒ operating range
 - 6...10 V ⇒ V_{max} (mechanical stop)

i Actual value signal

The actual value signal corresponds to the current actuator position in the scale range and is not a measure of the actual volume flow rate, since the CAV controller does not measure the volume flow rate but only controls it using the aerodynamic forces.

Maintenance and cleaning

Maintenance

It is the system owner's duty to set up a maintenance schedule, taking the actual operating conditions (contamination, operating time etc.) of the ventilation system into consideration.

Important: Do not lubricate the bearings of the damper blade.

Maintenance jobs to be carried out regularly:

- Visually check the controller for contamination, damage and corrosion. Remove contamination; if the controller has been damaged, or if there is any corrosion, replace the controller.
- Check the fixing of the controller and of the connected ductwork.

Replacement parts and retrofitting

Incorrect replacement parts



WARNING!

Risk of injury from the use of incorrect replacement parts!

Incorrect or faulty replacement parts pose a risk to health and safety, and their use can cause malfunction, damage to property and total failure of equipment.

- Use only original replacement parts from TROX.

Retrofitting electric actuator

The RN controller can easily be retrofitted with an electric actuator.

Order code for retrofit kits:

NR-VAV-RN-B50	24 V AC / DC actuator min / max switching
NR-VAV-RN-B60	230 V AC / DC actuator min / max switching
NR-VAV-RN-B70	24 V AC / DC constant actuator for variable operation

NR-VAV-RN-S2	Auxiliary switch S2A (identical to attachment B*2)
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Cleaning

Please note:

- The cleaning intervals given in the VDI 6022 standard apply.
- Clean surfaces with a damp cloth.
- Use only common household cleaners, do not use any aggressive cleaning agents.
- Do not use cleaning agents that contain chlorine.