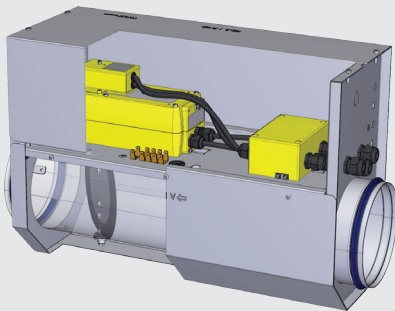





Operating and Installation Manual

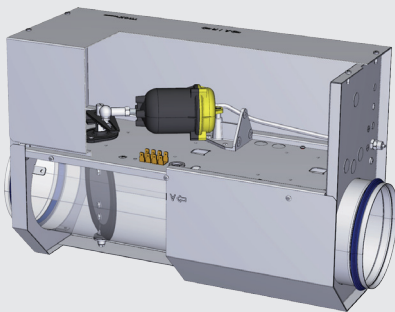
Shut-off damper Type AK-Ex with control components T0* and P50

AK-Ex with electric actuator



 II 2G c II TX
II 2D c II T 80 °C

AK-Ex with pneumatic actuator



 II 2G c IIB TX



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1 General information

This operating manual describes Type AK-Ex shut-off dampers with the following control components:

- Electric actuator (T0*)
- Pneumatic actuator (P50)

To ensure complete functioning of the unit it is essential to read the provided operating manual before starting any work, and to comply with it. This manual must be given to the system owner when handing over the system. The system owner must include the manual with the system documentation.

The manufacturer does not accept any liability for any malfunction or damage resulting from non-compliance with this manual or non-compliance with relevant statutory regulations.

This operating manual is intended for specialist consultants, developers, and system owners. This manual is also intended for people conducting the following work:

- Transport and storage
- Installation
- Electrical wiring
- Pneumatic tubing
- Commissioning
- Operation
- Maintenance and cleaning
- Troubleshooting
- Decommissioning, removal and disposal

Other applicable documentation

In addition to this operating manual, the following documents apply:

- Type examination certificate TÜV 05 7218 X for AK-Ex shut-off damper with electric or pneumatic actuator
- Instruction manuals for electric control components (manufacturer's instructions)
 - Explosion-proof actuators ExMax-5.10Y and YF
 - Terminal box ExBox-Y/S-SW
 - Auxiliary switch ExSwitch (optional)
- Instruction manuals for pneumatic control components (manufacturer's instructions)
 - Pneumatic actuator AK31 (up to nominal size 250)
 - Pneumatic actuator AK41 (from nominal size 315)
- Project-specific wiring documents

Symbols used in this manual



Danger!

Designates danger to life and limb due to electrical voltage.



Warning!

Designates danger to life and limb.



Important!

Designates danger that can cause minor personal injury or damage to property.



Note!

Designates important notes or information.

2 Safety and correct use

General information regarding safety

Only specialist personnel are allowed to perform the described work. Only skilled qualified electricians are allowed to work on the electrical system.

The installation location must be easily accessible and have sufficient clearance for electrical connection and maintenance.

It is essential to comply with the applicable regulations and generally recognised engineering practices when working. This applies in particular to the following German country specific regulations or as appropriate in the country where the installation is taking place:

- ATEX directive 94/9/EG = Explosionsschutzverordnung (11. ProdSV)
- Machinery Directive 2006/42/EC = Machinery Ordinance (9th ProdSV)
- Industrial Health and Safety Regulations (BetrSichV)

as well as the following accident prevention regulations:

- Principles of prevention (BGV A1)
- Electrical systems and operating equipment (BGV A3)

Standards and guidelines

The requirements in DIN VDE 0100 Part 610 apply to the initial test in all cases.

Comply with the following rules when operating the system:

- EN 50110-1 (VDE0105 Part 1)
- EN 50110-2 (VDE0105 Part 2)
- VDE 0105-100 (VDE0105 Part 100)
- EN 60079-14 (VDE 0165 Part 1)
- EN 13463-1 (for pneumatic actuators)
- Industrial Health and Safety Regulations (BetrSichV)

The system must meet the applicable lightning protection requirements.

Compliance with all additional relevant national and international standards and regulations for potentially explosive atmospheres is required.

Repair and replacement parts

The AK-Ex shut-off damper has been specially developed for use in potentially explosive atmospheres. To maintain the protection function for explosive atmospheres, use only genuine TROX replacement parts for repair.

The AK-Ex shut-off damper must only be repaired by the manufacturer or by specialist personnel authorised by the manufacturer.

Environmental protection

- Dispose of packaging in an environmentally sound manner.
- Have used components or the used product only disposed of by an authorised company.

Correct use

AK-Ex shut-off dampers are intended to be used for shutting off volume flows in ventilation systems; they are suitable for use in areas with potentially explosive atmospheres.

The dampers can be used in air, gases, mists and vapours according to the ATEX classification given on each damper.

AK-Ex shut-off dampers with an electric actuator are also suitable for use in dust zones in areas with potentially explosive atmospheres. However, dust deposits on the shut-off damper casing must not exceed 5 mm.

Incorrect use

The shut-off damper must not be used

- In areas with potentially explosive atmospheres for which the damper has not been approved
- In dust-laden air if a pneumatic actuator is used with the damper
- In aggressive atmospheres
- Use in ventilation systems in which high levels of dust and pollution, extreme humidity, or chemical contamination may impair the function
- Use outdoors without sufficient protection against the effects of weather
- In wet areas

Modifying the unit or using replacement parts that have not been approved by TROX is not permitted.

Residual risks

TROX products are subject to strict quality controls during manufacturing. They also undergo functional tests before shipping.

Damage can, however, occur during transport or installation and impair the function of the fire damper.

The system owner has to check the correct function of the tunnel damper as part of commissioning and ensure it through regular maintenance while the unit is in use.

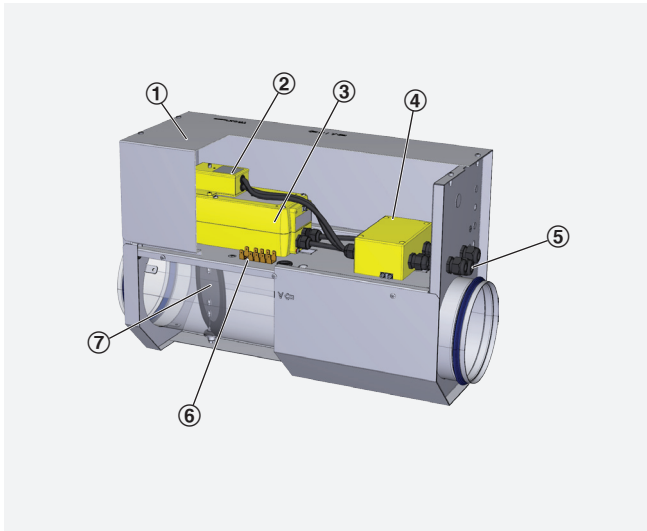
Under rare and unfavourable conditions and even when the mentioned regulations are complied with, the function of the shut-off damper with an electric actuator might be impaired by electromagnetic fields. This problem can usually be resolved by shielding or moving the electric actuator.

Foreseeable damage that might be caused by the failure of the shut-off damper should be anticipated and prevented.

3 Product description

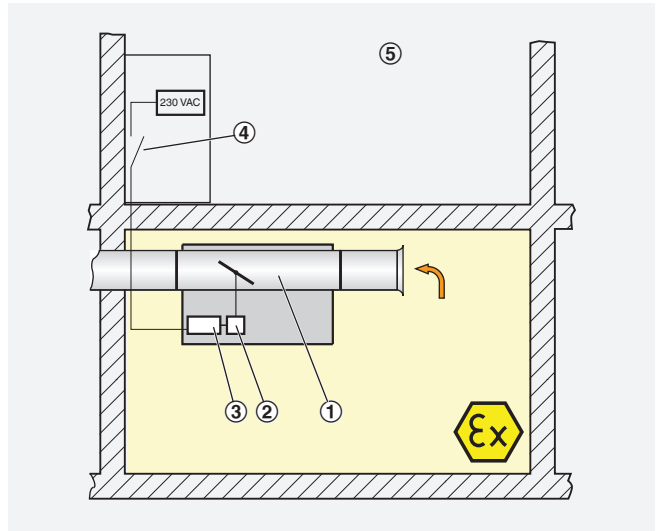
Electric actuator

Schematic illustration of the AK-Ex with electronic control



- ① Cover
- ② Auxiliary switch
- ③ Electric actuator
- ④ Terminal box
- ⑤ Cable bushing
- ⑥ Equipotential bonding
- ⑦ Damper blade

System diagram



- ① Shut-off damper
- ② Electric actuator
- ③ Terminal box
- ④ Switch (to be provided by others)
- ⑤ Safe area

Functional description

AK-Ex shut-off dampers are intended to be used for shutting off volume flows in ventilation systems; they are suitable for use in areas with potentially explosive atmospheres.

The damper is used to isolate parts of the ventilation system.

The damper consists of a casing with an electric actuator.

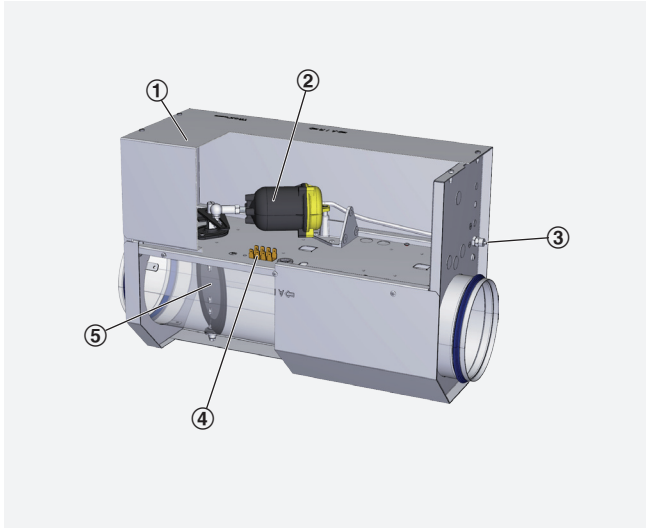
The actuator is controlled by a switch (by others) and moves the damper blade into OPEN or CLOSED position.

The damper is fitted with a plastic seal and provides minimal leakage shut-off according to EN 1751, Class 4 (Class 3 with nominal sizes 100 and 125).

3 Product description

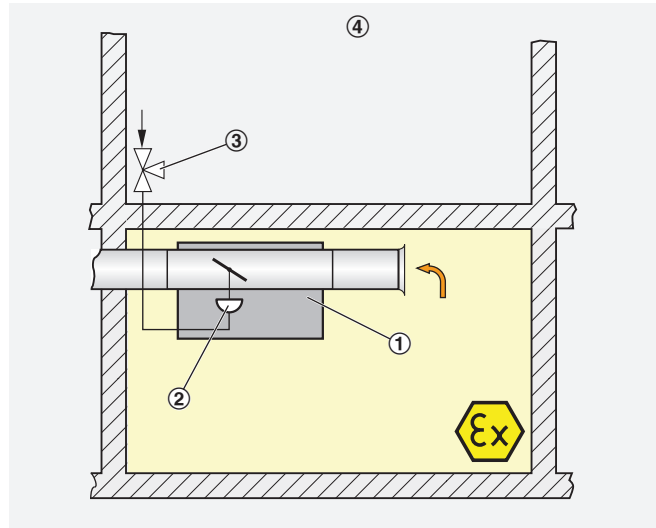
Pneumatic control

Schematic illustration of the AK-Ex with pneumatic control



- ① Cover
- ② Pneumatic actuator
- ③ Control signal connection
- ④ Equipotential bonding
- ⑤ Damper blade

System diagram



- ① Shut-off damper
- ② Pneumatic actuator
- ③ Valve or control signal 0 –1 bar (to be provided by others)
- ④ Safe area

Functional description

AK-Ex shut-off dampers are intended to be used for shutting off volume flows in ventilation systems; they are suitable for use in areas with potentially explosive atmospheres. The damper is used to isolate parts of the ventilation system.

The damper consists of a casing with a pneumatic actuator. The actuator is controlled by a switch (by others) and moves the damper blade into OPEN or CLOSED position.

The damper is fitted with a plastic seal and provides minimal leakage shut-off according to EN 1751, Class 4 (Class 3 with nominal sizes 100 and 125).

4 Operation

General

Opening the damper casing

Proceed as follows to open the casing:

- 1) Unscrew and remove screws **1** (4x) using a Phillips screwdriver.



Important!

Be careful to not damage the protective earth conductor.

The cover of shut-off damper casing is fitted with a protective earth conductor with a lockable blade receptacle connector.

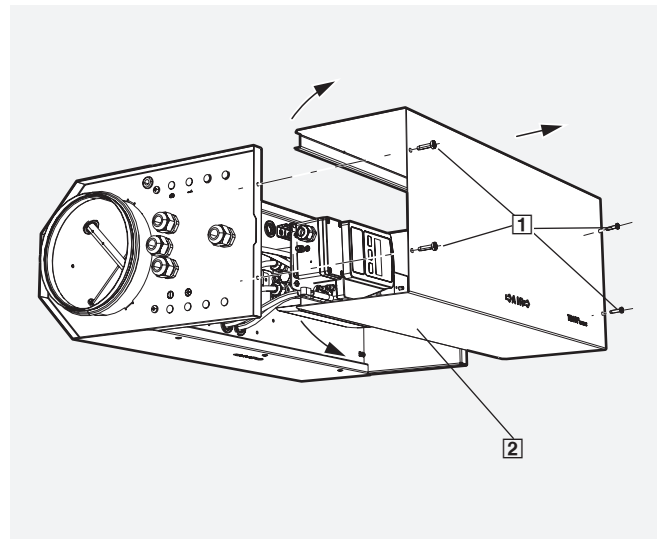
- Be careful when you open the damper casing.
- When pulling off the protective earth conductor, release the fuse by pressing the latch mechanism.

- 2) Press both side parts **2** of the cover slightly outwards using a screwdriver.
- 3) Lift the cover by hand such that you can pull off the protective earth conductor.
- 4) Remove the protective earth conductor from the cover.
- 5) Remove the cover and put it down.

Closing the damper casing

Proceed as follows to close the casing:

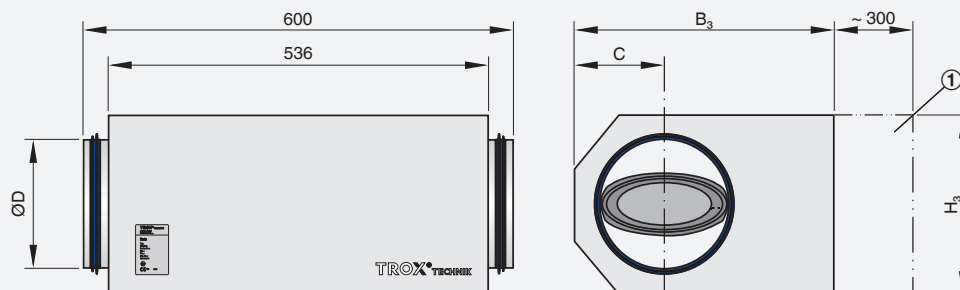
- 1) Attach the protective earth conductor to the cover (note which way the cover opens).
- 2) Put the cover back onto the damper casing.
- 3) Screw in and tighten screws **1** (4x) using a Phillips screwdriver.



5 Technical data

Product overview and dimensions

Dimensions of AK-Ex



① Keep clear to provide access for operation

Dimensions

Nominal size	ØD mm	B ₃ mm	H ₃ mm	C mm
125	124	372	221	129
160	159	372	221	111
200	199	463	311	182
250	249	463	311	157
315	314	627	461	289
400	399	627	461	246

Weights

Nominal size	AK-Ex/.../T0*	AK-Ex/.../P..
	m	m
	kg	kg
125	16.5	15.0
160	16.5	15.0
200	18.0	16.5
250	18.0	16.5
315	22.0	20.5
400	22.0	20.5

5 Technical data

Electric actuator:

Area of application and ATEX marking	
Operating temperature/humidity	+10 °C to +40 °C for T6 +1 °C to +50 °C for T5 Humidity according to EN60335-1
External casing protection level	IP 42
ATEX marking	
Atmosphere: Gases (gases, mists and vapours)	Zones 1 and 2 Ex II 2 G c II TX
Atmosphere: Dusts	II 2 D c II T 80 °C Zones 21 and 22

Actuator/spring return actuator	
Supply voltage ¹	24 – 230 VAC/DC 50/60Hz
Power rating ²	120 VA max.
Protection level	IP 66
IEC protection class	I (earthed)

¹ The inrush current is 3 to 5 times higher than the nominal current, with a pulse of a few milliseconds.

² Power consumption incl. inrush current.

Auxiliary switch			
Voltage		30 V	250 V
Inductive load AC	cos φ = 0.6	5 A	3 A
Inductive load DC	L/R = 3 μs	5 A	0.03 A
Protection level		IP 66	

Pneumatic actuator

Area of application and ATEX marking	
Operating temperature/humidity	0 °C to +50 °C
External casing protection level	IP 42
ATEX marking	
Atmosphere: Gases (gases, mists and vapours)	II 2 D c II B TX Zones 1 and 2
Atmosphere: Dusts	Not approved

Pneumatic actuator	
Operating pressure range	0.3...0.9 bar
Control pressure ¹	0...1.2 bar
Protection level	IP 20
Max. pressure	1.5 bar

¹ Required for achieving the actuator forces.

6 Transport, storage and packaging



Important!

Danger of injury from edges and sheet metal parts. Always wear protective gloves when handling the product.



Important!

Risk of damage to the shut-off damper. Handle the unit with care. Do not lift the shut-off damper by the actuator or the damper blade. Lift the unit only by lifting the entire casing.

Delivery check

Check delivered items immediately after arrival for transport damage and completeness. In case of any damage or an incomplete shipment, contact the shipping company and your supplier immediately.

A complete shipment includes:

- AK-Ex shut-off damper with electric or pneumatic actuator
- AK-Ex operating manual

Transport on site

If possible, take the AK-Ex shut-off damper in its transport packaging up to the installation location.

Storage

If the product has to be stored temporarily:

- Moisture and lack of ventilation can lead to oxidation, even on galvanised components. Remove any plastic wrapping in order to avoid oxidation.
- Protect the device from dust and contamination.
- Store the unit in a dry place and away from direct sunlight.
- Do not store the unit below -5 °C or above 60 °C.

Packaging

Properly dispose of packaging material.

7 Installation

Safety

Only specialist personnel are allowed to perform the described work on the shut-off damper.

Only skilled qualified electricians are allowed to work on the electrical system.

The personnel must have been trained and be aware of the special conditions that apply to areas with potentially explosive atmospheres.



Important!

Danger of injury from edges and sheet metal parts. Always wear protective gloves when handling the product.



Important!

Risk of damage to the shut-off damper. Handle the unit with care. Do not lift the unit by the actuator or the damper blade. Lift the unit only by lifting the entire casing.

Installation location

- Select the installation location for the shut-off damper such that the control components and inspection panels remain accessible. Provide at least 300 mm clear space for the cover to be opened.
- The installation orientation is not critical.

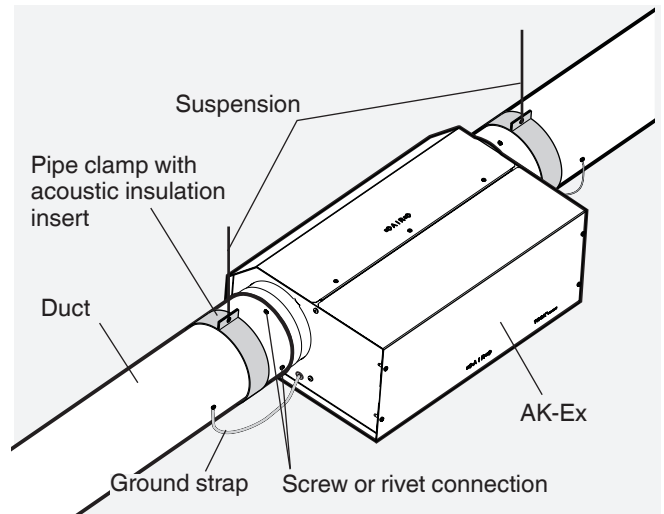
Installation

- Install the shut-off damper professionally, with a suitable suspension system, secured with locknuts. Load suspension systems only with the weight of the unit. Adjacent components and connecting ducts must be supported separately.
- Check the shut-off damper for contamination; clean it if necessary.
- Push ducts (DIN 1506 or EN 13180) onto the spigots; spigots are fitted with lip seals.
- Fix the shut-off damper with screws or rivets to the spigots such that it cannot be moved.
- For equipotential bonding, make an electrical connection by connecting the shut-off damper with the ground straps on both sides to the ducting. The connection should be self-locking.
- Connect the ducting to the terminal point for equipotential bonding of the building.



Note!

It is also possible to connect the shut-off damper directly to the terminal point for equipotential bonding of the building. The casing is fitted with a blade receptacle connector for this purpose.



8 Wiring

Electric actuator:



Danger!

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

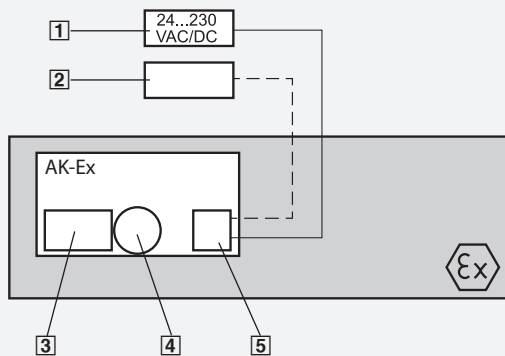
- Only skilled qualified electricians are allowed to work on the electrical system.
- Switch off the power supply before working on any electrical equipment.

Installation information

Connect the shut-off damper according to the following wiring diagrams. Comply with the following requirements and regulations:

- Guidelines of VDE (German association for electrical, electronic and information technologies) or appropriate national guidelines
- Local regulations and guidelines
- Wiring guidelines and project-specific circuit diagrams
- The standards and guidelines listed in chapter 2

Wiring diagram



- 1 Supply voltage 24 ... 230 V AC/DC (by others)
- 2 Shut-off signal (by others)
- 3 Actuator
- 4 Auxiliary switch (optional)
- 5 Terminal box
- Signal line
- Supply voltage

Notes on installation according to ATEX

The cables to be used must comply with ATEX. The type of protection for the unit must not be impaired by connecting cables. Irrespective of the type of protection, all cables to be used must have been tested and approved according to EN 50014, Appendix B (VDE 0170/0171, Part 1).

Further requirements on electrical installations in potentially explosive atmospheres can be found in EN 60079-14 (VDE 0165, Part 1). Section 9, for example, contains information on the connection of portable operating equipment.

General

All cables must be fed into the damper casing through the provided cable glands. The electrical connection is made in the explosion-proof terminal box, which has been approved for the relevant zones.

No loose terminals must be used in the terminal box. Once you have connected the cables, tighten the cable glands firmly in order to ensure IP protection (IP 66).

In areas with potentially explosive atmospheres unused openings for cable penetration must be sealed with certified dummy plugs.

Connecting the actuator

The connections for the supply voltage and signal lines of the actuator are made in the terminal box. The terminal box is inside the damper casing.

Note

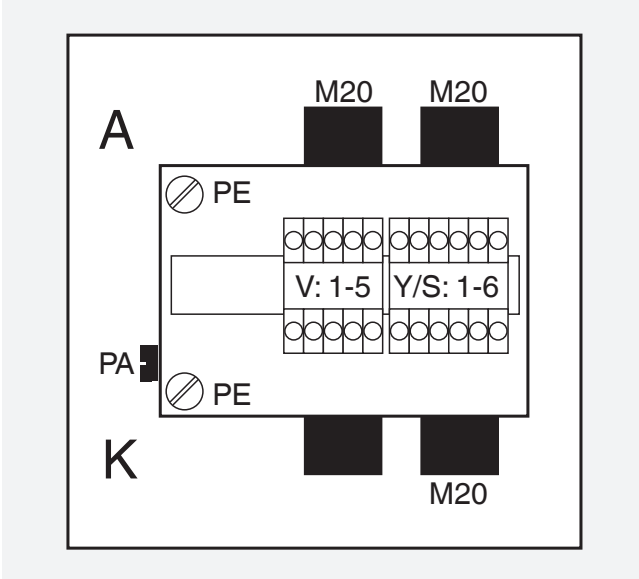
We recommend that you use screened cables for the signal lines of the actuator. Use separate grounds for the supply and signal cables.

8 Wiring

Electric actuator:

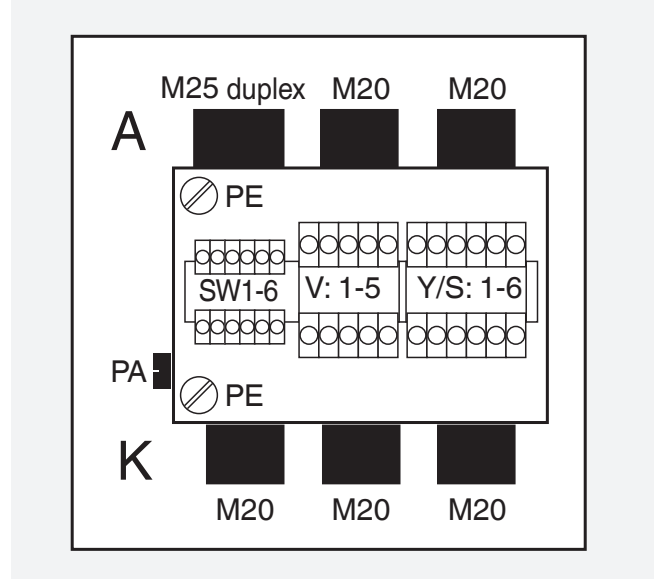
Terminal box connection assignment with electric actuator, with or without spring return

Without auxiliary switch



V: Terminals V (1-5) correspond to actuator cables A (1-5)
 Y/S: Terminals Y/S (1-6) correspond to actuator cables B (1-6)

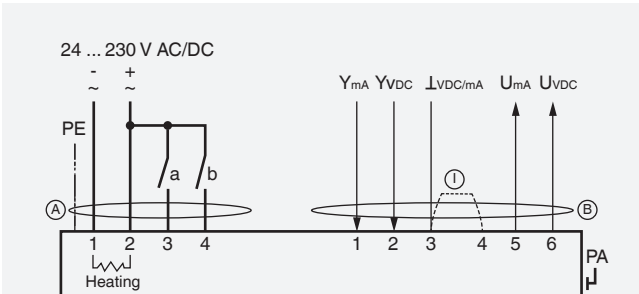
With auxiliary switch



V: Terminals V (1-5) correspond to actuator cables A (1-5)
 Y/S: Terminals Y/S (1-6) correspond to actuator cables B (1-6)
 SW: Terminals SW (1-6) correspond to ExSwitch connections HS1 (1-3) and HS2 (1-3)

ExMax connections

Modulating or 3-point without spring return SB 4.0



Self adjustment:

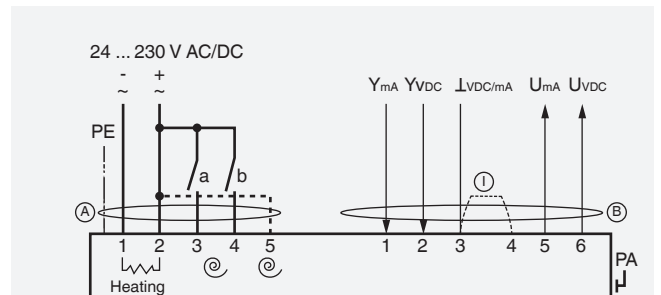
Press push button T for 3 seconds such that the actuator moves into both end positions to be adjusted.

Function and override control

- a closed, damper open (closed) – depending on the left/right mounting of the actuator
- b closed, damper closed (open) – depending on the left/right mounting of the actuator

Modulating or 3-point with spring return SB 5.0

SB 5.0



Self adjustment:

Press push button T for 3 seconds such that the actuator moves into both end positions to be adjusted.

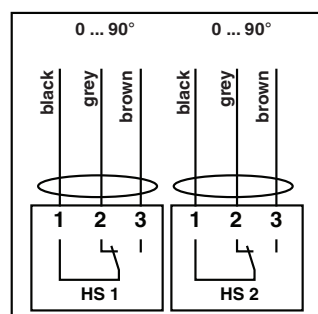
Spring return running time:

- Approx. 10 seconds with standard wiring
- Approx. 3 seconds with additional link to terminal 5

Function and override control

- a closed, damper open (closed) – depending on the left/right mounting of the actuator
- b closed, damper closed (open) – depending on the left/right mounting of the actuator

ExSwitch connections



9 Pneumatic connection

Pneumatic actuator



Danger!

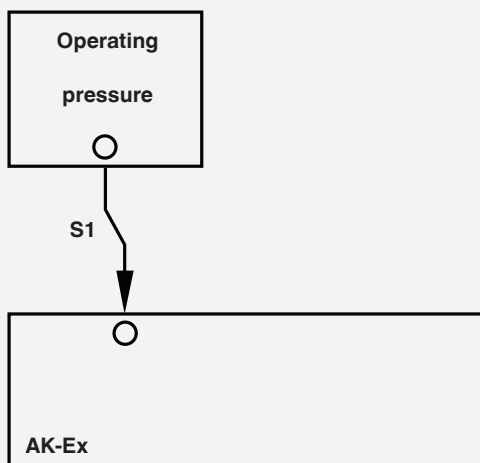
Operation only with instrument air that is free from oil, water and dust. Do not use combustible gases, oxygen or oxygen-enriched gases.

Installation information

Connect the shut-off damper according to the project-specific tubing diagrams and in compliance with the following instructions:

- Feed all the tubes into the damper casing through the bulk-head fittings on the outside of the damper casing.
- Only use pneumatic tubes that have an inside diameter of 4 mm and outer diameter of 6 mm.

Tubing diagram



- 1 Input for the operating pressure (1.3 bar, ± 0.1 bar)
- S1 Pneumatic switch (by others)

Shut-off damper	Pressure off: open	Pressure off: closed
	Damper blade position	
S1 actuated	CLOSED	OPEN
S1 not actuated	OPEN	CLOSED

Important!

The tubing diagrams shown are examples. The tubing documents supplied for the specific project apply.

10 Commissioning, operation



Warning!

Only authorised specialists are allowed to commission the shut-off damper.

Testing before commissioning

To comply with Industrial Health and Safety Regulations, a system requiring monitoring must be tested by an approved monitoring body before it is taken into operation for the first time and before it is taken into operation after a significant modification.

Correct assembly, installation, installation conditions and functional safety with regard to the intended use are subject to testing.

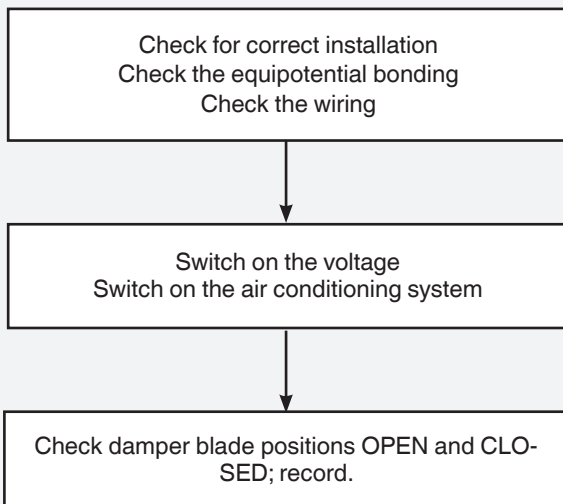
Operation

Once commissioning has been completed, the shut-off damper will operate independently and require no intervention from the system owner.

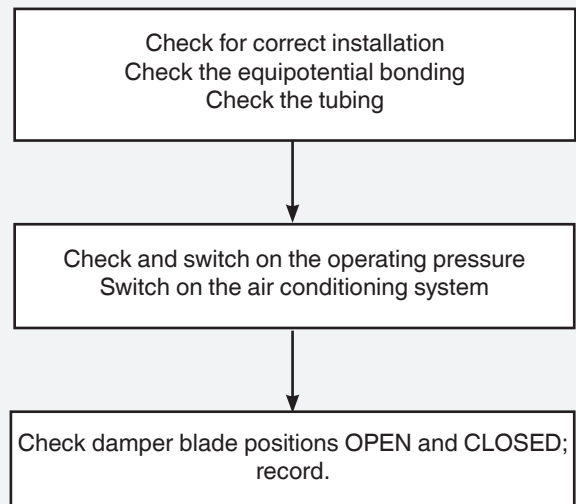
The statutory inspection intervals must be complied with.

In case of a malfunction, take the shut-off damper out of operation and repair it before commissioning it again.

Commissioning of a damper with electric actuator



Commissioning of a damper with pneumatic actuator



11 Maintenance



Warning!

Only authorised specialist personnel are allowed to perform the described maintenance measures.

The shut-off damper, the actuator and the electric/pneumatic actuator are maintenance-free with regard to wear, but the damper must still be included in the regular cleaning of the ventilation system.

Regular care and maintenance ensure operational readiness, functional reliability, and long service life of the shut-off damper.

The statutory regulations for maintenance must be complied with.

The system owner is responsible for maintenance. The system owner is responsible for creating a maintenance plan, for defining the maintenance goals, and for the functional reliability of the equipment.

Units for installation in areas with potentially explosive atmospheres must only be opened by the manufacturer. However, the following components may be opened for maintenance work:

- Casing of the shut-off damper
- Actuator terminal box/auxiliary switch

Inspection

Inspection should be performed by a specialist and at least once a year in accordance with statutory regulations and guidelines (see chapter 2).

The test of every single unit must be documented and evaluated. If the requirements are not fully met, suitable remedial action must be taken.

Inspection work



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.

The following inspection work must be performed:

- Remove contamination from the shut-off damper that affects its function.
- Check all screws for firm seating and retighten them, if necessary.
- Check whether the damper blade moves to the OPEN and CLOSED positions
- Check special functions (override controls, alarm suppression on monitoring systems) and make corrections, if necessary.
- Check the optical and acoustic alarm emitters.
- Check sequence control loops (room balancing) and make corrections, if necessary.
- Document maintenance measures and measurement results.

Repair

For safety reasons, repair work must only be carried out by expert qualified personnel or the manufacturer. Only genuine replacement parts must be used. Significant modifications may require a subsequent commissioning test.

Maintenance service

Regular maintenance by the TROX Technical Service is recommended in order to ensure operational readiness, functional reliability, and long service life of the unit.

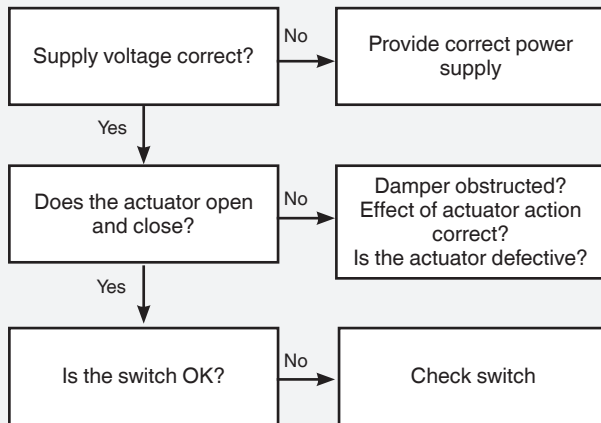
The TROX Technical Service can establish the actual condition of the unit, adapt or correct it if necessary, and ensure that the unit is in proper condition after maintenance.

Necessary adjustments and parameter setting can be conducted as part of maintenance such that a high level of safety is always maintained.

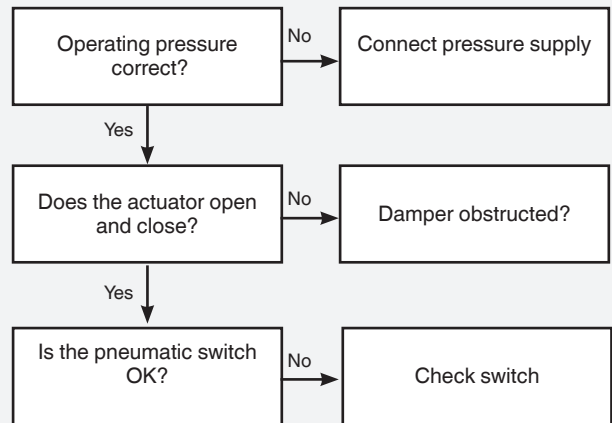
12 Troubleshooting

Most malfunctions can be rectified with the help of the troubleshooting diagrams. If the malfunction cannot be rectified, please contact TROX Service.

Troubleshooting with an electric actuator



Troubleshooting with a pneumatic actuator



13 Removal and disposal

Removal

1. Switch off the ventilation system.
2. Switch off the power supply or operating pressure.



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.

3. Disconnect the connecting cable or remove the tubing
4. Remove the unit.

Disposal

Have the damper disposed of by an authorised company.



