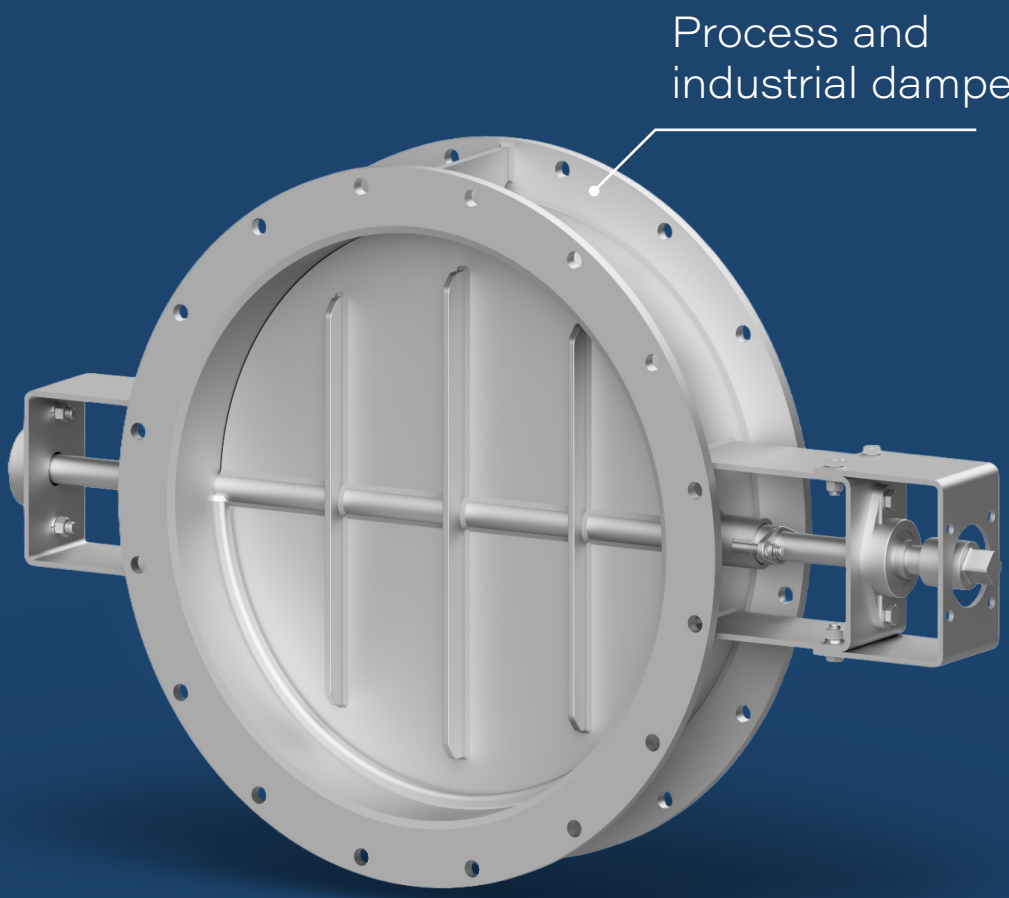
SWEDENBORG



Operation and maintenance instruction

Process and industrial dampers
S150 / S150-D(T) / S150-T / S200/S200-D(T) / S200-T etc.

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About this document

Operation and maintenance instructions for process and industrial dampers.

Original instruction for operation.

In general: Subject to technical changes.

SWEDENBORG

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1. Introduction

Thank you for choosing a Swedenborg damper. This instruction applies to our basic models S150 & S200. For customer-specific options, extra instructions may be needed. The dampers are delivered as either round or rectangular and are operated manually, pneumatically or electrically. The S150 and S200 models are also available as double dampers (S150-D(T) and S200-D(T)) with shut-off air, and T-pipe and bypass (S150T and S200T). All our dampers for gases have a maximum design pressure of 0.5 bar. Each damper is designed for specific applications. Maximum working pressure and temperature are given in the specification.

Damper seals are available in different designs depending on density, temperature and media.

See the specification for more information.

The dampers are designed and manufactured in Sweden.

1.1 Target audience

The target audience for the operating instructions is technically trained professionals.

1.2 Applicable document

- Order acknowledgement including specification.
- Drawing layout.
- Delivery documentation, operating instructions and documentation on accessories, etc.

1.3 Description of models

Butterfly damper S150 - Features ball bearings on the drive side and bearing cup on the opposite side, making it ideal for confined spaces and hard-to-reach places.

Butterfly damper S200 - Features ball bearings and bracket on both sides of the shaft, providing minimal friction and torque.

Fresh air damper S300 - Is without stuffing box and is best suited for ducts with clean air.

Disc damper S400/450 - Is designed with three-point linkage which, together with the blade shape, ensures 100% geometric sealing.

Guillotine dampers S500 - Suitable for both flue gases and bulk material with rectangular or round damper blade.

Check valve S600 - Is a non-return damper used in an industrial system and intended for a one-way flow in a duct.

Radial vane damper S700 - Can be used for flow control as well as for shut-off. With the blades meeting in a hub at the center, the air is rotated and moves better through the impeller or duct, reducing the load and thus the energy consumption of the fan.

Flap damper S800 - Is designed to discharge dust for intermediate container applications.

All models have a durable and reliable construction for industrial environments.

Selection of damper types

1.4 Standard construction

Damper frame

- Build length 120-500mm.
- Round DN100-DN3000, rectangular 200-3500.
- Flanged design.
- Shaft end in square design and mounting dimensions according to ISO 5211.
- Material selection, S235JR, COR-TEN, EN1.4301/4404.

Driving options

- Electric actuators.
- Pneumatic actuators.
- Manual with hand lever/knob or gear and chain wheel.

Possible automation

- End position sensors.
- Limit switches.
- Control on/off.
- Positioner

Sealing

- Box packing.
- Rubber gasket.
- Fiberglass braid.
- Fiberglass with ceramic core.

1.5 Labeling plate

Each damper is equipped with one or two labeling plates, depending on whether the product is ATEX classified.

A machine plate with CE marking according to the Machinery Directive (2006/42/EC) is mounted on the bracket. If the damper is classified for use in an ATEX zone, there is also a separate ATEX sign with Ex marking according to the ATEX Directive (2014/34/EU), placed next to the machine sign. Both signs are permanently fixed with rivets.

Each product has a unique serial number, which is used for all future correspondence and when spare parts or service are required.

In order for the warranty to be valid, Swedenborg must be contacted immediately in case of damage. When contacting us, please quote the instanced serial number found on the rating plate.

AN ADDITIONAL SIGN WITH ATEX INFORMATION MUST BE PERMANENTLY ATTACHED

1	Logo / address field
2	Model designation
3	Serial number
4	Marking from customer
5	Month and year of manufacture
6	Weight
7	Design pressure

1.6 Delivery specification

The following positions are included in the delivery.

- Dampers with accessories.
- Operation and maintenance instructions.
- Operating instructions for actuators and accessories.

2. Safety instructions

2.1 General

The operating instructions contain basic instructions for installation, operation and maintenance. The instructions ensure safe handling and help to avoid personal injury and property damage.

- Before installation and commissioning, the responsible personnel/machine operator must have read the operating instructions and understood their contents.
- The contents of the operating instructions must always be available to the specialist staff on site.

2.1.1 Potentially explosive atmospheres (ATEX)

Some damper types can be installed in zone classified areas according to ATEX Directive 2014/34/EU. Check if your damper is classified for use in potentially explosive atmospheres via the type plate and the delivery specification.

Dampers to be installed in ATEX zones must be correctly labeled (EX marking) and installed according to the applicable installation regulations for such environment.

Only components (e.g. actuators, sensors) approved for the zone in question may be used.

It is the user's responsibility to ensure the correct classification and installation method according to ATEX requirements.

2.2 Intended use

- The damper **may only be used in a technically faultless condition.**
- Never use the damper when it is dismantled or not fully installed. This can lead to serious injury.
- Only the media **described in the documentation may flow through** the damper. Take into account the model and material design.
- The damper **shall only be used in applications described in the** specification.
- The design and layout of the damper are mainly adapted for static loads according to current standards. Dynamic stresses or other effects require consultation with the manufacturer.
- Check operating conditions not mentioned in the documentation with the manufacturer.

Never exceed the permitted uses or the use limits for temperature, etc. specified in the data sheet or documentation.

Follow all safety and operating instructions in the relevant operating manual.

2.3 Hazards when the operating instructions are not followed

Failure to comply with the operating instructions may not give rise to warranty claims or claims for damages.

If these operating instructions are not followed, the following risks may occur:

- Personal injuries due to electrical, thermal, mechanical or chemical effects, and risk of explosions.
- Loss of essential functions of the product.
- Reduced ability to carry out proper care and maintenance as prescribed.
- Environmental damage caused by leakage of dangerous substances.

2.4 Instructions for staff

Dampers with actuators are designed to be used in areas where people are not normally present. However, if these dampers are to be used in areas where people are present, adequate safety devices must be provided in connection with the installation. The machine owner is responsible for ensuring this. Do not remove the protective devices if present (e.g. touch guard) during operation.

2.5 Instructions for maintenance, service and installation

- The damper may only be modified or altered with the approval of Swedenborg.
- Only original parts or components approved by the manufacturer may be used. The use

of non-approved parts may invalidate the manufacturer's liability.

- Maintenance, inspection and assembly should be carried out by authorized and qualified professionals who have carefully studied the instructions for use.
- Work on the damper may only be carried out when it is disconnected and in standby.
- The damper should have reached ambient temperature.
- The damper must be depressurized and emptied before work is carried out.
- The procedures in the operating instructions for taking the damper out of service must be followed carefully.
- Voltage, pneumatics and hydraulics must be disconnected from the controller.
- Sanitize dampers used with harmful media.
- Protect the damper and the control unit from shocks.
- Regular monitoring is required to prevent damage from condensed flue gases.
- Safety and protective devices shall be installed and activated immediately after completion of the work. Follow the commissioning instructions before using the damper again.

2.6 Unauthorized modes of operation

- The limit value of the damper is outside those indicated in the specification.
- The damper is used in a way other than its intended use.
- The use of components or parts not approved by the manufacturer may adversely affect the damper and lead to unforeseen failures or safety issues.
- Repairing, inspecting or adjusting the damper while it is in operation is dangerous and may cause personal injury or equipment damage.
- Flue gas dampers used with hazardous or harmful media must be handled with proper safety devices and methods to prevent accidents or damage to personnel and equipment.

Following the manufacturer's recommendations and using approved procedures is essential to ensure the safe and efficient operation of a flue damper.

3. Handling of dampers

Before delivery, a visual check of the damper seal and a maneuvering test are always carried out. For more information, see the ITP inspection in the final documentation. Electric actuators are not tested after installation, as they have already been tested by the manufacturer. Adjustment and checking of torque and limit switches must be carried out on site before commissioning.

3.1 Check delivery authorization

- When handing over the delivery, check that the goods are undamaged.
- Any transportation damage must be carefully examined, documented and immediately reported in writing to Swedenborg, the retailer and the insurance company.

3.2 Transportation

The dampers are delivered on wooden pallets or as agreed. Handle the dampers carefully during loading and unloading to minimize the risk of damage. Check the damper carefully before installation.

All products are surface treated, unless otherwise stated. In case of damage to the rust protection, repairs should be made immediately to prevent rust damage.

Attach and handle the damper as shown in the pictures on the right.

- Transport the damper only in the specified position. Upright or horizontal for round dampers and horizontal for rectangular dampers.
- Attach the lifting equipment only as shown in the picture, for dampers with a diameter of less than DN550mm, the damper can be lifted by the shaft at the inner bracket inside the bearing.
- Take into account weight indications, center of gravity and attachment points.
- Use only designated and authorized lifting equipment.
- Dampers must not be lifted in handwheels, actuators or in the shaft if the damper is larger than DN550mm.

3.3 Storage

In case of delayed commissioning after delivery, the following measures are recommended to avoid damage due to frost, moisture or soiling:

- Store the damper in a frost-free room with stable humidity, protected from dust and vibrations.
- Cover dampers and actuators with protective plastic sheeting or tarpaulin to prevent dust, dirt and mechanical damage. For outdoor storage, place the damper above ground.
- Stainless and high-alloy dampers should be stored separately from mild steel to avoid contamination.

3.4 Storage position

The delivered damper is transported and stored in the position in which it is intended to be used:

- Closed position for manual and motorized dampers.
- Open position for dampers with safety function (fail open).

This ensures that the damper remains intact and is ready to operate correctly upon installation.

Lift the dampers in this position.

Lift the dampers in this position.

Lift the dampers in this position.

Do not lift the dampers in diagonal position.

4. Damper installation

4.1 Before installation

The planner, plant designer or operator is responsible for placing and installing the damper. Errors in planning or installation can affect the operation of the damper and pose serious risks.

- Check the damper for transport damage before installation.
- Check existing superstructure parts for transport damage.
- Check that the damper is correctly configured according to the specification.
- Do not install damaged dampers.
- Use the right personal protective equipment (PPE) such as gloves, goggles and protective clothing to protect yourself from potential hazards.

Ensure that the system is switched off and that all heating, gas, system air and electricity are disconnected before starting work.

4.2 Installation

The dampers are designed for vertical or horizontal mounting (position 1 and 2) to ensure maximum life of ball bearings and gasket and to facilitate maintenance.

In exceptional cases, the damper can be mounted at an oblique angle between 45° and 90° (pos. 3), but the actuator should always be directed upwards.

From left: Pos. 1, pos. 2, pos 3.

Pos. 1	Horizontal channel, horizontal axis.
Pos. 2	Vertical channel, horizontal axis.
Pos. 3	Horizontal channel, vertical axis. NOT TO BE RECOMMENDED.

The dampers should be installed without being subjected to mechanical stress from the ductwork. The connections should be carefully aligned and parallel. Check that the damper is correctly aligned with the duct and its flange connection. The screw joints should be tightened crosswise according to the tightening torques given in the table below.

4.2.1 Tightening table

Thread	**Gradient** (mm)	**Material**	**Strength class**	**Preload Force** (kN)	**Recommended tightening torque** (Nm)
M10	1.5	Carbon steel Stainless steel	8.8 A2-70 (A4)	25 20	55 33
M12	1.75	Carbon steel Stainless steel	8.8 A2-70 (A4)	40 31	95 57
M16	2.0	Carbon steel Stainless steel	8.8 A2-70 (A4)	80 62	230 140
M20	2.5	Carbon steel Stainless steel	8.8 A2-70 (A4)	120 95	450 273

ISO898-1 Carbon steel, Table values apply to hot-dip galvanized (HDG) steel bolted joints.
ISO3506-1 Stainless steel. The table refers to dry bolted joints.

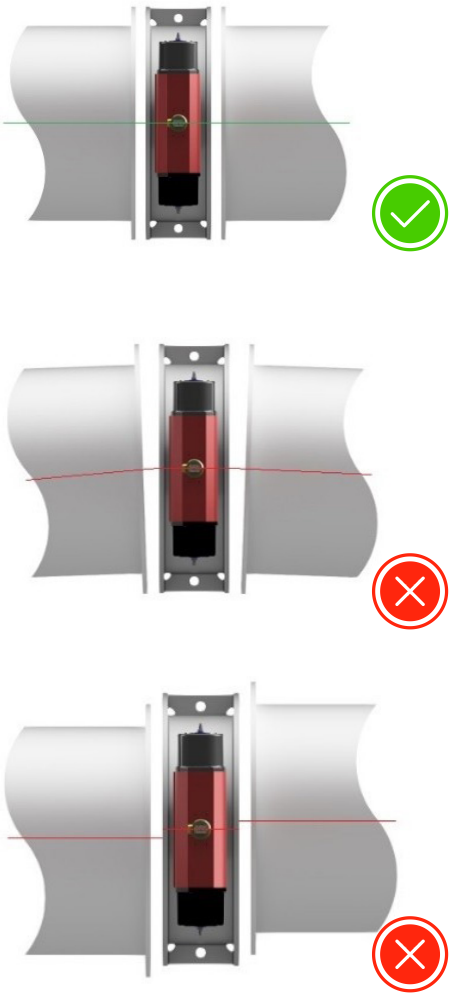
4.3 Instructions for cross-drawing dampers with multiple bolted joints

Preparation: Check that the seal is correctly positioned and that the sealing surfaces are clean and free from damage.

Pre-assemble all bolts loosely by hand.

Tighten the screws in a criss-cross pattern, starting with one screw, then move to the opposite side, and continue in a star pattern.

Pull in two steps with torque wrench: First pull with a preload force according to the table above, then pull with the recommended force, Finish by pulling an extra turn around all bolts in a circle (sequential order) to ensure even pressure.



Swedenborg accepts no liability for damages arising from the incorrect use of the values in the table on the previous page.

4.4 Damper with 1 axis

Close the damper completely and attach approved lifting equipment to the damper, see paragraph 3.4 for detailed instructions.

- Check that the damper is correctly positioned in the direction of flow (See damper drawing)
- Once the damper is in place in the duct, check the tightness between the damper blade and the damper seal seat if possible.

4.5 Dampers with 2 or more axes

Close the damper completely and attach approved lifting equipment to the damper, see paragraph 3.4 for detailed instructions.

- Check that the damper is correctly positioned in the direction of flow (See damper drawing)
- Once the damper is in place in the duct, check the tightness between the damper blade and the damper seal seat if possible.
- The linkage between shafts is adjusted and checked at the factory to ensure that the damper blade seals against its sealing seat, if a fault is suspected, see chapter 7.12 for adjustment.

4.6 Double damper with air sealing valve

Close the damper completely and attach approved lifting equipment to the damper, see point 3.4.

- Check that the damper is correctly positioned in the direction of flow (See damper drawing)
- Once the damper is in place in the duct, check the tightness between the damper blade and the damper seal seat if possible.
- The linkage between shafts is adjusted and checked at the factory to ensure that the damper blades seal against their sealing seat, in case of suspicion of a fault see chapter 7.12 for detailed information on adjustment.
- Separate the linkage to the air shut-off valve by detaching the link arm from the valve shaft.

- Split the flange joint and release the shut-off valve, retaining the loose pipe connection.
- Weld the connection, checking the orientation of the flanges before welding around.

When reassembling the air shut-off valve after welding its connection to the delivery limit, perform the following:

- The sealing surfaces of the flanges are clean and undamaged.
- Check that the pipeline is correctly aligned. Check that the flanges are parallel.
- Open and close the damper to check that the damper disc can rotate freely.
- Push the pipeline flanges apart so that there is sufficient space between the flanges and the protruding front of the bellows.
- Insert the valve between the two flanges and center it with the mounting screws.
- Tighten the bolted joint crosswise with a suitable tool until the valve body and pipeline flanges touch (metallic contact). For correct tightening torque see point 4.2
- Operate the valve several times to check that the damper disc can rotate freely.
- Reinstall the link arm on the valve shaft.
- Check that the air shut-off valve is fully closed when the damper is open.

4.7 Tandem double damper (-DT)

A double tandem damper works in a similar way to a traditional double damper, but differs in that both blades are mounted on a common shaft instead of two. The mechanism between the shaft and the air shut-off valve is simpler and contains fewer components.

Check that the damper is correctly positioned in the direction of flow (See damper drawing)

- Once the damper is in place in the duct, check the tightness between the damper blade and the damper seal seat if possible.
- Split the linkage to the air shut-off valve by detaching the link arm from the valve shaft.
- Split the flange joint and release the shut-off valve, retaining the loose pipe connection.
- Weld the connection, checking the orientation of the flanges before welding around them.

When reassembling the air shut-off valve after welding its connection to the delivery limit, see chapter 4.5 -Reassembly.

4.8 Bypass / T-pipe

Attach approved lifting equipment to the damper, see paragraph 3.4 for detailed instructions.

- Check that the damper is correctly positioned in the direction of flow (See damper drawing)
- The link arm between the axes can be dismantled to facilitate installation. Remove the entire link arm without changing its length by loosening the bolt in the link head.
- Once the damper is in place in the duct, check the tightness between the damper blade and the damper seal seat if possible.
- The linkage between shafts is adjusted and checked at the factory to ensure that the damper blades seal against their sealing seat, in case of suspicion of a fault see chapter 7.12 for detailed information on adjustment.
- All connections must fit correctly against the duct. After installation, there must be no tension around the flange joints, as this can cause distortion of the T-pipe.

4.9 Dampers with counter flanges, all damper types

Install the counter flanges on the damper

without flange gasket (if supplied). When welding, it is not necessary to use all screws.

Welding shall be carried out with short, alternating passes around the entire flange before a full weld is made. This minimizes the risk of distortion during the welding process.

The flange must be fully welded around the inside of the duct. On the outside, welding can be carried out either intermittently or as a full weld all around.

4.10 Check after final assembly, applies to dampers over DN1000mm:

Ensure that the system is completely shut down and that all heat, gas, system air and electricity are disconnected before starting work.

- Check that all blades move freely when the damper is operated from closed to open position. The damper blades must not scrape against the inside of the duct.
- Close the damper and make a visual inspection from the inside. Inspect that the damper blade(s) seal against the seal seat:

Example of seals from left:
Figure 1 & 2: Fiberglass seal. Figure 3: Rubber gasket.
Figure 4: Steel seal.

4.11 Damper with 1 axis

If the damper blade is only against one side of the seal seat, the damper may have been subject to misaligned stresses during installation. The following action options are recommended:

- **Option 1:** Adjust the counter flanges so that the damper blade is in contact with the sealing seat all around. This is done by loosening the fasteners and gradually tightening the flange screws evenly and crosswise, so that the damper is centered in the flange joint without tension.
- **Option 2:** Move the seal seat on the leaking side closer to the damper blade until full contact is achieved.

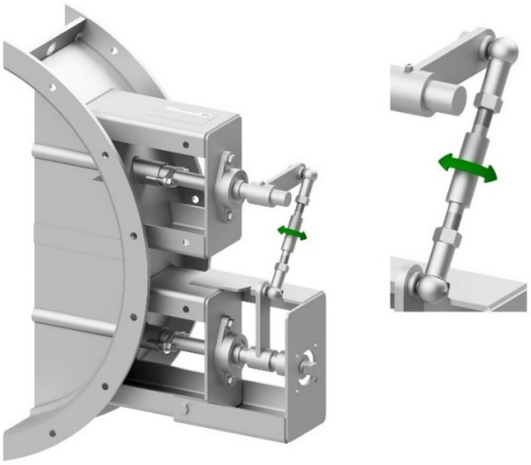
4.12 Dampers with 2 or more axes

If a blade half is not in contact with its sealing seat, an adjustment of the linkage system may be necessary.

- **Option 1:** Extend or shorten the link arm by turning the link rod. Turn left to lengthen or right to shorten the distance.

For more details, see also chapter 7.12 -Adjustment of link arms on dampers with 2 or more axes.

- **Option 2:** Move the seal seat on the leaking side closer to the damper blade until full contact is achieved.



4.13 Double damper with air shut-off valve

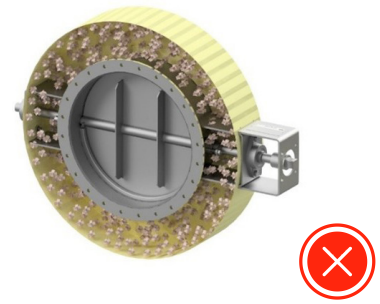
Each damper blade should rest against its sealing seat. If this is not achieved, the link arms should first be adjusted, see chapter 7.12. If adjustment of the link arms is not sufficient, it may be necessary to move the seal seat on the leaking side, bringing it closer to the damper blade until full contact is achieved.

- Check that the air shut-off valve is fully closed when the damper is open. This prevents flue gases from entering back into the fan during operation.
- If the air shut-off valve is equipped with its own actuator, it is particularly important to ensure that it is closed when the damper is open - and vice versa.

4.14 Bypass / T-pipe

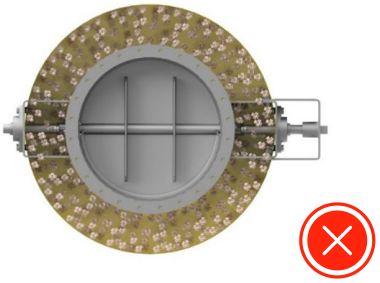
Each damper blade should rest against its sealing seat. If this is not achieved, the link arms should first be adjusted, see chapter 7.12.

If adjustment of the link arms is not sufficient, it may be necessary to move the seal seat on the leaking side by moving it closer to the damper blade until full contact is achieved.



4.15 Insulation of dampers

The dampers are designed to handle a standard insulation depth up to 160 mm. The insulation may extend up to the inside of the inner bracket where the storage is mounted.

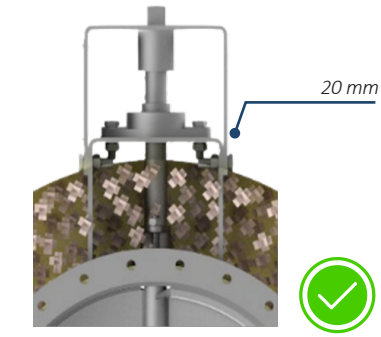


Media temperatures above 300 °C:

- At temperatures above 300 °C, it is important to leave an air gap of about 20 mm between the insulation and the inner bracket, especially at the ball bearing. This allows efficient heat dissipation and prevents overheating of the ball bearing.

High temperatures (>700 °C):

- For operation at temperatures above 700 °C, an extended inner bracket is required. This allows for increased insulation thickness, which is necessary to protect the system components from excessive heat.



20mm

Restrictions on insulation:

- The insulation must not go past the inner bracket where the ball bearing is mounted. This is to avoid heat being insulated into the bearing, which can negatively affect its function and lifetime.

Ventilation of shaft:

- It is important to ensure adequate ventilation at the outer bracket. This prevents heat from being conducted up the shaft to the ball bearing and on to the actuator. Insufficient ventilation can lead to heat build-up and damage to the bearing or other components.

5. Installation of equipment

Before starting the installation of electrical and pneumatic components on the damper, it shall be ensured that the damper and its associated parts are clean and free from contamination. Check that all system functions operate according to specifications and that the correct components are used to meet applicable operational requirements and safety standards.

5.1 Instrument air - Air quality

To ensure optimal functioning and lifetime of pneumatic actuators, positioners and solenoid valves, the compressed air should meet the following quality requirements:

ISO 8573-1 Class 3.3.3 (for outdoor use)
ISO 8573-1 Class 3.6.3 (for indoor use)

This means that:

Particulate matter (Class 3): Maximum particle size ≤ 5 µm; concentration ≤ 5 mg m³

Water (Class 3 or 6):

Class 3: Pressure dew point ≤ -20 °C (recommended for outdoor environments)

Class 6: Pressure dew point ≤ +10 °C (accepted for indoor environments with stable temperature)

Oil (Class 3): Maximum total oil concentration (aerosol + vapor) ≤ 1.0 mg/m³

This air quality is normally achieved with:

- Standard 5µm particle filter
- Refrigerant dehumidifier (for Class 6) or adsorption dryer (for Class 3)
- Standard oil separator/filter in modern compressors

Positioners and actuators are designed for a standard pressure of 6 bar (87 psi).

Please note that positioners have a limited maximum working pressure that must not be exceeded. The exact limit is specified in the instructions for each model, and it is often lower than the maximum working pressure of the actuator.

If the air supply exceeds this limit, the positioner may fail and risk permanent damage, as it is more sensitive to overpressure than the actuator.

The maximum working pressure of the actuator varies between 10 and 16 bar, depending on the model. For detailed specifications, see the documentation of the actuator in question.

Class	MAX Particle size		Water	Oil
	Particle size (µm)	Concentration (mg/m3)	MAX Pressure dew point (°C)	MAX Concentration (mg/m³)
1	0.1	0.1	-70	0.01
2	1	1	-40	0.10
3	5	5	-20	1.00
4	15	8	+3	5.00
5	40	10	+7	25.00
6	-	-	+10	-

Please note: Always check the component manufacturer's recommendations. Some sensitive applications may require higher air quality.

5.2 Pneumatic actuators

Read the documentation, follow the manufacturer's manual carefully. It contains specific requirements and instructions for installation.

- Ensure that the actuator is stable and well anchored to prevent movement or damage during operation.
- Ensure that the pneumatic actuator is correctly supplied with compressed air, see chapter 5.1.
- Use correctly sized pipes and fittings to connect the actuator to the air source.
- Check that the damper movement is consistent with the control signals from the actuator.

5.3 Electric actuators

Read the documentation, follow the manufacturer's manual carefully. It contains specific requirements and instructions for installation.

Ensure that the electrical voltage complies with the actuator requirements (AC/DC, voltage level). The wrong voltage can damage the equipment.

Electrical connection

- **Grounding:** Ensure that the actuator is properly earthed to minimize the risk of electric shock and damage to the equipment.
- **Cables and connectors:** Check that the cables are correctly sized for the current and that all connections are properly insulated.
- **Polarization:** Check the correct polarity, especially for DC actuators, to prevent the motor from going the wrong way or being damaged.
- **Cable laying:** Route the cables in a way that prevents damage, wear or contact with moving parts.

After installation

- **Insulation measurement:** Check that there is no leakage current or short circuit before switching on the power.
- **Functional test:** Test the actuator throughout its range of motion to ensure that it functions as specified.

External factors

- Environment: Protect the actuator from moisture, dust and extreme temperatures, unless it is designed for such conditions.
- Vibrations and shocks: Install the actuator so that it is safe from mechanical stresses that could damage the connections.

Regulations and standards

- Electrical standards: Ensure that the installation complies with local and international requirements, such as IEC standards, ATEX, CE marking and national electrical regulations.

5.3.1 Installation in ATEX zones

When installed in zoned areas, all electrical and pneumatic components must comply with the ATEX Directive.

Check the following:

- Explosion protection class of the apparatus.
- Method of installation (e.g. wiring, embedded junction boxes, distance to earthed surfaces)
- Approval according to the product documentation.

Installation should always be carried out by qualified personnel with experience in ATEX environments. Documentation and certificates of inspection must be kept.

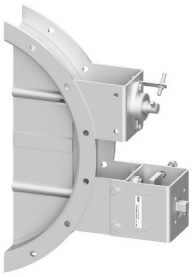
5.4 Limit switches

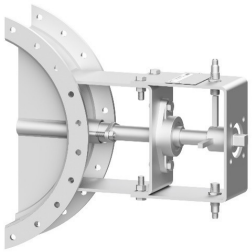
The damper can be equipped with limit switches, either mechanical or inductive, which are usually mounted in the outer bracket. The number of limit switches varies from one to several, depending on the specification. Connection should always be carried out according to the manufacturer's instructions.

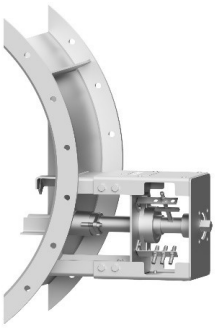
Read the documentation and follow the manufacturer's manual carefully. It contains specific requirements and instructions for installation.

- Ensure that the electrical voltage matches the sensor requirements. The wrong voltage can damage the equipment.
- Check that the limit switch is compatible with the control system or PLC used.
- After installation, the limit switch should be calibrated to ensure accuracy and correct detection range.

Examples of placements:

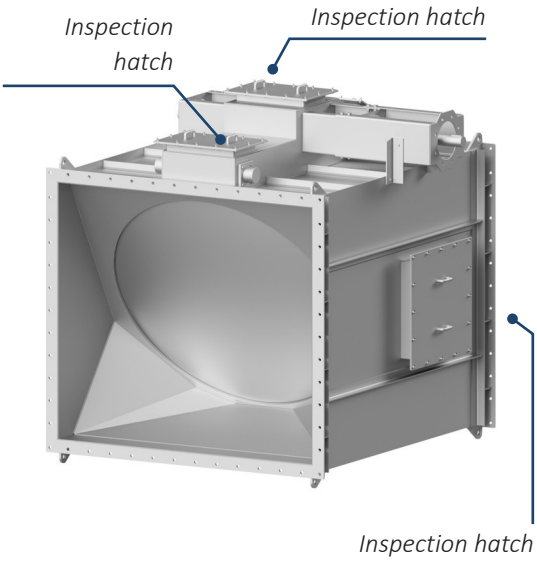






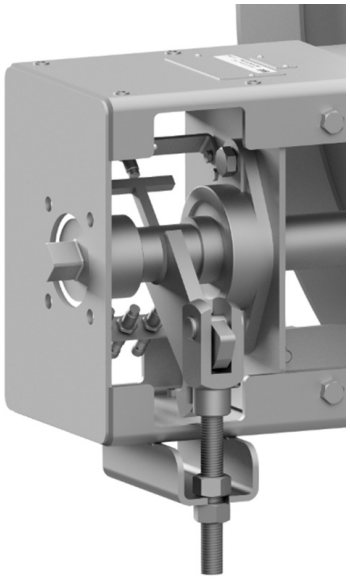
5.5 Inspection hatch

The damper may be equipped with one or more inspection hatches. Before commissioning, all inspection hatches must be checked to ensure that they are properly closed and sealed to prevent leakage during operation.



5.6 Mechanical locking

The damper may be equipped with a type of mechanical lock that is only used for servicing. Check that the mechanical lock is correctly fitted and in the correct position. Locking should **not** be active or in use during normal operation.



6. Commissioning/ decommissioning

Before putting the damper into operation, ensure the following:

- Compare the operational data with the order acknowledgment to verify that materials, temperature data and other specifications match.
- Check that the damper is correctly connected to the duct on both sides.
- Check that the damper disc rotates freely and is in contact with the sealing surfaces.
- Ensure that the actuator is connected according to the operating instructions for each actuator.
- Follow the general safety rules for the installation.

6.1 Use/ Operation

Once the damper has reached its working temperature, minor leakage may occur at the shaft seal. If leakage is detected at the stuffing box, adjust it according to the instructions in chapter 7.10.

6.2 Damper with operating lever/ switch

- **Operating lever:** Release the hand lever by turning the locking knob anticlockwise. The damper (as seen from the protractor) is opened by pulling the hand lever counter-clockwise towards the 100% mark. The damper is adjustable between 0 and 100%.
- **Hand gear:** Open the damper by turning the handwheel counterclockwise. The indication on the hand gear shows the position of the damper blade. To close the damper, turn the handwheel clockwise.
- **Chain wheel:** Pull the chain so that the chain wheel rotates counterclockwise to open the damper. The indication on the hand gear shows the position of the damper blade. Pull the chain so that the chain wheel rotates clockwise to close the damper.
- **Damper with counterweight, check damper S600:** The damper counterweight is roughly adjusted on delivery but needs to be checked/adjusted further to work correctly according to the actual flow in the duct.

6.3 Damper with electric or pneumatic actuator

- Always follow the manufacturer's instructions for use of each actuator.

6.4 Shutdown and restart

The shutdown and restart of the damper shall always be performed according to the plant control system and the customer's internal procedures. The following points should be considered to ensure safe handling:

Shutdown

- Ensure that the damper can be closed without adversely affecting operation or safety.
- Check that the damper moves freely and closes to the desired position without mechanical obstacles.
- For manual operation, see the instructions in Chapter 6.2.
- Confirm that the damper is fully closed (or in the correct closing position) by visual check or limit switch, if available.
- If the damper is part of a safety or emergency stop system, these functions shall be checked according to customer procedures.

Restarting

- Before restarting, check that the damper is free of damage and correctly installed.
- Ensure that the damper is in the correct initial position according to the process requirements.
- Any manual locking should be removed and service work completed.
- Confirm that electrical, pneumatic or hydraulic connections are correctly reconnected.
- After restarting, check that the damper works as expected and reaches the correct position.

7. Service / Maintenance

7.1 Preparation

Before starting maintenance, please read the applicable safety rules for the installation. Ensure that no flow passes through the damper and that it is depressurized to atmosphere. If there is any residual pressure in the duct, gas may escape through the stuffing box and flange joint.

7.2 Decoupling of energy

Disconnect the energy supply and prevent it from being reconnected for dampers with actuators, electric and pneumatic. **Ensure that the damper blade cannot be operated if the actuator is spring loaded** for example when replacing seals.

7.3 Inspection and measures

Carefully examine the damper blade and housing for signs of corrosion, erosion or build-up of material. Also check the outer link arms and clamp guards for any signs of wear, damage or malfunction. Ensure that all identified non-conformities are corrected before the damper is put back into operation.

7.4 Ball bearing

As standard, permanently lubricated ball bearings of the types UCFL or UCF are used. These bearings require minimal or no lubrication to function properly. Under normal operating conditions, the storage units can be considered as lifetime lubricated. However, at abnormally high operating temperatures or in contaminated environments, relubrication may be necessary. To enable this, the bearing units are supplied with a grease nipple.

Shaft diameter	Storage type
Ø15	UCFL-202
Ø20	UCFL-204
Ø30	UCFL-206
Ø50	UCFL-210
Ø70	UCF-214

7.5 Replacing ball bearings

On the drive side:

1. Marking of the actuator position:

Mark the position of the actuator in relation to the shaft and coupling. This ensures proper reassembly and functioning.

2. Dismantling of actuators:

Remove the actuator or any hand gear or hand lever fitted.

3. Removal of bracket:

Remove the outer bracket to gain access to the shaft and bearing.

4. Marking of coupling:

Mark the position of the coupling on the shaft with a clear line to facilitate accurate reassembly.

5. Dismantling of coupling:

- If the coupling is fitted with a keyway: loosen it carefully.
- If the coupling is welded: grind off the weld with a suitable tool.

6. Preparation of the damper shaft:

Clean and grind the damper shaft outside the bearing if it is painted or has corrosion damage, to facilitate disassembly and assembly.

7. Dismantling of ball bearings:

Use a ball bearing puller to safely remove the existing ball bearing.

8. Installation of a new ball bearing:

Fit the new ball bearing as specified. Check the fit carefully.

9. Reassembly of the coupling:

Weld the coupling back onto the shaft in exactly the same position as previously marked.

On the opposite side of the drive side:

1. Cleaning of the shaft:

Check that the shaft outside the bearing is free of paint, corrosion or damage. Clean and grind if necessary.

2. Dismantling of ball bearings:

Remove the bearing with a ball bearing puller.

3. Installation of a new ball bearing:

Install the bearing according to the manufacturer's instructions and specifications. Check that the bearing is correctly aligned.

7.6 Damper seals - Varieties and characteristics & exchange

Damper seals are available in several designs to meet different application requirements:

- **Steel against steel:** Robust seal for applications with high mechanical stress and wear resistance requirements.
- **Fiberglass:** Temperature resistant seal for operation up to **600 °C**.Suitablein environments with high temperatures but limited chemical requirements.
- **Soft seal (for example, silicone):** Chemical and temperature resistant seal for operation up to **250 °C**.Usedwheretightnessagainst gas is a priority.
- **Fiberglass with ceramic core:** Developed for extreme temperatures. Can handle continuous operation over **700 °C** and up to **1250 °C**. Suitable for very demanding thermal environments, such as combustion gases.

7.7 Important information when replacing a seal

Please consult Swedenborg to select a seal that meets the temperature, pressure and chemical requirements of the application.

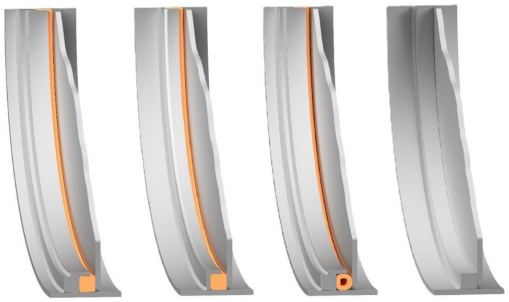
Safety note:

In the selection and installation of seals:

Take into account temperature, pressure and chemical stresses in the application.

Ensure that the seal is correctly sized and compatible with the damper material to avoid leakage or malfunction.

Contact Swedenborg to get the most reliable solution.



Example of seals from left: Figure 1 & 2 Fiberglass seal Figure 3 Silicone hose. Figure 4 Steel seal.

7.8 Replacing the seal

Secure the work area: Set the damper to the open position. Mechanically block the damper disc to eliminate the risk of serious crushing should the damper close automatically during work.

Dismantling of the seal: The seal is mounted in a U-shaped sealing profile and is held in place by parts of the profile being pressed into the seal, like locking tongues.

Use a suitable tool to carefully straighten the locking tongues before pulling out the seal.

For applications where the seal is secured with dowel pins, use heavy-duty pliers to remove the pins before removing the seal.

Remove the old seal: Pull the seal out of the profile and check that no residue remains in the seal profile.

Cleaning of the sealing profile: Clean the profile from dirt, grease and old seal residues with a suitable cleaning agent. A clean surface is essential for the correct and tight installation of the new seal.

Installation of a new seal: Press in the seal with a rubber mallet, if necessary use a rubber mallet to simplify installation.

Secure the seal: Fold back the locking tongues to hold the seal in place, or refit the clamping pins if this method of fixing is used.

Safety note: After installation, check that the seal is correctly installed and that there is no risk of damaging any part of the damper disc during operation.

7.9 Flange gasket

Flange gaskets are available in several variants: fiberglass and graphite gasket, among others.

Assembly: Place the sealing material inside the bolt circle.

7.10 Packing box

Important: Not all dampers have a stuffing box.

On dampers with a stuffing box, it is located on one or both sides of the shaft. The gasket consists of a graphite impregnated glass fiber braid. It is important that the area around the stuffing box and the axle is kept clean from dirt and liquids.

When a new damper is put into service, it may leak a little at first. This is normal and can be remedied.

Here's what to do in case of a leak:

1. Tighten the nuts on the stuffing box a quarter turn at a time.

2. Wait for about two minutes - the seal may swell from the heat.

3. Repeat until it no longer leaks.

If you have tightened as much as you can, the gasket must be replaced.

Keep in mind:

- Never change the gasket while the damper is in operation.
- Do not unscrew the nuts completely - this can lead to gas leakage!

7.11 Replacing the box seal

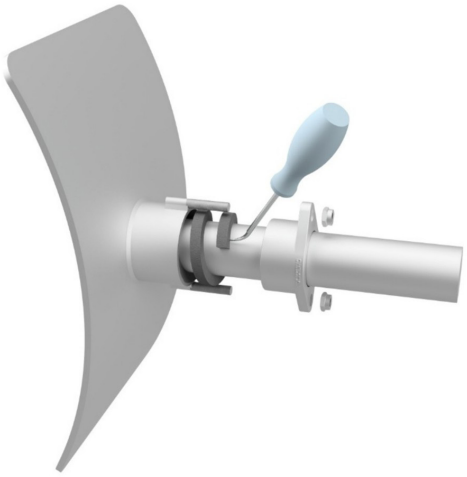
1. Loosen the lock nuts.

2. Remove existing graphite braid with screw chisel or suitable tool.

3. Thoroughly clean the shaft from dirt and residues.

4. Wrap new graphite impregnated seal around the shaft for 3-5 turns.

5. Tighten the lock nuts, see point 7.10



Shaft diameter	Graphite braid
Ø15	6 x 6 mm
Ø20	6 x 6 mm
Ø30	6 x 6 mm
Ø50	10 x 10 mm
Ø70	12 x 12 mm

7.12 Adjustment of link arms - dampers with two or more axes

Adjustment of the damper blade position via link arms.

The angle of the damper blade can be adjusted by changing the length of the link arms. These consist of a right-hand and a left-hand threaded rod (red-1, see next page), which allows fine adjustment without loosening the fasteners (blue-2, see next page) at both ends.

Safety before adjustment:

Ensure that the damper is in a safe position (e.g. fully closed) and that it cannot be activated during work. See point 7.1 & 7.2

Starting point:

The adjustment should always be based on **the damper blade, on the drive shaft (green-3, see picture on the right), is against the seal seat** in the closed position, the drive shaft is the shaft with the actuator mounted.

1. Loosen the lock nuts: Loosen the lock nuts on both sides of the link arms, if there are several axles.

2. **Shorten the** link arm - pulls the damper blade closer to the seal seat on that side.

3. **Extending** link arm - pushes the blade away from the seal. Adjust small steps at a time.

4. **Lock the link arms:** Once the correct position is reached, tighten the locknuts to fix the setting.

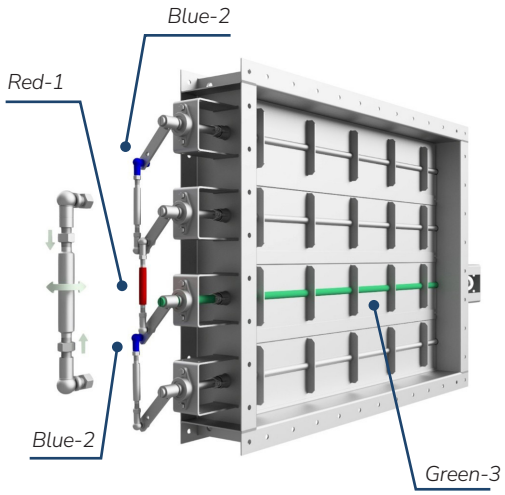


Figure 1 & 2 link arms, from left. Figure 1 shows the lock nuts on the link arm. Figure 2 shows an example of a drive shaft in green.

7.13 Maintenance intervals

To maintain safe and efficient operation, our products should be checked regularly according to the points below.

Early action on minor faults prevents more serious problems, unnecessary downtime and costly repairs.

Lubrication

Damper ball bearings are permanently lubricated at the factory and normally do not require relubrication. When used as a control damper, with continuous movement, however, the need for lubrication may arise, to enable this, the bearing units are supplied with a grease nipple. In such cases, it is recommended that the condition of the bearings and any need for lubrication is checked in connection with regular maintenance, at least once a year.

To ensure reliable operation and long life, UCFL (UCF) bearings (flanged Y-bearing housings) should be lubricated with a suitable industrial grease, adapted to the requirements of the application - especially load, temperature and environment.

Interval	Control points
3rd month (Regulation)	No leakage from control damper stuffing box. See 7.10
6th month (On/off, Regulation)	• **Packing box:** There shall be no leakage from the stuffing box onto any of the dampers. • **Link arms:** Check the movement when maneuvering. There must be no gaps or mechanical faults. • **Maneuvering:** The damper shall be able to turn easily - there shall be no sluggish or chafing movement. • **Function:** Check that the damper opens and closes correctly. • **Donation function:** Check that the actuator works as specified, e.g. that the correct end position is reached for single acting actuators (open or closed).
12th month (On/off, Regulation)	• If necessary, relubricate ball bearings, especially on control dampers. • Check erosion, corrosion and material build-up around blades and housings. Clean or replace components if necessary. • Check that all bolts are correctly tightened and that there is no leakage between flanges. • For dampers with actuators: follow the supplier's recommendations for the actuators.

Use a high-performance industrial grease with a wide temperature range, such as a lithium complex or polyurea grease, designed for both low and high temperatures (e.g. -40°C to +180°C).

Standard applications temperature range:
-20° - +120 °C

Tex Universal grease type LGMT3 (SKF)

High temperature applications temperature range: > +120 °C, in case of continuous operation in elevated temperatures polyurea or PAO based greases are used.

7.14 Spare parts

Recommended spare parts

To ensure long-term operation and reliability, the following spare parts are recommended:

- **Ball bearing**
- **Shaft seal** (stuffing box) - adapted to the size, type and application of the damper. See data sheet for up-to-date information.
- **Damper seal** - normally fiberglass braid, sized according to nominal diameter (DN) and number of shafts.
- **Actuators and electrical equipment** - assessed per application. Recommended spare parts are determined per order taking into account the size of the installation.

Shaft diameter	Ball bearing	Graphite braid
Ø15	UCFL-202	6 mm
Ø20	UCFL-204	6 mm
Ø30	UCFL-206	6 mm
Ø50	UCFL-210	10 mm
Ø70	UCF-214	12 mm (0.5 in.)

7.15 Troubleshooting

Quick guide/checklist

The problem	Possible cause	Proposed action
The damper is slow to maneuver	Non-aligned stuffing box causing uneven pressure distribution on the shaft	Loosen all nuts. Adjust the stuffing box so that an even pressure is achieved around the entire shaft. Tighten the nuts evenly and crosswise.
	Packing box overtightened	Loosen the nuts evenly. Adjust to an appropriate tightening torque so that the seal remains tight without affecting the freedom of movement of the shaft. Check that the damper is easy to operate.
	Foreign objects in the packing box	Dismantle the packing box. Remove any material and check the shaft and sealing surfaces for damage or wear. Clean thoroughly and reassemble, possibly with a new seal. Check the function and cleanliness of the shaft seal.
	Incorrect or incorrectly fitted seal	Check that the correct seal type and dimension is used. Also check that the seal is correctly fitted without displacement or deformation. Replace if necessary and tighten the stuffing box evenly.
	Defective ball bearing	Replace the defective bearing with a new one of the correct type and size. Check shaft and bearing housing for damage. Ensure proper lubrication as recommended. See section 7.5.
	The damper is skewed, causing the shaft to tighten	Loosen the fasteners and center the damper correctly in the flanges. Check that the shaft runs freely and that the damper can be operated without inertia. Tighten the fasteners evenly and crosswise. Check function after adjustment.

Quick guide/checklist cont.

The problem	Possible cause	Proposed action
The damper does not close completely	Foreign material obstructs the damper blade	Open the inspection hatch (if applicable) or dismantle the damper. Remove foreign material. Check damper blade, seal and housing for damage. Clean and verify that the blade moves freely.
	The damper seal is damaged	Remove the seal and clean the sealing surfaces. Identify the cause of the damage (wear, debris, incorrect assembly). Install new seal according to specification. Check tightness and function. See section 7.8.
	Actuator sensors are misadjusted or defective	Check settings for limit switches and other sensors as specified. Adjust if necessary. Test the sensors or replace defective units. Check that the damper reaches the closed position.
The damper does not close completely	Adapter between shaft and actuator is incorrectly fitted	Adjust the adapter according to the manufacturer's instructions so that the movement is not hindered.
	The damper is installed incorrectly, causing distortion	See installation instructions, section 4.2. Check mounting position and centering.
The damper does not open fully	The damper blade takes in the duct wall (square dampers)	Check that the damper is centered in the duct. Inspect the blade and duct for deformation or incorrect dimensions. Adjust assembly or replace damaged parts. Ensure free space for movement.
Leakage in packing box	Insufficient tightening	Tighten the nuts until the leak stops. See section 7.10.
	Long-term stored damper	Inspect visually. Clean moving parts. Check maneuverability. Lubricate according to instructions. Replace gaskets if necessary. Verify functionality before commissioning. See 7.11.

Quick guide/checklist cont.

	Wrong type of seal	Replace with original seal as specified. See section 7.11.
Leakage in flange joints	Incorrect installation	Dismantle the damper. Check sealing surfaces, flange flatness and shaft alignment. Reassemble with correct centering and tightening according to instructions. See 4.2.
	Seal slips or damper shifts during operation	Close the facility. Loosen the flanges. Check the sealing. Tighten the bolts crosswise with the correct torque. Replace the seal if necessary. Retighten after a certain period of operation.
	Worn out seal	Dismantle the damper and replace the seal. Clean sealing surfaces and check housing/ blade for damage. Install new seal according to specification. Verify function.
	Damaged damper housing due to erosion	Inspect the damage. For minor damage - repair. If larger - replace damper housing. Evaluate operating conditions and consider erosion protection (paving or material replacement).

8. Terms of guarantee

Swedenborg guarantees the function of products of its own manufacture against material and manufacturing defects under normal use. The warranty is valid for 24 months from the date of delivery, unless otherwise agreed in writing.

The warranty does not cover products that have become defective due to:

- Abnormal use
- Incorrect installation
- Incorrect electrical connection
- Damage caused by corrosion or erosion

Our obligation under the warranty is limited to repairing or replacing defective products. The buyer shall return the product to us, carriage paid, for inspection. If investigation shows that the fault is covered by the warranty, repair or replacement is free of charge.

For equipment supplied by Swedenborg but manufactured by another party (e.g. actuators, limit switches), the same warranty conditions apply as those provided to us by the manufacturer.

Swedenborg is not responsible for products returned without our written authorization.

Unless otherwise agreed, our sales are subject to **NL 17 - General terms of delivery**.

9. Environment, recycling & disposal

Our products are designed and manufactured for longevity.

At the end of the product's life, it is important that it is handled and disposed of in an environmentally sound manner.

The damper contains no hazardous materials and can be recycled without special measures.

Components such as actuators, gears, oils and greases should be recycled separately according to local regulations.

Always follow national and local environmental requirements when disposing of and recycling the product and its components.

9.1 Waste management

Ensure that the system is switched off and that all heating, gas, system air and electricity are disconnected before starting work.

- Use protective equipment such as gloves, goggles and protective clothing to protect yourself from potential hazards.
- Carefully remove the installed flue gas damper.
- Flush and clean the damper - especially if harmful, explosive, hot or other dangerous media are used.
- Follow the facility's procedures for recycling metals and other materials.
- Dispose of according to local regulations and legal requirements.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