ROD SOURCE SHIELDS LB 8300

Operating Manual



69560BA2 Rev.02 06/2026

BERTHOLD

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1 About this operating manual

1.1 Applicable documents

Technical Information, Id. No. 69560TI2

1.2 Some prior remarks

The product is handed over to you by the manufacturer BERTHOLD TECHNOLOGIES GmbH & Co. KG (designated as Berthold in the following) in a complete and functionally reliable condition.

This operating manual illustrates how to:

- set up/install the product
- operate the product
- carry out maintenance on the product
- dismount the product
- dispose of the product

Read these instructions thoroughly and completely before working with the product. We have tried to compile all the information for safe and proper operation for you.

However, should questions arise which are not answered in this manual, please contact Berthold.

Store the instructions where they are accessible for all users at all times.

1.3 Storage

This operating manual as well as all product-related documentation relevant to the respective application must be accessible at all times during the life cycle near the device.

1.4 Target group

The product may only be installed, operated, maintained and repaired by trained personnel.

This manual is directed at qualified specialist personnel who are familiar with handling radioactive sources and heavy system components.

Specialist personnel refers to those who can assess the work assigned to them and recognize possible dangers through their specialist training, knowledge and experience as well as knowledge of the relevant regulations.

1.5 Validity of the manual

The manual is valid from the delivery of the Berthold product to the user until its disposal. Version and release date of this operating manual can be found in the bottom of each page. An alteration service is not provided by the manufacturer Berthold.

The manufacturer reserves the right to make changes to this operating manual at any time without stating reasons.

NOTICE

The current revision of this operating manual replaces all previous versions.

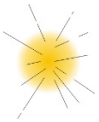
1.6 Structure of the manual

This manual has been divided into chapters. The order of the chapters should help you to familiarize yourself quickly and properly with the operation.

1.7 Copyrights

This manual contains copyright-protected information. None of the chapters may be copied or reproduced in any other form without prior authorization from the manufacturer.

1.8 Representation

Identifier	Meaning	Example
Round brackets	Image reference	Connect the plug (fig. 1, item 1)
	Prohibited actions, procedures or processes within a figure.	
	Representation of the ionizing radiation within a figure.	

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1.9 Symbols used

NOTICE

If this information is not observed, deterioration in the operation and/or property damage may occur.

IMPORTANT

Sections marked with this symbol point out important information on the product or on handling the product.

Tip

Provides tips on application and other useful information.

	**General warning symbol**
	**Warning symbol danger of crushing**
	**Warning symbol heavy loads**
	**Warning symbol suspended load**
	**Warning of radioactive substances**
	**Wear protective helmet**
	**Wear safety shoes**
	**Do not touch the surface**

1.10 Structure of warnings

⚠ Signal word



Source and consequence
Explanation, if required
- ▶ Measure

In case of emergency

- **Warning symbols:** (warning triangle) draws attention to the hazard
- **Signal word:** states the severity of the hazard
- **Source:** states the type and source of the hazard
- **Consequence:** describes the consequences if warning is ignored
- **Measure:** states how one can avoid the hazard.
- **In case of emergency:** states how to react in case of direct danger.

Warning levels used

In this manual, warning instructions in front of instructions for action refer to risks of injury or damage to property. The hazard-prevention measures described must be observed.

⚠ DANGER



Indicates an **imminent**, major hazard, which will certainly result in serious injuries or even death if the hazard is not avoided.

⚠ WARNING



Indicates a **potential** hazard, which can result in serious injuries or even death if the hazard is not avoided.

⚠ CAUTION



Refers to a **potentially dangerous** situation, which can result in medium or minor physical injuries or damages to property, if it is not avoided.

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1.11 Definition of Terms

Source
Sealed radioactive sources.

Ionizing radiation
Radiation from a radioactive substance.

Emergency
Event that immediately or later leads to a serious danger or to high property damage.

1.12 Symbols used on the device



Ionizing radiation

The shield is equipped with a radioactive source. Please note the handling instructions. Please observe the transport instructions in this operating manual.



Crush hazard

On variants with an actuator, there is a risk of crushing from moving components after the protective housing has been removed.

2 Safety

2.1 Product safety

The device was designed, manufactured, and tested in accordance with the state of the art and generally recognized technical standards. It was delivered in a condition free of safety-related defects.

2.2 Proper use

The source with shield is used in connection with a detector and a suitable evaluation unit provided by Berthold to measure the radiation intensity occurring during a radiometric measurement.

The shield was developed as shield/protective container for radioactive sources and may be used exclusively for this purpose.

Usually, the shield contains a radioactive source. The notes on radiation protection contained in the present manual as well as any statutory requirements in this respect are to be strictly adhered to.

The following constitutes proper use

- Adhering strictly to the instructions and operation sequences and not undertaking any different, unauthorized practices which could put your safety and the operational reliability of the shield at risk.
- Observing the provided safety instructions.
- Carrying out the prescribed maintenance measures or having them carried out for you.

The following constitutes improper use and is to be avoided

- Any non-compliance with the present operating manual for the supplied products
- Applying conditions and requirements which do not conform to those stated in the technical documents, data sheets, operation and assembly instructions and other specific guidelines of the manufacturer.
- Using the product after any repair carried out by employees who have not been authorized by Berthold.
- Using the product in a damaged or corroded condition.
- Dismounting the unit while the radiation beam outlet is in the open position (except for situations in which the locking mechanism is defective and the beam outlet can no longer be closed).
- Operation without the safety precautions provided by the manufacturer.
- Any modification to design and function, except for any activities provided for and described in the present manual.
- Restructuring or changing the system components.
- Manipulation or avoidance of existing safety equipment.

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Berthold shall only accept liability for / guarantee the correspondence of the product to its publicized specifications.

If the product is used in a way which is not described in this manual, the product's protection is compromised and the warranty becomes void.

2.3 Ambient conditions during operation and storage

The shield was specifically designed for use in rough ambient conditions. The compliance with the operating conditions specified below contributes to guaranteeing the permanent functionality of the shield and the prevention of damage.

Shields containing radioactive substances and sources are to be stored in a lockable storage room complying with the national requirements for the storage of radioactive substances.

Storage temperature: -20°C to +60°C. Storage outside this range can lead to malfunctions, permanent damage to the device, safety risks and potential danger to persons. This temperature range does not apply to the optional components limit switch and pneumatic actuator. Please observe the specifications in the document Technical Information (Id. No. 69560TI2).

Operating temperature: -30°C to +80°C. Operation outside this range can lead to malfunctions, permanent damage to the appliance, safety risks and potential danger to persons. This temperature range does not apply to the optional components limit switch and pneumatic actuator. Please observe the specifications in the document Technical Information (Id. No. 69560TI2).

The higher the dust and dirt content of the environment, the more likely the rotational motion of the shutter mechanism can be impaired or entirely blocked. For this reason, the functional test intervals (see chapter 7) should be adjusted for the ambient conditions. Highly combustible or explosive substances must not be kept in the vicinity of shields in order to prevent a fire from spreading to the radioactive substances. Furthermore, the ambient condition requirements in the document Technical Information (Id. No. 69560TI2) are to be observed.

2.4 Qualification of the personnel

NOTICE

A minimum requirement for all work on or with the product would be employees with general knowledge who are instructed by an expert or authorized person.

At different parts in this manual, reference is made to personnel with certain qualifications who can be entrusted with different tasks during the installation, usage and maintenance.

The four groups this refers to are:

- Employees with general knowledge
- Experts
- Authorized persons
- Radiation Safety Officer

Employees with general knowledge

NOTICE

Employees with general knowledge must always be guided by one expert at the very least. When dealing with radioactive substances, a radiation safety officer must also be consulted.

Employees with general knowledge are e.g. technicians or welders who can undertake different tasks during the transportation, assembly and installation of the product under the guidance of an authorized person. This may also refer to construction site personnel. The persons in question must have experience in handling the product.

Experts

Experts are people who have sufficient knowledge in the required area due to their specialized training and who are familiar with the relevant national health and safety regulations, accident prevention regulations, guidelines and recognized technical rules.

Expert personnel must be capable of safely assessing the results of their work and they must be familiar with the content of this manual.

Authorized personnel

Authorized personnel are those who are either designated for the corresponding task due to legal regulations or those who have been authorized by Berthold for particular tasks. When dealing with radioactive materials, a radiation safety officer must also be consulted.

Radiation safety officer

In order to ensure proper handling and compliance with the statutory requirements, the company has to appoint a radiation safety officer in accordance with the applicable national law (radiation protection regulation). The radiation safety officer must implement the statutory radiation protection requirements in order to protect employees against damage to their health caused by handling radioactive materials.

NOTICE

Dangerous goods officers must not perform any activities as radiation protection officers, unless they underwent a special training as radiation safety officer!

Radiation safety officers must have a special training with attendance of an officially recognized course and appropriate professional experience.

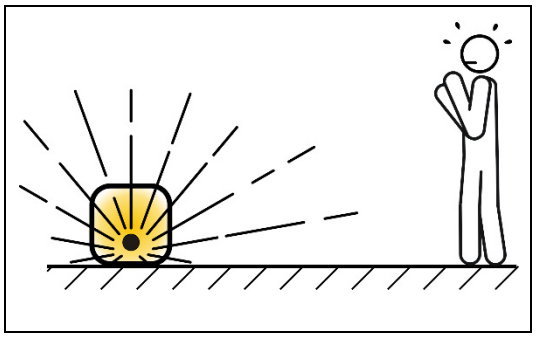
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2.5 Radiation protection

2.5.1 Basic principles and regulations

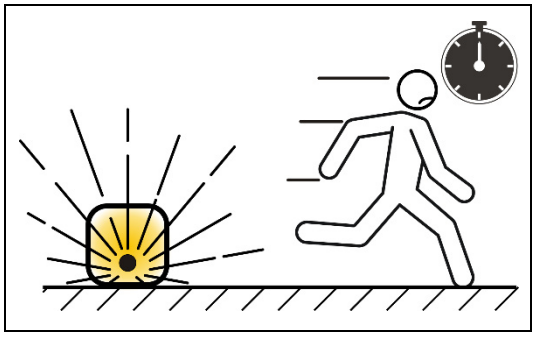
The amount of radiation absorbed by the body (exposure to radiation) is determined by three parameters from which the basic radiation protection regulations can be derived:

Distance



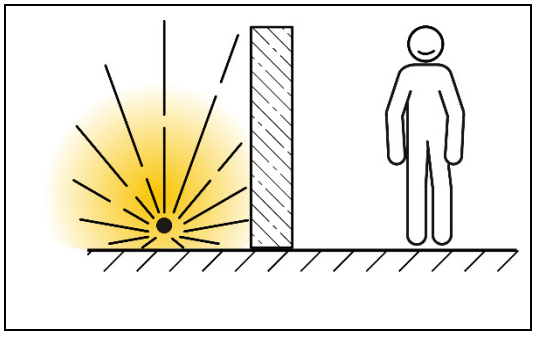
If work close to equipment containing radioactive substances is required, the largest distance possible is to be kept. In particular, this applies to employees not immediately required to work directly with the radioactive devices.

Time



Any work required in the vicinity of radiometric measuring systems is to be prepared for carefully and to be organized in a way that the work can be executed as quickly as possible. Here, providing the correct tools and aids is particularly important.

Shield



When mounting and dismounting the shield, it is to be ensured in advance that the radiation beam outlet is closed.

Exposure of employees to radiation

During installation, maintenance and decommissioning of the shield, employees may be exposed to radiation.

In order to keep such exposure as low as possible, the shield with the source may only be mounted and/or dismounted by authorized employees. Such authorized staff is to be instructed as regards all rules of behavior when handling radioactive substances in advance.

It is to be ensured that the locking mechanism of the shield is closed and secured in order to prevent the emission of unshielded radiation. Modification or damage to the shield must be avoided at all times.

Work may only be executed according to the instructions and under the supervision of the radiation safety officer, who furthermore has to calculate or estimate the exposure of the employees to radiation in order to ensure that the statutory dose rate limits are not exceeded.

Theft protection

Radioactive substances or equipment containing radioactive substances must be secured in a way that they are protected against access by unauthorized persons. In the case of firmly installed equipment containing radioactive substances, the protection against unauthorized access is generally provided by the firmly attached installation.

Shields with radioactive sources which are decommissioned for a certain period of time must be dismounted and securely stored in a storage room complying with the national regulations for the storage of radioactive substances.

Portable measuring systems must never be left unsupervised. When this equipment is not in use, it is to be protected against access by unauthorized persons.

In the case of fire

The shield material can melt and leak from the shield if exposed to very high temperatures for an extended period of time. During and after a fire, there is a risk of major long-time consequences for your health due to the incorporation of lead as well as a risk of increased radiation exposure.

When planning the use of radiometric measuring systems, constructional measures ensuring fire prevention are to be provided.

- In the case of fire, these measures limit the access to this area.
- Avoid the incorporation, contamination and exposure by keeping sufficient distance.
- Notify Berthold of the situation; you will promptly receive information on immediate measures.

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2.6 Emergency procedure

2.6.1 The shutter mechanism won't close

Due to mechanical damage, the shutter mechanism can no longer be moved to the CLOSED position.

1. Immediately leave the affected area.
2. Notify the radiation protection officer.
3. The radiation protection officer initiates appropriate measures and coordinates further action with Berthold.
4. If the necessary expertise is available, dismantle the radiation protection container (if applicable) and point the radiation exit channel towards, for example, a thick wall, the floor, or a steel plate.

2.6.2 Handling major operational disruptions

In case of serious operational trouble, such as fire or explosion, which could adversely affect the radiometric device, it cannot be ruled out that the function of the shield lock, the shield efficiency or the stability of the source capsule have been compromised. In this case, it is possible that people in the vicinity of the shield have been exposed to higher levels of radiation.

If you suspect such a severe malfunction, the Radiation Safety Officer has to be notified immediately. He will then investigate the situation immediately and take all necessary actions to prevent further damage and to avoid more exposure of the operating staff to radiation.

The Radiation Safety Officer has to make sure that the measuring system is no longer in operation and then take appropriate steps. If necessary, the competent authority must be notified, or the manufacturer or supplier of the measuring equipment must be consulted. All further measures may only be carried out under expert supervision.

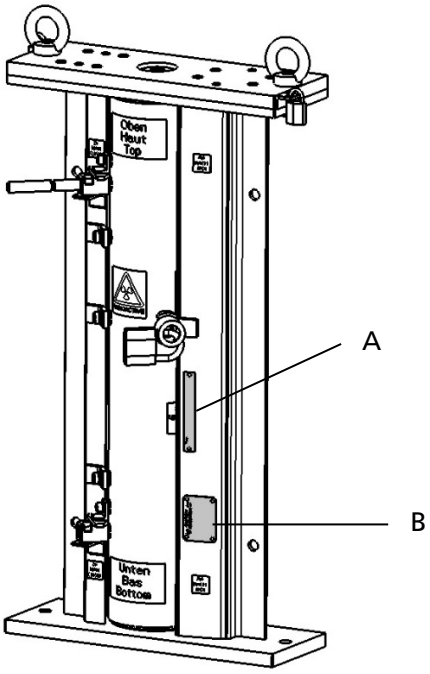
2.7 Operator's obligations

The operator of the product must regularly train his personnel in the following topics:

- Observation and use of the operating manual and the legal provisions.
- Proper use of the product.
- Observation of the plant security instructions and the operating instructions of the operator

2.8 Type plates

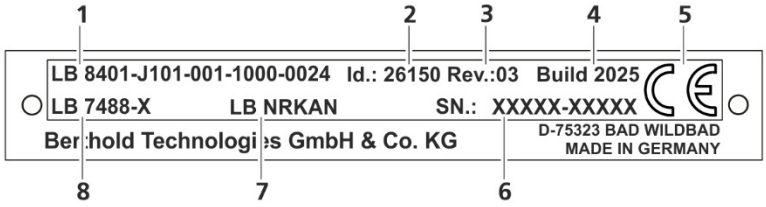
Type plates contain the most important information regarding the shield and the radioactive source installed within it.



A Type plate shield
B Type plate source

Fig. 1 Type plates, positions at the shield

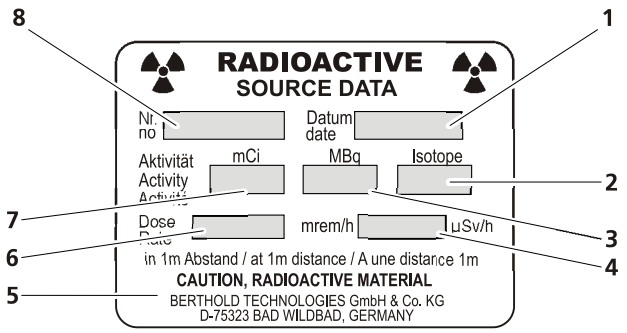
2.8.1 Type plate shield



1 LB number shield (Unique identification of the shield)
2 Order number
3 Bill of materials version
4 Year of construction (only if a CE declaration is available for the shield)
5 CE marking (only if a CE declaration is available for the shield)
6 Serial number
7 LB number Canada (if available)
8 LB number USA (if available)

Fig. 2 Type plate of the shield

2.8.2 Type plate source



1 Date of manufacture of the source
2 Isotope
3 Activity [MBq]
4 Dose rate at 1 m distance [µSv/h]
5 Supplier of the source
6 Dose rate at 1 m distance [mrem/h]
7 Activity [mCi]
8 Source number

Fig. 3 Type plate of the source

3 System description

The rod source shield is intended as shield/protective container for radioactive rod sources. The radioactive substance is contained in a leak-proof welded source capsule and installed in the rod source shield. Apart from source and shield, additional system components such as detectors and evaluation units are required for a complete measuring system. Usage of these system components is not the subject of this operating manual. Please refer to the individual manuals of the respective system components.

The shield consists of a robust steel housing holding a rotatable cylinder. The rotatable steel cylinder is filled with lead except for the very center which holds the radioactive rod source and a narrow channel along the active length of the source - the radiation beam path. The provided lever rod can be used to rotate the cylinder and its beam path 90 degrees between two positions. The closed position has the beam path pointed towards a vertical lead filled section of the shield frame, blocking the radiation coming through the beam path. The open position has the beam path pointed towards the process unit and detector.

The locking cylinder can be locked in both rotational positions (radiation beam path open, radiation beam path closed) using fixing screws or a padlock.

The locking plate on the upper side of the shield ensures that the source cannot be removed by unauthorized persons. Operators can secure the locking plate by installing a padlock at the right-hand and the left-hand side.

Only the provided bolt holes in the lower mounting plate, upper locking plate (after removing the lifting eye nuts) and vertical side bars can be used to mount the shield!

The vertical side bars and the upper locking plate bolt holes can optionally be used for tilt protection.

The rod source shield is additionally available in a version with a pneumatic actuator. In this version, the rotary movement of the lock cylinder is not performed manually via the lever rod, but automatically by a pneumatic shutter actuator. The pneumatic actuator performs the function of moving the beam exit channel between the "Closed" and "Open" positions.

In principle, all technical descriptions, safety-related notes, and functional principles in this manual apply equally to both variants—the manually operated as well as the pneumatically actuated version.

Deviations resulting specifically from the use of the pneumatic actuator (e.g., mounting requirements, power supply, control, or specific safety instructions) are described separately in the respective chapters.

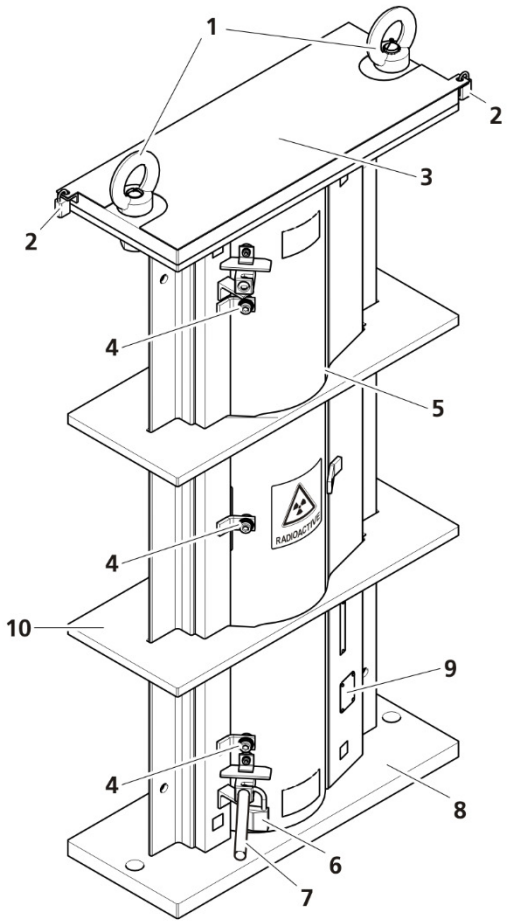
The rod source shield is available in different versions. You can find an overview of all variants in document Technical Information (Id. No. 69560TI2).

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Functional scope of the shield

- Shield radiation to a level that is non-hazardous for operating personnel
- Locking the radiation beam path in the CLOSED position for transport and during installation
- Protecting the integrated source capsule from mechanical damage and the effects of the environment

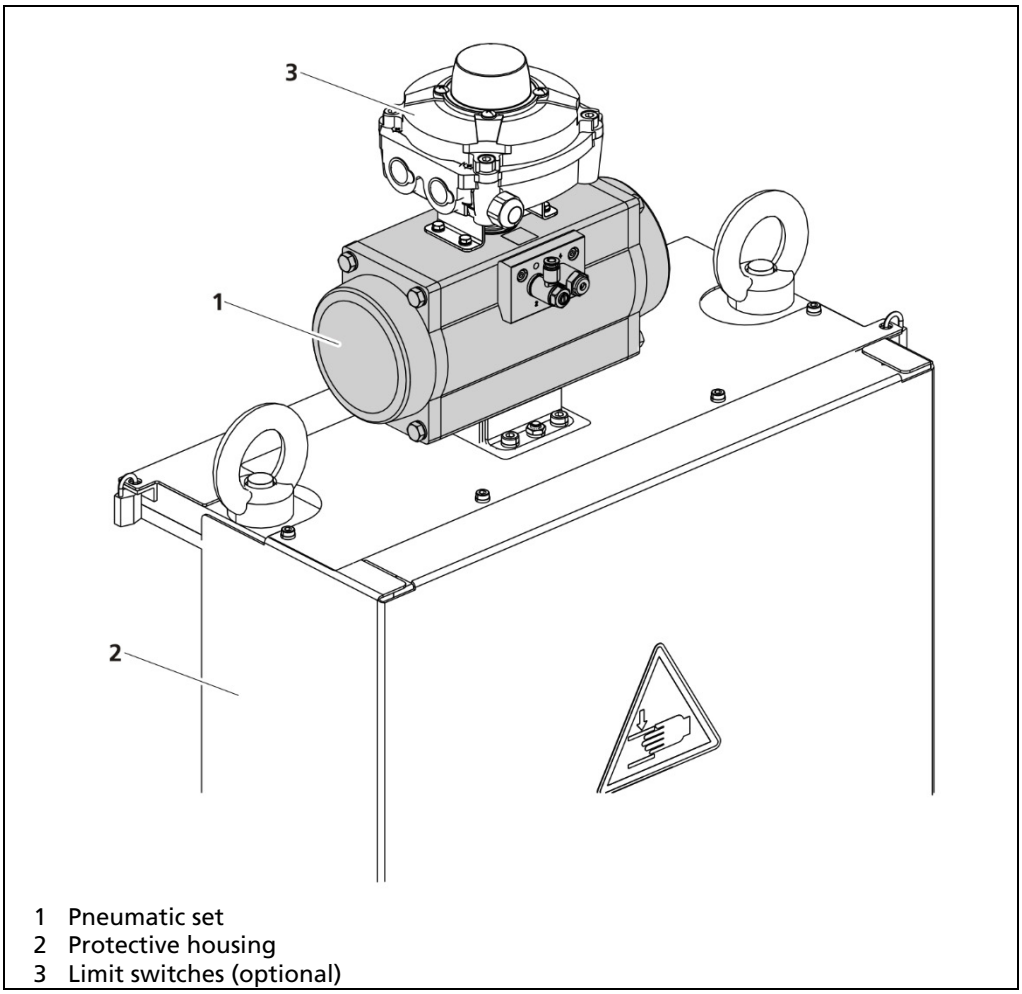
3.1 View



1 Lifting eye nuts DIN 582
2 Locking plate padlocks
3 Locking plate
4 Transport screw
5 Rotatable cylinder
6 Rotatable cylinder padlock (secures the shield against unauthorized opening or closing)
7 Removable lever rod (auxiliary equipment used for turning the rotatable cylinder)
8 Mounting base
9 Source type plate
10 Supporting plate (quantity depends on the shield length and rotatable cylinder diameter)

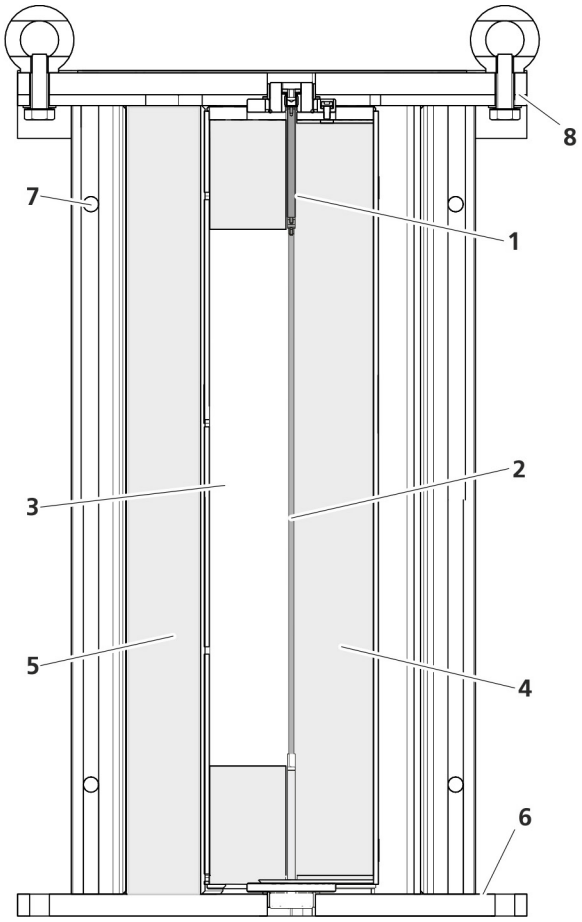
Fig. 4 Basic layout LB 8300

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1 Pneumatic set
2 Protective housing
3 Limit switches (optional)

Fig. 5 Basic design of the LB 8300 with pneumatic shutter actuator



1 Tungsten spacer
2 Rod source
3 Radiation beam path channel
4 Lead filled rotatable cylinder
5 Lead filled side structure for *CLOSED*-position
6 Mounting plate bolt holes
7 Tilting protection bolt holes
8 Upper locking plate bolt holes (after removing the lifting eye nuts)

Fig. 6 Sectional view (position *CLOSED*)

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4 Transport

4.1 Safety instructions

⚠ WARNING!



Danger of injury by falling loads!

Shields have built-in lead components increasing the weight.

- Only use the lifting eye nuts provided on the shield to attach the lifting gear.
- Never stand underneath a lifted or suspended load, keep at a safe distance.
- Wear head protection and safety shoes.

⚠ WARNING!



Danger of injury caused by heavy and bulky system components!

- Heavy and bulky system components should only be handled using aids and by at least 2 people.
- Observe the guidelines for safe handling of heavy loads.
- Ensure stability and use the provided fixing options.

⚠ CAUTION!



Danger caused by ionizing radiation!

Shields usually contain radioactive sources. An increased exposure to radiation may lead to damage to health.

- Consult the radiation safety officer responsible for your company.
- Transport the source exclusively inside the closed and secured shield.
- The locking mechanism must be in the *CLOSED* position and secured during transport and mounting of the shield.

NOTE



The device may only be transported by competent people (see 2.4 Qualification of the personnel).

The applicable national regulations of the country of use have to be observed. Observe the marking for the center of gravity on the outer packaging, if applicable.

4.2 Packaging

The shield containing the radioactive source is delivered in packaging that complies with applicable regulations for the transport of radioactive materials. Upon delivery, the shield is in the CLOSED position and secured with a lock. At the operator's request, the shield and the source may be delivered separately; in this case, the source is supplied subsequently in a dedicated transport shield.

4.3 Temporary storage of the source

If the source must be temporarily stored at the site of use between delivery and installation, please observe the following notes:

- Store the source exclusively inside a closed and secured shield.
- Store the shield in a lockable and properly marked room. The storage room must comply with the national requirements regarding the storage of radioactive substances.
- Accessible areas of increased radiation exposure must be marked and closed off, if required.

4.4 Scope of delivery

Check the delivery for completeness (material parts) and integrity. In the case of damage, immediately notify the forwarding agent and the manufacturer.

Check delivery

Document any visible transport damage with photos on delivery. In case of damage contact the transport company and the manufacturer immediately.

4.5 Transport to operation site

The transportation may only be executed by construction site personnel experienced in handling heavy components. The construction site personnel is to be instructed by at least by one authorized person. If the shields contains a radioactive source, the radiation protection officer is to be consulted, as well!

For lifting packages or shields weighing more than 25 kg, suitable aids (e.g. forklift truck) are to be used. If shields are lifted without transport packaging (wooden box or pallet), the provided lifting eyes are to be used exclusively for attaching the sling gear.

Please observe the radiation protection regulations for the transportation of radioactive substances.

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5 Installation

The shield may only be installed and mounted by competent people (see chapter 2.4 Qualification of the personnel). Possibly the radiation protection officer is to be consulted, as well.

5.1 Safety instructions

⚠ WARNING!



Danger of injury by falling loads!

- Only use the lifting eyes provided on the shield to attach the lifting gear.
- Never stand underneath a lifted or suspended load, keep at a safe distance.
- Only use tested sling gear components appropriate for the transport weight.
- Observe the marking for the center of gravity on the outer packaging, if applicable.
- Wear head protection and safety shoes.

⚠ WARNING!



Danger of injury caused by heavy and bulky system components!

- Heavy and bulky system components should only be handled using aids and by at least 2 persons.
- Observe the guidelines for safe handling of heavy loads.
- Ensure stability and use the provided fixing options.

⚠ CAUTION!



Danger caused by ionizing radiation!

Shields usually contain radioactive sources. An increased exposure to radiation may lead to damage to health.

- Consult the radiation safety officer responsible for your company.
- Transport the source exclusively inside the closed and secured shield.
- The locking mechanism must be in the *CLOSED* position and secured during transport and installation of the shield.

IMPORTANT



The applicable national regulations of the country of use have to be observed.

5.2 Ambient conditions during installation

Mount shield using the lifting eyes (Fig. 4, item 1). The minimum permissible temperature during installation is **-20 °C**.

5.3 Temporary storage of the source

If the source must be temporarily stored at the site of use between delivery and installation, please observe the following notes:

- Store the source exclusively inside a closed and secured shield.
- Store the shield in a lockable and properly marked room. The storage room must comply with the national requirements regarding the storage of radioactive substances.
- Accessible areas of increased radiation exposure must be marked and closed off, if required.

5.4 Preparing the installation

NOTE

The shutter must be turned and secured in the CLOSED position during transport and installation of the shield.

IMPORTANT

Size and position of the applicable measuring range are specified in the project planning phase and determined by means of drawings, sketches or written notes. During installation, these specifications must be strictly observed since deviations may lead to malfunction of the measuring system.

To avoid an unnecessary exposure to radiation, the handling period of the source (even if it is shielded) must be kept as short as possible during installation. It is therefore recommended to perform the following steps prior to delivery of the source:

- Installation planning (including estimation of radiation exposure)
- Instruction of the employees
- Organizing and cleaning the installation site
- Preparing the required tools and hoisting devices
- Removing all obstacles which might hinder the installation of the shield or the source

5.5 Checking the delivery

1. Check the delivery for completeness using the packing list.
2. Clean the parts, if required
3. In the case of damage, immediately notify the forwarding agent and the manufacturer.

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5.6 Installation of the shield

⚠ WARNING!



Risk of injury due to tilting shield!

There is a risk of injury to people when working on non-fixed shields.

- ▶ Always secure upright shields against falling by fasten securing straps to the lifting eyes.

NOTE



Malfunctions and / or damage to the shield due to impermissible ambient conditions!

The mounting location and mounting position are determined during the project planning and defined by drawings, sketches or written instructions. These instructions must be observed strictly during assembly.

- ▶ Also note the information in the document Technical Information (Id. No. 69560TI2).

To avoid unnecessary exposure to radiation, install the shield as final system component. The shield is placed on a mounting base at the measuring point and fixed. The mounted shield is secured against tilting by means of tipping protection.

Tip



If the shield contains a radioactive source, the measurement of the background count rate of the detector should take place before the shield is installed.

5.6.1 Requirements for variants with shutter actuator

If the shield is installed with pneumatic shutter actuator and the optionally limit switch unit, additional supply lines for compressed air and power supply (optional – only with limit switch) must be planned.

Requirements for Line Routing

All supply lines must be routed in such a way that they are permanently protected against the ambient conditions prevailing at the installation site. Observe the following protective measures:

- Mechanical protection: Route lines with strain relief and free of chafing to prevent mechanical damage.
- Thermal protection: Maintain minimum clearances to hot system components or use heat-resistant lines.
- Chemical protection: Ensure the material resistance of the lines against aggressive media or vapors on site.

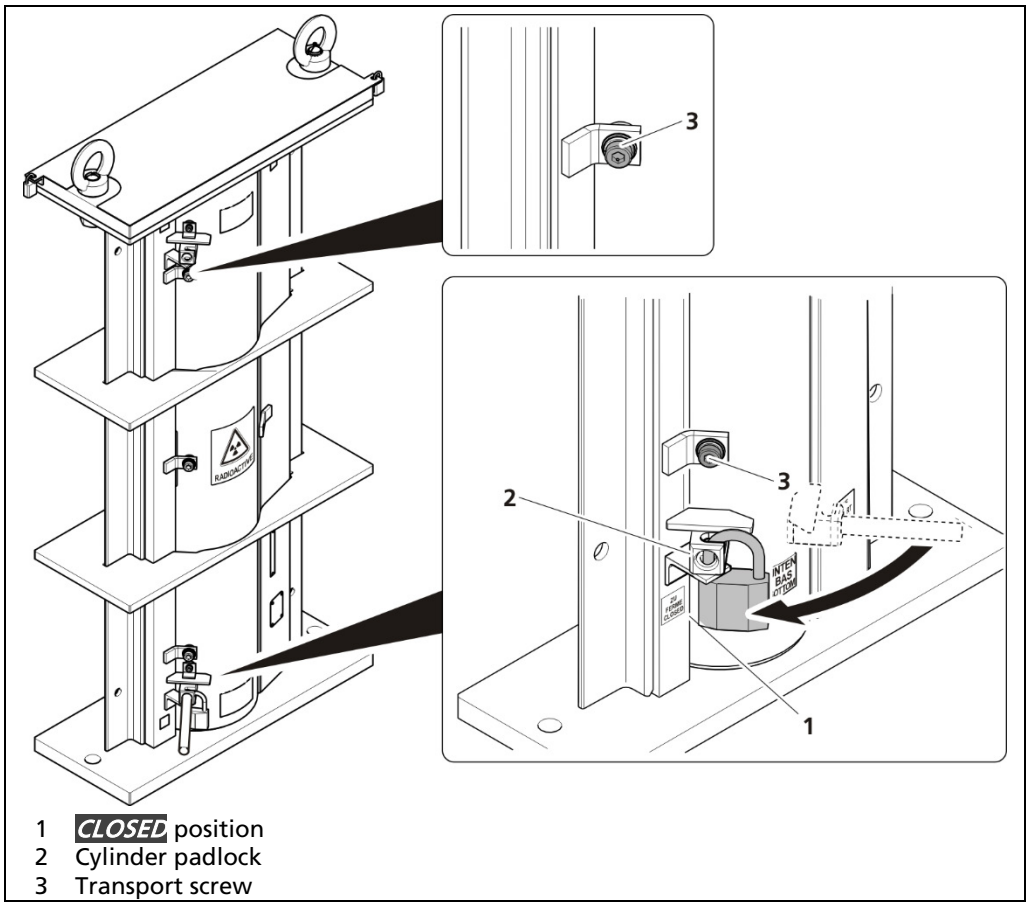
IMPORTANT



Please refer to the enclosed manufacturer documentation of the respective lines for specific limit values, bending radii, and connection data.

5.6.2 Carry out the mechanical assembly

The following sections describe and visualize the mechanical assembly of the shield in the standard version (without pneumatic shutter actuator and limit switch unit).



1 *CLOSED* position
2 Cylinder padlock
3 Transport screw

Fig. 7 Shield closed (*CLOSED* position)

1. Ensure that the shield has been closed and secured
   - the rotatable cylinder is set to the *CLOSED* position
   - The transport screw and, if applicable, the cylinder padlock are in place.

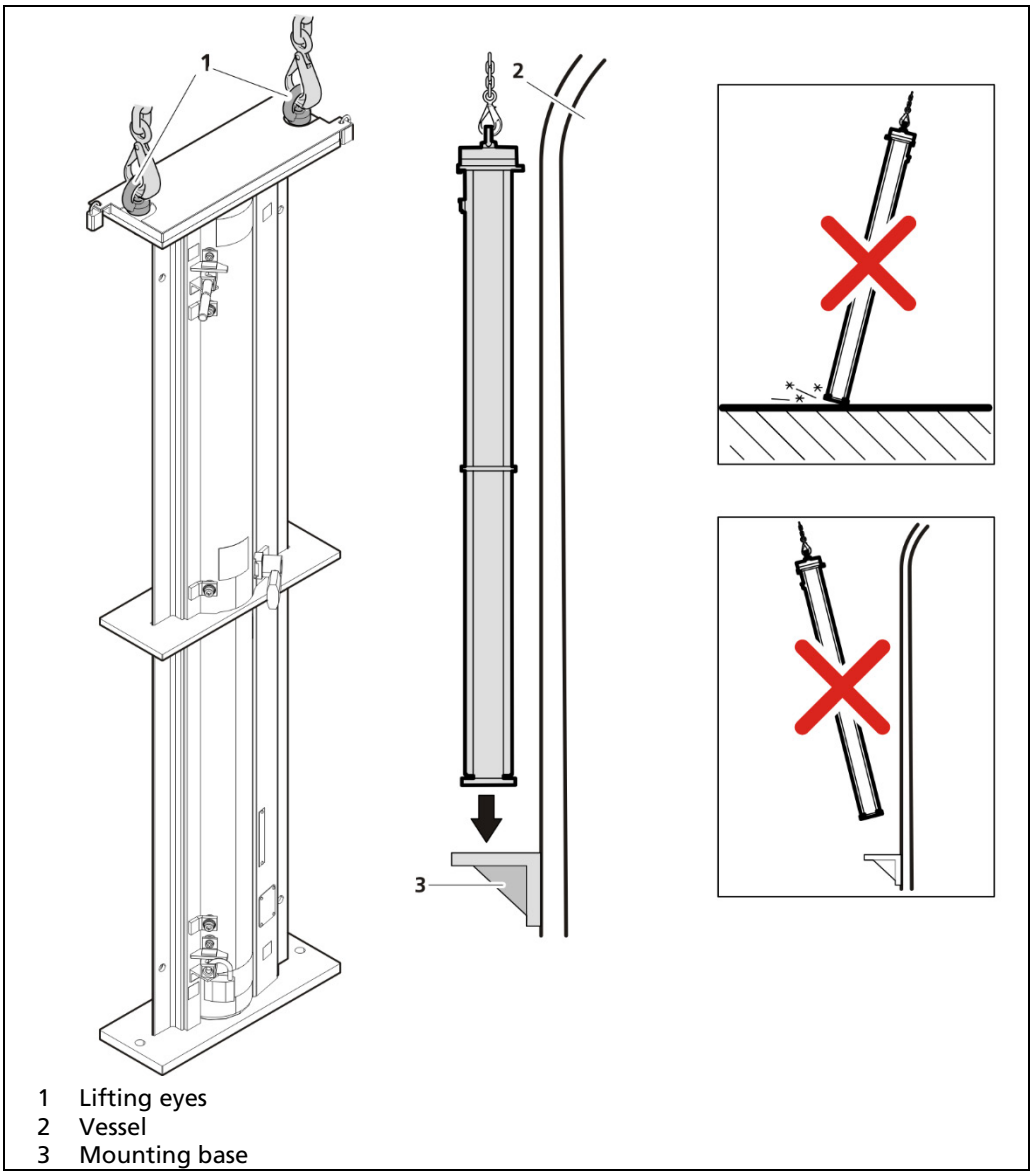
⚠ WARNING!

Danger of injury by falling loads!
Falling loads can endanger people.
- Never stand underneath a lifted or suspended load, keep at a safe distance.
- Cordon off the danger zone with barrier tape.

⚠ WARNING!

Danger of crushing by moving the shields!
Due to the high weight of the shield, there is a risk of injury.
- Heavy and bulky system components should only be handled using aids and by at least 2 people.
- Do not reach between the shield and the container or mounting base.

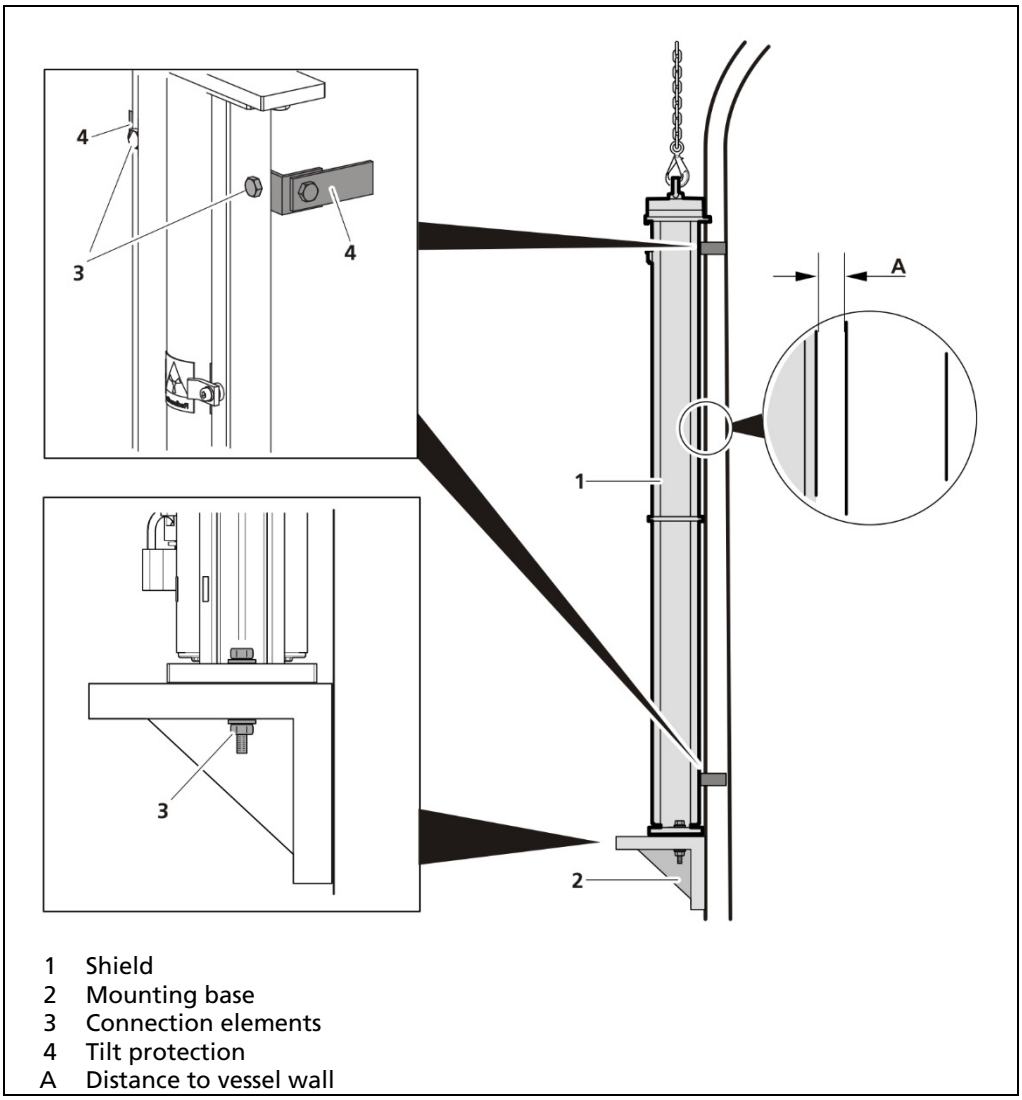
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1 Lifting eyes
2 Vessel
3 Mounting base

Fig. 8 lift and lower the shield

2. Fasten the shield with sufficiently dimensioned and tested lifting straps at the lifting eyes (Fig. 8, item 1).
3. Raise the shield and place it vertically in the mounting position.
4. Carefully place the shield on the mounting base (Fig. 8, item 3).
5. Make sure the cylinder padlock side faces out and the beam path side faces the vessel.



1 Shield
2 Mounting base
3 Connection elements
4 Tilt protection
A Distance to vessel wall

Fig. 9 Installation on vessels

⚠ WARNING!

Incorrect assembly may result in accidents!

Incorrect selection of the fastening elements endangers the stability of the shield.

- Use correctly sized and approved mounting elements (mounting base, anti-tilt, nuts and bolts, screw lock).

6. Fasten the shield (Fig. 9, item 1) to the mounting base (Fig. 9, item 2). The plant operator is responsible for selecting the connection elements (Fig. 9, item 3), the screw locking and the tightening torque.
7. Secure the shield to the container wall with the anti-tilt device on both sides (Fig. 9, Item4). The plant operator is responsible for selecting the connection elements (Fig. 9, item 3), the screw locking and the tightening torque.

NOTICE

In the design of the shield it was assumed that the shield is mounted with a distance A of 20 mm, see Fig. 9.

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NOTICE

Shields can be stacked or staggered when a larger measuring range is needed than one shield can provide. Please refer to the chapter "Mounting Variants" in the document Technical Information (Id. No 69560TI2).

- The installation is complete.

5.7 Shields with pneumatic shutter

These additional instructions apply to the LB 8300 shields with pneumatic shutter actuator. An optional limit switch is used to provide clear signaling of the current position of the shield.

⚠ WARNING!



Risk of injury from moving parts!!

- Ensure that the actuator is only commissioned after the protective housing has been fully assembled.

NOTE



Observe further documentation!

When using a pneumatic shutter actuator, please observe the notes and recommendations in Technical Information 69560TI2 in advance.

Please observe the external documentation for the pneumatic shutter actuator and the optional limit switch unit.

IMPORTANT



The shield and the actuator (pneumatic set), as well as the protective housing, are delivered in an unassembled state. The actuator must therefore be mounted on-site. The installation and mounting of the shield may only be performed by qualified personnel (see 2.4 Qualification of the personnel). If necessary, the radiation protection officer must be consulted.

5.7.1 Operating Mode

The pneumatic actuator is designed to open the shield only when compressed air is supplied. When sufficient operating pressure is applied to the actuator, it opens the shield and unblocks the beam path. To maintain the shield in the open position, the compressed air supply must be continuously present throughout operation.

5.7.2 Safety Function (Fail-Safe)

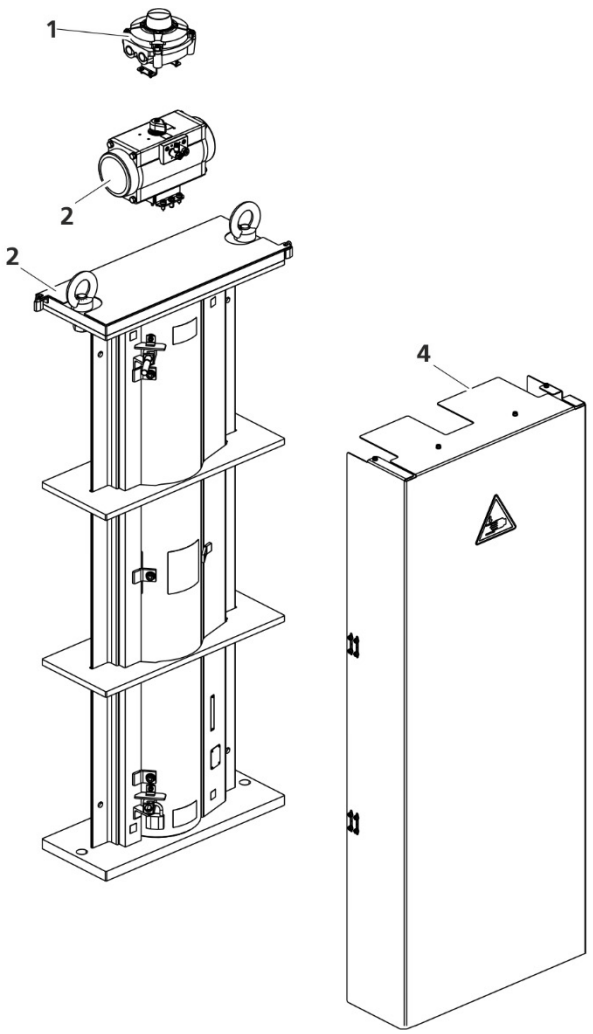
The shield operates according to the "fail-safe closed" principle (safety position: *CLOSED*). The shield closes automatically and immediately interrupts the beam path in the event of:

- Failure or interruption of the compressed air supply
- Pressure drop below the required minimum operating pressure
- Faults within the external compressed air system
- Activation of the emergency stop circuit or disconnection of the supply voltage

This mechanical and pneumatic shutter ensures that the shield automatically moves to the safe end position (*CLOSED*) upon any loss of pressure, thereby maintaining a safe system state at all times.

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5.7.3 Delivery Condition



1 Limit switch (option)
2 Pneumatic set
3 Shield
4 Protective housing

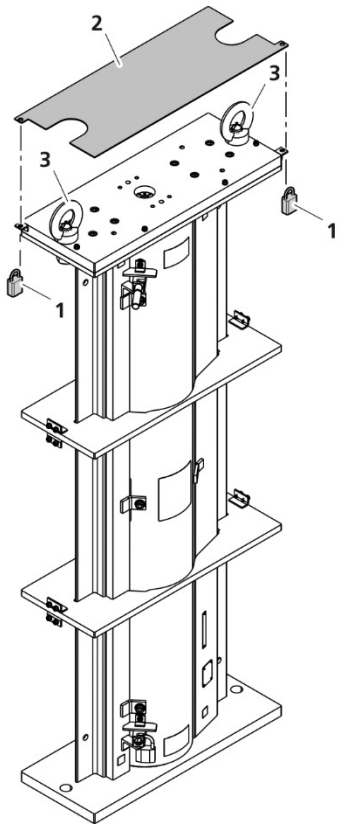
Fig. 10 Delivery condition

5.7.4 Installation of the actuator (pneumatic set)

NOTE

Observe installation specifications!

Mount the shield on the vessel as described in 5.6 Installation of the shield. The pneumatic switch device must not be put into operation until the shield has been fully mounted at the installation site.



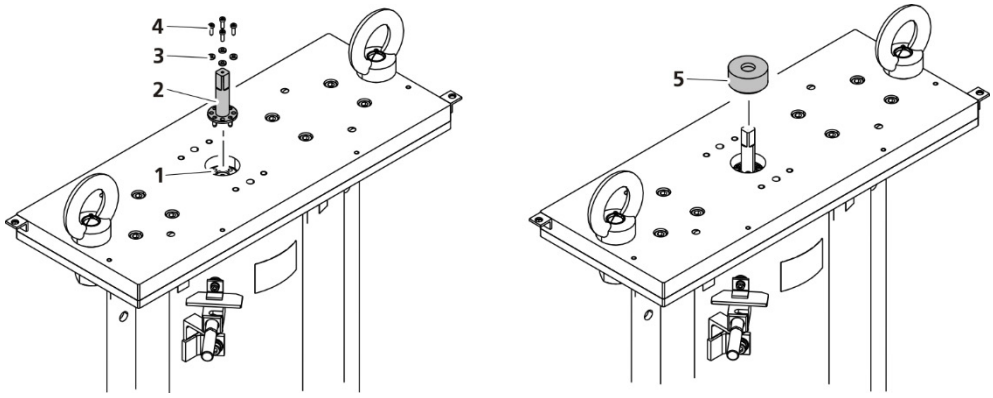
1 Padlock
2 Locking plate
3 Lifting eye nut

Fig. 11 Installation of the pneumatic actuator

1. Remove the padlocks (item 1) and the locking plate (item 2).
2. For variants 100, 270, 69540-2x, additionally remove the lifting eye nut (Item 3) before carrying out further work.

▶ The bearing plate is accessible and the pneumatic unit can be mounted.

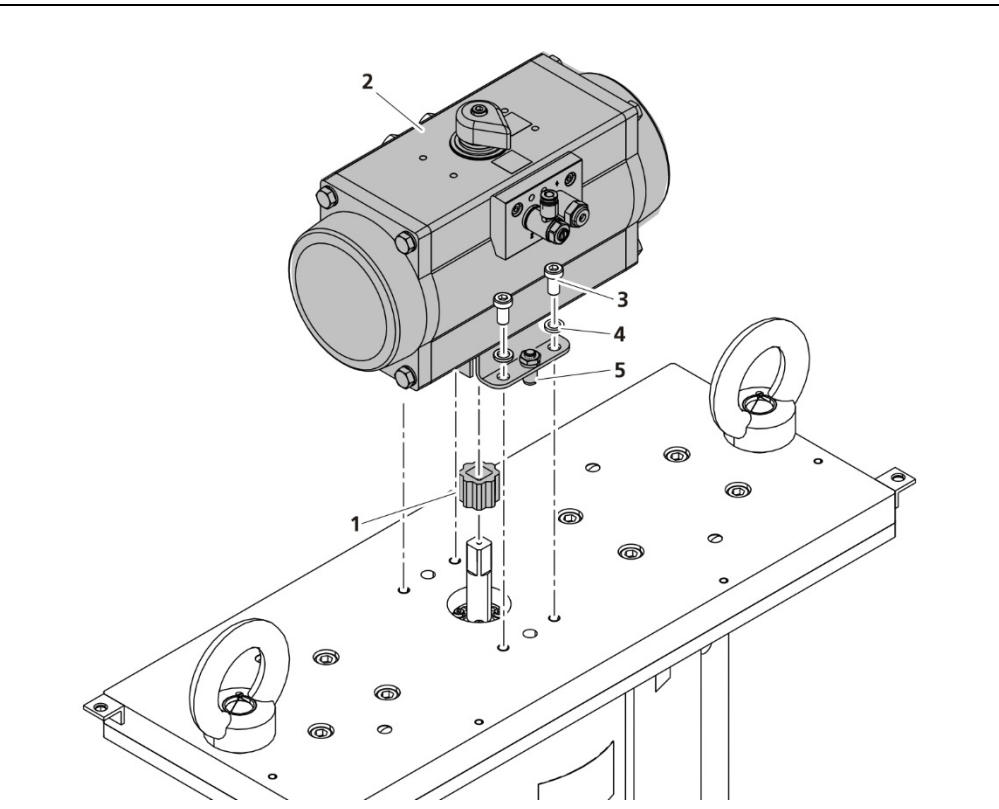
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1 Bearing plate
2 Coupling
3 Self-locking washer M4
4 Hex socket head screw M4x12
5 Dust cap

Fig. 12 Mounting of the coupling

3. Place the coupling (Item 2) onto the bearing plate (Item 1).
4. Fasten the coupling using the supplied lock washers (Item 3) and the screws (Item 4). Tighten the screws to a tightening torque of 1.8 Nm.
5. Slide the dust cap (Item 5) completely over the mounted coupling (Item 2).



1 Reduction sleeve
2 Self-locking washer M8
3 Hex socket head screw M8x16
4 Pneumatic actuator
5 Dowel pin

Fig. 13 Mounting of the actuator

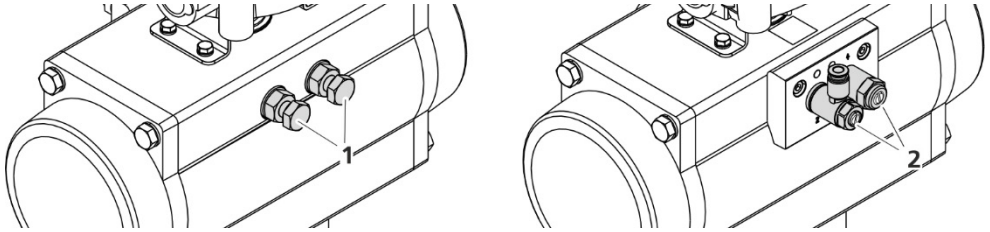
6. Place the reduction sleeve (Item 1) onto the square actuator of the coupling.
7. Position the actuator (Item 4) using the pre-assembled dowel pins (Item 5).
8. Fasten the actuator (Item 4) using the supplied self-locking washers (Item 2) and the screws (Item 3).
9. Tighten the screws to a tightening torque of 15 Nm.

NOTE

Observe the preset end stops!

The mechanical end stops (Fig. 14, item 1), as well as the flow control valve and the exhaust air flow control valve (Fig. 14, item 2) of the compressed air supply, are preset at the factory to the intended operating pressure of 5.5 bar.

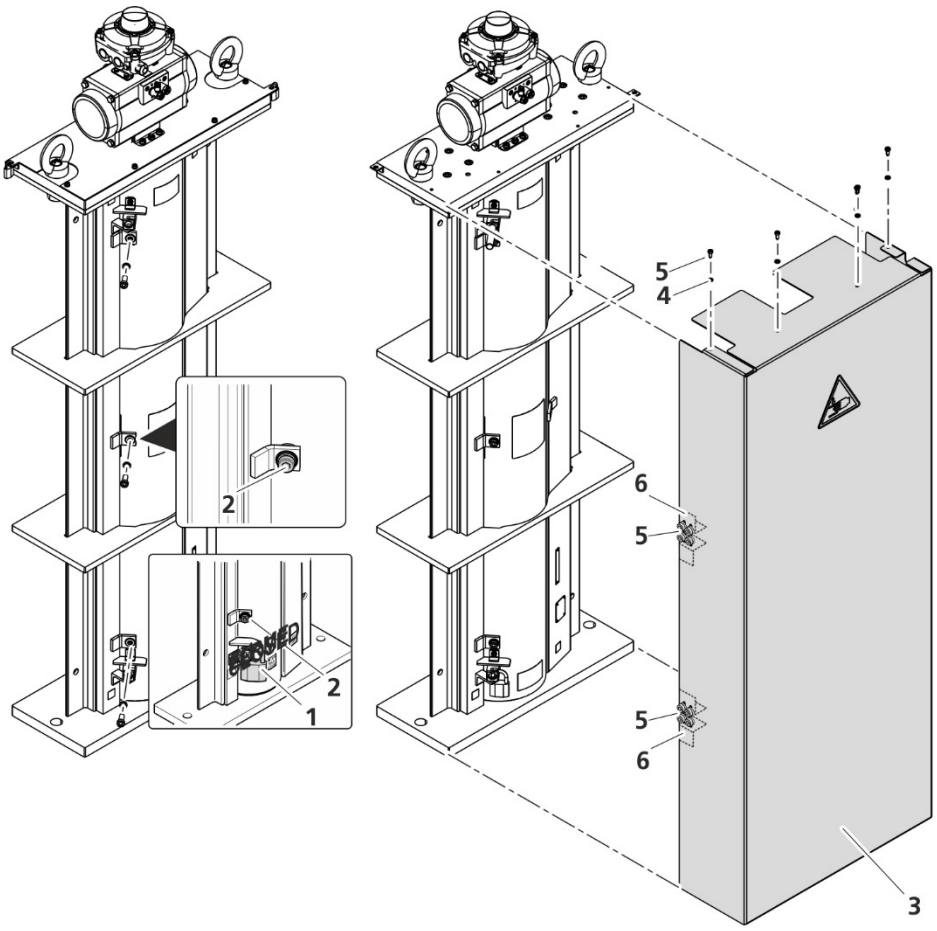
- Modifications or readjustments of these components must be carried out exclusively by qualified personnel.
- Improper adjustments can impair the function, operational safety, and service life of the pneumatic actuator. Applicable operating and safety regulations must be observed before making any changes.



1 Preset end stop
2 Control valve

Fig. 14 Preset end stops and control valve

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1 Padlock
2 Transport lock screws
3 Protective housing
4 Lock washer M6
5 Hex socket screw M6x12
6 Clamping piece

Fig. 15 Mounting of the actuator

10. Remove the padlock (Item 1) on the locking cylinder as well as the transport lock screws (Item 2) so that the cylinder can move freely and be set in motion by the actuator.
11. Attach the supplied protective housing (item 3). The clamping pieces on both sides must rest tightly against the stiffening plate. If necessary, loosen the lateral hex socket screws (item 5) beforehand.
12. Fasten the supplied protective housing (Item 3) to the upper mounting points using hex socket screws (item 5) and lock washers (item 4). Tighten all screws (item 5) to a torque of 6.3 Nm.

▶ The assembly of the actuator is complete.

5.7.5 Compressed air connection for pneumatic shutter actuator

⚠ WARNING!



Risk of injury from work on compressed air lines!

- ▶ Before working on compressed air lines: Fully depressurize the lines and secure the system against reconnection.
- ▶ After installation: Test for leaks and check the switching function.

⚠ WARNING!



Risk of explosion due to non-compliance with manufacturer instructions!

- ▶ For operation in potentially explosive atmospheres, compliance with the specifications in the "Operating Conditions | EX" manual from the manufacturer of the pneumatic actuator is mandatory.

NOTICE



When using a pneumatic shutter actuator, please refer to the notes and recommendations in the Technical Information 69560TI2 in advance.

Connecting the compressed air line

- The actuator features a QS-6 push-in connector, suitable for hoses with an outer diameter of 6 mm.
- Cut the hose cleanly and at a right angle to ensure a secure seal.
- Insert the hose straight into the connector until it audibly or tangibly clicks into place (push-in principle).
- To remove the hose, press the blue release ring of the QS-6 connector down evenly and then pull the hose out.

Testing the system

- Check the system for leaks. Ensure that no leaks can occur along the entire air-line.
- In the event of a leak, the pneumatic switching device automatically switches back to the "Closed" position via spring pressure as soon as the pressure in the air line drops below 2 bar.

Compressed air shutdown

NOTICE



The parts required for the compressed air shutdown of the pneumatic shutter actuator are not included in the scope of delivery. Such a valve allows you to shut off the air supply to the shutter actuator.

Option 1

- Install an electrical switching valve
- Use a suitable solenoid valve, e.g., Festo VOFC/VOFD.
- Mount the valve in the compressed air line that supplies the pneumatic shutter actuator.

- Connect the electrical control line according to the manufacturer's specifications.
- Test the function: When the electrical voltage is switched off, the air supply must be interrupted and the shield is closed.

Option 2

- Install a manually operated switching valve for emergency shutdown
- Use a manually operated valve for compressed air shutdown.
- Mount the valve in the compressed air line near the system, but outside the radiation area.
- Ensure a safe and easily accessible position for emergencies.
- Test the function: Actuating the button must immediately interrupt the compressed air supply and close the shield.
- Clearly mark the position of the manual valve as an emergency shutdown.

5.7.6 Electrical connection of the limit switches

These instructions apply to the LB 8300 shield with a pneumatic shutter actuator and limit switch. The limit switch attachment is used for detecting and providing electrical and visual feedback on the end positions of a actuator.

To ensure reliable feedback on whether the shield has actually reacted to the pneumatic switching impulse, we recommend using a limit switch.

⚠ DANGER



Danger to life from electric shock!

- The installation must only be carried out by a qualified electrician.
- Observe the relevant safety regulations. Electrical installations must be carried out in accordance with applicable national and international regulations as well as the recognized rules of technology. Improper connection can lead to severe property damage, electric shock, or fire.
- Only carry out installation and maintenance work when the device is de-energized.
- In the event of an electric shock, perform the necessary first-aid measures and immediately contact the emergency services.

⚠ WARNING!



Danger to life from explosion!

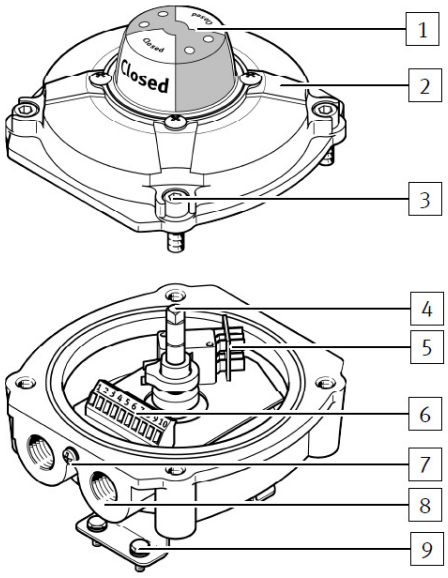
Non-compliance will result in severe injury or death.

- When using the limit switch units in hazardous areas, strictly observe the Technical Information 69560TI2 and the enclosed safety information.
- Only carry out installation, commissioning, and operation within the parameters and specifications defined therein.
- Operation outside of these specifications is impermissible.

NOTICE



- In any case, also observe the safety instructions enclosed with the limit switches and the associated operating instructions.
- The supplied plastic blanking plugs are intended exclusively for protection against contamination during transport and handling. Before commissioning, replace these with cable glands and/or blanking plugs that are approved for the respective hazardous area.



1 Position indicator
2 Housing cover
3 Housing screws
4 Shaft with cams
5 Proximity switch
6 Terminal block
7 Ground connection (PE)
8 Cable entry M20x1.5 or ½ NPT
9 Mounting bracket with fixing screws

Fig. 16 Limit switch SRBE-…-MW-22A-1W-… (ID.-No. 78265)

1. Note the position of the housing cover (Fig. 16, Item2) relative to the housing. Loosen the housing screws (Fig. 16, Item3) on the housing cover and remove the housing cover.
2. Screw the cable gland into the cable entry (Fig. 16, Item8). Guide the electrical connection cable through the cable gland to the terminal block.

NOTE

- Use cable glands of type of protection "flameproof enclosure" (Ex d) with a degree of protection of at least IP67.
- Close unused cable entries with approved blanking plugs.
- The cable glands must be suitable for the respective thread type.
- The threads of the cable glands must not protrude into the interior of the housing.

⚠ WARNING!

Loss of explosion protection due to incorrect assembly of the housing cover!

Improper assembly can trigger an explosion in hazardous areas and will result in severe injury or death.

- Only use the original housing cover.
- Mount the housing cover so that it seals tightly.
- Strictly observe the designated alignment of the component.

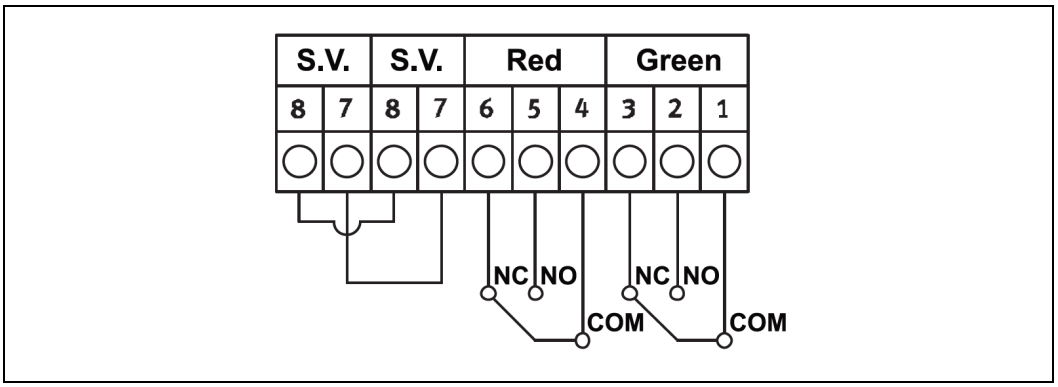
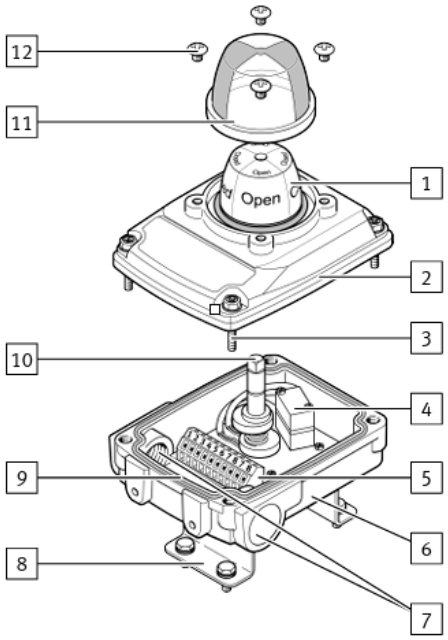


Fig. 17 Connection diagram

3. Wire the connections (Fig. 17). Maximum tightening torque of the screws: 0.4 Nm.
4. Connect the ground connection to the ground potential with low impedance (short line with a large cross-section).
5. Ensure the correct position of the seal. Position the housing cover (Fig. 16, Item2) and tighten the housing screws (Fig. 16, Item3).

▶ The installation position of the housing cover must correspond to the delivery status. Do not mount the cover twisted.



1	Position indicator	7	Cable entry
2	Housing cover	8	Mounting bracket
3	Housing screws	9	Ground connection
4	Proximity switch	10	Shaft with cams and spring
5	Terminal block	11	Protective cap
6	Shaft	12	M5 screws

Fig. 18 Limit switch SRBC-…-1W-… (Id. No.: 78264) and SRBC-…-1WG-…-EX6 (Id. No.: 78266)

1. Loosen the housing screws (Fig. 18, item 3) on the housing cover (Fig. 18, item 2) and remove the housing cover.
2. Screw the cable gland into the cable entry (Fig. 18, item 7). Guide the electrical connection cable through the cable gland to the terminal block (Fig. 18, item 5).

Type	Cable gland	Blind plug
SRBC-…-	3.5 Nm	3.5 Nm
SRBC-…-EX6	4.5Nm	5 Nm

3. Close unused openings with blanking plugs.

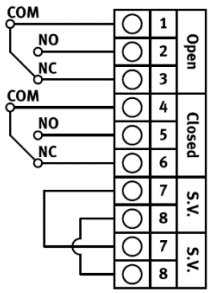


Fig. 19 Connection diagram

4. Wire the connections. Tightening torque: 0.4 Nm.

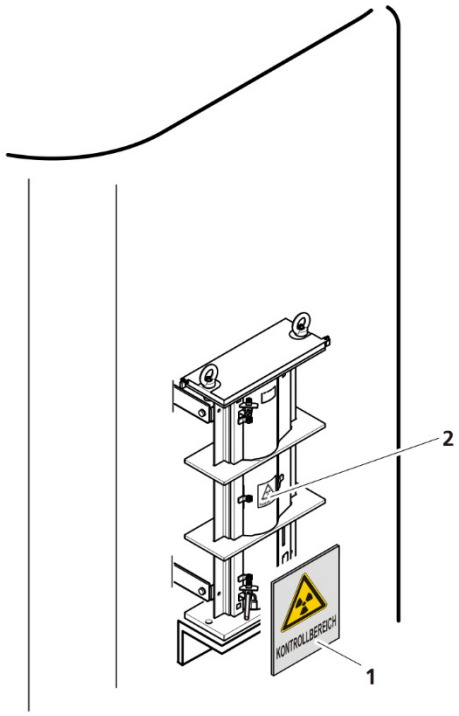
5. Connect the ground connection to the ground potential with low impedance. Tightening torque: 1.3 Nm.
6. Tighten the union nut of the cable gland.
7. Ensure the correct position of the seals. Position the housing cover (Fig. 18, item 2) and tighten the housing screws (Fig. 18, item 3). Tightening torque: 2 Nm.

▶ The installation position of the housing cover must correspond to the delivery status. Do not mount the cover twisted.

5.8 Marking

The radiation warning sign (Fig. 20, item 1) indicates the beginning of the control area as long as the control area is outside the shield.

If the control area is within the shield, then the radiation warning sign (Fig. 20, item 2) already applied to the shield is sufficient. Fig. 20 shows an exemplary identification of the control area according to German law. Please observe the local legislation of the country of installation. The marking of potential radiation protection areas must be carried out in accordance with local legislation.



1 Radiation warning sign control area
2 Rod source shield radiation sign

Fig. 20 Example marking

6 Usage

The shield may only operate by competent people (see 2.4 Qualification of the personnel). When operating the shield, unexpected changes at the process control system can occur. Before opening the locking mechanism, the guidelines of the system operator must be observed.

6.1 Safety instructions

⚠ CAUTION!



Danger caused by nuclear radiation!

Shields usually contain radioactive sources. An increased exposure to radiation may lead to damage to health.

- Ensure that the shield does not show any signs of damage or functional limitations.

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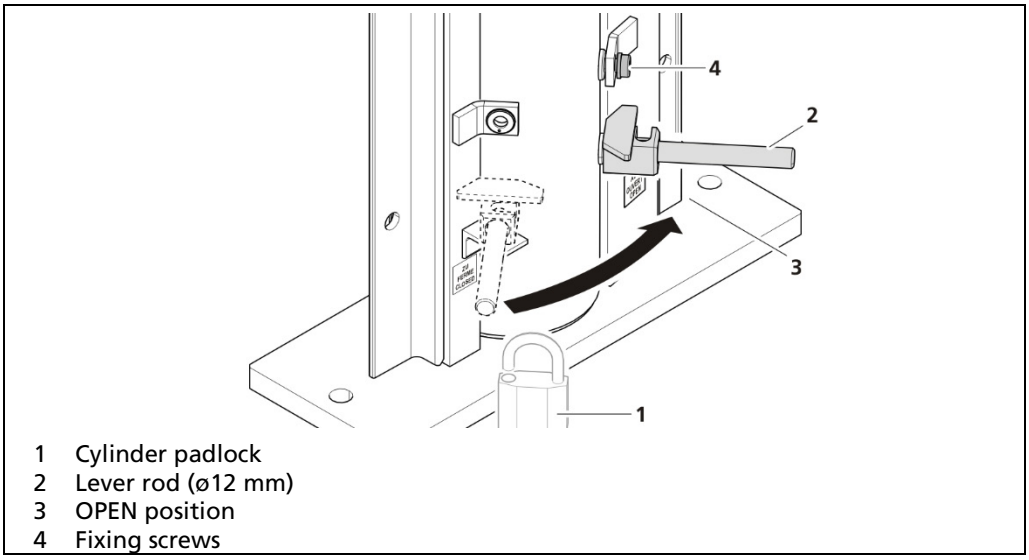
6.2 Opening and closing the locking mechanism

The locking mechanism is used for opening and closing the beam path.

NOTICE

During transport and installation of the shield, the rotary cylinder must be set to *CLOSED* and be secured.

Opening the locking mechanism



1 Cylinder padlock
2 Lever rod (ø12 mm)
3 OPEN position
4 Fixing screws

Fig. 21 Shield open (*OPEN* position)

1. If applicable, remove the cylinder padlock.
2. Remove the fixing screws.
3. Turn the rotary cylinder to the *OPEN* position with the help of the lever rod.
4. Secure the rotatable cylinder in the new position using fixing screws or the optional locking tool set (Fig. 22) with padlock.

▶ The radiation beam outlet is now open.

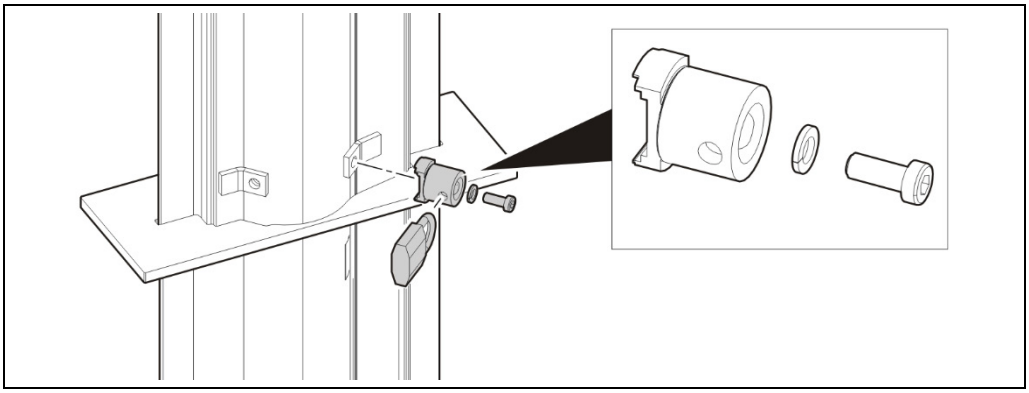
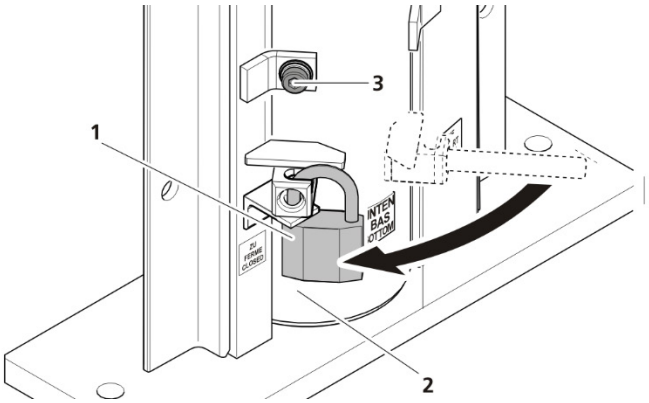


Fig. 22 Optional locking tool set (Mat. No. 73883)

NOTICE

Securing the rotatable cylinder in the *OPEN* position is not permitted in every country.

Closing the locking mechanism



1 Cylinder padlock
2 *CLOSED* position
3 Fixing screws

Fig. 23 Shield closed (*CLOSED* position)

1. Remove the fixing screws or the locking tool (Fig. 22).
2. Turn the rotatable cylinder to the *CLOSED* position using the lever rod.
3. Secure the rotatable cylinder in the new position using fixing screws and the cylinder padlock.

▶ The radiation beam outlet channel is now closed.

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6.3 Opening and closing the shutter mechanism pneumatically

The pneumatic shutter actuator enables safe opening and closing of the beam path via remote actuation from decentralized control stations. On-site intervention at the shield is not required during normal operation.

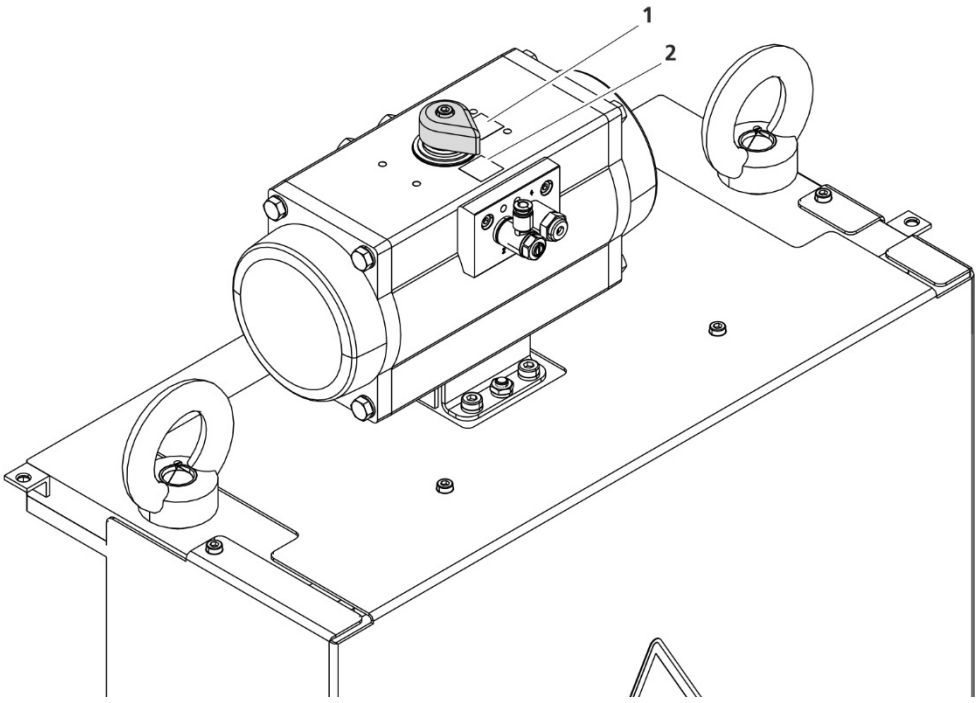
NOTE

The locking cylinder must strictly be in the *CLOSED* position and secured during transport and assembly of the shield.

⚠ WARNING!

Risk of injury from moving parts!

- Ensure that the actuator is only commissioned after all protective housing have been fully assembled.



1 Position *OPEN*
2 Position *CLOSED*

Fig. 24 Shutter mechanism positions

1. Ensure that the padlock on the locking cylinder and the transport lock have been removed.
2. Ensure that the supplied protective housing is properly installed as described in chapter 5.7.
3. Actuate the pneumatic actuator to move the shield to the *OPEN* position.

- The beam exit channel is now open.

7 Maintenance and repair

The maintenance may only be carried out by competent people (see 2.4 Qualification of the personnel), which is supervised by experts or authorized persons. For repair work the radiation protection officer is to be consulted.

7.1 Safety instructions

⚠ CAUTION!



Danger caused by nuclear radiation!

Shields usually contain radioactive sources. An increased exposure to radiation may lead to damage to health.

- Consult the radiation safety officer responsible for your company.
- Ensure that no one is in the radiation beam during operation.
- Longer repair and maintenance work on shields must not be carried out with the source installed. If a removal of the source is not possible, please contact the manufacturer.

IMPORTANT



The applicable national regulations of the country of use have to be observed.

Document the results of the tests you conducted using the check list in chapter 10. This documentation as well as the seal test certificates must be kept during the entire life cycle of the shield.

NOTICE



Adjust the intervals of the visual inspection and the functional check to the ambient conditions. If the ambient conditions are especially rough, the atmosphere is corrosive and / or there is a serious threat of contamination, the intervals should be shortened accordingly.

NOTICE



If damage affecting the secure function of the shield is detected during handling, maintenance or regular checks, the damage must be repaired after consultation with Berthold before the system is used again. Only spare parts specified by Berthold may be used and required repair work may be carried out exclusively by authorized persons.

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7.2 Visual inspection

The visual inspection must be carried out by people who are at least employees with general knowledge at the following intervals:

- before initial commissioning
- with every repair that may be required
- regularly at least every six months
- before shipping

When determining the intervals for the visual inspection, the following conditions are to be considered:

- ambient conditions (outdoors, rain, sunlight, wind)
- operating conditions (degree of utilization of the plant, misuse)

Performing the Visual Inspection:

1. Check the shield for obvious damage (dents, cracks, holes etc.) and corrosion.
2. Only before shipping: Check if the shield is in closed position and if the cylinder padlock as well as the fixing screws are installed.

Tip



If there is any doubt regarding the actual position of the beam path: Check the dose rate at the shield using a dose rate measuring device. If the shield is closed, the dose rate in the direction of the beam may not be significantly higher than at other parts of the shield.

3. If any defects are identified during visual inspection, inform the radiation safety officer who will initiate the measures required for repairing the defects.

For further information, please contact Berthold.

7.3 Leak test

Depending on the supervisory authority responsible for the area where the source is used, regular leak tests must be carried out according to ISO 9978. These tests are to be carried out at the discretion of the competent supervisory authority either by an authorized expert or by the manufacturer. For this test, the corresponding source documentation must be made available.

NOTICE

A leak test is not only required as a routine inspection measure but must also be performed after any incident that could compromise the source's containment.

In such cases, the leak test must be ordered by the responsible radiation safety officers in accordance with all applicable regulations and must cover not only the shield but also all other affected parts of the shield. The leak test must be performed immediately after the incident.

The leak test described below is intended for the following purposes:

- For periodic inspections during ongoing operation
- During prolonged storage of the shield
- When the shield is to be returned to service after storage

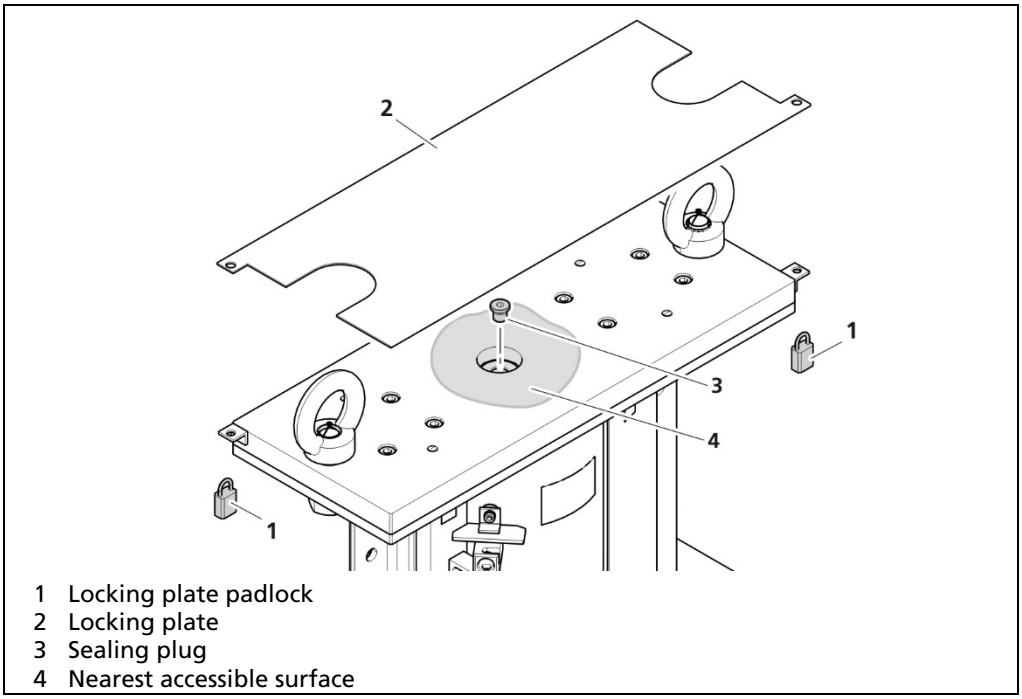
Required documents

- Inventory list of the sources to be tested including indication of previous leak tests.
- **Source certificate containing the following information:** Nuclide, activity, procurement date, physical/chemical form, description of the enclosure and type of sealing, resistance against mechanical and thermal influences or classification of the source design. The source certificate is provided together with the source.
- Information on the location, application as well as on the maximum customary mechanical and thermal strains.
- If the source is installed in a device, a drawing is to be provided. In the drawing, the position of the source and of all parts intended to protect the source against external influences must be clearly indicated. Recommendations regarding the most appropriate test method should be given, e.g. by indicating alternative test areas. If required, recommendations should be given on how the necessary test can be conducted without affecting the functionality of the system or device.

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Nearest accessible surface

The nearest accessible surface is defined as the area, which is most likely to be contaminated if a source is leaking. This area should be used primarily for performing the leak test.



1 Locking plate padlock
2 Locking plate
3 Sealing plug
4 Nearest accessible surface

Fig. 25 Nearest accessible surface for leak test

⚠ WARNING

Risk of contamination due to a leaking source!

If contamination is detected on the test surface, there is a risk of spreading radioactive material. This can lead to health hazards as well as widespread contamination of personnel, equipment, and the surrounding area.

- Notify the radiation safety officer immediately and follow his or her instructions.
- Immediately cordoning off the affected area to prevent the spread of contamination.
- Take appropriate measures to prevent contamination of the surrounding area by the radiation source. Secure the source.
- Notify the competent authority immediately that a potentially leaking source has been detected.
- Comply with national regulations.

The following instruction should be used:

- The area marked in grey in Fig. 25.

1. Remove the locking plate padlock and the locking plate
2. Unscrew the sealing plug.
3. Swab the area underneath the sealing plug and the surrounding area highlighted in (Fig. 25, item 4).

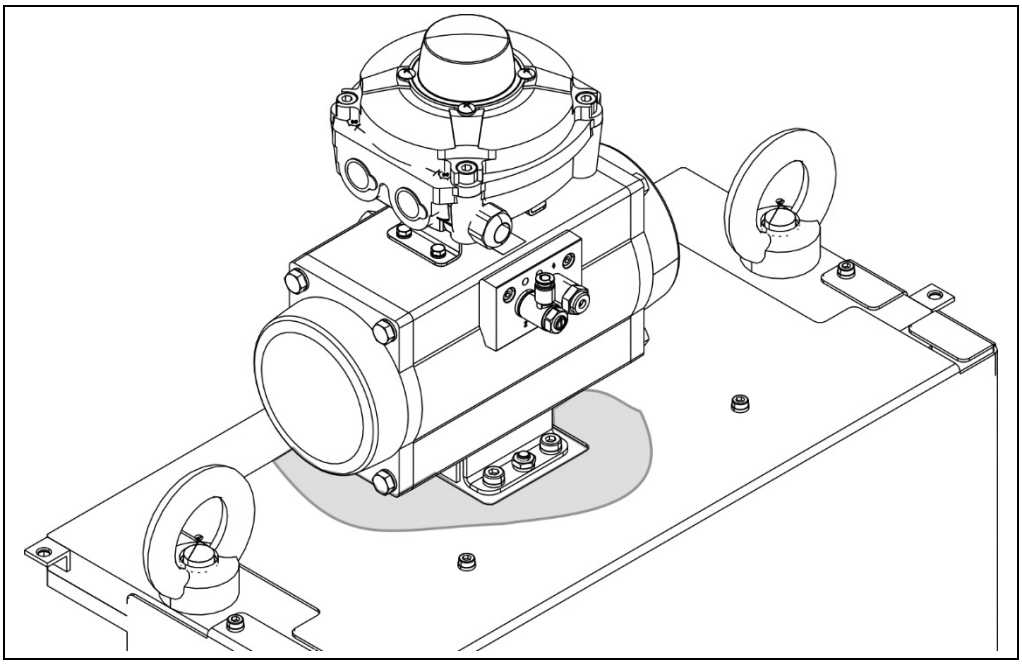


Fig. 26 Nearest accessible surface for leak test

Perform the contamination inspection on the equivalent test area of the shield with a pneumatic actuator, which is marked in gray in Fig. 26 .

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7.4 Shutter check procedure

The functional test of the rotating mechanism must be carried out by a person who is at least an employee with general knowledge. We recommend conducting the test of the rotating mechanism at the same intervals as the visual inspection if the operating condition of the system allows.

1. Ensure that no employees are present in the direction of the radiation beam outlet. Otherwise, these persons will be exposed to the radiation beam when the locking mechanism is opened.
2. Open and close the shield several times (see chapter 6) while observing the measuring signal of the corresponding measurement system.
   The shield works properly if the measured value approximately corresponds to the maximum value when the locking mechanism is closed (*CLOSED* position).

Tip



Alternatively, you can measure the dose rate in the beam path. In this case, the dose rate in the *CLOSED* position must be clearly lower than in the *OPEN* position. At the same time, the dose rate in the *CLOSED* position may not be significantly higher than at other parts of the shield.

3. Return the rotatable cylinder to its starting position (*OPEN* position or *CLOSED* position).
4. If applicable, reinstall the fixing screws and/or the cylinder padlock.
5. Immediately report any malfunction or stiffness of the rotating mechanism to the competent radiation safety officer.

▶ The shutter check is completed.

7.5 Removing and installing the source

Before conducting extended maintenance work at the shield, you have to remove the source. After the maintenance work is finished, you can reinstall the source. This does require the direct handling of the unshielded source.

You must clarify with the responsible supervisory authority in advance whether your license for handling radioactive substances includes handling unshielded sources.

In any case, the source may only be installed/removed by authorized people. The radiation safety officer is responsible for planning and monitoring the work.

NOTICE

In order to keep the exposure to radiation during the removal / installation of the source as low as possible, all people involved should familiarize themselves with the exact procedure in advance.

NOTICE

Only remove / install the source in areas with closed floors. Any apertures which are larger than the external diameter of the source (7 mm) are to be covered before commencing any work.

7.5.1 Removing the source

NOTICE

To be able to remove, install, or replace the source on the motorized variant, the complete actuator unit must first be disassembled. To do this, follow the steps in chapter 5.7.4 in reverse order. The work steps for removing, installing, or replacing the source are identical for all variants and do not differ between the models.

⚠ WARNING!

Risk of injury from work on compressed air lines!

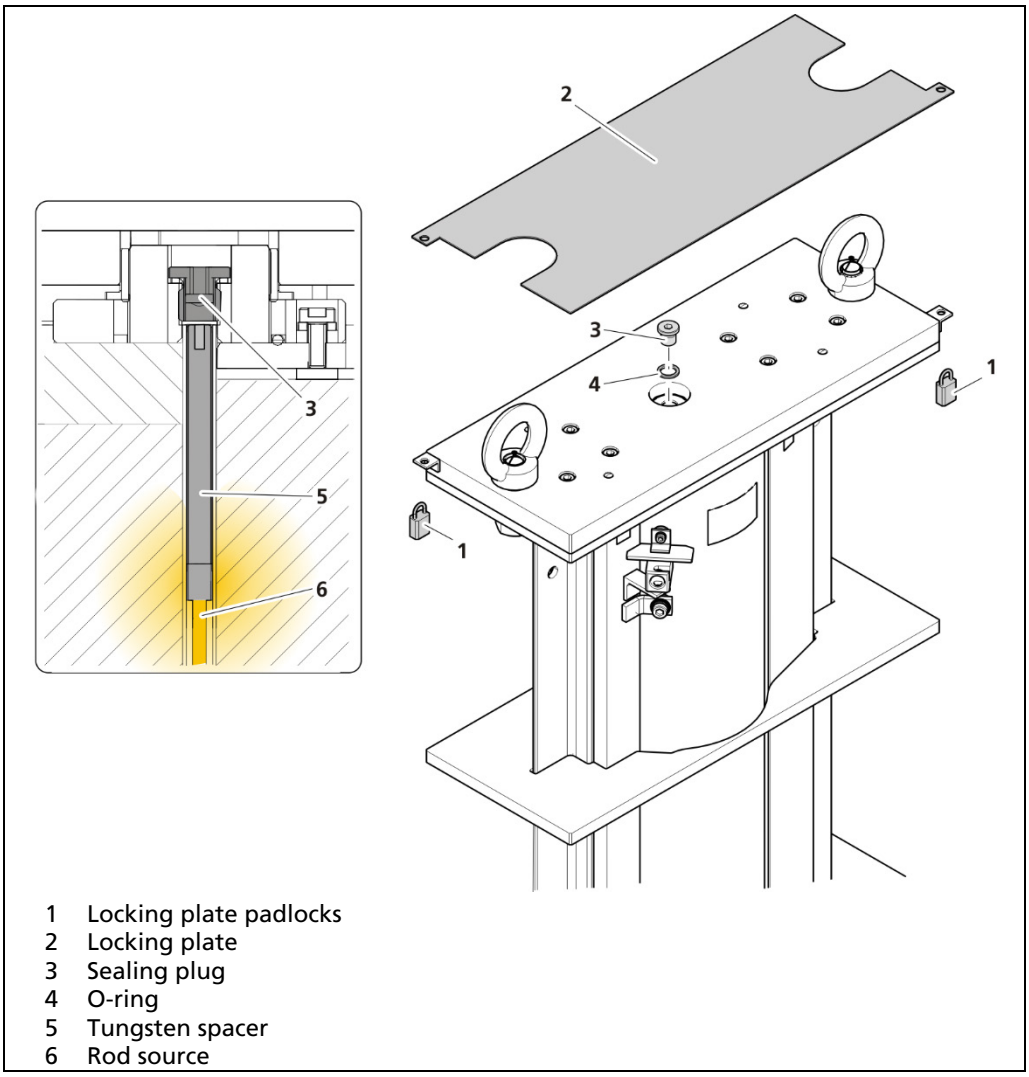
A sudden release of pressure or uncontrolled hose movements can cause injuries.

- ▶ Before working on the compressed air line, completely depressurize the system and secure it against reactivation.
- ▶ After installation or recommissioning, test the system for leaks and proper switching function.

The following tools are required:

- pliers to securely grip the source
- 12 mm hexagon wrench to unscrew the sealing plug of the tungsten spacer
- M3 threaded rod (approx. 50 mm) for screwing into tungsten spacer and pulling out the attached rod source

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1 Locking plate padlocks
2 Locking plate
3 Sealing plug
4 O-ring
5 Tungsten spacer
6 Rod source

Fig. 27 Make the source accessible

To remove the source, proceed as follows:

1. Prepare the transport shield (Fig. 28, item 4) for the source, remove the cover (Fig. 28, item 6) and the locking plug (Fig. 28, item 5).
2. Remove the locking plate padlocks (Fig. 27, item 1) and remove the locking plate (Fig. 27, item 2).

▶ You can now see the sealing plug (Fig. 27, item 3).

3. Unscrew the sealing plug (Fig. 27, item 3).
4. Remove the O-ring (Fig. 27, item 4).

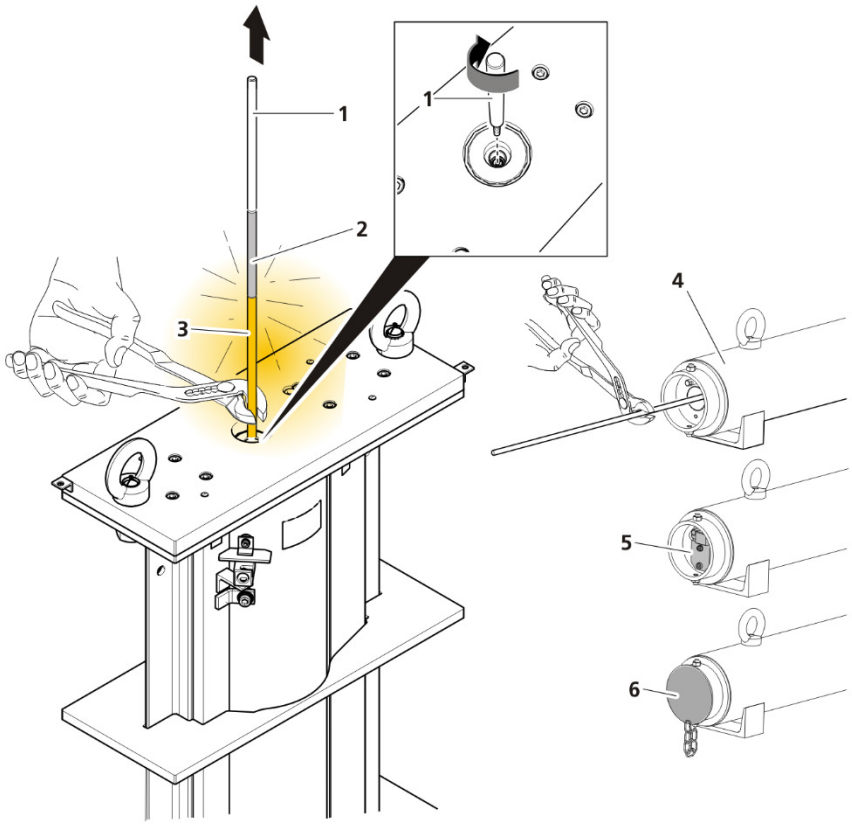
⚠ CAUTION!



Danger caused by ionizing radiation!

When the source is removed, the unshielded source must be handled as quickly as possible. An increased exposure to radiation may lead to damage to health.

- ▶ Hold the source only with pliers.
- ▶ Keep the source far from the body.
- ▶ Ensure that no people are in the field of radiation during the work.



1 Threaded rod
2 Tungsten spacer
3 Source
4 Transport shield
5 Transport shield locking plug
6 Transport shield cover

Fig. 28 Remove source out of shield

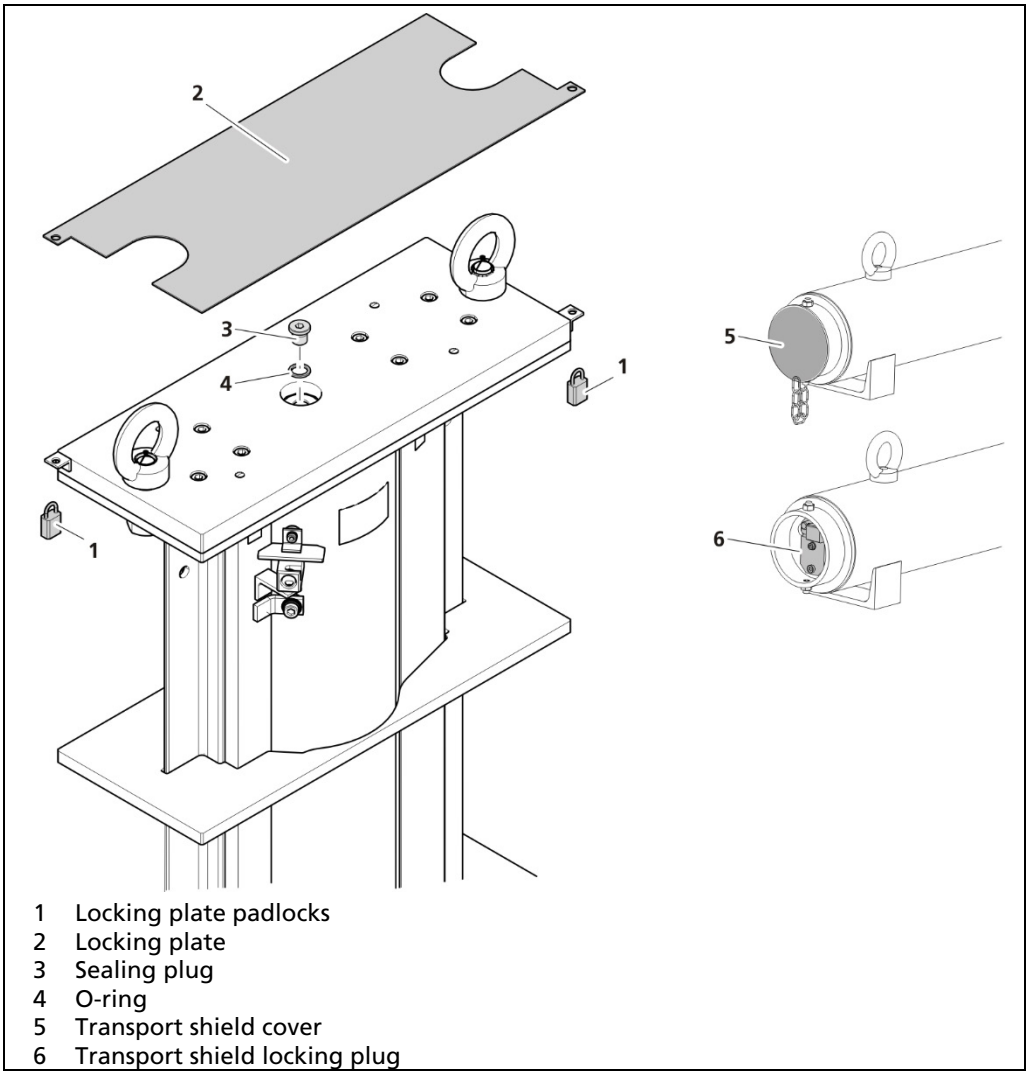
5. Screw the threaded rod (Fig. 28, item 1) into the thread of the tungsten spacer (Fig. 28, item 2).
6. Pull the source out of the shield with the threaded rod. Hold the source (Fig. 28, item 3) with pliers.
7. Insert the source as quickly as possible into the provided and opened transport shield (Fig. 28, item.4) and close the locking plug (Fig. 28, item 5) and the cover (Fig. 28, item 6).

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7.5.2 Installing the source

To install the source, the following tools are required:

- pliers to securely grip the source
- 12 mm hexagon wrench to unscrew the sealing plug of the distance piece



1 Locking plate padlocks
2 Locking plate
3 Sealing plug
4 O-ring
5 Transport shield cover
6 Transport shield locking plug

Fig. 29 Prepare the installation

To install the source, proceed as follows:

1. If necessary, remove the locking plate padlocks (Fig. 29, item 1) the locking plate (Fig. 29, item 2).
2. Unscrew the sealing plug (Fig. 29, item 3).
3. Remove the O-ring (Fig. 29, item 4).
4. Prepare the transport shield (Fig. 28, item.4) with the source to be installed and remove the cover of the transport shield (Fig. 29, item 5).
5. Remove the locking plug (Fig. 29, item 6) to open the transport shield.

⚠ CAUTION

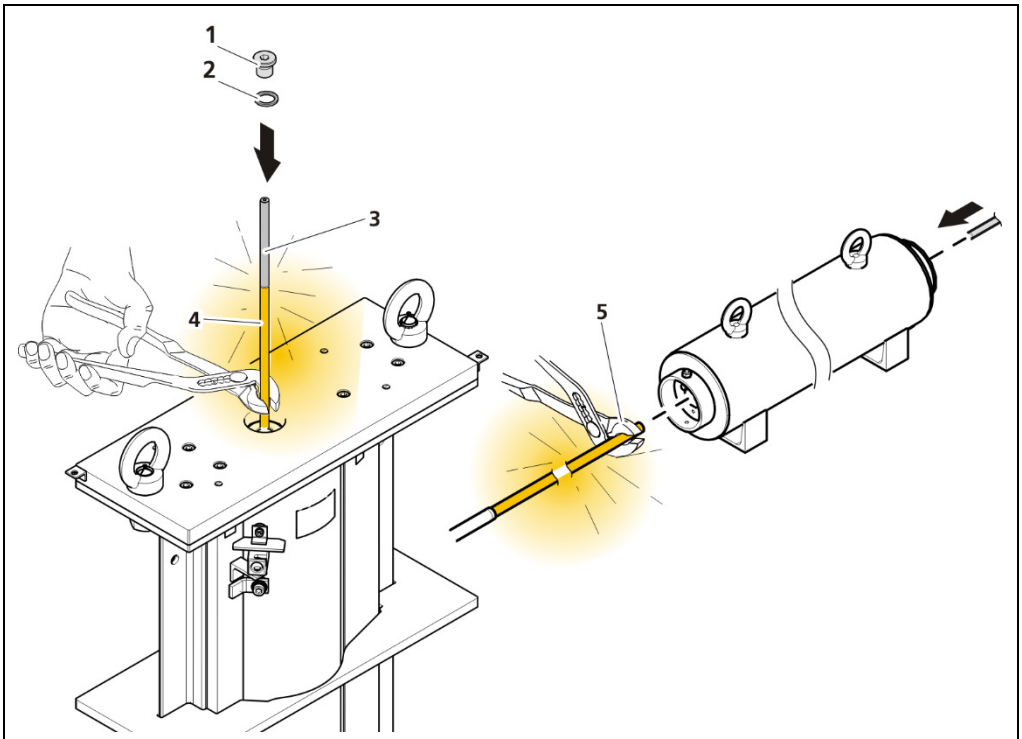


Danger caused by ionizing radiation!

When the source is removed, the unshielded source must be handled as quickly and little as possible. An increased exposure to radiation may lead to damage to health.

- Hold the source only with pliers.
- Keep the source far from the body.
- Ensure that no people are in the field of radiation during the work.

6. Grasp the tungsten spacer (Fig. 30, item 3) and pull the rod source out of the transport shield with the pliers (Fig. 30, item 5).



1 Sealing plug
2 O-ring
3 Tungsten spacer
4 Source
5 Handle source with pliers

Fig. 30 Installing the source in the shield

7. Insert the source as quickly as possible into the shield.
8. Attach the O-ring (Fig. 30, item 2) and screw in the sealing plug (Fig. 30, item 1).
9. Place the locking plate (Fig. 29, Item 2) and secure locking plate with locking plate padlocks (Fig. 29, item 1).
10. Turn the rotatable cylinder to the starting position (position *OPEN* or position *CLOSED*).
11. Replace the fixing screws and the cylinder padlock.

- The installation is complete.

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7.6 Source replacement

When to replace the source

Generally, the radioactive source used enables a service life between 5 and 10 years. A replacement of the source is only required if the statistical fluctuations of the output signal are inadmissibly large and compensation by increasing the time constant is no longer possible, e.g. for control-technical reasons.

Manufacturer's number for reordering

When reordering, always indicate the manufacturer's number of the source used since the new source must correspond to the original version.

The manufacturer's number can be found on the type plate of the shield as well as on the individual seal test certificate of each source.

7.6.1 Replacing the source

Replacing the source does require the direct handling of the unshielded source.

You must clarify with the responsible supervisory authority in advance whether your license for handling radioactive substances covers handling unshielded sources.

In any case, the source may only be installed/removed by authorized people. The radiation safety officer is responsible for planning and monitoring the work.

NOTICE

In order to keep the exposure to radiation during the removal / installation of the source as low as possible, all persons involved should familiarize themselves with the exact procedure in advance.

NOTICE

Only remove / install the source in areas with closed floors. Any apertures which are larger than the external diameter of the source (7 mm) are to be covered before commencing any work.

To replace the source, the following tools are required:

- pliers to securely grip the source
- 12 mm hexagon wrench to unscrew the screwed sealing plug of the tungsten spacer
- M3 threaded rod (approx. 50 mm)

To replace the source, proceed as follows:

1. Prepare the transport shield and open it.
2. Remove the old source from the shield and insert the old source in the transport shield, see chapter 7.5.1.
3. Check the shield for damage and wear and repair it if required (see chapter 7.2).
4. Remove the type plate of the old source from the shield and rivet on the new type plate.
5. Install the new source in the shield, see chapter 7.5.2.

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8 Accessories and spare parts overview

8.1 Available accessories

Mat. No.	Part	Notes
73883	Safety tool set for LB 8300	For securing the shield in the open position. Only for variants, not for pneumatically actuated variants.
77559	Pneumatic set 69540-2x	Pneumatic shutter actuator (ATEX) For shield diameter 100 mm of the LB8300 ID No. 69540-2x series.
78251	Pneumatic set 69550-2x	Pneumatic shutter actuator (ATEX) For shield diameter 150 mm of the LB 8300 ID No. 69550-2x series.
78244	Pneumatic set 69560-2x	Pneumatic shutter actuator (ATEX) For shield diameter 200 mm of the LB 8300 ID No. 69560-2x series.
78724	Pneumatic set 69570-2x	Pneumatic shutter actuator (ATEX) For shield diameter 270 mm of the LB 8300 ID No. 69570-2x series.
78266	Limit switch (ATEX, Ex-i)	For electrical/optical position feedback (*OPEN* / *CLOSED*) of the shield with pneumatic part-turn actuators.
78265	Limit switch (ATEX, Ex-d)	For electrical/optical position feedback (*OPEN* / *CLOSED*) of the shield with pneumatic part-turn actuators.
78264	Limit switch (non-ATEX)	For electrical/optical position feedback (*OPEN* / *CLOSED*) of the shield with pneumatic part-turn actuators.
-	Protective housing	Depending on length and diameter. Please contact your Berthold sales team.

9 Uninstallation

The shield may only be dismounted and put out of operation by competent people (see 2.4 Qualification of the personnel). Possibly the radiation protection officer is to be consulted, as well.

9.1 Safety instructions

⚠ WARNING!






Danger of injury by falling loads!

- Never stand underneath a lifted or suspended load, keep at a safe distance.
- Only use tested sling gear components appropriate for the transport weight.
- Use only the designated attachment points (lifting eye nuts) to attach the lifting gear
- Wear head protection and safety shoes.

⚠ WARNING!



Danger of injury caused by heavy and bulky system components!

- Heavy and bulky system components should only be handled using aids and by a at least 2 people.
- Observe the guidelines for safe handling of heavy loads.
- Ensure stability and use the provided fixing options.

⚠ CAUTION!



Danger caused by ionizing radiation!

Shields usually contain radioactive sources. An increased exposure to radiation may lead to damage to health.

- Consult the radiation safety officer responsible for your company.
- Transport the source exclusively inside a closed and secured shield.

IMPORTANT



The applicable national regulations of the country of use have to be obeyed.

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9.2 Dismounting the shield

⚠ WARNING!



Danger of injury by falling loads!

Falling loads can endanger people.

- Never stand underneath a lifted or suspended load, keep at a safe distance.
- Cordon off the danger zone with barrier tape.

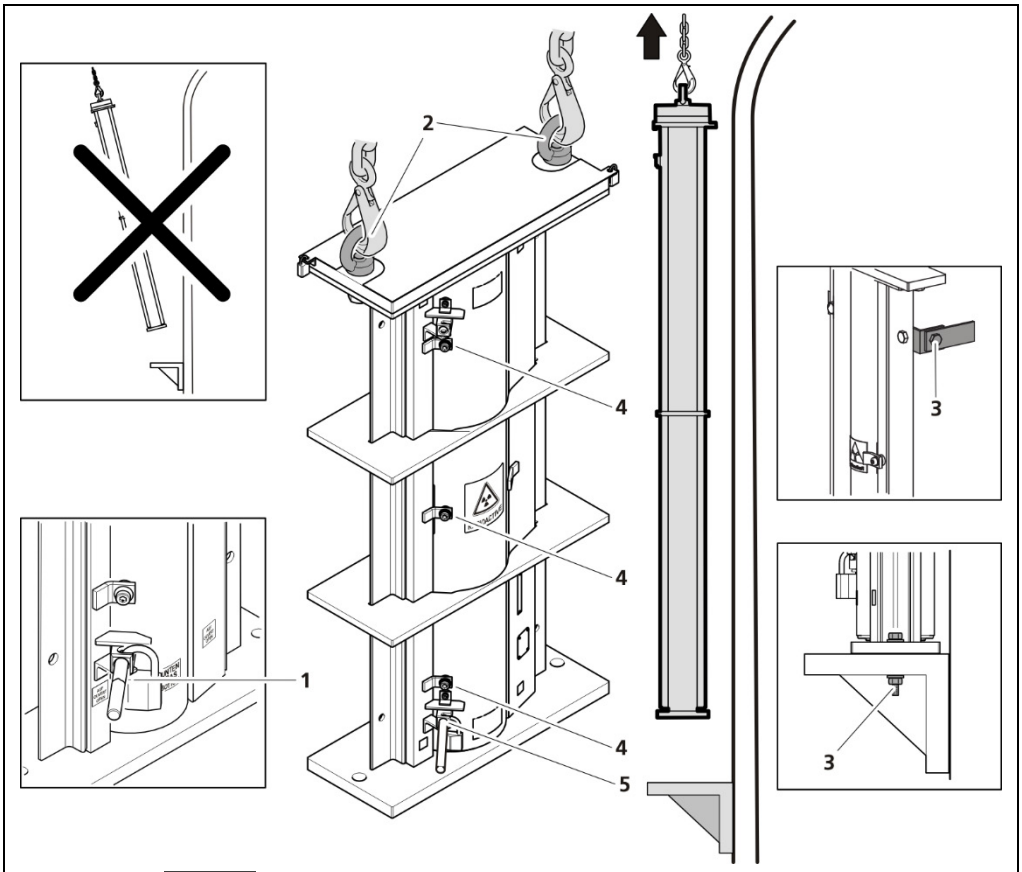
⚠ WARNING!



Danger of crushing by moving the shields!

Due to the high weight of the shield, there is a risk of injury.

- Heavy and bulky system components should only be handled using aids and by a at least 2 people.
- Do not reach between the shield and the container or mounting base.



1 Position CLOSED
2 Lifting eyes
3 Connection elements
4 Fixing screws
5 Cylinder padlock

Fig. 31 Disassemble the shield

1. Ensure that the shield has been closed and secured.

- The arrow on the locking cylinder points towards CLOSED.
- The fixing screws (Fig. 31, item 4) and, if applicable, the cylinder padlock (Fig. 31, item 5) are installed.

2. Fasten the shield with sufficiently sized and tested lifting straps at the lifting eyes (Fig. 31, item 2).
3. Remove all connection elements (Fig. 31, item 3).
4. Raise and set down the shield vertically.

9.3 Disposal of radioactive substances

NOTICE

Should you have any questions regarding the transportation or disposal of radioactive substances, please contact the manufacturer.

Generally, each country has a depot where radioactive material is accepted and can be disposed of.

9.4 Shipment of radioactive substances

If you wish to ship radioactive material, you must observe the international regulations for the transport of dangerous goods and for radiation protection as well as any applicable national regulations. It is the full responsibility of the sender to comply with these regulations.

Please also note the following:

- Dose rate at the surface of the packaging must be lower than 2000 µSv/h.
- Dose rate at a distance of 1m from the surface of the packaging must be lower than 100 µSv/h.
- The packaging must be marked with a reference for dangerous goods in accordance with the applicable regulations with the UN number.
- Furthermore, transport documents with the correct description of the content as well as an accident procedures sheet according to the ADR regulations are required.
    - With regard to transport by air, the IATA DGR.
    - IAEA as the basis for all regulations.
- Packaging must comply with the current ADR regulations (for example European Agreement concerning the International Carriage of Dangerous Goods by Road).
- The cargo must be secured in the transport vehicle according to the applicable national and international regulations.
- Before dispatch, each shield containing a source must be subjected to a visual inspection by the user (chapter 7.2). The shields may only be dispatched if the test requirements are met.
- At the time of shipment, a valid leak test lab result for the source must be available.

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Preconditions for returning shields to BERTHOLD TECHNOLOGIES GmbH & Co. KG

- Radioactive substances and their shields must not be damaged in any way and a respective, valid leak test certificate must be provided. The leak test certificate issued before the arrival of the radioactive substances in Germany may not be older than 6 months.
- If radioactive sources with isotope Am-241 or Cm-244 are returned, the special form certificate must be attached.
- At all times, any radioactive material sent to us must be sufficiently labelled with your name and address. If we have sent you a quotation in advance, our quotation number must be indicated, as well.
- Radioactive substances may only be returned after the respective approval by Berthold. We are pleased to send you a quotation regarding the costs.
- Radioactive substances must be sent to Bad Wildbad, Germany, carriage paid. Berthold will not assume any costs for customs clearance or transportation.
- Berthold is to be informed about any return transport in advance. Berthold will reject any radioactive substances sent to Berthold without prior notice. Any storage costs accrued in such case shall be borne by the sender.
- Before shipment of a radioactive source, a notification form with information about the source needs to be filled out and sent to Berthold. We will be pleased to send you the current version of the notification form.
- It is mandatory to attach a copy of the enclosed notification form and the valid leak test certificate to the shield. The original documents must be enclosed with the shipping documents. Before shipment, the documents must be sent to Berthold via e-mail.

NOTICE

Observe the applicable regulations when taking them out of operation and disposal.

10 Appendices

10.1 Check lists for tests

Visual inspection

Requirement	met	not met
The shield must be free from damage.		
The type plates must be legible.		
If there is corrosion, it must not affect the function and stability of the shield.		
Only before shipment: The beam path must be closed.		
Only before shipment: The locking plate must be mounted and secured.		
Only before shipment: The transport securing device(s) must be installed.		
Name of inspector:	Date:	Signature:

Checking the functions of the locking mechanism

Requirement	met	not met
It must be possible to move the locking mechanism completely back and forth between the two positions (OPEN / CLOSED).		
The measuring signal of the measurement system must approximately correspond to the maximum value in the CLOSED position.		
If alternatively a dose rate measurement device is used, the dose rate in the CLOSED position must be clearly lower than in the OPEN position.		
Only with manual actuation: It must be possible to turn the rotatable cylinder using one hand and the lever rod.		
Only with pneumatic actuation: The air pressure required for moving the locking mechanism may not exceed the maximum permissible air pressure for the pneumatic actuator (see technical data of the pneumatic actuators)		
Name of inspector:	Date:	Signature:

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