
# Rotatable point source shieldings

**Operating manual**
**59596BA2**

**Rev. No.: 01, 07/2016**

**BERTHOLD TECHNOLOGIES GmbH & Co. KG**
Calmbacher Str. 22
75323 Bad Wildbad, Germany
www.Berthold.com

Telephone +49 7081 177-0
Fax +49 7081 177-100
**industry@berthold.com**

# Table of Contents

# 1 About this operating manual

## 1.1 Some prior remarks

The product is handed over to you by the manufacturer BERTHOLD TECHNOLOGIES GmbH & Co. KG 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
- disassemble 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 TECHNOLOGIES GmbH & Co. KG.

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

## 1.2 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.

## 1.3 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 recognise possible dangers through their specialist training, knowledge and experience as well as knowledge of the relevant regulations.

## 1.4 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 TECHNOLOGIES GmbH & Co. KG.

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.

## 1.5 Structure of the Manual

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

## 1.6 Copyrights

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

## 1.7 Representation

| Identifier | Meaning | Example |
|---|---|---|
| **Round brackets** | Image reference | Connect the plug (fig. 1, item 1) |

## 1.8 Symbols Used

### 1.8.1 Structure of Warnings

**j 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.

**j DANGER**

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

**j WARNING**

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

**j 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.

**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.

## 1.8.2 Symbols used on the device

**Nuclear radiation**

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

# 2 Safety manual

## 2.1 Proper use

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

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

Usually, the shielding 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, unauthorised practices which could put your safety and the operational reliability of the shielding 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 TECHNOLOGIES GmbH & Co. KG.
- Using the product in a damaged or corroded condition.
- Dismounting the unit while the radiation beam outlet is open (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.

BERTHOLD TECHNOLOGIES GmbH & Co. KG shall only accept liability for / guarantee the correspondence of the product to its publicised 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.

## 2.2 Ambient conditions during operation and storage

The shielding 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 shielding and the prevention of damage.

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

Furthermore, the following prescribed ambient conditions are to be observed:

- The minimum admissible operating/storage temperature is -40°C. Below this temperature, the sealing rings of the shielding may become brittle. In such case, the leakproofness of the shielding can no longer be guaranteed.
- The maximum admissible operating/storage temperature is +100°C. Above this temperature, the sealing rings of the shielding may be destroyed. In such case, the leakproofness of the shielding can no longer be guaranteed.
- The higher the dust and dirt content of the environment, the more likely stiffness or an entire blockage of the locking mechanism is. For this reason, the functional test intervals (see chapter 6) should be adjusted to the ambient conditions.
- Highly combustible or explosive substances must not be kept in the vicinity of shieldings in order to prevent a fire from spreading to the radioactive substances.

## 2.3 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 authorised 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
- Authorised 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 authorised person. This may also refer to construction site personnel. The persons in question must have experience in handling the product.

## Experts

Experts are persons who have sufficient knowledge in the required area due to their specialist training and who are familiar with the relevant national health and safety regulations, accident prevention regulations, guidelines and recognised 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.

## Authorised Persons

Authorised persons are those who are either designated for the corresponding task due to legal regulations or those who have been authorised by BERTHOLD TECHNOLOGIES for particular tasks. When dealing with radioactive materials, a radiation safety officer must also be consulted.

## Radiation Safety Officer

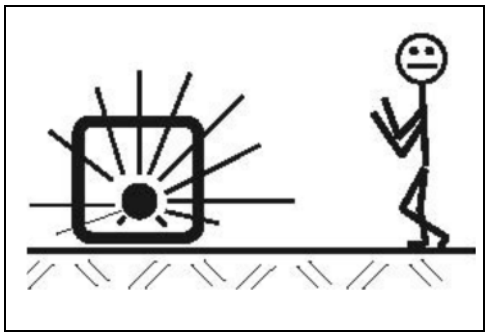
In order to ensure proper handling and compliance with the statutory requirements, the company has to appoint a radiation safety officer in accordance with the applicable national law (in Germany: Strahlenschutzverordnung [German radiation protection regulation]). The radiation safety officer must implement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

## 2.4 Radiation Protection

### 2.4.1 Basic principles and regulations

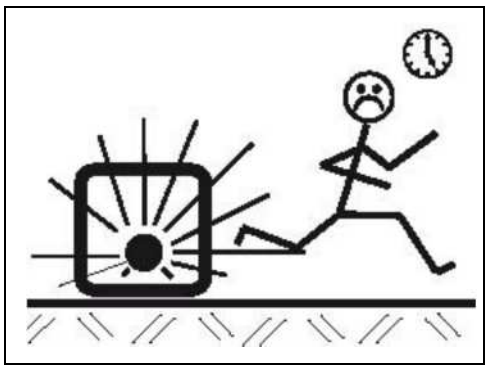
The amount of radiation absorbed by the body (exposure to radiation) is determined by three parameters from which the basic radiation protection regulations can be derived:

#### Distance



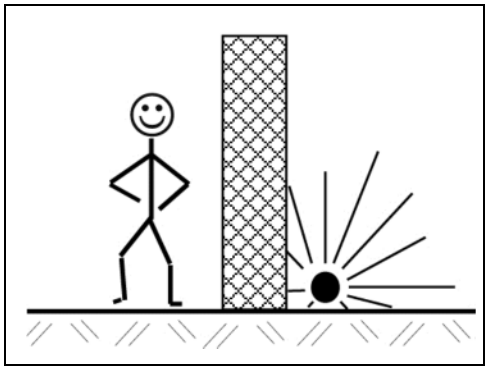
If work close to equipment containing radioactive substances is required, the largest distance possible is to be kept. In particular, this shall apply for employees which do not immediately participate in such work.

#### Time



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

#### Shielding



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

### 2.4.2 Exposure of employees to radiation

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

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

It is to be ensured that the locking mechanism of the shielding is closed and secured in order to prevent the emission of unshielded radiation. Modification or damage to the shielding 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.

### 2.4.3 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.

Shieldings 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 as regards the storage of radioactive substances.

Portable measuring systems must never be left unsupervised. When this equipment is out of use, it is to be protected against access by unauthorised persons.

### 2.4.4 In the case of fire

The shielding material can melt and leak from the shielding 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.

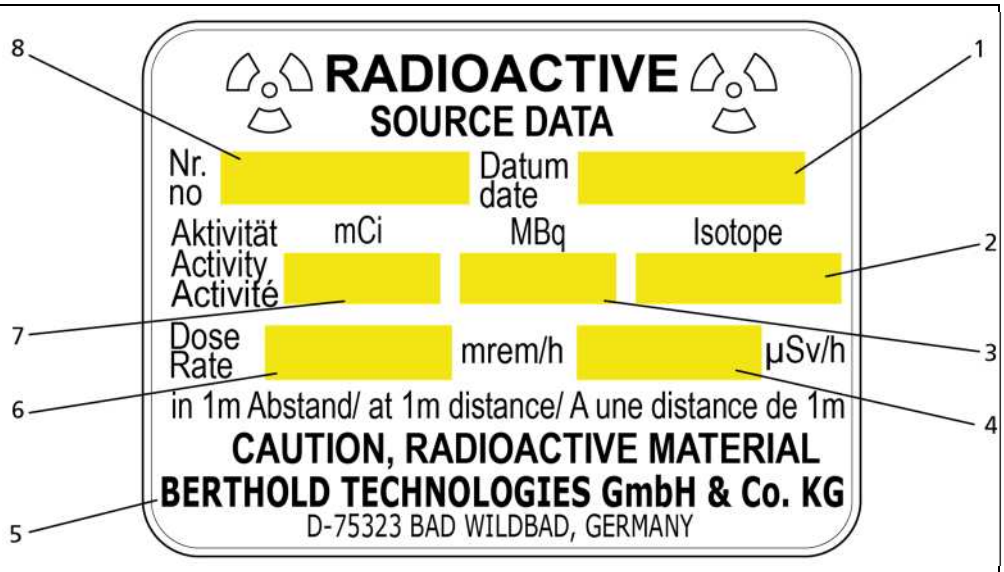
- In the case of fire, these measures limit the access to this area.
- Avoid the incorporation by keeping sufficient distance.
- Notify **BERTHOLD TECHNOLOGIES** of the situation; you will promptly receive information on immediate measures.

## 2.5 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

## 2.6 Type plate of the source




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

Fig. 1 Type plate of the source

# 3 System Description

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

The shielding container consists of a robust steel housing filled with lead. The locking cylinder of the shielding is pivoted. The provided lever rod can be used to turn the locking cylinder to the two end positions. The radiation beam outlet is thereby opened and closed.

The locking plate on the upper side of the shielding 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.

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

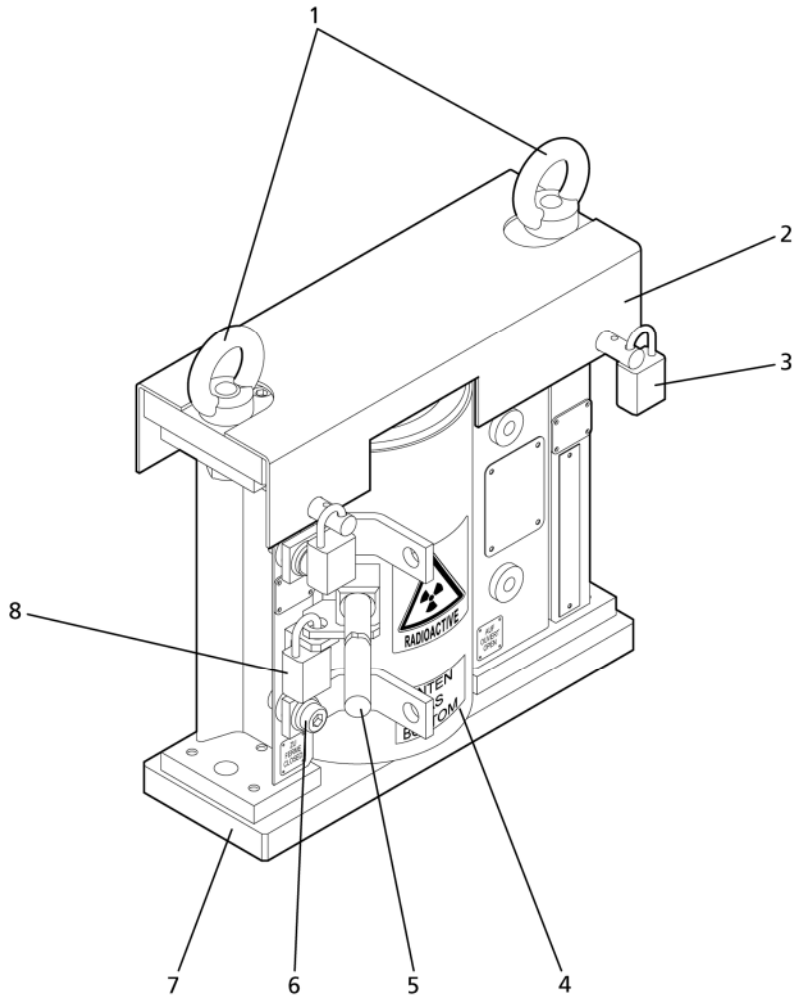
A fastening element on which the shielding can be installed is attached to the bottom. Assembly brackets for the installation on a conveyor are available as accessories.

The rotatable point source shielding is available in different versions and with various radiation beam outlet angles. You can find an overview of all variants in the appendix.

## The shielding has the following functions:

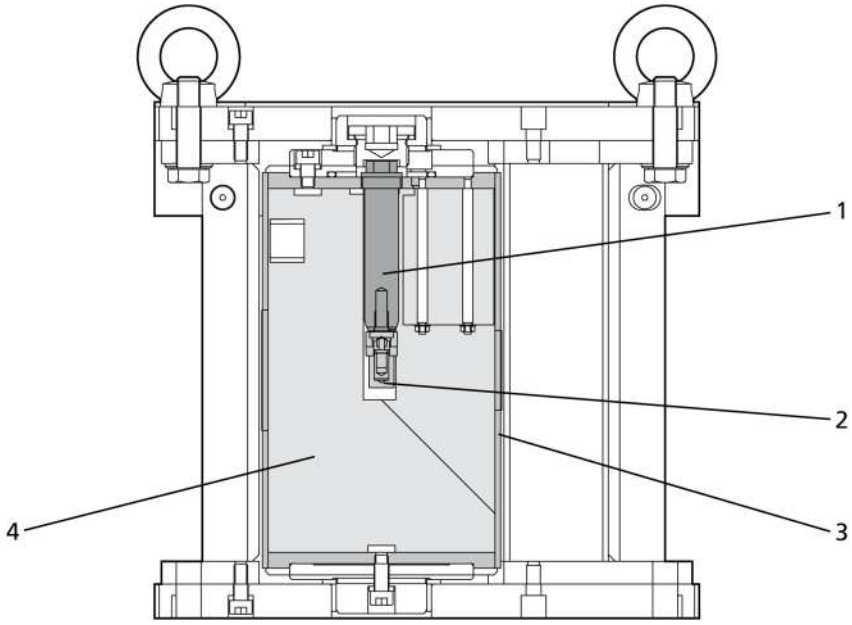
- Shielding radiation to a level that is non-hazardous for the operating personnel
- Locking the radiation beam outlet channel for transport and during installation
- Protecting the integrated source capsule from mechanical damage and the effects of the surrounding environment

## 3.1 View




1 Sling gear
2 Locking plate
3 Fastening bolts with padlock
4 Locking cylinder
5 Lever rod (auxiliary equipment used for turning the locking cylinder)
6 Fixing screw
7 Fastening element
8 Padlock (secures the closed shielding against rotation)

Fig. 2 Basic layout




1 Source holder
2 Source
3 Radiation beam outlet channel
4 Locking cylinder with shielding material

Fig. 3 Sectional view

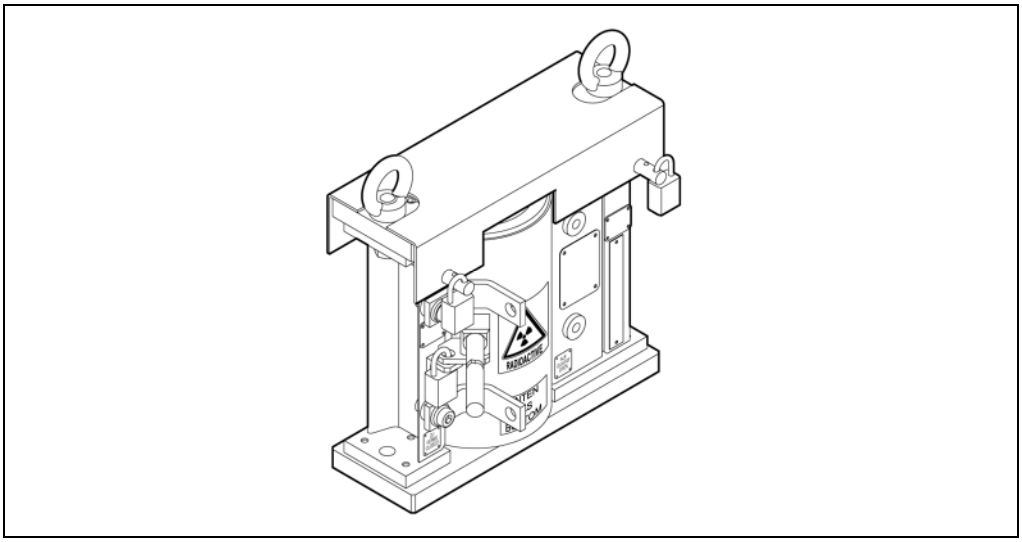


Fig. 4 View type 100

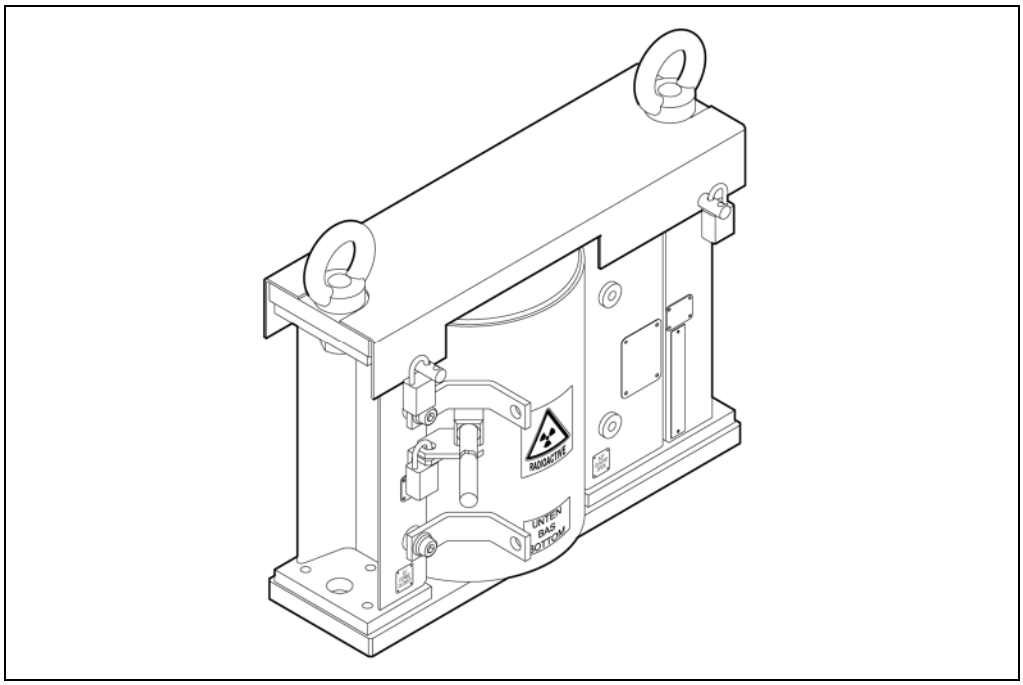



Fig. 5 View type 150

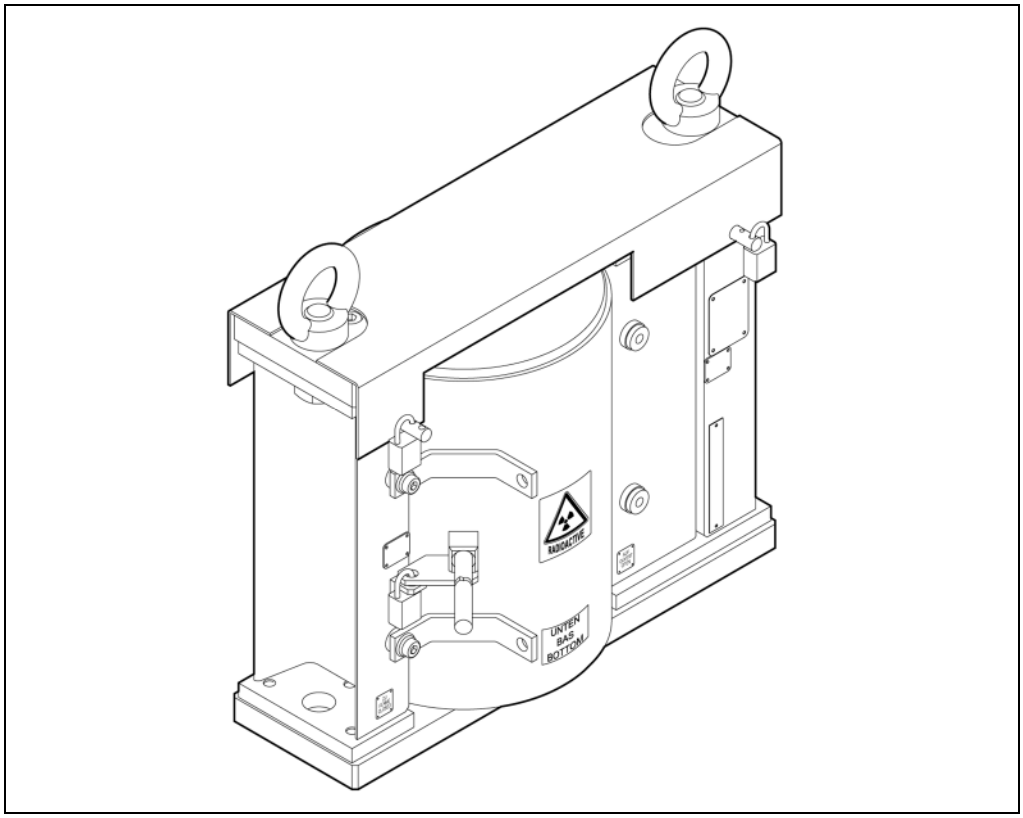



Fig. 6 View type 200

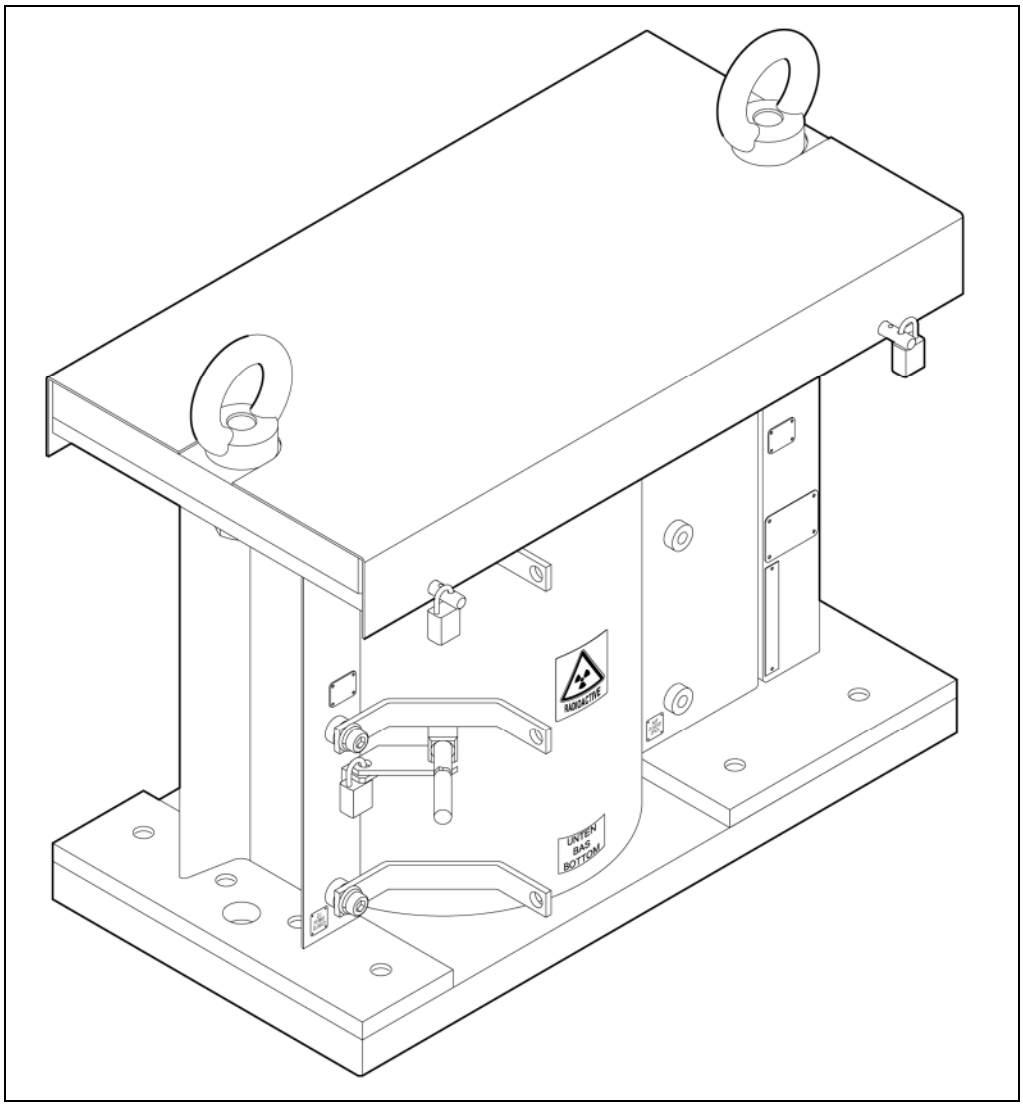



Fig. 7 View type 270

# 4 Installation

## 4.1 Safety Instructions

**j 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.

- Exclusively use the provided fixing possibilities (lifting brackets) for attaching the sling gear.
- Observe the marking for the centre of gravity on the outer packaging, if applicable.

- Wear head protection and safety shoes.

**j CAUTION**

**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 persons.
- Observe the guidelines for safe handling of heavy loads.
- Ensure stability and use the provided fixing possibilities.

**j CAUTION**

**Danger caused by nuclear radiation**

Shieldings 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 shielding.

**IMPORTANT**

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

## 4.2 Packaging

The shielding with radioactive source is supplied in a package which corresponds to the regulations for the transport of radioactive substances (type A packaging).

## 4.3 Intermediate storage of the source

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

- Store the source exclusively inside a closed and secured shielding.
- Store the shielding 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 Preparing the Installation

**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 (incl. estimation of radiation exposure)
- Instruction of the employees
- Organising and cleaning the installation site
- Preparing the required tools and hoisting devices
- Removing all obstacles which might hinder the installation of the shielding or the source

## 4.5 Checking the delivery

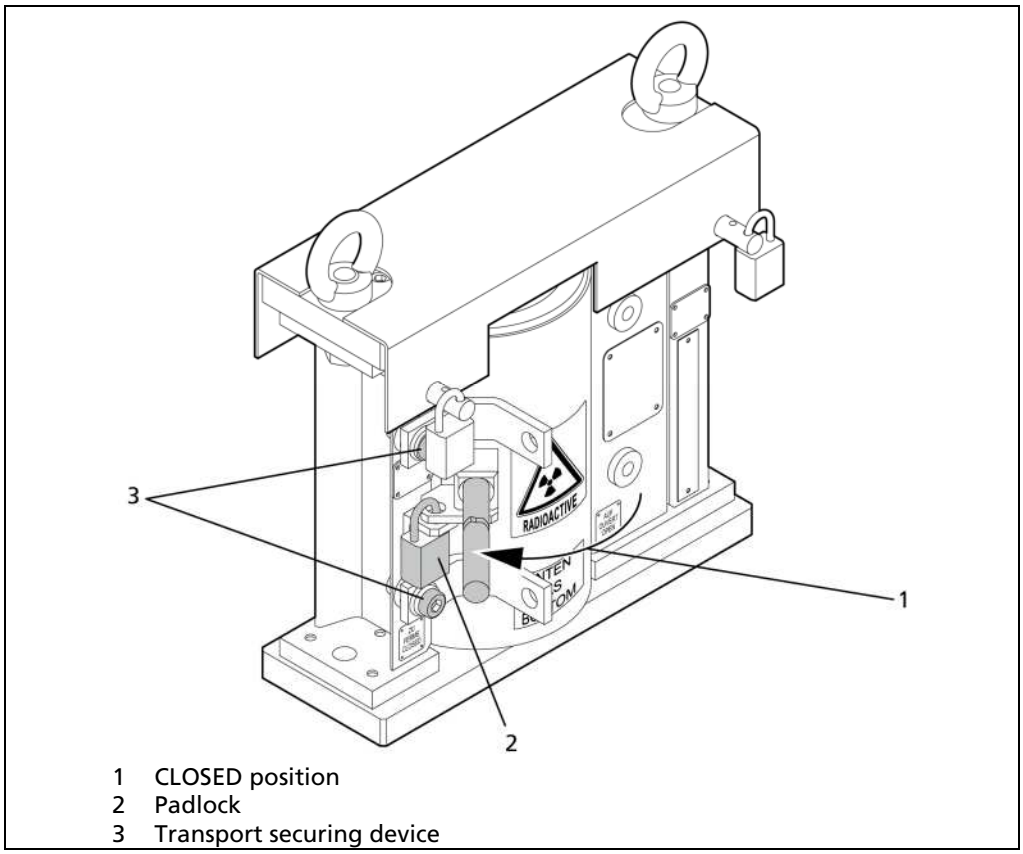
1. Check the delivery for completeness using the packing list.
2. Clean the parts, if required
3. In the case of damage, immediately notify the forwarding agent and the manufacturer.

## 4.6 Installation of the shielding

To avoid unnecessary exposure to radiation, install the shielding as final system component.

### Tip

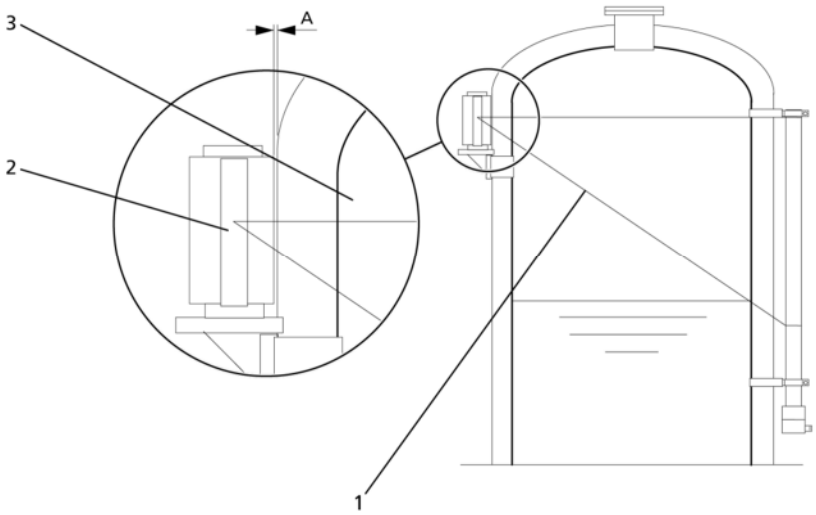
If the shielding contains a radioactive source, the measurement of the background count rate of the detector should take place before the shielding is installed.




1 CLOSED position
2 Padlock
3 Transport securing device

Fig. 8 Shielding closed (CLOSED position)

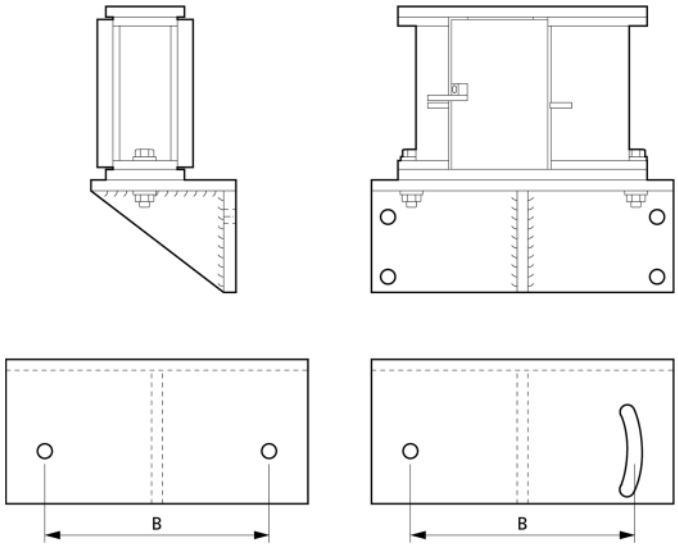
1. Ensure that the shielding has been closed and secured
   - the locking cylinder is set to the CLOSED position
   - the transport securing device and, if applicable, the padlock are installed




1 Radiation beam outlet
2 Shielding
3 Container
A Distance to the container wall

Fig. 9 Installation on containers

2. **Installation on containers:** Position the shielding (2) on a fastening element in the installation position on the container (3).
The fastening element is to be provided by the operator. See the figure below for the required hole spacing:



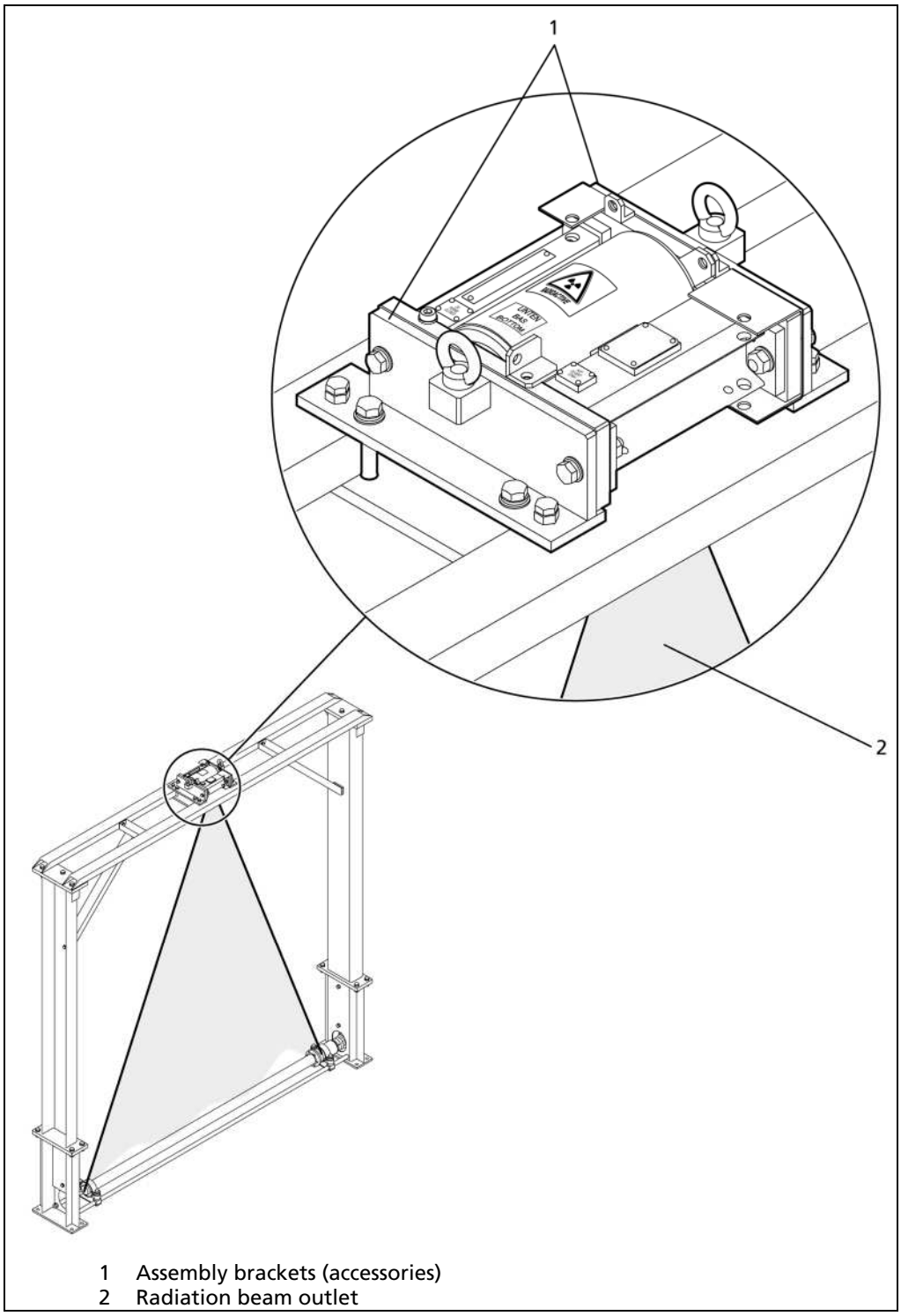

**Hole spacing B in the fastening element:**

| | | | |
|---|---|---|---|
| Type 100 | 210 mm | Type 200: | 360 mm |
| Type 150 | 320 mm | Type 270: | 510 mm |

Fig. 10 Fastening element (to be provided by the operator).

**NOTICE**

For the design of the shielding, it was assumed that the shielding will be installed at a distance A of 20 mm, see Fig. 9.




1 Assembly brackets (accessories)
2 Radiation beam outlet

Fig. 11 Installation on a conveyor

3. **Installation on a conveyor:** Position the shielding on the mounting frame above the conveyor using both assembly brackets (1).
4. Position the shielding in a way that the radiation beam outlet is directed towards the detector.
5. Install the shielding in the final position using the fastening screws.

# 5 Usage

## 5.1 Safety instructions

**j CAUTION**

**Danger caused by nuclear radiation**

Shieldings 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 the shielding does not show any signs of damage or functional limitations.
- Please observe the instructions on regular maintenance.

## 5.2 Opening and closing the locking mechanism

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

**IMPORTANT**

During transport and installation of the shielding, the locking cylinder must be set to CLOSED and be secured.

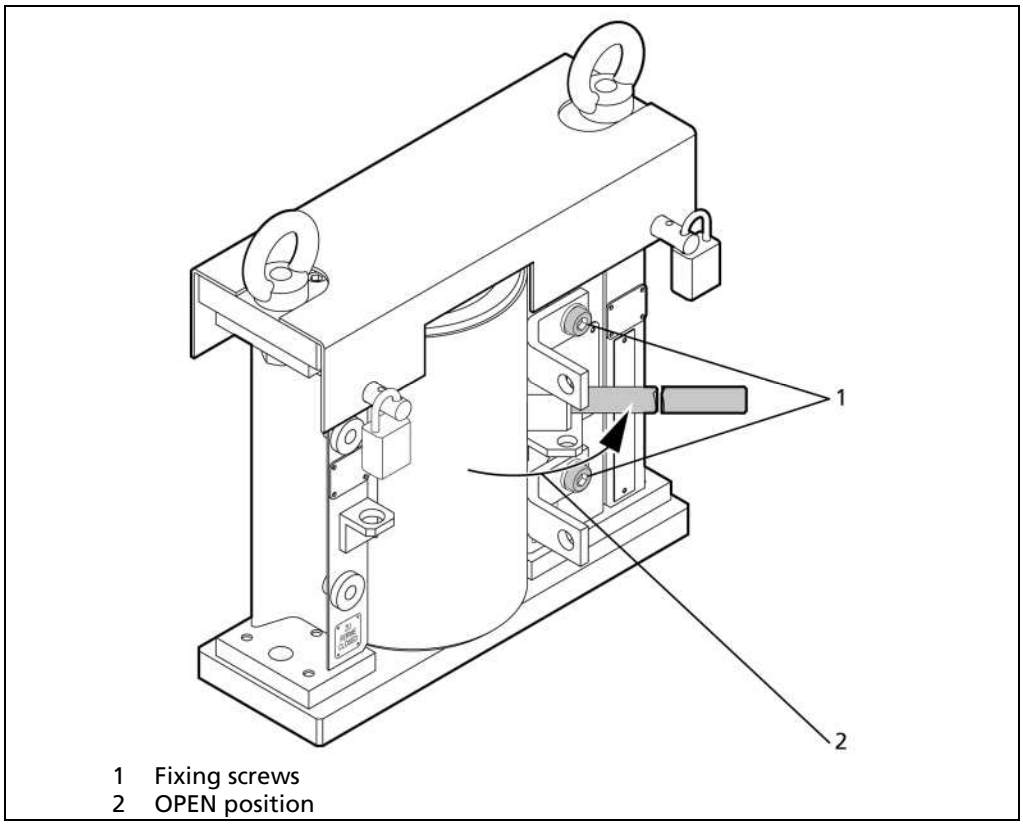
**IMPORTANT**

The locking mechanism may only be operated by persons who are at least employees with general knowledge and were instructed by an expert or authorized person. If the shielding includes a radioactive source, the responsible radiation safety officer must be consulted.

### Opening the locking mechanism:

1. If applicable, remove the padlock.
2. Turn the locking cylinder to the OPEN position with the help of the lever rod.
3. Retain the locking cylinder in the new position using fixing screws.

- The radiation beam outlet is now open.



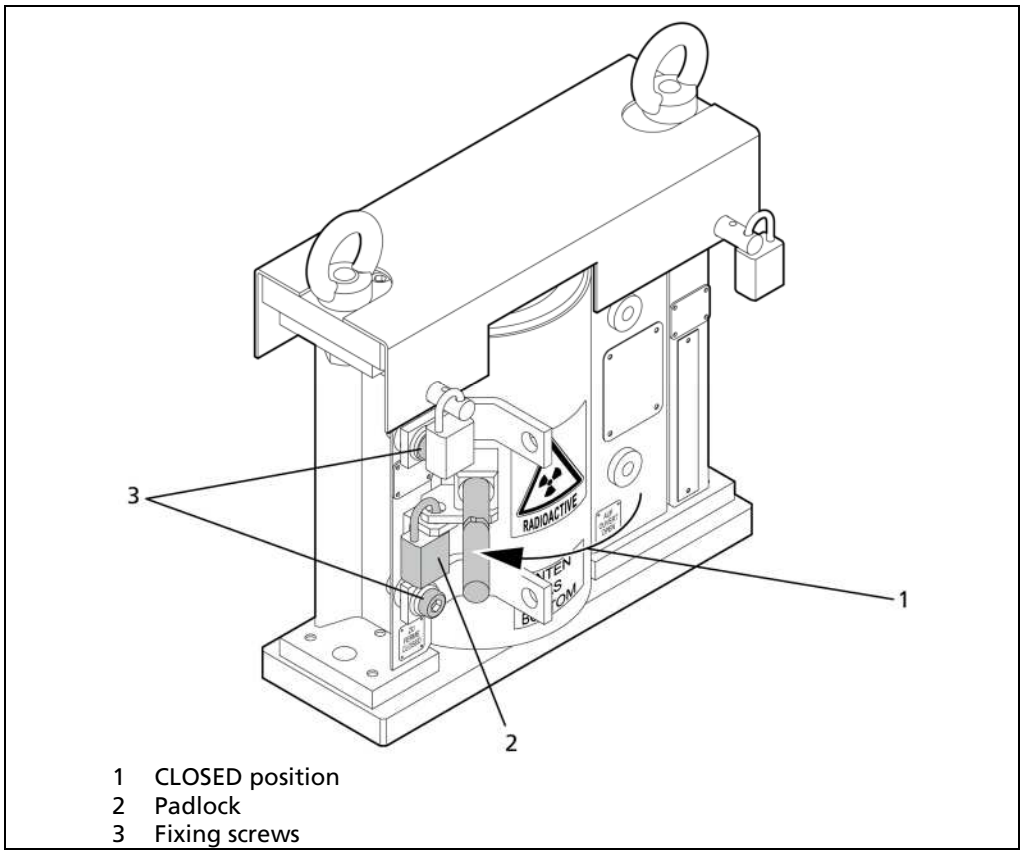

1 Fixing screws
2 OPEN position

Fig. 12 Shielding open (OPEN position)

## Closing the locking mechanism:

1. Remove the fixing screws.
2. Turn the locking cylinder to the CLOSED position using the lever rod.
3. Retain the locking cylinder in the new position using fixing screws and/or a padlock.

▶ The radiation beam outlet channel is now closed.



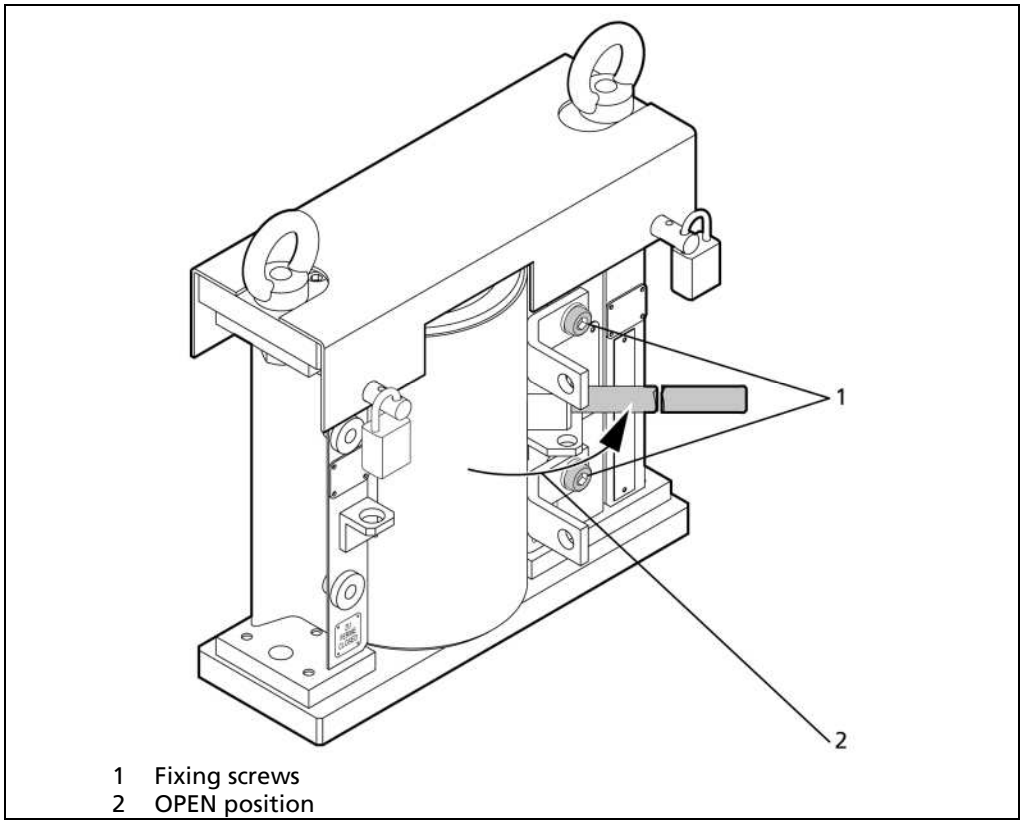

1 CLOSED position
2 Padlock
3 Fixing screws

Fig. 13 Shielding closed (CLOSED position)

## 5.3 Commissioning

To commission the shielding after installation, proceed as follows:

1. Remove the transport securing device.
2. If applicable, remove the padlock.




1 Fixing screws
2 OPEN position

Fig. 14 Shielding open (OPEN position)

3. To open the shielding directly before commissioning the measuring system: Turn the locking cylinder to the OPEN position.
4. Retain the locking cylinder in the new position using fixing screws.

# 6 Maintenance and Repair

## 6.1 Safety instructions

**j CAUTION**

**Danger caused by nuclear radiation**

Shieldings 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 shieldings 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.

**IMPORTANT**

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

**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 shielding is detected during handling, maintenance or regular checks, the damage must be repaired after consultation with BERTHOLD TECHNOLOGIES GmbH & Co KG before the system is used again. Only spare parts specified by BERTHOLD TECHNOLOGIES GmbH & Co. KG may be used and required repair work may be carried out exclusively by authorized persons.

## 6.2 Visual inspection

The visual inspection must be carried out by persons 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 dispatch

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 utilisation of the plant, misuse)

### Performing the visual inspection:

1. Check the shielding for obvious damage (dents, cracks, holes etc.) and corrosion.
2. Only before dispatch: Check if the shielding is in closed position and if the padlock as well as the transport securing device are installed.

**Tip**

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

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 the manufacturer.

## 6.3 Leak test

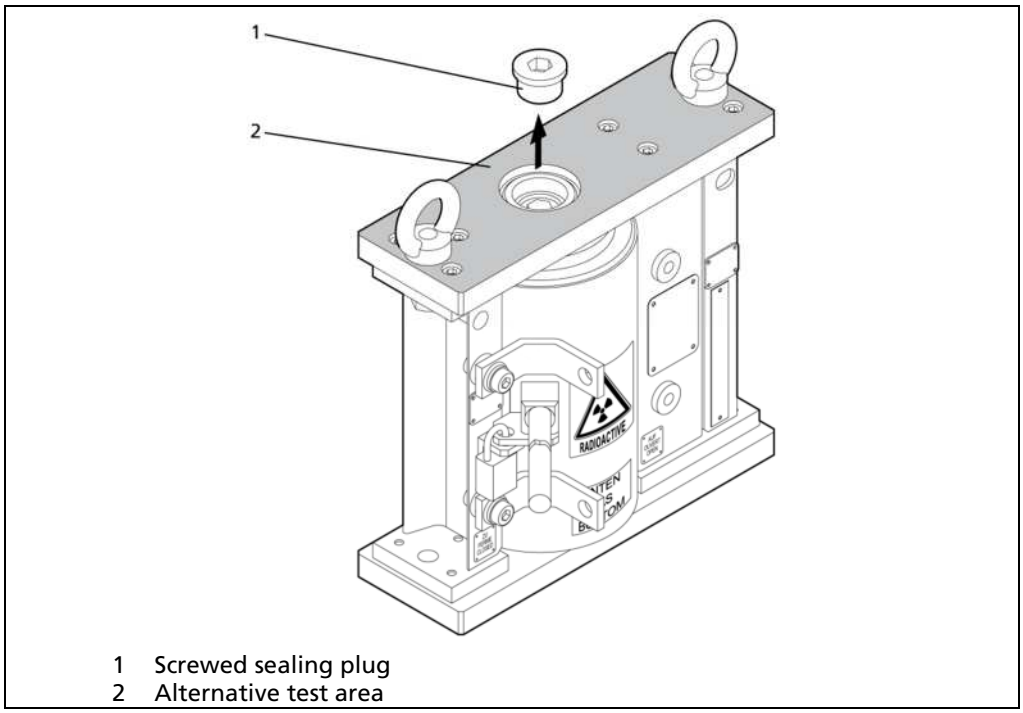
Depending on the supervisory authority responsible for the area where the source is used, regular leak tests must be carried out. These tests are to be carried out at the discretion of the competent supervisory authority either by an authorized expert or by the manufacturer. For this test, the corresponding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

## 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.

## Alternative test areas:

Alternative test areas are areas of a shielding which will most likely be contaminated if a source is leaking.




1 Screwed sealing plug
2 Alternative test area

Fig. 15 Alternative test area

The following alternative test area of the shielding can be used:

- the area marked in grey in the figure above

1. Remove the guard plate and the screwed sealing plug (1) of the source holder.
2. Conduct the contamination test at the alternative test area (2).

## 6.4 Checking the locking mechanism

The functional test of the locking mechanism must be carried out by a person who is at least an employee with general knowledge. We recommend conducting the test of the locking 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 locking mechanisms several times (see chapter 5) while observing the measuring signal of the corresponding measurement system. The locking mechanism 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 shielding.

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

## 6.5 Removing and installing the source

Before conducting extended maintenance work at the shielding, 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 comprises handling unshielded sources.

In any case, the source may only be installed/removed by authorised persons. The competent 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 familiarise themselves with the exact procedure in advance.

**NOTICE**

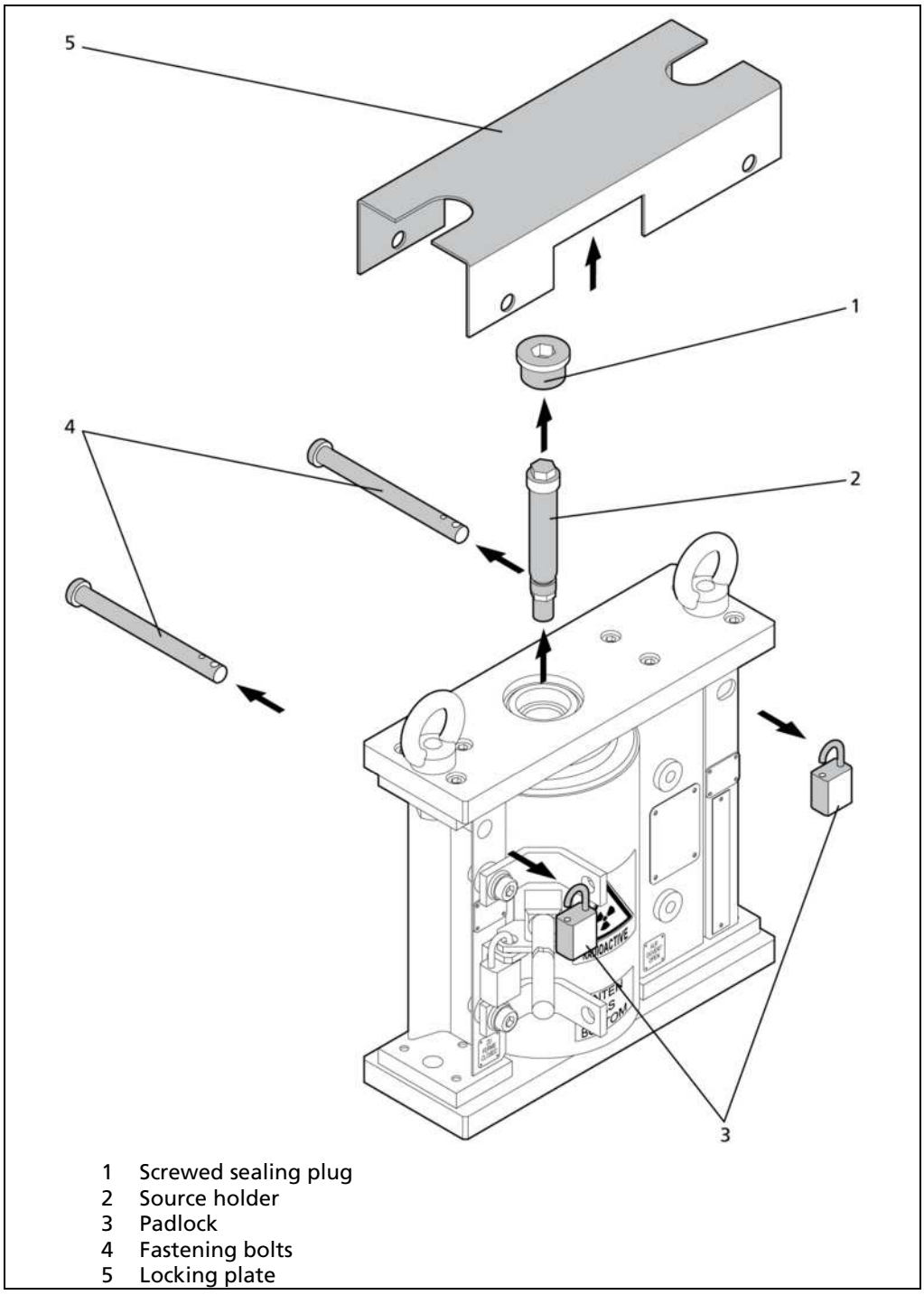
Only remove / install the source in areas with closed floors. Any apertures which are larger than the external diameter of the source (14 mm) are to be covered before commencing any work.

### 6.5.1 Removing the source

To install 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 source holder
- hexagon wrench size 12 to unscrew the source holder

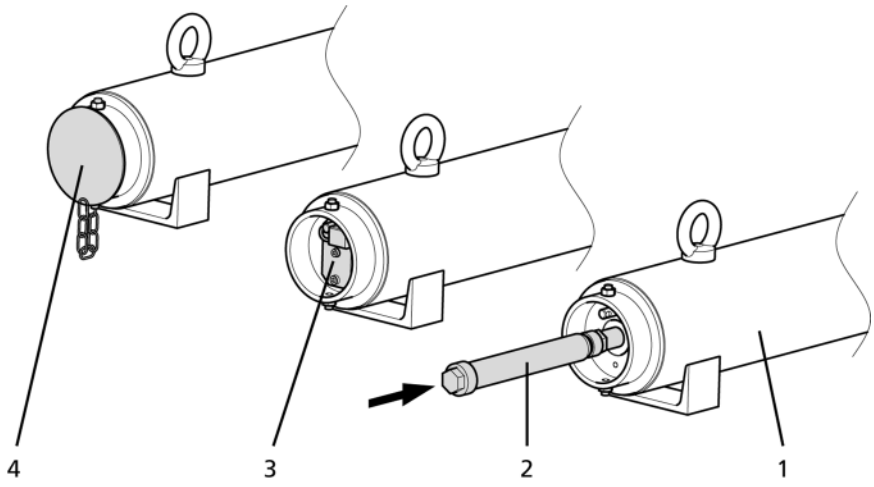
To remove the source, proceed as follows:




1 Screwed sealing plug
2 Source holder
3 Padlock
4 Fastening bolts
5 Locking plate

Fig. 16 Removing the source from the shielding

1. Prepare the transport shielding for the source and open the transport shielding.
2. Remove the locking plate (5). You can now see the screwed sealing plug of the source holder.
3. Loosen the screwed sealing plug (1).
4. Loosen the source holder (2).
5. Take the source holder out of the shielding using the pliers.




1 Transport shielding
2 Source holder with source
3 Plugs
4 Protective cover

Fig. 17 Inserting the source into the transport shielding

6. Insert the source holder into the prepared transport shielding as quickly as possible and close the transport shielding.

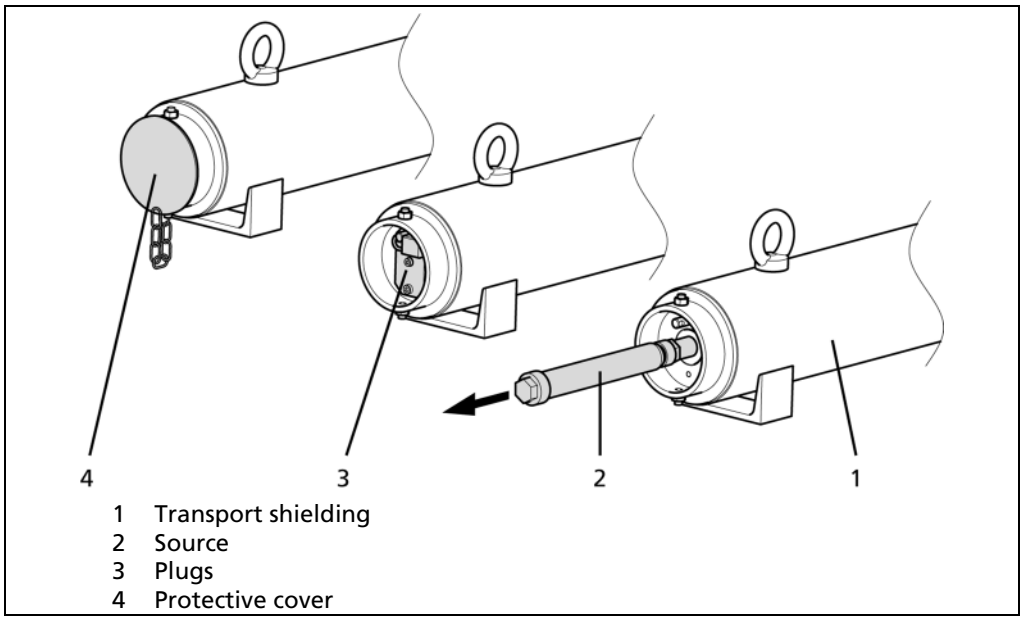
### 6.5.2 Installing the source

To install the source, the following tools are required:

- pliers to securely grip the source
- 12 mm hexagon wrench to unscrew the screwed sealing plug of the source holder
- hexagon wrench size 12 to unscrew the source holder
- torque wrench

To install the source, proceed as follows:

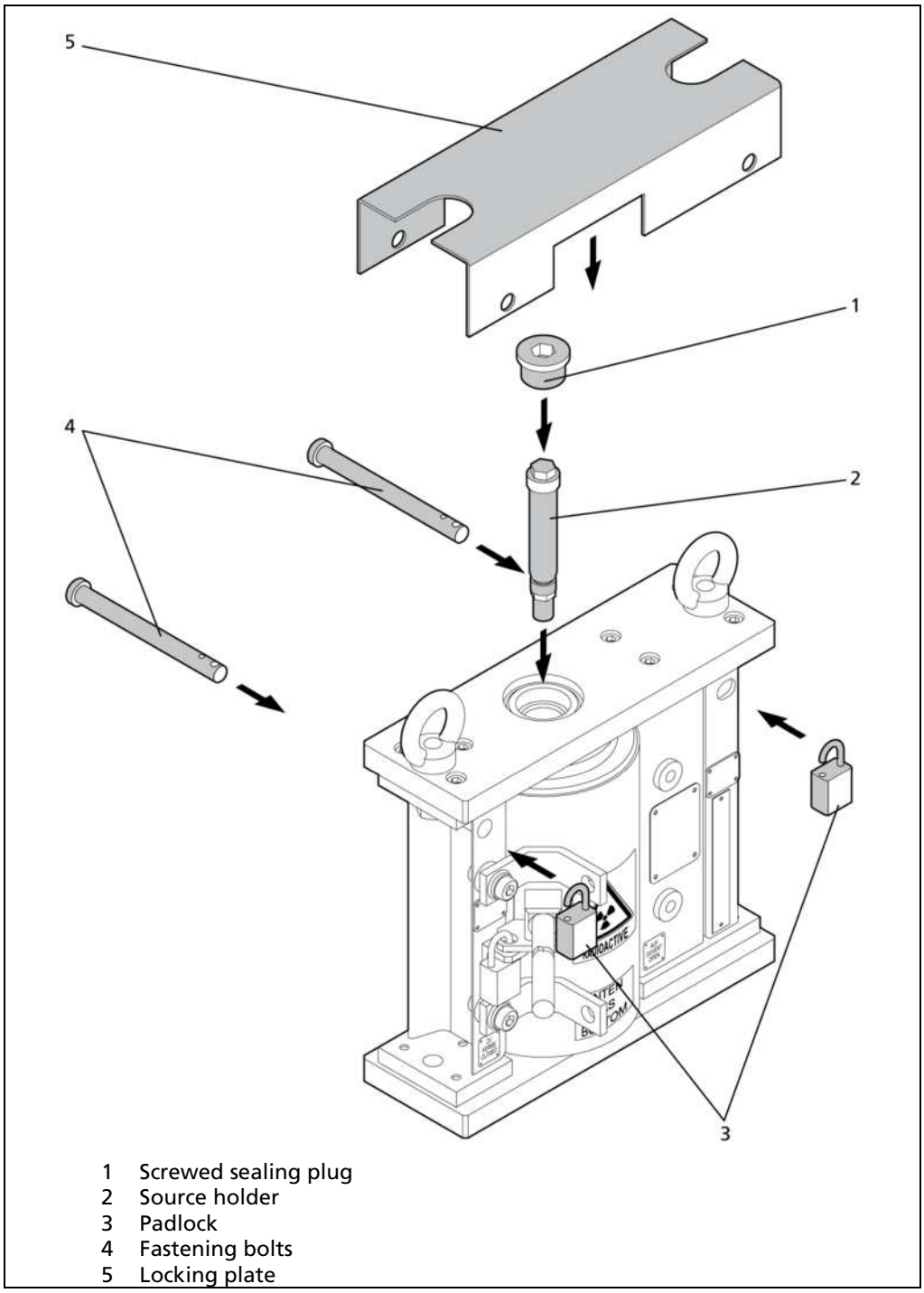
1. If applicable, remove the locking plate.
2. If applicable, loosen the screwed sealing plug of the source holder.
3. Prepare the transport shielding with the source to be installed.




1 Transport shielding
2 Source
3 Plugs
4 Protective cover

Fig. 18 Removing the source from the transport shielding

4. Open the transport shielding.
5. Grip the source holder using the pliers and pull the source out of the transport shielding.




1 Screwed sealing plug
2 Source holder
3 Padlock
4 Fastening bolts
5 Locking plate

Fig. 19 Installing the source in the shielding

6. Insert the source holder into the shielding as quickly as possible.
7. Screw the source holder in the shielding (torque: 44 Nm).
8. Reinstall the screwed sealing plug.
9. Reinstall the locking plate. Secure the locking plate using fastening bolts and padlock.
10. Turn the locking cylinder to its starting position (OPEN position or CLOSED position).
11. If applicable, reinstall the fixing screws and/or the padlock.

## 6.6 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 consists of three number groups, e.g.:

1234 – 11 – 09

The first number group is a consecutive number, the second group refers to the month of manufacture (here: November) and the third one refers to the year of manufacture (here: 2009).

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

## 6.6.1 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 comprises handling unshielded sources.

In any case, the source may only be installed/removed by authorised persons. The competent 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 familiarise 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 (14 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 source holder
- hexagon wrench size 12 to unscrew the source holder
- torque wrench

To replace the source, proceed as follows:

1. Prepare the transport shielding and open it.
2. Remove the old source from the shielding and insert the old source in the transport shielding, see chapter 6.5.1.
3. Check the shielding for damage and wear and repair it if required (see chapter 6.2).
4. Remove the type plate of the old source from the shielding and rivet on the new type plate.
5. Install the new source in the shielding, see chapter 6.5.2.

# 7 Accessories

## Available accessories

| Part number | Accessory part |
|---|---|
| various | Pneumatic actuator without limit switch |
| various | Pneumatic actuator with limit switch |
| various | Pneumatic actuator with limit switch (explosion-proof) |
| 39704 | Shielding bracket set type 100 for mass flow measuring frame |
| 39705 | Shielding bracket set type 150 for mass flow measuring frame |
| 39706 | Shielding bracket set type 200 for mass flow measuring frame |

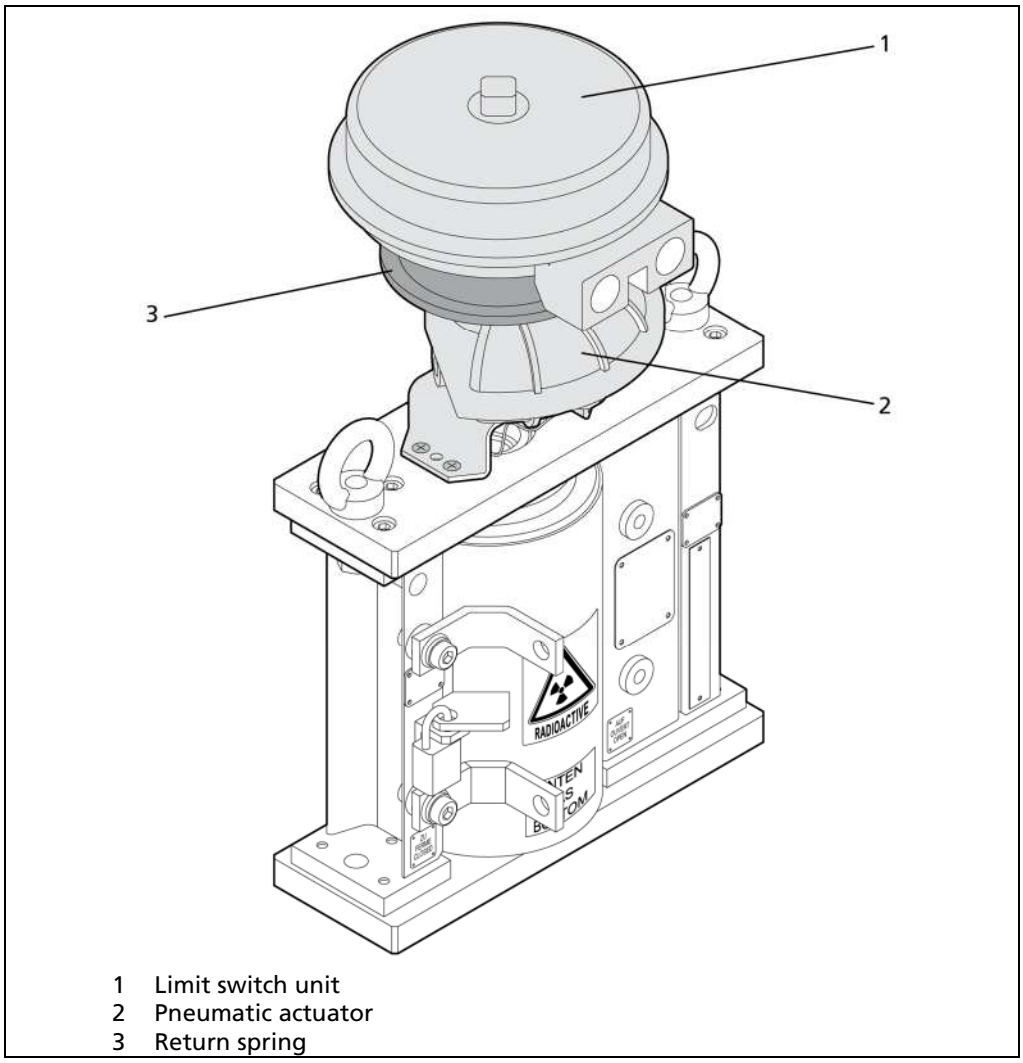
**NOTICE**

Installing a pneumatic actuator is a complicated conversion procedure. To ensure proper functioning, these accessory parts must be installed at the manufacturer's premises.

**IMPORTANT**

If you have any questions regarding accessories or spare parts, please contact the service department of **BERTHOLD TECHNOLOGIES GmbH & Co. KG**, Calmbacher Str.22, 75312 Bad Wildbad, Germany, www.berthold.com, Tel.: +49 7081-177-0, Fax: +49 7081-177-100, industry@berthold.com.

## 7.1 Pneumatic actuator




1 Limit switch unit
2 Pneumatic actuator
3 Return spring

Fig. 20 Shielding with pneumatic actuator

### 7.1.1 Connecting the compressed air supply

- Connect the compressed air supply to the corresponding port of the pneumatic actuator.

**NOTICE**

Please observe the technical data in the appendix regarding the permissible operating conditions.

## 7.1.2 Electrical connection of the limit switch unit

**j WARNING**

**Danger to life by explosion**

- Strictly observe the permissible ambient temperature.
- Exclusively use pneumatic drives equipped with explosion-proof limit switch units in explosive atmospheres.
- For installation and operation, please observe the technical data in the appendix. The limit switch unit may only be operated as specified.
- Exclusively use cable glands approved for explosion protection type “e” (increased safety) and observe the installation and operating instructions of the cable gland manufacturer.
- Before commissioning, ensure that the cable glands as well as the cover of the limit switch unit are screwed on tightly.
- If used in an explosive atmosphere, the terminal compartment may only be opened if the device has been de-energized for at least 2 minutes beforehand.

**j DANGER**

**Danger of death by electric shock!**

- The installation may only be carried out by qualified electricians.
- All relevant safety regulations have to be observed.
- Installation/maintenance may only be carried out if the device has been de-energised.
- The contact protection may only be removed if the device has been de-energised.

In case of an electric shock, carry out first aid measures and immediately call an emergency service.

1. Loosen the screws on the cover of the supplied limit switch unit.

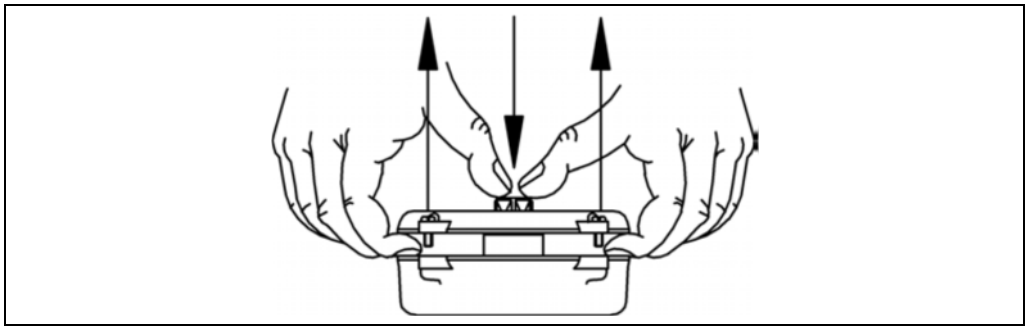


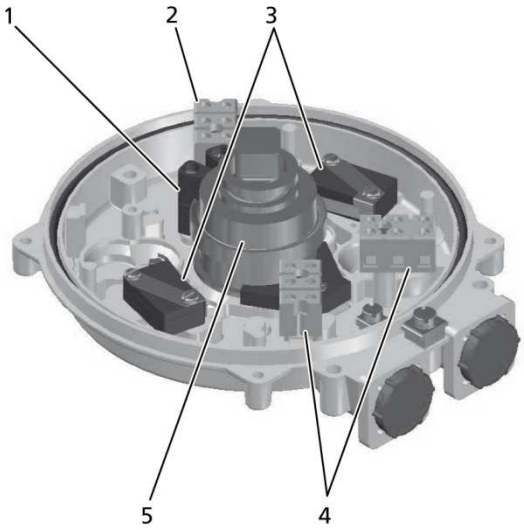
Fig. 21 Removing the cover from the limit switch unit

2. Pull the cover off as shown in the figure while pushing down the limit switch shaft at the same time. Do not lose the cover gasket!
3. Remove the blind plug and install the cable glands (not included in the scope

of delivery) according to the manufacturer's instructions.

Ensure that cable bushings which are not in use are sealed by means of blind plugs.

4. Insert the connecting cables through the cable glands and tighten the cable glands (observe the manufacturer's instructions).




1 Adjustable switching cams
2 Optional end terminal for solenoid valve (not used)
3 Relay contacts
4 Connecting terminals
5 Shaft

Fig. 22 Limit switch unit without housing cover

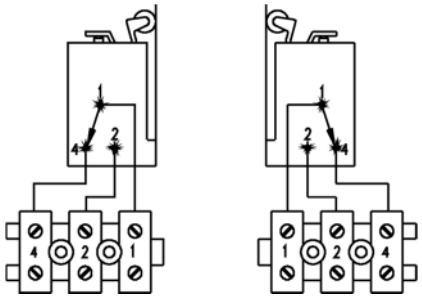



Fig. 23 Connection diagram of the explosion-proof limit switch unit

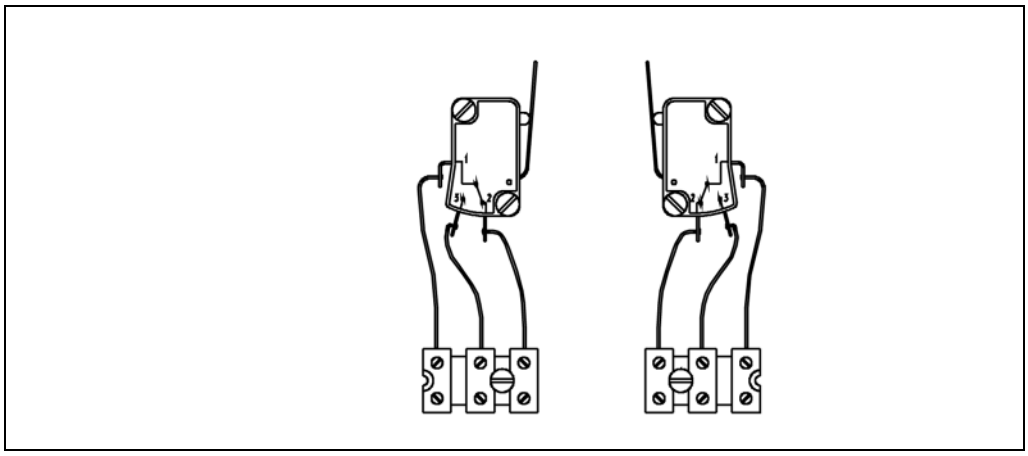


Fig. 24 Connection diagram of the limit switch unit (non-ex)

5. Connect the connecting cables to the terminals of the relay contacts (as shown)
6. Connect the equipotential bonding conductor, if applicable (mandatory in explosive atmospheres).
7. Close and screw on the cover. Ensure that the cover is closed tightly.

**NOTICE**

Ensure that the cover gasket is inserted in its groove!

### 7.1.3 Adjusting the switching cams

The switching cams are already correctly adjusted by the manufacturer. If a readjustment is necessary, proceed as follows:

1. Loosen the screws on the cover of the supplied limit switch unit.

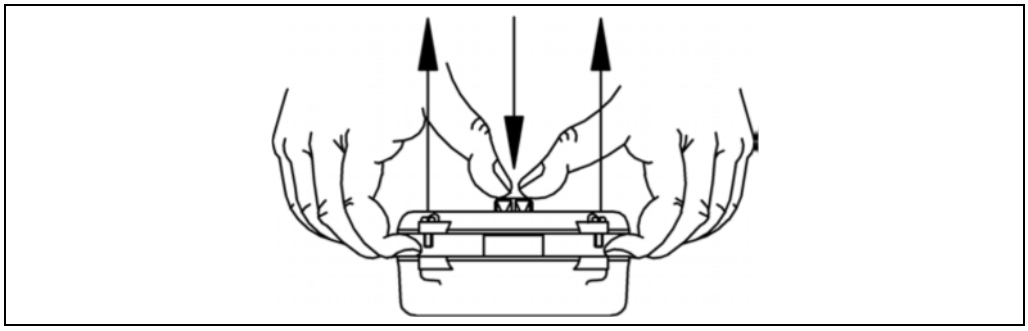


Fig. 25 Removing the cover from the limit switch unit

2. Pull the cover off as shown in the figure while pushing down the limit switch shaft at the same time. Do not lose the cover gasket!
3. Bring the rotor of the slew drive into its starting position.
   The end stops of the slew drive should already be adjusted to eliminate the need for a subsequent adjustment of the switching cams.
4. Loosen the clamping screw and move the corresponding switching cam on the guiding ring until a slight snap indicates the switching process. To be safe, move the switching cams 2-3 degrees further and tighten clamping screw.
5. Bring the rotor in the opposite end position. With single-acting slew drives with spring end unit, compressed air is required for this process.
6. Proceed in the same way for the second switching cam.

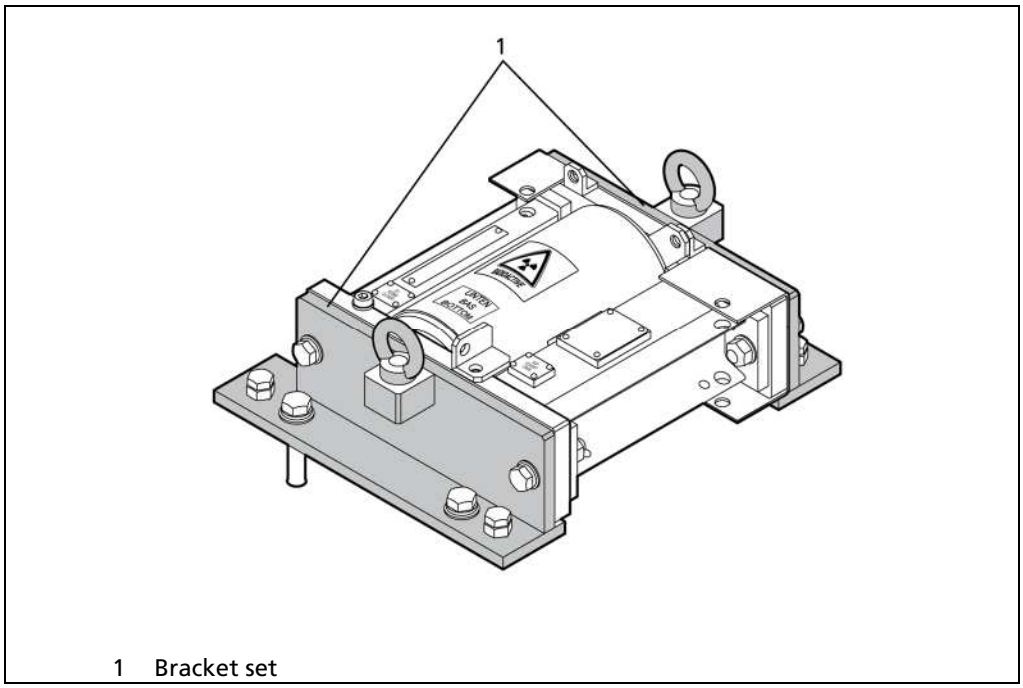
## 7.1.4 Technical data (pneumatic actuator)

| | Pneumatic actuator with limit switch | Pneumatic actuator with limit switch, explosion-proof | Pneumatic actuator without limit switch |
|---|---|---|---|
| Limit switch unit | Standard | explosion-proof | without |
| Compressed air | 4 bar … 7 bar,<br>oil-free,<br>clean as common for compressed air tools | 4 bar … 7 bar,<br>oil-free,<br>clean as common for compressed air tools | 4 bar … 7 bar,<br>oil-free,<br>clean as common for compressed air tools |

## 7.1.5 Technical data (limit switch unit)

| | limit switch, standard | | | Limit switch, explosion-proof | |
|---|---|---|---|---|---|
| Explosion protection | without | | | II 2 G, EEx ed IIC T6 | |
| Ambient temperature | -20°C … +80°C | | | -20°C … +60°C | |
| Leakproofness | IP 54-65 | | | IP 54-65 | |
| Cable inputs | M20 x 1.5 | | | M20 x 1.5 | |
| Connection cross-sections:<br>Signal cable<br>Protective earth<br>Ground | <br>2.5 mm²<br>2.5 mm²<br>4.0 mm² | | | <br>2.5 mm²<br>2.5 mm²<br>4.0 mm² | |
| Loading capacity of the relay contacts at voltage: | Ohmic load | Inductive load (max.) | Lamp | Ohmic load | Inductive load (max.) |
| 250 V (AC) | 15 A | 5 A | 1.5 A | 7 A | 5 A |
| 125 V (AC) | 15 A | 5 A | 1.5 A | 7 A | 5 A |
| up to 12 V (DC) | 15 A | 5 A | 1.5 A | 7 A | 5 A |
| up to 24 V (DC) | 10 A | 1 A | 1.0 A | 1 A | 1 A |
| up to 48 V (DC) | 3 A | 0.06 A | 0.3 A | 0.5 A | 0.06 A |
| up to 250 V (DC) | 0.25 A | 0.03 A | 0.025 A | 0.3 A | 0.03 A |
| Housing material | Zinc die-cast | | | Zinc die-cast | |
| Coating | epoxy resin, etched | | | epoxy resin, etched | |
| Sealing material | nitrile | | | nitrile | |

## 7.2 Bracket set for installation on a conveyor




1 Bracket set

Fig. 26 Shielding with bracket set

For dimensional drawings, see chapter 10.4.

# 8 Decommissioning

## 8.1 Safety instructions

**j 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.
- Exclusively use the provided fixing possibilities (lifting brackets) for attaching the sling gear.
- Wear head protection and safety shoes.

**j CAUTION**

**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 possibilities.

**j CAUTION**

**Danger caused by nuclear radiation**

Shieldings 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 shielding.

**IMPORTANT**

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

## 8.2 Decommissioning the shielding

For decommissioning, proceed as follows:

1. Ensure that the shielding has been closed and secured

- the arrow on the locking cylinder points in the CLOSED direction
- the transport securing device is mounted

2. Dismount the shielding.

## 8.3 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.

## 8.4 Shipment of radioactive substances

If you wish to dispatch 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 the UN number and a sign indicating dangerous goods.
- Furthermore, transport documents with the correct description of the content as well as an accident procedures sheet according to the ADR regulations are required.
- Packaging must comply with the current ADR regulations (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 shielding containing a source must be subjected to a visual inspection by the user (chapter6.2). The shieldings may only be dispatched if the test requirements are met.
- At the time of dispatch, a valid certificate concerning the leakproofness of the source must be available.

## Preconditions for returning shieldings to BERTHOLD TECHNOLOGIES GmbH & Co. KG

- Radioactive substances and their shieldings must not be damaged in any way and a respective, valid seal test certificate must be provided. The seal 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 TECHNOLOGIES GmbH & Co. KG. We are pleased to send you a quotation regarding the costs.
- Radioactive substances must be sent to Bad Wildbad, Germany, carriage paid. BERTHOLD TECHNOLOGIES GmbH & Co. KG will not assume any costs for customs clearance or transportation.
- BERTHOLD TECHNOLOGIES GmbH & Co. KG is to be informed about any return transport in advance. BERTHOLD TECHNOLOGIES GmbH & Co. KG will reject any radioactive substances sent to Berthold without prior notice. Any storage costs accrued in such case shall be borne by the sender.
- A copy of the attached notice form and the seal test certificate must be attached to each shielding that includes a radioactive source. The original is to be included in the transport documents. Beforehand, the documents are to be sent to our department for the disposal of sources and repairs.

▶ Use the following notice form to return sources or shieldings to us:

# 9 Technical Information

## 9.1 Technical data Type 100

| Variant | Housing | Shielding | Weight | Vertical radiation beam outlet | Horizontal radiation beam outlet | Attenuation factor | Operating temperature | Coating |
|---|---|---|---|---|---|---|---|---|
| Type 100 45° | S235 | 42 mm lead | approx. 32 kg | approx. 45° | approx. 11° | approx. 8 (Co-60)<br>approx. 70 (Cs-137) | -40°...+100°C | RAL 1007 2K polyurethane varnish |
| Type 100 50° | | | | approx. 50° | approx. 11° | approx. 8 (Co-60)<br>approx. 70 (Cs-137) | | |
| Type 100 54° | | | | approx. 54° | approx. 11° | approx. 8 (Co-60)<br>approx. 70 (Cs-137) | | |
| Type 100 72° | | | | approx. 72° | approx. 11° | approx. 8 (Co-60)<br>approx. 70 (Cs-137) | | |

## 9.2 Technical data Type 150

| Variant | Housing | Shielding | Weight | Vertical radiation beam outlet | Horizontal radiation beam outlet | Attenuation factor | Operating temperature | Coating |
|---|---|---|---|---|---|---|---|---|
| Type 150 45° | S235 | 67 mm lead | approx. 70 kg | approx. 45° | approx. 8° | approx. 30 (Co-60)<br>approx. 700 (Cs-137) | -40°...+100°C | RAL 1007 2K polyurethane varnish |
| Type 150 50° | | | | approx. 50° | approx. 8° | approx. 30 (Co-60)<br>approx. 700 (Cs-137) | | |
| Type 150 54° | | | | approx. 54° | approx. 8° | approx. 30 (Co-60)<br>approx. 700 (Cs-137) | | |
| Type 150 72° | | | | approx. 72° | approx. 8° | approx. 30 (Co-60)<br>approx. 700 (Cs-137) | | |

## 9.3 Technical data Type 200

| Variant | Housing | Shielding | Weight | Vertical radiation beam outlet | Horizontal radiation beam outlet | Attenuation factor | Operating temperature | Coating |
|---|---|---|---|---|---|---|---|---|
| Type 200 45° | S235 | 94 mm lead | approx. 150 kg | approx. 45° | approx. 6° | approx. 170 (Co-60)<br>approx. 15 000 (Cs-137) | -40° ...+100°C | RAL 1007 2K polyurethane varnish |
| Type 200 50° | | | | approx. 50° | approx. 6° | approx. 170 (Co-60)<br>approx. 15 000 (Cs-137) | | |
| Type 200 54° | | | | approx. 54° | approx. 6° | approx. 170 (Co-60)<br>approx. 15 000 (Cs-137) | | |
| Type 200 72° | | | | approx. 72° | approx. 6° | approx. 170 (Co-60)<br>approx. 15 000 (Cs-137) | | |

## 9.4 Technical data Type 270

| Variant | Housing | Shielding | Weight | Vertical radiation beam outlet | Horizontal radiation beam outlet | Attenuation factor | Operating temperature | Coating |
|---|---|---|---|---|---|---|---|---|
| Type 270 45° | S235 | 130 mm lead | approx. 370 kg | approx. 45° | approx. 4° | approx. 1500 (Co-60)<br>approx. 550 000 (Cs-137) | -40° ...+100°C | RAL 1007 2K polyurethane varnish |

## 9.5 Maximum permissible activities during transport

**NOTICE**

The activities indicated here are the maximum activities with which the individual shieldings can be loaded according to the international dose rate limit for the transport of radioactive substances (2000 µSv/h at the surface of the package and 100 µSv/h at a distance of one meter from the surface). National dose rate limits for the operation of measurement systems are usually significantly lower and only allow loading with significantly lower activities. The national provisions must be complied with.

| Shielding model | Maximum activity (Co-60) | Maximum activity (Cs-137) |
|---|---|---|
| Type 100 | 92.5 MBq / 2.5 mCi | 3700 GBq / 100 mCi |
| Type 150 | 925 MBq / 25 mCi | 133 GBq / 16 Ci |
| Type 200 | 7400 MBq / 200 mCi | 600 GBq / 16 Ci |
| Type 270 | 104 GBq / 2.8 Ci | 600 GBq / 16 Ci |

## 9.6 Technical Data of the Pneumatic actuator

| | Pneumatic actuator with limit switch | Pneumatic actuator with limit switch, explosion-proof | Pneumatic actuator without limit switch |
|---|---|---|---|
| Limit switch unit | Standard | explosion-proof | without |
| Compressed air | 4 bar … 7 bar,<br>oil-free,<br>clean as common for compressed air tools | 4 bar … 7 bar,<br>oil-free,<br>clean as common for compressed air tools | 4 bar … 7 bar,<br>oil-free,<br>clean as common for compressed air tools |

### Limit switch unit

| | limit switch, standard | | | Limit switch, explosion-proof | |
|---|---|---|---|---|---|
| Explosion protection | without | | | II 2 G, EEx ed IIC T6 | |
| Ambient temperature | -20°C … +80°C | | | -20°C … +60°C | |
| Leakproofness | IP 54-65 | | | IP 54-65 | |
| Cable inputs | M20 x 1.5 | | | M20 x 1.5 | |
| Connection cross-sections:<br>Signal cable<br>Protective earth<br>Ground | <br>2.5 mm²<br>2.5 mm²<br>4.0 mm² | | | <br>2.5 mm²<br>2.5 mm²<br>4.0 mm² | |
| Loading capacity of the relay contacts at voltage: | Ohmic load | Inductive load (max.) | Lamp | Ohmic load | Inductive load (max.) |
| 250 V (AC) | 15 A | 5 A | 1.5 A | 7 A | 5 A |
| 125 V (AC) | 15 A | 5 A | 1.5 A | 7 A | 5 A |
| up to 12 V (DC) | 15 A | 5 A | 1.5 A | 7 A | 5 A |
| up to 24 V (DC) | 10 A | 1 A | 1.0 A | 1 A | 1 A |
| up to 48 V (DC) | 3 A | 0.06 A | 0.3 A | 0.5 A | 0.06 A |
| up to 250 V (DC) | 0.25 A | 0.03 A | 0.025 A | 0.3 A | 0.03 A |
| Housing material | Zinc die-cast | | | Zinc die-cast | |
| Coating | epoxy resin, etched | | | epoxy resin, etched | |
| Sealing material | nitrile | | | nitrile | |

# 10 Appendices

## 10.1 Check lists for tests

### Visual inspection

| Requirement | met | not met |
|---|---|---|
| The shielding 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 shielding. | | |
| Only before dispatch:<br>The beam path must be closed. | | |
| Only before dispatch:<br>The locking plate must be mounted and secured. | | |
| Only before dispatch:<br>The transport securing device 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:<br>It must be possible to turn the locking cylinder using one hand and the lever rod. | | |
| Only with pneumatic actuation:<br>The air pressure required for moving the locking mechanism may not exceed the maximum permissible air pressure (see technical data of the pneumatic actuators) | | |
| Name of inspector: | Date: | Signature: |

## 10.2 Variant overview

| Variant | Part number | Description |
|---|---|---|
| Type 100, 45° | 59596-01 | Application: level; housing: steel<br>Radiation beam outlet: 45° asymmetrical |
| Type 100, 50° | 59596-04 | Application: Mass flow; housing: steel<br>Radiation beam outlet: 50° asymmetrical |
| Type 100, 54° | 59596-03 | Application: Mass flow; housing: steel<br>Radiation beam outlet: 54° symmetrical |
| Type 100, 72° | 59596-02 | Application: Mass flow; housing: steel<br>Radiation beam outlet: 72° symmetrical |
| Type 150, 45° | 59645-01 | Application: level; housing: steel<br>Radiation beam outlet: 45° asymmetrical |
| Type 150, 50° | 59645-04 | Application: Mass flow; housing: steel<br>Radiation beam outlet: 50° asymmetrical |
| Type 150, 54° | 59645-03 | Application: Mass flow; housing: steel<br>Radiation beam outlet: 54° symmetrical |
| Type 150, 72° | 59645-02 | Application: Mass flow; housing: steel<br>Radiation beam outlet: 72° symmetrical |
| Type 200, 45° | 59656-01 | Application: level; housing: steel<br>Radiation beam outlet: 45° asymmetrical |
| Type 200, 50° | 59656-04 | Application: Mass flow; housing: steel<br>Radiation beam outlet: 50° asymmetrical |
| Type 200, 54° | 59656-03 | Application: Mass flow; housing: steel<br>Radiation beam outlet: 54° symmetrical |
| Type 200, 72° | 59656-02 | Application: Mass flow; housing: steel<br>Radiation beam outlet: 72° symmetrical |
| Type 270, 45° | 59646-01 | Application: level; housing: steel<br>Radiation beam outlet: 45° asymmetrical |

## 10.3 Dimensional drawings of the different variants

### Variants of type 100

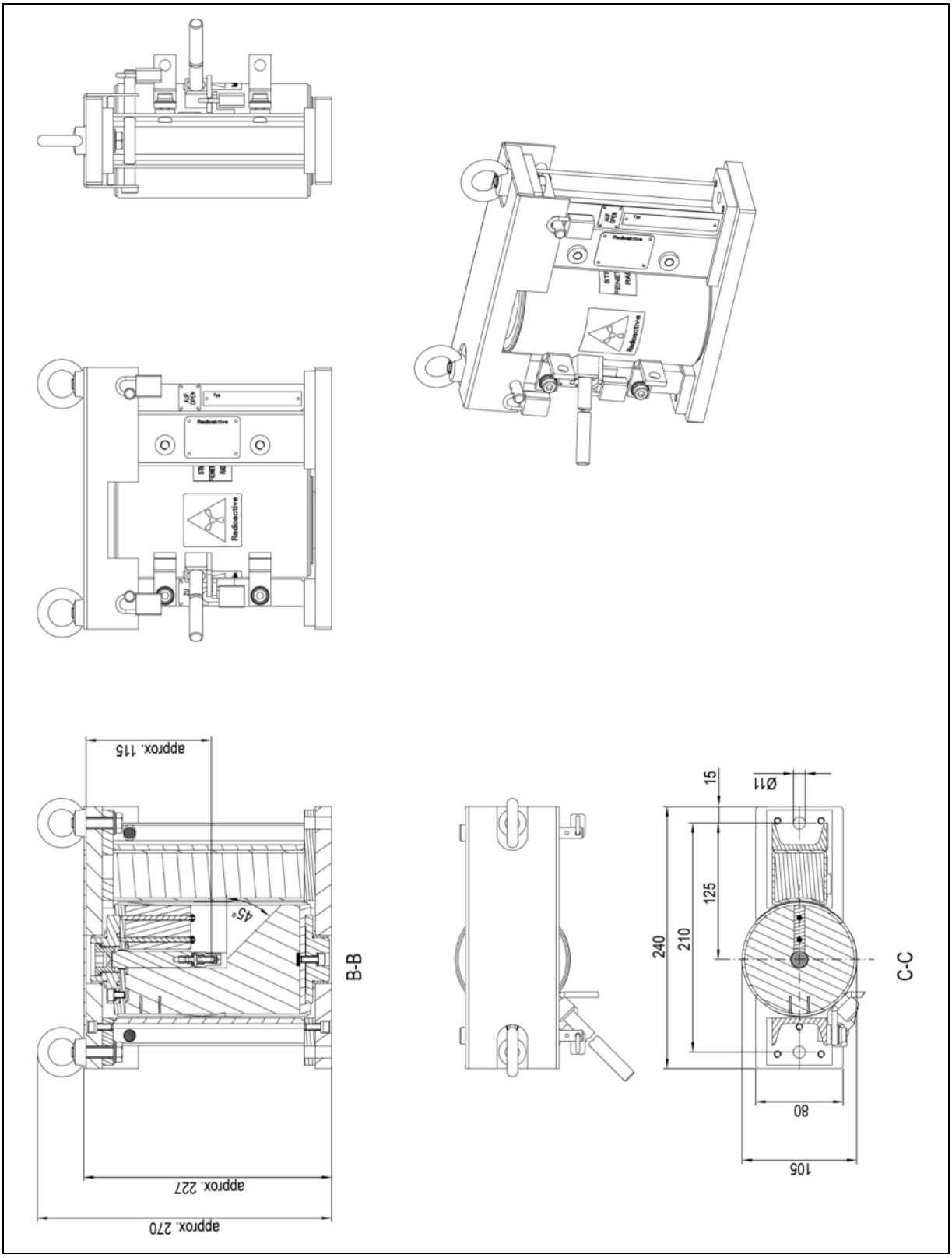



Fig. 27 Type 100, 45° (dimensions in mm)

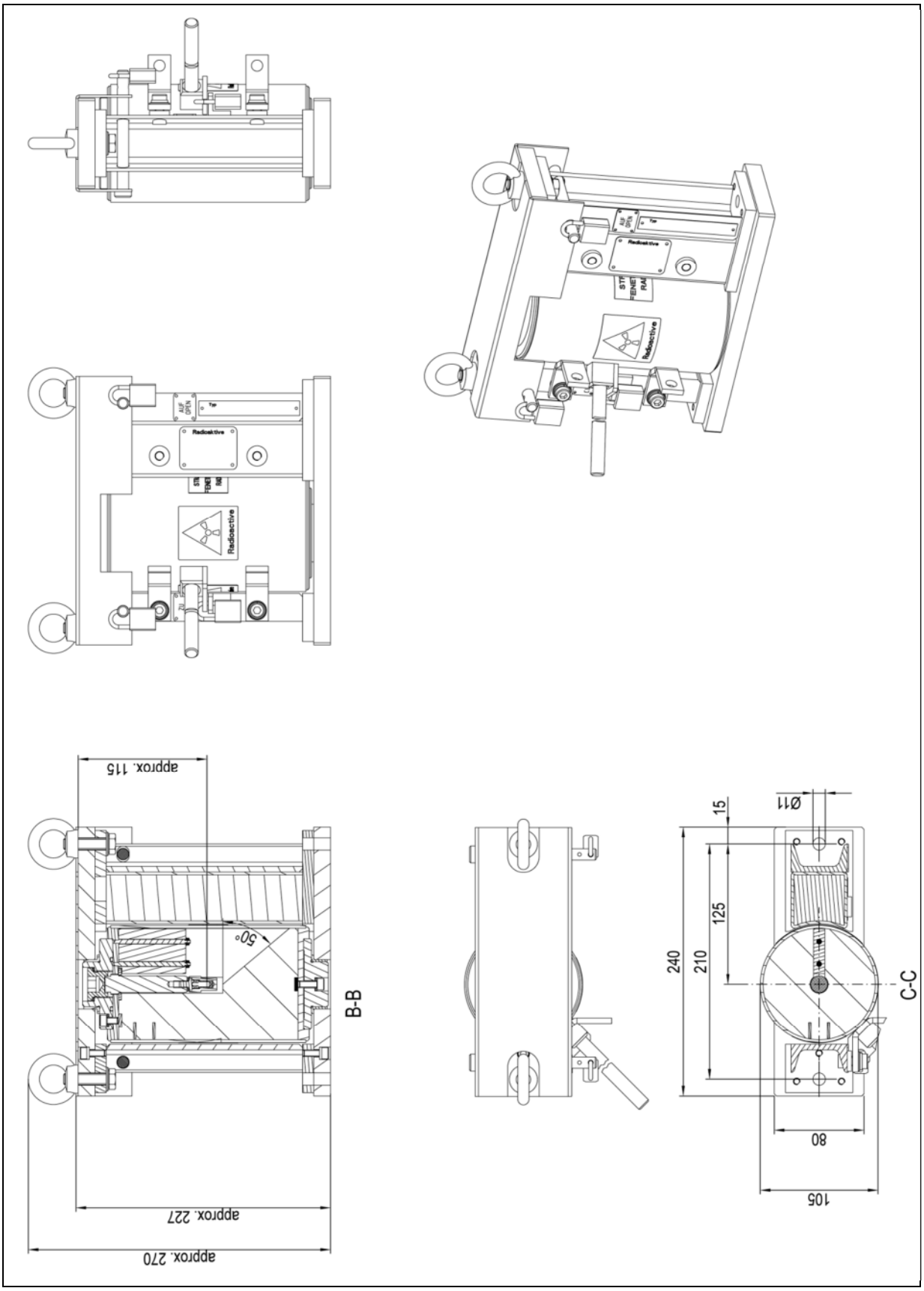



Fig. 28 Type 100, 50° (dimensions in mm)

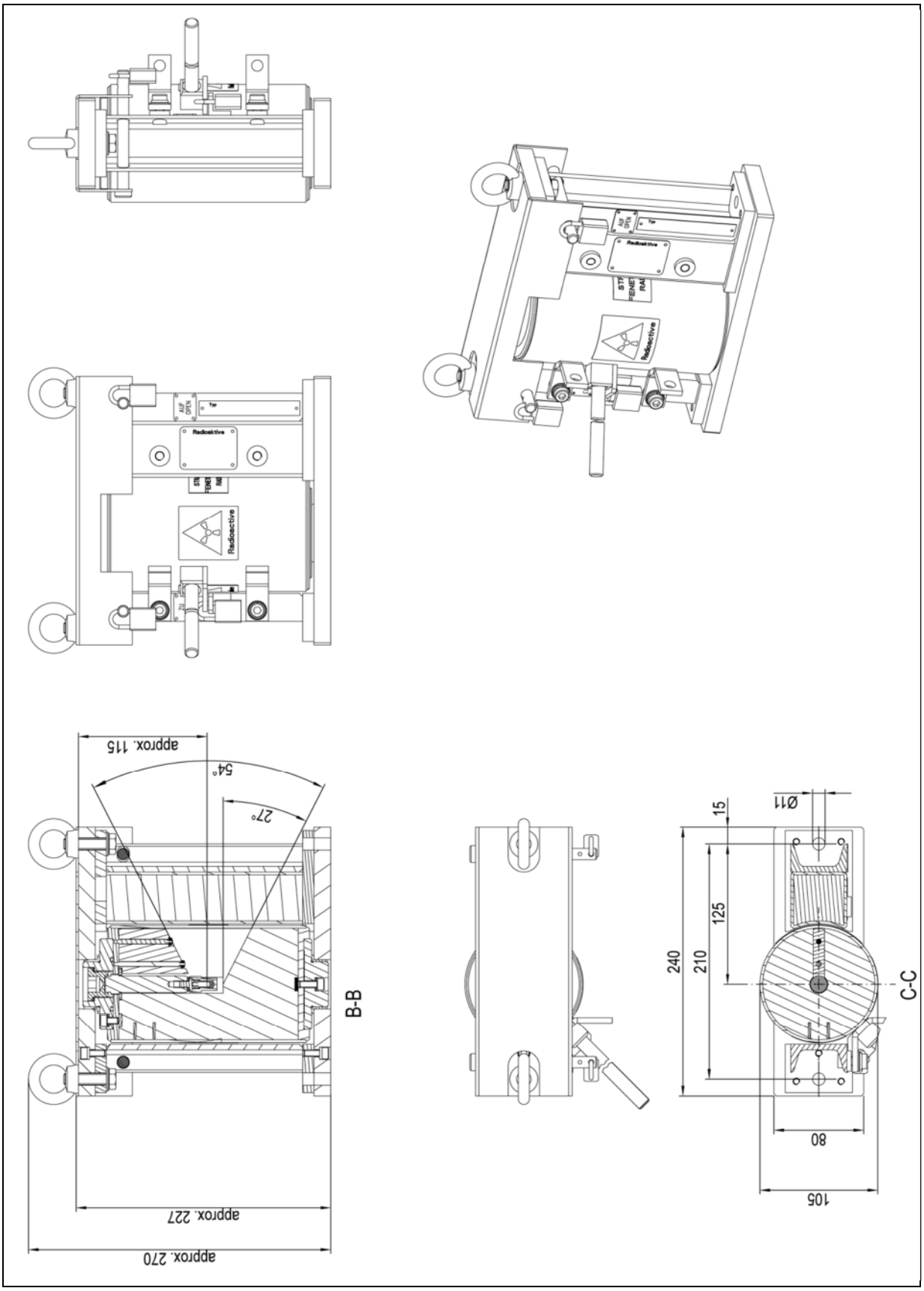



Fig. 29 Type 100, 54° (dimensions in mm)

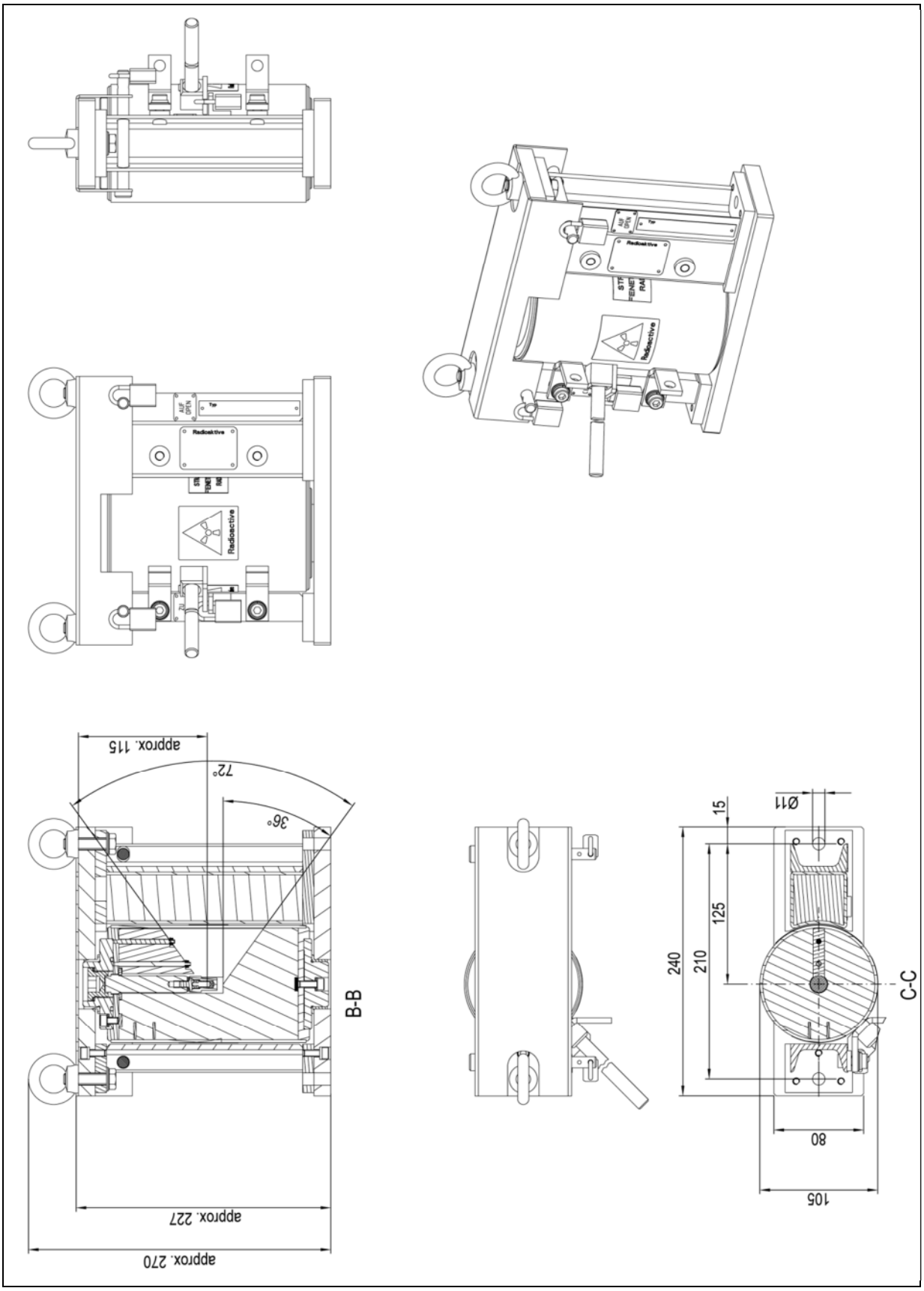



Fig. 30 Type 100, 72° (dimensions in mm)

## Variants of type 150

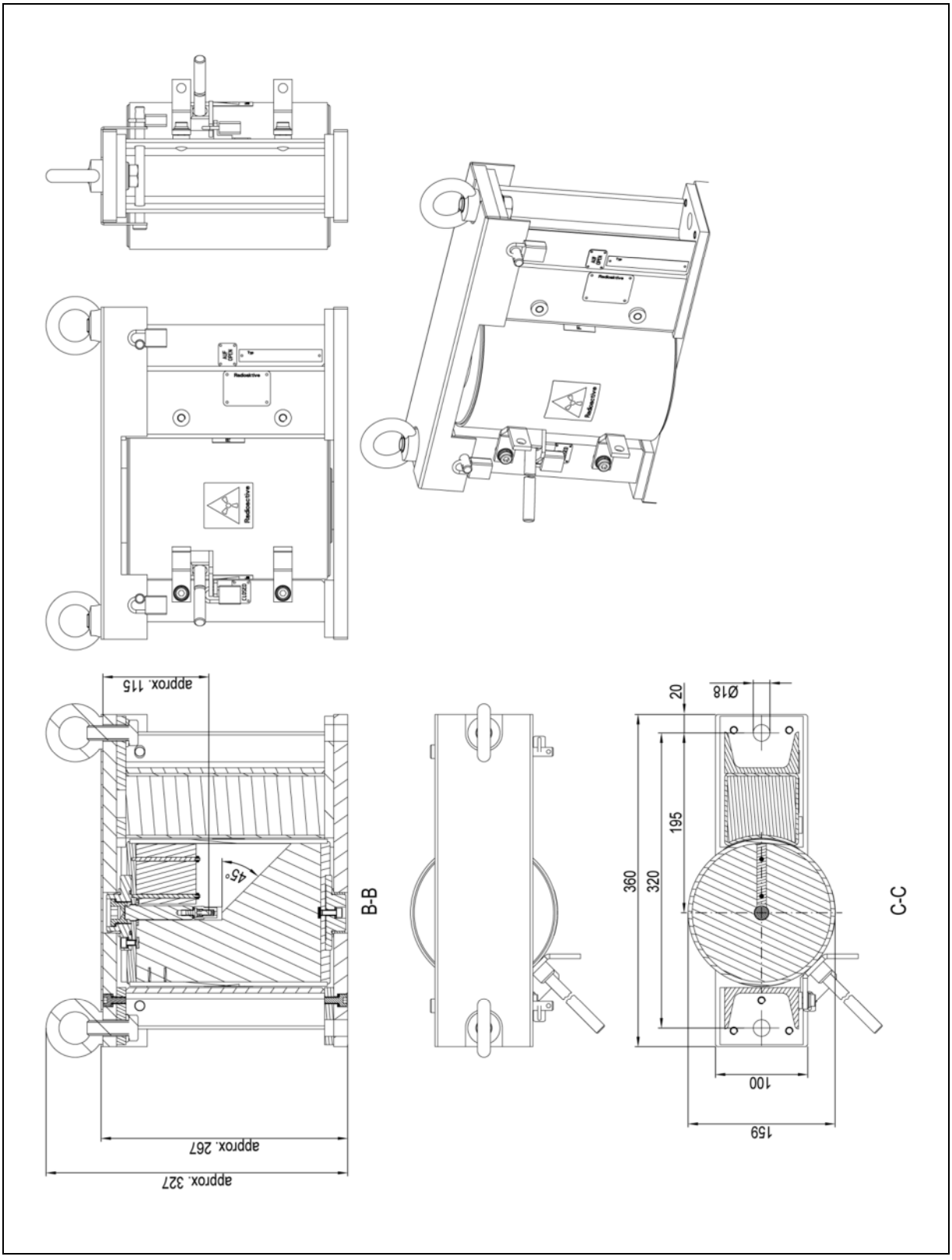



Fig. 31 Type 150, 45° (dimensions in mm)

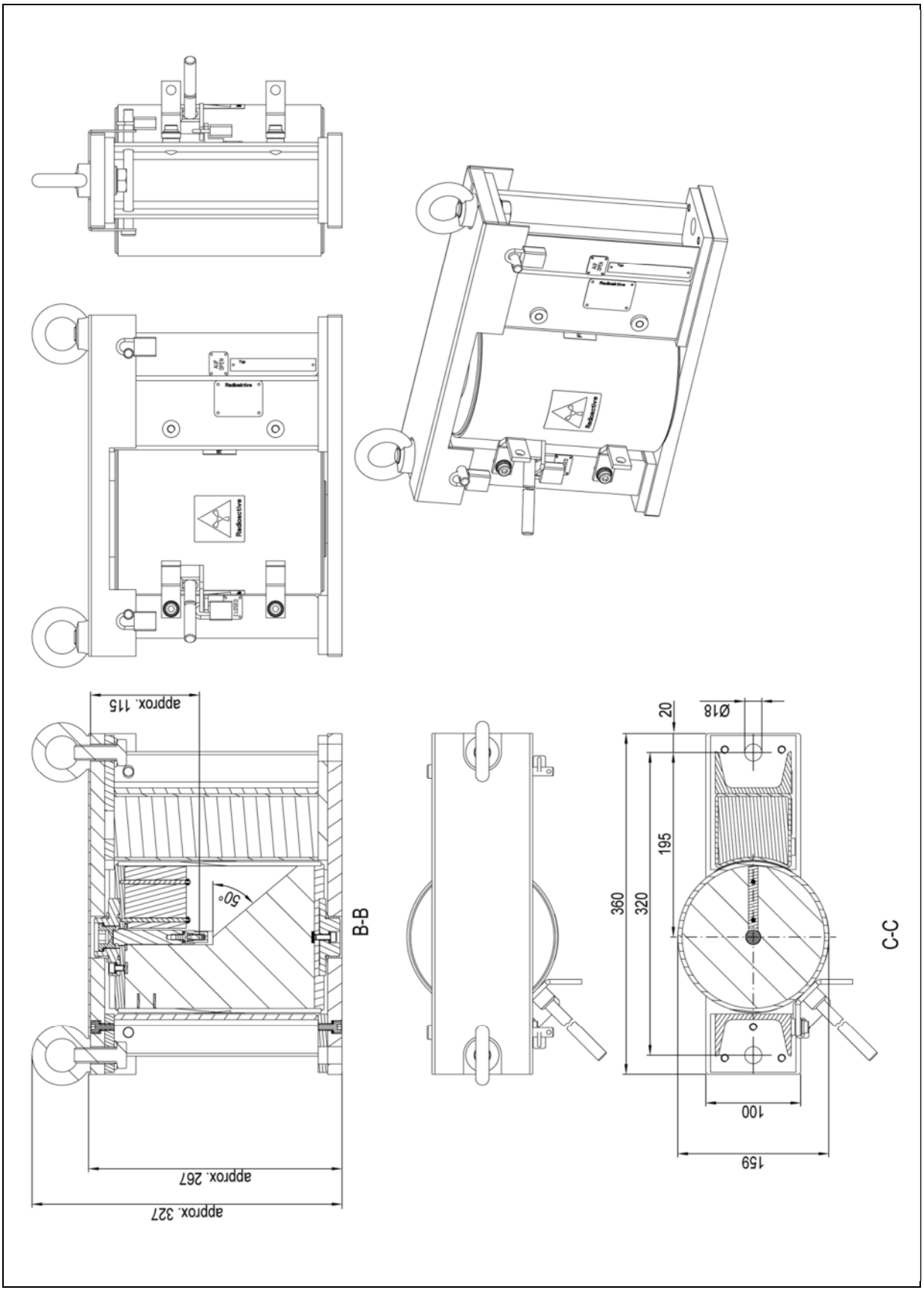



Fig. 32 Type 150, 50° (dimensions in mm)

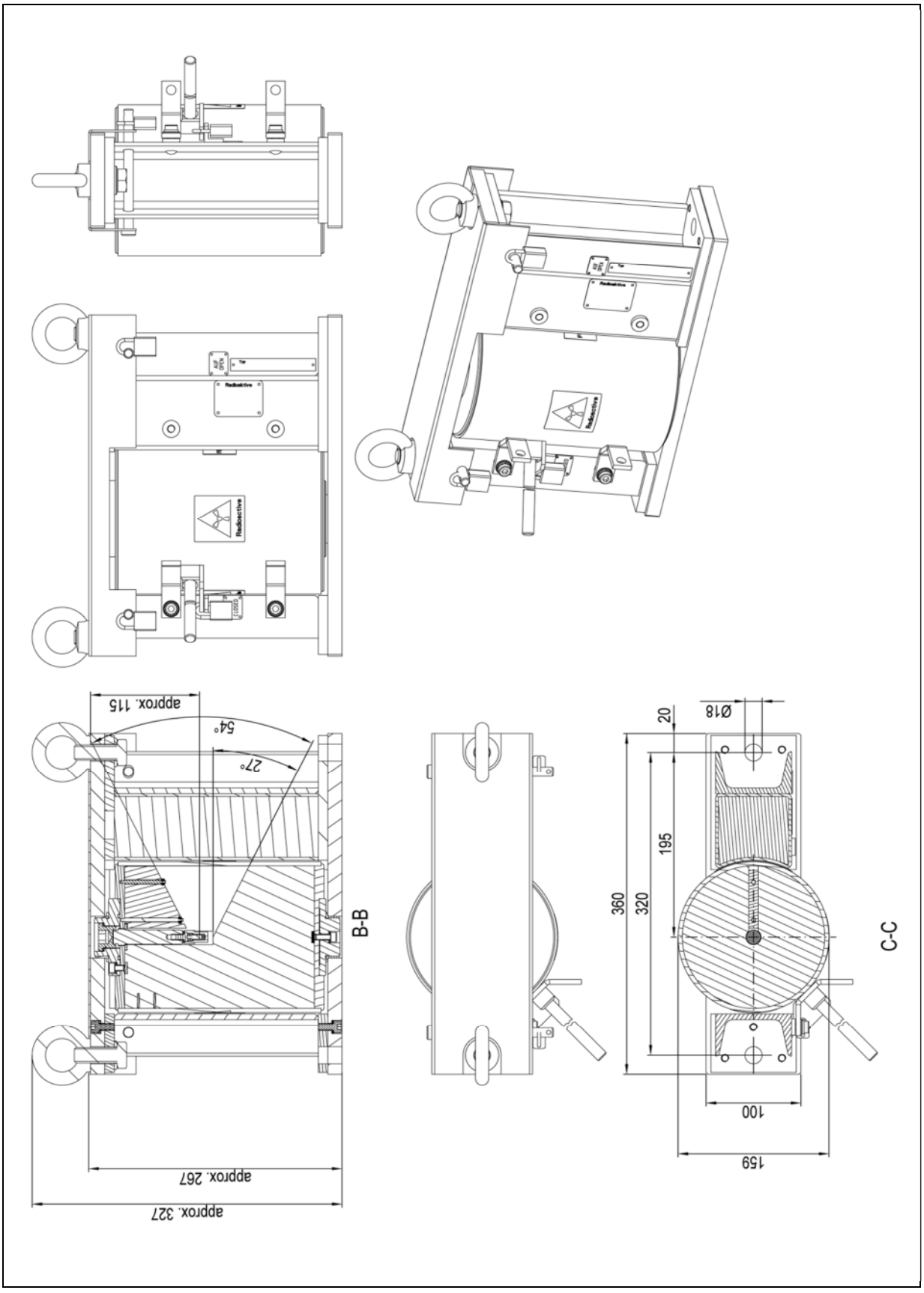



Fig. 33 Type 150, 54° (dimensions in mm)

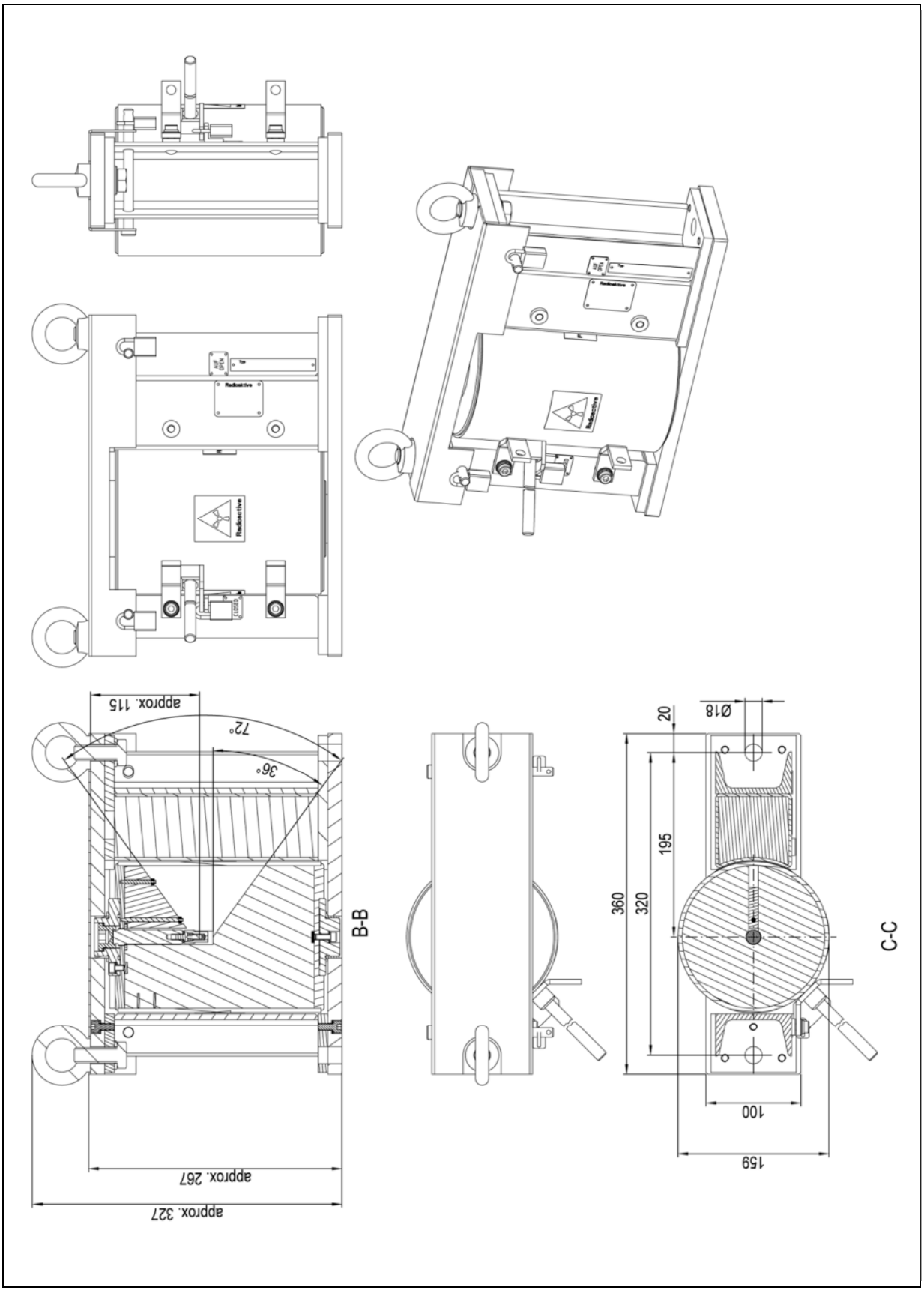



Fig. 34 Type 150, 72° (dimensions in mm)

## Variants of type 200

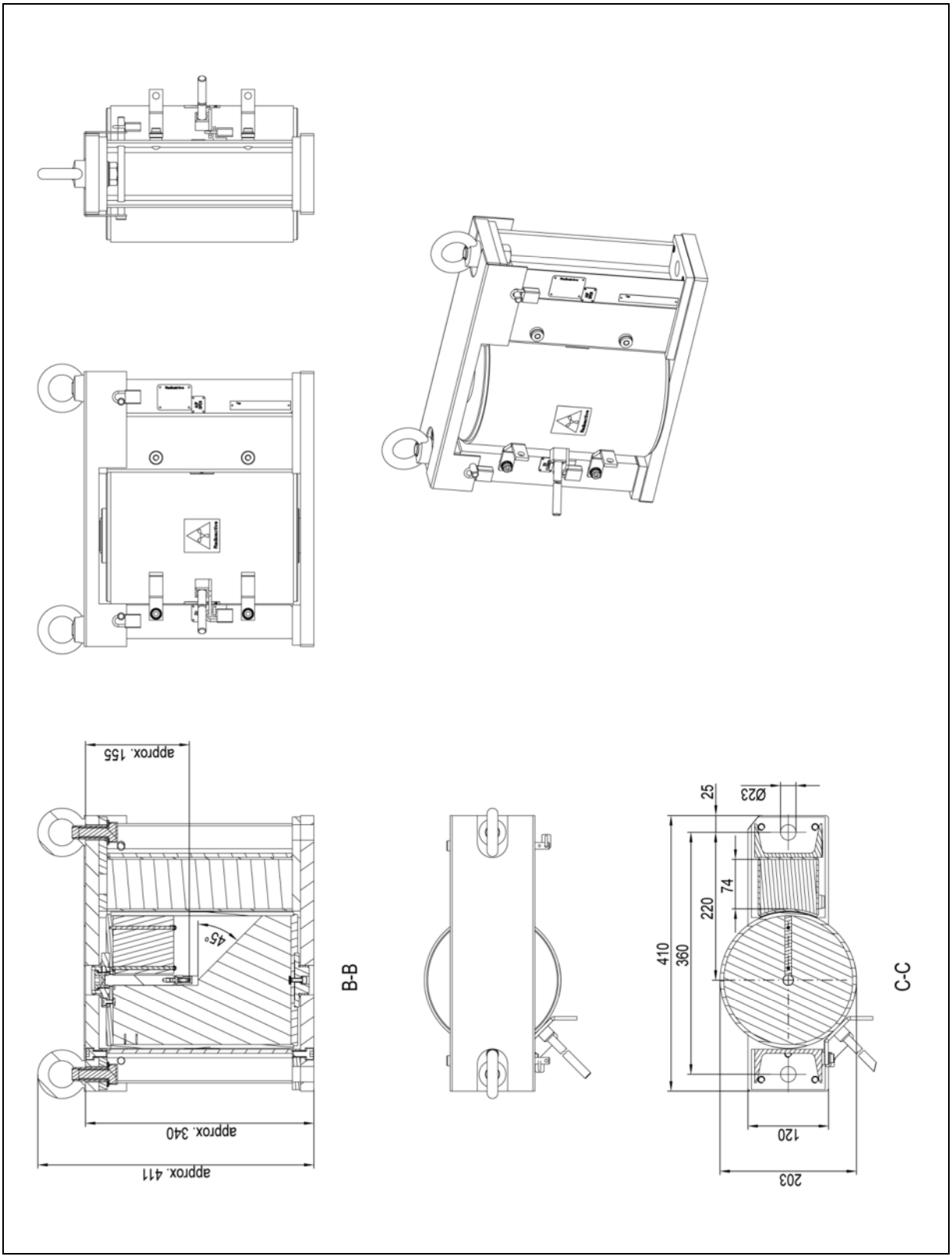



Fig. 35 Type 200, 45° (dimensions in mm)

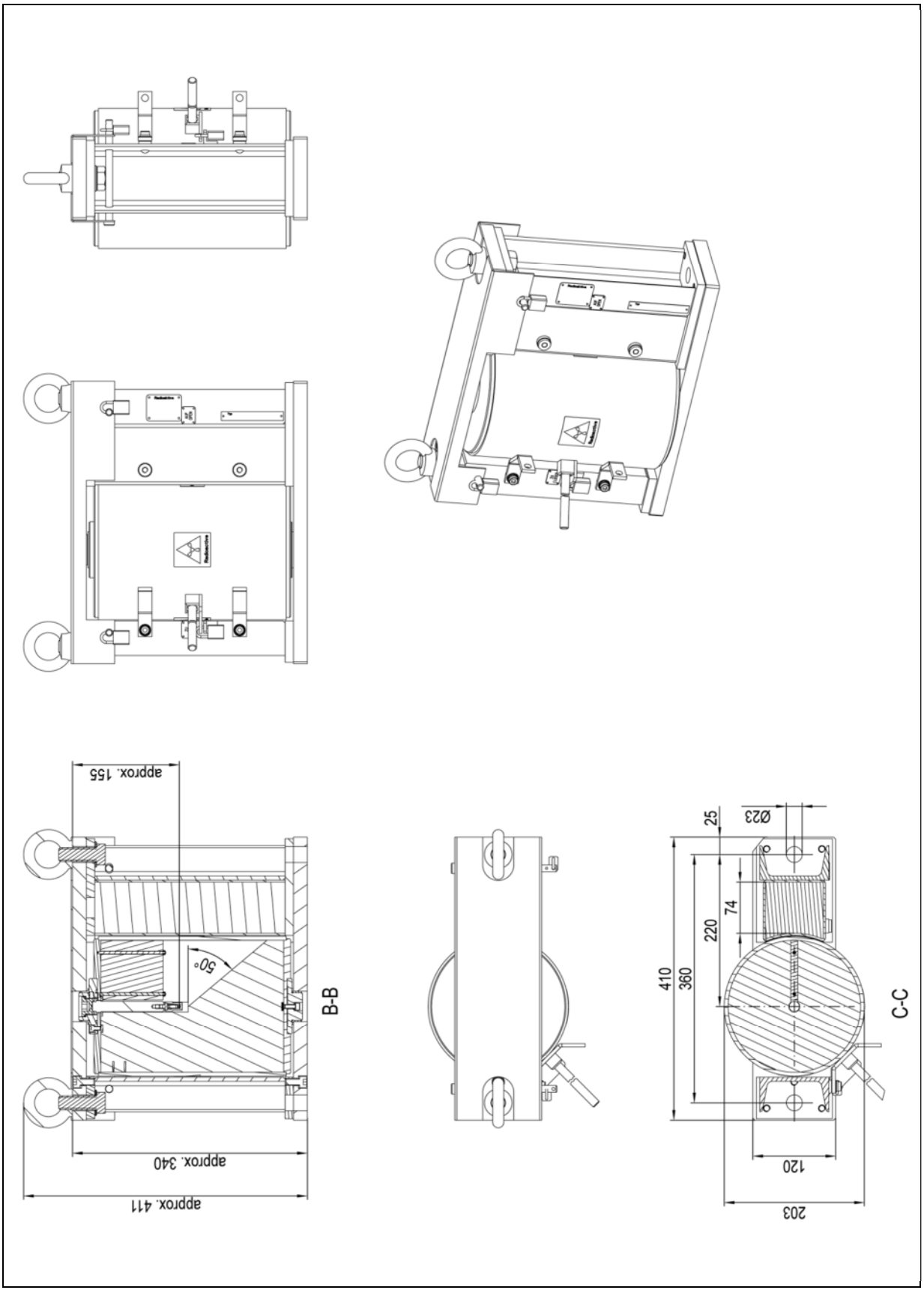



Fig. 36 Type 200, 50° (dimensions in mm)

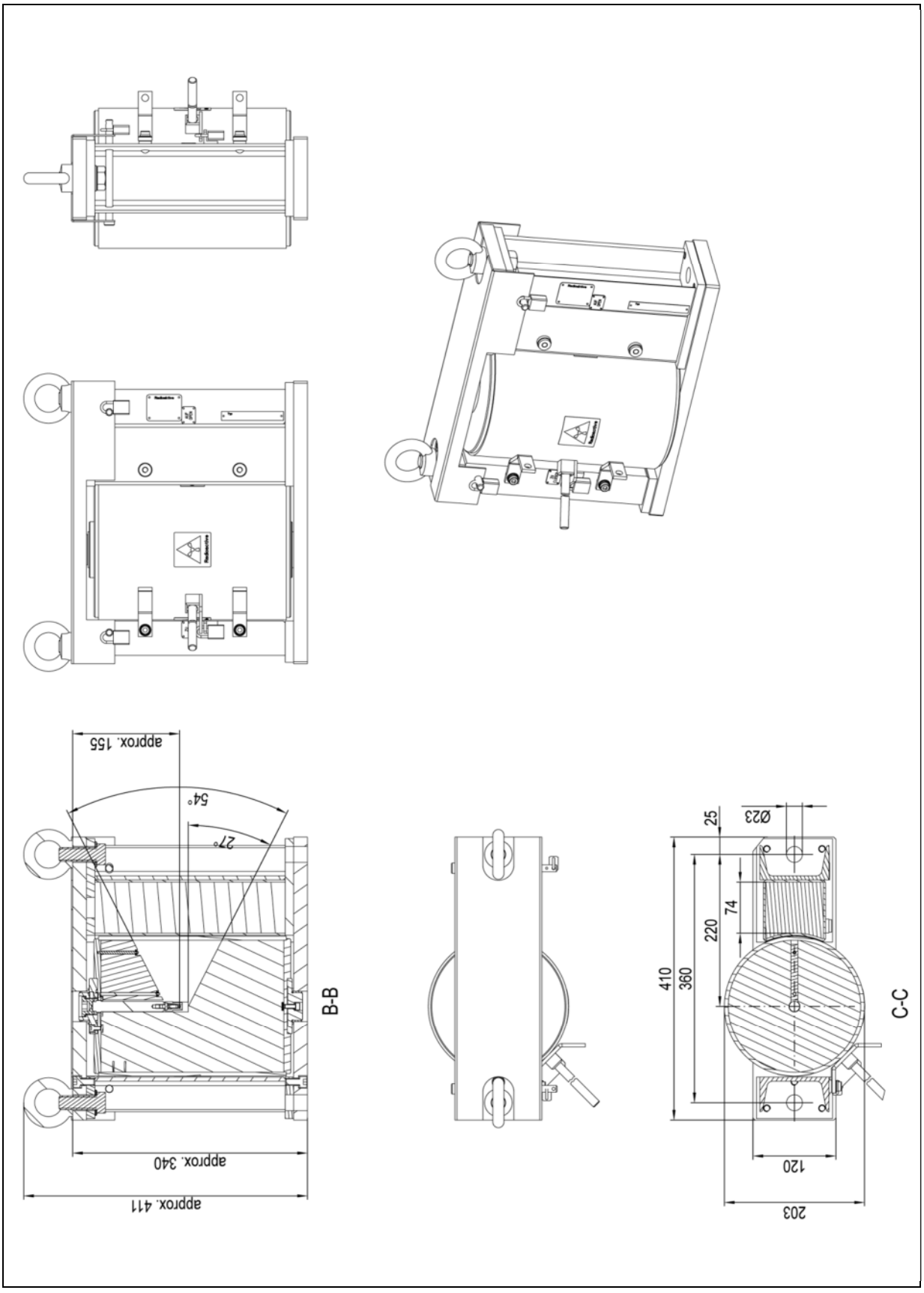



Fig. 37 Type 200, 54° (dimensions in mm)

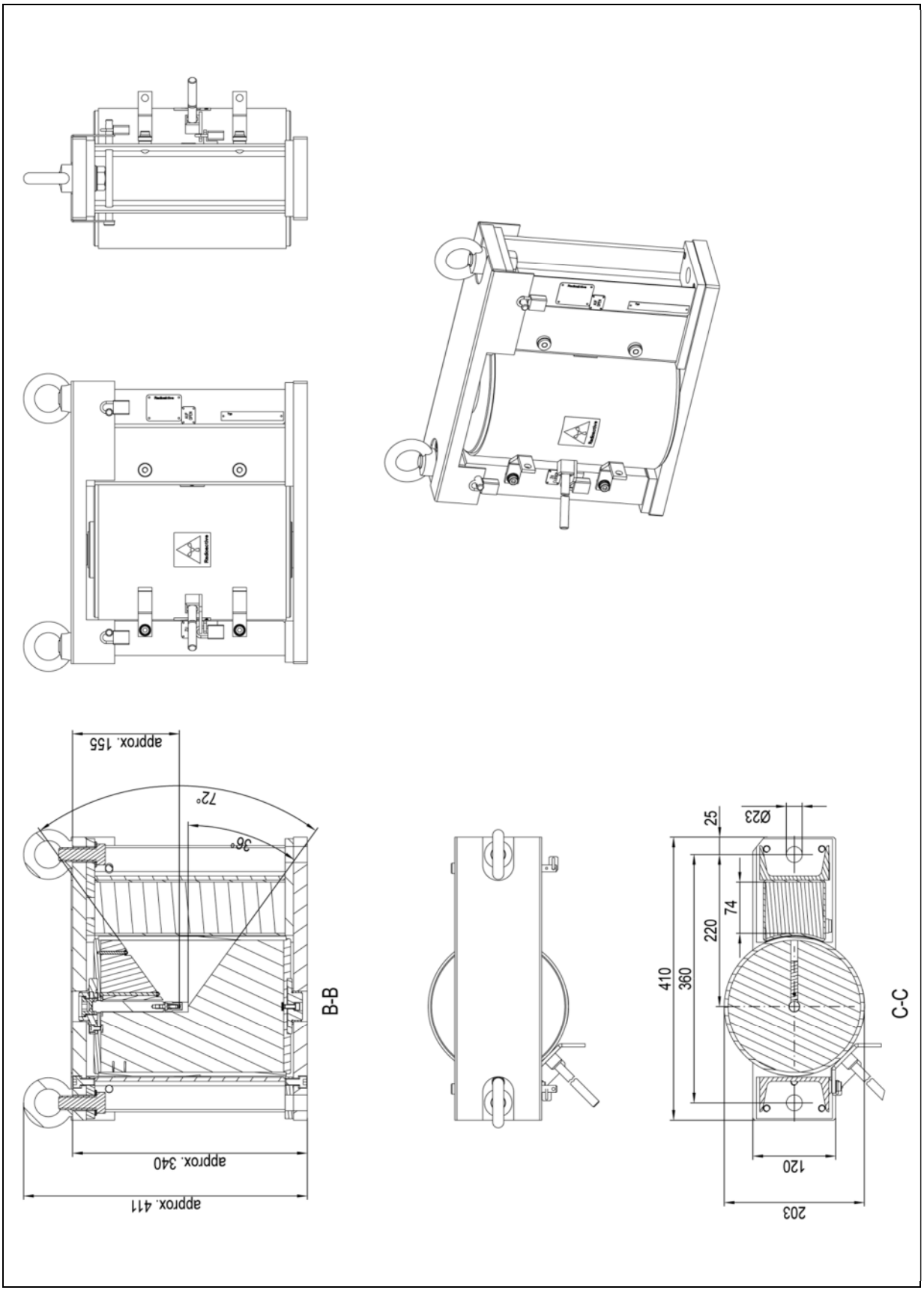



Fig. 38 Type 200, 72° (dimensions in mm)

## Variants of type 270

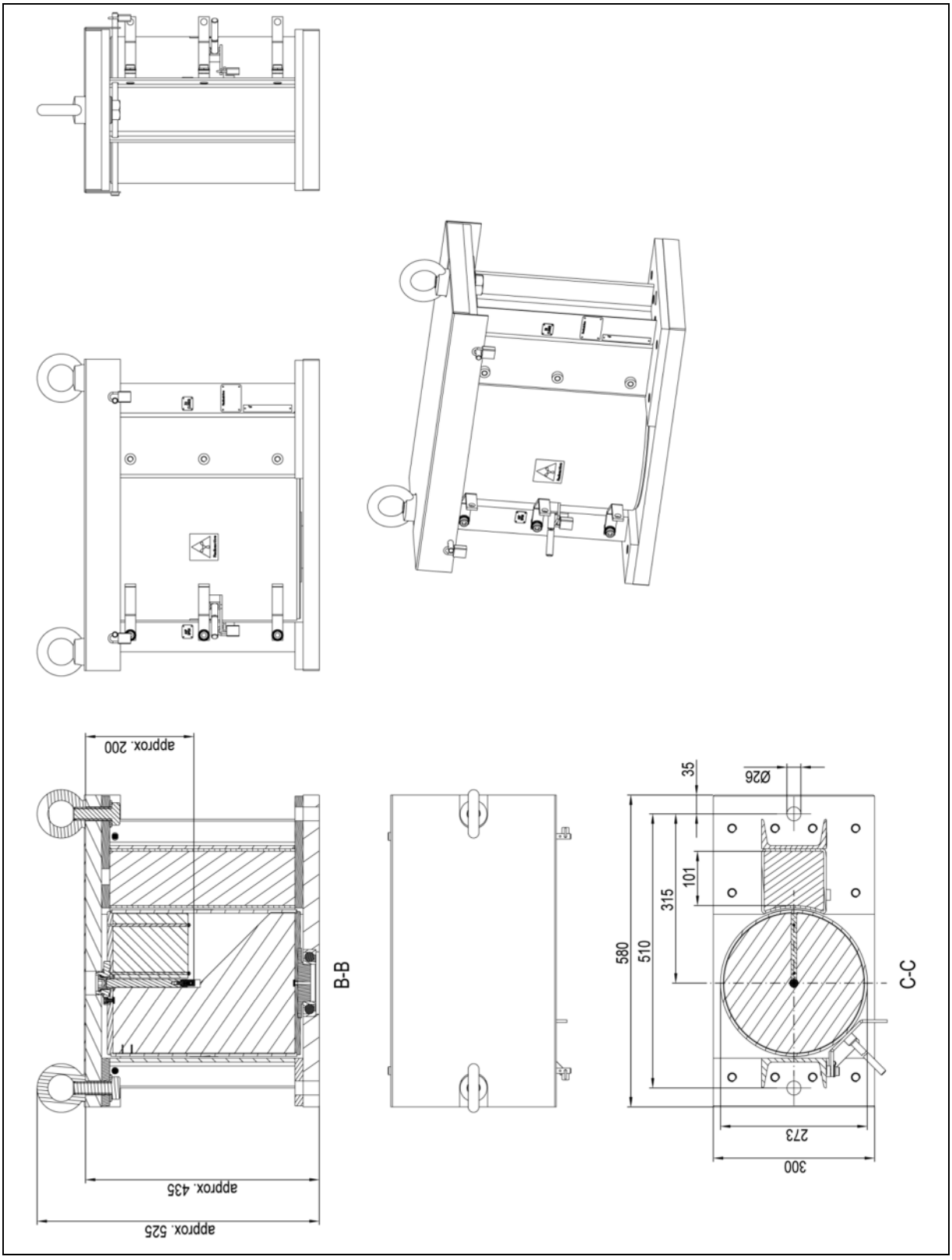



Fig. 39 Type 270, 45° (dimensions in mm)

## 10.4 Dimensional drawings of the bracket set (accessory)

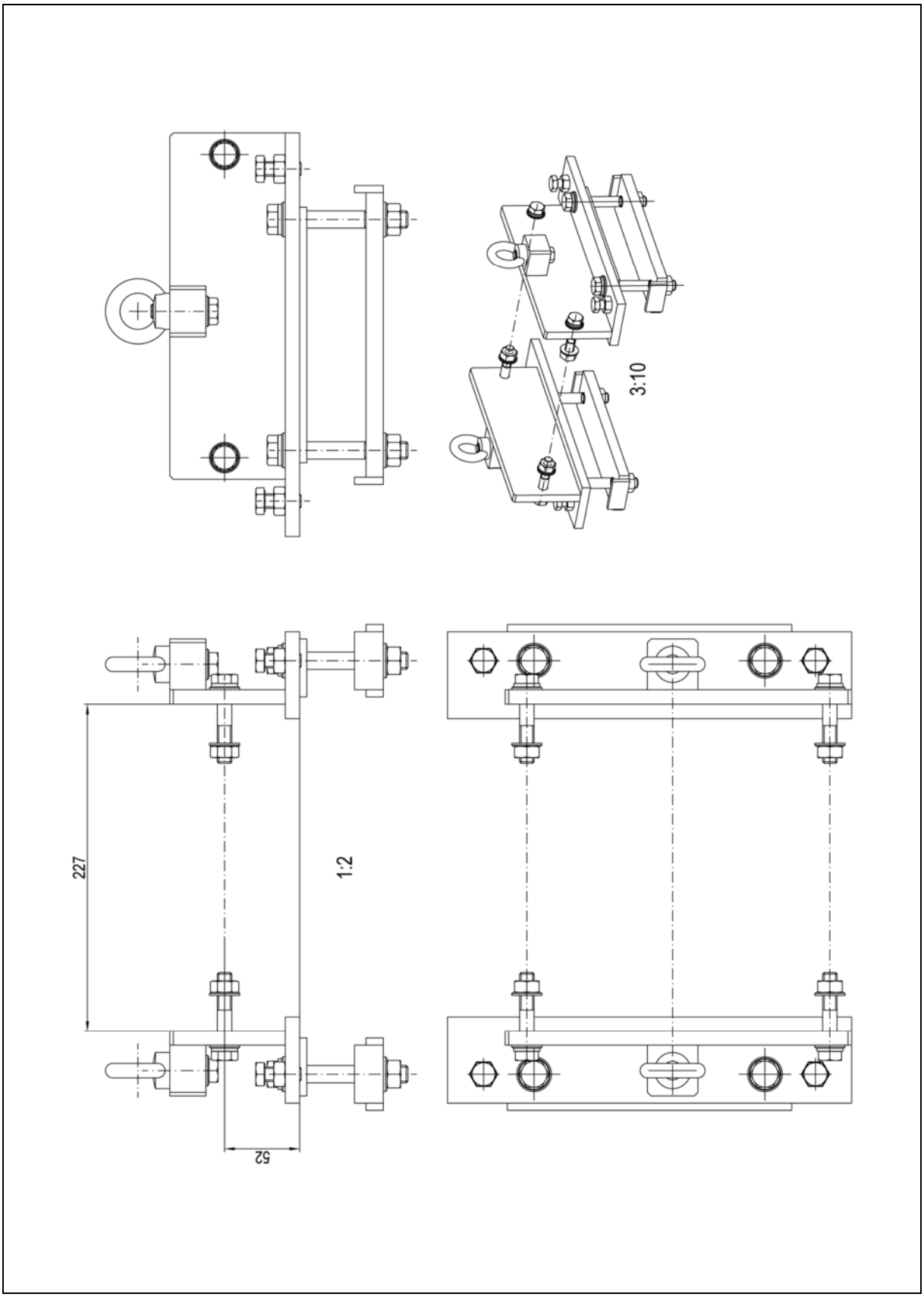



Fig. 40 Bracket set for type 100 (dimensions in mm)

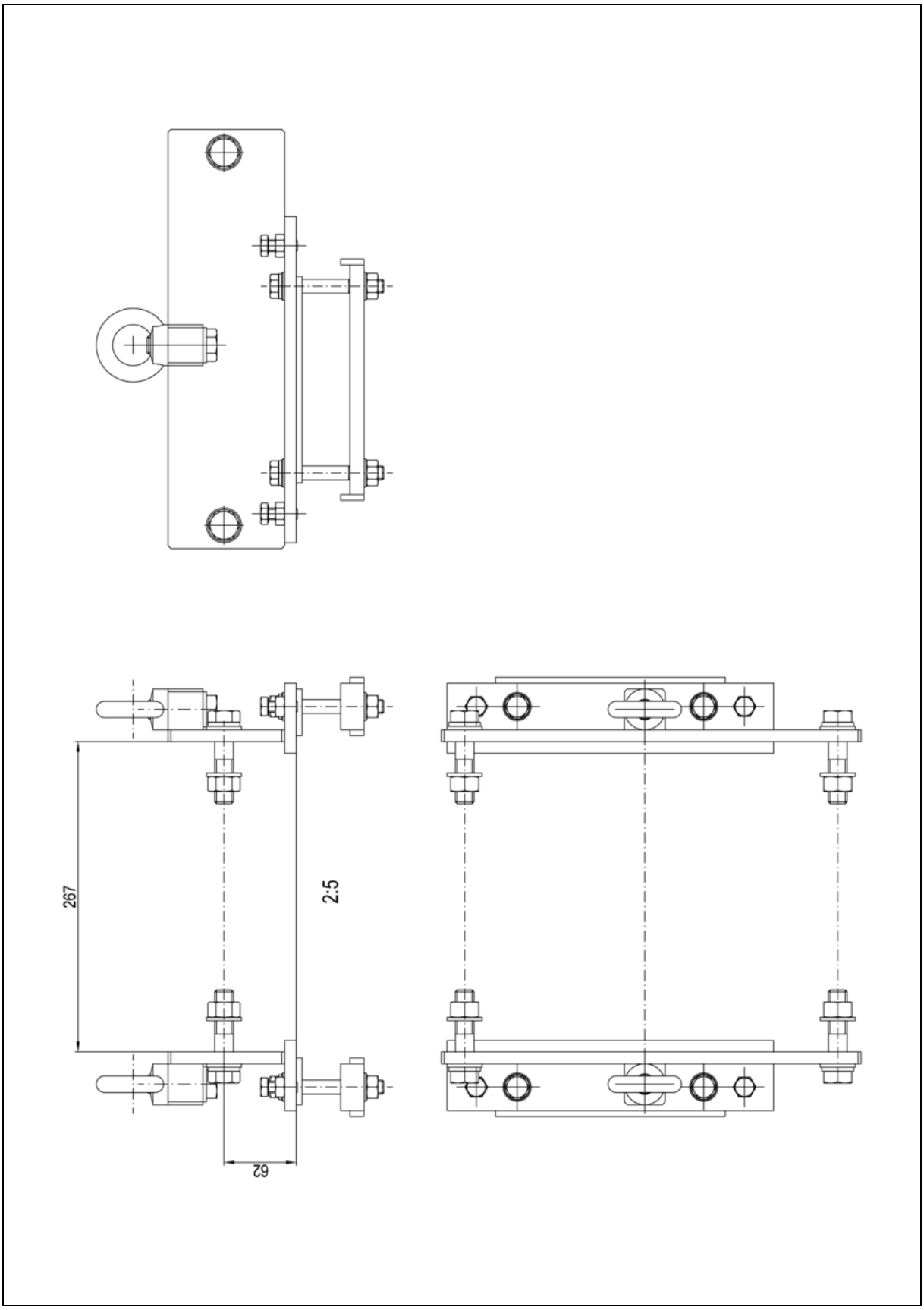



Fig. 41 Bracket set for type 150 (dimensions in mm)

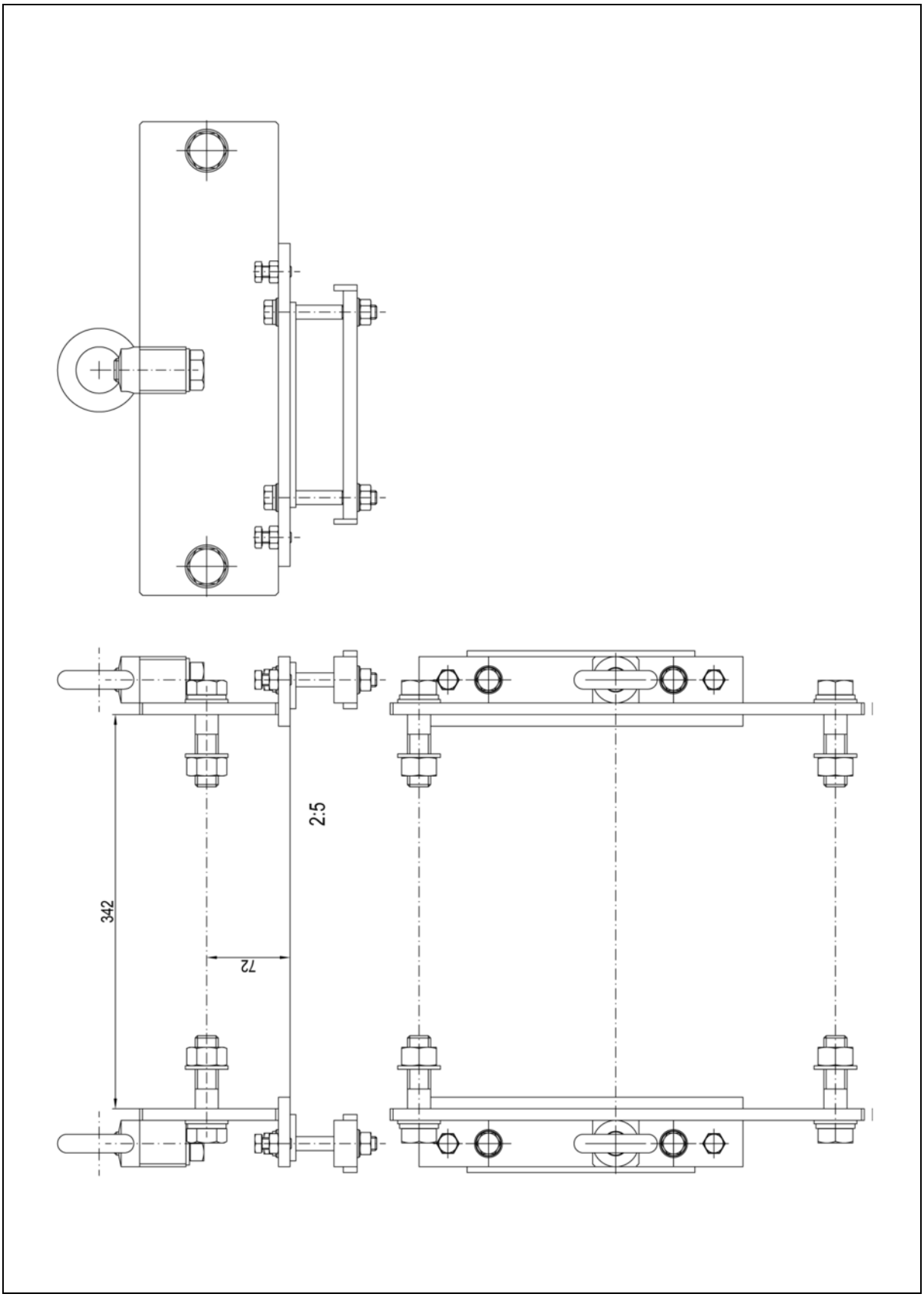



Fig. 42 Bracket set for type 200 (dimensions in mm)

## 10.5 ATEX certificates

### 10.5.1 Pneumatic actuator (explosion-proof)

ITS Intertek Testing Services

1. EC TYPE-EXAMINATION CERTIFICATE

2. **Equipment or Protective System Intended for use in Potentially Explosive Atmospheres Directive 94/9/EC**

3. EC-Type Examination Certificate Number: ITS03ATEX31060

4. Equipment or Protective System: TYPE ULS UNIVERSAL LIMIT SWITCH BOX

5. Manufacturer: KINETROL LIMITED

6. Address: Trading Estate, Farnham, Surrey, GU9 9NU

7. This equipment or protective system and any acceptable variation thereto is specified in the schedule to this certificate and the documents therein referred to.

8. The ITS Testing and Certification Limited, notified body number 0359 in accordance with Article 9 of the Council Directive 94/9/EC of 23 March 1994, certifies that this equipment or protective system has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of equipment and protective systems intended for use in potentially explosive atmospheres given in Annex II to the Directive.

   The examination and test results are recorded in confidential Report Number: ITS Report Ref 02008915, dated March 2003

9. Compliance with the Essential Health and Safety Requirements has been assured by compliance with:
   EN 50014:1997, EN 50018:2000 and EN 50019:1999
   except in respect of those requirements listed at item 18 of the Schedule.

10. If the sign "X" is placed after the certificate number, it indicates that the equipment or protective system is subject to special conditions for safe use specified in the schedule to this certificate.

11. This EC-TYPE EXAMINATION CERTIFICATE relates only to the design of the specified equipment or protective system. Further requirements of this Directive apply to the manufacture and supply of this equipment or protection system.

12. The marking of the equipment or protective system shall include the following:-

    II 2 G, EEx ed IIC T6 ( Tamb= -20°C to 70°C)

R M Adams
Deputy Certification Manager
11 April 2003

ITS Testing & Certification Limited
ITS House, Cleeve Road, Leatherhead, Surrey, KT22 7SB
Tel: + 44 (0)1372 370900 Fax: +44 (0)1372 370977
http://www.etlsemko.com/uk
Registered No 3272281 Registered Office: 25 Savile Row London W1X 1AA

This certificate may only be reproduced in its entirety and without any change, schedule included.

Sheet 1 of 2

ITS Intertek Testing Services

13. Schedule

14. EC-TYPE EXAMINATION CERTIFICATE NUMBER ITS03ATEX31060

15. DESCRIPTION OF EQUIPMENT OR PROTECTIVE SYSTEM.

Type ULS Universal Limit Switch Box consists of an Increased Safety enclosure fitted with Component approved Flameproof switches PTB 98 ATEX 1033U and Increased Safety terminals Sira 01ATEX3248U. The equipment is to be fitted to valve actuators in the Kinetrol range 03 to 14 to indicate the position of quarter turn valves. The switch box is mounted onto valve actuators by means of two or four screws and a square section shaft. Discrete mount versions may be fitted to other devices by four screws and either a square section or flat sided shaft.

The equipment is rated for use at 250 Vac with a maximum current rating of 4 A per switch, both internal and external earthing facilities are provided.

16. REPORT NO. ITS REPORT REF 02008915.

17. SPECIAL CONDITIONS FOR SAFE USE
None

18. ESSENTIAL HEALTH AND SAFETY REQUIREMENTS
Essential Health and Safety Requirements not addressed by Standards listed are covered by the manufacturers Technical Dossier and identified in ITS Report Ref 02008915.

19. DRAWINGS

| Number | Issue | Date | Description |
|---|---|---|---|
| 305-000-046 | C | 09.04.03 | General Assembly and parts list |
| SK 3290 | A | 14-03-03 | Cover |
| SK 3291 | A | 19-03-03 | Base |
| 305-052 | D | 09.04.03 | Label |
| KTR 115 | - | 20-03-03 | Technical file |
| KF-434-03/03 | - | 03.03 | Installation Instructions |

**ITS Testing & Certification Limited**
**ITS House, Cleeve Road, Leatherhead, Surrey, KT22 7SB**
**Tel: + 44 (0)1372 370900 Fax: +44 (0)1372 370977**
http://www.etlsemko.com/uk
**Registered No 3272281 Registered Office: 25 Savile Row London W1X 1AA**



Sheet 2 of 2

Intertek ETL SEMKO

1. SUPPLEMENTARY EC-TYPE EXAMINATION CERTIFICATE

2. **Equipment or Protective System Intended for use in Potentially Explosive Atmospheres Directive 94/9/EC**

3. Supplementary EC-Type Examination Certificate Number: ITS03ATEX31060/1

4. Equipment or Protective System: TYPE ULS UNIVERSAL LIMIT SWITCH BOX

5. Manufacturer: KINETROL LIMITED

6. Address: Trading Estate, Farnham, Surrey, GU9 9NU

7. This supplementary certificate extends EC-Type Examination Certificate Number ITS03ATEX31060 to apply to equipment or protective systems designed and constructed in accordance with the specification set out in the Schedule of the said Certificate but having variations specified in the Schedule attached to this certificate and the documents therein referred to.

   Intertek Report Ref 03012354 Issue 1, dated February 2004

   This Supplementary Certificate shall be held with the original Certificate

8. The marking of the equipment or protective system shall include the following:-

   II 2 GD, EEx ed IIC T6 ( Tamb= -20°C to 70°C)

R M Adams
Certification Manager
27 February 2004

Intrertek Testing & Certification Limited
Intertek House, Cleeve Road, Leatherhead, Surrey, KT22 7SB
Tel: + 44 (0) 1372 370900 Fax: +44 (0) 1372 370977
http://www.uk.intertek-etlsemko.com
Registered No 3272281 Registered Office: 25 Savile Row London W1X 1AA



Sheet 1 of 2

Intertek ETL SEMKO

## Schedule

SUPPLEMENTARY EC-TYPE EXAMINATION CERTIFICATE NUMBER ITS03ATEX31060/1

VARIATION ONE

**Description of the Variation to the Equipment or Protective System.**

To permit the following changes:

The Type ULS Universal Limit Switch Box has been further assessed to comply with the requirements of EN 50281-1-1:1998, Electrical apparatus for use in the presence of combustible dust.

The coding has been revised as per item 7 of the Schedule.

**Report No.**

Intertek Report Ref 03012354 Issue 1, dated February 2004

SPECIAL CONDITIONS FOR SAFE USE

None

**Essential Health and Safety Requirements**

See original certificate

DRAWINGS

| Number | Issue | Date | Description |
|---|---|---|---|
| 305-000-046 | D | 08.12.03 | General Assembly and parts list |
| 305-052 | E | 08.12.03 | Label |
| KTR 115 | | 05.02.04 | Technical file |
| KF-434-12/03 | - | 12.03 | Installation Instructions |

Intertek Testing & Certification Limited
Intertek House, Cleeve Road, Leatherhead, Surrey, KT22 7SB
Tel: + 44 (0) 1372 370900 Fax: +44 (0) 1372 370977
http://www.uk.intertek-etlsemko.com
Registered No 3272281 Registered Office: 25 Savile Row London W1X 1AA



Sheet 2 of 2

Modifications due to technical advancement reserved.


12/2013
Language: English
Rev. no.: 00
Printed in Germany

**BERTHOLD TECHNOLOGIES GmbH & Co. KG**

Calmbacher Str. 22
D-75323 Bad Wildbad
Germany
www.Berthold.com

ID no. 59596 BA2