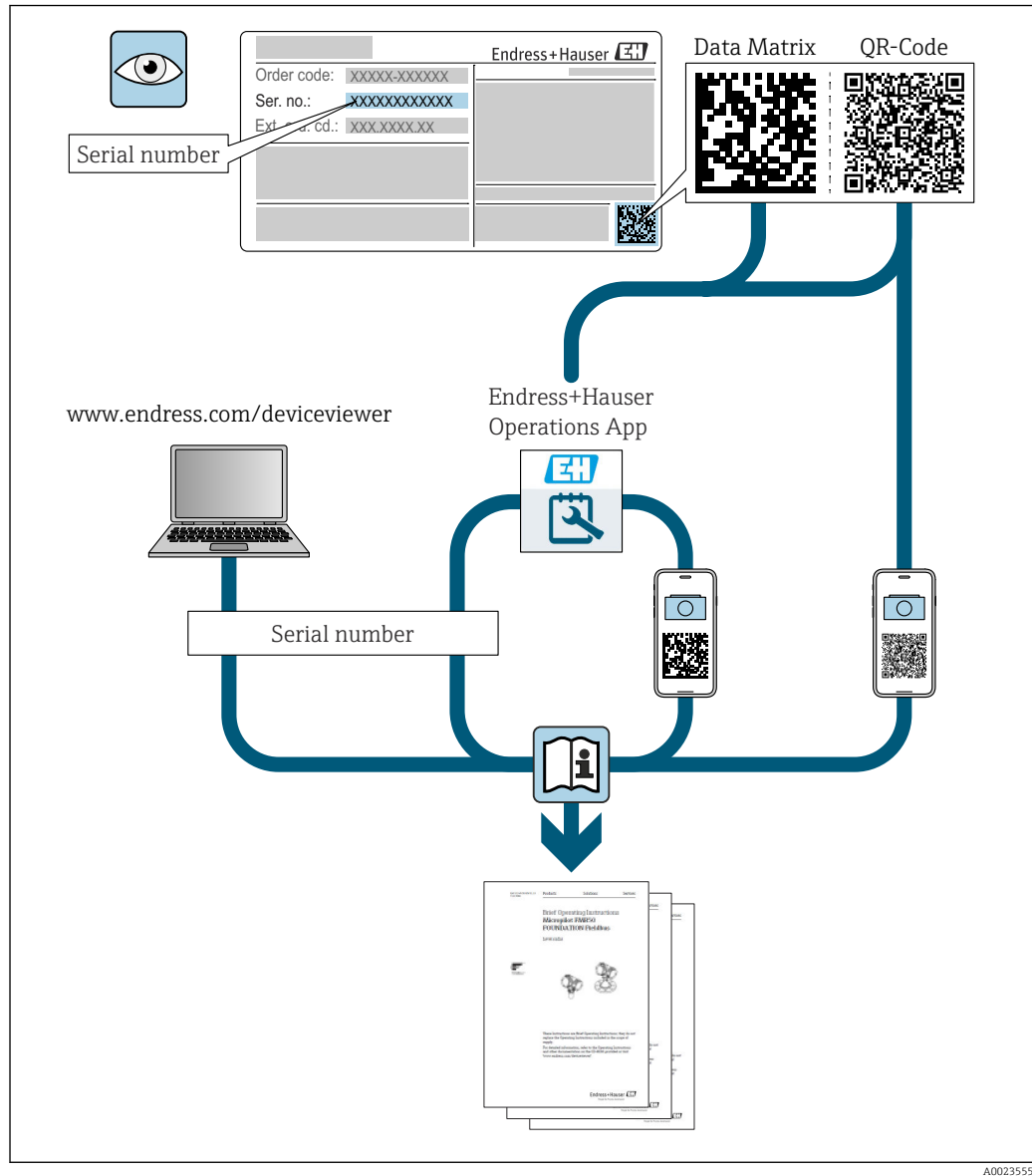


Operating Instructions

Source Container FQG63

Radiometric level, density and interface measurement
Source container with flexible source holder extension to
position the radiation source inside the process vessel





A0023555

- Make sure the document is stored in a safe place such that it is always available when working on or with the device
- Avoid danger to individuals or the facility: read the "Basic safety instructions" section carefully, as well as all other safety instructions in the document that are specific to working procedures

The manufacturer reserves the right to modify technical data without prior notice. The Endress+Hauser sales organization will supply you with current information and updates to these instructions.

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1 About this document

1.1 Document function

These Operating Instructions contain all the information required in the various life cycle phases of the device: from product identification, incoming acceptance and storage, to installation, connection, operation and commissioning, through to troubleshooting, maintenance and disposal.

1.2 Symbols

1.2.1 Safety symbols



This symbol alerts you to a dangerous situation. Failure to avoid this situation will result in serious or fatal injury.



This symbol alerts you to a potentially dangerous situation. Failure to avoid this situation can result in serious or fatal injury.



This symbol alerts you to a potentially dangerous situation. Failure to avoid this situation can result in minor or medium injury.



This symbol alerts you to a potentially harmful situation. Failure to avoid this situation can result in damage to the product or something in its vicinity.

1.2.2 Radiation warning sign



Warning symbol for radioactive source according to ISO 7010

Warning sign for ionizing radiation

Identification of places and objects in and around which the presence of ionizing radiation is to be expected.



Warning symbol for highly radioactive source according to ISO 21482

High radiation warning sign

- Warns of highly radioactive substances or ionizing radiation.
- Highly radioactive sources are marked separately on the source containers with the wording "highly radioactive source" and the supplemental warning symbol according to ISO 21482.

1.2.3 Symbols for certain types of information

Radiation warning sign

Warns against radioactive substances or ionizing radiation

Permitted

Procedures, processes or actions that are permitted

Forbidden

Procedures, processes or actions that are forbidden

Tip

Indicates additional information



Reference to documentation



Reference to graphic



Notice or individual step to be observed

1., **2.**, **3.**

Series of steps



Result of a step

1.2.4 Symbols in graphics

1, 2, 3, ...

Item numbers

A, B, C, ...

Views

→ **Safety instructions**

Observe the safety instructions contained in the associated Operating Instructions

1.2.5 Tool symbols



Phillips head screwdriver



Flat-blade screwdriver



Torx screwdriver



Allen key



Open-ended wrench



Wire cutter

1.3 Documentation

 For an overview of the scope of the associated Technical Documentation, refer to the following:

- *Device Viewer* (www.endress.com/deviceviewer): Enter the serial number from the nameplate
- *Endress+Hauser Operations app*: Enter serial number from nameplate or scan matrix code on nameplate.

2 Basic safety requirements

DANGER

Danger from ionizing radiation in case of incorrect handling or a defective source container

Hazard for persons and the environment posed by ionizing radiation and contamination. Ionizing radiation and contamination could increase the risk of cancer and the risk of genetic birth defects. Depending on the dose received, ionizing radiation could lead to immediate physical harm, such as nausea, vomiting, hair loss, changes to blood count, serious tissue damage and even death.

- ▶ **The instructions and warning notes in this manual relating to dangers to health posed by ionizing radiation and contamination must be strictly observed. Disregard for these instructions and warning notes could lead to serious injuries or death and hazards for the environment.**
- ▶ Observe applicable national requirements for radioactive radiation sources. Observe requirements for fire protection measures in particular.
- ▶ Observe the conditions of use of radiation sources with respect to environmental conditions (e.g. vibration or operating temperature).
- ▶ In cases of doubt, contact the responsible radiation safety officer, the responsible national inspectorate or the manufacturer.

Information on potential risks from ionizing radiation is marked with the  warning symbol in these instructions.

DANGER

Danger from ionizing radiation if radiation sources lost

If radiation sources are lost, there is a danger to the general public and the environment

- ▶ **The instructions and warning notes in this manual relating to dangers to health posed by ionizing radiation and contamination must be strictly observed. Disregard for these instructions and warning notes could lead to serious hazards for the environment and public safety.**
- ▶ Observe applicable national requirements for anti-theft measures for radioactive radiation sources throughout the entire life cycle (from delivery to disposal).
- ▶ There is a risk of radioactive material being used for criminal or premeditated unauthorized acts, which poses a threat to public safety.

⚠ WARNING**Risk of accident from heavy gross weight**

During assembly: If source containers are assembled incorrectly, there is an impact danger to persons in the event of a dropped load and a risk of serious damage to physical items. During transport: In the event of incorrect or unsecured transport of the source container and overpack (loads), there is a risk that persons could go unnoticed or suffer impact because it is not possible to stop in time. Due to a high center of gravity or uneven weight distribution, there is also the risk of the load tipping, which poses a serious risk of personal injury. For suspended loads: There is the danger of persons being impacted by falling loads or parts thereof, of being impacted by moving suspended loads or of bumping into stationary suspended loads. Parts of the overpack and attachment parts of the source container could weigh over 18 kg.

- ▶ Observe the assembly instructions.
- ▶ Inspect the assembly diligently and check at regular intervals.
- ▶ Observe safety instructions and transport conditions for heavy loads.
- ▶ Wear personal protective equipment.
- ▶ Lift source containers only at the defined lifting points.
- ▶ Use only appropriate lifting accessories for the load.
- ▶ During assembly and transport, only those persons who are directly involved and have knowledge of guidance and requirements may be present in the danger zone.
- ▶ During transport, the center of gravity of the packaging must be taken into consideration and a suitable surface must be ensured.

⚠ CAUTION**Risk of burns from hot components**

Components could heat up as a consequence of high temperatures in the process. These high component temperatures could lead to burn injuries.

- ▶ Wear personal protective equipment, such as correctly sized heat-resistant gloves.
- ▶ Define organizational measures for protection from hot parts (particularly process adapters and flexible source holder extensions). Equipment operators must be warned of the danger posed by hot parts on the source container, e.g. in the form of notices and training.
- ▶ The plant operator is responsible for ensuring that the radiation sources can be safely set to the "AUS/OFF" switch position in an emergency. A risk of injury from hot parts on the source container must be taken into consideration.
- ▶ If possible, allow the process to cool down before the ropes are retracted.

2.1 Requirements for the personnel

⚠ WARNING**Danger from inadequately qualified personnel.**

Physical damage and personal injury. Particularly as a consequence of incorrect handling.

- ▶ The requirements for personnel described below are mandatory for the plant operator.

Operating personnel

The operating personnel are responsible for operation and monitoring. They switch the radiation on or off, for example. The operating personnel

- ▶ must be instructed and authorized by the plant operator according to the requirements of the task, and
- ▶ must have a relevant qualification for this specific function and task, in accordance with the relevant national requirements.

Installation and service personnel

The installation and service personnel are responsible for installation, commissioning, maintenance, monitoring, and removal. They must strictly meet the following requirements:

- ▶ They must be trained, qualified specialists, having a relevant qualification for this specific function and task, in accordance with the relevant national requirements.
- ▶ They must be authorized by the plant operator.
- ▶ They must be familiar with federal/national regulations.

Authorized repair personnel

Authorized repair personnel are

- ▶ qualified specialists having the appropriate qualification for the relevant function and task and meeting the relevant national requirements,
- ▶ authorized by the plant operator and
- ▶ familiar with national regulations.

Maintenance personnel – radiation

Maintenance personnel (radiation) carry out any maintenance work affecting the radiation source, including disassembly and replacement. The maintenance personnel – radiation are

- ▶ accredited and monitored in relation to radiation exposure
- ▶ They must be trained specialists in radiation protection and
- ▶ authorized by the plant operator.

Transport personnel

Transport personnel transport the product or parts thereof from, for example, the manufacturer or storage location to the point of use. Transport personnel

- ▶ are qualified to transport "Class 7 dangerous goods".

Disposal personnel

Disposal personnel dispose of the product or parts thereof. Disposal personnel are

- ▶ accredited and monitored in relation to radiation exposure,
- ▶ specialists qualified in radiation protection and
- ▶ authorized by the disposal company.

Radiation safety officer

The radiation safety officer is responsible for compliance with all applicable laws and regulations. The company/plant operator must nominate a radiation safety officer in accordance with applicable national legislation. The radiation safety officer is, among other things, responsible for

- ▶ monitoring the source container at the respective point of use,
- ▶ the training of employees in the context of radiation protection and
- ▶ developing and implementing measures in an emergency. The radiation safety officer is therefore reachable at all times.

The radiation safety officer is

- ▶ qualified for the task,
- ▶ a nationally recognized person for the task and
- ▶ a specialist authorized by the plant operator.

2.2 Intended use

The source container shields the surrounding area from radiation and allows it to escape almost completely unattenuated only in the measuring position when the source holder is extended via a flexible extension into the double-walled protection pipe to be provided by the customer. In order to guarantee the screening effect and exclude damage of the

radiation source, all instructions given in these Operating Instructions for mounting and operation, as well as all regulations for radiation protection must be strictly observed.

When moving or changing the location of the source container, it is absolutely essential to switch the container to the "AUS/OFF" switch position (radiation source is switched off).

The source containers described in this document contain the radioactive radiation sources used for radiometric level, density and interface measurements, as well as point level measurement.

The following are considered intended uses

- Use as a transport and storage vessel according to hazardous class 7 and as source container in the process
- Exclusive use with radioactive, double-encapsulated materials in special form, in accordance with ISO 2919
- Replacement of radiation sources when the same source capsule type is used.

For intended use, the following conditions must be met:

- The instructions and handling guidelines in the Operating Instructions, particularly the radiation protection instructions, must be followed
- Areas of use must be within the limits of technical specifications
- Only the radiation sources specified in the technical specifications must be used, in compliance with the maximum activity levels specified there.

2.2.1 Foreseeable incorrect use

The following is not permitted:

- Operation outside the technical specifications
- Attaching the lifting gear to points not intended for this purpose
- Permanent process installation of the source container in a suspended state
- Commissioning or switching on radiation while the source container is in a suspended state
- Transporting the source containers with an open shutter
- Use with insufficient protection of the radiation sources against corrosion (see the following note)
- Use of an auxiliary drive on the flexible source holder extension to raise or lower the radiation source.



Protection of radiation sources in measuring applications against corrosion is ensured through:

- Appropriate material selection of the protection pipe
- Monitoring or, if necessary, double-walled design of the protection pipe
- The operator is responsible for ensuring radiation source protection through the protection pipe

Endress+Hauser assumes no liability for damage resulting from improper use.

2.3 Workplace safety

For work on and with the device

1. In case of any doubt in relation to correct handling, contact Endress+Hauser Service.
2. Make detailed preparations to ensure that the source container is installed as quickly and efficiently as possible. Provide all necessary tools and equipment before starting work.
3. Observe all instructions in this manual when working on the source container.
4. When working with radiation sources, avoid any unnecessary exposure to radiation.
5. Keep all unavoidable radiation exposure to a minimum.
6. Implement suitable measures (e.g. blocking of access, shielding) to prevent danger to people.

7. Observe applicable national requirements.

Lowering or raising of source holders

When the source holders are being lowered or raised, the radiation sources are outside the source container. The source container does not provide shielding in this case.

1. Make detailed preparations to ensure that the source holders are lowered or raised as quickly and efficiently as possible.
2. Compliance with the required protective measures for personnel and the environment.
3. Only the required, authorized personnel are permitted in the danger zone.
4. The dimensions of the danger zone must be determined and cordoned off accordingly in accordance with the applicable national requirements.

2.4 Operational safety

The “protection from ionizing radiation” function could be affected by damage, tampering, modification or repair. There is a threat of radiation damage or extremely serious injuries.

In cases of doubt in relation to operational safety, the source container must not continue to be used under any circumstances.

The product's suitability as a source container and as a shipping package for the transport of radioactive materials of special form is ensured only when

- all tests and maintenance have been carried out to the manufacturer's specifications and
- no modifications or tampering have taken place.

The manufacturer offers no guarantee of after-sales service or take-back if modifications have been carried out.

Maintaining operational safety:

- ▶ By carrying out maintenance and formal periodic inspections, make sure that the device is in technically flawless and operationally safe condition.
- ▶ Check moving parts, particularly the closing mechanism, regularly. It must be possible for the radiation to be switched off at any time.
- ▶ If the application is designed to have radiation sources lowered into the process, retrievability of the radiation sources must be ensured at all times. In particular, the ropes and source holders must be checked for corrosion and correct operation.
- ▶ Adapt checking intervals to environmental conditions. Check more frequently in harsh and corrosive environments.

Conversion

Modifications and attachments to the source container are not permitted without the express written authorization of Endress+Hauser.

Repair

- Do not carry out any repairs unless they are permitted repairs. Permitted repairs are described in these Operating Instructions or reference is made in this manual to the appropriate repair documents.
- Use only original spare parts and original accessories.
- Observe notes on radiation protection, particularly self-protection, hazards to third parties, and compliance with legal requirements.

Tampering

- No tampering with the source container is permitted.
- For source containers with a flexible source holder extension, no tampering with the flexible source holder extension is permitted. If other rope lengths are required to be able to lower radiation sources into the process, only the original parts of Endress+Hauser may be used.
- Endress+Hauser offers no guarantee of after-sales service or take-back in this case.

2.5 Product safety

This state-of-the-art device is designed and tested in accordance with good engineering practice to meet operational safety standards. It left the factory in a condition in which it is safe to operate.

It meets general safety requirements and legal requirements.

2.6 Basic instructions for use, transport, and storage

The handling of radioactive radiation sources involves particular risks and dangers and therefore requires special care.

For safe and legal handling

1. Observe the applicable regulations and national/international standards.
2. Comply with radiation protection regulations when using, storing and working with the radiometric measuring system.

If there is any suspicion of improper condition of a plant with radiometric measuring system

1. Inform the radiation safety officer immediately.
2. Check the area around the device for signs of increased radiation or contamination. See section "What to do in an emergency"

In the event of defects

1. Inform the radiation safety officer immediately.
2. Do not continue to use the device, withdraw it from service as quickly as possible and exchange it.
3. Conduct the required leak test according to the applicable regulations and instructions.

Minimizing the hazard potential through good planning and careful conduct

1. The radiation may be switched on only by instructed personnel.
2. Before switching on the radiation, make sure that no-one is in the radiation zone (or inside the product vessel).
3. Heed warning signs and observe controlled areas.
4. When operating, transporting and storing the device, protect it against extreme influences (e.g. chemical products, weather, mechanical impacts, vibrations).
5. Carry out recurrent tests at regular intervals. These include, for example, checking for secure fastening of the source container, checking safety measures or checking for integrity.

For storage and transport

1. Before transporting: Retract the radiation source into the source container and set the source container to the "AUS/OFF" switch position.
2. Always secure the "AUS/OFF" switch position by using the transport lock and padlock.
3. Carry out recurrent tests before dispatch.
4. Observe the center of gravity and weight information on the packaging.

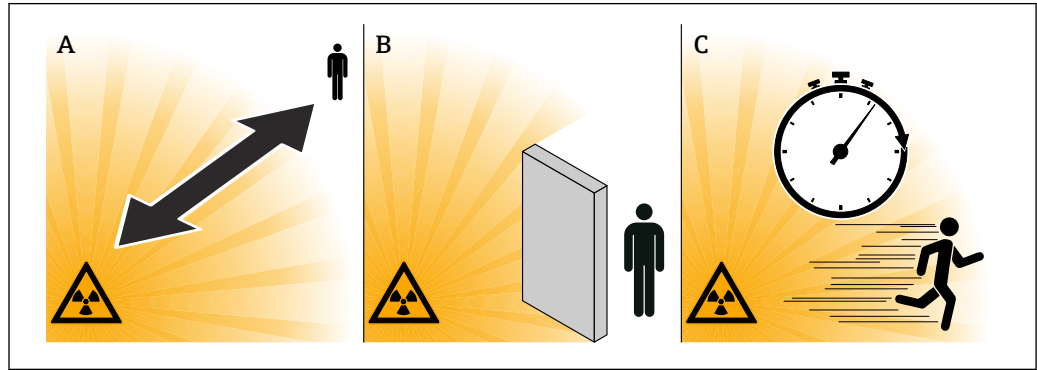
For use in a potentially explosive atmosphere

1. The use of the radiometric measurement method in potentially explosive atmospheres must be specially checked and implemented by the plant operator based on applicable national rules and regulations.

2. Integrate the device into the potential equalization system of the plant.

2.7 General instructions on radiation protection

When working with radioactive radiation sources, avoid any unnecessary exposure to radiation. All unavoidable radiation exposure must be kept to a minimum. Three basic concepts apply to achieve this:



 1 Protective measures

- A Distance
B Shielding
C Time

Distance

Keep as far away from the radiation source as possible.

The local dose rate decreases in proportion to the square of the distance from the radiation source.

Shielding

Ensure the best possible shielding between the radiation source and personnel.

Effective shielding is provided by source containers and high-density materials (e.g. lead, iron, concrete).

Time

Keep the time spent in the area exposed to radiation as short as possible.

2.8 Legal regulations for radiation protection

The handling of radioactive radiation sources is regulated by law. The radiation protection regulations of the country in which the plant is operated are of overriding importance and must be strictly observed. In the Federal Republic of Germany, the current versions of the Radiation Protection Act and the Radiation Protection Directive apply. The following points derived from this Ordinance are particularly important for radiometric measurement:

Handling permit

A handling permit is required by the operator of a plant that uses gamma radiation. Permit applications are made to the local state government or the authority responsible (State Offices for Environmental Protection, Trade Inspection Offices, etc.). The Endress+Hauser sales organization will be happy to help you obtain the handling permit.

Radiation safety officer

The plant operator must appoint a radiation safety officer (RSO) who has the necessary specialist knowledge and who is responsible for observing the Radiation Protection Ordinance and all radiation protection procedures.

Endress+Hauser offers training courses in which individuals can acquire the necessary specialist knowledge.

Plant operator

The plant operator is responsible for ensuring compliance with all national radiation protection regulations. The operator must also ensure safe operation and adequate qualification of the personnel involved.

Controlled area

Only persons who are exposed to radiation during the course of their job and are subject to official personal dose monitoring procedures may work in controlled areas (i.e. areas where the local dose rate exceeds a specific value). The limit values for the controlled area are specified in the current Radiation Protection Ordinance applicable for your area.

For further information on radiation protection and regulations in other countries, please contact the relevant Endress+Hauser sales organization.

2.9 Supplementary safety instructions

Fire and anti-theft protection

To design a safe installation, keeping and storage of the radiation sources, observe the safety measures for the radiation source with respect to fire and anti-theft protection. Implement requirements in accordance with applicable national legislation.

Handling of lead

This device contains more than 0.1% lead with CAS No. 7439-92-1. With the source container in undamaged condition, there is no direct contact with lead.

If the source container suffers damage, national regulations for the handling of lead must be observed.

3 Product description

The source container performs the following functions:

- The source container is used to safely set up a measuring point based on a radiometric measurement. The source container shields the surrounding area from radiation and facilitates measurement in accordance with the measuring point design.
- The source container also serves as a transport container for the radiation sources in accordance with the certificate of suitability.

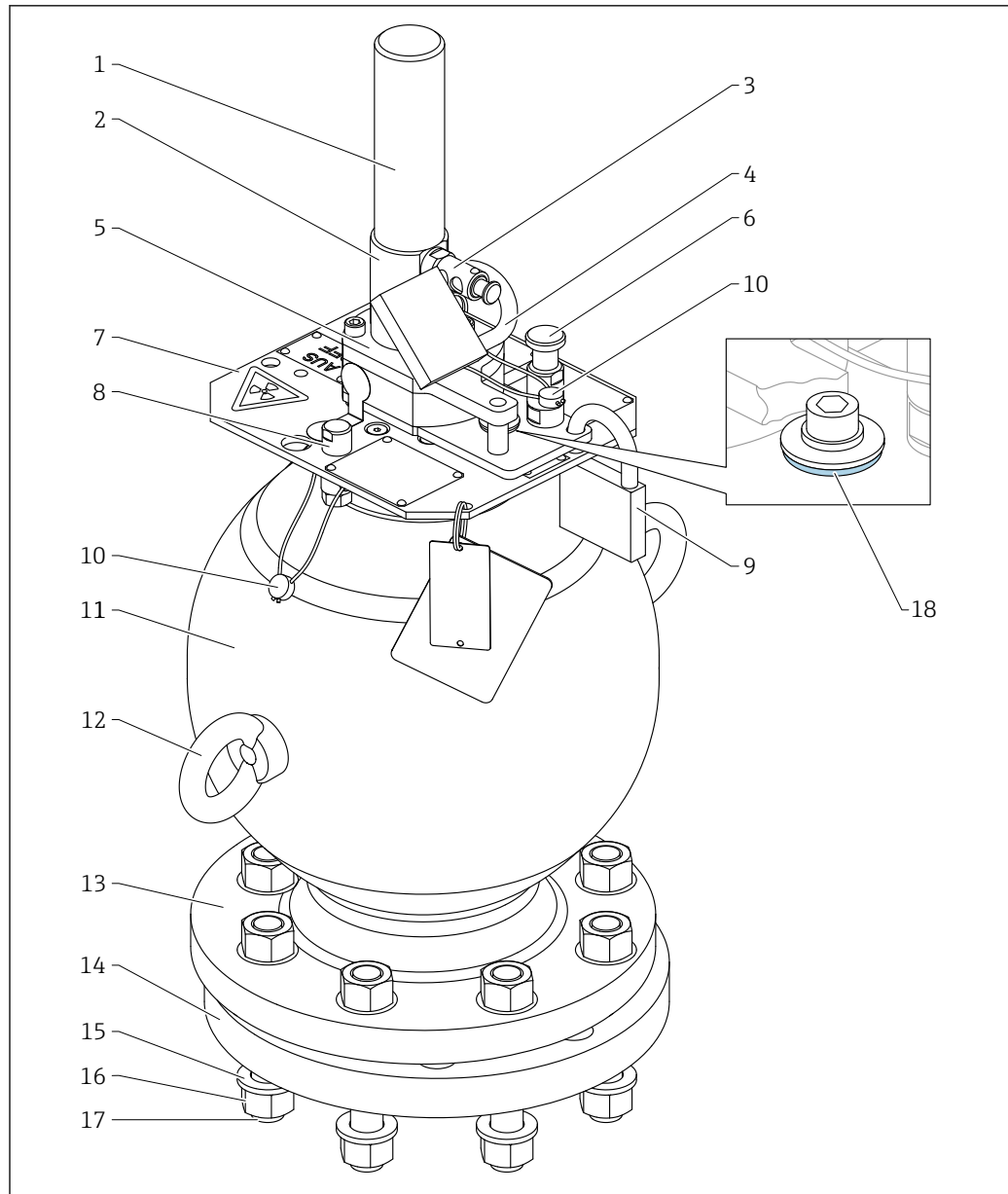
3.1 Product design

3.1.1 Overview of source container

The base body is filled with lead to shield the radiation sources stored in the source container. The source container is available in different versions.



More detailed information on the following features can be found in the "Ordering information" section in the Technical Information document.



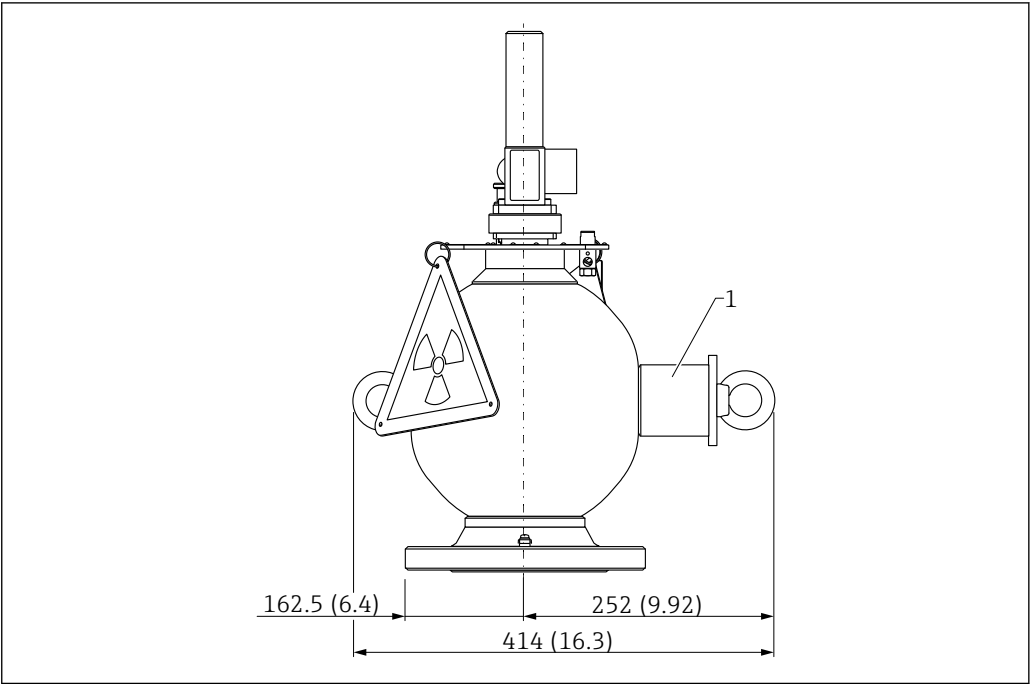
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- 1 Protection cap
- 2 Cylinder
- 3 Locking bolt no. 1
- 4 Padlock no. 2 (for option C only)
- 5 Turnable source holder
- 6 Locking bolt no. 2
- 7 Indication plate
- 8 Stop pin
- 9 Padlock no. 1
- 10 Seals
- 11 Source container with lead filling
- 12 Lifting point
- 13 Flange
- 14 Adapter/centering flange
- 15 Washer
- 16 Nuts M16
- 17 Thread bolt M16x105 (144 Nm (106.20 lbf ft))
- 18 Reference O-ring



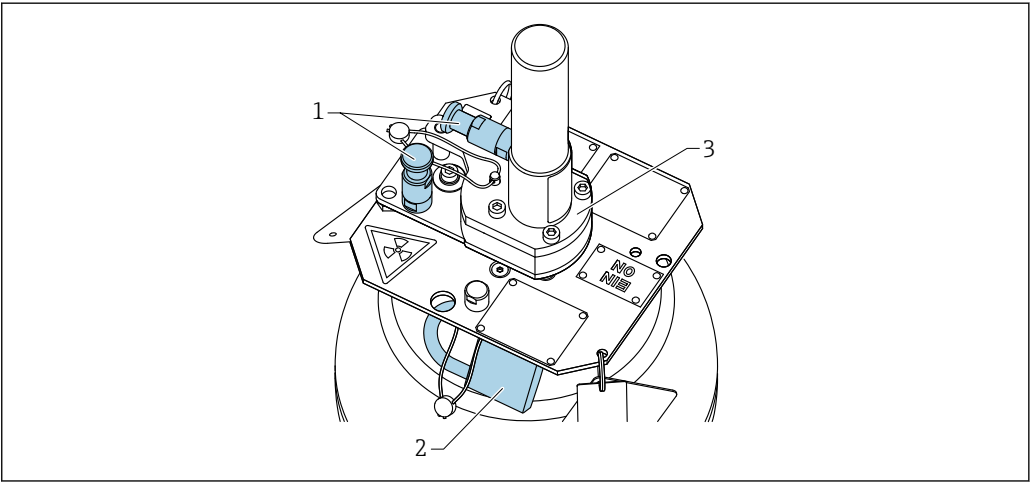
The reference O-ring is intended to help check for damage or the influence of aggressive media. The condition of the reference O-ring is an indicator of the possible condition of the seals inside the source container.

Optional: "Fire-resistant" additional function



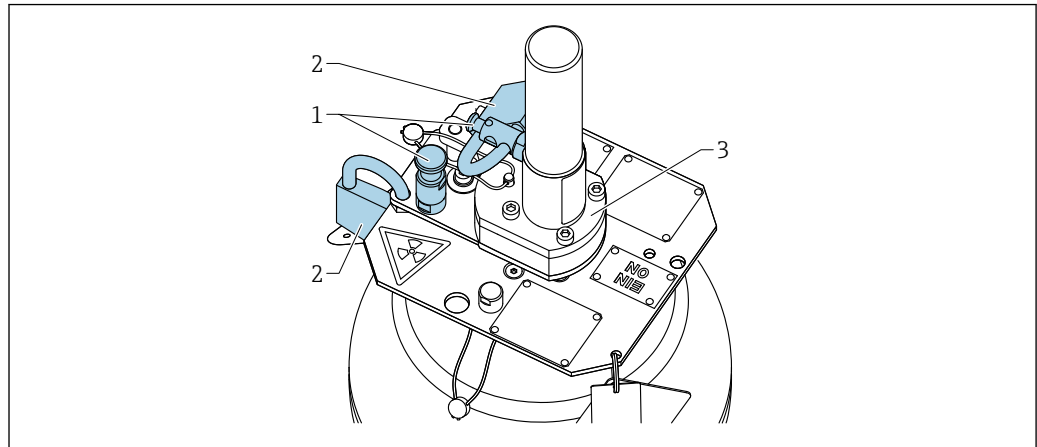
- 2 Units: mm (in)
1 Compensation compartment

Source Container FQG63; feature 020, option B "Rotary bracket + locking bolt ON + padlock securing OFF"



- 1 Locking bolt to secure the ON switch position
2 Padlock to secure the OFF switch position
3 Turnable source holder for manual switch-ON/switch-OFF

Source Container FQG63; feature 020, option C "Padlock securing ON/OFF + rotary bracket"



A0058413

- 1 Locking bolt to secure the ON switch position
- 2 Padlocks to secure the ON or OFF switch position
- 3 Turnable source holder for manual switch-ON/switch-OFF

3.1.2 Shutter

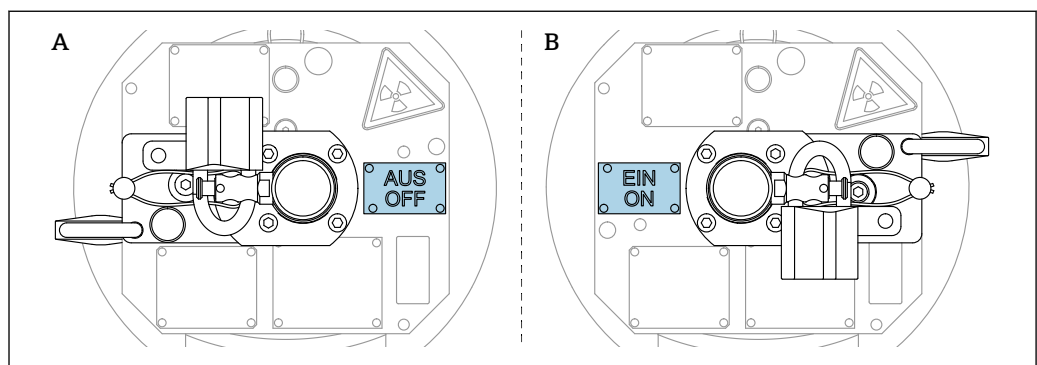
There is a guide shaft inside the housing where the shutter can be moved by a turnable source holder.

The position (ON/OFF) of the shutter can be identified by two labels on the indication plate.

A locking bolt prevents unintentional displacement of the shutter. Depending on the version, a lock additionally secures the position of the shutter (ON/OFF).

Position of the shutter

- "OFF/AUS" position: The source holder and rope are fully retracted into the source container and the emission channel is closed. It also provides maximum shielding of the radiation source.
- "ON/AN" position: The radiation source can be lowered into the tank.



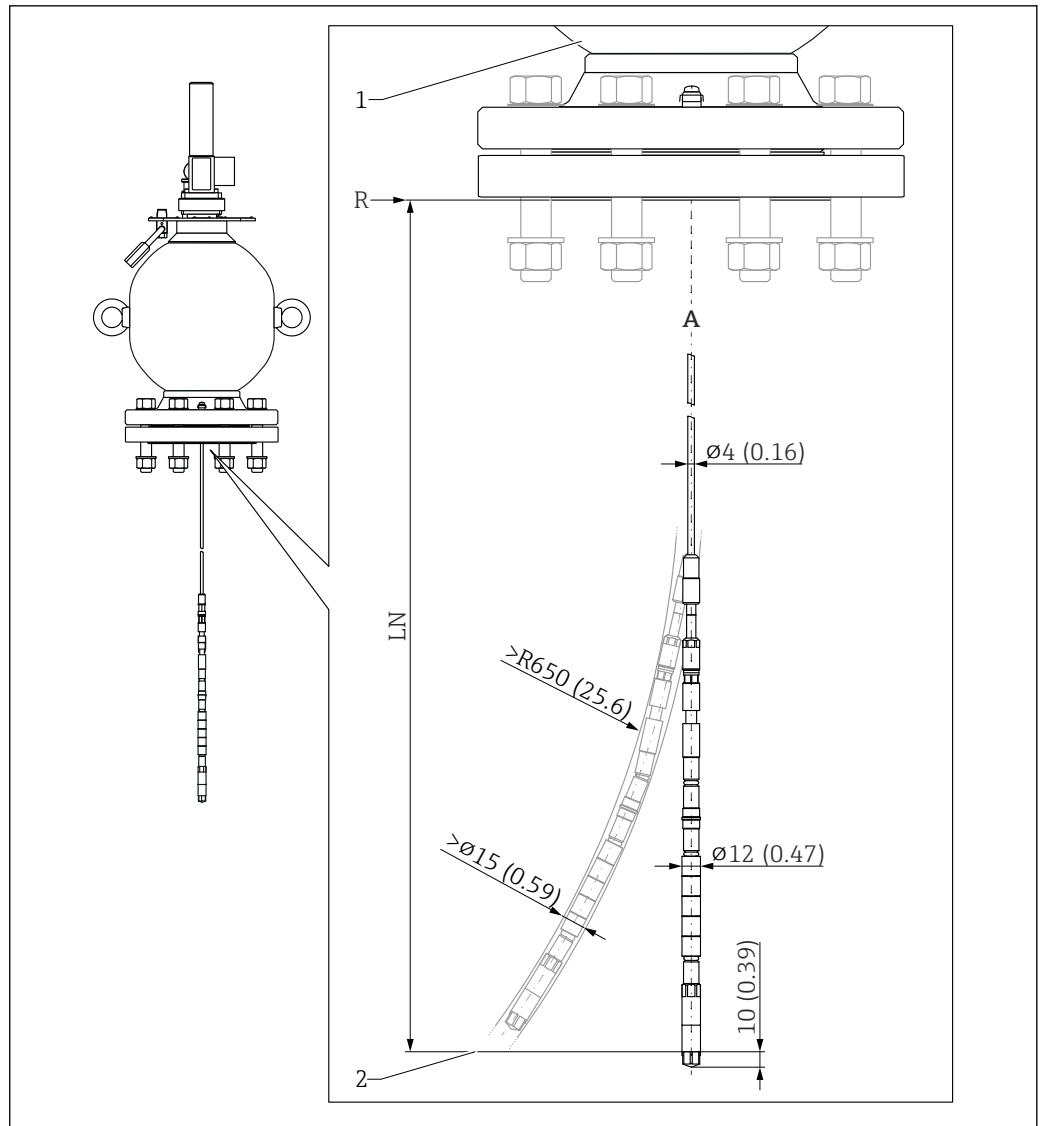
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3 Position of the shutter

- A Source container in "OFF/AUS" position
B Source container in "ON/AN" position

3.1.3 Source holder and radiation source

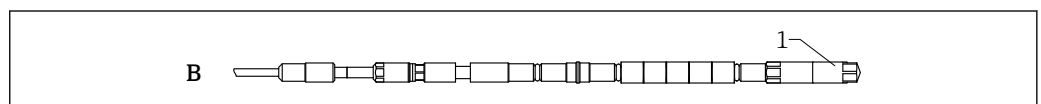
- i** The radiation sources are accommodated in the source holder protection cap (front part of the source holder).



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4 Position of the source holder

- 1 Source container
- 2 On position of the radiation source
- A Source holder extension with flexible source holder
- R Reference point
- LN Variable nominal length (depending on order)



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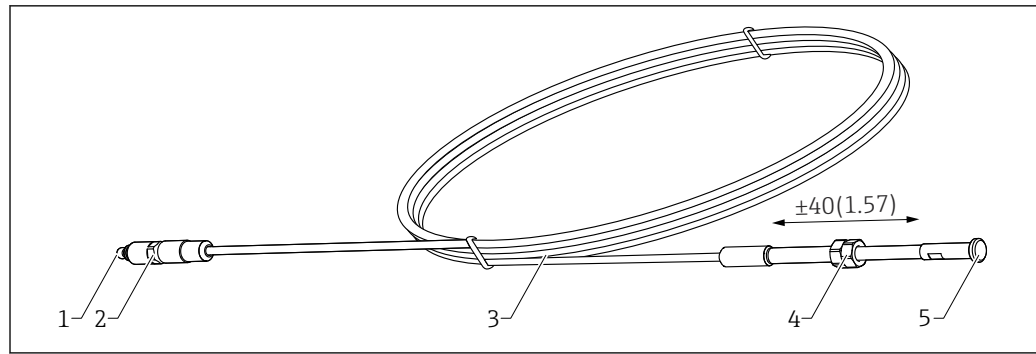
- 1 Protective cap over the radiation source
- B Flexible source holder

3.1.4 Flexible source holder extension

The flexible source holder extensions are available in different lengths (up to max. 30 m (98.4 ft)).

Flexible source holder extensions are screwed to the rope separators so that the radiation sources can be lowered.

i After the counter nut has been loosened, the length of the flexible source holder extension can be changed by 40 mm (1.57 in) with fine adjustment.



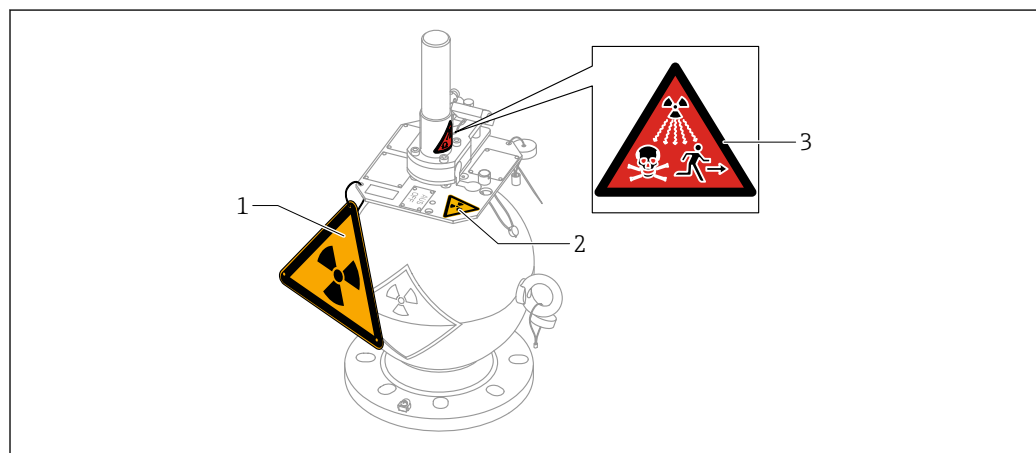
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5 Flexible source holder extension

- 1 Ball head
- 2 Locking sleeve, can be screwed, after the ball head engages
- 3 Extension rope
- 4 Counter nut for the fine position adjustment of the radiation source
- 5 Item number of the source holder

3.2 Radiation warning signs

- The radiation warning signs warn of ionizing radiation.
- The radiation warning signs must be fitted in the appropriate places.



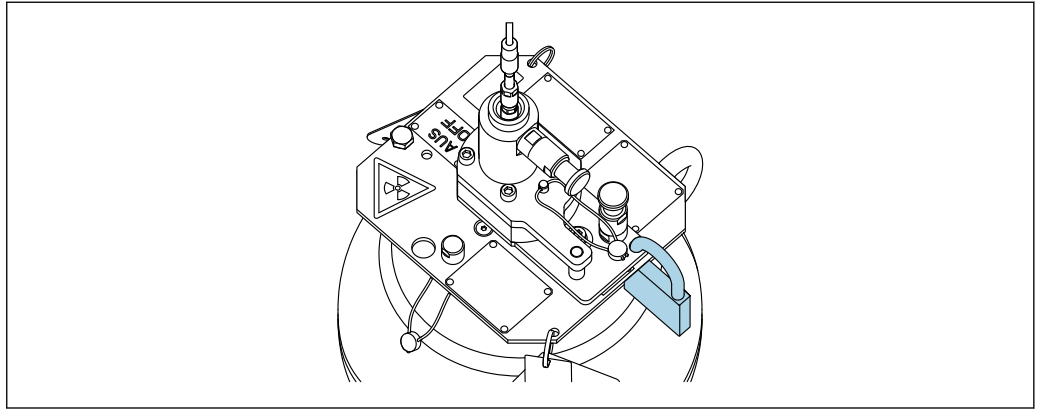
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6 Radiation warning signs

- 1 "Caution - Radiation" stainless steel warning sign
- 2 "Radioactive" stick-on label
- 3 "Highly radioactive" stick-on label, only for highly radioactive radiation sources

3.3 Anti-theft and tamper protection

3.3.1 Tamper protection

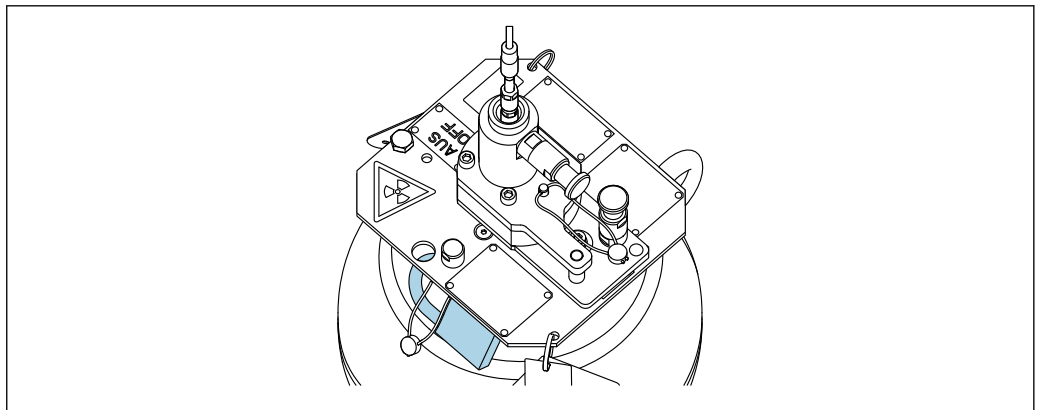


 7 Padlock to prevent tampering with the switch status

A lock prevents unauthorized tampering with the source container.

3.3.2 Anti-theft protection

 **For Germany:** The anti-theft protection does not meet the protective measures required by DIN 25422. Implement appropriate anti-theft measures in installation and storage rooms.



 8 Anti-theft lock

The lock prevents unauthorized removal of the radiation sources.

3.4 Installation adapter

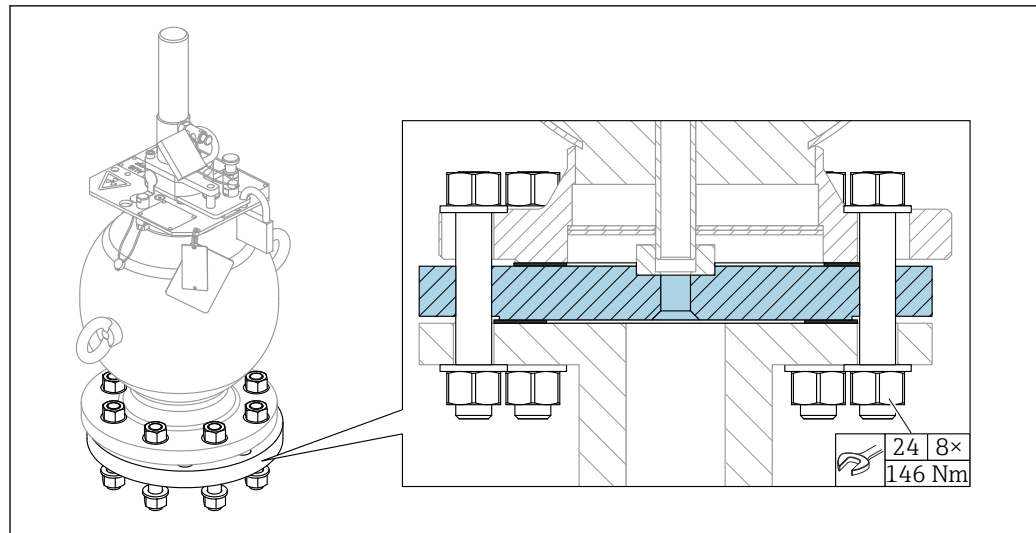
 For the version with installation adapters:
Contact the Endress+Hauser sales organization

3.4.1 Installation adapter for protection pipe

The source container is mounted on a protection pipe using an adapter flange.

The adapter flange has a centering aid.

The adapter flange of the source container is screwed onto the customer flange.



9 Adapter flange

3.5 Use as Type A packaging

i For the definition of Type A packaging, see IAEA safety standards no. SSR-6 (Regulations for the safe transport of radioactive material; International Atomic Energy Agency; 2018 edition; IAEA safety standards series no. SSR-6 (Rev. 1))

The source container can also be used as a Type A transport and storage container in accordance with dangerous goods class 7. The application area is determined by the suitability certificate of the source container.

For further information, see section "Transport and storage -> Transport as Type A package".

4 Incoming acceptance and product identification

i Incoming acceptance and product identification require qualified installation and service personnel – see "Requirements for the personnel" section.

i **Dangerous goods class**

- The source container is a Type A transport and storage container in accordance with dangerous goods class 7.
- The source container can be packaged in an overpack.

4.1 Incoming acceptance and unpacking

4.1.1 Incoming acceptance

⚠ DANGER

Noncompliance with national rules and regulations for the handling and storage of radiation sources.

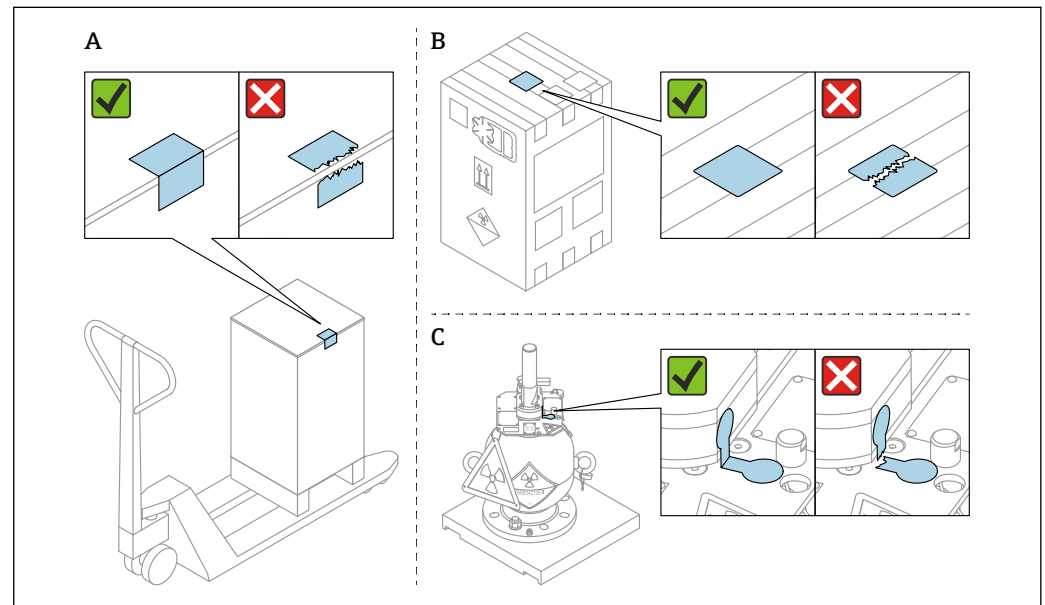
Legal consequences and dangers from errors in the handling of radiation sources.

- Follow the instructions of radiation safety officers.

Check the following during incoming acceptance:

- Is the overpack free from damage?
- Is the protective seal on the overpack free from damage?
- Do the order code on the delivery note and the packaging label (located on top of the overpack) match?
- **After unpacking:** Are the source container and its protective seal free from damage?
- **After unpacking:** Do the nameplate data correspond to the ordering information on the delivery note? The nameplate is explained in the "Product identification" section.

If one of these conditions is not satisfied, notify the radiation safety officer immediately, who will then determine the further course of action.

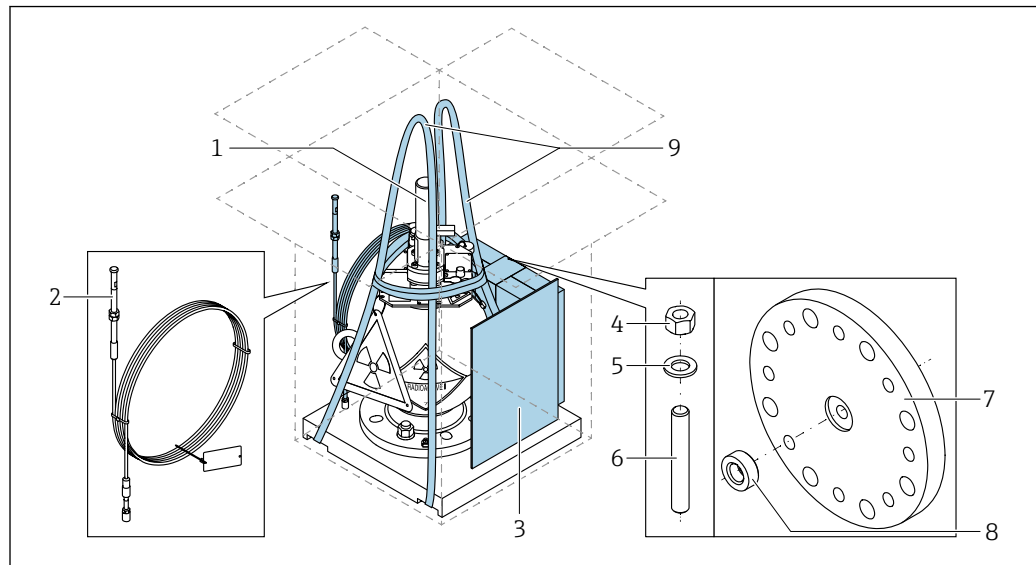


A0058452

10 Position of the protective seals

- A Protective seal on overpack (wood)
- B Protective seal on overpack (cardboard)
- C Protective seal on source container

Scope of delivery



A0058453

11 Scope of delivery

- 1 Source container
- 2 Flexible source holder extension
- 3 Document folder
- 4 16 x nut DIN EN ISO 4032, M16
- 5 16 x washer DIN125 A17-4 or ISO7089-16-A4
- 6 8 x thread bolt M16
- 7 Adapter/centering flange
- 8 Centering aid (welded on)
- 9 Transport slings

 The radiation source can be included (installed) in the scope of delivery as an option.

4.1.2 Required tool(s)

- Open-ended wrench AF 24
- Knife for separating the straps on the packaging

4.1.3 Unpacking

WARNING

Risk of injury from using the carrying handles as lifting points!

This could result in personal injury or even death as a consequence of impact.

- ▶ Never use the carrying handles as a lifting point. The handles are designed for lifting and carrying only and must be used on both sides simultaneously.

CAUTION

The heavy weight of the overpack could lead to handling errors when unpacking the source container.

This could result in personal injury as a consequence of the crush hazard for hands and feet.

- ▶ Wear protective equipment.
- ▶ Use suitable lifting accessories. In conformity with EN 1492 or EN 13414, for example.

CAUTION

Sharp edges on secondary packaging.

This could result in personal injury in the form of cuts and abrasions.

- ▶ Wear protective equipment.

⚠ CAUTION

The heavy weight of the seawater-resistant packaging can cause it to tip over or fall if handled incorrectly!

This could result in personal injury as a consequence of the crush hazard for hands and feet.

- ▶ Wear protective equipment.
- ▶ Use suitable lifting gear or lifting equipment. In conformity with EN 1492 or EN 13414, for example.

⚠ CAUTION

Sharp edges on seawater-resistant packaging!

This could result in personal injury in the form of cuts and abrasions.

- ▶ Wear protective equipment.

⚠ CAUTION

The heavy weight of the seawater-resistant packaging could lead to handling errors when unpacking the source container.

This could result in personal injury as a consequence of the crush hazard for hands and feet.

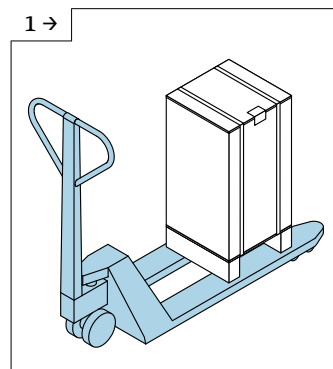
- ▶ Wear protective equipment.
- ▶ Use a suitable sling. In conformity with EN 1492 or EN 13414, for example.

⚠ CAUTION

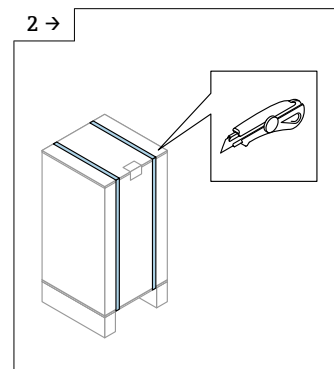
Risk of injury from the heavy weight of the overpack.

This could result in back injuries during heavy lifting.

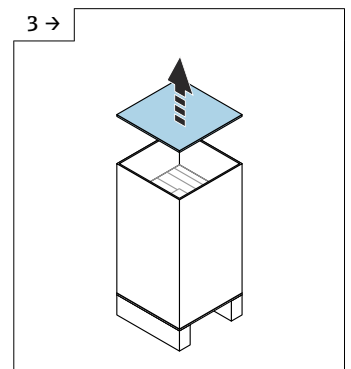
- ▶ At least two persons are required when using the handles on the overpack.
- ▶ Use of the lifting points in the overpack with suitable lifting accessories. A crane or rope winch, for example.



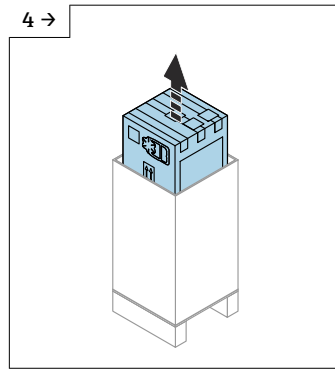
- ▶ Use pallet trucks for transport.
- ▶ Observe the load capacity.



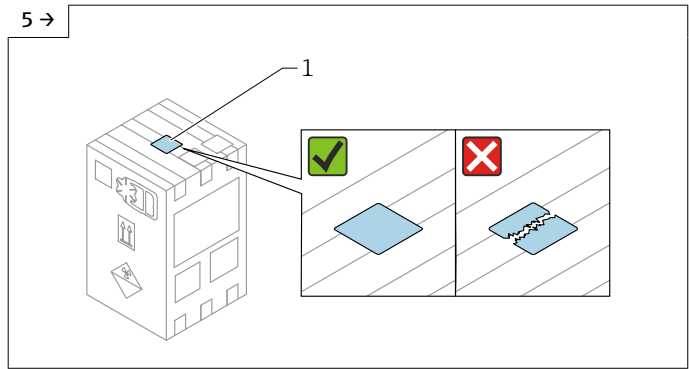
- ▶ Remove the straps.
- ▶ **CAUTION: RISK OF INJURY FROM CUTS AND ABRASIONS!** Follow the safety instructions at the start of this section.



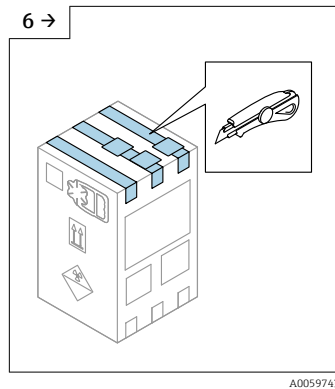
- ▶ Remove the crate lid.



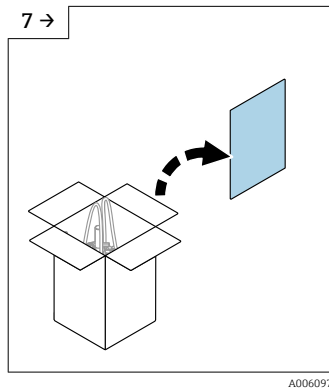
- ▶ Remove package.
- ▶ **⚠ CAUTION: RISK OF BACK INJURY CAUSED BY IMPROPER LIFTING!** Follow the safety instructions at the start of this section.



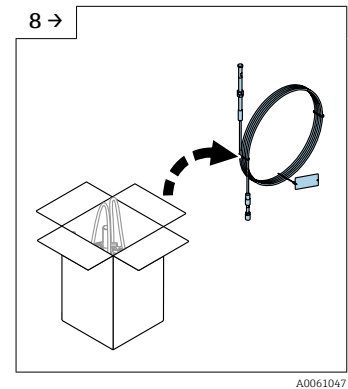
- ▶ Check the protective seal on the package.
- ▶ The protective seal must not be broken.
- ▶ **i** If the protective seal has been cut: Inform the radiation safety officer immediately, who will then determine the further course of action.



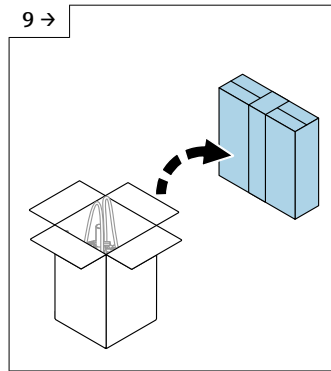
- ▶ Open the package.



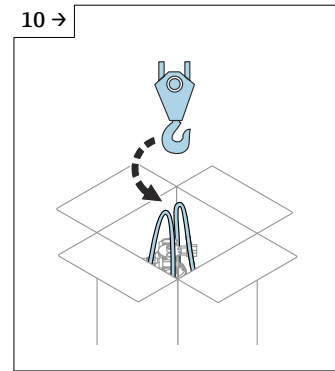
- ▶ Remove the document folder and store it in a safe place.



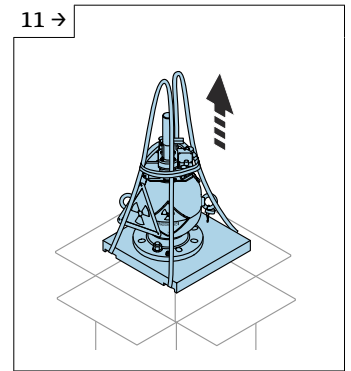
- ▶ Remove the flexible source holder extension and store it in a safe place.
- ▶ **i** The printed length of the flexible source holder extension corresponds to the measured length of the rope on the source holder extension.



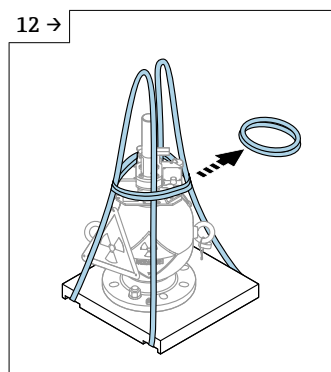
- Remove the package with the adapter/centering flange and store it in a safe place.



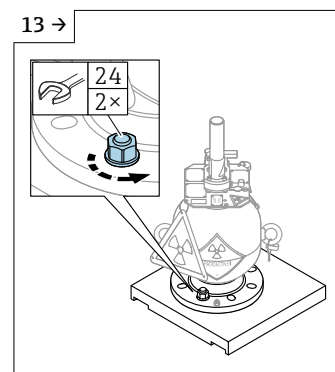
- **⚠ CAUTION: RISK OF INJURY FROM HEAVY WEIGHT!** Follow the safety instructions at the start of this section.
- **⚠ CAUTION: FALL HAZARD!** Follow the safety instructions at the start of this section.
- Attach the fastening hooks of a suitable lifting tool to the transport slings.



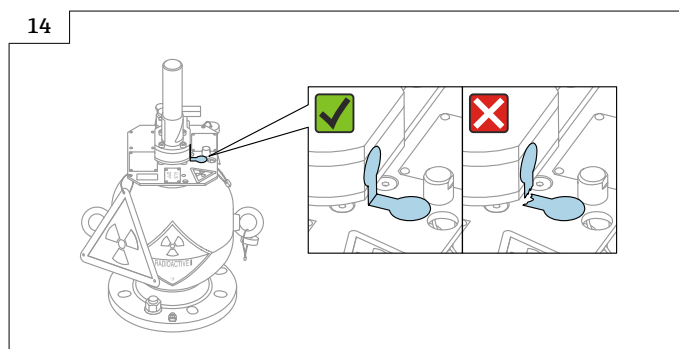
- Lift the source container out of the packaging using the lifting tool and place it on a suitable, flat surface.
- **⚠ CAUTION: RISK OF INJURY FROM HEAVY WEIGHT!** Follow the safety instructions at the start of this section.
- **⚠ CAUTION: FALL HAZARD!** Follow the safety instructions at the start of this section.



- Remove the fastening ring and carrying straps.



- Release the screws to loosen the source container from the base plate.



- Check the protective seal on the source container.
- The protective seal must not be broken.
- **i** If the protective seal has been cut: Inform the radiation safety officer immediately, who will then determine the further course of action.

4.2 Product identification

The following options are available for identification of the device:

- Nameplate specifications
- Extended order code with breakdown of the device features on the delivery note
- ▶ Enter serial number from nameplates in *W@M Device Viewer* (www.endress.com/deviceviewer)
 - ↳ All of the information on the device and on the scope of the technical documentation pertaining to the device is displayed.
- ▶ Enter the serial number from the nameplate into the *Endress+Hauser Operations App* or scan the 2-D matrix code on the nameplate.
 - ↳ All of the information on the device and on the scope of the technical documentation pertaining to the device is displayed.

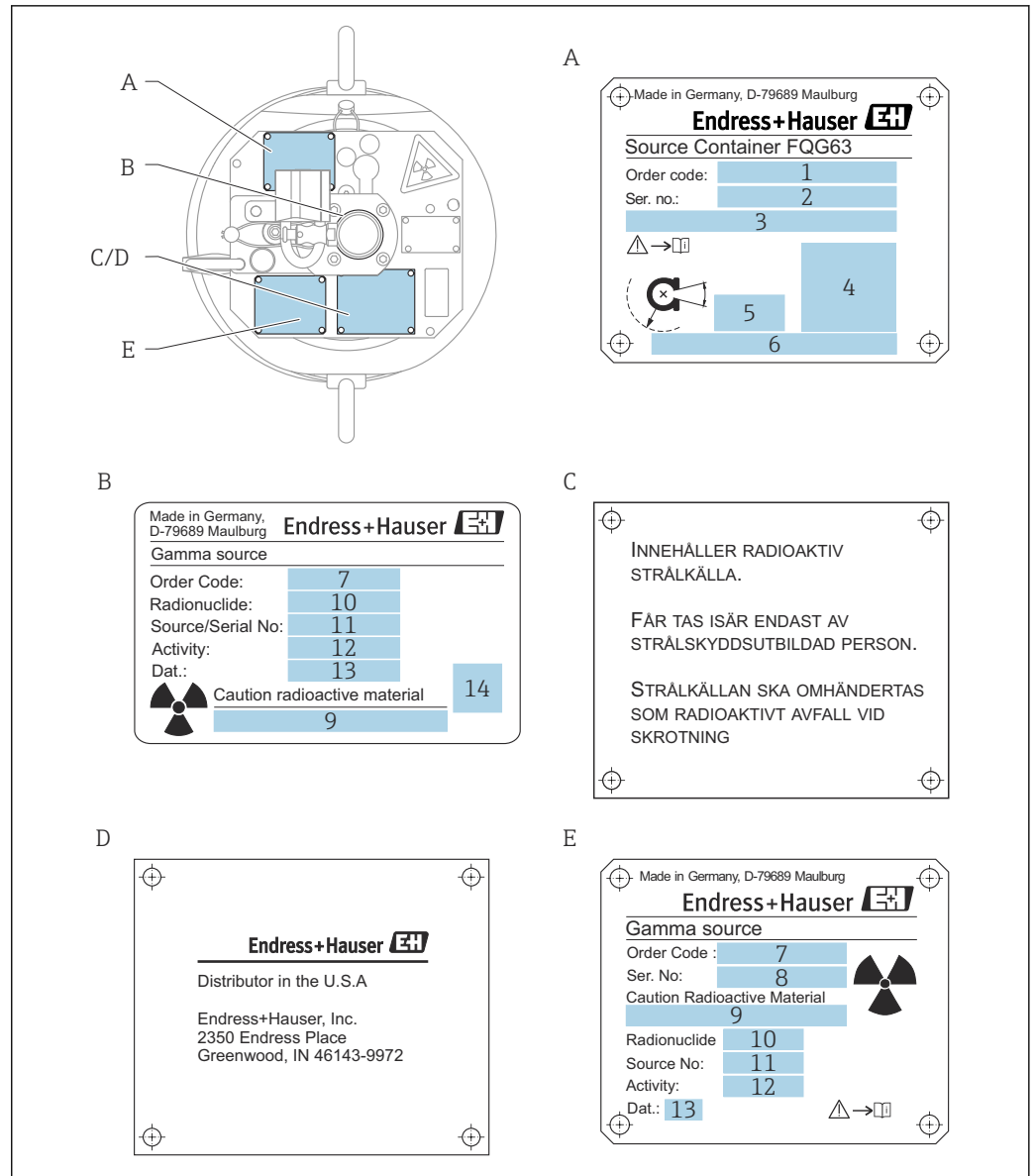
4.2.1 Nameplate

Device nameplate

Different nameplate layouts are available depending on the device version. A selection of examples is provided below. See the Technical Information for further versions.



Identification of the device using RFID and NFC; see the Technical Information.



A0019391

- A Nameplate of source container
- B Radiation source nameplate
- C Additional nameplate only for Sweden or Norway (example)
- D Additional nameplate of NRC approval (optional), only for feature 010 "License", option AE "NRC Device Registration + wipe test, USA"
- E Additional nameplate of radiation source
- 1 Order code
- 2 Serial number of source container
- 3 Not used
- 4 QR code
- 5 Radiation emission angle (not relevant in source container, radiates 360° in ON position)
- 6 Local dose rate at a defined distance from the surface (when switched off, outside the beam path)
- 7 Internal Endress+Hauser order code for the radiation source
- 8 Internal Endress+Hauser serial number for the radiation source
- 9 NOTICE: "Highly radioactive source", if required
- 10 Designation of the nuclide
- 11 Serial number of the source capsule (according to supplier certificate)
- 12 Activity including unit (MBq or GBq)
- 13 Date of manufacture of radiation source
- 14 Data matrix code (optional)

NOTICE

The local dose rate specified on the nameplate at a defined distance refers to the OFF position. It is safety-oriented and takes into account production-related variations in the radiation sources as well as the tolerance ranges of the measuring instruments. Therefore it may be slightly different from the local dose rate which has been calculated from the specified attenuation factors.

► See Technical Information.

4.2.2 Manufacturer address

Endress+Hauser SE+Co. KG

Hauptstraße 1

79689 Maulburg, Germany

Place of manufacture: See nameplate.

5 Storage and transport

5.1 Storage

Permitted storage temperature (excluding packaging):

- **Source container:** -52 to +120 °C (-62 to +248 °F)

- **Flange:** -52 to +200 °C (-62 to +392 °F)



- Fulfill the storage requirements in the "Maintenance -> Recurrent tests" section.
- Implement anti-theft protection in accordance with national rules and requirements.

5.2 Transport as Type A package



Transport as a Type A package requires qualified transport personnel. See the "Requirements for personnel" section

5.2.1 General provisions and requirements

The source container can be used as a Type A package in accordance with the certificate of suitability of the source container.

The source container may only be used in good condition. In particular, the condition of the source container must be documented (see the "Maintenance and recurrent checks" section).

Suitability is voided in the event of improper use or any modification to the source container/package not explicitly authorized by the manufacturer.

For the carriage of a shipment, measures for quality assurance and aging management of the packaging must be implemented. Aging management requires the regular checking and appropriate marking of the packaging, see ADR (Agreement concerning the International Carriage of Dangerous Goods by Road).

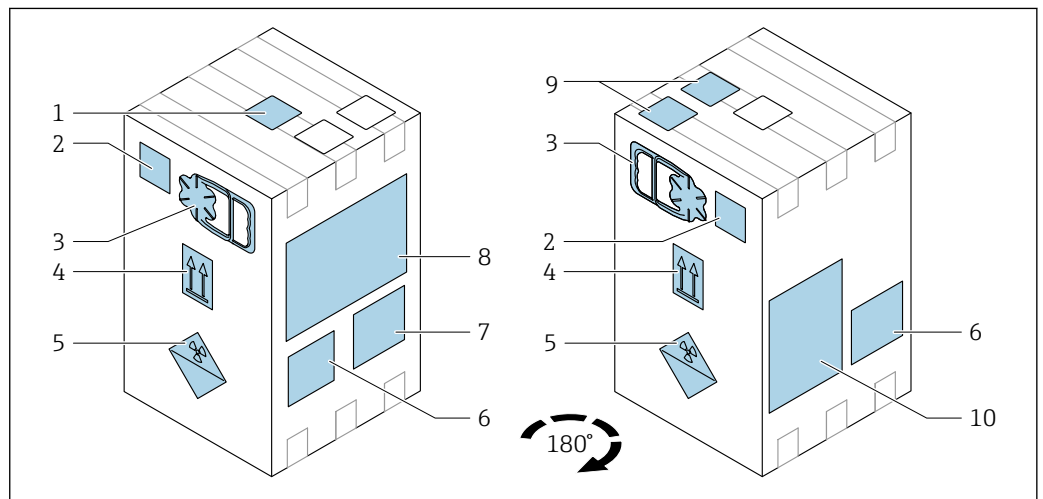


- The source container may be used as a Type A package only with the approved radiation sources. Approved radiation sources are listed in the Technical Information for the source container. Maximum permissible activities could be further restricted by country-specific approvals.
- For transport, the source container must have a valid recurrent check record.
- Extraordinary incidents that occur in the handling of the source container must be reported to the manufacturer.

5.2.2 Overpack

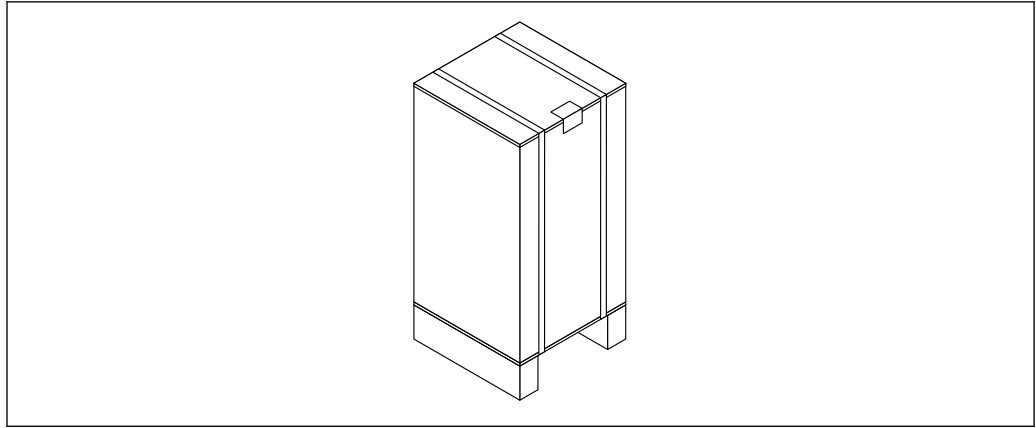
For transport, the source container can be protected by a cardboard box with foam packing or by seawater-resistant packaging. This packaging must be marked as overpack in accordance with IAEA SSR-6.

 The exact packaging instructions can be found in the special documentation SD00309F.



 12 Overpack

- 1 "Security seal" sign
- 2 Hazard label with transport index (TI) and category in accordance with IAEA SSR-6
- 3 Handle
- 4 Parcel label: Package orientation - Top
- 5 Label for class 7 dangerous goods, Type A package (Transport index and category)
- 6 "Cargo Aircraft Only - Forbidden in Passenger Aircraft" (optional) transport label
- 7 Identification label of the sender and recipient (shipper label)
- 8 Marking as overpack of a Type A package
- 9 Shipping label Source Container FQG63 and FSG6x
- 10 Accompanying documents



A0060201

 13 Seaworthy overpack, packed onto pallet

 The seawater-resistant overpack is labeled as the overpack of a Type A package, just like the cardboard box.

5.2.3 Securing loads

DANGER

Displacement of the dangerous goods due to inadequate load securement with single straps.

Damage to or loss of the dangerous goods. Risk of loss of control of the radiation source with the consequence of possible health hazards due to unshielded ionizing radiation.

- The use of single straps could lead to displacement of the dangerous goods. To secure the load, always use load restraint nets and, if necessary, implement further safety measures.

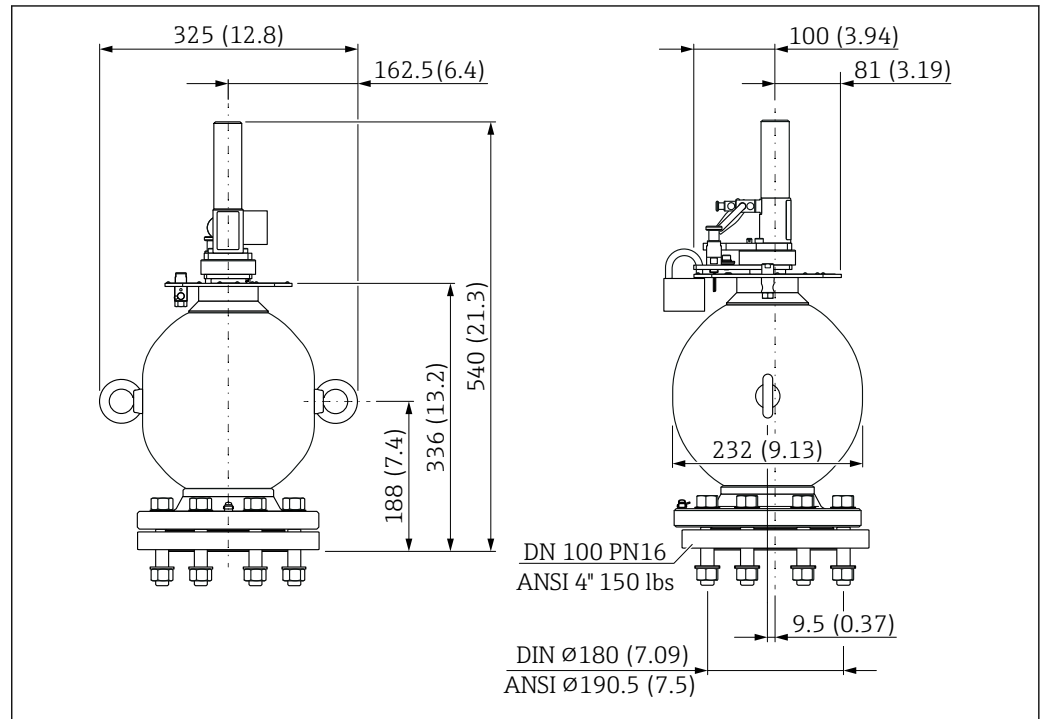
The load securement method must conform to the requirements of the respective traffic codes on the modes of transport used.

 For road transport, load securement is defined by VDI 2700.

5.3 Dimensions, weights

5.3.1 Source container

Dimensions



14 Unit: mm (in)

L Max. 30 000 mm (1 181 in) 30,000

* Eccentricity 9.5 mm (0.37 in)

Packaging dimensions

375 x 375 x 600 mm (14.7 x 14.7 x 23.6 in)

Weight

- Source Container FQG63 (incl. turnable source holder, without adapter flange): max. 87 kg (191.84 lb)
- Source Container FQG63 (incl. turnable source holder, without adapter flange), fire-resistant version: max. 88 kg (194.04 lb)
- Source Container FQG63 on pallet with overpack: 119 kg (262.35 lb)
- Adapter flange (incl. thread bolts and nuts): max. 10 kg (22.05 lb)
- Rope extension (with 4 m (13 ft) rope): approx. 1 kg (2.21 lb)
- Rope extension (with 30 m (98 ft) rope): max. 2.5 kg (5.51 lb)

5.4 Handling

i Handling requires qualified installation and service personnel – see section "Requirements for the personnel".

⚠ WARNING**Risk of injury from ionizing radiation.**

Ionizing radiation can increase the risk of cancer and genetic defects in offspring.

- ▶ Only lift the source container from the overpack in the OFF position.
- ▶ The source container must be secured against being opened inadvertently by means of a lock.
- ▶ Refer to the general instructions on radiation protection.

⚠ WARNING**Source container not fitted to the crane correctly, potentially causing the source container to fall!**

This could result in personal injury or even death as a consequence of impact.

- ▶ Wear protective equipment.
- ▶ Slings must be suitably rated for the gross weight.

⚠ WARNING**Risk of injury from using the carrying handles as lifting points!**

This could result in personal injury or even death as a consequence of impact.

- ▶ Never use the carrying handles as a lifting point. The handles are designed for lifting and carrying only and must be used on both sides simultaneously.

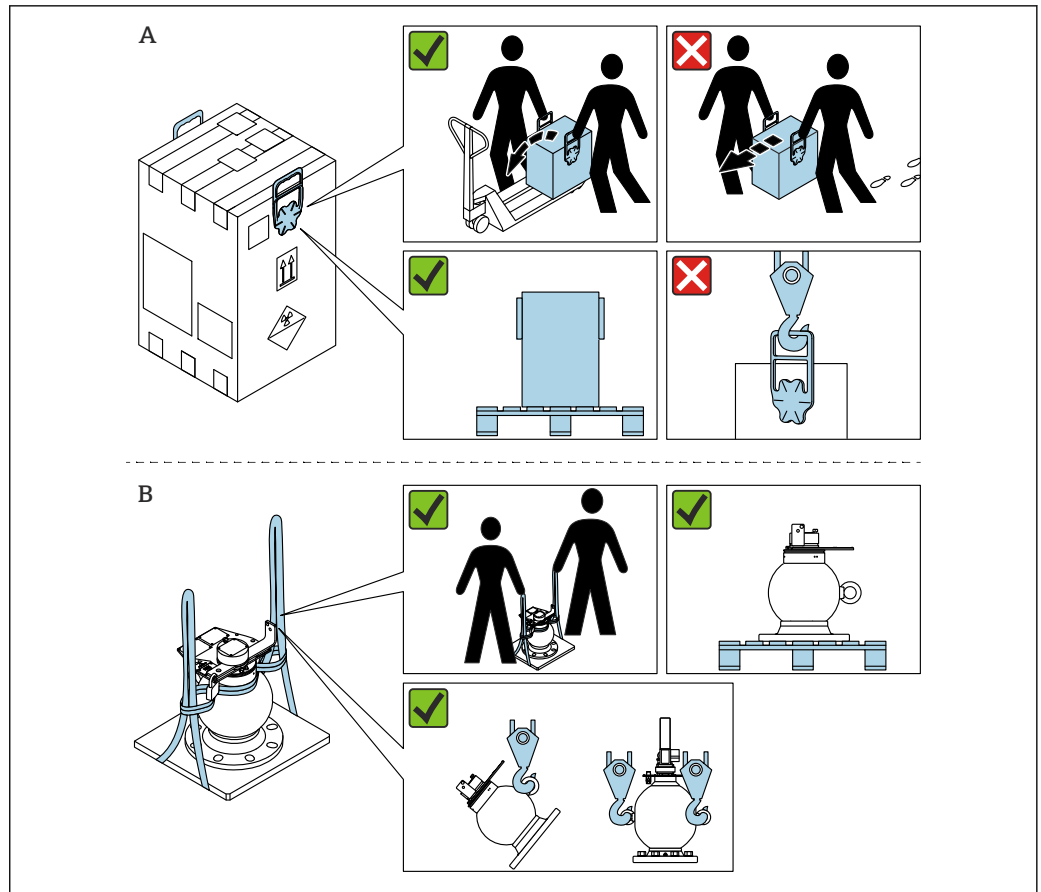
⚠ CAUTION**Sharp edges on the source container.**

This could result in personal injury in the form of cuts and abrasions.

- ▶ Wear protective equipment.

**Total weight**

~87 kg (191.84 lb) without packaging



A0022393

15 Transport

- A With overpack
B Without overpack

1. **CAUTION: RISK OF INJURY FROM THE HANDLES BREAKING OFF!** Follow the safety instructions at the start of this section.
2. **WARNING: FALL HAZARD!** Follow the safety instructions at the start of this section.

5.4.1 Required tool(s)

- Open-ended wrench AF 24
- Open-ended wrench AF 13
- Key for padlock

6 Installation

The source container is mounted as follows:

On a flange (not pressurized and not in contact with the process)

The double-walled protection pipe must already be supplied by the customer

i Installation requires qualified installation and service personnel – see the "Requirements for the personnel" section.

⚠ DANGER

When the shutter is switched to the ON position, the user will be exposed to unshielded ionizing radiation if he or she is in front of the beam exit channel.

Ionizing radiation can increase the risk of cancer and genetic birth defects. Depending on the dose, ionizing radiation can cause immediate physical harm such as nausea, vomiting, hair loss, changes in blood composition, and severe tissue damage that may lead to death.

- ▶ Never stand underneath the flange.
- ▶ Do not look into the exit opening under any circumstances.
- ▶ All precautionary measures for moving the radiation sources have been prepared (process adapter or process connections fitted and open to the top).
- ▶ Persons must be within a protected zone.
- ▶ When the source container is being switched on, personnel must be monitored with respect to their radiation exposure.

⚠ WARNING

Corrosion or damage to the protection pipes!

Leaking protection pipes can compromise the integrity of the radiation sources, increasing the risk of contamination.

- ▶ Use double-walled protection pipes whenever possible. Protection of the radiation sources via the protection pipe is the responsibility of the operator and must be ensured through appropriate measures, such as recurrent tests.
- ▶ The material used for the protection pipe must be suitable for the process conditions.
- ▶ Follow the measures in the "Emergency procedures" section.

6.1 Required tool(s)

- Open-ended wrench AF 24
- Open-ended wrench AF 10
- Open-ended wrench AF 13
- Phillips head screwdriver size 1
- Wire cutter for releasing the keys from the wire cable
- Key for padlock

6.2 Installation requirements

NOTICE

In cases of doubt during mounting, hazardous situations could arise.

- ▶ If there is any uncertainty, contact Endress+Hauser Service for support before work begins.
- Installation must always be carried out in accordance with local legislation or the handling permit. All local conditions must be taken into consideration.
- All work should be carried out as quickly as possible and as far away as possible from the radiation source (screening!). Suitable measures (e.g. blocking of access etc.) must also be taken to protect other individuals from all possible risk.
- Mounting and removal is only permitted with the shutter in the "AUS/OFF" switch position, secured by a padlock.
- Consider the weight 87 kg (191.84 lb) and center of gravity of the source container.
- Use lifting points and suitable lifting equipment.
- The device must be installed on the flange; other types of installation are not permitted.
- Optimum fire resistance is only guaranteed in the vertical position.
- Use in non-stationary plants is not permitted.
- Customer shielding to protect the operator from radiation when turning the device on and off.
- Ensure that the process temperature is not transferred to the source container.



Temperature range during installation or removal:

–52 to +120 °C (–62 to +248 °F)

6.2.1 Checking the rope length before installation

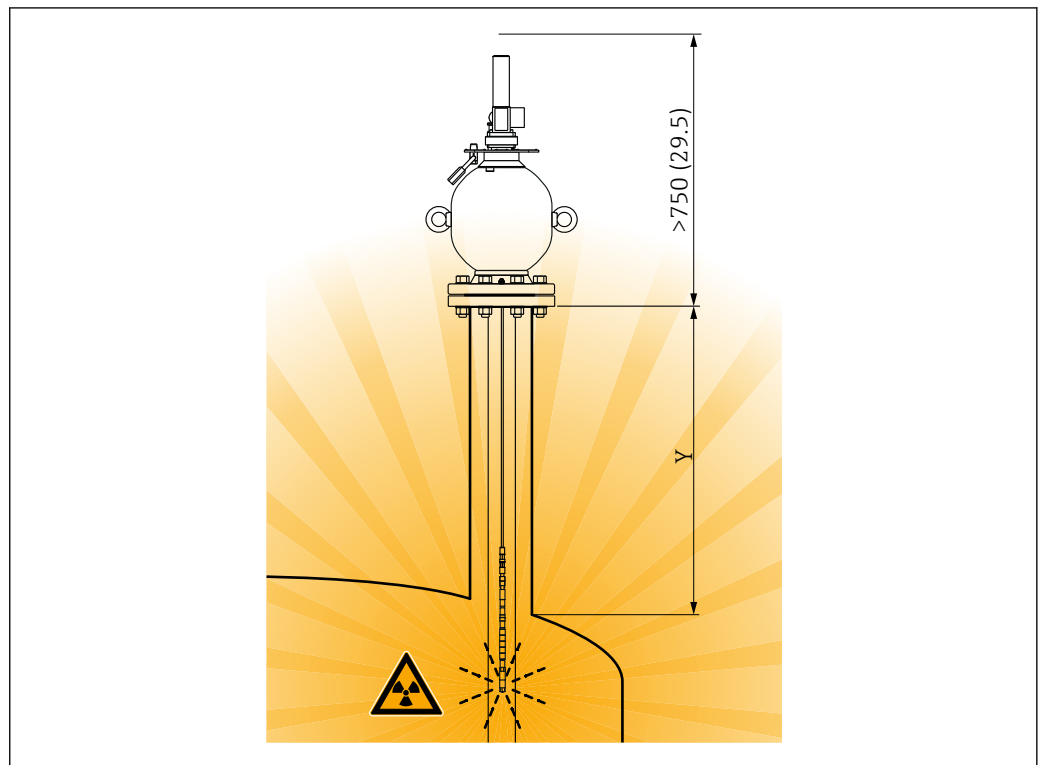
⚠ DANGER

Danger due to high radiation exposure

Ionizing radiation could increase the risk of cancer and the risk of genetic birth defects.

- ▶ The dimensions specified in the figure must be strictly observed.
- ▶ When in lowered condition, the radiation sources must be located inside the product vessel.
- ▶ Compliance with the required protective measures.
- ▶ The dimensions of the danger zone must be determined and cordoned off accordingly in accordance with the applicable national requirements (e.g. StrlSchV).

i The dimension "y" must be selected so that the radiation source is inside the product vessel when lowered. $y \leq LN$



16 Installation dimensions

y: Length, from mounting flange to product vessel

LN: Variable rope length, depending on version

6.3 Orientation

⚠ DANGER

Risk of accident from heavy gross weight

Incorrectly mounted source containers could lead to personal injuries and serious damage to physical items if they fall.

- ▶ Only vertical flange mounting is permitted.

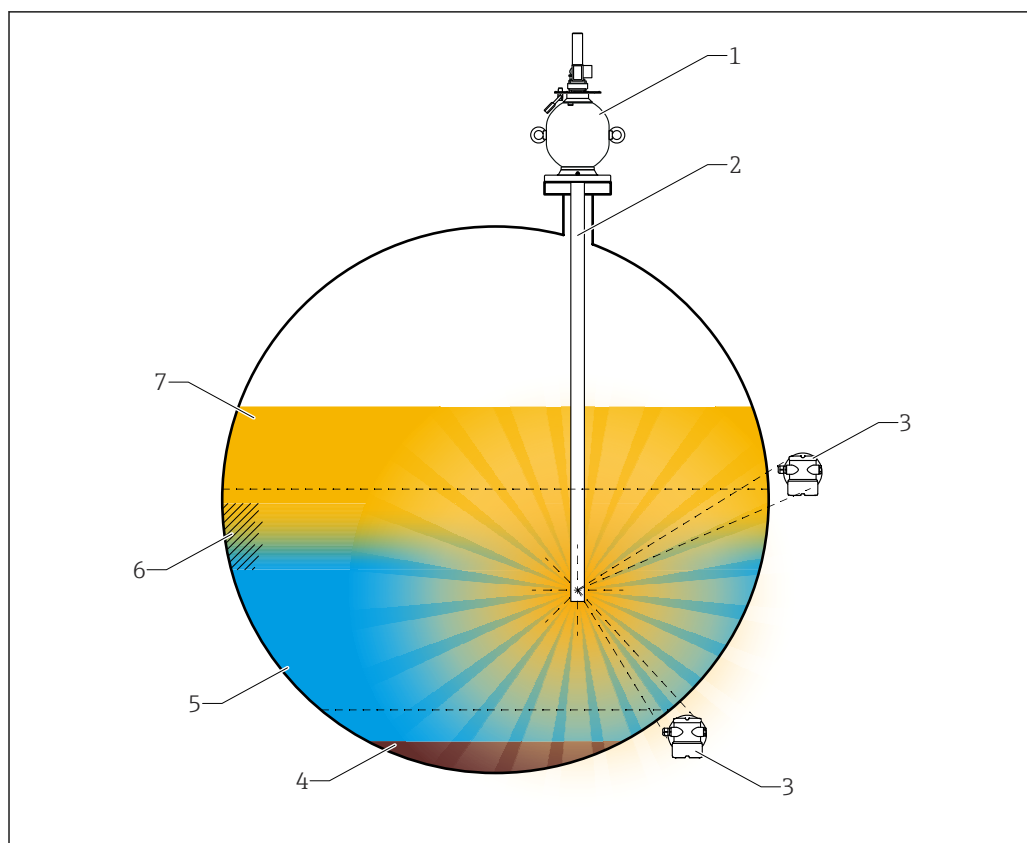
⚠ WARNING

Unsuitable or missing screws or incorrect tightening torque when mounting the source container.

Possible falling of the source container, leading to personal injury or even death as a consequence of impact.

- ▶ Observe the installation instructions.

6.3.1 Interface measurement



A0061055

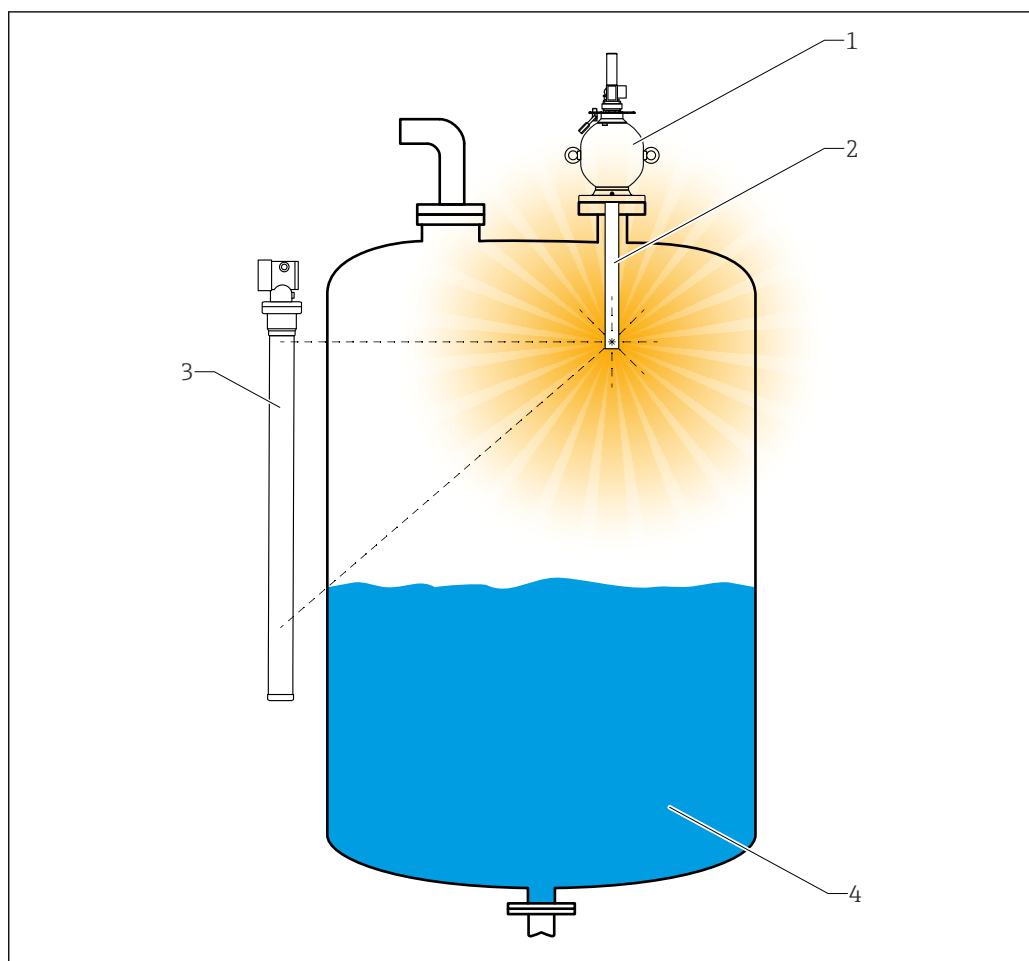
17 Interface measurement

- 1 Source Container FQG63
- 2 Protection pipe
- 3 Gammapijot FMG50
- 4 Medium: Sand/sludge
- 5 Medium: Water
- 6 Medium: Emulsion
- 7 Medium: Oil



For the version with curved protection pipes:
Contact the Endress+Hauser sales organization

6.3.2 Level measurement



A0061056

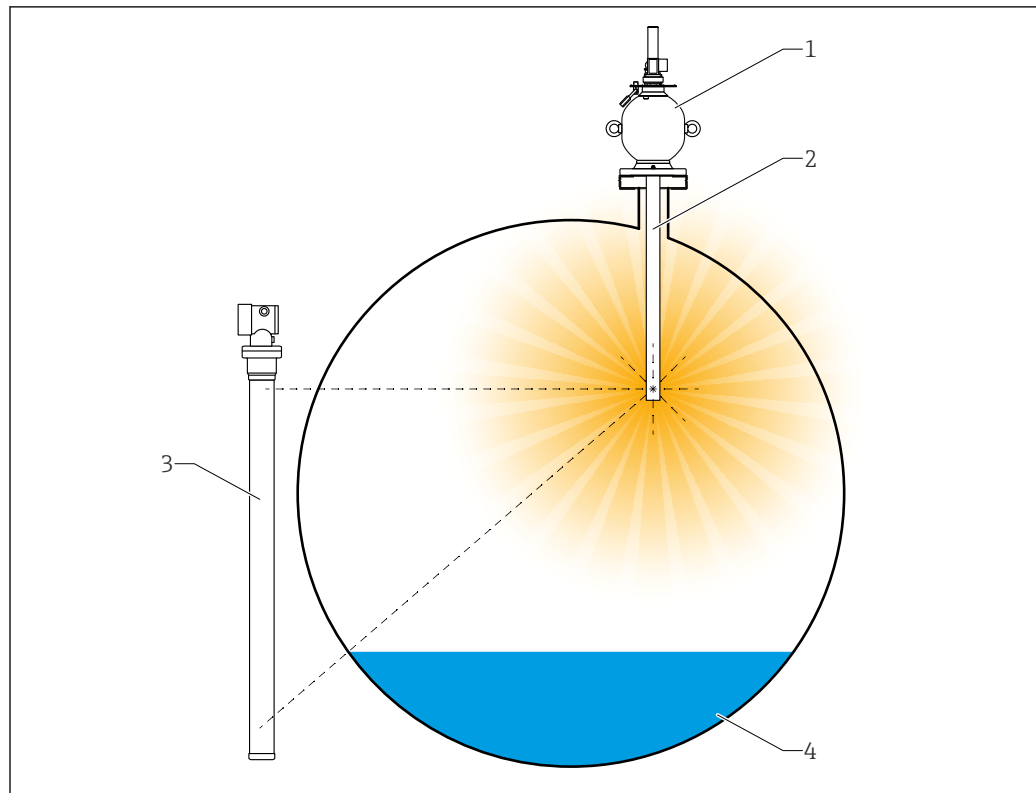
18 Level measurement

- 1 Source Container FQG63
- 2 Protection pipe
- 3 GammapiLOT FMG50
- 4 Medium

i Observe the notes for long measuring ranges in the GammapiLOT FMG50 Operating Instructions ("Cascading operation" section)

B BA01966F, GammapiLOT FMG50 Operating Instructions

6.3.3 Density measurement (multipoint)



A0061057

19 Density measurement (multipoint)

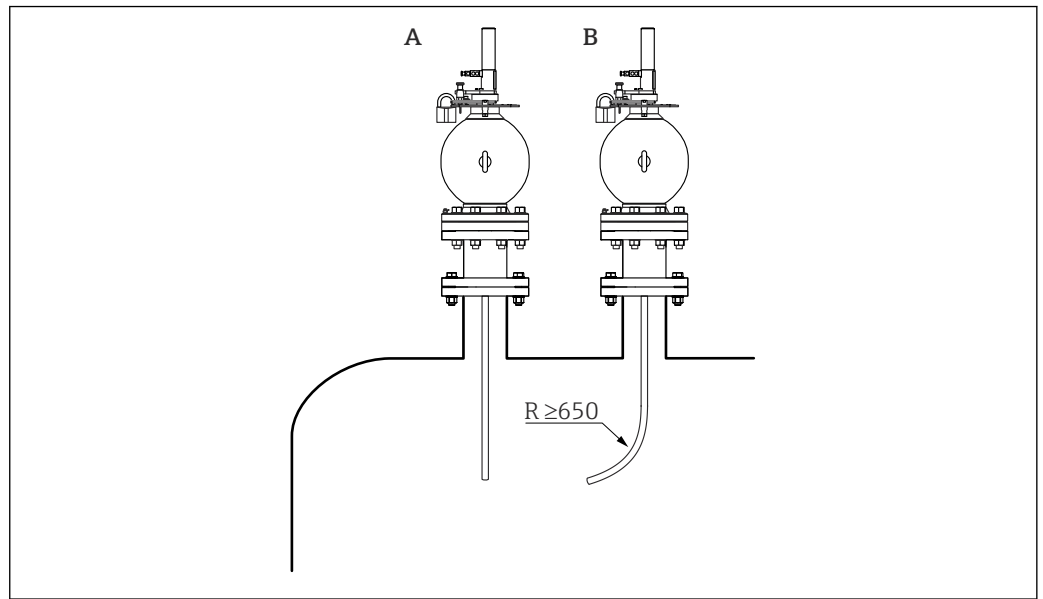
- 1 Source Container FQG63
- 2 Protection pipe
- 3 Gammapipe FMG50 (horizontal mounting)
- 4 Medium

6.3.4 Installation examples

If mechanical stress is likely, the double-walled protection pipe must be braced or secured in some other way.

Installation can be from the top, the side, or the bottom. Installation at the bottom is not recommended when installing the fire-resistant version. The following restrictions must be observed for side installation of the fire-resistant version.

Installation from above

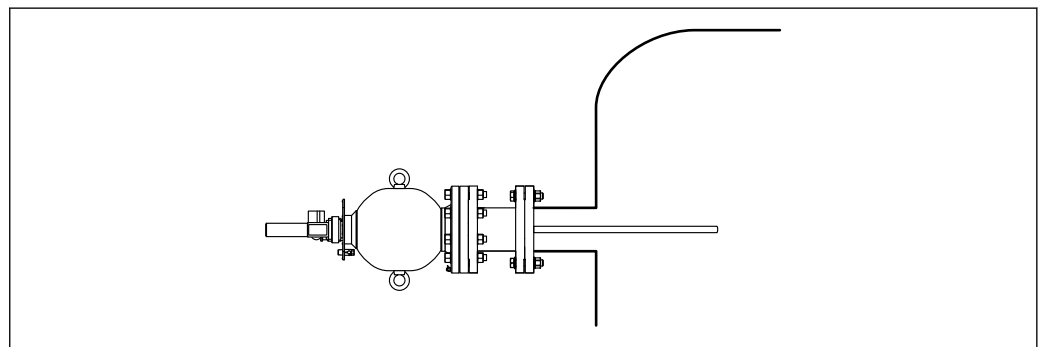


A0019395

20 Examples, unit: mm (in)

- A Straight, double-walled protection pipe, internal diameter: $\varnothing 13.5$ to 18 mm (0.53 to 0.71 in)
 B Curved protection pipe, internal diameter: $\varnothing 15$ to 18 mm (0.59 to 0.71 in), bending radius ≥ 650 mm (25.6 in)

Side installation

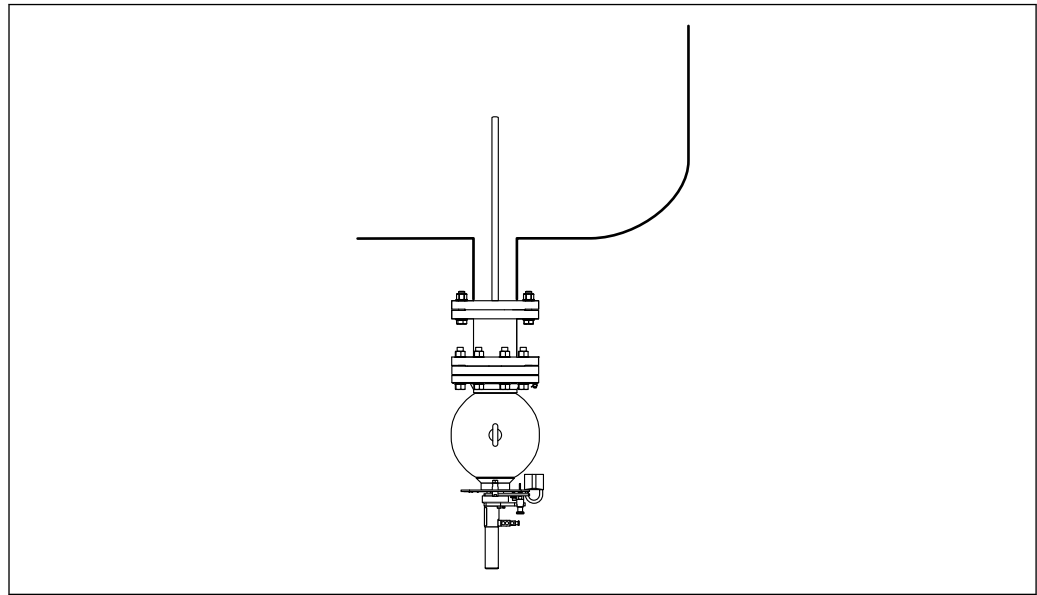


A0019396

21 Examples for installation of a non-fire resistant source container

- i** After a fire, the screening is slightly reduced in the upper area of the container.

Installation from below



A0019397

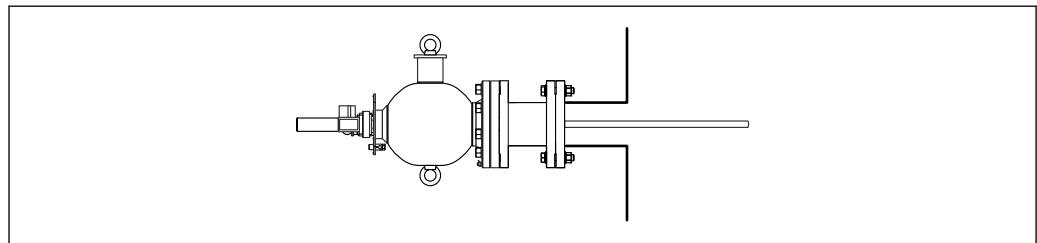
22 Example, unit: mm (in)

Restriction: installation length max. 4 000 mm (157 in)

Orientation of the fireproof version

Orientation I (recommended)

The source container is mounted with the compensation compartment at the highest point. In the event of fire only the emission channel is sealed by the liquefied lead.



A0058455

23 Orientation I

Orientation II (only if orientation I is not possible due to space restrictions)

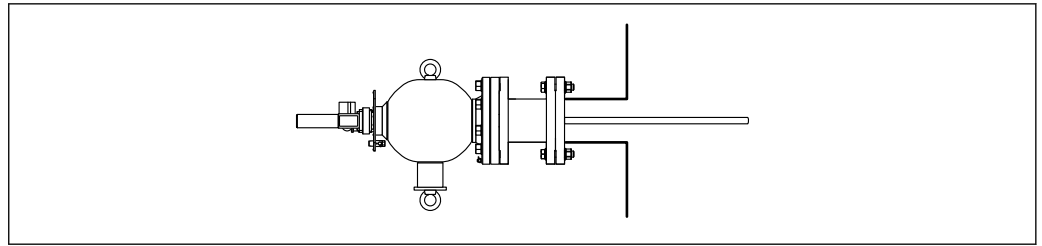
The source container is mounted with the compensation compartment at the bottom or the side. In the event of a fire, the emission channel and the compensation compartment are filled with liquefied lead.

WARNING

Installation with the compensation compartment facing downwards weakens the shielding after a fire. Risk of injury from ionizing radiation!

Ionizing radiation can increase the risk of cancer and genetic birth defects.

- Make sure you observe the emergency measures following a fire.



24 Orientation II

A0058456

6.4 Installing the source container

⚠ WARNING

Source container not fitted to the crane correctly, leading to possible falling of the source container.

This could result in personal injury or even death as a consequence of impact.

- ▶ Wear protective equipment.
- ▶ Observe the installation instructions of the lifting points manufacturer.
- ▶ Lifting accessories must be suitably rated for the gross weight.

⚠ WARNING

Swinging of the source container possible during mounting and dismounting.

This could result in personal injury or even death.

- ▶ Wear protective equipment.
- ▶ Handle heavy loads correctly.

⚠ WARNING

During mounting, a hand could become caught between the flange of the source container and the flange of the process connection.

This could result in serious, possibly irreversible, personal injury in the form of crushed body parts or fractures.

- ▶ Wear protective equipment.
- ▶ Handle heavy loads correctly.

⚠ WARNING

During installation or disassembly, hands or other body parts may get caught between components!

Severe, potentially irreversible injuries such as crushing or fractures may occur.

- ▶ Wear protective equipment.
- ▶ Handle heavy loads properly.

⚠ WARNING

Unsuitable or missing screws or incorrect tightening torque when mounting the source container.

Possible falling of the source container, leading to personal injury or even death as a consequence of impact.

- ▶ Observe the installation instructions.

⚠ WARNING

Underestimating the weight of components may result in parts falling!

This may cause severe or fatal injuries due to impact.

- ▶ Wear protective equipment.
- ▶ The area below and around the installation site must be kept clear during installation.

⚠ WARNING

Electrostatic charge in the potentially explosive atmosphere if potential equalization not established.

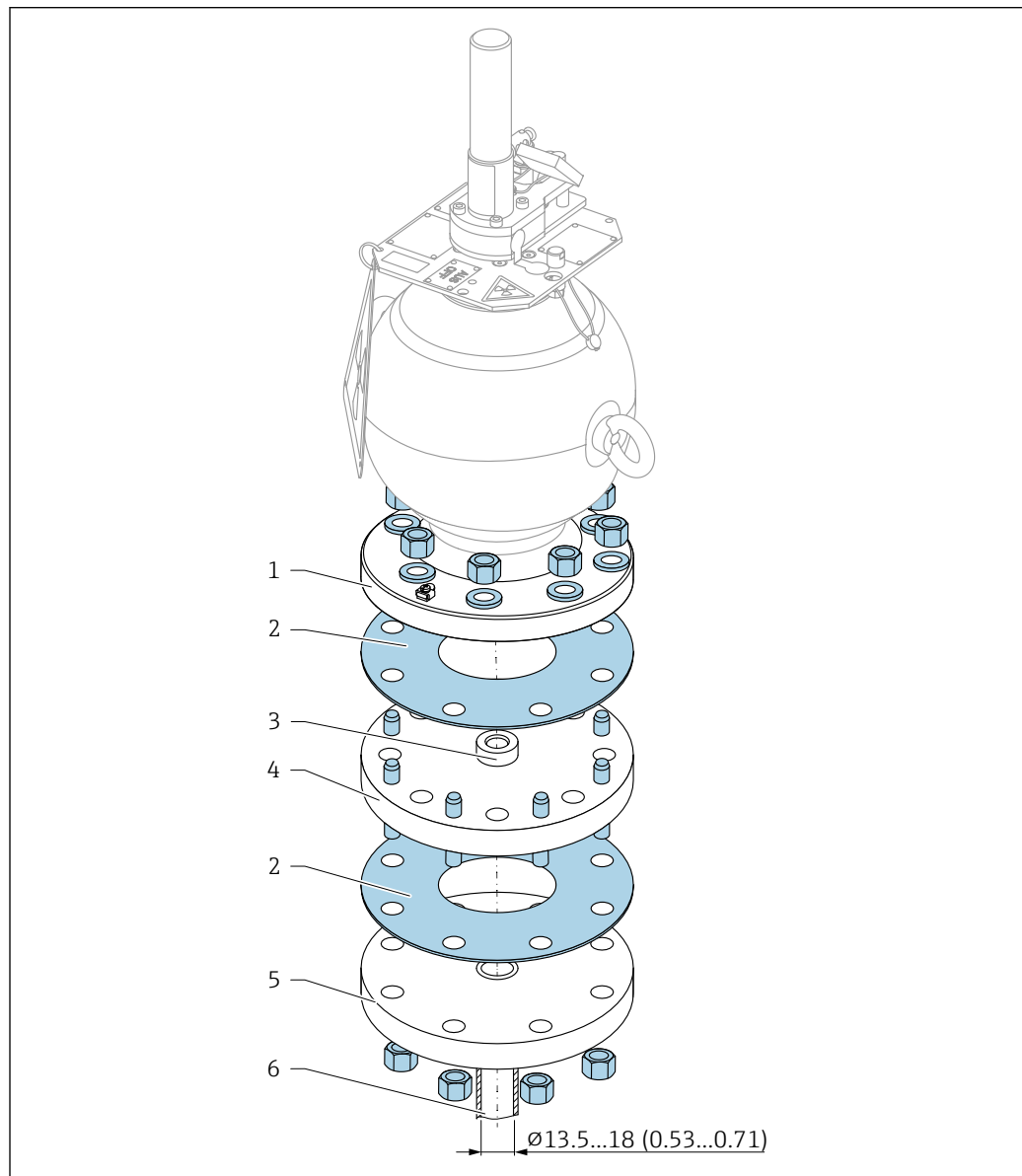
- The device must be integrated into the potential equalization system of the plant.

⚠ CAUTION

Sharp edges on the source container.

This could result in personal injury in the form of cuts and abrasions.

- Wear protective equipment.



A0019394

25 Unit: mm (in)

- 1 Mounting flange
- 2 Two seals (must be provided by the customer)
- 3 Centering aid (welded on)
- 4 Adapter/centering flange
- 5 Vessel flange (must be provided by the customer)
- 6 Double-walled protection pipe: Internal diameter $\varnothing 13.5$ to 18 mm (0.53 to 0.71 in), must be provided by the customer

- **⚠ WARNING: PERSONAL INJURY IN THE FORM OF CRUSHED BODY PARTS OR FRACTURES!** Follow the safety instructions at the start of this section.

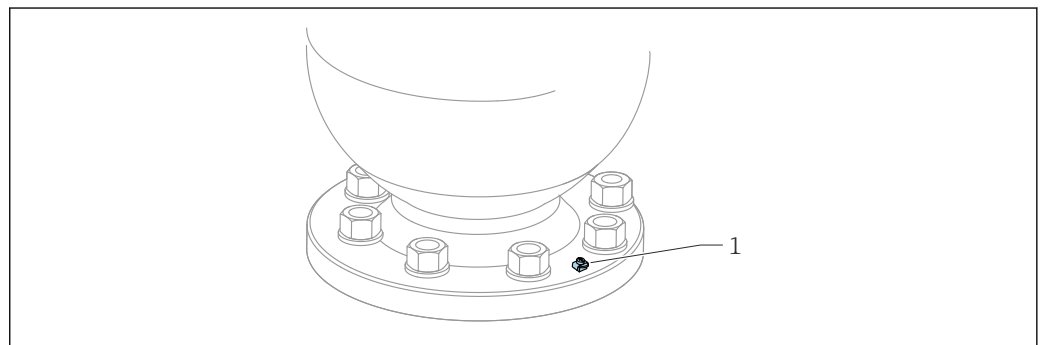
1. Place the adapter/centering flange (4) with the seal (2) on the vessel flange (5), with the centering aid (3) facing the source container (see fig.).
2. Torque: approx. 146 Nm (107.68 lbf ft), AF 24, observe sealing specifications! 
WARNING: DANGER DUE TO UNSUITABLE SCREWS, MISSING SCREWS OR INCORRECT TIGHTENING TORQUE! Follow the safety instructions at the start of this section.
 Screw the adapter/centering flange onto the vessel flange with the seal; screw the 8 setscrews (M16) halfway into the centering flange; screw on the hex nuts and tighten them.
3. Place the source container with the seal (7) on the adapter/centering flange. The centering aid and the slotted holes in the mounting flange ensure that the emission channel is positioned exactly above the protection pipe.
4. Torque: approx. 146 Nm (107.68 lbf ft), AF 24, observe sealing specifications!
 Tighten the mounting flange to the adapter/centering flange and the vessel flange using the hex nuts.

6.4.1 Ground connection

WARNING

Electrostatic charge in the potentially explosive atmosphere if potential equalization not established.

- The device must be integrated into the potential equalization system of the plant.



A0019399

 26 Ground connection

1 Ground terminal

1. Connect the source container to the plant's potential equalization via the ground terminal.
2.  Potential equalization: Max. 4 mm² (12 AWG)

6.4.2 Tightening torque of mounting screws

Material	Property class	Coefficient of friction (μ)	Torque
Stainless steel	70	0.14	50 to 140 Nm (36.87 to 103.25 lbf ft)
Steel	8.8	0.14	50 to 140 Nm (36.87 to 103.25 lbf ft)

6.5 Post-installation check

- Is the device undamaged (visual check)?
- Are the measuring point identification and labeling correct (visual inspection)?
- Does the device comply with the measuring point specifications? For example:
 - Ambient temperature
 - Measuring height
 - Activity
- Are all the fixing screws on the flange of the source container tightened securely?
- Has the source container been integrated into the plant's potential equalization?

6.6 Removing the source container from the measuring point

WARNING

Source container not fitted to the crane correctly, leading to possible falling of the source container.

This could result in personal injury or even death as a consequence of impact.

- ▶ Wear protective equipment.
- ▶ Observe the installation instructions of the lifting points manufacturer.
- ▶ Lifting accessories must be suitably rated for the gross weight.

WARNING

Swinging of the source container possible during mounting and dismounting.

This could result in personal injury or even death.

- ▶ Wear protective equipment.
- ▶ Handle heavy loads correctly.

CAUTION

Sharp edges on the source container.

This could result in personal injury in the form of cuts and abrasions.

- ▶ Wear protective equipment.

CAUTION

Swinging or tilting from horizontal to vertical position and vice versa during the turning process.

This could result in personal injury in the form of contusions and crushed body parts.

- ▶ Wear protective equipment.
- ▶ Use squared timber as an aid to assist the turning process.
- ▶ Make sure that the surface does not allow the skids to slip.
- ▶ Use ropes to prevent the source container from swinging.

NOTICE

If the source container is to remain unused or stored for a lengthy period.

Functional impairment due to foreign bodies in the source container.

- ▶ Prevent the ingress of dirt or liquids.
- ▶ Seal off.
- ▶ Cover up.

NOTICE

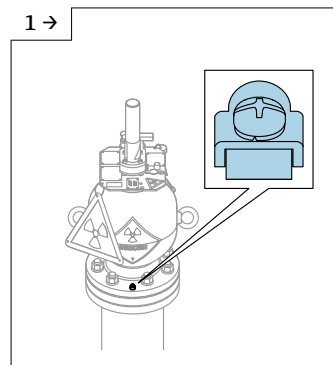
Risk of contamination of the protection pipe

The protection pipe, which is now open, can be contaminated by environmental influences.

- ▶ Protect the protection pipe connection from penetration by foreign bodies, liquids or moisture.

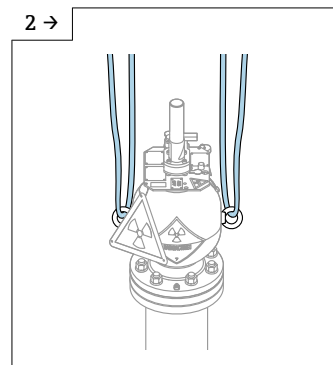
6.6.1 Removal with straight protection pipe

i Before removing the source container, follow the steps in the "Switching off the radiation" section.



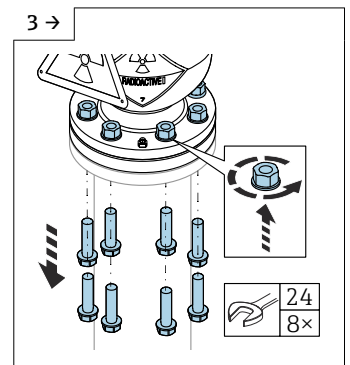
A0061129

- ▶ Loosen the ground terminal on the source container.
- ▶ Remove the ground terminal.



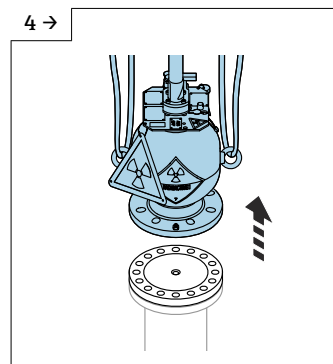
A0061130

- ▶ **⚠ WARNING: RISK OF SOURCE CONTAINER FALLING!** Follow the safety instructions at the start of this section.
- ▶ Attach the transport slings



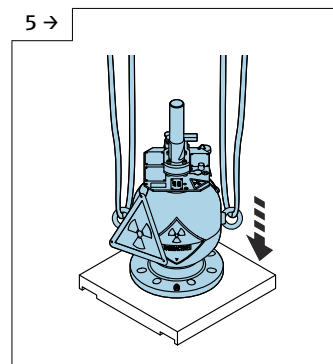
A0061131

- ▶ **⚠ CAUTION: SHARP EDGES!** Follow the safety instructions at the start of this section.
- ▶ Loosen the flange screws and nuts.



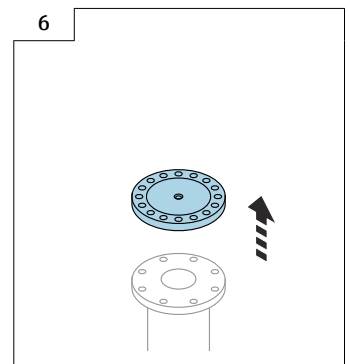
A0061132

- ▶ **⚠ WARNING: DANGER DUE TO SWAYING OF THE SOURCE CONTAINER!** Follow the safety instructions at the start of this section.
- ▶ Lift the source container in a vertical position and remove it from the mounting location.



A0061133

- ▶ **⚠ WARNING: RISK OF INJURY DUE TO UNEVEN AND NON-LOAD BEARING BASE!** Follow the safety instructions at the start of this section.
- ▶ Place the source container on the base plate.



A0061134

- ▶ Carefully lift the adapter/centering flange off the vessel flange, pack it and store it safely.
- ▶ **i NOTE:** Risk of contamination! Protect the protection pipe connection from penetration by foreign bodies, liquids or moisture. Follow the safety instructions at the start of this section.

- ▶ **i** Fulfill the storage requirements in the "Maintenance -> Recurrent tests" section.
- ▶ Consider theft protection in compliance with national regulations.

7 Commissioning

i For initial commissioning, qualification as installation and service personnel is required.

See the section "Requirements concerning personnel".

i Commissioning requires qualified operating personnel.

See the section "Requirements concerning personnel".

7.1 Preparatory steps

Before commissioning the measuring point, make sure that the post-mounting and post-connection checks have been performed.

"Post-installation check" checklist

During initial commissioning, measure the local dose rate; see the "Measuring the local dose rate" section.

Required tool(s)

Key for padlock

7.2 Switching on the radiation

The source container is in the "AUS/OFF" switch position.

WARNING

When moving the extension ropes in ON position or OFF position, the user is exposed to ionizing radiation.

Ionizing radiation can increase the risk of cancer and genetic defects in offspring.

- ▶ The radiation safety officer must instruct personnel on the procedure.
- ▶ Never stay underneath the flange.
- ▶ Extension ropes must be fully and promptly lowered when lowering.
- ▶ Extension ropes must be fully and promptly retracted into the source container when raised, and the radiation sources must be secured immediately in their parking position.

NOTICE

Do not operate the locking bolt!

The source holder could fall uncontrollably into the protection pipe.

- ▶ Only operate the locking bolt once the flexible source holder extension has been fitted.

7.2.1 Feature 020; option B "Rotary bracket + locking bolt ON + padlock securing OFF"

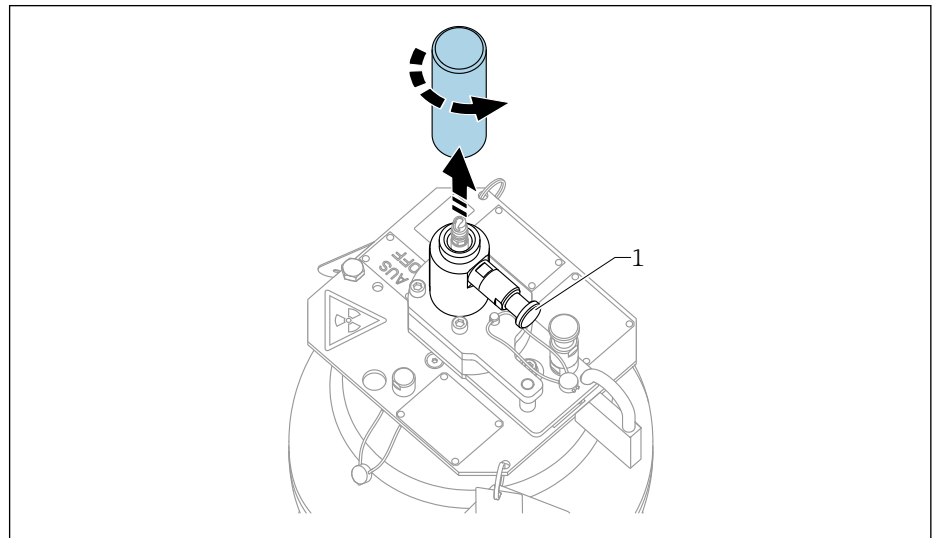
1. NOTICE

Do not operate the locking bolt!

The source holder could fall uncontrollably into the protection pipe.

- Only operate the locking bolt once the flexible source holder extension has been fitted.

Unscrew the protection cap.



A0019400

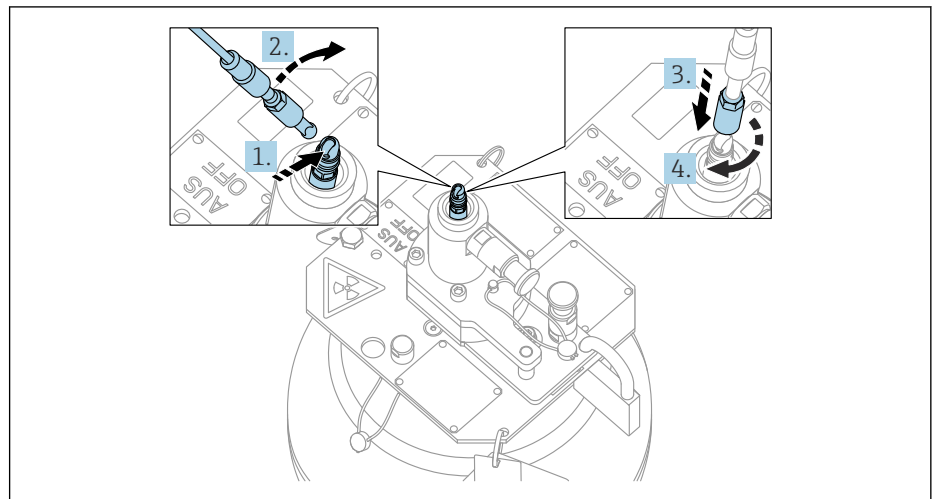
2. NOTICE

Locking sleeve of the flexible source holder extension not tightened.

Increased risk of losing the source holders in the protection pipe.

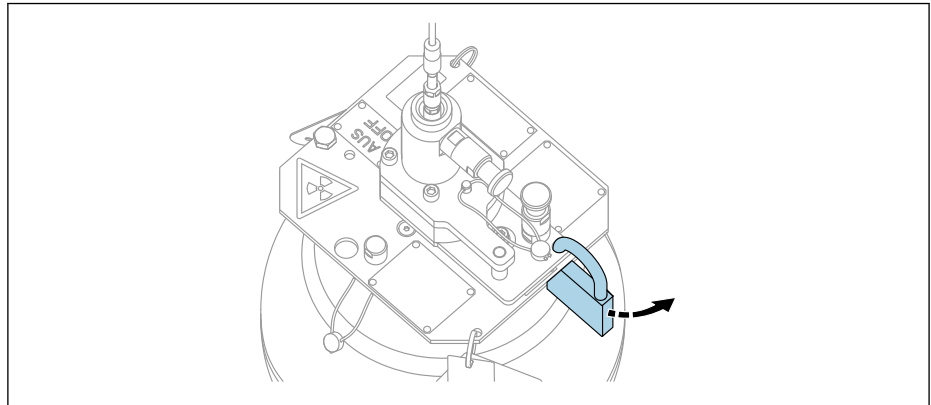
- Check for correct installation of the locking sleeve.

Connect the flexible extension to the ball head and tighten the locking sleeve as far as it will go.



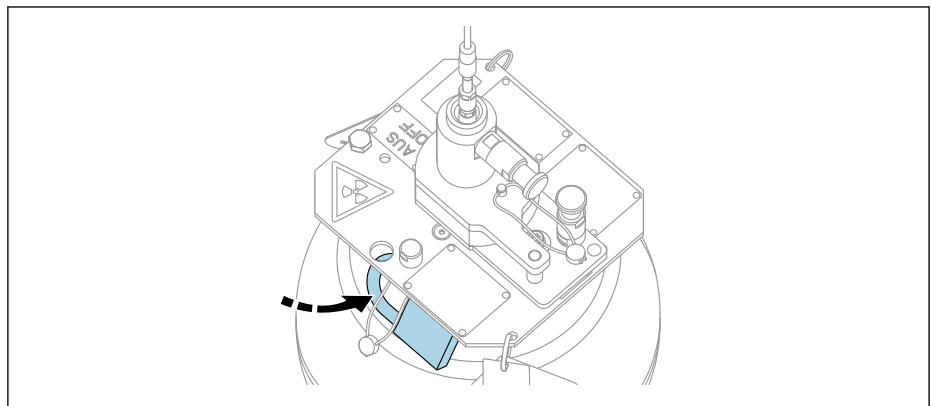
A0019401

3. Remove the padlock.



A0019402

4. Attach and lock the padlock in its storage position (anti-theft protection).



A0019403

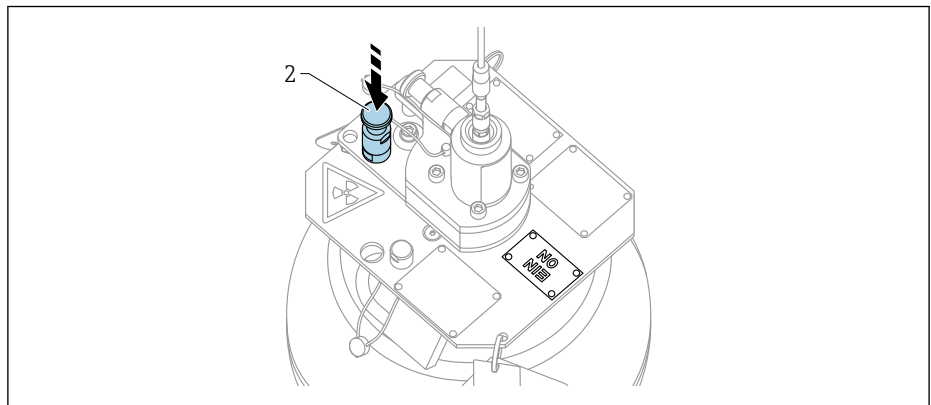
5. **NOTICE**

The switch status is indicated by the sign that is visible ("EIN/ON" or "AUS/OFF").

The other sign is covered by the turnable source holder.

- Pay attention to the switch status.

Let the locking bolt (2) snap into place in the "EIN/ON" switch position. Check that it is locked correctly.



A0019405

6. ⚠ CAUTION

If the source container is installed upside down, the flexible source holder extension may fall out of the protection pipe uncontrollably.

This can result in mechanical damage to the source holder, malfunctions, or, in the worst case, compromise radiation safety. Incorrect operation increases the risk of radiation exposure.

- ▶ When installing upside down, secure the flexible extension at all times to prevent it from falling back.
- ▶ Secure the flexible source holder extension mechanically before insertion (e.g., using a holder or clamp).
- ▶ Insert the flexible source holder extension carefully and slowly.
- ▶ Make sure the protection cap is screwed on after it has been fully positioned.

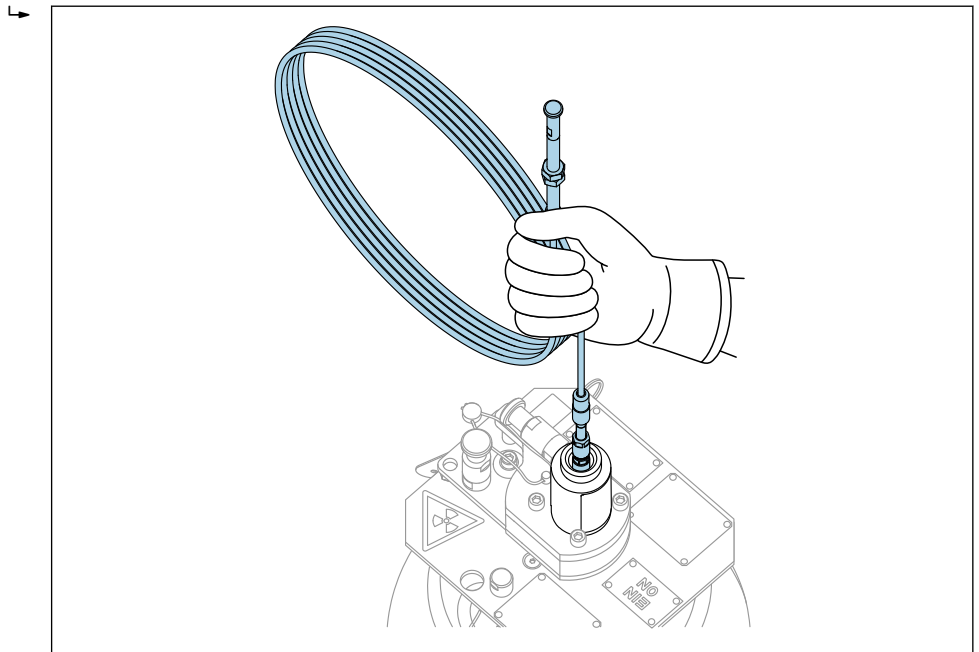
⚠ CAUTION

Abrasions and cuts caused by a rope falling!

The flexible source holder extension can suddenly slip downward due to its own weight if it is not secured. The falling rope can cause abrasions and cuts to the hands, arms, or other parts of the body.

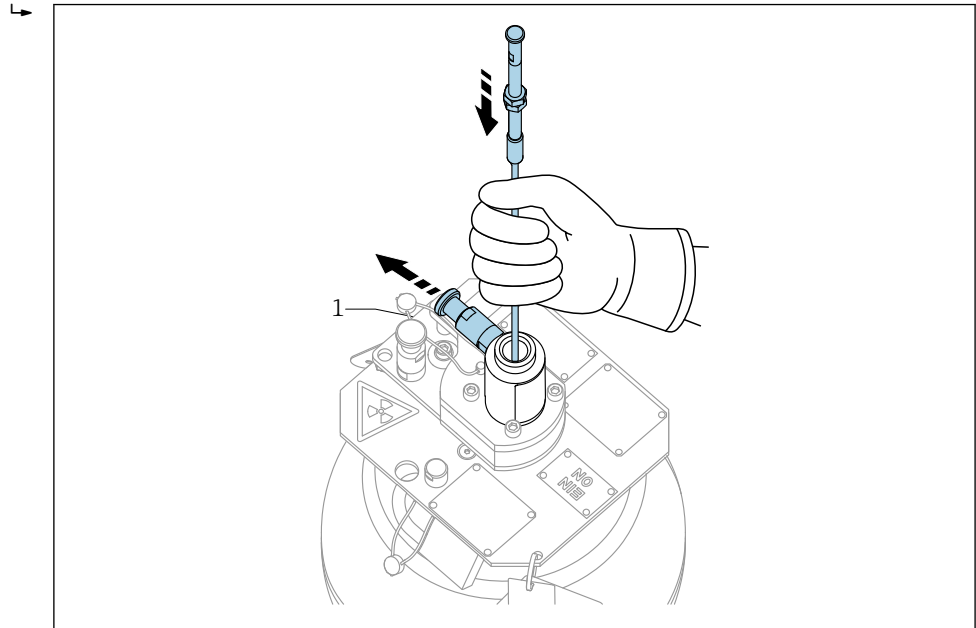
- ▶ Hold the flexible extension firmly for the following steps!
- ▶ Proceed slowly and carefully; do not make any sudden movements.
- ▶ Wear personal protective equipment: safety gloves with cut protection.

Seize the flexible extension with your hand and hold it firmly.



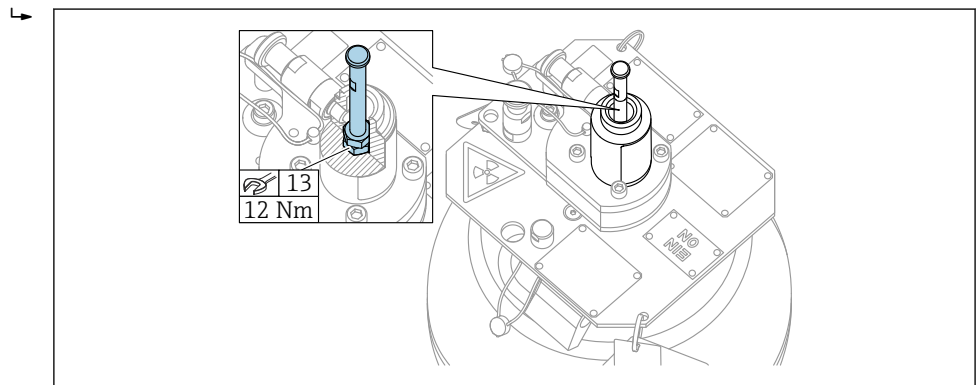
A0019406

7. Pull the locking bolt (1) outward to release the locking mechanism and hold it in that position. Carefully slide the flexible extension into the source container.



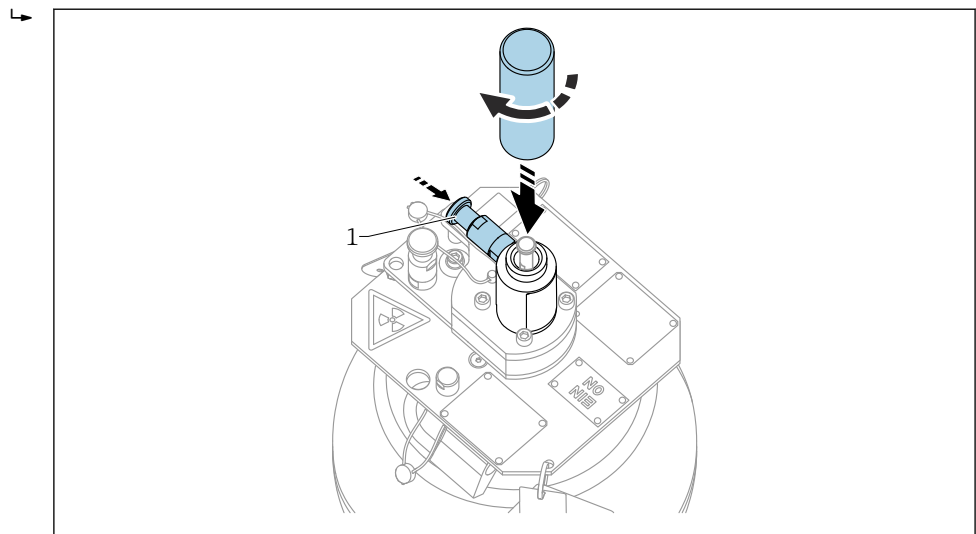
A0019407

8. The two lock nuts can be used to adjust (+/- 40 mm) and secure the radiation position. Once adjusted, tighten the nuts again. Torque 12 Nm (8.85 lbf ft).



A0019408

9. Let the locking bolt (1) snap into place in the "EIN/ON" switch position. Check that it is locked correctly. Fit the protection cap and tighten it as far as possible.



A0019409

7.2.2 Feature 020; option C "Padlock securing ON/OFF + rotary bracket"

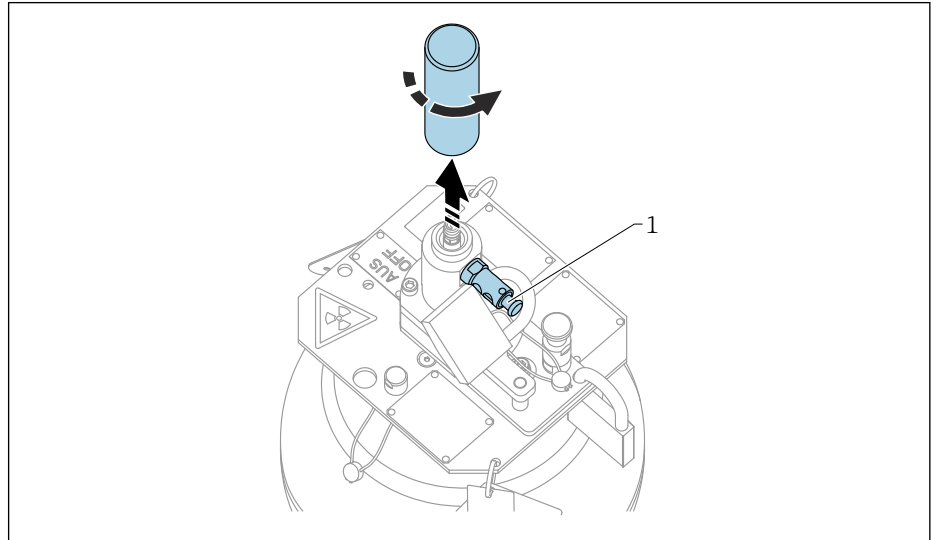
NOTICE

Do not operate the locking bolt!

The source holder could fall uncontrollably into the protection pipe.

- Only operate the locking bolt once the flexible source holder extension has been fitted.

1. Unscrew the protection cap.



A0019410

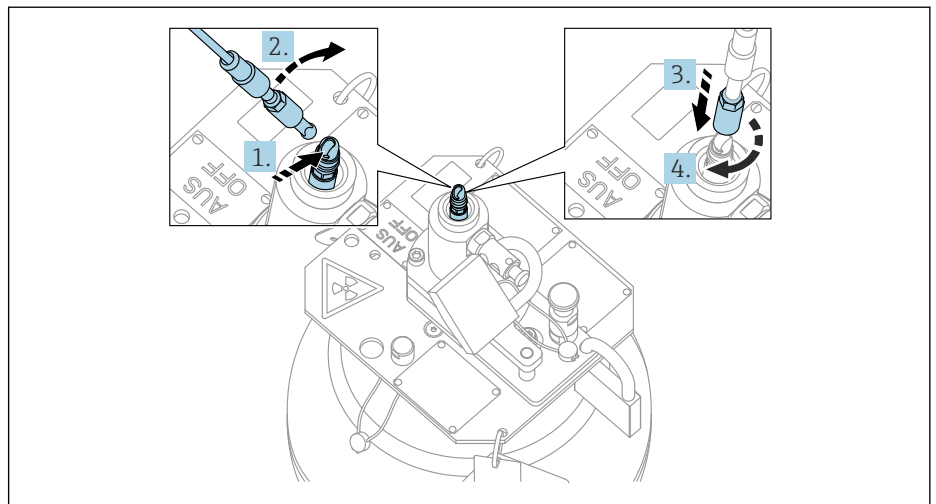
2. **NOTICE**

Locking sleeve of the flexible source holder extension not tightened.

Increased risk of losing the source holders in the protection pipe.

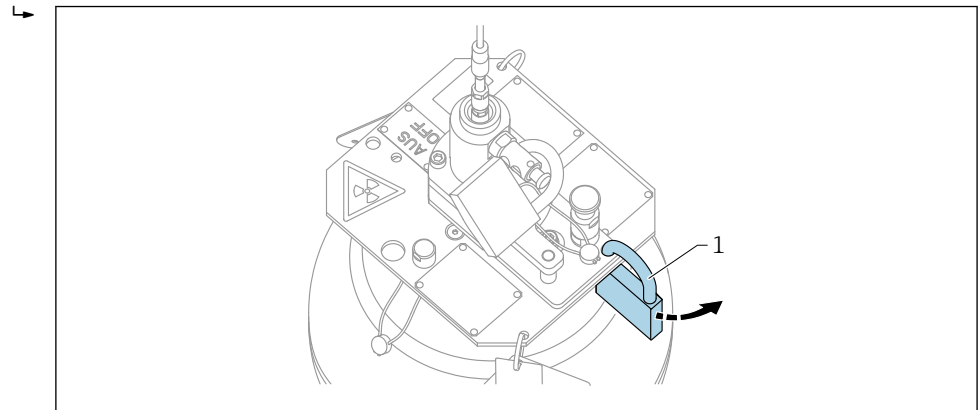
- Check for correct installation of the locking sleeve.

Connect the flexible extension to the ball head and tighten the locking sleeve as far as it will go.



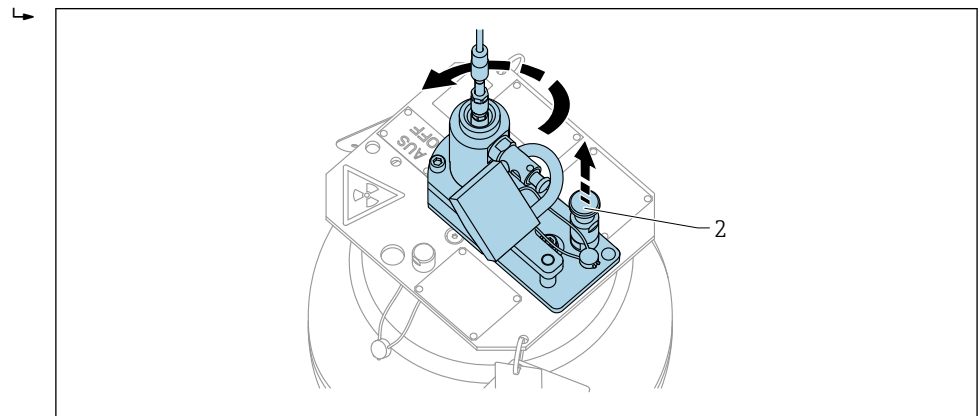
A0019411

3. Remove the padlock.



A0019412

4. Pull locking bolt no. 2 upwards and rotate the turnable source holder counterclockwise by 180°.



A0019413

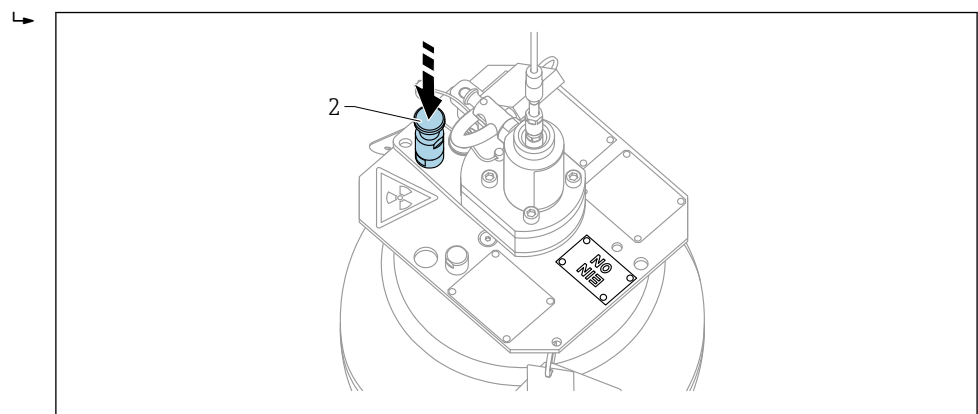
5. **NOTICE**

The switch status is indicated by the sign that is visible ("EIN/ON" or "AUS/OFF").

The other sign is covered by the turnable source holder.

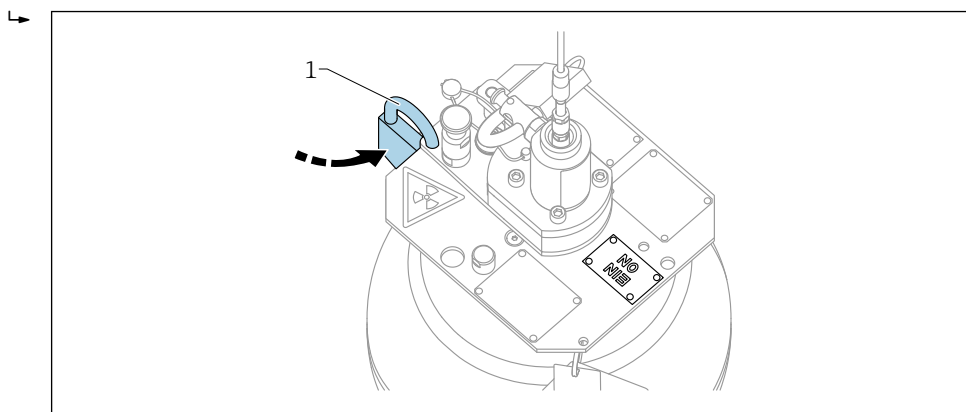
► Pay attention to the switch status.

Let the locking bolt (2) snap into place in the "EIN/ON" switch position. Check that it is locked correctly.



A0019414

6. Secure the "EIN/ON" switch position by hooking the padlock (1) into the position provided.



A0019415

7. ⚠ CAUTION

If the source container is installed upside down, the flexible source holder extension may fall out of the protection pipe uncontrollably.

This can result in mechanical damage to the source holder, malfunctions, or, in the worst case, compromise radiation safety. Incorrect operation increases the risk of radiation exposure.

- ▶ When installing upside down, secure the flexible extension at all times to prevent it from falling back.
- ▶ Secure the flexible source holder extension mechanically before insertion (e.g., using a holder or clamp).
- ▶ Insert the flexible source holder extension carefully and slowly.
- ▶ Make sure the protection cap is screwed on after it has been fully positioned.

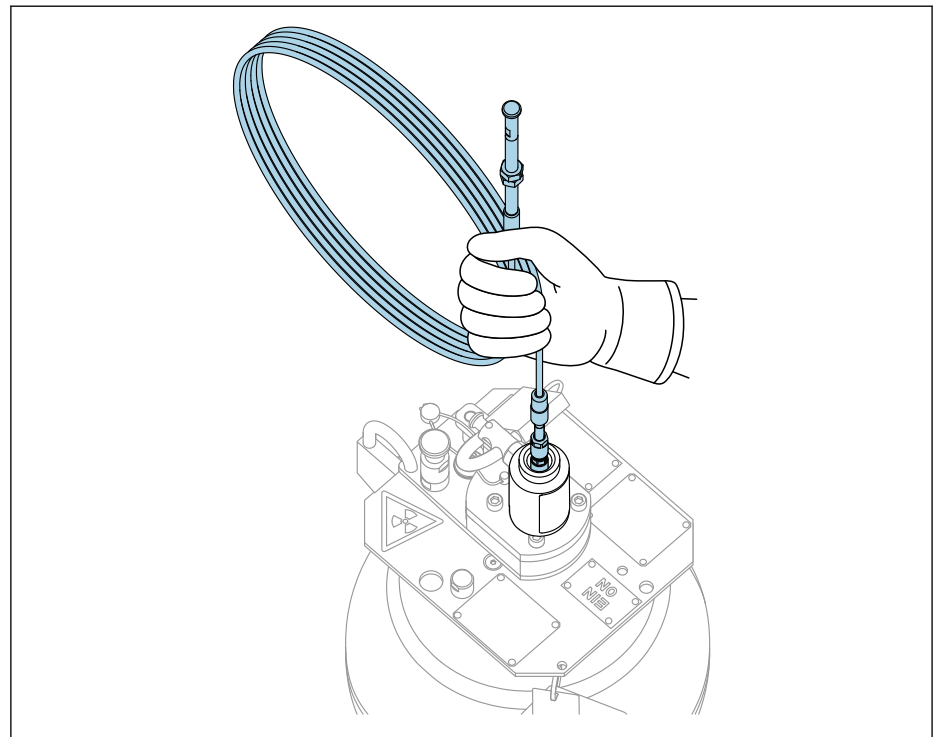
⚠ CAUTION

Abrasions and cuts caused by a rope falling!

The flexible source holder extension can suddenly slip downward due to its own weight if it is not secured. The falling rope can cause abrasions and cuts to the hands, arms, or other parts of the body.

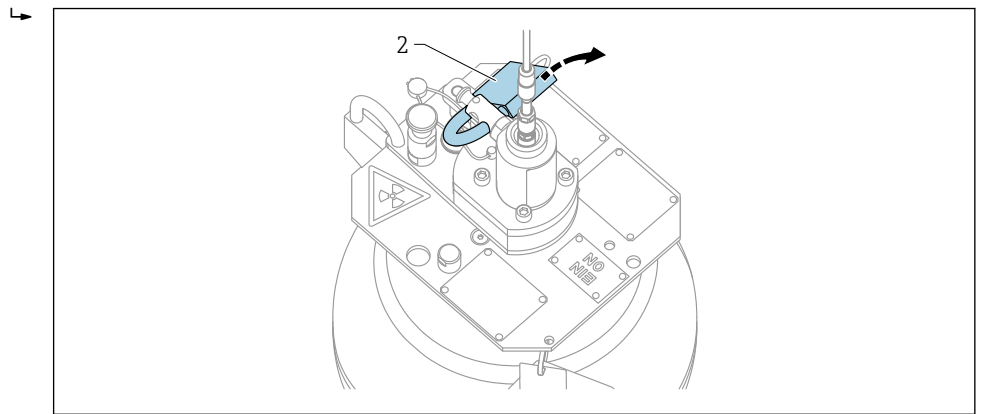
- ▶ Hold the flexible extension firmly for the following steps!
- ▶ Proceed slowly and carefully; do not make any sudden movements.
- ▶ Wear personal protective equipment: safety gloves with cut protection.

Seize the flexible extension with your hand and hold it firmly.



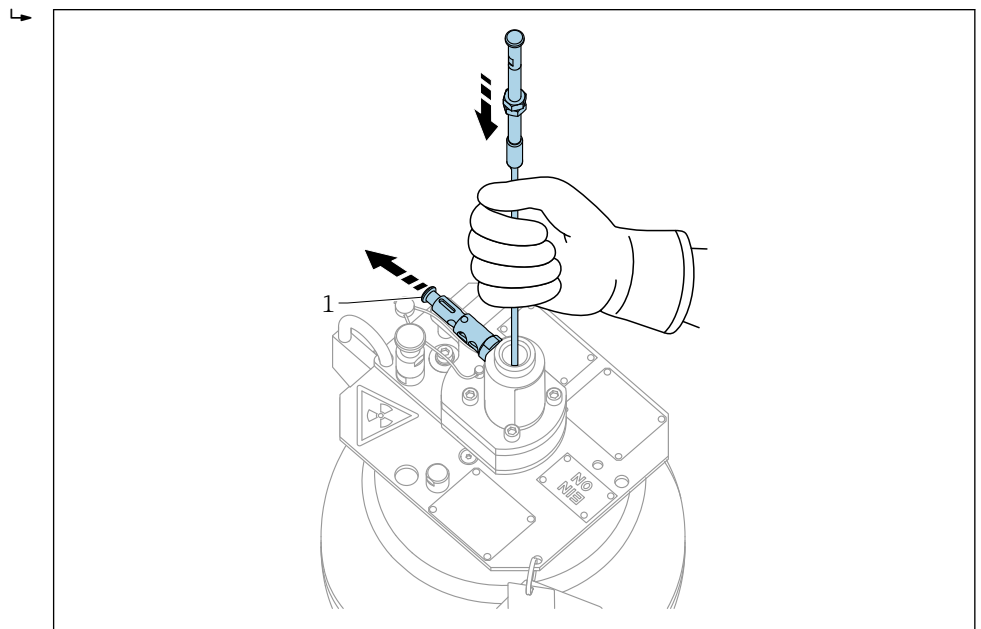
A0019416

8. Remove the padlock (2) from the locking mechanism.



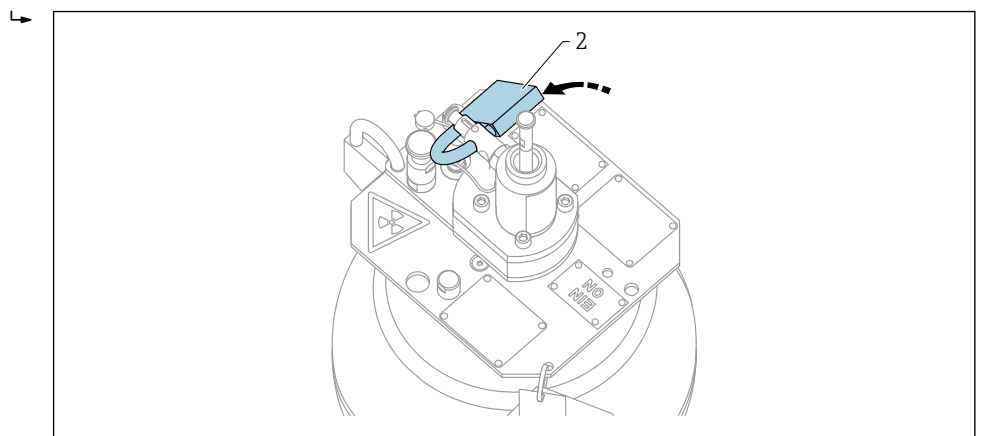
A0019417

9. Pull the locking bolt (1) outward to release the locking mechanism and hold it in that position. Carefully slide the flexible extension into the source container as far as it will go.



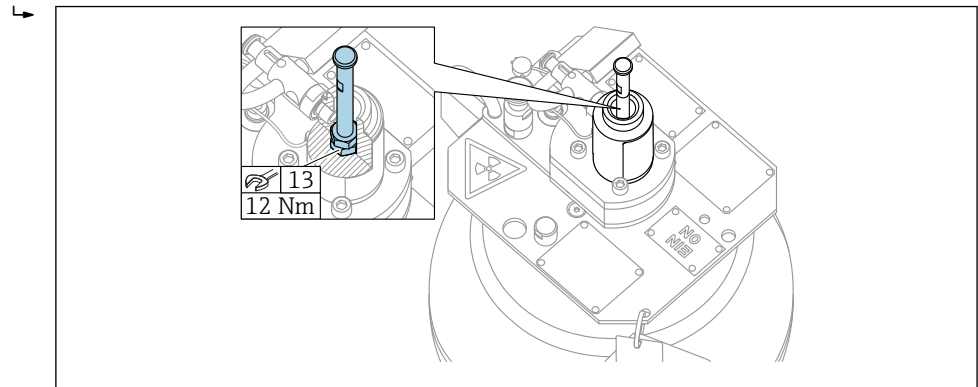
A0019418

10. Hook the padlock (2) in the second outer bore on the locking mechanism to store it (do not close).



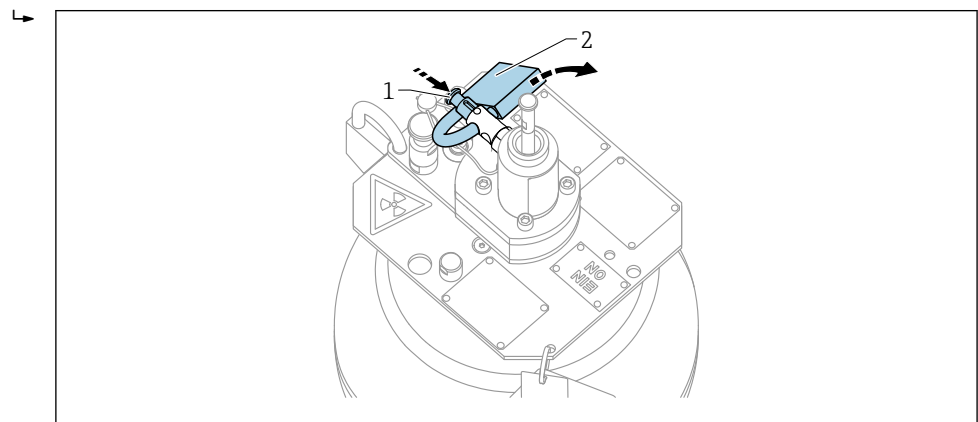
A0019419

11. The two lock nuts can be used to adjust (+/- 40 mm) and secure the radiation position. Once adjusted, tighten the nuts again. Torque 12 Nm (8.85 lbf ft).



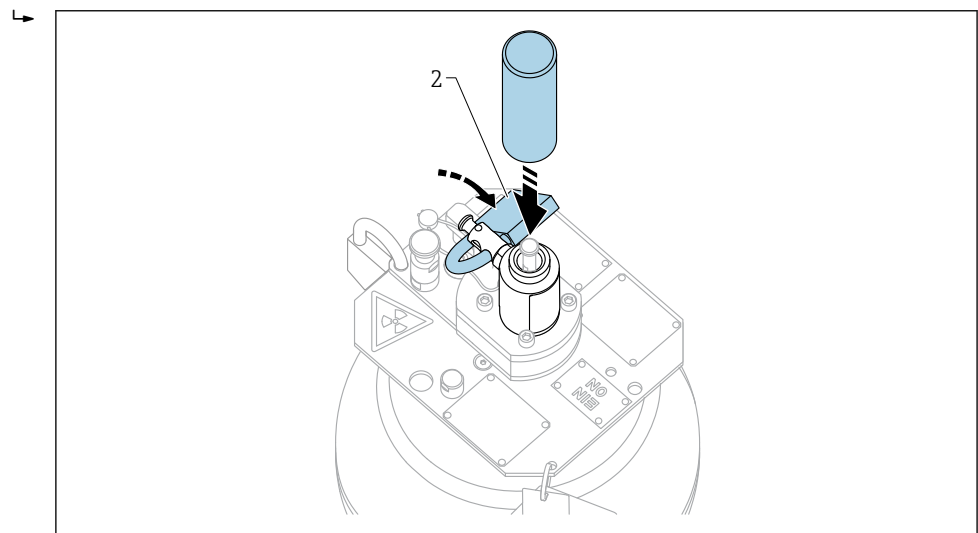
A0019420

12. Remove the padlock (2). Insert the locking bolt (1) as far as it will go.



A0019421

13. Hook the padlock (2) into the first inner bore and close. Fit the protection cap and tighten it as far as possible.



A0019422

- i** The source container can be removed from the measuring point if necessary. See section "Removing the source container from the measuring point"

- i**
- Fulfill the storage requirements in the "Maintenance -> Recurrent tests" section.
 - Implement anti-theft protection in accordance with national rules and requirements.

7.3 Measuring the local dose rate

 **DANGER: IONIZING RADIATION!** Follow the safety instructions at the start of this section.

- Once mounting is complete, the local dose rate in the vicinity of the source container and the detector must be measured.
- Depending on the installation, ionizing radiation can also occur outside the actual beam exit channel as a consequence of scattering.
- Shield with additional lead or steel sheets.
- Cordon off and mark all controlled and exclusion areas.

7.3.1 What to do in event of empty process vessel or pipe

CAUTION

Risk of injury from ionizing radiation due to missing or inadequate securing or safeguarding measures when working with or on product vessels!

Potential health risks from unshielded ionizing radiation. Ionizing radiation can increase the risk of cancer and genetic birth defects. Ensure compliance with the following measures for personal safety and environmental protection. Violations could cause serious health risks. The following safety measures must be observed when working with or on product vessels that contain or may contain ionizing radiation:

- ▶ **Determining and securing the controlled area.** Once an empty process vessel has been correctly mounted, the controlled area around the process vessel must be determined using appropriate measurement methods. If necessary, cordon off this area and mark it clearly in accordance with the applicable regulations.
- ▶ **Securing the interior area.** Access points to the product vessel interior must be securely closed. In addition, a warning sign with the "Radioactive" symbol must be attached in such a way that it is clearly visible.
- ▶ **Ensuring controlled access.** Access to the controlled area may only be approved by the radiation safety officer in charge. This area may only be accessed following inspection and confirmation of the required safety measures, and only when the source container is deactivated.
- ▶ **Ensure that the radiation source is switched off before working in or on the product vessel.** Before starting any work in or on the product vessel, the radiation source must be switched off. If necessary, additional shielding must be implemented to ensure personnel protection.

If the pipe becomes empty as a result of operational processes, the level of radiation on the detector side can reach dangerous levels:

A high local dose rate also causes the detector unit (scintillator and photomultiplier) to age quickly.

The best way to avoid such a situation is to mount a second radiometric measuring system that monitors the radiation intensity. If high radiation levels occur, an alarm occurs and the source container must be switched off ("AUS/OFF" position).

7.4 Switching off the radiation

WARNING

When moving the extension ropes in ON position or OFF position, the user is exposed to ionizing radiation.

Ionizing radiation can increase the risk of cancer and genetic defects in offspring.

- ▶ The radiation safety officer must instruct personnel on the procedure.
- ▶ Never stay underneath the flange.
- ▶ Extension ropes must be fully and promptly lowered when lowering.
- ▶ Extension ropes must be fully and promptly retracted into the source container when raised, and the radiation sources must be secured immediately in their parking position.

⚠ WARNING**Risk of ropes falling due to loose screws!**

This could result in personal injury or even death as a consequence of impact.

- ▶ Wear personal protective equipment.

⚠ WARNING**Hot flexible source holder extensions due to process heat transfer.**

This could result in burns to hands.

- ▶ Wear protective equipment.
- ▶ Define organizational measures for protection from hot parts. Warn equipment operators of the danger posed by hot parts on the source container, e.g. in the form of notices and training.
- ▶ The plant operator must ensure that the radiation sources can be safely set to the OFF position in an emergency. A risk of injury from hot parts on the source container must be taken into consideration.
- ▶ If possible, allow the process to cool down before the ropes are retracted.

⚠ CAUTION**When the radiation sources are being raised, there is a risk of injury from rope defects on the flexible source holder extensions (e.g., due to frayed wire).**

This could result in personal injury in the form of cuts and abrasions.

- ▶ Wear protective equipment.

NOTICE**Locking sleeve of the flexible source holder extension not tightened.**

Increased risk of losing the source holders in the protection pipe.

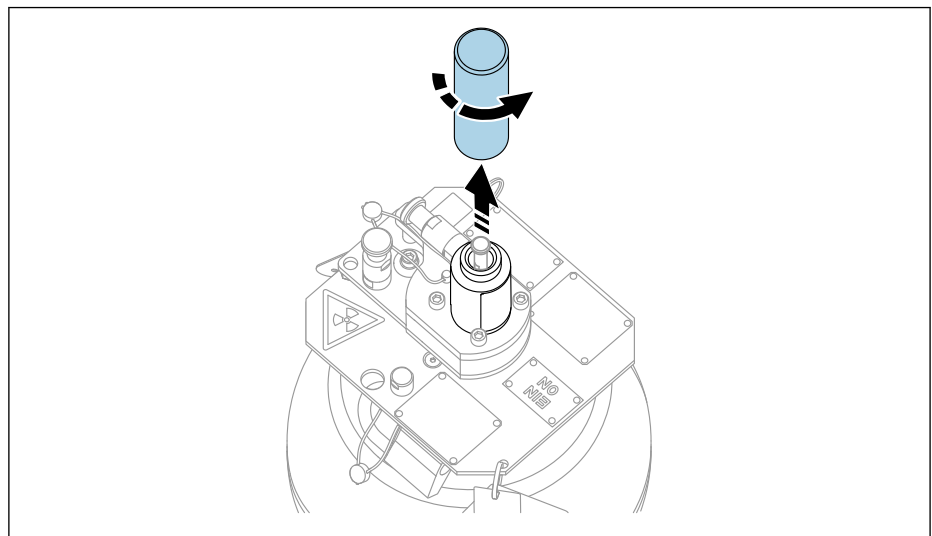
- ▶ Check for correct installation of the locking sleeve.



The source container can be removed from the measuring point if necessary. See section "Removing the source container from the measuring point"

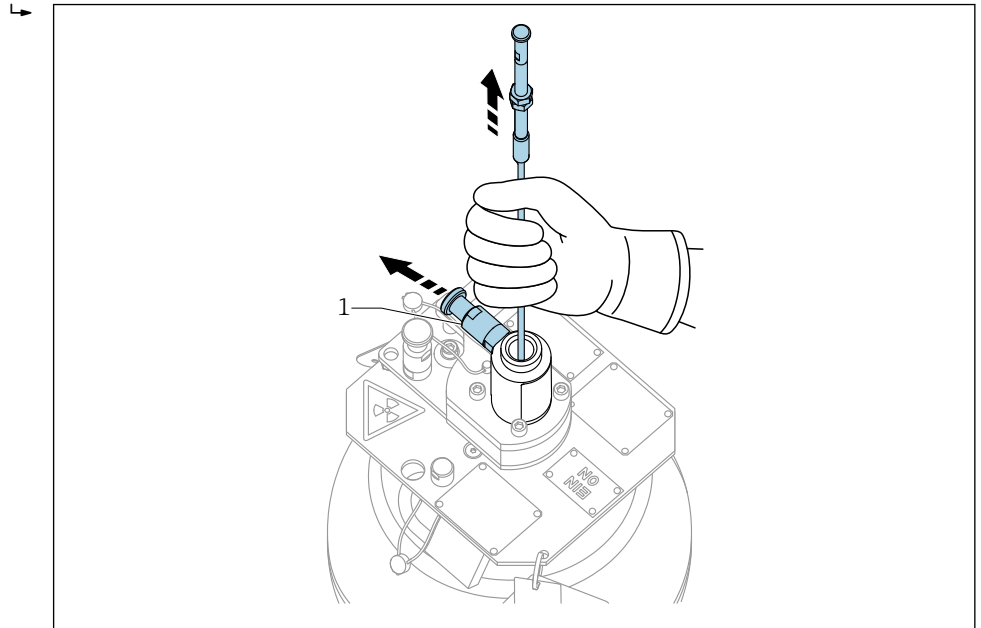
7.4.1 Feature 020; option B " Rotary bracket + locking bolt ON + padlock securing OFF"

1. Unscrew and remove the protection cap.



A0058899

2. Pull the locking bolt (1) outward to release the locking mechanism and hold it in that position. Carefully pull the flexible extension out of the source container.



A0058900

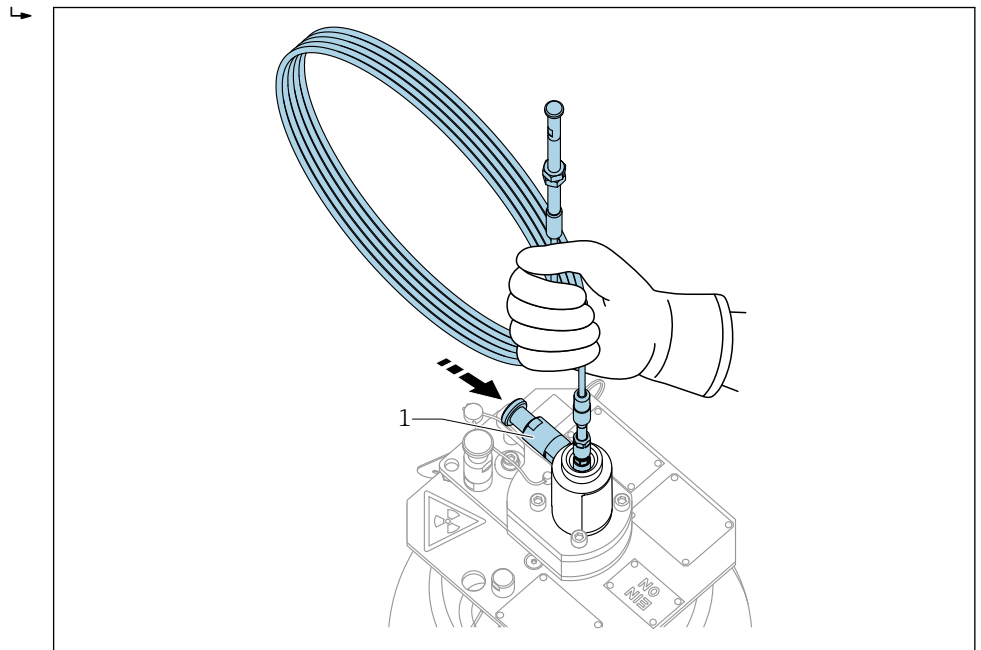
3. **NOTICE**

Hold the flexible source holder extension firmly!

The source holder could fall uncontrollably into the protection pipe.

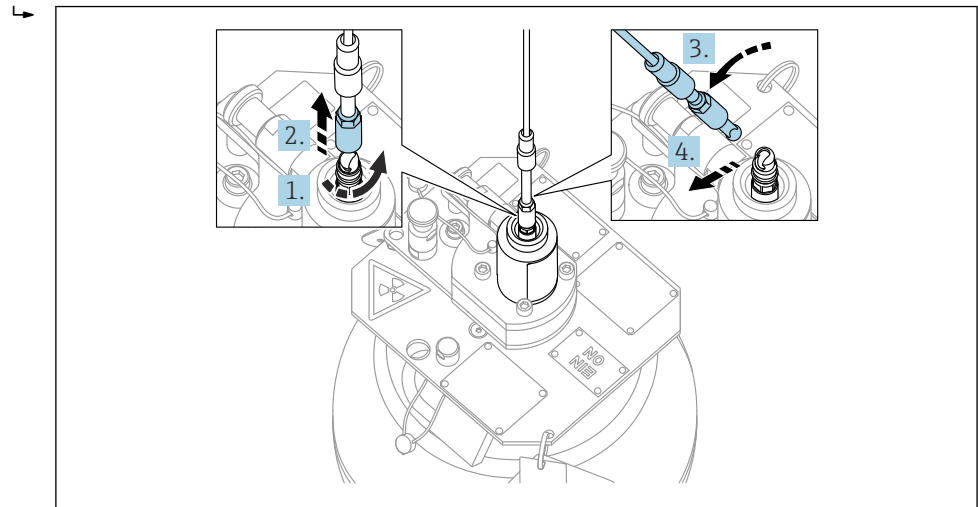
- Do not release the flexible source holder extension until the locking bolt is engaged.

Pull the extension out of the source container until the ball head appears, hold it in place and let the locking bolt (1) snap into place. Check that it is locked correctly.



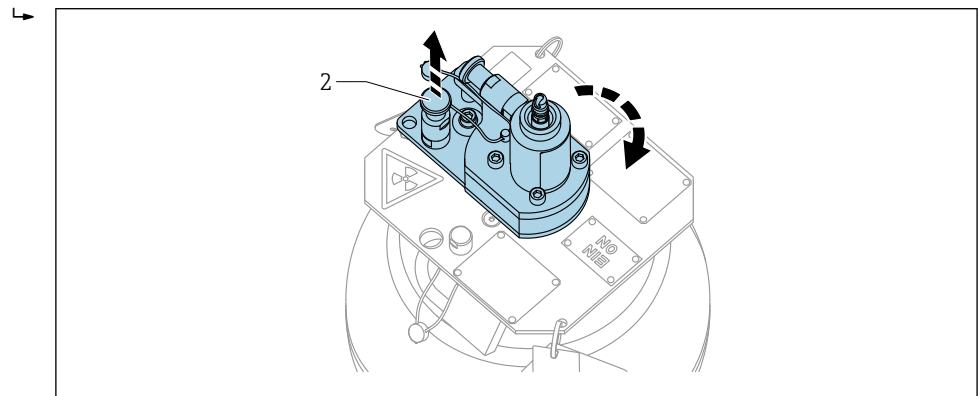
A0058901

4. Release the locking sleeve (1) and push it upwards (2). Release flexible extension from ball head (3, 4).



A0058902

5. Pull out the locking bolt (2) and turn the shutter to the "AUS/OFF" switch position.



A0058903

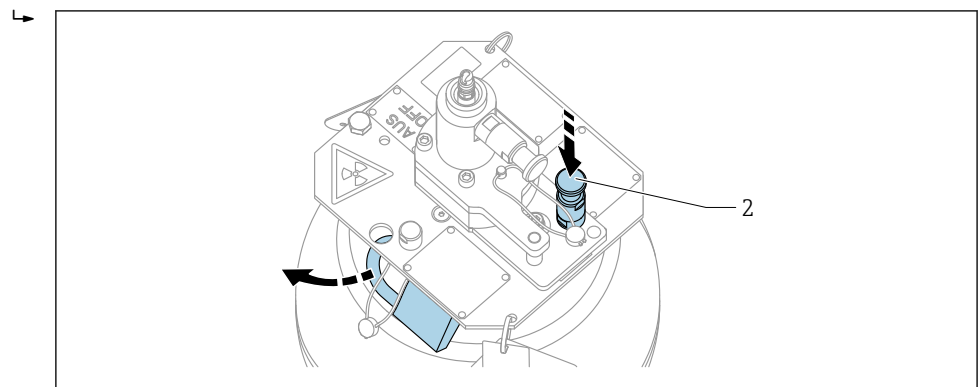
6. **NOTICE**

The switch status is indicated by the sign that is visible ("EIN/ON" or "AUS/OFF").

The other sign is covered by the turnable source holder.

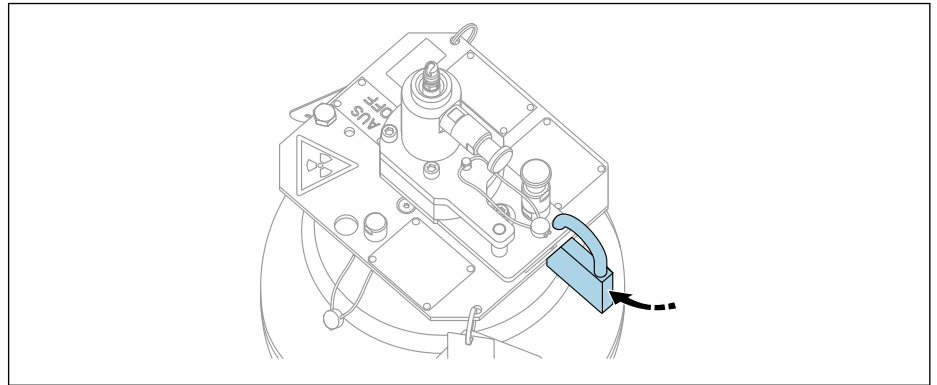
- Pay attention to the switch status.

Snap the locking bolt (2) into place. Check that it is locked correctly. Remove the padlock from the anti-theft position.



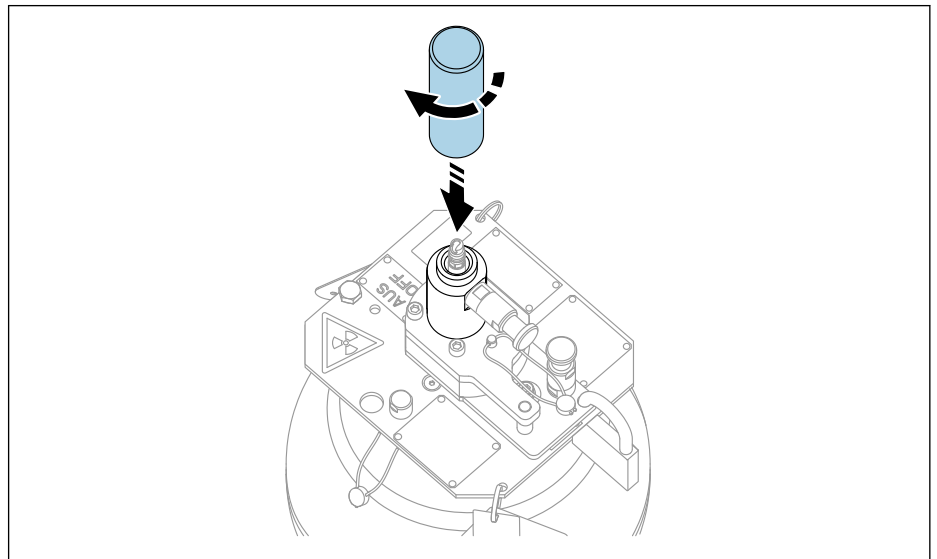
A0058904

7. Hook the padlock into the tamper-proof position and close.



A0058905

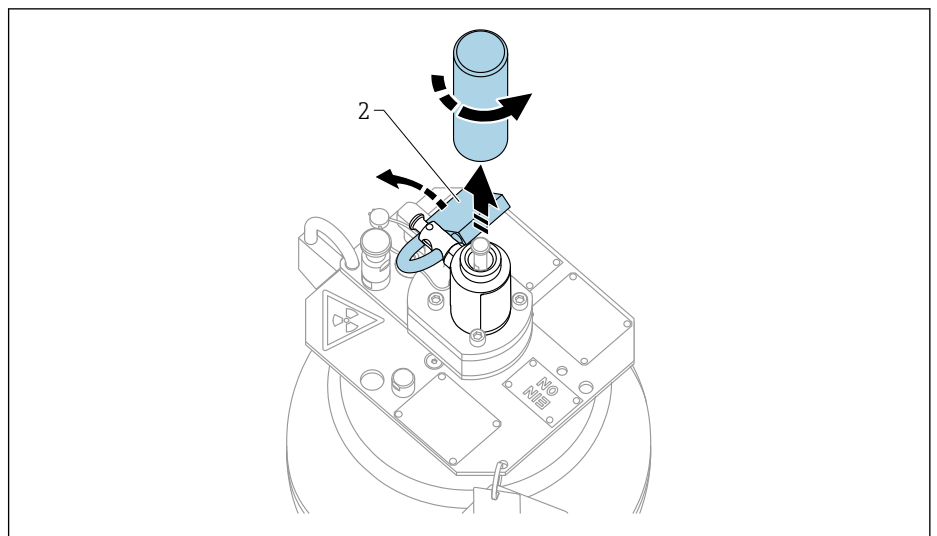
8. Fit the protection cap and tighten.



A0058906

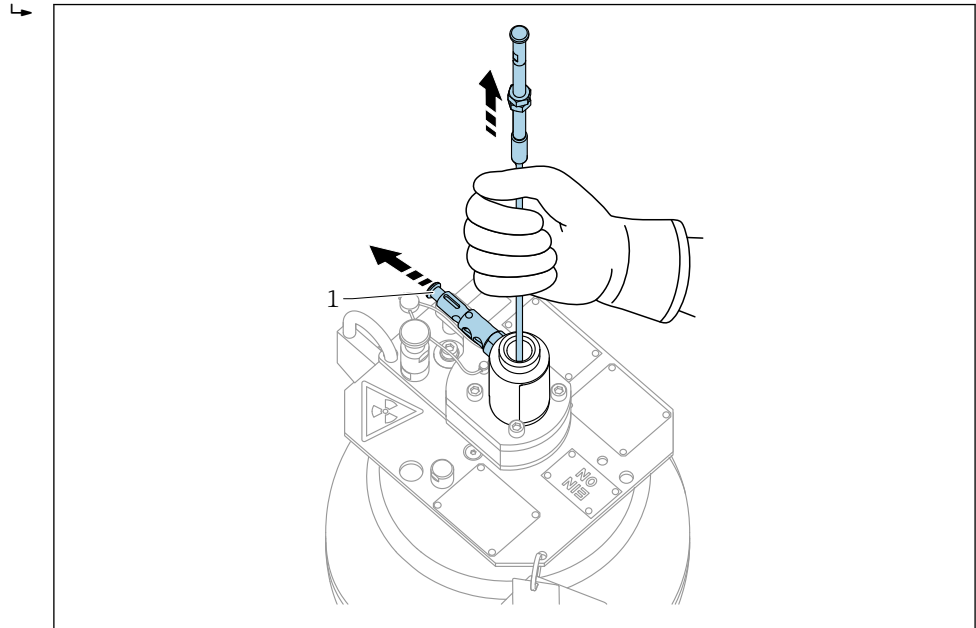
7.4.2 Feature 020; option C "Padlock securing ON/OFF + rotary bracket"

1. Unscrew and remove the protection cap.



A0058907

2. Pull the locking bolt (1) outward to release the locking mechanism and hold it in that position. Carefully pull the flexible extension out of the source container.



A0058908

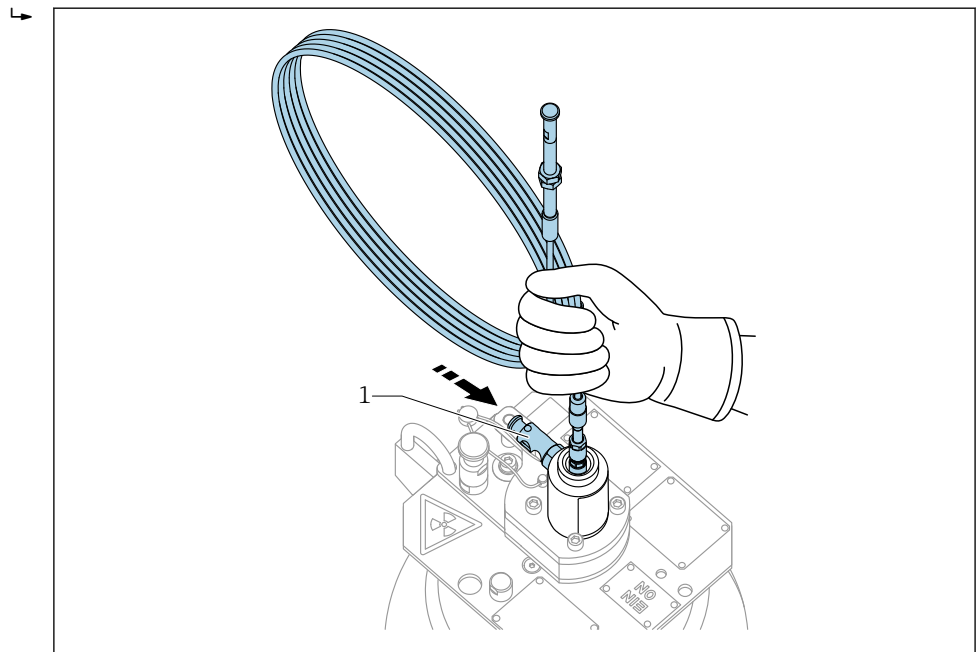
3. **NOTICE**

Hold the flexible source holder extension firmly!

The source holder could fall uncontrollably into the protection pipe.

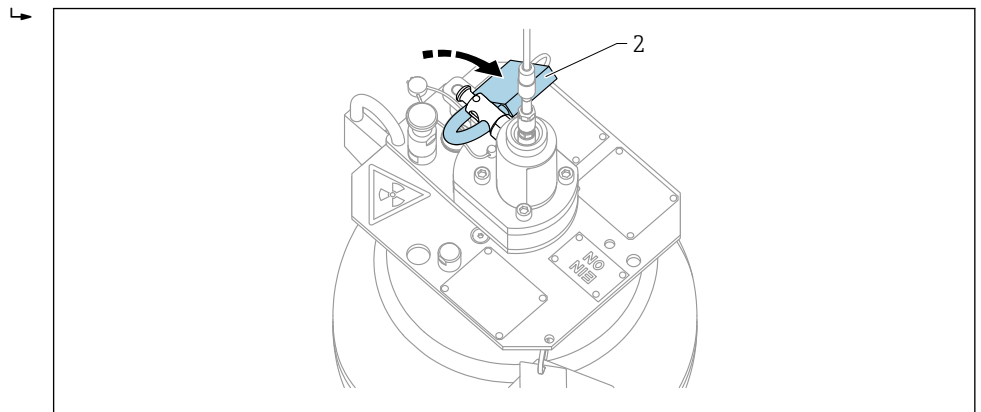
- Do not release the flexible source holder extension until the locking bolt is engaged.

Pull the extension out of the source container until the ball head appears, hold it in place and let the locking bolt (1) snap into place. Check that it is locked correctly.



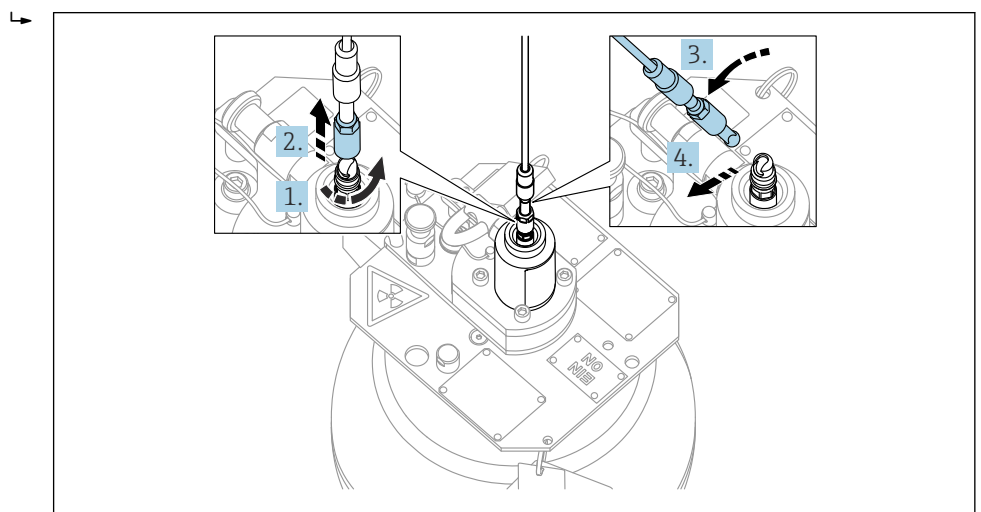
A0058909

4. Fit the padlock.



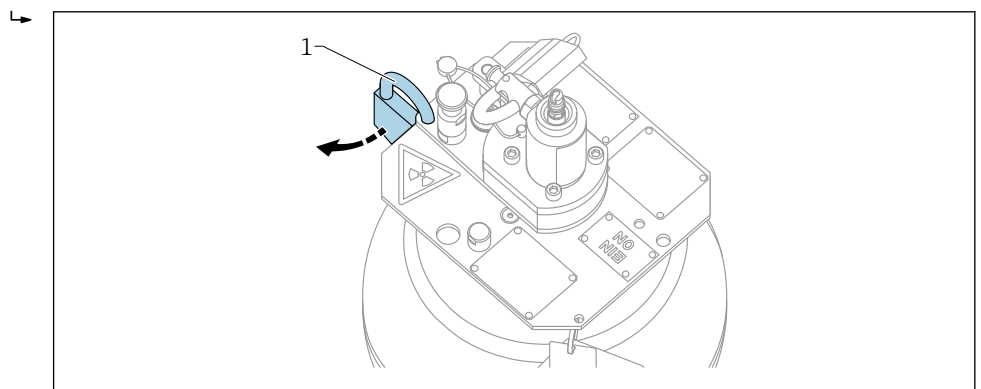
A0019760

5. Release the locking sleeve (1) and push it upwards (2). Release flexible extension from ball head (3, 4).



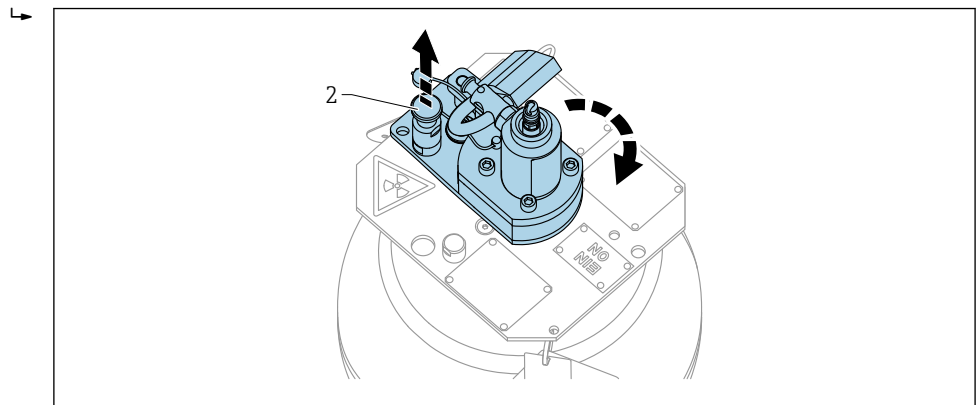
A0058910

6. Pull out the locking bolt (2) and turn the shutter to the "AUS/OFF" switch position.



A0058911

7. Pull out the locking bolt (2) and turn the shutter to the "AUS/OFF" switch position.



A0058912

8. **NOTICE**

The switch status is indicated by the sign that is visible ("EIN/ON" or "AUS/OFF").

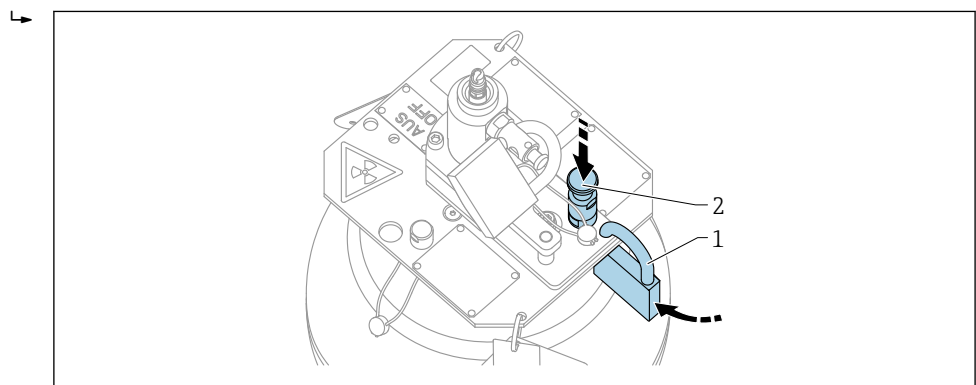
The other sign is covered by the turnable source holder.

- Pay attention to the switch status.

Snap the locking bolt (2) into place. Check that it is locked correctly. Remove the padlock from the anti-theft position.

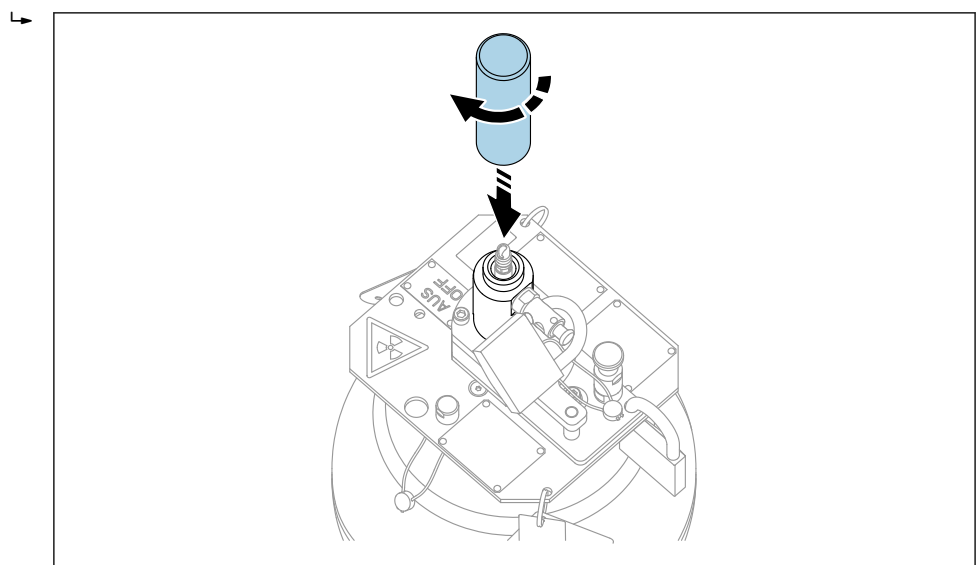


9. Hook the padlock into the tamper-proof position and close.



A0058913

10. Fit the protection cap and tighten.



A0058914

7.5 Loading and exchanging the radiation sources

 Loading and exchanging the radiation sources require qualified maintenance personnel - radiation; see "Requirements for the personnel" section.

This procedure requires expert knowledge above and beyond the operation of the measuring point. Before radiation sources are loaded or exchanged, the procedure must be planned. In particular, the applicable legal radiation protection regulations for the handling of radioactive materials must be observed, see section -> "Basic safety instructions" -> "Legal regulations for radiation protection".

The loading and exchanging of radiation sources must be carried out in accordance with the description in SD00297F.

8 Maintenance

 Maintenance requires qualified operating, installation and service personnel.

Maintenance work involving the radiation source requires the maintenance personnel – radiation qualification.

See the "Requirements for personnel" section.

WARNING

Health hazard from inadequate shielding of the radiation source.

In the event of visible irregularities on the source container, adequate shielding from ionizing radiation cannot be guaranteed.

- ▶ Inform the responsible radiation safety officer immediately for further instructions.
- ▶ Do not attempt to carry out any repairs of your own. Repairs or maintenance beyond the scope of the routine formal inspection must be carried out only by Endress+Hauser or a person authorized for this purpose.

Maintenance is performed in response to defects identified by a recurrent test. Under normal intended use and adherence to the specified environmental and operating conditions, no periodic maintenance tasks are defined.

8.1 Recurrent tests

Recurrent tests depend on the type of use. In addition to its use as a source container, the source container can also be used as a Type A package. Use as a Type A package requires specific tests. Recurrent tests and tests for use as a Type A package must be documented according to the test instructions.

Tests must be carried out by a qualified, technically competent person. The results of recurrent testing must be documented in a test book for the specific source container.

-  ■ The user is responsible for maintaining a test log for documenting recurrent tests.
- For a template for recurrent tests, see the section with the same name below.
 - For a template for a logbook, see the section with the same name below.

8.1.1 Test intervals

Test situation	Interval	Test for
After transport	Always	Integrity
In the process	Annually	Integrity Functional test
During storage in "loaded" condition*	Every five years	Integrity Safety

Test situation	Interval	Test for
Before dispatch in "loaded" condition*	Always	Integrity Safety Compliance with all regulations
Before dispatch in "empty" condition*	Always	Integrity Functional test
Before loading	Always	Integrity Functional test

* The source container is not contaminated.

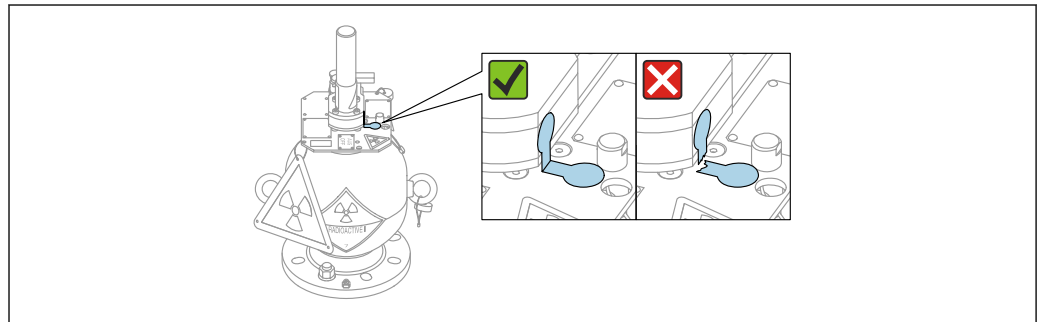
- i** ■ The time between dispatch and testing must not exceed six months.
- The time between leak testing and dispatch must not exceed three months.
- Use of a loaded source container in the process corresponds to storage in loaded condition from the point of view of transport, i.e. use as a Type A package.

8.1.2 Integrity tests

The housing, cap, source holder with rope, anti-theft protection labels, lifting points and seals must be tested.

Internal housing parts and internal shielding cannot be tested directly. It is assumed that damage, e.g. due to corrosion, will already be clearly visible on externally accessible parts

After transport



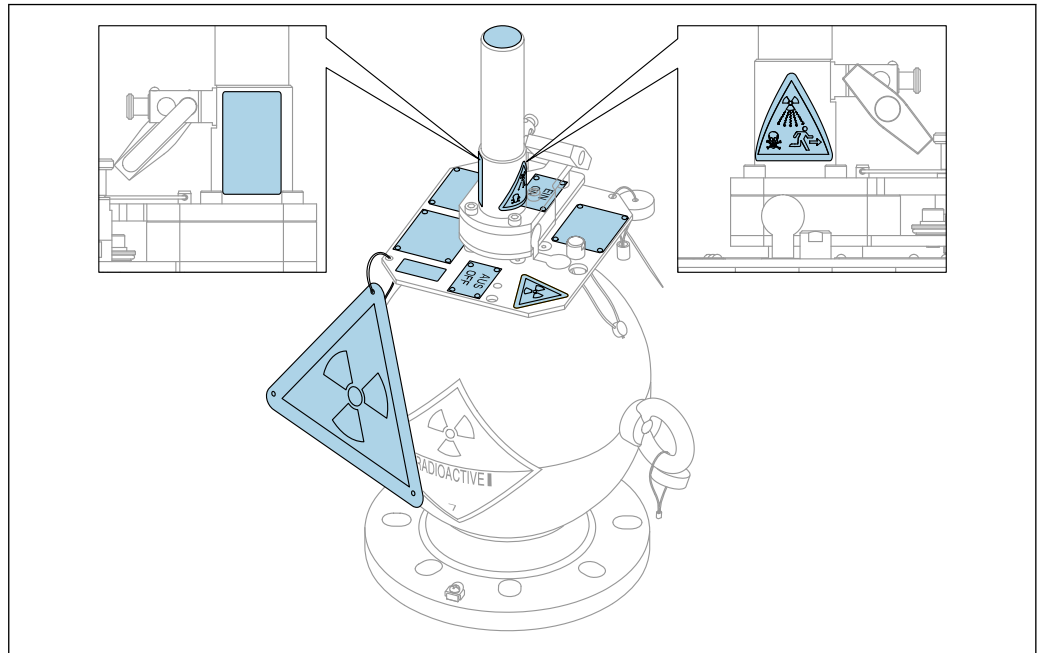
A0058505

27 Position of the seal

- Check whether the seal on the source container is intact.

- i** If a seal is broken, the possibility of tampering cannot be ruled out. Contact Endress+Hauser immediately.

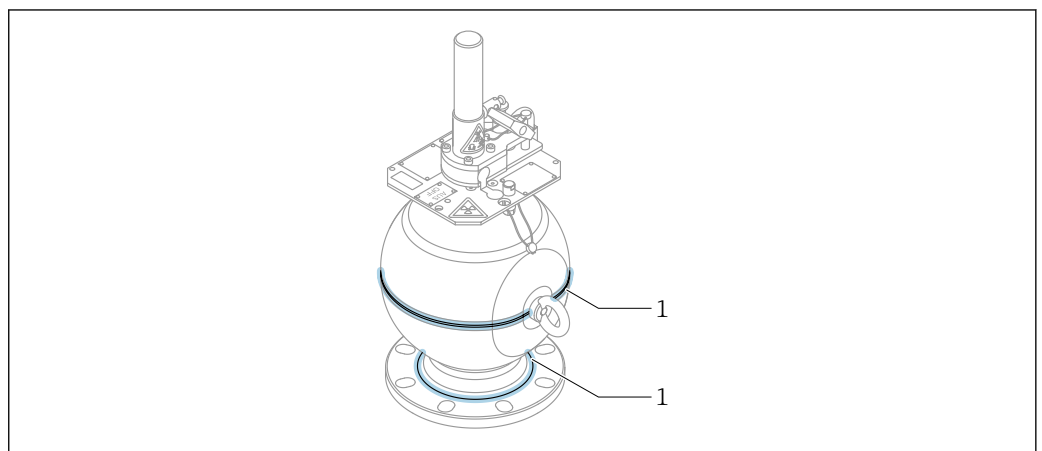
General



A0058457

28 Position of metal signs and stick-on labels

- For the position of the nameplates, see the "Product description -> Overview" section.
 - For an explanation of how to interpret the nameplates, see the "Incoming acceptance and product identification -> Product identification -> Nameplate" section.
1. Identify and document the source container and radiation source based on the nameplates.
 2. Ensure that the correct markings are attached.
 3. Check that nameplates and warning signs are firmly attached and easy to read.
 4. Check that the source container and protection cap are externally sound.
 5. Check that the source container and protection cap show no signs of significant corrosion that could compromise the safe storage of the radiation source.

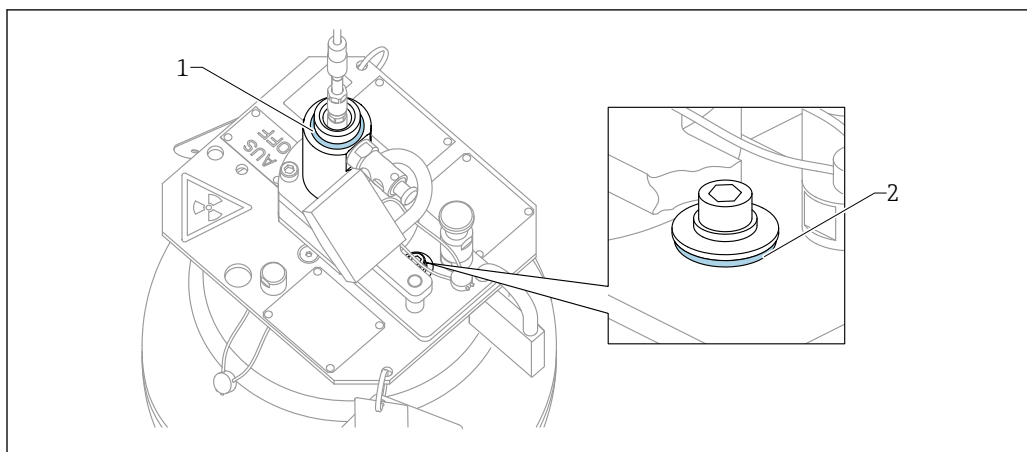


A0058458

29 Position of weld seams

- 1 Welding seam

6. Check that the welds are intact and show no signs of damage caused by corrosion, fire, falls or collisions.

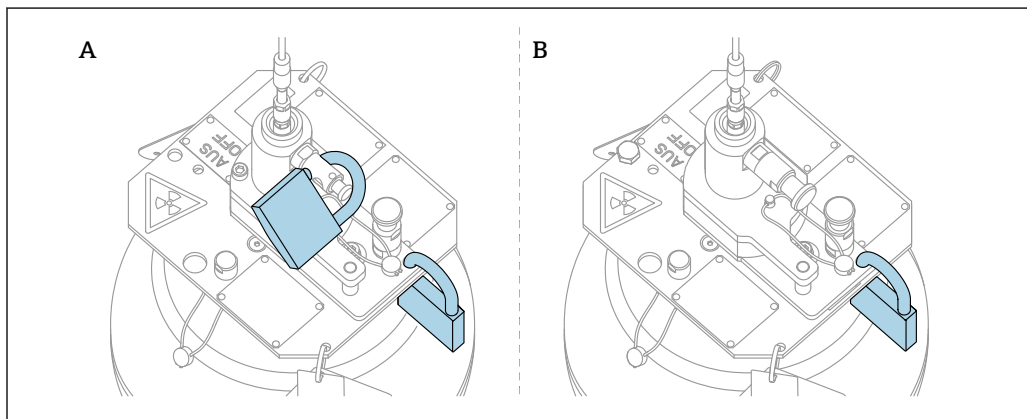


A0060776

30 Positions of sealing ring and reference O-ring

- 1 Sealing ring for protection cap on the source holder
- 2 Reference O-ring

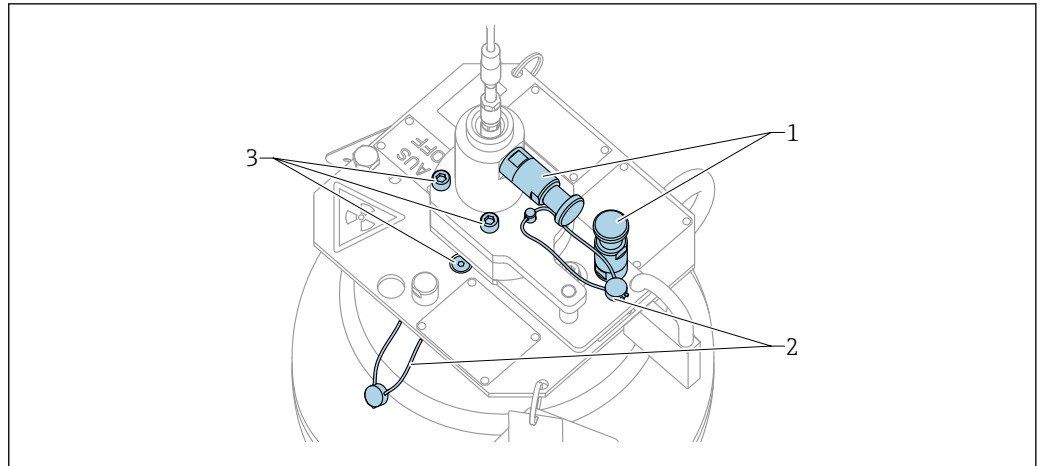
- Visual inspection of sealing ring and reference O-ring. Replace if necessary.



A0060832

- A Anti-theft protection for all options except NRC: two padlocks
- B Anti-theft protection for option NRC: one padlock

- Check that all locks are present.

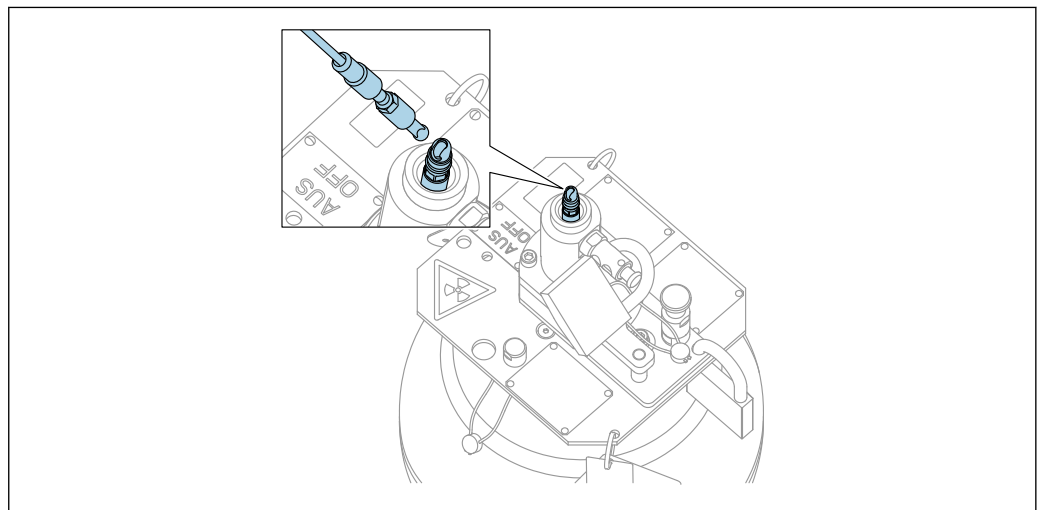


A0060834

31 Positions of various testing points

- 1 Locking bolt
- 2 Sealing wires
- 3 Threaded joints

1. Make sure that the locking bolts are securely engaged.
2. Make sure that the sealing wires are present.
3. Check that the threaded joints are secure.



A0060881

32 End of the flexible source holder extension and rope separator on the source holder

⚠ DANGER

Risk of injury from ionizing radiation!

Hazard for persons and the environment posed by ionizing radiation and contamination. Ionizing radiation and contamination can increase the risk of cancer and genetic birth defects. Depending on the dose, ionizing radiation can cause immediate physical harm such as nausea, vomiting, hair loss, changes in blood composition, and severe tissue damage that may lead to death.

- ▶ Never check the source holders directly.
- ▶ Carry out checks only on the rope separator and flexible source holder extension.

1. If the **radiation source is inside the process**, check if the end of the flexible source holder extension is showing signs of corrosion.
2. If the **radiation source is located in the source container**, check if the rope separator is showing signs of corrosion.

8.1.3 Functional tests

⚠ DANGER

Risk of injury from ionizing radiation!

Ionizing radiation can increase the risk of cancer and genetic birth defects. Depending on the dose, ionizing radiation can cause immediate physical harm such as nausea, vomiting, hair loss, changes in blood composition, and severe tissue damage that may lead to death.

- Only carry out functional tests if the source container is unloaded or the path of the beam is sufficiently shielded, for example by the process medium.

Radiation source in source container

Functional test

1. Can the source container be moved from ON to OFF, and from OFF to ON?
2. Can the locking bolts be moved?

Radiation source inside the process

Functional test

- Can the source holder be retracted to the OFF position?

8.1.4 Checking the locking devices on the source container

1. Make sure that the source container is in the "OFF/AUS" position.
2. Make sure that the lock(s) is/are attached and closed.
3. Make sure the seals are in place.
4. Carry out a documented leak test, see the "Maintenance -> Maintenance tasks -> Leak test" section.

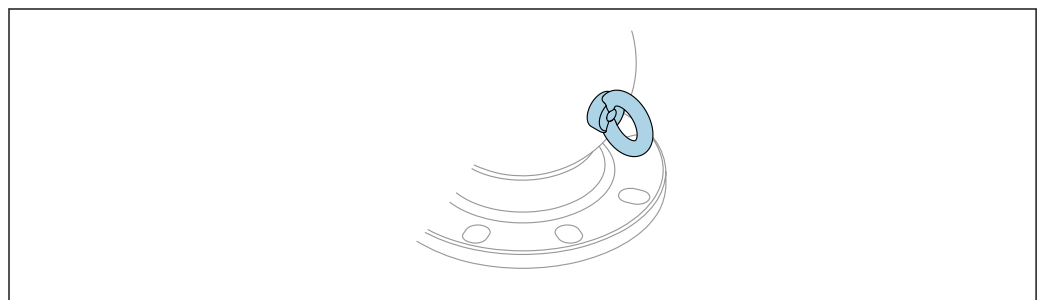
8.1.5 Checks for compliance with all regulations (for dispatch)

- i** It is prohibited to dispatch the source container without valid and complete documents.

Dispatch as Type A package:

1. Make sure that the transport index is present and the category is correctly marked for the radiation source concerned.
2. Make sure that the source container is marked in accordance with international regulations concerning the transport of dangerous goods (ADR/RID, DGR/IATA).

8.1.6 Checking the condition of the lifting points



A0060546

33 *Lifting point*

The lifting points are not permanently in use. They must therefore be checked before each use:

1. Check whether the weld seams are in good condition.
2. Check if the lifting points are damaged or deformed.

8.1.7 Template for recurrent tests

Company	
Name	
Address	
Name of inspector and role	

Source container	FQG _ - _____
------------------	---------------

Radiation source	
Nuclide	☐ ^{137}Cs ☐ ^{60}Co
Serial number of the radiation source	
Nominal activity (MBq/GBq)	
Date of manufacture	

- A: ☐ After transport
- B: ☐ In the process
- C: ☐ Before dispatch in "empty" condition ☐ Before loading
- D: ☐ During storage in "loaded" condition
- E: ☐ Before dispatch in "loaded" condition

A	B	C	D	E	Tests		
x				x	The seal is present and is not damaged.		
x	x	x	x	x	Labeling is correct and clearly legible.		
x	x	x	x	x	There is no significant corrosion on the source container that could compromise the safe storage of the radiation source.		
x	x	x	x	x	There is no damage caused by fire, falls or collisions.		
x	x	x	x	x	The weld seams are intact.		
x	x	x	x	x	Lead seals are present and unbroken.		
	x				The locking bolts can be operated.		
x	x	x	x	x	Threaded connections on the source container are secure and all screws are present.		
x	x	x	x	x	Seals are in good condition, sealing surfaces are free of dirt.		
x	x	x	x	x	All components of the anti-theft devices are present and in working order.		
x	x	x	x	x	The source insert and source holder are free from corrosion.		
	x	x			The source holder can be set from ON to OFF.		
		x	x	x	The source container is in the OFF position		
		x	x	x	The lock is attached and closed.		
			x	x	Leak test has been carried out: The source container is sealed.		

A	B	C	D	E	Tests		
				x	The leak test report is no older than 3 months and is included with the delivery documentation.		
				x	The transport index is present.		
				x	The source container is labeled according to international regulations concerning the transportation of dangerous goods (ADR/RID, DGR/IATA).		

Date

Signature

8.1.8 Template for the creation of a logbook

The following information should be stated on the cover sheet:

Logbook for a transport container	
Source container type	
Plant operator, user	
Identification number (nameplate)	
Date of acceptance certificate (initial check before commissioning)	
Manufacturer's details	

The following information should be stated inside the logbook:

- Certificate of suitability
- Acceptance certificate (check before commissioning)
- Handling instructions
- Technical data sheet
- Record of exchanged parts
- Logs of recurrent checks
- Records of miscellaneous incidents

8.2 Maintenance Tasks

A leak test is used to ensure that no ionizing radiation can escape during intended use and that no contamination occurs which could pose a hazard to humans and the environment.

8.2.1 Overview of maintenance tasks



Risk of injury from ionizing radiation.

Ionizing radiation could increase the risk of cancer and the risk of genetic birth defects. Depending on the dose received, ionizing radiation could lead to immediate physical harm, such as nausea, vomiting, hair loss, changes to blood count, serious tissue damage and even death.

- Do **not** open the shutter if the radiation sources are in the source container.

Source container

1. Check source container for cracks, damage and severe corrosion.
 - ↳ - If cracks, damage, or severe corrosion are found on the source container, replace the source container.
 - If cracks, damage, or severe corrosion are found on the cap, replace the cap.
 - Contact the manufacturer.
 - Do not use as Type A packaging.
2. Before installation, clean any dirt from the lifting points on the housing.

Source insert

1. Check the source holder for corrosion.
 - ↳ Do not load if corrosion is present and always contact the manufacturer.
2. Check that the screws are firmly seated.
 - ↳ If screws are loose, tighten.

Source holder

1. In the event of corrosion:
 - ↳ Contact the manufacturer.
2. If you suspect the radiation source is leaking or lost:
 - ↳ - Initiate emergency measures.
 - Inform the radiation safety officer immediately.
 - Contact the manufacturer.

Anti-theft protection

1. Check the lock for correct function and ease of movement.
 - ↳ If malfunctioning or difficult to operate, replace the lock (use the same type).
2. Check the locks for corrosion.
 - ↳ If there is excessive corrosion, replace the locks (use the same type).
3. Inspect all components of the anti-theft protection system for corrosion, damage, and completeness.
 - ↳ Order corroded, missing, or damaged parts as spare parts.

Labeling

- ▶ Check signs for legibility.
 - ↳ Replace signs promptly if they are no longer clearly visible.

Lifting point

- ▶ Check lifting point for corrosion, wear and damage.
 - ↳ If corrosion, wear, damage identified: contact the manufacturer and do not use.

Seals

- ▶ Visual inspection of seals
 - ↳ Replace seals if necessary.
 - o If the reference O-ring is damaged, all seals must be replaced, including those of the source holder.

8.2.2 Leak test

The radiation source must be checked for leaks at regular intervals. The frequency of the leak tests must correspond to the intervals specified by the authorities or handling permit.

 The leak test requires instructed personnel. The radiation safety officer is responsible for compliance with all regulations and for how it is carried out.

See the "Requirements for personnel" section.

WARNING

Risk of serious bodily harm if leak test not carried out.

A leak test is not only required as part of routine checks but must also be performed whenever an incident occurs that may impair the casing around the radiation source. In such cases, the leak test must be arranged by the responsible radiation safety officer, with due consideration to the applicable regulations. The leak test must comprise both the source container and all other affected parts of the process vessel and must be performed as soon as possible after the incident. The leak test procedure described below is intended for the following situations:

- ▶ For routine tests during continuous operation
- ▶ When the source container has been in storage for an extended period
- ▶ When the source container is to be put back into operation after storage
- ▶ If the source container is to be used as a Type A package

Leak test procedure

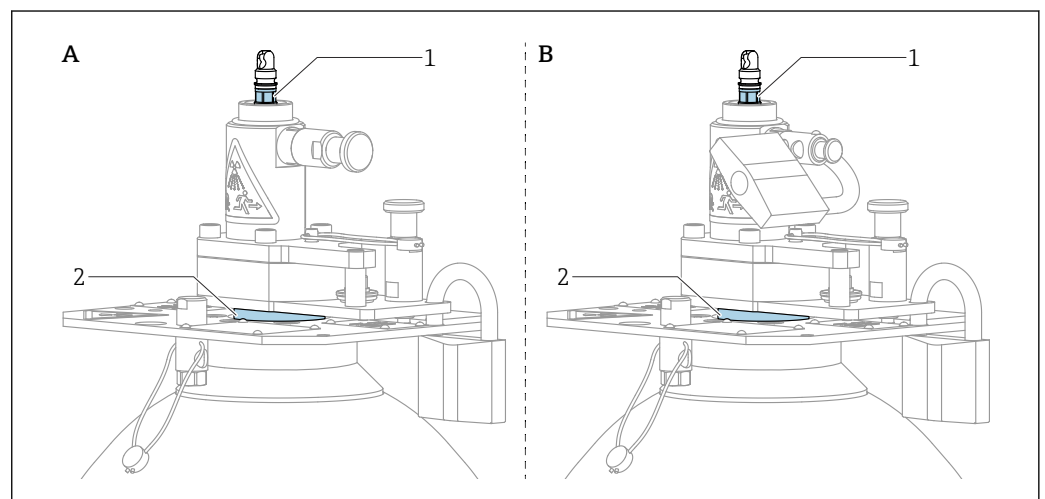
WARNING

Be aware of the risk of possible contamination.

- ▶ Use appropriate personal protective equipment
- ▶ Follow safety measures when putting away the flexible source holder extension

Leak tests must be performed by a person or an organization authorized to provide leak test services, or using a wipe test kit. Wipe test kits must be used according to the manufacturer's instructions. Records of the test results must be stored.

Perform the following leak test procedure unless otherwise instructed:



 34 Alternative test areas for leak test

A Feature 020, option B

B Feature 020, option C

1. The source container must be in the "AUS/OFF" position.

Wipe along the annular gap junction (1)/(2) in accordance with the diagram.

2. Have the samples analyzed by an authorized organization. A radiation source is considered to be leaking if more than 185 Bq (5 nCi) 185 Bq (5 nCi) is detected in the leak test sample.

 This limit value applies to the USA. National regulations may specify other limit values.

⚠ WARNING

The radiation source capsule is potentially leaking

- ▶ Inform the radiation safety officer immediately and follow his instructions.
- ▶ Take appropriate measures to prevent a potential spread of radioactive contamination from the radiation source. Secure the radiation source.
- ▶ Inform the responsible authority immediately that a leaking radiation source has been detected.
- ▶ Observe national requirements

8.2.3 Cleaning

⚠ WARNING

Risk of injury from ionizing radiation when cleaning a loaded source container.

Ionizing radiation can increase the risk of cancer and genetic defects in offspring. Depending on the radiation dose, ionizing radiation can cause immediate physical harm such as nausea, vomiting, hair loss, changes in blood composition, and severe tissue damage that may lead to death.

- ▶ Do not open the shutter when the source container is loaded.
- ▶ Do not remain in the area of radiation emission.

Measures: Clean the source container at regular intervals.

1. Clean the source container to remove any substances that could affect its safety function.
2. Remove dirt, especially from sealing surfaces.
3. Keep labeling in a legible condition.
4. Clean labels with a damp cloth.

8.2.4 Routine tests of the shutter mechanism

Source containers with manual ON/OFF switching mechanism

1. Switch off the source container, see the "Commissioning/Switching off the radiation" section.
2. Move the source holder several times from ON to OFF and from OFF to ON as described in the "Operation" section. It should be possible to move the source holder easily and there should be no visible signs of corrosion:
 - If it is not possible to move the source holder from ON to OFF, follow the instructions in the "What to do in an emergency" section (emergency action).
 - If it is hard to move the source holder or if there are other signs of a malfunction, the source holder must be secured in the "OFF" position and the competent radiation safety officer notified.
 - In the event of corrosion, follow the instructions in the section "Maintenance and inspection" (measures in the event of corrosion).

8.2.5 Measures in case of corrosion

If there are clear signs of corrosion at the source container, the local dose rate around the device must be measured. If the value is significantly above the normal operation levels, cordon off the area and notify the radiation safety officer responsible.

CAUTION

What to do if the source container is damaged

- ▶ Corroded source containers must be replaced immediately.
- ▶ Replace damaged padlock.

8.3 Measuring and test equipment

 Comply with national regulations!

Dosimeter to check the controlled area

8.4 Repair services

Endress+Hauser offers a wide range of services.

 Your Endress+Hauser Sales Center can provide detailed information on the services.

9 Repair

 Repair work requires the qualification "Authorized repair personnel".
See the "Requirements for personnel" section.

9.1 General information

Repairing the source container

- Observe national legislation.
- Verify whether the repair is allowed under the relevant handling permit.
- Take all local conditions into account.
- Crucial factors for avoiding harmful radiation effects are distance, shielding and exposure time. For further information, see the "General instructions on radiation protection" section.
- Repair is only permitted in the "AUS/OFF" switch position, secured by the transport lock.
- Take the weight of the source container without pallet into consideration:
 - Source Container FQG63 (incl. turnable source holder, without adapter flange): max. 87 kg (191.84 lb)
 - Source Container FQG63 (incl. turnable source holder, without adapter flange), fire-proof version: max. 88 kg (194.04 lb)
- For more information on service and spare parts, contact Endress+Hauser Service:
www.endress.com/worldwide.

9.2 Spare parts

Product spare parts that are currently available can be found online at:
www.endress.com/onlinetools

9.3 Repair services

Endress+Hauser offers a wide range of services.



Your Endress+Hauser Sales Center can provide detailed information on the services.

9.4 Return

9.4.1 Federal Republic of Germany

Contact the responsible Endress+Hauser sales center to organize a return for the purpose of testing for reuse or recycling by Endress+Hauser.

9.4.2 Other countries

Contact the responsible Endress+Hauser sales center or appropriate authority to find a way of returning the device within your country, if possible. If it is not possible to return the device in your country, the next steps to be taken must be agreed with the Endress+Hauser sales center/representative concerned. The destination airport for potential returns is Frankfurt, Germany (FRA).

9.4.3 Conditions

The following conditions must be met before returning the device:

- An inspection certificate no more than three months old and confirming the leak-tightness of the radiation source must be submitted to Endress+Hauser (wipe test certificate). The wipe test can be performed on the radiation source itself or on alternative test areas as described in the "Maintenance tasks" section.
- The serial number of the radiation source, the type of isotope (cobalt-60 or cesium-137), the nominal activity and the date of manufacture of the radiation source as per the radiation source certificate must be provided. This data is listed in the documents supplied with the radiation source.
- The source container must not show any signs of severe corrosion that could jeopardize the safe storage of the radiation sources.
- The source container must not show signs of serious mechanical damage from fire, falls, or collisions.
- The "EIN/ON" and "AUS/OFF" mechanism must be in correct working order, as described in the "Operation" section.
- The source container must be secured in the "AUS/OFF" position by means of a transport lock.
- If there are any doubts about the integrity of the source container, the radiation source must be returned in a separate Type A transportation cask. Contact the responsible Endress+Hauser sales office for this purpose.
- The aforementioned checks must be confirmed in an inspection report. The inspection report must be enclosed when returning the product.
- The transport index must be determined according to IAEA Safety Standards No. SSR-6 (<https://www.iaea.org/publications/12288/regulations-for-the-safe-transport-of-radioactive-material>) or equivalent national standards. The source container and any overpack must be labeled accordingly.
- The leak test certificate, the manufacturer's certificate for the radiation source and the completed pre-return inspection report must be sent to Endress+Hauser before returning the device.



Following successful inspection, Source Container FQG6x is suitable for shipment as a Type A package. However, the Type A labeling on the source container itself is no longer valid for any subsequent device returns. Before the source container is returned, it must be relabeled according to international regulations concerning the transportation of hazardous materials (ADR/RID, DGR/IATA).

9.4.4 Inspection before return

Company	
Name	
Address	
Name of inspector and role	

Source container	FQG _ - _____
------------------	---------------

Radiation source	
Isotope	☐ ^{137}Cs ☐ ^{60}Co
Serial number of the radiation source	
Nominal activity (MBq/GBq)	
Date of manufacture	

Tests	Result	
	☒	☒
Wipe test report, not older than three months, enclosed with the return delivery documents		
Leak test including test report, not older than three months, enclosed with the return delivery documents		
A copy of the manufacturer's certificate for the radiation source is enclosed with the return delivery documents		
No significant corrosion on the source container that could jeopardize the safe storage of the radiation source		
No signs of serious damage on the source container from fire, falls or collisions		
Visual inspection: Weld seams intact?		
"EIN/ON" and "AUS/OFF" mechanism works according to the Operating Instructions		
Is the source container secured with a lock in the "AUS/OFF" position and can the lock be operated?		
Is the transportation lock fitted?		
The transport index has been determined		
The source container is labeled according to international regulations concerning the transportation of hazardous materials (ADR/RID, DGR/IATA)		

Date

Signature

9.5 Source container disposal

Observe the following notes during disposal:

- ▶ Observe national regulations.
- ▶ Comply with national regulations governing the disposal of radioactive radiation sources.
- ▶ Comply with national regulations governing the disposal of lead. The source container contains more than 0.1% lead with CAS no. 7439-92-1.
- ▶ Ensure proper separation and reuse of the device components.

10 What to do in an emergency

The procedure described here for what to do in an emergency must be initiated immediately for the safety of persons and the environment.

The procedure is designed to safeguard persons affected until the arrival of the responsible radiation safety officer who will then instruct further measures.

The custodian of the radioactive sources (i.e. the person appointed and authorized by the customer) is responsible for observing this procedure.

10.1 Radiation source no longer at the intended location

10.1.1 Description of the emergency

- Radiation source no longer present in the source container
- Radiation source no longer present in the process application with the measuring system switched on
- Radiation source not present in the source container with the measuring system switched off

10.1.2 How to identify the emergency

In the following cases, a loss of the radiation source can be assumed:

- **No** measured value even though the measuring system is switched on
- Measured value even though the measuring system is **switched off**
- Suspicion of theft: Damaged security seals or missing locks suggest unauthorized tampering with the source container

10.1.3 Immediate measures

1. Leave the affected area immediately.
2. Make sure that no persons enter the suspected danger zone.
3. Notify the radiation safety officer.
4. Set up an extensive cordon around the suspected danger zone (e.g. with yellow marking tape or rope). For the cordon, also take into consideration the areas above and below the danger zone.
5. Mark the affected area with the international radiation warning symbol.
6. As soon as it becomes possible to measure radiation levels, determine the extent of the danger zone by carrying out a radiation measurement.

 Crucial factors for avoiding harmful radiation effects are distance, shielding and exposure time. For further information, see the "General instructions on radiation protection" section.

10.1.4 Further measures

- In case of theft: Notify the authorities and police
- If suspected loss inside protection pipe:
 - Prevent access to the tank
 - Check for contamination
 - Check the integrity of the protection pipe
 - Contact Endress+Hauser

10.2 Source container or ionizing radiation cannot be switched off

10.2.1 Description of the emergency

Radiation cannot be switched off due to mechanical damage.

10.2.2 How to identify the emergency

- Shutter cannot be moved into the "OFF/AUS" position
- Rope cannot be retracted (jammed)
- Shutter cannot be closed

 If the closing mechanism can be moved but radiation is still present, radioactive contamination should be suspected.

10.2.3 Emergency action

1. Leave the radiation source in the process or return it swiftly into the process.

In all cases:

2. Notify the radiation safety officer.
3. Notify the person responsible for the process.

 Crucial factors for avoiding harmful radiation effects are distance, shielding and exposure time. For further information, see the "General instructions on radiation protection" section.

10.2.4 Further measures

Shutter cannot be moved into the "OFF/AUS" position:

- Remove the source container and aim the beam exit channel preferably toward a process container suitable for shielding or, alternatively, toward a very thick wall or floor.
- Agree on how to proceed with the radiation safety officer and Endress+Hauser

10.3 Source container damaged

10.3.1 Description of the emergency

- Source container has been damaged, e.g. by fire or fall, leading to possible increased radiation exposure
- Shielding performance could be affected by the damage

10.3.2 How to identify the emergency

- External damage such as deformation or cracks
- External discoloration caused by fire
- Constituent parts of the source container broken off or deformed

10.3.3 Immediate measures

1. Leave the area around the source container immediately.
2. Make sure that no persons enter the suspected danger zone.
3. Notify the radiation safety officer.
4. Mark the affected area with the international radiation warning symbol.
5. As soon as it becomes possible to measure radiation levels, determine the extent of the danger zone by carrying out a radiation measurement.

 Crucial factors for avoiding harmful radiation effects are distance, shielding and exposure time. For further information, see the "General instructions on radiation protection" section.

Carry out a leak test in the form of a wipe test.

10.3.4 Further measures

- Act appropriately in accordance with radiation measurement
- Exchange defective parts in all cases

10.4 Contamination detected

10.4.1 Description of the emergency

- Damage to the radiation source could lead to contamination
- For all events that could have caused damage to the radiation source, contamination should be suspected
- Contamination is suspected if beta radiation also detected at the point of use in addition to gamma radiation

10.4.2 How to identify the emergency

Leak test revealed leakage.

Example: Leak test in the form of a wipe test is positive.

10.4.3 Immediate measures

1. Leave the affected area immediately.
2. Persons in the affected area should be suspected of having been contaminated. Initiate protective measures for affected persons. Take appropriate measures to avoid spreading the contamination.
3. Make sure that no persons enter the suspected danger zone.
4. Notify the radiation safety officer.
5. Set up an extensive cordon around the suspected danger zone (e.g. with yellow marking tape or rope). For the cordon, also take into consideration the areas above and below the danger zone.
6. Mark the affected area with the international radiation warning symbol.
7. As soon as it becomes possible to measure radiation levels, determine the extent of the danger zone by carrying out a radiation measurement.
8. Immediately forward all required information to the local and national authorities.

10.4.4 Further measures

Report the incident to Endress+Hauser.

10.5 Notifying the responsible authorities and Endress+Hauser

Incidents are generally subject to mandatory reporting.

1. Forward all required notifications to the responsible local and national authorities.
 2. The responsible radiation safety officer, together with the local authority, implements suitable remedial measures for the problem concerned.
 3. Forward all incidents to Endress+Hauser to ensure information feedback.
-  National regulations may require other procedures and reporting obligations. Endress+Hauser assists with any questions and provides technical guidance.

11 Accessories

Accessories currently available for the product can be selected via the Product Configurator at www.endress.com:

1. Select the product using the filters and search field.
2. Open the product page.
3. Select **Spare parts & Accessories**.

12 Technical data

 For additional technical data, see "Technical Information" for Source Container FQG63"



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