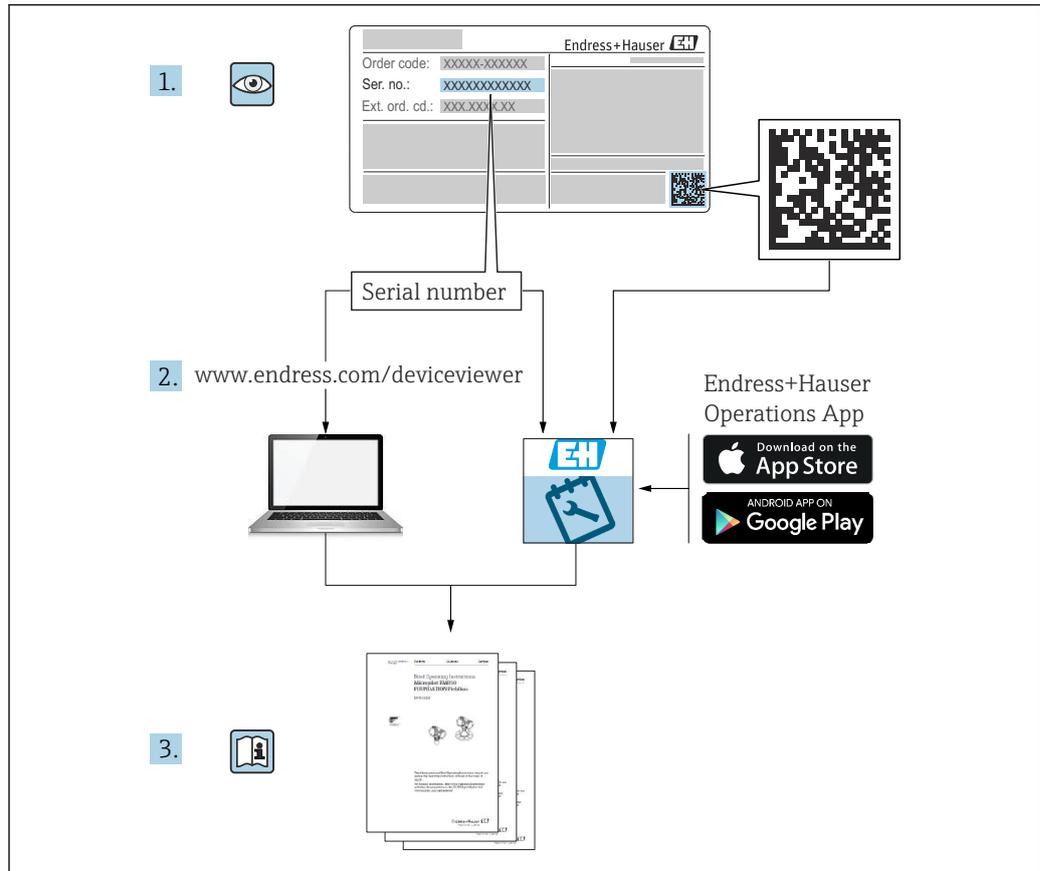


Operating Instructions

Source container FQG61, FQG62

Radiometric level and density measurement
Source container with source holder for manual or
pneumatic activation and deactivation





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

DANGER

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

WARNING

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

CAUTION

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

NOTICE

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 ISO21482

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 ISO21482.

1.2.3 Symbols for certain types of information and graphics

Radiation symbol

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, 3, ...

Item numbers

A, B, C, ...

Views

Safety instructions

Observe the safety instructions contained in the associated Operating Instructions

1.2.4 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 instructions

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.

In this manual, warnings about potential risks from ionizing radiation are marked with the warning symbol .

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.

2.1 Requirements for 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 containers shield the radiation from the environment, only allowing radiation to escape during measurement operations within the measuring application.

The source containers described in this document contain the radioactive radiation sources used for radiometric point level, level and density 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 measuring application
- 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

Endress+Hauser assumes no liability for damage resulting from improper 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 container with an open shutter
- Use with insufficient protection of the radiation sources against corrosion

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.

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 been carried out.

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.
- ▶ Adapt checking intervals to environmental conditions. Check more frequently in harsh and corrosive environments.

Modification

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 this operating instructions manual 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.
- 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

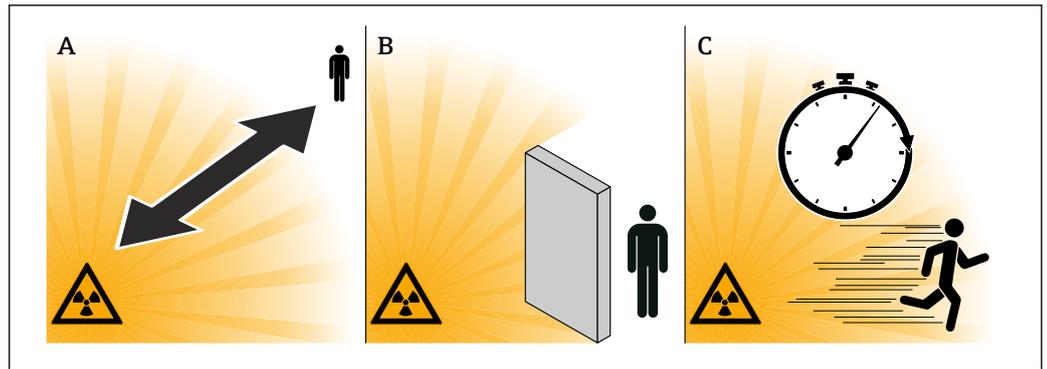
1. Always secure the "AUS/OFF" switch position using a padlock.
2. Carry out recurrent tests before dispatch.
3. Observe the center of gravity and weight information on the packaging.

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:

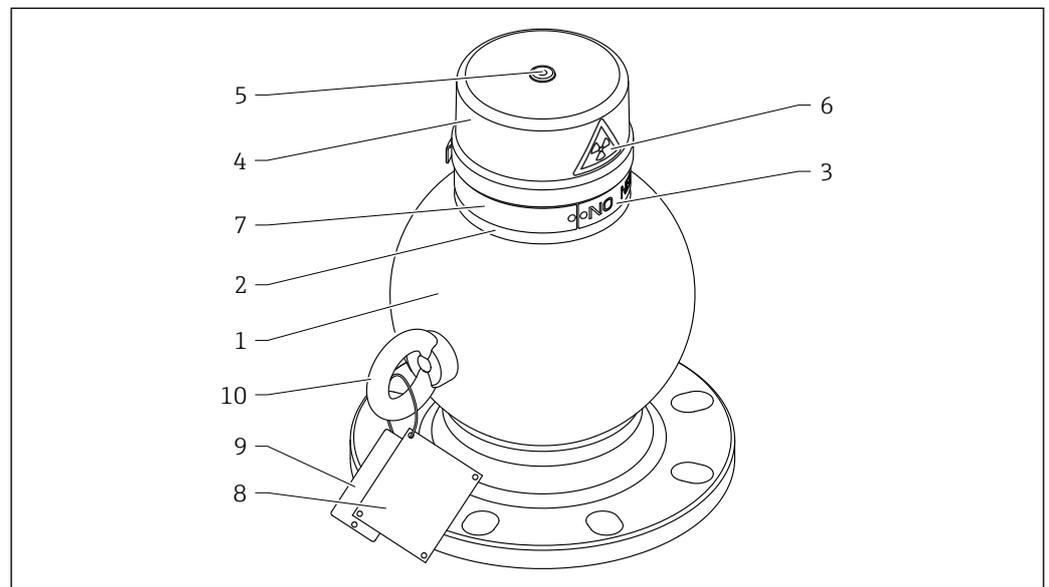
- The source container is used to safely set up a measuring point based on a radiometric measurement. The source container shields the surrounding area from radiation and facilitates measurement in accordance with the measuring point design.
- The source container also serves as a transport container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

3.1 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.

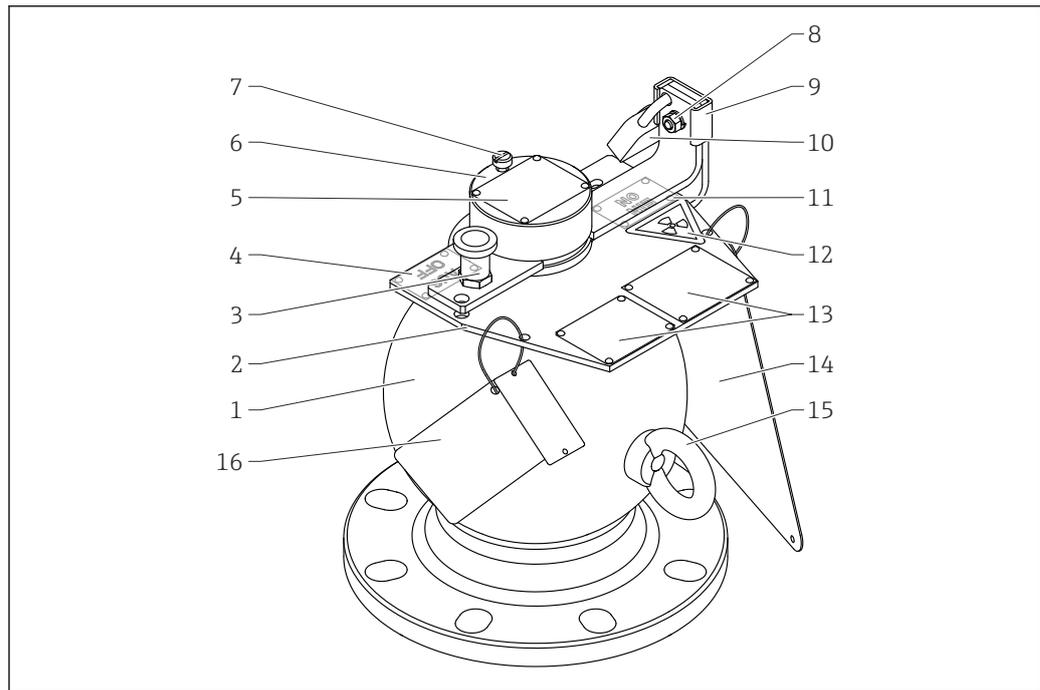
3.1.1 FQG61/FQG62; feature 020, option A



A0018393

- 1 Housing
- 2 Housing ring
- 3 Nameplate
- 4 Cover
- 5 Screw/groove pin
- 6 Warning sign
- 7 Nameplate for radiation source
- 8 Tag
- 9 Tag
- 10 Eyelet

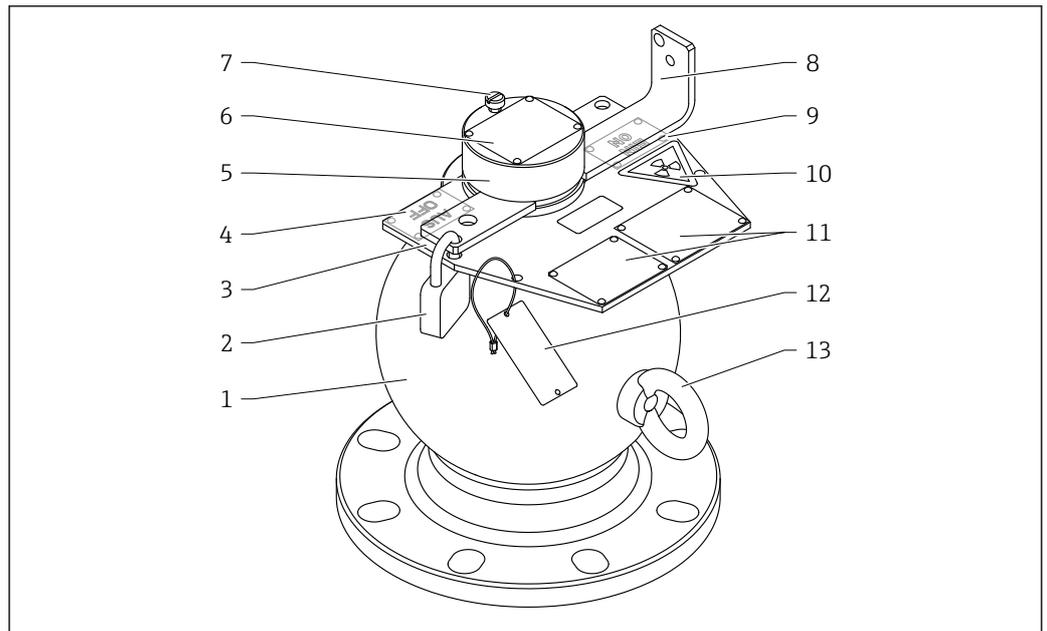
3.1.2 FQG61/FQG62; feature 020, option B



A0018394

- 1 Housing
- 2 Indication plate
- 3 Locking bolt
- 4 "AUS/OFF" sign
- 5 "Radiation source" nameplate
- 6 Rotary element
- 7 Fixing screw
- 8 Screw for removal guard
- 9 Bracket
- 10 Padlock: Lock body/Shackle
- 11 "EIN/ON" sign
- 12 "CAUTION!" warning sign
- 13 Additional national sign/"Source container" nameplate
- 14 "Caution radiation" sign
- 15 Eyelet
- 16 Tag plate [optional additional sign for country-specific approvals]

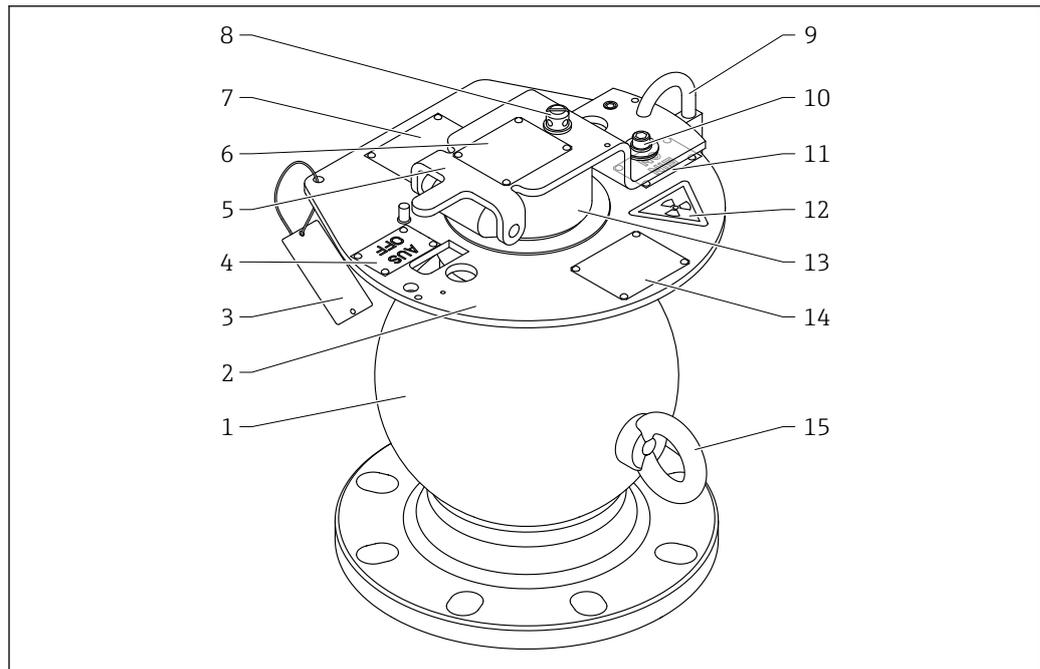
3.1.3 FQG61/FQG62; feature 020, option C



A0018395

- 1 Housing
- 2 Padlock: Lock body/Shackle
- 3 Indication plate
- 4 "AUS/OFF" sign
- 5 Rotary element
- 6 "Radiation source" nameplate
- 7 Screw, fastener for density measurement [optional]
- 8 Swivel bracket
- 9 "EIN/ON" sign
- 10 "CAUTION!" warning sign
- 11 Additional national sign/"Source container" nameplate
- 12 Tag plate [optional additional sign for country-specific approvals]
- 13 Eyelet

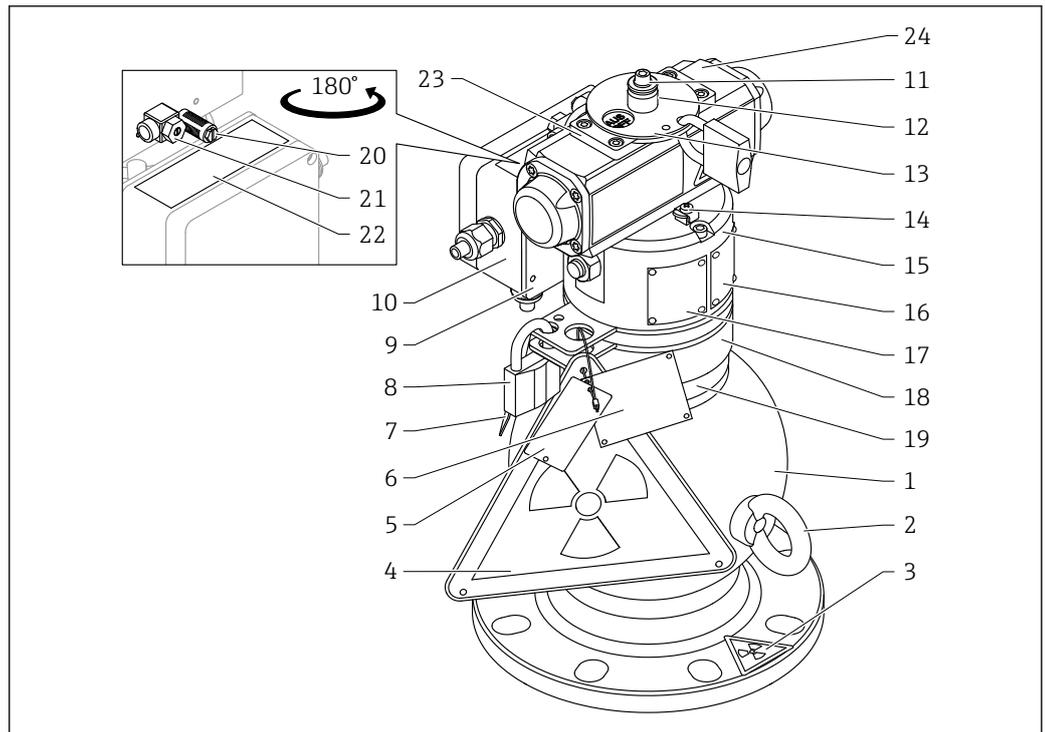
3.1.4 FQG61/FQG62; feature 020, option D



A0018396

- 1 Housing
- 2 Indication plate
- 3 Tag
- 4 "AUS/OFF" sign
- 5 Swivel bracket
- 6 "Radiation source" nameplate
- 7 Additional national sign
- 8 Fixing
- 9 Padlock: Lock body/Shackle
- 10 Reference O-ring
- 11 "EIN/ON" sign
- 12 "CAUTION!" warning sign
- 13 Rotary element
- 14 "Source container" nameplate
- 15 Eyelet

3.1.5 FQG61/FQG62; feature 020, option K, L, M or N



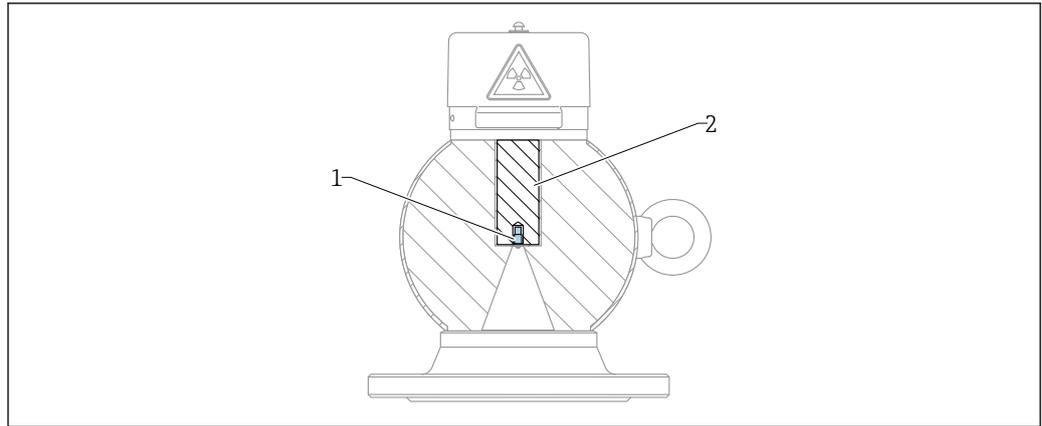
A0018397

- 1 Housing
- 2 Eyelet
- 3 "CAUTION! Radioactive" warning sign
- 4 "Caution radiation" sign
- 5 / 6 Tag plate [optional additional sign for country-specific approvals]
- 7 "Radioactive material" sign
- 8 Padlock
- 9 Securing plate
- 10 Terminal housing
- 11 Reference O-ring
- 12 Sleeve
- 13 Disk
- 14 Ground terminal
- 15 Cover
- 16 "Australia" nameplate
- 17 "Source container" nameplate
- 18 Adapter disk
- 19 "Radiation source" nameplate
- 20 Muffler G1/8
- 21 Check valve G1/8
- 22 Terminal housing nameplate (non Ex/Ex)
- 23 Indication plate
- 24 Pneumatic drive

3.2 Radiation sources



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



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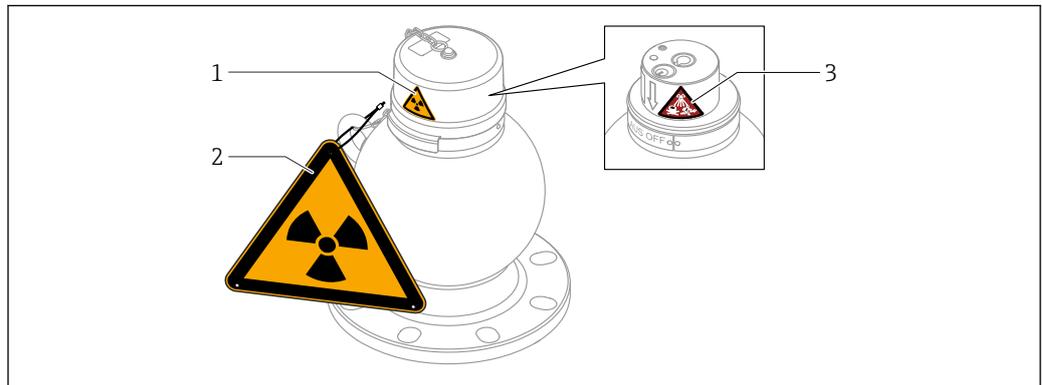
 2 Position of the source holder and radiation source in the source container

- 1 Radiation source
- 2 Source holder

3.3 Radiation warning signs

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

3.3.1 FQG61/FQG62; feature 020, option A

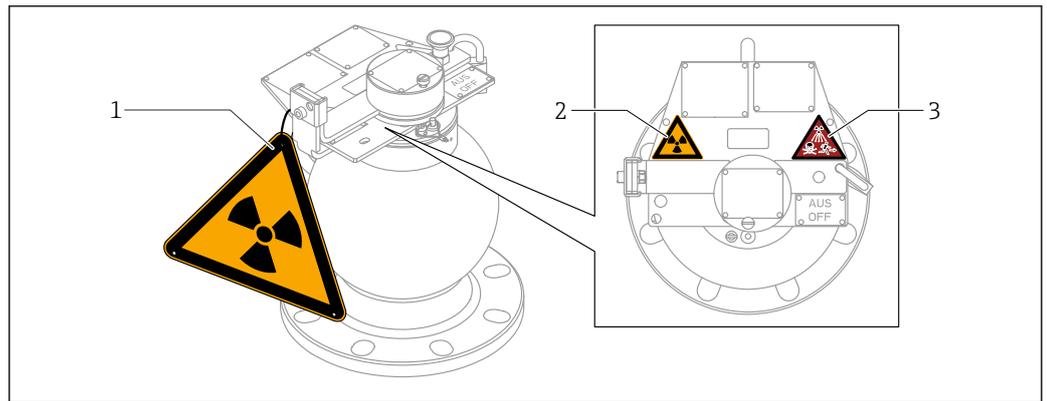


A0059657

 3 Position of radiation warning signs

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

3.3.2 FQG61/FQG62; feature 020, option B

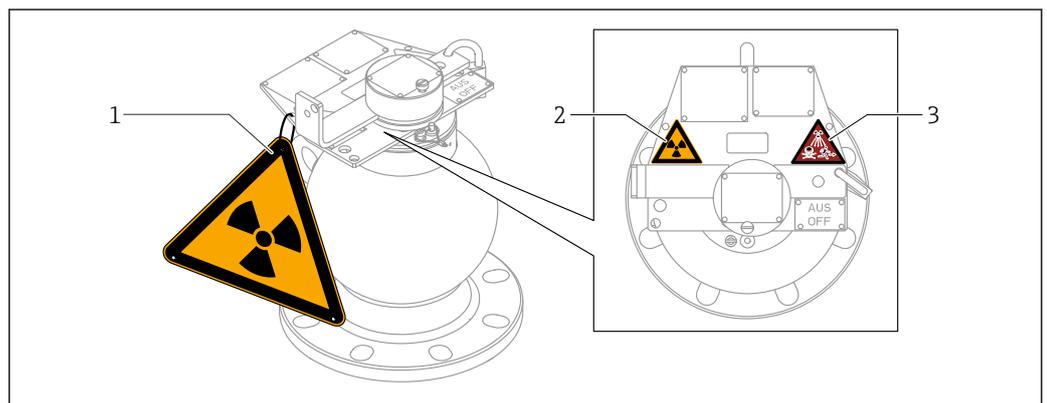


A0059658

4 Position of 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

3.3.3 FQG61/FQG62; feature 020, option C

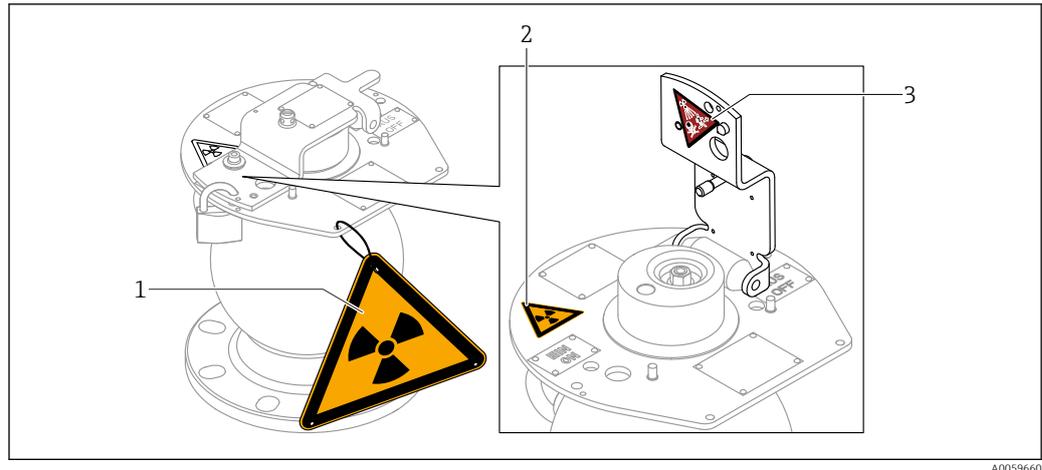


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5 Position of radiation warning signs

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

3.3.4 FQG61/FQG62; feature 020, option D



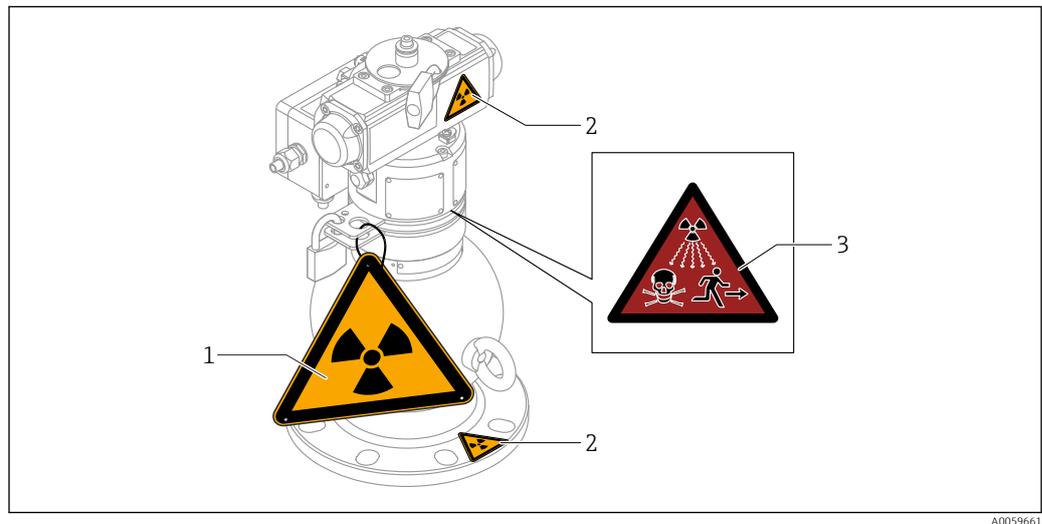
6 Position of radiation warning signs

1 "Caution – Radiation" stainless steel warning sign

2 "Radioactive" stick-on label

3 "Highly radioactive" stick-on label, only for highly radioactive radiation sources (concealed under the swivel bracket)

3.3.5 FQG61/FQG62; feature 020, option K, L, M or N



7 Position of radiation warning signs

1 "Caution – Radiation" stainless steel warning sign

2 "Radioactive" stick-on label

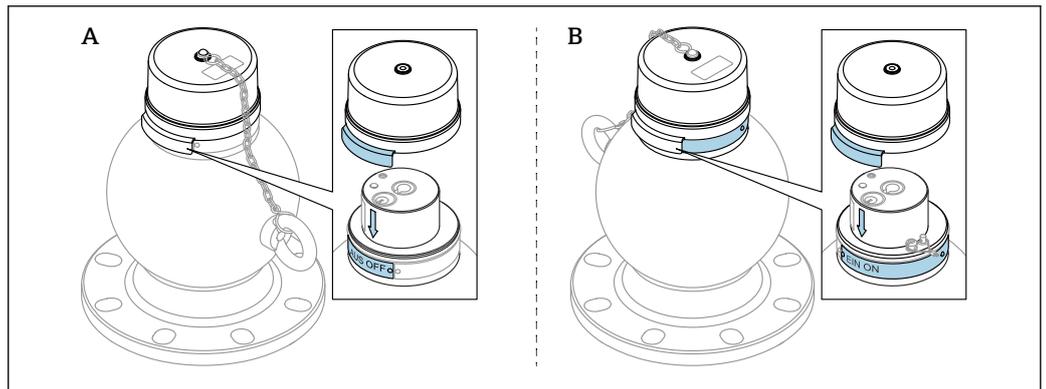
3 "Highly radioactive" stick-on label, only for highly radioactive radiation sources (concealed under the pneumatic drive)

3.4 Anti-theft and tamper protection

The lock prevents unauthorized tampering with the source container and unauthorized removal of the radiation source.

i **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.

3.4.1 FQG61/FQG62; feature 020, option A

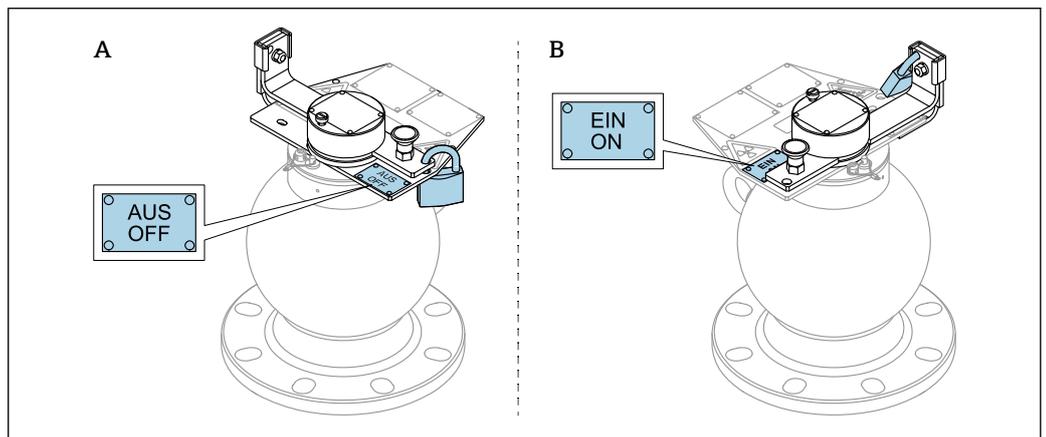


A0059604

8 Position of the lock

- A Source container switched off
- B Source container switched on

3.4.2 FQG61/FQG62; feature 020, option B

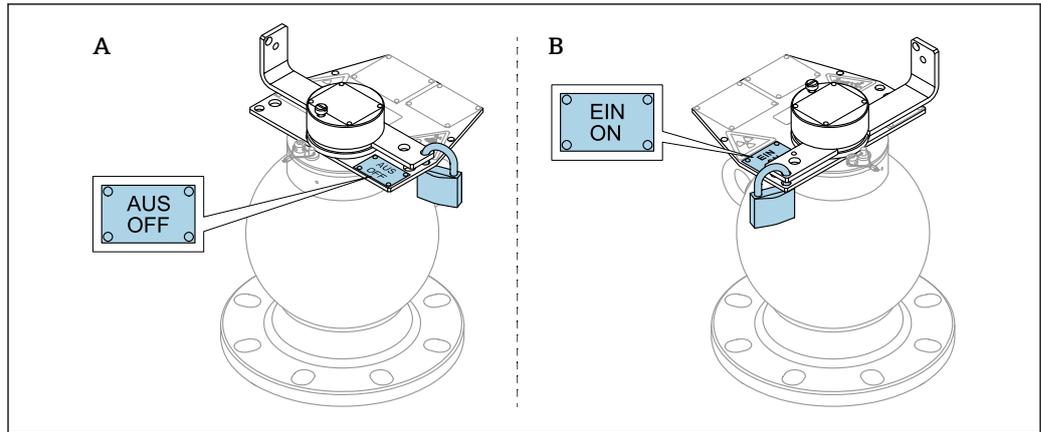


A0059605

9 Position of the lock

- A Source container switched off
- B Source container switched on

3.4.3 FQG61/FQG62; feature 020, option C

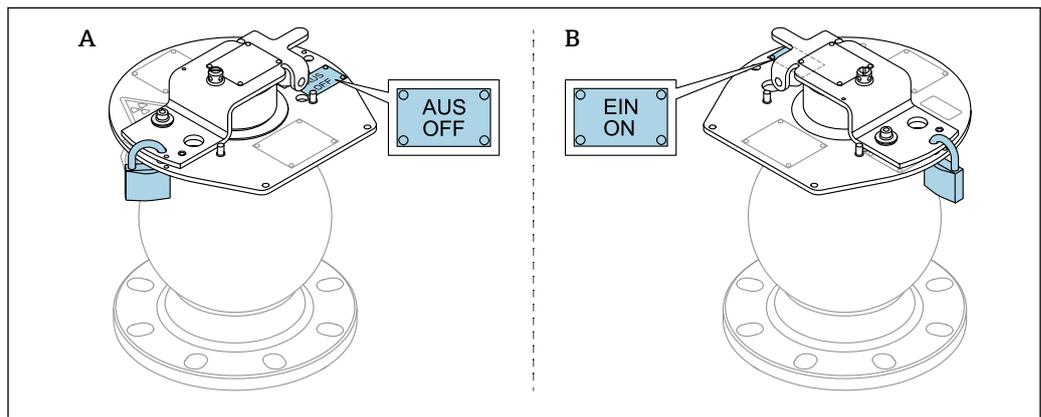


A0059606

10 Position of the lock

- A Source container switched off
- B Source container switched on

3.4.4 FQG61/FQG62; feature 020, option D

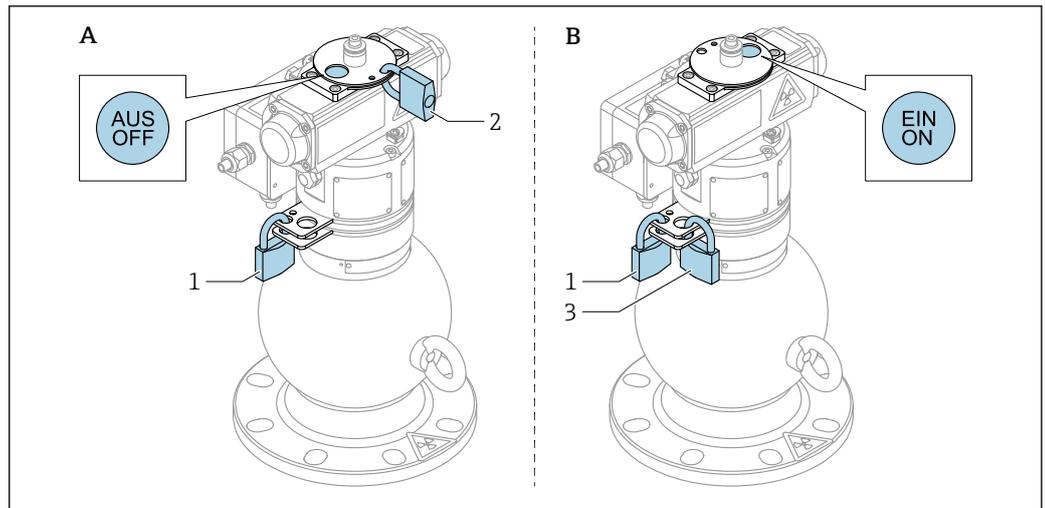


A0059607

11 Position of the lock

- A Source container switched off
- B Source container switched on

3.4.5 FQG61/FQG62; feature 020, option K, L, M or N



A0059665

12 Position of the lock

A Source container switched off

B Source container switched on

1 Lock (radiation source removal guard)

2 Lock (switch-on protection)

3 Lock (switch-on protection, parking position)

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.

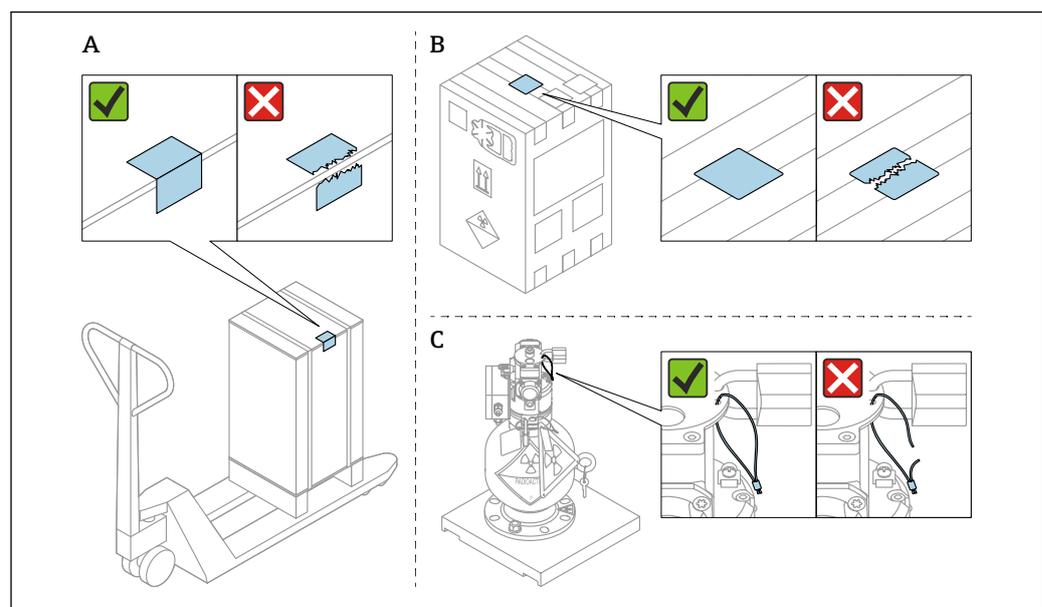
Legal consequences and dangers from errors in the handling of radiation sources.

- ▶ 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, the radiation safety officer must be informed immediately. The radiation safety officer will determine the further course of action.

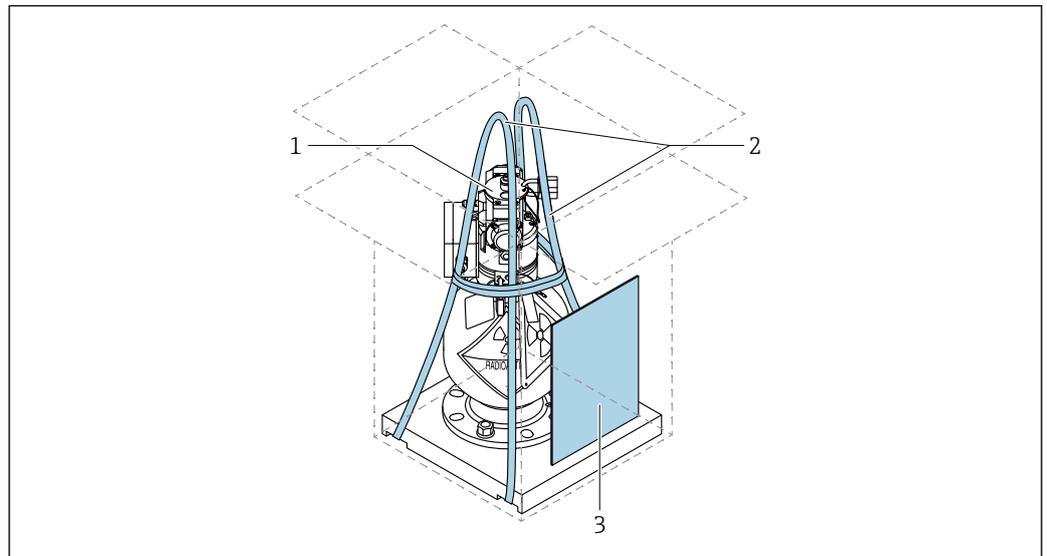


A0059736

13 Position of protective seal and lead seal

- A Protective seal on overpack
- B Protective seal on source container
- C Lead seal

Scope of delivery



A0059737

14 Constituent parts

- 1 Source container
- 2 Carrying straps / lifting points
- 3 Document folder (acceptance certificate, final inspection report, optional: wipe test report), Operating Instructions

4.1.2 Required tool(s)

Open-ended wrench AF24

4.1.3 Unpacking

⚠ 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

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

Overpack not fitted to the crane correctly, leading to possible falling of the overpack.

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

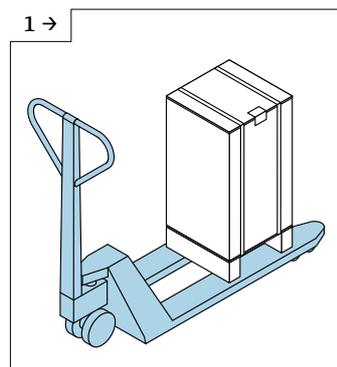
- ▶ Wear protective equipment.
- ▶ Observe the installation instructions.

⚠ CAUTION

Risk of injury from the heavy weight of the overpack.

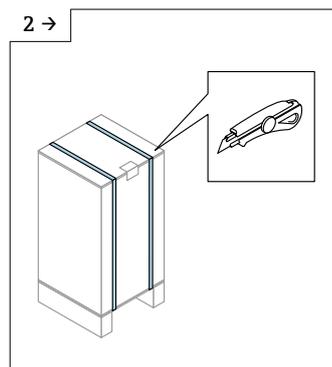
This could result in back injuries during heavy lifting.

- ▶ 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.



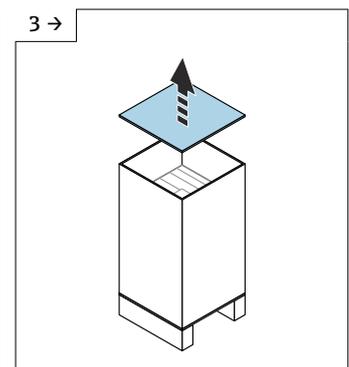
A0059738

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



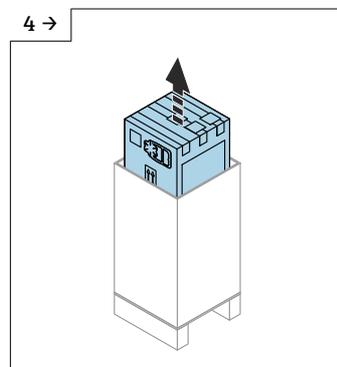
A0059739

- ▶ Remove the straps.
- ▶ **⚠ CAUTION: SHARP EDGES!** Follow the safety instructions at the start of this section.



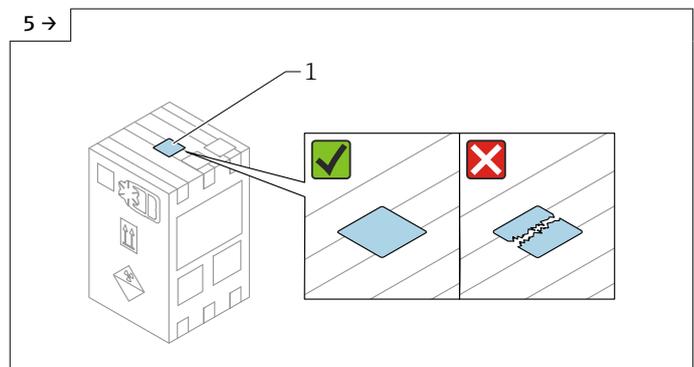
A0059740

- ▶ Remove the crate lid.



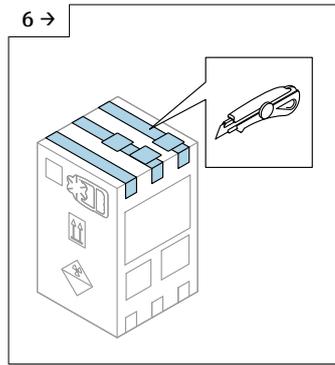
A0059741

- ▶ Remove package.



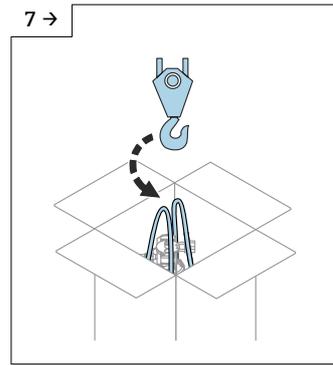
A0059742

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



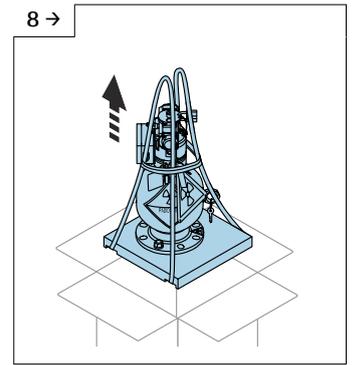
A0059743

▶ Open the package.



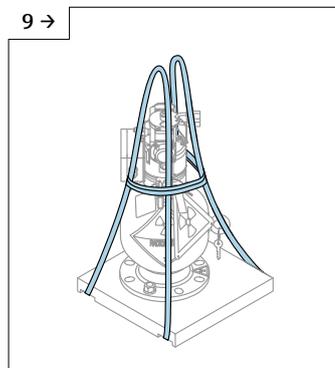
A0059744

▶ **⚠ CAUTION: RISK OF INJURY FROM HEAVY WEIGHT!** Follow the safety instructions at the start of this section.
▶ Attach the fastening hooks of a suitable lifting tool to the carrying straps.



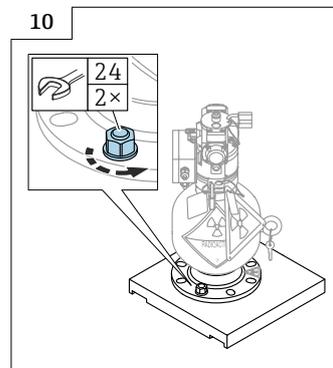
A0059745

▶ Lift the source container out of the packaging using the lifting tool.



A0059746

▶ Place the source container down on a suitable, level surface.

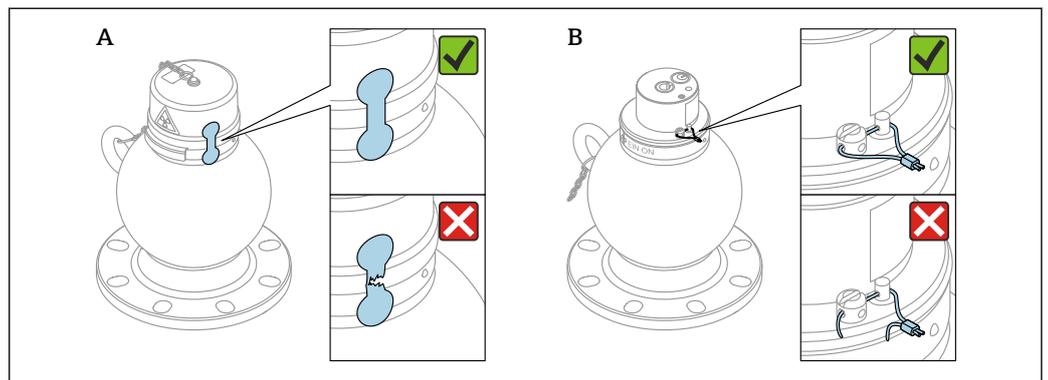


A0059747

▶ Release the screws to release the source container from the base plate.

Check the protective seal on the source container

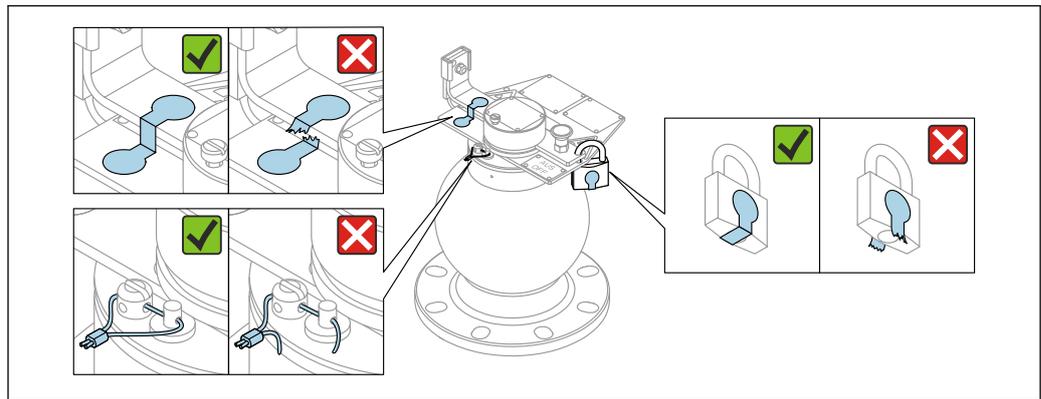
FQG61/FQG62; feature 020, option A



A0059890

1. Check the protective seal or lead seal on the source container.
2. The protective seal or lead seal must not be broken.
3. **i** If the protective seal or lead seal has been cut, notify the radiation safety officer immediately. The radiation safety officer will determine the further course of action.

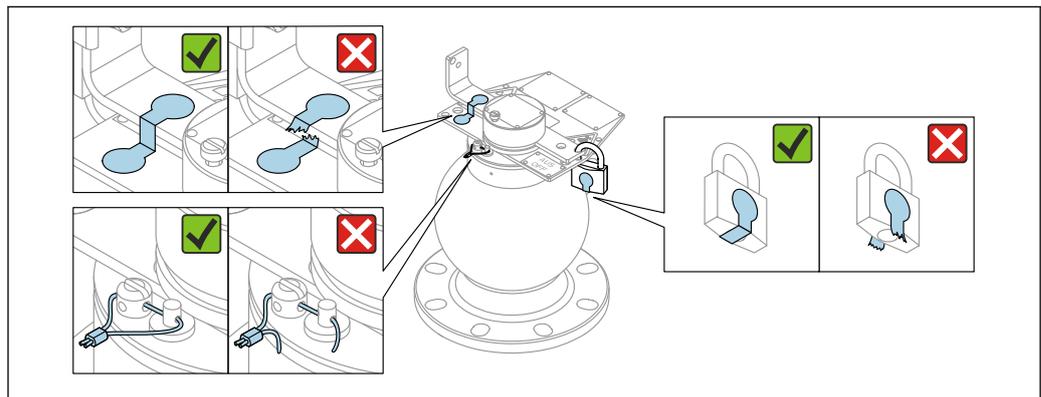
FQG61/FQG62; feature 020, option B



A0059891

1. Check the protective seal or lead seal on the source container.
2. The protective seal or lead seal must not be broken.
3. **i** If the protective seal or lead seal has been cut, notify the radiation safety officer immediately. The radiation safety officer will determine the further course of action.

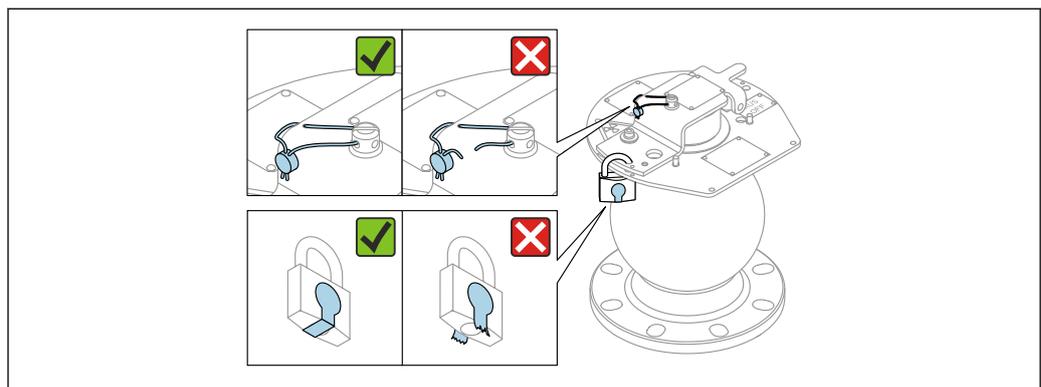
FQG61/FQG62; feature 020, option C



A0059892

1. Check the protective seal or lead seal on the source container.
2. The protective seal or lead seal must not be broken.
3. **i** If the protective seal or lead seal has been cut, notify the radiation safety officer immediately. The radiation safety officer will determine the further course of action.

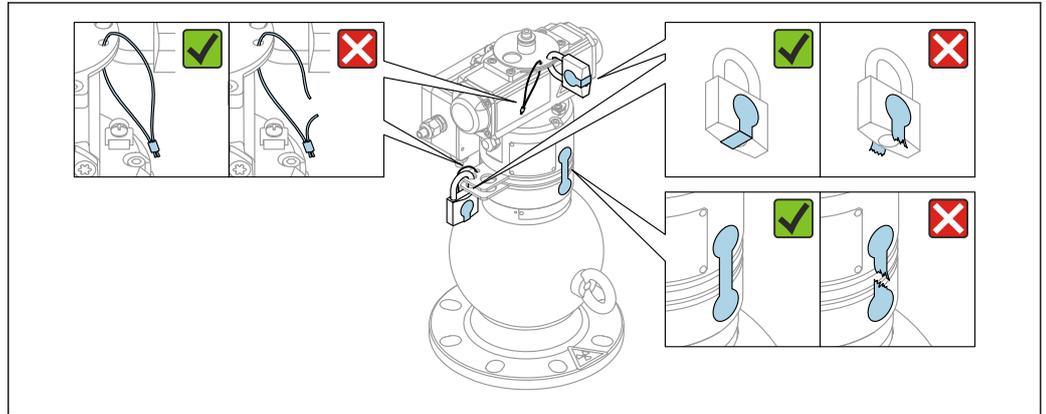
FQG61/FQG62; feature 020, option D



A0059749

1. Check the protective seal or lead seal on the source container.
2. The protective seal or lead seal must not be broken.
3. **i** If the protective seal or lead seal has been cut, notify the radiation safety officer immediately. The radiation safety officer will determine the further course of action.

FQG61/FQG62; feature 020, option K, L, M or N



1. Check the protective seal or lead seal on the source container.
2. The protective seal or lead seal must not be broken.
3. **i** If the protective seal or lead seal has been cut, notify the radiation safety officer immediately. The radiation safety officer will determine the further course of action.

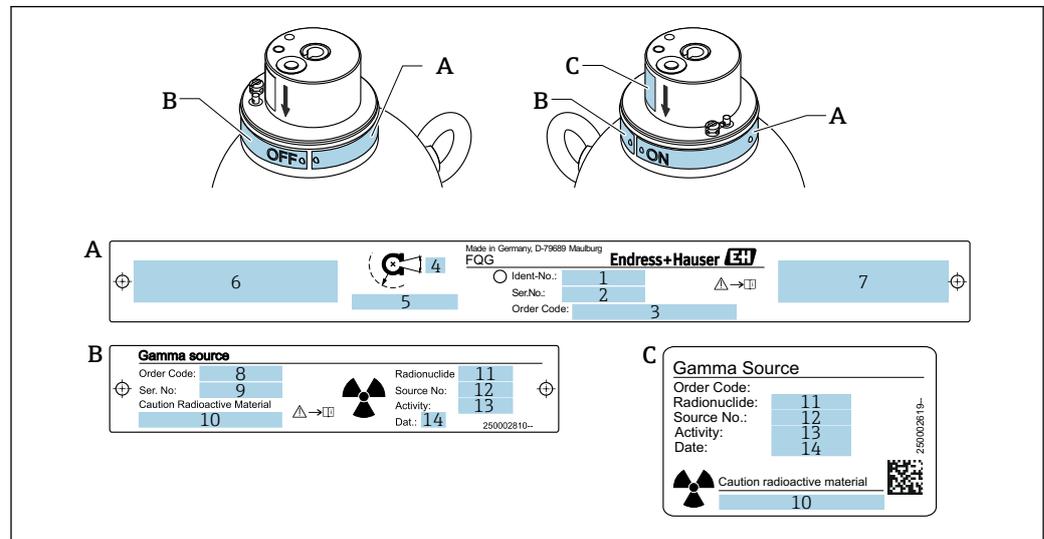
4.2 Product identification

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 Nameplates

FQG61/FQG62; feature 020, option A



A0018398

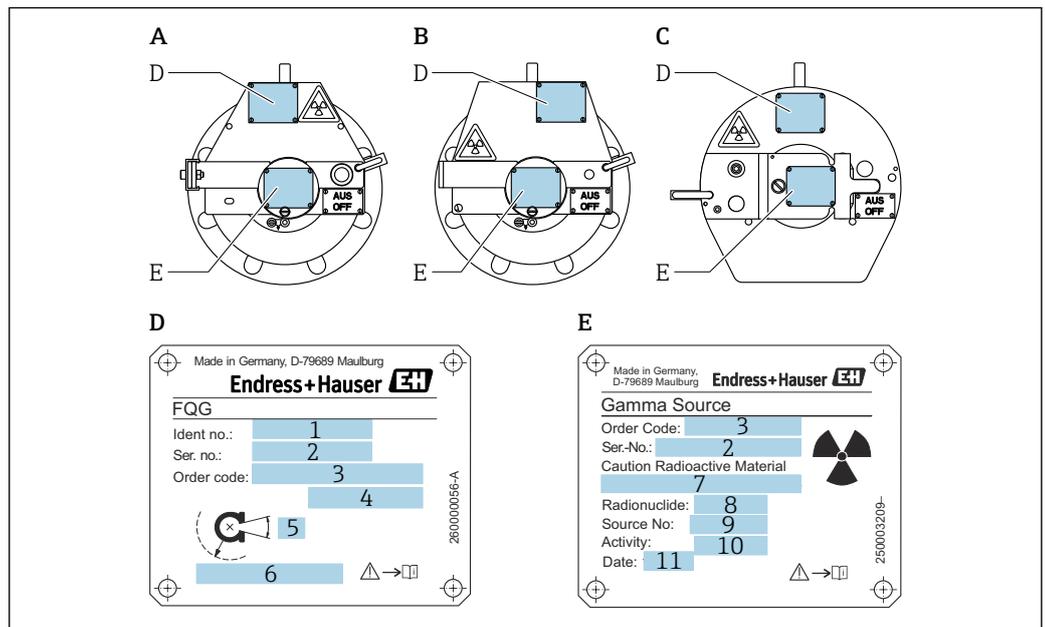
- A Nameplate of source container
- B Nameplate of the radiation source
- C Additional nameplate of radiation source
- 1 ID number of source container
- 2 Serial number of source container
- 3 Order code of source container according to product structure
- 4 Beam exit angle
- 5 Local dose rate at a defined distance from the surface (when switched off, outside the path of the beam)
- 6 Labeling for "OFF" switch position plus additional language (depending on customer selection)
- 7 Labeling for "ON" switch position plus additional language (depending on customer selection)
- 8 Internal Endress+Hauser order code for the radiation source
- 9 Internal Endress+Hauser serial number for the radiation source
- 10 Wording "Caution Radioactive Material", if required
- 11 "Cs137" or "Co60"
- 12 Serial number of the source capsule (according to supplier certificate)
- 13 Activity including unit (MBq or GBq)
- 14 Date of loading (month/year)

NOTICE

The local dose rate specified on the nameplate applies to the switched-off state

- Outside the beam path, at a defined distance, it is safety-oriented and takes into account production dependent fluctuations of the radiation source activity and tolerances of the measuring instruments. Therefore it may be slightly different from the local dose rate which has been calculated from the specified attenuation factors.
- For feature 015, option AG "ARPANSA", the specified local dose rate also includes the path of the beam if switched off.

FQG61/FQG62; feature 020, option B, C or D



A0018399

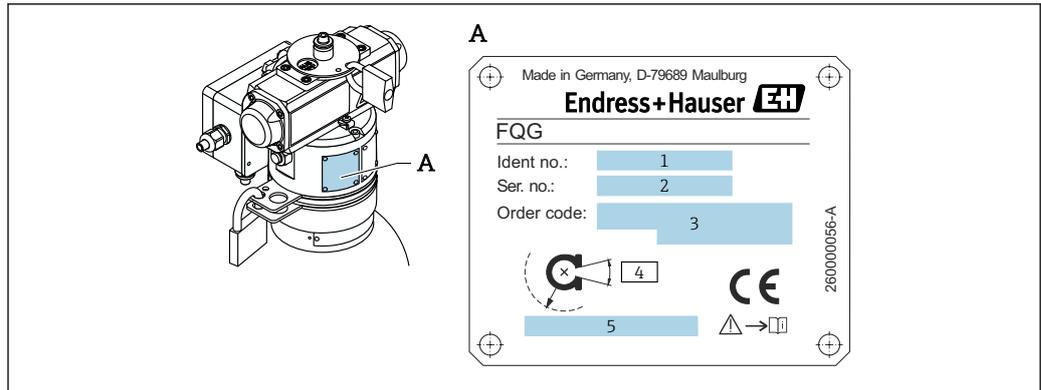
- A FQG61/FQG62; feature 020, option B
- B FQG61/FQG62; feature 020, option C
- C FQG61/FQG62; feature 020, option D
- D Nameplate of source container
- E Nameplate of the radiation source
- 1 ID number of source container
- 2 Serial number of source container
- 3 Order code of source container according to product structure
- 4 Order code of source container according to product structure
- 5 Beam exit angle
- 6 Local dose rate at a defined distance from the surface (when switched off, outside the path of the beam)
- 7 Wording "Caution Radioactive Material", if required
- 8 "Cs137" or "Co60"
- 9 Serial number of the source capsule (according to supplier certificate)
- 10 Activity including unit (MBq or GBq)
- 11 Date of loading (month/year)

NOTICE**The local dose rate specified on the nameplate applies to the switched-off state**

- Outside the beam path, at a defined distance, it is safety-oriented and takes into account production dependent fluctuations of the radiation source activity and tolerances of the measuring instruments. Therefore it may be slightly different from the local dose rate which has been calculated from the specified attenuation factors.
- For feature 015, option AG "ARPANSA", the specified local dose rate also includes the path of the beam if switched off.

FQG61/FQG62; feature 020, option K, L, M or N

Nameplate of source container

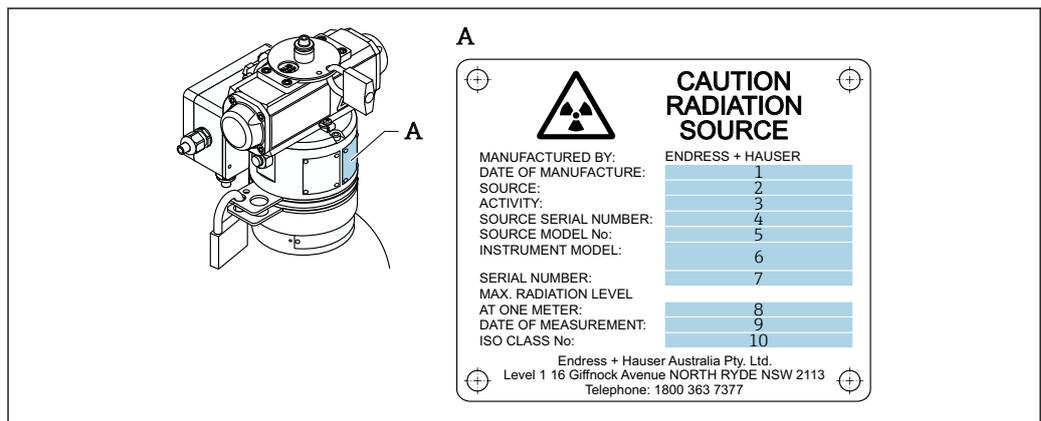


A0034014

15 *Nameplate of source container*

- 1 ID number of source container
- 2 Serial number of source container
- 3 Order code of source container (product structure)
- 4 Beam exit angle
- 5 Local dose rate at a defined distance from the surface (when switched off, outside the path of the beam)

Additional nameplate for Australia

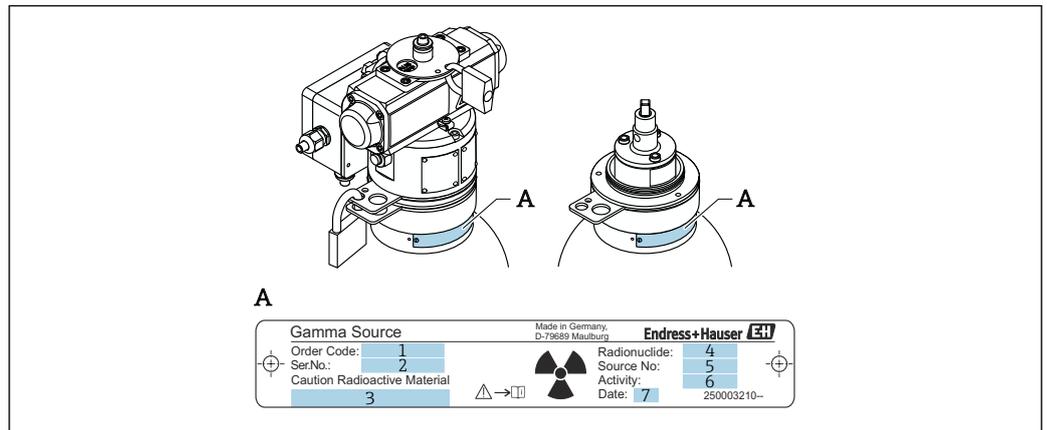


A0034015

16 *Additional nameplate for Australia*

- 1 Date of manufacture of the radiation source
- 2 "Cs137" or "Co60"
- 3 Activity including unit (MBq or GBq)
- 4 Serial number of source
- 5 Order code of radiation source
- 6 Internal Endress+Hauser order code for the radiation source
- 7 Internal Endress+Hauser serial number for the radiation source
- 8 Dose rate at a distance of 1 m (3.3 ft)
- 9 Date of source container inspection
- 10 Material class of radiation source

Nameplate of the radiation source

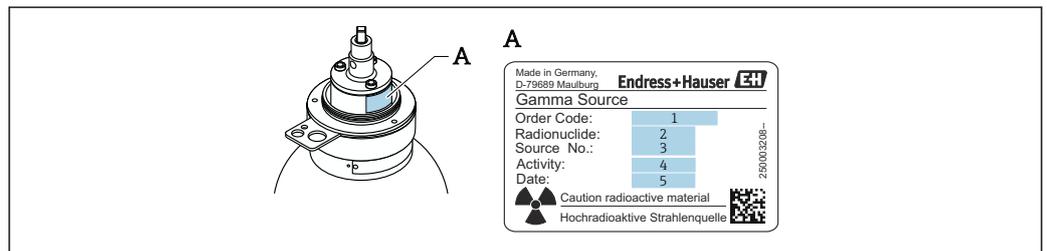


A0034016

17 Nameplate of the radiation source

- 1 Internal Endress+Hauser order code for the radiation source
- 2 Internal Endress+Hauser serial number for the radiation source
- 3 Wording "Caution Radioactive Material", if required
- 4 "Cs137" or "Co60"
- 5 Serial number of the source capsule (according to certificate)
- 6 Activity including unit (MBq or GBq)
- 7 Date of loading (month/year)

Additional nameplate of radiation source

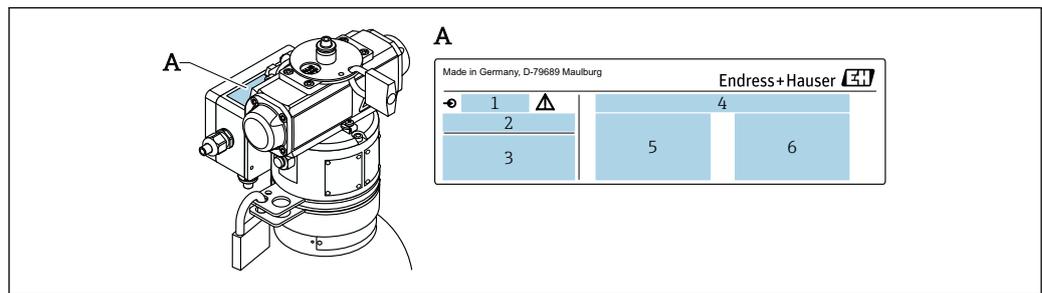


A0034017

18 Additional nameplate of radiation source

- 1 Internal Endress+Hauser order code for the radiation source
- 2 "Cs137" or "Co60"
- 3 Serial number of the source capsule (according to supplier certificate)
- 4 Activity including unit (MBq or GBq)
- 5 Date of loading (month/year)
- 6 Wording "Caution Radioactive Material", if required

Terminal housing nameplate, non-Ex, only for option K, M

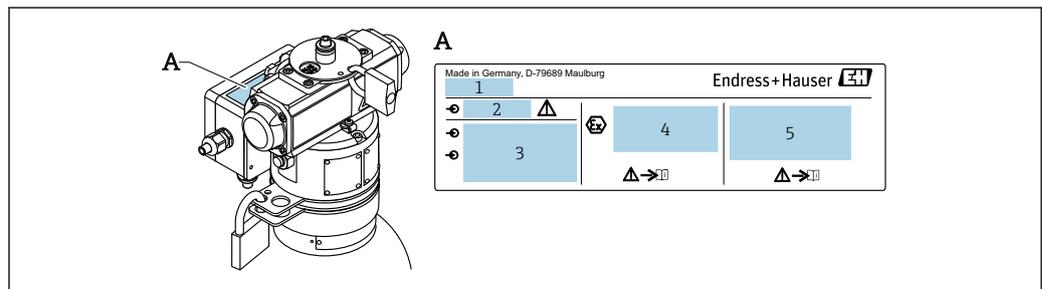


A0034018

19 Terminal housing nameplate, non-Ex, only for option K, M

- 1 Maximum pressure
- 2 Temperature information
- 3 Degree of protection
- 4 NAMUR information
- 5 Circuit diagram ON
- 6 Circuit diagram OFF

Terminal housing nameplate, Ex (ATEX), only for option L, N



A0060236

20 Terminal housing nameplate, Ex (ATEX), only for option L, N

- 1 Device name
- 2 Maximum pressure
- 3 Terminal assignment
- 4 Ex-related specifications
- 5 Warning sign

NOTICE

The local dose rate specified on the nameplate applies to the switched-off state

- ▶ Outside the beam path, at a defined distance, it is safety-oriented and takes into account production dependent fluctuations of the radiation source activity and tolerances of the measuring instruments. Therefore it may be slightly different from the local dose rate which has been calculated from the specified attenuation factors.
- ▶ For feature 015, option AG "ARPANSA", the specified local dose rate also includes the path of the beam if switched off.

RFID TAG

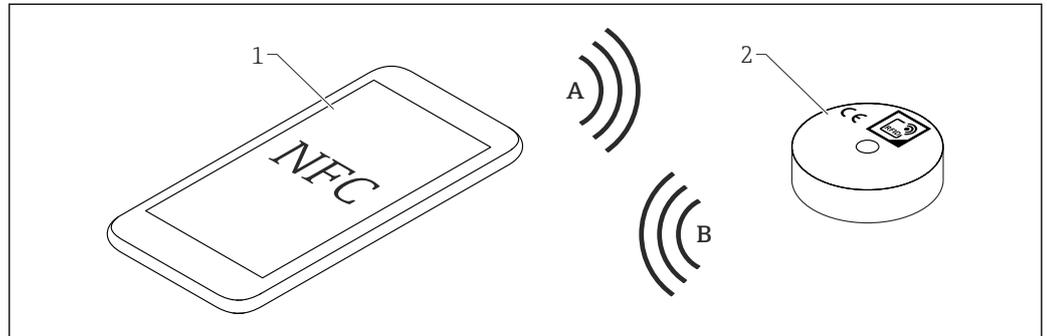
Operating principle of RFID and NFC

Radio frequency identification (RFID) makes it possible to identify the measuring point without direct visual contact, and exchanges data between suitable terminals. A transponder consists of a microchip, an antenna and a carrier/housing. The digital information is saved in the microchip. Energy is supplied to the microchip during the communication process by the electromagnetic field initiated by the transmitter.

Near field communication (NFC) is an extension of RFID technology and is an international communication standard for wireless data transfer at a frequency of 13.56 MHz. The external power supply and safety standards only allow a short range with a maximum data

transmission rate of 423 kBit/s and a connection setup of <0.1 s. The latest NFC technology can be used with NFC-enabled terminals.

Passive NFC transponders do not have their own power source (e.g. batteries) and are therefore maintenance-free. They are powered by the electromagnetic field of the transmitter.



A0026682

21 Operating principle of RFID and NFC

- A Data, energy
- B Data
- 1 Mobile device that supports NFC
- 2 RFID TAG

i The RFID TAGs of the radiation source (FSG60, FSG61) and the source container (FQG61, FQG62) are identical in appearance. The only difference is the data they contain and their location on the device.

For additional information see:

i SD01502F/00

i ZE01020F/00

4.2.2 Manufacturer address

Endress+Hauser SE+Co. KG
 Hauptstraße 1
 79689 Maulburg, Germany
 Place of manufacture: See nameplate.

5 Transport and storage

5.1 Transport as Type A package

5.1.1 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 Good by Road).



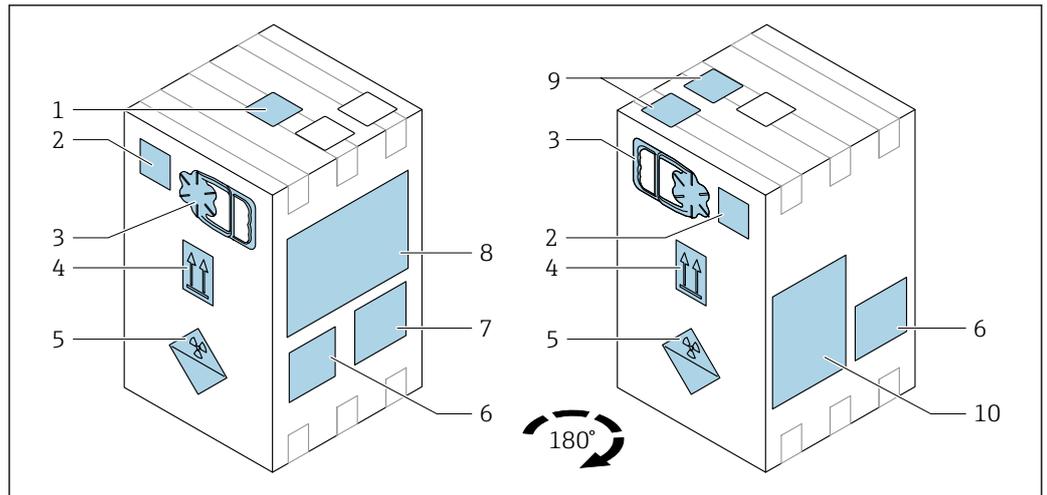
- The source container may be used as a Type A package only with the approved radiation sources. Approved radiation sources are listed in the Technical Information for the source container. Maximum permissible activities could be further restricted by country-specific approvals.
- For transport, the 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.

5.1.2 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.



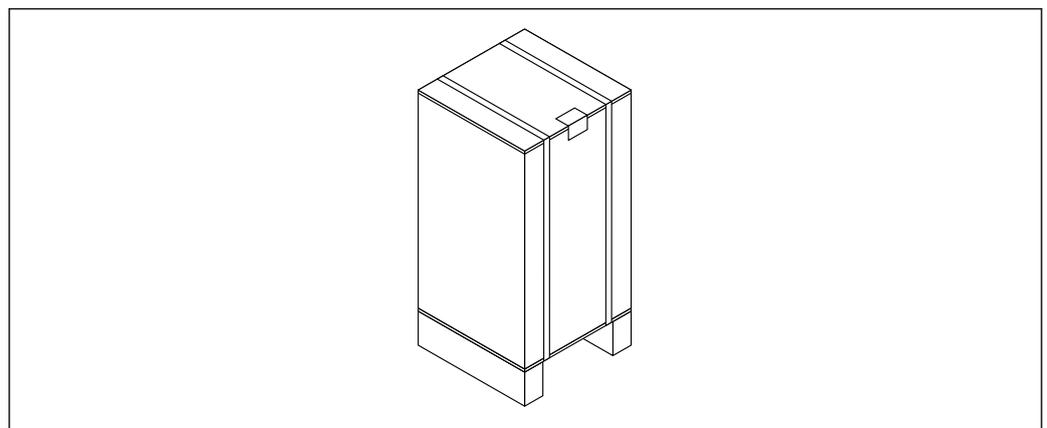
The exact packaging instructions can be found in the special documentation SD00309F.



A0058454

22 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 FQG61/62 and FSG6x
- 10 Accompanying documents



A0060201

23 Seaworthy overpack, packed onto pallet

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

5.1.3 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.

5.2 Dimensions, weights

5.2.1 Dimensions

Source Containers FQG61s and FQG62 are available in a number of different configurations for various purposes. Refer to the accompanying "Technical Information" for the exact dimensions of the selected configuration.

Packaging dimensions:

- Without pneumatic actuator: 375 x 375 x 450 mm (14.8 x 14.8 x 17.7 in)
- With pneumatic actuator: 375 x 375 x 600 mm (14.8 x 14.8 x 23.6 in)

5.2.2 Weights

	Version	Feature VKM020	Weight Without packaging [kg]	Weight With packaging [kg]	Dimensions Packaging [mm]
FQG61	Standard	A	39	46	375x375x450
	Euro	C	40	47	375x375x450
	Chemical industry	D	42	49	375x375x450
	USA	B	40	47	375x375x450
	Pneumatics	K/L/M/N	46	54	375x375x600
FQG62	Standard	A	83	90	375x375x450
	Euro	C	84	91	375x375x450
	Chemical industry	D	86	93	375x375x450
	USA	B	84	91	375x375x450
	Pneumatics	K/L/M/N	90	98	375x375x600

5.3 Handling

 Handling requires qualified assembly and service personnel. See the "Requirements for personnel" section

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.

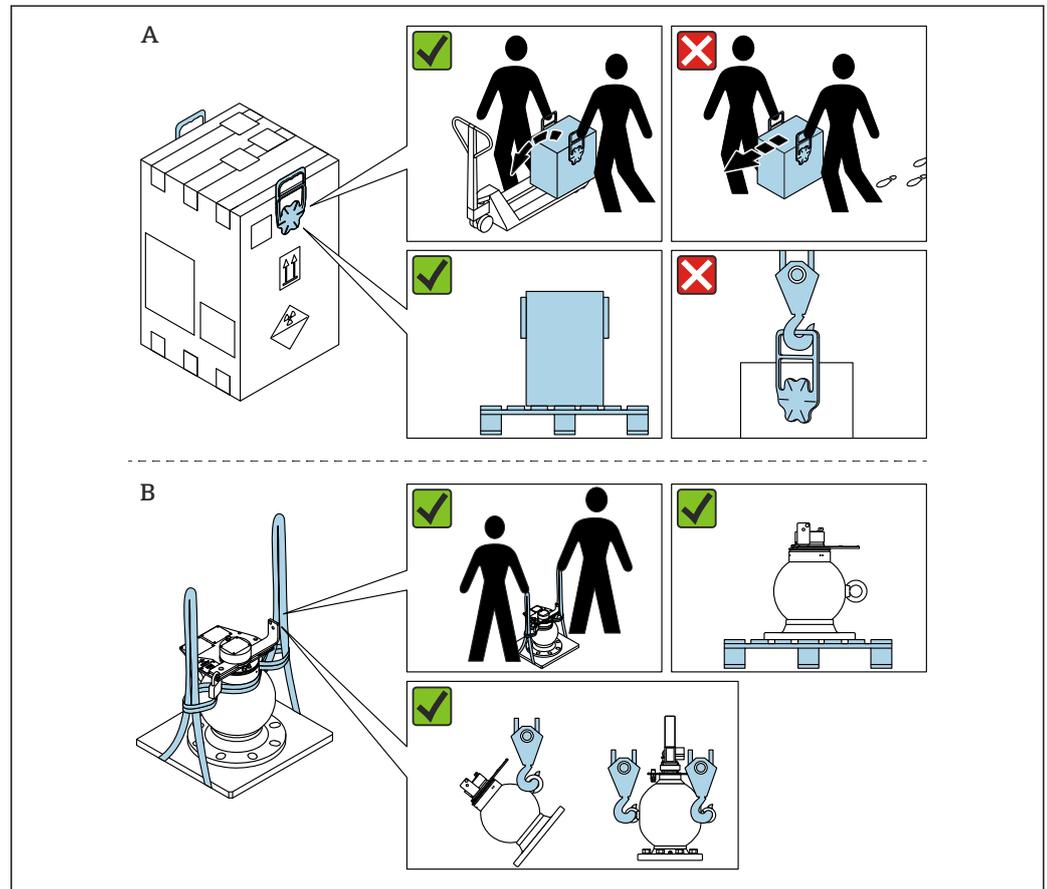
- ▶ Wear protective equipment.
- ▶ Handle heavy loads correctly.

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

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

- ▶ Wear protective equipment.

i See Technical Information for total weight.



A0022393

A With overpack

B Without overpack

Additional handling instructions:

- Follow the safety instructions and observe the transport conditions.
- A lifting point is provided on the source container as a transport and mounting aid.
- Only lift and transport the source container using the lifting point.

5.3.1 Required tool(s)

- Key for padlock
- Tool for flange mounting (screws not included in scope of delivery)

5.3.2 Preparation for transport to the installation location

i See the "Incoming acceptance and product identification" section for information on incoming acceptance.

The source container serves as a Type A package (IATA rules) for the radiation source. For transportation purposes, it is protected by foam packing in a box.

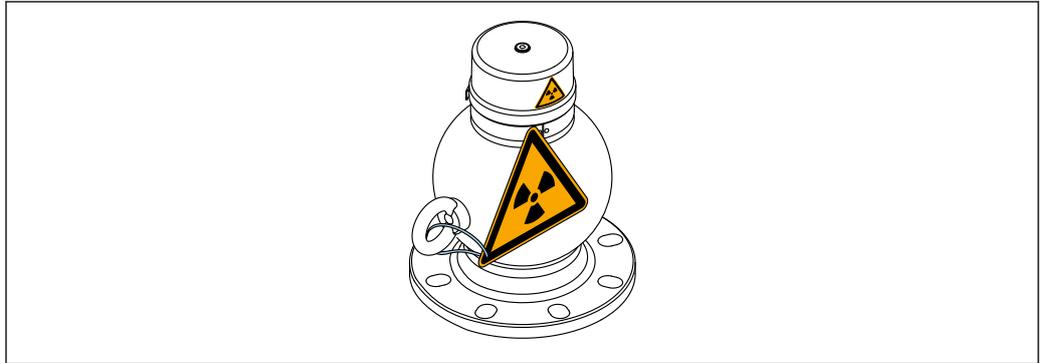
Packaging dimensions:

- Without pneumatic actuator: 375 x 375 x 450 mm (14.8 x 14.8 x 17.7 in)
- With pneumatic actuator: 375 x 375 x 600 mm (14.8 x 14.8 x 23.6 in)

i The foam packing can be disposed of as normal household waste.

i The radioactive warning signs (triangular) must not be removed.

All other signs can be removed.



A0037584

5.4 Storage

Permitted storage temperature:

Version	Ambient temperature
Manual switch-ON/switch-OFF	-40 to +200 °C (-40 to +392 °F)
Pneumatic switch-ON/switch-OFF	-20 to +80 °C (-4 to 176 °F)

WARNING

Risk of injury due to incorrect operating and storage temperature of the proximity switch in hazardous areas

Use of the proximity switches in hazardous areas may require further restriction of the operating and storage temperature, depending on the supply and temperature class.

- ▶ Pay particular attention to the maximum permitted ambient temperature for the proximity switches in the Operating Instructions. Scan the QR code on the connecting cable of the proximity switch for specific device information, or enter the serial number of the proximity switch in the serial number search field on www.pepperl-fuchs.com

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

6 Installation

- By a nozzle directly on the container or pipe (not pressure-bearing and not in contact with process)
- On an external construction with low to zero vibration

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

DANGER

When the shutter is switched to the EIN / ON position, the user will be exposed to unshielded ionizing radiation if they are located in the vicinity of the beam exit channel or look into it.

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.

- ▶ Never remain in the beam outlet area.
- ▶ Restrict access to the irradiated area.
- ▶ Restrict access to process tanks or pipelines that are exposed to radiation.

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

Installation with open shutter

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.

- ▶ The source container must not be in the ON position 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.

6.1 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.
- Installation and removal are only permitted in the "AUS/OFF" switch position. The switch position is secured by the cover of the shutter and lock.
- Mount the source container vertically on the process adapter.

- Take into account the weight and center of gravity of the source container: FQG61: 39 to 46 kg (86 to 101.4 lb), FQG62: 83 to 90 kg (183 to 198.4 lb)
- 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.
- Ensure that the process temperature is not transferred to the source container.

6.2 Orientation

The source container can be mounted as follows:

⚠ DANGER

Risk of accident from heavy gross weight

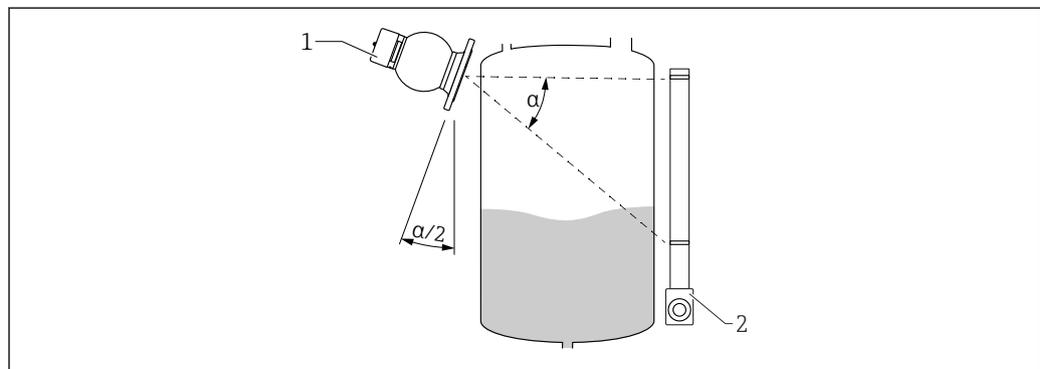
Incorrectly installed source containers could lead to personal injuries and serious damage to physical items if they fall.

- ▶ Observe the specified torque of the fixing screws.
- ▶ The mounting bracket must be designed to hold the weight (take the additional weight of the Gamma Modulator FHG65 into account).
- ▶ Take vibration into account in the design.

6.2.1 Level measurement

For continuous level measurement, the source container must be installed at the height of, or slightly above, the maximum level.

The radiation must be aligned exactly with the detector installed on the opposite side. The source container and detector should be installed as close as possible to the product vessel to avoid controlled areas. The source container and detector should be installed as close as possible to the product vessel to avoid controlled areas.



A0018401

24 *Angle of emission*

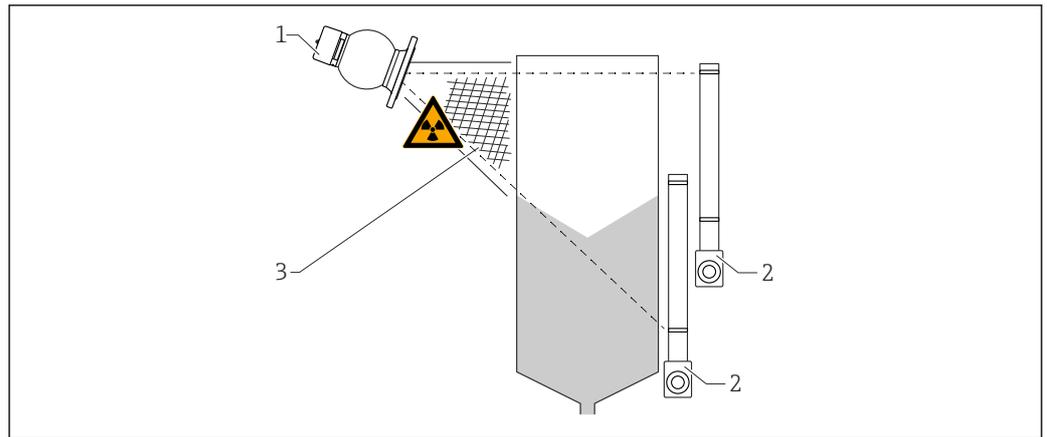
1 FQG61, FQG62

2 Gammapilot

α Angle of emission

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

A distance between the source container and the product vessel is often unavoidable if the measuring range is large and the container diameter small. The space in between must then be cordoned off and marked.



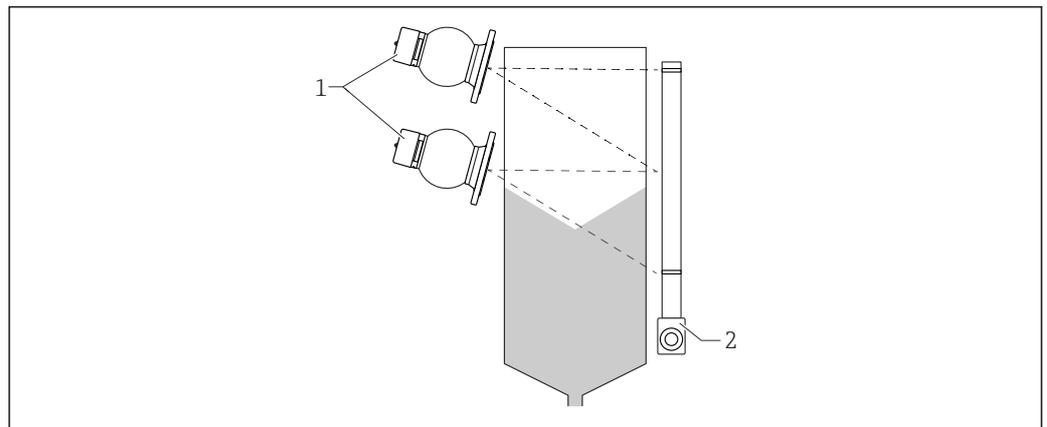
A0018402

25 Area of ionizing radiation

- 1 FQG61, FQG62
- 2 Gammapilot
- 3 Area to be cordoned off

⚠ DANGER: IONIZING RADIATION WHEN OPENING THE SHUTTER! Follow the safety instructions at the start of this section.

Two or more source containers are generally used for large measuring ranges. The use of multiple radiation sources may be necessary not only due to large measuring ranges but also for measurement accuracy reasons.



A0018403

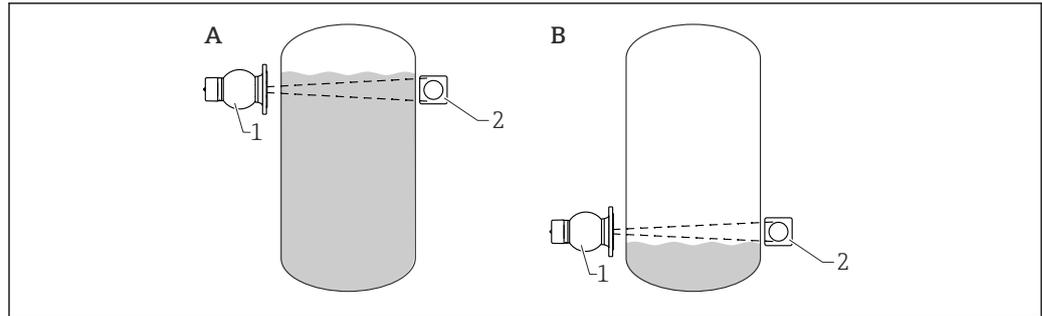
26 Area of ionizing radiation

- 1 FQG61, FQG62
- 2 Gammapilot

6.2.2 Point level measurement

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

The version of the source container with an angle of emission of 5° is recommended for point level measurement. If larger angles of emission (20° or 40°) are used, make sure that the beam is horizontal. For this purpose, mount the source container in such a way that the eyelet is horizontal.



A0018075

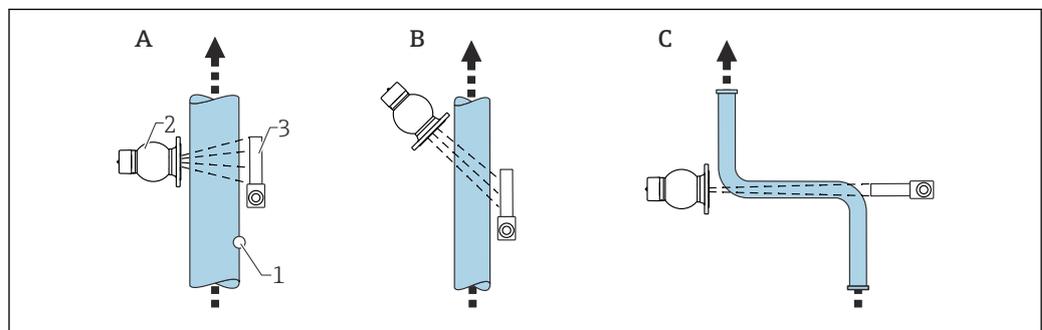
- 1 FQG61, FQG62
2 Radiation detector

- i** ■ Keep the distance between Source Container FQG60/FQG61 and the container wall to a minimum!
■ Secure any space between the source container and wall by cordoning it off, if necessary.

6.2.3 Density measurement

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

The most constant conditions for density measurement in pipes are achieved if the unit is mounted on vertical pipelines and the feed direction is from bottom to top. If only horizontal pipes are accessible, the path of the beam should also be arranged horizontally to reduce the influence of air bubbles and buildup. In order to achieve a longer path of the radiation through the medium and thus a better measuring effect, a diagonal beam or a measurement section can be used.



A0060202

- A Vertical beam
B Diagonal beam
C Measuring section
1 FQG61, FQG62
2 Gammapilot

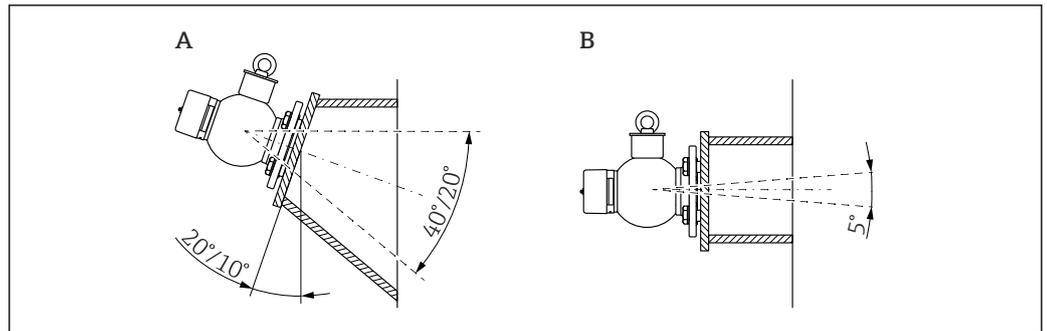
The following accessories are available for mounting the source container and the FMG60 compact transmitter on pipes:

- Clamping device FHG61, see "Accessories" section in Technical Information document.
- Measuring section FHG62, see "Accessories" section in Technical Information document.

6.2.4 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.



A0018406

☑ 27 Orientation I

- A Level measurement
B Point level measurement

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

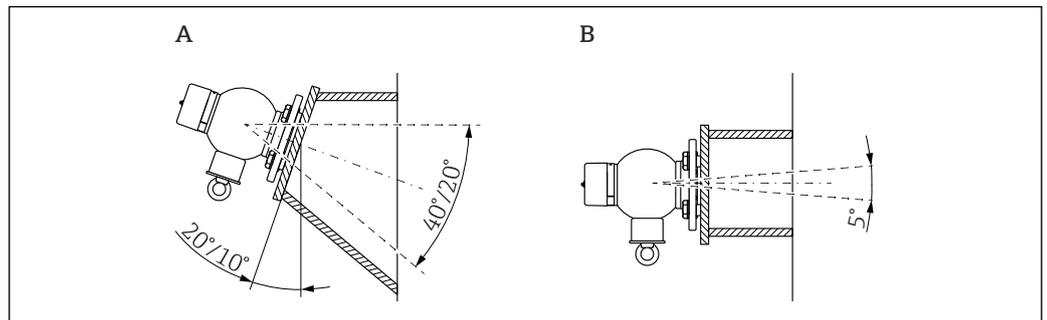
The source container is mounted with the compensation compartment at the bottom or the side. In the event of fire, the emission channel and the compensation compartment are filled with liquefied lead.

⚠ 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.



A0018407

☑ 28 Orientation II

- A Level measurement
B Point level measurement

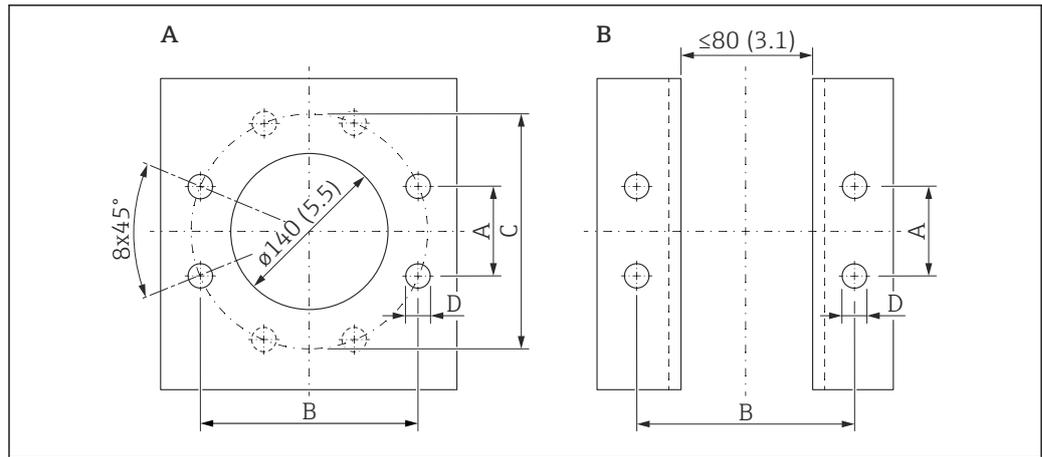
6.2.5 Required tools

See installation instructions SD02557F, SD02558F or SD02665F.

6.2.6 Installing the source container

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

The source container can be mounted on a mounting plate or L-profiles, for example



A0018409

A Example of a mounting plate
 B Example for L-profiles

Dimensions	EN	ANSI
A	68.9 mm (2.71 in)	72.9 mm (2.87 in)
B	166.3 mm (6.55 in)	176.0 mm (6.93 in)
C	180.0 mm (7.09 in)	190.5 mm (7.5 in)
D	18.0 mm (0.71 in)	19.1 mm (0.75 in)

i The mounting flange of FQG61 and FQG62 is compatible with:

- DN 100 PN16
- ANSI 4" 150lbs

Toothed lock washers

⚠ 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.

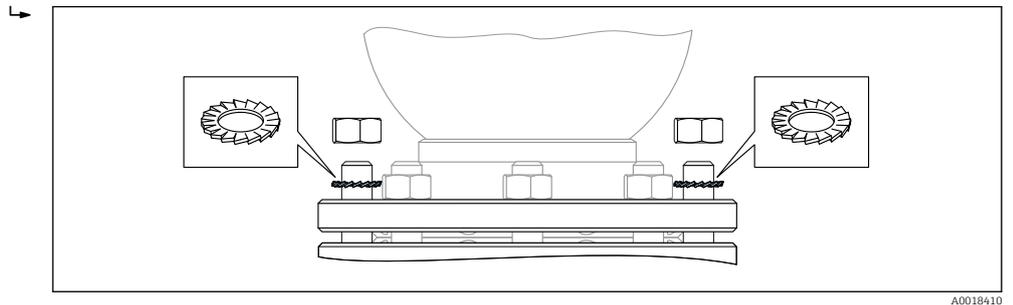
⚠ WARNING

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.

- ▶ In order to ensure electrical contact between the source container and the mounting support, the supplied toothed lock washers must be used on two of the flange screws as indicated in the adjacent graphic.



29 Mounting the toothed lock washers

Tightening torque for 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)

6.3 Post-mounting check

- Is the device undamaged (visual inspection)?
- Are the measuring point identification and labeling correct (visual inspection)?
- Does the device meet the measuring point specifications? For example:
 - ambient temperature
 - Measuring height
 - Activity of the radiation source
 - Beam exit angle
- Are the securing screws firmly tightened?

6.4 Connecting the pneumatic actuator

-  This section only applies to source containers with a pneumatic actuator. (In the product structure: feature 020, versions K, L, M or N)
-  Only use dried and filtered compressed air according to ISO 8573-1. For suitable working conditions, the operating medium must have a dew point of -20 °C or be at least 10 °C below the ambient temperature. The temperature of the operating medium should not be above 85 °C and the maximum particle size must not exceed $40\text{ }\mu\text{m}$. Monitoring the dew point of the compressed air is recommended.

WARNING

Risk of injury from ionizing radiation caused by uncontrolled switching of the shutter to the ON position via remote control!

Personnel and visitors in the facility may be exposed to uncontrolled, ionizing radiation if the actuator is automatically used by the process control system. Ionizing radiation can increase the risk of cancer and genetic birth defects.

- ▶ The source container must be secured in the "OFF" position before work is carried out on the radiation emission channel. This also applies to access to tanks, for example during maintenance or behind piping.
- ▶ Please follow the instructions on radiation protection contained in the Operating Instructions.
- ▶ Contact the relevant radiation safety officer for specific instructions.
- ▶ Monitor the switch state via the installed sensors and take appropriate organizational measures to prevent access to the radiation area when the sensors do not report an OFF state.
- ▶ We recommend that a risk analysis be carried out to define the measures and that the employees be trained on the dangers.

WARNING

Risk of injury from ionizing radiation if the pneumatic drive fails!

Contamination or moisture in the compressed air system can cause the pneumatic drive to fail, preventing the shutter from being moved to the OFF position and allowing radiation to continue to escape unshielded. Ionizing radiation can increase the risk of cancer and genetic birth defects.

- ▶ Use only dried and filtered compressed air.
- ▶ Monitor the switch state via the installed sensors and take appropriate organizational measures to prevent access to the radiation area when the sensors do not report an OFF state.

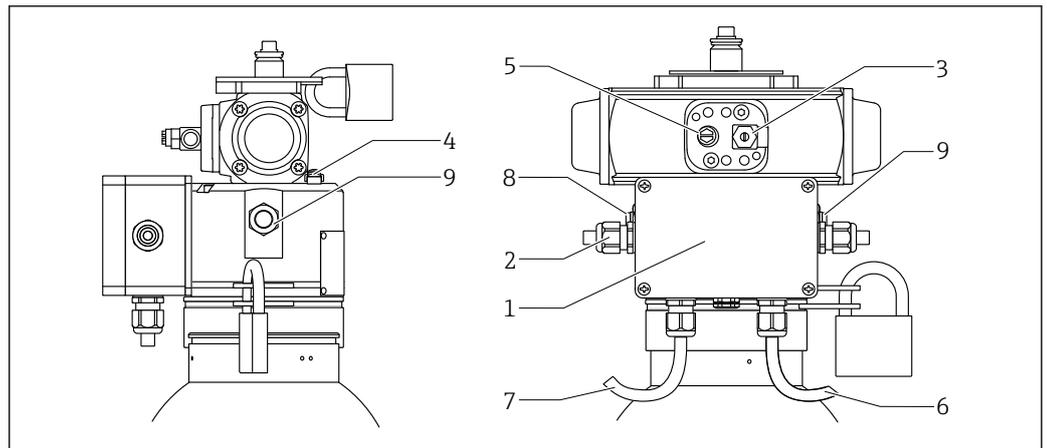
CAUTION

Risk of being crushed by moving parts!

The actuator contains moving parts that can cause crushing injuries if anyone reaches into it. Hands may be crushed, resulting in personal injury.

- ▶ Do not touch the cover plate or reach into the lock hole while the pneumatic auxiliary power supply of the drive is connected and active.
- ▶ When working on the source container, deactivate and lock the pneumatic auxiliary power supply.
- ▶ Do not wedge objects under the cover plate to stop the drive moving.
- ▶ If the drive is blocked (e.g., due to "seizing" after being out of operation for a prolonged period), deactivate and lock the pneumatic auxiliary power supply before releasing the blockage.

6.4.1 Compressed air connection



A0018411

- 1 Terminal box for connection of the proximity switches
- 2 Cable glands for cable diameter 5 to 10 mm (0.2 to 0.4 in)
- 3 Throttle check valve for compressed air connection
- 4 Connection for potential equalization
- 5 Vent filter
- 6 Connecting cable of proximity switch for "AUS/OFF" switch position
- 7 Connecting cable of proximity switch for "EIN/ON" switch position
- 8 Proximity switch for "EIN/ON" switch position
- 9 Proximity switch for "AUS/OFF" switch position

The compressed air line is connected to the throttle check valve

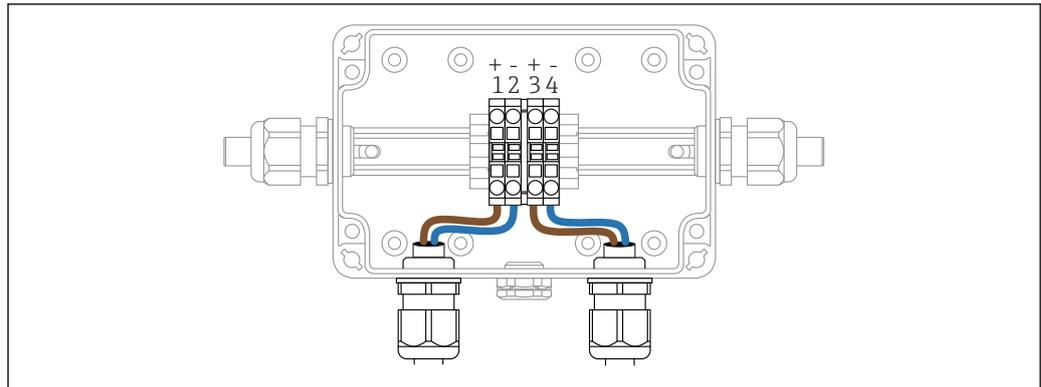
CAUTION

Increased risk of crushing if the throttle check valve is incorrectly set

Crushing injuries can result in personal injury.

- The throttle check valve is set at the factory and secured with thread locking fluid. Do not change the setting of the throttle check valve.

6.4.2 Connecting the proximity switches



A0034001

30 Terminal assignment

- 1 Proximity switch for "EIN/ON" switch position, positive lead (brown)
- 2 Proximity switch for "EIN/ON" switch position, negative lead (blue)
- 3 Proximity switch for "AUS/OFF" switch position, positive lead (brown)
- 4 Proximity switch for "AUS/OFF" switch position, negative lead (blue)

Proximity switch

⚠ WARNING

Using a proximity switch beyond the permitted ambient and operating conditions of the Pepperl+Fuchs Ex approvals.

Protection of personnel and the facility are not guaranteed if the proximity switches are not used for their intended purpose.

- ▶ For the intended use of the proximity switches, ensure compliance with the laws, standards, and guidelines applicable to the place of use, especially in relation to hazardous areas.
- ▶ The Operating Instructions and certificates for the proximity switches with information on safety-related specifications, ambient conditions and electrical connections apply in addition and are binding. You will find these documents at www.pepperl-fuchs.com/en. Scan the QR code on the connecting cable of the proximity switch for specific device information, or enter the serial number of the proximity switch in the serial number search field on www.pepperl-fuchs.com

Type model: Pepperl+Fuchs NCB2-12GM35-NO-10M

Cable entries

Suitable cable diameter: 5 to 10 mm (0.2 to 0.39 in)

Potential equalization

Terminal on the cover →  49

Connection data

- Nominal voltage: 8V
- Current consumption
 - Measuring plate not detected: ≥ 3 mA
 - Measuring plate detected: ≤ 1 mA

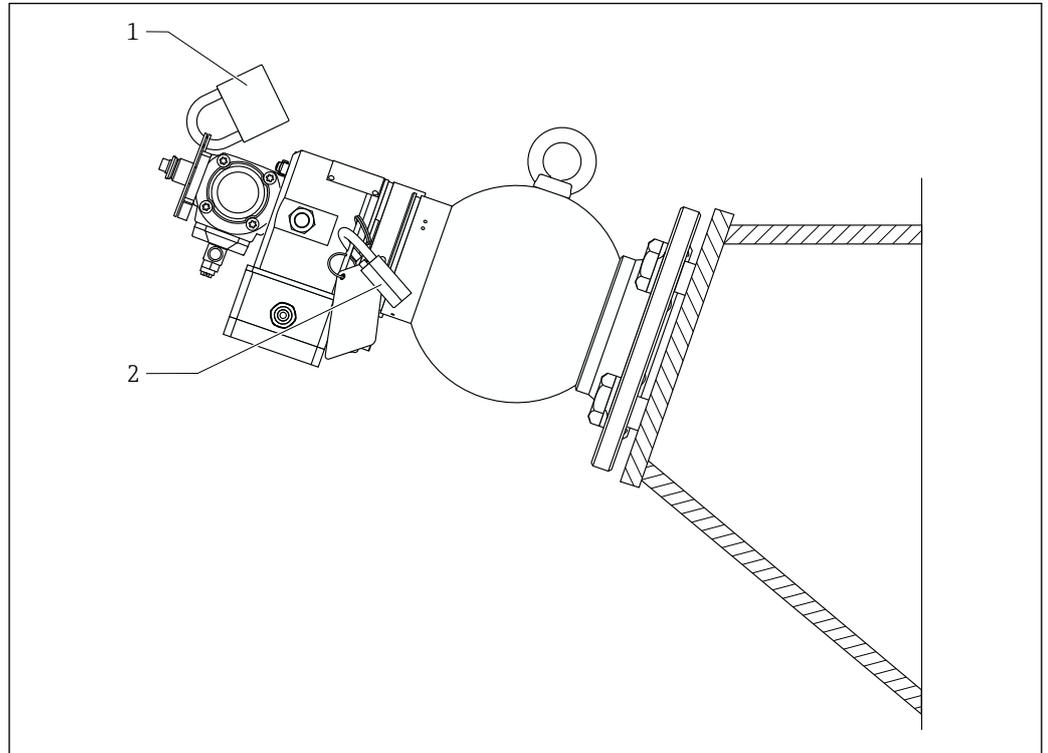
Isolating amplifier

The following isolating amplifiers, for example, can be connected for signal evaluation:

- RLN22 NAMUR isolating amplifier (Endress+Hauser)
- KFD2-SH-Ex1, 24 V_{DC} (Pepperl+Fuchs)

6.4.3 Commissioning

Before commissioning, the compressed air supply must be connected for the pneumatic drive and the padlock (1) on the top must be removed. The padlock must only be reattached for maintenance purposes (OFF position) and should be hooked in next to the padlock (2) in the parking position until then. The lower padlock (2) blocks access to the radiation source and must not be removed during normal operation.

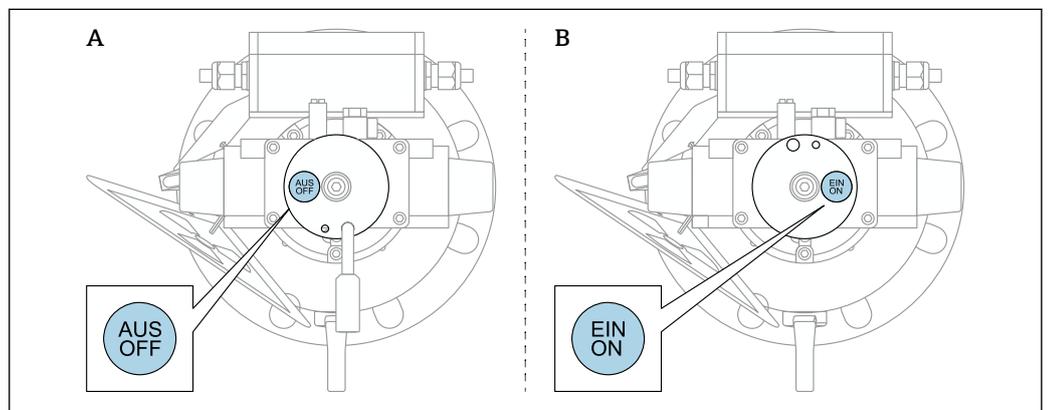


A0018413

- 1 Padlock for securing the switch state - remove when operating the pneumatic actuator
- 2 Padlock for safeguarding the radiation source - must not be removed during normal operation

6.4.4 Reading the switch state

The current switch state is indicated by the sign that is visible ("EIN - ON" or "AUS - OFF"). The other sign is covered by the rotary disk on the pneumatic switch.



A0018414

31 Switch state

- ▶ **CAUTION:** Risk of being crushed by moving parts! Follow the safety instructions at the start of this section.

6.4.5 Technical data of the pneumatic actuator

- Swivel range: 180°
- Compressed air connection: G1/8
- Actuating pressure: 3.5 to 6 bar (51 to 87 psi)
- Reset by spring force
- Required compressed air quality: ISO 8573-1 Class 3; maximum particle size 40 µm, pressure dewpoint corresponding to a dewpoint of -20°C or a dewpoint of at least 10 K below ambient temperature
- Type: Prism PAGWS.3B221A

7 Commissioning

 Commissioning requires qualified operating personnel; see "Requirements for the personnel" section.

7.1 Preliminaries

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

"Post-mounting 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 the radiation ON and OFF

DANGER

When the shutter is switched to the EIN / ON position, the user will be exposed to unshielded ionizing radiation if they are located in the vicinity of the beam exit channel or look into it.

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.

- ▶ Never remain in the beam outlet area.
- ▶ Restrict access to the irradiated area.
- ▶ Restrict access to process tanks or pipelines that are exposed to radiation.

7.2.1 FQG61/62; feature 020, option A

WARNING

Ionizing radiation if removal guard is taken off inadvertently!

Risk of loss of control of the radiation source with the consequence of possible health hazards due to unshielded ionizing radiation. Ionizing radiation can increase the risk of cancer and genetic birth defects.

- ▶ Do NOT press the sealing screw and locking pin!

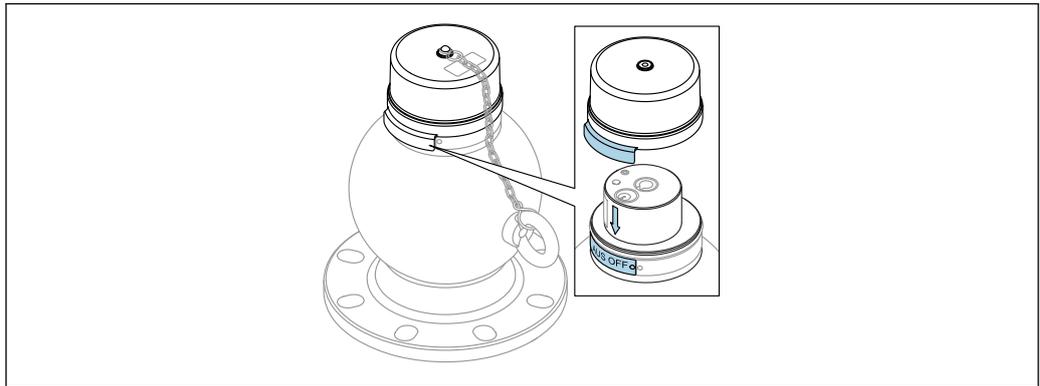
NOTICE

Risk of source container contamination due to contaminated O-ring!

Contamination of the O-ring may impair the sealing effect and cause water or dirt to enter the lid.

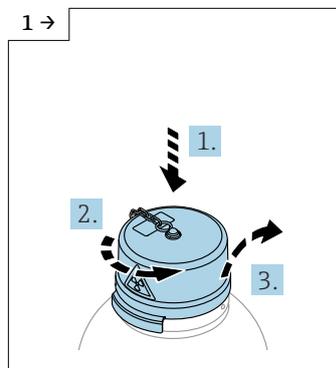
- ▶ Make sure that the O-ring is clean and free of dirt, dust or moisture before fitting the cover.
- ▶ If necessary: clean the O-ring with a lint-free cloth.

Switching on the radiation



A0059563

32 Starting point: source container is switched off. The arrow points to "AUS - OFF".



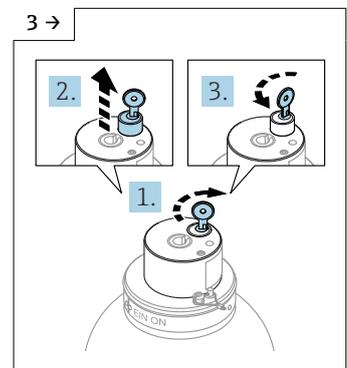
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- ▶ Press the cover firmly against the source container.
- ▶ Turn the cover counterclockwise as far as it will go.
- ▶ Remove the cover.



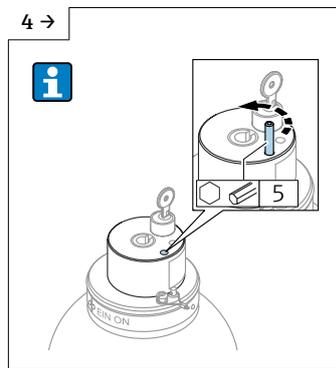
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- ▶ Insert the key into the closing cylinder.



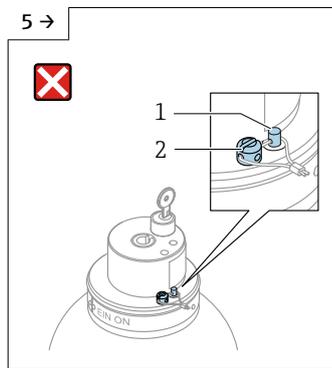
A0059566

- ▶ Turn the key clockwise in the closing cylinder.
- ▶ Pull out the cylinder lock as far as it will go.
- ▶ Turn the key counterclockwise in the closing cylinder.
- ▶ ⚠ DANGER: IONIZING RADIATION WHEN OPENING THE SHUTTER! Follow the safety instructions at the start of this section.



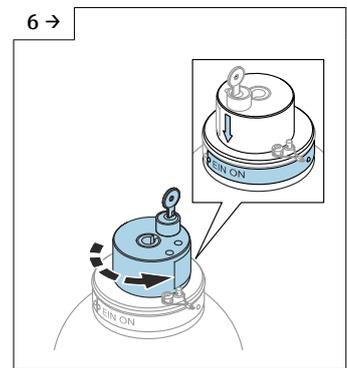
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- ▶ **Only for source container with feature 670 "Additional function", option WA "Density measurement > Fixation ON":** release the locking screw using the Allen key.



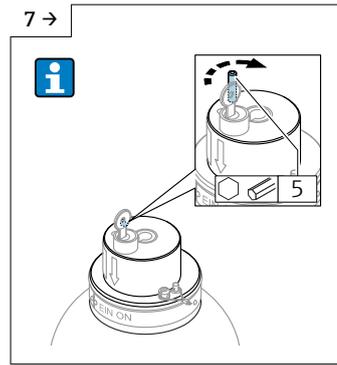
A0059568

- ▶ Do not press the sealing screw (2) and locking pin (1)!
- ▶ ⚠ WARNING: Risk of losing control over the radiation source! Follow the safety instructions at the start of this section.

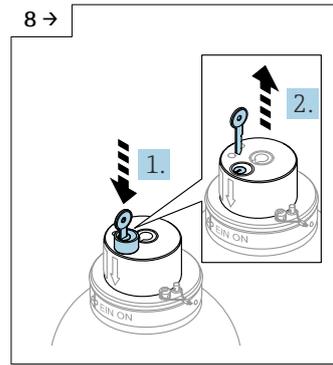


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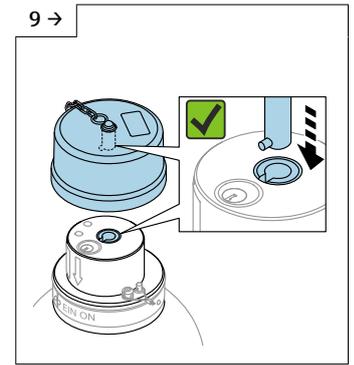
- ▶ Turn the insert counterclockwise until the arrow is at the "EIN-ON" mark.



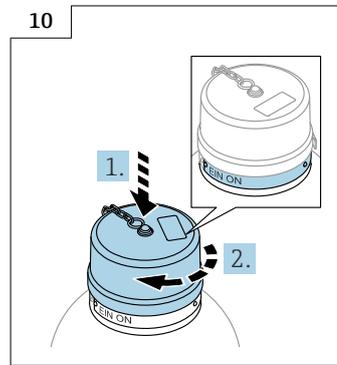
- ▶ **Only for source container with feature 670 "Additional function", option WA "Density measurement > Fixation ON":** screw in the locking screw using the Allen key.



- ▶ Press in the cylinder lock with the key until it engages.
- ▶ Pull out the key and store in a safe place.



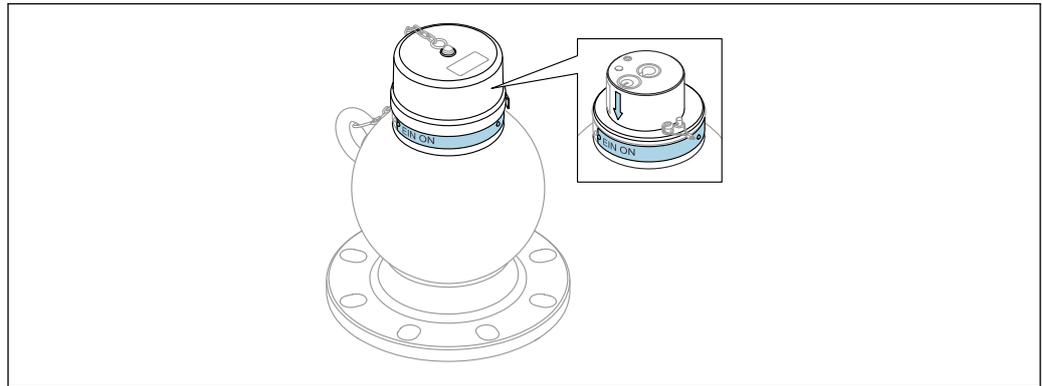
- ▶ Put on the cover.
- ▶ **i** NOTE: O-ring contamination! Follow the instructions at the start of this section.



- ▶ Press the cover firmly against the source container.
- ▶ Turn the cover clockwise as far as it will go.

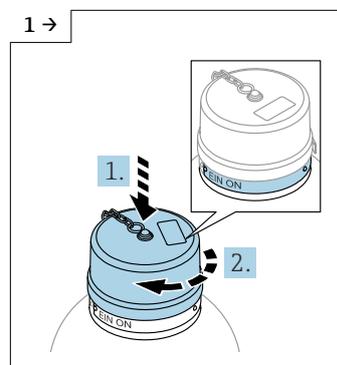
The source container is now switched on.

Switching off the radiation



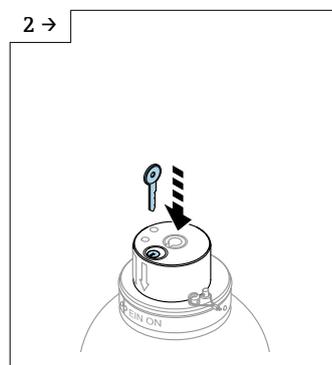
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33 Starting point: source container is switched on. Arrow is pointing to the "EIN-ON" marking.



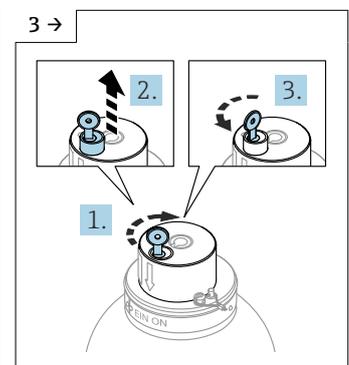
A0059724

- ▶ Press the cover firmly against the source container.
- ▶ Turn the cover counterclockwise as far as it will go.
- ▶ Remove the cover.



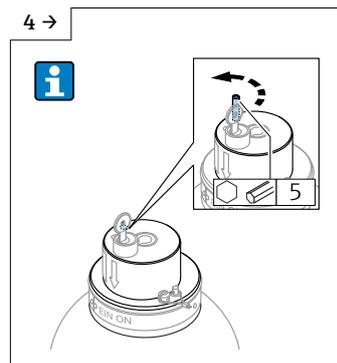
A0059668

- ▶ Insert the key into the closing cylinder.



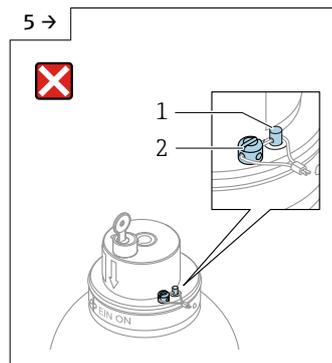
A0059669

- ▶ Turn the key clockwise in the closing cylinder.
- ▶ Pull out the cylinder lock as far as it will go.
- ▶ Turn the key counterclockwise in the closing cylinder.



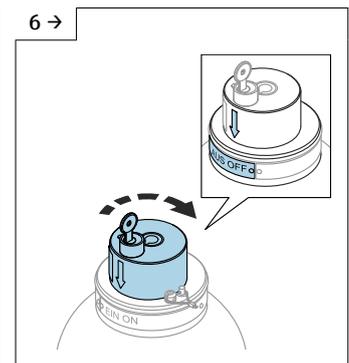
A0059670

- ▶ **Only for source container with feature 670 "Additional function", option WA "Density measurement > Fixation ON"**: release the setscrew using the Allen key.



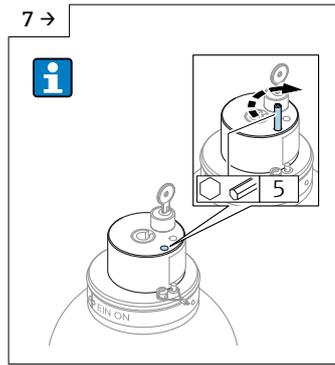
A0059671

- ▶ Do not press the sealing screw (2) and locking pin (1)!
- ▶ **⚠ WARNING: Risk of losing control over the radiation source! Follow the safety instructions at the start of this section.**



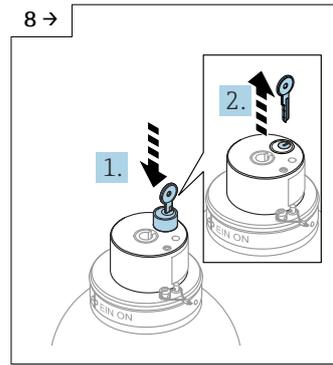
A0059672

- ▶ Turn the insert clockwise until the arrow is at the "AUS-OFF" mark.



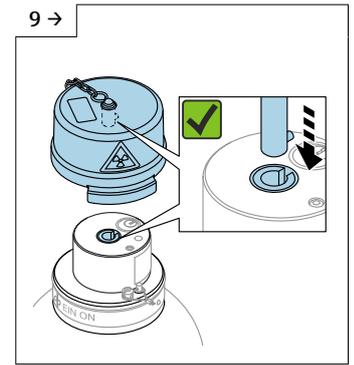
A0059673

- ▶ Only for source container with feature 670 "Additional function", option WA "Density measurement > Fixation ON":screw in the locking screw using the Allen key.



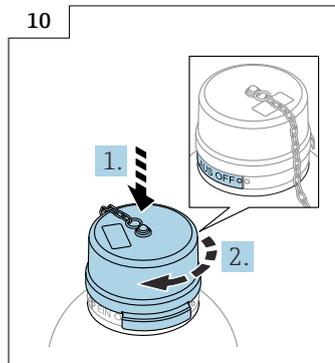
A0059674

- ▶ Press in the cylinder lock with the key until it engages.
- ▶ Pull out the key and store in a safe place.



A0059675

- ▶ Put on the cover.
- ▶ **i** NOTE: O-ring contamination! Follow the instructions at the start of this section.

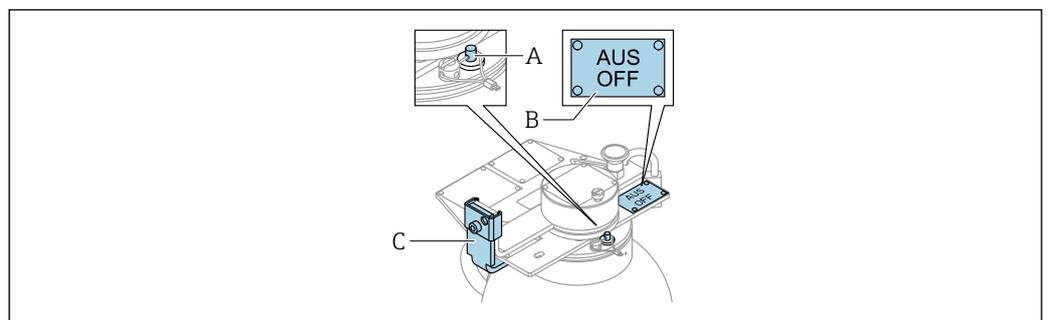


A0059676

- ▶ Press the cover firmly against the source container.
- ▶ Turn the cover clockwise as far as it will go.

The source container is now switched off.

7.2.2 FQG61/62; feature 020, option B



A0059579

- A Locking pin, lead-sealed
- B "AUS/OFF" sign
- C Safety bar

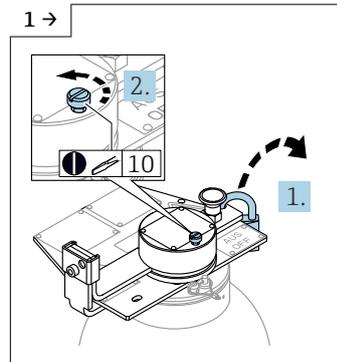
⚠ WARNING

Ionizing radiation if removal guard is taken off inadvertently!

Risk of loss of control of the radiation source with the consequence of possible health hazards due to unshielded ionizing radiation. Ionizing radiation can increase the risk of cancer and genetic birth defects.

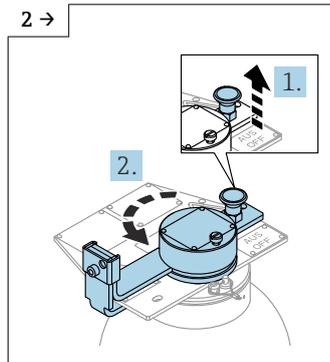
- ▶ Do NOT press the sealing screw and locking pin!

Switching ON the radiation



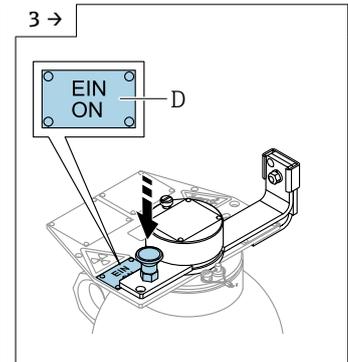
A0059580

- ▶ Remove the padlock.
- ▶ Only for source container with feature 670 "Additional function", option WA "Density measurement > Fixation ON": release the (optional) locking screw.



A0059581

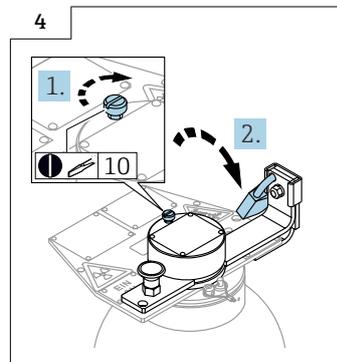
- ▶ Pull out the locking bolt.
- ▶ Turn the safety bar 180° counterclockwise. The current switch state is indicated by the sign that is visible ("EIN - ON" or "AUS - OFF"). The other sign is covered by the safety bar.



A0059582

- ▶ If the sign "EIN - ON" (D) is displayed: allow the locking bolt to click into place. Check that it is locked correctly.

- ▶ **⚠ DANGER: IONIZING RADIATION WHEN OPENING THE SHUTTER!** Follow the safety instructions at the start of this section.

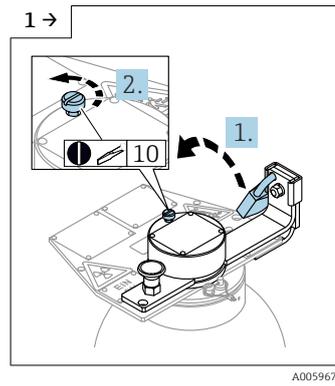


A0059583

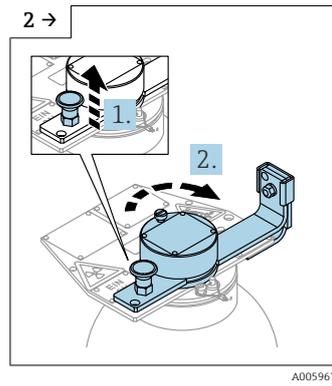
- ▶ Fix the padlock in the position provided.
- ▶ Only for source container with feature 670 "Additional function", option WA "Density measurement > Fixation ON": tighten the (optional) locking screw.

The source container is now switched on.

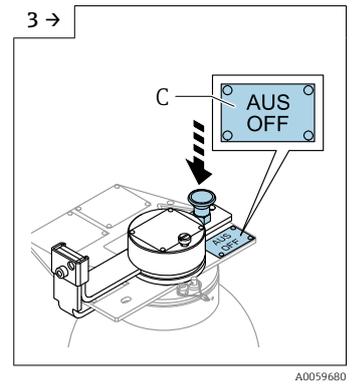
Switching OFF the radiation



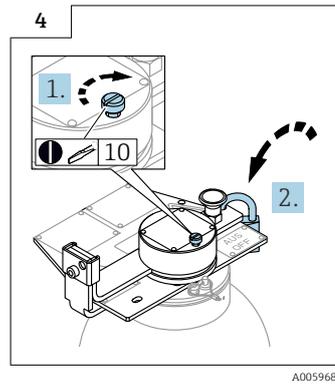
- ▶ Remove the padlock.
- ▶ Only for source container with feature 670 "Additional function", option WA "Density measurement > Fixation ON": release the (optional) locking screw.



- ▶ Pull out the locking bolt.
- ▶ Turn the safety bar 180° clockwise. The current switch state is indicated by the sign that is visible ("EIN - ON" or "AUS - OFF"). The other sign is covered by the safety bar.



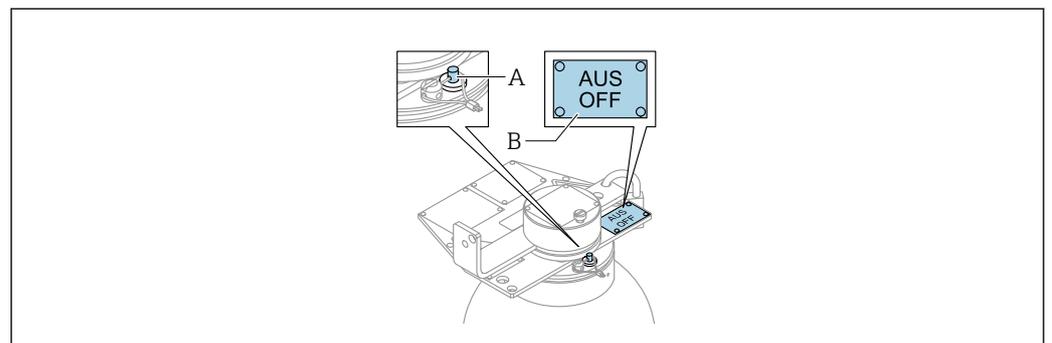
- ▶ If the sign "AUS - OFF" (C) is displayed: allow the locking bolt to click into place. Check that it is locked correctly.



- ▶ Only for source container with feature 670 "Additional function", option WA "Density measurement > Fixation ON": tighten the (optional) locking screw.
- ▶ Fix the padlock in the position provided.

The source container is now switched off.

7.2.3 FQG61/62; feature 020, option C



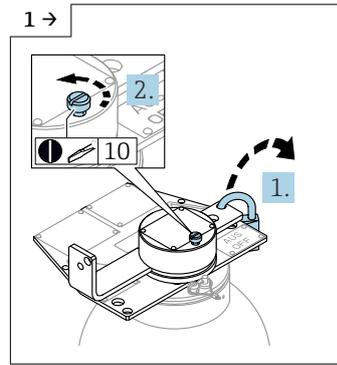
- A Locking pin, lead-sealed
- B "AUS/OFF" sign

A0059588

⚠ WARNING**Ionizing radiation if removal guard is taken off inadvertently!**

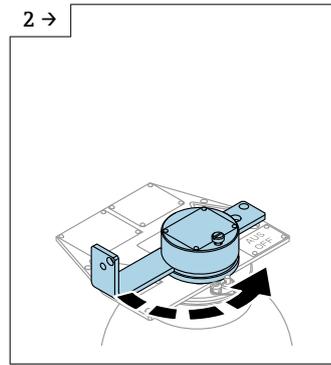
Risk of loss of control of the radiation source with the consequence of possible health hazards due to unshielded ionizing radiation. Ionizing radiation can increase the risk of cancer and genetic birth defects.

- ▶ Do NOT press the sealing screw and locking pin!

Switching ON the radiation

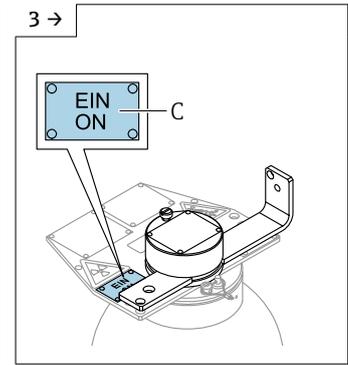
A0059589

- ▶ Remove the padlock.
- ▶ Only for source container with feature 670 "Additional function", option WA "Density measurement > Fixation ON": release the (optional) locking screw.



A0059590

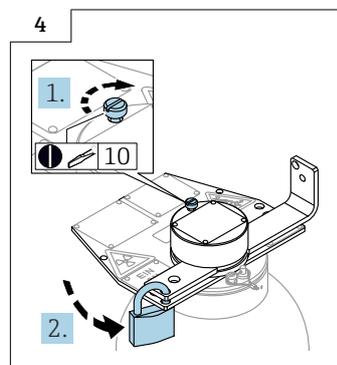
- ▶ Turn the swivel bracket 180 ° counterclockwise. The current switch state is indicated by the sign that is visible ("EIN - ON" or "AUS - OFF"). The other sign is covered by the swivel bracket.



A0059591

- ▶ The swivel bracket is in the correct position if the "EIN - ON" (C) sign is visible.

- ▶ ⚠ DANGER: IONIZING RADIATION WHEN OPENING THE SHUTTER! Follow the safety instructions at the start of this section.

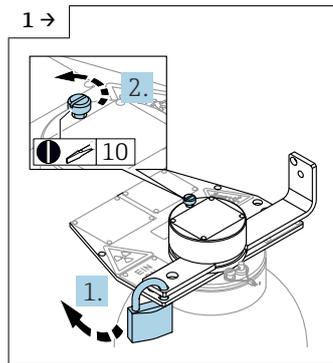


A0059592

- ▶ Only for source container with feature 670 "Additional function", option WA "Density measurement > Fixation ON": tighten the (optional) locking screw.
- ▶ Secure the "ON" switch position by hooking the padlock into the position provided.

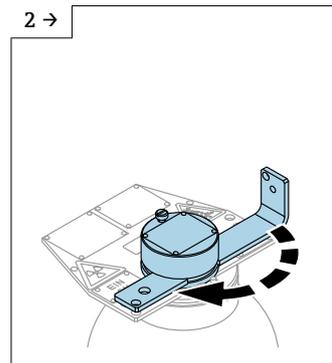
The source container is now switched on.

Switching OFF the radiation



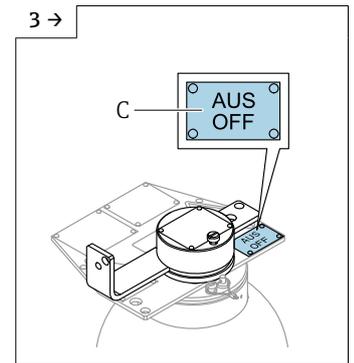
A0059684

- ▶ Remove the padlock.
- ▶ Only for source container with feature 670 "Additional function", option WA "Density measurement > Fixation ON": release the (optional) locking screw.



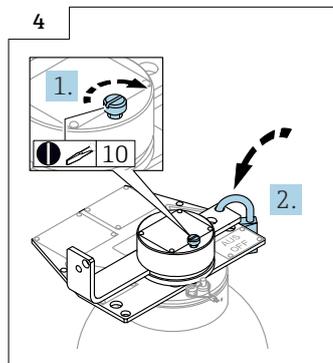
A0059685

- ▶ Turn the swivel bracket 180° clockwise. The current switch state is indicated by the sign that is visible ("EIN - ON" or "AUS - OFF"). The other sign is covered by the swivel bracket.



A0059686

- ▶ The swivel bracket is in the correct position if the "EIN - ON" (C) sign is visible.

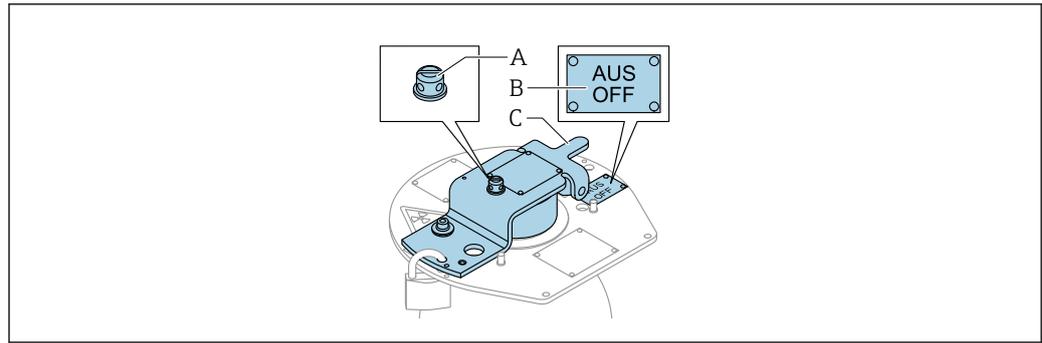


A0059687

- ▶ Only for source container with feature 670 "Additional function", option WA "Density measurement > Fixation ON": tighten the (optional) locking screw.
- ▶ Secure the "ON" switch position by hooking the padlock into the position provided.

The source container is now switched off.

7.2.4 FQG61/62; feature 020, option D



A0059593

- A Sealing screw
- B "AUS/OFF" sign
- C Swivel bracket (for radiation source replacement)

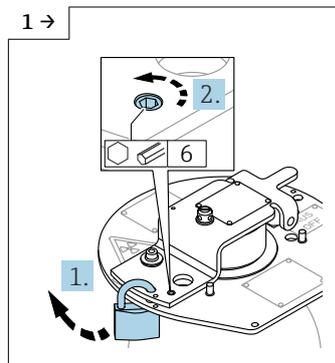
⚠ WARNING

Ionizing radiation if removal guard is taken off inadvertently!

Risk of loss of control of the radiation source with the consequence of possible health hazards due to unshielded ionizing radiation. Ionizing radiation can increase the risk of cancer and genetic birth defects.

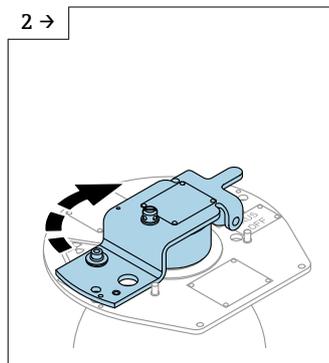
- ▶ Do NOT release the sealing screw!
- ▶ Turn the swivel bracket to switch it on and off. Do not fold it up!

Switching ON the radiation



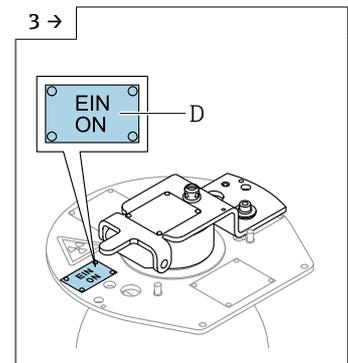
A0059594

- ▶ Remove the padlock.
- ▶ Only for source container with feature 670 "Additional function", option WA "Density measurement > Fixation ON": release the (optional) locking screw.



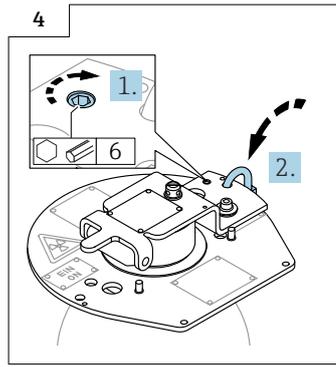
A0059595

- ▶ Turn the swivel bracket 180° clockwise. The current switch state is indicated by the sign that is visible ("EIN - ON" or "AUS - OFF"). The other sign is covered by the swivel bracket.



A0059596

- ▶ The swivel bracket is in the correct position if the "EIN - ON" (C) sign is visible.

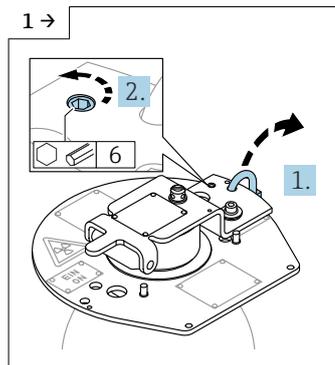


A0059597

- ▶ Only for source container with feature 670 "Additional function", option WA "Density measurement > Fixation ON": tighten the (optional) locking screw.
- ▶ Secure the "ON" switch position by hooking the padlock into the position provided.

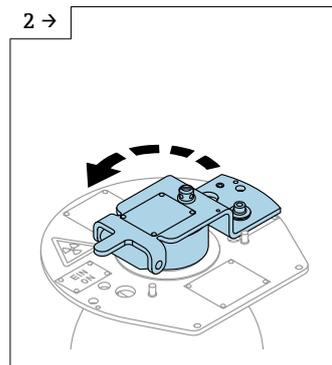
The source container is now switched on.

Switching OFF the radiation



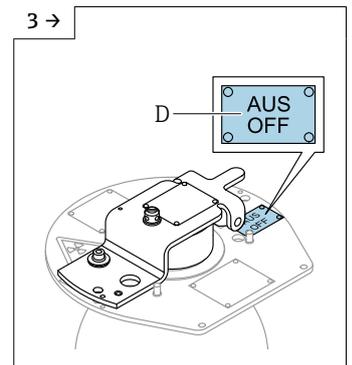
A0059689

- ▶ Remove the padlock.
- ▶ Only for source container with feature 670 "Additional function", option WA "Density measurement > Fixation ON": release the (optional) locking screw.



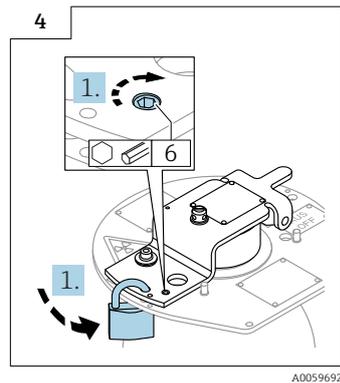
A0059690

- ▶ Turn the swivel bracket 180° counterclockwise. The current switch state is indicated by the sign that is visible ("EIN - ON" or "AUS - OFF"). The other sign is covered by the swivel bracket.



A0059691

- ▶ The swivel bracket is in the correct position if the "AUS - OFF" (D) sign is visible.



A0059692

- ▶ Only for source container with feature 670 "Additional function", option WA "Density measurement > Fixation ON": tighten the (optional) locking screw.
- ▶ Secure the "ON" switch position by hooking the padlock into the position provided.

The source container is now switched off.

7.2.5 FQG61/62; feature 020, option K, L, M or N

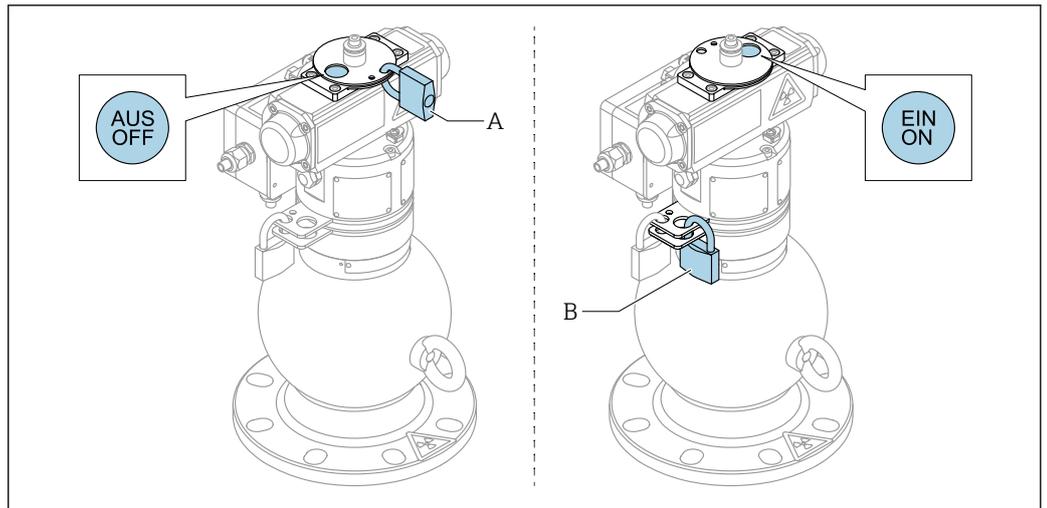
CAUTION

Risk of being crushed by moving parts!

The actuator contains moving parts that can cause crushing injuries if anyone reaches into it. Hands may be crushed, resulting in personal injury.

- ▶ Do not touch the cover plate or reach into the lock hole while the pneumatic auxiliary power supply of the drive is connected and active.
- ▶ When working on the source container, deactivate and lock the pneumatic auxiliary power supply.
- ▶ Do not wedge objects under the cover plate to stop the drive moving.
- ▶ If the drive is blocked (e.g., due to "seizing" after being out of operation for a prolonged period), deactivate and lock the pneumatic auxiliary power supply before releasing the blockage.

i The second, lower padlock blocks access to the radiation source and must not be removed during normal operation.



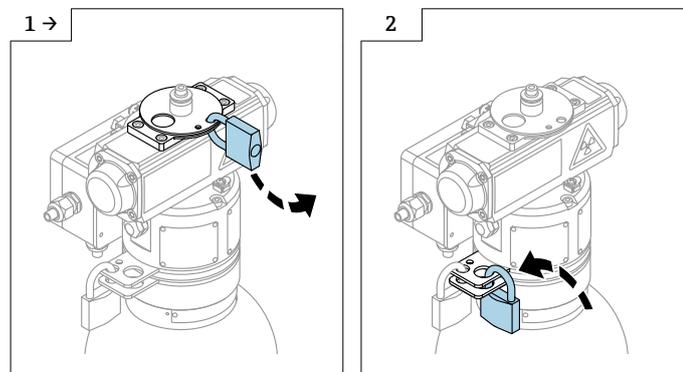
A0061109

- A Padlock in switch-on protection position
- B Padlock in parking position

Note the following for source containers with a pneumatic switch-on device for switching on and off:

- The lock must be removed before switching on. It is then possible to switch automatically.
- Permanent shutdown or during maintenance: Secure with the lock to prevent automatic startup.

Switching on the drive



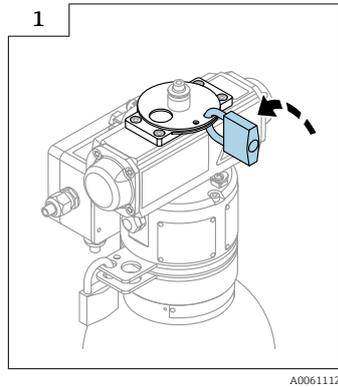
A0061110

A0061111

- ▶ Make sure that the pneumatic system is switched off.
 - ▶ **⚠ CAUTION:** Crushing hazard due to moving parts! Follow the safety instructions at the start of this section.
 - ▶ Remove padlock from the switch-on protection position.
 - ▶ Attach the padlock in the parking position.
 - ▶ Switch on the pneumatic system.
 - ↳ Using compressed air, switch the source holder from the "OFF" position to the "ON" position. The source holder should move smoothly to the "ON" position without any interruption.
- The source container is now operational.**

Switching off the drive

- ▶ Switch off the pneumatic system. ⚠ CAUTION: Crushing hazard due to moving parts! Follow the safety instructions at the start of this section.



- ▶ Insert the padlock into the switch-on protection position.

The source container is now safely deactivated.

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 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 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

- i** 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 being used as a source container, the 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 the recurrent tests must be documented in a container-specific test log.

- i**
- The user is responsible for maintaining a test log for documenting recurrent tests.
 - A template for recurrent tests is provided below.
 - A template for a test log is provided below.

8.1.1 Inspection intervals and tests to be performed

In addition to the points listed here, observe national regulations and documentation specifications must.

Test intervals

Test situation	Interval	Test for
After transport	Always	Integrity
In the process	Annually	Integrity Function
During storage in "loaded" condition ¹⁾	Every five years	Integrity Safety
Before dispatch in "loaded" condition	Always	Integrity Safety Compliance with all regulations
Before dispatch in "empty" condition ²⁾	Always	Integrity Function
Before loading	Always	Integrity Function

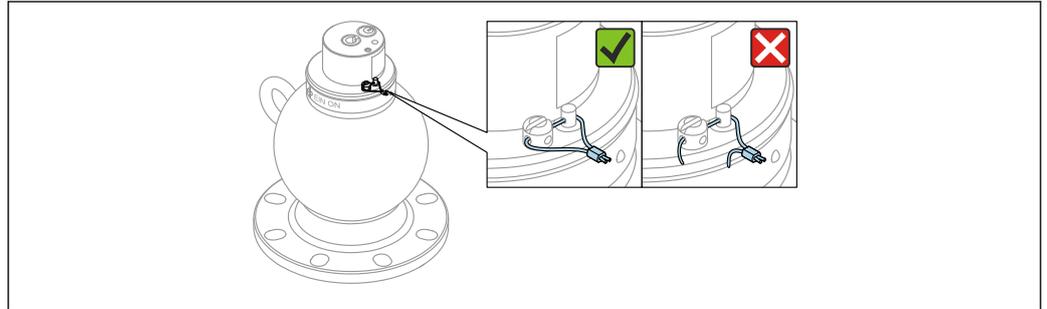
1) Radiation sources in the container

2) The 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.

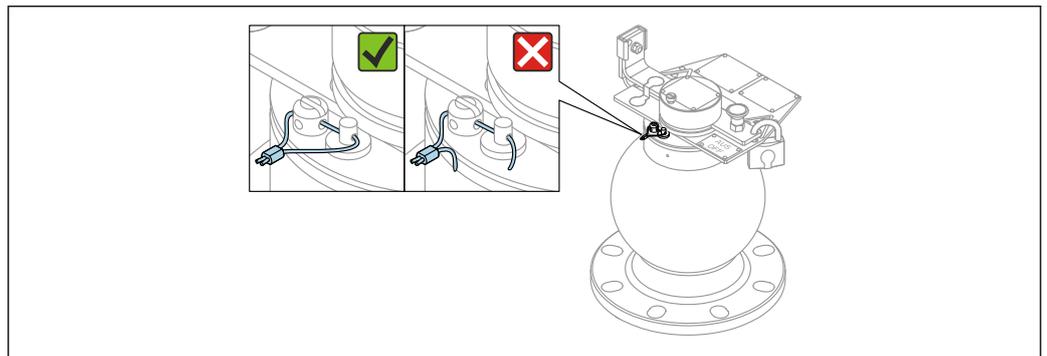
Integrity tests

After transport



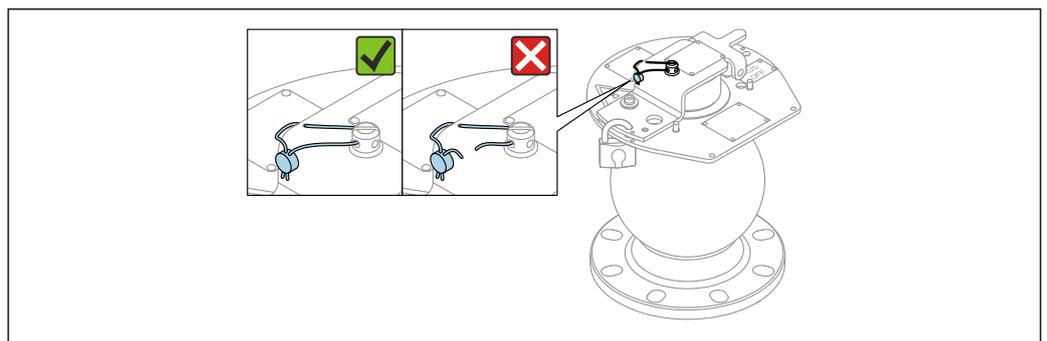
A0060484

34 Lead seal for feature 020, option A



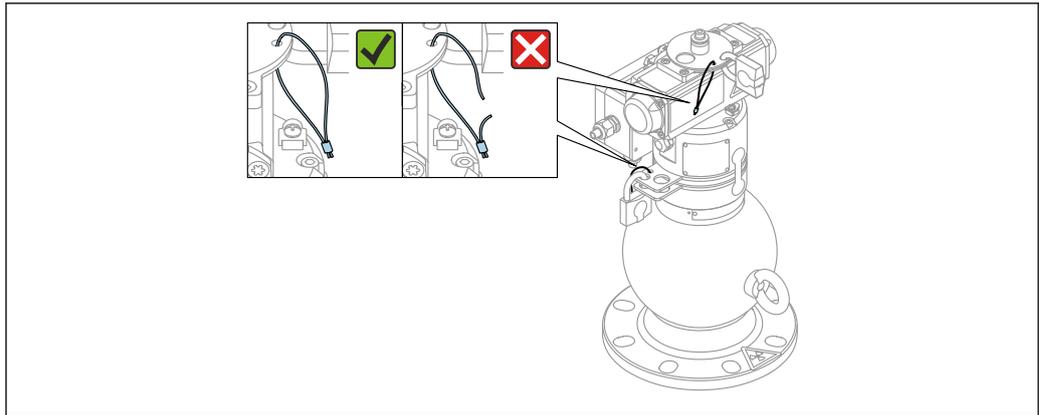
A0060485

35 Lead seal for feature 020, option B + C + Y



A0060486

36 Lead seal for feature 020, option D



A0060508

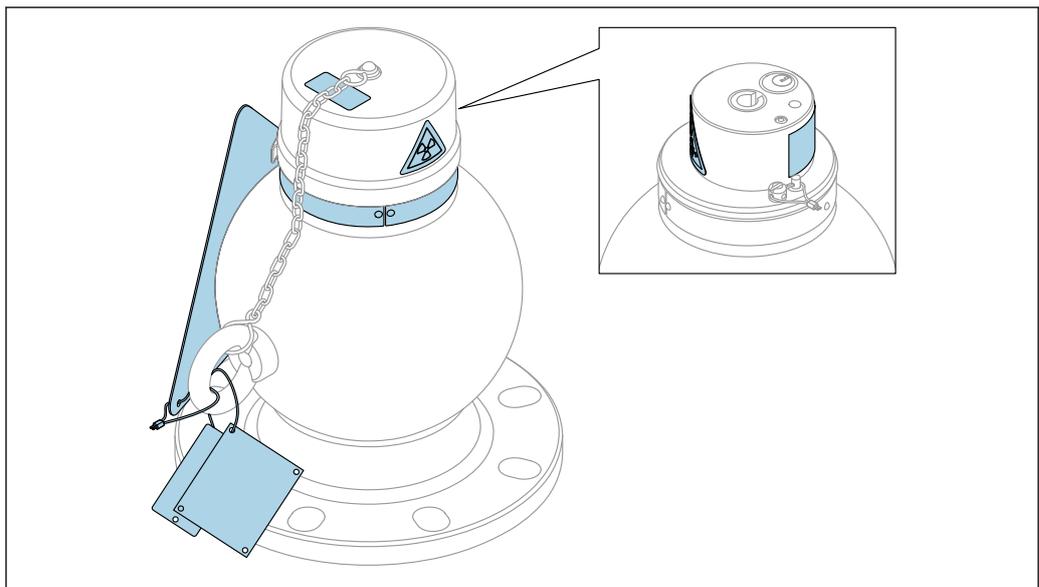
37 Lead seal for feature 020, option K,L,M,N

- ▶ 1. Check if the lead seal is present.

General

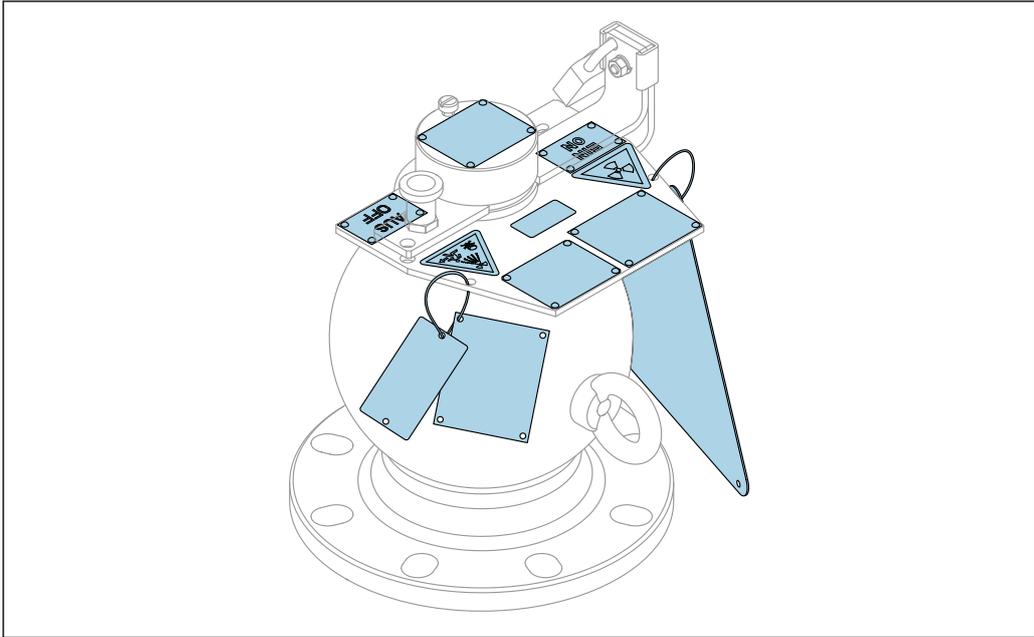
Nameplates and warning signs

- See "Product description -> Overview" for the position of the nameplates.
- For an explanation of how to interpret the nameplates, see "Incoming acceptance and product identification -> Product identification -> Nameplate".



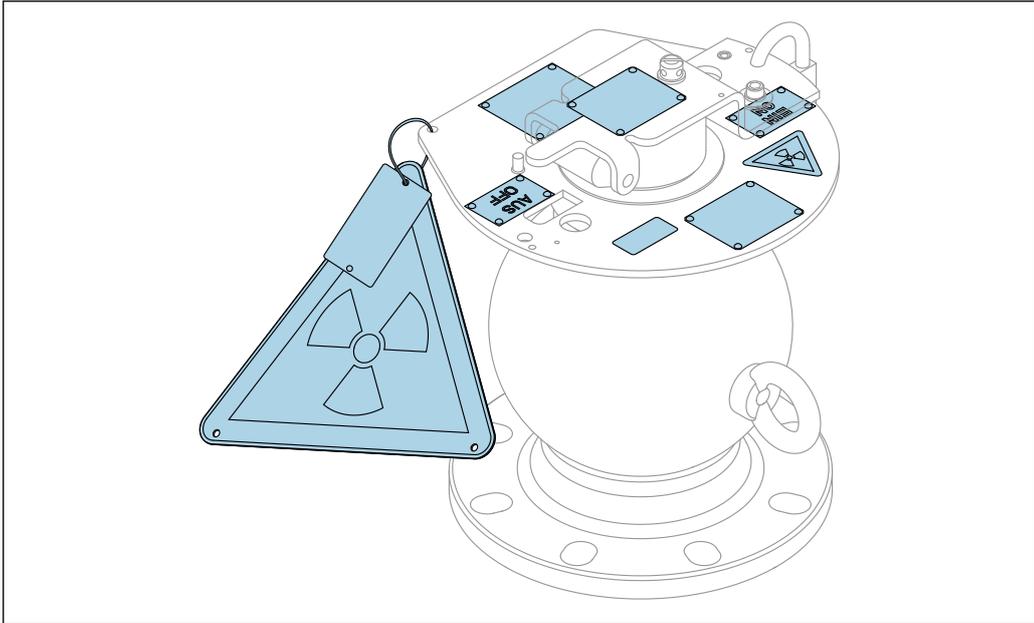
A0060509

38 Warning signs - feature 020, option A



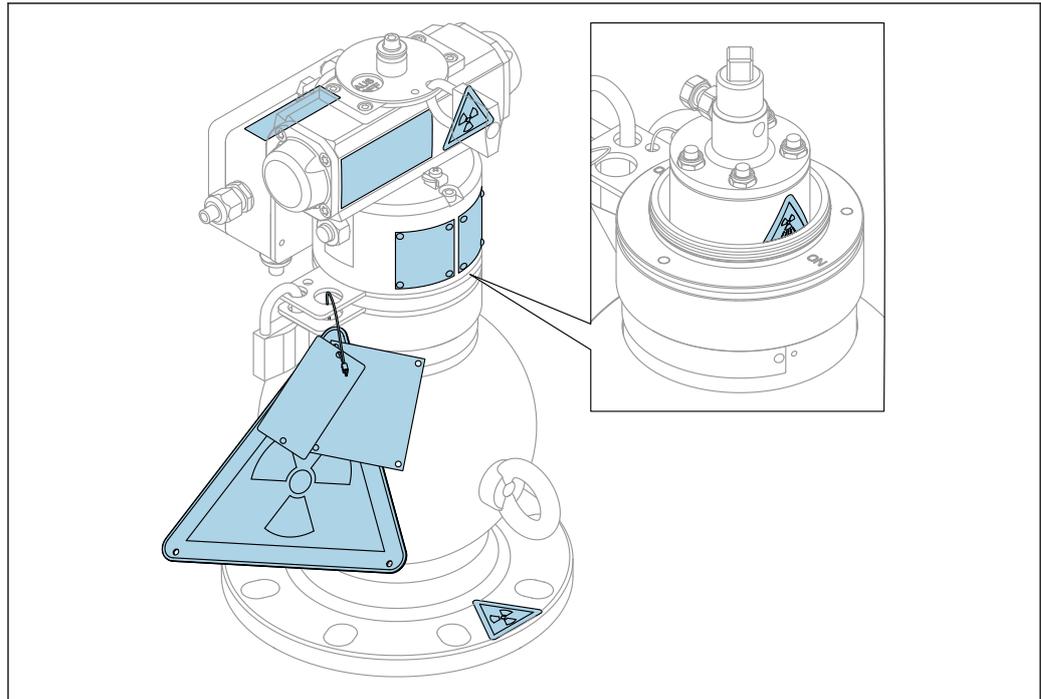
A0060518

39 Warning signs - feature 020, option B + C + Y



A0060519

40 Warning signs - feature 020, option D



A0060520

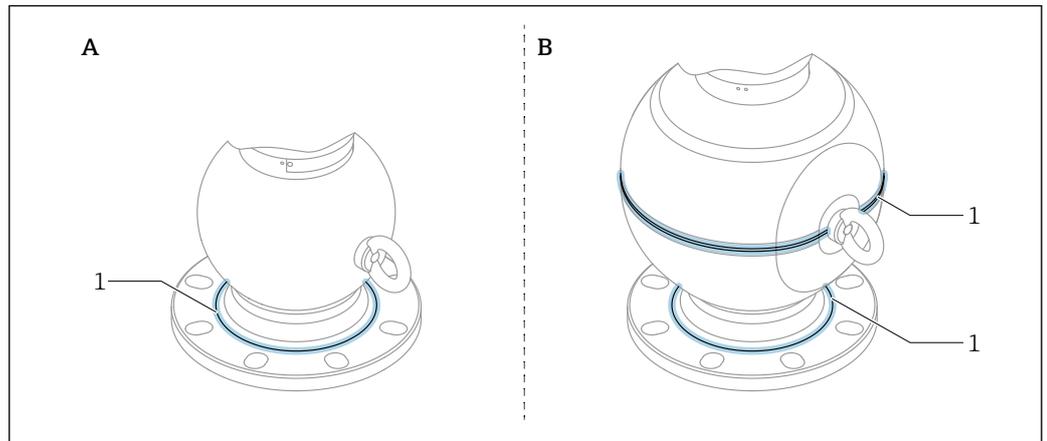
41 Warning signs - feature 020, option K, L, M, N

1. Identify and log the radiation sources using the nameplates.
2. Checking that the labeling is correct:
 - ↳ a. Ensure that the warning signs are attached and easy to read.
 - b. Ensure that the nameplates are securely attached and easy to read.
3. Is the shutter "ON/EIN" or "OFF/AUS" position easy to read? See "Product description - > Shutter" section.

Integrity of the source container and cover

1. Visual inspection: No significant corrosion on the source container that could jeopardize the safe storage of the radiation source. No significant corrosion on the cover.
2. Visual inspection: Check that the source container and cover are showing no signs of damage caused by fire, falling or collision.
3. Detailed inspection of weld seams for aforementioned points: Are the weld seams intact? Contact the Service team if there are any cracks.

Weld seams



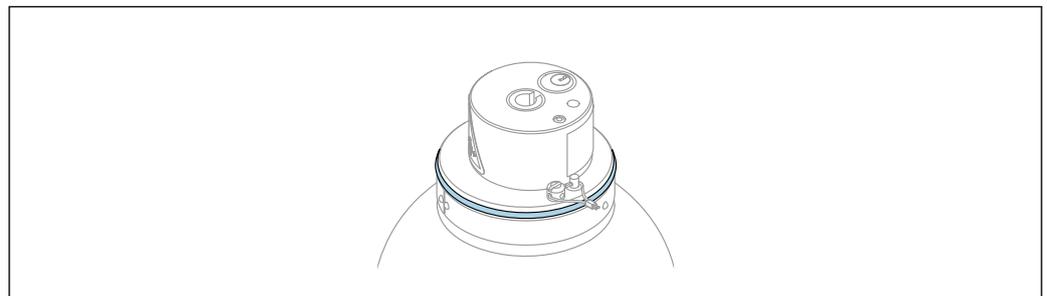
A0061202

42 Positions of weld seams

1 Weld seams

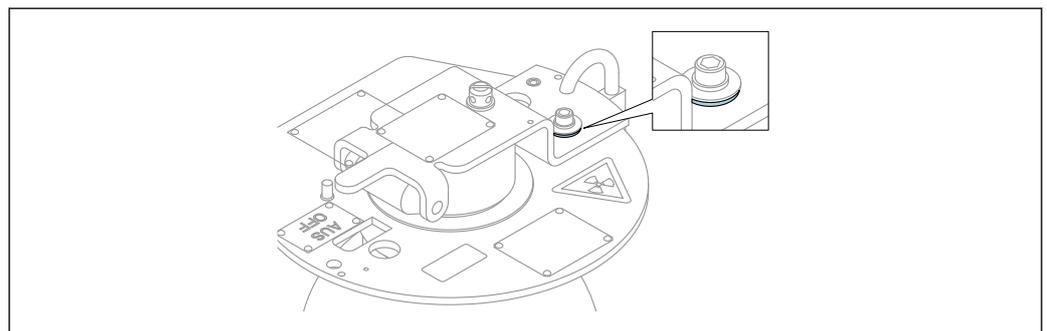
- Detailed inspection of weld seams for aforementioned points: Are the weld seams intact? Contact the Service team if there are any cracks.

Seals



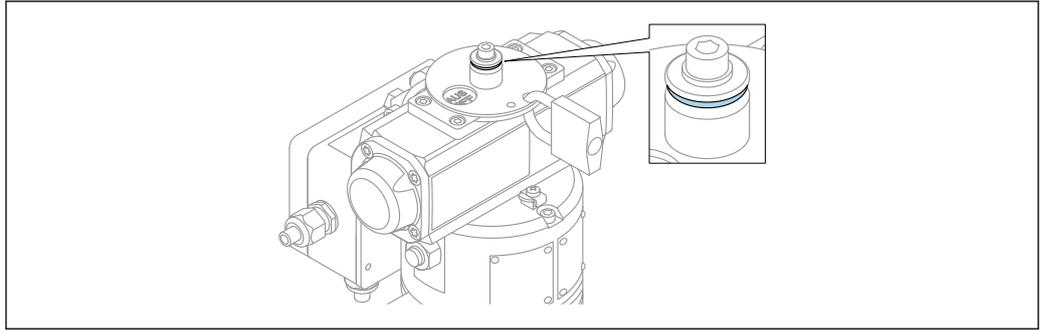
A0060525

43 Cover seal (feature 020, option A)



A0060526

44 Reference O-ring (feature 020, option D)

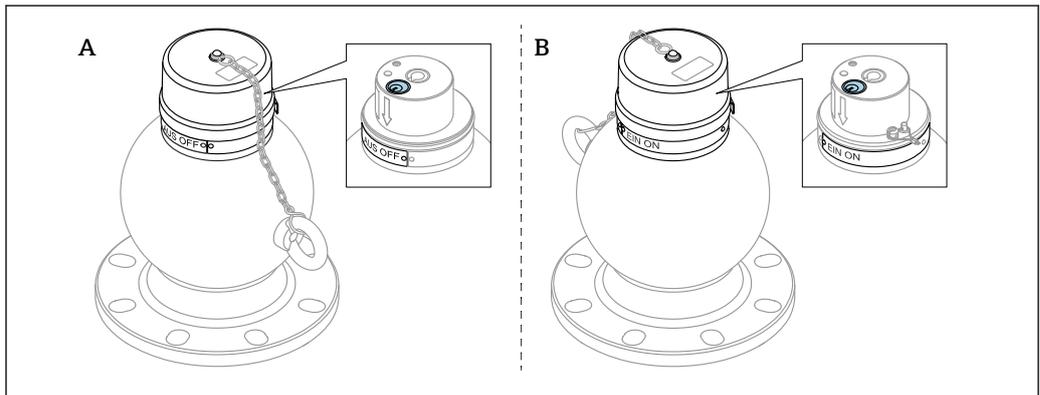


A0060527

45 Reference O-ring (feature 020, option K, L, M, N)

- ▶ Check seals and replace if necessary:
 - ↳ - Cover seal (option A)
 - Reference O-ring (option B+C+Y)
 - Reference O-ring (option D)
 - Reference O-ring (option K, L, M, N)

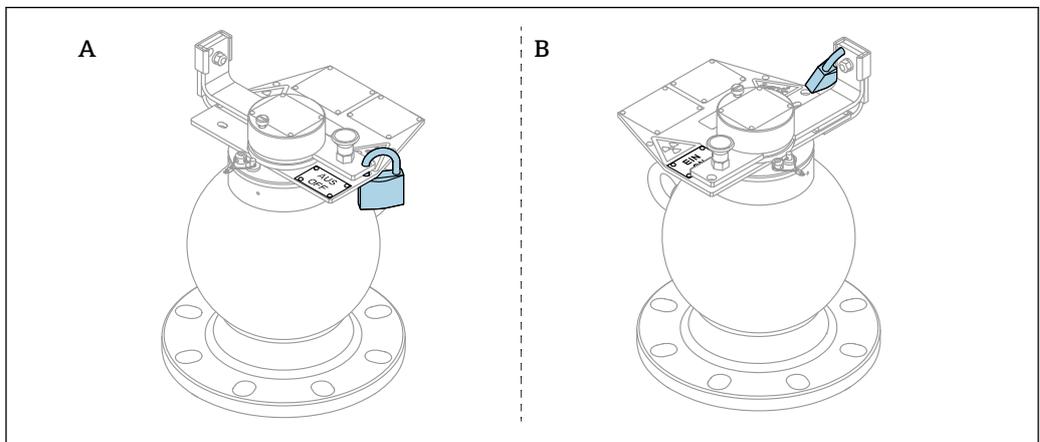
Anti-theft protection



A0060530

46 Feature 020, option A

- ▶ Checking the anti-theft protection:
 - ↳ - If required: are the locks present?
 - Are the keys for the lock present?

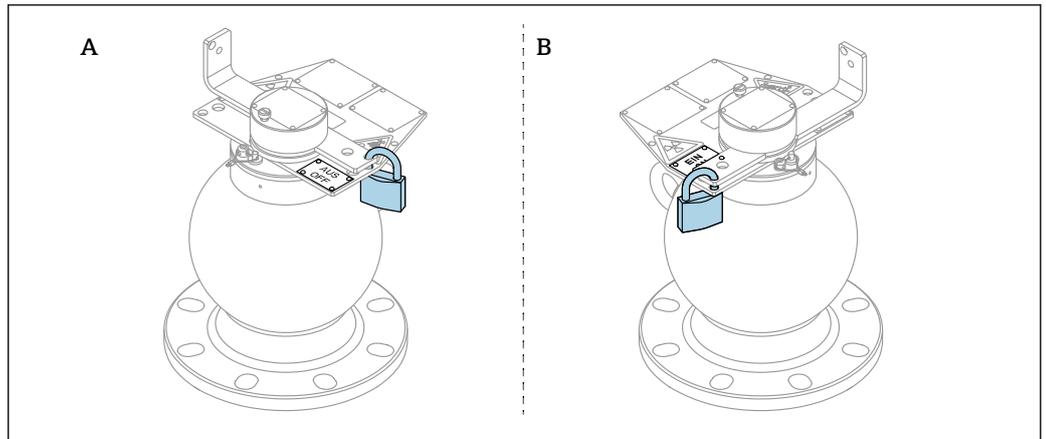


A0060531

47 Feature 020, option B

- A Source container switched off
- B Source container switched on

- ▶ Checking the anti-theft protection:
 - ↳ - If required: are the locks present?
 - Are the keys for the lock present?

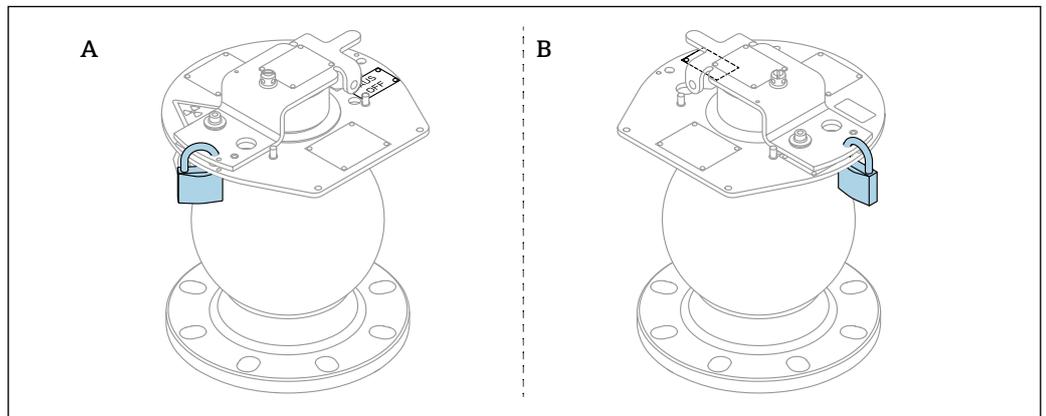


A0060532

48 Feature 020, option C

- A Source container switched off
- B Source container switched on

- ▶ Checking the anti-theft protection:
 - ↳ - If required: are the locks present?
 - Are the keys for the lock present?

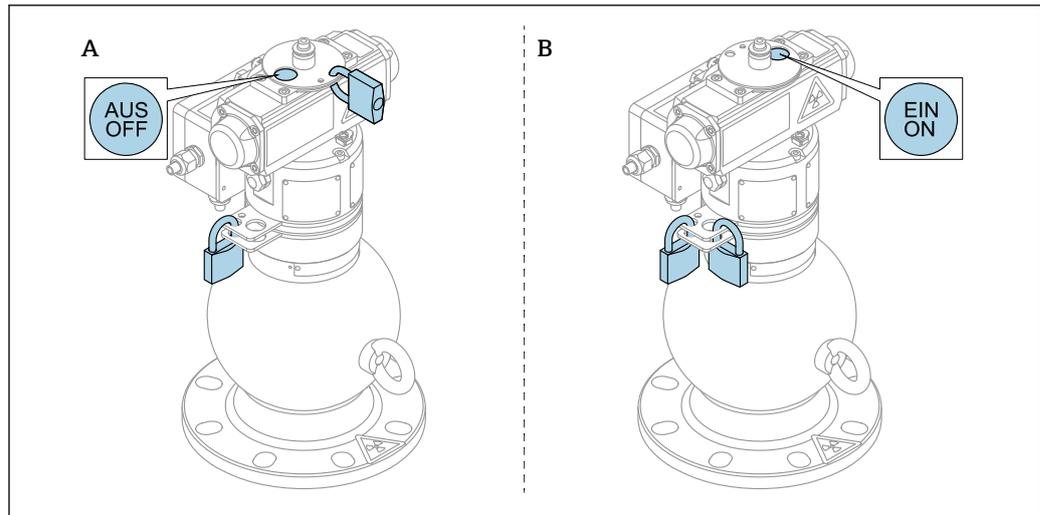


A0060533

49 Feature 020, option D

- A Source container switched off
- B Source container switched on

- ▶ Checking the anti-theft protection:
 - ↳ - If required: are the locks present?
 - Are the keys for the lock present?



A0060534

☐ 50 Feature 020, option K, L, M, N

A Source container switched off

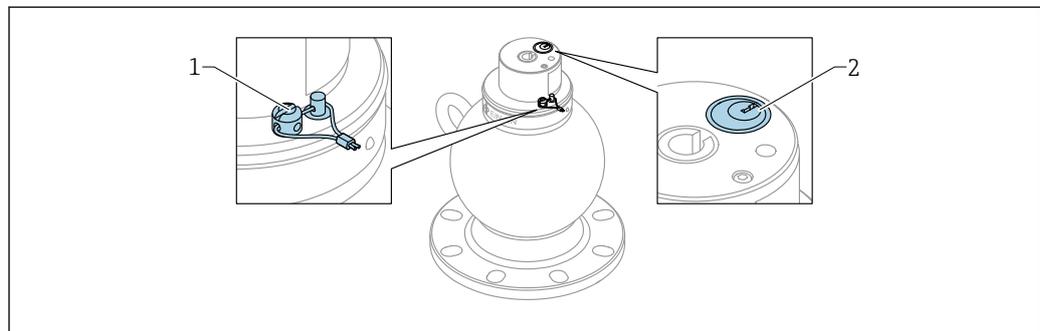
B Source container switched on

► Checking the anti-theft protection:

- ↳ - If required: are the locks present?
- Are the keys for the lock present?

Source holder

Feature 020, option A



A0060554

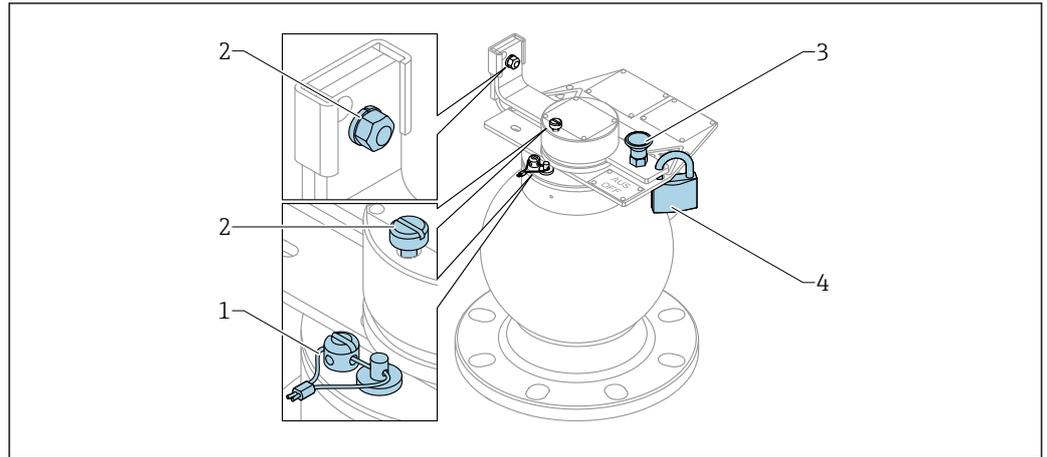
☐ 51 Standard source holder (option A)

1 Lead sealing

2 Lock

1. Check the visible part of the source holder for corrosion.
2. Check if the lead sealing is present.
3. Check that the lock is securely fitted.

Feature 020, option B



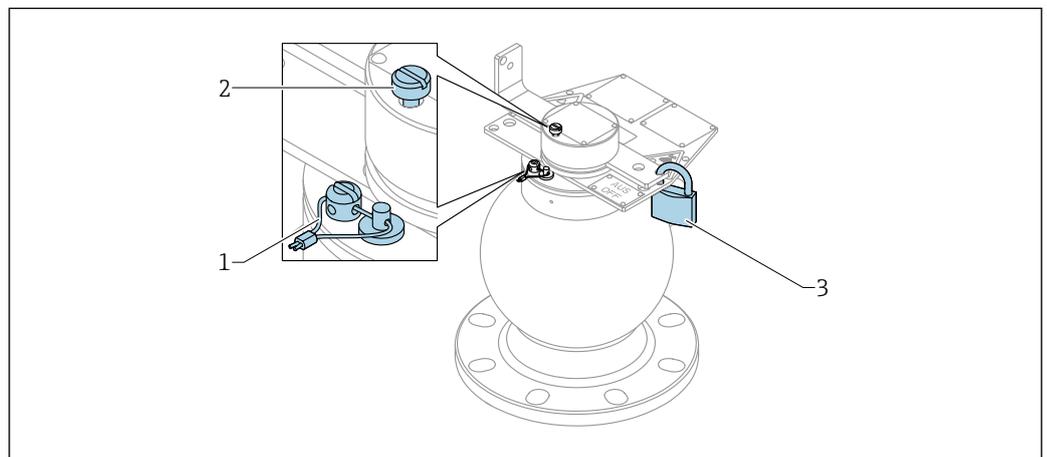
A0060555

52 NRC source holder (option B)

- 1 Lead sealing
- 2 Threaded joints
- 3 Locking bolt
- 4 Lock

1. Check the visible part of the source holder for corrosion.
2. Check if the lead sealing is present.
3. Check that the screw connections are secure.
4. Check whether the locking pin is securely fitted.
5. Check if the lock is present.

Feature 020, option C



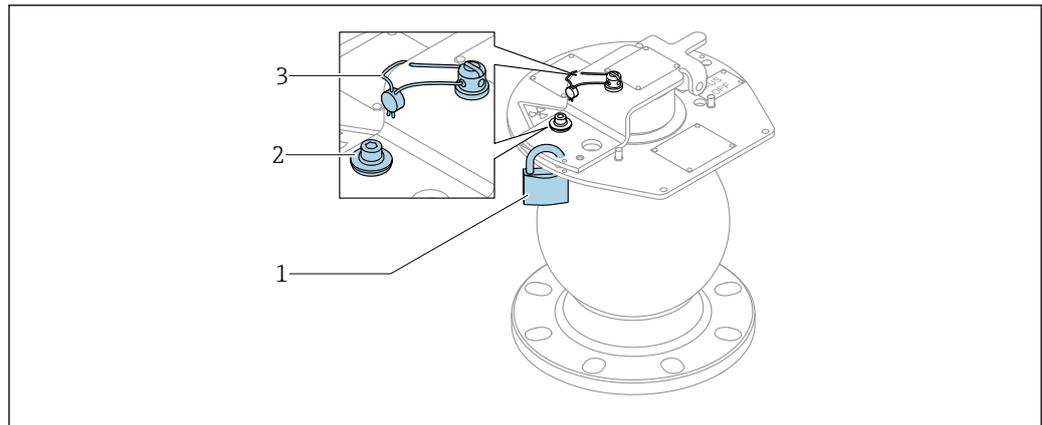
A0060556

53 Euro source holder (Option C)

- 1 Lead sealing
- 2 Threaded joints
- 3 Lock

1. Check the visible part of the source holder for corrosion.
2. Check if the lead sealing is present.
3. Check that the screw connections are secure.
4. Check if the lock is present.

Feature 020, option D



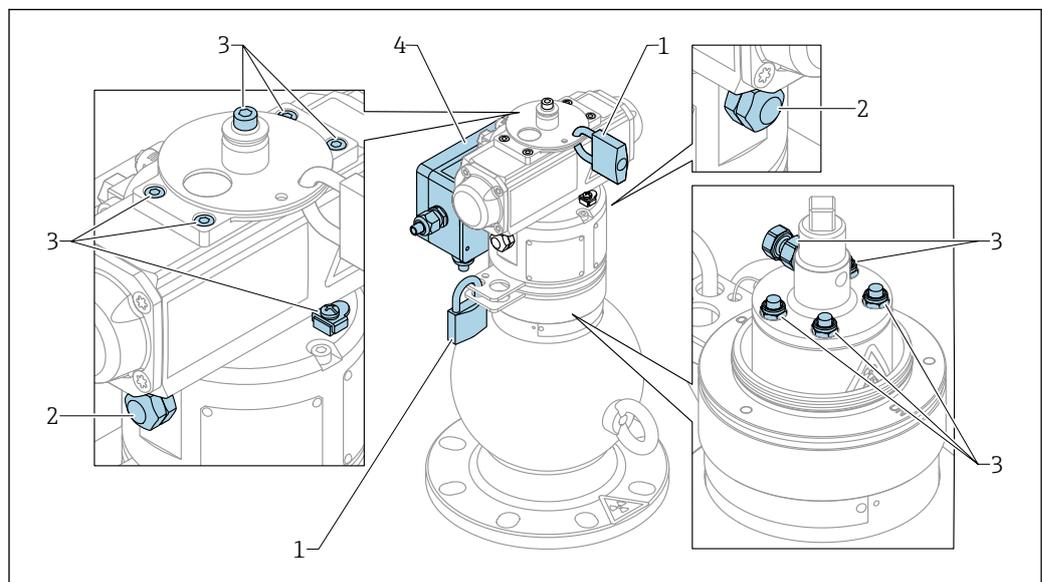
A0060557

54 Source holder, chemical industry (option D)

- 1 Lock
- 2 Threaded joints
- 3 Lead sealing

1. Check the visible part of the source holder for corrosion.
2. Check if the lock is present.
3. Check that the screw connections are secure.
4. Check if the lead sealing is present.

Feature 020, option K, L, M, N



A0060558

55 Source holder K, L, M, N

- 1 Lock
- 2 Inductive sensors
- 3 Threaded joints
- 4 Terminal box

i This test is only required if the drive is disassembled for operational reasons.

1. Check the visible part of the source holder for corrosion.
2. Check if the lock (1) is present.
3. Check if the inductive sensors (2) are securely fitted.

4. Check that the screw connections (3) are secure.
5. Check that the terminal boxes (4) are secure and check for the effects of aging. ⚠
WARNING: IONIZING RADIATION WHEN OPENING THE SHUTTER! Follow the safety instructions at the start of this section.

Testing for correct functioning

1. Can the shutter be moved to the "ON/EIN" or "OFF/AUS" position? Refer to "Commissioning -> Switching on the radiation" or "Commissioning -> Switching off the radiation".
2. Option B only: can you move the locking bolt?
3. Only for option K, L, M, N:
 - ↳ A. Does the pneumatic drive work?
 - ↳ B. Do the proximity switches work?
4. Testing the anti-theft protection:
 - ↳ Is the lock present and can the lock be operated? See "Product description -> Anti-theft protection" section.

Testing for safety

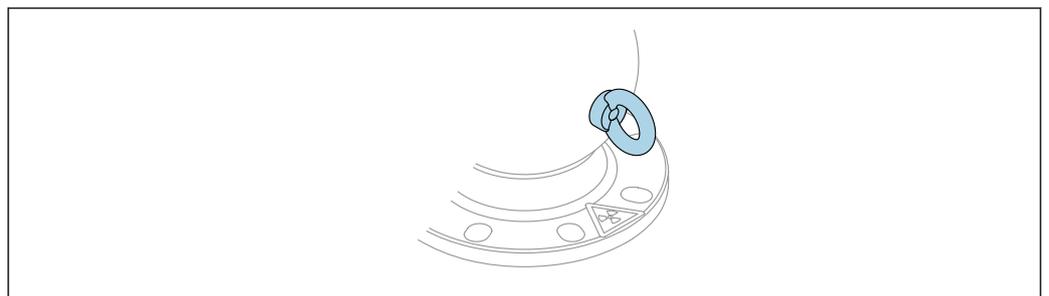
1. Carry out a documented leak test, see the "Maintenance -> Maintenance tasks -> Leak test" section.
2. Make sure that the container is secured in the "AUS/OFF" position with a lock, see "Product description -> Overview".

Checks for compliance with all regulations (for dispatch)

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 container is marked in accordance with international regulations concerning the transport of dangerous goods (ADR/RID, DGR/IATA).
3. Attach the lead seal before shipping.

Checking the condition of the crane lug



56 Crane lug

A0060546

The crane lug is not in constant use. It must therefore be checked before each use:

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

Template for recurrent tests

Company	
Name	
Address	
Name of inspector and role	

Source container	FQG_ - _____
-------------------------	--------------

Radiation source	
Isotope	<input type="checkbox"/> Cesium-137 <input type="checkbox"/> Cobalt-60
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	<input checked="" type="checkbox"/>	<input type="checkbox"/>
x	x	x	x	x	Security seals are present and unbroken.		
x	x	x	x	x	Markings are 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(s).		
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 bolt can be operated. Option B only.		
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 and sealing surfaces are free from dirt.		
x	x	x	x	x	All components of the anti-theft devices are present and in working order.		
x	x	x			The lock for the anti-theft protection is present and operable.		
x	x	x	x	x	The source container is free from corrosion.		
	x	x			The shutter of the source container can be moved to the "ON/EIN" or "OFF/AUS" position.		

A	B	C	D	E	Tests	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	x				Options K, L, M, N: Is the pneumatic drive in working order? Are the components of the pneumatic drive securely screwed on?		
	x				Options K, L, M, N, Y: Are the proximity switches in working order and securely screwed on? Are the terminal box and cable entries free from damage and the effects of aging?		
		x	x	x	The source container is closed (in the "OFF" position).		
			x	x	The lock has been fitted and locked.		
	x		x	x	Leak test was performed: The source container is sealed.		
				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

8.1.2 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:

- Suitability description
- 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

-  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.

8.2.1 Overview of maintenance tasks

DANGER

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 and cover

- ▶ Check source container for cracks, damage and severe corrosion.
 - ↳ - If cracks, damage, or severe corrosion are found, replace the source container.
 - Contact the manufacturer.
 - Do not use as Type A packaging.

Source holder

- ▶ Check the source holder for corrosion.
 - ↳ Do not load if corrosion is present.
 - Contact the manufacturer.

If screws are loose:

- ▶ Tighten the screws.

If you suspect the radiation source is leaking or lost:

1. Initiate emergency measures, see "What to do in an emergency" section.
2. Immediately inform the radiation safety officer.
3. Contact the manufacturer.

Anti-theft protection

1. Check the lock for proper function and smooth operation.
 - ↳ If malfunctioning or difficult to operate, replace the lock (use the same type).
2. Check the lock for corrosion.
 - ↳ If there is excessive corrosion, replace the lock (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 points

- ▶ Check the lifting points for corrosion, wear, damage, and completeness.
 - ↳ Replace corroded, worn or damaged lifting points.
If any parts are missing or damaged, order them as spare parts.

Seals

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

Pneumatic drive

- ▶ Check the compressed air connection on the throttle check valve.
 - ↳ Replace seals if necessary.
Check the vent filter for dirt.
Check rotary drive and reset function.

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.

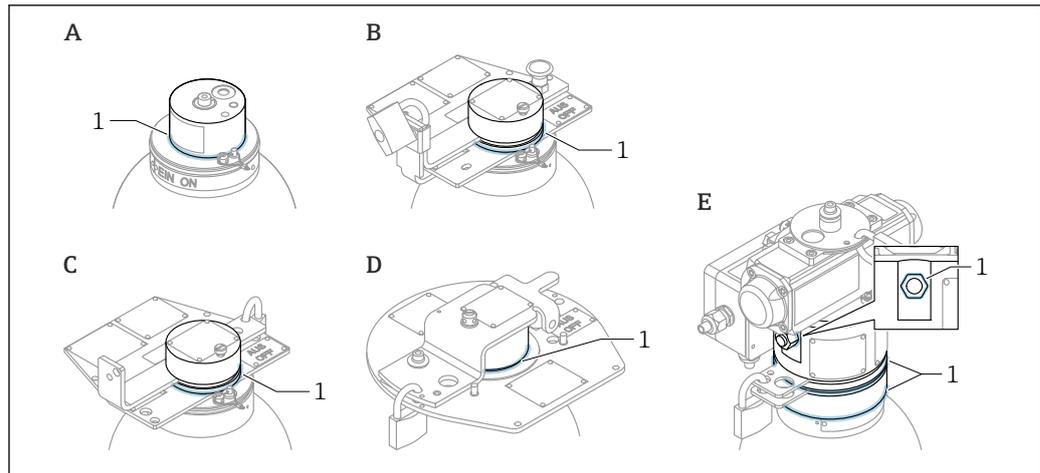
A leak test is not only required as part of routine checks but must also be performed whenever an incident occurs that may impair the casing around the radiation source. In such cases, the leak test must be arranged by the responsible radiation safety officer, with due consideration to the applicable 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

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:



A0018425

- A FQG61/FQG62; feature 020, option A
 B FQG61/FQG62; feature 020, option B
 C FQG61/FQG62; feature 020, option C
 D FQG61/FQG62; feature 020, option D
 E FQG61/FQG62; feature 020, option K, L, M or N

⚠ WARNING

Risk of injury from ionizing radiation if the radiation source is switched on inadvertently with the remote control!

Uncontrolled setting of the shutter to the "ON/EIN" position by remote control: Personnel and visitors to the facility may be exposed to uncontrolled ionizing radiation if the actuator is used automatically by the process control system. Potential health risks from unshielded ionizing radiation. Ionizing radiation can increase the risk of cancer and genetic birth defects.

- ▶ **Before working in the area of the radiation emission channel, secure the source container in the "OFF/AUS" position with a lock.** These precautions also apply when accessing tanks, for example during maintenance, or for work behind pipes.
- ▶ **Please follow the instructions on radiation protection contained in the Operating Instructions.**
- ▶ **Contact the relevant radiation safety officer for specific instructions.**
- ▶ **Monitor the switch state via the installed sensors and take appropriate organizational measures to prevent access to the radiation area when the sensors do not report an OFF state.**
- ▶ We recommend that a risk analysis be carried out to define the measures and that the employees be trained on the dangers.

⚠ WARNING

Risk of injury

- ▶ In the case of source containers with a pneumatic actuator, the switch must be secured and padlocked in the "OFF" position before the wipe test. In the case of manually operated source containers, the wipe test can be performed irrespective of the switch position

1. Take a wipe sample at the following points at least:
 - ↳ FQG61/FQG62; feature 020, option A, B, C, D: along the groove between the source insert and the housing
 - FQG61/FQG62; feature 020, option K, L, M, N: along the thread of the proximity switches and the three annular grooves on the cylinder housing

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

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

- ▶ If a leak is detected, initiate emergency measures immediately; see "What to do in an emergency" section.

8.3 Cleaning

DANGER

Risk of injury from ionizing radiation!

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.

- ▶ Follow all safety instructions during cleaning; see section "Basic safety instructions".

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.

8.4 Routine tests of the shutter mechanism

8.4.1 Source containers with manual ON/OFF switching mechanism

1. Release the locking bolt (Source Container FQG61/FQG62; feature 020, option B) or remove the padlock (if present) as described in the "Operation" 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 easily move the source holder and there should not be any 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).

8.4.2 Source containers with pneumatic ON/OFF switching mechanism

CAUTION

Risk of being crushed by moving parts!

The actuator contains moving parts that can cause crushing injuries if anyone reaches into it. Hands may be crushed, resulting in personal injury.

- ▶ Do not touch the cover plate or reach into the lock hole while the pneumatic auxiliary power supply of the drive is connected and active.
- ▶ When working on the source container, deactivate and lock the pneumatic auxiliary power supply.
- ▶ Do not wedge objects under the cover plate to stop the drive moving.
- ▶ If the drive is blocked (e.g., due to "seizing" after being out of operation for a prolonged period), deactivate and lock the pneumatic auxiliary power supply before releasing the blockage.

1. Remove the padlock

2. WARNING

Risk of injury

- ▶ Do not reach into the indicator window area of the indicator plate.

Using compressed air, switch the source holder from the "OFF" position to the "ON" position. The source holder should move smoothly to the "ON" position without any interruption.

3. Reduce the pressure to below 2.5 bar (36.25 psi). The source holder must move back to the "OFF" position:

- If the source holder does not move continuously 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.
- 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).
- In the event of corrosion, follow the instructions in the section "Maintenance and inspection" (measures in the event of corrosion).
- Check the vent filter, compressed air connection and throttle check valve for dirt.
- Check that the compressed air connection is seated correctly. Check for:
 - leaks,
 - damage to the housing,
 - loose threaded connections.

If soiling is detected:

- Flush the line upstream of the valve.
- For stubborn particles: Remove the filter and blow it out with dry compressed air (no oil or water!).

8.5 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.

8.6 Measuring and test equipment

 Comply with national regulations!

Dosimeter to check the controlled area

8.7 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 notes

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.
- Repairs are only permitted when the switch is in the "AUS/OFF" position.
- Take into account the weight and center of gravity of the source container: FQG61: 39 to 46 kg (86 to 101.4 lb), FQG62: 83 to 90 kg (183 to 198.4 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 substitute wiping surfaces 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 source.
 - The source container must not show any signs of serious mechanical damage caused by 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 in the "AUS/OFF" position.
 - 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 the IAEA safety standards series 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 dangerous goods (ADR/RID, DGR/IATA).

9.4.4 Inspection before return

Company	
Name	
Address	
Name of inspector and role	

Source container	FQG_ - _____
------------------	--------------

Radiation source	
Isotope	<input type="checkbox"/> ¹³⁷ Cs <input type="checkbox"/> ⁶⁰ Co
Serial number of the radiation source	
Nominal activity (MBq/GBq)	
Date of manufacture	

Tests	Result	
	<input checked="" type="checkbox"/>	<input type="checkbox"/>
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 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?		
The transport index has been determined		
The source container is labeled according to international regulations concerning the transportation of dangerous goods (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

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

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
- 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. Notify the radiation safety officer.
2. 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 FQG61, FQG62".



www.addresses.endress.com
