



Technical Information / Operating Instructions **Source container FQG60**

Radiometric Level Measurement



Container with radiation source insert with manual switch-on and switch-off

Application

The FQG60 source container is designed to hold the radioactive source during radiometric level limit measurement, level measurement and density measurement. The radiation is emitted almost unattenuated in one direction only, and is damped in all other directions.

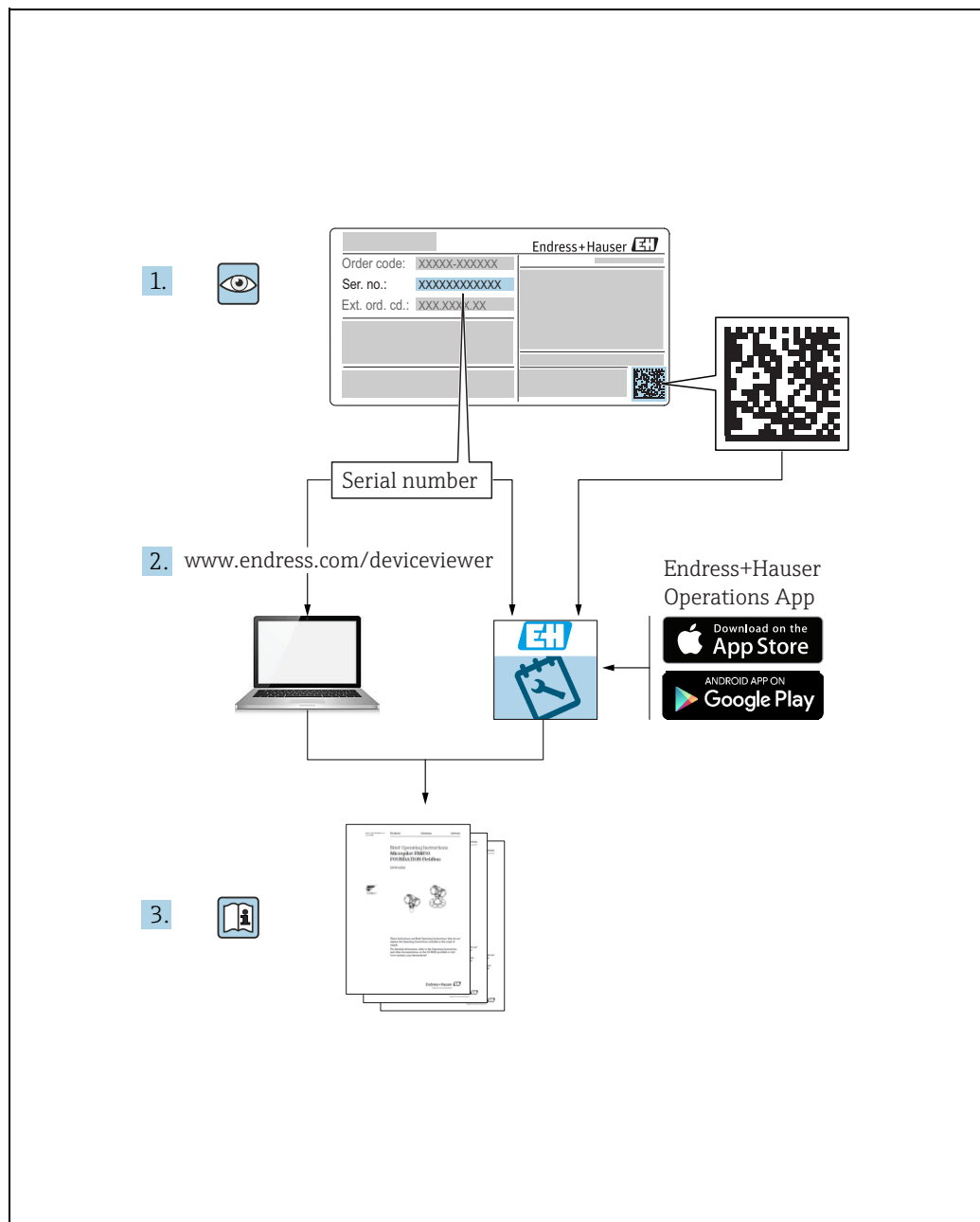
The FQG60 is suitable for ^{137}Cs to 1.11 GBq (30 mCi).

The FQG61, FQG62 or FQG66 devices are able for larger activities.

In the case of density measurement, it is suitable for pipe outer diameters ranging from 48 to 273 mm (1.89 to 10.7 in).

Your benefits

- Small-size, lightweight device provides optimized screening
- Highest safety classification for the source supplied (DIN 25426/ISO 2919, typical classification C66646)
- Fire-resistant version 821 °C (1510 °F)/ 30 minutes
- Compact device that is easy to mount
- Various angles of emission for optimum adaptation to the application
- Manual switch-on and switch-off (ON/OFF)
- Padlock to fix switching positions (ON/OFF), or snap hook to fix switching position ON
- Switch status easily identified
- Integrated mounting device for density measurement on pipes
- Optional: calibration plate for quick and easy density recalibration



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Safety Instructions

Designated use

The source containers described in this document contain the radioactive source, which is used for radiometric measurement of the level limit, level and density. It screens the radiation towards the surrounding and allows it to be emitted almost unattenuated only in the direction of the measurement. In order to guarantee the screening effect and to exclude damage of the radiation source, all instructions given in this Technical Information for mounting and operation as well as all regulations for radioactive protection are to be followed exactly. Endress+Hauser accepts no responsibility for any damage caused by incorrect use.

In the case of non-stationary systems or applications, it is absolutely essential to set the source container to the OFF position when transporting the device.

Basic Instructions for use and storage

- Observe the applying rules and national regulations.
- Observe the radiation protection regulations in use, storage and for work on the radiometric measuring system.
- Observe warning signs and safety areas.
- Install and operate the device according to this manual and the relevant conditions as specified by the regulatory authority.
- The device shall not be operated or stored outside the specified parameters.
- Protect the device against extreme influences (e.g. chemical products, weather, mechanical impacts, vibrations) when operated or stored.
- Always secure the "OFF" position using the padlock.
- Before switching ON the radiation beam it is necessary to ensure that no personnel are within the area of the radiation (or, indeed, inside the vessel). The radiation beam may only be switched ON by specially trained personnel.
- Do not operate or store damaged or corroded devices. Contact the responsible radiation safety officer for appropriate instructions and measures when damage or corrosion occurs.
- Conduct the required leak testing procedure according to the applying regulations and instructions.

⚠ WARNING

If the device is exposed to strong vibrations or mechanical impacts, check that the lead shielding (shutter) is stable and securely seated at regular intervals. Also ensure the securing and inspect the condition of the padlock or snap hook.

⚠ CAUTION

In case of doubt about proper condition of the device check the area around the device for leakage radiation and/or contact immediately the responsible radiation safety officer.

Hazardous area

General Instructions

⚠ CAUTION

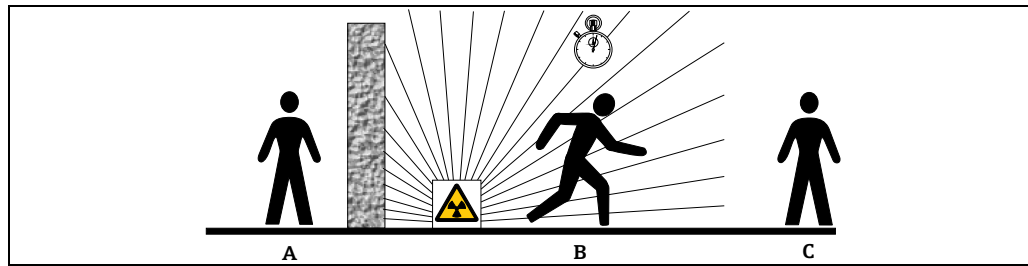
The suitability of the radiometric measurement method and of the device for applications in hazardous areas has to be checked by the operator of the plant according to national regulations.

The following has to be observed:

- Avoid electrostatic charge at the device. Do not rub synthetic surfaces dry.
- The device must be integrated in the potential equalization of the plant.

General instructions on radiation protection

When working with radioactive sources, any unnecessary exposure to radiation must be avoided. Unavoidable exposure to radiation must be kept to as low a level as possible. Three important measures help you to achieve this:



A Screening
B Time
C Distance

Screening

Ensure the screening between the radiation source and you and all other persons is as good as possible. Source containers (e.g. FQG60, FQG61, FQG62, FQG63, FQG66) and all high-density materials (lead, iron, concrete etc.), can be used for effective screening purposes.

Time

Time spent in the exposed area should be kept to a minimum.

Distance

Keep at as large a distance as possible from the radiation source. The local dose rate of the radiation decreases with the square of the distance from the radiation source.

Legal requirements for radiation protection

Handling radioactive sources is legally controlled. The radiation protection regulations of the country in which the plant is to be operated are to be strictly observed. For example, the valid radiation protection requirements are applicable in Germany. The following important points derived from this for radioactive measurement are:

Handling permit

A handling permit is required for operating a plant which uses gamma radiation. Application for the permit must be made to the Land government or the authority responsible (Land Offices for Environmental Protection, Trade Inspection Offices, etc.). The Endress+Hauser Sales Organization will be pleased to help you to obtain the permit.

Radiation Safety Officer

The operator of the plant must nominate someone responsible for radiation protection who has the necessary specialist knowledge and who is responsible for observing all radiation protection regulations and procedures for radiation protection. Endress+Hauser offers training courses in which the necessary specialist knowledge can be acquired.

Control area

Only persons exposed to radiation during the course of their job may sojourn in control areas (i.e. areas where the local dose rate exceeds a specific value) provided they are subjected to official personnel dose monitoring procedures. For the Federal Republic of Germany the limit values for the control area are specified in the current radiation protection requirements.

The Endress+Hauser sales office will be pleased to provide further information of radiation protection and regulations in other countries.

Supplementary Instructions

Observe the associated Instruction Manuals SD00292F/00 (for Canada) and SD00293F/00 (for the USA).

⚠ CAUTION

This device contains more than 0.1% lead with CAS No. 7439-92-1.

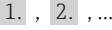
The lead is not accessible in vessels that are free from damage. If the vessel is damaged, national regulations surrounding the handling of lead must be observed.

Symbols

Safety symbols

Symbol	Meaning
 A0011189-DE	Danger! This symbol alerts you to a dangerous situation. Failure to avoid this situation will result in serious or fatal injury.
 A0011190-DE	WARNING! This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in serious or fatal injury.
 A0011191-DE	CAUTION! This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in minor or medium injury.
 A0011192-DE	NOTICE! This symbol contains information on procedures and other facts which do not result in personal injury.

Symbols for certain types of information

Symbol	Meaning
 A0011184	Forbidden Indicates procedures, processes or actions that are forbidden.
 A0015484	Reference to page Refers to the corresponding page number.
	Series of steps

Symbols in graphics

Symbol	Meaning
1, 2, 3, 4, ...	Item numbers
1., 2., ...	Series of steps
A, B, C, D, ...	Views

Function and system design

Function

Function of the radiation source container

In the FQG60 source container, the radioactive source is surrounded by a steel casing filled with lead which screens off gamma radiation. The radiation is emitted, almost unattenuated, in one direction only through a channel (focusing emission channel). This beam is used for the radiometric measurement.

Switching the radiation on and off

- The current switch position (ON or OFF) is clearly indicated on the exterior of the radiation source container.
- The OFF position is secured by a padlock.
- The ON position is secured by a padlock or a snap hook (depending on the version; see the product structure →  28).

Attenuation factor and half-value layers

In the direction of the beam

- Attenuation factor F_S : 11
- Number of the half-value-layers: 3.5

In the direction opposite to the beam

- Attenuation factor F_S : 22
- Number of the half-value-layers: 4.5

NOTICE

These are typical values, which do not take into account production-dependent fluctuations of the source activity and tolerances of the measuring devices.

Maximum activity of the radiation source

^{137}Cs - 1.11 GBq (30 mCi)

⚠ CAUTION

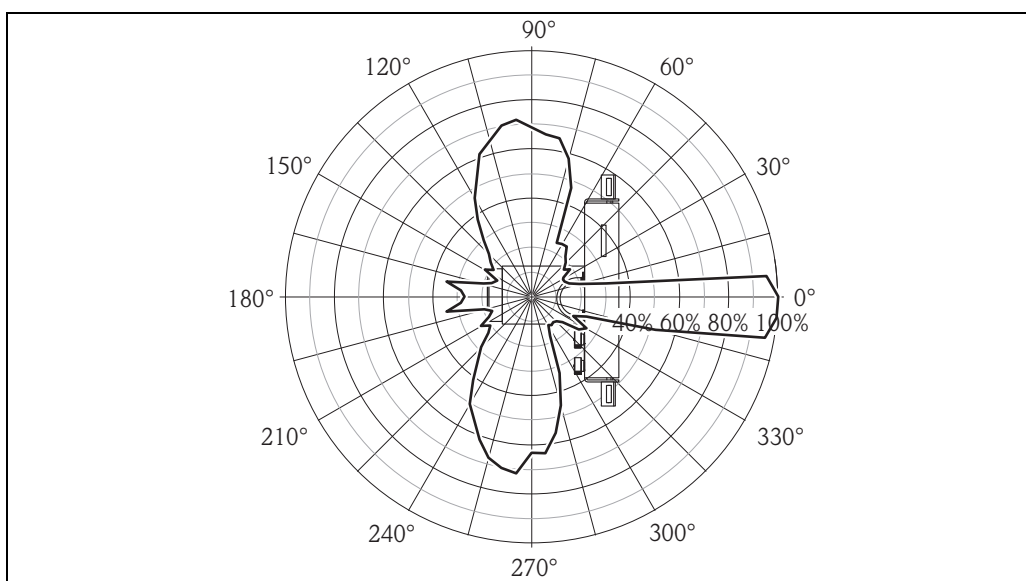
The maximum admissible activity may be further restricted by country-specific regulations or approvals.

Dose rate diagrams

A dose rate diagram specifies the local dose rate in a specified distance from the surface of the radiation source container. Below you find examples of dose rate diagrams for FQG60. They are valid for a distance of 1 m (3.3 ft) and for selected activities of a ^{137}Cs radiation source, and refer to the radiation being switched OFF. Dose rate diagrams for other distances and activities are available on request. The dose rate diagram for the real charging can be ordered in Feature 580 "Test, Certificate".



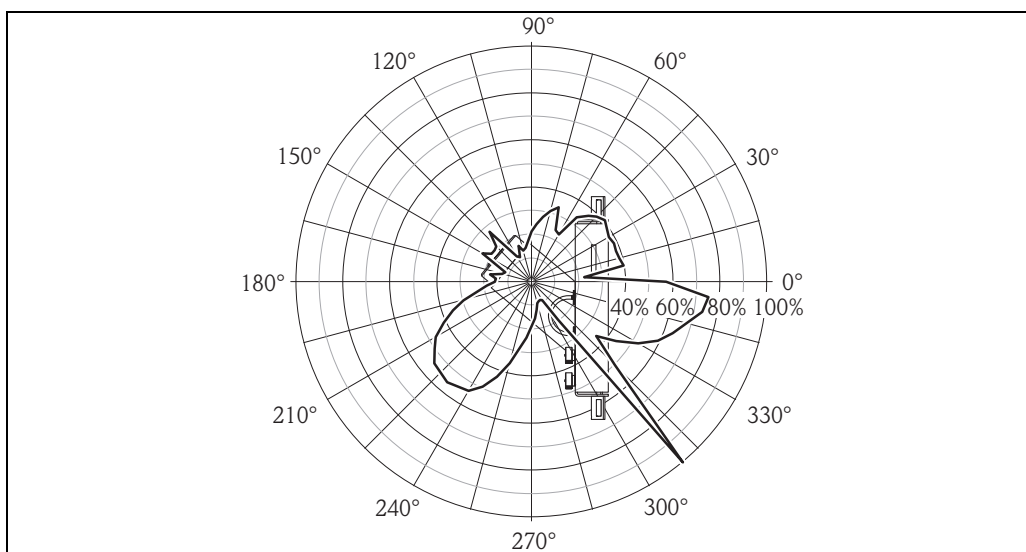
Allocation to the option, see the Product Configurator on the Endress+Hauser website: www.endress.com → Select your country → Products → Select measuring technology, software or components → Select the product (picklist: measurement method, product family etc.) → Device support (right column): Configure the selected product → The Product Configurator for the selected product opens

Dose rate diagrams for ^{137}Cs 

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Feature 240 "Emission Angle; Application", Option model 3 "20 deg; limit switch + density"

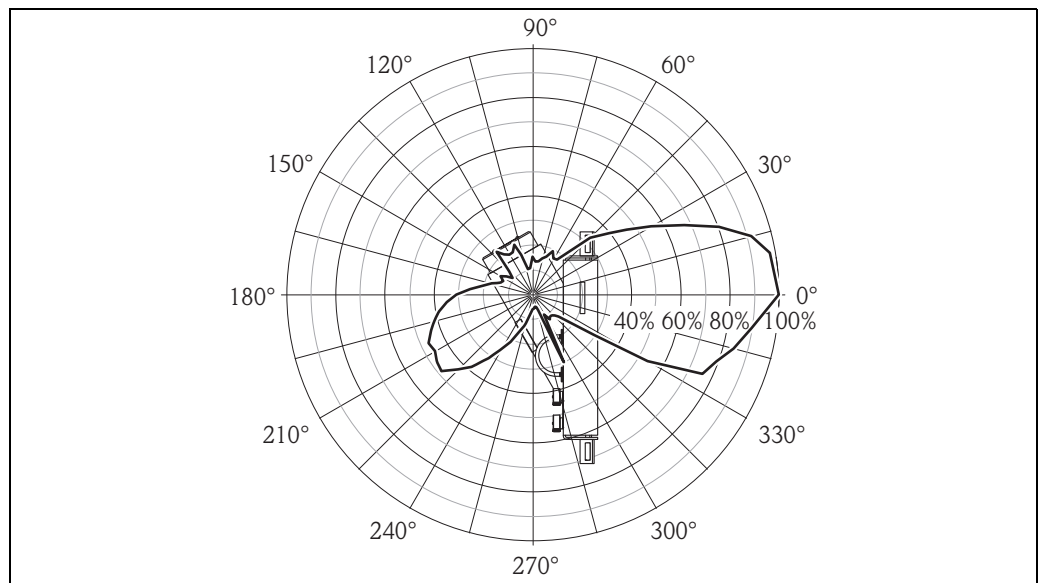
Option model in Feature 100 "Prepared for Source Activity"	Activity in MBq	max. value (100%) in $\mu\text{Sv/h}$
AC	18,5	0,10
AD	37	0,20
AE	74	0,41
AF	111	0,61
AG	185	1,02
AH	370	2,03
AK	740	4,06
AL	1110	6,09
RS	0,74	<0,01



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Feature 240 "Emission Angle; Application", Option model 5 "40 deg; level"

Option model in Feature 100 "Prepared for Source Activity"	Activity in MBq	max. value (100%) in $\mu\text{Sv/h}$
AC	18,5	0,15
AD	37	0,29
AE	74	0,59
AF	111	0,88
AG	185	1,47
AH	370	2,94
AK	740	5,87
AL	1110	8,81
RS	0,74	<0,01



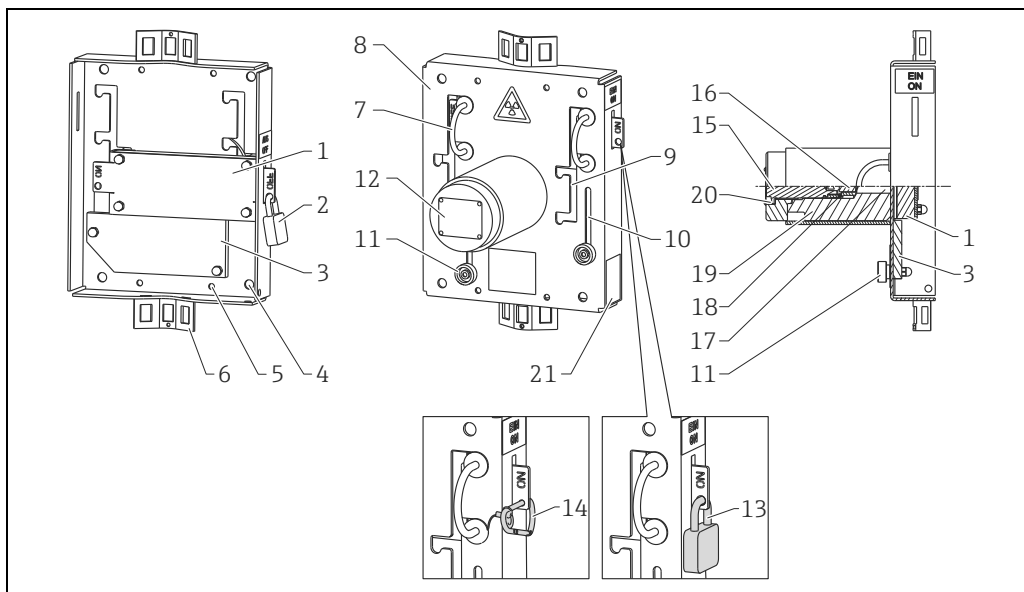
Feature 240 "Emission Angle; Application", Option model 4 "20 deg; density 30 deg diagonal radiation"

Option model in Feature 100 "Prepared for Source Activity"	Activity in MBq	max. value (100%) in $\mu\text{Sv/h}$
AC	18,5	0,17
AD	37	0,34
AE	74	0,68
AF	111	1,02
AG	185	1,70
AH	370	3,40
AK	740	6,80
AL	1110	10,20
RS	0,74	<0,01

Mechanical construction

Version	Feature 020, → 28	Properties
Option model B "Locking bolt ON + padlock fixation OFF"		- Shutter for manual switch-ON/switch-OFF - Padlock to secure the OFF switching state - Snap hook to secure the ON switching state
Option model C "Padlock fixation ON/OFF"		- Shutter for manual switch-ON/switch-OFF - Padlock to secure the ON/OFF switching state

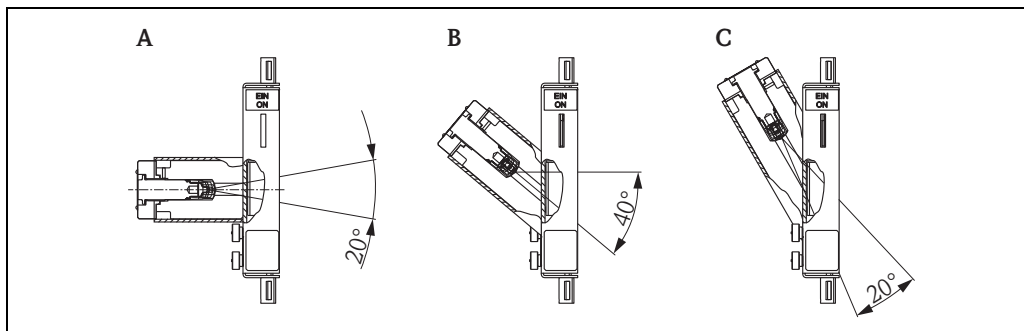
Components



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- | | | | |
|----|--|----|---|
| 1 | Shutter in OFF position | 12 | Nameplate with source data (metal) → 14 |
| 2 | Padlock in OFF position | 13 | Padlock in ON position |
| 3 | Calibration plate (optional) ¹⁾ | 14 | Snap hook in ON position |
| 4 | Mounting holes (4 x) for mounting plate | 15 | (Feature 020, Option model C) |
| 5 | Mounting holes (4 x) for clamping device (FHG61) | 16 | Source insert |
| 6 | Fastening lug | 17 | Source capsule |
| 7 | Bow-type handle of shutter | 18 | Radiation emission channel |
| 8 | Housing | 19 | Protection cap |
| 9 | Guide slot for shutter | 20 | Lead shielding |
| 10 | Guide slot for calibration plate | 21 | Graphite flat gasket |
| 11 | Clamps (to move the calibration plate into the radiation path) | | Nameplate of source container → 14 |

Radiation emission channel



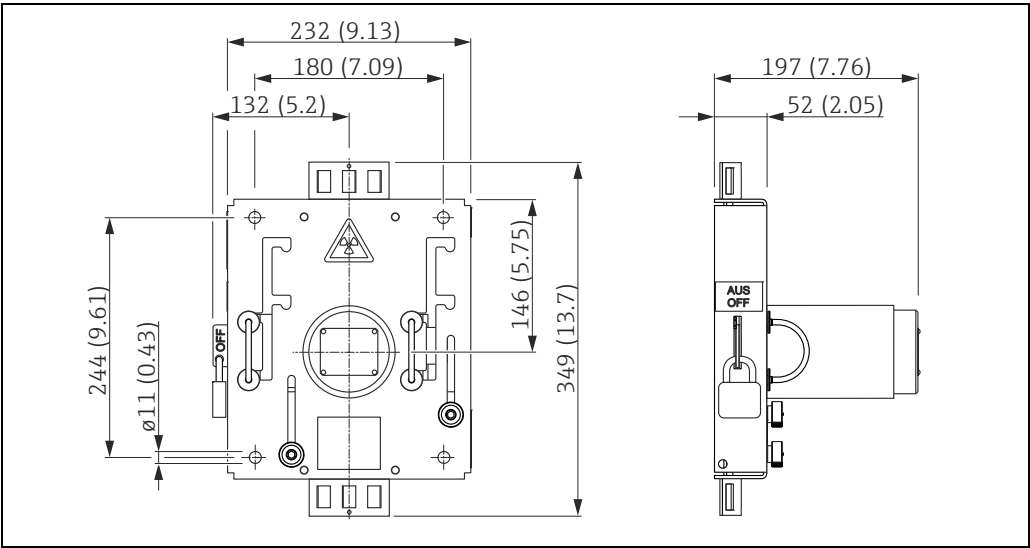
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- | | |
|---|---|
| A | Feature 240 "Emission Angle; Application", Option model 3 "20 deg; limit switch + density" |
| B | Feature 240 "Emission Angle; Application", Option model 5 "40 deg; level" |
| C | Feature 240 "Emission Angle; Application", Option model 4 "20 deg; density 30 deg diagonal radiation" |

1) The recalibration function is described on → 22

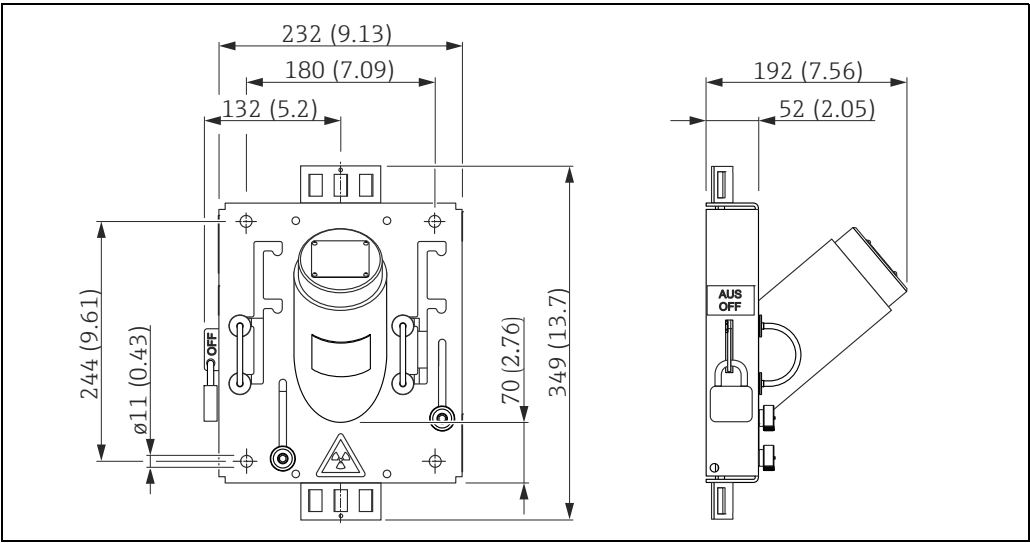
Design, Dimensions

Density and level limit measurement



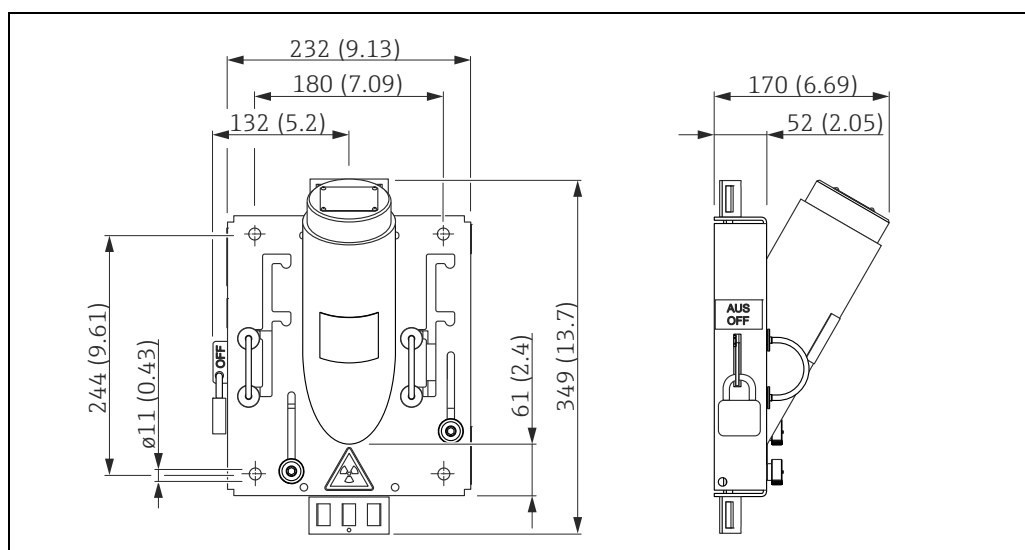
Dimensions: mm (in)
Feature 240 "Emission Angle; Application", Option model 3 "20 deg; limit switch + density"
20° radiation emission angle

Level measurement



Dimensions: mm (in)
Feature 240 "Emission Angle; Application", Option model 5 "40 deg; level"
40° radiation emission angle

Density measurement



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Dimensions: mm (in)

Feature 240 "Emission Angle; Application", Option model 4 "20 deg; density 30 deg diagonal radiation"
 30° diagonal irradiation, 20° radiation emission angle

Weight

Max. 18 kg (39.69 lbs)

Materials

Component	Material
Source insert and internal components	Stainless steel 304 (1.4301)
Housing	Stainless steel 304 (1.4301)
Surface treatment	Glass bead blast
Exterior seal	Pure graphite and metal-backed graphite gasket
Screening material - Shutter - Housing/source holder	Lead, painted Lead and 304 (1.4301)
Nameplate	Laser foil black-and-white; Adhesive: Acrylate, strong adhesion
Warning sign	Laser foil black-and-white; Adhesive: Acrylate, strong adhesion
Grooved drive stud	A2-70
Padlock: - Body - Shackle	Brass Hardened steel
Snap hook	316 L (1.4404)

Safety equipment

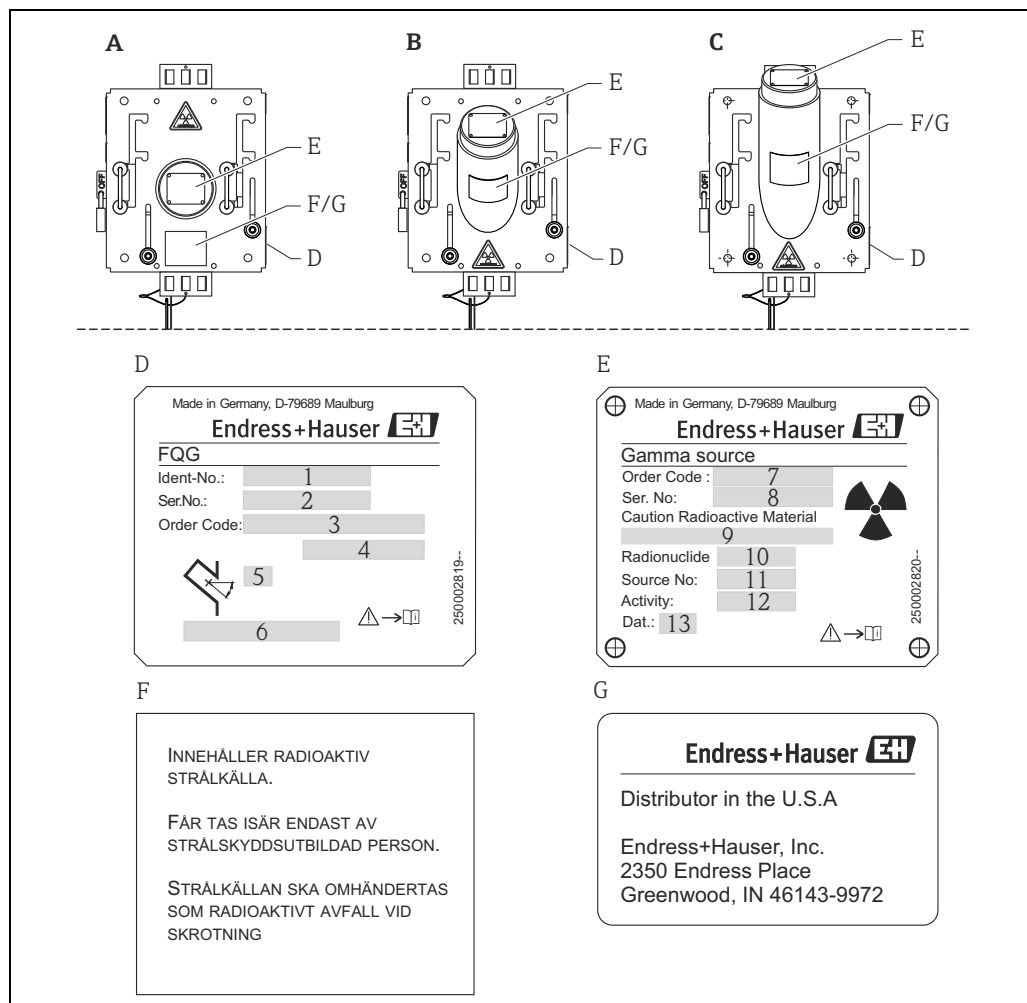
- Padlock to fix switching position ON or OFF, or snap hook to fix switching position ON (depending on the device version).
- Stainless steel nameplate riveted over the source insert for theft protection.

Ambient conditions

Ambient temperature	-40 to +120 °C (-40 to +248 °F)
Ambient pressure	Atmospheric pressure
Vibration resistance	IEC EN 60068-2-64 test Fh; 10 to 2000 Hz; 0.01 g ² /Hz
Shock	IEC-60068-2-27 test Ea (30 g; 18 ms; 3 shocks / direction / axis)
Degree of protection	IP66; NEMA Type 4
Fire resistance	30 min. @ 821 °C (1510 °F)

Identification

Nameplates



- A Feature 240 "Emission Angle; Application", Option model 3 "20 deg; limit switch + density"
 B Feature 240 "Emission Angle; Application", Option model 5 "40 deg; level"
 C Feature 240 "Emission Angle; Application", Option model 4 "20 deg; density 30 deg diagonal radiation"
 D Nameplate of source container
 E Additional nameplate of radiation source (optional, also functions as theft protection for source insert),
 F Additional sign for Sweden or Norway only (example)
 G Additional nameplate of NRC license (optional)
 only for feature 010 "License", option model AE "NRC Device Registration + wipe test, USA"

- 1 ID number of source container (abbreviated order code)
 2 Serial number of source container
 3, 4 Order code of source container as per product structure (→ 28)
 5 Radiation emission angle (when switched off)
 6 Local dose rate at a defined distance from the surface (when switched off)
 7 Endress+Hauser internal order code for the radiation source
 8 Endress+Hauser internal serial number for the radiation source
 9 Marking "Hochradioaktive Strahlenquelle" (according to German regulations), if required
 10 ¹³⁷Cs
 11 Serial number of the source capsule (provided for source tracking, if required)
 12 Activity in MBq or GBq
 13 Date (month/year)

NOTICE

The local dose rate at a defined distance specified on the nameplates is based on a worst-case estimation if switched off and takes into account production-dependent fluctuations of the source activity and tolerances of the measuring devices.

- Therefore it may be slightly different from the local dose rate which was calculated from the specified attenuation factor (→ 7).

Installation

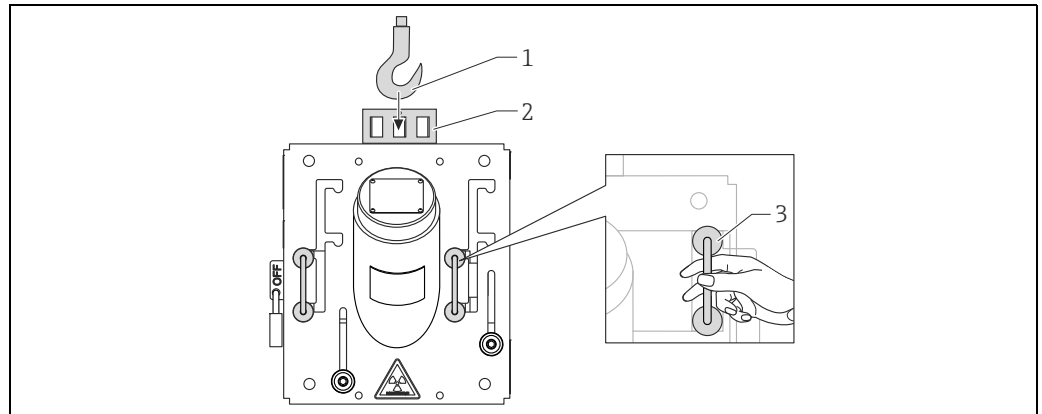
Incoming acceptance, transport

The radiation source container also serves as Type-A packaging (IATA rules) for the radiation source. For transport, it is protected in the box by foam packaging.
Package dimensions: 375 x 330 x 275 mm (14.8 x 13 x 10.8 in)

⚠ CAUTION

Don't use bow-type handles for transportation

- ▶ Only use the bow-type handles (3) of the shutter to remove the source container from the packaging by hand.
- ▶ To transport the source container, use the slots on the fastening lug, e.g. with a lifting eye.



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- 1 Lifting eye
2 Fastening lug
3 Handles



The foam packaging can be disposed like ordinary consumer waste.

Mounting hints

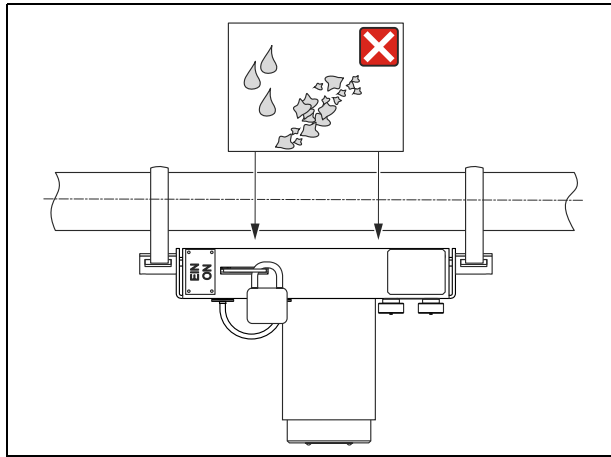
The radiation source container can be mounted in one of the following ways:

- Using L-profiles or a mounting plate (not pressurized and not in contact with the process) directly on the vessel or pipe (→ 18).
- On an external construction with low to zero vibration.
- Directly on the pipe at the customer's site using the clamping device FHG61 (→ 29).

⚠ CAUTION

Mounting of source container

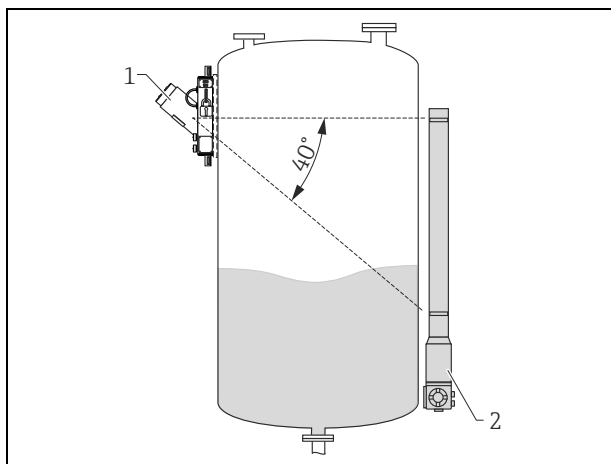
- ▶ All maintenance such as mounting, removal or replacement of the radioactive source may only be carried out by supervised personnel who have been specially trained in radiation procedures according to local regulations or the handling permit. Ensure that this is allowed in the handling permit. Local conditions are to be observed.
- ▶ All work must be carried out as quickly as possible and from a distance as large as possible (shielding!). Safety procedures (e.g. blocking of access) must also be carried out to protect personnel from all possible risks.
- ▶ Mounting and dismounting is only allowed in the "OFF" position, secured by the padlock..
- ▶ Take into account the weight of the radiation source container: max. 18 kg (39.69 lbs).
- ▶ To ensure the correct operation of the switch-ON/switch-OFF function, no parts of the vessel, pipe and clamping device may project into the area of the shutter. If the unit is secured via the mounting holes $\varnothing 11$ mm (0.43 in) this should not warp or damage the metal housing.
- ▶ If using the device in non-stationary systems, appropriate measures must be taken to ensure the device cannot be lost, and to protect it from collision and impact.
- ▶ If using methods other than the mounting plate or L-profiles to secure the device, we recommend the use of the clamping device FHG61.
- ▶ Mounting instructions are provided in the documentation: SD00330F/00 and SD0331F/00.



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To guarantee the operation of the switch-ON/switch-OFF function, upside down installation or similar is only permitted if it can be ensured that no particles or high-viscosity liquids can enter the area of the shutter (see graphic).

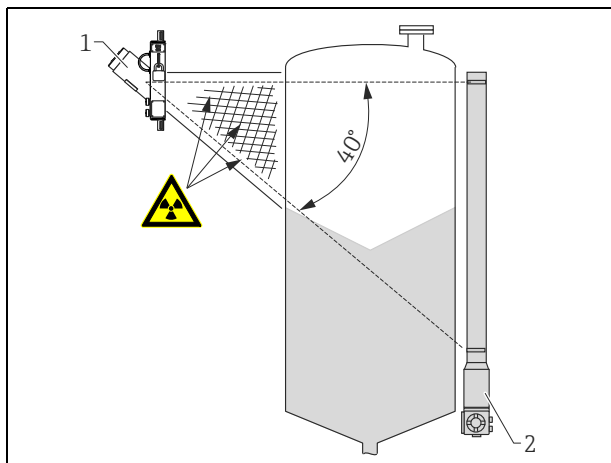
Mounting position for level measurement



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- 1 FQG60; Feature 240 "Emission Angle; Application", Option model 5 "40 deg; level"
- 2 FMG60

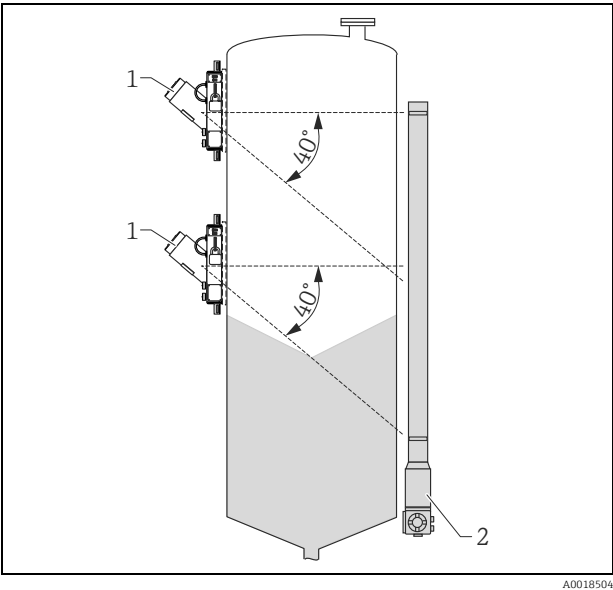
The source container must be mounted at the height of, or slightly above, the maximum level for continuous level measurement. The radiation must be aligned exactly with the compact transmitter mounted opposite. The source container and compact transmitter should be mounted as close as possible to the product vessel to avoid control zones.



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- 1 FQG60; Feature 240 "Emission Angle; Application", Option model 5 "40 deg; level"
- 2 FMG60

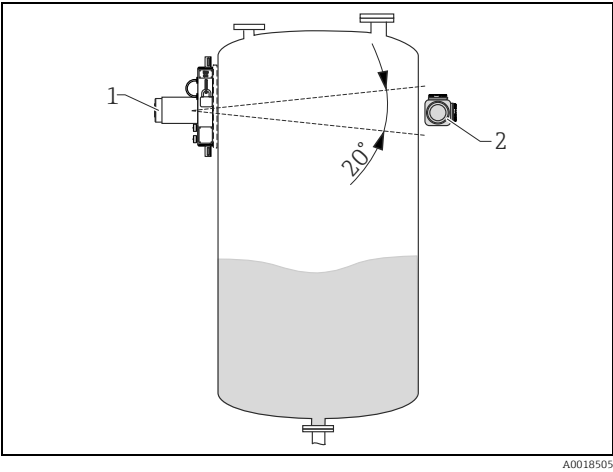
A distance between the source container and the product vessel often cannot be avoided if the measuring range is large and the container diameter small. This space must then be blocked off and marked.



- 1 FQG60; Feature 240 "Emission Angle; Application", Option model 5 "40 deg; level"
- 2 FMG60

Two or more source containers are used for large measuring ranges. The use of several sources can be necessary not only from the aspect of large measuring ranges but also for accuracy reasons.

Mounting position for level limit detection



- 1 FQG60; Feature 240 "Emission Angle; Application", Option model 3 "20 deg; limit switch + density"
- 2 FMG60

For level limit detection, the radiation source container is mounted at the same height as the detector.

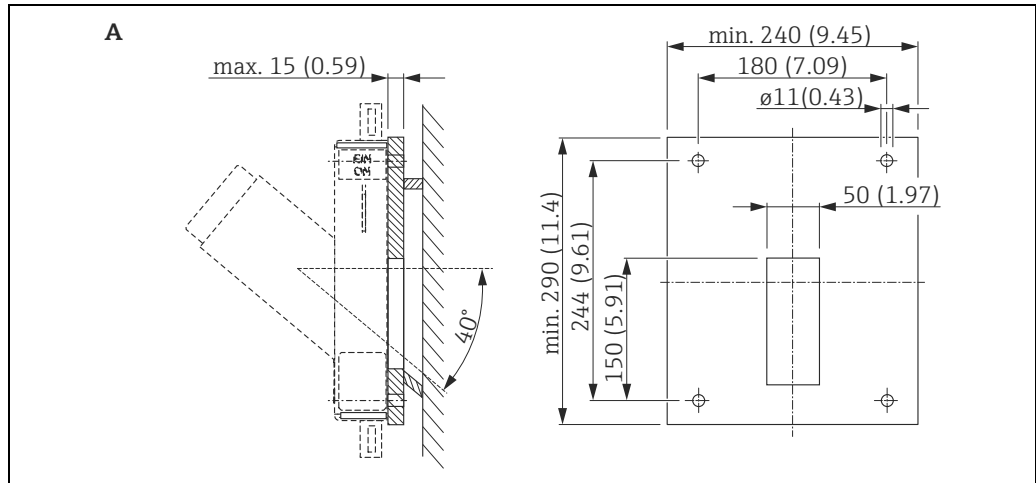
Mounting device (supplied by customer)

Orientation for level and level limit measurement

The device can be mounted on vessels via a mounting plate or L-profiles. Only the four mounting holes $\varnothing 11$ mm (0.43 in) may be used for this purpose.

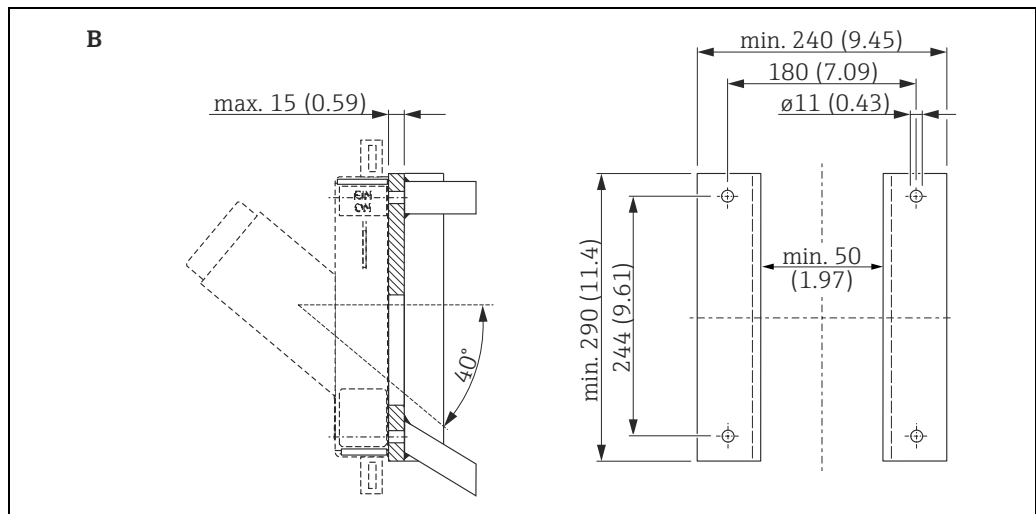
⚠ CAUTION

The intermediate space must be blocked off if necessary (to limit access).



Dimensions: mm (in)

A Mounting plate

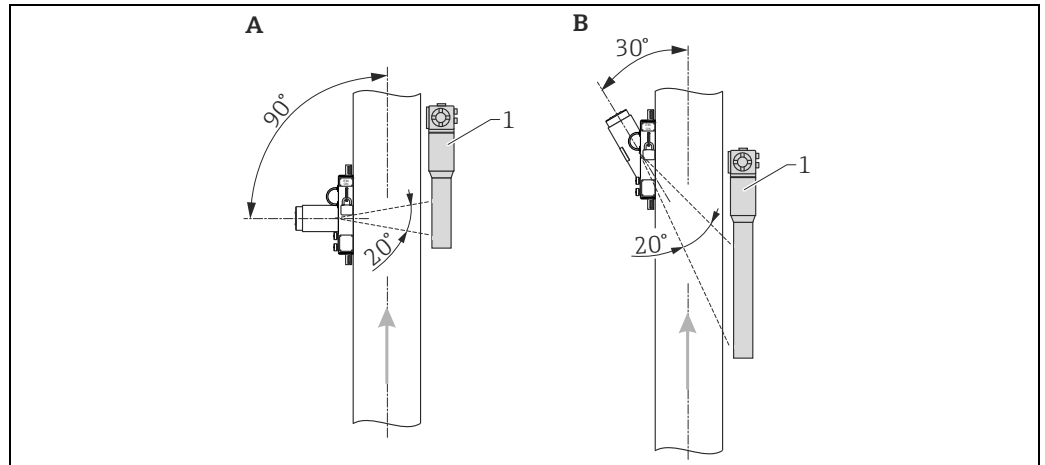


Dimensions: mm (in)

B L-profiles

Orientation for density measurement on vertical pipes

If possible, density should be measured with a flow direction from bottom to top. With this type of measuring arrangement, the Gammapiot M FMG60 should preferably be positioned with the terminal head at the top. If this arrangement is not possible, an additional bracket must be used to secure the Gammapiot M FMG60 against slipping.

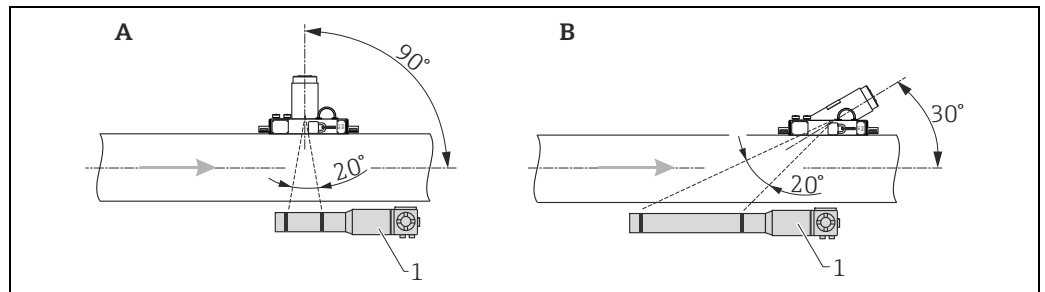


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- A Feature 240 "Emission Angle; Application", Option model 3 "20 deg; limit switch + density"
 B Feature 240 "Emission Angle; Application", Option model 4 "20 deg; density 30 deg diagonal radiation"
 1 FMG60

Orientation for density measurement on horizontal pipes

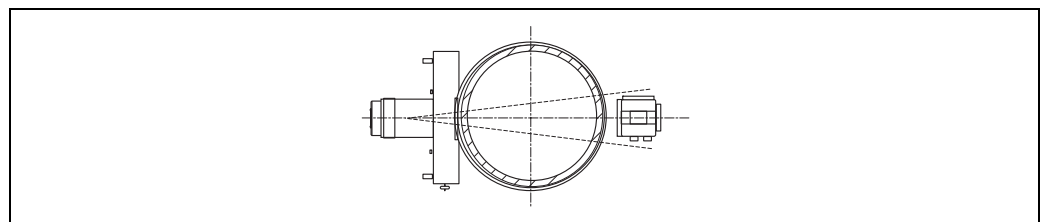
With this type of orientation, it is advisable to mount the FQG60 above the pipe. This prevents the buildup of solid particles or liquids on the shutter. However, attention should be paid to the effect of air bubbles and material buildup in the pipe.



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- A Feature 240 "Emission Angle; Application", Option model 3 "20 deg; limit switch + density"
 B Feature 240 "Emission Angle; Application", Option model 4 "20 deg; density 30 deg diagonal radiation"
 1 FMG60

Lateral installation (see graphic) is only permitted in low-vibration applications, while taking safety instructions into account (periodical inspection of the shutter, padlock or snap hook and mounting clamps). A clamping device is available as an accessory for mounting the device on pipes (→ 29).



A0018510

General information

The clamping device must be installed in a way such that it can support the weight of the source container and the Gammapiot M FMG60 under all expected operating conditions (e.g. vibrations). If necessary, the customer should provide additional support with a separate stable, low-vibration construction. Note weights: Gammapiot M FMG60: 14 to 29 kg (30.87 to 63.95 lbs)
Source container FQG60: max. 18 kg (39.69 lbs)

NOTICE

**Mounting instructions are provided in the documentation:
SD00330F/00 and SD00331F/00.**

**Torque for the mounting
screws (supplied by
customer)**

Material	Min. tensile strength	Coefficient of friction (μ)	Torque
Stainless steel	700 N/mm ² (157.36 lbf)	0.14	32 Nm (23.6 lbf ft)

Post-installation check

Measuring the local dose rate

The local dose rate in the vicinity of the source container and the detector must be measured after mounting the unit.

⚠ CAUTION

Depending on the installation, radiation can also occur outside the actual beam-emitting channel through scattering.

- ▶ In such cases it must be screened by the use of additional lead or steel shielding.
- ▶ Render or mark all control and exclusion areas as prohibited for unauthorized entry.

Behavior in event of empty process vessel or pipe

⚠ CAUTION

Radiation

- ▶ Once the unit has been correctly mounted, the control area of the empty process vessel has to be measured.
- ▶ If it is necessary, this area must be blocked off and marked. If there is an entry into the interior space of the process vessel, it has to be closed and marked with a sign "radioactive".
- ▶ The entry is only allowed after checking all safety regulation by the responsible radiation protection officer.
- ▶ If maintenance operations are carried out in or at the product vessel, it is mandatory to switch the radiation OFF.

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

- In such instances, the radiation emission channel must be closed immediately for reasons of radiation protection.
- A high local dose rate also causes the detector unit (scintillator and photomultiplier) to age quickly.

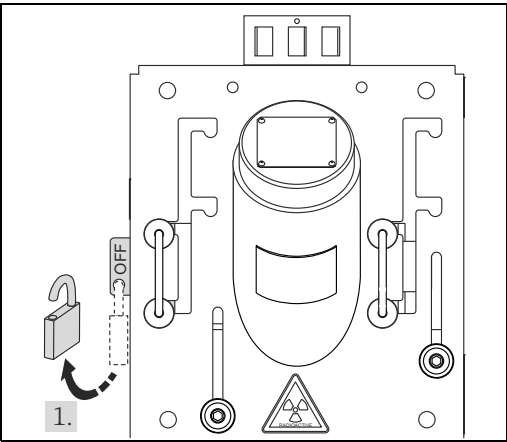
The best way to avoid such a situation is to mount a second radiometric measuring system that monitors the radiation intensity. If high radiation levels occur, an alarm is issued and the source container shall be switched OFF.

Operation

Safety instructions for switching ON the radiation

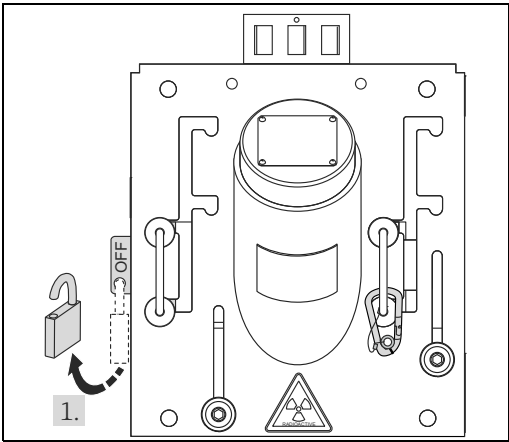
- Before switching ON the radiation beam it is necessary to ensure that no personnel are within the area of the radiation (or, indeed, inside the vessel).
- The radiation beam may only be switched ON by specially trained personnel.

Switching radiation ON



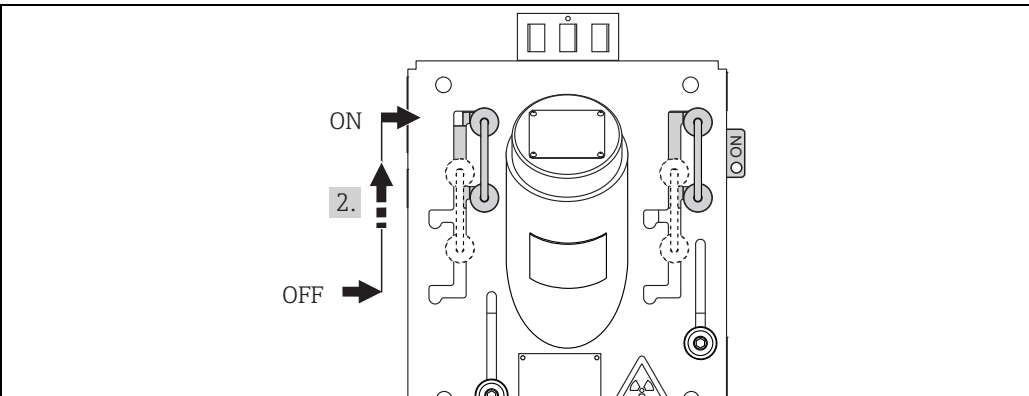
Feature 020, Option model C

1. Remove padlock in OFF position.

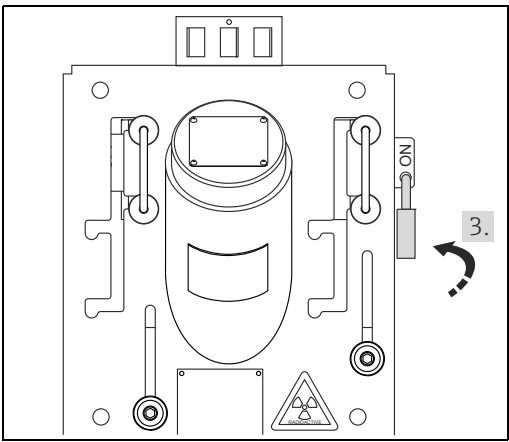


Feature 020, Option model B with snap hook

1. Remove padlock in OFF position.

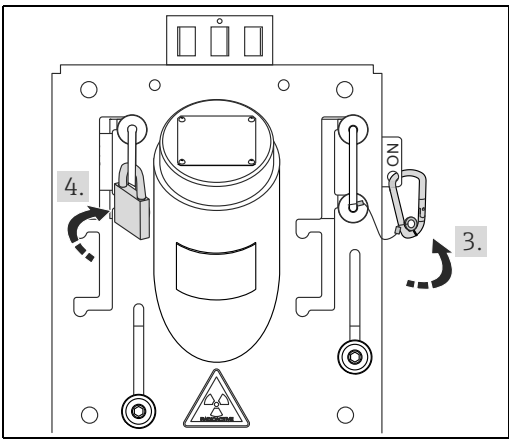


2. Using the bow-type handles, move the shutter (lead shielding) from the OFF position to the ON position.



Feature 020, Option model C

3. Insert padlock in the ON position.



Feature 020, Option model B

3. Insert snap hook in the ON position.
4. Insert padlock in the left handle.

Switching radiation OFF

In order to switch the radiation OFF, perform the above steps in reverse order.

Recalibration

Recalibration with calibration plate

An optional, 10 mm-thick (0.39 in) calibration plate is available for the purpose of checking a density measurement quickly and easily (→ 28).

The calibration plate is located underneath the shutter (→ 10).

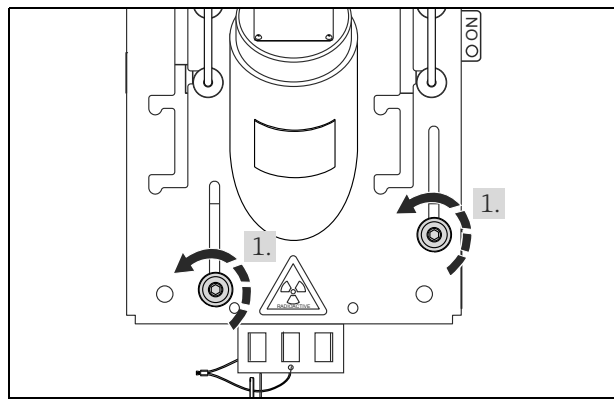
⚠ CAUTION

The shutter must be set to the ON position before a recalibration is carried out (→ 21).

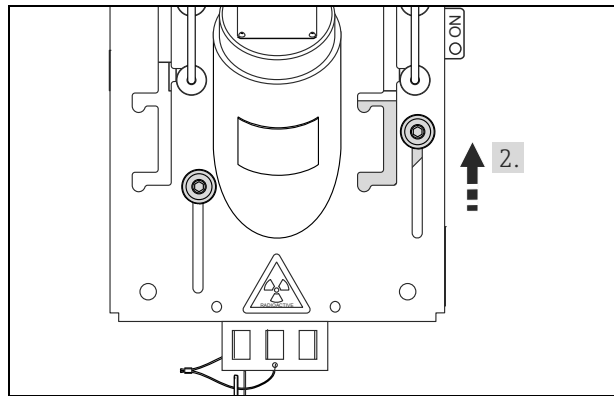
After commissioning a density measurement, the calibration plate is introduced into the radiation path under constant conditions, as described below, and the displayed density value at the FMG60 is determined and recorded.

Constant conditions comprise:

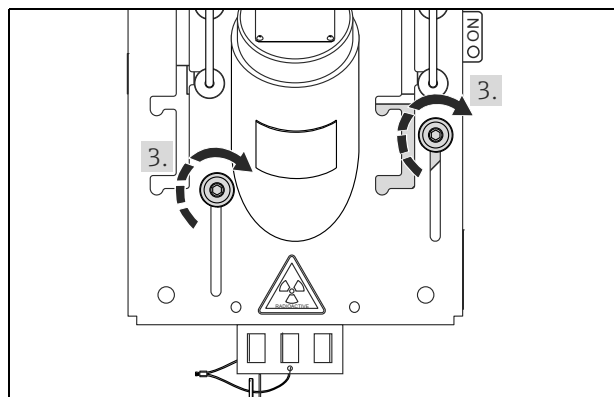
- Empty pipe (note local dose rate)
- Filled with a defined medium, e.g. water



1. Release the clamps



2. Slide the calibration plate into the radiation path to the upper limit stop.



3. Tighten the clamps again. Perform the recalibration.

After recalibration, perform the steps above in the reverse order. To bring the calibration plate to its rest position, slide it to the lower limit stop.

To quickly check the density measurement, always recreate these constant conditions and check the value displayed. If the values deviate, perform a recalibration (→  30, associated documentation "Gammapilot M FMG60").

The adjustment point "10" is available with the Gammapilot M device for recalibration. This point can be entered if the measuring conditions have changed, for example due to buildup in the measuring tube.

I_0 corresponds to the pulse rate when the pipe is empty. The value can be significantly larger than all the pulse rates that actually occur during measurement. Once the information has been entered, I_0 is recalculated to suit the current measuring conditions. The absorption coefficient μ is retained from the original calibration.

** WARNING**

The calibration plate does not represent a shielding in the sense of radiation protection.

Maintenance and Inspection

Cleaning	Clean the device in periodical intervals. When doing so, observe the following: ■ Clean the device from substances which may have impact on safety functions. ■ Keep labels in legible condition. ■ Clean the labels with a damp cloth and water only. ⚠ CAUTION When cleaning the device, the safety instructions have to be observed → 4.
Maintenance and Inspection	In designated use, operated under the specified ambient and operating conditions, no maintenance of the device is required. Within the framework of routine inspections of the plant the following checks are recommended: ■ Visual inspection for corrosion of the housing, weld seams, padlock or snap hook and the "radiation source" nameplate with grooved drive studs (anti-theft). ■ Test of the movability of the shutter (ON/OFF function) ■ Visual check of the readability of the labels and the condition of the warning symbols ■ Test of the function of the padlock, and also of the snap hook if present ⚠ CAUTION What to do in case of incorrect function ▶ If there is any doubt about correct function or proper condition of the device, immediately contact the responsible radiation safety officer for advice. ▶ Non-routine repair or maintenance must be performed by the gauge manufacturer or distributor or - in the USA - by a person specially authorized by NRC or an Agreement State. Measures in case of corrosion If considerable corrosion occurs at the source container, measure the radiation level around the device. If values occur exceeding the normal operation level, cordon off the area and contact the responsible radiation safety officer for instructions immediately. ⚠ CAUTION What to do if source container is damaged ▶ Corroded source containers must be replaced immediately. ▶ Only use genuine spare parts to replace damaged padlocks or snap hooks.
Routine shutter mobility test	1. Loosen the snap hook (Feature 020, Option model B) or remove the padlock (Feature 020, Option model C) as described in the "Operation" section (→ 21). 2. Move the shutter several times from ON to OFF and from OFF to ON as described in the "Operation" section. The shutter should be easy to move and must not show any visible indication of corrosion. - If the shutter cannot be moved from ON to OFF, follow the instructions in the "Emergency Procedure" section (→ 26). - If the shutter does not move easily or shows any other indication of possible malfunctions, secure it in the OFF position and contact the responsible radiation safety officer for further instructions. - In case of corrosion follow the instructions in the "Inspection (Measures in case of corrosion)" section (→ 24).

Routine leak test procedure

The capsule enclosing the radiation source must be checked for leaks at regular intervals. Leak tests shall be performed according to the interval specified by the authority or handling authorization.

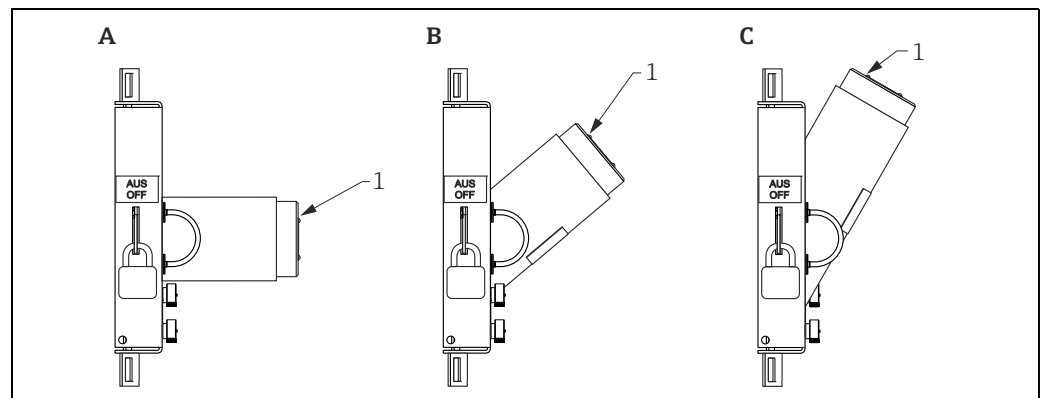
NOTICE**Leak test**

Leak tests are not only required as routine checkup but also whenever an incident occurs that may damage the sealed source or the shielding. In such a case the leak test procedure shall be defined by the responsible radiation safety officer observing the applicable regulations and considering the source container and all involved parts of the process vessel. The leak test shall be conducted as soon as possible after the incident. The leak test procedure described below is intended for the following situations:

- ▶ as routine leak test procedure during continuous operation,
- ▶ as routine leak test procedure during continuous storage of the radiation source container,
- ▶ when placing back the radiation source container into operation after storage.

Leak test procedure

Leak tests shall be performed by a person or an organization authorized to provide leak test services or using a leak test kit. Leak test kits shall be used according to its supplier's instructions. Records of the leak test results shall be maintained. Perform following procedure unless otherwise instructed:



A0018519

- A Limit Switch and Density measurement (Feature: Emission Angle, Application; Option model: 3)
 B Level measurement (Feature: Emission Angle, Application; Option model: 4)
 C Density measurement (Feature: Emission Angle, Application; Option model: 5)
 1 Wiping surfaces for the leak test along the edge of the nameplate

1. Take a wipe sample at the indicated point. The wipe sample can be taken when the shutter is either in the "ON" or "OFF" position.
2. Have the samples analyzed by an authorized organization. A source is considered to be leaking if more than 185 Bq (5 nCi) is detected on a leak test sample.

NOTICE

This limit value is valid for the US. National regulations may define other limits.

In case of an indeed leaking source:

- Contact the responsible radiation safety officer for instructions
- Take appropriate measures to control a potential spread of radioactive contamination from the source.
- Notify the authority of the fact that a leaking source has been detected.

Emergency procedure

Objective and overview

This emergency procedure shall be put into effect immediately to secure an area in the interests of protecting personnel where an exposed source is known, or suspected, to exist.

Such an emergency exists when a radioisotope is exposed either by it becoming separated from the source container or a source container cannot be put into the OFF position. This procedure will safeguard the personnel until the responsible radiation safety officer will attend site and advise on corrective action.

The custodian of the radioactive source (the customer's designated "authorized person") is responsible for observing this procedure.

Emergency procedure

1. Determine the unsafe area by on-site measurement.
2. Cordon off the concerned area by yellow tape or rope and post international radiation warning signs.

The shutter cannot be switched to the "OFF" position.

In this case the radiation source container must be unbolted from its mounting position.

⚠ CAUTION

Dismounting

- ▶ Point the emission channel towards a very thick wall (e.g. steel or lead) or mount a thick plate (e.g. steel, lead) in front of the emission channel.
- ▶ Personnel should at all times be behind the source housing, not in front of the emission channel.

The radiation source is outside from the source container.

In this case, the radiation source must be placed at a safe location or additional shielding must be applied.

⚠ CAUTION

Handling of the source

- ▶ The source should only be handled via pliers or tongs and held as far away from the body as possible.
- ▶ The time needed for the transport should be estimated and minimized by rehearsal without radiation source prior to execution.

Notification to authority

1. Make necessary notifications to local authorities within 24 h.
2. After thorough assessment of the situation, the responsible radiation safety officer, in conjunction with local authorities, shall agree a remedy to the specific problem.

NOTICE

National regulations may require other procedures and reporting obligations.

Procedures after termination of the application

Internal measures

As soon as a radiometric measuring device is no longer required, the source container must be switched off. The source container shall be removed in accordance with all relevant regulations and saved in a lockable room having no through traffic. The responsible authorities shall be informed of these measures. The access area to the storage room shall be measured out and signed. The radiation safety officer is responsible for protecting against theft. The radiation source in the source container must not be scrapped with the other parts of the plant. It should be returned as quickly as possible.

CAUTION

Removal of the source container may only be carried out by supervised personnel, who have been specially trained in radiation procedures according to local regulations or handling permit. Ensure that this is allowed in the handling permit. Local conditions are to be observed. All work must be carried out as quickly as possible and from a distance as large as possible (shielding!). Safety procedures (e.g. blocking of access) must also be carried out to protect personnel from all possible risks. The source container may only be disassembled in OFF position. Make sure that the OFF position is secured with a padlock.

Return

Federal Republic of Germany

Contact your Endress+Hauser Sales Center to organize the return of the radiation source for inspection with a view to reuse or recycling by Endress+Hauser.

Other countries

Contact your Endress+Hauser Sales Center or the appropriate authority to find a way of returning the radiation source nationally. If return is not possible domestically, the further procedure must be agreed with the sales center concerned. The destination airport for potential returns is Frankfurt, Germany.

Conditions

The following conditions must be met before returning the material:

- An inspection certificate no more than three months old confirming the leak-tightness of the radiation source must be in the possession of Endress+Hauser (wipe test certificate).
- The serial number of the source capsule, type of radiation source (^{137}Cs), activity and model of the radiation source must be specified. This data may be found in the documents supplied with the radiation source.
- The source container must be returned in type-tested type-A packaging (IATA rules) (see TI00439F/00).

NOTICE

The type-A-labeling at the radiation container itself is invalid for a return of the device.

Ordering information

Ordering information

Detailed ordering information is available from the following sources:

- In the Product Configuration on the Endress+Hauser website: www.endress.com → Select your country → Products → Select measuring technology, software or components → Select the product (picklist: measurement method, product family etc.) → Device support (right-hand column): Configure the selected product → The Product Configurator for the selected product opens
- From your Endress+Hauser Sales Center: www.addresses.endress.com



Product Configurator - the tool for individual product configuration

- Up-to-the-minute configuration data
- Depending on the device: Direct input of measuring point-specific information such as measuring range or operating language
- Automatic verification of exclusion criteria
- Automatic creation of the order code and its breakdown in PDF or Excel output format
- Ability to order directly in the Endress+Hauser Online Shop

Scope of delivery

- Source container FQG60
- Radiation source (built in)
- Radiation warning sign (depending on the version)
- Technical Information/Operating Instructions: TI00445F/00
- Technical Information: TI00439F/00

Delivery

Germany

We can only ship radioactive sources once we have received a copy of the handling permit. We are more than happy to assist in procuring the necessary documents. Please contact our local sales center. For safety reasons and to save costs, we generally supply the source container loaded, i.e. with the radiation source installed. If the user requires the source container be delivered first and if the source must be delivered subsequently, transportation drums are used for shipping.

Other countries

We can only ship radioactive sources once we have received a copy of the import license. Endress+Hauser is more than happy to assist in procuring the necessary documents. Please contact your local sales center. Please contact your local sales center.

The source container is delivered in the OFF position. This position is secured with a padlock. The transport of loaded source containers is conducted by a company commissioned by Endress+Hauser and officially certified for executing this type of job.



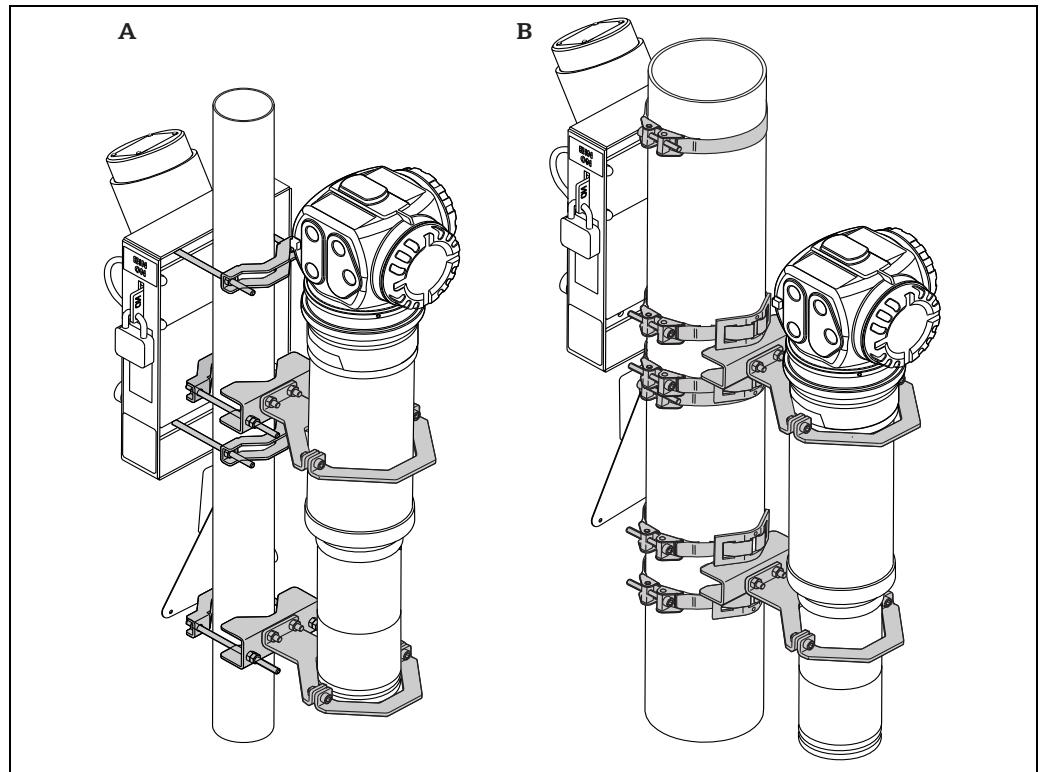
Refer to SD00309F/00.

These source containers meet the requirements of a Type A package and therefore do not require separate Type A packaging. However, it is preferable to use the return packaging kits and labeling kits for return transportation.

Accessories

Device-specific accessories

Clamping device FHG61



A Clamping device for pipes with outer diameters 48 to 77 mm (1.89 to 3.03 in)
 B Clamping device for pipes with outer diameters 80 to 273 mm (3.15 to 10.7 in)

Ordering information

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For details refer to:

- SD00330F/00
Clamping device for pipes with an outer diameter 80 to 273 mm (3.15 to 10.7 in)
- SD00331F/00
Clamping device for pipes with an outer diameter 48 to 77 mm (1.89 to 3.03 in)

Documentation



The following document types are also available in the Download Area of the Endress+Hauser website: www.endress.com → download

Gamma Radiation Source	TI00439F/00 ■ Technical Information for Gamma Radiation Source FSG60/FSG61 ■ Returning source container ■ Type A packaging
Instructions for loading and changing the source	SD00297F/00 Instructions for loading and changing the source / Label set
Clamping Device FHG61	SD00330F/00 Clamping device FHG61 Clamping device for pipes with an outer diameter 80 to 273 mm (3.15 to 10.7 in) SD00331F/00 Clamping device FHG61 Clamping device for pipes with an outer diameter 48 to 77 mm (1.89 to 3.03 in)
Gammapilot M FMG60	TI00363F/00 Technical Information for Gammapilot M FMG60 BA00236F/00 Operating Instructions for Gammapilot FMG60 (HART) BA00329F/00 Operating Instructions for Gammapilot FMG60 (PROFIBUS PA) BA00330F/00 Operating Instructions for Gammapilot FMG60 (FOUNDATION Fieldbus)
Gammapilot FTG20	TI01023F/00 Technical Information for Gammapilot FTG20 BA01035F/00 Operating Instructions for Gammapilot FTG20
Supplementary Instruction Manuals	SD00292F/00 Supplementary Instruction Manual for Canada SD00293F/00 Supplementary Instruction Manual for the USA

Manufacturer Declaration
Radiation Source Container**Eignungsbescheinigung
Manufacturer Declaration****Endress+Hauser** 
People for Process Automation**Company** Endress+Hauser SE+Co. KG, Hauptstraße 1, 79689 Maulburgerklärt als Hersteller, dass das folgende Produkt
declares as manufacturer, that the following product**Product** **Strahlenschutzbehälter/ Radiation Source Container**
Typ FQG60, FQG61, FQG62, FQG63, FQG66

den Anforderungen über die internationale Beförderung gefährlicher Güter ADR/RID (2020) und IATA/DGR (2020) an ein Typ A Versandstück entspricht. Die Strahlenschutzbehälter sind für den Transport von umschlossenen radioaktiven Stoffen und von umschlossenen radioaktiven Stoffen in besonderer Form vorgesehen.

Die Eignung als Typ A Versandstück wurde durch eine Baumusterprüfung nach den Anforderungen von IAEA-TS-R-1 (2005) Kapitel 6 nachgewiesen und in den internen Dokumenten 961000072, 960009590, 961000169, 961000170 niedergelegt.

Die Qualitätssicherung während der Entwicklung, der Herstellung und der Prüfung der Strahlenschutzbehälter erfolgt gemäß BAM-GGR016 Rev. 0 vom 10. Nov. 2014. Der Ablauf ist im Qualitätssicherungsprogramm für Typ A Versandstücke (Dokumenten-ID GL_0372) beschrieben.

confirms the requirements on international transportation of hazardous materials ADR/RID (2020) and IATA/DGR (2020) for Type A packaging and is suitable for the transportation of sealed radioactive material and sealed special form radioactive material.

The qualification as type A packaging is tested by an type approval according to IAEA-TS-R-1 (2005) section 6 and documented by the internal reports 961000072, 960009590, 961000169, 961000170.

The quality management during development, manufacturing and testing of the source containers is following the requirements of TRV006 and BAM-GGR016 Rev. 0 from 2014.Nov.10. It is described in the quality program for Type A packaging (document-ID GL_0372).

Maulburg, 4-März-2020
Endress+Hauser SE+Co. KGI.A. Dr. Karl Barton
Gefahrgutbeauftragter
Safety advisor for the
transport of dangerous goods

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