

# Technical Information

## Radiation sources

### FSG60 and FSG61

Radiometric level measurement



Radiation source for non-contact level, point level, density and interface detection

#### Scope

Radioactive, gamma-emitting isotopes are used as radiation sources for level, density and interface measurement as well as for point level detection. The gamma radiation radiates evenly from the radiation source in all directions. When it comes to measuring technology, however, only radiation in one direction – i.e. the radiation passing through the container or pipe – is generally required. Radiation in all other directions is undesired and must be shielded (damped). For this reason, the radiation sources are inserted into source containers, which ensure gamma radiation in one direction only.

#### Benefits

- Radiation source in the source container ensures simple handling and easy installation
- Double-walled encasement of the radiation source in a source capsule complies with the strictest safety requirements: Typical classification 66646 according to ISO 2919
- Selection option:  $^{137}\text{Cs}$  or  $^{60}\text{Co}$
- Selection option according to the required activity ensures optimum adaptation to the application

## Table of contents

<b>About this document</b> . . . . .	<b>3</b>
Symbols used . . . . .	3
<b>Radiation sources</b> . . . . .	<b>4</b>
Safety . . . . .	4
Highly radioactive sources (high-activity sealed sources) . . .	4
<b>Technical data</b> . . . . .	<b>5</b>
Standard radiation sources . . . . .	5
<b>Application</b> . . . . .	<b>6</b>
Application for $^{60}\text{Co}$ . . . . .	6
Application for $^{137}\text{Cs}$ . . . . .	7
Dosing capacity values for exposed radiation sources . . . . .	7
Recommended period of use . . . . .	9
Additional radiation source capsule types . . . . .	10
<b>The radiation sources are delivered and transported in source containers or transportation casks</b> . . . . .	<b>10</b>
Dimensions . . . . .	10
Additional information . . . . .	13
Germany . . . . .	13
Other countries . . . . .	16
<b>What to do in an emergency</b> . . . . .	<b>16</b>
Objective and overview . . . . .	16
Immediate measures . . . . .	16
Notifying the responsible authority . . . . .	16
Recurrent tests . . . . .	17
<b>Measures after termination of the application</b> . . . . .	<b>17</b>
Internal measures . . . . .	17
<b>Ordering information</b> . . . . .	<b>17</b>
Ordering information . . . . .	17
<b>Supplementary documentation for FSG60/61</b> . . . . .	<b>18</b>
Source containers . . . . .	18
Additional safety instructions . . . . .	18

## About this document

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### Symbols used

#### Safety symbols

 **CAUTION**

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

 **DANGER**

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

 **NOTICE**

This symbol contains information on procedures and other facts which do not result in personal injury.

 **WARNING**

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

#### Radiation warning signs



Warning symbol for radioactive source according to ISO 7010



Warning symbol for highly radioactive source according to ISO 21482

#### High radiation warning sign

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


#### Symbols for certain types of information

 **Permitted**

Procedures, processes or actions that are permitted

 **Preferred**

Procedures, processes or actions that are preferred

 **Forbidden**

Procedures, processes or actions that are forbidden

 **Tip**

Indicates additional information



Reference to documentation

#### Symbols in graphics

1, 2, 3, ...

Item numbers

A, B, C, ...

Views

## Radiation sources

### Safety

$^{137}\text{Cs}$  and  $^{60}\text{Co}$  are used in double-encased, welded source capsules made of stainless steel. The radiation sources are classified according to ISO 2919:2012 Table 1. This table contains a list of environmental tests with identification numbers of classes that are indicated in order of increasing degree of stress.

**This classification means that a test of the following environmental influences has been passed:**

- Temperature (first digit of classification)
  - Class 6
    - 40 °C (-40 °F) 20 min
    - +800 °C (+1 472 °F) 60 min
    - Thermal shock from +800 °C (+1 472 °F) to +20 °C (+68 °F)
- Exterior pressure (second digit of classification)
  - Class 6
    - 0.025 to 170 MPa<sub>abs</sub>
  - Class 5
    - 0.025 to 70 MPa<sub>abs</sub>
- Impact (third digit of classification)
  - Class 6
    - 20 kg (44.1 lb) from height of 1 m (3.3 ft)
  - Class 5
    - 5 kg (11 lb) from height of 1 m (3.3 ft)
  - Class 3
    - 200 g (0.44 lb) from height of 1 m (3.3 ft)
- Vibration (fourth digit of classification)
  - Class 4
    - Three times 30 min 25 to 80 Hz at 1.5 mm (0.06 in) peak-to-peak amplitude and 80 to 2 000 Hz at 20 g
- Puncture (fifth digit of classification)
  - Class 6
    - 1 kg (2.2 lb) from height of 1 m (3.3 ft)
  - Class 5
    - 300 g (0.66 lb) from height of 1 m (3.3 ft)

Only the classifications relevant for FSG60 and FSG61 are displayed here.

Classification C 66646 thus provides maximum protection against temperature, pressure, impact, vibrations and puncture.

 An "X" in the classification means a special test in the respective capacity category.

The manufacturer tests the leak-tightness and decontamination of each radiation source before delivery. After this test, the radiation source can be considered as a sealed radioactive material as defined in the German Radiation Protection Ordinance. Only tested radiation sources with a leak test certificate are supplied.

- The  $^{60}\text{Co}$  material is enclosed in the capsule as a solid metal
- The  $^{137}\text{Cs}$  material is enclosed in the capsule in the form of a ceramic substrate

 The radiation sources must be used in environmental conditions that guarantee the integrity of the source capsule.

### Highly radioactive sources (high-activity sealed sources)

In accordance with IAEA Safety Standards Series No. RS-G-1.9, highly radioactive sources are  $^{137}\text{Cs}$  radiation sources with activity values  $\geq 100$  GBq (2.7 Ci) or  $^{60}\text{Co}$  radiation sources  $\geq 30$  GBq (0.81 Ci).

Highly radioactive sources are thus the following radiation sources with sales feature 100 "Activity":

Product	VKM100
FSG60 with option	BF, BG, BH, BJ, BK, BL, BM, BN, BP
FSG61 with option	BB, BF, BG, BH

Highly radioactive sources are marked separately on the source containers with the wording "Highly radioactive source" and the additional warning symbol according to ISO 21482.



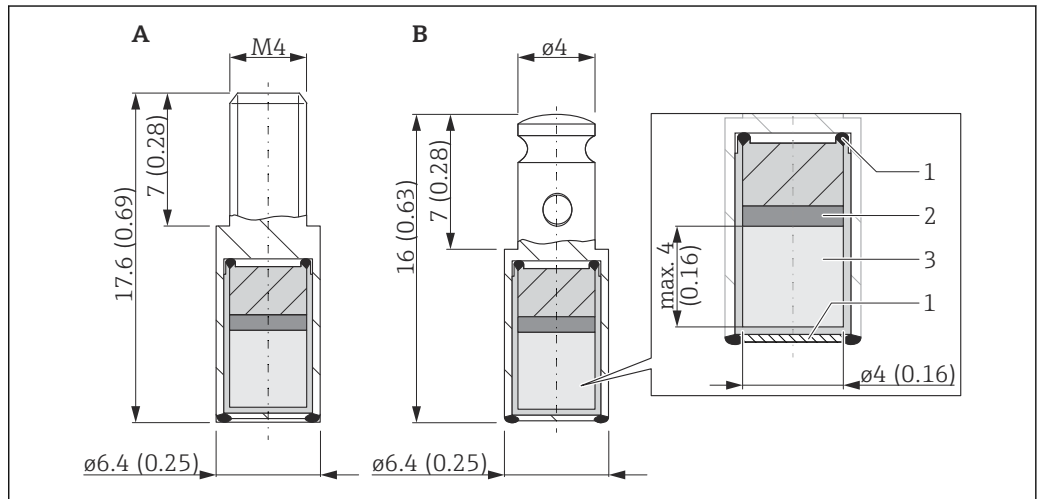
A0055607

1 Warning symbol for highly radioactive source according to ISO 21482

The warning symbol for highly radioactive sources is also included in the set of signs for source loading and replacement, see SD00297F for this. It must be used solely and exclusively for identifying highly radioactive sources.

## Technical data

### Standard radiation sources



A0019878

2 Unit: mm (in)

- A VZ1508-001 (CDC.P4), VZ1486-001 (CKC.P4)
- B VZ79-001 (CDC.P4), VZ64-001 (CKC.P4), VZ79-002
- 1 Welded
- 2 Empty volume filled with stainless steel screen
- 3 <sup>60</sup>Co as metal or <sup>137</sup>Cs as ceramic

Model	Isotope	VKM200 option	Model designation	ISO 2919 classification	Operating temperature range	Recommended period of use (years)
FSG60	<sup>137</sup> Cs	A1	VZ-79-001	C66646	-55 to +470 °C (-67 to +842 °F)	15
		B1	VZ-1508-001	C66646	-55 to +470 °C (-67 to +842 °F)	15
		C1	VZ-357-001	C65345	-55 to +470 °C (-67 to +842 °F)	15
		D1	VZ-3579-001	C65345	-55 to +470 °C (-67 to +842 °F)	15
		E1	VZ-79-002	CX6646, X=1359 °C	-55 to +800 °C (-67 to +1472 °F)	15

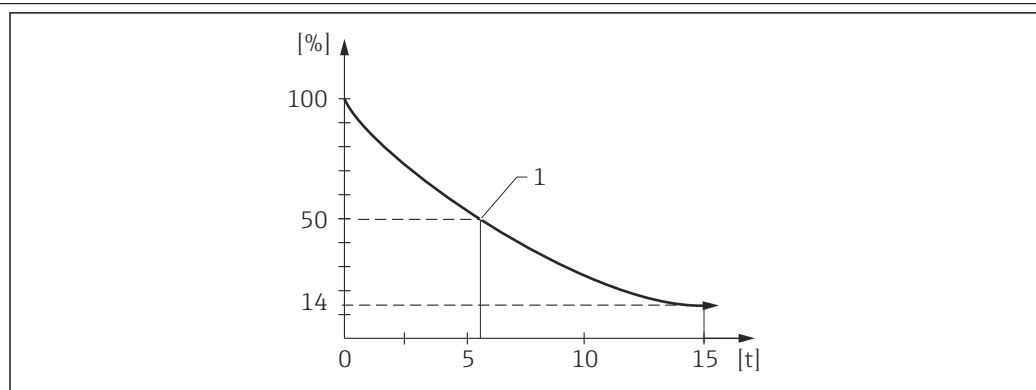
Model	Isotope	VKM200 option	Model designation	ISO 2919 classification	Operating temperature range	Recommended period of use (years)
		F1	X.9	C66646	-40 to +200 °C (-40 to +392 °F)	15
		G1	X.38/4	C66646	-40 to +200 °C (-40 to +392 °F)	15
		P1	P04	C66646	-55 to +470 °C (-67 to +842 °F)	15
		Q4	P17-1	C66646	-55 to +470 °C (-67 to +842 °F)	15
FSG61	<sup>60</sup> Co	A2	VZ-64-001	C66646	-55 to +470 °C (-67 to +842 °F)	15
		B2	VZ-1486-001	C66646	-55 to +470 °C (-67 to +842 °F)	15
		L2	CO1HK	C66646	1)	10
		P1	P04	C66646	-55 to +470 °C (-67 to +842 °F)	15
		Q4	P17-1	C66646	-55 to +470 °C (-67 to +842 °F)	15

1) On request

- **Weight:** Approx. 0.005 kg
- **Double encasement:** Double-welded source capsule made of stainless steel
- **Classification:** Typically C66646 according to ISO 2919, see table above.
- **Isotope material:**
  - <sup>60</sup>Co: Metal
  - <sup>137</sup>Cs: Ceramic

## Application

### Application for <sup>60</sup>Co



3 Decline in activity of a <sup>60</sup>Co radiation source over time

- % Activity  
 t Time in years  
 1 Half-life: 5.3 years

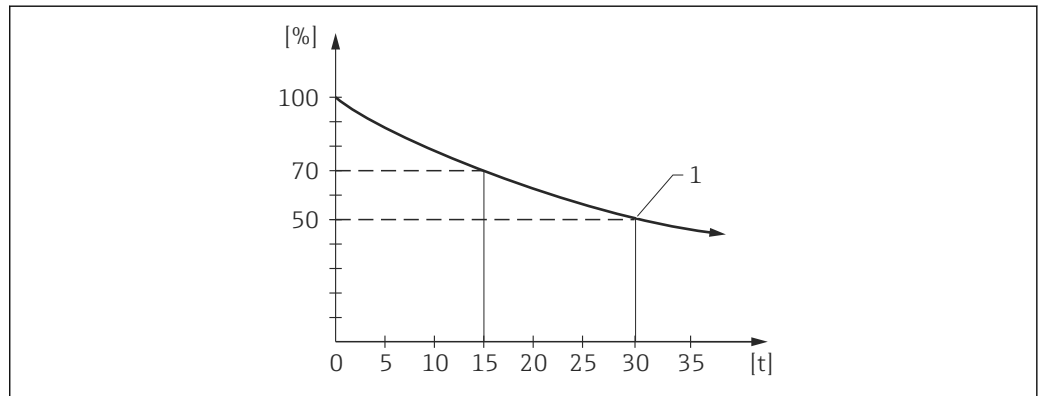
The <sup>60</sup>Co radiation source (radiation energy 1.173 MeV and 1.333 MeV; half-life 5.3 years) is mostly used for point level measurement if the activity required by <sup>137</sup>Cs is too high. Its advantage lies in its high penetration capacity, which enables measurement over large distances or through thick container walls. <sup>60</sup>Co should also be used for applications that measure continuously if the use of <sup>137</sup>Cs would require activities that are too high.


**Example:** Activity after a 15-year period of use: 14 % -> replacement of radiation source is required.

 Detailed information on half-life and radiation energy can be found in the "LNHB Atomic and Nuclear data table". For this, see:

<http://www.lnhb.fr/home/nuclear-data/nuclear-data-table/>

**Application for <sup>137</sup>Cs**



 4 Decline in activity of a <sup>137</sup>Cs radiation source over time

- % Activity
- t Time in years
- 1 Half-life: 30 years

<sup>137</sup>Cs (radiation energy 0.662 MeV) has proven to be ideal for continuous level measurement, point level detection and density measurement systems. Its half-life of 30 years enables a long period of use without the need for radiation source replacement (lower costs and no readjustment).

As it is better at absorbing radiation, there is generally no controlled area.

**Example:** Activity after a 15-year period of use: 70 % -> no replacement of radiation source is required.

 Detailed information on half-life and radiation energy can be found in the "LNHB Atomic and Nuclear data table". For this, see:

<http://www.lnhb.fr/home/nuclear-data/nuclear-data-table/>

**Dosing capacity values for exposed radiation sources**

The ambient dose equivalent at the place to be protected without a source container can be calculated according to equation (1) (DIN 6844-3, 2020-07).

$$\dot{H}_0^*(10) = \frac{\Gamma_{H^*} \cdot A}{r^2}$$

Here,  $\dot{H}_0^*(10)$  is the ambient dose equivalent at the place to be protected without a source container that is to be taken into account in  $\mu\text{Sv/h}$ ,  $\Gamma_{H^*}$  is the dosing capacity constant according to Appendix A1 of (DIN 6844-3, 2020-07), A is the activity in GBq and r is the distance in m.

For FSG60 (Cs137), the dosing capacity constant is  $\Gamma_{H^*} = 92.7 \mu\text{Sv m}^2 / \text{h GBq}$ .

For FSG61 (Co60), the dosing capacity constant is  $\Gamma_{H^*} = 354 \mu\text{Sv m}^2 / \text{h GBq}$ .

FSG60 with VKM100	Activity [GBq]	Radiation source exposed	
		At a distance of 10 cm	At a distance of 1 m
		Ambient dose equivalent [ $\mu\text{Sv/h}$ ]	Ambient dose equivalent [ $\mu\text{Sv/h}$ ]
RT	0.00185	17	<0.5
AC	0.0185	171	2

FSG60 with VKM100	Activity [GBq]	Radiation source exposed	
		At a distance of 10 cm	At a distance of 1 m
		Ambient dose equivalent [ $\mu\text{Sv/h}$ ]	Ambient dose equivalent [ $\mu\text{Sv/h}$ ]
AD	0.037	342	3
AE	0.074	685	7
AF	0.111	1018	10
AG	0.185	1711	17
AH	0.370	3423	34
AK	0.740	5088	51
AL	1.11	6845	68
AM	1.85	10175	102
AN	3.7	13875	139
AP	7.4	17113	171
AR	11.1	25900	259
AT	18.5	34225	342
AW	29.6	50875	509
BB	37	68450	685
BC	55.5	85563	856
BD	74	101750	1018
BF	111	138750	1388
BG	148	171125	1711
BH	185	273800	2738
BJ	222	342250	3423
BK	259	513375	5134
BL	296	684500	6845
BM	333	1026750	10268
BN	370	1369000	13690
BP	740	1711250	17113

FSG61 with VKM100	Activity [GBq]	Radiation source exposed	
		At a distance of 10 cm	At a distance of 1 m
		Ambient dose equivalent [ $\mu\text{Sv/h}$ ]	Ambient dose equivalent [ $\mu\text{Sv/h}$ ]
AA	0.0037	131	1
AB	0.0074	262	3
AC	0.0185	655	7
AD	0.037	1310	13
AE	0.074	2620	26
AF	0.111	3894	39
AG	0.185	6549	65
AH	0.370	13098	131
AK	0.740	19740	195
AL	1.11	26196	262



FSG61 with VKM100	Activity [GBq]	Radiation source exposed	
		At a distance of 10 cm	At a distance of 1 m
		Ambient dose equivalent [ $\mu\text{Sv/h}$ ]	Ambient dose equivalent [ $\mu\text{Sv/h}$ ]
AM	1.85	38 940	389
AN	3.7	53 100	531
AP	7.4	65 490	655
AR	11.1	99 120	991
AT	18.5	130 980	1 310
AW	29.6	194 700	1 947
BB	37	261 960	2 620
BC	55.5	327 450	3 275
BD	74	389 400	3 894
BF	111	531 000	5 310
BG	148	654 900	6 549
BH	185	1 047 840	10 478

**Recommended period of use**

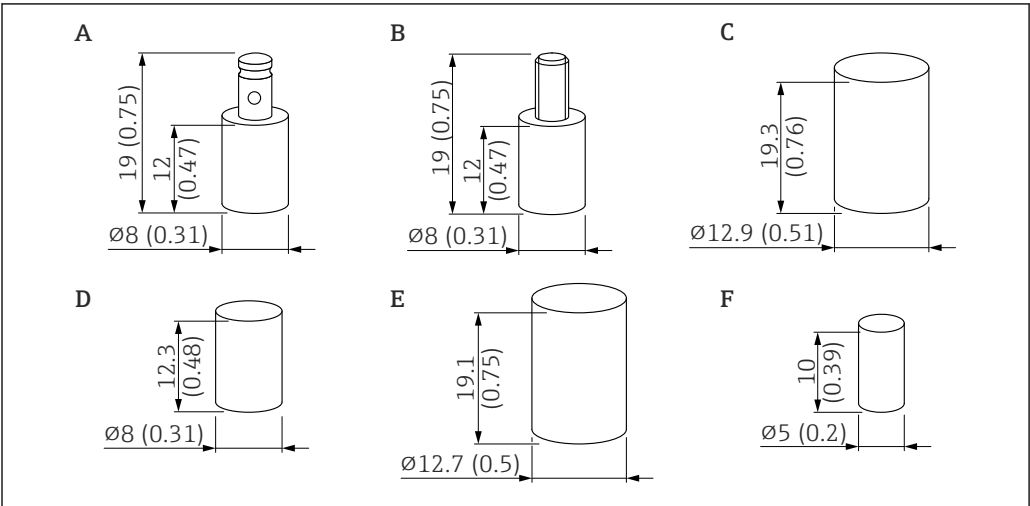
The period of use depends on the application. The period of use can also be defined by country-specific specifications. I.e. the country-specific specifications must be complied with in all cases for the period of use and for the tests to be carried out.

Unfavorable environmental conditions, improper use or combinations of materials during use may influence the exterior and the intactness of the radiation source. It is the responsibility of the user to carry out regular inspections and tests to determine when the radiation source needs to be replaced.

As a rule, many radiometry users proceed here as follows: The radiation source is a capsule with double metallic encasement which is permanently installed in the source container. If there are no indications of impairment when it comes to the intactness of the source container (e.g. no indications of corrosion or damage on the source container, etc.), the user assumes that the radiation source in the source container is also intact, and therefore does not need to be replaced.

The source container must be checked by the radiation safety officer at regular intervals depending on the specification, e.g. annually (visual check, function of the closure, etc.). The leak-tightness of the radiation source is also ensured at defined wiping surfaces via a wipe test. This regular leak testing by an expert is prescribed, for example, in Germany in the handling permit. If there is a suspicion of damage or leakage, then the radiation sources must not be used further, and must be checked immediately by an expert determined by the authorities.

Additional radiation source capsule types



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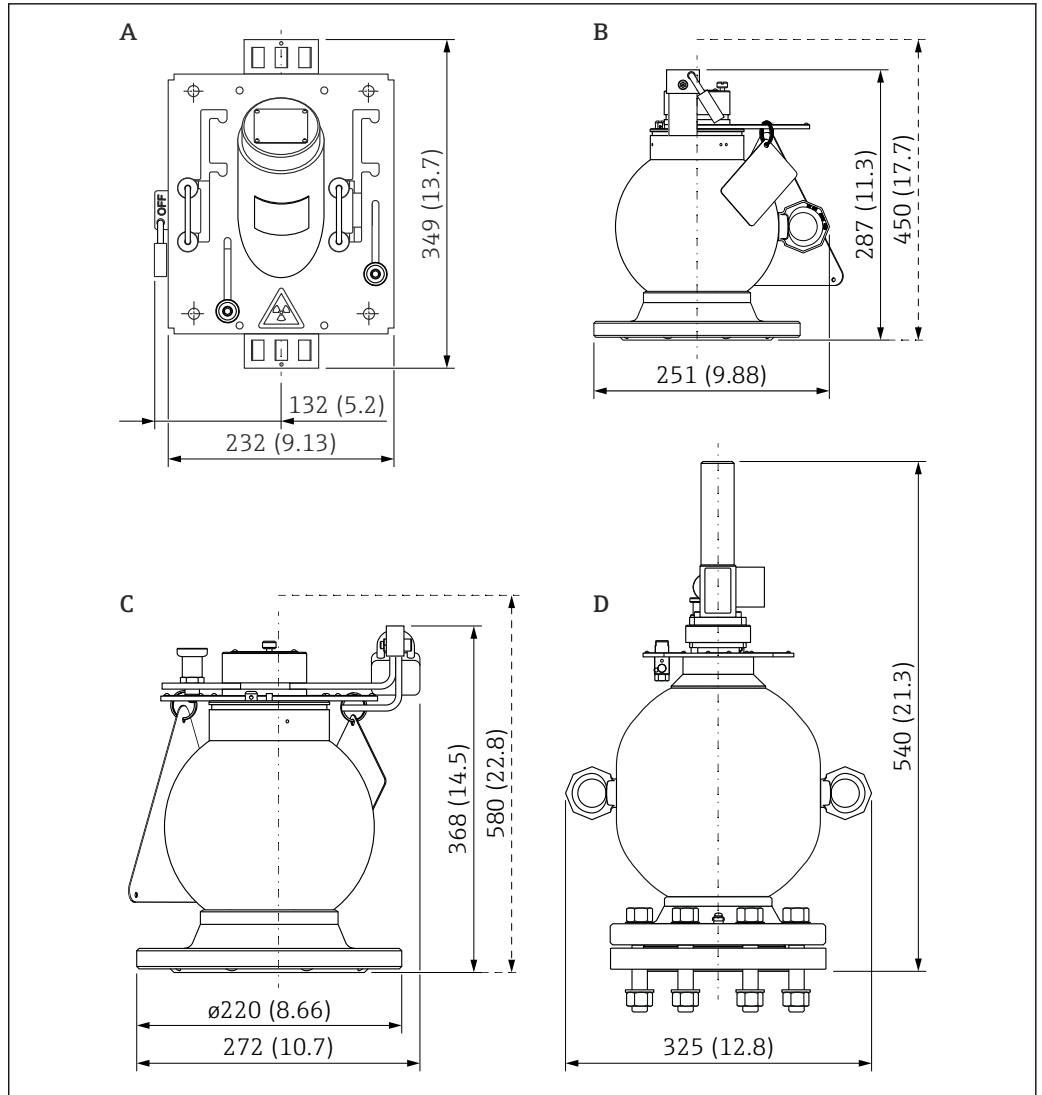
5 Unit: mm (in)

- A VZ357-001
- B VZ3579-001
- C X.38/4
- D X.9 (CDC.93), IGI-Z-4, P-04
- E P17, P17-1
- F CO1HK

The radiation sources are delivered and transported in source containers or transportation casks

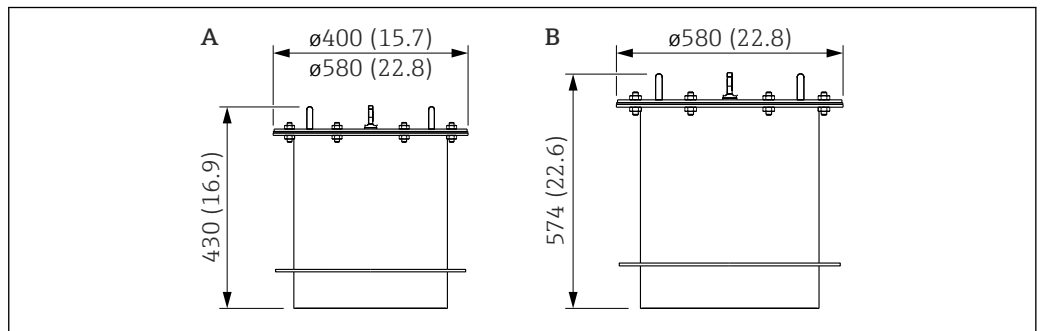
Dimensions

The following illustrations show an overview of all the models in each order version. Information on other order versions is available in the Technical Information of the individual models.



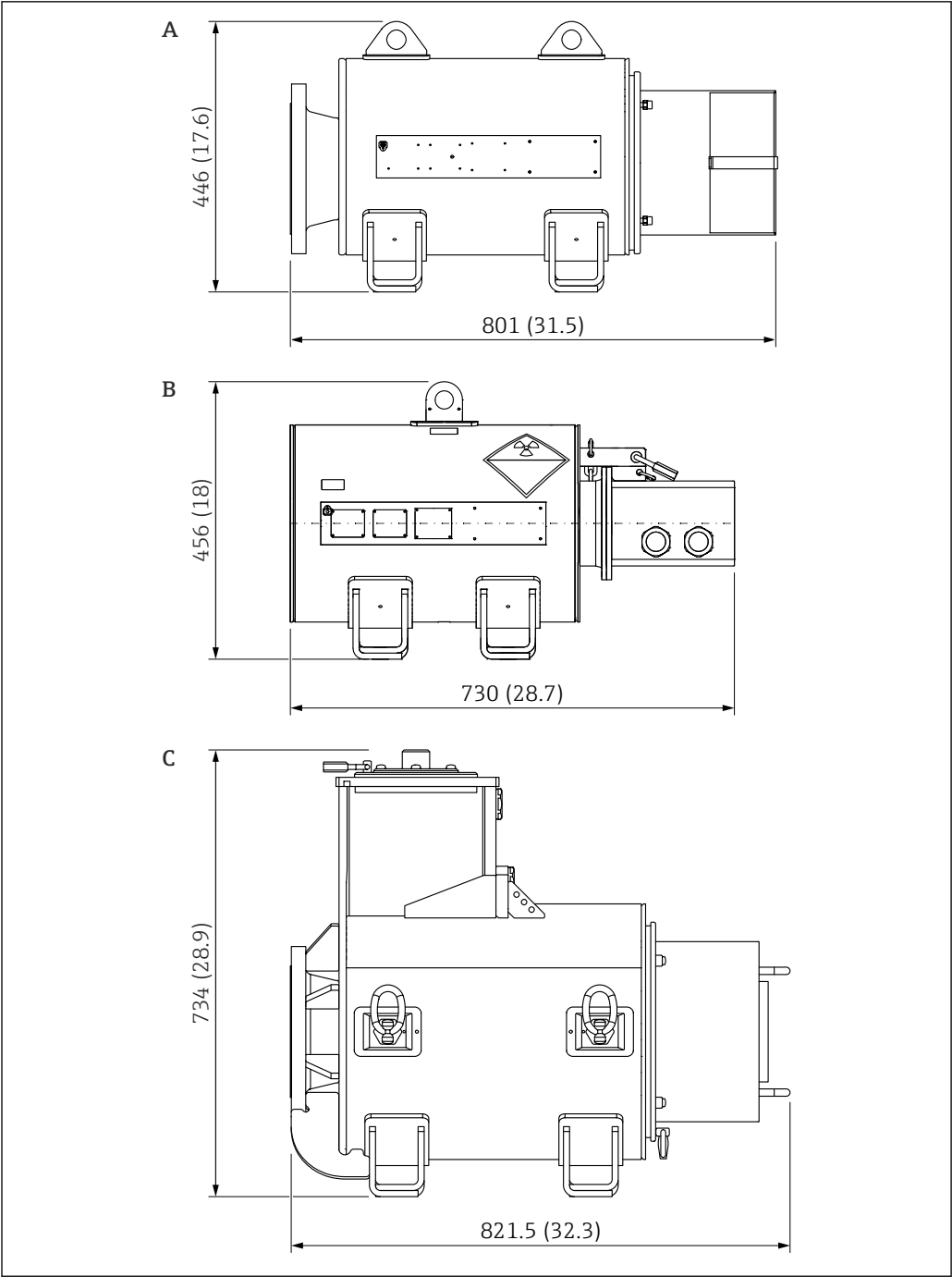
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- A FQG60
- B FQG61
- C FQG62
- D FQG63



A0056375







- A Transportation cask T40
- B Transportation cask T75, T110



A0056381

- A FQG64
- B FQG66
- C FQG74


**Additional information**

-  TI00445F/00  
FQG60, "Mechanical construction" section
-  TI00435F/00  
FQG61, FQG62, "Mechanical construction" section
-  TI00446F/00  
FQG63, "Mechanical construction" section
-  TI01171F/00  
FQG66, "Mechanical construction" section
-  TI01798F/00  
FQG74, "Mechanical construction" section
-  SD01316F/00  
Transportation cask T40/T75/T110, "Delivery of a loaded transportation cask" section

**Germany**

**Delivery conditions:**

- Radiation sources can only be delivered upon presentation of a handling permit (copy)
- Source containers are always shipped with the radiation source installed
  - The source container is in the "OFF" switch position when delivered
  - The "OFF" switch position is secured by a lock
- If the operator requests advance delivery of the source container and subsequent delivery of the radiation source, the radiation source will then be delivered as a Type A package (e.g. in a transportation cask).

 Endress+Hauser is more than happy to assist in procuring the necessary documents by contacting the responsible sales organization.


**Reporting obligation for highly radioactive sources**

<sup>137</sup>Cs radiation sources with activities  $\geq 100$  GBq (2.7 Ci) and <sup>60</sup>Co radiation sources  $\geq 30$  GBq (810 mCi) are reportable, highly radioactive sources (high-activity sealed sources, HASS) according to the German Radiation Protection Ordinance, Section 5, Subsection 1.

Highly radioactive sources are:


See the "Radiation sources -> Highly radioactive sources (high-activity sealed sources)" section.

Highly radioactive sources are recorded in a central register at the German Federal Office for Radiation Protection. Information on the HASS register and the application procedure can be found on the website <https://hrq.bfs.de/>.

 Highly radioactive sources are specifically identified on the source container, see the "About this document -> Radiation sources -> Highly radioactive sources" section.


**Determination of requirements for installation spaces according to DIN 25422**

DIN 25422 can be consulted when it comes to designing the safe installation, retention and storage of the sources. This standard helps you to define safety measures regarding fire and theft protection for your radiation sources. In the following, we give you information on the fire protection class and required safety level according to DIN 25422:2021.

 Endress+Hauser is more than happy to assist in designing the fire and theft protection measures by contacting the responsible sales organization.


**- Fire protection**

All FSG60 and FSG61 radiation sources comply with fire protection class BB, as they meet the requirements of DIN 25422 with their classification according to ISO 2919. No further measures shall thus be taken with regard to fire protection for container-like storage facilities (here, the FQG source container) according to DIN 25422.

 Nevertheless, please note the requirement of installation spaces in DIN 25422 and the hazard group of German fire service regulation 500 (FwDV500), see below.

Additional requirements must be met for the space group or the installation space depending on the activity class (which is determined by the isotope and radiation source activity).

- **Activity class 1**  
Radiation sources with activities  $\leq 10^4$  times the exemption limit according to the German Radiation Protection Ordinance, Appendix 4, Table 1.  
The requirements of conventional fire protection are sufficient to comply with DIN 25422 here.
- **Activity class 2**  
Radiation sources with activities  $> 10^4$  times and  $\leq 10^7$  times the exemption limit according to the German Radiation Protection Ordinance, Appendix 4, Table 1.  
In addition, the BR1 requirements of DIN 25422 must be fulfilled for the space group or the installation space.
- **Activity class 3**  
Radiation sources with activities  $> 10^7$  times and  $\leq 10^{10}$  times the exemption limit according to the German Radiation Protection Ordinance, Appendix 4, Table 1.  
In addition, the BR1 requirements of DIN 25422 must be fulfilled for the space group or the installation space.

 Fire protection class 3 is reduced here by one level (from BR2 to BR1) when using radiation sources of fire protection class BB.

*Activity classes sales feature 100 "Activity"*

Product	Activity class 1	Activity class 2	Activity class 3
FSG60 with option	AC, AD, AE, RT	AF, AG, AH, AK, AL, AM, AN, AP, AR, AT, AW, BB, BC, BD	BF, BG, BH, BJ, BK, BL, BM, BN, BP
FSG61 with option	AA, AB, AC, AD, AE, AF, AG, AH, AK	AL, AM, AN, AP, AR, AT, AW, BB, BD, BF, BG, BH	-

#### - Theft protection

The safety level for the selection of suitable theft protection measures depends on the activity and isotope used.

**Safety level F** is required for radiation sources with activities  $< 100$  times the exemption limit according to the German Radiation Protection Ordinance, Appendix 4, Table 1.


FSG61 radiation sources with an activity  $< 10$  MBq (0.27 mCi), see the following table.

Safety level F is automatically met when the radiation source is used with all source containers from Endress+Hauser.

**Safety level E** is required for radiation sources with activities  $\geq 100$  times the exemption limit and with an HASS value  $< 0.01$  according to the German Radiation Protection Ordinance, Appendix 4, Table 1.

- FSG60 radiation sources with an activity  $< 1$  GBq (27 mCi), see the following table.
- FSG61 radiation sources with an activity  $\geq 10$  MBq (0.27 mCi) and  $< 300$  MBq (1.8 mCi), see the following table.

Safety level E can be met with almost all source containers from Endress+Hauser. However, the standard padlock with a keyed alike lock must be replaced by a padlock with a **keyed to differ** lock of at least safety level 4 according to DIN EN 12320. With this lock, the source containers comply with theft protection class DB1.

 A suitable lock can also be ordered as an accessory to the source container.

#### NOTICE

**Source Containers FQG60 and FQG61/FQG62 with sales feature 020 "Version", option A, FQG63 and FQG74 do not fulfill the requirements of theft protection class DB1.**

- ▶ Alternative solutions for theft protection must be implemented here in accordance with DIN 25422.

**Safety level D** is required for radiation sources with activities with an HASS value  $\geq 0.01$  and with an HASS value  $< 1$  according to the German Radiation Protection Ordinance, Appendix 4, Table 1.

- FSG60 radiation sources with an activity  $\geq 1$  GBq (27 mCi) and  $< 100$  GBq (2.7 Ci), see the following table.
- FSG61 radiation sources with an activity  $\geq 300$  MBq (1.8 mCi) and  $< 30$  GBq (0.81 Ci), see the following table.

Safety level D can be met with almost all source containers from Endress+Hauser.

However, the standard padlock with a keyed alike lock must be replaced by a padlock with a **keyed to differ** lock of at least safety level 4 according to DIN EN 12320. With this lock, the source containers comply with theft protection class DB1.

In addition, the storage room or space group must meet requirement DR1 of DIN 25422, or an intruder alarm complying with the specifications of DIN 25422 must be used.



A suitable lock can also be ordered as an accessory to the source container.

**NOTICE**

**Source Containers FQG60 and FQG61/FQG62 with sales feature 020 "Version", option A, FQG63 and FQG74 do not fulfill the requirements of theft protection class DB1.**

- ▶ Alternative solutions for theft protection must be implemented here in accordance with DIN 25422.

**Safety level C** is required for highly radioactive radiation sources.

- FSG60 radiation sources with an activity  $\geq 100$  GBq (2.7 Ci), see the following table.
- FSG61 radiation sources with an activity  $\geq 30$  GBq (0.81 Ci), see the following table.

**WARNING**

**Hazard potential due to unsafe storage of the radiation source!**

Under no circumstances are the theft protection measures of the source containers sufficient for safe storage of the radiation sources.

- ▶ In the case of highly radioactive sources, you must take safety measures to prevent the misuse of radiation sources by third parties. The SEWD guideline SisoraSt applies!
- ▶ To clarify the required protective measures, you must contact the supervisory authority responsible for you.

*Required safety level as per sales feature 100 "Activity"*

Product	Safety level F	Safety level E	Safety level D	Safety level C
FSG60 with option	-	AC, AD, AE, AF, AG, AH, AK, RT	AL, AM, AB, AP, AR, AT, AW, BB, BC, BD	AL, AM, AB, AP, AR, AT, AW, BB, BC, BD
FSG61 with option	AA, AB	AC, AD, AE, AF, AG	AH, AK, AL, AM, AN, AP, AR, AT, AW	AH, AK, AL, AM, AN, AP, AR, AT, AW

**Categorization into hazard groups according to FwDV500**

German fire service regulation 500 (FwDV500) categorizes installation spaces and areas with radiation sources into various hazard groups. The categorization depends on the activity, as well as the ISO 2919 classification. Caution: The following categorization applies only to individual radiation sources. When it comes to categorization, the overall activity in an area must always be noted.

- Hazard group IA is to be assigned for the following:
  - Individual FSG60 radiation sources with sales feature 200 "Capsule type", option C1, D1 - AND with an activity  $< 100$  MBq (2.7 mCi), see the following table.
  - Individual FSG60 radiation sources with sales feature 200 "Capsule type", option A1, B1, F1, G1, H1, J1, L1, P1, Q4 - AND with an activity  $< 100$  GBq (2.7 Ci), see the following table.
  - Individual FSG61 radiation sources in all versions, see the following table.
- Hazard group IIIA is to be assigned for the following:
  - Individual FSG60 radiation sources with sales feature 200 "Capsule type", option C1, D1 - AND with an activity  $> 100$  MBq (2.7 mCi), see the following table.
  - Individual FSG60 radiation sources with sales feature 200 "Capsule type", option A1, A1, B1, F1, G1, H1, J1, L1, P1, Q4 - AND with an activity  $> 100$  GBq (2.7 Ci), see the following table.



Endress+Hauser is more than happy to assist in determining the hazard group by contacting the responsible sales organization.


Hazard group by activity (Sales feature 100) in combination with capsule type (Sales feature 200)

Product	Sales feature 200	Hazard group IA and Sales feature 100	Hazard group IIIA and Sales feature 100
FSG60 with options	C1, D1	AC, AD, AE	AF, AL, AM, AB, AP, AR, AT, AW, BB, BC, BD, BF, BG, BH, BK, BL, BM, BN, BP
	A1, B1, F1, G1, H1, J1, L1, P1, Q4	AC, AD, AE, AF, AL, AM, AB, AP, AR, AT, AW, BB, BC, BD	BF, BG, BH, BK, BL, BM, BN, BP
FSG61 with options	All	All	-

## Other countries

### Export conditions:

- Radiation sources can only be delivered upon presentation of an import license (copy)
- Radiation sources are delivered in a source container
  - The source container is in the "OFF" switch position when delivered
  - The "OFF" switch position is secured by a lock
- The source containers containing the installed radiation source are transported by a company commissioned by Endress+Hauser and officially certified to perform this type of transportation work.  
Most FQG6x source containers are suitable for the radiation source as a Type A package (IAEA rules). SD00311F gives an overview of all available Type A packages.

 Endress+Hauser is more than happy to assist in procuring the necessary documents by contacting the responsible sales organization.

## What to do in an emergency

### Objective and overview

In the interests of personnel safety, the emergency procedure described here must be put into effect immediately to secure an area where an exposed radiation source is known, or suspected, to exist

#### An emergency exists if:

- The radiation source has escaped from the source container or the source holder
- The source container cannot be switched to the "AUS – OFF" position
- The source container has been mechanically damaged or exposed to fire.

### Immediate measures



#### High ionizing radiation due to exposed radiation source or defective source container!

A high level of exposure to ionizing radiation may result in serious injury or death.

- ▶ Keep your distance from the radiation source.
- ▶ Inform the radiation safety officer responsible for the affected radiation source immediately.
- ▶ Shut off the affected area, being generous with the area that is included. Also take into account areas above and below the radiation source.

#### Radiation source has escaped from the source container or the source container has been exposed to fire

##### Important measures to be taken:

- Determine the hazardous area by on-site measurement.
- Shut off the affected area with yellow tape or a rope, being generous with the area that is included.
- Mark the affected area using international radiation warning signs.
- Estimate and optimize residence times by prior testing without a radiation source.

#### The source container cannot be switched to the "AUS – OFF" position

See the "What to do in an emergency" section of the Operating Instructions of the source container.

### Notifying the responsible authority

1. Pass on all the necessary information to the responsible local and national authorities immediately
2. After a thorough assessment of the situation, the responsible radiation safety officer must agree, together with the local authority, on an appropriate corrective measure for the respective problem



3. Mark the affected area using the international radiation warning sign



National regulations may require different procedures and reporting obligations

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**Recurrent tests****See the relevant Technical Information:**

- TI00445F/00 (FQG60)
- TI00435F/00 (FQG61, FQG62)
- TI00446F/00 (FQG63)
- BA01327F/00 (FQG66)
- BA02361F/00 or BA02365F/00 (FQG74)

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## Measures after termination of the application

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**Internal measures**

As soon as a radiometric measuring device is no longer required, the radiation must be switched off on the source container. The source container must be removed in accordance with all relevant regulations and stored in a lockable room with no through-traffic. The responsible authorities must be informed of these measures. The access area to the storage room must be measured and marked accordingly. The radiation safety officer is responsible for implementing theft protection measures. 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.

**⚠ WARNING****Increased exposure to radiation or contamination due to improper removal!**

A high level of exposure to ionizing radiation may result in serious injury or death.

- ▶ The source container may only be removed according to local regulations by certified, specially trained personnel authorized by the operator.
- ▶ Take all local conditions into account.
- ▶ Carry out all work as quickly as possible, at the greatest possible distance from the radiation source and so that the radiation source is as shielded as possible.
- ▶ Take suitable measures (e.g. blocking of access) to prevent hazards for other people.
- ▶ Only remove the source container when it is in the "AUS – OFF" switch position. The radiation is minimized in this position.
- ▶ Make sure that the "AUS – OFF" position is secured with a lock.

**Returns**

The procedure for returns is explained in document SD00309F.



Returns may be made only if all the conditions of document SD00309F are fulfilled.

**Information regarding Type A packages**

The various Type A packages are illustrated in detail in document SD00309F.

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## Ordering information

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**Ordering information**


Detailed ordering information is available from the following sources:

- In the Product Configurator: [www.us.endress.com/en/field-instruments-overview/product-finder](http://www.us.endress.com/en/field-instruments-overview/product-finder) -> Select product -> Configure
- From an Endress+Hauser Sales Center: [www.endress.com/worldwide](http://www.endress.com/worldwide)

**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


## Supplementary documentation for FSG60/61

-  For an overview of the scope of the associated Technical Documentation, refer to the following:
- *Device Viewer* ([www.endress.com/deviceviewer](http://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.

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### Source containers

#### FQG60

-  TI00445F  
Technical Information and Operating Instructions for Source Container FQG60

#### FQG61/FQG62

-  TI00435F  
Technical Information and Operating Instructions for Source Containers FQG61 and FQG62

#### FQG63


-  TI01171F  
Technical Information and Operating Instructions for Source Container FQG63

#### FQG66

-  TI01171F  
Technical Information for Source Container FQG66

-  BA01327F  
Operating Instructions for Source Container FQG66

#### FQG74


-  TI01798F  
Technical Information for Source Container FQG74


-  BA02361F  
Operating Instructions for Source Container FQG74


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### Additional safety instructions

-  SD00142F  
Additional safety instructions for radiation sources and source containers that are approved for use in Canada (in English).

-  SD00292F/00  
Additional safety instructions (Canada)

-  SD00293F, SD00313F, SD00335F, SD01561F  
Additional safety instructions (United States)

-  SD00276F  
Additional safety instructions, particularly for QG020/100 and QG2000 (United States)





[www.addresses.endress.com](http://www.addresses.endress.com)

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