TI00439F/00/EN/23.25-00
71698290
2025-02-24

Technical Information
Radiation sources FSG60 and FSG61

Radiometric level measurement

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

Application

Radioactive gamma-emitting isotopes are used as radiation sources for level, density and interface measurement as well as for point level measurement. The gamma radiation radiates evenly from the radiation source in all directions. For radiometric measurements, however, only radiation in one direction - i.e. the radiation passing through the vessel or pipe - is generally required. The radiation in all other directions is undesired and must be shielded off (attenuated). For this reason, the radiation sources are inserted into source containers, which ensure gamma radiation in one direction only.

Advantages

- Radiation source in the source container ensures simple handling and easy installation
- Double-walled encasement of the radiation source complies with the strictest safety requirements: typical classification 66646 according to ISO2919
- Choice of isotope: ^{137}Cs or ^{60}Co
- Choice of required activity ensures optimized dosage for your application

Endress+Hauser
People for Process Automation

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About this document

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}Cs and ^{60}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 $_{abs}$
  - Class 5
    0.025 to 70 MPa $_{abs}$
- 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}Co material is enclosed in the capsule as a solid metal
- The ^{137}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}Cs radiation sources with activity values ≥ 100 GBq (2.7 Ci) or ^{60}Co radiation sources ≥ 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.

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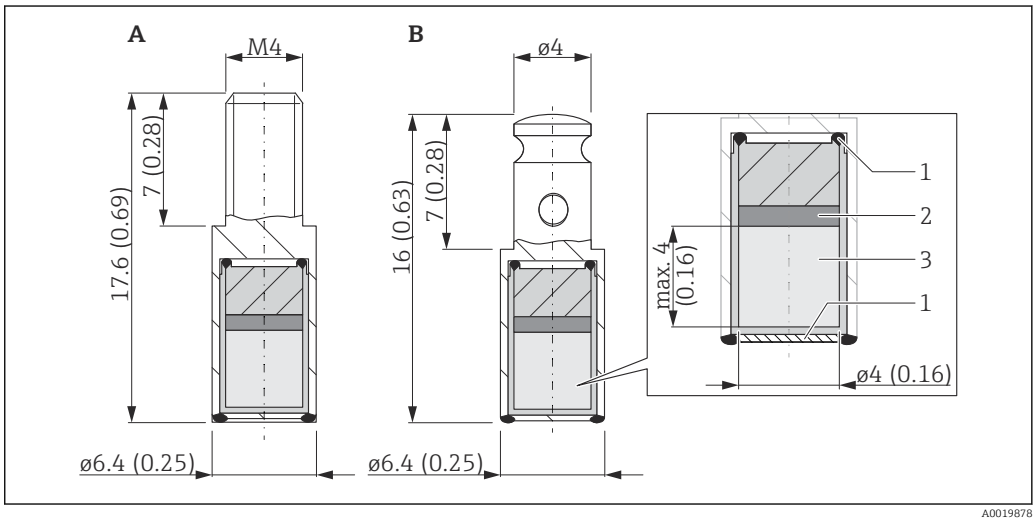
1 *Warning symbol for highly radioactive source according to ISO 21482*

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



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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 ^{60}Co as metal or ^{137}Cs as ceramic

Model	Isotope	VKM200 option	Model designation	ISO 2919 classification	Operating temperature range	Recommended period of use (years)
FSG60	^{137}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

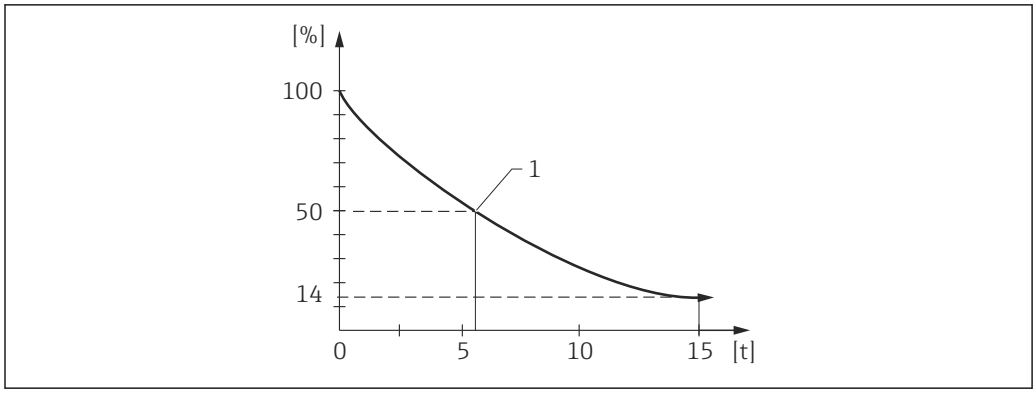
Model	Isotope	VKM200 option	Model designation	ISO 2919 classification	Operating temperature range	Recommended period of use (years)
		F1	X.9	C66646	−40 to +200 °C (−40 to +392 °F)	15
		G1	X.38/4	C66646	−40 to +200 °C (−40 to +392 °F)	15
		P1	P04	C66646	−55 to +470 °C (−67 to +842 °F)	15
		Q4	P17-1	C66646	−55 to +470 °C (−67 to +842 °F)	15
FSG61	^{60}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:**
  - ^{60}Co: Metal
  - ^{137}Cs: Ceramic

Application

Application for ^{60}Co



3 Decline in activity of a ^{60}Cs radiation source over time

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

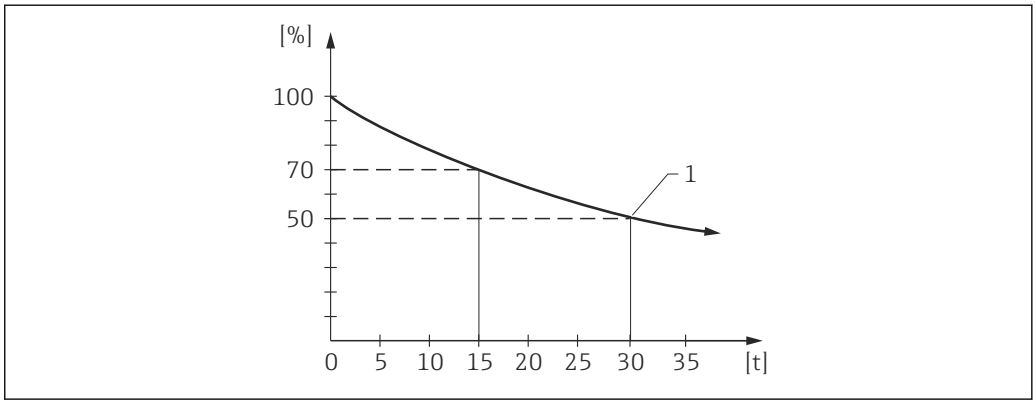
The ^{60}Co radiation source (radiation energy 1.173 MeV and 1.333 MeV; half-life 5.3 years) is mostly used for point level measurement if the activity required by ^{137}Cs is too high. Its advantage lies in its high penetration capacity, which enables measurement over large distances or through thick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

Example: Activity after 15 years of operation: 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", see:

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

Application for ^{137}Cs



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4 *Decline in activity of a ^{137}Cs radiation source over time*

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

The ^{137}Cs (radiation energy 0.662 MeV) is ideal for continuous level measurement, point level detection and density measurement systems. Its half-life of 30 years ensures a long operation time without the need for radiation source replacement (lower costs and no recalibration).

As the radiation is readily absorbed, there is generally no controlled area.

Example: Activity after 15 years of operation: 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", see:

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

Dose rate values for unshielded radiation sources

12.8 50.5 45 555 557	1
	4
34	45
2	678

The ambient dose equivalent rate at the location to be protected without shielding is calculated according to equation (1) (DIN 6844-3, 2020-07).

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

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Here $\dot{H}_0^*(10)$ is the ambient dose equivalent rate to be taken into account at the location to be protected without shielding in µSv/h, Γ_{H*} is the dose rate 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 dose rate constant is Γ_{H*} = 92.7 µSv m² / h GBq.

For FSG61 (Co60), the dose rate constant is Γ_{H*} = 354 µSv m² / h GBq.

FSG60 with VKM100	Activity [GBq]	Radiation source unshielded	
		at a distance of 10 cm	at a distance of 1m
		Ambient dose equivalent rate [µSv/h]	Ambient dose equivalent rate [µSv/h]
RT	0.00185	17	<0.5
AC	0.0185	171	2
AD	0.037	343	3
AE	0.074	686	7
AF	0.111	1029	10
AG	0.185	1715	17
AH	0.370	3430	34
AK	0.740	6860	69
AL	1.11	10290	103
AM	1.85	17150	171
AN	3.7	34299	343
AP	7.4	68598	686
AR	11.1	102897	1029
AT	18.5	171495	1715
AW	29.6	274392	2744
BB	37	342990	3430
BC	55.5	514485	5145
BD	74	685980	6860
BF	111	1028970	10290
BG	148	1371960	13720
BH	185	1714950	17150
BJ	222	2057940	20579
BK	259	2400930	24009
BL	296	2743920	27439
BM	333	3086910	30869
BN	370	3429900	34299
BP	740	6859800	68598

FSG61 with VKM100	Activity [GBq]	Radiation source unshielded	
		at a distance of 10 cm	at a distance of 1 m
		Ambient dose equivalent rate [µSv/h]	Ambient dose equivalent rate [µSv/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	3929	39
AG	0.185	6549	65

FSG61 with VKM100	Activity [GBq]	Radiation source unshielded	
		at a distance of 10 cm	at a distance of 1 m
		Ambient dose equivalent rate [µSv/h]	Ambient dose equivalent rate [µSv/h]
AH	0.370	13 098	131
AK	0.740	26 196	262
AL	1.11	39 294	393
AM	1.85	65 490	655
AN	3.7	130 980	1 310
AP	7.4	261 960	2 620
AR	11.1	392 940	3 929
AT	18.5	654 900	6 549
AW	29.6	1 047 840	10 478
BB	37	1 309 800	13 098
BC	55.5	1 964 700	19 647
BD	74	2 619 600	26 196
BF	111	3 929 400	39 294
BG	148	5 239 200	52 392
BH	185	6 549 000	65 490

Recommended operating time

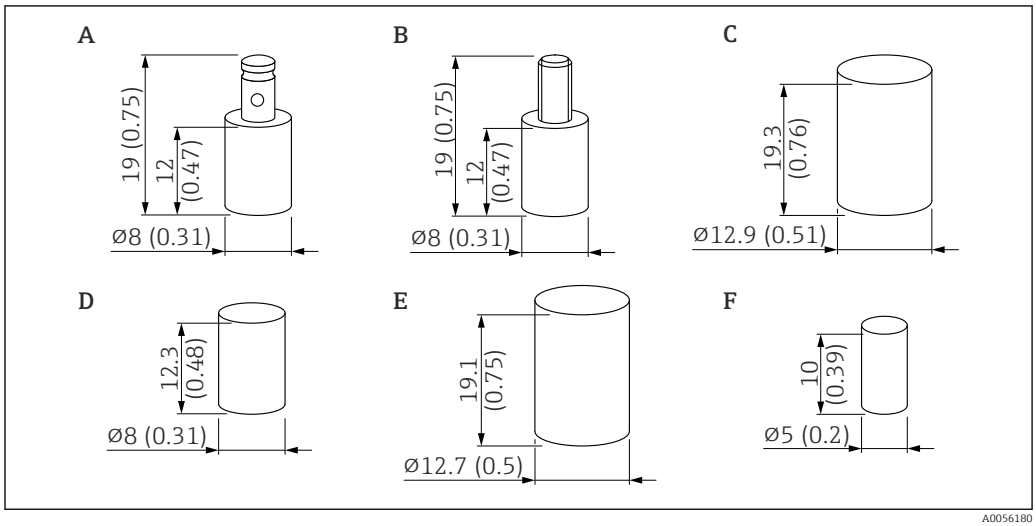
The operating time depends on the application. The operating time can also be defined by country-specific requirements. This means that country-specific requirements must always be observed for the operating time and the tests to be carried out.

Unfavorable ambient conditions, improper use or combinations of materials during use can affect the appearance and integrity 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 as follows: The radiation source is a double metal-enclosed capsule that is permanently installed in the source container. If there is no indication of damage to the integrity of the source container (e.g. no indication of corrosion or damage to the source container etc.), the user assumes that the radiation source is intact in the source container and thus does not need to be replaced.

The source container must be checked regularly by the radiation safety officer, e.g. once a year according to requirements (visual inspection, shutter functioning properly etc.). The integrity of the radiation source is also guaranteed by means of a wipe test on specified wipe surfaces. The requirement for regular leak testing by an expert is stipulated in the handling permit in Germany, for example. If there is any suspicion of damage or leakage, the radiation sources must not be used again and must be checked immediately by an officially appointed expert.

Alternative source capsule types



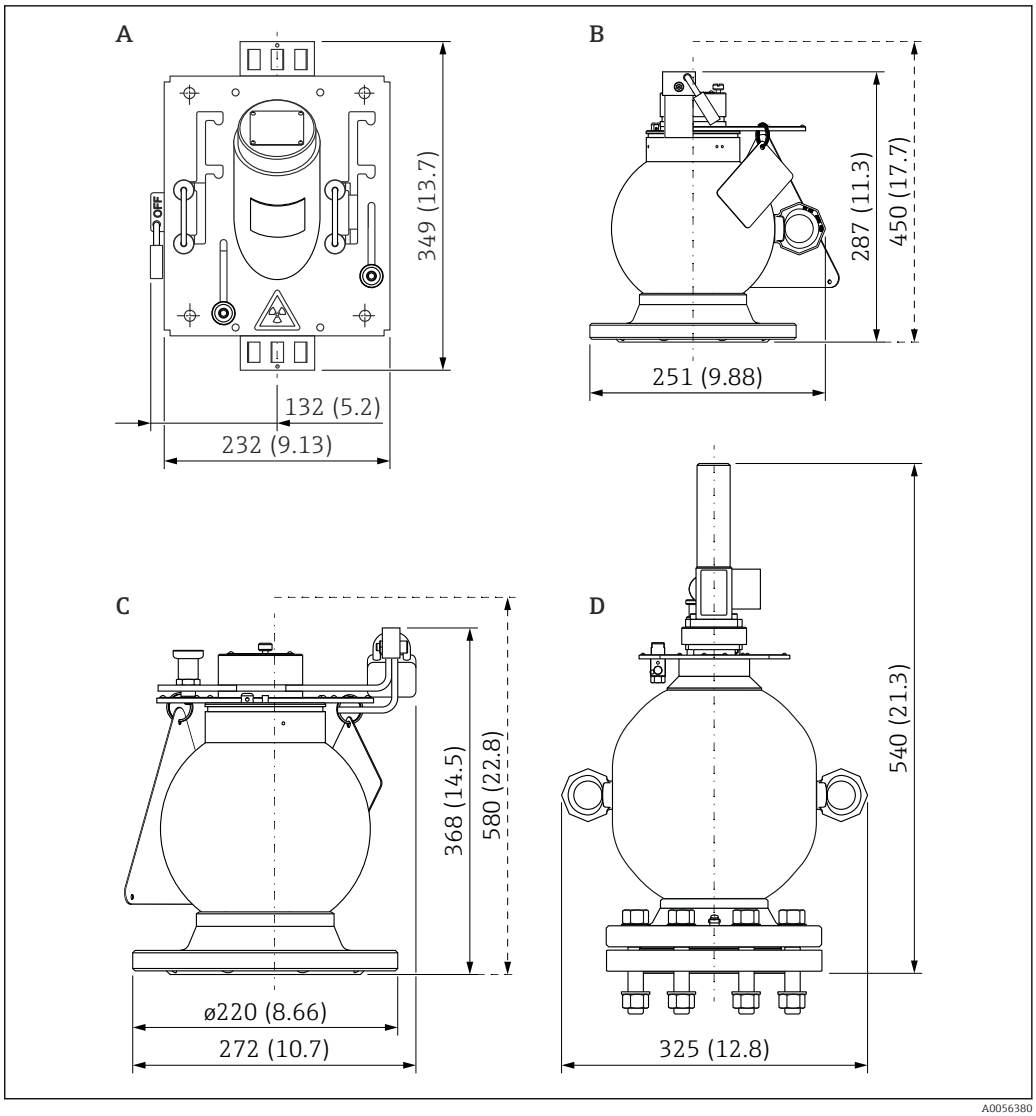
5 Unit: mm (in)

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

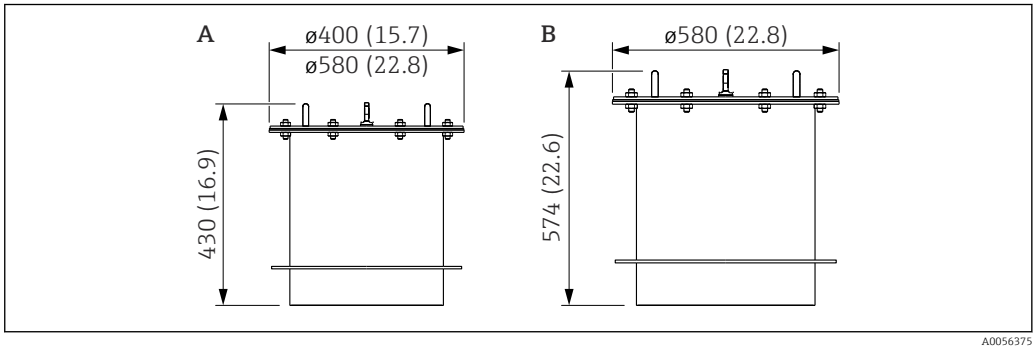
The radiation sources are delivered and transported in source containers or transportation casks

Dimensions

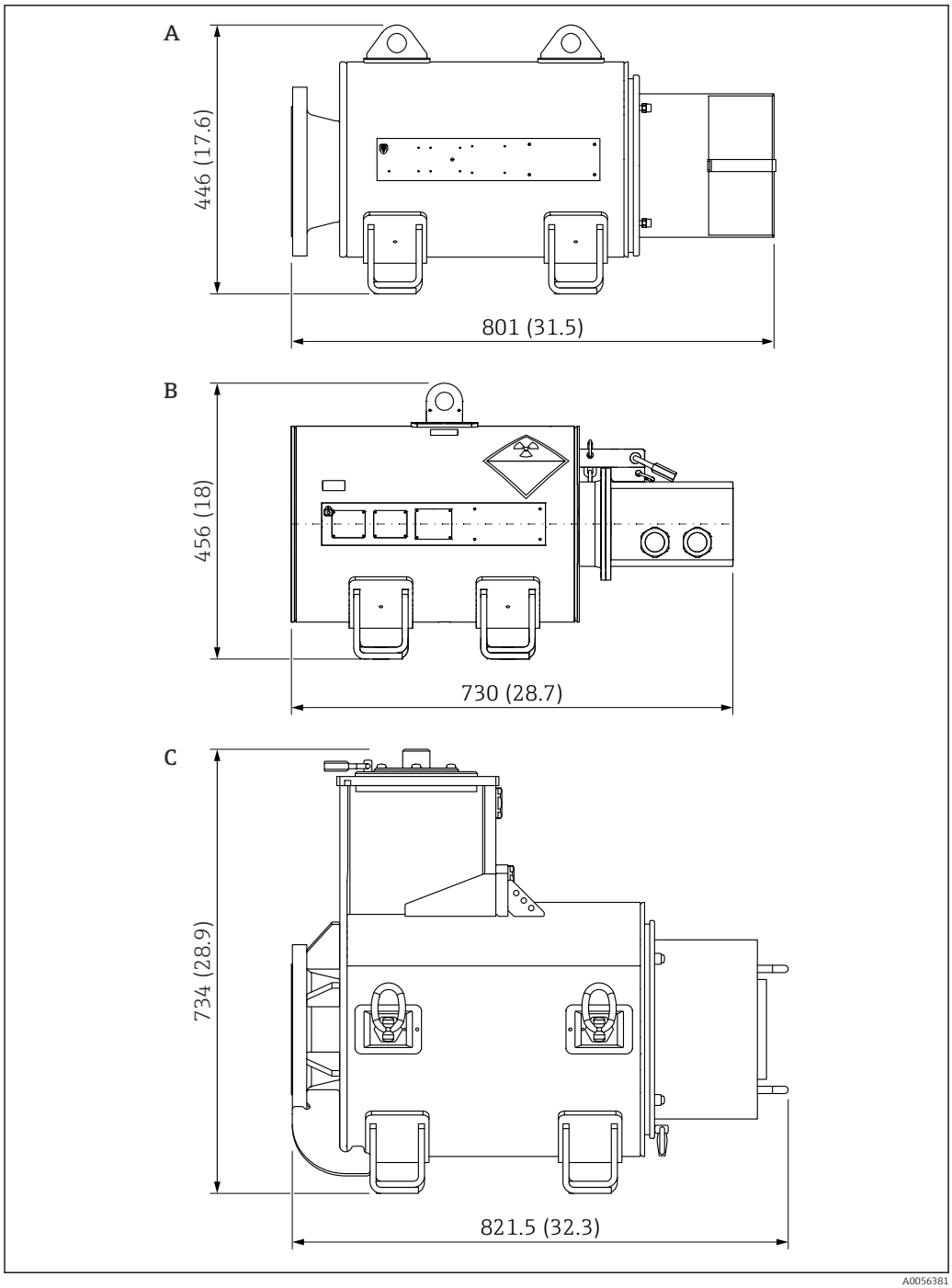
The following illustrations show an overview of all the models in each order version. Information on other order versions is available in the Technical Information of the individual models.



A FQG60
B FQG61
C FQG62
D FQG63



A Transportation cask T40
B Transportation cask T75, T110



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

^{137}Cs radiation sources with activities ≥ 100 GBq (2.7 Ci) and ^{60}Co radiation sources ≥ 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 ≤ 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 ≤ 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 ≤ 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 ≥ 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 ≥ 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 FGQ61/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 ≥ 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 ≥ 1 GBq (27 mCi) and < 100 GBq (2.7 Ci), see the following table.
- FSG61 radiation sources with an activity ≥ 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 FGQ61/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 ≥ 100 GBq (2.7 Ci), see the following table.
- FSG61 radiation sources with an activity ≥ 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

DANGER

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

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)

Measures after termination of the application

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.

Ordering information

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 -> Select product -> Configure
- From an Endress+Hauser Sales Center: 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): Enter the serial number from the nameplate
- *Endress+Hauser Operations app*: Enter serial number from nameplate or scan matrix code on nameplate.

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

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)

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