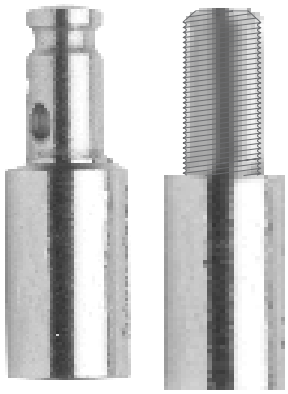
Level | Pressure | Flow | Temperature | Liquid Analysis | Registration | Systems Components | Services | Solutions

Technical Information

Gamma Radiation Source FSG60, ^{137}Cs and FSG61, ^{60}Co

Radiometric Measurement
For level, limit, density and interface measurement
Conform to strict safety standards



Application

Radioactive isotopes are used as gamma radiation sources for level, density and interface measurement as well as for level limit detection.

The gamma source radiates equally in all directions. For radiometric measurements, however, only radiation passing through the tank or pipe is of interest. All other radiation is superfluous and must be shielded off.

For this reason, the radioactive source is mounted in a special source container which affords the necessary protection while providing a defined, practically unattenuated, narrow beam in one direction only.

Your benefits

- Point source in special source container ensures simple handling and easy installation
- Specially constructed source capsule conforms to strictest safety requirements: Typically class 66646 to ISO 2919
- Choice of isotope (^{137}Cs or ^{60}Co) and activity ensures optimized dosage for your application.

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Gamma sources

Source capsule

The radioactive sources, both ^{137}Cs and ^{60}Co, are sealed in a double-walled, welded stainless steel capsule. The encapsulation corresponds to Performance Class C 66646 as per ISO 2919, providing maximum protection against temperature, external pressure, impact, vibrations and puncture.

Test	Class					
	1	2	3	4	5	6
Temperature	No test	-40 °C (20 min) +80°C (1h)	-40 °C (20 min) +180°C (1h)	-40 °C (20 min) +400°C (1h) and thermal shock 400 °C to 20 °C	-40 °C (20 min) +600°C (1h) and thermal shock 600 °C to 20 °C	-40 °C (20 min) +800°C (1h) and thermal shock 800 °C to 20 °C
External pressure	No test	25 kPa	25kPa$_{abs}$ to 2 MPa$_{abs}$	25kP$_{abs}$ to 7 MPa$_{abs}$	25kPa$_{abs}$ to 70 MPa$_{abs}$	25kPa$_{abs}$ to 170 MPa$_{abs}$
Impact	No test	50 g from 1 m	200 g from 1 m	2 kg from 1 m	5 kg from 1 m	20 kg from 1 m
Vibration	No test	3 x 10 min 25 to 500 Hz at 5 g peak amplitude	3 x 10 min 25 to 50 Hz at 5 g peak amplitude, 50 ... 90 Hz at 0.635 mm amplitude peak to peak, 90 ... 500 Hz at 10g peak amplitude	3 x 30 min 25 ... 80 Hz at 1.5 mm amplitude peak to peak, 80 ... 2000 Hz at 20 g peak amplitude		
Puncture	No test	1 g from 1 m	10 g from 1 m	50 g from 1 m	300 g from 1 m	1 kg from 1 m

^{137}Cs isotopes

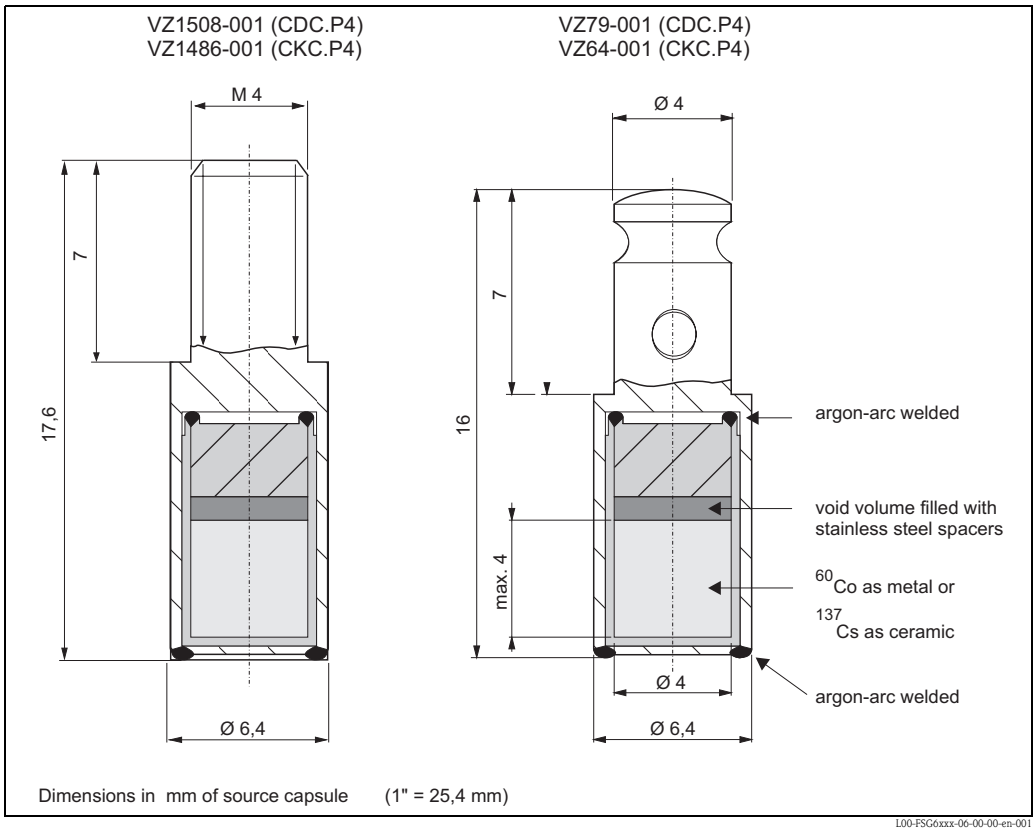
The radioactive material contained in the capsule is ^{137}Cs dispersed within a ceramic substrate. In view of the fact that there is no danger of leakage if the capsule is punctured, regular sealing tests are required only every five years if the capsule is permanently mounted in an Endress+Hauser source container or every three years for other installations. ^{137}Cs sources are not recommended for use in environments which promote corrosion or leakage of the stainless steel capsule.

^{60}Co isotopes

The radioactive material contained in the capsule is metallic ^{60}Co. Before they are delivered, the manufacturer tests the sealing and decontamination of the finished capsules. After testing, the capsule can be considered as a sealed radioactive source in accordance with ISO 2919. The source is accompanied by a sealing test certificate and PTB approval (German authorising agency).
In view of the fact that the radioactive source is in solid, metallic form within in a double-walled stainless steel capsule, depending on national regulations there is normally no requirement for regular sealing tests.

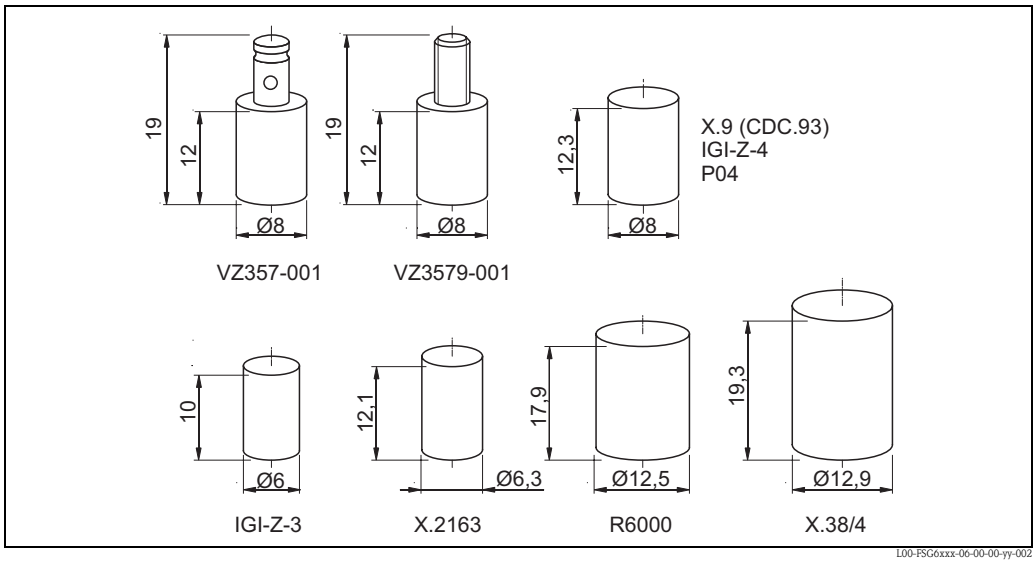
Technical data

Standard radiation sources



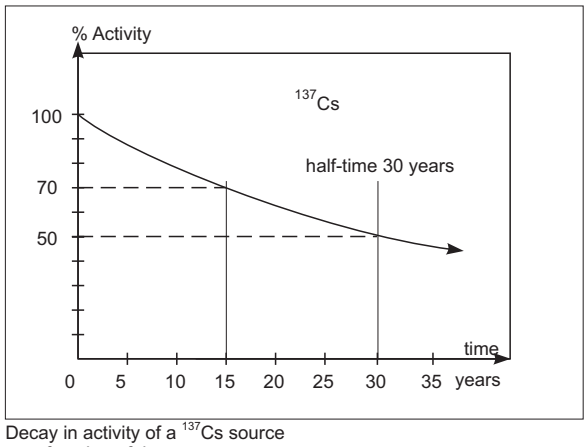
- Weight: 0.005 kg
- Encapsulation: double-walled, welded stainless steel, tye 1.4541 (321 S 18)
- Performance class typically C66646 to ISO 2919
- Protection: IP68
- Nominal operating range: -40 °C to +250 °C (-40 °F to 428 °F)
- Radioactive material:
  - ^{60}Co: metallic
  - ^{137}Cs: compound dispersed in ceramic substrate
- Energy of radiation:
  - ^{60}Co: 1.173 MeV and 1.333 MeV
  - ^{137}Cs: 0.662 MeV

Alternative capsule types



Application

^{137}Cs applications



Decay in activity of a ^{137}Cs source as a function of time

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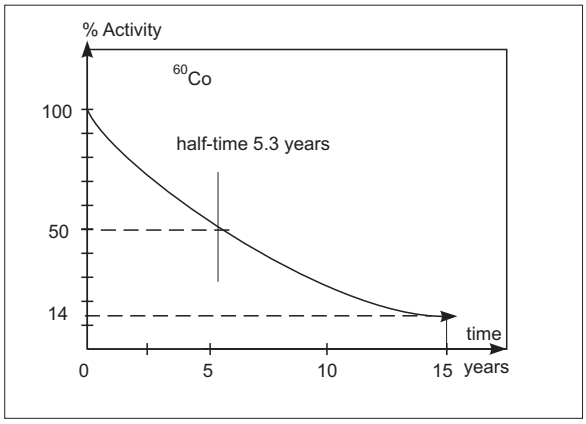
The ^{137}Cs source (energy 0.662 MeV) is ideal for continuous level, limit detection and density measurement. Its long half life (30 years) ensures a long operation time without the need for cost-intensive source replacement or recalibration. Thanks to the low source energy, the radiation is readily absorbed and the equipment can often be operated with no control zone.

Example:
Remaining activity after 15 years of operation: 70% –> no replacement of radiation source required.

^{60}Co applications



Decay in activity of a ^{60}Co source as a function of time

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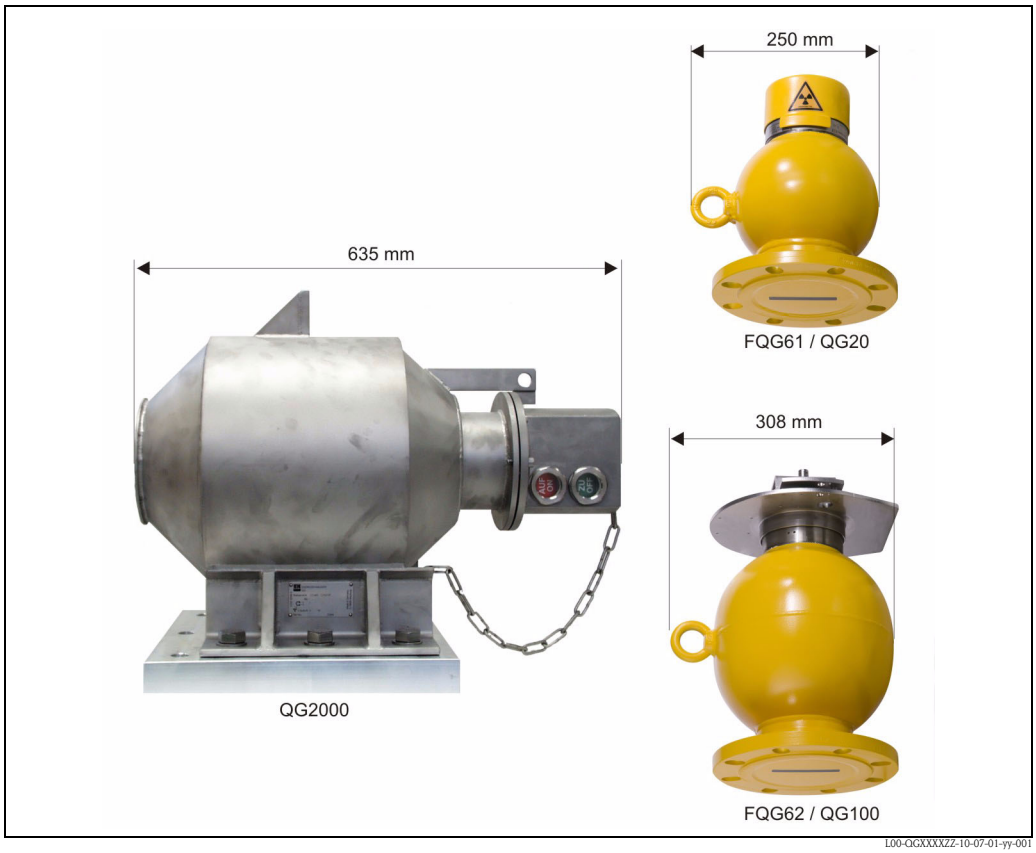
The ^{60}Co source (energy 1.173 and 1.333 MeV; half life 5.3 years) is used mostly for level limit detection when the corresponding ^{137}Cs activity is too high. Its advantages lie in its large depth of penetration, which enables measurement over large distances or through thick tank walls. The ^{60}Co source can also be used for continuous level measurements when the activity of a suitable ^{137}Cs source is considered to be too high.

Example:
Remaining activity after 15 years of operation: 14% –> replacement of radiation source required.

Delivery, Transport

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 centre.
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 licence. Endress+Hauser is more than happy to assist in procuring the necessary documents. Please contact your local sales centre.
Please contact your local sales centre.
Radioactive sources must be installed in the source container for delivery abroad.

The source container is delivered in the OFF position, secured with a lock.
The transport of loaded source containers is conducted by a company commissioned by Endress+Hauser and officially certified for executing this type of job.
Transportation shall take place in a Type "A" package which complies to the regulations of the European Agreement on the International Transportation of Hazardous Substances on Roads (ADR and DGR/IATA).

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 holder cannot be put into OFF position.
This procedure will safeguard the personnel until the responsible radiation safety officer can 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 radiation source container can not be switched to the "OFF" position

In this case the radiation source container must be unbolted from its mounting position.
Point the emission channel towards a very thick wall (e.g. steel or lead) or mount a blind flange in front of the emission channel.
Personnel should at all times be behind the source housing, not in front of the emission channel (flange of the FQG61/FQG62).
The lifting eye on the housing should facilitate safe handling.

The radiation source has escaped from the source container

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

Note!
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 radiation source on 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 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 approval. Ensure that the contents of the handling approval is valid. 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 must also be carried out to protect personnel from all possible risks.
The disassembly of the source container can only be executed during OFF position.
Make sure, the OFF position is secured with a padlock.

Return

Federal Republic of Germany

Contact your Endress+Hauser Sales Centre to organise 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 Centre 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 centre 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 (^{60}Co or ^{137}Cs), activity and model of radiation source must be specified. This data may be found in the documents supplied with the radiation source.
- The material must be returned in type-tested type-A packaging (IATA rules).
  Order code: 52011467
  Dimensions: 400 mm x 400 mm x 650 mm (16" x 16" x 26")

  ✎ Note!
  The type-A-labelling at the radiation container itself is invalid for a return of the device.

Ordering information

Product structure FSG60, Cs137

100	Activity	
	AC	18,5MBq/0,5mCi
	AD	37MBq/1mCi
	AE	74MBq/2mCi
	AF	110MBq/3mCi
	AG	185MBq/5mCi
	AH	370MBq/10mCi
	AK	740MBq/20mCi
	AL	1,1GBq/30mCi
	AM	1,85GBq/50mCi
	AN	3,7GBq/100mCi
	AP	7,4GBq/200mCi
	AR	11GBq/300mCi
	AT	18,5GBq/500mCi
	AW	29,6GBq/800mCi
	BB	37GBq/1000mCi
	BC	55,5GBq/1500mCi
	BD	74GBq/2000mCi
	BF	111GBq/3000mCi
	BG	184GBq/4000mCi
	BH	185GBq/5000mCi
	BJ	222GBq/6000mCi
	BK	259GBq/7000mCi
	BL	296GBq/8000mCi
	BM	333GBq/9000mCi
	BN	370GBq/10000mCi
	BP	740GBq/20000mCi
	YY	Special version, to be specified

200		Capsule Type	
		A1	Nipple d=6,4x16mm, capsule VZ79-001; classification C66646, ISO2919
		B1	Thread M4 d=6,4x17,6mm, capsule VZ1508-001; classification C66646, ISO2919
		C1	Nipple d=8x19mm, capsule VZ357-001; classification C65545, ISO2919
		D1	Thread M4 d=8x19mm, capsule VZ3579-001; classification C65345, ISO2919
		F1	Cylinder d=8,05x12,3, capsule X.9; classification C66646, ISO2919
		G1	Cylinder d=12,9x19,3, capsule X.38/4; classification C66646, ISO2919
		H1	Cylinder d=12,5x17,9, capsule R6000; classification C63646, ISO2919
		J1	Cylinder d=6x10, capsule IGI-Z-3; classification C65546, ISO2919
		L1	Cylinder d=8x12, capsule IGI-Z-4; classification C65546, ISO2919
		Y9	Special version, to be specified

FSG60 -			complete product designation

Product structure FSG61, Co60

100		Activity
	AA	3,7MBq/0,1mCi
	AB	7,4MBq/0,2mCi
	AC	18,5MBq/0,5mCi
	AD	37MBq/1mCi
	AE	74MBq/2mCi
	AF	110MBq/3mCi
	AG	185MBq/5mCi
	AH	370MBq/10mCi
	AK	740MBq/20mCi
	AL	1,1GBq/30mCi
	AM	1,85GBq/50mCi
	AN	3,7GBq/100mCi
	AP	7,4GBq/200mCi
	AR	11GBq/300mCi
	AT	18,5GBq/500mCi
	AW	29,6GBq/800mCi
	BB	37GBq/1000mCi
	BD	74GBq/2000mCi
	YY	Special version, to be specified

200		Capsule type
	A2	Nipple D=6,4x16mm, capsule VZ64-001; classification C66646, ISO2919
	B2	Thread M4 d=6,4x17mm, capsule VZ1486-001; classification C66646, ISO2919
	C2	Cylinder d=6,3x12,1, capsule X.2163; classification C63545, ISO2919
	Y9	Special version, to be specified

FSG61 -			complete product designation

Associated documentation

Radiation Source Container QG20/QG100	**TI264F** Technical Information and Operating Instructions for Radiation Source Container QG20/QG100
Radiation Source Container FQG61/FQG62	**TI435F** Technical Information and Operating Instructions for Radiation Source Container FQG61/FQG62
Radiation Source Container QG2000	**TI346F** Technical Information for Radiation Source Container QG2000 **BA223F** Operating Instructions for Radiation Source Container QG2000
Gammapilot M FMG60	**TI363F** Technical Information for Gammapilot M FMG60 **BA236F** Operating Instructions for Gammapilot FMG60 (HART) **BA329F** Operating Instructions for Gammapilot FMG60 (PROFIBUS PA) **BA330F** Operating Instructions for Gammapilot FMG60 (FOUNDATION Fieldbus)
Gammapilot FTG470Z	**TI218F** Technical Information for Gammapilot FTG470Z
Detectors DG17/DG27	**TI197F** Technical Information for Detectors DG17/DG27
Supplementary Instruction Manuals	**SD292F** Supplementary Instruction Manual for Canada **SD293F** Supplementary Instruction Manual for the USA

Instruments International

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