

# Radiometric Measurement *Gamma Radiation Sources*

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



capsule  
(secondary  
cover)



lid



spacer



source



primary  
cover



lid



Nipple-source

M4-thread source

## 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.

## Features and Benefits

- Point source in special source container ensures simple handling and easy installation
- Specially constructed source capsule conforms to strictest safety requirements, Class 66646 to ISO 2919
- Choice of source type and activity ensures optimised dosage for your application

Exploded view of source capsule

Endress + Hauser

The Power of Know How



## Gamma Sources

### Source Capsule

The radioactive sources, both  $^{137}\text{Cs}$  and  $^{60}\text{Co}$ , 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
<b>Temperature</b>	No test	-40°C (20 min) +80°C (1 h)	-40°C (20 min) +180°C (1 h)	-40°C (20 min) +400°C (1 h) and thermal shock 400°C to 20°C	-40°C (20 min) +600°C (1 h) and thermal shock 600°C to 20°C	-40°C (20 min) +800°C (1 h) and thermal shock 800°C to 20°C
<b>External Pressure</b>	No test	25 kPa absolute to atmospheric pressure	25 kPa absolute to 2 MPa absolute	25 kPa absolute to 7 MPa absolute	25 kPa absolute to 70 MPa absolute	25 kPa absolute to 170 MPa absolute
<b>Impact</b>	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
<b>Vibrations</b>	No test	3 x 10 min 25 Hz to 500 Hz at 5 gn peak amplitude	3 x 10 min 25 Hz to 50 Hz at 5 gn peak amplitude and 50 Hz to 90 Hz at 0 - 635 mm amplitude peak to peak and 90 Hz to 500 Hz at 10 gn	3 x 30 min 25 Hz to 80 Hz at 1 - 5 mm amplitude peak to peak and 80 Hz to 2000 Hz at 20 gn		
<b>Puncture</b>	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

Classification of sealed source performance standards to ISO 2919. The source capsule fulfils the maximum requirement in each case

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**<sup>60</sup>Co source**

The radioactive material contained in the capsule is metallic <sup>60</sup>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).

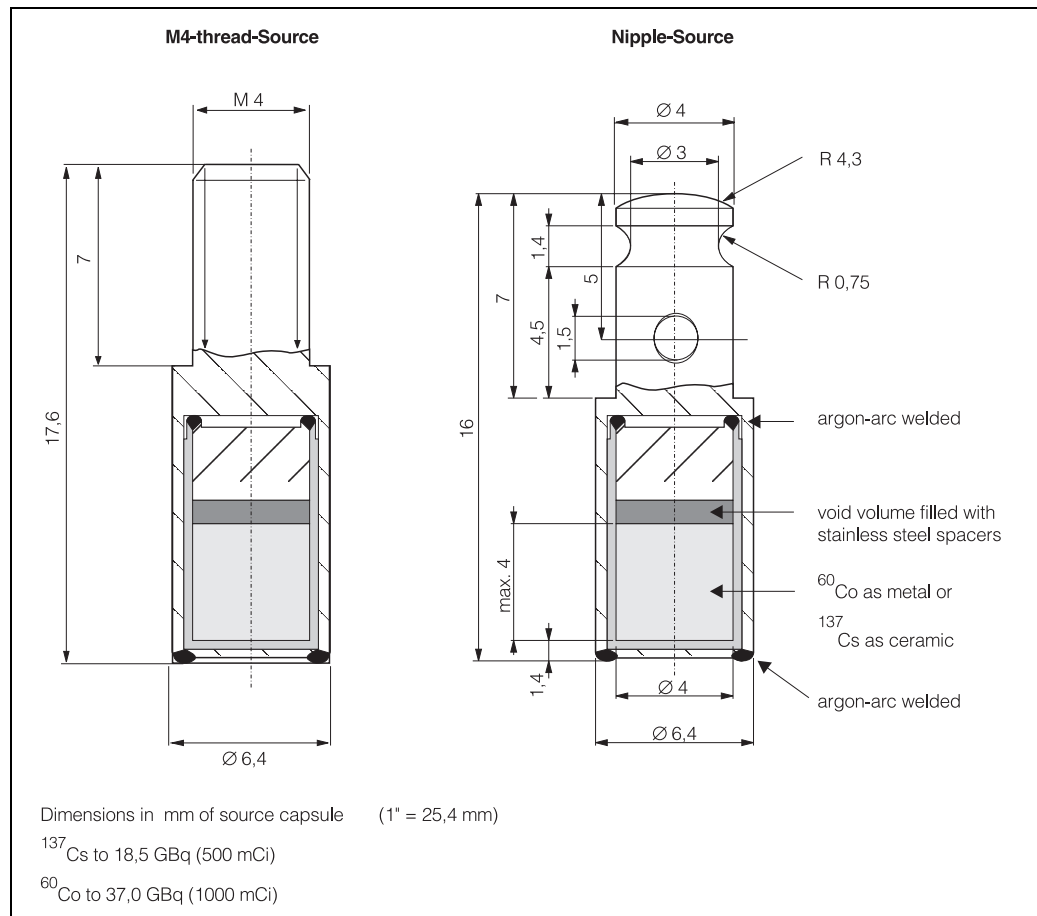
In view of the fact that the radioactive source is in solid, metallic form within in a double-walled stainless steel capsule, there is normally no requirement for regular sealing tests (see PTB approval).

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**<sup>137</sup>Cs source**

The radioactive material contained in the capsule is <sup>137</sup>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. <sup>137</sup>Cs sources are not recommended for use in environments which promote corrosion or leakage of the stainless steel capsule.

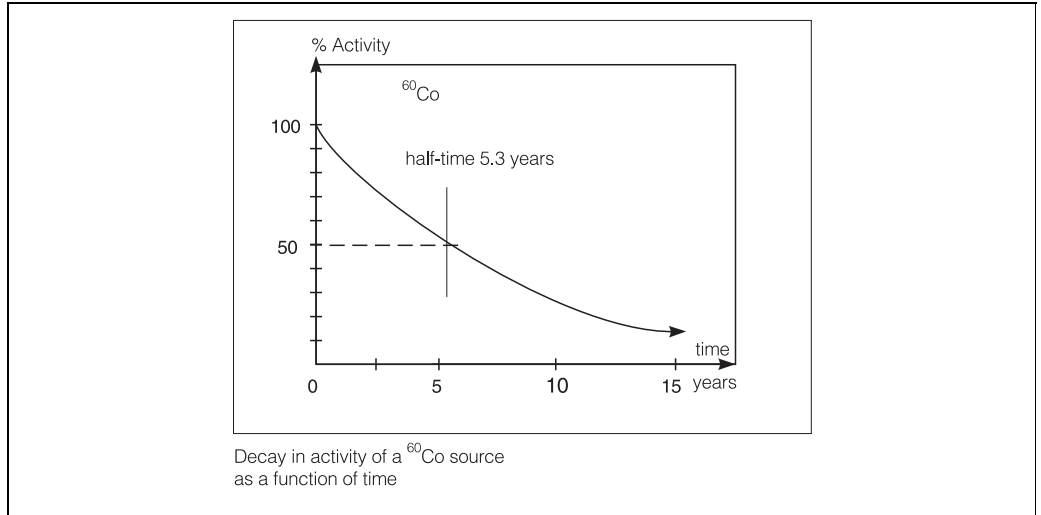
## Technical Data



- Weight: 0.02 kg
- Encapsulation: double-walled, welded stainless steel, type 1.4541(≅ 321 S 18)
- Performance class: C 66646 to ISO 2919
- Protection: IP 68
- Nominal operating range: -20°C...+250°C (-4°F...482°F)
- Radioactive material: metallic <sup>60</sup>Co or <sup>137</sup>Cs compound dispersed in ceramic substrate
- Energy <sup>60</sup>Co : 1.173 and 1.333 MeV;
- Energy <sup>137</sup>Cs : 0.622 MeV

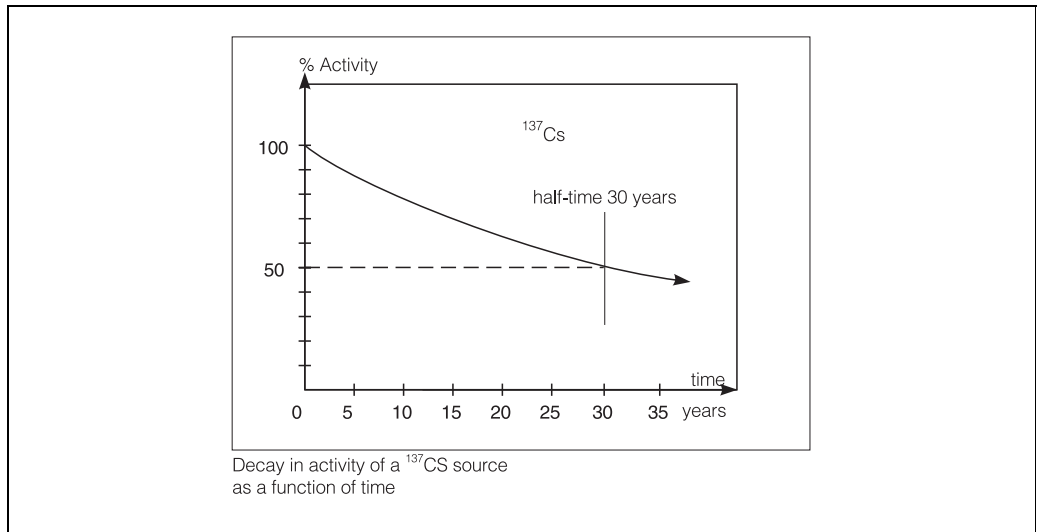
## Application

### <sup>60</sup>Co-Source Applications



The economical <sup>60</sup>Co source (energy 1.173 and 1.333 MeV; half life 5.3 years) is used mostly for level limit detection when the corresponding <sup>137</sup>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 <sup>60</sup>Co source can also be used for continuous level measurements when the activity of a suitable <sup>137</sup>Cs source is considered to be too high.

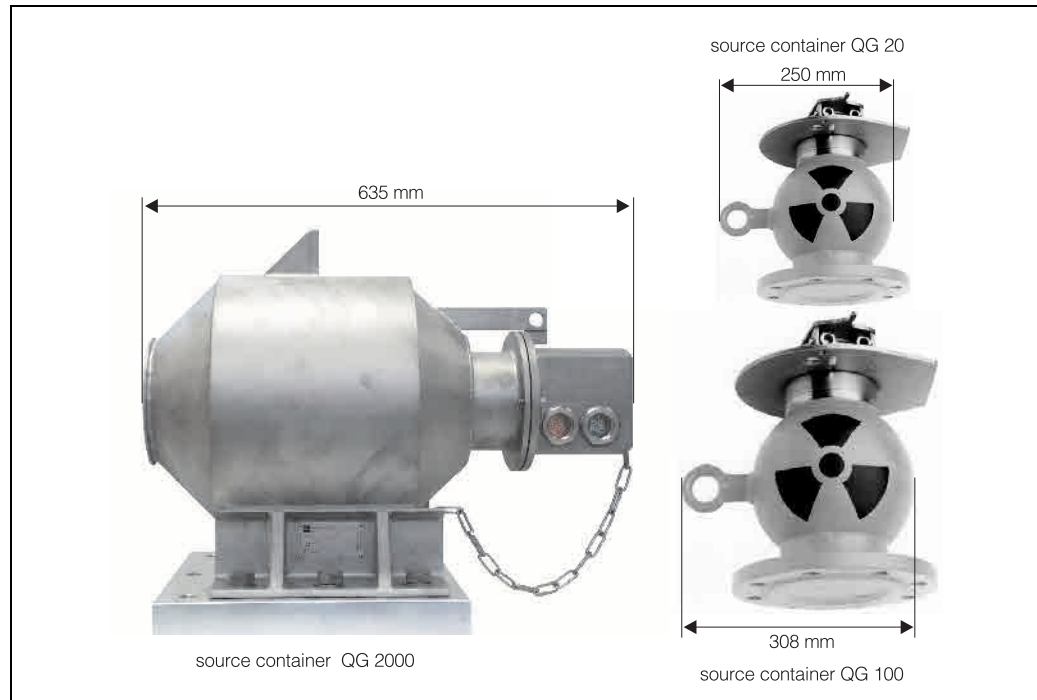
### <sup>137</sup>Cs-Source Applications



The <sup>137</sup>Cs source (energy 0.622 MeV) is ideal for continuous level, limit detection and density measurement. Its long half life (30 years) ensures durable service without the need for 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. <sup>137</sup>Cs is used in limit detection for low density bulk solids or short distances where the harder <sup>60</sup>Co radiation cannot be satisfactorily absorbed, or when extreme demands are placed on the service life of the installation.

## Delivery and Transport

### Germany



Radioactive sources may only be delivered when we have received a copy of the authorisation for handling radioactive materials. Endress+Hauser will gladly help you acquire the necessary documents. Please contact your nearest Sales Organisation.

For reasons of safety and cost, the radioactive source is usually shipped already loaded in the source container. Arrangements can also be made to ship the source separately in a special transport drum.

They will only be transported by approved shipping agents according to current GGVS/ADR guidelines, with all safety regulations being observed.

### Other Countries

Radioactive sources may only be delivered when we have received a copy of the import license. Endress+Hauser will gladly help you acquire the necessary documents. Please contact your nearest Sales Organisation.

We can only deliver radioactive sources in their source containers.

They will only be transported by approved shipping agents according to current GGVS/ADR and DGR/IATA guidelines, with all safety regulations being observed.

Radioactive sources can be shipped only when a copy of your authorisation for handling radioactive materials has been presented to Endress+Hauser.

For reasons of safety and cost, the radioactive source can be shipped already loaded in the source container. Arrangements can also be made to ship the source separately in a special transport drum.

## How to Order

Isotope	Activity		Order No. for Nipple Source	Order No. for M4-thread Source
<sup>60</sup> Co	37.00 MBq	(1 mCi)	008 347-0000	008 347-1000
<sup>60</sup> Co	74.00 MBq	(2 mCi)	008 348-0000	008 348-1000
<sup>60</sup> Co	110.00 MBq	(3 mCi)	008 816-0000	008 816-1000
<sup>60</sup> Co	185.00 MBq	(5 mCi)	008 349-0000	008 349-1000
<sup>60</sup> Co	370.00 MBq	(10 mCi)	008 350-0000	008 350-1000
<sup>60</sup> Co	740.00 MBq	(20 mCi)	008 351-0000	008 351-1000
<sup>60</sup> Co	1.10 GBq	(30 mCi)	008 352-0000	008 352-1000
<sup>60</sup> Co	1.85 GBq	(50 mCi)	010 012-0000	010 012-1000
<sup>60</sup> Co	3.70 GBq	(100 mCi)	008 354-0000	008 354-1000
<sup>60</sup> Co	5.55 GBq	(150 mCi)	011 502-0000	011 502-1000
<sup>60</sup> Co	7.40 GBq	(200 mCi)	010 108-0000	010 108-1000
<sup>137</sup> Cs	37.00 MBq	(1 mCi)	008 356-0000	008 356-1000
<sup>137</sup> Cs	74.00 MBq	(2 mCi)	010 014-0000	010 014-1000
<sup>137</sup> Cs	110.00 MBq	(3 mCi)	008 357-0000	008 357-1000
<sup>137</sup> Cs	185.00 MBq	(5 mCi)	008 358-0000	008 358-1000
<sup>137</sup> Cs	370.00 MBq	(10 mCi)	008 359-0000	008 359-1000
<sup>137</sup> Cs	550.00 MBq	(15 mCi)	010 015-0000	010 015-1000
<sup>137</sup> Cs	740.00 MBq	(20 mCi)	008 814-0000	008 814-1000
<sup>137</sup> Cs	1.10 GBq	(30 mCi)	010 542-0000	010 542-1000
<sup>137</sup> Cs	1.85 GBq	(50 mCi)	008 361-0000	008 361-1000
<sup>137</sup> Cs	3.70 GBq	(100 mCi)	008 362-0000	008 362-1000
<sup>137</sup> Cs	5.55 GBq	(150 mCi)	011 504-0000	011 504-1000
<sup>137</sup> Cs	7.40 GBq	(200 mCi)	010 185-0000	010 185-1000
<sup>137</sup> Cs	9.25 GBq	(250 mCi)	011 505-0000	011 505-1000
<sup>137</sup> Cs	11.00 GBq	(300 mCi)	010 186-0000	010 186-1000
<sup>137</sup> Cs	15.00 GBq	(400 mCi)	010 187-0000	010 187-1000
<sup>137</sup> Cs	18.50 GBq	(500 mCi)	010 188-0000	010 188-1000
Other activities on request				

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# Supplementary Documentation

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## System Information

### SI 016F/00/en

System Information for Gammasilometer, Gammapilot  
(Radiometric measurement of level, interface layers and density)

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## Technical Information

### TI 194F/00/en

Technical Information for Source Container QG 020/100  
(Standard design)

### TI 264F/00/en

Technical Information for Source Container QG 020/100  
(Chemical, Euro- and Sweden design)

### TI 346F/00/en

Technical Information for Source Container QG 2000

### TI 218F/00/en

Technical Information for Gammapilot FTG 470 Z

### TI 177F/00/en

Technical Information for Gammapilot FTG 671

### TI 219F/00/en

Technical Information for gammasilometer FMG 671 (P)

### TI 110F/00/en

Technical Information for System FMG 573 Z/S-Density

### TI 197F/00/en

Technical Information for Detector DG 17 (Z), DG 27 (Z)

### TI 180F/00/en

Technical Information Detector DG 57

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