Technical
Information
TI 194F/00/en

Operating Instructions
017172-1000

Radiometric Measurement
Source Container QG 020/100

Designs conforming to chemical industry, European and Swedish standards
With rotating insert for source mounting and manual on/off switching

Source container
QG 020/100
Euro/Swedish design

Source container
QG 020/100
Chemical industry
design

Application

In radiometric limit, level and density measurements, radioactive isotopes are used as gamma sources. The radioactive material is sealed in a double-walled, welded, stainless steel capsule.

- The use of all such gamma sources is governed by the national radiation protection regulations of the country where the measuring system is installed.

The capsule is secured in a lead-filled QG 020 or QG 100 source container, which shields off unwanted radiation. The QG 100 has additional shielding which allows the use of stronger sources.

Features and Benefits

- For measuring systems with point radiation source and rod scintillation counters – high sensitivity with low source activity
- Radiation exit angles of 5°, 20°, 40° offer optimal adaptation to the application at hand
- Flanges to DIN or ANSI
- Padlocked for locking and anti-theft protection
- Switching status easily seen
- Spherical design gives best possible shielding

Versions

- Swedish design: upholds strict Scandinavian safety regulations, nameplates in Swedish
- European design: as Swedish design but with English/German nameplates
- Chemical design: fulfils additional demands for chemical industry
  - use under rugged conditions
  - safe and easy source handling.

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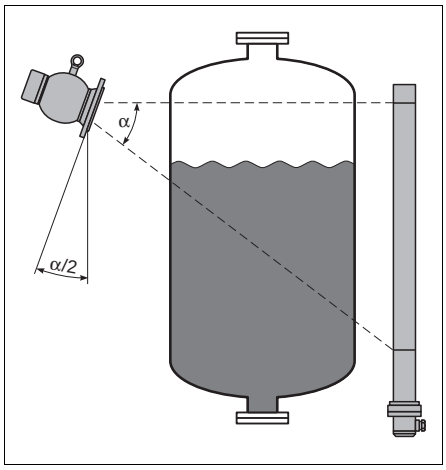
The Power of Know How

Mounting



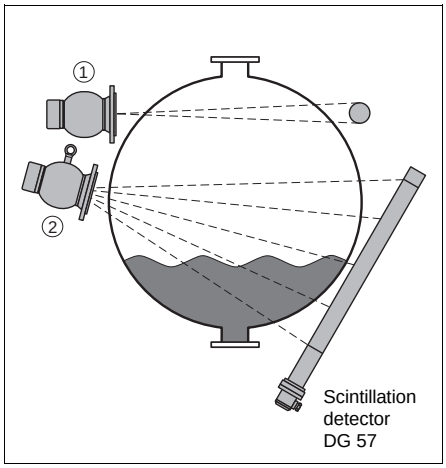
Standard vessel

Level Measurement

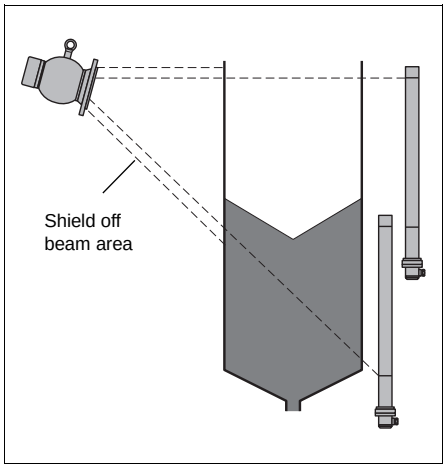
The source container must be mounted a little higher than the maximum level to be measured. In order that measurements can be made across the entire measuring range of the rod detector DG 57, the source container must be mounted at an angle. The mounting angle depends upon the angle α of the radiation exit channel. For example, if the angle α is 40°, then the source container must be mounted at an angle of 20° to the vertical.

The source container must be mounted such that the radiation is precisely directed onto the detector at the other side of the vessel. When the ring bolt points directly upwards, the longitudinal axis of the radiation exit channel is vertical.

The source container can be supplied with 5°, 20° or 40° radiation exit channels. The lateral angle of the channel is 6°.



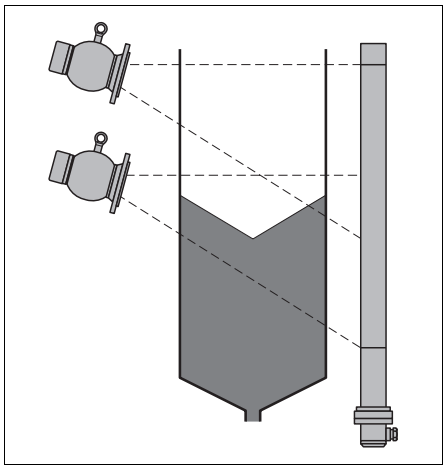
Cylindrical or spherical vessels
① limit detection
② level measurement



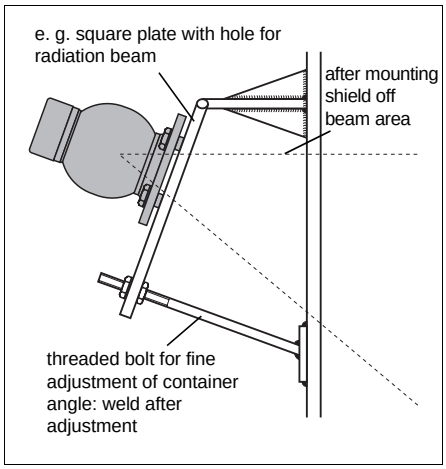
Tall and narrow vessels with one source container

Tall and Narrow Vessels

- For tall or relatively narrow vessels the source container can be mounted at a distance from the vessel. In this case, additional safety measures such as shielding, barriers, warning shields etc. will be necessary.
- For large measuring ranges, two or more source containers are normally required
- The use of two sources may be dictated not only by the measuring range but also by the accuracy of measurement.

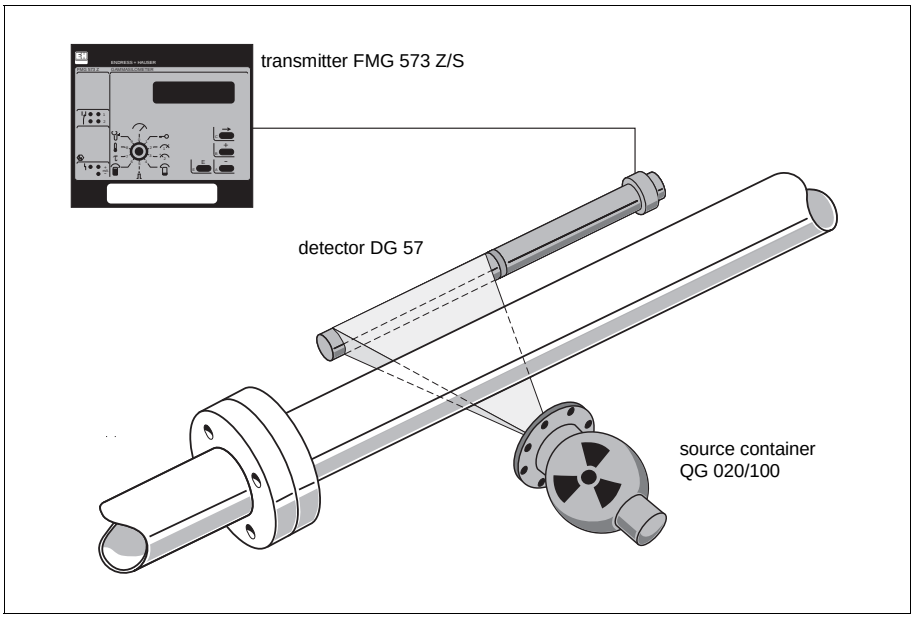


left:
Narrow vessels with two containers



right:
Mounting suggestion for source container

Mounting



Density measurement in horizontal pipe with transverse radiation beam

Density Measurement
In the case of density measurement in pipes, the quality of the measurement is very much dependent upon the way in which the measuring system is mounted and the process conditions. The most consistent measurements are obtained when:

- The system is mounted on a vertical pipe section with the direction of flow upwards.

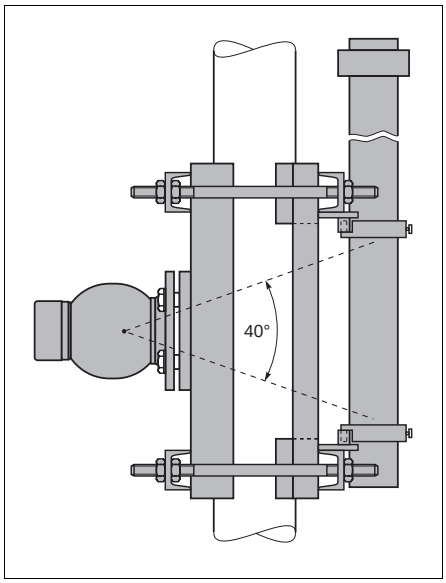
If horizontal pipes only are accessible, the radiation beam should travel transversely: this reduces the effect of air bubbles and build-up.

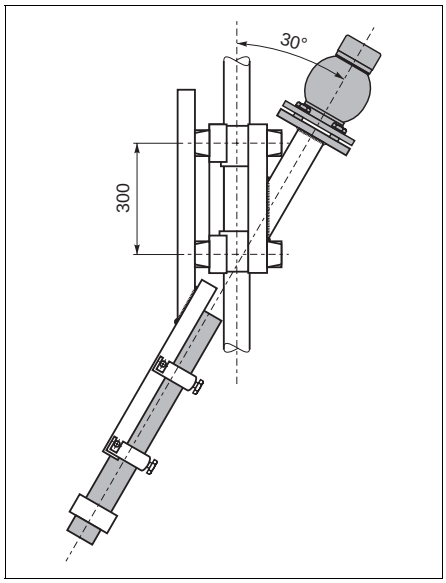
The beam exit angle required for density measurements is dependent upon the distance from and the orientation of the detector. European and Swedish design source containers for the measurement of density are supplied modified to the TSP 13337-0000 specification – the source can be pinned in the ON position.

Clamping devices
Three clamping devices are available for mounting:

- Type TSP 013336 for pipe diameters DN 80…340
- Type TSP 013252 for pipe diameters DN 340…820
- Type TSP 015354-0000 for diagonal radiation of pipes with diameters DN 80…340.

Further details can be taken from TI 110F/00/e

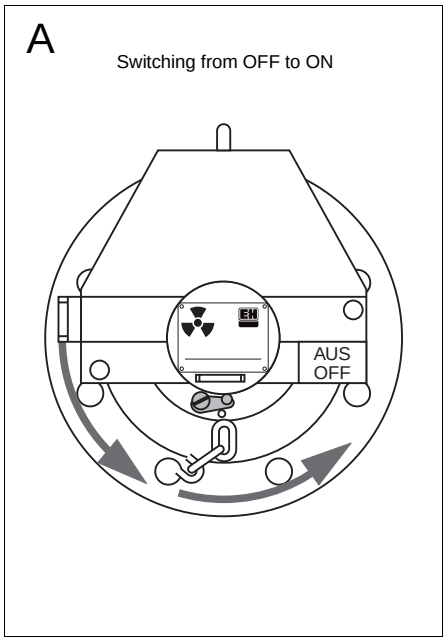


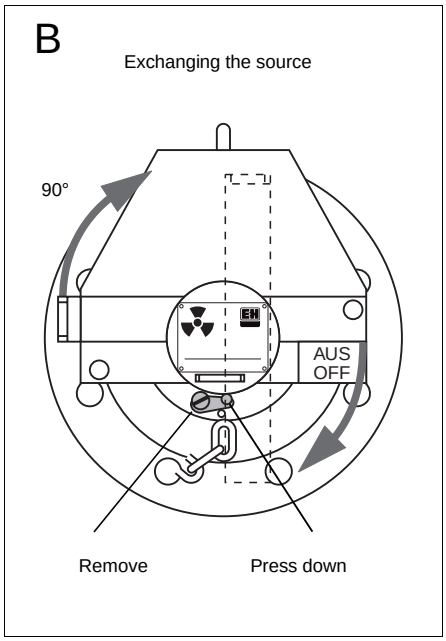


left:
Type TSP 013336 for pipes DN 80…340 or TSP 013252 for pipes DN 340…820; QG with beam exit angle 40°

right:
Type TSP 015354 for pipes DN 80…200; QG with beam exit angle 5°

Operation
European Design
Swedish Design





Operation
A Switching from OFF to ON

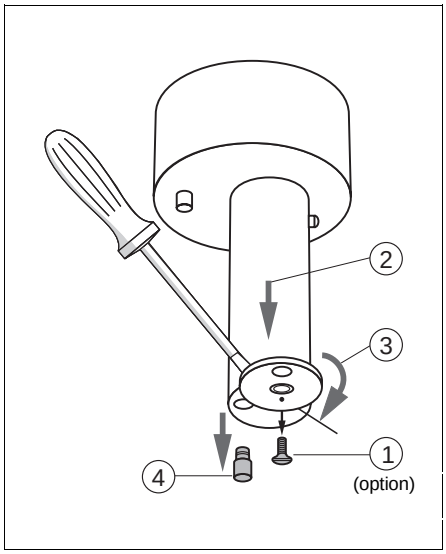
B Exchanging the source

Switch Radiation On
- Unlock padlock and remove
- Turn handle counter-clockwise through 180°
- The shield »EIN/ON« can now be seen and the shield »AUS/OFF« is covered
- Hang padlock in the holes provided for it and lock.

Switch Radiation Off
- Unlock padlock and remove
- Turn handle clockwise through 180°
- The shield »AUS/OFF« can now be seen and the shield »EIN/ON« is covered
- Hang padlock in the holes provided for it and lock.

Exchanging the Source
The source may be changed by authorised personnel only under strict observance of local radiation protection regulations.

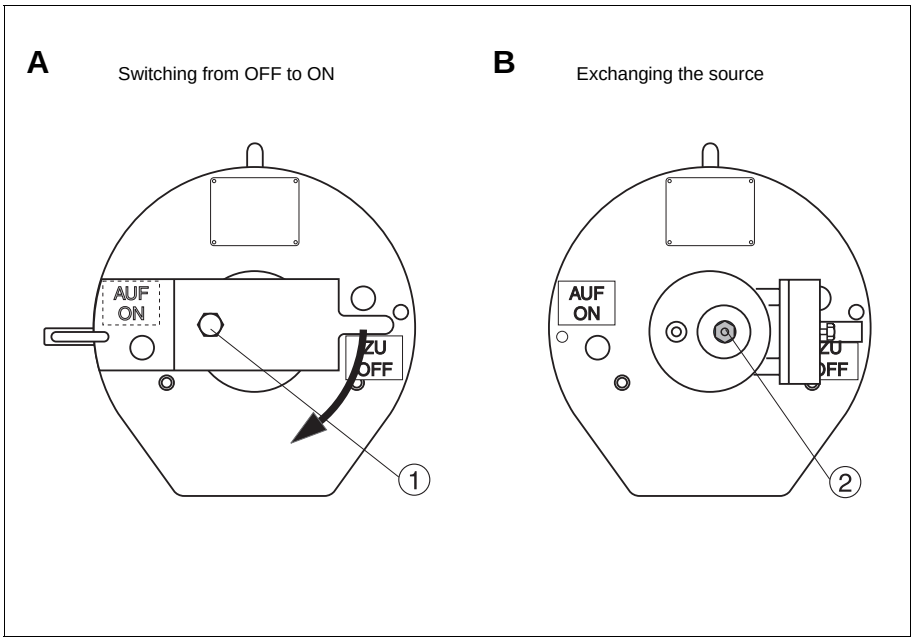
- Unlock padlock and remove
- Remove lead seal from locking pin and screw. Remove screw and push pin down. Turn handle so that insert swings over the depressed pin
- Remove insert
- Remove fixing screw on the face of the insert (option).
- Swivel insert cover plate to the side – e. g. prise it up with the blade of a screwdriver and push to the side.– and allow the source capsule to slide out into a transport container.



Exchanging the source
① Remove screw (option)
② Prise up cap
③ Swivel away cover plate
④ Let source capsule fall into transport

- Insert new capsule and close cover plate
- Screw in fixing screw (option).
- Push insert into the source container and turn until it engages, then turn further to the position »ON« or »OFF«.
- Hang padlock in the holes provided for it and lock
- Reinsert locking screw and if appropriate, reseal the locking pin.

Operation
Chemical Industry
Design



Operation
A Switching from OFF to ON

B Exchanging the source

Switch Radiation On
- Unlock padlock and remove
- Turn handle clockwise through 180°
- The shield »AUF/ON« can now be seen and the shield »ZU/OFF« is covered
- Hang padlock in the holes provided for it and lock.

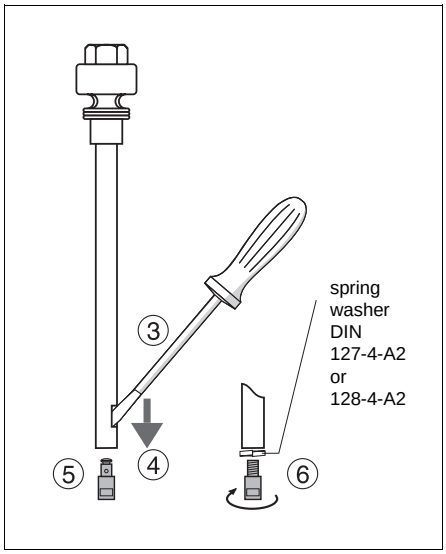
Switch Radiation Off
- Unlock padlock and remove
- Turn handle counter-clockwise through 180°
- The shield »ZU/OFF« can now be seen and the shield »AUF/ON« is covered
- Hang padlock in the holes provided for it and lock.

Note: the chemical design allows access to the source in the defined OFF position only.

Exchanging the Source
The source may be changed by authorised personnel only under strict observance of local radiation protection regulations.

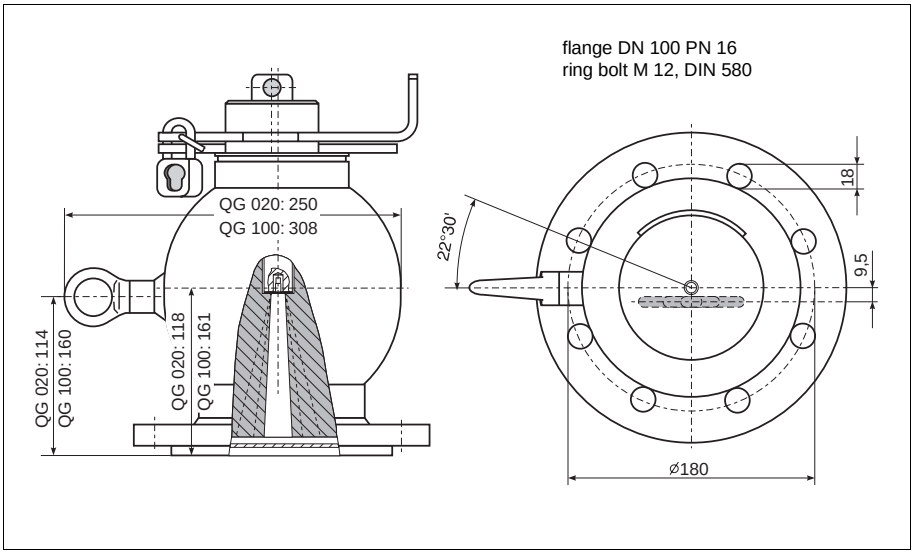
- Unlock padlock and remove
- Turn handle to the position »ZU/OFF«
- Unscrew locking screw ① (with AF 13 spanner) until it disengages
- Lift up handle to vertical position
- If appropriate, screw M 8 extension rod into the threaded hole in the source holder head ②
- Unscrew source holder using AF 13 spanner
- Position source holder above transport container
- Insert the blade of a screwdriver (4 mm) into the slot provided for it at the head of the holder and press out the capsule. For threaded version, unscrew with suitable tool
- Let the capsule fall into the transport container.

- Insert new source capsule: position holder over capsule and press over the capsule head until it engages. For threaded version, screw in with suitable tool: torque $2^{+0.5}$ N m
- Insert holder into source container
- Screw holder tight (using a AF 13 spanner)
- Pull handle down to horizontal position
- Screw down locking screw ① with screwdriver (or AF 13 spanner)
- Hang padlock in the holes provided for it and lock



Exchanging the source
③ Push screwdriver into the slot
④ Press downwards
⑤ Let source capsule fall into transport container
⑥ For threaded version, unscrew with suitable tool

Construction



Cross-section through the QG 020/100 source container (european design) showing source capsule and radiation exit channel

Dimensions in mm
1" = 25.4 mm

Design

The gamma rays emitted by the radioactive source radiate equally in all directions. In level measurement, however, only that radiation which travels through the vessel is required. All radiation in other directions is unwanted and must be shielded off. For this reason, the capsule containing the source is located in the source container, ensuring that unattenuated radiation can be emitted in the required direction only.

The lead shielding is enclosed in a welded steel housing. This housing is designed such that, if the source container is heated above the melting point of lead, 327°C, e. g., in a fire, neither the radioactive source nor the molten lead is lost.

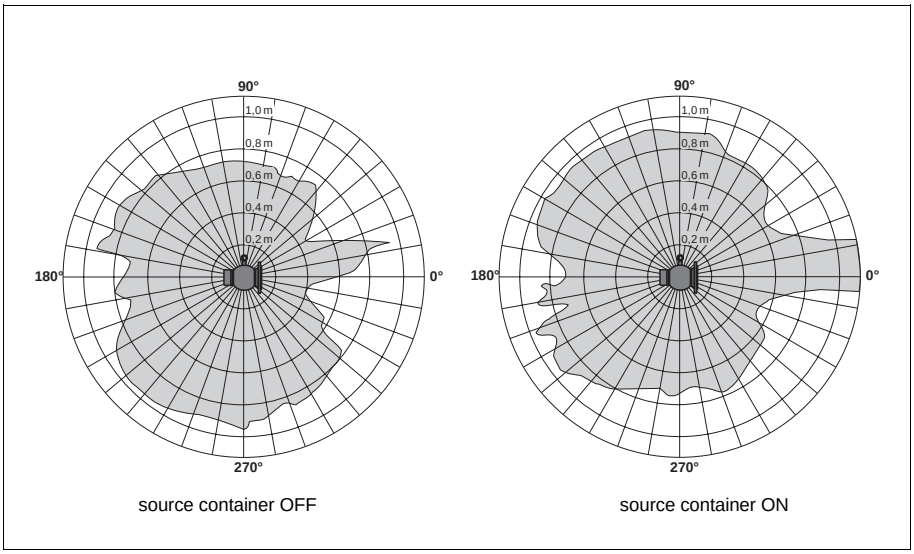
The position of the radiation exit channel is shown in the dimensioned drawings and marked on the source container flange. Note the position when planning or mounting the container.

Shipment

For shipment within the Federal Republic of Germany and the UK:
Radioactive sources can be shipped only when a copy of your authorisation for handling radioactive materials has been presented to Endress+Hauser.

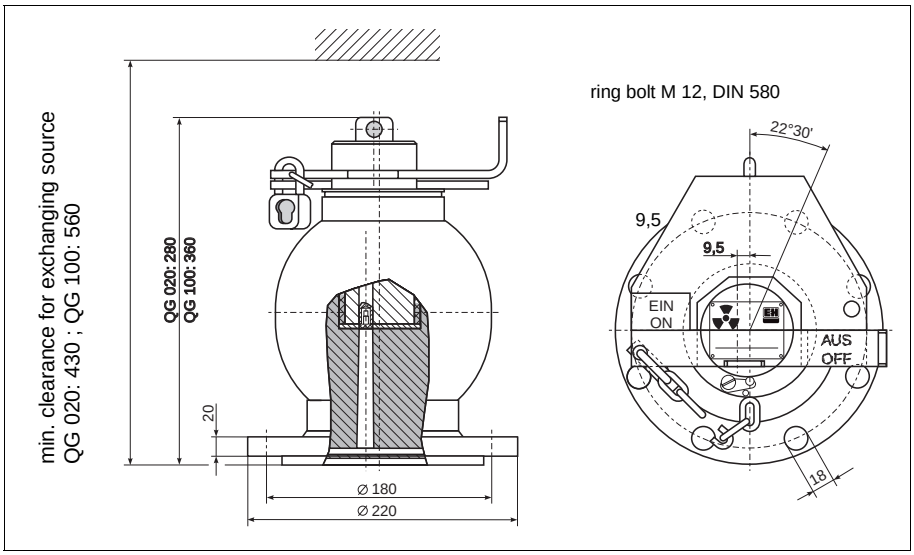
For reasons of safety and cost, the radioactive source is usually shipped already loaded in the source container. Arrangements can also be made to ship the source separately in a special transport drum.

For Other Countries
Radioactive sources are shipped already loaded in the source container only.



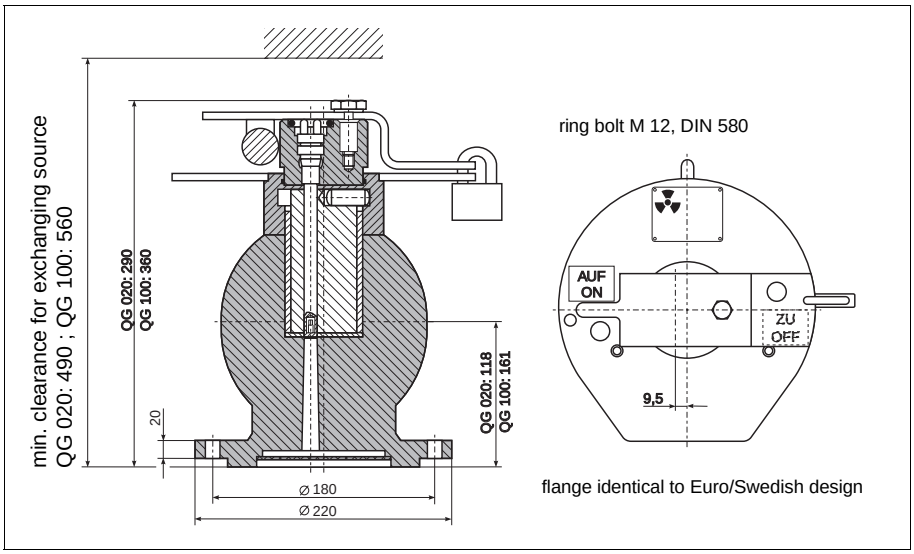
Typical isodose curves (7.5 µSv/h) for QG 100 source container loaded with 3.7 GBq (100 mCi) Co 60

Technical Data



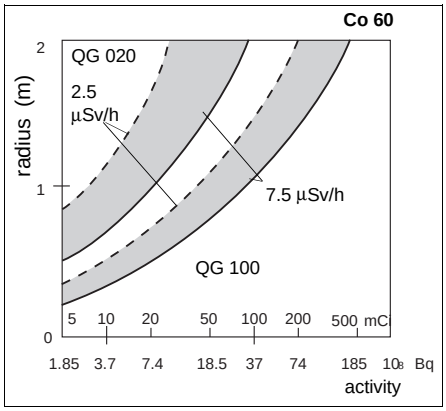
Dimensions in mm:
QG 020/100
European and Swedish design

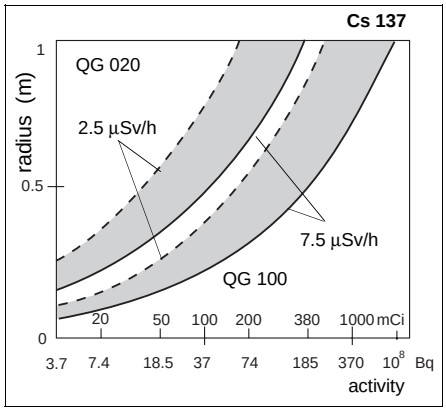
1" = 25.4 mm



Dimensions in mm:
QG 020/100
Chemical industry design

- Material insert and internal parts: stainless steel 1.4571 (≅ SS 316 L)
- Housing and flange: steel (1.4571 on request), painted yellow (RAL 1004) with black warning symbol
- Dimensions: see diagram
- Max. ambient temperature: +250 °C
- Shielding material: lead
- Shielding:
  QG 020: ca. 5.2 HLV for Co 60
  ca. 7.6 HLV for Cs 137
  QG 100: ca. 7.5 HLV for Co 60
  ca. 10.5 HLV for Cs 137
- Attenuation approx. 0.3 HVL through steel plate
- Control area, 2.5/7.5 µSv/h, measured from centre point of source container: see diagram
- Angle of radiation exit channel: 5° mostly for limit detection
  Versions: 20°, 40° (in one plane) lateral angle 6° in all cases
- Weight:
  QG 020: ca. 40 kg
  QG 100: ca. 87 kg





Control areas for Co 60 and Cs 137, taken from centre point of source container, dose rates 7.5 µSv/h and 2.5 µSv/h

Product Structure

Source container QG 020/100

Design
R Standard
C Chemical design
E European design
S Swedish design
Y Special design

Flange / Material
P1 Flange DN 100 PN 16 / steel
P2 Flange DN 100 PN 16 / stainless steel
R1 Flange similar to ANSI 4" 150 psi / steel
R2 Flange similar to ANSI 4" 150 psi / stainless steel

Radiation exit angle
A 5 degrees
B 20 degrees
C 40 degrees
Y Special design

QG020- [ ][ ][ ] product designation

QG100- [ ][ ][ ] product designation

Source container QG 020/100 modified for density measurement

Standard : TSP 013337-0001
Swedish Design : TSP 013337-0000

Supplementary Documentation

- ☐ Radiometric Measurement System Information SI 016F/00/en
- ☐ Gammasilometer FMG 671 Technical Information TI 219F/00/en
- ☐ Gammapilot FTG 671 Technical Information TI 177F/00/en
- ☐ Gammapilot FTG 470 Technical Information TI218F/00/en
- ☐ Density Measurement with Gammasilometer FMG 573 Z/S Technical Information TI 110F/00/en
- ☐ Scintillation Detector DG 57 Technical Information TI 180F/00/en
- ☐ Geiger-Müller Detectors DG 17 (Z)/ DG 27 (Z) Technical Information TI 197F/00/en
- ☐ Standard Source Contatiner QG 020/100 Technical Information TI 264F/00/en
- ☐ Gamma Radiation Sources Technical Information TI 213F/00/en
- ☐ Source Container QG 2000 Technical Information TI 346F/00/en

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