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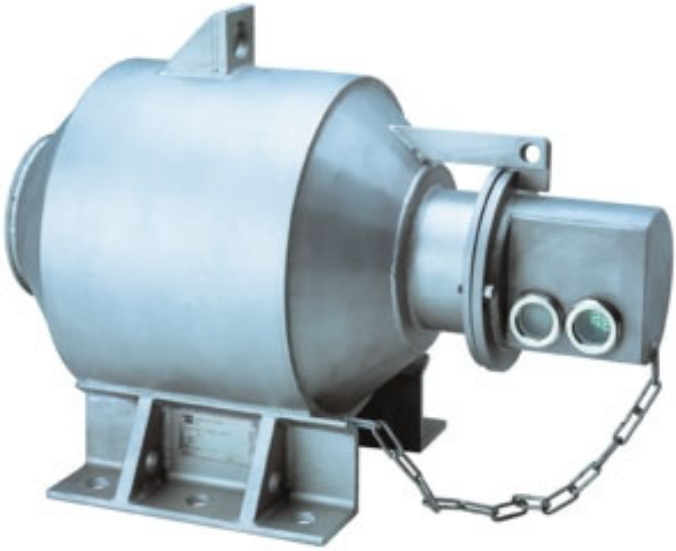
Technical Information

# Source Container QG2000 US version

## Radiometric Measurement
## Container with sliding source holder rod for manual ON/OFF switching



**Application**

The source container QG2000 encloses the radioactive source used for radiometric limit, level and density measurement. It allows the beam to emerge unattenuated only in one direction and gives an extremely high attenuation in all other directions.
When operating with very high sensitivity rod scintillation detectors, the QG2000 provides the lowest possible radiation loads in the surrounding.
It is therefore always used if the shielding effects of smaller source containers (QG020/100) are too low due to the high activity of the source or if no control area is permitted.
The QG2000 complies to all international standards and fulfils the strict requirements of the chemical industry.

**Features and Benefits**

- Extremely high shielding ensure that no control areas are generally required and that installation in accessed areas is possible.
- Simple and safe source replacement.
- Highest safety classification for the source supplied (DIN 25426/ISO 2919, Classification C 66646).
- Additional metallic protective hood with O-ring seal to protect the source against mechanical and chemical influences.
- Low space requirement and simple mounting
- Various angles of emission for optimum adaption to the application.
- Padlock for fixing the OFF switch position and to protect against theft.
- Easy identification of switch status through sight glasses on the cover or by remote display with proximity switches.

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# Function and System Design

**Function**

The radioactive source is surrounded by a lead shielding in the QG2000 source container to screen the gamma radiation. The radiation can only be emitted along one channel almost unattenuated. The limit values set for local dosages are not exceeded even with maximum activity.

**System Design**

The stainless steel housing ensures that the radiation source and lead shielding cannot be lost when the housing is heated above the melting point of lead (tested to DIN VDE 0412-1, Section 6.4, i.e. 30 min at 800 °C (1472 °F)).
The double sealed source itself is protected from mechanical and chemical influences by a stainless steel protective hood with an O-ring seal and can be placed in the emission channel (switching ON the radiation) and removed from it (switching OFF) by sliding the source holder rod. The mechanical resistance of the switching device has been tested according to DIN VDE 0412-1, Section 9.4.
The switch position OFF is secured by a padlock. It can easily be observed through the sight glasses from outside the container or can be transmitted to a remote electronic display in the control room.

**Attenuation factor and half-value layers**

| | $^{60}Co$ |
|---|---|
| Attenuation factor $F_S$ * | 4.096 |
| Number of half-value layers * | 12 |

* approximate values

**Radioactive Source**

The following table identifies the source model, isotope and activity level that can be used in the QG2000 series gauges:

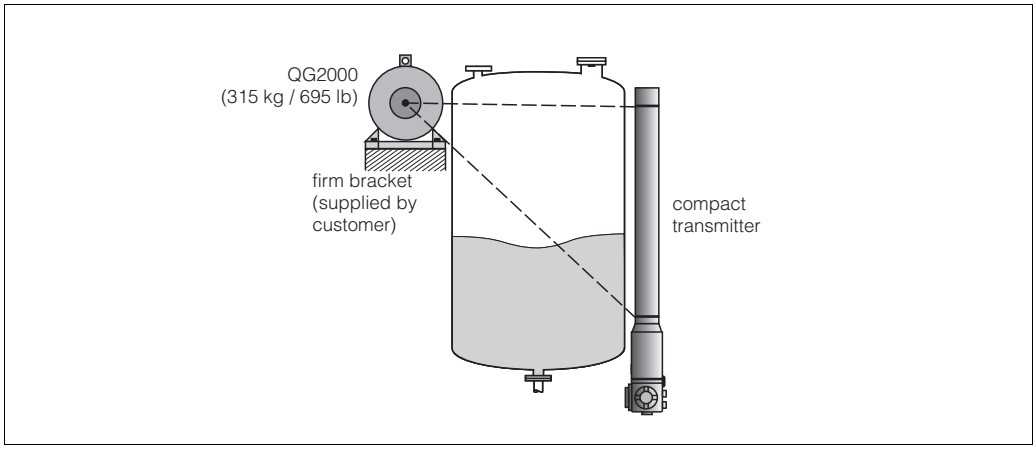
| QG Series | Source Model | Isotope | Maximum Activity |
|---|---|---|---|
| QG2000 | CKC.P4 | Co-60 | 1 Ci (37 GBq) |

**Note!**
Cesium-137 is not authorized for use in the QG 2000 series.

**Warning!**
This source container contains radioactive material.
For safety instructions see Radiation Safety Manual SD276F/00/en.

# Operating Conditions

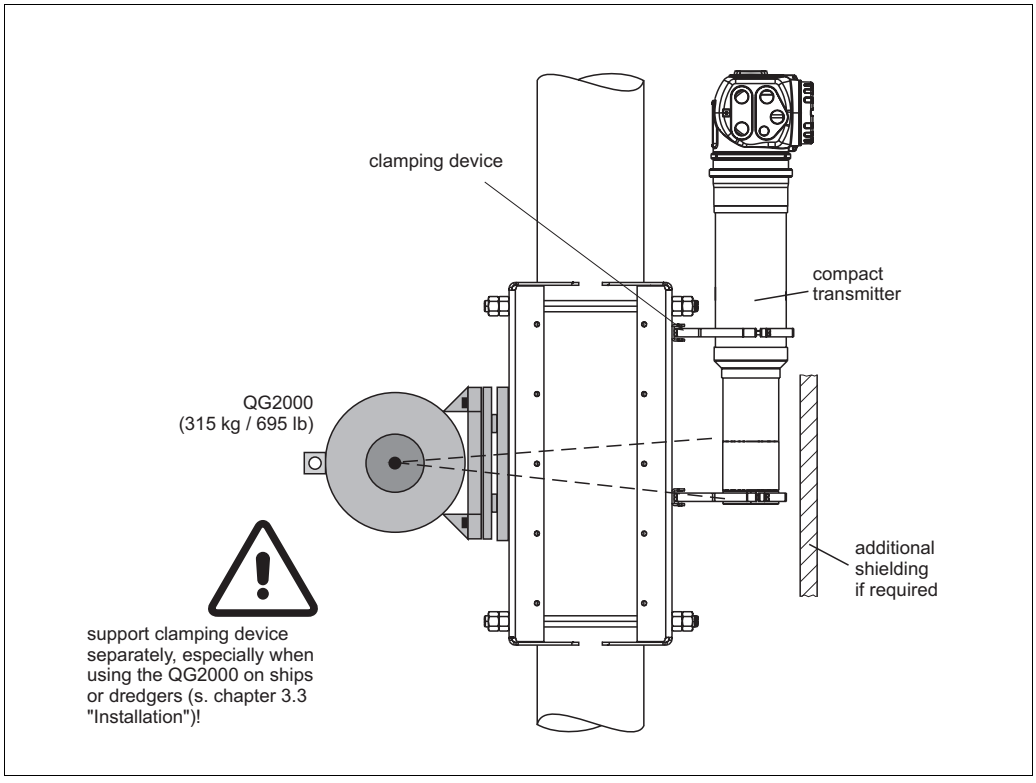
**Level Measurement**




In order to ensure stable measurement and lasting radiation protection, the QG2000 must be tightly screwed onto a rugged, low-vibration bracket that can withstand a weight of 315 kg (695 lb) under all operating conditions. Additional supports are generally required when mounting directly onto the vessel. A fastening for a crane on the QG2000 is provided for transporting it.

The source container must be mounted slightly above or at the same height as the maximum level. The radiation must be exactly directed towards the compact transmitter mounted opposite. To avoid control areas, the source container and compact transmitter should be mounted as near to the vessel as possible.

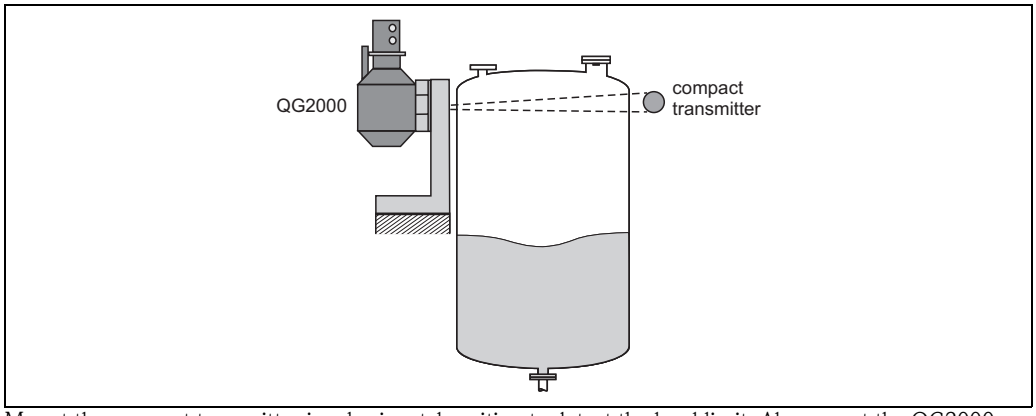
**Density measurement**




For density measurements, a clamp connection is available for pipe mounting.
The clamp connection must be separately supported to ensure that the weight of the source container (315 kg!/ 695 lb!) does not cause the pipe to bend.
When using the QG2000 on ships or dredgers, the fastenings on the piping must be suited to the loads occuring and appropriate supports should be provided.

Mount the sensor to vertical pipelines with the direction of conveyance from bottom to top to obtain the most constant conditions for density measurements in pipes. If only horizontal piping is accessible, then the radiation path should be horizontal to reduce the effects of air bubbles and build-up of material. A clamping device is available for mounting on piping. Support the clamping device separately to avoid the weight of the QG2000 (315 kg / 695 lb) from acting on the pipe.

**Level limit detection**




Mount the compact transmitter in a horizontal position to detect the level limit. Also mount the QG2000 so that the radiation runs horizontally.

**Mounting position**

**Note!**
The radiation source container QG2000 may not be mounted at a height greater than 27 feet.

**Ambient conditions**

**Entry of particles or water**
The source holder rod of the QG2000 has an additional metallic hood with an O-ring seal to prevent particles and streams of water from entering (ingress protection IP 65 acc. to IEC EN 60529).

**Ambient temperature (without proximity switches for remote display):**
T = -20 °C...200 °C (-4 °F...392 °F)

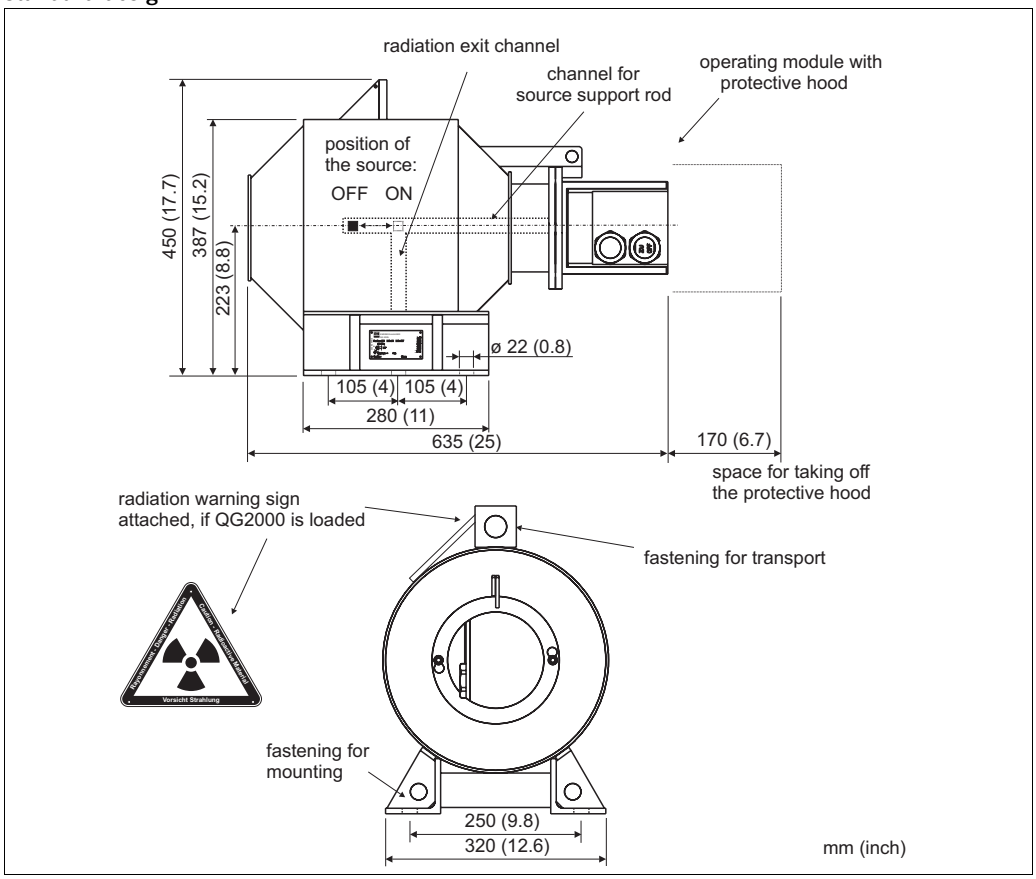
**Ambient temperature (with proximity switches for remote display):**
T = -20 °C...100 °C (-4 °F...392 °F)

**Fire resistance**
Tested to DIN VDE 0412-01, Section 6.4, i.e. 30 min at 800 °C (1472 °F).

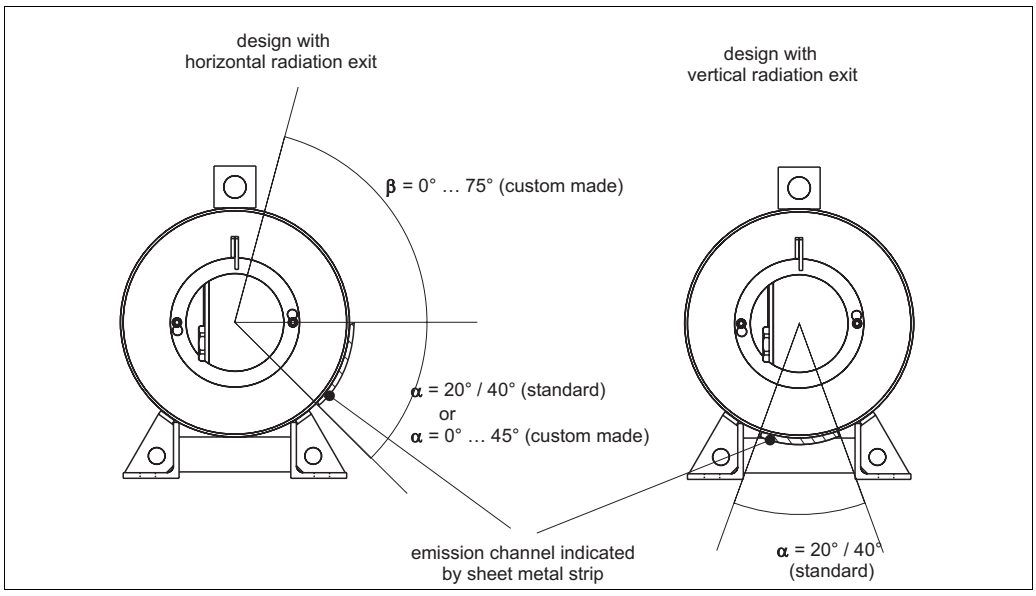
# Mechanical Construction

**Design, size**

**Standard design**




**Fitting position/emission angle (when switched on):**
- **standing/horizontal**
- **standing/vertical**

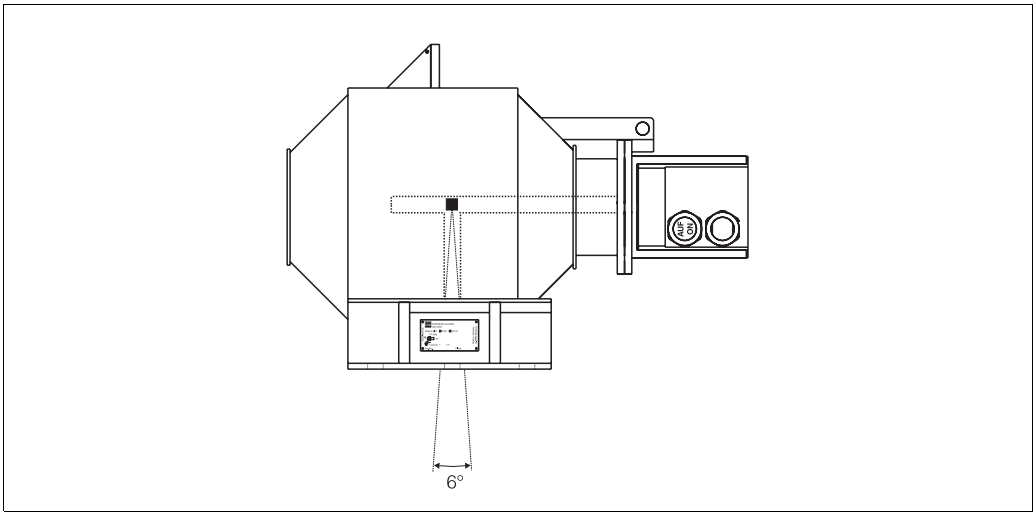



**with horizontal beam emission with one angle (standard):**
$\alpha$ = 20° or $\alpha$ = 40° (measured from the horizontal downwards)

**with horizontal beam emission with two angles (individually selectable):**
$\alpha$ = 0°...45° (measured from the horizontal downwards)
$\beta$ = 0°...75° (measured from the horizontal upwards)
Both angles can be selected in steps of 5°.

**with vertical beam emission with one angle (standard):**
$\alpha$ = 20° or $\alpha$ = 40°

**Width of the beam emission channel (when switched on)**




The width of the emission channel is 6° for all designs.
The emission channel is marked on the external container wall.

**Weight**

approx. 315 kg (695 lb) for all designs

**Housing materials**

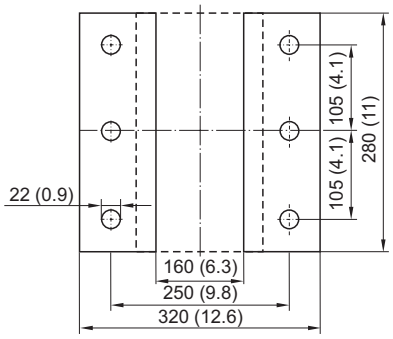
Stainless steel SS 316Ti (1.4571), for surface treated versions:
- glass bead blasted
- epoxy enamel coating
- seawater-resistant coating

**Shielding material**

Lead

**Mounting plate**

**Example: L-profile** (supplied by customer)




**Max. permissible torque Nm** (min. 6 x M 20 screws)

| Material | property class | coefficient of friction (μ) | Tightness |
|---|---|---|---|
| SS | 70 | 0.14 | 281 Nm |
| Steel | 8.8 | 0.14 | 425 Nm |

mm (inch)

**Bracket**

**Note!**
In order to ensure stable measurement and lasting radiation safety officer, the QG2000 must be tightly screwed onto a rugged, low-vibration bracket that can withstand a weight of 315 kg (695 lb) under all operating conditions. Additional supports are generally required when mounting directly on the vessel.
Especially when using the QG2000 on ships or dredgers, the fastenings on the piping must be able to take the weight of any loads placed on them and appropriate supports provided.
The screw joint dimensions are contained in the table (see figure).

# Ambient conditions

**Protection against external influences**

The source holder rod of the QG2000 is protected from external influences by an additional metallic hood sealed by O-ring (ingress protection IP 65 to acc. IEC EN 60529).

**Ambient temperature**

**without initiators for remote display**
T = -20 °C...200 °C (-4 °F...392 °F) (Class 3 to DIN VDE 0412-01)

**with initiators for remote display**
T = -20°C...100 °C (-4 °F...212 °F) (Class 2 to DIN VDE 0412-01)

**Fire resistance**

Tested to DIN VDE 0412-1, Section 6.4, i.e. 30 min at 800 °C (1472 °F).

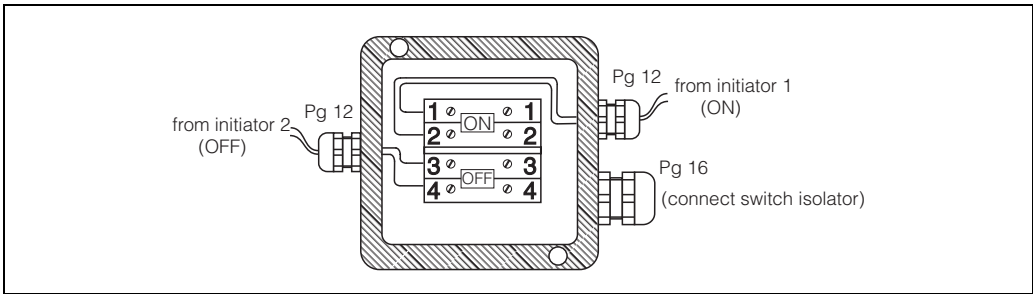
# Operating elements

**Standard design**

- ON/OFF switching by manually sliding the source holder rod
- Fixing and securing the switching status in OFF with a padlock
- Reading off the switching status through the sight glasses

**Design with proximity switches for remote display of switch status**

In addition to the sight glasses supplied, with this design the switching status is also detected by two proximity switches NJ4-12GK-SN supplied by Pepperl+Fuchs.
For signal evaluation, the following isolating switch amplifiers from, e.g. Pepperl+Fuchs can be used:
KFD2-SH-Ex1 (24V DC)
The Pg 12 cable glands on the connecting box are assigned to the proximity switches on delivery. The Pg 16 cable gland connects the isolating switch amplifier.




The Pg 12 cable glands on the connecting box are assigned to the initiators on delivery. The Pg 16 cable gland connects the isolating switch amplifier

The table below shows the pin assignment:

| | |
|---|---|
| Terminals 1, 2 | Initiator for position "radiation ON" |
| Terminals 3, 4 | Initiator for position "radiation OFF" |

The connecting diagram is also provided inside the connecting box cover.

# Certificates and Approvals

| | |
|---|---|
| **Specific license** | The QG2000 series is only authorized to be distributed as a specifically licensed device. |
| **PTB** | Isodose curve with $^{60}$Co (37GBq/1000 mCi). |
| **German Lloyd** | For applications on dredgers. |
| **Proximity switches supplied by Pepperl+Fuchs** | Ingress protection IP 67 to IEC 60529. |

# Ordering information

**Product structure**

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Design** | | | | | | | | |
| V | US, manual ON/OFF | | | | | | | |
| W | US, manual ON/OFF, remote indication | | | | | | | |
| | | **Radiation shielding** | | | | | | |
| | | 1 | Standard shielding | | | | | |
| | | | **Fitting position/Emission angle** | | | | | |
| | | | A | Standing/horizontal | | | | |
| | | | B | Standing/vertical | | | | |
| | | | | **Emission angle** | | | | |
| | | | | 1 | 20° | | | |
| | | | | 2 | 40° | | | |
| | | | | 3 | Specified in 5°-steps ($\alpha$ and $\beta$) [1] | | | |
| | | | | | **Material** | | | |
| | | | | | A | SS 316Ti (1.4571) glass bead blasted | | |
| | | | | | B | SS 316Ti (1.4571) epoxy enamel coating | | |
| | | | | | C | SS 316Ti (1.4571) seawater-resistant coating | | |
| | | | | | | **Additional options** | | |
| | | | | | | 1 | Option not selected | |
| | | | | | | S | GL (Germanischer Lloyd) marine certificate | |
| | | | | | | | **Documentation** | |
| | | | | | | | A | No documentation |
| | | | | | | | C | PTB isodose curve with $^{60}$Co (37 GBq/1000 mCi) |
| | | | | | | | D | Isodose curve for $^{60}$Co |
| QG2000 | | | | | | | | Product designation |

[1] $\alpha$: 0...45° / $\beta$: 0...75°

**Delivery**

**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 Organization.
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 seperately 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 Organization.
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.

**USA**
The source container must be shipped with the radioactive source already installed. The shutter will be secured in the OFF position with a padlock and security seal. The shipment will be a "Type A" package and all marking, labeling and documentation will comply with U.S. Department of Transportation (DOT) regulations. Transport will be by common carrier, or other entity authorized to carry radioactive material.
Shipments to Specific Licensees cannot be made until we have a copy of the Specific License authorizing receipt, possession and use of the radioactive material. Endress+Hauser will be happy to assist with procuring this license if desired.
Shipments to General Licensees (a regulatory license issued for certain inherently safe devices containing sealed sources) cannot be made until we have written authorization from the user which contains the name and telephone number of the person on site who will be responsible for the device.

Contact our local sales center for questions or assistance.

# Supplementary Documentation

| | |
|---|---|
| **System Information** | **CP017F/00/en**<br>Radiometric measurement technology |
| **Operating Instructions** | **BA370/00/en**<br>Operating instructions for the source container QG2000 |
| **Technical Information** | **TI213F/00/en**<br>Technical Information on gamma radiation sources<br><br>**TI428/00/en**<br>Technical Information for the source container QG020/100<br><br>**TI363/00/en**<br>Technical Information for Gammapilot FMG60 |
| **Certificates** | **ZE251F/00/de**<br>Test certificate Germanischer Lloyd (for applications on dredgers) |
| **Special documentation** | **SD142F/00/en**<br>Supplementary Safety Instructions for Radioactive Sources and Source Containers approved for Use in Canada |
| **Safety manual** | **SD276F/00/en**<br>Radiation Safety Manual |

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