Operating Instructions

SHLD 2®

Source Holder

Document ID:
63138

Radiometric

Table of Contents

Revision Table

Version of manual	Description	Date
1.0	Initial release	200110

The material in this document is provided for informational purposes and is subject to change without notice.

ISO 9001:2015 approval by Eagle Registrations Inc. to these Quality Management System Standards: ASQ/ANSI/ISO 9001:2015, Approval Certificate No. 5504.

NOTES

1 About this Document

1.1 Intended Use

These **Operating Instructions** provide specific instructions for the safe setup and operation of the source holders, and important instructions for maintenance, fault rectification, and the exchange of parts. The instructions and procedures in the documentation are designed for users seeking product knowledge, usage, and functionality. Make certain you read and understand this information before putting the instrument into operation.

NOTE

The instructions in this guide are written for qualified and well-trained personnel. Make sure you read and understand all the instructions and safety guidelines in the **Operating Instructions** before operating this equipment. Keep this manual accessible in the immediate vicinity of the device.

Figure 1.1 SHLD 2

1.2 Targeted Group

The **Operating Instructions** are provided for trained personnel. The manual not only provides instructions for the setup and operation of the instruments, but also specifically address topics and procedures required by an intermediate level user such as the following:

- Operator
- Instrumentation Technician
- Field Service
- Internal Support
- Process Engineers
- Field Sales

1.3 Explanation of Symbols

Danger

Identifies an imminently hazardous situation which, if not avoided, will result in death or injury.

Warning

Identifies a potentially hazardous situation which, if not avoided, could result in death or injury.

Caution

Identifies a potentially hazardous situation which, if not avoided, may result in minor or moderate injury or in equipment damage.

Note

Identifies tips or useful information about the instrument.

Ex Applications

Indicates special instructions for Ex applications.

Radiation

Introduces information concerning radioactive materials or radiation safety.

- **Bulleted list**

  Indicates a list of items with no intended or implied sequence

1. **Steps or Sequence**

   Identifies successive steps in a procedure

NOTES

2 For Your Safety

2.1 General Safety

Make sure you read and understand all the instructions and safety guidelines in the **Installation and Operation Guide** before operating the source holder. The instructions in this guide are written for qualified and trained personnel.

Your equipment requires strict observance of standard regulations and guidelines. You must take note of the safety instructions in these operating instructions. In addition, you must adhere to the country-specific installation standards and all prevailing safety regulations and accident prevention rules.

2.2 Radiation Safety

The radiation safety information is included as a service to you and serves as a guide only in the most general terms. Regulatory agencies throughout the world have different requirements, regulations, and restrictions with respect to the use of radiometric instrumentation. You are responsible for familiarizing yourself with your national and local regulations. These regulations are enforced by agencies such as:

- U.S. Nuclear Regulatory Commission (NRC) or the Agreement State
- Atomic Energy Control Board (Canada)
- International Atomic Energy Agency (IAEA)

Your regulatory agency may limit or require certain activities including:

- Installation
- Maintenance
- Relocation
- Testing
- De-commissioning

Field Service Engineers have the proper licenses required to install and commission radiometric sources and can instruct you how to operate the source holder correctly and safely.

Refer to the **Radiation Safety Manual** for more detailed safety information and instructions.

*If it is necessary to enter the vessel on which the gauge is used, you must follow proper lock-out procedures. See the **Radiation Safety Manual** for specific procedures and other safety responsibilities.*

Radiation Safety Officer

The plant operator must appoint a radiation safety officer with the necessary expert knowledge. He is responsible for ensuring that the radiation protection ordinance is complied with and for implementing all radiation protection measures.

VEGA offers the appropriate training for a radiation safety officer and training that imparts the necessary qualification in this field.

2.3 Appropriate Use

When in operating mode, the source container SHLD 2 described in this document contains a radioactive source for radiometric level, interface, switching and density measurement. The source container shields the radiation from the surroundings and only allows it to exit in the direction of measurement.

To ensure this shielding and exclude damage to the radioactive source, you must observe all instructions in this operating instructions manual and the legal radiation protection regulations during installation and operation.

Operational reliability is ensured only if the instrument is used properly. VEGA is not liable for damages caused by improper use.

2.4 Incorrect Use

Inappropriate or incorrect use of this instrument may cause hazards, such as the risks of exposure to gamma radiation. Damage to the instrument, property and persons or environmental contamination is possible.

2.5 Safety Instructions

This is a state-of-the-art instrument complying with all prevailing regulations and directives. Operate the instrument in a technically flawless and reliable condition. The operator is responsible for the trouble-free operation of the instrument. When measuring aggressive or corrosive media that can cause a dangerous situation if the instrument malfunctions, the operator has to implement suitable measures to make sure the instrument is functioning properly.

During the entire duration of use the user is required to determine compliance to the necessary occupational safety measures with the current valid rules and regulations and also take note of new regulations.

You must observe the safety instructions in this operating instructions manual, the national installation standards as well as the valid safety regulations and accident prevention rules.

For safety and warranty reasons, only manufacturer authorized personnel may perform any invasive work on the device beyond that described in the operating instructions manual. Arbitrary conversions or modifications are explicitly forbidden. For safety reasons, you must only use the accessories specified by the manufacturer.

You must observe the safety approval markings and safety tips and understand their meaning on the device to avoid any danger.

2.6 Installation and Operation in US & Canada

This information is only valid for the US and Canada. Hence the following text is only available in the English language.

Installations in the US shall comply with the relevant requirements of the National Electrical Code (ANSI/NFPA 70).

Installations in Canada shall comply with the relevant requirements of the Canadian Electrical Code.

2.7 Safety Instructions for Ex Areas

Instruments with approvals can have different technical data depending on the version. With these instruments, you must observe the corresponding approval documents. These documents are part of the scope of delivery or you download the documents from "www.vega.com", "*Instrument search (serial number)*" as well as using "*Downloads*" and "*Approvals*".

The operator must check the suitability of the radiometric measuring principle as well as of the instrument for use in hazardous areas by consulting the applicable national regulations.

Note the following instructions:

Static charge: Avoid electrostatic charges on the instrument. Never rub dry.

Potential equalization: You must integrate the instrument in the potential equalization of the system. Use lock washers to ensure a good electrical contact between the source container and the mounting bracket.

Pneumatic switching facility: (With pneumatically actuated source containers) For use in hazardous areas of category ATEX II 2G, note the corresponding safety instructions.

Corrosion: Do not use the pneumatic actuation under ambient conditions that can cause corrosion in and on the pneumatic actuator.

2.8 Applications

Intended Applications

The SHLD 2 source holder is designed for radiation-based measurement of applications including density and continuous and point level. The most common industries for the SHLD 2 include:

- Chemical
- Petrochemical
- Offshore
- Refining

2.9 Certifications

These source holders are designed for certification compliance from the following agencies:

- AERB - India (B, C, and R only)
- CNSC - Canada
- ODH/NRC - Ohio Department of Health and Nuclear Regulatory Commission

Standards

The SHLD 2 source holders is regulated by the U.S. Nuclear Regulatory Commission (NRC). Compliance certificates are issued by the State of Ohio under an agreement with the NRC.

2.10 Manufacturer's Responsibility

VEGA source holders are designed to International standards for construction and safety.

2.11 User's Responsibility

All users who operate and service the equipment are responsible for ensuring safety requirements are met. This responsibility requires a basic understanding of the nature of radiation and an adherence to all operating procedures.

3 Product Description

3.1 Principle of Operation

The SHLD 2 is used to position and protect a radioactive source near a process vessel, pipe or on a conveyor belt/spiral conveyor. Radiation from the source is directed through the process by an integral collimator. A radiation detector placed opposite the source holder measures radiation fluctuations caused by process condition changes. The detector correlates radiation levels to process conditions such as level and density.

The source container shields the environment against gamma radiation and protects the radioactive source against mechanical damage or chemical influences. In case of large measuring ranges, such as high vessels, two or more source holders are used.

3.2 Components

The SHLD 2 houses a source capsule that provides gamma energy for radiation-based mass-flow, point level, level, and density measurements. This compact, lightweight source holder is available in low carbon steel with polyester powder coating or an optional 316 stainless steel option. Additionally, the SHLD 2 has lead shielding material and a rotary shutter.

Documentation

Documentation included with the equipment may include:

- Operating Instructions Manual
- Radiation Safety Manual

Caution - Radioactive Material Label

The Caution-Radioactive Material label provides the following:

- Isotope
- Activity
- Model Number
- Serial Number
- Date of Assay

You must not remove the stainless steel Caution-Radioactive Material Label. The label must remain clean of process material, unaltered, and legible for the duration of the source holder's use.

Source Holder

The source holder is constructed from either stainless steel or low carbon steel with a polyester powder coating designed to perform the following:

- House all radiation-emitting source capsules.
- Protect the radioactive source.
- Provide a means for shielding and locking out the radiation beam.
- Shield all areas in which radiation is not intended.

Source Material

The source material is either Cesium 137 (Cs-137) or Cobalt 60 (Co-60). The course capsules are Special Form, double-encapsulated in stainless steel. (Optional: Special Form, triple-encapsulated in Haynes 320).

Shutter

A shutter is the mechanism that opens or closes the radiation beam port and either permits or denies the movement of the source carriers from the safe storage of the source holder into the process vessel.

3.3 Configuration

The type label contains the most important data for the identification and use of the instrument:

- Order code
- Serial number
- Source holder
- Source contained
- Activity
- Local dose rate
- Article number - Documentation

- Note: "Highly radioactive source" (if necessary)

The serial number allows you to access the delivery data of the instrument via "www.vega.com", "*VEGA Tools*" and "*Instrument search*".

The local dose rate on the type label at a defined distance is safety-oriented and includes production-related fluctuations of the emitters and tolerances of the measuring devices. Deviations in the local dose rate calculated with the specified attenuation factors are possible.

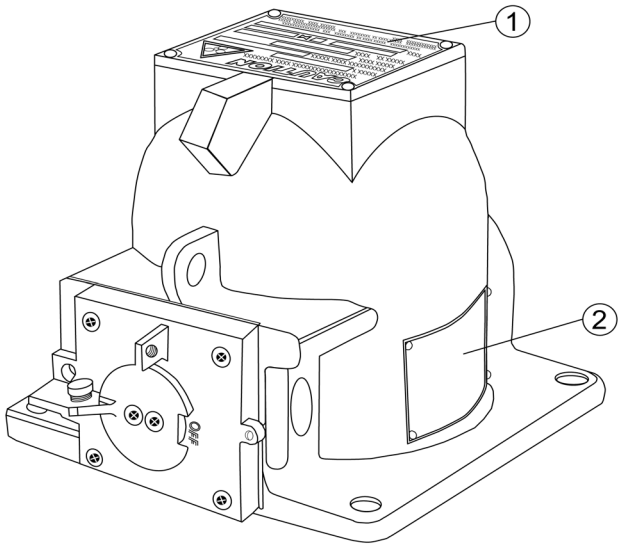

Figure 3.1 Position of the Type Labels

1. Type Label - Source
2. Type Label - Source Holder
3. Warning U.S. (optional)

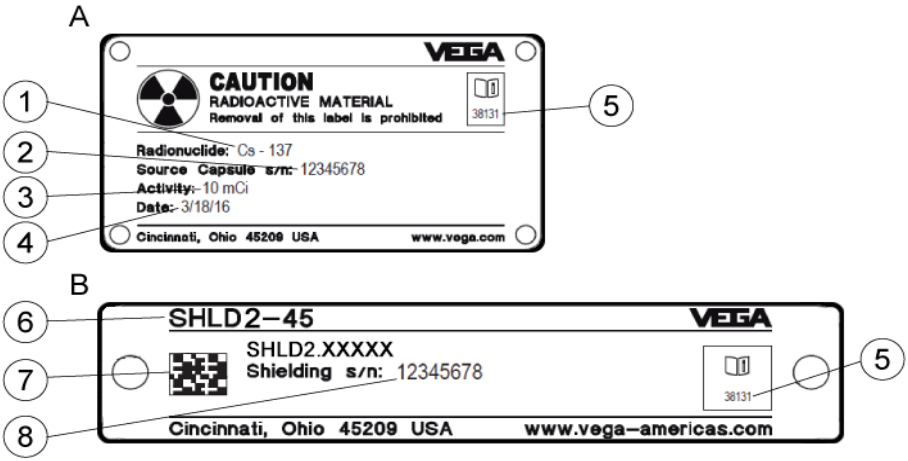

Figure 3.2 Type Label

A. Type Label - Source
B. Type Label - Source Holder
1. Source: Cs-137
2. Serial Number of Source Capsule (for traceability of source)
3. Activity of Sources in MBq and mCi or GBq and mCi
4. Date (dd/mm/yyyy) U.S., Version: (mm/yy)
5. Number of Corresponding Operating Instructions
6. Source Holder Type
7. Order Code of Source Holder
8. Serial Number of Source Holder

Versions

There are several versions of the SHLD 2 available with different options. Apart from the manual versions, there are also versions with pneumatic switchover.

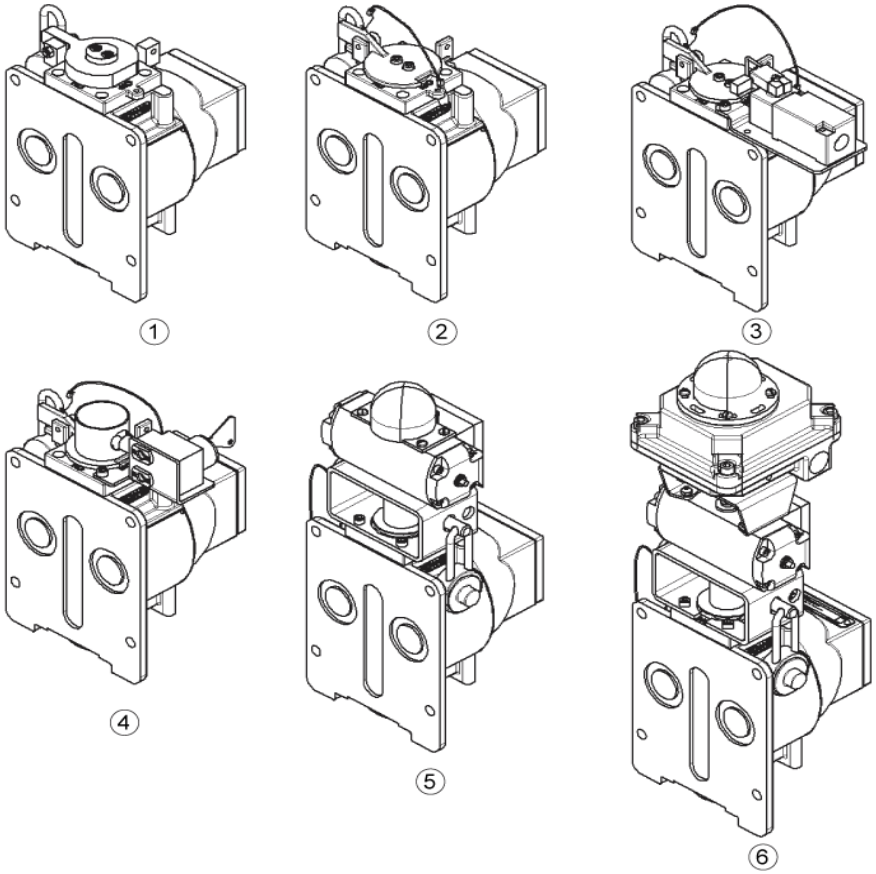

Figure 3.3 SHLD 2 Versions

1. Overview
2. Standard Version
3. With Position Switch
4. With Interlock Safety Switch
5. With Pneumatic Switching Mechanism
6. With Pneumatic Switching Mechanism and Position Switch

3.4 Application Area

The SHLD 2 is a source holder designed for shielding radioactive sources such as Cs-137. The radioactive source in the source container emits gamma rays. The SHLD 2 is mounted on the vessel, the pipeline, or on a conveyor belt/spiral conveyor directly opposite the sensor.

The source container shields the environment against gamma radiation and protects the radioactive source against mechanical damage or chemical influences. In case of large measuring ranges (e.g. with high vessels) two or more source holders are used.

The SHLD 2 consists of the components:

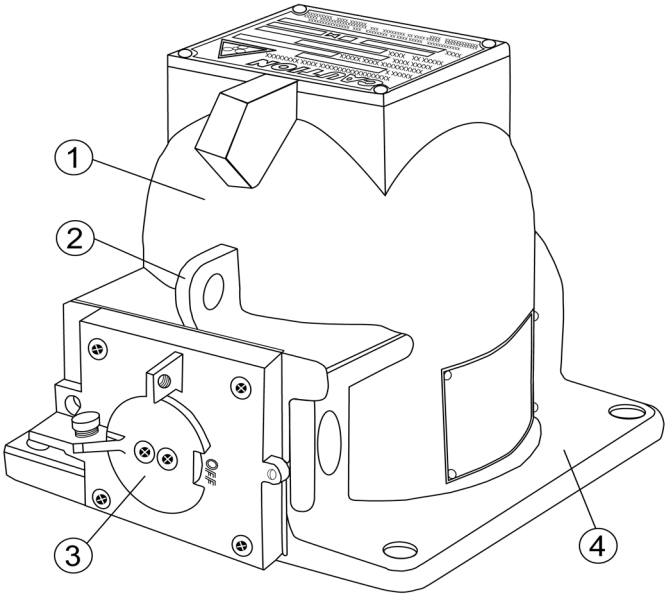

Figure 3.4 Application Area - SHLD 2

1. Source Holder
2. Lift Lug
3. Switchover/locking Mechanism
4. Mounting Surface

Maximum Activity of Source

The following table states the maximum activity of the sources. Production-related fluctuations of the radiation activity and tolerances of the measuring instruments are not taken into account.

	Cs-137
Maximum Cs-137 Activity	185 GBq (5 Ci) for 50 uSv@305mm (5mR/hr@12") 500 mCi for point sources 500 mCi total and 50 mCi/ft for multi-point sources

Country-specific approvals can limit the maximum permissible activity of the source.

	Cs-137
Number of half-value layers	250

3.5 Packaging, Transport & Storage

Your instrument was protected by packaging during transport. Its capacity to handle normal loads during transport is assured by a test based on ISO 4180.

For transport, the source holder is fixed on a transport board of wood and protected by foam packaging. As an option the source holder can be also shipped in a wooden box (USA).

For transport in Europe, the source holder is protected in an outer packaging of sheet steel.

The outer packaging of standard instruments consists of environment-friendly, recyclable cardboard. PE foam or PE foil is also used for packing the instrument. Dispose of the packaging material in standard household waste or specialized recycling companies

Storage and Transport Temperature

Description	Data
Ambient Temperature	
- SHLD 2 with manual switching mechanism	-50 … +105 °C (-58 … +221 °F)
- SHLD 2 with pneumatic switching mechanism	-12 … +105 °C (+10 … +221 °F)
Relative Humidity	20 ... 85%

3.6 Receiving the Equipment

Make sure you read and understand all the instructions and safety guidelines in the **Installation and Operation Guide** before you unpack, install or operate the equipment. The instructions in this guide are written for qualified and trained personnel.

You must be familiar with radiation safety practices in accordance with your U.S. Agreement State, the U.S. Nuclear Regulatory Commission, or other local nuclear and international regulatory agencies before unpacking the source holder.

When you unpack your equipment, make sure you follow the steps below.

1. Unpack the unit in a clean, dry area.
2. Visually inspect the source holder for damage.
3. Check the entire shipment for damage during shipment.
4. File a claim against the carrier, reporting the damage in detail, if there was damage to the unit during shipment. Any claims against VEGA for shortages, errors in shipment, etc., must occur within 30 days of receipt of the shipment.

If you must return the equipment to VEGA, make sure to contact your VEGA representative.

5. Make certain the shutter of the source holder is closed and locked.

If you find the shutter is open, close it immediately and secure it.

6. Compare the shipment against the packing slip to make certain you received your complete order.
7. If you are not installing or mounting the source holder immediately, find a storage area that is secure and isolated.

Low level radiation fields are always present around a source holder.

8. Allow access to authorized personnel only.
9. Maintain records of the shipping and receipt.
10. While they are not required, a survey and a leak test provide additional assurance that the source holder is in a safe condition.

NOTES

4 Mounting

4.1 General

Anyone with basic radiation safety awareness training can mount the source holder on the process vessel provided the source is locked in the OFF position and the following instructions are observed.

Before beginning any installation steps, all technicians must be specifically licensed by a nuclear regulatory authority in order to perform any non-routine maintenance.

4.2 Mounting Checklist

Before beginning the mounting of the source holder, perform the following steps:

1. Conduct visual inspection of source holder.
2. Ensure that the shutter is closed and locked.
3. Ensure that external surfaces are not damaged.
4. Check that the mounting position of the source holder complies with manufacturer's engineering drawings and specifications. (See certified correct drawings or contact VEGA Americas.)
5. Ensure adequate clearance to operate the shutter or cable mechanism.
6. Consider in advance any high temperature or corrosive environmental conditions. For example, you should consider the following items:
   - Adequate insulation to protect source holder from high temperature.
   - Special cooling system required to reduce source holder temperature.
   - Additional protection required to prevent corrosive material from settling on source holders.
   - Excessive vibration (over 1G).
7. Have personnel and equipment, cranes, hoists, and supports available to mount the unit.
8. Be prepared to handle the weight of the unit. Remember, source holders are very heavy.

The following mounting instructions are specific to the SHLD 2.

- For mounting of the SHLD 2, you need a special handling permit.
- Only authorized, qualified pesonnel who are monitored for radiation exposure according to local laws or the handling permit, may mount the source holder. Take note of the specifications in the handling permit. Also take the local conditions into account.
- Carry out all work within the shortest possible time and at the largest possible distance.
- Provide suitable shielding
- Avoid risk to other people by taking suitable measures such as a safety fence, when mounting the source holder.
- Depending on the version, the center of gravity of the SHLD 2 can vary. Keep this in mind during crane transport on the lug.

Mounting with a Crane

Check the hoisting equipment for sufficient lifting capacity, which is approximately 330 lbs(150 kg).

Never allow anyone to stand beneath the loads.

The source holder is screwed onto a transport board. Loosen the screws and lift the source holder from the transport board. Make sure you use the lug when moving the SHLD 2.

Use suitable lifting equipment (chain, snap hook, etc.) to fasten the source holder to the crane hook. Keep in mind that the source holder will tilt to the side while you are lifting it.

4.3 Mounting Orientation

Prior to mounting the SHLD 2, make certain the orientation of the source holder is correct.

Continuous Level Orientation

For continuous level measurement the source holder must be mounted slightly above or at the height of the max. level. The radiation must be directed exactly towards the detector mounted on the opposite side.

The source holder SHLD 2 should be mounted as close as possible to the vessel.

However, with large measuring ranges and small vessel diameters, a gap can often is not avoidable.

If there are gaps or empty spaces around the installation, provide protective fences or grids to keep hands away from the dangerous area. Such areas must be marked accordingly.

Align the source holder according to its beam exit angle.

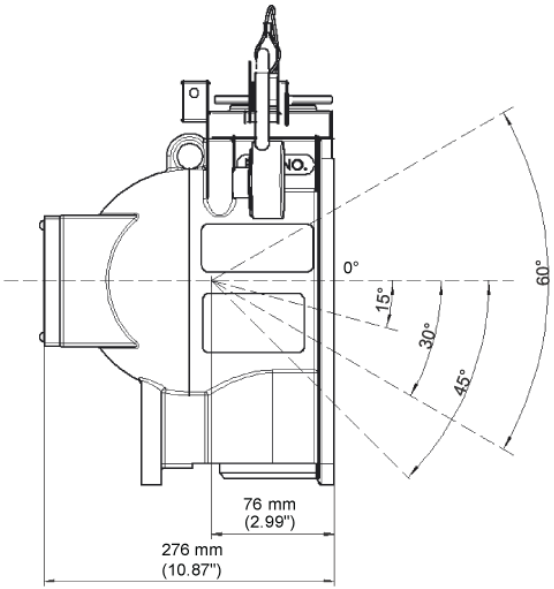

Figure 4.1 Continuous Level Orientation

Mass Flow Orientation

For continuous mass flow determination, you must mount the source holder above a conveyor belt or a discharge screw conveyor. Make certain the radiation is directed exactly towards the detector mounted on the opposite side.

Mount the source holder SHLD 2 on the measuring frame (optional). There are large spacings and gaps between the measuring frame and conveyor belt.

If there are gaps or empty spaces around the installation, provide protective fences or grids to keep hands away from the dangerous area. You must mark such areas accordingly.

The arrangement of the source holders depends on the width and the loading height of the conveyor belt. In the case of wide conveyor belts, using two sources holders is advantageous.

Make sure that the total width of the conveyor belt as well as the complete loading height are in the detection range of the measuring system.

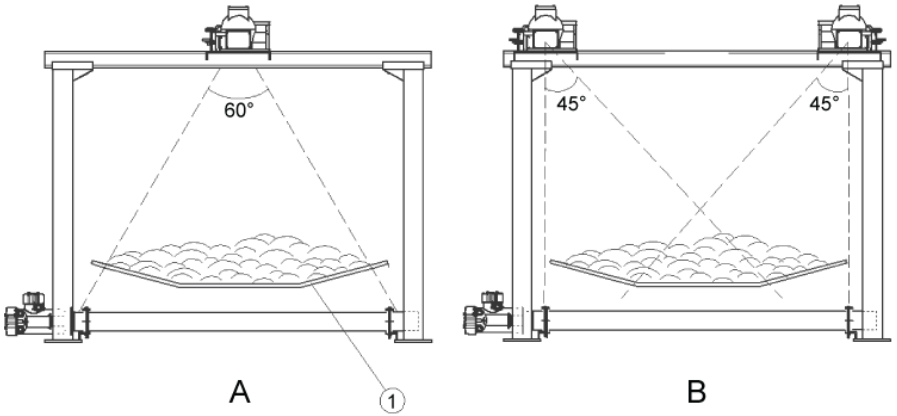

Figure 4.2 Mass Flow Orientation

A Measurement setup with a source holder - Beam angle 60°

B Measurement setup with two source holders - Beam angle 45°

1. Conveyor belt

Make sure when planning the measuring system that the sensor electronics are easily accessible. Mount the sensor in such a way that the sensor housing is on the same side as the catwalk. Mount the source holder with symmetrical radiation orientation (60°) so that the manual switchover mechanism is also accessible from the catwalk side.

Point Level Orientation

The version of the source container with a beam exit angle of 0° is best suited for point level detection. Make sure the radiation is directed exactly towards the detector mounted on the opposite side.

To use larger exit angles (15°, 30°, 45° or 60°), you must certain the beam is horizontal. To make sure the beam is horizontal, you have to mount the source holder so that the implied opening of the exit channel is in a horizontal position.

Mount the SHLD 2 as close as possible to the vessel. With large measuring ranges and small vessel diameters, a gap may exist.

If there are gaps or empty spaces around the installation, provide protective fences or grids to keep hands away from the dangerous area. You must mark such areas accordingly.

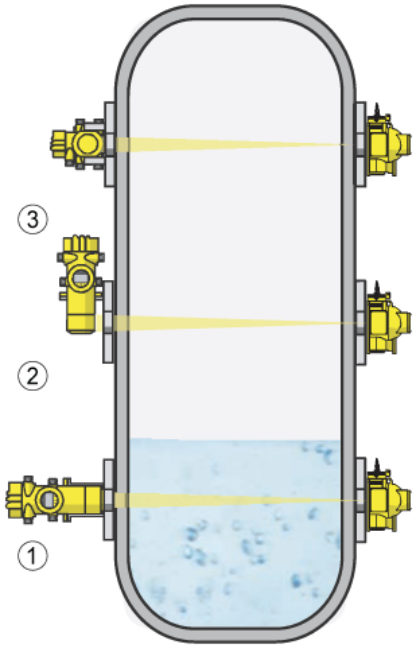

Figure 4.3 Point Level Orientation

1. *Horizontal mounting*
2. *Vertical mounting*
3. *Mounting horizontally, at right angles to container*

Density Orientation

Achieve the optimum and most constant conditions for density measurement in pipes by mounting the measuring equipment on vertical pipelines or conveyors.

Orient the radiation directly towards the detector mounted on the opposite side.

To extend the distance the beam travels through the medium and thus achieve a better measuring effect, radiate the tube diagonally or use a measuring track.

Find the required mounting accessories in the chapter *"Supplemental-Info"*.

Mount the source holder SHLD 2 as close as possible to the vessel.

However, with large measuring ranges and small vessel diameters, a gap can often is not avoidable.

If there are gaps or empty spaces around the installation, provide protective fences or grids to keep hands away from the dangerous area. You must mark such areas accordingly.

The ideal measurement setup for density measurement is installation on a vertical pipeline.

Make sure the pipe diameter is at least 1.97 in (50 mm) and the flow direction is from bottom to top.

Mounting brackets, angled attachments as well as mounting clamps are available for mounting.

Vertical Pipeline, 30° Inclined, diameter 1.97…3.94 in (50…100 mm)

For small pipe diameters 1.97 … 3.94 in (50 … 100 mm), a diagonal radiation path is recommended. The distance of the beam through the medium is thus longer and an improved measuring effect is achieved. In such cases, the optional lead shielding for the detector is recommended to avoid influence from any secondary radiation sources.

Figure 4.4 Vertical Pipeline, 30° inclined, diameter 1.97 … 3.94 in (50 … 100 mm)

Vertical Pipeline, diameter 1.97 … 23.62 in (50 … 600 mm)

For pipe diameters 1.97 ... 23.62 in (50 ... 600 mm), a straight radiation path is possible. Mount the radiometric sensor either horizontally or vertically.

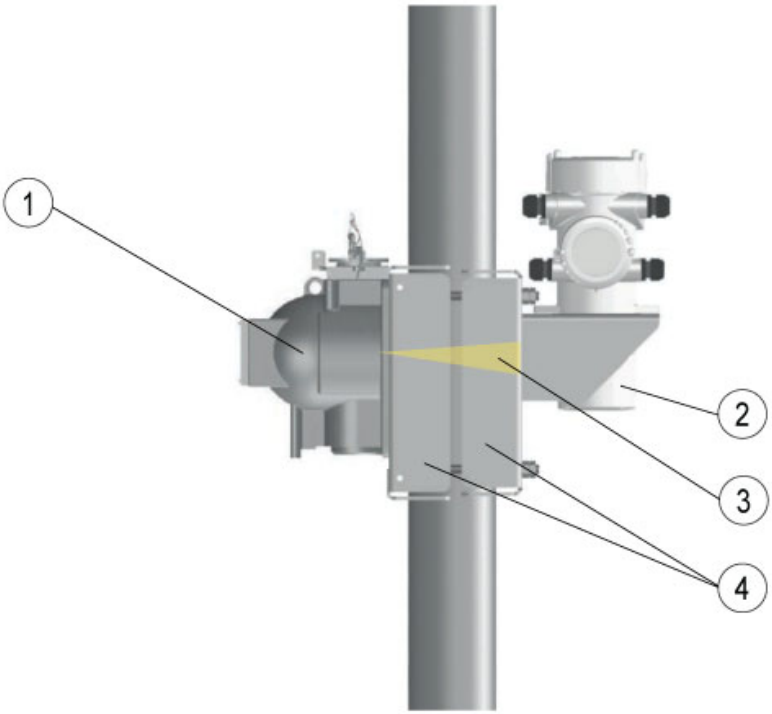

Figure 4.5 Vertical Pipeline, 30°, diameter 1.97 … 23.62 in (50 … 600 mm)

1. *Source Holder (SHLD 2)*
2. *Radiometric Sensor (MINITRAC)*
3. *Mounting horizontally, at right angles to container*
4. *Mounting Bracket*

Avoiding Stray Radiation - Vertical Pipeline, diameter 1.97 … 23.62 in (50 … 600 mm)

When mounting the radiometric sensor horizontally, the optional lead shielding is recommended in order to avoid influence from secondary radiation sources.

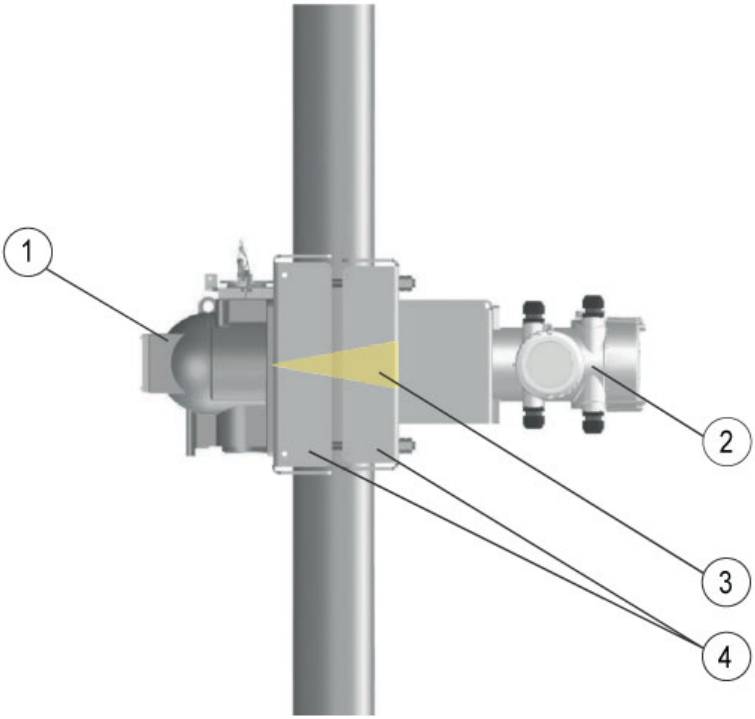

Figure 4.6 Vertical Pipeline with Horizontal Sensor 1.97…23.62 in (50…600 mm)

1. *Source Holder (SHLD 2)*
2. *Radiometric Sensor (MINITRAC)*
3. *Mounting horizontally, at right angles to container*
4. *Mounting Bracket*

Horizontal pipeline

On a horizontal pipeline, the radiation should be directed horizontally to avoid interference from air pockets.

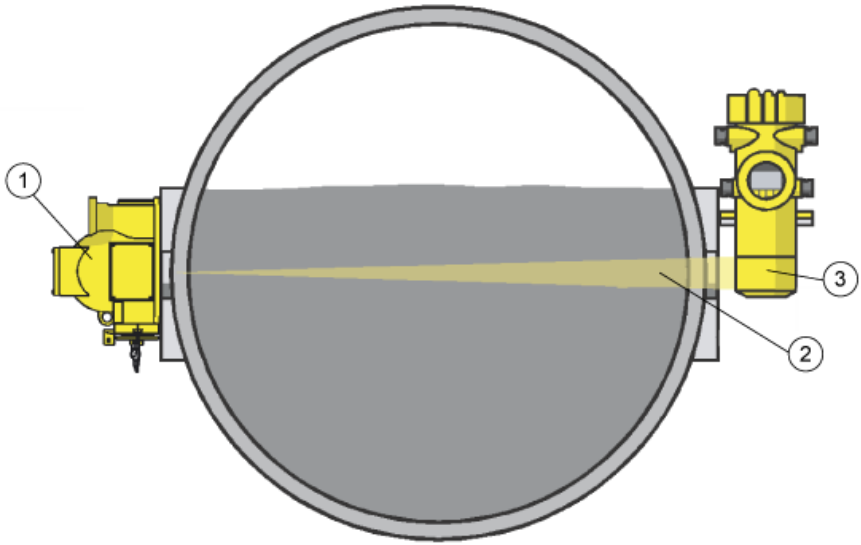

Figure 4.7 Measurement Setup on Horizontal Pipeline

1. *Source holder (SHLD 2)*
2. *Radiated area*
3. *Detector (MINITRAC)*

Screw Locking Mechanism

The source holder must be integrated in the potential equalization of the system.

To ensure a good electrical contact between the source holder and the mounting bracket, you must use the supplied lock washers to the following illustration.

Use the prescribed torque for the mounting screws (M10). Make sure that the screws have electrical contact to the potential equalization.

Material	Strength Class	Torque
Stainless Steel	70	32 Nm
Steel	8.8	50 Nm

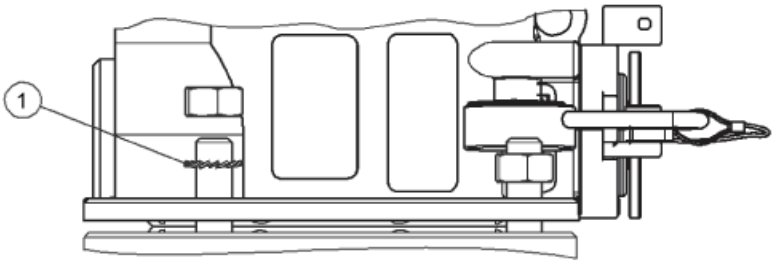

Figure 4.8 Lock Washers and Conductive Connection

1. *Lock Washers (2 pcs.) - provided by customer*
   In conjunction with WeighTrac: Retaining washers Nordlock (2 pcs.) - in the scope of delivery

Mounting Facilities

You can also mount the source container on a mounting plate provided by the customer or on an L-Profile.

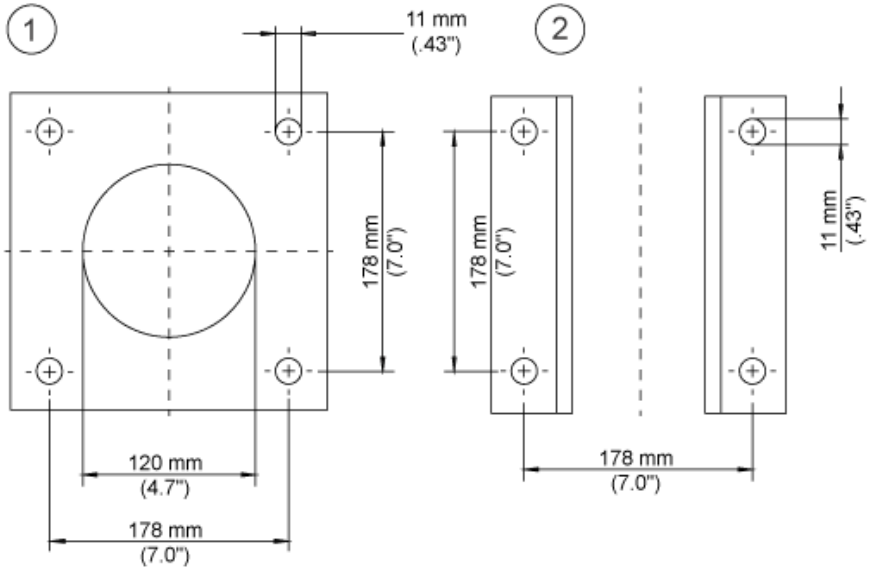

Figure 4.9 Mounting Facility Supplied by Customer - Hole Pattern

1. *Mounting Plate*
2. *L-profiles*

Installation Control

Measurement of Local Dose Rate

After mounting, or as soon as the radioactive emitter is mounted in the source holder, you must measure the local dose rate in the area of the source holder and the detector.

Depending on the respective installation, radiation can also leak out of the beam exit channel due to scattering. Make sure stray radiation is shielded off with additional lead or steel sheets. Also, make certain all control and off-limit areas are not accessible and marked with warning signs.

Behavior with Empty Vessel

After you have correctly mounted the source holder, make sure the control area around the empty vessel is measured for radioactivity. If any radioactivity exists, cordon of the area and mark the area with warning signs.

Reliably close off any accessible ways of access to the inside of the vessel and mark them with a warning sign "Radioactive".

The responsible radiation safety officer can allow access after having checked the safety measures with the shutter closed on the source holder. If you must work in and on the vessel, it is absolutely necessary to close the shutter on the source holder.

Location

At the time you ordered your equipment, VEGA sized the source holder for optimal performance for the designated application. If the location of the equipment has changed or is different from the original order, notify VEGA before installing the equipment.

Locate the source holder where process material cannot coat it. Appropriate location ensures the continuing proper operation of the source shutter, if applicable. Many regulatory agencies, such as the U.S. Nuclear Regulatory Commission (NRC), require periodic testing of the shutter. See the **Radiation Safety Manual** for details about current regulations.

External Obstructions

Any material in the path of the radiation can affect the measurement. Some materials that are present during the initial adjustment pose no problem because the adjustment accounts for the effect of those materials. Examples of such materials are:

- Tank walls
- Liners
- Insulation

However, when the materials change or you introduce new ones, an erroneous gauge reading is possible. For example, insulation that you add after adjustment absorbs the radiation and causes the gauge to erroneously read upscale.

Source Interference

When multiple adjacent pipes, vessels, or conveyors have radiometric gauges, you must consider the orientation of the source beams so each gauge senses radiation only from its appropriate source. Maximize the distance between the source holders when mounting them on adjacent vessels. Make sure to maintain the appropriate source to detector distance as illustrated in **Figure 4.10**.

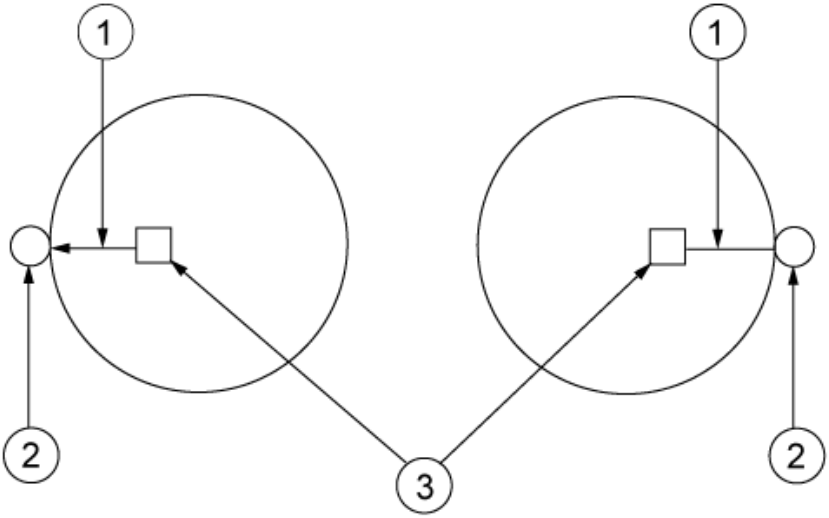

Figure 4.10 Source/Detector Arrangement for Adjacent Vessels

1. *Radiation Beam*
2. *Detector*
3. *Source Holders*

4.4 Temperature

Your source holder may have components that are sensitive to temperature extremes. Avoid exposure to temperatures beyond the specified limits. The maximum ambient temperature is -50 ... +105°C (-58 ... +221 °F). Consult the factory if this temperature is exceeded.

Ambient Temperature

You may use the source holder in continuous ambient temperature conditions. The SHLD 2 with a manual switching shutter operates from -50 °C … +105 °C (-58 °F … +221 °F). The SHLD 2 with a pneumatic switching shutter operates from -12 °C … +105 °C (+10 °F … +221 °F).

Shipping Shield

The source holder is transported with a shield in place for protection and shielding. This shield is installed on the flange-end of the source holder. The shield limits the radiation field exiting from flange end of the holder to very low levels and should remain on the holder until the source holder is being prepared for mounting to the vessel.

NOTES

5 Commissioning the Source Holder

5.1 Commission the Source Holder

Commissioning a source holder is performed **only** by a specific licensed individual trained in radiation safety.

Depending on the source holder type and the specific license requirements, the process of commissioning the source holder can include:

- Inspecting the mounting supports
- Testing the source holder for any source material leakage
- Conducting open and closed radiation surveys
- Performing an occupancy evaluation

See the **Radiation Safety Manual** for specific details.

Commissioning Call Checklist

In many installations, a VEGA Americas Field Service Engineer commissions the gauge. To reduce service time and costs, use this checklist to ensure the gauge is ready for commissioning before the engineer arrives:

- Allow access to the source holder for testing purposes.
- Have process ready for adjustment.
- To ensure the most accurate measurement, a process adjustment is necessary. This adjustment requires establishing and changing vessel levels. If process material is not available, you may use water in most cases.
- Do not remove the lock on the source holder.
- Notify your Radiation Safety Officer or contact VEGA Americas Field Service if there is damage to the source holder.

5.2 Normal Operation

Before putting the source holder into operational use, be aware of the requirements for installing the source holder.

Source Holder Installation Requirements

The following statements are important in defining the requirements for the installation of a source holder:

- Regard each separate placement or relocation as a new installation.
- Installation is the process of preparing the mounted source holder for use and consists of the following:
    - Preliminary radiation survey
    - Leak test
    - Installation radiation survey
    - Shutter or cable mechanism operation test
- Only a specifically licensed individual can perform the installation.
- The specifically licensed person must use a calibrated survey meter and must be present at the site during the entire procedure.
- The licensee may perform future periodic tests by following the instructions in this manual.

Preliminary Survey

1. Ensure that the survey meter is calibrated and operational.
2. Conduct a radiation survey of the mounted unit by surveying the source holder and detector, omni-directionally, one foot from the surface.
3. If the radiation field is normal, less than 50 mSv/hr (5 mrem/hr) at 30 cm (12") for most VEGA Americas source holders, proceed with the leak test.
4. If the radiation field is greater than 50 mSv/hr (5 mrem/hr) at 30 cm (12"), complete the following: Post restrictions of the area, if required.
5. Verify with the manufacturer that this condition is normal for the type of source and source holder you are installing.

Perform a Leak Test

1. Remove the zip-top bag containing the swab stick.
2. Write the source serial number or other identification on the bag.
3. Open the zip-top bag and grasp the swab stick by the end opposite of the fiber tip.
4. Wipe the external surface of the source holder by using the fiber-tipped end of the swab stick. Wipe the locations where contamination would most likely accumulate in the event the source capsule was leaking.
5. Place the swab stick into the zip-top plastic bag and close.
6. Put the zip-top bag in an envelope and seal it.

Do not touch the fiber tipped end or allow the tip to touch other objects since this could spread contamination if the source is leaking. If the swab stick contains a significant amount of radioactive material, send an emergency notification, by telephone immediately. Contact the appropriate nuclear regulatory agency and VEGA Americas for assistance. You must make arrangements with VEGA Americas, or another specifically licensed person to take the source out of service.

Radiation Survey after Installation

1. Complete the survey sheets with measurements at 30 cm (12") omni-directionally to record the radiation pattern.
2. Survey in the closed (OFF) position and then in the open (ON) position.
3. Do an occupancy evaluation to determine the dose personnel might receive. There are two categories, each with a different limit:
    - Members of the general public can receive 20 mSv/hr (2 mrem/hr), not to exceed 1,000 µSv/yr (100 mrem/year). These numbers include only individuals who are in the area infrequently and have no assigned reason for exposure.
    - Occupationally-exposed individuals can receive 50,000 mSv (5,000 mrem) per year with no specified rate limit. This number includes anyone whose assigned duties require his presence in the vicinity of the source holder. Complete the evaluation to determine if the limit of 50,000 mSv (5,000 mrem) per year, which would require monitoring, is potentially reachable.
4. Decide if additional shielding is required to prohibit members of the general public from receiving radiation doses greater than 20 mSv/hr (2 mrem/hr).
5. Notify appropriate personnel of the presence of radioactive materials and precautions that they must take to minimize exposure.
6. If there are radiation fields above 20 mSv/hr (2 mrem/hr) present on the detector side, notify the RSO (Radiation Safety Officer) of the problem.
7. Restrict the area, if required.

Shutter Operation Test (on applicable source holders)

The shutter operation test verifies that the shutter is functioning.

If the shutter does not work correctly, see the **Radiation Safety Manual Emergency Guidelines**.

Shutter (ON/OFF) Mechanism (required every six months)

Depending upon whether or not your source holder uses a shutter or cable mechanism, checks are normally performed at intervals not to exceed six months.

To test the shutter mechanism, move the actuator back and forth several times between the OFF and ON positions.

Customers who have the ability to cycle shutters or check cables on a more frequent basis without disturbing production requirements are recommended to do so. The application of lubricating oil to the shutter mechanism will assist in maintaining the source holder in good working order.

The actuator should move easily, but not freely. There will be some resistance to movement due to bearing friction and inertia of the mechanism.

There are no ON/OFF indicators to verify that the shutter or cable mechanism is working correctly or that the source is in the shielded position. When the source shutter or positioning cable is in the retracted position and the shutter is closed, it is assumed that the source is in the shielded position. Monitoring of the radiation levels by level detectors or other means is necessary to ensure that the source is in the shielded position and not in the source well.

Keep the records of these tests, listing the date and name of the person performing the test, for at least three years.

At the first indication that a shutter or cable mechanism is not working properly, contact the manufacturer for advice. A sticky shutter or a cable that will not retract is a warning that the proper operation is compromised and you need to address the inoperable mechanism.

If the shutter or cable mechanism becomes inoperable, contact your regulator and manufacturer immediately for advice. DO NOT attempt to free up the shutter or cable by mechanical means with the use of wrenches, hammers, channel locks, levers, etc. These devices may cause more damage and are prohibited. Such actions have been known to shear the source cable.

If a device has an inoperable shutter or cable, the source holder should not be removed without consulting the manufacturer.

5.3 Special Conditions

Radiation Fields Inside Vessels

You must measure the radiation fields inside a vessel when entering the vessel. Use the following statements when defining those requirements:

- Equipment that is mounted on vessels or has accessible air gaps must have written lockout procedures to ensure that access to the high levels of the primary radiation beam is not possible.
- In North America, many of these types of installations are considered by OSHA (Occupational Safety and Health Administration) as confined spaces and the radiation is classified as "other known energy hazards". These installations require lockout documentation consistent with OSHA rules.

At a minimum, follow the steps listed below, where applicable:

1. Verify, by signature, that the source holder is locked in the OFF (shutter closed) position.
2. Ensure that one person, who controls individuals entering the air gap, holds the key to the interlock system, if acquired.
3. Make certain the radiation field is very low by using the gauge electronics or a survey meter.
4. Check that the gauge electronics shows a high reading or maximum density, since no radiation is reaching the detector.
5. Make sure the survey meter allows for quantitative measurements. The fields measured should match very closely to background readings.
6. Ensure that the vessel is vacant and the entrance door is locked, after the work is completed.
7. Complete these steps before inserting the source holder and returning it to the "ON" position.

5.4 Pneumatic Switching Facility Connection

These instructions apply to the SHLD 2 source holders with a pneumatic switching mechanism. Optional position switches signal the switching status of the source holder. Using position switches is recommended. They give reliable feedback and indicate if the switching mechanism has really reacted to the pneumatic switching impulse.

Do not connect the position switches unless there is a complete absence of line voltage.

If over-voltage surges are expected, install over-voltage arresters.

Potential Equalization

The terminal box of the position switches is mounted on the pneumatic switching mechanism. In the terminal box, you can connect a signal line for a PLC/DCS to the terminals.

Connect the position switches according to Figure 5.1. Take note of the general installation regulations. As a rule, connect the SHLD 2 to vessel ground (PA), or in case of plastic vessels, to the next ground available. Inside the housing there is a ground terminal. On the outside of the lower housing part, there is an additional hole for a grounding screw. This connection drains off electrostatic charges.

Connection Cable

The instrument is connected with standard two-wire cable without screen.

Use cable with round cross-section. A cable outer diameter of 5 … 10 mm (0.2 … 0.39 in) ensures the cable gland is sealed. If you are using cable with a different diameter or cross-section, exchange the seal or use a suitable cable gland.

As an alternative you can insert the connection cable with conduit pipe connections.

Electrical Connection

The electrical connection is a built-in Honeywell MicroSwitch V7-1C13D8-201.

Make sure you are aware of the operating instructions of the position switch for the electrical connection and setup.

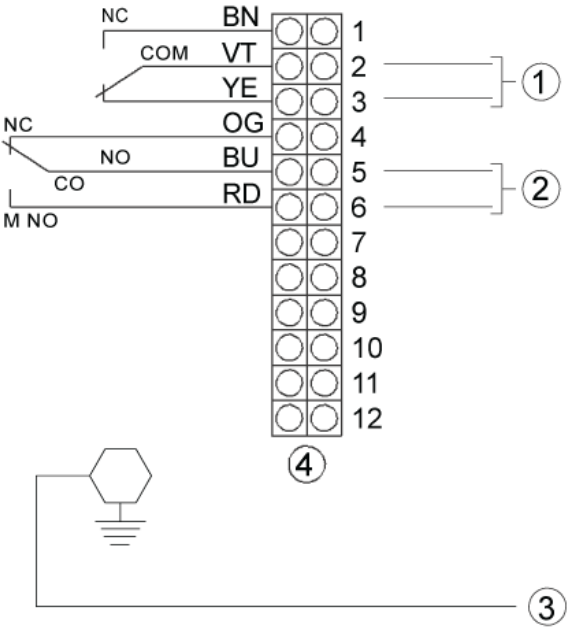

Figure 5.1 *Connection Terminal Box of Position Switches*

1. *Upper position switch for switch position "ON" (terminals 1 to 3)*
2. *Lower position switch for switch position "OFF" (terminals 4 to 6)*
3. *Ground terminal*
4. *Connection terminals*

5.5 Compressed Air Connection

These instructions apply to the SHLD 2 source holders with a pneumatic switching mechanism. Do not put the pneumatic switching mechanism into operation until after the source holder is mounted.

Connecting Pneumatic Lines

The pneumatic line is connected outside on the threaded hole. A connection adapter appropriate to the ordered thread type is attached.

Tighten the pneumatic line and make sure there are no leaks in the entire air line. In case of a leak, the pneumatic switching mechanism switches automatically to the "OFF" position (spring pressure) as soon as the pressure in the air line falls below 4 bar (58 psi).

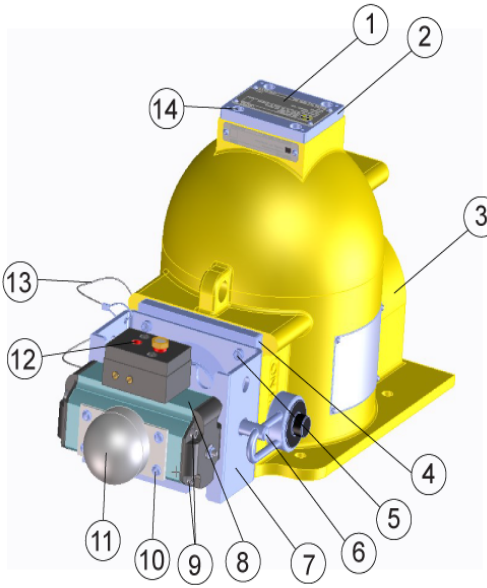

Figure 5.2 *Connection of Pneumatic Lines (with Pneumatic Switching Mechanism)*

1. *Padlock for securing the switch position "OFF"*
2. *Ventilation filter*
3. *Indication of the switching position*
4. *Threaded hole for connection of the compressed air (optionally with connection adapter)*
5. *Locking bolt*
6. *Retention hole for locking bolt*
7. *Cable protection*

Use an electrical switching valve, such as the Festo CPE, in the pneumatic line. With this valve, you can switch off the air supply.

Optionally you can install an additional hand-operated switching valve, such as the Festo VHEM in the pneumatic line. In emergencies you can then interrupt the pneumatic air supply on site and switch off the source holder. Mount this hand-operated switching valve in a safe position outside the radiated area.

The pneumatic actuation can be operated as follows:

1. Remove the padlock
2. Pull out the locking bolt.

These steps secure the "OFF" position. The locking bolt is fixed on a steel cable.

Do not grasp any mechanical parts of the pneumatic drive while the pneumatic actuator is switching over.

3. Using compressed air, switch the pneumatic actuator from the "OFF" position to the "ON" position. The pneumatic actuator should move without interruption to the "ON" position.

Insert the unused locking bolt into its parked position.

Apart from the safety hole, there is another laterally displace hole in which you can insert the locking bolt for safe retention.

Attach the required padlock to the locking bolt so that the padlock does not get lost.

6 Operation

6.1 Principle of Operation

The SHLD 2 is a source holder designed for shielding radioactive sources such as Cs-137. The radioactive source in the source container emits gamma rays. The SHLD 2 is mounted on the vessel, the pipeline, or on a conveyor belt/spiral conveyor directly opposite the sensor. The source container shields the environment against gamma radiation and protects the radioactive source against mechanical damage or chemical influences.

Switching on Radiation

Before switching on the radiation, make sure that no one is inside the radiated areas or inside the vessel.

Only trained personnel may switch on the radiation.

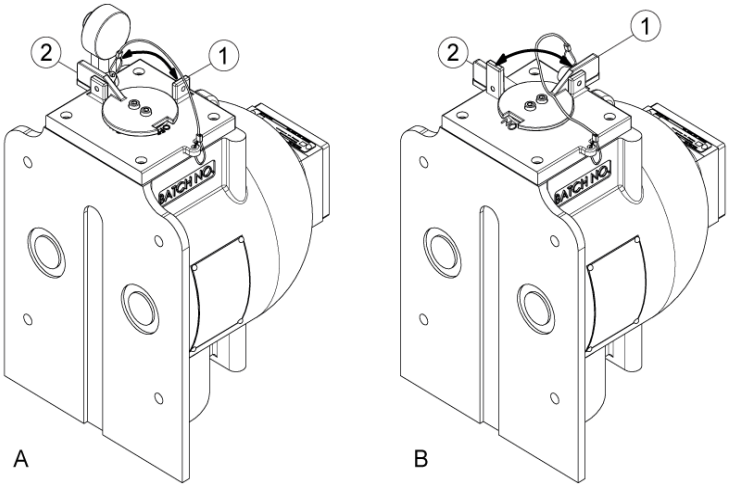

Figure 6.1 Switching on Radiation with Manual Operating Lever

A. Source holder switched off - operating lever in position "OFF" (2)
B. Source holder switched on - operating lever in position "ON" (1)
1. Switching position "ON"
2. Switching position "OFF"

Make sure the source holder shutter is in the “OFF” position before switching the radiation on.

1. Open and remove padlock.
2. The radiation safety officer gets a separate notification with the code for the padlock. Contact your sales organization.
3. Keep the padlock near by the source holder. Do not insert the padlock into the opening of the "OFF" position or you cannot switch the source holder off completely in case of emergency.
4. Screw out safety screw (3) (screw is fixed to the safeguard cable and is not detachable.
5. Turn the operating lever 90° clockwise up to the stop. "ON" (1) then appears in the position recess of the operating lever.
6. Secure the operating lever in position "ON" (1).
7. Screw in the safety screws (3) as shown in Figure 6.2. Vibrations or other external influences can cause uncontrolled movement of the operating lever.

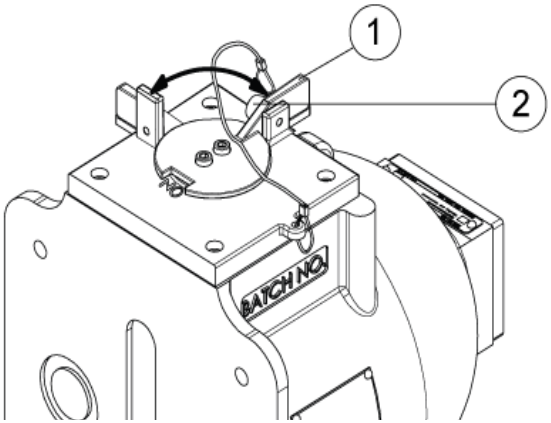

Figure 6.2 Safety Screws for Secure Switching Position

1. Operating lever in switching position "ON"
2. Safety screw

Interlock Safety Switch

The SHLD 2 version with interlock safety switch allows switches, actuators, valves, doors or safety fences for security.

To reach, the key to an access door or safety fence, make sure the source holder is switched off. Only then can you open the access point to the radiation hazardous area.

The requirements on function and design of the safety switch are extremely different, making it impossible to mount a certain switch version in advance.

For that reason there is only a mounting plate for the interlock safety switch. The safety switch itself must be provided by the customer.

The safety bolt of the interlock switch must have a diameter of 16 mm.

The mounting plate has the following holes:

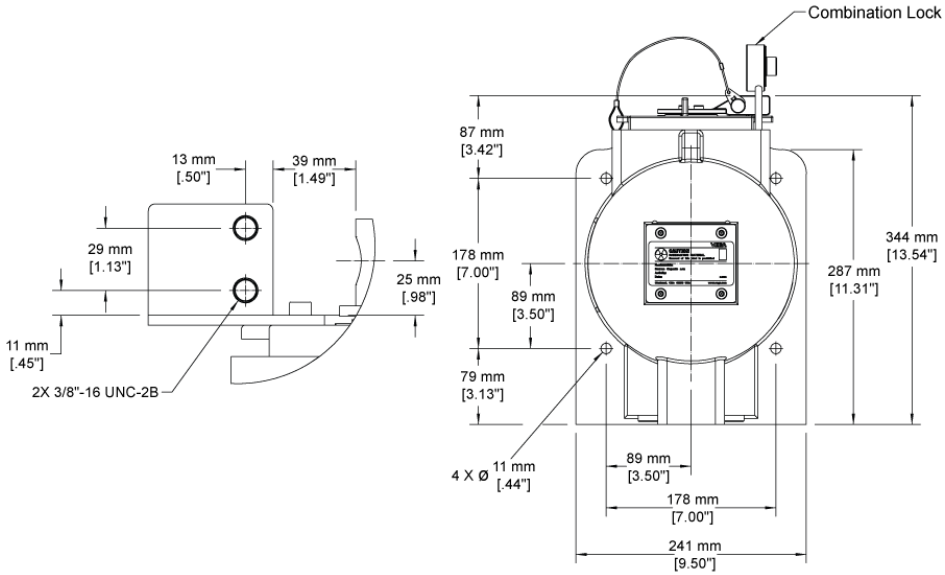

Figure 6.3 Drilling Template of Interlock Safety Switch

A. Mounting plate for the interlock safety switch

NOTES

7 Maintenance

The SHLD 2 source holder contains minimal moving parts, so very little periodic maintenance is required. However, to prevent potential problems and comply with radiation regulations, VEGA recommends the following maintenance schedule.

7.1 Cleaning

Clean the instrument in regular intervals. Note the following points:

- Clean the instrument of substances that can impair the safety function.
- Remove deposits of medium or other substances that could impair or prevent the source holder from switching over
- Take care that the lettering remains legible
- Clean the adhesive labels and the connection box (version with pneumatic switching mechanism) with water and a slightly damp rag.
- Avoid creating electrostatic charges on the instrument. Never rub the source holder with a dry cloth when cleaning.

Take note of all safety instructions in this manual when cleaning the source holder.

7.2 Inspection

If used properly and if the specified ambient and operating conditions are maintained, SHLD 2 requires no special maintenance.

Along with the regular inspections of the system, we recommend the following:

- Visually check for corrosion on the housing, the weld joints, the outer parts of the source holder, the lock, and the lock washers.
- Make sure the source holder shutter (switching on and off function) is working correctly.
- Check all labels and warning signs for legibility.
- Make sure all parts and screw connections are stable and firmly attached.

If you are not sure of the proper functioning or condition of the instrument, contact your VEGA representative.

Only the manufacturer. supplier, or specially authorized personnel may make repairs or maintenance work beyond the scope of normal inspection.

Corrosion

If there are clear traces of corrosion on the source holder, you must measure the local dose rate (µSv/h) in the surrounding areas. If the rate is clearly above the values during normal operation, then you must cordone off the area and inform the responsible radiation safety officer.

Make certain you exchange the corroded instruments and lock washers as soon as possible.

Replace source holders that have corroded or stiff locking devices. Also, replace any source holder that has a shutter that is not operating correctly.

Test Shutter Mechanism

Test the function of the shutter mechanism on the source holder at regular intervals. We recommend carrying out this test every six months. See the Shutter (ON/OFF) Mechanism procedure.

Manual Shutter Mechanism

To test the function of the shutter mechanism on a manual shutter, complete the following steps:

1. Remove the padlock.
2. Move the shutter several time from the "ON" to the "OFF" position.

The shutter should move easily and have no traces of corrosion.

If the shutter is not movable or difficult to move, contact your radiation safety officer.

Pneumatic Shutter Mechanism

To test the function of the shutter mechanism on a pneumatic shutter, complete the following steps:

1. Remove the padlock.
2. Pull out the safety bolt.
3. Using compressed air, move the shutter from "OFF" position to the "ON" position. The shutter should move easily to the "ON" position.

Do not grasp any mechanical parts of the pneumatic drive while the pneumatic actuator is switching over.

4. Reduce the pressure below 4 bar (58 psi). The shutter must move back to the "OFF" position.

The shutter should move easily and have no traces of corrosion.

If the shutter is not movable or difficult to move, contact your radiation safety officer.

Leak Test

A leak test is required at regular intervals or after an incident that could impair the source holder shielding, as noted by the specifications of the handling permit. Specifically, you must perform a leak test for the following reasons:

- Regular testing during operation
- When the source holder is stored for longer periods
- When the source holder is placed into operation after an extended storage period

An authorized person must carry out the leak test with a leak test kit, as described in Chapter 5, Perform a Leak Test. If no other instructions are provided, make sure you complete the test as illustrated in Figure 7.1.

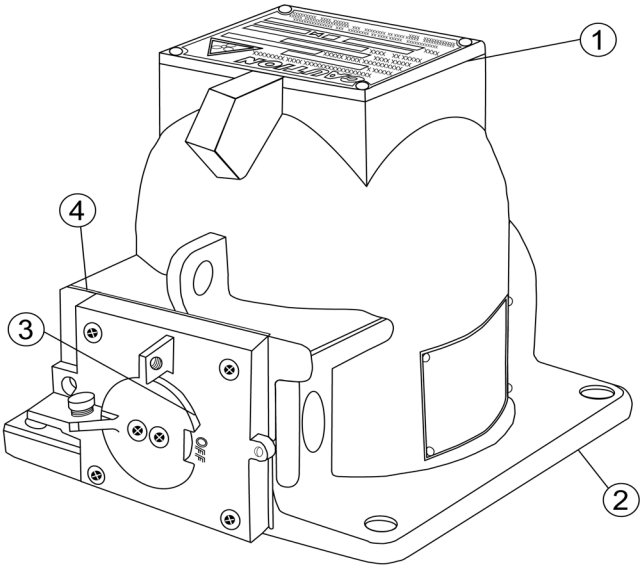

Figure 7.1 Leak Test - Wipe Surfaces

1. *On the groove beneath the cover plate*
2. *On the lower edge of the mounting surface*
3. *Along the groove between the shutter and the housing*
4. *On the groove beneath the bearing flange*

Manually Operated Source Holder

With the manually operated source holders, you can perform the leak test with the shutter in the ″ON″ or ″OFF″ position. The manually operated source holder has the following four (4) locations in which a leak test is performed:

1. On the groove beneath the cover plate
2. On the lower edge of the mounting surface
3. Along the groove between the shutter and the housing
4. On the groove beneath the bearing flange

Once the test is complete, have the samples tested by an authorized authority. A radiation source is considered leaky if more than 185 Bq (5uCi) are detected in the sample.

The specified value is valid for the U.S. International regulations may specify different values

If the source is potentially leaky, perform the following steps:

- Inform the radiation safety officer
- Take suitable measures to avoid contamination of the environment by securing the source.
- Inform the responsible authority of the potentially leaky source.

7.3 Periodic Maintenance Schedule

Description	Frequency	Procedure
Source holder shutter check ON/OFF Mechanism (On applicable source holders)	Every six months unless otherwise required by applicable nuclear regulatory agency	See the Shutter (ON/OFF) Mechanism procedure.
Source wipe/Leak test	Every three years unless otherwise required by applicable nuclear regulatory agency	See the Leak Test procedure.
Location/Inventory	Annually unless otherwise required by applicable nuclear regulatory agency	Ensure that the source holder is in the correct location. If the source is not in the correct location, contact your regulatory agency immediately.
Mounting brackets and hardware	Annually	Check for loose mounting hardware.
Tags and labels	Annually	Make certain the tags and labels are in place and legible.

Description	Frequency	Procedure
General cleanliness	Annually	Make certain there is no buildup of dirt or process material on the source holder.
Corrosion or rusting	Annually	Check the housing, winches, and the shutter/lock pin.
Painting	As needed	Clean and paint as necessary. Do not paint labels.

7.4 Diagnostics

The source holder does not have any diagnostics that alert users to potential problems. However, emergency guidelines as outlined in the **Radiation Safety Manual** provide steps you can take for the following emergency situations:

- Stuck Shutter or Inoperable Cable
- Loss or Theft
- Entering a Tank or Vessel
- Fall, Collision, or Fire

7.5 Troubleshooting

The source holder is extremely reliable, but errors can occur during operation. Some of those potential problems are caused by the following:

Item	Action to Take
Abandoned or discarded source	In the United States, contact the U.S. NRC or an agreement state.
Damaged or failed source	Retract the capsules into the shielded position, if possible and contact VEGA Americas Nuclear Services.
Missing or broken lock	Do not remove the source from the crate or mount the source. If the source is already mounted, contact VEGA Americas Nuclear Services.

Item	Action to Take
Cable not operating correctly	Contact VEGA Americas Nuclear Services.
Source leak	Evacuate the immediate area and control entry to the area. Contact VEGA Americas Nuclear Services.
Improper Handling	Contact VEGA Americas Nuclear Services.
Improper or damaged shielding	Contact VEGA Americas Nuclear Services.
Improper mounting	Contact VEGA Americas Nuclear Services.
Improper installation	Contact VEGA Americas Nuclear Services.
Label damaged or removed	Contact VEGA Americas for a replacement and the procedures for installing the label.
Improper licensing	In the United States, contact the U.S. NRC or an agreement state.
Cables can get stuck	Contact VEGA Americas Nuclear Services.
Maximum weight of the insertion element	Contact VEGA Americas Nuclear Services.
Apply too much force breaks cable and causes source to drop to bottom of vessel	Contact VEGA Americas Nuclear Services.

7.6 Correcting Issues

The operator of the system is responsible for taking the appropriate measures to correct any issues.

The radiation safety officer is responsible for all matters having to do with radiation protection. They must ensure all radiation protection requirements are observed and maintained. Additionally, the radiation safety officer can decide on the appropriate corrective actions if issues or malfunctions occur.

If you are unable to correct the problem, please contact VEGA Americas Field Service at 1-844-VEGA-NOW (1-844-834-2669).

Emergency Measures

Apply the emergency procedure immediately for personnel safety or to secure an area in which an unshielded radiation source exists or is assumed to exist.

An emergency situation exists if the following occurs:

- A radioactive source is no longer inside the source holder
- If the source holder cannot be switched to the "OFF" position
- If an increased local dose rate is detected near the source holder.

The emergency procedure protects personnel until the responsible radiation safety officer arrives and decides upon further measures.

The person charged with the supervision of the radiation source is responsible for implementing this procedure.

- Determine the dangerous area on site by measuring the local dose rate.
- Cordon off the affected area with yellow marking tape or rope.
- Mark the area with the international radiation warning symbol.

8 Dismounting

Before you attempt to dismount the source holder, make sure you are aware of any potentially dangerous process conditions such as extreme temperatures, high pressure in the vessel, and toxic or corrosive materials.

8.1 De-commission the Source Holder

In many U.S. installations, a VEGA Field Service Engineer de-commissions the source holder. Only people with a specific license from the U.S. NRC, Agreement State, or other nuclear regulatory agency may remove the source holder lock.

Users outside the United States must comply with the appropriate nuclear regulatory agency's regulations in matters pertaining to licensing and handling of the equipment.

See the **Radiation Safety Manual***,* and the appropriate current regulations for details.

Dismount or Removal Requirements

Before you remove the source holder, perform the following steps:

- Conduct a visual inspection of source holder. Make certain the external surface is smooth and not damaged.
- Check corroded and rusted units, which have been in service under extreme environmental conditions. These units may require special removal, handling, and shipping procedures.
- Ensure that the shutter is closed and locked on applicable source holders.
- Have personnel and equipment, cranes, hoists, and supports available to remove unit.

- Inform all personnel involved in the removal, of the procedures necessary to limit radiation exposure. For example, how to reduce exposure using time, distance, and shielding.
- Be prepared to handle the weight of the source holder. The approximate weight of the source holder is on the certified correct drawing.

Specific requirements for removing the source holder include the following:

- Radiation Survey
- Leak Test, if shipping the unit.
- Only a specifically licensed individual can perform the removal.
- The specifically licensed person must use a calibrated survey meter. Make sure the radiation safety officer is present at the site during the entire procedure.

Make sure the radiation field conforms to the installation survey or less than 50 mSv/hr (5 mrem/hr) at 30 cm (12") from the surface omni-directionally.

The information in this guide is specific to work that is necessary prior to the installation and removal of a source holder in the United States. Other licensees must have specific wording in their license that allows installation and removal of a source holder.

8.2 Transfer Ownership or Disposal

Source Disposal

Contact VEGA Field Service for information regarding the disposal of the source. The contact information for the U.S. and Canada is:

Contact Information	Telephone Number
Monday through Friday 8:00 A.M. - 5:00 P.M. EST (Eastern Standard Time)	1-844-VEGA-NOW (1-844-834-2669)
Emergencies: Follow the voice mail instructions	513-272-0131
E-mail	service@vega.com

NOTES

9 Supplemental Information

9.1 Technical Data

The following technical data provides a description of the attributes specific to your source holder. In addition, the dimensions provide the detailed length, width, and height of your source holder.

General Data

Maximum Cs-137 Activity	185 GBq (5 Ci) for 50 uSv@305mm (5mR/hr@12") 5 Ci for point sources 25 Ci total and 12 Ci/ft for multi-point sources
Beam Angle	0°, 15°, 30°, 45°, 60°
Fire Resistance	+538 °C (+1000 °F) for 5 minutes
Temperature - Manual Shutter - Pneumatic Shutter	 -50 °C ... +105 °C (-58 °F ... +221 °F) -12 °C ... +105 °C (+10 °F ... +221 °F)
Pressure	Atmospheric
Humidity	0-100%, non-condensing
Weight - Manual Shutter - Pneumatic Shutter - Pneumatic Shutter with Position Switch	 Approximately 100 kg (212 lbs) Approximately 103 kg (217 lbs) Approximately 104 kg (219 lbs)
Housing Versions	Low carbon steel with polyester powder coating, 316L Stainless steel
Materials - Process Fitting - Flange - Shielding - Source Capsule Holder - Manual Shutter - Pneumatic Shutter	 316L Stainless Steel Lead 316 L Stainless steel 316 L Stainless steel 316 L Stainless steel
Temperature - Manual Shutter - Pneumatic Shutter	 -50 °C ... +105 °C (-58 °F ... +221 °F) -12 °C ... +105 °C (+10 °F ... +221 °F)

Vibration	- Tested to IEC 68-2-6, IEC 68-2-27, and IEC 68-2-36 - DIN EN 60721-3-4 - Classification 4M7
Life Expectancy	20 years
Corrosion	Mild
Licensing	Any use of the source holder requires a specific license in the U.S. Check local requirements for International use.
Leak Test	At least once every 36 months
Shutter	At least once every 6 months
Transfer and Disposal	Transfer of this source holder containing the sealed source is only to a specifically licensed person or as specified in OAC 3701:1-46 (an equivalent to 10 CFR 31 and 32). If you need to transfer the source holder to another location or dispose of the source holder, specific licensees are required.
Handling, Installation, and Storage	You may not commission/install the source holder into service. Only a specifically licensed person may perform this service.
Storage	When removing the device from its mounted position, mount the cover plate on the device to shield the beam port and keep foreign material out of the shutter assembly.
Physical Inspection	Perform physical inspections of the device and its labeling at least once every six months for corrosion prevention and maintenance in accordance with the manufacturer's instructions.

Materials

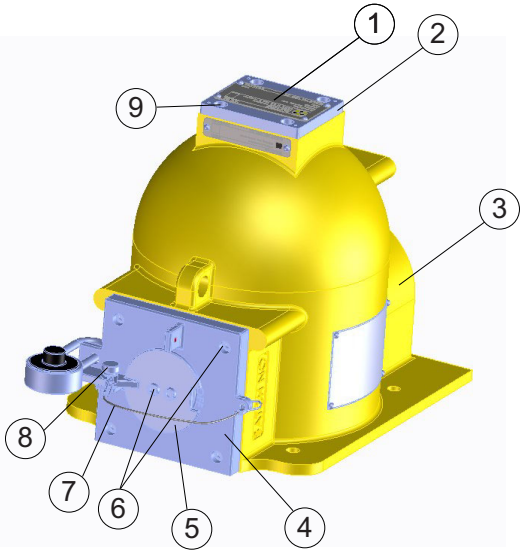

Figure 9.1 SHLD2 Source Holder - Standard

Number	Component	Material
1	Type Label - Source	316
2	Cover Plate	316
	O-ring (beneath cover plate)	FKM
3	Housing	316
4	Bearing Flange	316
5	Shutter Handle	316
6	Screw	316
7	Safeguard Cable	304, Plastic-coated (Vinyl)
8	Safety Screw	316
9	Screw (torx tamper-resistant)	304

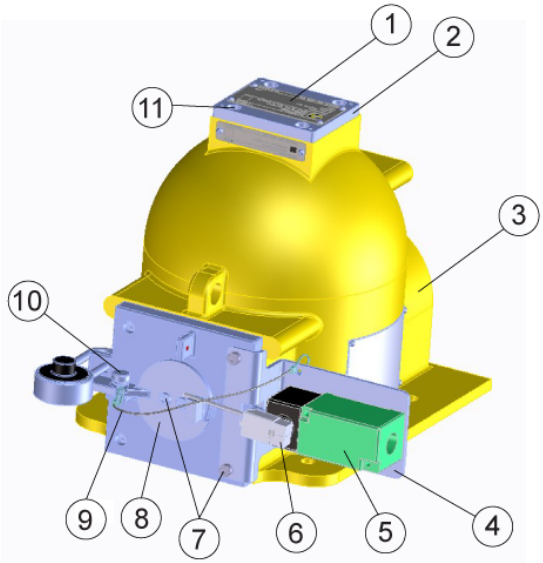

Figure 9.2 SHLD2 Source Holder - Limit Switch

Number	Component	Material
1	Type Label - Source	316
2	Cover Plate	316
	O-ring (beneath cover plate)	FKM
3	Housing	316
4	Mounting Plate	316
5	Housing - Limit Switch	Zinc Die Casting
6	Shutter - Limit Switch	304
7	Screw	316
8	Shutter Handle	316
9	Safeguard Cable	304, Plastic-coated (Vinyl)
10	Safety Screw	316
11	Screw (torx tamper-resistant)	304

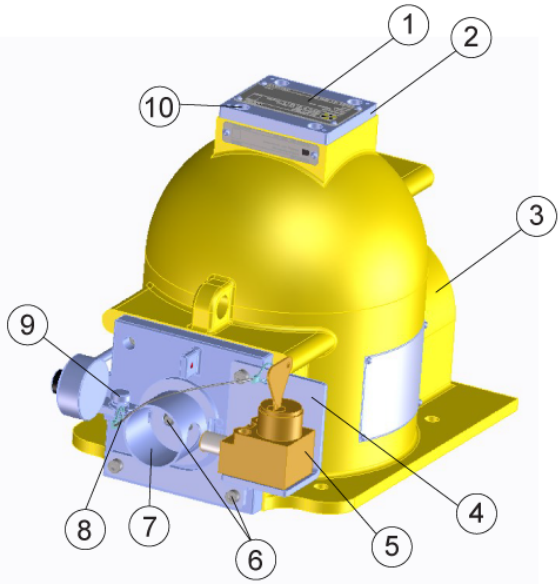

Figure 9.3 SHLD2 Source Holder - Interlock Safety Switch

Number	Component	Material
1	Type Label - Source	316
2	Cover Plate	316
	O-ring (beneath cover plate)	FKM
3	Housing	316
4	Mounting Plate	316
5	Housing - Safety Switch with Locking Rod	Lock provided by customer
6	Screw	316
7	Shutter Handle with Interlock Locking Sleeve	316
8	Safeguard Cable	304, plastic-coated (Vinyl)
9	Safety Screw	316
10	Screw (torx tamper-resistant)	304

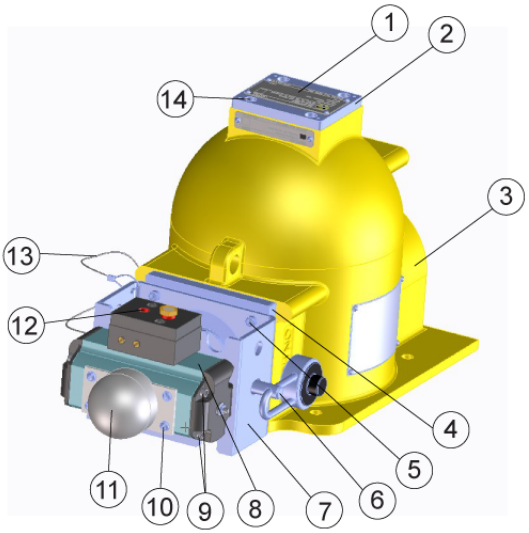

Figure 9.4 SHLD2 Source Holder - Air Actuator

Number	Component	Material
1	Type Label - Source	316
2	Cover Plate	316
	O-ring	FKM
3	Housing	316
4	Bearing Flange	316
5	Screw	316
6	Locking Rod	316
7	Bracket, Air Actuator	316
8	Housing, Air Actuator	Aluminum, Anodized
9	Screw	316
10	Screw	304
11	Indication of Switching Position	Polycarbonate
12	Air Connection	Aluminum, Anodized
13	Safeguard Cable	304, Plastic-coated (Vinyl)
14	Screw (torx tamper-resistant)	316

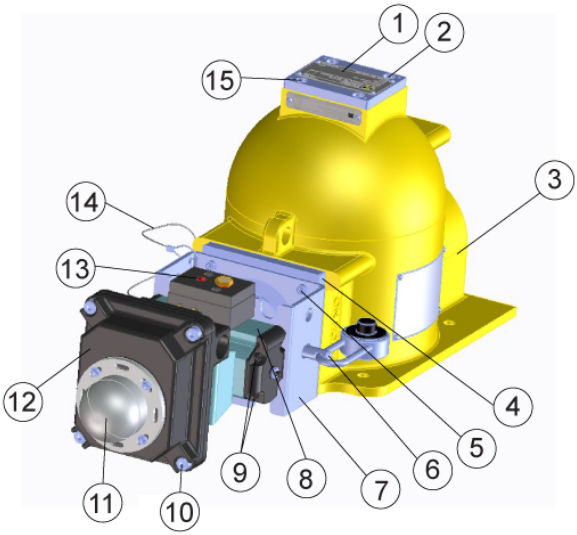

Figure 9.5 SHLD2 Source Holder - Air Actuator and Limit Switch

Number	Component	Material
1	Type Label - Source	316
2	Cover Plate	316
	O-ring	FKM
3	Housing	316
4	Bearing Flange	316
5	Screw	316
6	Locking Rod	316
7	Bracket Air Actuator	316
8	Housing, Air Actuator	Aluminum, Anodized
9	Screw	316
10	Screw	304
11	Indication of Switching Position	Polycarbonate
12	Housing, indicates switching position	Aluminum
13	Air Connection	Aluminum, Anodized
14	Safeguard Cable	304, plastic-coated (Vinyl)
15	Screw (torx tamper-resistant)	316

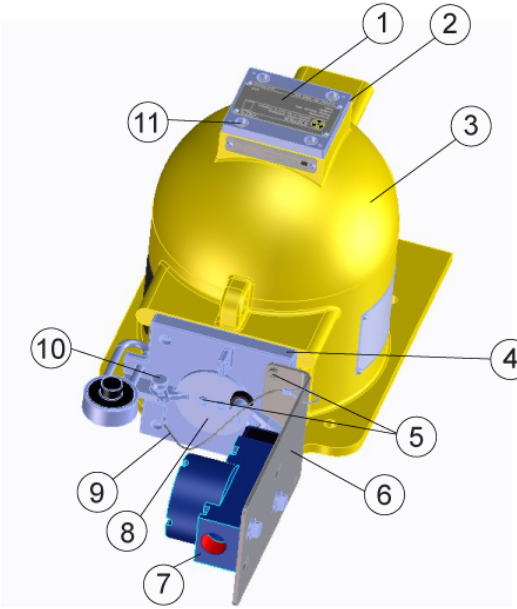

Figure 9.6 SHLD2 Source Holder - Explosion Proof with Limit Switch

Number	Component	Material
1	Type Label - Source	316
2	Cover Plate	316
	O-Ring	FKM
3	Housing	316
4	Bearing Flange	316
5	Screw	316
6	Bracket, Exp Proof Limit Switch	316
7	Limit Switch, Exp Proof	Zinc Die Casting
8	Shutter Handle	316
9	Safeguard Cable	304, plastic-coated (Vinyl)
10	Safety Screw	316
11	Screw (torx tamper-resistant)	316

Pneumatic Switching Mechanism (optional)

Pivoting range	180°
Compressed air connection	G⅛"
Switching pressure	4 … 7 bar (58 … 102 psi)
Reset of switching facility	By spring force
Compressed air conditioning	Class 5 according to ISO 8573-1, pressure dew point 10 K below operating temperature. See local regulations for International regulations.
Connection data - with position switches	
- Operating voltage	277 V AC
- Current load	15 A
- Function	SPDT

Source and Vessel Characteristics

Source	Cs-137
Number of half value layers of source holder	275
Maximum activity of source holder	185 GBq (5000 mCi)

9.2 Dimensions

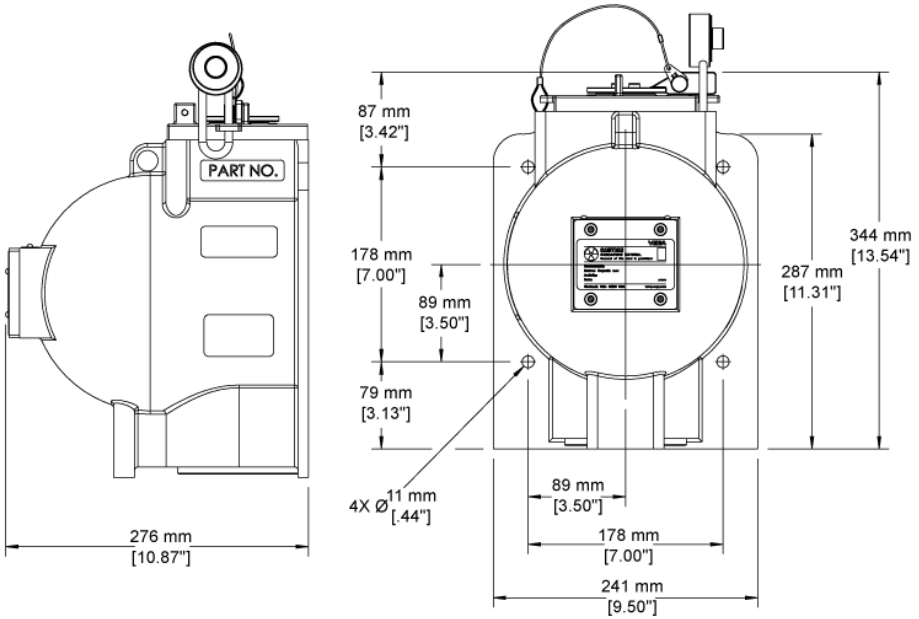

Figure 9.7 Source Holder SHLD 2 - Standard Version

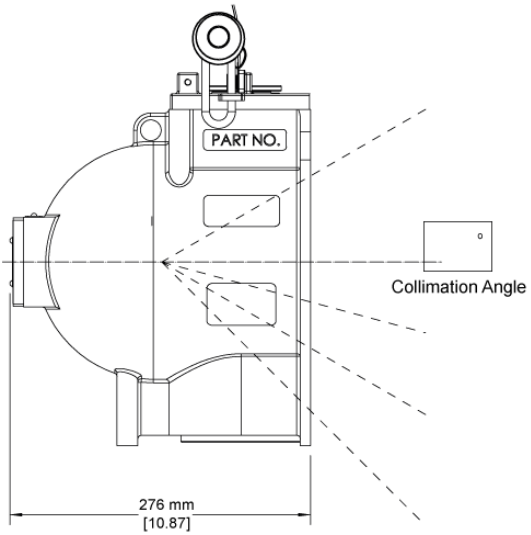

Figure 9.8 SHLD 2 Beam Angles

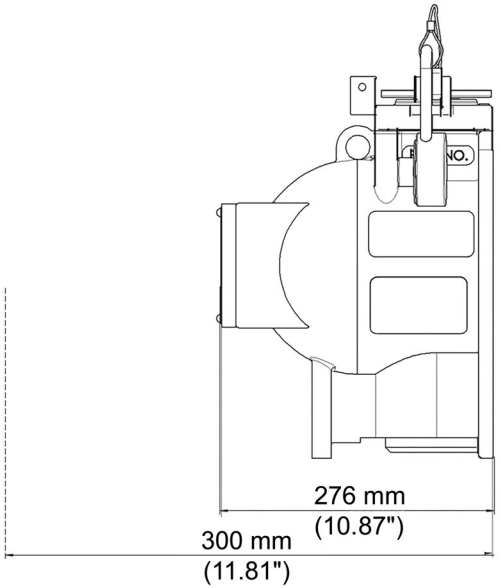

Figure 9.9 SHLD 2 Height for Source Exchange

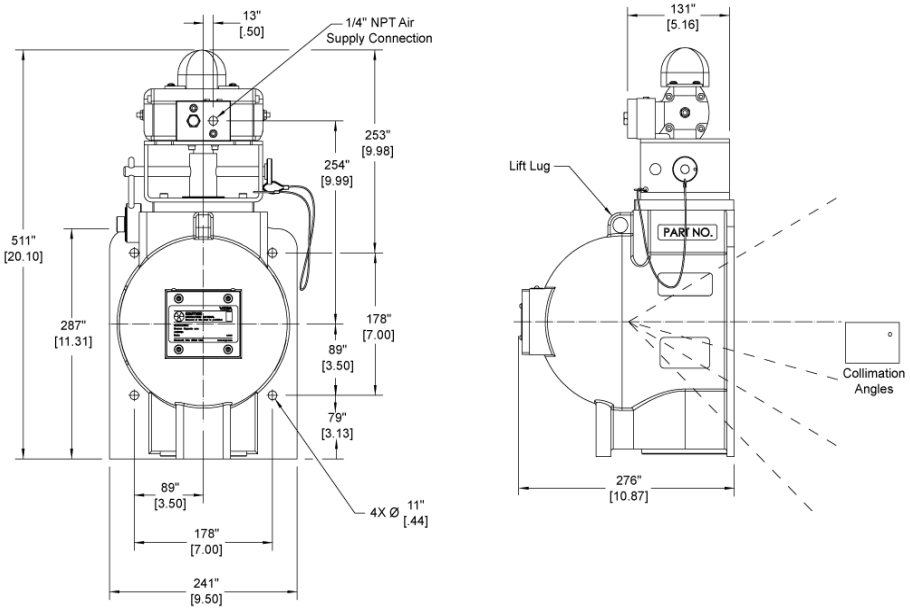

Figure 9.10 Source Holder SHLD 2 - with Limit Switch

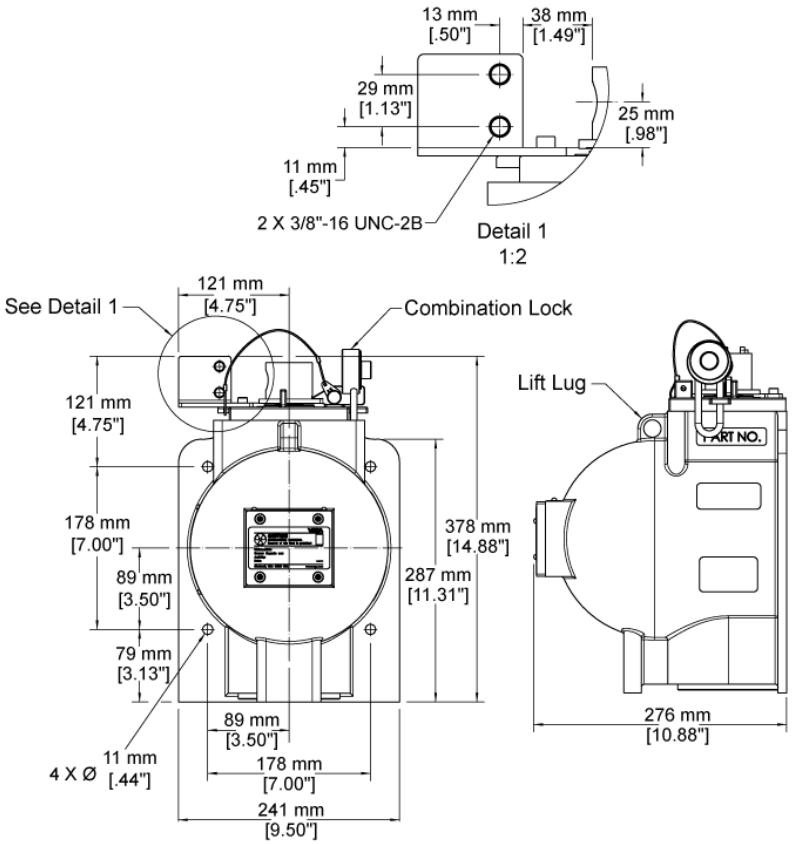

Figure 9.11 Source Holder SHLD 2 - with Interlock Safety Switch

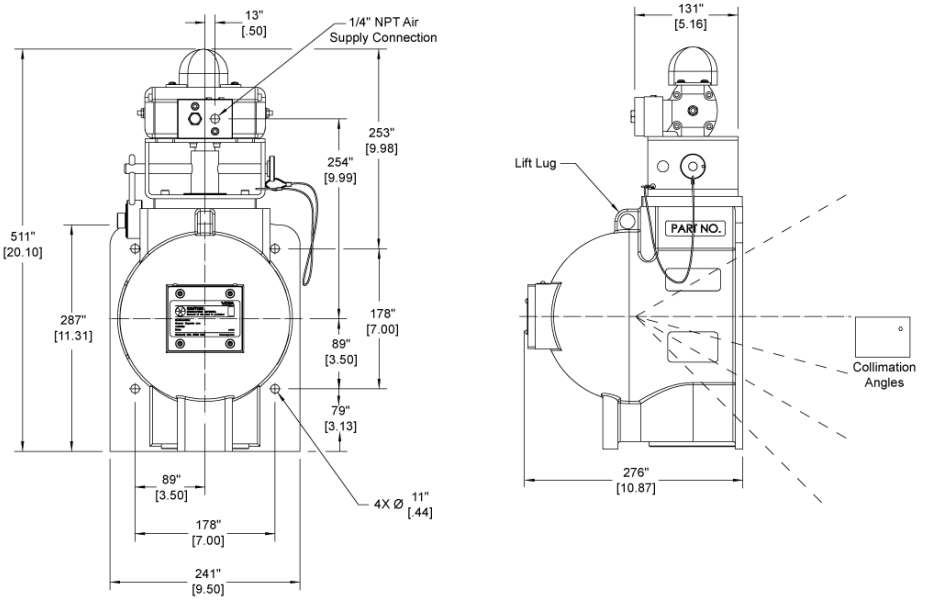

Figure 9.12 Source Holder SHLD 2 - with Air Actuator

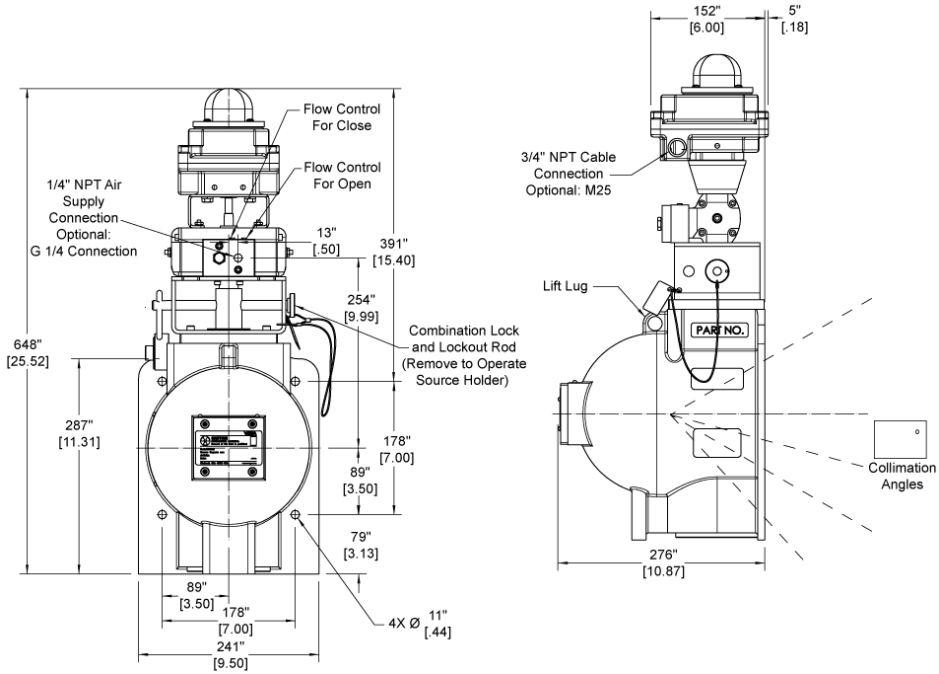

Figure 9.13 Source Holder SHLD 2 - with Air Actuator and Limit Switch

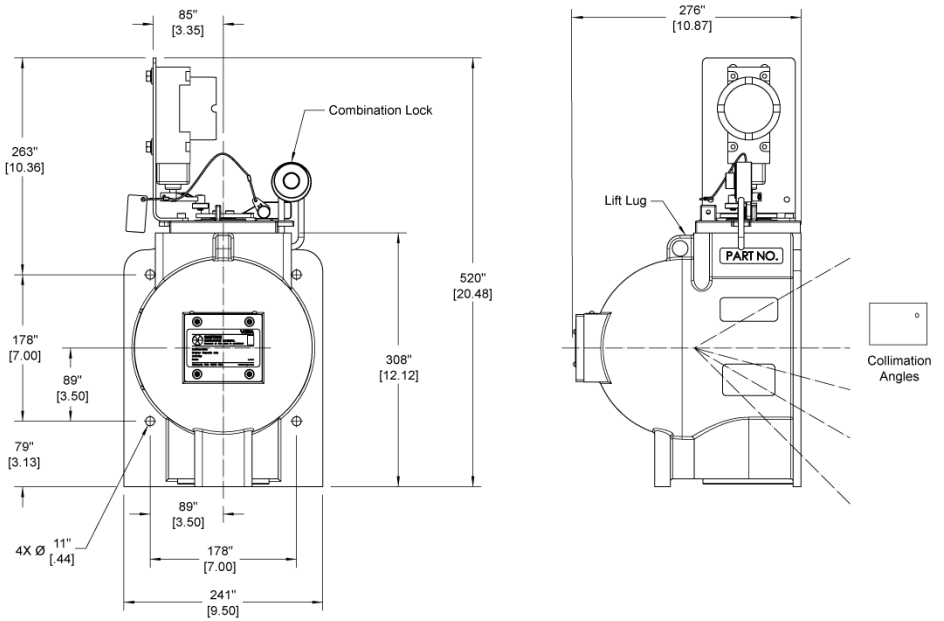

Figure 9.14 Source Holder SHLD 2 - Explosion Proof with Limit Switch

10 Customer Service

10.1 Find Help

If you are unable to find an answer to your specific question, VEGA has service personnel located throughout the world to assist you.

Some of the services available to you include:

- Emergency service telephone support available 24 hours a day
- Radiation survey meter calibration
- Wipe test and wipe test analysis
- Start up and commissioning
- Service, maintenance, and disposal of source material

10.2 U.S., Canada, and Worldwide

VEGA has Field Service Engineers available for on site service, emergency services or gauge start up.

Contact Information	**Telephone Number**
Monday through Friday 8:00 A.M. - 5:00 P.M. EST (Eastern Standard Time)	1-844-VEGA-NOW (1-844-834-2669)
Emergencies: Follow the voice mail instructions	513-272-0131
International (Worldwide)	513-272-0131
E-mail	service@vega.com

10.3 Necessary Information

When you call with a question, please have the following necessary information available for the Field Service Engineer or representative:

- VEGA Customer Order (C.O.) Number - located on the engraved label on the source holder

NOTES

VEGA Americas, Inc.
4170 Rosslyn Drive
Cincinnati, Ohio 45209 USA
Phone: 1.513.272.0131
Fax: 1.513.272.0133
E-mail: americas@vega.com
www.vega-americas.com

All statements concerning scope of delivery, application, practical use, and operating conditions of the sensors and processing systems correspond to the information available at the time of printing.