Operating Instructions

SHLM CXx and CPx®
Source Holder Models

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Radiometric

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Revision Table

Version of manual	Description	Date
1.0	Initial release	190920
2.0	SHLM CX Update	241118

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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. The instructions and procedures in the documentation are designed for users seeking product knowledge, usage, and functionality.

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.

Figure 1.1 SHLM CXx and SHLM CPx

1.2 Targeted Group

The **Operating Instructions** not only provide 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.

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

2.3 Applications

Intended Applications

The SHLM source holders are designed for radiation-based measurement of applications including density and continuous and point level. The most common industries for the SHLM models include:

- Chemical
- Petrochemical
- Offshore
- Refining

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

2.5 Manufacturer's Responsibility

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

2.6 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 SHLM is mounted onto a dry well that extends into the process tank or vessel. In addition, the SHLM is used to position and protect a radioactive source in the process tank or vessel using a cable. Radiation from the source is broadcast through the process material and out of the vessel. A radiation detector placed outside the vessel measures radiation fluctuations caused by process condition changes. The detector correlates radiation levels to process conditions such as level and density.

3.2 Components

The SHLM CXx or SHLM CPx source holder housings are a lead-filled, welded steel shell fitted with an internal cable assembly that functions as the carrier for source capsules. The physical size determines the amount of lead each series model contains for shielding. The dash numbers following the model number are assigned to differentiate between the models with different amounts of shielding. A “4" has the most shielding and a “1" has the least shielding. The source holder design can use a single point source in density and/or level measurement. The source holder design can also use multiple point sources for level measurement.

The source carrier assembly is attached to a cable and can have up to four cables mounted in the cabinet, for the SHLM CPx, to guide into the dry well. In all cases, the source carrier(s) is inserted into the vessel well and returned to the source holder for storage, where the sources can be locked in the OFF position.

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 also remain clean of process material, unaltered, and legible for the duration of the source holder's use.

Source Holder

The source holders are 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.

Figure 3.1 Source Holders

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.

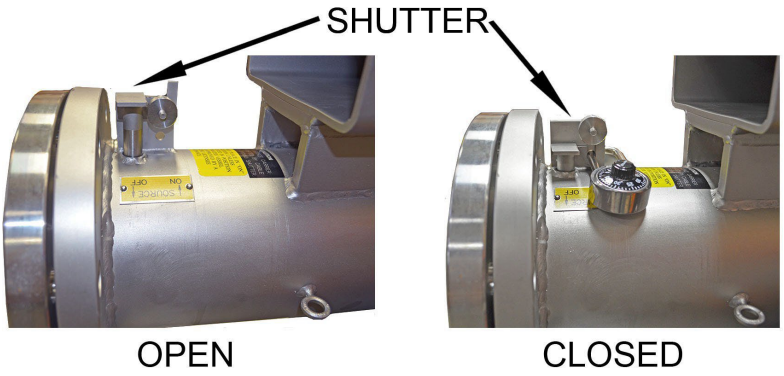


Figure 3.2 Shutter Open and Closed CXx

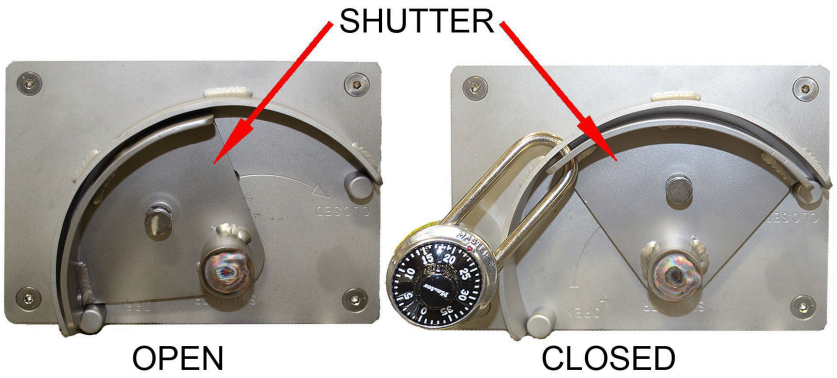


Figure 3.3 Shutter Open and Closed CPx

Bracket and Lifting Eye

A forklift bracket and the lifting eyes on the housing (optionally provided) assists when lifting the source holder into place for mounting.

4.3 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.

4 Mounting

4.1 General

Anyone with basic radiation safety awareness training can mount the source holder to the nozzle flange on the process vessel provided the source is locked in the OFF position and the following instructions are observed. Canadian licensees must have specific wording in their license that allows these operations.

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 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.

4.3 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.

Typical Orientation

The SHLM CXx and SHLM CPx mounts to a nozzle flange on the process vessel. VEGA Americas provides application drawings based upon your particular application. Make sure you refer to those drawings for the correct orientation of your source holder.

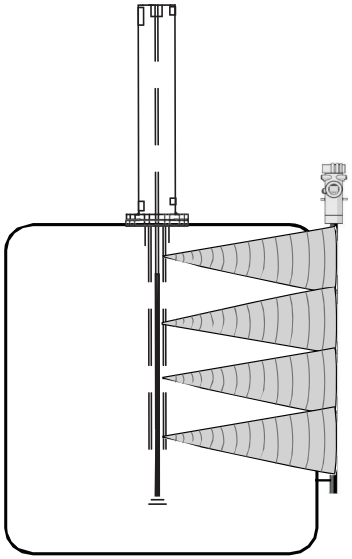


Figure 4.1 SHLM Typical Level Orientation

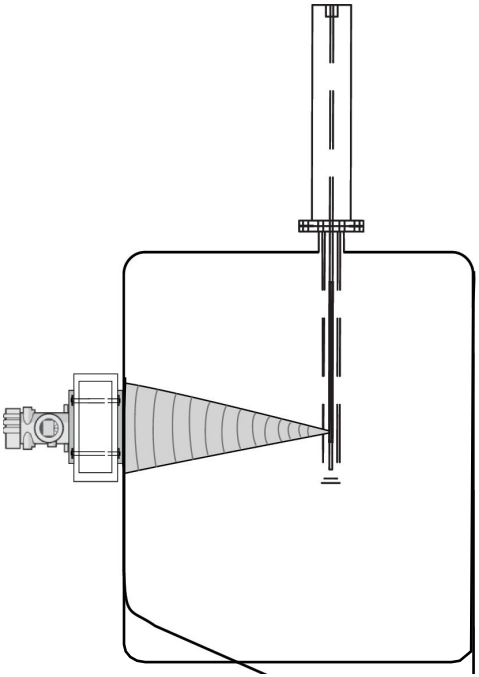


Figure 4.2 SHLM Typical Density and Point Level Orientation

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 4.3**.

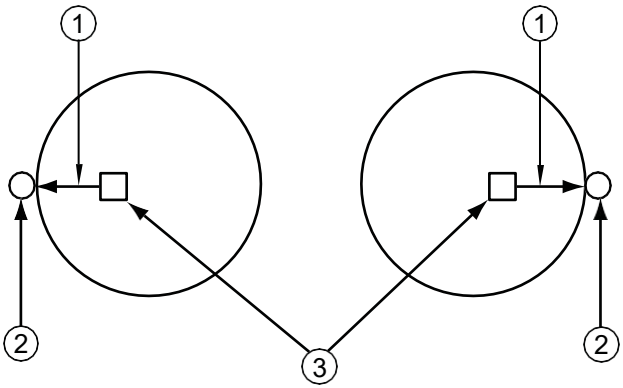


Figure 4.3 Source/Detector Arrangement for Adjacent Vessels

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 operating temperature for the vessel is + 260 °C (+ 500 °F). Consult the factory if this temperature is exceeded.

Ambient Temperature

You may use the source holder in continuous ambient temperature conditions from - 40 °C … + 60 °C (-40 °F … + 140 °F). Minimize direct exposure to sunlight when ambient temperatures exceed + 40 °C (+ 105 °F).

4.5 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.

5 Commissioning the Source Holder

5.1 Commissioning/Installing 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.

5.2 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.

6 Operation

6.1 Applications

The VEGA SHLM product family is designed such that source capsules are deployed via cable from a shielded housing directly into a drywell or closed end pipe that extends into a process vessel. During shipping the source carrier is contained and locked within the shielding element. The source cable is typically deployed via winch or multiple winches depending upon application requirements.

The standard configuration for the model SHLM source holder depends on its design. The SHLM-CX has one carrier, and the SHLM-CP has multiple carrier assemblies, with a maximum of four (4). This allows individual control for positioning each carrier assembly containing one or multiple source capsules to the desired elevation within the process vessel.

During shipping, the cable configuration is standard, which is a cable attached to each of the source carriers. The source carriers are attached to their respective winches within the source holder cabinet. All sources are contained and secured within the shielded body of the source holder.

6.2 Installing the Source Holder

To install the SHLM source holder, securely mount it onto a flange at the designated point of access. Ensure that the flange is sturdy and stable, as it serves as the main mounting point. **This surface is not intended to withstand pressure; it acts solely as a support for the source holder.**

During the engineering phase of the quotation, the mounting flange size and design should have been agreed upon, and the drywell structure should have an appropriate mating flange. If not, an adapter flange should have been provided by VEGA to accommodate non-similar flanges utilized in the mounting. Please refer to provided approval drawings to confirm the mounting flange of the SHLM equipment.

Before mounting, verify the inner diameter (ID) of the dry well to match the correct configuration:

- For SHLM-CX models, the dry well ID is **1 inch.**
- For SHLM-CP models, the dry well ID is **2.3 inches.**

There are designated lifting points on the SHLM, and the equipment center of mass to assist in rigging for any lifting activity required for the equipment. Please refer to provided approval drawings for additional information.

If SHLM is expected to see vibration in excess of 1G, VEGA recommends additional support and/or stabilization. Please refer to provided approval drawings for additional information.

6.3 Commissioning

The commissioning process involves preparing the SHLM source holder for its first deployment by carefully lowering the source carrier(s) into the dry well.

1. **Verify Source Holder Positioning:** Confirm that the SHLM source holder is securely mounted to its flange and aligned properly with the dry well for seamless carrier deployment.
2. **Removal of Padlock from Locking Mechanism**: A licensed individual should be responsible for removing the padlock from the locking rod or shutter mechanism, that will allow the security measure to be opened and the source carrier deployed from the shielding structure of the source holder.

   Additional steps of leak testing and occupancy survey preparation are also required as part of the commissioning of any fixed installation source holder.
3. **Deploying the Source Carrier:** Remove the safety locking rod or move shutter handle to the open position before initiating the winch to allow deployment operation.
   - **Removal of Locking Rod:** Locate the locking rod and disengage it carefully. This step is critical for allowing the winch to reel down the source carrier and ensure safe movement.

Figure 6.1 SHLM-CX in closed & locked position

Figure 6.2 SHLM-CX in closed & un-locked position

Figure 6.3 SHLM-CX in open position

Figure 6.4 SHLM-CP in locked/closed position.

4. **Deployment Using the Winch**:

   - Begin by turning the winch slowly, guiding the cable to lower the source carrier assembly into the dry well.
   - Monitor the cable tension and movement for smooth deployment to prevent cable twisting or binding.

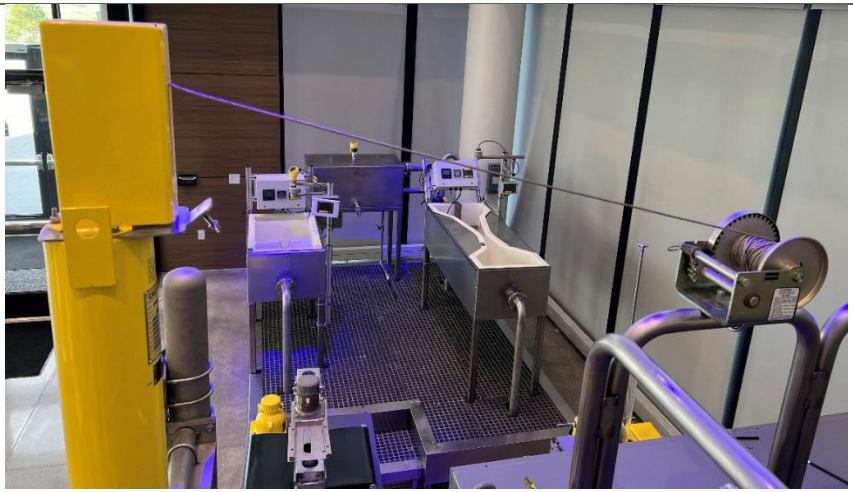


Figure 6.5 SHLM-CX Winch Example

Figure 6.6 SHLM-CX winch cabinet in closed and locked position.

6.4 Deployment and Removal

The SHLM source holder's winch system enables safe deployment and retraction of the radiometric source carriers for operation or maintenance.

1. **Deploying for Operation**:

- Once the locking rod has been removed and the source carrier is positioned above the dry well, operate the winch to lower the carrier to the required depth, based on process specifications or application needs.
    - In models with multiple carriers, deploy each one individually if using the SHLM-CP model, positioning each carrier as needed in the dry well compartments.

2. Positioning and Verification of Source Capsule Placement:

Once the source carrier is lowered to the desired position, verify that the source capsule is correctly located for optimal measurement accuracy. Use the detector output to confirm proper placement by observing stable and expected readings based on application requirements. Any deviation from expected output values may indicate that the source capsule requires repositioning. Adjust as necessary using the winch controls to fine-tune the source capsule's location and continue to monitor the detector output until stable and correct readings are achieved.

- Once the source carrier(s) are properly located inside the process vessel, ensure that the positive stop cable markers are installed on the respective source carrier cable. These are used to ensure that the source carrier can be reposition in a repeatable fashion. It is expected that source carriers will need to be periodically withdrawn into the shielding of the SHLM to support vessel maintenance activities, and the relocation for the source carrier is imperative to maintain instrument calibration after redeployment.

  The cable markers are included with the new SHLM shipment and require a hex key to secure them to the source carrier cable.

3. **Retrieving the Source Carrier**:

    - To remove the source carrier, reverse the winch operation to reel the cable up, ensuring a controlled retraction of the source carrier assembly. The source carrier will reach a mechanical stop inside the shielding body of the source holder. A survey meter can also be used to ensure the source carrier(s) is fully retracted into the shielding body of the source holder.

    - Reinsert the locking rod upon retraction to secure the carrier assembly for transport or maintenance. If the source is expected to be out of service for a prolonged period of time, then site Lock Out Tag Out procedures should be followed to isolate the radiation source capsule as an energy source during maintenance activities.

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 their presence is required 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 the detector, omni-directionally, one foot from the surface.
3. If the radiation field is standard, 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"), post restrictions of the area, if required.
5. Verify with the manufacturer that this condition is standard 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.
5. Wipe the locations where contamination would most likely accumulate in the event the source capsule was leaking.
6. Place the swab stick into the zip-top plastic bag and close the bag.
7. 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 touching the tip could spread contamination if the source is leaking. If the swab stick contains a significant amount of radioactive material, send an emergency notification through an email message or 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 with the shutter in the closed (OFF) position and then with the shutter in the open (ON) position.
3. Perform 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 5,000 mSv (500 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 the 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.

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 the 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 at 1-844-VEGA-NOW (1-844-834-2669) if there is damage to the source holder.

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 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 assists in maintaining the source holder in good working order.

The actuator should move easily, but not necessarily freely. There is 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, do not remove the source holder without consulting the manufacturer.

7 Maintenance

Th SHLM CXx and SHLM CPx source holders contain 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 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.
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.

7.2 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

7.3 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.
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.

Item	Action to Take
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 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.

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

NOTES

7.4 Spare Parts

Spare parts are available directly from the VEGA Parts and Repairs Department for U.S. and Canadian installations. Countries outside the U.S. and Canada may purchase parts through their local VEGA representative.

7.5 Equipment Repair

To request source holder repair within the United States and Canada, contact an VEGA Americas Field Service Engineer.

Contact Information	Telephone Numbers
Monday through Friday, 8:00 A.M. - 5:00 P.M. EST (Eastern Standard Time)	1-513-272-0131
For emergencies after hours, call the number listed and follow the voice mail instructions.	1-513-272-0131

Repair Information

When calling VEGA Americas for repair, have the following information available:

- Product model that is being repaired.
- Description of the problem.
- VEGA Americas Customer Order (C.O.) Number.
- Purchase Order Number for the repair service.
- Shipping address.
- Billing address.
- Date needed.
- Method of shipment.
- Tax information.

NOTES

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 persons 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.
- Make sure the cable is retracted on applicable source holders.
- 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. Canadian 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 Specifications

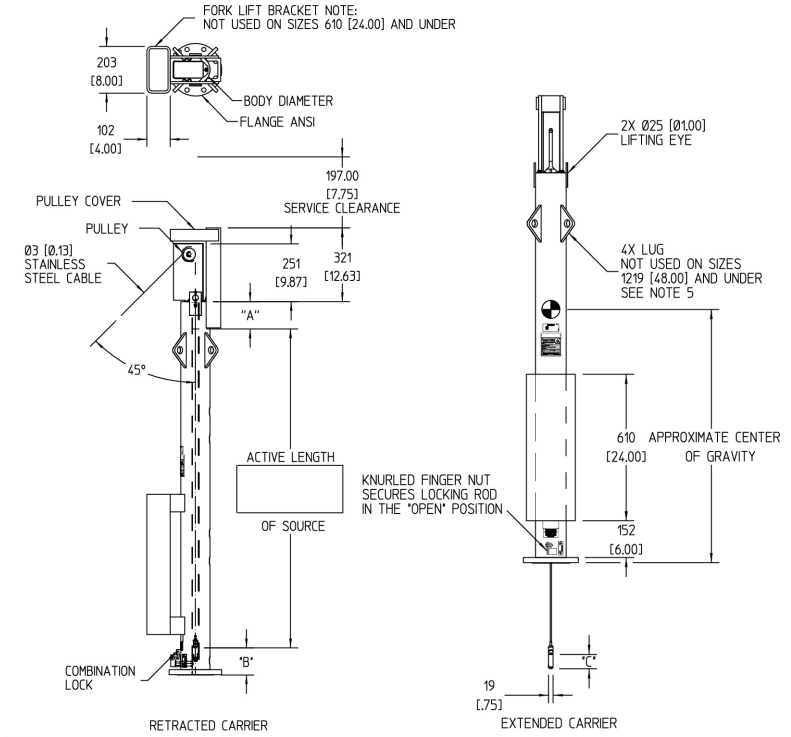
The following technical data provides a description of the attributes specific to your source holder. In addition, the dimensions provide the detailed length, width, and height of your source holder.

Technical Data

Maximum Cs-137 Activity	37 GBq (1000 mCi) for 50 uSv@305 mm (5mR/hr@12") 5 Ci for point sources 25 Ci total and 12 Ci/ft for multi-point sources
Maximum C0-60 Activity	1.85 GBq (5 mCi) for 50 uSv@305mm (5mR/hr@12") 500 mCi for point sources 500 mCi total and 50 mCi/ft for multi-point sources
Fire Resistance	+538 °C (+1000 °F) for 5 minutes
Temperature	-40 … +60 °C (-40 … +140 °F)
Vessel Temperature (Maximum Operating)	+260 °C (+500 °F) Consult factory, if exceeded. +538 °C (+1000 °F) Optional Haynes 230 capsule
Weight	See drawing
Housing Versions	Low carbon steel with polyester powder coating, Stainless steel
Materials - Shielding - Cable	 Lead Stainless, Hastelloy, or Iconel are available.
Temperature	-20 °C ... +50 °C (-4 °F ... +122 °F) extended temperature options available
Humidity	0-100%, non-condensing
Vibration	Tested to IEC 68-2-6, IEC 68-2-27, and IEC 68-2-36

Life Expectancy	20 years
Pressure	Atmospheric
Vibration	Mild (less than 5g)
Corrosion	Mild
Licensing	Any use of the source holder requires a specific license.
Leak Test	At least once every 36 months
Shutter or Cable Test	At least once every 6 months
Transfer and Disposal	The 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 to perform this work.
Handling, Installation, and Storage	You may not commission/install the source holder into service. Only a specifically licensed person may perform this service.
Storage	Whenever you remove 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.

9.2 Dimensions SHLM CXx

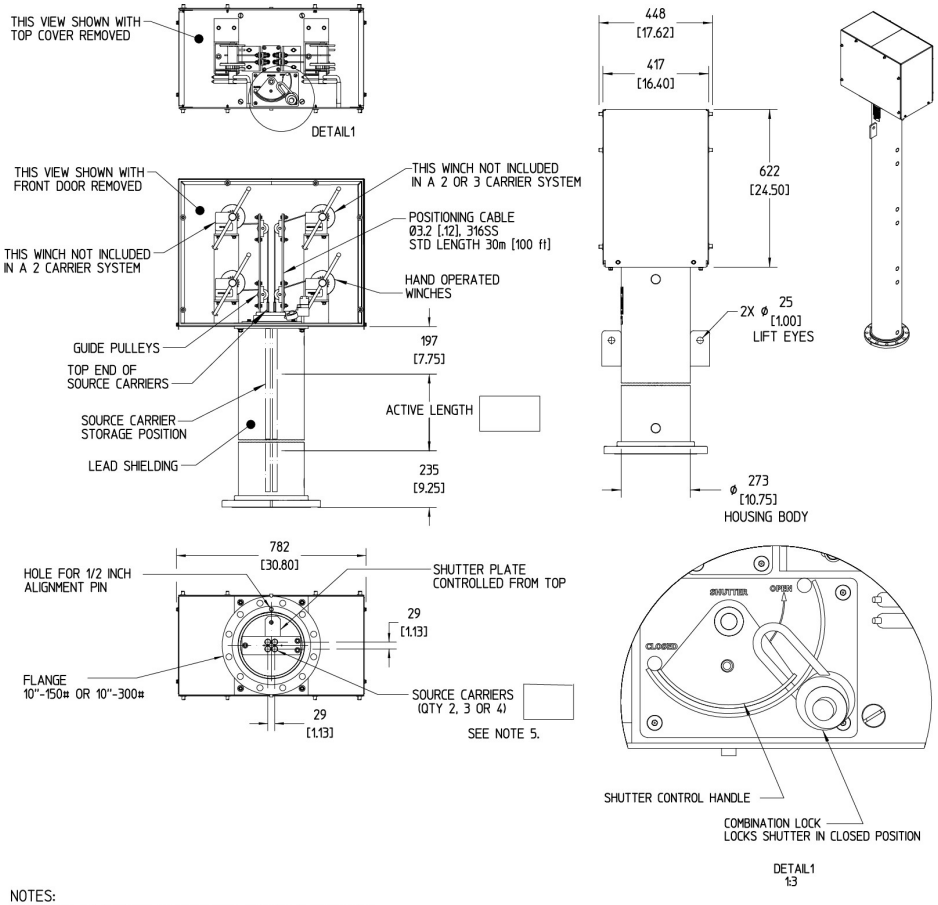


NOTES:
1. SOURCE HOLDER IS DESIGNED TO MEET ANSI N43.8 2008: 54-SSS-353-R2 AND ISO 7205-1986(E): B2-23SS-34-4-2.
2. VIBRATION APPLIED TO SOURCE HOLDER SHALL NOT PRODUCE AN ACCELERATION GREATER THAN 1 g.
3. DO NOT INSERT LOCKING ROD UNLESS SOURCE CARRIER HAS BEEN TOTALLY RETRACTED INTO THE SOURCE HOLDER LOCKING ROD MAY BE SECURED IN THE "OFF" POSITION BY MEANS OF A PADLOCK (ROD IS LOCKED OFF FOR SHIPPING).
4. STANDARD LENGTH FOR CABLE IS 15240mm [50 ft]. CABLE MAY BE ORDERED LONGER IF NECESSARY.
5. EXTERNAL SUPPORT (SUPPLIED BY CUSTOMER) IS RECOMMENDED ON ALL INSTALLATIONS. HEIGHT OF SHLM AND NOZZLE SIZE DICTATE ACTUAL REQUIREMENTS. EXTERNAL SUPPORT TO BE RIGIDLY MOUNTED TO VESSEL. DO NOT REST SHLM ON LUGS.
6. ACTIVE LENGTHS FOR THIS SOURCE HOLDER ARE 152 [6.00] TO 3048 [120.00] IN 152 [6.00] INCREMENTS.
7. APPROXIMATE CENTER OF GRAVITY: (A.L. + "A" + "B")/2.
8. APPROXIMATE WEIGHT: SHLM.CX1 = 41 kg [90 lb] + 4 kg [8 lb] X A.L. [INCHES]*
SHLM.CX2 = 86 kg [190 lb] + 6 kg [13 lb] X A.L. [INCHES]*
SHLM.CX3 = 147 kg [323 lb] + 10 kg [23 lb] X A.L. [INCHES]*
*ADD 27 kg [59 lb] TO UNITS OVER 610 [24.00] IN LENGTH.

		SHLM.CX1	SHLM.CX2	SHLM.CX3
BODY DIA.		127 [5.00]	168 [6.63]	219 [8.63]
FLANGE ANSI		4" - 150 lb	6" - 150 lb	8" - 150 lb
APPROX. WEIGHT		SEE NOTE 8	SEE NOTE 8	SEE NOTE 8
CENTER OF GRAVITY		SEE NOTE 7	SEE NOTE 7	SEE NOTE 7
"A"	A.L. 60" & LESS	97 [3.81]	114 [4.50]	140 [5.50]
	A.L. OVER 60"	116 [4.56]	133 [5.25]	159 [6.25]
"B"	A.L. 60" & LESS	155 [6.13]	171 [6.75]	197 [7.75]
	A.L. OVER 60"	174 [6.88]	190 [7.50]	216 [8.50]
"C"	END PLUG 1 SOURCE	73 [2.88]	89 [3.50]	114 [4.50]
	END PLUG >1 SOURCE	92 [3.63]	108 [4.25]	132 [5.19]

Figure 9.1 SHLM CX Source Holders with Multiple Point Sources

9.3 Dimensions SHLM CPx



NOTES:
1. WEIGHT OF SOURCE HOLDER PER SHIELDED DIAMETER:
   Ø5" SHIELDING, SHLM-CP1, APPROXIMATE WEIGHT EQUAL TO:
      ACTIVE LENGTH mm X .2 kg/mm + 163 kg
      ACTIVE LENGTH in X 11.5 lb/in + 360 lb
   Ø6" SHIELDING, SHLM-CP2, APPROXIMATE WEIGHT EQUAL TO:
      ACTIVE LENGTH mm X .3 kg/mm + 190 kg
      ACTIVE LENGTH in X 15.2 lb/in + 420 lb
   Ø10" SHIELDING, SHLM-CP4, APPROXIMATE WEIGHT EQUAL TO:
      ACTIVE LENGTH mm X .65 kg/mm + 331 kg
      ACTIVE LENGTH in X 36.3 lb/in + 730 lb
2. SOURCE HOLDER MATERIAL IS LOW CARBON STEEL WITH POWDER-COAT FINISH (STAINLESS STEEL OPTION AVAILABLE).
   SOURCE CARRIER AND OTHER UNFINISHED PARTS ARE MADE OF STAINLESS STEEL.
   WINCHES ARE STEEL WITH ZINC CHROMATE FINISH (STAINLESS STEEL OPTION AVAILABLE).
3. SOURCE HOLDER IS DESIGNED TO MEET ANSI N43.8 2008: 54-SSS-454-R2
   AND ISO 7205-1986(E), B2-23SS-34-4-1
4. VIBRATION APPLIED TO SOURCE HOLDER SHALL NOT PRODUCE AN ACCELERATION GREATER THAN 1g.
5. SEE APPLICATION-SPECIFIC DRAWING FOR SOURCE CARRIER CONFIGURATION.

Figure 9.2 SHLM CP Source Holders with Multiple Point Sources

9.4 Accessories

Accessory	Description	Part Number
Leak Test Kit	Leak test kit for one source holder. Includes swab, shipping container, instructions, analysis and report	229555
Signage	"Caution Radioactive Materials" warning sign	238911
Survey Meter	General purpose digital survey meter	245644
Survey Meter	Model 2402 general purpose survey meter with scintillator probe and 1 m cable	240943

NOTES

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

3877 Mason Research Parkway | Mason, OH 45036 | USA

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.

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