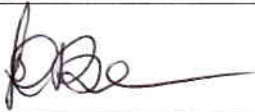





Operating and Maintenance Instructions for the 3746B

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1. General

- 1.1 This document provides the minimum information to operate this container. Operators are advised to create their own procedures and checklists to ensure they comply with all internal and external safety and regulatory requirements.
- 1.2 This document must be available to all personnel operating this container.
- 1.3 This document must be read in conjunction with 'Safety Information and Instructions' HI 018, a copy of which must accompany each shipment.
- 1.4 The container may only be handled by personnel who are so authorised.
- 1.5 The container may only be used for purposes agreed in writing by QSA Global.
- 1.6 Any modifications or repairs without the written permission of QSA Global will invalidate the transport license.
- 1.7 Do not lift the drum or pot manually. Use mechanical assistance such as a crane, hoist or fork-truck.

2. Description

- 2.1 The container comprises drum, cork packing and lead pot. The drum and cork protect the pot which provides the radiation shielding.
- 2.2 The pot has a core shield that may be tungsten or depleted uranium (DU) depending on the shielding required.
- 2.3 The drum with pot weighs 54 kg and is 325 mm diameter by 405 mm high. The pot weighs 43 kg and is 160 mm diameter by 200 mm high.



Figure 1: Ready for shipment

3. Contents

3.1 The 3746B can carry up to four, 180-190mm long, source holders for industrial radiography devices. The Type B transport license specifies the maximum allowable activity of the contents. The table below gives the approximate surface dose rate to expect for each core shield.

Core Shield	Typical Surface Dose Rate (mSv/h)	
	Ir-192	Se-75
P558 (Tungsten)	1.0 (3.4 TBq*)	<0.005
P954 (DU)	1.0 (7.4TBq*)	<0.005

* Output activity.

Should both radionuclides be carried, the sum of the proportions of each with respect to the maximum licensed activity must not exceed one.

- 3.2 Only sources licensed as Special Form material may be carried.
- 3.3 Non-fixed contamination levels must not exceed 4Bq/cm² (beta-gamma) or 0.4Bq/cm² (alpha).
- 3.4 Pots with a DU core shield will be labelled to that effect. The shield must not be damaged, cut into or disposed of in any way.



Figure 2: The lead pot

4. Loading with new sources

- 4.1 Check container has completed turnaround inspection and annual maintenance is not due before shipment is completed.
- 4.2 Remove clamp-band, drum lid and cork cap.
- 4.3 Select core shield required. If it contains DU check that the casing is not swollen.
- 4.4 Assemble insert in pot (using lead spacers as necessary under core shield to ensure insert tubes do not foul the top of the pot).
- 4.5 Replace securing screws (use shims as necessary to ensure insert is lightly gripped).
- 4.6 Check pot carries a warning label if core shield contains DU.
- 4.7 Fit a source identity tag to the neck of each tube to be loaded. If loading two sources use opposite locations to minimise dose rates. Ensure there is an empty source tube to accommodate the first returned source if there is to be a source exchange.
- 4.8 Move pot into shielded cell.
- 4.9 Insert each source holder as far as it will go into the tube and check the top of the connector is not underflush.
- 4.10 Record each source number against the tube number on loading chart in HI 018.
- 4.11 Remove pot from cell and label with contents and date.
- 4.12 Check pot for contamination (see paragraph 3.3 for acceptance levels).
- 4.13 Fit a short cap if the connector protrudes less than 12mm, i.e. 174-194mm overall length, or a long cap if less than 25mm, i.e. 187-207mm overall length, and tighten finger tight.
- 4.14 Replace cover plate and tighten screw to a torque of 8 to 10 Nm.
- 4.15 Replace pot in drum.
- 4.16 Replace cork cap and place any relevant documentation (including HI 018) on top.
- 4.17 Replace drum lid and fit clamp band, with wider flange on top. Tighten clamp screw, whilst gently tapping around the rim, to a torque of 8 to 10 Nm. When correctly fitted gap between ends should be less than 15 mm.
- 4.18 Check radiation level on drum does not exceed 2 mSv/h. If there are any unusually high readings check pot has been correctly assembled (unloading may be necessary).
- 4.19 Attach temporary label describing contents.
- 4.20 Fit non-reusable security seal through holes in clamp band end bosses, or hole in clamp screw, so drum cannot be opened without breaking seal (see Figure 3).
- 4.21 Move container to designated area to await dispatch. See Section 5 for shipment instructions.

5. Dispatching a loaded container

- 5.1 Check drum for contamination (see paragraph 3.3 for acceptance levels).
- 5.2 Measure highest surface dose rate. Determine transport category from table below. Se-75 shipments should never exceed 0.005mSv/h (0.5mrem/h) and so should always be Category I.
- 5.3 Measure highest dose rate at one metre in mSv/h. Multiply value obtained by 100 and round up to 1 decimal place. This is the Transport Index (TI). If less than 0.05 it may be taken as zero. Determine transport category from the table below.
- 5.4 The transport category is the higher of the two determined above.

Surface Radiation not exceeding (5.1)		Transport Index (5.2)	Transport Category
0.005 mSv/h	(0.5 mrem/h)	0	I
0.5 mSv/h	(50 mrem/h)	1.0	II
2 mSv/h	(200 mrem/h)	10.0	III

- 5.5 The dose rate on the drum should not exceed 2 mSv/hr if it has been correctly assembled.
- 5.6 Mark nuclide, activity and TI on two category labels and attach to opposite sides of the drum.
- 5.7 If it is a Type A shipment cover over the “TYPE B” markings on the stainless steel identity plate with “TYPE A” labels but do not obscure the weight markings.
- 5.8 Attach a ‘Goods To’ address label and any other applicable transport labels.
- 5.9 Prepare shipment documentation according to the requirements of the shipment mode and the shipping agent to be used (consult specialist freight forwarders for advice if necessary). Note:
 - If the total activity exceeds 1.0 TBq (27Ci) of Ir-192 or 3.0 TBq (81Ci) Se-75 the UN number and proper shipping name are “UN 2916 – RADIOACTIVE MATERIAL, TYPE B(U) PACKAGE”.
 - If the total activity does not exceed 1.0 TBq (27Ci) of Ir-192 or 3.0 TBq (81Ci) Se-75 the UN number and proper shipping name are “UN 3332 – RADIOACTIVE MATERIAL, TYPE A PACKAGE”.

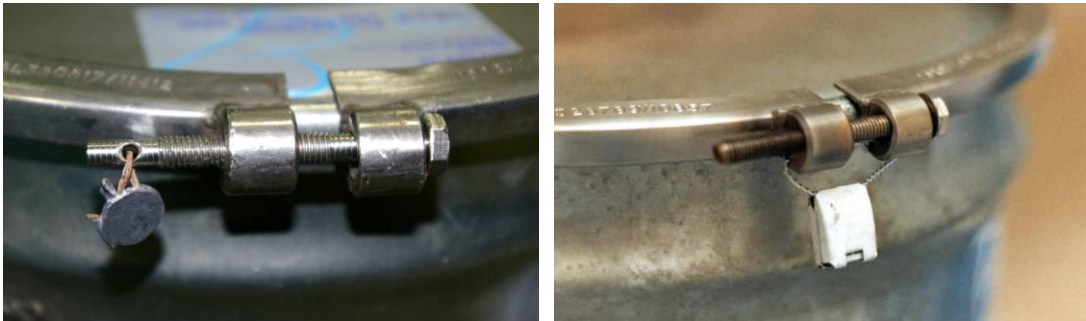


Figure 3: Typical security seals

6. Dispatching an empty container

6.1 An unloaded container may be described as an Excepted Package when:

- The radiation level on the drum is less than 5 $\mu\text{Sv/h}$;
- Internal contamination levels do not exceed 400Bq/cm² (beta-gamma) or 40Bq/cm² (alpha);
- External levels do not exceed 0.4Bq/cm² (beta-gamma) or 0.04Bq/cm² (alpha);

6.2 The UN number and proper shipping name with a lead or tungsten core shield are: “UN 2908 – RADIOACTIVE MATERIAL, EXCEPTED CONTAINER – EMPTY PACKAGING”.

6.3 The UN number and proper shipping name with a DU core shield (pot will be labelled) are “UN 2909 – RADIOACTIVE MATERIAL, EXCEPTED CONTAINER – ARTICLES MANUFACTURED FROM DEPLETED URANIUM”.

For further details on dispatch see Safety Information and Instructions, HI 018.

7. Shippers notes

7.1 Tie-down: The container must be adequately restrained from movement within the conveyance. Straps must have a working load limit at least 100 kg or a breaking load of at least 650 kg. They must be attached to the drum handles and strong points on the vehicle. Chocks should also be used to prevent slippage. Cargo netting may be used as an alternative method of tying down.

7.2 Stowage: The container may be stowed with general non-hazardous cargo with no special precautions provided it is not prohibited by other regulations.

7.3 Emergency Instructions. The consignor must ensure that the carrier is provided with appropriate emergency instructions. In the event of an emergency during consignment follow the instructions but in any event notify the police in the first instance together with such other emergency services are appropriate.

8. Unloading directly into a projector

8.1 Follow the Safety Information and Instructions, HI 018. If you do not have a copy contact QSA Global or their agent.

8.2 Empty returns: Reassemble pot into drum and securely tighten clamp band screw. See Section 6 for shipment instructions.

8.3 Source returns: Go to Section 10.

9. Unloading in a shielded cell

- 9.1 Check shipping documentation has correct details for expected contents.
- 9.2 Use audible personal gamma alarms as well as a package monitor.
- 9.3 Check security seal shows no signs of tampering – if it does report to supervisor and consignor.
- 9.4 Remove security seal, clamp band and drum lid.
- 9.5 Confirm any paperwork inside the drum complies with shipping documentation. If there is any discrepancy notify consignor.
- 9.6 Remove cork cap. Monitor for contamination and radiation.
- 9.7 Move pot to the handling cell (do not tip drum on side to remove pot).
- 9.8 Remove cover plate.
- 9.9 Remove source identity tags and all four cap nuts.
- 9.10 Move pot into handling cell and close shield door.
- 9.11 Use source loading record to identify holes containing sources.
- 9.12 Transfer source(s) into storage.
- 9.13 Check all tubes are empty.
- 9.14 Remove pot from cell.
- 9.15 Check pot for contamination (see paragraph 3.3 for acceptance levels).
- 9.16 Replace tube caps, cover plate and securing screw.
- 9.17 Replace pot and cork cap in drum.
- 9.18 Replace lid and clamp band (check wider flange is on top).
- 9.19 Tighten clamp band screw.
- 9.20 Remove all temporary labels and affix an 'Empty' label.
- 9.21 Move container to designated area for turnround inspection. It may not be used for further shipment until it has cleared this.

10. Returning spent sources

- 10.1 Do not dismantle beyond that described below.
- 10.2 Remove clamp-band, drum lid and cork cap.
- 10.3 Move pot to loading area.
- 10.4 Monitor pot during the following actions in case it contains a source.
- 10.5 Remove cover plate and the cap from each tube being loaded.
- 10.6 Check with a dummy holder each hole is empty.
- 10.7 Transfer each holder into pot following instructions in Safety Instruction booklet, HI 018.
- 10.8 Replace each cap and the cover plate and securing screw.
- 10.9 Attach label to pot describing contents and loading date.
- 10.10 Check pot for contamination (see paragraph 3.3 for acceptance levels).
- 10.11 Replace pot in drum.
- 10.12 Replace cork cap and lay any relevant shipping or packaging documentation on top.
- 10.13 Fit drum lid and clamp band with wider flange on top. Tighten screw to a torque of 10 N.m (1 kgf.m) at the same time gently tapping around rim. When correctly fitted gap between ends should be less than 15 mm.
- 10.14 Attach temporary label describing contents.
- 10.15 Thread non-reusable security seal through holes in end bosses, or hole in clamp screw, so drum cannot be opened without breaking seal, see Figure 3.
- 10.16 See Section 5 for shipment instructions.

Appendix A

Turnround Inspection

A.1 General

- 1) Turnround inspection must be completed before a container may be used for a shipment.
- 2) The inspection is primarily visual and must be carried out by a competent person at QSA Global or by a person or organisation approved by QSA Global as an agent.
- 3) A written record, such as a checklist, signed and dated by the inspector, must be made. It must include the principal inspection actions and the serial numbers of the drum and the pot.
- 4) Replacement components must be obtained from QSA Global or their approved agent. Repairs may only be carried out by QSA Global or their approved agent.
- 5) Any doubts regarding component compliance or serviceability must be resolved by QSA Global or their approved agent.
- 6) Inspection must be carried out in a clean, well lit area.

A.2 Procedure

- 1) Monitor for contamination before and as dismantling proceeds (see paragraph 3.3 for acceptance levels).
- 2) Check documentation that container is empty.
- 3) Check stainless steel drum label is securely attached.
- 4) Check drum and lid for damage.
- 5) Check clamp-band screw operates smoothly.
- 6) Check clamp band is not damaged and end welds are not cracked.
- 7) Check lid fits cleanly on drum.
- 8) Check drum handles are not damaged and are securely attached.
- 9) Check cork cap lifts out freely and is dry and free from damage.
- 10) Check by monitoring pot does not contain a source then confirm by inspection.
- 11) Check pot lifting links are not damaged and are securely attached.
- 12) Check lifting lugs welds are not cracked.
- 13) Check pot cover plate and securing screw are not damaged.
- 14) Check cap nuts screw freely onto tubes.
- 15) Remove all temporary labels from drum and pot except “Empty”, “Maintenance Due” and DU warning, if fitted.
- 16) Reassemble container and label as having passed turnround inspection.
- 17) Sign off inspection record, distribute as necessary and file.

Appendix B

Annual Maintenance

B.1 General

- 1) Scheduled inspection must be carried out at intervals not exceeding twelve calendar months.
- 2) The inspection is primarily visual and must be carried out by a competent person at QSA Global or by a person or organisation approved by QSA Global as an agent.
- 3) A written record, such as a checklist, signed and dated by the inspector, must be made. It must include principal inspection actions and drum and pot serial numbers. A copy must be kept by QSA Global.
- 4) If there is any doubt concerning the serviceability of a component it must be replaced or repaired. Replacement components must be obtained from QSA Global or their approved agent. Repairs may only be carried out by QSA Global or their approved agent.
- 5) Inspection must be carried out in a clean, well lit area.

B.2 Procedure

- 1) Notes:
 - Container must first be completely dismantled and checked for contamination (see paragraph 3.3 for acceptance levels).
 - Check with documentation pot does not contain a source. As dismantling proceeds confirm by monitoring pot is empty then finally confirm by inspection.
 - Remove all temporary labels from drum and pot except “Empty”, “Maintenance Due” and DU warning, if fitted.
 - Remove all adhesive residue, spirit pen markings, discoloration and surface dirt.
- 2) Drum and lid:
 - Check stainless steel label is legible and secure.
 - Check lid fits freely.
 - Check reinforcing bars beneath base are securely attached.
 - Check base is not split.
 - Check handles are not distorted and are firmly secured. If there is any doubt use liquid penetrant.
 - Check for corrosion. If plating is no longer effective prepare surface and apply nominal 70µm coat of silver grey polyester powder (e.g. Interpon 610) in accordance with manufacturer’s instructions.
- 3) Clamp band:
 - Check batch marking is legible.
 - Check end welds are not cracked. If there is any doubt use liquid penetrant..
 - Check screw is not worn or damaged.

- 4) Cork:
 - Check identity markings are legible.
 - Check base and cap fit freely together in drum and around pot.
 - Check they are not wet, mouldy, crumbling or cracked.
- 5) Pot:
 - Check identity marking “3018/nn” is legible.
 - Check internal cavity is clean and free from damage.
 - Check lifting links are not damaged and are securely attached.
 - Check base and lugs welds are not cracked. If there is any doubt use liquid penetrant.
- 6) Cover plate and securing screw:
 - Check identity marking is legible.
 - Check plate is not damaged or distorted.
 - Check screw thread is not worn or damaged.
 - Check fit onto pot.
- 7) Insert:
 - Check identity marking is legible.
 - Check insert fits pot freely.
 - Check components are not damaged or corroded.
 - Check tube and cap nut threads are not worn or damaged.
 - Check tubes are clean and clear inside.
- 8) Core shield:
 - Check identity marking is legible.
 - Check shield fits pot and insert freely.
 - Check shield is not damaged or corroded.
 - DU shields:
 - Wipe-test to confirm absence of alpha contamination.
 - Confirm absence of distortion or swelling.
 - Check welds for cracks. If there is any doubt use liquid penetrant.
- 9) Re-assembly:
 - Replace core shield and insert (using lead spacers as necessary under core shield to ensure insert tubes do not foul the top of the pot).
 - Replace securing screws (use shims as necessary underneath ends to ensure insert is lightly gripped), ensuring threads are lightly coated with anti-seize lubricant, and tighten securely.
 - Check pot carries a warning label if core shield contains DU.
 - Replace cap nuts.

- Replace cover plate and screw ensuring thread is lightly coated with anti-seize lubricant.
- Replace base cork and pot in drum.
- Replace cork cap, drum lid, clamp band and screw ensuring thread is lightly coated with anti-seize lubricant.
- Update “Maintenance Due” label on drum and move container to storage area.
- Sign off inspection record, send a copy to QSA Global and file.