

Shipping of LiH pellets from University of Turin and Thales Alenia Space to GSI

INSTRUCTIONS FOR USE

0. List of the items that need to be present at GSI before the delivery of the package

- Personal protective equipment (PPE): gloves, lab safety goggles, mask, lab coat.



- Inert gas bottle (argon or nitrogen), pressure reducing valve, gas pipes.

1. Receiving the package

- 1.1. Open the cardboard box without damaging it. The same box will be used for the returning the samples to the University of Turin at the end of the measurements slot.



- 1.2. On the top you will find the following documents:

- Safety Data Sheet (SDS) in English, German and Italian.
- Envelope containing the transport document for the return shipping.
- Envelope containing spare documents to be used only in case of need (UN 1414 labels for the external side of the cardboard box; labels in English and Italian for the containers with the samples; empty envelope for the transport document).

1.3. Read the Safety Data Sheet (SDS) before any other action.

1.4. Verify the presence of the following items:

- Sealed transparent plastic bag containing two rigid plastic containers immersed in the absorbing filler (container A is empty and will be used for the return shipping of LiH samples of batch 1, already present at GSI; container B with LiH samples of batch 2). Each container is further sealed in a single plastic bag.
- 3 glove bags (one for handling samples of batch 1 in container A; one for handling samples of batch 2 in container B; a spare one).
- A second plastic bag for return shipping in the case the transparent plastic bag is damaged during opening procedure.



1.5. Keep the fillers (both the inert and the absorbing ones) for the return shipping.

1.6. Before starting any other action (e.g. opening sealed transparent bag containing containers A and B, opening container B with samples, etc.) read carefully all the instructions list.

2. **Handling of the LiH samples at GSI**

2.1. Handling LiH samples (even if sealed in plastic envelopes) always requires the use of the Personal Protective Equipment (PPE).

2.2. Before opening the sealed transparent plastic bag with containers A and B, install the glove bag according to point 5 of the instructions list. The glove bag must be ready in advance to face safely any possible emergency.

2.3. Open carefully the sealed transparent plastic bag with containers A and B.

2.4. Remove the absorbing filler and keep it in the empty transparent plastic bag (the absorbing filler and the transparent plastic bag will be used for the return shipping).

2.5. Insert in the glove bag container A (open) together with stopper and screw tap.

2.6. Open container B with samples of batch 2. Samples are brittle, therefore they should be handled with care.

- 2.7. Take out carefully the envelopes containing the samples one by one. Take a picture of each sample in the envelope. Samples are in form of pellets.
- 2.8. Verify that each envelope is vacuum tight sealed and the pellets are not broken or damaged.
Repeat this procedure once a day.
- 2.9. If any envelope is damaged or is not vacuum tight sealed, insert them into the glove bag (point 4 of the instructions list).
- 2.10. Proceed with measurements on the samples.

3. **How to prepare the return shipping**

Note: it would be convenient using a different glove bag for each batch.

3.1. Container B for samples of batch 2 (not damaged)

- a) Open the zipper-lock of the glove bag.
- b) Flow inert gas in the glove bag.
- c) Insert in the glove bag container B (open), stopper, screw tap, envelopes with samples (not damaged).
- d) Let flow the gas inside the glove bag (one minute). Let flow the gas inside container B.
- e) Close the zipper-lock of the glove bag and inflate glove-bag with inert gas to a very soft pillow level, then turn off the gas valve.
- f) Open partially the zipper-lock of the glove bag to allow the gas to escape. Deflate the glove bag by pushing down on bag with hands to force gas out (carefully!).
- g) Close the zipper-lock of the glove bag and inflate glove-bag with inert gas to a very soft pillow level, then turn off the gas valve.
- h) Repeat points f) and g) 3 times.
- i) Insert carefully in container B the envelopes with the samples of batch 2. Envelopes need to be partially (and gently) folded in order to fit into the entrance of the container.
- j) Seal container B with its stopper and screw tap.
- k) Open the zipper-lock of the glove bag and take out container B.
- l) Fold the empty glove bag.

3.2. Container A for samples of batch 1 and possible damaged samples of batch 2

- a) Open the zipper-lock of the glove bag. Container A is already inside together with stopper and screw tap. At this point there are two possible cases:
 - a.1. There are not damaged samples of batch 2: container A is open (see point 2.5).
 - a.2. There are damaged samples of batch 2: container A is sealed (see point 4.9).
- b) Flow inert gas in the glove bag.
- c) Insert in the glove bag envelopes with samples of batch 1.
- d) Let flow the gas inside the glove bag (one minute).
- e) Close the zipper-lock of the glove bag and inflate glove-bag with inert gas to a very soft pillow level, then turn off the gas valve.
- f) Open partially the zipper-lock of the glove bag to allow the gas to escape. Deflate the glove bag by pushing down on bag with hands to force gas out (carefully!).

- g) Close the zipper-lock of the glove bag and inflate glove-bag with inert gas to a very soft pillow level, then turn off the gas valve.
- h) Repeat points f) and g) 3 times.
- i) Insert carefully in container A the envelopes with the samples of batch 1. Envelopes need to be partially (and gently) folded in order to fit into the entrance of the container.
- j) Seal container A with its stopper and screw tap.
- k) Do not extract container A from the glove bag (it might be contaminated with LiH powder).
- l) Remove tubing connectors (point 5.3.a) and seal the small opening with adhesive tape.
- m) Open partially the zipper-lock of the glove bag to allow the gas to escape. Deflate the glove bag by pushing down on bag with hands to force gas out (carefully!).
- n) Close the zipper-lock of the glove bag.
- o) Fold the glove bag with container A (closed) inside.

3.3. Use the cardboard for separating the external filler from the transparent plastic bag containing the absorbing filler. Initially, leave 2 cm of absorbing filler on the bottom (the lower distance between the samples and the external cardboard must be 2 cm).



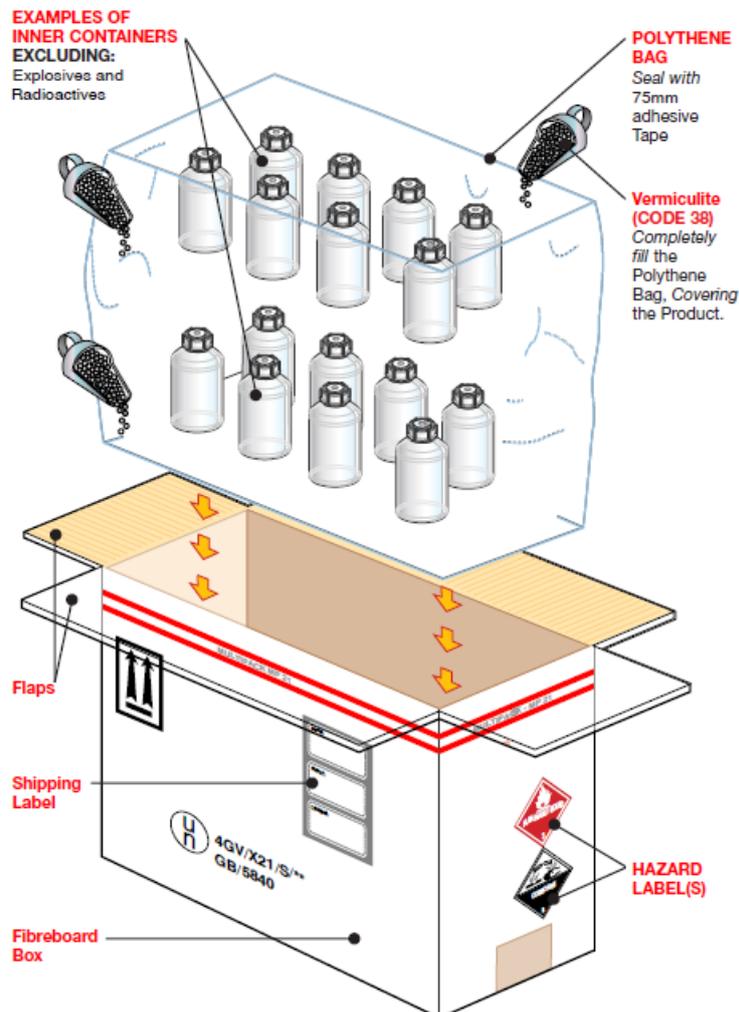
3.4. Insert the container B (containing undamaged samples of batch 2) and the folded glove bag with container A (with samples of batch 1 and possible damaged samples of batch 2) into the plastic bag with 2 cm of absorbing filler on the bottom.

3.5. Add the remaining absorbing filler and cover completely the container and the folded glove bag.





- 3.6. Seal with adhesive tape the transparent plastic bag.
- 3.7. Insert Safety Data Sheet (SDS).
- 3.8. Seal the cardboard box with adhesive tape.
- 3.9. Add transport document for the return shipping on the external side of the cardboard box.
- 3.10. Ship the package with courier (contact us for organizing the shipping).

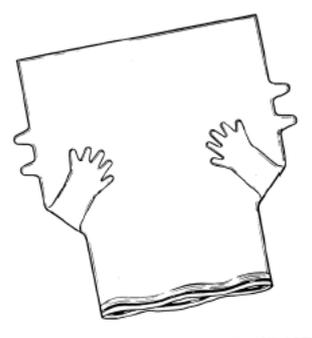


4. **In case of emergency (e.g. leakage of LiH powders, fracture of the vacuum tight sealed envelopes)**

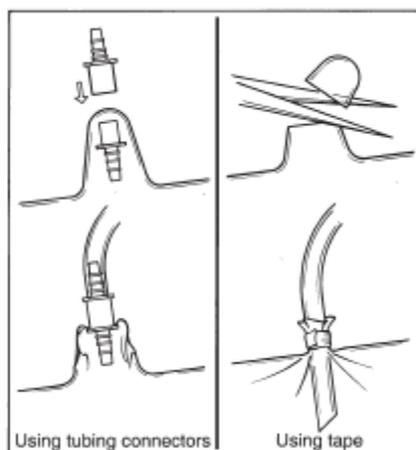
- 4.1. Follow the instructions reported in the Safety Data Sheet (SDS).
- 4.2. To face safely any possible emergency it is necessary that
 - the glove bag is already installed and containing an inert gas atmosphere;
 - container A (open) is already inside the glove bag together with its stopper and screw cap.
- 4.3. Do not inhale the powder, avoid contact with skin and eyes.
- 4.4. Do not use water.
- 4.5. Check to wear the Personal Protective Equipment (PPE) and pick up possible spilled material.
- 4.6. Insert in the glove bag the spilled material and/or the broken envelope with the pellet.
- 4.7. Close the zipper-lock of the glove bag and inflate glove-bag with inert gas to a very soft pillow level, then turn off the gas valve.
- 4.8. Working under inert gas atmosphere in the glove bag, insert in container A the spilled material and/or the broken envelope with the pellet.
- 4.9. Seal container A with stopper and screw cap.
- 4.10. Do not remove container A from the glove bag (it might be contaminated with LiH powder).

5. **How to use the glove bag (extracted from instructions given by Sigma Aldrich)**

- 5.1. Select appropriate work area. Unfold AtmosBag with open end towards you and place on a non-porous bench top or inside a fume hood when handling toxic materials to prevent and protect against exposure resulting from leakage. Check operation of Zipper-lock (if equipped) to ensure that track opens and closes properly. **Note:** *Zipper-lock track can distort if creased or folded excessively making closure of the bag difficult. Track distortion will usually self-correct if Zipper-lock is closed and allowed to remain flat for a period of time.*



- 5.2. Connect purge gas. Inlets are located on each side of the bag for these connections. PE connectors are available for making gas and vacuum connections with flexible tubing. Tape, wrap-it ties, or rubber bands are used to seal tubing connections on Tape-seal AtmosBags.



5.3. a) Installing tubing connectors for Zipper-lock AtmosBags:

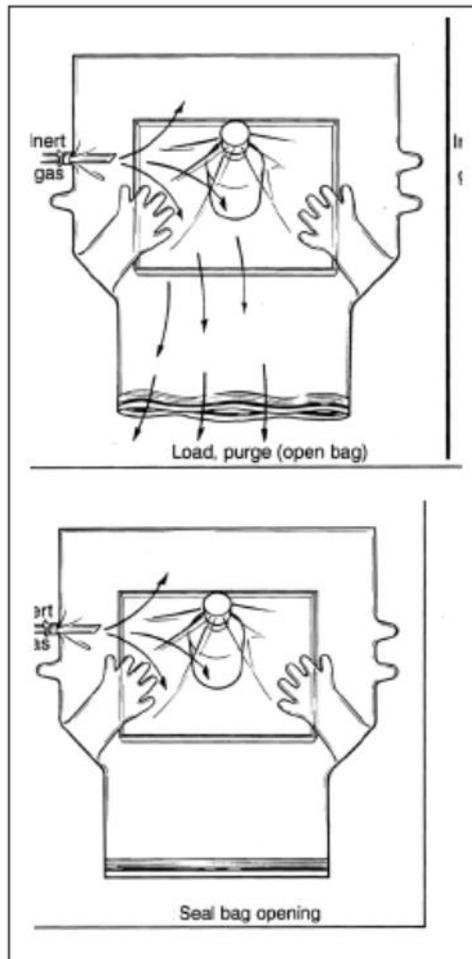
- Snip end of bag inlet with scissors to make a very small opening.
- Separate two-piece tubing connector. Position one end inside of bag inlet and the other outside of bag inlet.
- Push connector pieces together firmly.
- Connect AtmosBag to purge gas source

5.3. b) Installing tubing for Tape-seal AtmosBags:

- Snip end of bag inlet with scissors to make a small opening.
- Insert flexible tubing and secure to inlet with tape, wrap-it tie, or rubber band.
- Connect AtmosBag to purge gas source.

5.4. Load AtmosBag. Turn on purge gas and allow gas to gently flow out of front opening during loading. Place all necessary equipment inside of AtmosBag including items such as samples, sampling and transfer equipment, wipers, anti-static products, over-gloves, etc. Empty bottles can be purged with gas prior to loading to save time.

5.5. Purge AtmosBag – inert gas only. When a source of vacuum is unavailable, use the following procedure to purge AtmosBag with inert gas.



- 5.5.1. Seal open end of AtmosBag. For Zipper-lock bags, slide track closed. For Tape-seal bags, seal opening with strip of removable tape by folding it along the length of the opening.
- 5.5.2. Inflate bag, then turn off inert gas.
- 5.5.3. Open end of bag slightly to allow gas to escape. Deflate AtmosBag by pushing down on bag with hands to force gas out. Seal open end of AtmosBag. Repeat inflation/deflation cycle 3 to 5 times, finally inflating bag with inert gas to a very soft pillow level that allows easy insertion of hands. Turn off inert gas.
- 5.5.4. Fold end over two times* and clip.
- 5.5.5. Observe that bag maintains inflation pressure over several minutes, then go to STEP 5.6. If bag deflates, correct leakage and repeat steps b., c., and d. until inflation pressure is maintained.
- 5.6. Insert hands into AtmosBag. Don a pair of cotton glove liners prior to insertion of hands. These liners absorb moisture and permit easy removal of hands from the bag. Chemically-resistant “over-gloves” may be worn inside AtmosBag for extra protection when handling corrosive or toxic materials. For extra dexterity, don a pair of disposable nitrile gloves inside AtmosBag.
- 5.7. Operate according to the operator’s needs.