



Title: Cleaning and Packaging Specification for Hytec Stainless Steel Bellows Assemblies and Components.		Rev. C	Date: 8/25/98	No.: MPP C024 <i>LIGO-E970189-C-D</i>
Written By Peter L. Driscoll 7/25/97	Approval T.P. Michaluk 7/29/97	Approval R. J. Brouder 7/25/97		

SUBJECT: The cleaning and packaging of bellows assemblies and components for Hytec Inc., or others, for the LIGO project.

1.0 PURPOSE

1.1 This specification defines the process to be utilized for the cleaning and packaging of stainless steel bellows assemblies and components manufactured for Hytec Inc., or others, for the LIGO project.

2.0 SCOPE

2.1 This specification covers all Hytec part numbers manufactured by S.F.M.B. for the LIGO project.

3.0 DEFINITIONS

- 3.1 **Hytec**- Hytec Inc. or other agents procuring products for the LIGO project.
- 3.2 **S.F.M.B.**- Senior Flexonics Metal Bellows Division.
- 3.3 **M.O.S.**- Methods Operation Sheet - A shop traveler with detailed work instruction.
- 3.4 **U.H.V.** - Ultra High Vacuum.
- 3.5 **D.I.** - Deionized. A process by which metal ions are removed from water reducing its conductivity (the opposite of resistance).
- 3.6 **Meg Ohms** - The measure of resistance to electron flow.
- 3.7 **IPA**- Isopropyl Alcohol.

4.0 DOCUMENTATION

4.1 Hytec Technical Specification No. TS-LIGO-04a, LIGO-E970129-01-D, Rev. a, dated 9/10/97.



Revision	Date	Remarks	Approved
NR	7-24-97		P. Driscoll 7-25-97 T. Michaluk 7-29-97 R. Brouder 7-25-97
A	8-15-97	5.1 Added Nitrilite™ info., 5.3 Added reference to chill rings and pre-cleaning, 6.4.3 Added Cal-Stat™ info. per customer request.	P. Driscoll 8-15-97 R. Brouder 8-15-97
B	12-5-97	6.0 Removed most references to Clean Room and cleaning processes applying to Clean Room per customer request.	P. Driscoll 12-8-97 R. Brouder 12-15-97 T. Michaluk 12-15-97
C	8-25-98	6.4.1 Was "(6) stainless steel retaining blocks and hex..." 6.4.2 Added poly wrapped foam plug info. 6.4.3 Deleted reference to CP Stat mfr. Figure 4 Revised wording in Step 1 per customer request. ECN 33297	<i>P. Driscoll 8/25/98</i> <i>M. Henry 8/25/98</i> <i>T. Michaluk 8/25/98</i>

- 4.2 Hytec Drawing D972122, Rev.0, dated 6/16/97.
- 4.3 Hytec Drawing D972611, Rev.0, dated 8/11/97.
- 4.4 S.F.M.B. Specification ES-1150, Bellows-General Cleaning.
- 4.5 S.F.M.B. Specification ES-1098, Electropolishing.

5.0 GENERAL REQUIREMENTS

- 5.1 These parts are to be considered U.H.V. components and are not to be handled with unprotected hands. Clean U.H.V. quality gloves (Nitrilite™ brand only) must be worn when handling components. *Finger cots are not permitted.* If the gloves should touch unclean surfaces, such as the face, clothing, tools, bench, chairs, etc. they must be replaced immediately. (Nitrilite™ gloves, mfr. by Ansell Edmont Industrial, Inc.)
- 5.2 These parts are to be cleaned and packaged in a manner that will yield parts suitable for U.H.V. service. Personnel responsible for the processing of parts shall exercise good judgment and skill such that the area or parts do not become contaminated.
- 5.3 All equipment and tooling, including chill rings, required for the fabrication and testing of the parts shall be suitable for use with U.H.V. service parts. All shall be pre-cleaned to remove gross contamination then final cleaned with IPA prior to each use.
- 5.4 The resistance of D.I. water rinse must not be less than 1 Meg Ohms.
- 5.5 The M.O.S. with additional cleaning or packaging details will supersede this specification.
- 5.6 *The use of bubble wrap directly on parts is forbidden.* This is due to the fact it's polymers will penetrate into the surface of the metal and cannot be removed during cleaning. Anti-static bubble wrap may be used if the part has first been wrapped in polyethylene sheet or bag.

6.0 PROCEDURE See the attached flow diagrams for reference.

- 6.1 **Cleaning Procedure for Diaphragms and Components.** Ref. Figure 1. Note: This is Secondary Line, Sequence 3 as specified per ES-1150, Section 5.2.4.2.3.
 - 6.1.1 Pre-clean diaphragms or components in Alkaline cleaner (Bruhlin Non-Silicated HTD 2 detergent or equivalent) for 20 minutes at 140° F with agitation. Flush any blind holes to dislodge chips or contaminates with the nozzle.
 - 6.1.2 Rinse in 120° F counter-current D. I. water tank for 15 minutes with agitation.

- 6.1.3 Rinse in second 120° F counter-current D. I. water tank for 15 minutes with agitation.
- 6.1.4 Dry in forced hot air dryer with HEPA filtration at 250° F. (Time dependent on configuration)
- 6.1.5 Immerse parts in Electropolish solution (66% Phosphoric acid, 33% Electroflo 300) for 2 minutes at 3 volts and room temperature.
- 6.1.6 Rinse in second 120° F counter-current D. I. water tank for 5 minutes with agitation.
- 6.1.7 Immerse parts in 300-Series pickling solution for 10 minutes (30% NHO₃, 14% Turco Nitraad) at room temperature. Note: This is Secondary Line, Sequence 2 as specified per ES-1150, Section 5.2.4.2.2.
- 6.1.8 Rinse in 120° F counter-current D. I. water tank for 15 minutes with agitation.
- 6.1.9 Rinse in second 120° F counter-current D. I. water tank for 15 minutes with agitation.
- 6.1.10 Dry in forced hot air dryer with HEPA filtration at 250° F. (Time dependent on configuration).
- 6.1.11 Visually examine parts at 3.5X (hand glass) with sufficient light for watermarks, spotting or chemical residue, complete removal of oxides, uniform appearance, etc. Excessive etching or pitting of the base metal shall be cause for rejection. Repeat steps 6.1.7 - 6.1.11 if not acceptable.
- 6.1.12 Wrap cleaned parts in new UHV quality aluminum foil.
- 6.1.13 Place wrapped parts in clean covered containers and deliver to Stores.

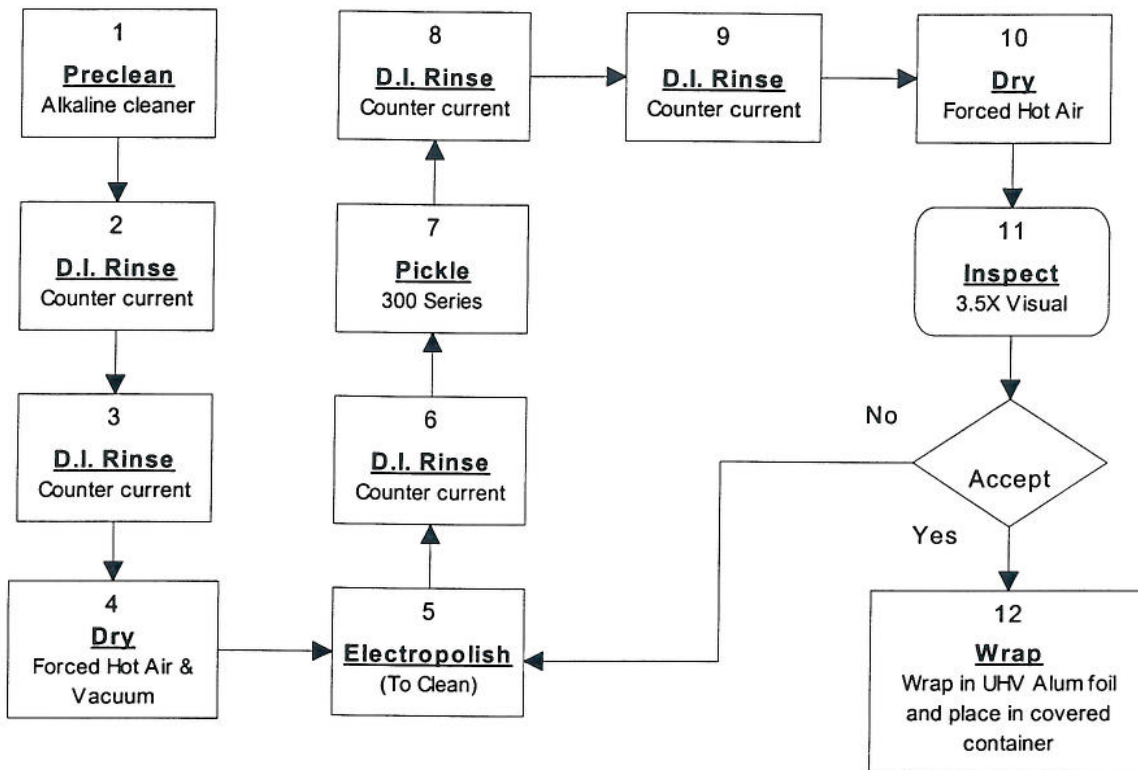


Figure 1

6.2 Cleaning Procedure for Capsules and Welded Sub-assemblies. (To remove leak test grease, if required.) Ref. Figure 2.

NOTE: All leak testing of welded components shall be attempted by using clean, low durometer seals without the use of leak test grease. If this method proves inadequate, the Customer shall be notified and a thin film of Krytox LVP shall be utilized to aid the sealing. Cleaning of the parts, should this method be required, shall be per the following steps

6.2.1 Dip the corner of a folded Texwipe in 0.8 μ -filtered IPA and wipe the end diaphragms or sealing surfaces to remove the leak test grease.

6.2.2 Darken the room and visually inspect assemblies with an Ultra-Violet Light (blacklight) for residue. Contamination will show as bright spots or areas. If the assembly indicates contamination, blow off surface with 0.1 μ -filtered dry nitrogen. Re-check with blacklight. If areas of contamination are still visible, reclean the component by wiping areas with a Texwipe or clean room swab wetted with 0.8 μ -filtered IPA.

6.2.3 Wrap cleaned parts in new UHV quality aluminum foil and place in a clean dry container and cover.

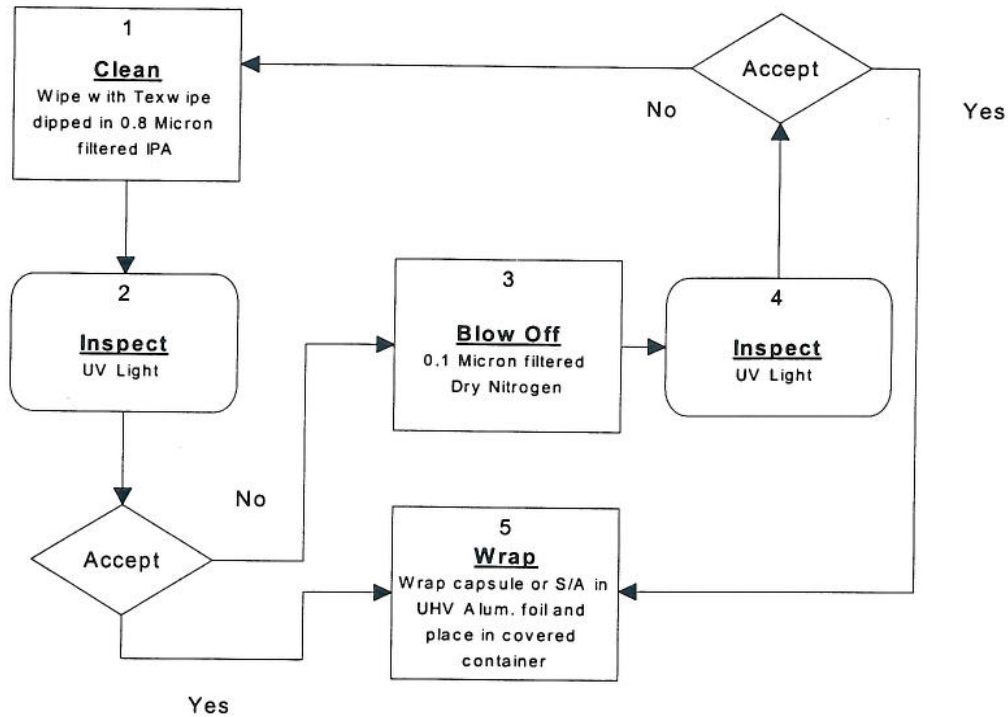


Figure 2.

6.3 Cleaning Procedure for Final Assemblies (Ref. Figure 3)

NOTE: All leak testing of welded components shall be attempted by using clean, low durometer seals without the use of leak test grease. If this method proves inadequate, the Customer shall be notified and a thin film of Krytox LVP shall be utilized to aid the sealing. Cleaning of the parts, should this method be required, shall be per the following steps. If leak test grease was not required, proceed to Step 6.3.4.

6.3.1 Dip the corner of a folded Texwipe in 0.8 μ -filtered IPA and wipe the sealing surfaces to remove the leak test grease.

6.3.2 Darken the room and visually inspect assemblies with an Ultra-Violet Light (blacklight) for residue. Contamination will show as bright spots or areas. If the assembly indicates contamination, blow off surface with 0.1 μ -filtered dry nitrogen. Re-check with blacklight. If areas of contamination are still visible, reclean the component by wiping areas with a Texwipe or clean room swab wetted with 0.8 μ -filtered IPA.

6.3.3 Repeat process until all areas of contamination are no longer visible.

6.3.4 In Class 1000 Clean Room, immerse assembly in hot D.I. water rinse tank with agitation, for 5 minutes minimum. Remove from tank and blow off excess water with 0.1 μ -filtered dry nitrogen.

6.3.5 Vacuum dry in 0.1 μ -filtered dry nitrogen purged oven at 200° F.

6.3.6 Visually inspect at 3.5X (hand glass) with sufficient light for water marks, spotting or chemical residue. Re-clean by repeating steps 6.3.4 –6.3.6 if required.

6.3.7 Package cleaned assemblies immediately per the following section.

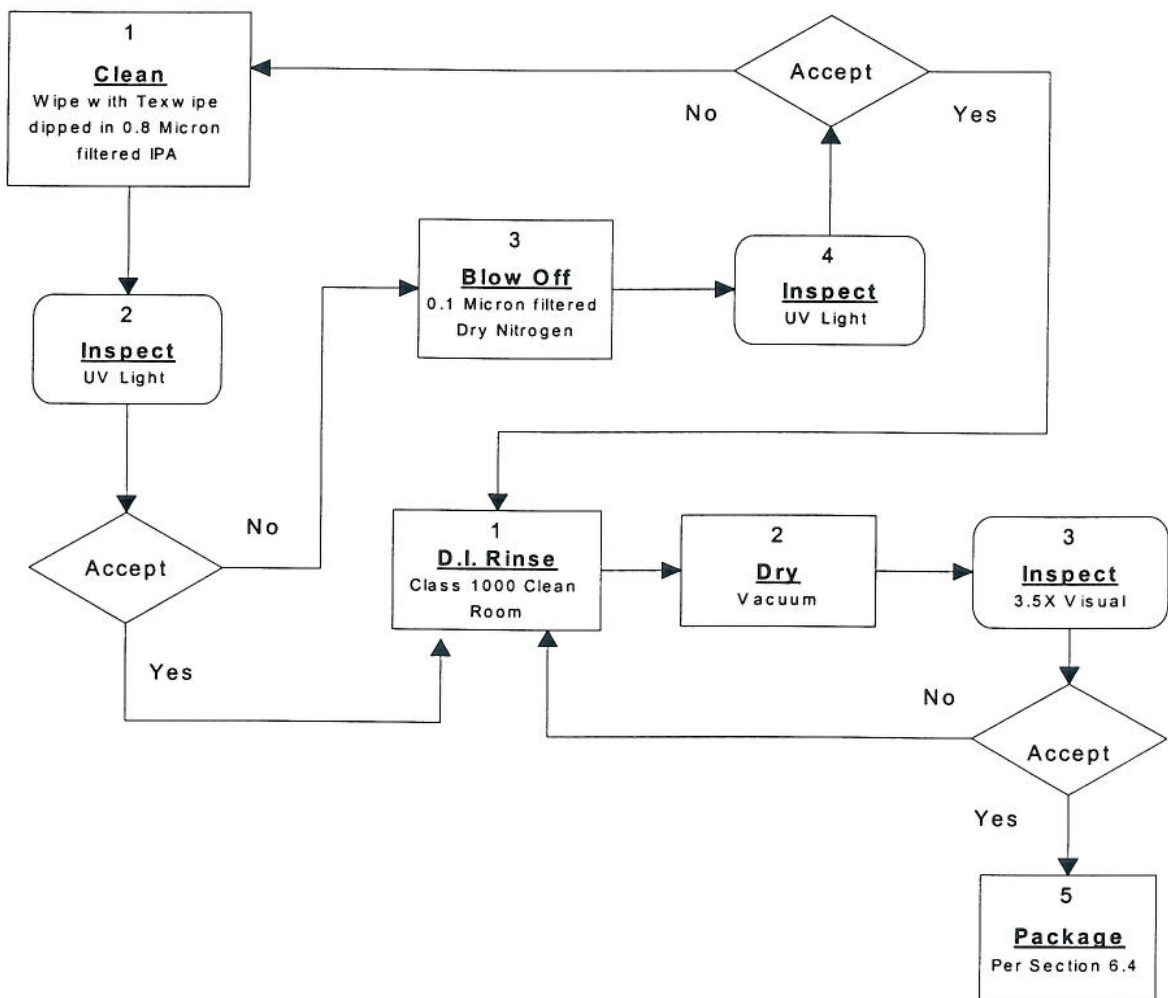


Figure 3.

6.4 Packaging of Final Assemblies for Shipping. Ref. Figure 4.

- 6.4.1 Install MDC copper gasket in rotatable flange and secure with (6) aluminum shipping blocks and socket head screws and washers. Tighten screws only enough to prevent the flange from rotating.
- 6.4.2 Place specified foam plug in an anti-static polyethylene bag fabricated from CP-STAT 100 ESD™ poly sheet (CP-STAT 100 ESD™ poly sheet distributed by Caltex Plastics, Inc.), remove excess air and heat seal shut. Insert bagged foam plug inside the bellows assembly, then wrap the outside of the bellows of each assembly with U.H.V quality aluminum foil.
- 6.4.3 Place each assembly in an anti-static polyethylene bag fabricated from CP-STAT 100 ESD™ poly sheet.
- 6.4.4 Evacuate and back fill the bag with 0.1 μ -filtered dry nitrogen.
- 6.4.5 Compress bag tightly around the assembly to purge excess nitrogen. Heat seal the bag for closure.
- 6.4.6 Place assembly in second anti-static polyethylene bag, as specified in 6.4.3 above, place “UHV CLEAN PART...” and identification labels between bags, remove excess air and heat seal shut, making sure both labels are visible on the rotatable flange end of the assembly.
- 6.4.7 Remove double bagged assemblies from clean room, using care to not puncture or cut bags.
- 6.4.8 Place double bagged assembly in shipping container with “UHV CLEAN PART...” and identification labels facing up. Seal container closed. Attach a label with the SFMB part number and serial number to the outside of the container. Attach “This Side Up - Arrow” labels to all (4) sides of container.
- 6.4.9 The M.O.S. will specify any additional shipping requirements.

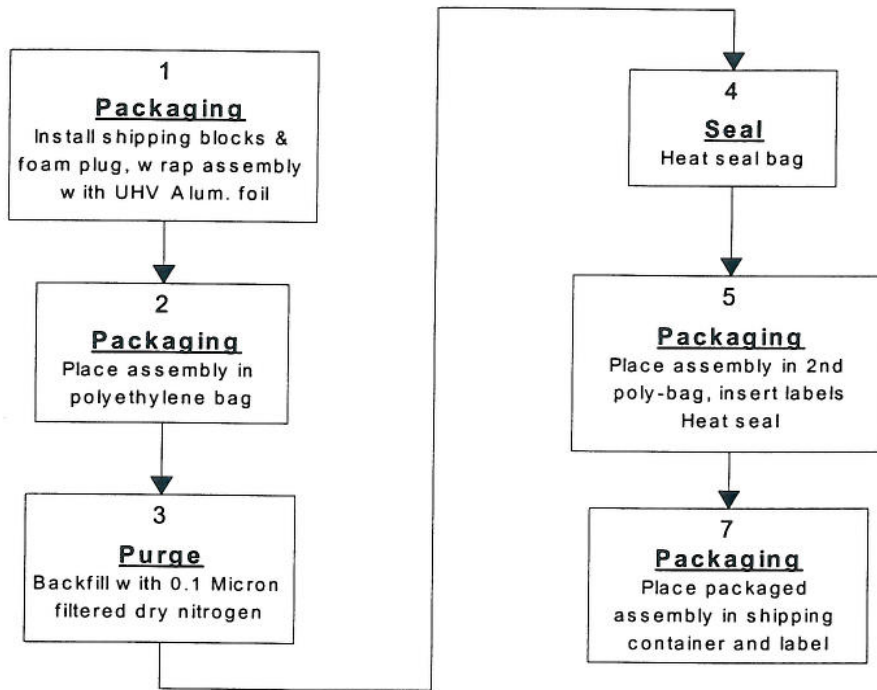


Figure 4.

7.0 RESPONSIBILITY

7.1 The Vacuum Group Manufacturing Manager is responsible for the adherence of this procedure.

7.2 The Engineering Department and Quality Assurance for the Vacuum Group are responsible for the maintenance of this procedure.