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# SUMITOMO RECOMMENDED PROCEDURE

## SRP SP-F04-024

## FutureFLEX®

## INSTALLATION PROCEDURES FOR LIQUID-TIGHT KELLEMS® GRIPS



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**1.0 General**

1.1 This procedure describes the standard techniques for installing Liquid-Tight Kellems® Grips to FutureFLEX Air-Blown Fiber (ABF) tube cables.

1.2 Liquid-Tight Kellems Grips provide a very effective means to seal and securely anchor the ends of a tube cable to Tube Distribution Unit (TDU) entry points. With cable ends firmly held in place, expansions / contractions of the tube cable are allowed to take place in the slack areas installed along the span.

1.3 Kellems Grips also offer several other key advantages.

1.3.1 When properly assembled, Kellems Grips provide a liquid-tight, dust-tight seal between the tube cable and the TDU entry point. Therefore, Kellems Grips are very well suited for use in any application (indoor or outdoor) where the TDU is subject to moisture from hosing, splashing, flooding, and so forth.

1.3.2 Kellems Grips provide a good compression fit around the tube cable without crushing or crimping the inner tubes.

1.3.3 Kellems Grips provide good strain relief and prevent kinking of the tube cable at its entry point. This feature also aids in protecting the tube cable if the TDU is located in an area susceptible to damage.

1.4 Strain Relief Kellems Grips and Heat-Shrinkable Cable Entry Seals (CESs) are acceptable fittings to secure FutureFLEX ABF tube cables to indoor TDUs only. Refer to SRP SP-F04-037 *Sumitomo Recommended Procedure FutureFLEX Installation Procedures for Strain Relief Kellems Grips and* SP-F04-038 *Sumitomo Recommended Procedure FutureFLEX Installation Procedures* for *Cable Entry Seals* for additional details.

1.4.1 Strain Relief Kellems Grips are to be used in indoor applications only. They provide for strain relief of the tube cable where required. However, Strain Relief Kellems Grips are not to be used where the TDU is subject to moisture from hosing, splashing, or flooding.

1.4.2 Heat-Shrinkable Cable Entry Seals (CESs) are to be used in indoor applications only. They provide a liquid-tight, fume-tight seal between the tube cable and the TDU entry point. However, CESs are not to be used where strain relief of the tube cable is required.

**2.0 Safety Precautions**

2.1 The use of safety equipment (safety glasses, safety shoes, cut-resistant Kevlar gloves, etc.) is recommended during this installation procedure.

**3.0 Reference Documents**

3.1 Sumitomo Recommended Procedure, *FutureFLEX Tube Cable Installation Procedures,* SRP SP-F04-008.

3.2 Sumitomo Recommended Procedure, *FutureFLEX Grounding and Bonding Metallic Tube Cables,* SRP SP-F04-030.

3.3 Sumitomo Recommended Procedure, *FutureFLEX Tube Cable Stripping Procedures,* SRP SP-F04-030.

3.4 Sumitomo Recommended Procedure, *FutureFLEX Tube Cables in Class I – Divisions 1 and 2 Environments,* SRP SP-F04-032.

3.5 Sumitomo Recommended Procedure, *FutureFLEX FutureFLEX Installation Procedures* for *Strain Relief Kellems Grips,* SRP SP-F04-037.

3.5 Sumitomo Recommended Procedure, *FutureFLEX Installation Procedures* for *Cable Entry Seals,* SRP SP-F04-038.

**4.0 Equipment / Tools Required**

The following equipment, tools, and materials are required to complete this procedure:

***Note:*** *Liquid-Tight Kellems Grip Kits are available from SEL for the different ABF tube cable types and sizes. Kits are supplied with metal clad Sealing O-Rings and Locknuts.*

4.1 **See TABLE 1** for Liquid-Tight Kellems Grip Kit Part Numbers and Recommended Knockout Hole Sizes.

**TABLE 1**
**Liquid-Tight Kellems Grips**

| If Installing Tube Cable SEL P/N | Use Liquid-Tight Kellems Grip Kit SEL P/N | Recommended Knockout Hole Size (inches) |
|---|---|---|
| TC02MSOS<br>TC02TOX | DELTKG1<br>Also see Para. 4.2 | 1.719 – 1.766 |
| TC04MSOS<br>TC04TOD | DELTKG1<br>Also see Para. 4.3 | 1.719 – 1.766 |
| TC07MSOS<br>TC07TOX<br>TC07TLW | DELTKG1 | 1.719 – 1.766 |
| | | |
| TC02MSOS-2<br>TC02TOX-2 | DELTKG2 | 1.719 – 1.766 |
| | | |
| TC04MSOS-2<br>TC04TOD-2 | DELTKG3 | 1.969 – 2.016 |
| | | |
| TC07MSOS-3<br>TC07TOX-3<br>TC07TLW-3 | DELTKG4 | 1.969 – 2.016 |
| | | |
| TC07MSOS-2<br>TC07TOX-2<br>TC07TLW-2 | DELTKG5 | 2.453 – 2.500 |
| | | |
| TC19MSOS<br>TC19TOX<br>TC19TLW | DELTKG6 | 2.453 – 2.500 |
| | | |
| TC19MSOS-2<br>TC19TOX-2<br>TC19TLW-2 | DELTKG7 | 2.953 – 3.000 |

4.2 Tube Cable Adapter Bushing (DE02TOX) if installing standard 2-tube cables TC02MSOS and TC02TOX; Adapter Bushing must be ordered separately.

4.3 Tube Cable Adapter Bushing (DE04TOD) if installing standard 4-tube cables TC04MSOS and TC04TOD; Adapter Bushing must be ordered separately.

4.4 Aluminum End Caps (if required to seal empty Liquid-Tight Kellems Grips before tube cable is installed)

- DE5KCAP for Kit DELTKG1
- DE6KCAP for Kits DELTKG2, DELTKG3, DELTKG4, DELTKG5, and DELTKG6
- DE7KCAP for Kit DELTKG7

4.5 Tube Cable Cutter (BETL01)

4.6 Utility Knife with Hook Blade

4.7 10-inch (or larger) Adjustable Wrenches

4.8 Strap Wrench or Channel Lock Pliers

4.9 Hammer

4.10 Hole Punch Set for Knockout Holes

4.11 Felt Tip Pen / Marker

4.12 Tape Measure

**5.0 Equipment Layout**

5.1 **See Fig. 1 and Fig. 2** for Liquid-Tight Kellems Grip layout.

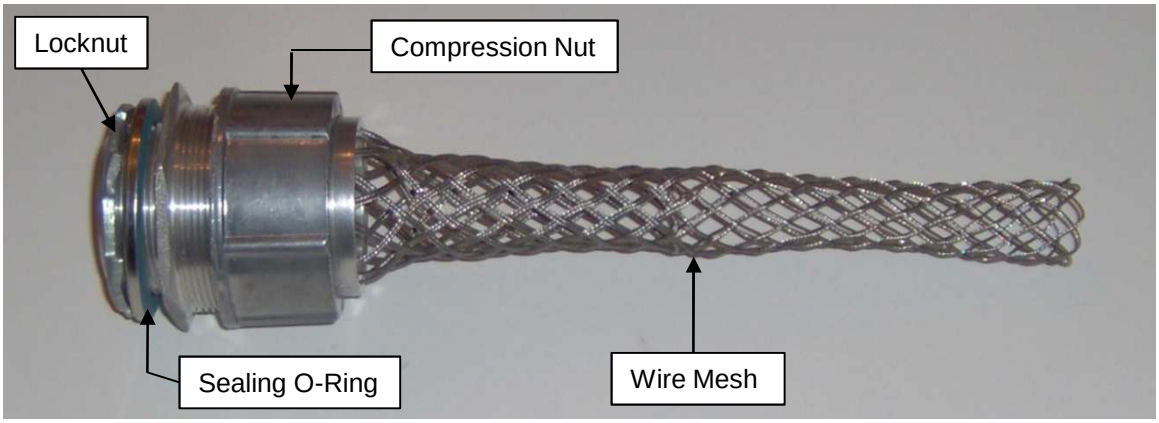


**Figure 1**
Liquid-Tight Kellems Grip - Assembled

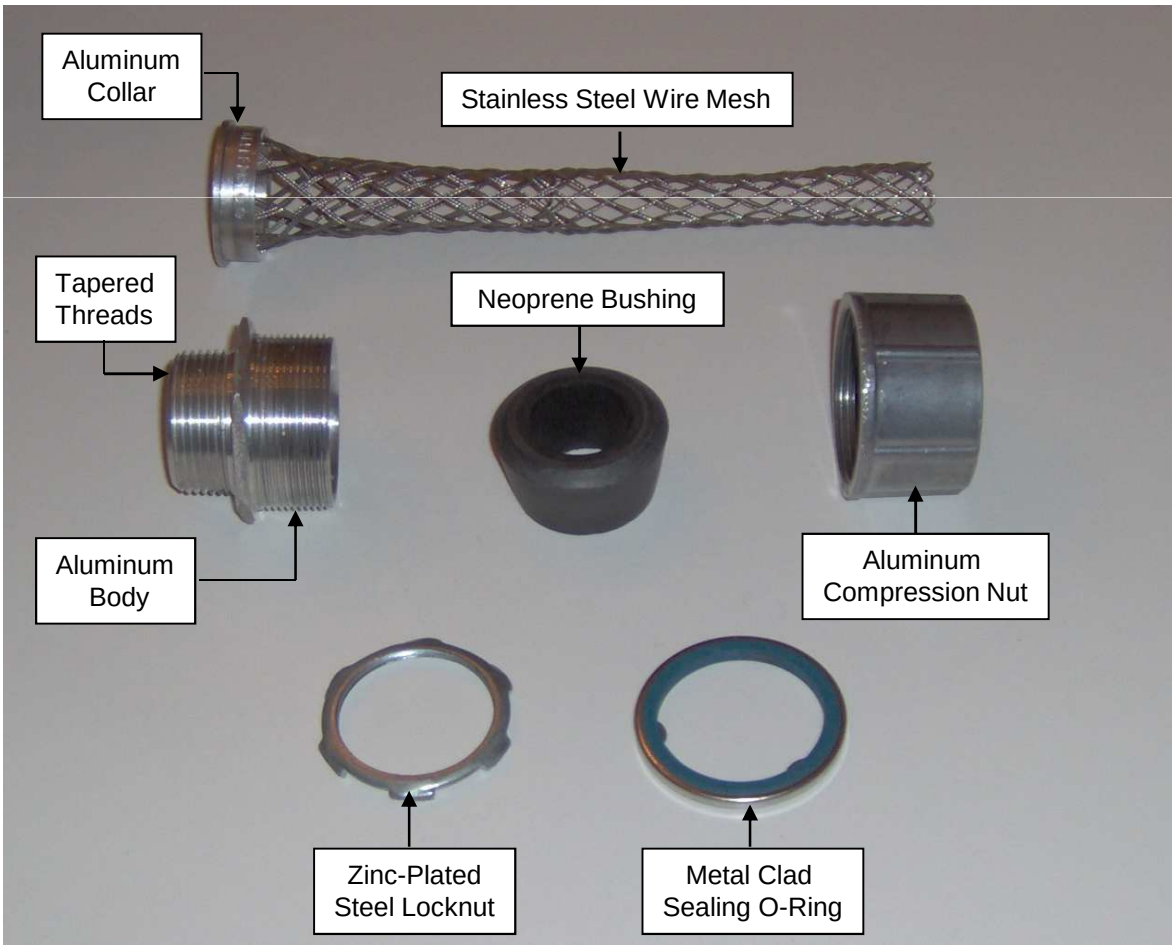


**Figure 2**
Liquid-Tight Kellems Grip - Straight Male Components

**6.0 Preparing the TDU Enclosure**

6.1 **Refer to TABLE 1** and identify Recommended Knockout Hole Size based on the Liquid-Tight Kellems Grip Kit to be used.

6.2 Prepare TDU enclosure by selecting and marking tube cable entry point locations. To best optimize TDU capacity, it is recommended to stagger tube cable entry locations if possible. **See Fig. 3a and Fig. 3b.**

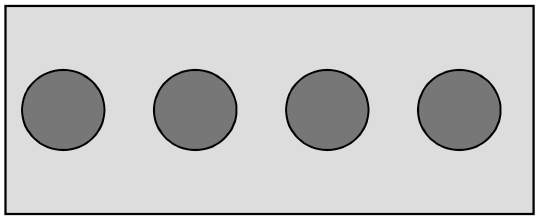

**Figure 3a**
Inline Tube Cable Entry Locations
Acceptable but Fails to Optimize
TDU Capacity

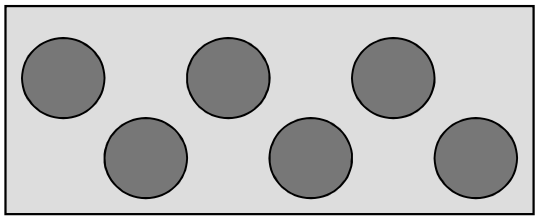

**Figure 3b**
Staggered Tube Cable Entry Locations
Preferred Method to Optimize
TDU Capacity

6.3 Use appropriate size hole punch and create opening in TDU.

6.4 Install Kellems Grip body into entry point hole.

6.5 Install Sealing O-Ring over tapered threads of body so rubber seal is against inner wall of TDU.

***Note:*** *If an airtight seal is required, apply an appropriate sealant (such as RTV Silicone, etc.) between inner wall of TDU and Sealing O-ring.*

6.6 Install and hand-tighten Locknut.

6.7 Use appropriate size wrenches and tighten Locknut to firmly secure Kellems Grip body to TDU. **See Fig. 4.**

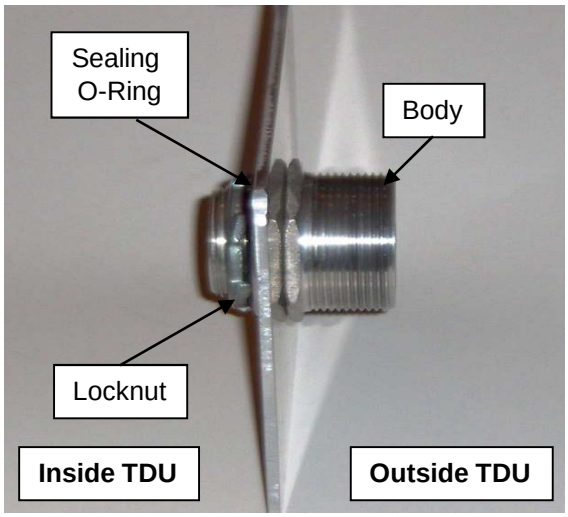


**Figure 4**
Body Installed in TDU Knockout Hole
O-Ring Installed and Locknut Tighten

**7.0 Preparing the Tube Cable**

7.1 Slide Kellems Grip compression nut onto end of tube cable.

7.2 Compress wire mesh and slide onto end of tube cable.

7.3 Place tube cable into TDU enclosure and mark jacket in two (2) places. **See Fig. 5.**

7.3.1 Make first mark about 1" beyond tapered end of Kellems Grip body.

***Note:*** *If tube cable is armored, the metallic element or elements must be grounded and bonded. Make first mark about 4" beyond tapered end of Kellems Grip body. See SRP SP-F04-030.*

7.3.2 Second mark must be determined on-site. Measure distance required to route individual tubes from the 1" mark to the farthest tube connection point inside TDU and make second mark.

7.4 Remove tube cable from TDU enclosure. Use Tube Cable Cutter (BETL01) to cut tube cable at second mark.

7.5 Use Hook Blade Knife to lightly score tube cable jacket at 1" mark. Pull ripcord and strip jacket away to expose individual tubes.

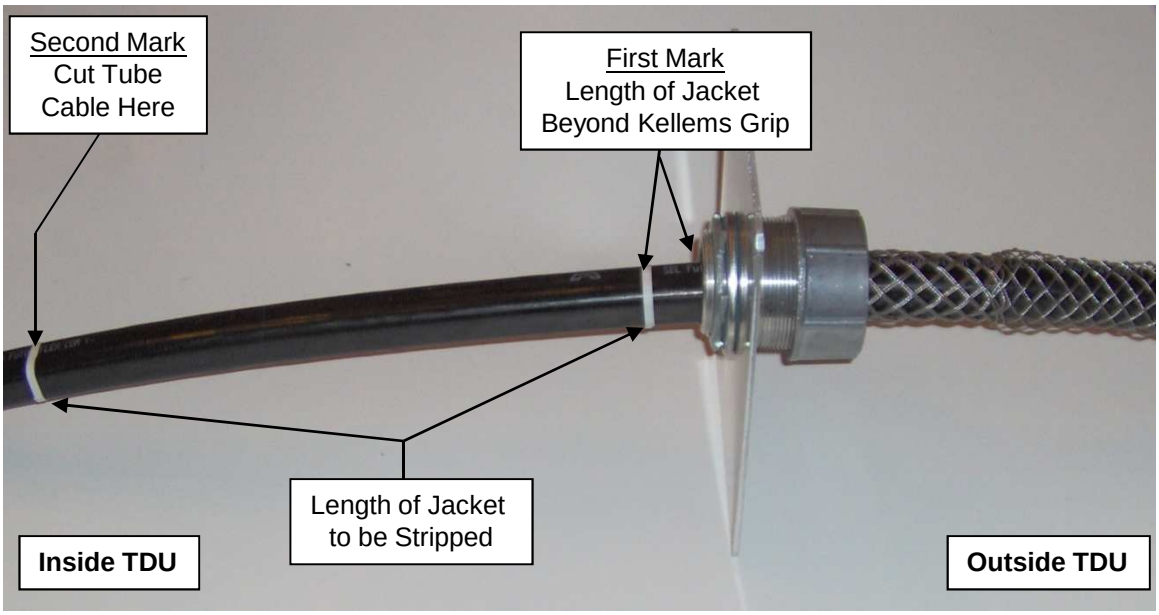


**Figure 5**
Measuring and Marking Tube Cable

**8.0 Completing Liquid-Tight Kellems Grip Assembly**

8.1 Slide Kellems Grip neoprene bushing over exposed inner tubes and tube cable jacket.

8.2 Install exposed inner tubes and tube cable through Kellems Grip body and into TDU.

8.3 Continue feeding tube cable through body until about 1" of jacket extends beyond tapered end of Kellems Grip body.

8.4 Slide neoprene bushing, wire mesh, and compression nut forward until they mate with body's threads. **See Fig. 6.**

8.5 Hand-tighten the compression nut onto body; adjust position of wire mesh and neoprene bushing to ensure proper fit.

8.6 Use appropriate size wrenches and tighten compression nut to obtain a liquid-tight, dust-tight seal.

***Note:*** *Wrench tightening may cause tube cable to twist within wire mesh. To relieve twisting, compress wire mesh while turning compression nut. Remove all slack from the installed mesh by smoothing it tight to the tube cable jacket.*

***Note:*** *It is recommended that these components be re-tightened after 24 hours to ensure the seal is maintained.*

8.7 If grounding and bonding are required, install shield connector assembly or grounding clamps to the tube cable's metallic jacketing. See SRP SP-F04-030.

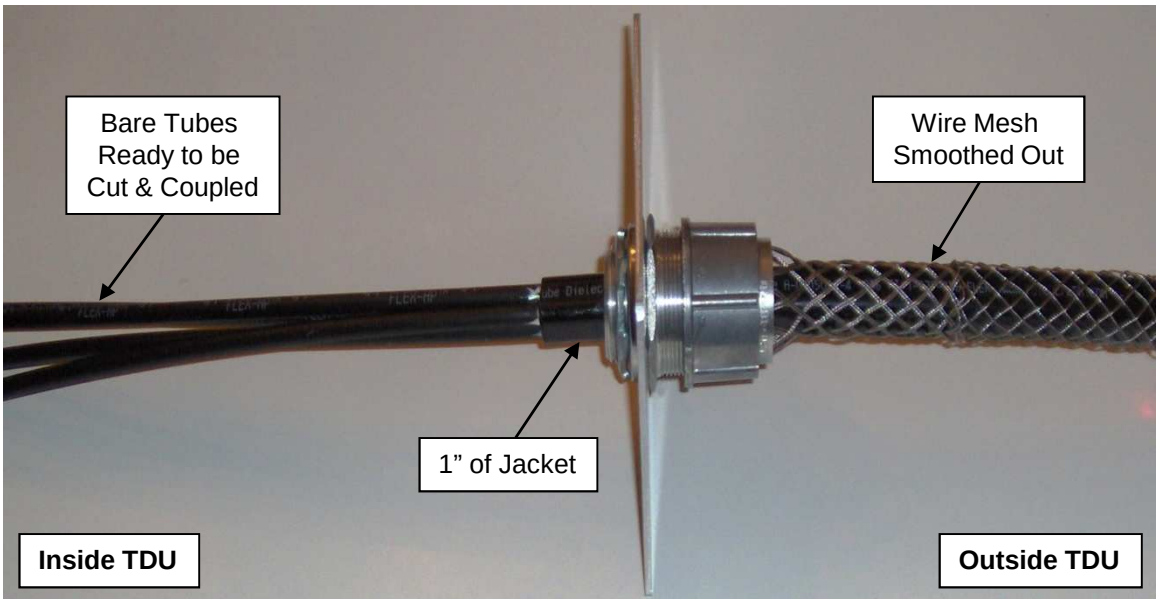


**Figure 6**
Kellems Grip Installed and Tube Cable Ready for Coupling

**9.0 Tube Cable Adapter Bushings**

9.1 Use Tube Cable Adapter Bushings (DE02TOX and DE04TOD) to install standard 2- and 4-tube cables into Liquid-Tight Kellems Grips.

9.2 The 2-tube cable has an oblong shape and the 4-tube cable has a square shape. The inner openings of these Adapter Bushings are uniquely shaped to accept these tube cables and establish a liquid-tight seal around them.

9.3 Discard the neoprene bushing supplied with the Kellems Grip. Replace with appropriate Adapter Bushing and proceed with normal installation procedures. **See Fig. 7a and Fig. 7b.**

**Figure 7a**
2-Tube Adapter Bushing

**Figure 7b**
4-Tube Adapter Bushing

**10.0 Sealing Unoccupied Kellems Grips**

10.1 Use Aluminum End Caps (DE5KCAP, DE6KCAP, and DE7KCAP) to seal an empty / unoccupied Liquid-Tight Kellems Grip. End Caps are round metal discs with a diameter that corresponds to the interior size of the Grip's compression nut. **See Fig. 8.**

10.2 Install appropriate size Aluminum End Cap between Kellems Grip wire mesh collar and neoprene bushing.

***Note:*** *If an airtight seal is required, apply an appropriate sealant (such as RTV Silicone, etc.) between End Cap and wire mesh collar.*

10.3 Install and hand-tighten compression nut.

10.4 Use appropriate size wrenches and tighten compression nut to obtain a liquid-tight, dust-tight seal.

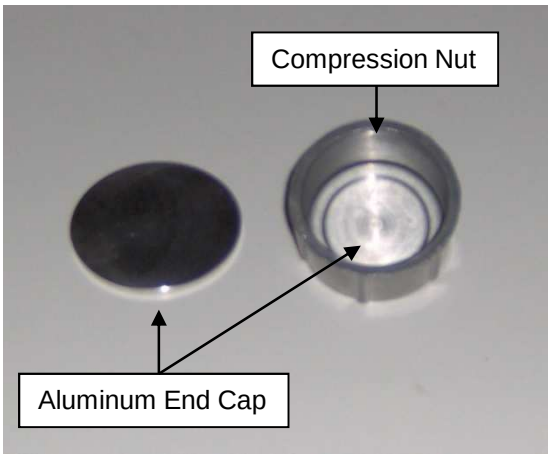


**Figure 8**
Aluminum End Caps to Seal
Unoccupied Kellems Grips