This document describes the draw-rod assembly and installation for O Plus C II™ EHV bushings.

Scope
This information does not cover all possible contingencies which may arise during assembly and installation. If you require further information, contact your ABB representative.

Required tools/materials
- Pull adapter tool (Figure 1):
  A. McMaster-Carr end adapter (p/n 3475T885)
  B. 30 feet [9 m] stranded metal cable with outside diameter of 0.125 inch [3 mm] or less
- Adjustable face-pin type spanner wrench (pin dia 0.157 inch [4.0mm] or less or custom spanner socket (Figure 2)
- 15/16 inch box spanner (Figure 3) or modified 15/16 inch deep well socket
- Adjustable wrenches
- Scotch-Brite and alcohol based cleaner

- Several torque wrenches maybe needed to meet the following torque values:
  A. 20 In-lbs [2.3 N-m]
  B. 60 In-lbs [6.8 N-m]
  C. 7 ft-lbs [9.5 N-m]
  D. 30 ft-lbs [40.7 N-m]
- 1/8 inch allen wrench
- 1/2 inch socket
- 15/16 Inch un-modified deep well socket and drive ratchet

For your convenience, ABB offers a draw-rod installation kit, 1ZUA520901-ABB, which contains a box spanner, a custom spanner socket, and a cable end adapter. Please contact your ABB representative for more information.
Draw-rod assembly options
The draw-rod will be shipped from Alamo assembled inside the bushing. The draw-rod can be disassembled in two locations depending on how the transformer will ship from the manufacturer. If the transformer is to be shipped with the bushings and turrets removed then the draw-rod can be taken apart at the joint closest to the lower terminal. If the transformer is to be shipped with only the bushings removed then the second joint up from the lower terminal can be taken apart. Please see figure 4 above.

Shield installation
The shield kit for the O Plus C II EHV bushings can be mounted from above or below depending on when you want to install the shield. For the shield to be mounted from above, it must be installed prior to draw-rod installation.

Shield installation from above
- Pre-assemble the hardware by placing the spring washer onto the cap screw with the concave side facing away from the hex head. Next place the flat washer onto the cap screw assembly. Thread each screw through the tapped hole in the shield until it spins freely. The mounting hardware is captive in the shield.

- It is easiest to install the shield from above before the draw-rod is inserted into the bushing. However, if the draw-rod has already been inserted into the bushing, ensure that the draw-rod is partially extended from the bottom of the bushing.

- Place the shield over the lower terminal and draw-rod assembly as shown in figure 5 (right).

- Thread the mounting ring assembly onto the lower terminal with the large step facing upward, towards the bushing.

- Once the mounting ring assembly seats against the lip of the lower terminal, torque the two sets screws to 20 In-lbs [2.3 N-m].

- Connect the transformer lead to the lower terminal.

- Lower the shield assembly aligning the holes of the shield with those on the mounting ring. Start each of the cap screws by hand alternately tightening them until snug. Torque the cap screws to 60 In-lbs [6.8 N-m].
**Shield installation from below**

- For bottom installation it is not necessary that the draw-rod be partially extended from the bushing. Thread the mounting ring assembly onto the lower terminal with the large step on the mounting ring facing downward, away from the bushing.

- Once the mounting ring assembly seats against the lip of the lower terminal, torque the two sets screws to 20 In-lbs [2.3 N-m].

- Pre-assemble the hardware by placing the spring washer onto the cap screw with the concave side facing away from the hex head. Next place the flat washer onto the cap screw assembly. Thread each screw through the tapped hole in the shield until it spins freely. The mounting hardware is captive in the shield.

- Place the shield assembly over the transformer lead and attach the transformer lead to the bottom terminal.

- Raise the shield aligning the holes of the shield with those on the mounting ring. Start each of the cap screws by hand alternately tightening them until snug. Torque the cap screws to 60 In-lbs [6.8 N-m].

**Draw-rod installation**

- The parts below the transformer cover are usually supported in a transport cover similar to the one shown in figure 8. At erection, remove the transport cover and loosen the support for the draw-rod. Transport cover design will vary by manufacturer. Should you have questions about transport cover removal please contact the transformer manufacturer.

- Locate the uppermost piece of the draw-rod which is often placed in the bushing during transportation. If necessary, remove the upper draw-rod from the bushing by removing the top plug from the upper terminal, loosening the nut, and removing the steel washer (see figure 9). Retain these parts as they will be re-used during installation.

- Re-assemble the draw-rod using an adjustable wrench on the flat of the disassembled joint.

- The uppermost piece of the draw-rod is drilled and tapped with ¼ inch - 20 UNC thread to attach a pull cable. A pulling adaptor tool such as that shown in figure 1 may be used.

<table>
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<th>! Note</th>
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<td>The outside of the pulling device must not exceed 0.562 inch [14.25 mm]. Verify that the pulling device fits through the opening of the nut. The corners of the pulling device may need to be filed or machined to meet the 0.562 inch [14.25 mm] max outer diameter requirement.</td>
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- A stranded metal cable with outside diameter of 0.125 inch [3 mm] should be used to pull the draw-rod through the bushing ID during installation. A minimum length of 30 feet [9 m] is required for installation. Attach a cable to the pulling device, but do not thread the device into the top of the draw-rod at this point.

- The mating surfaces of the draw-rod terminal and bushing lower support must appear clean and shiny. If they are not, clean them with an abrasive pad, alcohol and rags. Make sure all bits of abrasive pad are removed after cleaning, and apply a light film of transformer oil to the mating surfaces.
- Remove the upper terminal plug on the bushing and then remove the washer and nut. Put the pulling device through the box spanner, nut, and washer. Pay careful attention to the order (see figure 7).

- Attach the upper draw-rod to the lower draw-rod mounted inside the transformer tank and remove all accessories used to support the lower portion of the draw-rod during transportation.

- Lower the pulling device through the bushing tube inner diameter from the top tube. Attach the pull adaptor to the top piece of the draw-rod. Be sure that jam nut is snug so the pull adaptor does not loosen.

- While holding the cable from above the bushing, lower the bushing over the draw-rod. For bushing lifting and general installation instructions, please refer to ABB O Plus C II EHV Installation and Maintenance Guide, document number 1ZUA 2751-244.

- Once the bushing is fully seated on the mounting flange and the draw-rod is extended into the upper terminal, install the washer and nut inside the upper terminal and loosely secure with the box spanner by making 2 to 3 turns.

- Remove the pulling device and box spanner.

- Using the torque wrench with the 15/16 inch socket torque the nut to 7 ft-lbs [10 N-m]. This is a preliminary torque to seat the parts for alignment. Make sure the lower terminal is properly seated against the bushing lower support.

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<th>Type O Plus C II Voltage Class</th>
<th>Number of Turns</th>
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<tbody>
<tr>
<td>345</td>
<td>2.5</td>
</tr>
<tr>
<td>550</td>
<td>3</td>
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- Further tighten the nut by turning the wrench according to the table above. Do not allow the wrench to ratchet or slip, so as not to lose count.

- Apply a light film of transformer oil to the o-ring on the upper terminal plug, insert the plug and torque to 30 ft-lbs [41 N-m] using a spanner wrench.
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