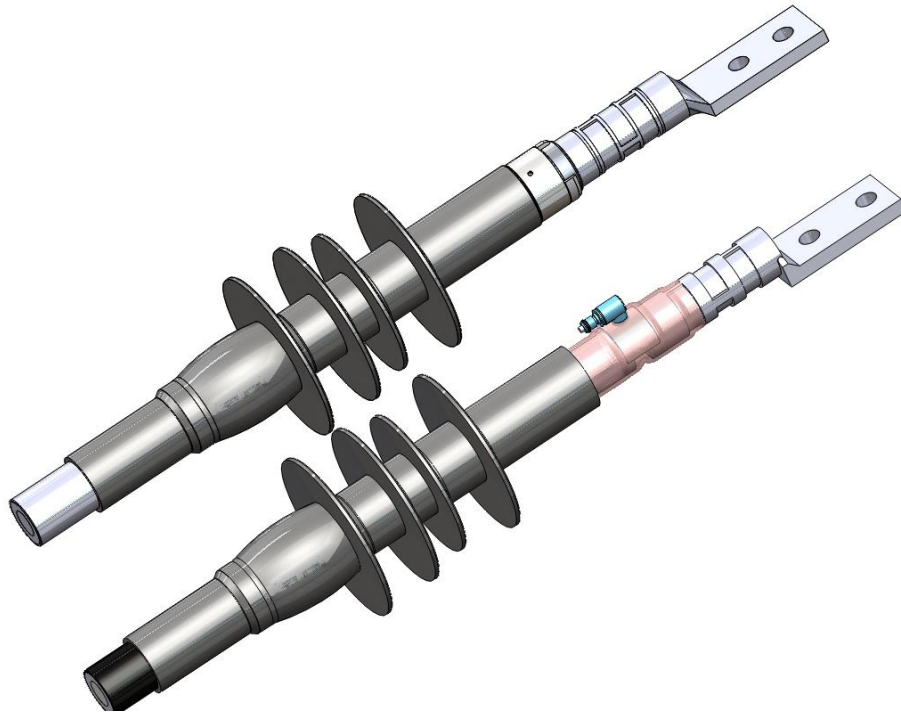


Rejuvenation Instructions

#561 – 600A Live-Front Terminations – UPR



This NRI covers the following:

- Applications and limitations of the two live-front seal kit options used on 600A cables.
- How to install the threaded seal kit and heat-shrink seal kit on live-front terminations.
- How to correctly size and select each seal kit to match the cable.

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WARNING: It is dangerous working around energized high-voltage systems, pressurized systems, and chemicals. Always work in accordance to the Novinium Field Operations Safety Handbook (FOSH) or other local governing safety standards.

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Introduction

There are two seal kit options for live-front terminations installed on large diameter (600A) cables.

Threaded Live-Front Seal Kit:

- It is the preferred option.
- It is a rigid device that seals the gap between the live-front connector and the cable’s insulation.
- A sliding valve allows for fluid injection into the cable.
- With special tooling, the seal kit can adapt to a range of cables and insulation thicknesses.

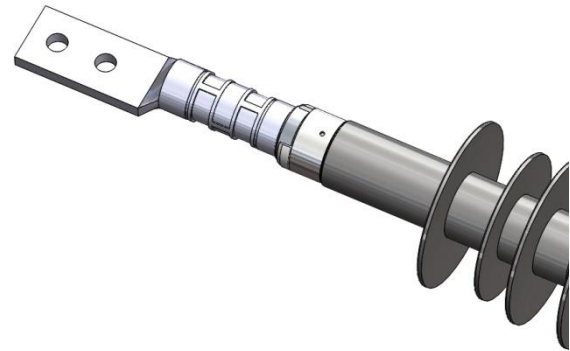


Figure 1: Threaded live-front seal kit.

Heat-Shrink Live-Front Adapter (HLFA):

- It is an option for when the existing connector cannot be replaced.
- The HLFA uses a saddle support to span the gap between the connector and insulation.
- The saddle support serves as the mounting point for the quick-disconnect (QD) fitting.
- An adhesive-lined heat-shrink sleeve creates the fluid seal.

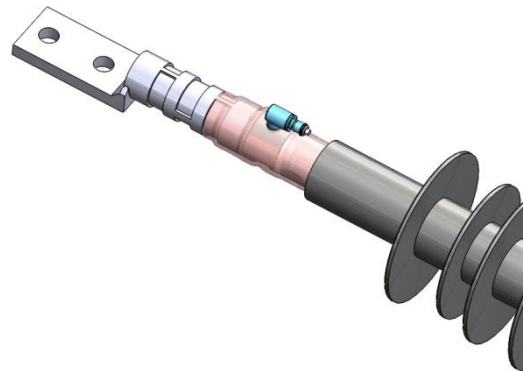


Figure 2: Heat-shrink live-front adapter (HLFA).

1. Applications

Threaded Seal Kit	HLFA
<ul style="list-style-type: none"> Live-front terminations on large diameter 600A cables in most applications. 	<ul style="list-style-type: none"> Live-front terminations on large diameter 600A cables when the existing connector cannot be removed/replaced easily or when there is no slack in the cable.

2. Pressure Rating

Threaded Seal Kit	HLFA
<ul style="list-style-type: none"> Up to 120psi injection pressure. 30psi static head pressure while the cable is in service (consult with Engineering for higher pressures). 	<ul style="list-style-type: none"> Up to 60psi injection pressure. 25psi static head pressure while the cable is in service.

3. Limitations

Threaded Seal Kit	HLFA
<ul style="list-style-type: none"> De-energized injections only. 10-35kV insulation thickness. Adhesive requires an over-night cure time (consult with Engineering for deviations). Existing lug must be removed. 	<ul style="list-style-type: none"> De-energized injections only. Not intended to be used on circuits with sustained heavy loads and must never be used above 194°F. Not compatible with porcelain style terminations.

4. Required Equipment

Threaded Seal Kit	HLFA
<ul style="list-style-type: none"> Threaded seal kit. Thread and shoulder cutting tool kit. Adhesive (3M DP8005). Stress-control termination. Injection adapter (required for injection). 	<ul style="list-style-type: none"> Heat-shrink tube. Teflon installation tool. Counterbore tool. Raychem torch, regulator, and hose. Saddle support. Quick-disconnect (QD) fitting. Stress-control termination.

Installing the Threaded Seal Kit

1. Prepare the cable.

- a. Determine the jacket removal or neutral pullback lengths by adding the length of the conductor cutback and the seal kit to the dimension found in the manufacturer's instructions.
- b. For the 3M QTIII stress control kits (5-28kV), these dimensions are found in Table 1. For other stress control terminations, the dimension can be calculated as follows:
 - **UPR Jacket Cutback** = 3M Cutback + Seal Kit + Insulation Cutback
 - **UPR Neutral Pullback** = 3M Pullback + Seal Kit + Insulation Cutback

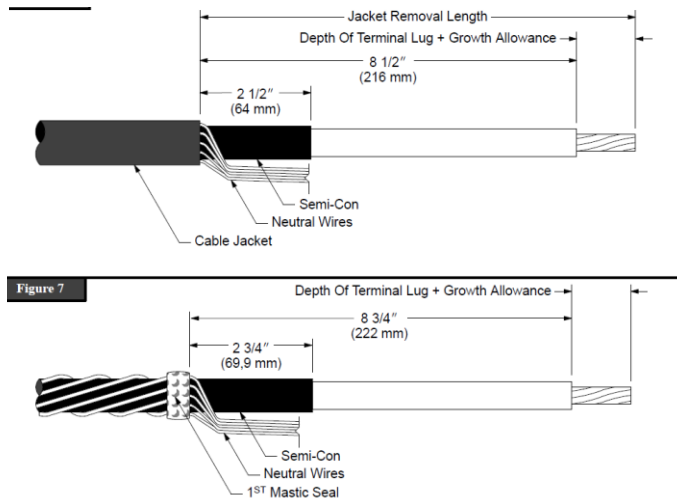


Figure 3: Adjust jacket removal/neutral pullback distances to accommodate seal kit.

- c. Prepare the jacket, ground wires, and insulation shield accordingly.
- d. Perform the insulation cutback in accordance with Table 1. Finish the insulation cutback with a smooth and square edge.
- e. File the leading edge of the conductor to remove any burrs or sharp edges.



Figure 4: Finish the insulation with a smooth and square edge.

- f. Configure the shoulder and threading tool by fitting the blade and threading die specified in Table 1.
- g. Select the bushing that provides the best fit on the conductor. For more details, refer to the Shouldering and Threading Tool Instructions (P/N 860340).

- h. Use the shoulder cutting end of the thread and shoulder cutting tool to turn down the diameter of the cable's insulation.
- i. Visually inspect the shoulder to see that it is round and concentric to the conductor.

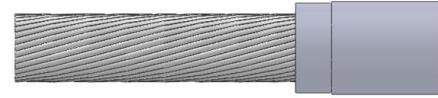


Figure 5: Shoulder the insulation.

- j. Use the threading end of the thread and shoulder cutting tool to thread the shoulder.
- k. Thread only as far as the die readily advances into the cable. Do **NOT** overturn as this will damage the threads.



Figure 6: Thread the insulation.

- l. Clean and pull away burrs and any loose shavings from the thread and the square edge.
- m. Slide the stress-control kit over the end of the cable. Do **NOT** shrink into position at this time.

Selection Criteria			Insulation Cutback (+/-1/8")	3M QTIII		Tooling	
Kcmil/AWG	Conductor Type	Conductor Dia. (in.)		Neutral Pullback	Jacket Cutback	Threading Die	Blade 11585-
1000	Standard	1.072-1.152	4 7/8"	15 5/8"	15 3/8"	1 1/2"-12	-1
	Compact	1.037-1.077				1 3/8"-12	-2
750	Standard	.933-.998	3 3/4"	14 1/2"	14 1/4"	1 3/8"-12	-2
	Compact	.898-.938				1 1/4"-12	-3
500	Standard	.757-.814	3 1/4"	14"	13 3/4"	1 1/8"-12	-4
	Compact	.732-.760				1 1/8"-12	-4
350	Standard	.637-.681	2 1/2"	13 1/4"	13"	1"-14	-5
	Compact	.613-.640				1"-14	-6
250	Standard	.538-.575	2"	12 3/4"	12 1/2"	15/16"-16	-7
	Compact	.518-.541				15/16"-16	-7
4/0	Standard	.493-.528	1 3/4"	12 1/2"	12 1/4"	13/16"-16	-8
	Compact	.475-.496				13/16"-16	-8

Table 1: Insulation cutback chart.

2. Install the threaded seal kit.

- a. Due to the short curing time of the thread sealant, this section must be completed within five minutes.
- b. Create a clean environment around where the termination will be installed and remove the protective tape wrapping from the machined shoulder to get the threaded collar assembly and the modified connector ready.
- c. Affix the static mixer nozzle provided in this seal kit to the adhesive gun assembly in the thread and shoulder cutting tool kit and squeeze a quarter-sized bead onto a drop cloth.

- d. Apply an even coating of adhesive to the internal thread of the threaded collar and the external thread of the cable.

- Use the supplied brush to help spread the adhesive.

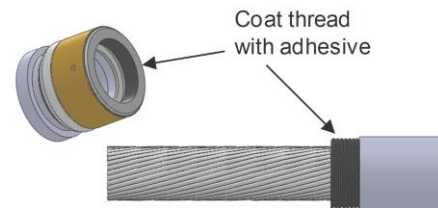


Figure 7: Apply adhesive to the threaded shoulder and the internal threads of the collar.

- e. Slide the threaded collar assembly over the conductor strands and thread onto the cable's insulation until it has bottomed out.

- The retaining ring can be removed and the strap wrench from the thread and shoulder cutting tool kit can be used to assist.

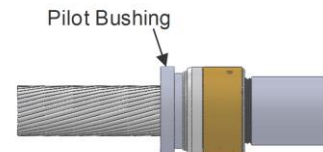


Figure 8: Thread the collar onto the cable until it has bottomed out.

- f. Remove the pilot bushing from the threaded collar and prepare the conductor strands for crimping by using a wire brush and corrosion inhibiting compound or other local procedure.

- g. Apply o-ring lubricant to the leading edge of the modified connector and insert past the internal o-ring of the threaded collar.

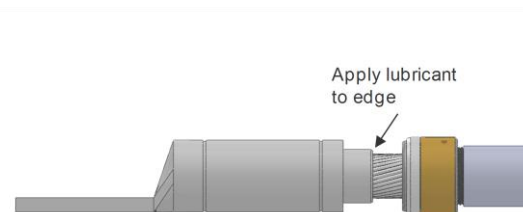


Figure 9: Lubricate the leading edge of the compression lug.

- h. Use the pilot bushing to create the necessary gap to account for connector elongation.
- 🔗 **NOTE:** No gap is required for installing the 13/16"-16 sized collar (3/0 and 4/0 sized cable).

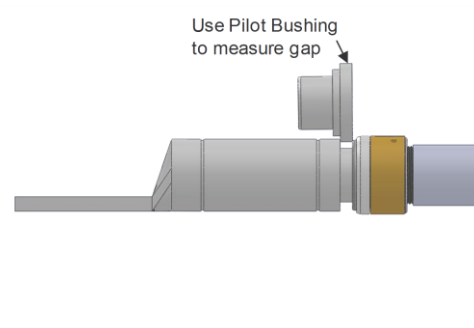


Figure 10: Insert the leading edge of the connector past the internal o-ring and measure the gap.

- i. Use cable cleaner to clean away any adhesive that may have run off onto the cable's insulation surface.
- j. Use the correct Burndy U or P series die to crimp the modified connector while staying between the two machined grooves.
- k. Inspect the connector and use a file to smooth any sharp edges that could damage the housing.

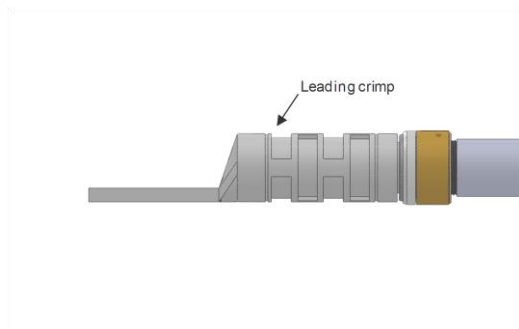


Figure 11: Crimp the connector using a Burndy U or P series die.

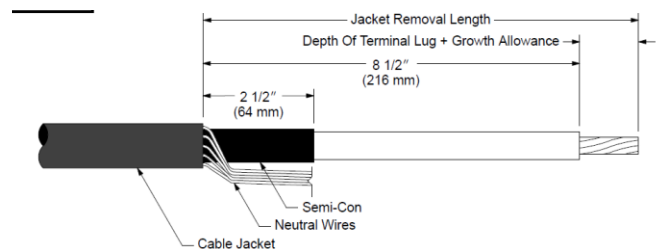
3. Test, inject, and complete the termination.

- a. It is ideal to perform a flow and pressure test at this point. However, the thread sealant must be allowed to cure overnight prior to exposing to Cablecure fluids.
- b. Follow standard line worker practice and clean the cable adapter and connector with an approved cable cleaner.
- c. After the injection process is complete, continue installing the stress-control termination by following the instruction sheet supplied by the manufacturer.

Installing the Heat-Shrink Live-Front Adapter (HLFA)

1. Prepare the cable.

- a. If starting from an existing installation, remove the old stress control termination and examine the lug. The seal kit requires a solid pad lug.
- b. Determine the jacket removal or neutral pullback lengths by adding the length of the conductor cutback and the seal kit to the



dimension found in the manufacturer’s instructions.

- c. For the 3M QTIII stress control kits (5-28kV), these dimensions are found in Table 2. For other stress control terminations, the dimension can be calculated as follows:

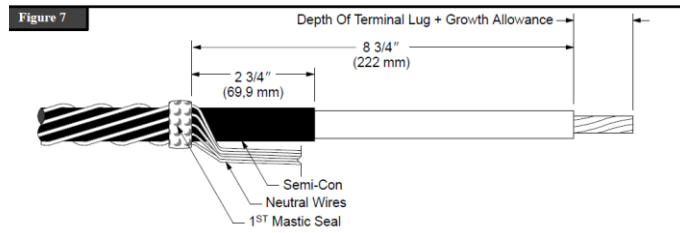


Figure 12: Adjust the jacket removal/neutral pullback distances to accommodate the seal kit.

- **UPR Jacket Cutback** = 3M Cutback + Seal Kit + Insulation Cutback
- **UPR Neutral Pullback** = 3M Pullback + Seal Kit + Insulation Cutback

- d. Prepare the jacket, ground wires, and insulation shield accordingly.
- e. Use the wire brush (819362) and corrosion inhibiting grease (819361) to prepare the conductor strands for crimping.
- f. Crimp the connector and leave ample surface at the end of the connector for the saddle support to rest and for the heat-shrink tube to seal (minimum of about 3/8”).

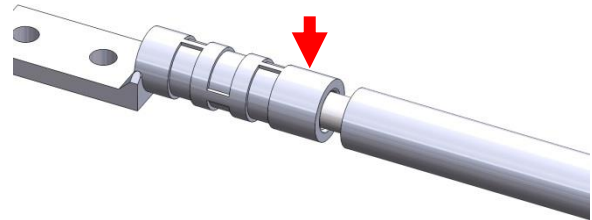


Figure 13: Leave 3/8” of sealing surface at the base of the connector.

Kcmil/AWG	Insulation Cutback	3M QTIII (5-28kV)	
		Jacket Cutback	Neutral Pullback
1000	5 7/8”	16 3/8”	16 5/8”
750	4 1/2”	15”	15 1/4”
500	4 3/8”	14 7/8”	15 1/8”
350	3 5/8”	14 1/8”	14 3/8”
250	2 7/8”	13 3/8”	13 5/8”
4/0	2 5/8”	13 1/8”	13 3/8”

Table 2: Cable prep table for HLFA.

2. Install the heat shrink.

- a. Test fit the saddle support for proper fit on the connector and insulation.
 - It should slip easily into position and rest evenly.



Figure 14: Test fit the saddle support.

- a. Insert the Teflon installation tool through the heat shrink tube and thread it onto the support saddle.
 - The Teflon tool can be used hold the saddle support in position and will prevent adhesive from running into the threads.
- b. Position the heat shrink over the cable with the center of the saddle in the insulation gap.

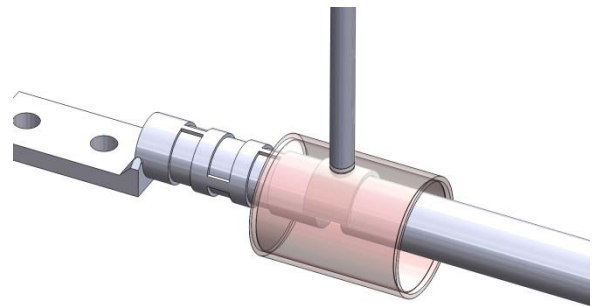


Figure 15: Use the Teflon tool to hold the heat shrink and saddle in position.

- c. Use the Raychem torch to collapse the heat shrink so that it seals on the connector and insulation.
- d. Start heating at the center of the heat shrink tube and move toward the edges.
 - Heating from the edges may cause the heat shrink to split.

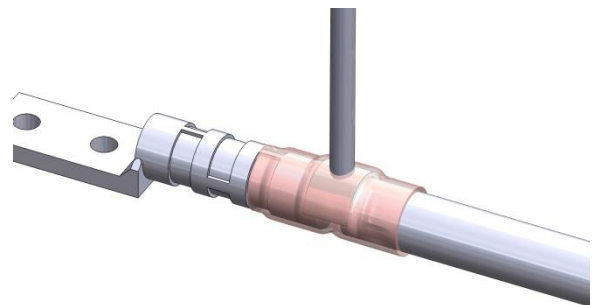


Figure 16: Shrink the heat shrink tube from the center out.

- e. Continue heating until the entire tube is clear and you can see the adhesive flowing.
- f. Apply a little extra heat to the connector to bring it up to the melting temperature of the adhesive.
 - This is especially important in cold temperatures where the conductor acts as a heat sink.
- g. Allow the HLFA to cool until the tube is white and the adhesive has set.

3. Complete the assembly.

- a. Remove the teflon installation tool from the saddle support.
- b. Use the counterbore tool (11637-1) to open up the hole by removing the heat shrink and adhesive from around the threads.
- c. Install the quick disconnect (QD) fitting using several wraps of Teflon tape on the pipe threads to create a leak-proof seal.
- d. Install the stress-control termination by following the manufacturer's instructions.
- e. Cover the white heat shrink and any exposed insulation with silicone non-tracking tape (818662) using good line worker practices.

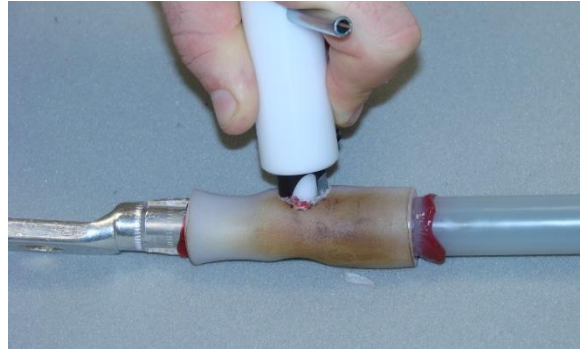


Figure 17: Clean the adhesive from around the threads.

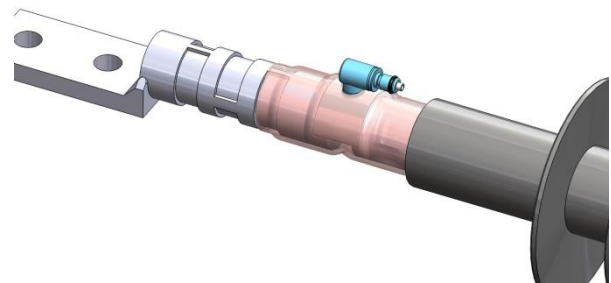


Figure 18: Install the QD fittings.

Sizing Instructions

1. Select the threaded seal kit for 600A dead-front terminations.

- a. Select the conductor size.
- b. Select the level of conductor compression.
- c. Verify that the conductor diameter falls within the given range.
- d. Verify that the insulation diameter meets or exceeds the minimum requirements.
- e. Select the stress control termination from Table 3.

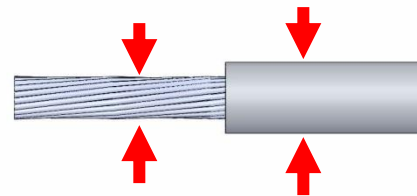


Figure 19: Size the threaded seal kit by conductor size and verify that the cable meets the minimum insulation diameter.

Selection Criteria				Seal Kit	Tool Kit
Kcmil/ AWG	Conductor Type	Conductor Dia. (in.)	Insulation Min. Dia. (in.)	Part No. 11590-	Part No. 11582-
1000	Standard	1.072-1.152	1.49	-1	-1
	Compact	1.037-1.077	1.37	-2	-1
750	Standard	.933-.998	1.37	-4	-1
	Compact	.898-.938	1.24	-5	-1
500	Standard	.757-.814	1.12	-8	-1
	Compact	.732-.760			-1
350	Standard	.637-.681	1.00	-10	-1
	Compact	.613-.640			-2
250	Standard	.538-.575	.93	-13	-2
	Compact	.518-.541			-2
4/0	Standard	.493-.528	.81	-14	-2
	Compact	.475-.496			-2

Table 3: Sizing – threaded live-front seal kit.

2. Select the heat-shrink live-front adapter.

- a. Select the saddle support from Table 4 by measuring the outer diameter of the connector and the cable insulation.
- b. Select the heat shrink tube using Table 4.
- c. Select the QD that best fits the application using Table 4.
- d. If necessary, select the 2-hole lug from Table 5.
- e. Select the stress control termination from Table 6.

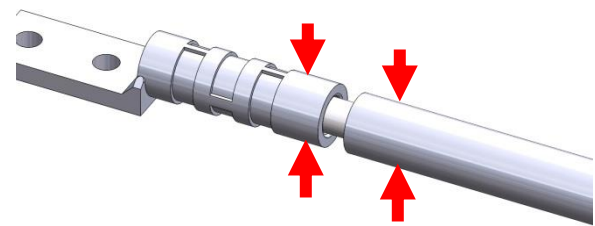






Figure 20: Size the heat-shrink seal kit based on the connector barrel and the insulation diameters.

inches	0.7	0.8	0.9	1.0	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	2.0	2.1	2.2	2.3
0.7	1	19	26	35	-	-	-	-	-	-	-	-	-	-	-	-	-
0.8	19	2	20	27	36	-	-	-	-	-	-	-	-	-	-	-	-
0.9	26	20	3	21	28	37	-	-	-	-	-	-	-	-	-	-	-
1.0	35	27	21	4	22	29	38	-	-	-	-	-	-	-	-	-	-
1.1	-	36	28	22	5	17	30	39	-	-	-	-	-	-	-	-	-
1.2	-	-	37	29	17	6	23	31	40	-	-	-	-	-	-	-	-
1.3	-	-	-	38	30	23	11	18	32	41	-	-	-	-	-	-	-
1.4	-	-	-	-	39	31	18	12	24	33	7	-	-	-	-	-	-
1.5	-	-	-	-	-	40	32	24	13	25	34	42	-	-	-	-	-
1.6	-	-	-	-	-	-	41	33	25	14	9	8	43	-	-	-	-
1.7	-	-	-	-	-	-	-	7	34	9	15	10	44	47	-	-	-
1.8	-	-	-	-	-	-	-	-	42	8	10	16	45	48	51	-	-
1.9	-	-	-	-	-	-	-	-	-	43	44	45	46	49	52	55	-
2.0	-	-	-	-	-	-	-	-	-	-	47	48	49	50	53	56	59
2.1	-	-	-	-	-	-	-	-	-	-	-	51	52	53	54	57	60
2.2	-	-	-	-	-	-	-	-	-	-	-	-	55	56	57	58	61
2.3	-	-	-	-	-	-	-	-	-	-	-	-	-	59	60	61	62

Support saddle sizing chart 11031-

Heat Shrink Tubes

	11030-1
	11030-1 & 11030-2
	11030-2
	11030-3

Quick Disconnect (QD)

Male-straight	816547
Male-90deg	818036
Female	816546

Table 4: Saddle support sizing chart.

Kcmil/AWG	Part No.
1000	819025
750	819024
500	819022
350	819021
250	819020
4/0	819019

Table 5: 2-hole lug sizing table.

3. Select the stress control termination.

Selection Criteria		5-28kV		5-35kV	
Insulation Dia. (in.)	Jacket Dia. (in.)	3M p/n	Novinium p/n	3M p/n	Novinium p/n
0.64 – 1.08	0.97 – 1.48	7652-S-4	819792		
0.72 – 1.29	1.04 – 1.60	7653-S-4	819793	7663-S-8	819797
0.83 – 1.53	1.12 – 1.87	7654-S-4	819794	7664-S-8	819798
1.05 – 1.80	1.39 – 2.40	7655-S-4	819795	7665-S-8	819799
1.53 – 2.32	1.84 – 2.80	7656-S-4	819796	7666-S-8	819800

Table 6: Stress control selection table.