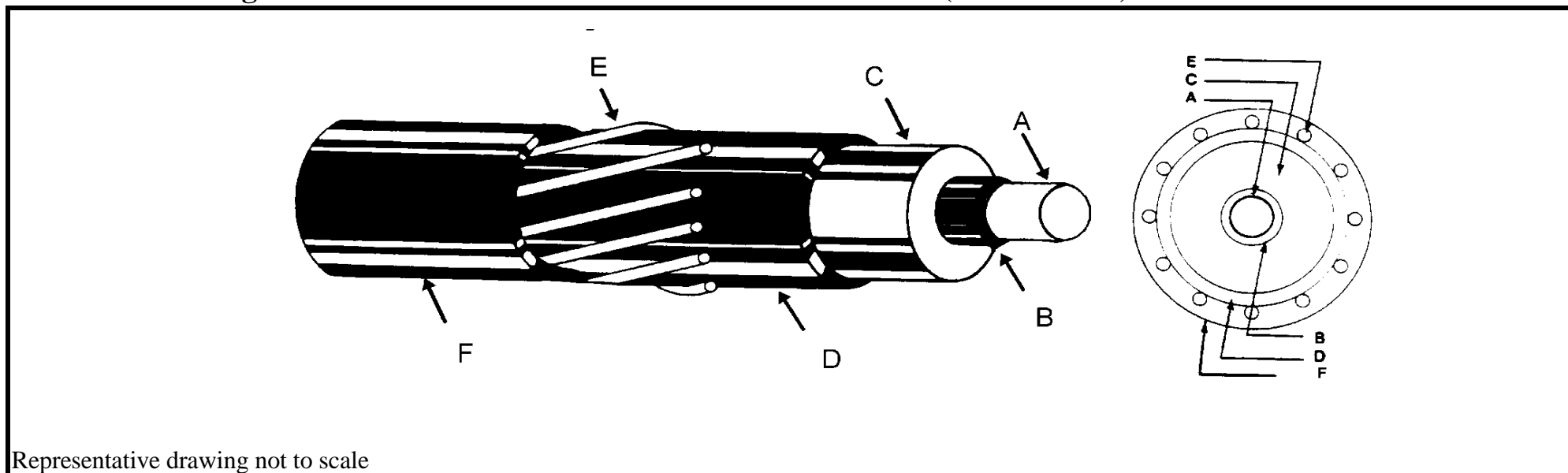




Drawing / Data Sheet

Single Conductor EmPowr® Link Concentric Neutral (Round Wire) Power Cable 15kV



Representative drawing not to scale

Component Description	Thickness (inches)			Diameter (inches)				
	Min.	Nom.*	Max.	Min.	Nom.*	Max.		
A: Conductor : 1/2 To 3/4 Hard 1 AWG Solid AL Conductor	--	--	--	0.284	0.289	0.295		
B: Conductor Shield: Super Smooth Semiconducting Thermoset Polymer	0.012	0.018	--	--	0.325	--		
C: Insulation Tree Retardant Crosslinked Polyethylene	Insulation Level 100%		0.165	0.175	0.205	0.645	0.675	0.725
D: Insulation Shield Semiconducting Thermoset Polymer	0.030	0.035	0.060	0.705	0.745	0.825		
E: Concentric Neutral / Metallic Shield 10 x 14 AWG Bare Copper Round Wire	--	--	--	--	0.862	--		
F: Jacket EXTRUDED-TO-FILL Linear Low Density Polyethylene w/ 3 Red Extruded Stripes	0.045	0.055	0.080	--	0.972	--		
Single Conductor Finished Cable Nominal Weight: 474 lb/kft *								
Single Conductor Finished Cable Nominal Overall Diameter: 0.972 inches *								

* - Nominal Values are Subject to Manufacturing Tolerances; Bold Font Indicates Minimum Average Values

Customer:	COLORADO SPRINGS UTILITIES	Customer P/N:	EA/PC Number:
		194-117-170	224513 Rev. 0
Specification / Standard:	194-1 Date: 1/12/2017 AEIC CS8-13, ICEA S-94-649	Prepared By:	Date:
		WYQUNXN	1/17/2019

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Electrical Characteristics

Single Conductor EmPowr® Link Concentric Neutral (Round Wire) Power Cable 15kV

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Input Parameters:	Electrical Characteristics Based on Normal Operating Temperature: 90 °C IR Constant @ 60°F: 20000 Dielectric Constant: 2.35 Earth Resistivity: 100 Ω·m		Dissipation Factor: 0.01 % Voltage (line to ground): 8.66 kV Conductor Center to Center Spacing (S): 7.5 in		<p>Flat Arrangement</p>																																			
Conductor Resistance:			R_{dc} @ 25°C: 0.2107 Ω/kft R_{ac} @ 25°C: 0.2107 Ω/kft R_{ac} @ 90°C: 0.2650 Ω/kft	0.6912 Ω/km 0.6914 Ω/km 0.8696 Ω/km																																				
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Velocity of Propagation				485.02 ft/μs 147.83 m/μs																																				

Customer:	COLORADO SPRINGS UTILITIES	Customer P/N:	194-117-170	EA/PC Number:	224513 Rev. 0
Specification / Standard:	194-1 Date: 1/12/2017 AEIC CS8-13, ICEA S-94-649	Prepared by:	WYQUNXN	Date:	1/17/2019

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Single Conductor EmPowr® Link Concentric Neutral (Round Wire) Power Cable 15kV

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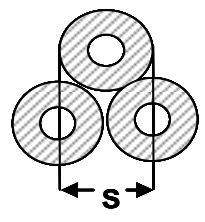
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Dielectric Losses: (Per Phase)				0.15 W/kft 0.50 W/km																																					
Electrical Stress:		Insulation Average: 49.49 V/mil Conductor Shield - Insulation Interface Maximum: 72.85 V/mil Insulation - Insulation Shield Interface Minimum: 35.09 V/mil		1.95 kV/mm 2.87 kV/mm 1.38 kV/mm																																					
Insulation Resistance:				6344.25 MΩ-kft 1933.63 MΩ-km																																					
Velocity of Propagation				485.02 ft/μs 147.83 m/μs																																					

Customer:	COLORADO SPRINGS UTILITIES	Customer P/N:	194-117-170	EA/PC Number:	224513 Rev. 0
Specification / Standard:	194-1 Date: 1/12/2017 AEIC CS8-13, ICEA S-94-649	Prepared by:	WYQUNXN	Date:	1/17/2019

Dimensions and weights not designated minimum or maximum are nominal and subject to manufacturing tolerances.

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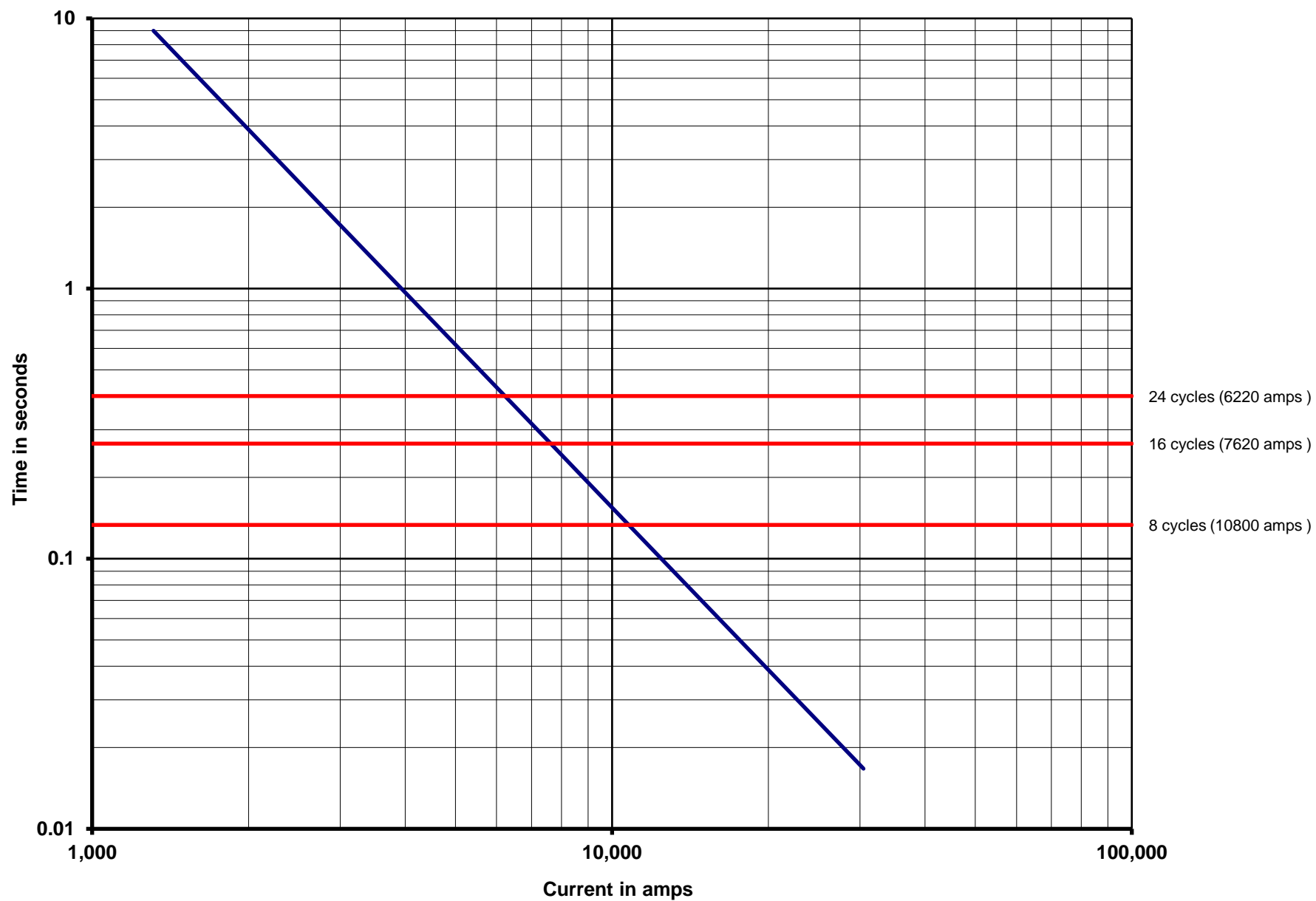
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Conductor Fault Current

1 AWG Solid Al, 0.175" TRXLPE, 10 x #14 AWG Cu, LLDPE

**MAXIMUM FAULT CURRENT OPERATING LIMITS
FOR AN 1 INSULATED ALUMINUM CONDUCTOR AT 60 Hz**



1 Insulated Aluminum Conductor

Number of Cycles	Time (s)	Current (amps)
8	0.13	10800
16	0.27	7620
24	0.40	6220

Notes -

The calculations are as per ICEA P-32-382. The calculations assume that all heat generated remains in the metal. The duration of a short circuit is considered to be up to approximately 2 seconds. The indicated short circuit value shown on this graph for durations longer than 2 seconds should be used with caution. The time shown is calculated for a given RMS fault current to bring the conductor to a temperature that will not cause damage to the conductor shield or the insulation. The calculations are based on a cross-sectional area of 83700 cmil of Aluminum starting at an initial temperature of 90 C, and a final temperature of 250 C. The calculations utilize an absolute temperature of resistivity of 228 and an ICEA calculation factor of 0.0125. The system frequency is 60 Hz.

Customer:	COLORADO SPRINGS UTILITIES	Customer P/N:	EA/PC Number:
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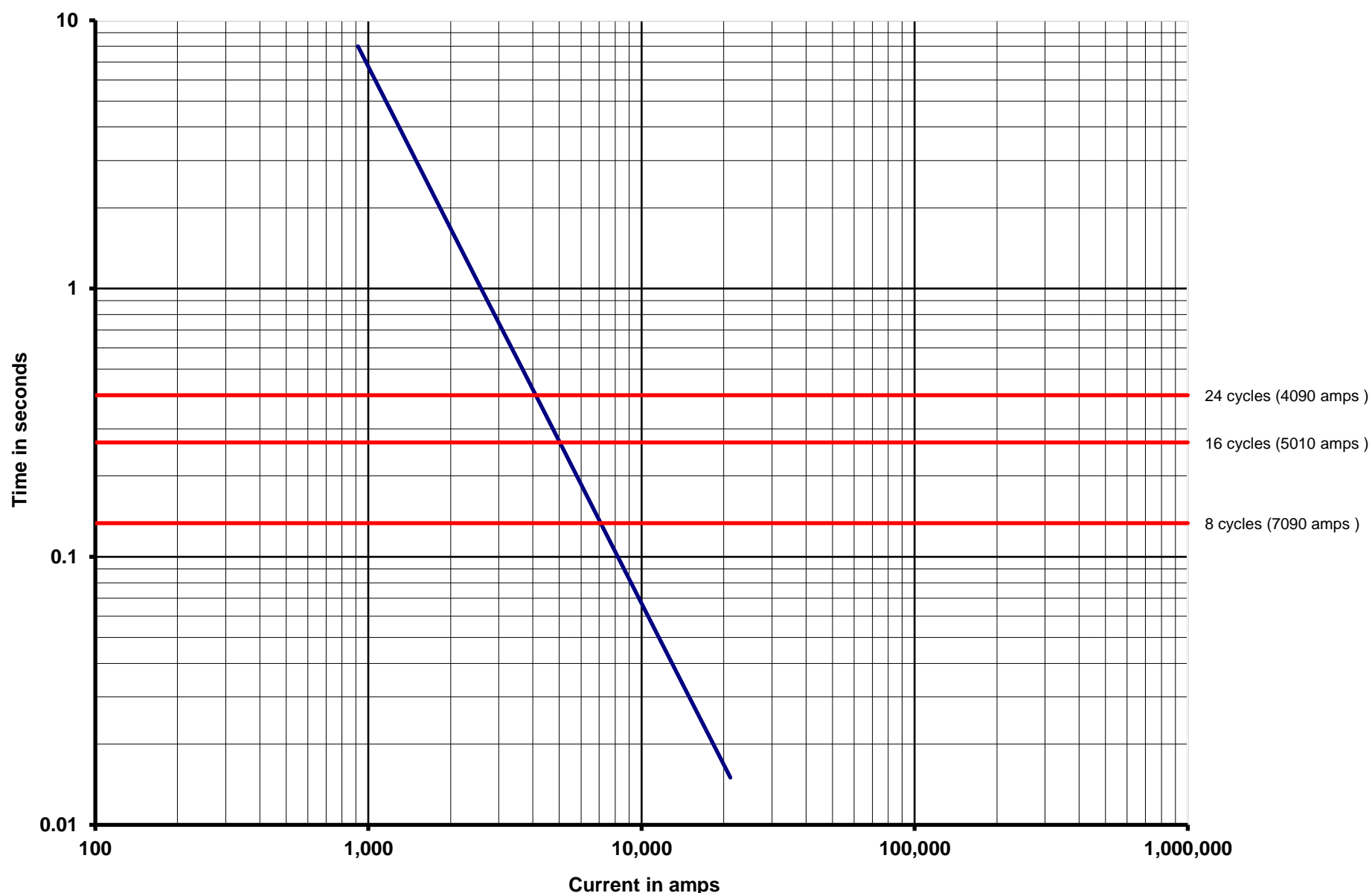
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Shield Fault Current

1 AWG Solid Al, 0.175" TRXLPE, 10 x #14 AWG Cu, LLDPE

**MAXIMUM FAULT CURRENT OPERATING LIMITS
FOR A 41100 cmil COPPER METALLIC SHIELD AT 60 Hz**



10 x #14AWG Copper Concentric Neutral

Number of Cycles	Time (s)	Current (amps)
8	0.13	7090
16	0.27	5010
24	0.40	4090

Notes -

The curves assume that all heat generated remains in the metal. The time shown is that calculated for a given RMS fault current to bring the metallic shield to a temperature that will not cause damage to the insulation shield or cable jacket. The calculations are as per ICEA P-45-482 using an "M factor" of 0.063 corresponding to a 5-15 kV rated cable, with a conductor temperature of 90 and a metallic shield starting temperature of 85 C and a metallic shield ending temperature of 200

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Cable Installation

Single Conductor EmPowr® Link Concentric Neutral (Round Wire) Power Cable 15kV


Cable Description:	1 AWG Solid Al, 0.175" TRXLPE, 10 x #14 AWG Cu, LLDPE																																																																												
Maximum Pulling Tension:	<table style="width: 100%; border: none;"> <tr> <td></td> <th colspan="2" style="text-align: center;">Single Conductor</th> <th colspan="2" style="text-align: center;">3x1/C Parallel</th> </tr> <tr> <td>Conductor Pulling Eye / Bolt:</td> <td style="text-align: center;">500 lb</td> <td style="text-align: center;">2.2 kN</td> <td style="text-align: center;">1000 lb</td> <td style="text-align: center;">4.4 kN</td> </tr> <tr> <td>Cable Basket Grip:</td> <td style="text-align: center;">660 lb</td> <td style="text-align: center;">2.9 kN</td> <td style="text-align: center;">1320 lb</td> <td style="text-align: center;">5.9 kN 3 grips, 1 per cable</td> </tr> </table> <p style="color: red; font-size: small;">NOTE: When exceeding 1000 lb pulling force with basket grips, proceed with caution. Pulling grips must be sized in accordance with grip manufacturer's recommendations and be installed in accordance with AEIC CG5-05</p>		Single Conductor		3x1/C Parallel		Conductor Pulling Eye / Bolt:	500 lb	2.2 kN	1000 lb	4.4 kN	Cable Basket Grip:	660 lb	2.9 kN	1320 lb	5.9 kN 3 grips, 1 per cable																																																													
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 elastimold

6625 Bluewater Rd W
(505) 836-2020 Fax (505) 836-2021
A Unit of Thomas & Betts



Part #: **162LRJS - B - 5220**

Desc.: **15KV 200A LB ELBOW W - JS**

Insul. Dia.:

Cont. Dia: **2 AWG STR COMPR**

Cont. Dia: **1 AWG COMPT SOL**

Code:

08/27/18

Memphis, TN 38125
www.tnb.com

Thomas & Betts

CRIMPING TOOLS & DIES RECOMMENDED FOR ELASTIMOLD® ELBOW COMPRESSION CONNECTORS

DANGER: Failure to follow these tool recommendations will result in product damage or failure, and serious or fatal injury.

CAT. NO. 02500	CRIMP BARREL O.D.	CU OR AL CONDUCTOR SIZE AWG OR KCM		T&B	CSA	HOMAC		ALCOA	BURNDY		KEARNEY		BLACKBURN	ANDERSON	
		STR. COMPR.	COMPT. SOLID	HYDR TBM15 TBM14M 13100A		UT	HYDR	12A	MD6,MD7	Y35 Y45*	O	H1,H2	OD58	HYDR	VC-6
				DIE NO.	DIE NO.	DIE NO.	DIE NO.	DIE NO.	DIE NO.	DIE NO.	DIE NO.	DIE NO.	DIE NO.	DIE NO.	DIE NO.
180	.625" (15,9mm)	#6	#5	50(3)	22(2) xx	UT(3) UT3M	52(2)	B24EA(1)	W243(3) WBG(3) BG Nose(5)	U243(2) UBG(3) U27RT(3)	5/8(5) Nose	9/16(3) or 572(2)	5/8(5)	B24EA(1)	** NO DIE REQ'D
190		#5	#4												
200		#4	#3												
210		#3	#2												
220		#2	#1												
230		#1	1/0												
240		1/0	2/0												
250		2/0	3/0												
260	.781" (20,0mm)	3/0	4/0	62(2)	—	—	—	—	W247(4)	U29RT(3) U27ART(3)	747(3)	747(2)	—	—	VC-6 NOT RECOMMENDED
270		4/0	250	—	—	—	—	—	—	—	—	—	—	—	—

- * Requires Adapter No. 6515.
- ** To be used on aluminum conductor ONLY.
- () Minimum number of crimps recommended
- xx Overlap crimp.

**Wire brush bared aluminum conductor before inserting into connector.
Rotate each successive crimp 180°.**

Installation Instructions 3/0 and 4/0 Spade Contacts in Small Housings

This instruction sheet applies to 3/0 and 4/0 spade contact when used in small elbow housings, GA and smaller, or G and smaller.

DANGER

All apparatus must be de-energized during installation or removal of part(s).

Do not touch or move energized products in the work area.

These instructions do not attempt to provide for every possible contingency.

Failure to follow these instructions will result in damage to the product and serious or fatal injury.

This product should be installed only by competent personnel trained in good safety practices involving high voltage electrical equipment. These instructions are not intended as a substitute for adequate training or experience in such safety practices.

FOR MORE INFORMATION ON PARTS, INSTALLATION RATINGS AND COMPATIBILITY, CALL THE NEAREST ELASTIMOLD® OFFICE.

All apparatus must be installed and operated in accordance with individual user, local and national work rules and electrical standards.

For loadbreak products follow operating instructions. All deadbreak connectors must be de-energized before operating. All 200A deadbreak connectors must be mechanically secured with bails when connected.

If this product is supplied with a protective shipping cover(s), remove this shipping cover(s) and replace with the appropriate HV insulated cap(s) or connector(s) before submerging or energizing the circuit.

Inspect parts for damage, rating and compatibility with mating parts.

Excess distortion of the assembled product may result in its failure.

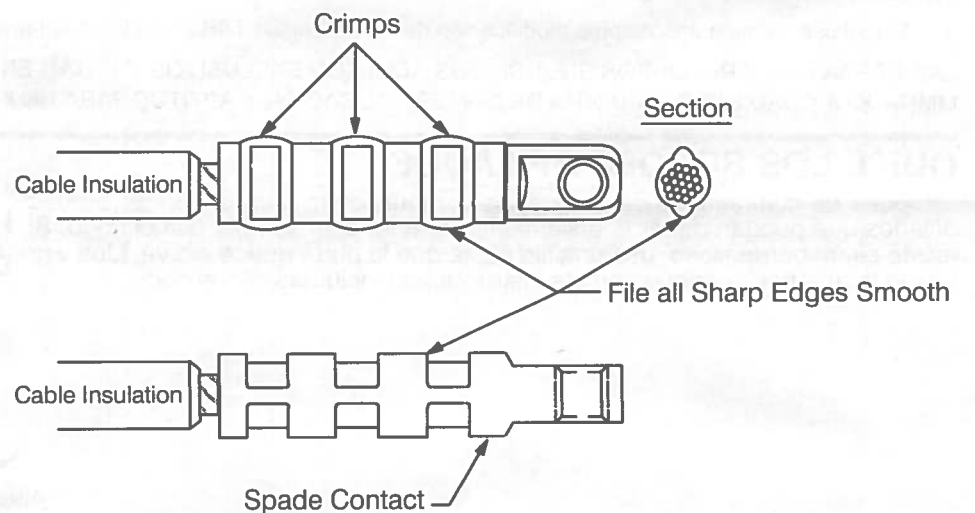
Limited Warranty:

1. T&B warrants that its products will be free from defects in materials or workmanship for a period of two (2) years, except for tools which are warranted separately (see warranty accompanying those products). Fisher Pierce® products and Elastimold® Reclosers are warranted for three years; and Joslyn™ VBT and VBU capacitor switches are warranted for four years or 40,000 operations whichever occurs first. Upon prompt notification of a warranted defect, T&B will, at its option, repair or replace the defective product.
2. In no event shall T&B be liable for any consequential, indirect or special damages, nor will T&B be liable for transportation, labor, or other charges arising out of the removal or reinstallation of its products. Liability for breach of warranty is limited to the cost of repair or replacement of the warranted product only.
3. Misuse, misapplication or modification of T&B products immediately voids all warranties.

THE WARRANTIES AND REMEDIES CONTAINED HEREIN ARE EXCLUSIVE AND ARE IN LIEU OF ALL OTHER WARRANTIES AND REMEDIES, INCLUDING BUT NOT LIMITED TO ANY IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, WHICH ARE SPECIFICALLY DISCLAIMED.

REMOVE SHARP EDGES

After crimping, inspect the crimps for any sharp edges that may damage the insulation during assembly of the spade contact into the elbow. If any sharp edges exist, use a file and carefully remove them until the part is smooth. After completing this, continue following the instructions packed with the elbow.

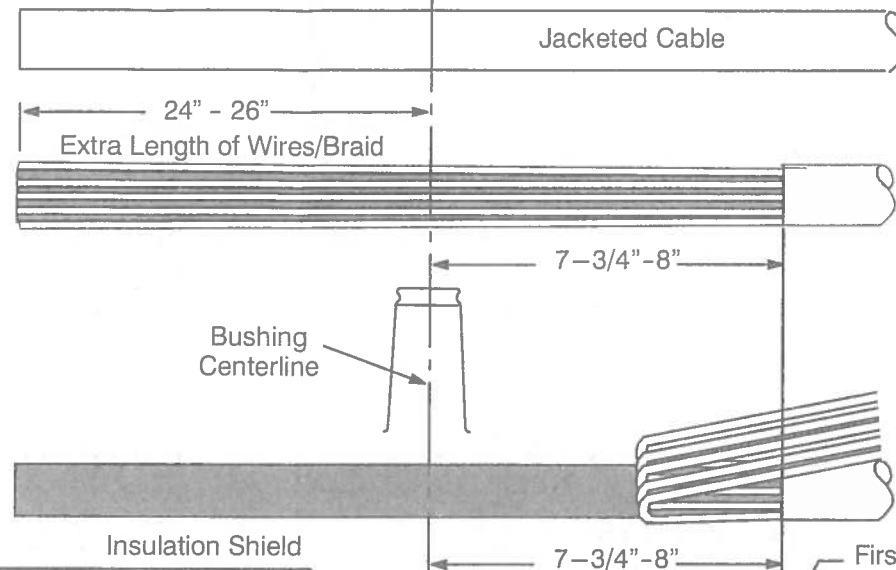


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STEP 1 CABLE TRAINING

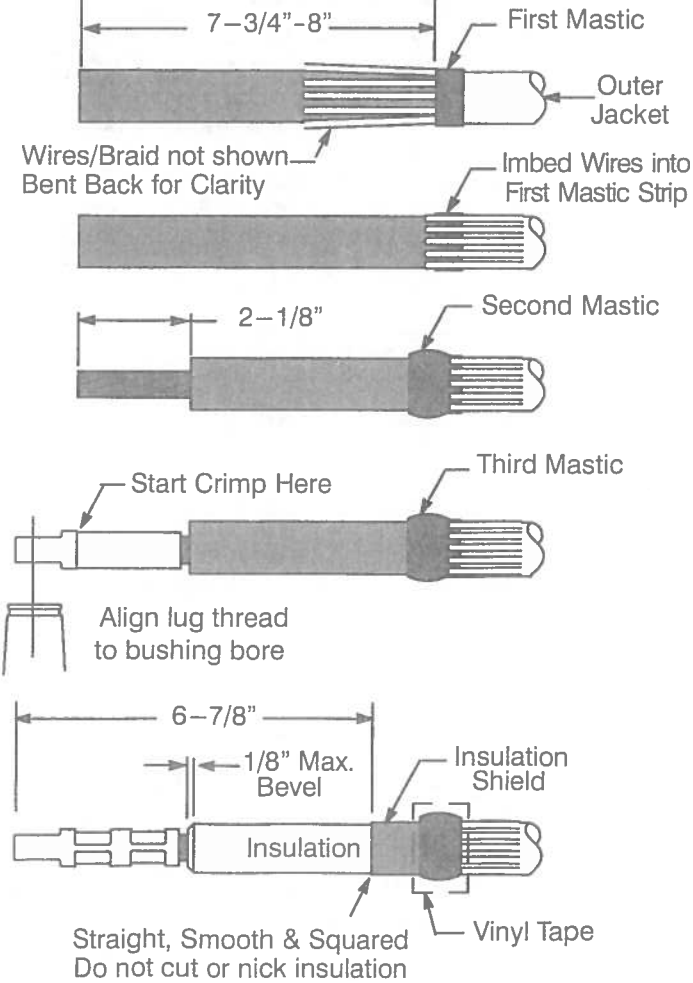
- Train cable to ensure slack for ease of operation.
- Use one of the two following methods to provide an extra length of concentric neutral wires or grounding braid wire to facilitate the connection of the neutral to the tank ground and the operation of the hotstick:
 - Mark the centerline of the bushing with tape and pull extra cable to 24-26" beyond the centerline. Remove the outer jacket 7 3/4" to 8" back from centerline.
 - Proceed to step "D" and connect the neutral wires to the tank ground with a jumper or grounding braid.
- Unwrap the neutral wire back past the bushing centerline.
- Cut excess cable squarely at the centerline of the bushing.



STEP 2 CABLE PREPARATION

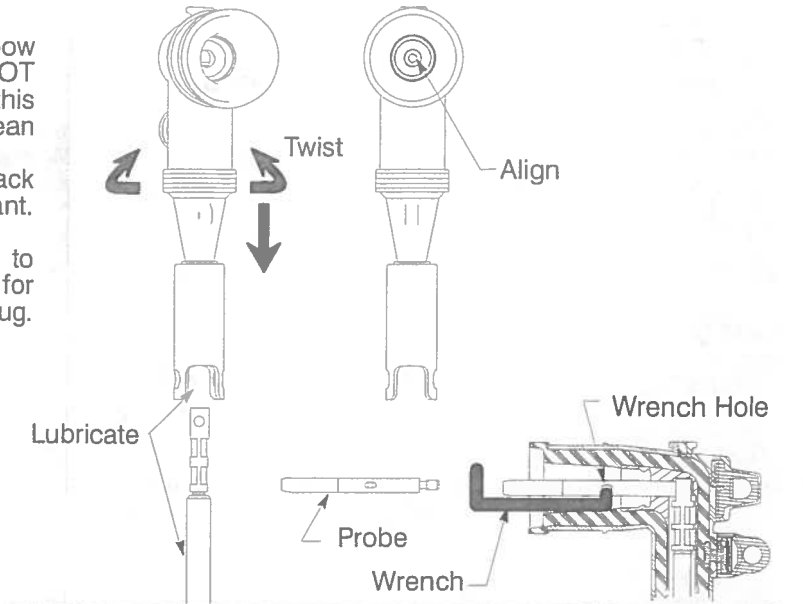
(Use cable cut back template (to the left) for dimensional guide.)

- Wrap one strip of mastic, stretching slightly, around jacket.
- Bend all of the neutral wires straight back over the mastic and along the cable. Press the wires into the mastic.
- Wrap the second strip of mastic completely around the outer jacket, overlapping the neutral wires imbedded into the first mastic strip. Use the third strip of mastic, if needed, to build-up the outer diameter in the area of the first mastic location. Cover all mastic with vinyl tape.
- Remove insulation shield and insulation from the cable end. Cut squarely taking care not to nick conductor.
- Wire brush bare aluminum conductors and immediately install compression lug. Rotate to spread inhibitor. Position compression lug so the CONTACT THREADED HOLE ALIGNS WITH THE BUSHING BORE. (Refer to crimp chart packaged with compression lug for recommended crimp tool information.) Start crimp at the crimp line mark. Rotate 180° each successive crimp. Carefully wipe excessive inhibitor from the outside of the lug and cable.
- Remove insulation shield as shown. Bevel insulation end 1/8" max.
- Thoroughly clean insulation to remove all traces of conductive residue.



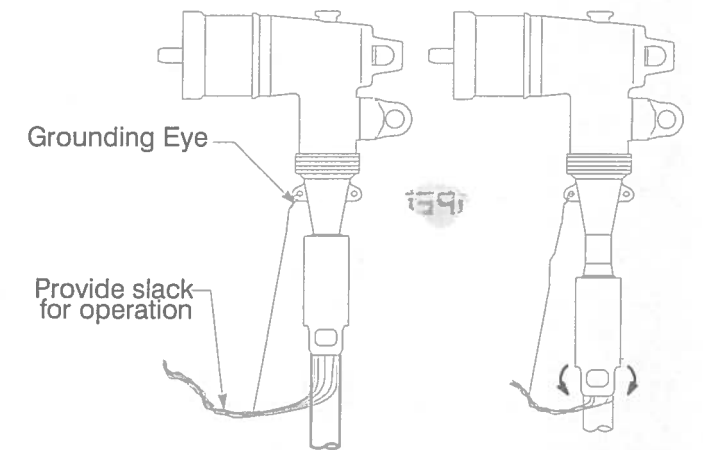
STEP 3 ELBOW ASSEMBLY

- Lubricate the cable insulation and inside the elbow housing with the lubricant supplied. DO NOT SUBSTITUTE. Other lubricants may be harmful to this product or its mating part(s). Keep insulation clean of dirt and grime.
- Slide the elbow connector onto the cable with a back and forth twisting motion. Wipe off all excess lubricant.
- Align elbow with compression lug's threaded hole.
- Thread probe into lug by hand, taking care not to cross-thread. The probe **must** turn freely for approximately four turns before becoming snug. Tighten with wrench until wrench bends.



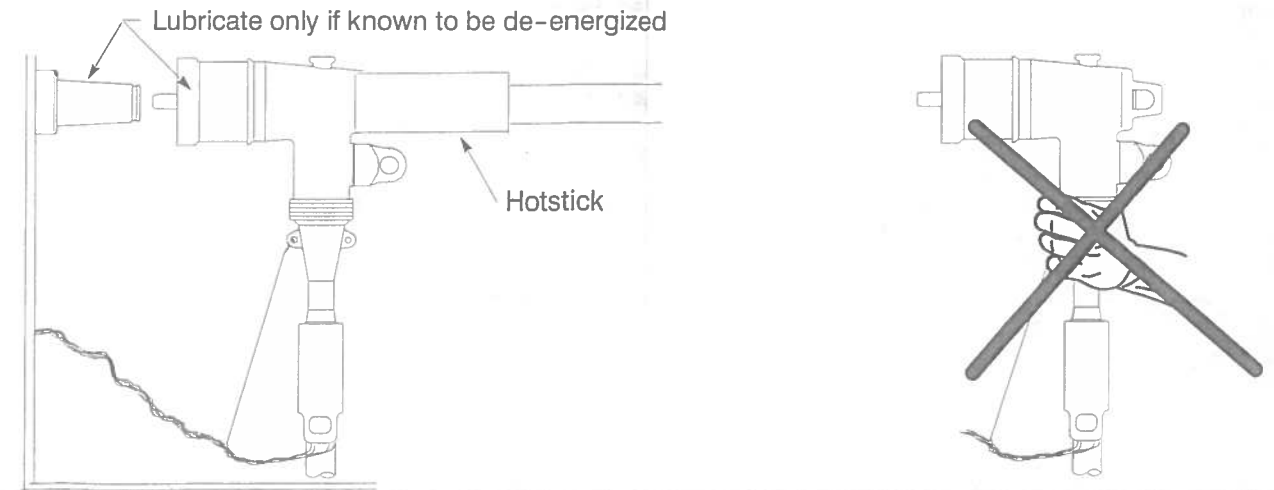
STEP 4 CONCENTRIC NEUTRAL CONNECTION

- Pull the hood over the concentric neutral seal area on the cable by pulling the tabs and/or rolling the seal down.
- Insert one end of a separate copper wire (No. 14 AWG / 2.5mm) or equivalent through the grounding eye on the elbow. Twist tightly taking care not to damage the eye.
- Twist all neutral wires and connect to ground using appropriate connector. Provide adequate slack in wires for elbow operation.



STEP 5 CONNECT ELBOW AND BUSHING PLUG

- Lubricate the receptacle portion of the elbow connector and the mating bushing with the lubricant supplied. LUBRICATE ONLY IF THE TRANSFORMER AND ELBOW ARE KNOWN TO BE DE-ENERGIZED.
- Operate per following instructions. DO NOT OPERATE BY HAND.



OPERATING INSTRUCTIONS

Before Loadmake or Loadbreak Operation:

Ensure connector is clean and free of any contaminants. Ensure work area is clear of obstructions to allow installer to establish firm footing and ensure a secure grasp on the hotstick tool. Maintain positive control over the movement of the loadbreak connector before, during and directly after the operating sequence. Because of the control, speed and force required to engage or disengage the elbow, certain operating positions are more advantageous than others. If there is some question as to proper operating position, it is recommended that the connectors be operated de-energized. Do not connect two different phases of a multiple-phase system. Before closing a single-phase loop, make certain both ends of the loop are the same phase.

LOADMAKE OPERATION

Loadbreak connectors must be operated with a fully insulated "hotstick" type live-line tool. Consult the Utility's safe work practices for the required live-line tool length.

- To prepare bushing for elbow connector, remove insulated cap by attaching hotstick tool to the insulated cap pulling eye, and following the instructions for this accessory, remove from bushing.
- Securely fasten the hotstick to the loadbreak connector pulling eye.
- Confirm positive control of the elbow connector. Withdraw the elbow from the accessory device on the apparatus parking stand with a fast, straight, firm motion being careful not to place the elbow connector near a ground plane. Check appropriate accessory device operating instructions to be sure that the device is rated for energized operation.
- Insert the probe tip approximately 2" (50mm) into the bushing (at this point the contacts are approximately 4" apart). **DO NOT HOLD IN THIS POSITION BUT IMMEDIATELY PUSH THE ELBOW HOME WITH A FAST, FIRM, STRAIGHT MOTION.** Use sufficient force to engage the internal lock on the elbow connector and bushing interface.

Fault Close

- DO NOT CONDUCT LOADMAKE OPERATIONS ON KNOWN FAULTS.**
- If a fault is experienced, both the elbow connector and the bushing must be replaced.

LOADBREAK OPERATION

- Place desired accessory device on apparatus parking stand. Refer to appropriate operating instructions for accessory device to be used. Confirm device is rated for energized operation.
- Firmly tighten the hotstick to the loadbreak connector pulling eye.
- Without exerting any pulling force, slightly rotate (clockwise) the connector in order to break surface friction prior to disconnection.
- Withdraw the connector from the bushing with a fast, firm, straight motion, being careful not to place the connector near a ground plane.
- Place connector on appropriate accessory device, following the operating instructions for that accessory.

VOLTAGE TEST

ELASTIMOLD® connectors equipped with an integral capacitance test point can be used to determine whether or not the circuit is energized.

When using the test point, complete the following steps:

- Remove test point cap with the hotstick. When removing cap, PEEL OFF AT AN ANGLE rather than pulling directly in line with the test point assembly.
- WARNING: THE VOLTAGE TEST POINT IS A CAPACITANCE DEVICE, IT IS NOT DIRECTLY CONNECTED TO THE CONDUCTOR.** Do not use conventional voltage measuring equipment. Follow the manufacturer's directions for the meter that is used. Test with a suitable sensing device, made for use with separable connectors manufactured with capacitive test points, to determine if cable is energized. Contamination, moisture, dirt, etc. around the test point or use of the wrong measuring equipment can provide a false "no voltage" indication on an energized elbow. To prevent serious or fatal injury treat the elbow as energized until the "no voltage" test point indication is confirmed by other means.
- After voltage detection has been made, clean and lubricate the inside surface of the cap with silicone lubricant supplied and replace it on the test point.

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Installation & Operating Instructions 161LRJS (without test point) / 162LRJS (with test point) Loadbreak Elbow Connectors with Jacket Seal

CONTENTS: Elbow Connector Housing, Compression Lug, Probe, Probe Wrench, Lubricant (Do Not Substitute) 3-Sealing strips and Installation/Operating Instructions.

The 161LRJS (without test point) and 162LRJS (with test point) are designed to terminate UD cable having jacketed concentric neutral wires and extruded insulation shielding. The elbow provides an operating interface for connecting to an Elastimold® 15kV class (8.3kV phase-to-ground and 14.4kV phase-to-phase) 200 ampere loadbreak bushing or accessory device with fault close rating of 10,000 amperes RMS symmetrical. Designed with a fold down extension on the cable entrance for sealing to the jacket of jacketed cable. When other types of UD cable are to be terminated, an appropriate Elastimold® cable shield or grounding device must be used.

DANGER

All apparatus must be de-energized during installation or removal of part(s) except for test point caps and indicators that can be installed and operated energized.

Do not touch or move energized products in the work area.

These instructions do not attempt to provide for every possible contingency.

Failure to follow these instructions will result in damage to the product and serious or fatal injury.

This product should be installed only by competent personnel trained in good safety practices involving high voltage electrical equipment. These instructions are not intended as a substitute for adequate training or experience in such safety practices.

All apparatus must be installed and operated in

Limited Warranty:

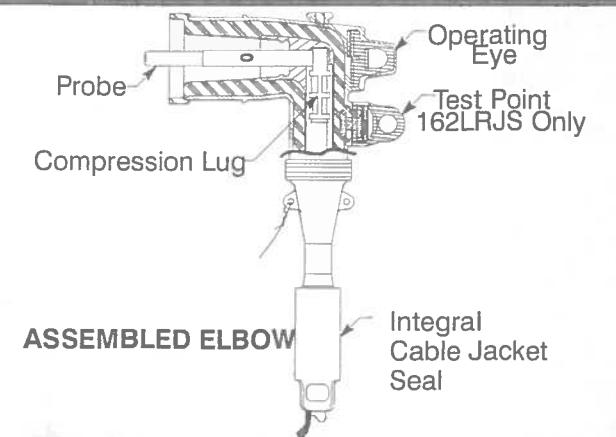
- T&B warrants that its products will be free from defects in materials or workmanship for a period of two (2) years, except for tools which are warranted separately (see warranty accompanying those products). Fisher Pierce® products and Elastimold® Reclosers are warranted for three years; and Joslyn™ VBT and VBU capacitor switches are warranted for four years or 40,000 operations whichever occurs first. Upon prompt notification of a warranted defect, T&B will, at its option, repair or replace the defective product.
- In no event shall T&B be liable for any consequential, indirect or special damages, nor will T&B be liable for transportation, labor, or other charges arising out of the removal or reinstallation of its products. Liability for breach of warranty is limited to the cost of repair or replacement of the warranted product only.
- Misuse, misapplication or modification of T&B products immediately voids all warranties.

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IMPORTANT

- Check contents of package to ensure they are complete and undamaged.
- Check all components to ensure proper fit with cable and/or mating products.
- Check threads by threading probe into compression lug. If resistance is encountered prior to full assembly, check for damage and replace damaged component.
- Read entire installation instructions before starting.
- Have all required tools at hand and maintain cleanliness throughout the procedure.

Caution: If test point cap is not installed, lubricate cap and test point and install cap.



Thomas & Betts

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