



# WILDLIFE AND ASSET PROTECTION

PRODUCT HANDBOOK

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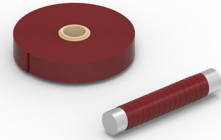


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BBIT /  
BPTM

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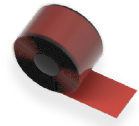


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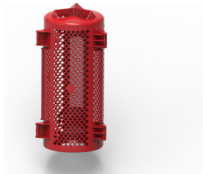
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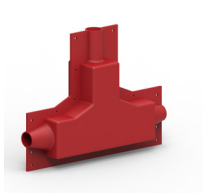
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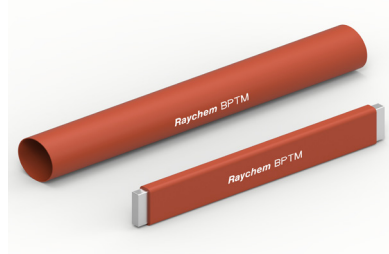
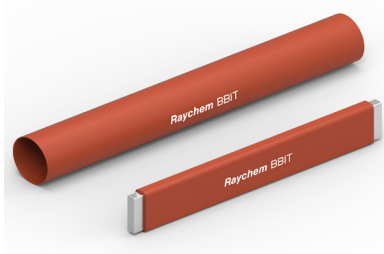
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MVLC

## Busbar Insulating Tubing (BBIT / BPTM)



### Description

TE Connectivity's (TE) Raychem extruded insulation tube is designed for use on straight or pre-formed bars, where air space clearance reduction on 24 - 36 kV systems is required. TE's product categories are;

- **BBIT (5 - 36 kV)**
- **BPTM (5 - 24 kV)**

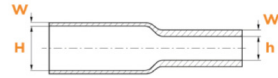
This heat shrinkable insulation for straight and bent busbars is extremely flexible, allowing them to be easily positioned on busbars and quickly installed using a gas torch or a hot air-circulating oven. They have a high expansion ratio, so each size of tubing fits a range of busbar sizes. Both BBIT and BPTM tubing are ideal for original equipment assembly, and for retrofit applications where access to one end is available.

### Key Features

- Exceptional insulation and long term reliability even at high continuous operating temperatures. The thermal endurance rating of this material is 125°C (257°F)
- Extremely durable, resists damage from solvents, UV light, weathering, mechanical impact
- Flame retardant and non halogen based material reduces flammability and the toxic and corrosive effect, in fire situations
- Good thermal emissivity and contact with busbars means no derating is required
- Excellent anti-tracking properties and suitable for indoor and outdoor use
- Easy to install over complex geometries
- REACH and RoHS Compliant

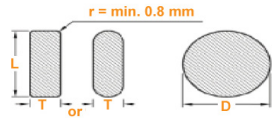
## Ordering/Application Information

- Select the appropriate catalogue number. Confirm selection with busbar dimensions.
- These products may be suitable for application with higher voltages than those listed over shorter durations. Please contact your TE representative for more information.
- Straight bolted connections require two layers of tubing.
- To environmentally seal the busbar at each end of the tubing, use S1085 sealing mastic.
- Minimum continuous length is 4.5 meters (15 Feet.)



## BBIT Order Information

Product size	Inside Diameter mm (Inches)		Wall thickness mm (Inches)		UOM roll of length m (Feet.)
	H min	h max	W nom	w min	
BBIT 25/10-A/U	25 (1.0")	10 (0.4")	1.6 (0.03")	3.6 (0.14")	25 (82.0ft)
BBIT 40/16-A/U	40 (1.6")	16 (0.6")	1.6 (0.03")	3.6 (0.14")	20 (65.6ft.)
BBIT 65/25-A/U	65 (2.6")	25 (1.0")	1.6 (0.03")	3.6 (0.14")	15 (49.2ft.)
BBIT 100/40-A/U	100 (4.0")	40 (1.6")	1.6 (0.03")	3.6 (0.14")	15 (49.2ft.)
BBIT 150/60-A/U	150 (6.0")	60 (2.4")	1.6 (0.03")	3.6 (0.14")	15 (49.2ft.)
BBIT 175/80-A/U	175 (6.9")	80 (3.1")	1.6 (0.03")	3.6 (0.14")	10 (32.8ft.)

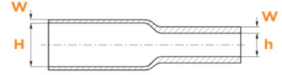


## BBIT Product Selection

Product Size	Rectangular bars L + T mm (Inches)		Round bars D mm (Inches)	
	Min	Max	Min	Max
BBIT 25/10 (1.0"/0.4")	17 (0.7")	28 (1.1")	11 (0.4")	20 (0.8")
BBIT 40/16 (1.6"/0.6")	28 (1.1")	45 (1.8")	18 (0.7")	32 (1.3")
BBIT 65/25 (2.6"/1.0")	44 (1.7")	69 (2.7")	28 (1.1")	47 (1.9")
BBIT 100/40 (4.0"/1.6")	69 (2.7")	102 (4.0")	44 (1.7")	72 (2.8")
BBIT 150/60 (6.0"/2.4")	102 (4.0")	148 (5.8")	65 (2.6")	105 (4.1")
BBIT 175/80 (6.9"/3.1")	133 (5.2")	196 (7.7")	85 (3.3")	125 (4.9")

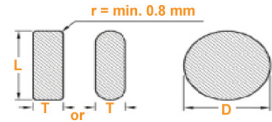
Note: W, H= as supplied. w, h=after free recovery.  
L + T= Length + Thickness  
d= diameter

## BPTM Order Information Global and EMEA Dimensions



Product size	Inside Diameter mm (Inches)		Wall thickness mm (Inches)	
	H min	h max	W nom	w min
BPTM 15/6-A/U	15 (0.6")	6 (0.2")	1.1 (0.04")	1.90 (0.07")
BPTM 30/12-A/U	30 (1.2")	12 (0.5")	1.1 (0.04")	220 (8.7")
BPTM 50/20-A/U	50 (2.0")	20 (0.8")	1.1 (0.04")	235 (9.3")
BPTM 75/30-A/U	75 (3.0")	30 (1.2")	1.1 (0.04")	235 (9.3")
BPTM 100/40-A/U	100 (3.9")	40 (1.6")	1.1 (0.04")	235 (9.3")
BPTM 120/50-A/U	120 (4.7")	50 (2.0")	1.3 (0.05")	280 (11.0")
BPTM 175/70-A/U	175 (6.9")	70 (2.8")	1.3 (0.05")	280 (11.0")
BPTM 205/110-A/U	205 (8.1")	110 (4.3")	1.3 (0.05")	280 (11.0")
BPTM 235/130-A/U	235 (9.1")	130 (5.1")	1.5 (0.06")	310 (12.2")

## BPTM Product Selection Global and EMEA Dimensions



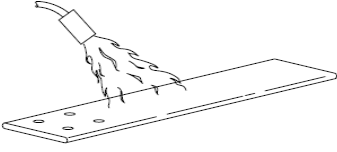
Product size	Rectangular busbars L + T mm (Inches)		Round bars D mm (Inches)	
	Min	Max	Min	Max
BPTM 15/6-A/U (0.6"/0.2")	12 (0.5")	18 (0.7")	6.5 (0.26")	12 (0.5")
BPTM 30/12 (1.2"/0.5")	22 (0.9")	38 (1.5")	13.5 (0.53")	25 (1.0")
BPTM 50/20 (2.0"/0.8")	36 (1.4")	65 (2.6")	22 (0.9")	43 (1.7")
BPTM 75/30 (3.0"/1.2")	55 (2.2")	95 (3.7")	33 (1.3")	63 (2.5")
BPTM 100/40 (3.9"/1.6")	70 (2.8")	130 (5.1")	44 (1.7")	86 (3.4")
BPTM 120/50 (4.7"/2.0")	90 (3.5")	165 (6.5")	55 (2.2")	105 (4.1")
BPTM 175/70 (6.9"/2.8")	125 (4.9")	235 (9.3")	80 (3.1")	150 (5.9")
BPTM 205/110 (8.1"/4.3")	200 (7.9")	276 (10.9")	127 (5.0")	190 (7.5")
BPTM 235/130 (9.1"/5.1")	235 (9.3")	315 (12.4")	150 (5.9")	220 (8.7")

Note: W, H= as supplied. w, h=after free recovery.  
L + T= Length + Thickness  
d= diameter

## Hints and Tips

- The busbar and components in the bolted connection should be free from sharp edges and swarf, prior to the application of the tube.
- Care should be taken when cutting tubing to ensure that the cut edge is straight and smooth, with no jagged edges.
- When measuring tubing for long busbar lengths, allow 10% extra tubing for longitudinal shrinking.
- Use a propane (preferred) or butane gas torch. Adjust the torch to obtain a soft blue flame with a yellow tip.
- Keep the flame moving continuously to avoid scorching the material.
- Tubing should be smooth and wrinkle free.
- Prepare the surface in accordance to the installation instructions.
- High temperature grease, EPPA 212 (silicone grease) and cleaning fluids are recommended during application.

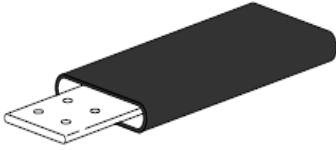
## Installation Straight Busbar



### 1. Preparation and preheating of the whole busbar

Inspect and remove any sharp edges and remaining swarf from the bar, and clean with a pre approved solvent.

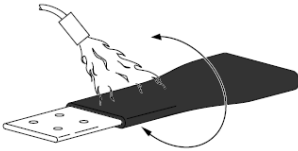
Note: If applying product to bent busbar, lubricate bar with a thin film of approved lubricant. Straight busbars do not require lubrication. Preheat the busbar with a torch until it feels hot to the touch.



### 2. Position the tube

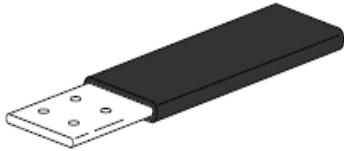
Slide the tube over the busbar into the correct position. Excess wrinkles should be avoided.

Note: If installing on a bent busbar, take care not to scratch the inside of the tube against the busbar end as evenly as possible.



### 3. Shrink in place

Begin shrinking at one end of the tube, working the torch with a smooth brushing motion around the tube. As the tube shrinks, work the torch as before towards the other end, continuously moving the torch to avoid scorching.



### 4. Inspect installation; trim excess

A properly installed tube will be smooth and conform to the contour of the busbar.

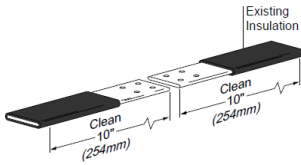
Note: Cold spots (or dimpling) may be present if the busbar was not sufficiently preheated. These may be eliminated by applying more heat to the tube.

Allow the insulated busbar to cool to room temperature before trimming the ends to the required length and/or punching holes in the tube.

**Installation is complete. EPP-3264**

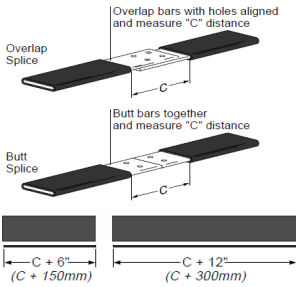


## Installation Connections and Seals



### 1. Clean the busbar for installation

Using an approved solvent, clean exposed busbar connection area's and adjacent insulation as shown.

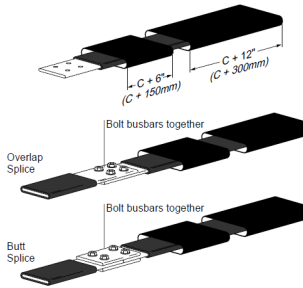


### 2. Cut BPTM

Refer to figure B for dimension C and cut two pieces of BPTM as shown.

### 3. Position pieces of busbar; connect busbar

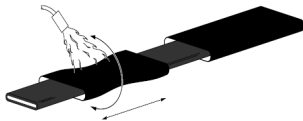
Slide the longer piece of BPTM over one side of the connection, then slide the shorter piece on the same side as shown.



Connect the busbar. Deburr and remove any sharp edges from the connection.

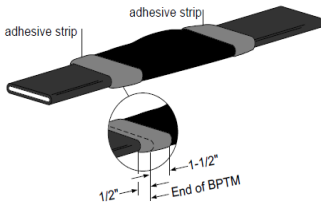
### 4. Position short tubing; shrink in place

Centre the shorter length of BBIT/BPTM over the connection.



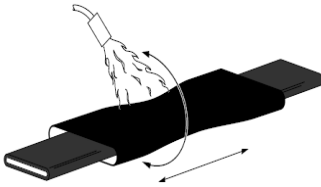
Begin shrinking at the centre of the tube, working the torch with a smooth brushing motion around the tube. As the tube shrinks, work torch as before towards one end, then the other, continuously moving the torch to avoid scorching.

## Installation



### 5. Apply adhesive strips

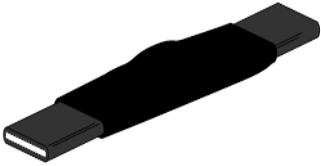
Wrap the adhesive strip on both sides of the installed BBIT/BPTM, overlapping the BBIT/BPTM and existing insulation as shown.



### 6. Position longer tube; shrink in place

Centre the longer length of BBIT/BPTM over the piece installed in step 4.

Shrink in place using method described in step 4.



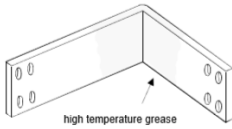
### 7. Inspect Installation

A properly installed tube will be smooth and conform to the contour of the busbar.

Note: Cold spots (or dimpling) may be present. These may be eliminated by applying more heat to the tube. As before, keep the torch moving to avoid scorching.

**Installation is complete. EPP-3264**

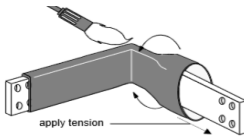
## Installation Bent Busbars



### 1. Prepare bent busbar for installation

Remove any sharp edge from the busbar by filing smooth.

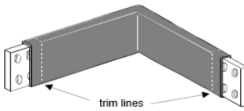
Clean and degrease the busbar. Using a gloved hand, apply a thin layer of high temperature grease to the whole busbar. The grease will help the tubing slide around the bent busbar.



### 2. Position the tubing

Slide the tubing over the busbar to the required position. Remove any protection tape from the ends of the busbar. BBIT/BPTM is a fast shrinking tubing. To avoid wrinkling or overlapping, apply slight tension to the tubing by pulling in the direction shown in the drawing.

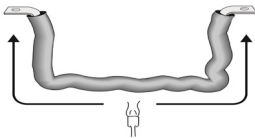
Shrink tubing, starting from one end, moving the flame continuously to the other end of the busbar.



### 3. Trim the edge lines

Inspect the tubing surface. Any flat spots or wrinkles should be reheated until the surface is smooth to the touch. During reheating, the torch should be moved continuously to avoid scorching the material.

After installation, the tubing may require trimming back to allow bolted connections to be made. Wait until tubing has cooled and mark the trim lines on tubing, using a sharp knife and a straight edge cut around trim lines. The end of the tubing should be smooth.



### 4. Tube shrinking

In order to get a good tube installation on a U shaped busbar, it is recommended that the flame starts at the centre of the busbar (as shown on the image).

The flame should then be evenly moved around the busbar in an upward direction (as shown by the direction of the arrows). Following these steps will prevent air pockets and achieve a successful installation on a challenging shaped busbar.

**Installation is complete. EPP-3264**

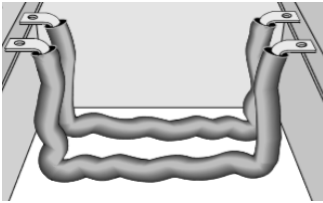
## Installation Oven Method



### 1. Tubing installation

Lubricate bent busbars by applying thin film layer of grease with a melting temperature above intended shrink temperature (silicone grease). Straight busbars do not need to be lubricated.

Slide the tubing over the busbar. Bends especially with U shaped busbars, may cause certain longitudinal shrinkage of the tubing.



### 2. Shrinking procedure

**Hot air oven—** For industrial production, an oven with air circulation is recommended with a minimum temperature of 135°C (275°F). Place the bars with tubing on the pre warmed oven.

Suspend or support the bars at the terminals as shown, to allow unrestricted recovery. The shrinking temperature should not exceed 180°C (356°F).

**Torch—** A propane torch is recommended for field installation, Adjust torch to obtain a soft blue flame with a yellow tip. Pencil-like blue flames should be avoided. Lubricate and preheat the busbar.

Slide the tubing over the busbar. Start shrinking the tubing at one end and proceed towards the other end. Keep the flame moving continuously to avoid scorching the tubing.



### 3. Finishing the installation

Allow the insulated busbar to cool to room temperature. Trim the end to the required distance.

**Installation is complete. EPP-3264**

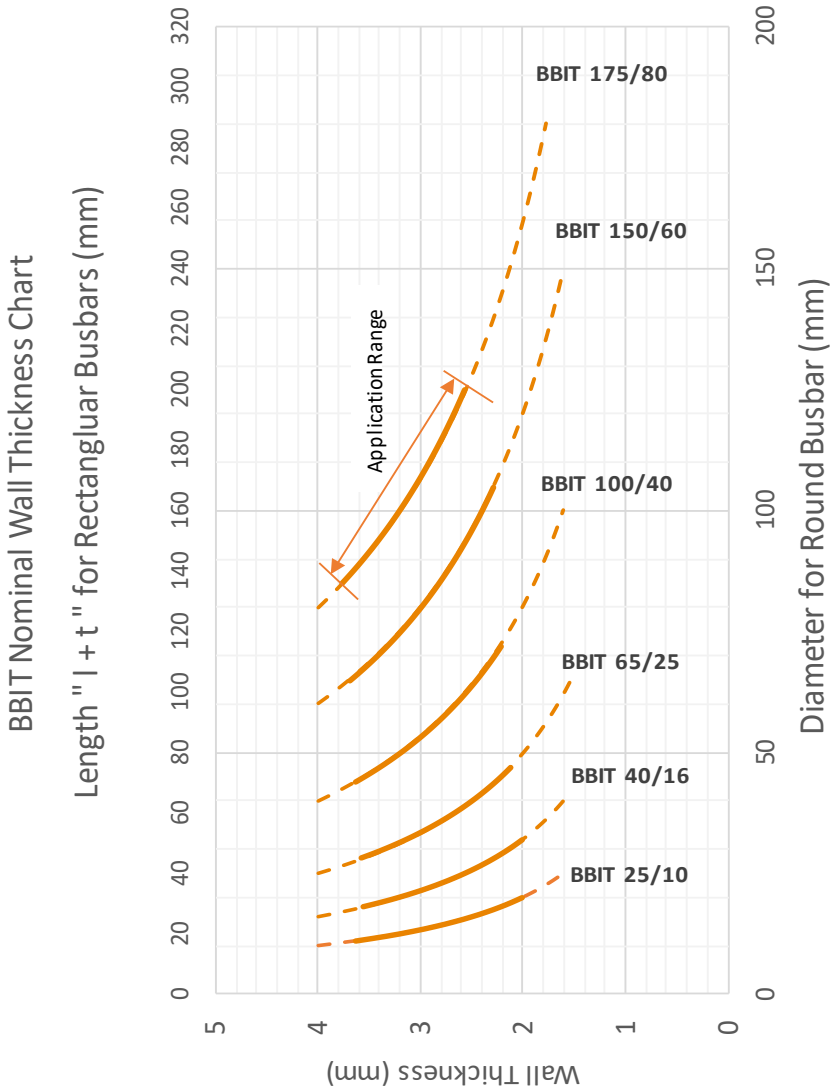
## Recommended Application Ranges

BBIT and BPTM tubing should normally be used on the following busbar sizes				
Product sizes	Rectangular bars. L + T mm (Inches)		Round bars, d mm (Inches)	
	Min	max	Min	max
BBIT 25/10	17 (0.7")	28 (1.1")	11 (0.4")	20 (0.8")
BBIT 40/16	28 (1.1")	45 (1.8")	18 (0.7")	32 (1.3")
BBIT 65/25	44 (1.7")	69 (2.7")	28 (1.1")	47 (1.9")
BBIT 100/40	69 (2.7")	102 (4.0")	44 (1.7")	72 (2.8")
BBIT 150/60	102 (4.0")	148 (5.8")	65 (2.6")	105 (4.1")
BBIT 175/80	133 (5.2")	196 (7.7")	85 (3.3")	125 (4.9")
BPTM 15/6	12 (0.5")	18 (0.7")	6.5 (0.26")	12 (0.5")
BPTM 30/12	22 (0.9")	38 (1.5")	13.5 (0.53")	25 (1.0")
BPTM 50/20	36 (1.4")	65 (2.6")	22 (0.9")	43 (1.7")
BPTM 75/30	55 (2.2")	95 (3.7")	33 (1.3")	63 (2.5")
BPTM 100/40	70 (2.8")	130 (5.1")	44 (1.7")	86 (3.4")
BPTM 120/50	90 (3.5")	165 (6.5")	55 (2.2")	105 (4.1")
BPTM 175/70	125 (4.9")	235 (9.3")	80 (3.1")	150 (5.9")
BPTM 205/110	200 (7.9")	176 (6.9")	127 (5.0")	190 (7.5")

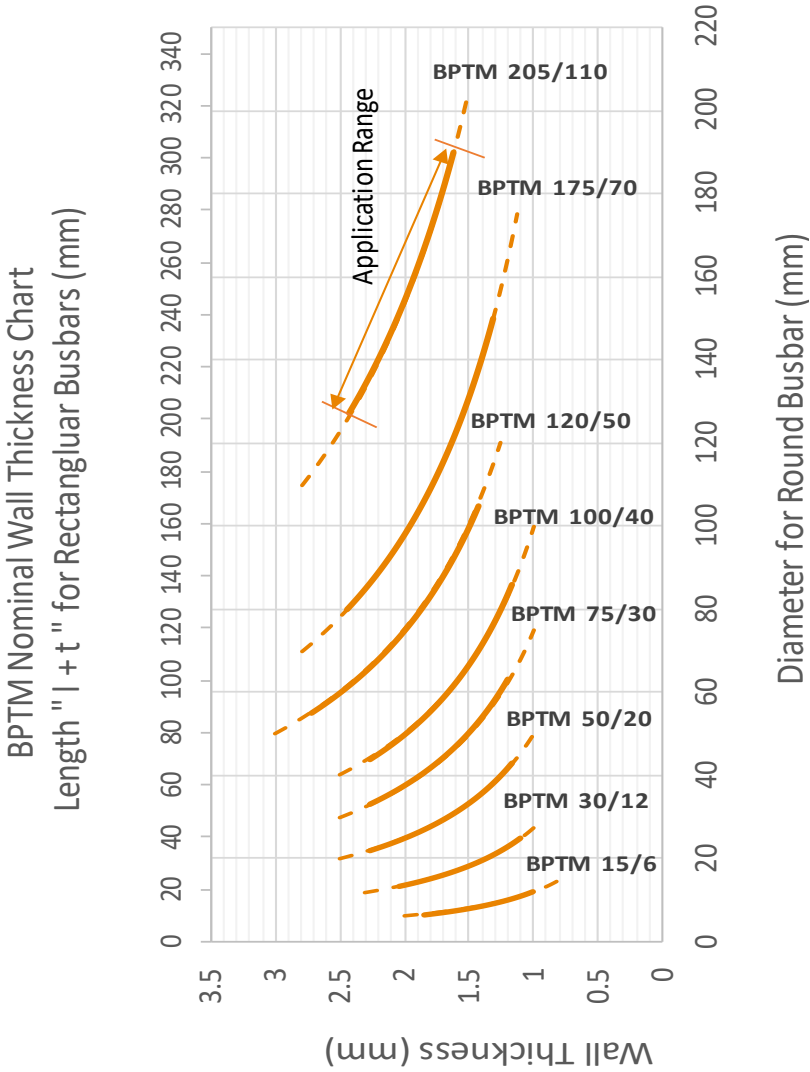
Typical BBIT and BPTM tubing application sizes					
Busbar size mm	Busbar size (Inches)	Recommended size BBIT		Recommended size BPTM	
		Single Busbar	Double Busbar	Single Busbar	Double Busbar
40 x 5	(1.6" x 0.2")	65/25	65/25	50/20	75/30
40 x 10	(1.6" x 0.4")	65/25	100/40	50/20	100/40
50 x 10	(2.0" x 0.4")	65/25	100/40	75/30	100/40
60 x 10	(2.4" x 0.4")	100/40	100/40	100/40	120/50
75 x 10	(3.0" x 0.4")	100/40	150/60	100/40	120/50
80 x 10	(3.1" x 0.4")	100/40	150/60	120/50	120/50
100 x 10	(3.9" x 0.4")	150/60	150/60	120/50	175/70
120 x 10	(4.7" x 0.4")	150/60	150/60	175/70	175/70

L + T= Length + Thickness  
d = diameter.

### BBIT Application Graph



## BPTM Application Graph



## Technical Data Sheet/Material Information

Key Material Properties	Test Method	Results
Accelerated Ageing	ASTM D2671	168hrs @ 150°C ( 300°F )
Tensile Strength		10MPa ( 1450 psi )
Ultimate Elongation		300%
Thermal Endurance	IEC 60216	-
Thermal Index (20,000 hours)		125°C ( 257 °F )
Continuous Operating Temperature (30 years)		105°C ( 221°F )
Accelerated Weathering	ASTM G154	300% @ 15000 hours UVA
Ultimate Elongation		
Dielectric Strength	ASTM D149	350kV/cm ( 890 V/mil ) min. @ 1mm
		180kV/cm ( 457 V/mil ) min. @ 2mm
		150kV/cm ( 380 V/mil ) min. @ 2.5mm
		120kV/cm ( 305 V/mil ) min. @ 3mm
Inclined Tracking Test (TERT)	ASTM D2303; IEC 60587	No tracking or erosion
		1hr @ 2.5kV
		1hr @ 2.75kV

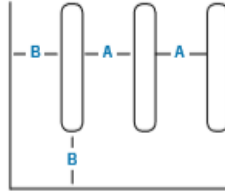
BBIT / BPTM Technical Report references	
EDR-5487	Heat Dissipation Testing for BPTM Tubing
EDR-5533	BBIT Tubing Qualification Report
EDR-5537	BPTM Tubing Qualification Report.
PPR-3320	Thermal Endurance
UVR 8091	Production-scale installation of BBIT/BPTM.
UVR 8130	Resistance of BBIT, MWTM and RNF 100 to 10%.

BBIT / BPTM Installation Instructions	
EPP-3264-12/18	BBIT BPTM Installation Instructions



## Clearance Reduction Diagram - Test and Performance Data

A = Phase to Phase
B = Phase to Ground



Specified Voltage (kV)	Minimum Spacing mm (Inches)		IEC 600 71-2 air clearance mm (Inches)
	Phase/phase mm (Inches)	Phase/ground mm (Inches)	
<b>Round Bars</b>			
12	120 30 (1.2") / 40 (1.6") 55 (2.2") / 65 (2.6")	120	120 (4.7")
17.5	160 45 (1.8") / 60 (2.4") 70 (2.8") / 85 (3.3")	160	160 (6.3")
24	220 60 (2.4") / 90 (3.5") 95 (3.7") / 125 (4.9")	220	220 (8.7")
36	320 100 (3.9") / 160 (6.3") 150 (5.9") / 205 (8.1")	320	320 (12.6")
<b>Rectangular Bars</b>			
12	120 35 (1.4") / 45 (1.8") 65 (2.6") / 75 (3.0")	120	120 (4.7")
17.5	160 55 (2.2") / 65 (2.6") 85 (3.4") / 105 (4.2")	160	160 (6.3")
24	220 70 (2.8") / 100 (3.9") 115 (4.5") / 150 (5.9")	220	220 (8.7")
36	320 140 (5.5") / 190 (7.5") 200 (7.9") / 285 (11.2")	320	320 (12.6")

**BBIT**

**BPTM**

**Air space clearance IEC 60071-2**

## Frequently Asked Questions BBIT / BPTM

**Q: Is BBIT/BPTM UL approved?**

**A:** Yes this product is UL approved.

**Q: Upon application can BBIT / BPTM be applied to bent busbars?**

**A:** Yes. Refer to the installation instructions in this chapter.

**Q: Is it halogen free?**

**A:** Yes this product is halogen free.

**Q: What is the service life for BBIT / BPTM?**

**A:** The expected service life for these tubes is 30 years. Will confirm the temperature according to latest testing.

**Q: Does this product have a shelf life?**

**A:** No, it can be stored at 50°C (122°F) indefinitely.

**Q: Does BBIT/BPTM provide an environmental seal?**

**A:** No, but when S1085 environmental mastic is wrapped around the conductor in a 50mm / 2" width section at each end of the conductor, an environmental seal can be created when the tube is recovered over the S1085 mastic.

**Q: Which cleaning fluid can be used without leaving long term damage to the tube?**

**A:** Any environmentally friendly cleaning solvent may be used for cleaning, such as an alcohol or soap based fluid. Because the tube is cross linked and chemically resistant, short term use will not affect the performance.

**Q: Which grease can be used on busbar bends and curves to enable full shrinkage into the corners?**

**A:** EPPA 212 is the grease that will be supplied in joint kits. Silicone greases can withstand higher temperatures and do not soak into the inside of the material, like a hydrocarbon grease could do.

**Q: What do the (Bxx), (Sxx) (Cxx) part numbers suffixes refer to in the Part Descriptions on the data sheet?**

**A:** (Bxx) is the supplied quantity measured in imperial "feet" and supplied on a cardboard spool. The (Sxx) and (Cxx) are metric quantities in "Meters". S= Cardboard spool, C = wooden reel.

**Q: Are the products REACH and RoHS compliant?**

**A:** Yes. All the latest compliance details and MSDS can be found on the TE website, TE.com.

**Product Information:**

<https://www.te.com/usa-en/utilities/product-compliance/safety-data-sheets.html>

**Product Compliance:**

<https://www.te.com/usa-en/product-CAT-BBIT.html#mdp-tabs-content>

<https://www.te.com/usa-en/product-CAT-BPTM.html#mdp-tabs-content>



## High Voltage Busbar Insulating Tape (HVBT)

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### Description

TE Connectivity's (TE) Raychem HVBT tape is designed to give the integrity of a heat shrinkable tubing with the versatility of a wraparound product. HVBT is a heat shrinkable, adhesive-coated tape which provides insulation enhancement and protection against accidentally induced flashovers.

A single layer of HVBT tape, two-thirds overlapped, will provide AC voltage withstand (flashover protection) to at least 17.5kV increasing to 36kV if a second layer is applied.

### Key Features

- Compatible with all TE's Raychem MV insulation enhancement systems
- Easy to apply, using readily available equipment
- Indoor and outdoor use
- Anti-tracking properties
- Continuous operating temperature up to 90°C (194°F)
- Versatile and flexible at temperatures as low as -40°C ( -40°F )
- REACH and RoHS compliant

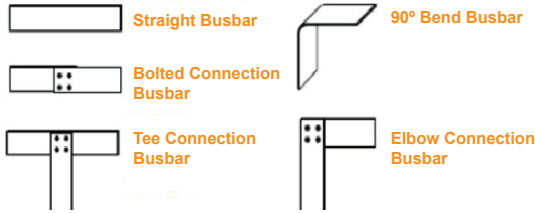
## Ordering/Application Information EMEA/Global

HVBT

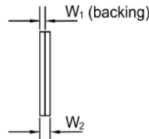
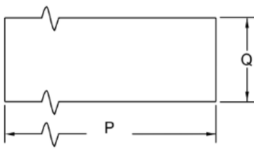
- Select the appropriate catalogue number for the application. Confirm selection with the following recommendations and HVBT tape dimensions.

**HVBT-12-A / HVBT-1-R-01** is best for short lengths and small bus tapes.  
**HVBT-14-A / HVBT-2-R-01** is the most versatile width for general purpose use.  
**HVBT-16-A / HVBT-2-R-01** is useful for long lengths and larger busbar sizes.

- HVBT may be suitable for applications with higher voltages than those listed. Please contact your local TE representative for more information.
- To environmentally seal the bus, order S1085 sealant strips separately.
- Recommended application is to wrap the tape around the busbar using a two third overlap.
- Bolted connections require two layers of tape.
- Continuous operating temperature: 90°C (194°F)



## Product Selection EMEA & Global Dimensions






- Dimensions in mm unless otherwise stated: a = as supplied, b = after free recovery.
- Maximum longitudinal change after free recovery: - 30% max.
- Use Imperial Part Number when ordering from delaware.

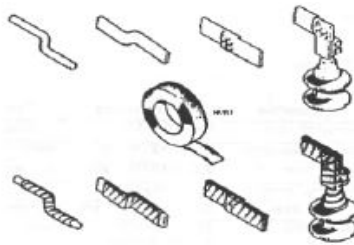
Product Selection					
Product Description	Dimensions				
	Q a min. mm (Inches)	W1 a min. mm (Inches)	W1 b min. mm (Inches)	W2 b min. mm (Inches)	UOM: Roll of length, P m (Feet.)
<b>HVBT-12-A (B10)</b>	25 (1.0")	0.38 (0.01")	0.56 (0.02")	0.86 (0.03")	10 (32.8 ft.)
<b>HVBT-14-A (B10)</b>	50 (2.0")	0.38 (0.01")	0.56 (0.02")	0.86 (0.03")	10 (32.8 ft.)
<b>HVBT-16-A (B10)</b>	100 (4.0")	0.38 (0.01")	0.56 (0.02")	0.86 (0.03")	10 (32.8 ft.)



## Product Selection

### Global Dimensions

Bus Width Inches		Recommended Product	Hvbt Length Needed Per Meter Of Busbar Feet
 RECTANGULAR BUSBAR	1.0"	HVBT-1-R-01 (B8)	2.5 ft.
	2.0"	HVBT-2-R-01 (B4)	3.3 ft.
	3.0"	HVBT-2-R-01 (B4)	2.2 ft.
	4.0"	HVBT-2-R-01 (B4)	1.6 ft.
	6.0"	HVBT-2-R-01 (B4)	1.0 ft.
	8.0"	HVBT-4-R-01 (B2)	1.6 ft.
 SQUARE BUSBAR	1.0" x 1.0"	HVBT-2-R-01 (B4)	4.0 ft.
	2.0" x 2.0"	HVBT-2-R-01 (B4)	2.0 ft.
	3.0" x 3.0"	HVBT-2-R-01 (B4)	1.3 ft.
	4.0" x 4.0"	HVBT-4-R-01 (B2)	2.0 ft.
	6.0" x 6.0"	HVBT-4-R-01 (B2)	1.3 ft.
 ROUND BUSBAR	0.5"	HVBT-1-R-01 (B8)	5.0 ft.
	1.0"	HVBT-2-R-01 (B4)	5.0 ft.
	2.0"	HVBT-2-R-01 (B4)	2.5 ft.
	3.0"	HVBT-2-R-01 (B4)	1.5 ft.
	4.0"	HVBT-4-R-01 (B2)	2.5 ft.




Catalogue number	Roll Width Inches	Roll Length Feet
HVBT-1-R-01 (B8)	1.0"	25 ft.
HVBT-14-A (B10)	2.0"	25 ft.
HVBT-16-A (B10)	4.0"	25 ft.

## Product Selection

### EMEA Dimensions

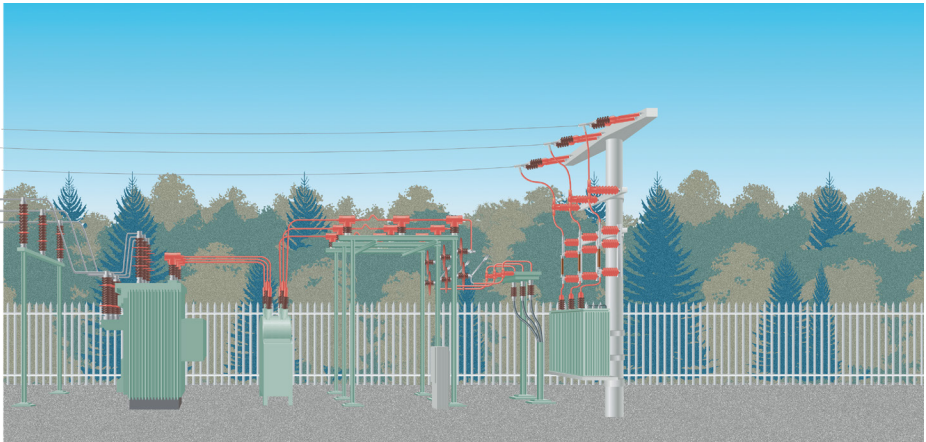
HVBT

Bus Width mm		Recommended Product	Hvbt Length Needed Per Meter Of Busbar M
 RECTANGULAR BUSBAR	25 mm	HVBT-12-A (B10)	10.0 m
	50 mm	HVBT-14-A (B10)	7.6 m
	75 mm	HVBT-14-A (B10)	11.4 m
	100 mm	HVBT-14-A (B10)	15.6 m
	150 mm	HVBT-14-A (B10)	25.0 m
	200 mm	HVBT-16-A (B10)	15.6 m
 SQUARE BUSBAR	25 x 25 mm	HVBT-14-A (B10)	6.0 m
	50 x 50 mm	HVBT-14-A (B10)	12.5 m
	75 x 75 mm	HVBT-14-A (B10)	20.0 m
	100 x 100 mm	HVBT-16-A (B10)	12.5 m
	150 x 150 mm	HVBT-16-A (B10)	20.0 m
 ROUND BUSBAR	12 mm	HVBT-12-A (B10)	5.0 m
	25 mm	HVBT-14-A (B10)	5.0 m
	50 mm	HVBT-14-A (B10)	10.0 m
	75 mm	HVBT-14-A (B10)	16.7 m
	100 mm	HVBT-16-A (B10)	10.0 m

Catalogue number	Roll Width mm	Roll Length m
HVBT-12-A (B10)	25 mm	10 m
HVBT-14-A (B10)	50 mm	10 m
HVBT-16-A (B10)	100 mm	10 m

## Hints and Tips

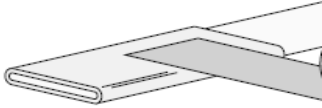
- Use a propane (preferred) or butane gas torch.
- Ensure the torch is always used in a well-ventilated environment.
- Adjust the torch to obtain a soft blue flame with a yellow tip.
- Pencil-like blue flames should be avoided.
- Keep the torch aimed in the shrink direction, to preheat the material.
- Keep the flame moving continuously to avoid scorching the material.
- Clean and degrease all parts that will come into contact with adhesive.
- If solvent is used follow the manufacturer's handling instructions.
- Ensure tubing is shrunk smoothly all around before continuing along the cable.
- Tubing should be smooth and wrinkle free, with inner components clearly defined.
- When installing HVBT on a conductor with an orientation above horizontal, ensure the top layer is shrunk from the bottom, to allow water run off.





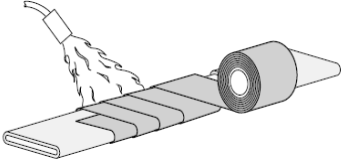
## Installation Straight Busbar

HVBT



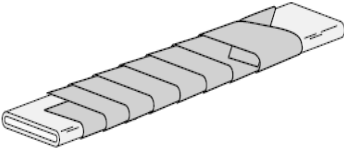
### 1. Wrap HVBT

Place HVBT adhesive side down, overlapping existing insulation by a minimum of 50 mm. (2").



Wrap the HVBT, applying 2/3 overlap across the bare busbar. Use sufficient tension to provide a snug fit, but do not stretch.

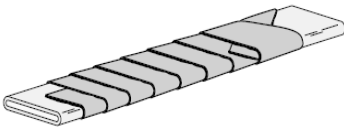
To prevent diameter build up, apply a small amount of heat to every few wraps of HVBT.



### 2. Secure end

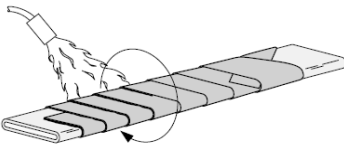
Overlap insulation on other side by a minimum of 50mm (2").

Pull snugly into place and use a slip knot to secure the end of the tape. Slip the loose end under the last wrap and pull tightly.



### 3. Shrink HVBT

Begin shrinking at the start of the wrap, working the torch with a smooth brushing motion around the busbar. As the tape shrinks, work the torch as before, towards the other end of the wrap.



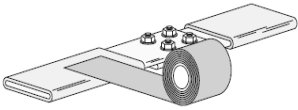
Shrinking is complete when a uniform bead of adhesive is visible between wraps.

Note: Allow to cool before moving or placing in service.

**Installation is complete. EPP-0619**

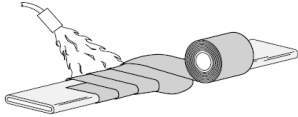
## Installation

### Bolted Connection

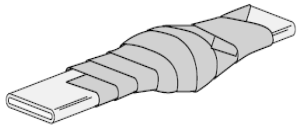


#### 1. Wrap HVBT

Place HVBT adhesive side down, overlapping existing insulation by a minimum of 50 mm (2"). Wrap the HVBT, applying 2/ overlaps across the bare busbar. Use sufficient tension to provide a snug fit, but do not stretch.



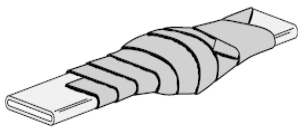
To prevent diameter build up, apply a small amount of heat to every few wraps of HVBT.



#### 2 Secure end

Overlap insulation on other side by 50 mm (2").

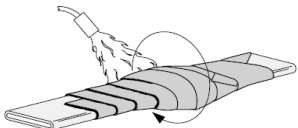
Pull snugly into place and use slip knot to secure the end of the tape. Slip the loose end under the last wrap and pull tightly.



#### 3. Shrink HVBT

Begin shrinking at the start of the wrap, working the torch with a smooth brushing motion around the busbar. As the tape shrinks, work the torch as before towards the other end of the wrap.

Shrinking is complete when a uniform bead of adhesive is visible between wraps.

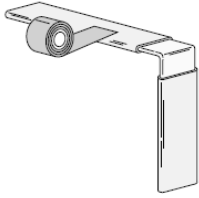


Note: Allow to cool before moving or placing in service.

**Installation is complete. EPP-0619**

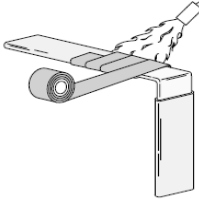
## Installation

### 90 degree bend

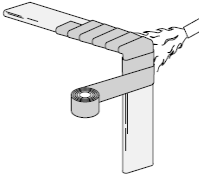


#### 1. Wrap HVBT

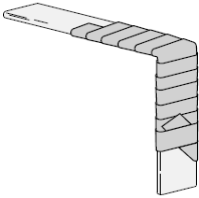
**A.** Place HVBT adhesive side down, overlapping existing insulation by a minimum of 50 mm (2").



**B.** Wrap the HVBT, applying 2/3 overlap across the bare bus. Use sufficient tension to provide a snug fit, but do not stretch.

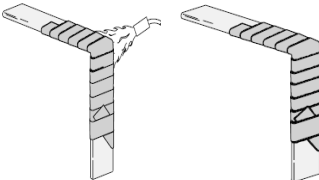


**C.** To prevent diameter build up, apply a small amount of heat to every few wraps of HVBT.



#### 2. Secure end

Overlap insulation on other side by 50 mm (2"). Pull snugly into place and use a slip knot to secure the end of the tape. Slip the loose end under the last wrap and pull tightly.



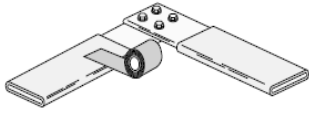
#### 3. Shrink HVBT

Begin shrinking at the start of the wrap, working the torch with a smooth brushing motion around the bus. As the tape shrinks, work torch as before towards the other end of the wrap. Shrinking is complete when a uniform bead of adhesive is visible between wraps.

Note: Allow to cool before moving or placing in service.

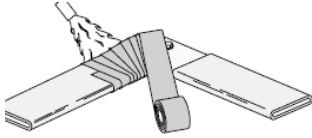
**Installation is complete. EPP-0619**

## Installation Elbow Connection

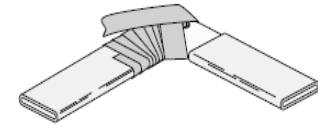


### 1. Wrap HVBT

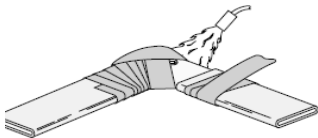
**A.** Place HVBT adhesive side down, overlapping existing insulation by a minimum of 50 mm (2").



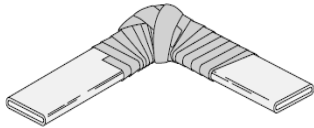
**B.** Using 2/3 overlap, wrap the HVBT to the corner as shown. Use sufficient tension to provide a snug fit, but do not stretch. To prevent diameter build up, apply a small amount of heat to every few wraps of HVBT.



**C & D.** Wrap across the corner as shown, and continue down other leg to overlap existing insulation by 50 mm (2").

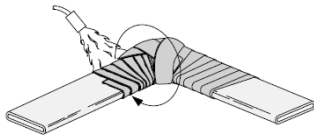


### 2. Secure end

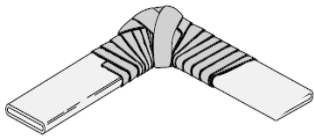


Wrap back towards the connection and cover corner again as shown. Pull snugly into place and use a slip knot to secure the end of the tape. Slip the loose end under the last wrap and pull tightly.

### 3. Shrink HVBT



Begin shrinking at the start of the wrap, working the torch with a smooth brushing motion around the busbar. As the tape shrinks, work torch as before towards the other end of the wrap.



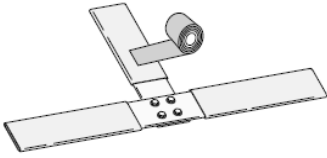
Shrinking is complete when a uniform bead of adhesive is visible between wraps.

Note: Allow to cool before moving or placing in service.

**Installation is complete. EPP-0619**

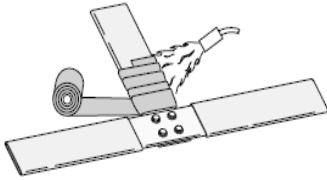
## Installation Tee Connection

HVBT

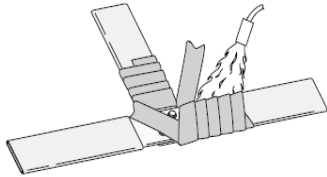


### 1. Wrap HVBT

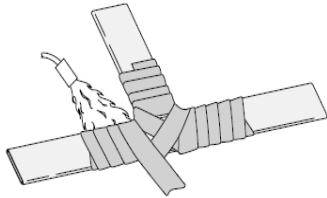
**A.** Place HVBT adhesive side down, overlapping existing insulation by a minimum of 50mm (2").



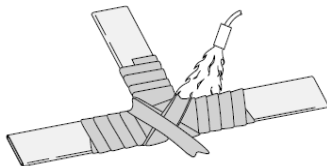
**B.** Wrap the HVBT, applying 2/3 overlaps across the bare busbar. Use sufficient tension to provide a snug fit, but do not stretch. To prevent diameter build up, apply a small amount of heat to every few wraps of HVBT.



**C.** Apply one diagonal wrap of HVBT across the bolt area, then wrap to overlap the existing insulation by 50mm (2"), as shown. Heat as necessary to prevent diameter build up.

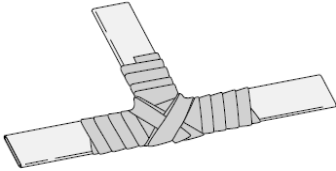


**D.** Wrap HVBT back to the connection, then diagonally across the bolt area and continue on to overlap the existing insulation on the other side by 50mm (2"). Heat as necessary.



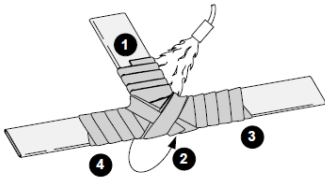
**E.** Wrap HVBT back to the connection. Begin wrapping a "Figure 8" pattern over the connection area as shown. Repeat until bolt area is covered.

## Installation



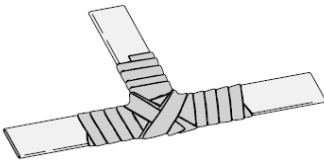
### 2. Secure end

Pull snugly into place and use a slip knot to secure the end of the tape. Slip the loose end under the last wrap and pull tightly.



### 3. Shrink HVBT

Begin shrinking at the start of the wrap (1), working the torch with a smooth brushing motion around the busbar. As the tape shrinks, work torch as before towards the other end of the connection (2) to each leg (3) and (4).



Shrinking is complete when a uniform bead of adhesive is visible between wraps.

**Note:** Allow to cool before moving or placing in service.

**Installation is complete. EPP-0619**

## Technical Data Sheet/Material Information

HVBT

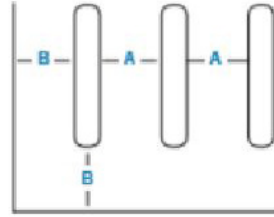
Key Material Properties	Test Method	Results
<b>Accelerated Ageing</b>	ASTM D2671	168hrs @ 120°C ( 250°F )
Tensile Strength		10MPa ( 1450psi )
Ultimate Elongation		300%
<b>Thermal Endurance</b>	IEC 60216	
Thermal Index (20,000 hours)		118°C ( 245°F )
Continuous Operating Temperature (30 years)		95°C ( 203°F )
<b>Accelerated Weathering</b>	ASTM G154	
Ultimate Elongation		300% @ 5000 hours UVA
<b>Dielectric Strength</b>	ASTM D149	130kV/cm ( 330V/mil ) min. @ 2mm
<b>Inclined Tracking Test (TERT)</b>	ASTM D2303; IEC 60587	No tracking or erosion
		1hr @ 2.5kV
		1hr @ 2.75kV

HVBT Technical Report references	
EDR-5466	HVBT Product Qualifications Report
EDR-5422	HVBT Material Qualification Report

HVBT Installation Instructions	
EPP-0619-8/98	HVBT Installation Instructions

## Typical Clearance for Rectangular Busbars

A = Phase to Phase
B = Phase to Ground



Rounded Busbars			
Ratec Voltage (kV)	Phase — Phase mm (Inches)	Phase — Ground mm (Inches)	IEC 71-2 air clearance mm (Inches)
12	30 (1.2")	40 (1.6")	120 (4.7")
17.5	45 (1.8")	60 (2.4")	160 (6.3")
24	60 (2.4")	90 (3.5")	220 (8.7")
36	100 (3.9")	160 (6.3")	320 (12.6")

Rectangular Busbars			
Ratec Voltage (kV)	Phase — Phase mm (Inches)	Phase — Ground mm (Inches)	IEC 71-2 air clearance mm (Inches)
12	35 (1.4")	45 (5.7")	120 (4.7")
17.5	55 (2.2")	65 (2.6")	160 (6.3")
24	70 (2.8")	100 (3.9")	220 (8.7")
36	140 (5.5")	190 (7.5")	320 (12.6")

This table indicated the possible clearance reduction as a result of using HVBT as insulation. These spacings are derived from BIL, AC withstand, DC withstand, and discharge extinction tests on a limited number of busbar configurations insulated with HVBT.

Due to the wide range of possible busbar geometries, these spacings should not be adopted without actual testing by the user.

Sharp electrodes and unusual geometries will require wider spacings.



## Frequently Asked Questions HVBT

HVBT

**Q: Does this product have a shelf life?**

**A:** No, it can be stored at 50°C (122°F) indefinitely.

**Q: Does HVBT provide an environmental seal?**

**A:** No, it can be installed with S1085 sealing mastic to create one.

**Q: Do I need to preheat the busbar prior to installation?**

**A:** No, you do not need to pre heat the busbar for application of HVBT.

**Q: Does HVBT stick to substrate / busbar?**

**A:** No, HVBT can be easily removed from the busbar if necessary, at any time.

**Q: What is the maximum application voltage for HVBT?**

**A:** The first layer of HVBT is up to 17.5kV and the second layer is up to 36kV.

**Q: Can HVBT be used at higher voltages?**

**A:** Please contact your local TE representative to find out more information about higher voltages.

**Q: When applying two layers, are they installed in the same direction or opposite direction?**

**A:** Opposite direction, to reduce the number of free ends.

**Q: Why is HVBT rated to 90°C (194°F)?**

**A:** The hot melt adhesive flows at 90°C (194°F). If the conductor runs consistently above 90°C (194°F), the

HVBT may come off the busbar. Other TE cold applied solutions for busbar connection insulation enhancement that work at higher temperatures are available. Please contact your local TE representative for details.

**Q: How do I know which side of the tape has adhesive?**

**A:** HVBT is supplied adhesive side out. To check practically, apply some heat to each side, the side with the mastic will flow/bubble and change colour. The HVBT must be wrapped with the mastic against the conductor.

**Q: What do the (B10) and (Bx) part number suffixes refer to in the Part Descriptions on the website?**

**A:** (B10) is the metric quantity in “meters” per roll. Each roll has 10m. For use in metric regions of the world. (Bx) is the supplied quantity of rolls per box. Each roll has 26ft. For use in imperial regions of the world.

**Q: Is HVBT REACH and RoHS compliant?**

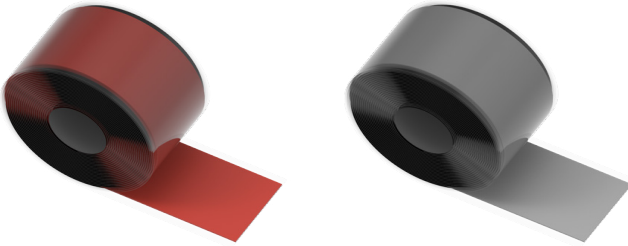
**A:** Yes. All the latest compliance details and a MSDS can be found on TE website, TE.com.

**Product Information:** <https://www.te.com/usa-en/utilities/product-compliance/safety-data-sheets.html>

**Product Compliance:** <https://www.te.com/usa-en/product-CAT-HVBT.html?source=header-match>

## Medium Voltage Fusion Tape (MVFT)

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### Description

TE Connectivity's (TE) Raychem Medium Voltage Fusion Tape (MVFT) is a self amalgamating tape, which provides insulation enhancement and protection against accidentally induced discharge.

MVFT is designed to combine the integrity of a silicone polymer with the versatility of a wrap around product.

MVFT is quick and easy to install. Upon application the tape amalgamates the overlapped layers together, producing a complete seal. A single layer of MVFT, two thirds overlapped, will provide AC voltage withstand (flashover protection) to at least 15kV, increasing to 35kV if a second layer is applied.

### Key Features

- Compatible with all TE's Raychem MV insulation enhancement systems
- Easy to apply, using readily available equipment
- Suitable for indoor and outdoor applications
- Anti-tracking properties
- Continuous operating temperature up to 90°C (194°F)
- MVFT will stick to itself and other insulating materials, but will not adhere to metal or porcelain
- Selective sticking allows for easy removal for maintenance
- REACH and RoHS Compliant

## Product Selection

### Global and EMEA Dimensions

Description	Supplied Length: m (Yards)	Width: m (Inches)	Colour	STD Pack
<b>MVFT-G-2-12 (B4)</b>	11 (12 yds)	50 (2")	Grey	4 rolls
<b>MVFT-50-6400</b>	6.4 (7 yds)	50 (2")	Red	1 roll

MVFT

## Application Information

Round Busbars	
Bus Width mm (Inches)	Bus Length Insulated per Roll 2/3 overlap m (Feet.)
12 (0.5")	3.9 (12.9 ft.)
25 (1.0")	2.2 (7.2 ft.)
50 (2.0")	1.1 (3.6 ft.)
75 (3.0")	0.7 (2.2 ft.)
100 (4.0")	0.6 (2.0 ft.)

Rectangular Busbars	
Bus Width mm (Inches)	Bus Length Insulated per Roll 2/3 overlap m (Feet.)
25 (1.0")	2.4 (8 ft.)
50 (2.0")	1.4 (4.7 ft.)
75 (3.0")	0.9 (3.1 ft.)
100 (4.0")	0.7 (2.3 ft.)
150 (6.0")	0.4 (1.4 ft.)
200 (8.0")	0.1 (0.4 ft.)

Square Busbars	
Bus Width mm (Inches)	Bus Length Insulated per Roll 2/3 overlap m (Feet.)
1x1 25 (1.0")	1.7 (5.7 ft.)
2x2 50 (2.0")	0.8 (2.8 ft.)
3x3 75 (3.0")	0.6 (1.9 ft.)
4x4 100 (4.0")	0.5 (1.7 ft.)

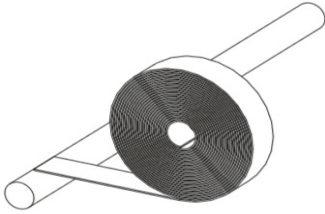
MVFT tape offers a simple and effective solution to the problems of retrofit insulation of busbars particularly where existing equipment cannot be dismantled. It can be used for indoor and outdoor applications and is easily installed over a wide variety of shapes including complex connections.

## Hints and Tips

- Check substrate for sharp edges. Remove before installing MVFT tape.
- Clean and degrease substrate before installation.
- A snug fit of MVFT over the busbar is recommended. However the tape should not be stretched more than 10% as this can lead to air entrapment.
- Apply no more than 10% stretch when wrapping MVFT tape to prevent air entrapment.
- When installing MVFT on a conductor with an orientation above horizontal, ensure the top layer is applied from the bottom, to allow water run off.



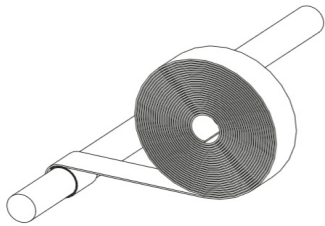
## Installation Circular Busbar



### 1. Begin Installation

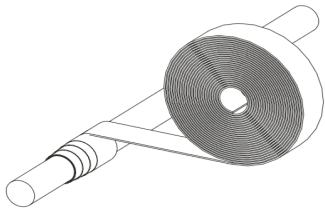
Begin the tape installation by placing the side without the plastic backing on the surface. As the tape is wrapped around the surface, the plastic backing should be removed so that the tape is allowed to adhere to itself.

MVFT



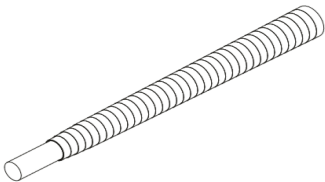
### 2. Wrap 2 layers

It is recommended to wrap 2 layers of tape at the starting point before continuing down the surface.



### 3. Apply 2/3 overlap

Continue wrapping the tape applying a 2/3 overlap across the surface. Use sufficient tension to provide a snug fit, do not stretch more than 10%.



### 4. Complete installation

When the desired area is covered with the 2/3 overlap, complete the installation with a 2 layer wrap at the end.

**Installation is complete. EPP-3150**

## Technical Data Sheet/Material Information

Key Material Properties	Test Method	Results
<b>Accelerated Ageing</b>	ASTM D2671	168hrs @ 150°C ( 300°F )
Tensile Strength		6MPa (870psi)
Ultimate Elongation		300%
<b>Thermal Endurance</b>	IEC 60216	
Thermal Index (20,000 hours)		130°C ( 265°F )
Continuous Operating Temperature (30 years)		95°C ( 200°F )
<b>Accelerated Weathering</b>	ASTM G154	
Ultimate Elongation		300% @ 5000 hours UVA
<b>Dielectric Strength</b>	ASTM D149	200kV/cm ( 508V/mil ) min. @ 0.75mm
<b>Inclined Tracking Test (TERT)</b>	ASTM D2303; IEC 60587	No tracking or erosion
		1hr @ 2.5kV
		1hr @ 2.75kV
		1hr @ 3.00kV
		20 mins@ 3.25kV

MVFT Technical Report references	
EDR-5465	Medium Voltage Fusion Tape Qualification Report

MVFT Installation Instructions	
EPP-3150-7/18	Installation Instructions for Medium Voltage Fusion Tape (MVFT)

## Frequently Asked Questions MVFT

**Q: What is the maximum application voltage for MVFT?**

**A:** The first layer of MVFT is up to 15kV and the second layer is up to 36kV.

**Q: Can MVFT be used at higher voltages?**

**A:** Please contact your local TE representative to find out more information about higher voltages.

**Q: Is MVFT available in any other colours apart from grey?**

**A:** This product is also available in red.

**Q: Can MVFT be used outside?**

**A:** Yes this product is suitable for outdoor use and environments.

**Q: Does this product have a shelf life?**

**A:** Yes, the shelf life is 24 months from the manufacturing date.

**Q: Does MVFT provide an environmental seal?**

**A:** No, it can be installed with S1085 sealing mastic to create one.

**Q: Is MVFT Halogen Free?**

**A:** Yes. It is a silicone based material

**Q: What does the (Bx) part numbers suffixes refer to in the Part Descriptions on the website?**

**A:** (Bx) is the supplied quantity of rolls per box. Each roll has 8m (26.2ft) of tape.

**Q: Are all the products REACH and RoHS compliant?**

**A:** Yes. All the latest compliance details

and MSDS can be found on the TE website, TE.com.

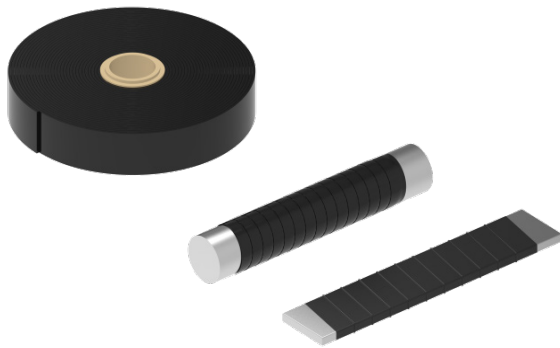
**Product Information:** <https://www.te.com/usa-en/utilities/product-compliance/safety-data-sheets.html>

**Product Compliance:** <https://www.te.com/usa-en/product-CAT-MVFT.html>

MVFT

## Low Voltage Busbar Tape (LVBT)

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### Description

TE Connectivity's (TE) Raychem Low Voltage Busbar Tape (LVBT) is a black, all purpose, adhesive coated, heat-shrinkable insulation tape for applications up to 1kV.

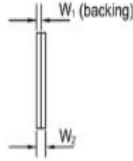
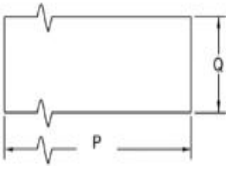
Designed to be compatible with other products in the low voltage insulation range, it is suitable for complex busbar geometries and restricted access areas. Where no open end is available, or when equipment cannot be dismantled, this wraparound product provides the optimum solution.

### Key Features

- Compatible with all other products in low voltage insulation range.
- Gives excellent electrical performance.
- Continuous operating temperature rating up to 90°C (194°F) in parenthesis
- Flame retardant
- Quick and easy to install
- UV resistant
- Good thermal emissivity and contact
- Can be stored indefinitely up to temperatures of 50°C (122°F) in parenthesis
- REACH and RoHS Compliant



## Order Information Global and EMEA Dimensions



1. Dimensions in mm unless otherwise stated:  
a = as supplied, b = after free recovery.
2. Maximum longitudinal change after free recovery: - 30% max.
3. Use Imperial Part Number when ordering from delaware.

Description	Q a min.	W1 a min.	W1 b nom.	W2 b min.	UOM: roll of length, P m (Feet.)
LVBT-1-R-01 (B8)	25	0.4	0.6	1.0	8 (26.2 ft.)
LVBT-2-R-01 (B4)	50	0.4	0.6	1.0	8 (26.2 ft.)
LVBT-4-R-01 (B2)	100	0.4	0.6	1.0	8 (26.2 ft.)

LVBT

## Product Selection/Application Information

Description	Busbar Width: mm (Inches)	Busbar Length Insulated per Roll m (Yards)
<b>Rectangular Busbars</b>		
LVBT-1-R-01 (B8)	25.4 (1")	1.2 (1.3 yds)
LVBT-2-R-01 (B4)	50.8 (2")	1.5 (1.6 yds)
LVBT-2-R-01 (B4)	76.2 (3")	1.1 (1.2 yds)
LVBT-2-R-01 (B4)	101.6 (4")	0.8 (0.9 yds)
LVBT-2-R-01 (B4)	152.4 (6")	0.6 (0.65 yds)
LVBT-4-R-01 (B2)	203.2 (8")	0.9 (1 yds)

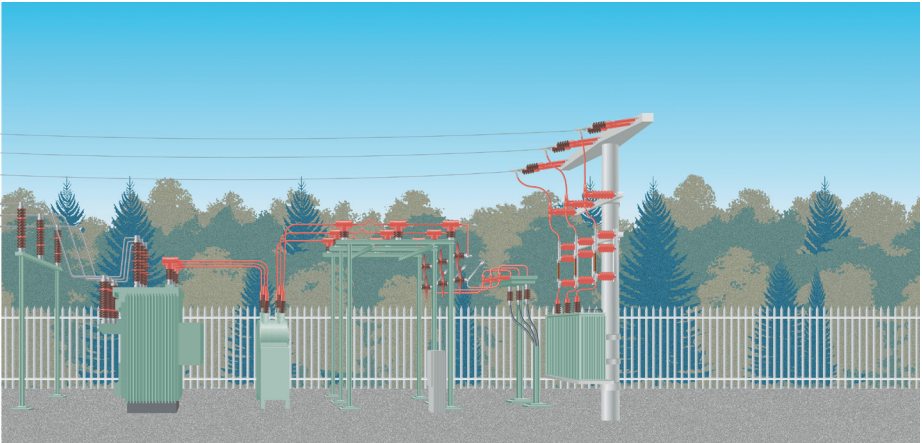
Description	Bus Diameter: mm (Inches)	Busbar Length Insulated per Roll m (Yards)
<b>Round Busbars</b>		
LVBT-1-R-01 (B8)	12.7 (0.5")	2.4 (2.6 yds)
LVBT-2-R-01 (B4)	25.4 (1")	2.4 (2.6 yds)
LVBT-2-R-01 (B4)	50.8 (2")	1.2 (1.3 yds)
LVBT-2-R-01 (B4)	76.2 (3")	0.8 (0.9 yds)
LVBT-4-R-01 (B2)	101.6 (4")	1.2 (1.3 yds)

Raychem tape LVBT will provide flashover protection up to 1kV in applications where tubing is not suitable for use. It can be used for both indoor and outdoor applications and is easily installed over a wide variety of substrate shapes including complex connections.

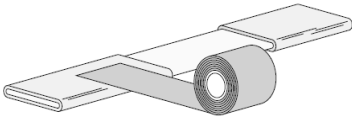


## Hints and Tips

- Unless otherwise instructed, start shrinking at the beginning of the wrap, working around the busbar with a smooth brushing motion.
- To minimize any effect of fumes produced by gas torches, always provide good ventilation of confined work spaces.
- Use a propane (preferred) or butane gas torch.
- Keep the flame moving constantly to avoid scorching.
- Ensure the torch is always used in a well-ventilated environment.
- Adjust the torch to obtain a soft blue flame with a yellow tip.
- Pencil-like blue flames should be avoided.
- Keep the torch aimed in the shrink direction, to preheat the material.
- Care should be taken when cutting the tape to ensure that the cut edge is clean and smooth with no jagged edges.
- Clean and degrease all parts that will come into contact with adhesives or mastics.
- If a solvent is used follow the manufacturer's instructions.
- Ensure that the tape is shrunk smoothly all round before continuing along the conductor.
- Tape should be smooth and wrinkle free.
- When installing LVBT on conductor with an orientation above horizontal, ensure top layer is shrunk from bottom to allow water run off.

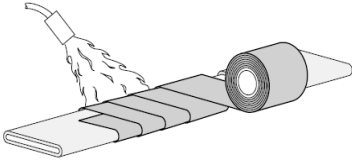


## Installation Straight Busbar



### 1. Wrap LVBT

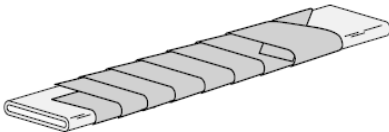
Place LVBT adhesive side down, overlapping existing insulation by a minimum of 50mm (2").



Wrap the LVBT, applying 1/2 overlap across the bare busbar. Use sufficient tension to provide a snug fit, but do not stretch.

To prevent diameter build up, apply a small amount of heat to every few wraps of LVBT.

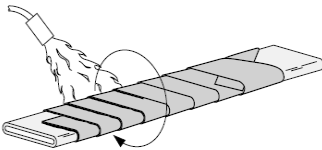
LVBT



### 2. Secure end

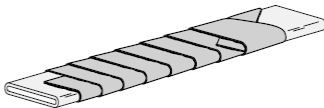
Overlap insulation on other side by a minimum of 50mm (2").

Pull snugly into place and use a slip knot to secure the end of the tape. Slip the loose end under the last wrap and pull tightly.



### 3. Shrink LVBT

Begin shrinking at the start of the wrap, working the torch with a smooth brushing motion around the busbar. As the tape shrinks, work the torch as before, towards the other end of the wrap.



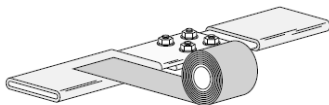
Shrinking is complete when a uniform bead of adhesive is visible between wraps.

Note: Allow to cool before moving or placing in service.

**Installation is complete. EPP-0621**

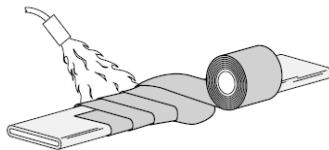
## Installation

### Bolted Connection



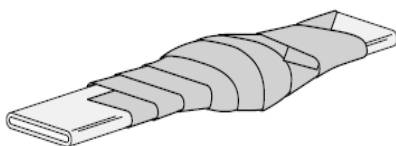
#### 1. Wrap LVBT

Place LVBT adhesive side down, overlapping existing insulation by a minimum of 50mm (2”).



Wrap the LVBT, applying 1/2 overlap across the bolts. Use sufficient tension to provide a snug fit, but do not stretch.

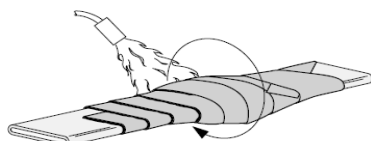
To prevent diameter build up, apply a small amount of heat to every few wraps of LVBT.



#### 2. Secure end

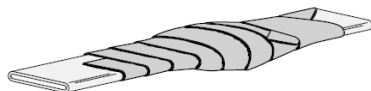
Overlap insulation on other side by a minimum of 50mm (2”).

Pull snugly into place and use a slip knot to secure the end of the tape. Slip the loose end under the last wrap and pull tightly.



#### 3. Shrink LVBT

Begin shrinking at the start of the wrap, working the torch with a smooth brushing motion around the busbar. As the tape shrinks, work the torch as before, towards the other end of the wrap.

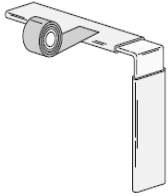


Shrinking is complete when a uniform bead of adhesive is visible between wraps.

Note: Allow to cool before moving or placing in service.

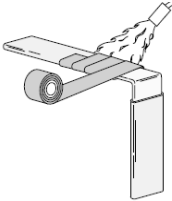
**Installation is complete. EPP-0621**

## Installation Right Angle Busbar

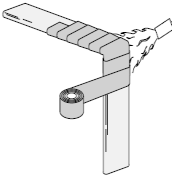


### 1. Wrap LVBT

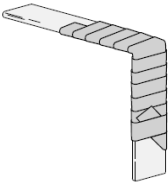
**A.** Place LVBT adhesive side down, overlapping existing insulation by a minimum of 50mm (2”).



**B.** Wrap the LVBT, applying 1/2 overlap across the bare busbar. Use sufficient tension to provide a snug fit, but do not stretch.

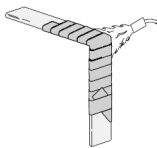


**C.** To prevent diameter build up, apply a small amount of heat to every few wraps of LVBT.



### 2. Secure end

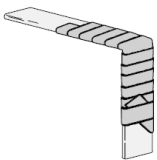
Overlap insulation on the other side by 50mm (2”). Pull snugly into place and use a slip knot to secure the end of the tape. Slip the loose end under the last wrap and pull tightly.



### 3. Shrink LVBT

Begin shrinking at the start of the wrap, working the torch with a smooth brushing motion around the busbar. As the tape shrinks, work the torch as before towards the other end of the wrap. Shrinking is complete when a uniform bead of adhesive is visible between wraps.

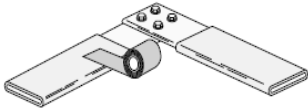
Note: Allow to cool before moving or placing in service.



**Installation is complete. EPP-0621**

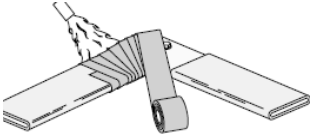
LVBT

## Installation Elbow Connection

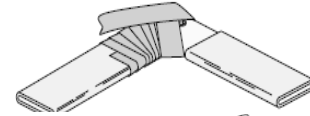


### 1. Wrap LVBT

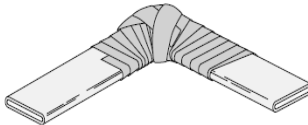
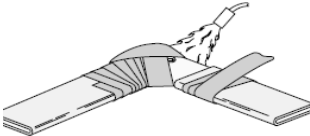
**A.** Place LVBT adhesive side down, overlapping existing insulation by a minimum of 50mm (2”).



**B.** Using 2/3 overlap, wrap the LVBT to the corner as shown. Use sufficient tension to provide a snug fit, but do not stretch. To prevent diameter build up, apply a small amount of heat to every few wraps of LVBT.

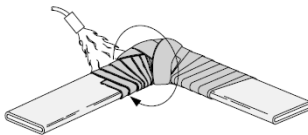


**C & D.** Wrap across the corner as shown, and continue down other leg to overlap existing insulation by 50mm (2”).



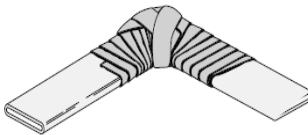
### 2. Secure end

Wrap back towards the connection and cover corner again as shown. Pull snugly into place and use a slip knot to secure the end of the tape. Slip the loose end under the last wrap and pull tightly.



### 3. Shrink LVBT

Begin shrinking at the start of the wrap, working the torch with a smooth brushing motion around the busbar. As the tape shrinks, work torch as before towards the other end of the wrap.

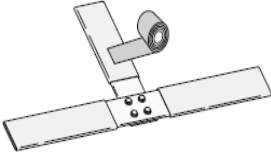


Shrinking is complete when a uniform bead of adhesive is visible between wraps.

Note: Allow to cool before moving or placing in service.

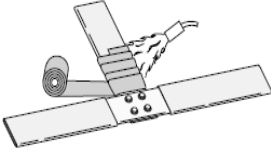
**Installation is complete. EPP-0621**

## Installation Tee Connection

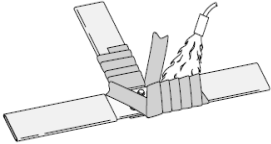


### 1. Wrap HVBT

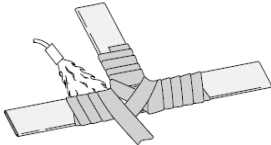
**A.** Place LVBT adhesive side down, overlapping existing insulation by a minimum of 50mm (2”).



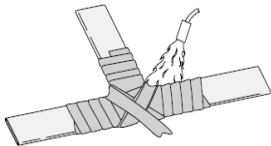
**B.** Wrap the LVBT, applying 1/2 overlap to the corner. Use sufficient tension to provide a snug fit, but do not stretch. To prevent diameter build up, apply a small amount of heat to every few wraps of LVBT.



**C.** Apply one diagonal wrap of LVBT across the bolted area, then wrap to overlap the existing insulation by 50mm (2”), as shown. Heat as necessary to prevent diameter build-up.



**D.** Wrap LVBT back to the connection, then diagonally across the bolt area and continue on to overlap the existing insulation on the other side by 50mm (2”). Heat as necessary.

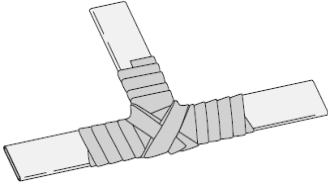


**E.** Wrap LVBT back to the connection. Begin wrapping a 'figure 8' pattern over the connection area as shown. Repeat until bolted area is covered.

LVBT

**Installation is complete. EPP-0621**

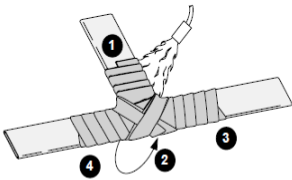
## Installation



### 2. Secure end

Pull snugly into place and use a slip knot to secure the end of the tape.

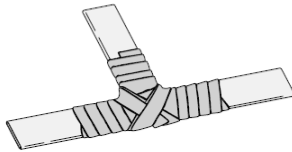
Slip the loose end under the last wrap and pull tightly.



### 3. Shrink LVBT

Begin shrinking at the start of the wrap, (1), working the torch with a smooth brushing motion around the busbar.

As the tape shrinks, work the torch as before to the other end of the connection (2), to each leg (3) and (4).



Shrinking is complete when a uniform bed of adhesive is visible between wraps. Allow to cool before moving or placing in service.

**Installation is complete. EPP-0621**



## Technical Data Sheet/Material Information

Key Material Properties	Test Method	Results
<b>Accelerated Ageing</b>	ASTM D2671	168hrs @ 150°C ( 302°F )
Tensile Strength		11MPa ( 1600 psi )
Ultimate Elongation		200%
<b>Thermal Endurance</b>	IEC 60216	
Thermal Index (20,000 hours)		120°C ( 250°F )
Continuous Operating Temperature (30 years)		100°C ( 210°F )
<b>Accelerated Weathering</b>	ASTM G154	
Ultimate Elongation		400% @ 1000 hours UVA
<b>Dielectric Strength</b>	ASTM D149	130kV/cm ( 330V/mil ) min. @ 2.5mm
<b>Inclined Tracking Test (TERT)</b>	ASTM D2303; IEC 60587	20 mins @ 2.5kV

LVBT

LVBT Technical Report references	
EDR-5490	LVBT Product Qualification Report
UVR-8180	LVBT Product Qualification Report

LVBT Installation Instructions	
EPP-0621-5/96	LVBT Installation Instructions

## Frequently Asked Questions LVBT

**Q: Does this product have a shelf life?**

**A:** No it does not, it can be stored up to 50°C (122°F) indefinitely.

**Q: Does LVBT provide an environmental seal?**

**A:** No but it can be installed with S1085 sealing mastic to create one.

**Q: Does LVBT stick to substrate / busbar?**

**A:** No, LVBT can be easily removed from the busbar if necessary.

**Q: What is the maximum voltage of LVBT?**

**A:** The maximum voltage is 1kV.

**Q: Is LVBT UL certified?**

**A:** No, please contact your local TE representative for more information.

**Q: Can LVBT be used at higher voltages?**

**A:** Yes, but please contact your local TE representative for more information.

**Q: How do I know which side of the tape has the adhesive on?**

**A:** LVBT is supplied adhesive side out. To check practically, apply some heat to each side, the side with the mastic will flow/bubble and change colour. The LVBT must be wrapped with the adhesive against the conductor.

**Q: Why is LVBT rated at 90°C (194°F)?**

**A:** The hot melt adhesive flows at 90°C (194°F). If the conductor runs consistently above 90°C (194°F) the LVBT may come off the busbar. Other TE cold applied solutions for busbar connection insulation enhancement

that works at higher temperatures, are available. Please contact your local TE representative for details.

**Q: Is LVBT halogen free?**

**A:** No. The flame retardancy performance is due to halogen flame retardant system in the tape material.

**Q: What does the (Bx) part numbers suffixes refer to in the Part Descriptions on the website?**

**A:** (Bx) is the supplied quantity of rolls per box. Each roll has 8m (26.2ft) of tape.

**Q: Are all the products RoHS and REACH compliant?**

**A:** Yes. All the latest compliance details and MSDS can be found on the TE website, TE.com.

**Product Information:**

<https://www.te.com/usa-en/utilities/product-compliance/safety-data-sheets.html>

**Product Compliance:**

<https://www.te.com/usa-en/product-CAT-LVBT.html?q=lvbt&source=header>



## Bus Isolation Animal Guard (BISG)



### Description

TE Connectivity's (TE) Raychem BISG family of easy to install isolation guards, prevent animal caused outages in electrical substation equipment. Years of successful protection from animals, raccoons, opossums, cats, birds and other small animals have been achieved through the installation of these very adaptable products.

BISG product categories are;

- **BISG-24**
- **BISG-60/115**
- **BISG-HOT-60/115**
- **BISG-100/400**

There are three markets that BISG models can be applied too; substations, overhead lines and railway catenary.

### Key Features

- Energized installation by one person
- Quick and easy wedge driven design
- Can easily be modified to suit different requirements
- Fast and easy installation
- Increases flashover distance between line and ground and prevents animals bridging the gap
- 35+ year life
- Rugged, anti-tracking, UV resistant polymer
- REACH and RoHS compliant

## Ordering/Application Information

- Standard package: 10 BISG-60/115-02 / 10 BISG-24-01 assemblies per box. (One BISG will install on one insulator).
- Related test report: EDR-5310, EDR-5517-Bus Insulator Animal Guard (BISG-24-01)

## Product Selection

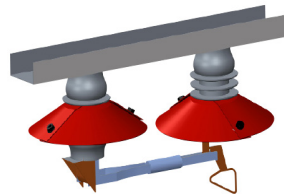
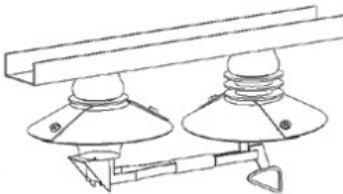
BISG-24-01	Insulator Core Diameter Range Millimetre (Inches)	Overall Product Diameter Millimetre (Inches)	Colour	Installation
Catalogue Number				
<b>BISG-24-01 (B10)</b>	62-125 mm (2.5"-5.0")	610 mm (24")	Red	One stick (energized)
<b>BISG-G-24-01 (B10)</b>	62-125 mm (2.5"-5.0")	610 mm (24")	Grey	One stick (energized)

Overall product diameter can be trimmed down to 400mm (16") diameter

BISG-60/115	Insulator Core Diameter Range Millimetre (Inches)	Overall Product Diameter Millimetre (Inches)	Colour	Installation
Catalogue Number				
<b>BISG-60/115-02 (B10)</b>	25-115 mm (1.0"-4.5")	610 mm (24")	Red	De-energized
<b>BISG-60/115-03-HOT (B10)</b>	25-115 mm (1.0"-4.5")	610 mm (24")	Red	Two stick (energized)
<b>BISG-G-60/115=02 (B10)</b>	25-115 mm (1.0"-4.5")	610 mm (24")	Grey	De-energized
<b>BISG-G-60/115-03-HOT (B10)</b>	25-115 mm (1.0"-4.5")	610 mm (24")	Grey	Two stick (energized)

Overall product diameter can be trimmed down to 430mm (17") diameter

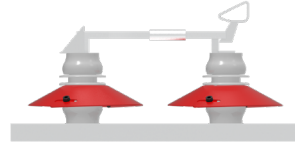
BISG-100/400	Shed Diameter Millimetre (Inches)	Fits Core Diameter Millimetre (Inches)	Application	Colour	Standard Pack
Catalogue Number					
<b>BISG-100/40 (B3)</b>	400 mm (16")	38-115 mm (1.50"-4.50")	Standard Installation	Red	3
<b>BISG-G-100/400 (B3)</b>	400 mm (16")	38-115 mm (1.50"-4.50")	Standard Installation	Grey	3



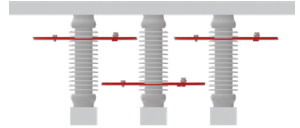
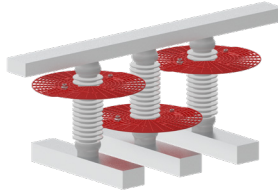
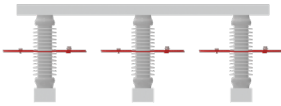
BISG

## Typical Applications

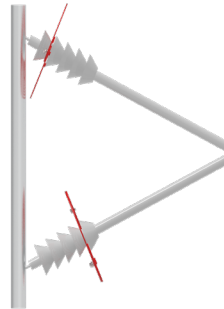
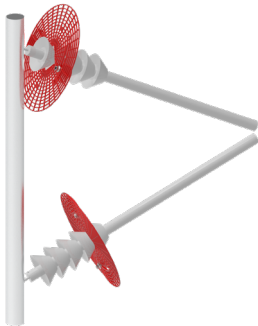
### Switch Banks / Fuse Cutouts



### Busbar Support



### Angled



Representation of air space clearance between guards, shown by 'a'.

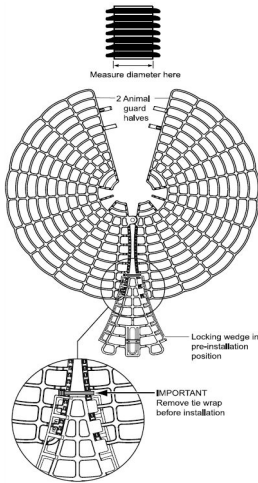
## Hints and Tips

- Before starting your installation, ensure that the kit you are going to use fits the insulator/bushing correctly.
- Check core preparation dimensions before installing the product.
- Refer to the kit label and the title of the installation instructions.
- Components or working steps may have been modified since you last installed this product.
- Therefore, carefully read and follow the steps in the installation instructions.
- Ensure the bolts are torqued to the correct setting as per the installation instructions.
- Before fitting the guard, push the bolts through the connections and back out again to enable smooth fitting of the bolts later in the installation.
- When installing on switches ensure unrestricted operation of the switch after the installation of the animal guard.

BISG

## Installation

### BISG-24-01

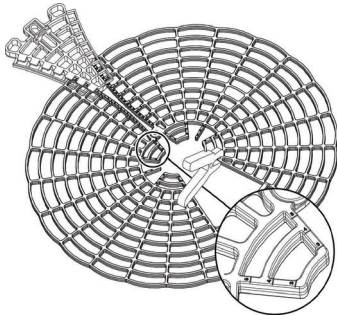


#### 1. Measure insulator core diameter

Measure the inner core diameter as shown to the left.

Tie wrap (holding guard halves and edge in place) must be removed prior to installation.

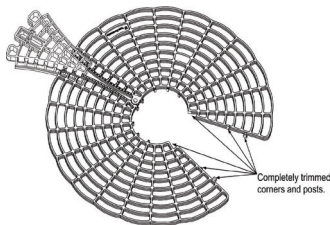
Should the wedge become dislodged from its original shipping and pre-installation position, then it must be returned to this position before installation.



#### 2a. Trim animal guard (if needed)

Trimming inner diameter. Using cutters, trim animal guard inner diameter to fit insulator core diameter. The untrimmed guard is designed to fit a 64mm (2.5") core diameter but can be trimmed to fit up to a 127mm (5") maximum core diameter.

The guard is marked with 76 mm (3"), 102 mm (4"), and 127 mm (5") incremented lines to aid in trimming.



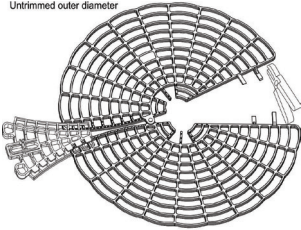
#### 2b. Trimming corners

When installing on insulators with core diameter greater than 114mm (4.5"), the four stabilizing posts and the two inside corners should be completely trimmed.

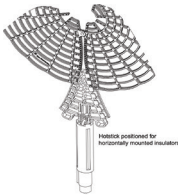
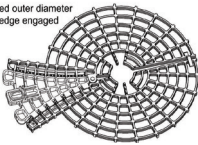


## Installation

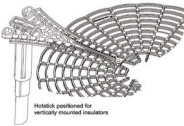
Untrimmed outer diameter



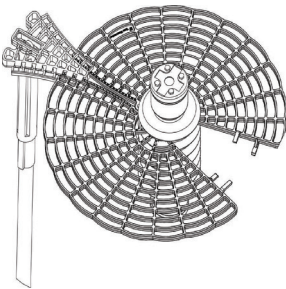
Trimmed outer diameter with wedge engaged



Hotstick positioned for horizontally mounted insulators



Hotstick positioned for vertically mounted insulators



### 2c. Trimming outer diameter

If applying animal guards to three-phases located close enough together that the shields may touch; install the center phase guard between the 2nd and 3rd insulator skirts or trim animal guard as shown.

Standard diameter is 610 mm (24"). Diameter can be reduced to a minimum of 400mm (16").

### 3a & 3b. Position the hot-stick

For installations on switches and horizontal mounted insulators, position the hot-stick as shown. The hot-stick is parallel to the animal guard.

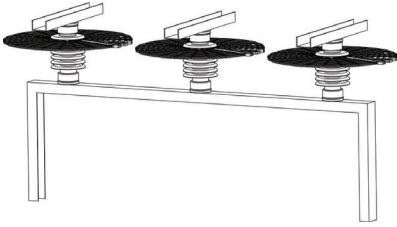
For installations on vertically mounted insulators, position the hot-stick as shown. The hot-stick is perpendicular to the animal guard.

### 4a. Positioning

Position the guard around the insulator between the insulator skirts.

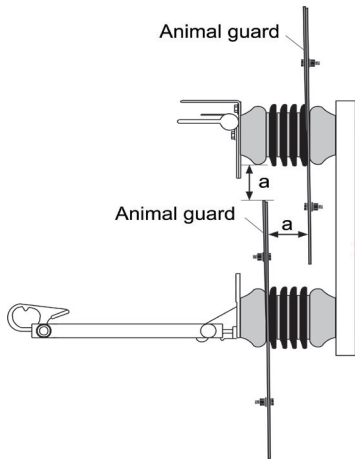
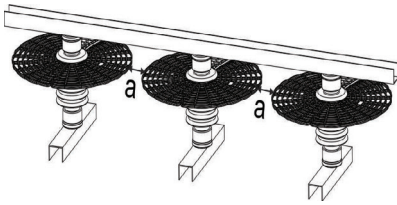
BISG

## Installation



### 4ba & 4bb. Vertical insulators

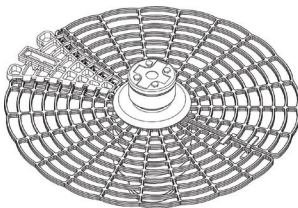
The animal guard should be installed between the upper most two skirts as shown on this figure.



### 4c. Horizontal insulators on vertical hook-switch disconnects

When installing animal guards on closely spaced horizontal insulators, like those found on hook switch disconnects, one complete guard should be installed per steps two through four between the skirts closest to the ground plane or base of switch. The second guard should be placed between the next skirts as shown to create a small air gap between shields.

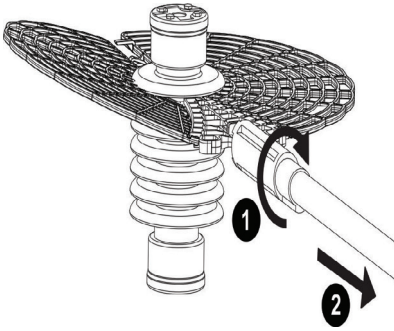
Check to make sure the installation of animal guards does not interfere with the blade or mechanism operation.



## 5. Complete installation

To finish the installation, push the locking wedge in completely. The animal guard is totally installed when the wedge reaches the stopping point and the halves on the opposite sides are almost touching.

## Installation



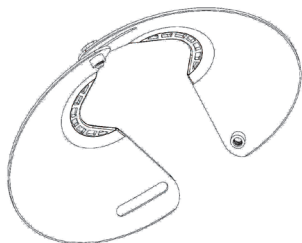
### 6. Removing guard

To remove the animal guard, attach the hot-stick and twist in a clockwise direction (1). While the hot-stick is twisted, firmly pull back on the wedge until it pulls free (2).

BISG

Installation is complete. EPP-3146

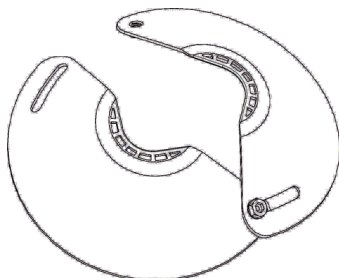
## Installation BISG-100/400



### 1. Attach BISG-100/400

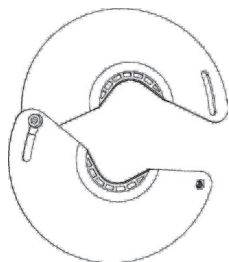
Attach two BISG-100/400 halves together using one bolt. The bolt should be finger tight.

The threaded boss should be below the part.



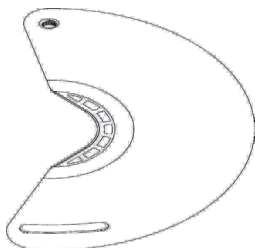
### 2. Accommodate insulator diameters

The BISG-100/400 can accommodate insulator diameters ranging from 38mm (1.5") to 114mm (4.5") depending on where the pivot bolt is installed in the slot.

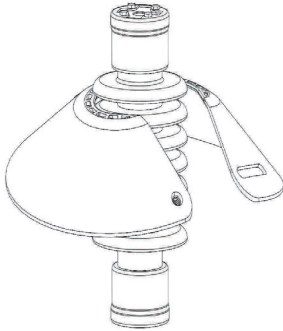


### 3. If insulator diameter larger than 114mm (4.5")

If the installation is on an insulator with a diameter larger than 102mm (4"), the grid area on top of the BISG-100/400 may be trimmed away with a cutting tool.

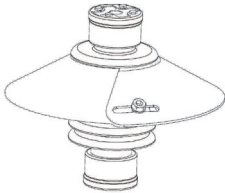


## Installation



### 4. Position BISG

Position the product between the insulator skirts.

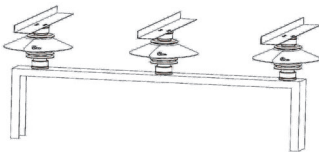


### 5. Tighten BISG

Tighten the BISG by sliding the slotted half over the threaded hole until the guard is securely around the insulator core. Install the second bolt through the threaded hole and turn until tight by hand or with a wrench, then apply one half additional turn to secure the guard in place 9 N.m (7ft-lbs). Repeat tightening process with first bolt.

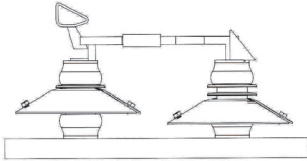
BISG

### 6. Typically install on vertical insulators



Typically, the BISG-100/400 is installed between the upper most two skirts on vertical insulators.

## Installation

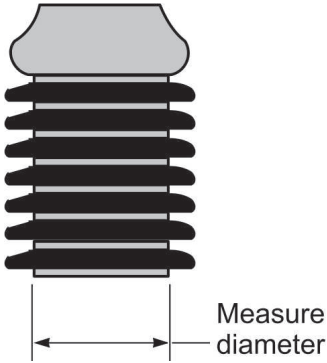


### 7. Install on closely spaced horizontal insulators

When installing the product on closely spaced horizontal insulators, like those found on hook switch disconnects, one guard should be installed between the skirts closest to the ground place or base of switch. The second guard should be placed between the next skirts as shown to ensure the guards do not touch.

Installation is complete. **EPP-3148**

## Installation BISG-60/115



### 1. Measure insulator core diameter

Measure the inner core diameter as shown at left.

Components per installation:

- 2 Animal guard halves
- Alignment bolt
- 1 pivot bolt

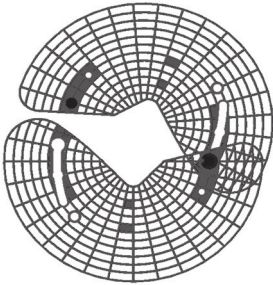
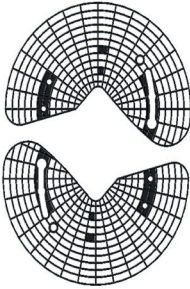
#### 1a. Alignment hole selection

To select the alignment hole position to use, see ranges in table 1 below.

Hole type: Ranges

Inner hole: Insulator core diameter 60-90mm (2.5"-3.5")

Outer hole: Insulator core diameter 90-115mm (3.5"-4.5")

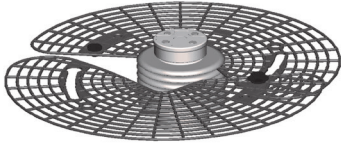


#### 2. Bolt shield together on one side as shown

To assemble the animal guard, first note that both halves are symmetrical. First overlap parts as shown in fig. 2, placing the keyway of Part A above the pivot bolt hole of Part B. Slide the pivot bolt through the large opening on the keyway slot of Part A and thread the pivot bolt into the pivot bolt hole location of Part B until the threads bottom out. When completely tightened, the guard should rotate at the pivot bolt location.

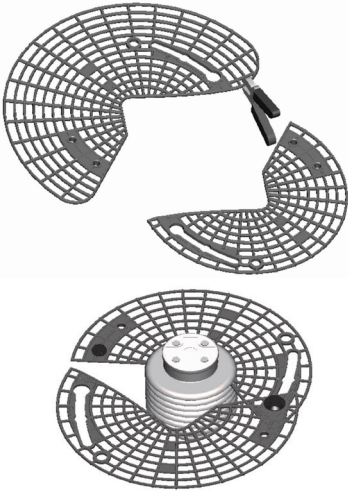
Then thread the alignment bolt (approximately 3 rotations) on the opposite side of the guard into the alignment bolt hole that corresponds with the core diameter of the insulator in table 1.

## Installation



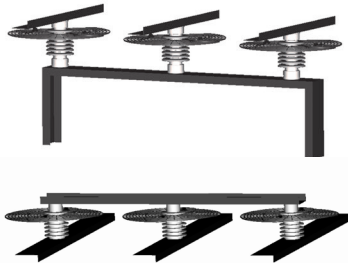
### 3. Position guard around the insulator between the insulator skirts

For vertical insulators; For vertical insulators, the animal guard should be installed between the upper and most two skirts.



#### 3a & 3b.

If applying animal guards to 3-phases located close enough together that the shields may touch; install the center phase guard between the 2nd and 3rd insulator skirts or trim animal guard as shown in Fig. 3a and Fig. 3b. Standard diameter is 580 mm (23"). Diameter can be reduced to a minimum of 430 mm (17").

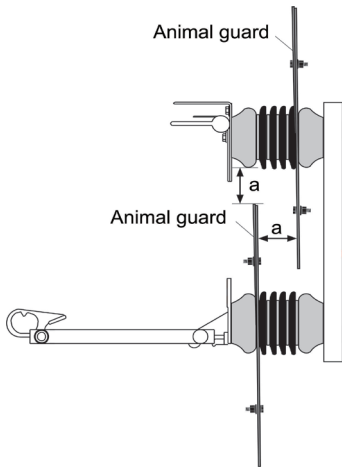


#### 3c.

Examples of animal guard installed between the upper most two skirts on vertical insulators (Fig. 3C).



## Installation



### 3d. For Horizontal Insulators on vertical hook-switch disconnects

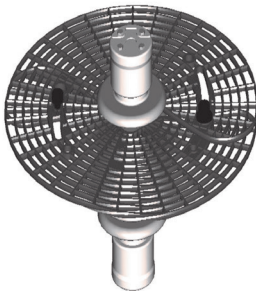
When installing animal guards on closely spaced horizontal insulators, like those found on hook-switch disconnects, one complete guard should be installed per steps 2 through 4 between the skirts closest to the ground plane or base of switch. The second guard should be placed between the next skirts as shown to create a small air gap between shields (Fig. 3d).

Check to make sure the installation of animal guards does not interfere with the blade or mechanism operation.

### 4. Complete installation

To complete the installation, position the alignment bolt installed in Part A under the large opening in the key-way slot in Part B and allow the alignment bolt to come up through the large opening in the key-way slot.

When the animal guard is properly installed, the halves will be configured in an over and under manner. Part A, will be on top of Part B on the pivot bolt side of the guard, and Part B will be on top of Part A, on the alignment hole side of the guard. This over and under configuration increases the stability of the guard on the insulator (see illustration).



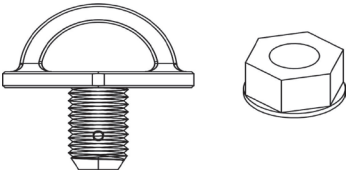
Slide the two halves together tightly on the core of the insulator. A slight bowing should occur when the guard is tight on the insulator core.

Tighten the alignment bolt firmly against the animal guard part surfaces by hand or with a wrench. Then apply one-half additional turn with a wrench to secure the guard in place. 9 N.m (7 ft-lbs.)

**Installation is complete. EPP-3147**

BISG

## Installation BISG-60/115-HOTSTICK



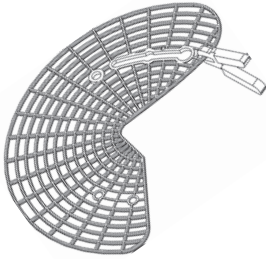
### 1. Measure insulator core diameter

Measure the inner core diameter as shown at left.

Components per installation:

- 2 Animal guard halves
- Alignment bolt
- 1 pivot bolt

To select the alignment hole position to use, see ranges in table 1 below.



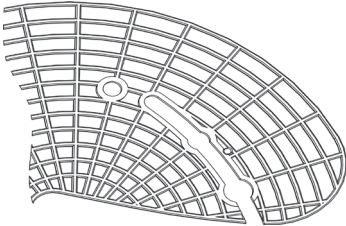
Hole type: Ranges

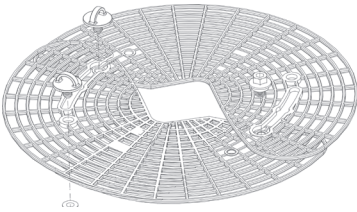
Inner hole: Insulator core diameter 60-90 mm  
(2.5"-3.5")

Outer hole: Insulator core diameter 90-115 mm  
(3.5"-4.5")

### 2. Bolt shield together on one side as shown

To assemble the animal guard, first note that both halves are symmetrical. First overlap parts as shown in fig. 2, placing the keyway of Part A above the pivot bolt hole of Part B. Slide the pivot bolt through the large opening on the keyway slot of Part A and thread the pivot bolt into the pivot bolt hole location of Part B until the threads bottom out. When completely tightened, the guard should rotate at the pivot bolt location. Then thread the alignment bolt (approximately 3 rotations) on the opposite side of the guard into the alignment bolt hole that corresponds with the core diameter of the insulator in Table 1.



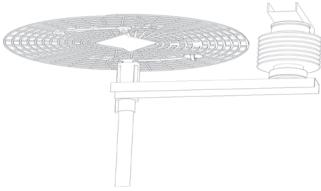


### 3. Position guard around the insulator between the insulator skirts

For vertical insulators; For vertical insulators, the animal guard should be installed between the upper and most two skirts.

If applying animal guards to 3-phases located close enough together that the shields may touch; install the center phase guard between the 2nd and 3rd insulator skirts or trim animal guard as shown in Fig. 3a and Fig. 3b. Standard diameter is 580 mm (23"). Diameter can be reduced to a minimum of 430 mm (17").

Examples of animal guard installed between the upper most two skirts on vertical insulators.



### 4. Complete installation

To complete the installation, position the alignment bolt installed in Part A under the large opening in the key-way slot in Part B and allow the alignment bolt to come up through the large opening in the key-way slot.

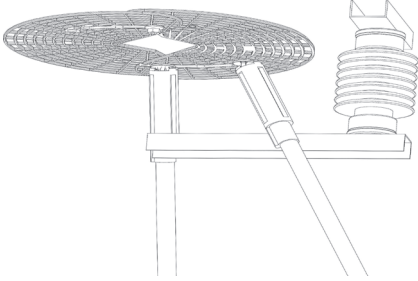
When the animal guard is properly installed, the halves will be configured in an over and under manner. Part A will be on top of Part B on the pivot bolt side of the guard, and Part B will be on top of Part A on the alignment hole side of the guard. This over and under configuration increases the stability of the guard on the insulator (See illustration to the right).

Slide the two halves together tightly on the core of the insulator. A slight bowing should occur when the guard is tight on the insulator core.

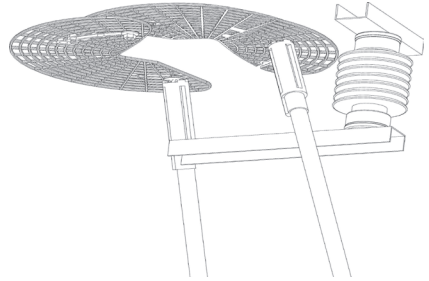
Tighten the alignment bolt firmly against the animal guard part surfaces by hand or with a wrench. Then apply one-half additional turn with a wrench to secure the guard in place. 9 N.m (7 ft-lbs.)

## Installation

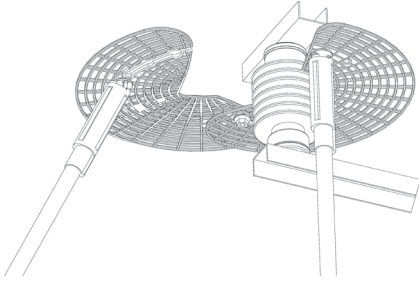
5.



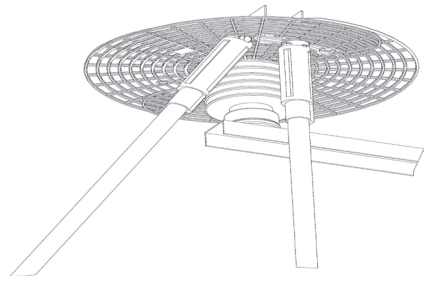
6.



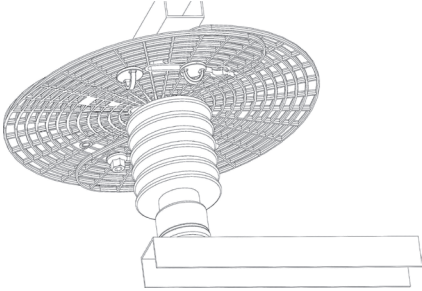
7.



8.



9.



Installation is complete. EPP-3256

## Technical Data Sheet/Material Information

Key Material Properties	Test Method	Results
<b>Accelerated Ageing</b>	ASTM D2671	168hrs @ 150°C ( 302°F )
Tensile Strength		17MPa ( 2450psi )
Ultimate Elongation		200%
<b>Thermal Endurance</b>		
Thermal Index (20,000 hours)	IEC 60216	115°C ( 240°F )
Continuous Operating Temperature (30 years)		100°C ( 210°F )
<b>Accelerated Weathering</b>		
Ultimate Elongation	ASTM G154	100% @ 1000 hours UVA
<b>Dielectric Strength</b>	ASTM D149	150kV/cm ( 380V/mil ) min. @ 2.5mm
<b>Inclined Tracking Test (TERT)</b>	ASTM D2303; IEC 60587	No tracking or erosion
		1hr @ 2.5 kV
		1hr @ 2.75 kV
		1hr @ 3.00 kV
		20 mins @ 3.25 kV

BISG

<b>BISG Technical Report references</b>	
EDR-5517	Bus Insulator Animal Guard (BISG-24-01). Mechanical/Electrical Evaluation
EDR-5311	Rigid Red Barrier Board (RRBB) Product Qualification Report. BISG materials Test Report.
EDR-5310	Bus Insulator Animal Guard (BISG-60/115-02-FT). Mechanical/Electrical Evaluation

<b>BISG Installation Instructions</b>	
EPP-3146-6/18	BISG-24-01 Installation Instructions.
EPP-3148-6/18	BISG-100/400 Installation Instructions
EPP-3147-6/18	BISG-60/115-02 Installation Instructions
EPP-3256-11/18	BISG-60/115-03-HOTSTICK

## Frequently Asked Questions BISG

### Q: Can it be installed live?

**A:** BISG-60/115 and BISG-100/400 is not a live installation. BISG-HOT-60/115 and BISG-24-01 can be installed live. Hot stick tools are available to assist with live installations.

### Q: Is it acceptable for animal guards to touch if they are on different phases?

**A:** No. Installation should be staggered at different phases to ensure no contact is made. Suitable air space clearance also must be made.

### Q: What is the maximum voltage BISG's can be used at?

**A:** There is no maximum application voltage level as the product is not under any electrical stress. Additionally the airspace clearance must be respected.

### Q: Can BISG's be trimmed or modified?

**A:** Yes, this can easily be done before installation. Can be trimmed to suit the individuals requirements.

### Q: Can they be removed after installation?

**A:** BISG-100/400, BISG-60/115 and BISG-HOT-60/115 can all be removed. However BISG-24-01 cannot be removed after installation. Note: bolts on ratchets cannot be removed.

### Q: Can BISG-100/400 be used on a vertical position?

**A:** This is not recommended as there is high wind resistance. This may cause damage to the product.

### Q: Are there any voltage ratings on BISG-60/115 and BISG-24-01?

**A:** No. They are considered isolators rather than insulators. Therefore that is why no voltage ratings are available for these BISG models.

### Q: Is there a performance difference between red and grey BISG's?

**A:** No, both meet the same product specifications and is a customer preference.

### Q: Is there a lead time for this product?

**A:** There is no lead time for the BISG models.

### Q: Are all BISG's REACH and RoHS compliant?

**A:** Yes, all of the BISG models covered in this chapter are REACH and RoHS compliant.

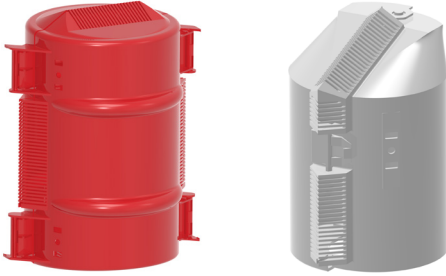
**Product Information:** <https://www.te.com/usa-en/utilities/product-compliance/safety-data-sheets.html>

**Product Compliance:** <https://www.te.com/usa-en/product-CAT-BISG.html?q=BISG&source=header>

BISG

## Bushing Connection Animal Covers (BCAC)

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### Description

TE Connectivity's (TE) Raychem BCAC hot stickable insulating cover is designed to prevent animal caused outages on pole-top transformer equipment ranging from 15kV to 36kV.

TE's BCAC have been a reliable and successful product within TE WAP portfolio for many years and have been eliminating outages from a range of animals while providing optimum protection with enhanced features. Below are the following sizes of BCAC, which are available in red and grey;

- **BCAC-5D/8**
- **BCAC-7D/10**
- **BCAC-8D/14**

### Key Features

- Reliable protection from animal-caused outages
- Fast and versatile installation
- High-performance materials for extreme durability
- Cover gripper attachment facilitates hot-stick insulation from pole to bucket
- Step latching mechanism for craft-friendly installation
- REACH and RoHS compliant



## Ordering/Application Information

- Standard package; 12 or 6 units per box, depending on the size of the cover. One BCAC, will install on one insulator.
- Related test reports: EDR-5339, UVR-8209
- Available in both red and grey colour, BCAC-G-5D/8

## Product Selection

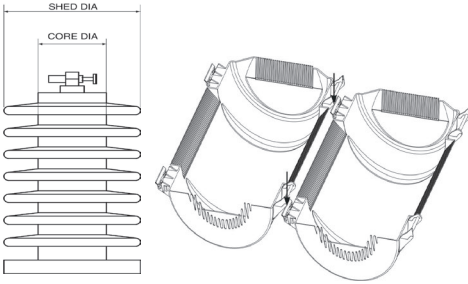
Description	Insulator Core Range Millimetres (Inches)	Insulator Shed Range Millimetres (Inches)	Cover Height Millimetres (Inches)	Colour	Standard Pack Size
BCAC-5D/8 (B12)	43-63 mm (1.7"-2.7")	75-122 mm (3.0"-4.8")	203 mm (8.0")	Red	12
BCAC-G-5D/8 (B12)	43-63 mm (1.7"-2.7")	75-122 mm (3.0"-4.8")	203 mm (8.0")	Grey	12
BCAC-7D/10 (B6)	38-108 mm (1.5"-4.25")	102-173 mm (4.0"-6.8")	266 mm (10.5")	Red	6
BCAC-G-7D/10 (B6)	38-108 mm (1.5"-4.25")	102-173 mm (4.0"-6.8")	266 mm (10.5")	Grey	6
BCAC-8D/14 (B6)	43-125 mm (1.7"-5.04")	125-203 mm (5.0"-8.0")	355 mm (14.0")	Red	6
BCAC-G-8D/14 (B6)	43-125 mm (1.7"- 5.04")	125-203 mm (5.0"-8.0")	355 mm (14.0")	Grey	6

BCAC

## Hints and Tips

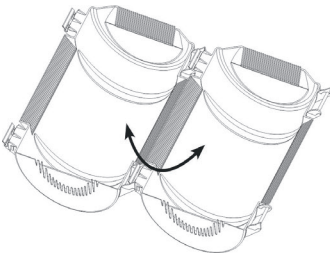
- Check to ensure that the kit you are going to use fits the insulator/bushing.
- Refer to the kit label and title of the installation instructions.
- Components or working steps may have been modified since you last installed this product.
- Carefully read and follow the steps in the installation instructions.
- Check core preparation dimensions before installing the product.
- Surface should be free of sharp edges or burrs and thoroughly cleaned and degreased before applying.
- Check core preparation dimensions before installing the product.
- Cleaning the cable - use an approved solvent, such as the one supplied in the P63 Cable Prep Kit, to clean the cable. Be sure to follow the manufacturer's instructions. Failure to follow these instructions could lead to product failure.
- Some newer solvents do not evaporate quickly and need to be removed with a clean, lint-free cloth. Failure to do so could change the volume resistivity of the substrate or leave a residue on the surface.
- Please follow the manufacturer's instructions carefully.
- Trim conductor exits tightly to avoid nesting.
- Ensure that the conductor insulation starts inside the BCAC cover.

## Installation BCAC 8D and 7D



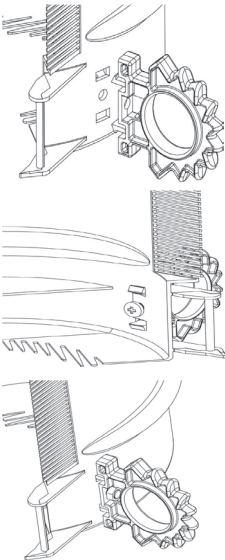
### 1. Snap cover together

Snap the two halves of the cover together at the hinge in the two places as shown.



### 2. Verify that the cover is joined properly

The cover should rotate freely after the hinge is snapped in place. Using the cutters, trim the fingers on the bottom of the cover to fit the core diameter (if needed).



### 3. Install two gripper attachments

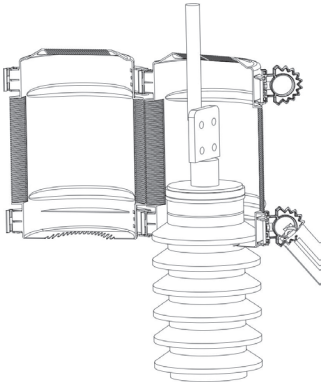
Install the two gripper attachments by pushing them together through the corresponding holes on the front part of the cover.

Fasten each gripper attachment in place with a bolt and nut as shown. Insert the plastic bolt through the centre hole from the inside of the cover. Attach the nut to the bolt from the outside of the cover. Tighten the bolt with the screwdriver.

Both gripper must be attached for hot-stick installations.

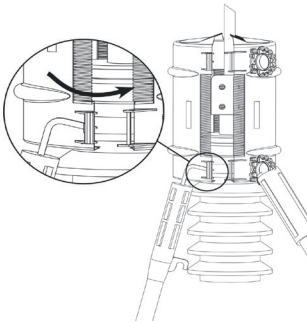
BCAC

## Installation



### 4. Position the cover on the bushing

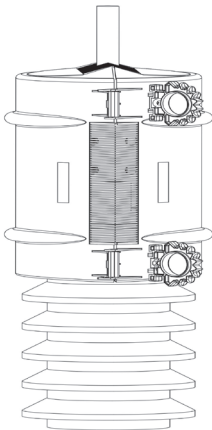
Using a shotgun stick to grab the lower gripper and maneuver the cover into place around the bushing. The cover should be positioned around the top skirt as shown.



### 5. Latch the cover

Place the end of a second hot stick (preferably a switch stick) inside the pocket of the lower latch as shown.

Apply force with the switch stick to close the lower latch. Disengage the sticks and repeat the steps to close the upper latch.

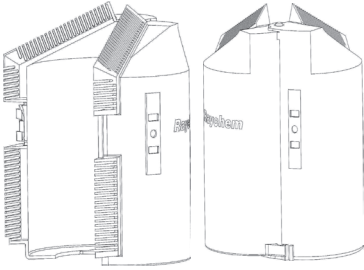


### 5. Complete installation

Installation of BCAC 8D and 7D is now complete.

**Installation is complete. EPP-3226**

## Installation BCAC 5D



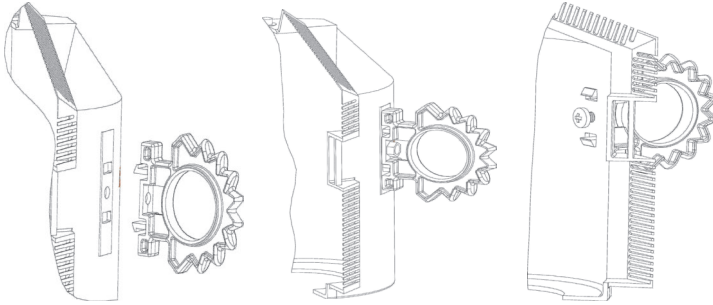
### 1. Gripper attachment installation

Install gripper attachment (GA) in either of the two locations as shown.

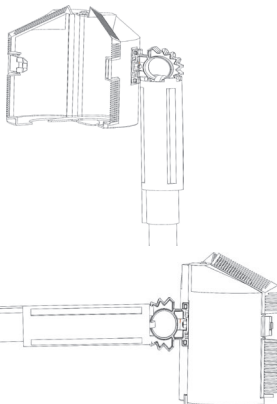
Location 1: If installing from pole or bucket below. (Most common location).

Location 2: If installing from a bucket at equal height.

Discard gripper attachment if installing with rubber gloves.

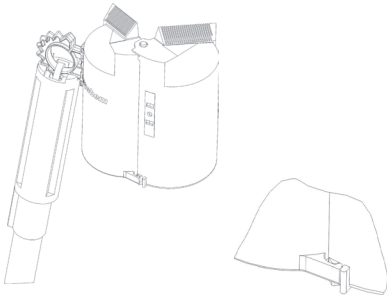


Push the GA latches through the corresponding square openings in the part. You will feel the GA lock in place. Then take the small screw and hex nut and attach as shown.



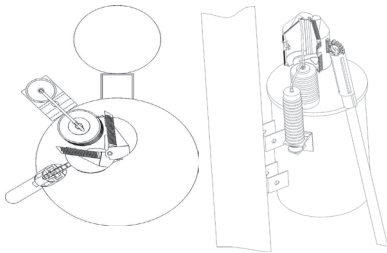
Take hot stick and grip the GA on the spurs which best suits the installation method (pole or bucket)

## Installation

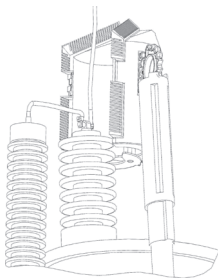


### 2. Hot stick installation from a pole below

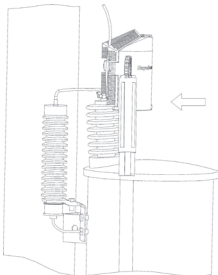
Open the cover completely until the catch in the lower back locks the cover in the open position.



When the two conductors are attached to the bushing. Position the cover for installation with the opening and scissor feature in line with the conductors.

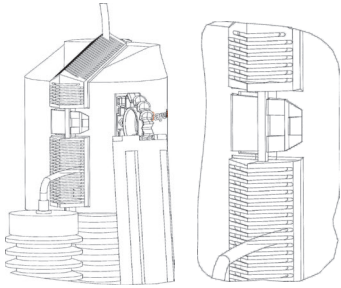


Place scissor feature between first and second skirts of the bushing. Do not cover more than one skirt.

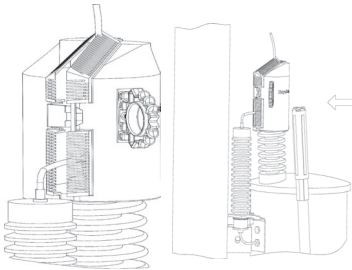


Apply a slow constant force towards the bushing with the hot-stick. Watch for alignment with the conductor.

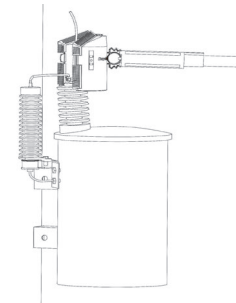
## Installation



Make sure the cover locks to the second latch step.



If the cover only locks to the first step, disconnect hot-stick from gripper attachment (cover will stay in place on bushing) and give a slight tap on the back of the cover with the stick. This force will push the cover onto the second and final latch step.



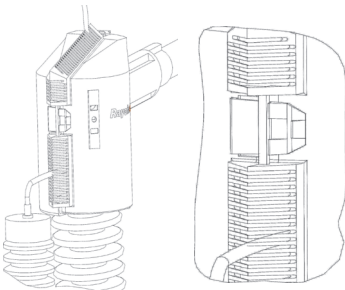
### 3. Hot stick installation from a bucket

Hold gripper attachment as shown. Place scissor feature between first and second skirts of the bushing.

Apply a constant force towards the bushing with the hot-stick. Watch for alignment with conductor.

### 4. Make sure cover locks to the second latch

Installation for BCAC 5D/8 is complete.



**Installation is complete. EPP-3225**

BCAC

## Technical Data Sheet/Material Information

Key Material Properties	Test Method	Results
<b>Accelerated Ageing</b>	ASTM D2671	168hrs @ 150°C ( 302°F )
Tensile Strength		17MPa ( 2450 psi )
Ultimate Elongation		200%
<b>Thermal Endurance</b>		
Thermal Index (20,000 hours)	IEC 60216	115°C ( 240°F )
Continuous Operating Temperature (30 years)		100°C ( 210°F )
<b>Accelerated Weathering</b>		
Ultimate Elongation	ASTM G154	100% @ 1000 hours UVA
<b>Dielectric Strength</b>	ASTM D149	150kV/cm ( 380V/mil ) min. @ 2.5mm
<b>Inclined Tracking Test (TERT)</b>	ASTM D2303; IEC 60587	No tracking or erosion
		1hr @ 2.5kV
		1hr @ 2.75kV
		1hr @ 3.00kV
		20 mins @ 3.25kV

<b>BCAC Technical report references</b>	
EDR-5339	Bushing Connection Animal Cover (BCAC-5D/8) Mechanical/Electrical Evaluation.
UVR-8209	Material Test Report

<b>BCAC Installation Instructions</b>	
EPP-3225-10/18	BCAC-5D/8
EPP-3226-10/18	BCAC-7D/10 and BCAC-8D/14



## Frequently Asked Questions BCAC

**Q: Can BCAC be installed live?**

**A:** Yes. BCAC 5D, 7D and 8D are all cold applied, hot stickable.

**Product Compliance:** <https://www.te.com/usa-en/product-CAT-BCAC.html?source=header-match>

**Q: What is the expected life time of BCAC for outdoor applications?**

**A:** The life time expectancy for BCAC is 30 years.

**Q: What colours are BCAC available in?**

**A:** BCAC is available in both red and grey.

**Q: Can BCAC products be modified?**

**A:** Yes. BCAC can be modified for the specific requirements by drilling or the use of side cutters only, to trim with side cutters.

**Q: Can the bushing be fully covered?**

**A:** No only bare metal needs to be covered. A maximum of one shed to be covered. Covering further sheds will result in reduced creepage length.

**Q: Do I need to add drain holes for water?**

**A:** No, water will naturally flow out through the fingers.

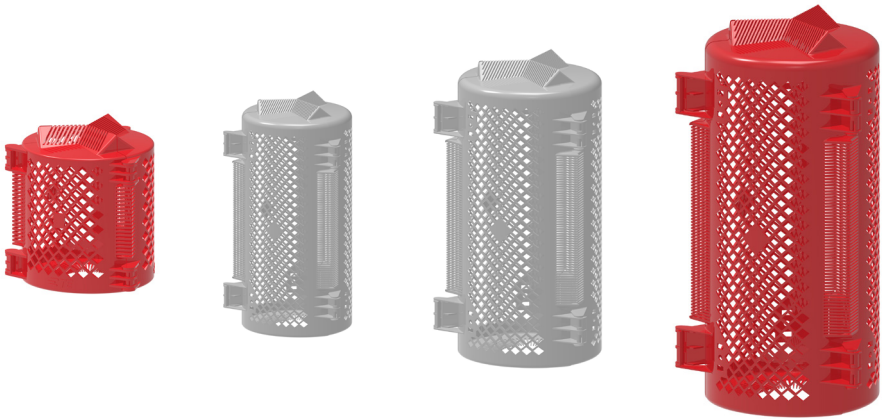
**Q: Are all products REACH and RoHS compliant?**

**A:** Yes, all of the BCAC models covered in this chapter are REACH and RoHS compliant.

**Product Information:** <https://www.te.com/usa-en/utilities/product-compliance/safety-data-sheets.html>

BCAC

## Bushing Connection Animal Cover - Inspection Cover (BCAC-IC)



### Description

TE Connectivity's (TE) Raychem BCAC-IC is a UV resistant, anti-tracking, rugged high temperature insulating cover, designed to prevent animal caused outages on breaker and transformer bushings, ranging from 15kV to 36kV.

BCAC-IC prevents animals such as squirrels coming into contact with bushings and insulator connections. There are multiple conductor exits out of the top and side interfaces of the product, which gives the conductor leads better flexibility.

BCAC-IC is available in red and grey and four sizes.

### Key Features

- Cold applied, de-energized
- Visual inspection of connection and oil levels
- Excellent water wash, no build up of "bug-house"
- Conductor and leads exit easily through the cover
- Robust latching and hinging mechanisms
- Fast and versatile installation
- REACH and RoHS compliant

## Ordering/Application Information

- Related test reports: EDR-5514, UVR-8209.
- BCAC-IC installed on bushings and insulators.

## Product Selection

Product	Insulator Core Range	Insulator Shed Range	Cover Height	Colour	Std. Pack Size
BCAC-IC-5D/6 (B6)	38-89 mm (1.5"-3.5")	63-127 mm (2.5"-5.0")	152 mm (6")	Red	6
BCAC-G-IC-5D/6 (B6)	38-89 mm (1.5"-3.5")	63-127 mm (2.5"-5.0")	152 mm (6")	Grey	6
BCAC-IC-7D/12 (B6)	76-124 mm (3.0"-4.87")	96-178 mm (3.75"-7.00")	305 mm (12")	Red	6
BCAC-G-IC-7D/12 (B6)	76-124 mm (3.0"-4.87")	96-178 mm (3.75"-7.00")	305 mm (12")	Grey	6
BCAC-IC-8D/18 (B6)	90-160 mm (3.5"-6.25")	100-200 mm (4.00"-8.00")	455 mm (18")	Red	6
BCAC-G-IC-8D/18 (B6)	90-160 mm (3.5"-6.25")	100-200 mm (4.00"-8.00")	455 mm (18")	Grey	6
BCAC-IC-10.5D/20 (B6)	90-125 mm (3.5"-8.5")	150-267 mm (6"-10.5")	508 mm (20")	Red	6
BCAC-G-IC-10.5D/20 (B6)	90-125 mm (3.5"-8.5")	150-267 mm (6"-10.5")	508 mm (20")	Grey	6

BCAC-  
IC

## BCAC-IC Applications

### Insulation on conductors

In terms of insulation on conductors, the required length of the conductor that needs to be insulated, from the inside of the BCAC-IC to the bare connection is 10mm (0.393").

Dependent on the application specifications the length of insulation on conductors will vary, but 100mm (3.93") is a TE recommendation.

### Compatible products

MVCC, BBIT and BPTM should be applied so it either starts or finishes inside the BCAC-IC. It should also extended out 760mm (30") to ensure electrical clearance.

HVBT and MVFT is used in applications when the conductor is long enough to stick out of the cover.

### Field trimming

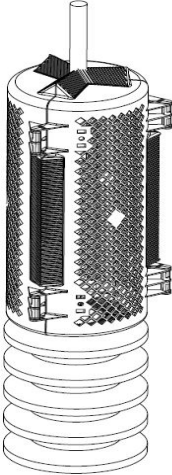
Field trimming is different for each BCAC-IC application. However it is important that the "fingers" at the bottom of the covers are trimmed, ensuring the hole is slightly larger than the bushing core dimension.

Additionally, trimming the conductor exits need to be cut tightly around the conductor, to prevent small birds from nesting.

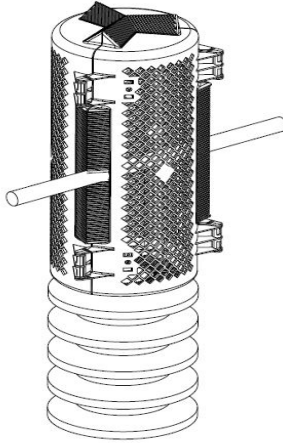
Field trimming is compatible with horizontal conductors, 180° straight through & round, square, box and angled conductors.

## BCAC-IC Applications Vectors

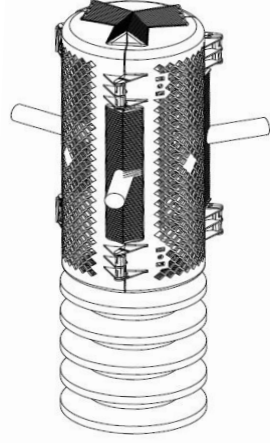
90°



180°

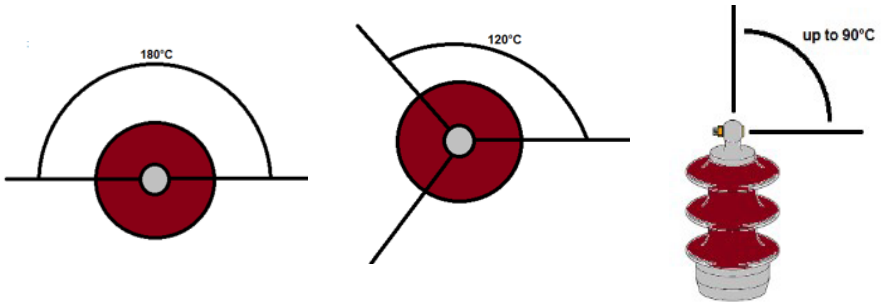


120°



- Demonstrating the field trimming of the BCAC-IC during installation.
- Conductors can be insulated with MVCC, MVLC, MVFT or HVBT.
- Conductors exiting through the fingers at 90°, 180° and 120°.

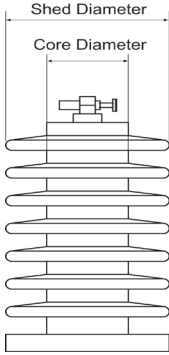
BCAC-  
IC



## Hints and Tips

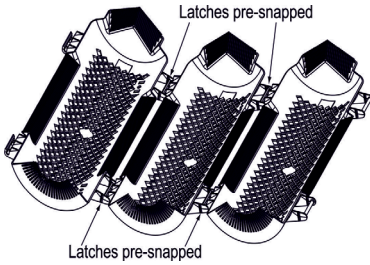
- Wear the appropriate gloves, protection glasses, shoes and apparel while performing the installation.
- Required tooling for installation are cutters, a measuring tape and a marker pen.
- Check to ensure that the kit you are going to use fits the insulator/bushing.
- Refer to the kit label and title of the installation instructions.
- Components or working steps may have been modified since you last installed this product.
- Carefully read and follow the steps in the installation instructions.
- Check core preparation dimensions before installing the product.
- Surface should be free of sharp edges or burrs and thoroughly cleaned and degreased before applying.
- Check core preparation dimensions before installing the product.
- Cleaning the Cable - use an approved solvent, such as the one supplied in the P63 Cable Prep Kit, to clean the cable. Be sure to follow the manufacturer's instructions. Failure to follow these instructions could lead to product failure.
- Some newer solvents do not evaporate quickly and need to be removed with a clean, lint-free cloth. Failure to do so could change the volume resistivity of the substrate or leave a residue on the surface.
- Please follow the manufacturer's instructions carefully.
- Trim conductor exits tightly to avoid nesting.
- Ensure that the conductor insulation starts inside the BCAC-IC cover.

## Installation BCAC-IC 5D, 7D, 8D and 10.5D



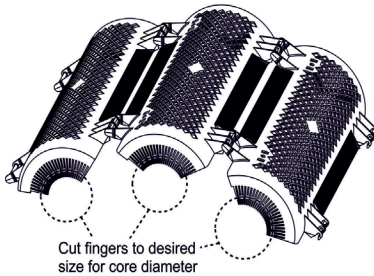
### 1. Prepare cover for installation

The three pieces come snapped together in two places.



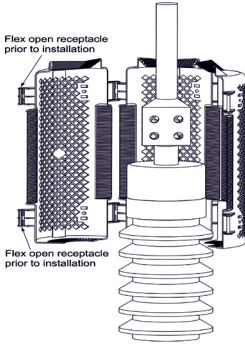
### 2. Trim fingers

Using the cutters, trim the fingers on the bottom of the cover to fit the core diameter (if needed).



BCAC-  
IC

## Installation

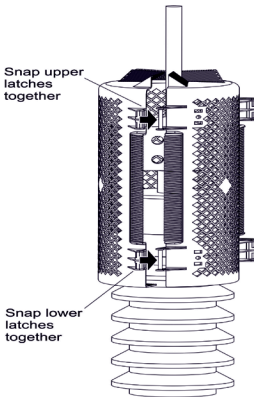


### 3. Position the cover on the bushing

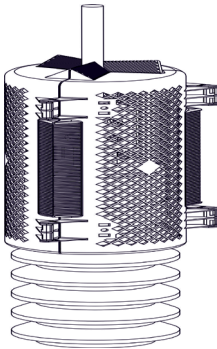
Position the cover between the first and second skirt of the bushing. Before snapping latches together, flex open the receptacle portion of the latches.

### 4. Latch the cover

Close the cover by bringing the two outer pieces together. Snap both the upper and lower latches together.



### 5. Completed installation



Installation is complete. EPP-3151



## Technical Data Sheet/Material Information

Key Material Properties	Test Method	Results
<b>Accelerated Ageing</b>	ASTM D2671	168hrs @ 150°C ( 302°F )
Tensile Strength		17MPa ( 2450psi )
Ultimate Elongation		200%
<b>Thermal Endurance</b>		
Thermal Index (20,000 hours)	IEC 60216	115°C ( 240°F )
Continuous Operating Temperature (30 years)		100°C ( 210°F )
<b>Accelerated Weathering</b>		
Ultimate Elongation	ASTM G154	100% @ 1000 hours UVA
<b>Dielectric Strength</b>	ASTM D149	150kV/cm ( 380V/mil ) min. @ 2.5mm
<b>Inclined Tracking Test (TERT)</b>	ASTM D2303; IEC 60587	No tracking or erosion
		1hr @ 2.5kV
		1hr @ 2.75kV
		1hr @ 3.00kV
		20 mins @ 3.25kV

<b>BCAC-IC Technical Report references</b>	
EDR-5514	BCAC-IC Electrical Evaluation.
UVR-8209	BCAC-IC Material Test Report

<b>BCAC-IC Installation Instructions</b>	
EPP-3151-7/18	BCAC-IC 5D, 7D, 8D and 10.5D Installation Instructions.

## Frequently Asked Questions BCAC-IC

**Q: Can BCAC-IC be installed live?**

**A:** Yes. BCAC-IC 5D, 7D, 8D and 10.5D are all cold applied with the use of hot gloves.

**Q: What is the expected life time of BCAC-IC for outdoor applications?**

**A:** The life time expectancy for BCAC-IC is 30 years.

**Q: What colours are BCAC-IC available in?**

**A:** BCAC-IC is available in both red and grey.

**Q: Can BCAC-IC products be modified?**

**A:** Yes. BCAC-IC can be modified for the specific requirements by drilling or the use of side cutters only, to trim with side cutters.

**Q: Is future inspection possible for BCAC-IC?**

**A:** Yes. BCAC-IC can be inspected for failure “hotspots” and general maintenance without having to remove the cover. This is possible because of its mesh design.

**Q: Can the bushing be fully covered?**

**A:** No only bare metal needs to be covered. A maximum of one shed to be covered. Covering further sheds will result in reduced creepage length.

**Q: Is jet washing possible?**

**A:** Yes, with the use of a high pressured wash tool.

**Q: Do BCAC-IC's attract bugs?**

**A:** No, an open design will allow for plenty of water wash, to prevent this attraction.

**Q: Are all products REACH and RoHS compliant?**

**A:** Yes, all of the BCAC-IC models covered in this product handbook are REACH and RoHS compliant.

**Product Information:** <https://www.te.com/usa-en/utilities/product-compliance/safety-data-sheets.html>

**Product Compliance:** <https://www.te.com/usa-en/product-CAT-BCAC-IC.html?q=BCAC-IC&source=header>

BCAC-  
IC



## Bushing Connection Insulating Covers (BCIC)



### Description

TE Connectivity's (TE) Raychem BCIC preformed covers are available for any equipment connections.

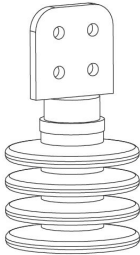
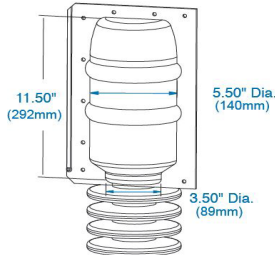
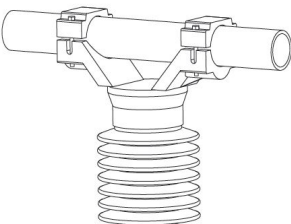
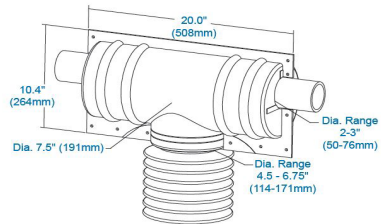
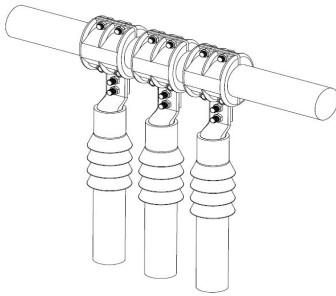
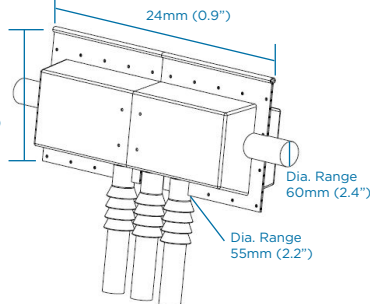
Easy modifications can be made to the cover, to ensure efficient and successful installation of various shapes and sizes of bushings. Additionally, no need to disconnect busbars during installation.

Raychem BCIC covers are held in place with UV established latches or cable ties, and can be easily removed for maintenance.

### Key Features

- UV stable, tracking and erosion resistant
- Typically tested to 36kV. Suitable for higher voltages.
- Cross-linked to create an extremely robust insulation system ensuring long reliable operation
- Field trimmable and customisable
- 30+ years of field proven experience
- with high voltage products in harsh environments
- Available in red and grey
- Range taking product
- Multi applications on distribution and transmission networks
- REACH and RoHS compliant

## Bushing Information

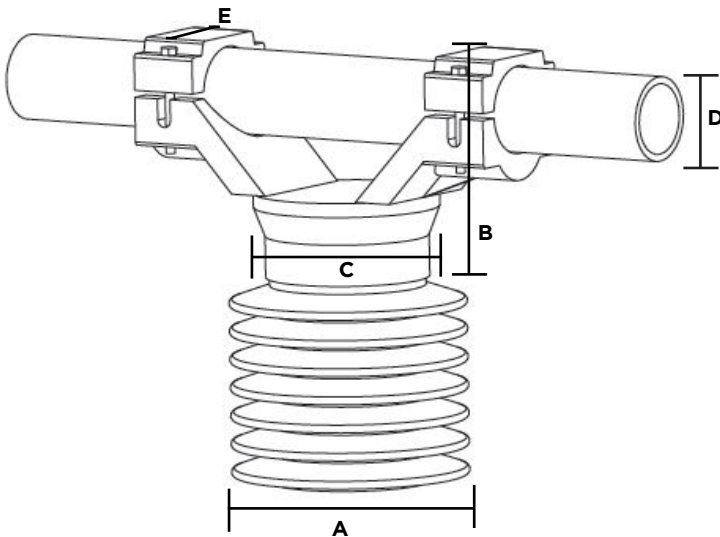
<p>BCIC 5.5D</p> 	
<p>BCIC 7.5D</p> 	
<p>BCIC Box (termination)</p> 	

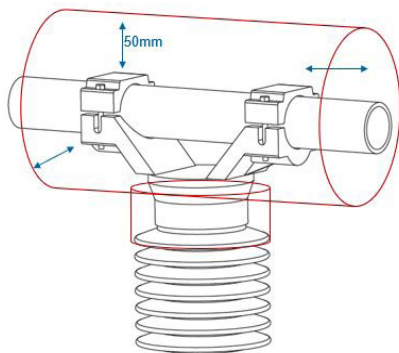
- Specific dimensions for installation are shown in the image
- All metal components need to be insulated, to prevent electrical stress and air entrapment
- Insulation of bushing needs to be fully covered, placed on top of the first shed
- The internal air space clearance must be greater than 50ml to ensure successful installation
- Ensure that the bolts and extremities are fitted correctly and as tightly as they can fit

BCIC

## Hints and Tips

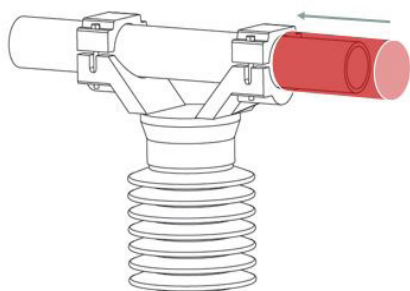
- Check the key geometries and measure before installation.
- There should be a 50mm (1.96") coverage with the conductor fully inside the cover.
- Install typically under or on the first shed.
- Voltage class typically tested and rated to 36kV. It can be used at higher voltages as long as the design incorporates the ability of more internal airspace clearance.
- Product selection is dependent on retrofit and disconnect possibilities.
- The recommended tooling for this installation is line cutters.
- Refer to the installation guide for the specific installation steps.
- Appropriate latches only required for pre-cut insulating covers. Ensure that the latches are pushed in tightly to prevent future maintenance.





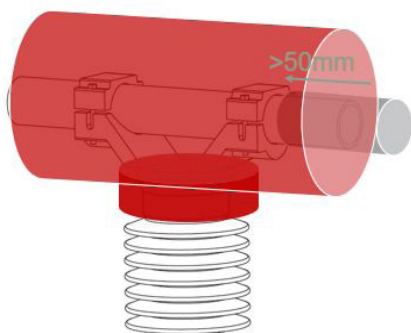
Here is the first visual representation of the cover over the conductor.

For successful installation, ensure that there is 50mm (1.96") of distance between the conductor and cover.



Once the cover has been fitted, it is important that the majority of the energized conductor is covered by the BCIC.

This will prevent accidental flashovers. As shown in the image the first half of the conductor is covered, however this must be repeated on the whole conductor.



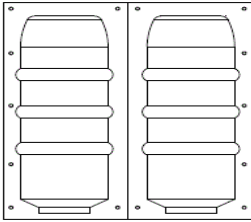
For a complete installation ensure that there is 50mm (1.96") of conductor not insulated by the cover.

This is applicable to both ends of the conductor. Once the adjustments have been made, installation of the cover on the BCIC is completed.

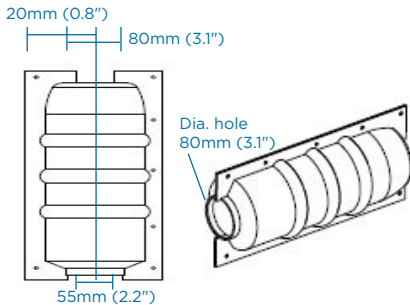
BCIC

## Installation Guidelines

### BCIC 5.5D

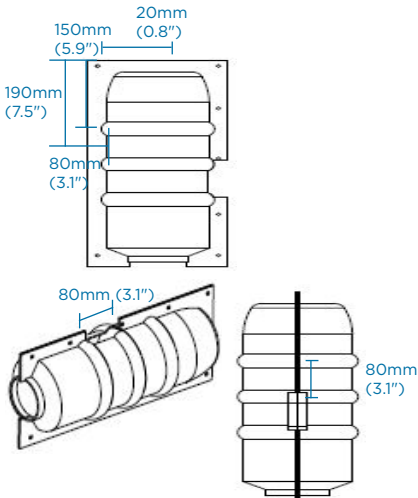


Installation for BCIC 5.5D is examples of, not limited to 90 degrees and vertical orientation. Open the cover out flat when making the top, bottom and side cuts.



1. Cut an 80 mm (3.1") diameter hole at the bottom of the cover.

Cut another hole at the top end of the cover. This hole should be 55 mm (2.2").



2. For angled orientation, the cut out needs to be 80 x 50 mm (3.1" x 2.0")

For 90 degree orientation, cut out a 25 mm (1.0") hole to the side of the cover. Leave a space of 150mm (6.0") between the top of the cover and middle cut out.

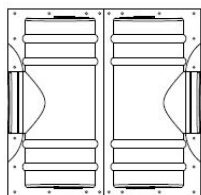
Installation complete.

**Installation is complete. EPP-3403**



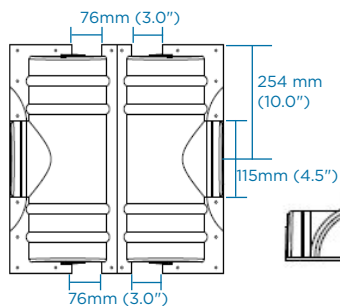
## Installation Guidelines

### BCIC 7.5D

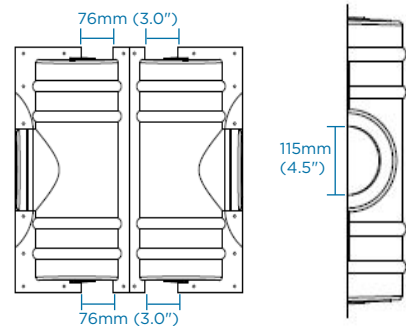
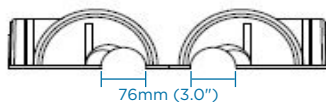


The installation steps and dimensions below show various orientations of BCIC 7.5D.

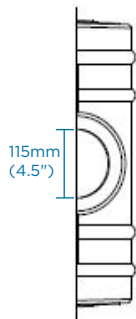
Open the cover out flat when completing the bottom, top and side cuts.



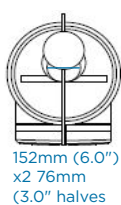
1. Cut out a 76 mm (3.0") diameter hole. The location of this hole is centred between the top and bottom at 190 mm (7.5").



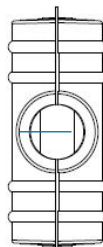
2. Cut a hole at the bottom of the cover that has a diameter of 115 mm (4.5").



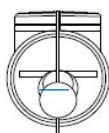
The cover now has three exit holes. Two on the sides and then one at the bottom.



152mm (6.0")  
x2 76mm (3.0") halves



115mm (4.5")



152mm (6.0") x2  
76mm (3.0") halves

Dependent on the orientation the number of exit holes needed for installation can vary.

**Installation is complete. EPP-3404**

BCIC

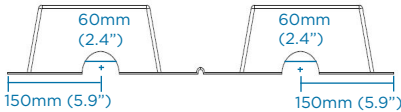
## Installation Guidelines BCIC box

The installation steps and dimensions below are installation guidelines. Adjustments will vary.

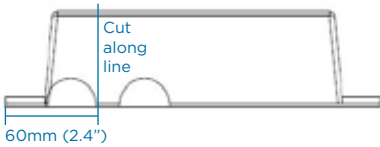
Fully open the box.



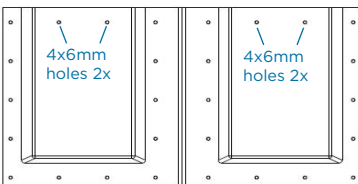
1. Cut two 55 mm (2.2") diameter holes at the location shown, on both sides of the cover.



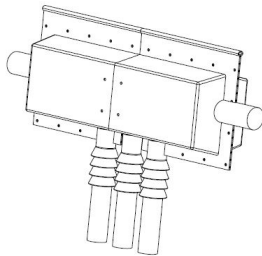
2. Cut a 60mm (2.3") diameter hole in both halves of the cover, located 150mm (5.9") from the end of box.



3. From the top of the box make a 60mm (2.3") cut, in a downwards position. Cut from the left side to the right. This should result in the top section of the box removed.



4. Cut a 115mm (4.5") diameter hole, on both sides. 4x6 mm holes need to be cut into the box. As guidance use the same location distances as per the holes which are already there.



Installed two boxes on application. Installation complete, BCIC boxes are connected together on the application such as busbar and termination arrangement.

**Installation is complete. EPP-3405**

## Material Test Data

Material Testing		
Key Material Properties	Test Method	Results
Accelerated Ageing	ASTM D2671	168 hrs @ 150°C ( 302°F )
Tensile Strength	ASTM D412; ISO 37	10MPa min. 1450 psi min.
Ultimate Elongation		300% min.
Thermal endurance	IEC 60216	105°C ( 220°F )
UV weathering Resistance (5000 hours)	ASTM D746	5MPa min; 725 psi min 200% min
Electrical		
Tracking and Erosion Resistance	ASTM D2303; IEC 60587	No tracking or erosion to top surface or flame. Stop voltage Method failure after 1hr . at 2.5kV 1hr . at 2.75 kV 1hr . at 3.0 kV 1hr . at 3.25 kV 1hr . at 3.5kV
Dielectric strength	ASTM G154	130kV/cm ( 330V/mil ) min (2.5 mm)

BCIC Installation instructions	
EPP-3403-7/19	BCIC 5.5D Installation Instructions
EPP-3404-7/19	BCIC 7.5D Installation Instructions
EPP-3405-7/9	BCIC Box Installation Instructions

BCIC

## Frequently Asked Questions Bushing Connection Insulating Cover

**Q: What are the key geometries and measurements of an insulating cover?**

**A:** The target of 50mm (2") air space clearance coverage, inside the cover. This is vital to remember when selecting a cover.

**Q: Can BCIC products be modified?**

**A:** Yes. It is cross linked so it does not tear/split. Can also be cut to allow for multiple conductor exits

**Q: Is jet washing possible?**

**A:** Yes, with the use of a high pressured wash tool.

**Q: What is the typical voltage?**

**A:** The voltage class is typically tested and rated at 36kV. However, it can be used at higher voltages as long as the design incorporates the ability of more internal airspace clearance.

**Q: What colours are BCIC Insulating covers available in?**

**A:** BCIC insulating covers are available in red and grey.

**Q: Is BCIC IP rated?**

**A:** There is no rating but products have additional drain holes

**Q: Can it be re-entry?**

**A:** Yes, re entry is possible for BCIC insulating covers

**Q: Does the cover block thermal measuring equipment?**

**A:** No, but it does reduce the accuracy

meaning the equipment will most likely display a fail

**Q: Will the bushing cover compromise the performance of the bushing?**

**A:** No, the performance will be the same when the cover is installed.

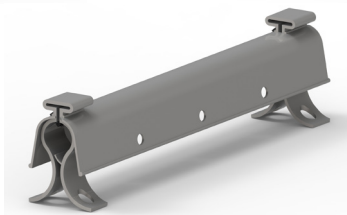
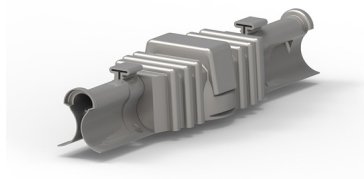
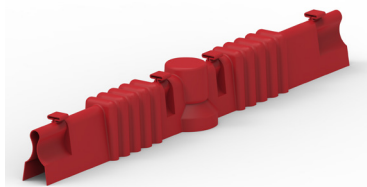
**Q: Are all products REACH and RoHS compliant?**

**A:** Yes, all of the BCIC models covered in this product handbook are REACH and RoHS compliant.

**Product Information:** <https://www.te.com/usa-en/utilities/product-compliance/safety-data-sheets.html>

**Product Compliance:** <https://www.te.com/usa-en/product-953853-000.html?q=BCIC&source=header>

## Bird Protection Covers (BCIC)



### Description

TE Connectivity's (TE) Raychem BCIC bird cap protects birds and other animals from live conductors on insulator cross arms. The flexible polymer means that most configurations of conductor attachment are easily accommodated. Installation is very simple and tool free, some versions can be installed on an energised line.

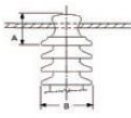
The raptor cover is a hot stickable insulating cover, designed to prevent raptor caused outages on medium voltage distribution lines. This family of products fit a variety of polymeric and porcelain insulator configurations. Including pin, horizontal post and dead end insulators.

### Key Features

- Live installation
- Suitable for side and centre tie
- UV stable, tracking and erosion resistant
- Cross-linked to create an extremely robust insulation system ensuring long, reliable operation
- 30+ years of field proven experience with high voltage
- products in harsh environments
- Available in red and grey
- Range taking conductor and insulator sizes
- Multi fixing techniques
- Pin, post, horizontal and vertical installation
- REACH and RoHS compliant

BCIC

## Selection information EMEA

Insulator size mm		BCIC Family Part Description								
		1215	1216	1217	1218	1219	1215-005	1215-006	3313	3314
	A	A min = 40 A max = 150	A min = 40 A max = 150	A min = 40 A max = 150	A min = 40 A max = 150	A min = 40 A max = 150	A min = 90 A max = 130	A min = 90 A max = 130	A min = 60 A max = 120	A min = 60 A max = 120
	B	B min = 90 B max = 190	B min = 90 B max = 190	B min = 90 B max = 190	B min = 90 B max = 190	B min = 90 B max = 190	B min = 90 B max = 185	B min = 90 B max = 185	B min = 130 B max = 160	B min = 130 B max = 160
<b>Conductor size (mm<sup>2</sup>)</b>		70 - 120	25 - 120	25 - 150	70 - 120	25 - 150	70 - 120	70 - 120	25 - 300	25 - 300
<b>Length (mm)</b>		1,400	1,400	1,400	1,400	1,400	1020	1150	1,380	1,380
<b>Fixing method</b>		Integral clips	Integral clips with plastic screws	Plastic screws	Integral clips with plastic screws	Cable ties	Integral clips	Integral clips	Metal hose clamps	Metal hose clamps
<b>Material options</b>		Ray-chem Red / LDPE Black	Ray-chem Red / LDPE Black	Ray-chem Red / LDPE Black polyester clear	Ray-chem Red / LDPE Black	Ray-chem Red / LDPE Black	Ray-chem Red	Ray-chem Red	Ray-chem Red	Ray-chem Red
<b>Live installation</b>		Yes	No	Yes	Yes	No	Yes	Yes	No	No
<b>Pack sizes</b>		3 or 36	3 or 36	3 or 36	36	3 or 36	50	10	3 or 24	3 or 24

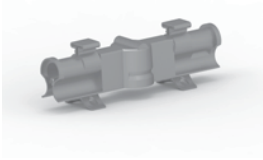
## Selection information

### Global

#### Dimensions in inches

Catalogue number	Application	Conductor Range	Cover Length	Insulator type/ANSI	STD. Pack
BCIC-G-PIN-556-01 (B6)	Porcelain PIN	#6-556	42	55-2, 55-3, 55-4, 55-5	6
BCIC-G-SMPIN-795-01 (B6)	Porcelain PIN	#6-795	42	55-2, 55-3, 55-4, 55-5	6
BCIC-G-PIN-795-01 (B6)	Porcelain PIN	#6-795	32	55-5, 55-6, 55-7, 56-1, 56-2, 56-3	6
BCIC-G-DPIN-795-01 (B6)	Double porcelain PIN	#6-795	41	55-5, 55-6, 55-7, 56-1, 56-2, 56-3	6
BCIC-G-DPIN-556-01 (B6)	Double porcelain PIN	#6-556	42	55-2, 55-3, 55-4, 55-5	6
BCIC-G-DSMPIN-795-01 (B6)	Double porcelain PIN	#6-795	42	55-5, 55-6, 55-7, 56-1, 56-2, 56-3	6
BCIC-G-HZ-795-01 (B6)	Horizontal post	#6-795	29	Polymeric	6
BCIC-G-HZPOR/3 5D-795-01 (B6)	Horizontal post	#6-795	29	Porcelain>35kV	6
BCIC-G-HZPOR/4 5D-795-01 (B6)	Horizontal post	#6-795	29	Porcelain 25 to 35kV	6
BCIC-G-PIN-556/55-01 (B6)	Line post	#6-556	55	Polymeric	6
BCIC-G-POR-228-795-01 (B6)	Line post	#6-795	55	Porcelain 7-9 inch diameter	6
BCIC-G-DE/CL-01 (B6)	Dead End	#6-795	27	Conductor	6

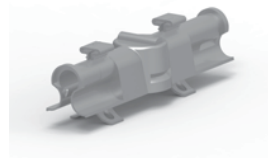
## New Birdcaps



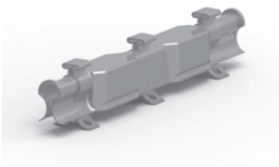
BCIC-GT-PIN (B6)



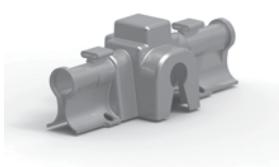
BCIC-GT-PIN/CT (B6)



BCIC-GT-PIN/XL (B6)



BCIC-GT-DPIN (B6)



BCIC-GT-HZ (B6)



BCAC-G-ARM-01 (B12)

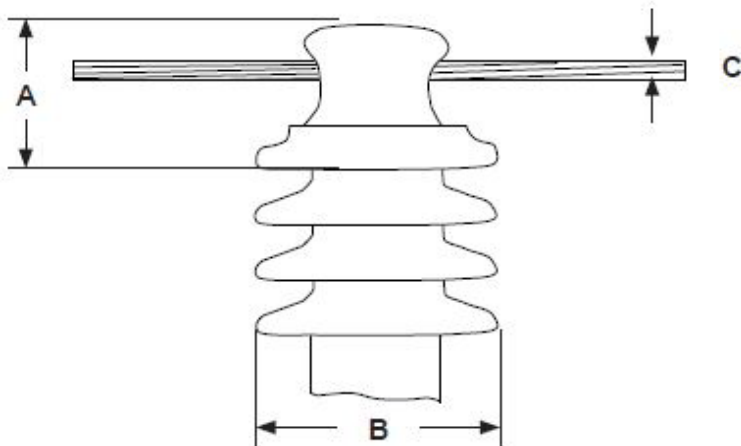
### Dimensions in inches

Catalogue number	Application	Conductor Range	Cover Length	Insulator type/ANSI	STD. Pack
BCIC-GT-PIN (B6)	Porcelain Pin, Post	#6-795	20	55-4, 55-5, 57-2	6
BCIC-GT-PIN/CT (B6)	Vise Top	#6-795	20	Vise Top, Hendrix	6
BCIC-GT-PIN-XL (B6)	Porcelain Pin	#6-795	21	56-1, 55-6, 55-7	6
BCIC-GT-DPIN (B6)	Porcelain Pin, Post	#6-795	30.5	55-4, 55-5, 57-2	6
BCIC-GT-HZ (B6)	Horizontal Post	#6-795	21	Polymeric	6
BCAC-G-ARM-01 (B12)	Extension	#6-795	31	-	12



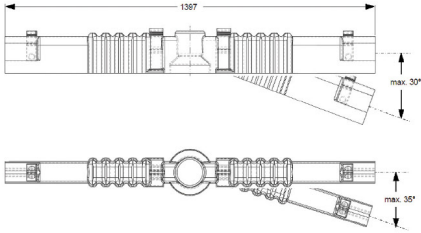
## Hints and Tips

- Check the size of the insulator and conductor before starting the installation.
- Accessories to use in installation should include non return clips, bolts and cable ties.
- Refer to kit label for each BCIC variant.
- For your information, "Typically the voltage class is rated at 36kV".
- Ensure that the cover does not interfere with the corona rings. These can be located on the outside, at the top and bottom of the insulator.
- Refer to the installation guide for specific installation steps.
- Before starting work, the five safety rules for operation and switching operations according to VDE 0101 must be observed.
- Check defective points and replace if necessary.
- Clean polluted insulators.
- When mounting the BCIC Birdcap Protection Cover on live lines, the regulations of the EVUs must be observed.

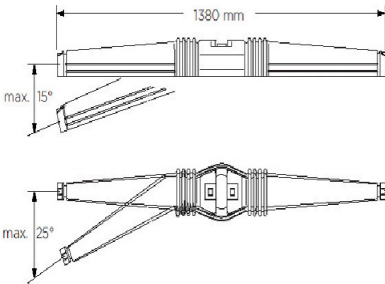


## Basic Shapes

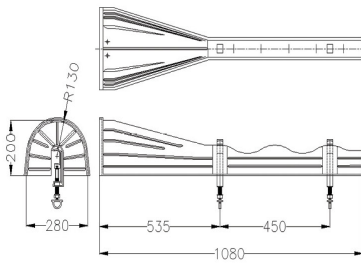
### BCIC-1215



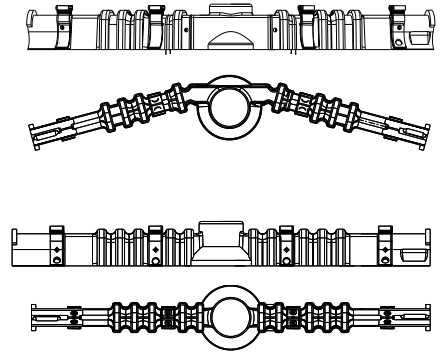
### BCIC-3313/14



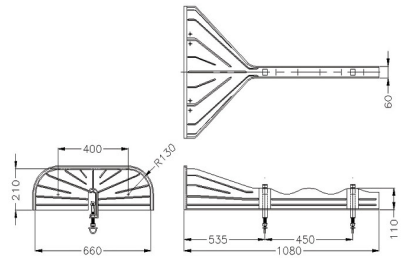
### BCIC-TEN-01



### BCIC-1215-005/006

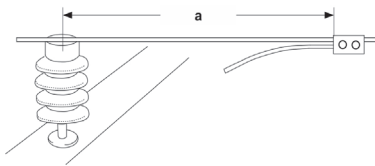


### BCIC-TEN-03

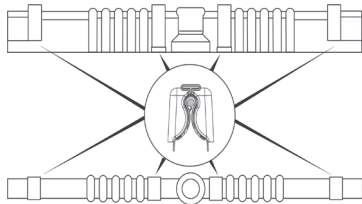


## Installation Guidelines

### BCIC-1215/16/18 with Integrated Clips

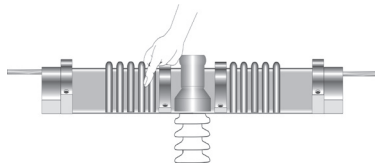


1. Check conductor cable and conductor cable fastening and if necessary change them so that they lie in the centre of the hood.



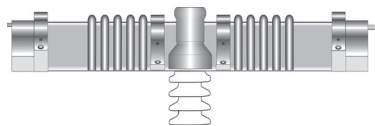
2. For attachment of the bird protection cover four integrated fixing clips are incorporated, two on each side of the support.

The cover is installed by pressing the four clips over the conductor cable. Each clip has an incorporated non-return arm which prevents them from being removed.



3. Position the bird protection cover over the centre of the support insulator. In the area of the respective fixing clips by applying vertical pressure from above, press them firmly with the palm of your hand on the conductor.

Start with the two inner fixing clips. Check that all four fixing clips are snapped over the conductor cable.

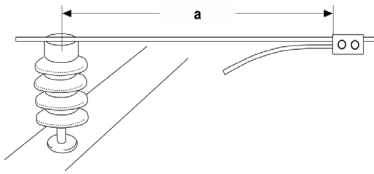


In the area of the fixing clips small holes are incorporated in order to additionally secure each with a fastening pin. Firmly press the fixing clip together at the lower end and insert the fastening pin from one side to the stop, so that the two legs of the clip are firmly closed.

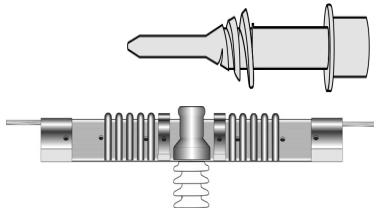
BCIC

**Installation is complete. EPP-3286**

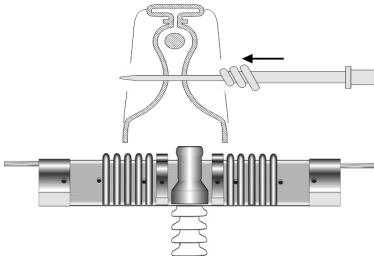
## Installation Guidelines BCIC-1217 with Fastening Screws



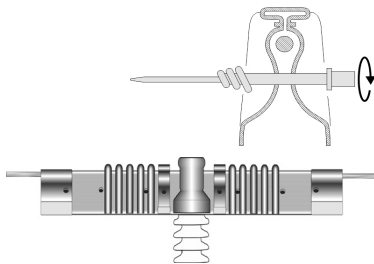
1. Check conductor cable fastening and if necessary change them so that they lie in the centre of the hood.



2. To fix the cover there are four holes on both sides, each with 10mm diameter. It is preferable to use four fastening screws.

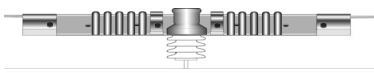


3. Only use the fastening screws enclosed. There are a total of four. Insert fastening screws (with the tip ahead) through the holes provided and ensure the tip of the screw is through the hole on the other side of the cover. The conductor must be enclosed.



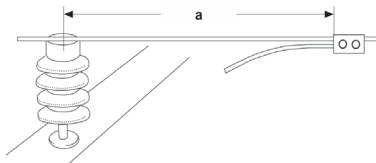
4. Insert screw and rotate clockwise applying slight pressure. Keep rotating until the full length of the thread is visible on the other side.

The cover can be removed if the fixing screws are cut middle and the screw halves are removed on both sides. The conductor rope must not be damaged.

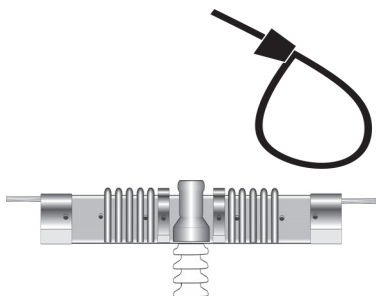


**Installation is complete. EPP-3286**

## Installation Guidelines BCIC-1217 with cable ties

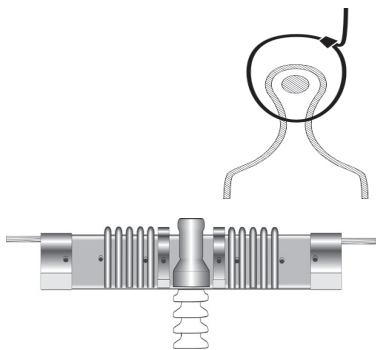


1. Check conductor cable and conductor cable fastening and if necessary change them so that they lie in the centre of the hood.



2. To affix the bird protection cover there are 4 holes, on both sides, each with a 10mm diameter incorporated into the cover. To secure the cover, preferably use holes A, C and D, fastened by means of six cable ties. Further securing at location B.

Only use the six cable ties supplied with the set during this installation.

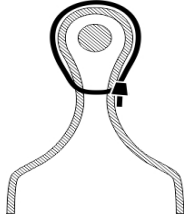


3. Position the bird protection cover in the middle above the support insulator and centre. Guide the cable tie (with the tip) through the holes provided and make sure the top of the cable tie is also through the opposite hole on the other side of the cover.

Insert the cable ties through itself over the cover. The conductor must be enclosed.

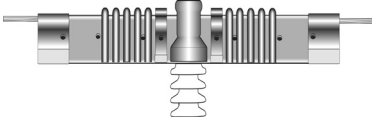
BCIC

## Installation Guidelines

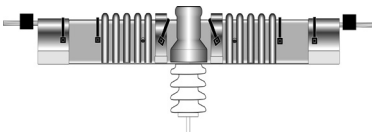


4. The cable ties for holes A must be positioned next to the center body, facing towards the post insulator.

Tighten cable ties and trim any excess length. There are cable tie locks next to the respective hole to secure them. Ensure the cover is firmly secured onto the conductor cable.



For disassembly, cut the cable ties, the conductor must not be damaged. When reassembling, use UV-resistant cable ties as supplied with this set (EPPA-024-5-350)



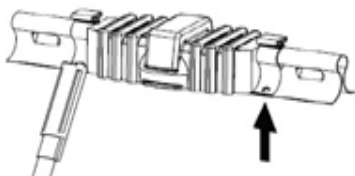
When reassembling, use UV-resistant cable ties as supplied with this set (EPPA-024-5-350).

**Installation is complete. EPP-3286**

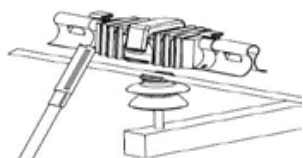
## Installation Guidelines

### BCIC-Raptor Covers

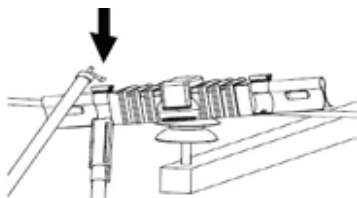
### BCIC-G-ARM



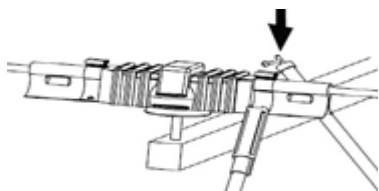
1. Secure BCIC cover to 'shotgun' type hotstick through one of four holes provided in the omega clip.



2. Drape the cover over the insulator and straddle the conductor.



3. Secure cover to conductor by taking a second hotstick and pushing down at the top of the clip. Disconnect hotstick.



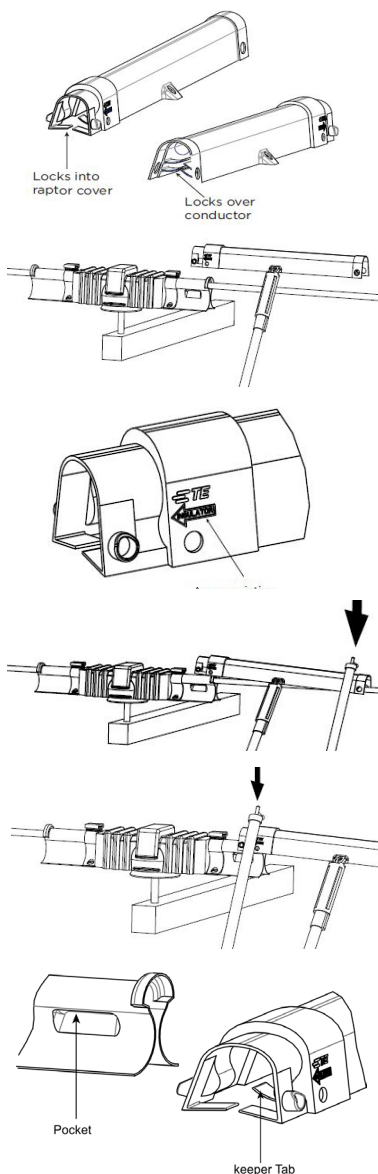
4. Secure hotstick to omega clip at opposite end of BCIC cover. Repeat step 3.



For extending the protection distance of the cover, use the BCAC-G-ARM.

BCIC

## Installation



The arm must be installed in the correct position to ensure a secure fit. One end of the arm snaps over the raptor cover, and the other end snaps over the conductor.

1. Secure hotstick in the tab in the middle of the BCAC-G-ARM.

Make sure the end of the arm with the insulator arrow is pointing towards the insulator.

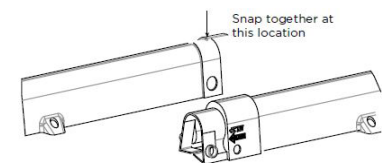
2. Using hotstick, press down on the end of the arm to snap onto the conductor.

3. Press down on the other end of the arm, to snap onto the raptor cover.

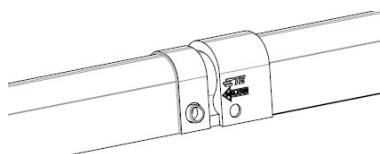
Make sure the “keeper” tab in clip sits into the pocket of the BCIC cover.



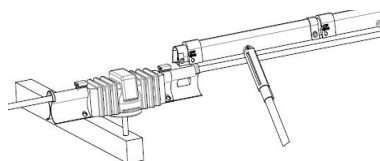
## Installation



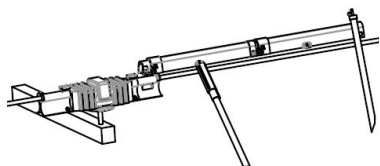
To increase the protection distance of the raptor cover, the arm can be doubled in length, by snapping two arms together.



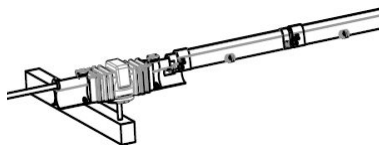
1. To assemble two arms together, press the arm end with holes down over the end with the circular boss.



2. Secure the hotstick in the tab closest to the insulator.



3. Using the hotstick, snap the arm down over the conductor in two places and also onto the raptor cover.



4. Repeat the process with two assembled arms on the other end of the raptor cover to complete the installation.

BCIC

**Installation is complete. EPP-3406**

## Material Test Data

Key Material Properties	Test Method	Results
<b>Accelerated Ageing</b>	ASTM D2671	150°C ( 302°C )
Tensile Strength	ASTM D412; ISO 37	10MPa min. 1450 psi min.
Ultimate Elongation		300% min.
<b>Thermal Endurance</b>	IEC 60216	105°C ( 220°F )
UV weathering Resistance (5000 hours)	ASTM G154	5MPa min; 725 psi min 200% min
Tracking and Erosion Resistance	ASTM D2303; IEC 60587	No tracking or erosion to top surface or flame. Stop voltage Method failure after 1hr . at 2.5kV 1hr . at 2.75 kV 1hr . at 3.0 kV 1hr . at 3.25 kV 1hr . at 3.5kV
Dielectric strength	ASTM D 149	130kV/cm ( 330V/mil ) min (2.5 mm)

<b>BCIC Bird Cap Protection and Raptor Covers</b>	
<b>Technical report references</b>	
PPR-3326	Material Test Report
PPR-2611	Product Test Report
PPR-3290	Product Test Report
EDR-5369	Product Test Report

<b>BCIC</b>	
<b>Installation Instructions</b>	
EPP-3286-1/19	Bird Cap Protection Covers installation instructions
EPP-3406-7/19	Raptor Cover and BCIC-G-ARM installation instructions

## Frequently Asked Questions Bird Protection Caps

**Q: Can it be installed live?**

**A:** Yes, however this is dependent on the design. Please refer to the selection table for each variants live installation.

**Q: Does it de-rate my overhead line after installation?**

**A:** No it does not.

**Q: Can these be used on side tie and centre tie applications?**

**A:** Yes, suitable for either.

**Q: How many phases needed to be insulated for a complete installation?**

**A:** All three phases need to be insulated.

**Q: Is 36kV the maximum voltage level?**

**A:** No, it can be used at higher voltages as long as the geometry and all three phases are insulated.

**Q: Can the product withstand high winds?**

**A:** Yes. Extensive wind testing has been completed on various fixing methods.

**Q: Is the product resistant to guano?**

**A:** Yes.

**Q: Is bird claw damage a problem for this product?**

**A:** No. The product is tear resistant and cross linked, preventing damage from birds.

**Q: Are all products REACH and RoHS****compliant?**

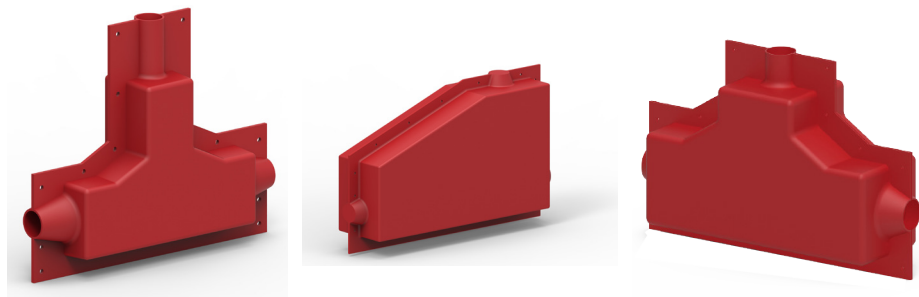
**A:** Yes, all of the BCIC models covered in this product handbook are REACH and RoHS compliant.

**Product Information:** <https://www.te.com/usa-en/utilities/product-compliance/safety-data-sheets.html>

**Product Compliance:** <https://www.te.com/usa-en/product-CAT-BCIC-RAPC.html?q=BCIC&source=header>

**Product Compliance:** <https://www.te.com/usa-en/product-CB1215-000.html?q=BCIC&source=header>

## Dead End And Suspension Clamp Covers (BCIC)



### Description

TE Connectivity's (TE) Raychem BCIC covers for Dead End connection points and Suspension Clamps protect energised lines from perching, landing and nesting birds.

When used together with an overhead line cover they combine to make an effective insulation enhancement system against accidental phase-phase or phase-ground bridging.

They use the same high performance material as the bird caps and substation BCIC's and are suitable for MV poles and HV towers.

### Key Features

- Cold applied
- UV stable, tracking and erosion resistant
- Cross linked to create an extremely robust insulation system, ensuring long reliable operations
- 30+ years of field proven experience
- Installed with MVLC for a complete installation enhancement system
- Available in red and grey
- REACH and RoHS compliant

<p><b>BCIC-9/10-3/L</b></p>		
<p><b>BCIC-10/13.5-L</b></p>		
<p><b>BCIC-4.75/11-3</b></p>		
<p><b>BCIC-7/20-4</b></p>		
<p><b>BCIC-H3-2-7</b></p>		

## Hints and Tips

- Check the size of the insulator and conductor before starting the installation.
- Installation accessories may include; non return clips, bolts or cable ties.
- Refer to kit label for each BCIC variant.
- Typically the voltage class is rated at 36kV.
- Ensure that the cover does not interfere with corona rings or arcing horns. These can be located on the outside, at the top and bottom of the insulator.
- Refer to the installation guide for specific installation steps.
- BCIC Dead end and Suspension clamp covers can be easily field trimmed to allow for additional conductor exits
- When using BCIC covers at voltages >36kV please consult a TE representative for advice
- When insulating a connection

## Material Test Data

Material Testing		
Key Material Properties	Test Method	Results
Tensile Strength	ASTM D412; ISO 37	10MPa min. 1450 psi min.
Ultimate Elongation	ASTM D412; ISO 37	300% min.
Thermal endurance	IEC 60216	105°C ( 220°F )
UV weathering Resistance (5000 hours)	ASTM G154	5MPa min; 725 psi min 200% min
Accelerated Ageing (168 hrs at 150°C)	ASTM D2671	10MPa min; 1450 psi min 300% min
Tracking and Erosion Resistance	ASTM D2303; IEC 60587	No tracking or erosion to top surface or flame. Stop voltage Method failure after 1hr . at 2.5kV 1hr . at 2.75 kV 1hr . at 3.0 kV 1hr . at 3.25 kV 1hr . at 3.5kV
<b>Dielectric strength</b>	ASTM D 149	130kV/cm ( 330V/mil ) min (2.5 mm)

### BCIC Bushing Connection Insulating Covers BCIC Dead End and Suspension Clamp Covers Technical Report References

PPR-3326	Material Test Report
PPR-3230	Product Test Report
EDR-5594	Product Test Report

### BCIC Installation Instructions

EPP-3408-7/19	BCIC Deadend and Suspension clamp Cover Installation Instructions
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BCIC

## Frequently Asked Questions Dead End Covers

**Q: Does it de-rate my overhead line after installation?**

**A:** No it does not.

**Q: How many phases needed to be insulated for a complete installation?**

**A:** All three phases need to be insulated.

**Q: Is the product resistant to guano?**

**A:** Yes.

**Q: Is bird claw damage a problem for this product?**

**A:** No, it is not. Cross linked properties are tear resistant against damage from birds.

**Q: Is 36kV the maximum voltage level?**

**A:** No, it can be used at higher voltages as long as the geometry and all three phases are insulated.

**Q: Are all products REACH and RoHS Compliant?**

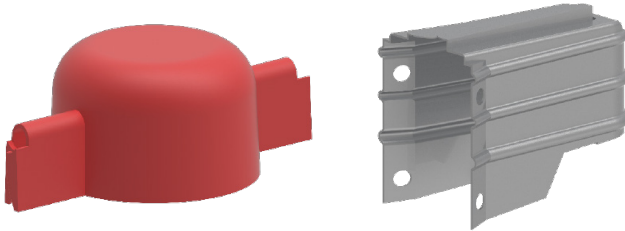
**A:** Yes, all of the BCIC models covered in this product handbook are REACH and RoHS compliant.

**Product Information:** <https://www.te.com/usa-en/utilities/product-compliance/safety-data-sheets.html>

**Product Compliance:** <https://www.te.com/usa-en/product-CV5597-000.html?q=BCIC&source=header#guest-click>



## Fuse Cutouts and Surge Arresters (BCAC)



### Description

TE Connectivity's (TE) Raychem BCAC Fuse Cutouts and Surge Arresters are designed to prevent bird caused outages on distribution equipment ranging from 15kV to 36kV.

Distribution covers are available for terminations, reclosures, lightning arresters and fuse cutouts.

These are suitable for a range of extreme outdoor environments. Years of testing and development have led to a durable manufactured material that ensures these covers meet standards requirements and are able to withstand a range of harsh weather conditions over long periods of time.

### Key Features

- UV stable, tracking and erosion resistant
- Cross-linked to create an extremely robust insulation system ensuring long reliable operation
- Field trimmable and customisable
- 30+ years of field proven experience with high voltage products in harsh environments
- Available in red and grey
- Multi applications on distribution and transmission networks
- Fast and versatile installation
- REACH and RoHS compliant

## Selection Information

### EMEA

Catalogue number	Hardware
BCAC-5D/8-01 (B12)	Transformer Bushing
BCAC-7D-10 (B12)	Transformer Bushing
BCAC-8D/14 (B12)	Transformer Bushing
BCAC-AR-5D-2 (B24)	Ohio Brass Arrester
BCAC-AR-4D-2 (B24)	TE Arrester
BCAC-AR-3.75D-2 (B24)	Copper Arrester
BCAC-G-CUTOUT-100-01 (B12)	Fuse Cutout Switch (100 AMP) Porcelain Style
BCAC-G-CUTOUT-200 (B3)	Fuse Cutout Switch (200 AMP) Porcelain Style
BCAC-G-CUTOUT-100-P2 (B12)	Fuse Cutout Switch (100 AMP) Polymeric Style
BCAC-G-CUTOUT-FT (B3)	Fuse Cutout Switch (200 AMP) Porcelain Style
BCAC-G-CUTOUT-FT-P (B3)	Fuse Cutout Switch (200 AMP) Polymeric Style

Selection Information: dimensions in inches (millimeters)

BCIC Fuse Cutouts and Surge Arresters Technical Report References	
EDR-5573	BCAC-CUTOUT Electrical Evaluation
EDR-5571	BCAC-AR Electrical Evaluation



## Frequently Asked Questions Fuse Cutouts and Surge arresters

### Surge arresters

**Q: What is the voltage protection rating?**

**A:** It is rated at 15kV.

**Q: Is tooling required for installation?**

**A:** There is no tooling required for installation of surge arresters.

**Q: Why does the arrester fit tightly around the first shed?**

**A:** This is to prevent bugs from getting under the cap and causing problems.

**Q: Are all products REACH and RoHS Compliant?**

**A:** Yes surge arresters are REACH and RoHS compliant

**Product Information:** <https://www.te.com/usa-en/utilities/product-compliance/safety-data-sheets.html>

### Fuse cutouts

**Q: Are there any versions for fault Tamer Fuses?**

**A:** Yes, BCAC-G-Cutout-FT.

**Q: Will these covers work with a load-breaker tool?**

**A:** Fuse cutout covers do work with this tool.

**Q: Are these covers placed on the bottom of the cutout too?**

**A:** No. Doing this will create a nesting area and will interfere with the fuse hinge.

**Q: Are these hot-stickable?**

**A:** Yes they are.

**Q: Are all products REACH and RoHS Compliant?**

**A:** Yes fuse cutout covers are REACH and RoHS compliant.

**Product Information:** <https://www.te.com/usa-en/utilities/product-compliance/safety-data-sheets.html>

**Product Compliance:** <https://www.te.com/usa-en/product-878742-000.html?q=Fuse%2Bcutout&source=header#guest-click>

BCIC



## Avian Flight Diverter (AFD)

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### Description

TE Connectivity's (TE) Raychem Avian Flight Diverter is designed to increase the visibility of medium voltage distribution power lines, for birds, to prevent collisions.

The AFD is inference free for use up to 69kV, incorporates a high visibility reflective and a luminescent strip for enhancing visibility in low light and foggy conditions. AFD is easily installed with a shearbolt fixing that controls the clamping force required to hold the product in position on the conductor.

Easily seen from a long distance, large birds, such as geese and swans will have enough time to change their direction and avoid potentially fatal consequences.

### Key Features

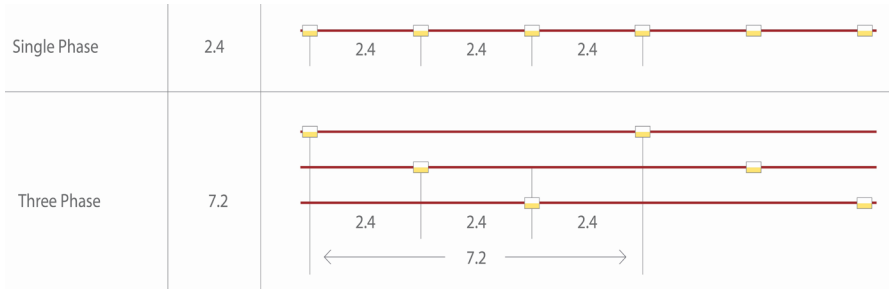
- Hot stickable, easy to install
- UV stable and tracking resistant
- Fits conductor diameters from 4-22 mm (#6-795)
- High reflectivity and visibility, day and night
- Glow strip for dusk
- Removable after installation
- REACH and RoHS Compliant

## AFD Product Selection Information: Dimensions In Millimetres (inches)

Catalogue Number	Description	Dimensions Width x Height	Conductor size (mm)	Std. Pack
CU7208-000	BCIC-AFD-01 (B10)	102 - 89 (4 x 3.5)	4 -22 (#6 - 795)	10

## AFD Overhead Line Spacing, Meters

Please see below the spacing guide of AFD's for a single and up to three phase application.

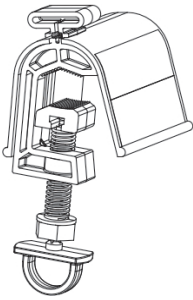


## Hints and Tips

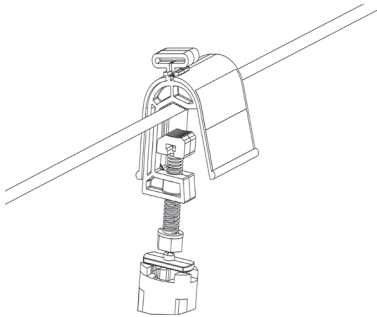
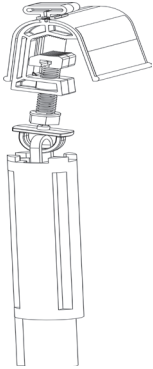
- Make sure the AFD is seated in the correct position, dependent on the information stated in the installation instructions
- Maximum span for smaller species is 2.4m ( 7.9ft ), including corbids and ducks. The maximum span is 10m ( 33ft ) for larger species such as swans and geese.
- AFD's can be pre-loaded at one end of the overhead line then slid into position before the final installation.
- Ensure the eyelet is only used for installation and the hex bolt head for removal only.



## Installation AFD



1. Attach shotgun type hot stick to AFD using bolt eyelet.

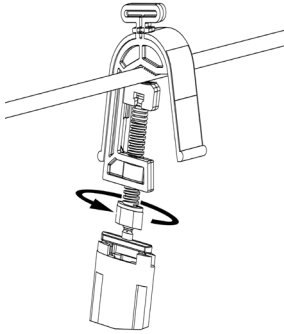


2. Place the AFD over the conductor at the desired location.

Ensure that the conductor is seated properly in the clamp before tightening the shear bolt. The conductor should be seated between the platform and the top inside of the clamp as shown.

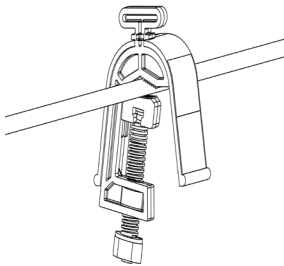
AFD

## Installation



**3.** Tighten the clamp onto the conductor by turning the shear bolt with the hotstick until the bolt head shears.

If the cover needs to be removed after shearing the bolt, the nut can be loosened with a wrench suitable for a 15/16" nut.



**4.** The installation is complete.

**Installation is complete. EPP-3360**

## Technical Data Sheet/Material Information

Key Material Properties	Test Method	Results
<b>Accelerated Ageing</b>	ASTM D2671	168hrs @ 150°C ( 302°F )
Tensile Strength		17MPa ( 2450psi)
Ultimate Elongation		200%
<b>Thermal Endurance</b>	IEC 60216	
Thermal Index (20,000 hours)		115°C ( 240°F )
Continuous Operating Temperature (30 years)		100°C ( 210°F )
<b>Accelerated Weathering</b>	ASTM G154	
Ultimate Elongation		100% @ 1000 hours UVA
<b>Inclined Tracking Test (TERT)</b>	ASTM D2303; IEC 60587	No tracking or erosion
		1hr @ 2.5kV
		1hr @ 2.75kV
		1hr @ 3.00kV
		20 mins @ 3.25kV

### AFD

#### Technical Report references

EDR-5536 Rev. A	AFD Mechanical Analysis of Clamping Device used in AFD's and Dead End Covers
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### AFD

#### Installation Instructions

EPP-3360-5/19	Avian Flight Diverter installation instructions
---------------	---

AFD

## Frequently Asked Questions AFD

**Q: Can AFD's be installed live?**

**A:** Yes, AFD's can be installed live with the use of a shotgun hot stick tool.

**Q: What voltage are AFD rated for?**

**A:** There are no radio frequency Interference issues to 69kV.

**Q: How do I know the clamp is tightened correctly?**

**A:** The clamp has a shearbolt feature that snaps off when the proper torque is achieved.

**Q: What is the suggested spacing?**

**A:** On a typical distribution line the Avian Flight Diverters are set in a staggered pattern across the three phases, spaced 2.4m to 10m (32ft.) apart.

**Q: How many AFD's do I install per span?**

**A:** On a typical three phase span, TE recommends using 10 AFD's staggered on the phases.

**Q: How long will the glow sticker last?**

**A:** Around 10-12 hours per day. Depending on the amount of sunlight it receives.

**Q: Can it be removed?**

**A:** Yes, easily. After the shearbolt ring is snapped off, a 15/16" nut remains that can be unscrewed with a socket.

**Q: Are all products REACH and RoHS****compliant?**

**A:** Yes, all of the AFD models covered in this product handbook are REACH and RoHS compliant.

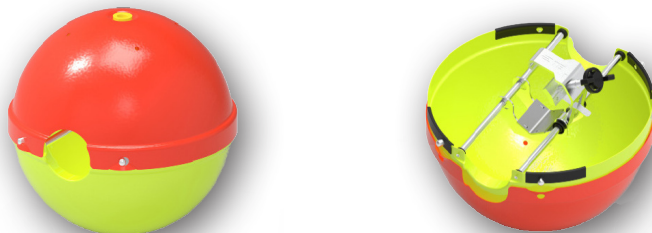
**Product Information:** <https://www.te.com/usa-en/utilities/product-compliance/safety-data-sheets.html>

**Product Compliance:** <https://www.te.com/usa-en/product-CAT-BCIC-AFD.html?q=AFD&source=header>



## Avisphere Universal Bird Warning Sphere

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### Description

TE Connectivity's (TE) Raychem Avisphere universal bird warning sphere is a bi-colour, photo-luminescent bird deterrent. Applied to overhead lines of 500kV and above, these luminescent deterrents prevent the risk of bird strikes day and night, helping to protect the biodiversity around the EHV network.

Made of two aluminium alloy half spheres with a diameter of 250mm(9.8"), the Avisphere can be installed very quickly by one operator and can withstand extreme outdoor weather conditions.

### Key Features

- De-energized, bolted design
- Operates at 500kV and above
- One generic size to fit HV transmission lines
- Quick and tool free installation
- Visible in low-light conditions and at night
- Suitable for high temperature conditions
- REACH and RoHS Compliant

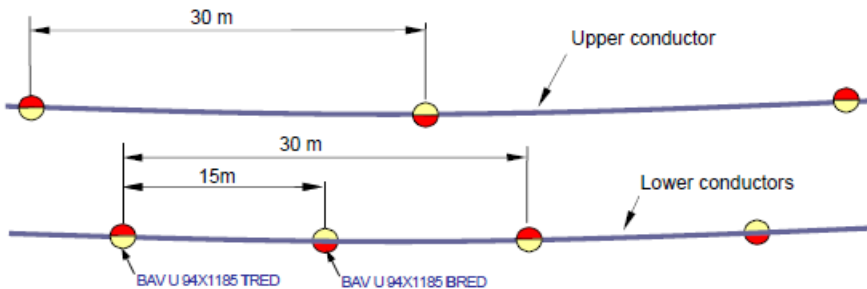
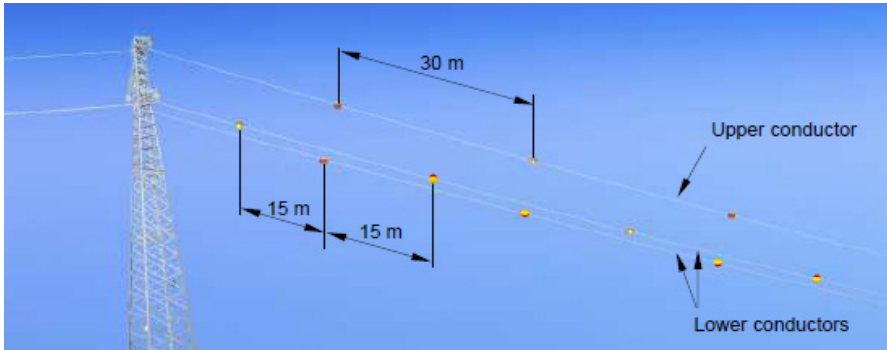
## Product Dimensions

Designation	TCPN	Cable Selection (mm <sup>2</sup> )	Dimensions (mm)		Colour of spheres		Weight (g)	Primary Package (parts)
			D	S	Upper	Lower		
BAV U 94X1185 TRED	2223036-1	94 - 1185	12.6 - 44.7	250	RED	*YELLOW	700	5
BAV U 94X1185 TYEL	2223036-2	94 - 1185	12.6 - 44.7	250	*YELLOW	RED	700	5

## Avisphere span arrangement

It is recommended alternating the Avispheres colors along the span in order to draw visual attention of the line to the birds

It is recommended leaving 15m (49 ft.) minimum distance 30m (98 ft.) distance per conductor bundle) through the set of conductor's phases which are positioned in the same horizontal plane.

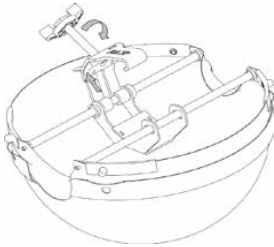


## Hints and Tips

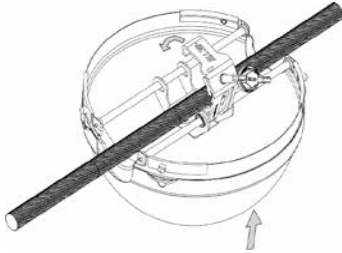
- Clean and degrease all parts that will come into contact with adhesive.
- If a solvent is used, follow the manufacturers handling instructions.
- Check core preparation dimensions before installing the products.
- Grease the jointing area only with the provided grease.
- Check cable ends for ingress of moisture before starting with cable preparation.
- For easy strip screen layers, always use a round file to cut radially through the core screen.



## Installation Avisphere

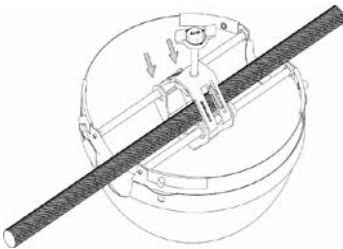


**1.** Unscrew the bolt in order to move-up the pad until its highest position as shown on the installation image.

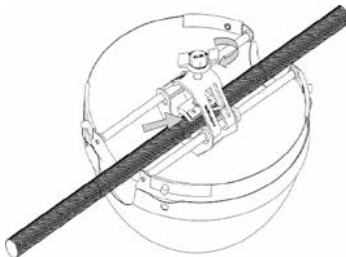


**2.** Put the avisphere in place on the bottom side of the conductor.

Keep applying a pressure from bottom during rotation of the clamp above conductor.

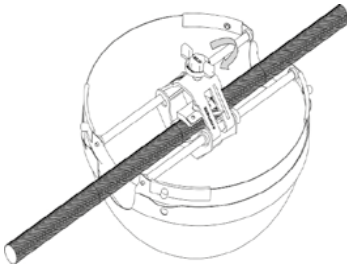


**3.** Lock the clamp by applying simultaneously pressure hard with two hands on the round bare and the rear part of the clamp.

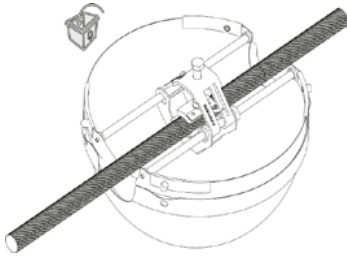


**4.** After locking the clamp, screw the bolt in order to put the pad into contact with the conductor.

## Installation

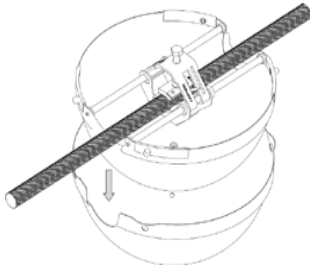


- 5.** Tight the bolt manually until breaking the shear. TE advise not to use any tools to tighten the bolt.



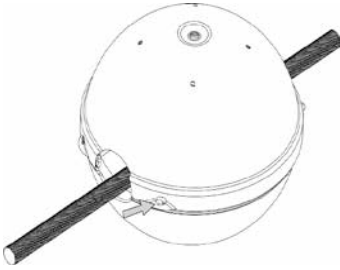
- 6.** As soon as the shear head is broken please make sure to recycle the plastic ring.

The shear head is a 100% recyclable material.



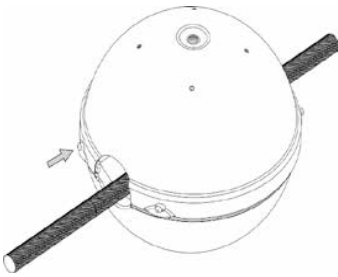
- 7.** Remove the upper half sphere from the lower one.

## Installation

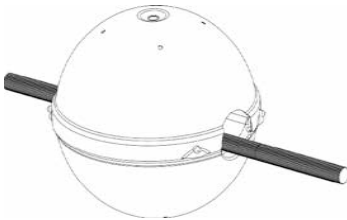


**8.** Adjust the upper half sphere on the lower one by making sure the four rubber straps are all enclosed inside the joint.

Lock the first hole in the pin.



**9.** Lock on the second pin at the opposite side of the first one.



**10.** Proceed accordingly to steps 8 and 9 for locking on the third and fourth pins.

The installation of Avisphere Universal Bird Warning Sphere, is now complete.

## Frequently Asked Questions Avisphere

**Q: Can the Avisphere be used as a warning for planes?**

**A:** No. Aviation regulation in Europe and US have different requirements, especially on the size of the spheres which must be a minimum of 600mm (23") diameter. Avispheres are 250mm(9.8") diameter.

**Q: Can the Avisphere be installed on any conductor at any voltage?**

**A:** Yes. Avisphere is a universal product with a wide conductor range and it is an all metal product which enables the Avisphere to work at any voltage level.

**Q: How can customers test the efficiency of the Avisphere on the transmission grid?**

**A:** Customers need to identify critical areas for bird protection in agreement with local bird associations. Actual area varies but for effective coverage, real life protection could be a few kilometers (3KMS mini).

**Q: Is photo luminescent paint lightening all night?**

**A:** Avisphere will start being visible at dusk when migratory birds are most active. The density

of the light will slowly decrease though the night but remain visible to birds until sunrise.

**Q: Why do we need 2 Part Numbers (red/yellow & yellow/red)?**

**A:** Ornithologists agree that birds' visual acumen is primarily inked to color contrast rather than color only, therefore, alternating the bi-colored spheres ensures birds detect the spheres from any direction.

**Q: Who determines the proper arrangement and placement of the spheres?**

**A:** Arrangement and position of the Avisphere is determined by the Utility who knows the acceptable working load conditions, although, guidelines are part of the installation manuals.

**Q: Can AVISPHERE be installed on live lines?**

**A:** Yes. The product has been designed in order to be installed by one operator. No loose parts.

**Q: Is there any special tool required to install the products?**

**A:** No tool are required to install AVISPHERE as it is clamped on the conductor by a manual shear head.

**Q: Are the used materials fit for working in harsh conditions?**

**A:** Yes and especially in icing and snow bonding conditions. AVISPHERE is also designed to work at high temperature (i.e.: composite & low sag conductors operating above 200°C (392°F)

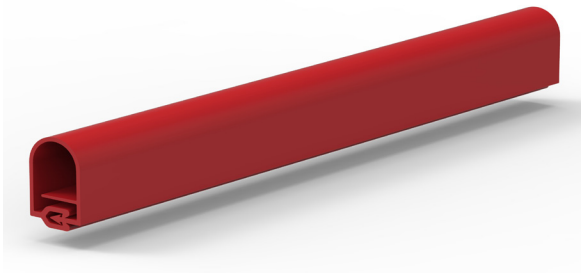
**Q: Are all products REACH and RoHS compliant?**

**A:** Yes, all of the Avisphere models covered in this product handbook are REACH and RoHS compliant. Please contact your local TE representative for more information.



## Medium Voltage Line Cover (MVLC)

---



### Description

TE Connectivity's (TE) Raychem MVLC is a retrofit cover that insulates overhead lines against flashovers caused by birds, intermittent tree contact and clashing conductors. Installation is made from one position, even with an energised line, by driving it along the conductor by hand for up to 20m (65 ft.), or by an automated tool for longer distances.

TE has designed a special tool that ensures fast and reliable application of the MVLC on the energised lines. It attaches directly to the overhead conductor and remains stationary in a single location on each span. The tool may be manually and automatically operated, using a hand crank or with the aid of a gasoline powered drill. The tool forms, closes and feeds the MVLC along the conductor with speed and consistency.

### Key Features

- Three sizes cover conductors from 0-38mm (16- 800 mm<sup>2</sup>)
- Voltages of 15kV without mastic and 25/36kV with mastic
- 30+ years of field proven experience with high voltage products in harsh environments
- UV stable, tracking and erosion resistant
- Cross-linked to create an extremely robust insulation system ensuring long reliable operation in harsh environments.
- REACH and RoHS Compliant.

## MVLC Product Selection

Voltage Class (kV)	Product	Pack Size
	Part Description	Quantity m (ft.)
15	MVLC-14-A/U (100)	100 (328)
25	MVLC-14-A/241-C (100)	100 (328)
15	MVLC-18-A/U-C (75)	75 (246)
25	MVLC-18-A/241-C (75)	75 (246)
15	MVLC-38R-A/U-C (50)	50 (164)
25	MVLC-38R-A/241-C (50)	50 (164)


## MVLC Weight Table

Product Size	Conductor Diameter Range mm (Inches)	Supplied Length m (Feet)	Weight kg (lb)
MVLC-14	Up to 12.7mm (0.5")	100m (109ft.)	0.28kg (0.62)
MVLC-18	Up to 18mm (0.75")	75m (82ft.)	0.38kg (0.84)
MVLC-38R	Up to 38mm (1.5")	50m (55ft.)	0.50kg (1.10)

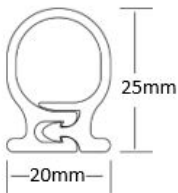
## MVLC Tooling Table

MVLC	Hand Tool	Automatic Tool
	Part description	Part description
-14	MVLC-HAND-TOOL-14	MVLC-14-TOOL-100
-18	MVLC-HAND-TOOL-02	MVLC-TOOL-03-2006
-38R	MVLC-38R-HANDTOOL	MVLC-38R-OHTOOL

## MVLC Cold Applied Busbar Insulation Selection

				
	Single Busbar (mm)	Double Busbar (mm)		Round busbar (diameter mm)
1 x MVLC-14	-	-	-	10
1 x MVLC-14	-	-	-	14
1 x MVLC-18	-	-	-	18
1 x MVLC-38R	-	-	-	25
1 x MVLC-38R	-	-	-	38
2 x MVLC-18	60 x 10	-	-	45
2 x MVLC-38R	80 x 10	2 x (60 x 10)	60 x 30	50
2 x MVLC-38R	100 x 10	2 x (80 x 10)	80 x 30	60
2 x MVLC-38R	120 x 10	2 x (100 x 10)	100 x 30	75
1 x MVLC-18 2 x MVLC-38R	-	2 x (120 x 10)	120 x 30	100

### Busbar shape applications



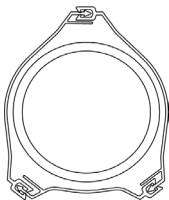
MVLC-14



MVLC-18



MVLC-38R



Busbar applications mm (Inches)	
50.8mm (2")	use 1-MVLC-38R and 1-MVLC-18
63.5mm (2.5") L	use 2-MVLC-38R
76.2mm (3")	use 2-MVLC-38R
101.6mm (4")	use 2-MVLC-38R and 1-MVLC-18



## Technical Data Sheet/Material Information

Material Testing		
Key Material Properties	Test Method	Results
Tensile Strength	ASTM D412; ISO 37	8 MPa min. 1150 psi min.
Ultimate Elongation		200% min.
Abrasion Resistance	1000 Cycles, 2068g	20% max. Thickness loss
Low temperature impact	ASTM D746	No cracking at -20°C
Dielectric Strength	ASTM D149	217 kV/cm at 1.27 mm 550 V/mil min at 0.050"
Tracking and Erosion Resistance	ASTM D2303 Step Voltage Method (initiate at 2.5kV)	No tracking or erosion to top surface or flame. Failure after: 200 minutes
Product Testing		
AC Dry Withstand / 1 min	15 kV min / 25 kV min	
AC Withstand / 1 min	15 kV min / 25 kV min	
AC Dry Long Term Withstand 4 hrs	8.6 kV min / 14.4 kV min	
30 day Terminal loading (8hrs at 130°C ( 260°F ); 16hrs off)	No MVLC Deformation	
Conductor Ampacity	82 - 89% of Bare Conductor Ampacity	

## Product Selection

Description	Conductor size up to mm <sup>2</sup>	Conductor Diameter up to mm (inch)	Voltage class kV	m (ft) spool length*
<b>MVLC-14-A/U</b>	99 mm <sup>2</sup> (#6-3/0 kcmil)	12.7 mm (0.5")	15 kV	100 (300)
<b>MVLC-14-A/241</b>	99 mm <sup>2</sup> (#6-3/0 kcmil)	12.7 mm (0.5")	25kV	100 (300)
<b>MVLC-18-A/U</b>	185 mm <sup>2</sup> (#2-397 kcmil)	18 mm (0.75")	15kV	75 (247)
<b>MVLC-18-A/241</b>	185 mm <sup>2</sup> (#2-397 kcmil)	18 mm (0.75")	25kV	75 (247)
<b>MVLC-38R-A/U</b>	800 mm <sup>2</sup> (477-1590 kcmil)	38 mm (1.5")	15kV	50 (165)
<b>MVLC-38R-A/241</b>	800 mm <sup>2</sup> (477-1590 kcmil)	38 mm (1.5")	25kV	50 (165)

MVLC Technical Report references	
EDR-5308	Medium Voltage Line Covers MVLC Product Test Report
EDR-5309	Medium Voltage Line Cover MVLC Material Test Report
EDR-5316	Medium Voltage Line Covers MVLC Extreme Cold Test Report

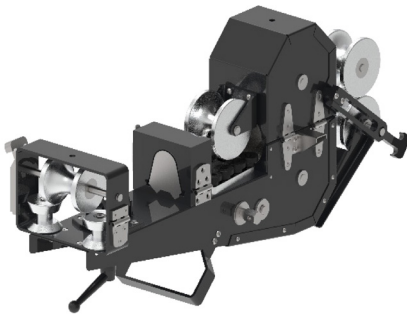
## Hints and Tips

### MVLC On Overhead Lines

### Long Span

- Check to ensure that the kit you are going to use fits the overhead line diameter.
- Refer to the kit label and the title of the installation instructions. Different instructions for each size. MVLC-14, 18 and 38R.
- Components or working steps may have been modified since you last installed this product.
- Carefully read and follow the steps in the installation Instructions.
- Select the correct tool for overhead line installation. For this application a machine tool will be necessary.
- Voltage class of MVLC; A/U is rated 15kV and -A/241 is rated 24kV. A rating of 36kV is all three phases are insulated.
- Check conductor diameters before installing the product.
- Check with/without mastic for correct voltage class.

### MVLC Machine Tool

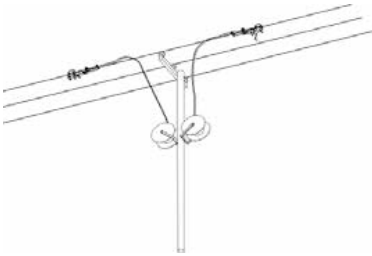


## Installation

### Key points for all sizes

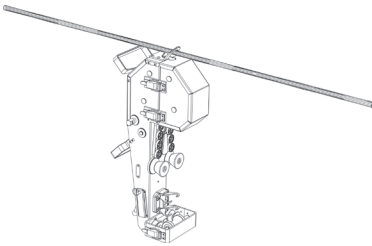
### MVLC-14, 18, 38R

MVLC - Installation Instructions	
EPP-3238-11/18	MVLC-14 Installation Instructions.
EPP-3152-11/18	MVLC-18 Installation Instructions
EPP-3348-4/19	MVLC-38R Installation Instructions
EPP-3348-4/19	MVLC Hand Tool Installation Instructions



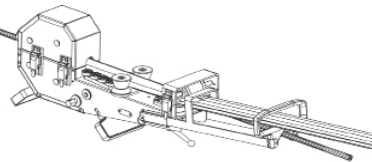
#### 1. Position spool of MVLC

Secure MVLC spool to the pole, to the bucket, or from the ground depending on the safe work practice of your company. Position the spool to insure the MVLC will feed correctly into the MVLC installation tool without sharp bends.



#### 2. Attach tool to conductor

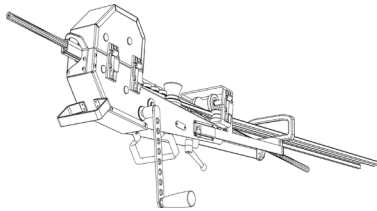
Open the conductor clamp, and hang the installation tool on the conductor by the mounting hook



#### 3. Close and latch the guide roller frame

Close and latch the guide roller frame. Shove the MVLC-14 extrusion through the funnel and closing rollers and into the drive rollers until you see the drive shaft turn.

## Installation



### 4. Start manual installation

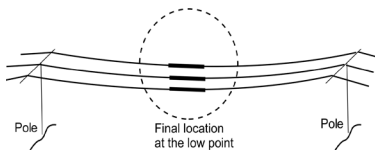
Keep hands and other objects away from openings and rollers to avoid pinching.

Hand crank a few turns until the MVLC exits the MVLC tool. Check to see that the MVLC is properly closed and positioned on the conductor as shown (10a).

If the MVLC is not properly closed, cut at the feed guide and hand crank forward to remove the short length. Do not try and “back out” the MVLC, as it will damage the tool. Start a new piece of MVLC.

Replace the hand crank with a motorized drill that is approved for use by your company.

### 5. Install drainage point

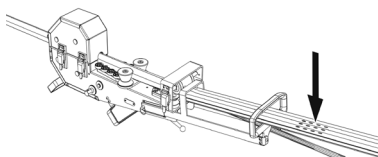


It is necessary to install a drainage point to allow water to escape freely from inside the MVLC. It is best to provide this drain point at the lowest point of the span. This point will be in the centre of the span on level ground but will vary when installed in areas with elevation changes.

Options exist. See choice 1 or 2 below.

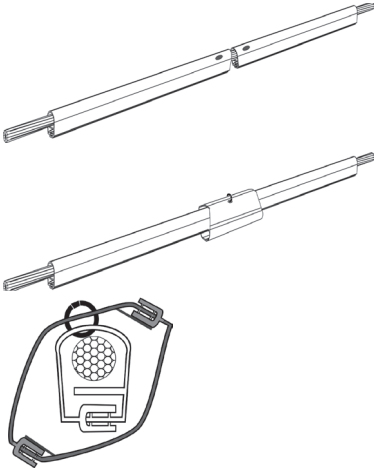
### 6. Option 1

#### Electrical performance NOT required at drainage points.



Using the punch provided in the MVLC tool case, punch a series of drainage points into the flat section of MVLC before it enters the tool (as shown).

## Installation

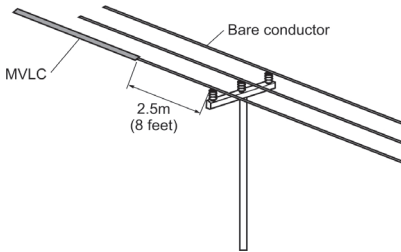


### 7. Option 2

#### Electrical performance required at drainage points

Electrical performance NOT required at drainage point.

Cut the MVLC and start new piece. Punch 2 holes and connect the 2 pieces together. Cover this areas with 2 pieces of MVLC cut to 200mm (8"). With a hole punched in the 2 MVLC pieces, place a cable tie through the cover and one of the holes made before.



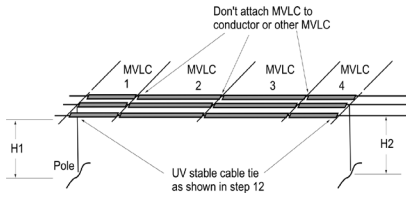
### 8. Final positioning

If it is possible for lightening to strike the line, the MVLC must not cover the entire span from insulator to insulator. To eliminate lightening from causing a problem one of two solutions is available.

Option 1: Provide 2.5 meters (8ft) of bare conductor at each insulator as shown.

Option 2: Install current limiting arcing horns as supplied by others at each insulator.

## Installation



### 9. Additional MVLC considerations

Splicing two rolls  
(See Step 11B, Option 2 for details.)

Covering connectors  
(See Step 11B, Option 2 for details.)

Dropped conductor  
(With relative lengths as shown).

MVLC 1 =  $H1 - 2$  meters (7 ft)

MVLC 2 = Approx = MVLC 3

MVLC 4 =  $H2 - 2$  meters (7 ft)

**MVLC-14, 18 & 38R installation complete.**

## Frequently Asked Questions Overhead lines - Long span

**Q: Does the complete span need to be insulated?**

**A:** No, a space at each end should be left open. This will allow any induced power arc to escape the circuit in the normal way.

**Q: Does the insulated overhead line need to be de-rated?**

**A:** Yes, see data sheet and test report for more information on this.

**Q: Will overhead lines have increased sag?**

**A:** Yes, see the data sheet for weight information.

**Q: Does MVLC add to snow/ice loading?**

**A:** No it does not. See test report for more information. EDR-5316 Extreme Cold Test Report has more information.

**Q: Can MVLC be double layered for use at higher voltages or closer air spaces?**

**A:** Yes. MVLC-38R fits over MVLC-18. Check dimensions and core diameters before installation.

**Q: Can MVLC be installed live?**

**A:** Yes. MVLC can be installed on live overhead lines of long spans.

## Hints and Tips

### MVLC on Substation And Jumper Leads Short Span

- Check cable/jumper lead diameter.
- Check voltage diameter.
- Select the correct tool for substation and jumper lead installation. For this application a hand tool will be necessary.
- Position MVLC so it fits inside BCIC/BCAC cover, up to the insulator/bushing connector.
- Insulate a minimum of 1.0m of conductor exiting a connection cover.

**MVLC-14 Hand Tool**

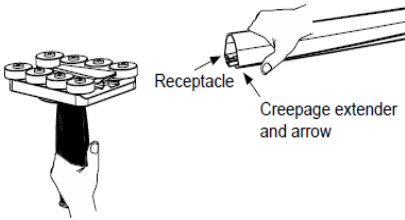


**MVLC-18 Hand Tool**



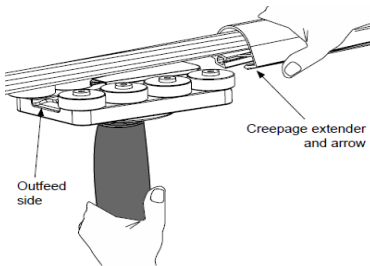


## Installation By hand tool



### Part 1. Perform prior to installation on conductor

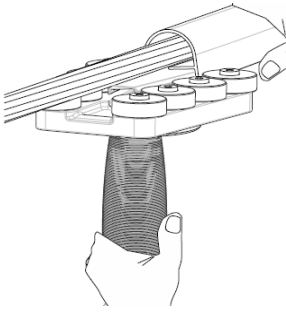
1. Place a 6-12" (150-300mm) length of MVLC in your right hand and the MVLC hand tool in your left hand.
2. Make sure that the arrow and creepage extender are on the near side and the receptacle is on the far side.
3. Use your right hand as a funnel to initiate the wrapping/closing of the product.
4. While keeping the creepage extender above the brass zipper, slide the arrow and receptacle into their respective compartments underneath the brass zipper.



### Part 2. Install MVLC on conductor

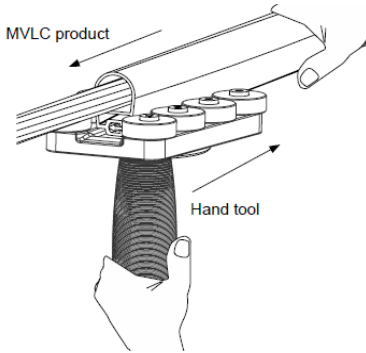
1. To install MVLC on conductor, place the hand tool under the conductor.
2. Wrap the MVLC around the conductor such that the arrow and creepage extender are on the near side.
3. Place the creepage extender under the conductor.

## Installation



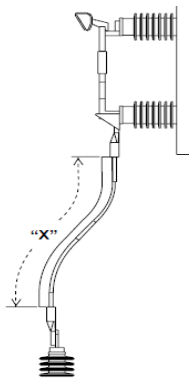
### 3. Continue installation

Continue sliding the MVLC towards the hand tool, ensuring that the creepage extender stays below the conductor, but slides on top of the brass zipper. Slide the arrow and receptacle into their respective compartments under the brass zipper.



### 4. Conductor installation complete

Continue pushing the product to the left and the hand tool to the right, until the MVLC installation is complete.

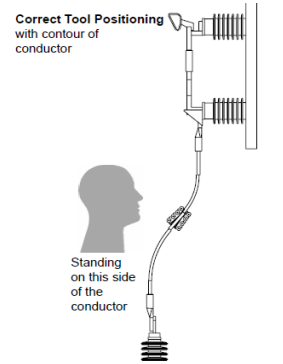


### 5. Vertical Installation on conductor leads

Measure the length of the conductor, excluding the lugs, then cut to required length

## Installation

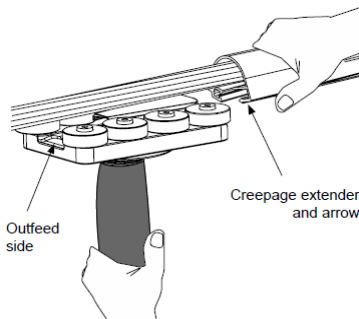
**Correct Tool Positioning**  
with contour of  
conductor



Standing  
on this side  
of the  
conductor

### 6. Place handtool in position

Place the handtool in your left hand such that the rollers and handle slide against the contour of the conductor and are approximately halfway up the conductor.

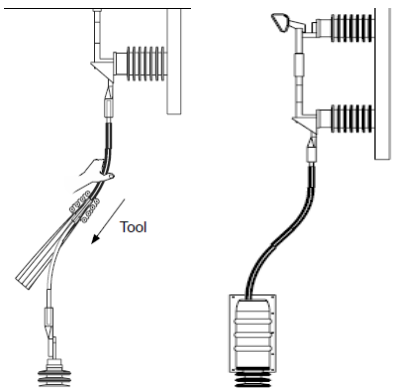


Outfeed  
side

Creepage extender  
and arrow

### 7. Slide the MVLC

Place the MVLC in your right hand, ensuring the arrow and creepage extender are on the near side. Wrap MVLC around conductor on top of brass zipper. While holding the tool in your left hand, slide the arrow and receptacle into respective compartments



Tool

### 8. Vertical conductor installation complete

When the MVLC reaches the top lug, grip the closed MVLC with your left hand and use your right hand to pull the tool toward bottom lug.

Place BCIC cover on the bushing.

**Hand Tool installation complete.**

## Frequently Asked Questions Substation and Jumpers - Short Span

**Q: What is the expected life time of MVLC for outdoor applications?**

**A:** The life time expectancy for MVLC is 30 years.

**Q: What colours are MVLC available in?**

**A:** BCIC insulating covers are available in red and grey.

**Q: Can MVLC products be modified?**

**A:** Yes. Cross linked so it does not tear/split. Holes drilled for drainage and cutting around unusual connector geometries.

**Q: Is jet washing possible?**

**A:** Yes, with the use of a high pressured wash tool.

**Q: Can MVLC only be used on round conductor?**

**A:** No, MVLC can be joined back to back or in combinations to fit “L” shaped and double busbar arrangements.

**Q: Can MVLC be used at higher voltage for insulation enhancement?**

**A:** Yes, airspace clearance applies.

**Q: Are all products REACH and RoHS compliant?**

**A:** Yes, all of the MVLC models covered in this product handbook are REACH and RoHS compliant.

**Product Information:** <https://www.te.com/usa-en/utilities/product-compliance/safety-data-sheets.html>

**Product Compliance:** <https://www.te.com/usa-en/product-CAT-MVLC.html?q=MVLC&source=header>



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##### EUROPE-MIDDLE EAST-AFRICA

Belgium/Luxembourg	+32 16-508-695
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##### ASIA-PACIFIC

Australia	+61 1-300-139-213
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Indonesia	+62 21-2929-3816
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Philippines	+63 2-988-9445
Singapore	+65 65-90-5151
Thailand	+66 2-834-6294
Vietnam	+84 28-3911-5025 (ext. 105)

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