

# 3M™ Cold Shrink Silicone Rubber 3/C Cable Breakout Boots 8560 Series

Data Sheet

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## Description

The 3M™ Cold Shrink Silicone Rubber 3/C Cable Breakout Boots 8561 through 8566 are a series of open-ended molded silicone rubber sealing assemblies that are factory expanded and mounted on removable inner supporting plastic cores. They are supplied for field installation in a pre-stretched condition. The supporting cores are removed after the seal has been positioned for installation around the breakout area of a 3/C (three conductor) cable. Core removal allows the silicone rubber boot to shrink down to a pre-determined diameter, creating an environmental enclosure for individual cable phase legs and overall cable jacket.

The 3M Cold Shrink Silicone Rubber 3/C Cable Breakout Boots 8560 Series are designed to protect the phase leg breakout area of 3/C medium voltage shielded power cable, from exposure to moisture, contamination, corrosion, ozone, ultra-violet radiation, physical contact and other hazards associated with 3/C termination operating environments.

The 3M Cold Shrink Silicone Rubber 3/C Cable Breakout Boots 8560 Series can be used in conjunction with 3M™ Cold Shrink Silicone Rubber Termination assemblies and 3M™ Silicone Rubber RJS Series 3/C Phase Rejacketing Systems for 3/C shielded power cable terminating applications.

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## Features

- One-piece versatile design allows quick installation and accommodates a wide range of cable sizes
- Cold shrink delivery system allows easy installation: Simply place break-out boot over prepared cable and unwind core to shrink into place (no force required)
- No torches or heat required
- Excellent resistance to ozone and ultra-violet radiation
- Good solvent resistance: Compatible with industry-approved cable cleaners
- Excellent thermal stability
- High dry and wet insulation resistance
- Highly flexible; accommodates power cable supplier bend radius recommendations
- Seals tight: Retains resiliency and pressure even after prolonged years of aging and exposure
- Compatible with 3M Cold Shrink Silicone Rubber Termination Products and RJS Series Phase Rejacketing Sleeves

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## Kit Contents

- 1 Poly-bagged Break-Out Boot Assembly (includes Scotch® Mastic Strip 2230)
  - 1 Instruction Sheet
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## Applications

The 3M Cold Shrink Silicone Rubber 3/C Cable Breakout Boots 8561 through 8566 are used to protect the phase breakout area of three conductor medium voltage power cable from moisture and contamination penetration after the jacket has been removed in preparation for terminating.

They can accommodate cable sizes ranging from No. 8 AWG (8 mm<sup>2</sup>) @ 3.3 kV to 500 kcmil (240 mm<sup>2</sup>) @ 35 kV.

Six sizes are available to cover cable metallic shield diameters ranging from 0.48" (12.2 mm) to 2.17" (55.1 mm) and cable jackets ranging from 1.30" (33.0 mm) to 5.52" (140.2 mm).

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## Ratings

The 3M Cold Shrink Silicone Rubber 3/C Cable Breakout Boots 8561 through 8566 can be used on cables with a continuous operating temperature of 221°F (105°C) and emergency overload temperature of 284°F (140°C). When used with 3M™ Cold Shrink Silicone Rubber Terminations, 3M™ Cold Shrink Silicone Rubber 3/C Cable Breakout Boots 8561 through 8566 meet or exceed the current rating of the cable on which they have been applied.

According to IEEE Standard 48 definition, a 3/C Class I Termination designation is achieved by combining three easy-to-use accessories: (a) 3M™ Cold Shrink Silicone Rubber Breakout Boot, (b) RJS Rejacketing Sleeves and (c) Cold Shrink Silicone Rubber Termination Assemblies.

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## Product Specifications

3M Cold Shrink Silicone Rubber 3/C Cable Breakout Boots 8561 through 8566 are one component of a 3/C cable termination and, as such, must conform to all internationally recognized termination performance standards; specifically to VDE 0278, Cenelec HD 629.1 S1, and the Class I designation of IEEE Standard 48. Cable Breakout Boots shall be made of track-resistant silicone rubber, dark gray in color and shall be supplied in the form of a one-piece assembly for hand application. Installation shall require no flame, heat source or specialized tools.

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## Engineering / Architectural Specifications

Seal and protect the cable phase (core) breakout area of all 3/C, 3.3 kV through 35 kV Class cable in accordance with the instructions provided in 3M 8561 through 8566 Cold Shrink Silicone Rubber 3/C Cable Breakout Boots Product Kits.

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## **Material Characteristics**

### ***Hydrophobicity***

When airborne contaminants are deposited on a termination surface destructive leakage currents can initiate when the surface becomes wet. Fog and drizzle are normally considered to be worse than rain as these two forms of precipitation can combine with accumulated surface contaminants to reduce surface resistivity and promote leakage current formation. Rain tends to wash the pollutants off the termination surface.

3M Cold Shrink Silicone Rubber 3/C Cable Breakout Boots 8561 through 8566 are hydrophobic; tending to reject moisture accumulation and thereby reducing the probability for discharge-initiated material erosion and tracking.

Severe environmental conditions that are sustained for long time periods can cause any polymeric surface to lose its hydrophobicity. EPDM polymers and others tend to lose their hydrophobic nature over time. Porcelain surfaces become increasingly hydrophilic with time which can result in premature failure or flashover. Silicone surfaces can regenerate their hydrophobic nature. The silicone insulator surface will re-establish its hydrophobic surface within 24 hours. This unique ability is a major factor for ensuring a long service life.

### ***Ozone, Heat and UV Resistance***

One of the most outstanding physical characteristics of silicone rubber is its retention of desirable properties over the very wide temperature range of -150°F (-100°C) to 600°F (315°C).

While there are applications that take advantage of these temperature extremes, a more attractive feature might be that of its extremely long life expectancy at moderate operating temperatures.

The silicone polymer molecular backbone, silicon-oxygen linkage, provides the same strong -Si-O-Si- type bond occurring in quartz, sand and glass. This accounts for the outstanding temperature properties of silicones and their resistance to oxidation by ozone, corona and weathering. Polymer chains from organic rubber materials often have double carbon bond molecular backbones which are quickly cleaved by ozone, light, heat or other influences found in the operating environment.

### ***Water Seal***

To determine material water sealing capability, samples of 8560 Series breakout boots were installed on non-shielded 3/C cable and submersed for a two week period.

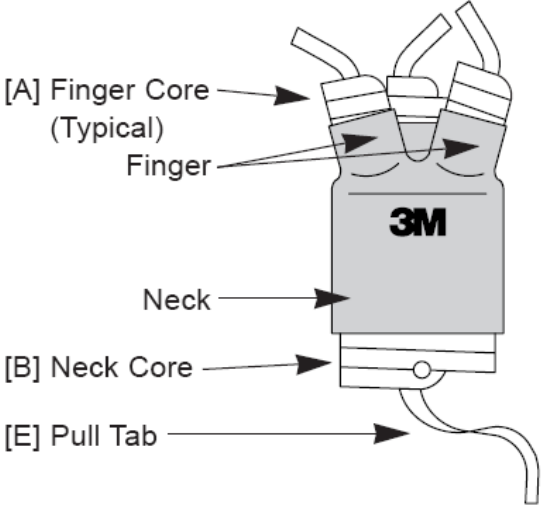
Resistance recorded between cable armor and surrounding water ranged from  $0.8 \times 10^9$  ohms to  $2.0 \times 10^9$  ohms at 1000 volts at the end of the two week period.

# 3M™ Cold Shrink Silicone Rubber 3/C Cable Breakout Boots 8560 Series

## Breakout Boot Installation

Detailed instructions are included in each kit to provide installer with all information required to properly install the appropriately sized 3M Cold Shrink Silicone Rubber 3/C Cable Breakout Boots 8561 through 8566 Product.

A brief summary of the installation steps for 3/C power cable is outlined below.

Breakout Boot Installation	
	A. Slide cable breakout boot assembly onto cable from the neck end. Guide individual cable phase legs through the assembly finger cores.
	B. Remove boot assembly Neck Core [B] by pulling, while unwinding, the loose pull tab [E] in a counter clock-wise direction around cable.
	C. Remove each finger core [A] using the same technique (Reference Step B.)
	The cable breakout area is now protected from environmental contamination and moisture.

## Surface Cleaning

3M Cold Shrink Silicone Rubber 3/C Cable Breakout Boots 8561 through 8566 are not harmed by field surface cleaning. Once the area has been de-energized, the breakout boots can be inspected, and if need be, cleaned. Some recommendations for cleaning 3M Cold Shrink Silicone Rubber 3/C Cable Breakout Boots 8560 Series are as follows;

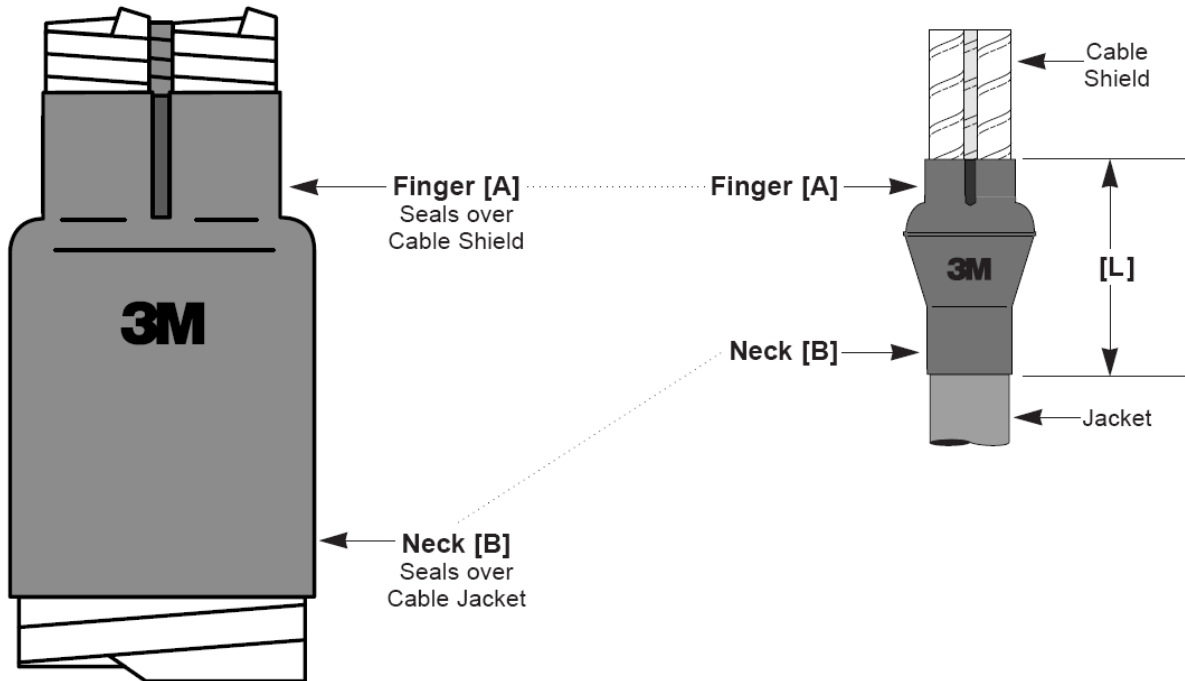
- Use a can of compressed 'air' in order to blast off dust and miscellaneous airborne contaminants on the surface of the breakout boot. If needed, wipe the surface of the termination with a cable cleaning solvent, such as 3M™ Cable Cleaning Solvent CC Series (3M™ Cable Cleaning Preparation Kit CC-2 and 3M™ Cable Cleaning Pad Kit CC-3), and allow to dry before re-energizing the installation.
- Mix a mild soap and water solution (deionized water is recommended, if available) in a hand sprayer, or spray bottle, and spray down the surface of the breakout boot. Wipe dry, or allow to air dry, before re-energizing.
- DO NOT abrade the surface of the breakout boot in any way. DO NOT use high pressure water with corn cobs, sandpaper or other abrasive products. This will damage the breakout boot surface.

# 3M™ Cold Shrink Silicone Rubber 3/C Cable Breakout Boots 8560 Series

## Selection Table

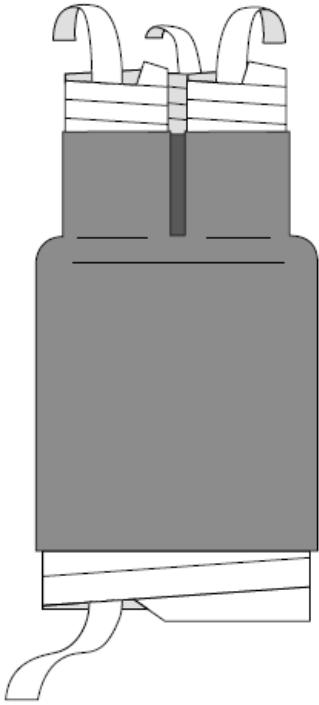
8560 Breakout Boot Selection Guide – Based on Shield and Jacket Diameter Range			Approximate Installed Length [L]
Product Number	Cable Shield* Diameter Range (Finger [A])	Cable Jacket* Diameter Range (Neck [B])	Dimension “L”
8561	0.48-0.72” (12.2-18.3 mm)	1.30-1.94 (33.0-49.3 mm)	5.00” (127 mm)
8562	0.61-0.95” (15.5-24.1 mm)	1.46-2.67 (37.1-67.8 mm)	5.00” (127 mm)
8563	0.82-1.18” (20.8-30.0 mm)	1.92-3.10 (48.8-78.7 mm)	5.75” (146 mm)
8564	1.02-1.63” (25.9-41.4 mm)	2.52-4.32” (64.0-109.7 mm)	8.25” (210 mm)
8565	1.09-1.94” (27.7-49.3 mm)	2.60-4.70” (66.0-119.4 mm)	8.25” (210 mm)
8566	1.23-2.17” (31.2-55.1 mm)	3.18-5.52” (80.7-140.2 mm)	9.40” (238 mm)

\* Use of shield grounding braids will slightly reduce product application ranges



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## Typical Properties

Breakout Boot Assembly	Property	Typical Value	Reference
	<b>Physical</b>		
	Color	Dark Gray	N/A
	Tear Resistance (Die B)	149 psi (1.03 Mpa)	ASTM D-624 B
	Ultimate Tensile Strength	1370 psi (09.5 Mpa)	ASTM D-412
	Modulus @ 100% Stretch	125 psi (0.86 Mpa)	ASTM D-412
	Ultimate Elongation	780%	ASTM D-412
	Permanent Set (22hrs @ 100°C & 100% Stretch)	8%	3M Test Method
	Temperature Rating	180°C (Class H)	ASTM D-2000
	<b>Electrical</b>		
	Max. Voltage Class Rating (Termination Based)	35 kV	N/A
	Dielectric Strength @ 0.065"	587 V/mil (23 kV/mm)	3M Test Method
	Track Resistance	6+ Hours	ASTM D-2303/IEC 587

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<b>Maintenance</b>	Termination designs incorporating 3M Cold Shrink Silicone Rubber 3/C Cable Breakout Boots 8561 through 8566 can be field tested by using normal cable testing procedures (reference: ANSI/IEEE Standard 400 "Guide for Field Testing and Evaluation of Insulation of Shielded Power Cable Systems." Refer to most recent version.
<b>Shelf Life &amp; Storage</b>	As provided, in the expanded state, the 3M Cold Shrink Silicone Rubber 3/C Breakout Boots 8560 Series have a 3-year shelf life from the date of manufacture when stored in a humidity controlled storage (50°F/10°C to 80°F/27°C and <75% relative humidity).
<b>Availability</b>	Please contact your local distributor; available from <a href="http://3M.com/electrical">3M.com/electrical</a> {Where to Buy (Find A Distributor)} or call 1-800-245-3573.
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