

## 3M Technical Information

### Barrier Boot

# 3M™ Cold Applied Barrier Boot System

For rated voltages 6.35/11(12) kV and 8.7/15(17.5) kV

92-EE 717-1



### Product Description

The **3M** Cold Applied Barrier Boot System consist of a one piece EPDM rubber body suitable for operating wet indoors under conditions of ambient temperature and loading.

The Barrier Boot is designed to accommodate bushings of cast resin or porcelain type with diameters between 40.0-70.0mm and is intended for Cold Shrink terminations of power cables up to 15kV with extruded insulation from 50 up to 300mm<sup>2</sup>.

The Barrier Boot in push on version provides the essential encapsulation of the metallic connection against ambient influences between bushing and cable termination and retains a constant compressive force on the sealing surfaces. This feature allows the Barrier Boot to follow expansions and contraction cycling of the cable under conditions of loading even after prolonged years. The Barrier Boot insulator material is tracking resistance EPDM rubber, which minimizes leakage currents in wet indoor conditions.

### Kit Content

The **3M** Barrier Boot Kit 92-EE717-1 is available in one size and is packed one kit per carton. Each kit contains sufficient quantities of the following components to install the product series in three-pole cable end boxes.

- 3 barrier boots
- 3 plastic gloves
- 3 packets of silicone grease
- installation instructions
- 1 material list

## Selection Table

Rated Voltages	Cable Cross Section (mm <sup>2</sup> )	Termination Diameter E (mm)		Circular Bushing * Diameter				Bushings Length C (mm)		Elliptical Bushing * F (mm)	
		Min	Max	D1 (mm)		D2 (mm)		Min	Max	Min	Max
				Min	Max	Min	Max				
6.35/11 (12)kV and 8.7/15 (17.5)kV	50 - 300	20.0	41.0	40.0	60.0	46.5	70.0	35	127	135	182

For Bushings below these minimum dimensions use Supplementary Kit 92-EE717-1-BSK containing a Cold Shrink EPDM Tube in conjunction with the standard Kit 92-EE717-1.

## Minimum Clearance Dimensions for Terminations shrouded with Barrier Boots

Voltage Class	Phase to Phase Clearance (mm)	Phase to Earth Clearance (mm)
6.6/11(12)kV	70	30
8.7/15(17.5)kV	95	50

## Product Features

- Versatile design allows reliable installations on a wide range of cable terminations and bushings
- Designed to fit all typical standard cable lugs
- Corrugated centre design allows straight and right angle applications
- High interface pressure ensures absolute water tightness
- Compatible with industry-approved cable cleaners
- No heat required
- No specific user skills or craftsmanship required

## Performance Tests

For practical reasons, it is permissible to carry out the tests with the terminations shrouded with Barrier Boots in a specified three-pole cable end box under consideration of the creepage lengths and clearances.

Typical Results per Cenelec HD 629.1 S1; Table 3 Tests  
Rated Voltage 8.7/15(17.5) kV

Test	Test Requirements	Results
D.C. voltage dry withstand	15 minutes at 6 U <sub>o</sub>	passed
A.C. voltage dry withstand	5 minutes at 4.5 U <sub>o</sub>	passed
Impulse voltage at ambient temperature	10 impulses of each polarity	passed
Electrical heat cycling in air	10 cycles at 2.5 U <sub>o</sub>	passed
A.C. voltage dry withstand	4 hours at 4.5 U <sub>o</sub>	passed
Humidity	300h duration at 1.25 U <sub>o</sub>	passed

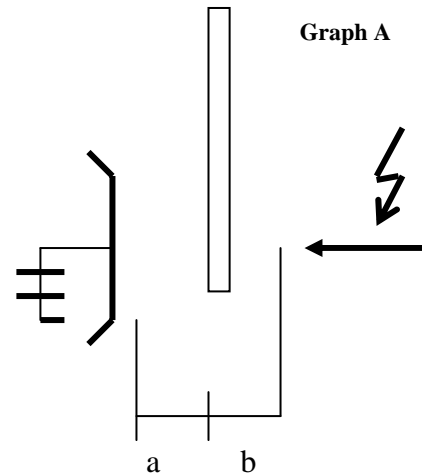
The performance of the product series is documented in the Test Reports below:

- Report No. D-1243-0 - Short Term Test in reference to Cenelec HD 629.1 , Table 10
- Report No. D-1248-0 - Humidity Test according to Cenelec HD 629.1 , Table 3
- Report No. I-0497-0e - High Voltage and Impulse Withstand Test ; type Genie Evo CB12 Indoor Circuit Breaker
- Report No. I-0496-0e - High Voltage and Impulse Withstand Test ; type Ringmaster Range RN2c SF6 Ring Main Unit

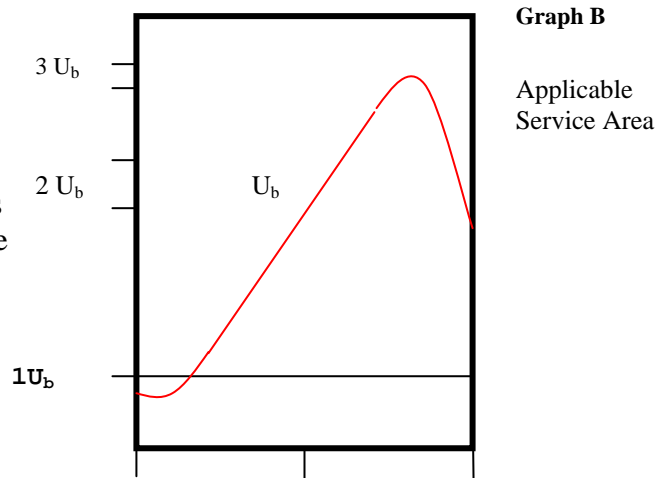


## Barriers of Insulating Materials

Graph A Illustrates the clearance between Pin-Electrode and grounded plate. Barriers of insulating materials increase the electric strength depending on the shape of electrodes and the position inside clearance. Consequently that ensures an appropriate electric ambience by using the EPDM rubber barrier



Graph B represents the course of the A.C. breakdown voltage  $U_b$  of an inhomogeneous clearance in air as a function of the barrier position. Optimised barrier boot arrangements are of particular interest and significant for the highest level of applicable service area



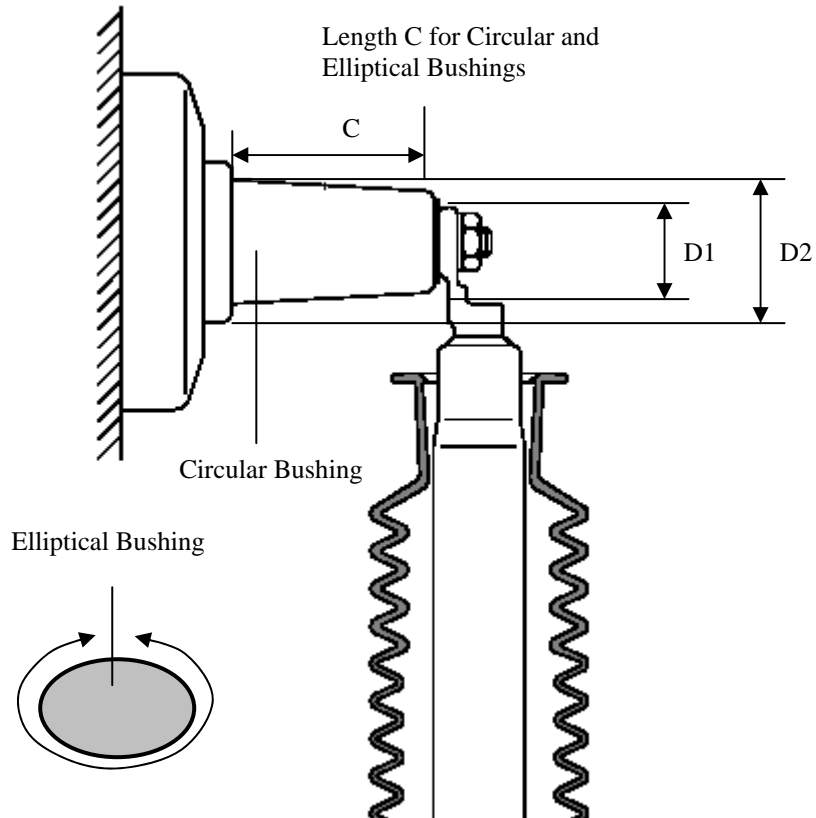
## Applications

The Cold Applied Barrier Boots are used on indoor terminations of power cables maximum rated 15kV, having extruded insulations of polyethylene (high and low density), cross linked polyethylene (XLPE), ethylene propylene rubber (EPR) and aluminium or copper conductors.

The Cold Applied Barrier Boots are arranged in switchgear and transformer cable end boxes, in which the cores of cables are terminated approaching vertically from below and are connected to bushings fixed therein.



**Cold Applied Barrier Boots arranged in a Three Pole Termination Box Bushings and Termination Dimensions**



**Physical and Electrical Properties**

The Barrier Boots can be used on terminations for extruded insulation cables with a rated maximum operating temperature of 90°C and an emergency overload rating of 130°C.

**EPDM Rubber Insulator**

**Electrical Properties**

Test Method	Specification	Typical Value *
Volume Resistivity	DIN IEC 60 093	6x10E14
Dielectric Strength	DIN IEC 60 243	25 kV/mm
Relative Dielectric Constant $\epsilon_r$	DIN IEC 60 250	3.5
Dissipation Factor $\tan \delta$	DIN IEC 60 250	0.001
Resistance to Tracking	DIN IEC 60 587	2.5kV 6 h

**Physical Properties**

Test Method	Specification	Typical Value *
Tensile Strength	DIN 53 504	8.0 MPa
Modulus 100% Elongation	DIN 53 504	0.7 MPa
Modulus 300% Elongation	DIN 53 504	1.8 MPa
Elongation at Break	DIN 53 504	700%
Tear Resistance	ASTM D 642	15 N/mm
Hardness Shore A	DIN 53 505	35
Compression Set 72h / 100°C	DIN 53 517	24 %
Colour		Ral 9011 black

\*all values are averages, based on several determinations and are not intended for specification purposes.



## **Installation**

Each kit contains detailed instructions XE-0091-2912-5 for appropriate product installation.

A brief summary of these procedures is as follows:

1. Apply silicone grease to the termination surface and inside both ends of the Barrier Boot.
2. Slide and park the Barrier Boot on the termination.
3. Connect the cable lug with the bushing.
4. Apply silicone grease to the bushing surface.
5. Slide upper part of the Barrier Boot over the metallic connection onto the bushing cone.
6. Adjust the Barrier Boot around the connection

## **Specifications**

This Cold Applied Barrier Boot System shall meet the requirements of the Cenelec HD 629.1 S1 Standard, Rated Voltage 8.7/15(17.5) kV. The Barrier Boot body must be of a moulded design made of tracking resistance EPDM rubber. Arrangements of terminations connected with bushings in three-pole cable end boxes shall be performed in accordance with the instructions provided with the 92-EE 717-1 Kit Series.

## **Storage Conditions**

The shelf life of the 3M 92-EE717-1 Barrier Boots is specified as 3 years.

Temperature: -40°C to +50°C (short term peaks at 60°C max.)

## **Legal Requirements**

The 3M 92-EE717-1 Barrier Boots are not subject of the European WEEE and RoHS Directives but meet their requirements.

## **Source of Supply**

3M UK

## **3M United Kingdom PLC**

**Electrical Products**

**PO Box 393**

**Bedford MK41 0YE**

**Tel: 0870 6094639**

### **Important Notice to Purchaser:**

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