

3M™ Wet Silicone Termination, TS145-II Series

Data Sheet

June 2011

Description 3M™ Wet Silicone Termination, TS145-II Series meets requirements of IEC60840-2004 and GB11017.3 standards. The termination uses polybutene as an insulation oil.

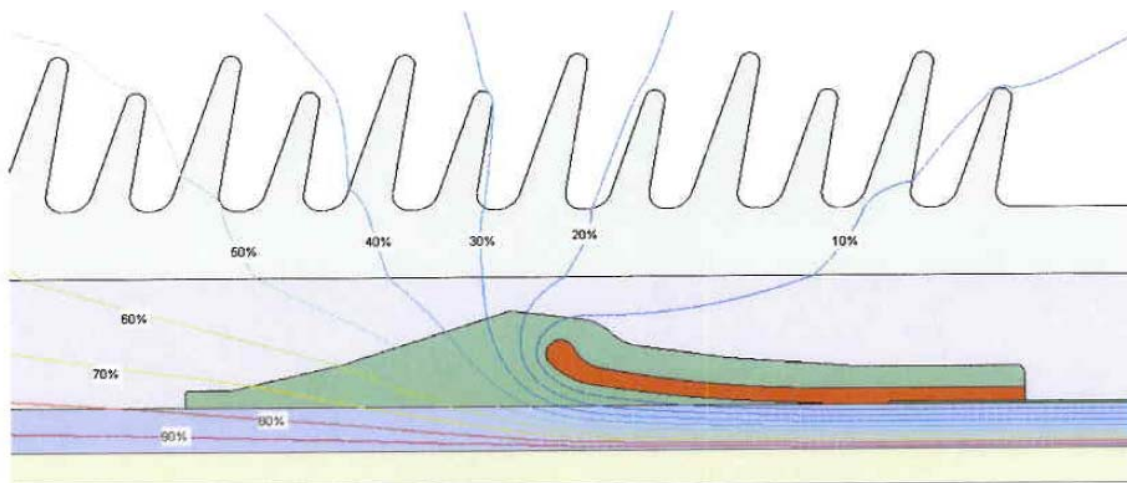
- Features**
- Designed for U_0/U_m 64/110/123 kV and 76/132/145 kV
 - Cold shrink stress cone for ease of installation
 - Stress cones are 100% factory tested

- Applications** The 3M TS145-II Series is designed for:
- Conductor size up to 1,750 kcmil (850 mm²)
 - Available for short (18.5" / 470 mm) installation length
 - Applications requiring 650 kV BIL performance levels
 - Vertical and horizontal installation
 - Tape Shield (TS), Jacketed Concentric Neutral (JCN), Tape Over Wire (TOW), Wire Over Tape (WOT), Lead shield (LS) or Longitudinally Corrugated (LC) shield high voltage cables

Transformer Applications Information

Corona shield available for oil transformer application

Stress Distribution



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Typical Properties

Not for specifications. Values are typical, not to be considered minimum or maximum. Properties measured at room temperature 73°F (23°C) unless otherwise stated.

Insulating Silicone Rubber

| Properties (Test Method) | Typical Value US units (metric) |
|--|------------------------------------|
| Elongation at Break (ISO 37) | 540% |
| Tensile Strength (ISO 37) | 8.9 N/mm ² |
| Tear Resistance (ASTM D624 B) | 32 N/mm |
| Dielectric Strength (IEC 60243) | 28 kV/mm |
| Dielectric Constant @ 50 Hz (IEC 60250) | 2.7 |

Semi-conductive Silicone Rubber

| Properties (Test Method) | Typical Value US units (metric) |
|--|------------------------------------|
| Elongation at Break (DIN 53 504 S2) | 640% |
| Tensile Strength (DIN 53 504 S2) | 7 N/mm ² |
| Tear Resistance (ASTM D624 B) | 35 N/mm |

Specifications

| Description | Value US units (metric) |
|--|---|
| Rated Voltage $U_o/U/U_m$ | 64/110/123 kV, 76/132/145 kV |
| Maximum Rating Permissible Voltage U_m | 145 kV |
| Current Carrying Capability | According to cable |
| Permissible Short-circuit Current I_5 | Max. 100 kA, according to the used cables |
| Maximum Conductor Temperature Operation Short-Circuit, 5 _s . | 194°F (90°C). 482°F (250°C) |
| With Pole Centre Distance | 43.30 in (1,100 mm) |
| Creepage Distance | 200.79 in (5,100 mm) |
| Flash-over Distance | 52.95 in (1,345 mm) |
| Position of Installation | Vertical ±30° |
| Pollution Level Class | IV |
| Power Frequency Withstand Voltage Test | >300 kV |
| Lightning Impulse Withstand Voltage U_{ps} 1.2/50μs | 650 kV |
| Type Test (according to IEC 60840-2004) | Pass |
| Conductor Connection Technique | Compression/mechanical |
| Weight (not including cable) | Approx. 105 kg |
| Cable Conductor Cross Section | 240-1200 mm ² |
| Application Range on Peeled Cable Insulation O.D. | 57-79 mm |

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Product Specification

Open Specification

The termination must be designed to match the cable construction. This termination shall meet or exceed the cable voltage rating, but will not exceed 145 kV. The termination will be tested in accordance with and meet or exceed the requirements of IEC Std. 60840.

The termination will be rated by the manufacturer for use on transmission class cable systems. It must be rated for continuous operation at 194°F (90°C), with an emergency overload temperature rating of 266°F (130°C).

This termination shall be capable of terminating cables with copper or aluminum conductors. The termination stress control body shall be of a cold shrink design, which does not require any additional heat source for installation. The body must be of a molded design made of silicone rubber.

The termination shall contain an insulating material that can vary to fit the application, consisting of cold shrink, heat shrink, a housing containing resin or a combination of previous materials. The color of the completed termination insulator shall be gray.

Engineering. Architectural Specifications

Closed Specification

The 3M™ Wet Silicone Termination, TS145-II Series is designed for polymeric type power cables and is rated 69 kV to 145 kV. The termination kit will contain all of the materials required to complete one termination, excluding cable preparation tools and supplies.

The termination shall be capable of terminating cables with copper or aluminum conductors and shall be installed in accordance with the instructions/drawing provided with the 3M TS145-II Series kit.

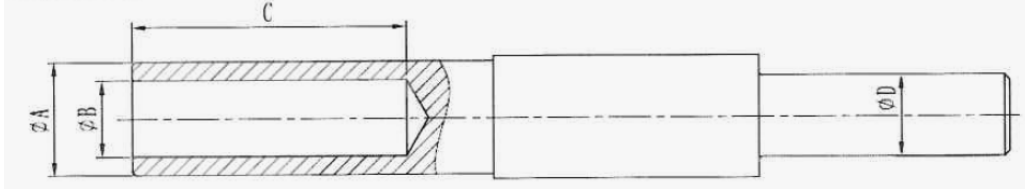
Selection Table for TS145-II

| Typical Conductor Size Kcmil (mm ²) | | Insulation O.D.* in (mm) |
|--|--------------------------------|-----------------------------|
| For 115 kV, 650-800 mil Cables | For 138 kV, 700-850 mil Cables | |
| <500 (<240) | <500 (<240) | 2.44 – 2.73 (57 – 67) |
| 500 – 1750 (240 – 850) | 500 – 1250 (240 – 630) | 2.64 – 3.11 (67 – 79) |

*Insulation O.D. cannot be less than the range minimum following cable preparation (semi-con removal and sanding).

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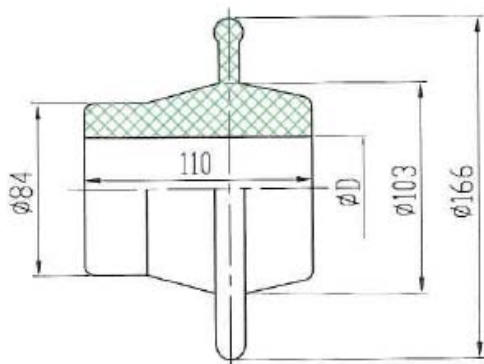
Compression Connection Bolts Selection



Compression Connection Typical Dimensions

| Cross Section Kcmil (mm ²) | O.D. for Compression | | Inner Diameter (ØB) mm | | Hole Depth (C) mm | | Connection O.D. (ØD) mm | |
|---|----------------------|----|------------------------|------|-------------------|-----|-------------------------|----|
| | Cu | Al | Cu | Al | Cu | Al | Cu | Al |
| 500 (240) | 32 | 32 | 21 | 21 | 100 | 100 | 30 | 30 |
| 600 (300) | 32 | 36 | 23.5 | 23.5 | | | | |
| 750 (400) | 36 | 42 | 26 | 26 | | | | |
| 1000 (500) | 42 | 44 | 28 | 28 | | | 40 | |
| 1250 (630) | 44 | 52 | 34 | 34 | 112 | 112 | 40 | 40 |
| 1500 (800) | 52 | 58 | 40 | 40 | | | | |
| 2000 (1000) | 58 | / | 43.5 | / | 112 | / | 40 | / |
| 2250 (1200) | 59.5 | / | 45 | / | 112 | / | 40 | / |

Sealing Sleeve Selection

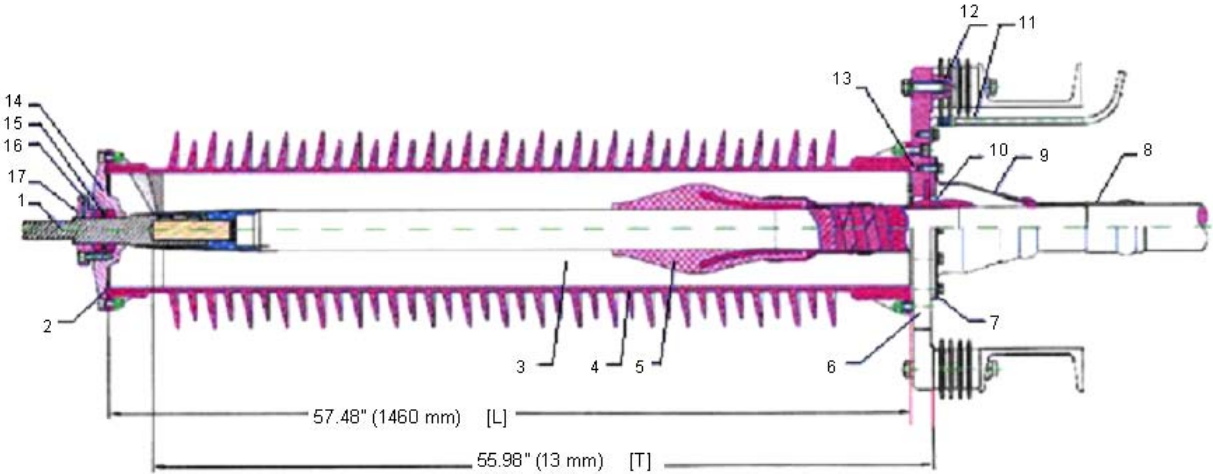


Sealing Sleeve Typical Dimensions

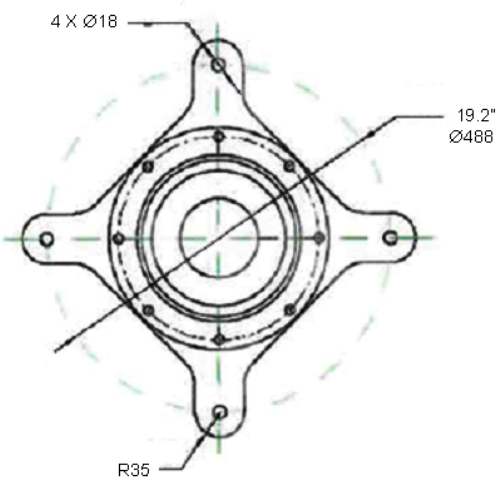
| Name | O.D. for Insulation Screen in (mm) |
|-------------------|------------------------------------|
| #1 Sealing Sleeve | (56 – 60) |
| #2 Sealing Sleeve | (60 – 64) |
| #3 Sealing Sleeve | (64 – 68) |
| #4 Sealing Sleeve | (68 – 73) |
| #5 Sealing sleeve | (73 – 77) |
| #6 Sealing Sleeve | (77 – 84) |

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Product Configuration



| | | |
|-------------------------|--------------------------|------------------------|
| 1 Connection Bolt | 2 O-Ring | 3 Filling Compound |
| 4 Insulator | 5 Stress Core | 6 Base Plate |
| 7 Support Ring | 8 Heat Shrink Tube | 9 Cable Sealing Funnel |
| 10 Cable Sealing Sleeve | 11 Earthing Bonding Lead | |
| 12 Post Insulator | 13 O-Ring | 14 Cover Plate |
| 15 Al-Support Ring | 16 Rubber Seal | 17 Pressure Ring |



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Performance Tests

Test Standard: GB/T 11017.3/ IEC68040-2004

| Test Item | Test Requirement | Test Result |
|---|--|-------------|
| Partial Discharge | No detectable from the test object at 96 kV | 1.2pC |
| Heating Cycle Voltage Test | 20 cycles under 128 kV and 95°C - 100 °C | Pass |
| Partial Discharge Test at High Temperature | No detectable discharge from the test object at 96 kV | 1.2pC |
| Partial Discharge Test at Ambient Temperature | No detectable discharge from the test object at 96 kV | 1.2pC |
| Hot Lightning Impulse Withstand Test | No breakdown or flashover should occur at 10 positive and 10 negative impulses of 550 kV | Pass |
| Power Frequency voltage Test After Impulse Voltage Test | No breakdown or flashover should occur at 160 kV for 15 min. | Pass |
| Power Frequency Voltage Wet Withstand Test | No breakdown or flashover should occur at 185 kV for 1 min | Pass |
| Pressure Leak Test | 0.2Mpa, 1 hr | Pass |
| Radio Influence Voltage Test | Radio influence voltage should not exceed 450µV at 1 MHz and 81 kV | 109 µV |

Remark: PD background noise is 1.2 pC during the whole test.

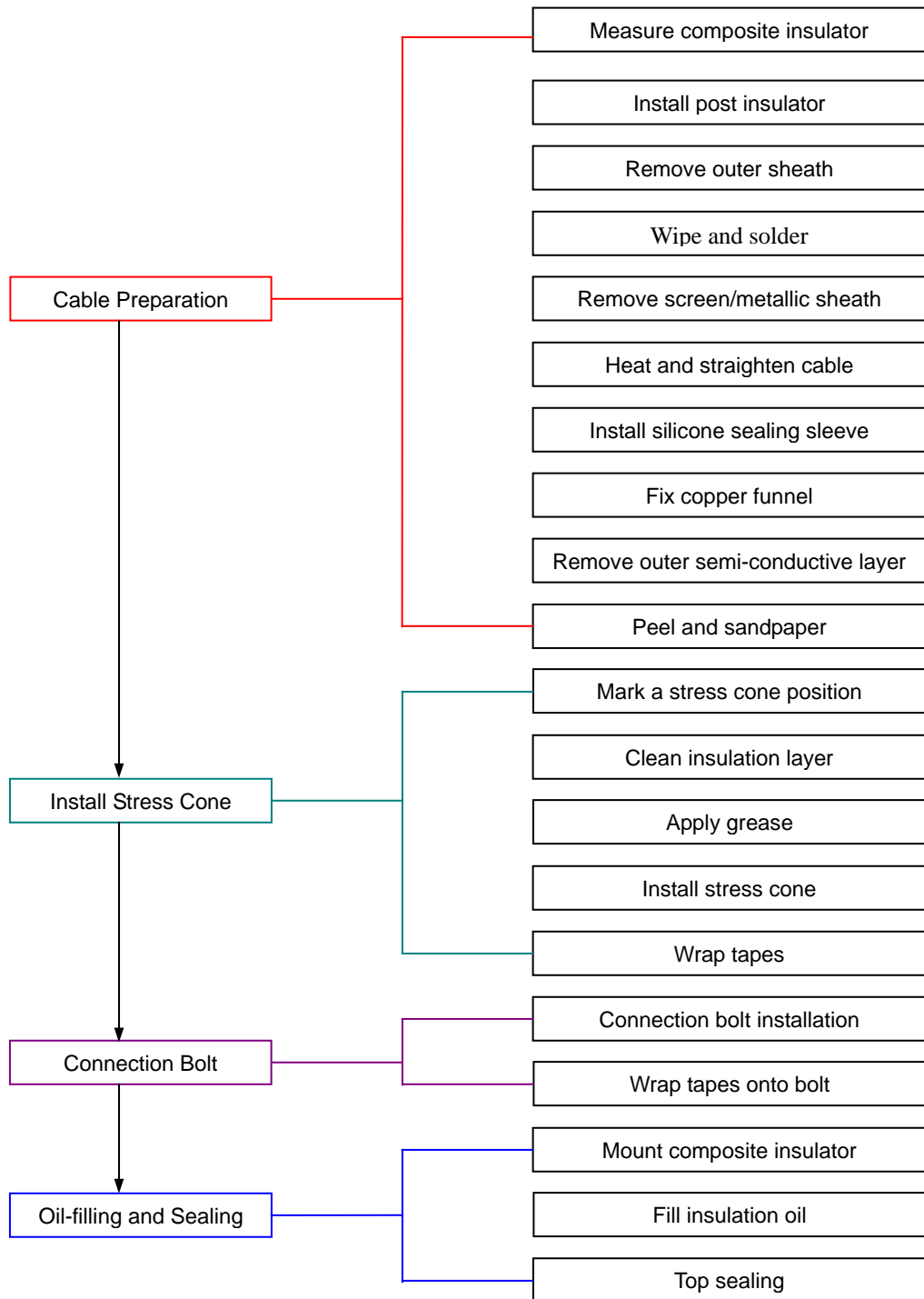
Test Standard: IEC60840-2004

| Test Item | Test Requirement | Test Result |
|---|--|--|
| Partial Discharge | No detectable from the test object at 114 kV | 2.0pC |
| Heating Cycle Voltage Test | 20 cycles under 152 kV and 95°C - 100 °C | Pass |
| Partial Discharge Test at High Temperature | No detectable discharge from the test object at 96 kV | 2.0pC |
| Partial Discharge Test at Ambient Temperature | No detectable discharge from the test object at 96 kV | 2.0pC |
| Hot Lightning Impulse Withstand Test | No breakdown or flashover should occur at 10 positive and 10 negative impulses of 650 kV | Pass |
| Power Frequency voltage Test After Impulse Voltage Test | No breakdown or flashover should occur at 190 kV for 15 min. | Pass |
| Accessory Examination | On completion of the electrical tests, the accessory was examined | There was no evidence of electrical activity |

Remark: PD background noise is 2.0 pC during the whole test.

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Installation The installation drawing is in the package. Workflow shows as below: (For a more detailed process, please see the *Instruction Sheet*)



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| | |
|---------------------------------|---|
| Shelf Life & Storage | 3M™ Wet Silicone Termination, TS145-II Series has a shelf life of 2 years, based on majority kit components, from date of manufacture when stored in a humidity-controlled storage (10°C/50°F to 27°C/80°F and <75% relative humidity.) |
| Availability | Please contact your local distributor; available from 3M.com/electrical [Where to Buy] or call 1.800.245.3573. |

| | |
|--|---|
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