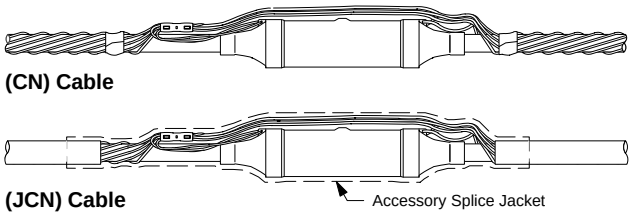
Quick Splice II

5451 and 5452

25 kV Molded Rubber Inline Splicing Kits

Data Sheet



1. Product Description

The 3M™ Quick Splice II 5451 and 5452 are 25 kV class inline splices designed for joining concentric neutral (CN) and jacketed concentric neutral (JCN) distribution class power cables. Each splice is a one-piece molded design made of specially formulated, peroxide cured EPDM rubbers. Each splice is production tested on CN cable to ensure reliability. The splice is designed for use with special CI–series Inline Compression Connectors, for connecting either aluminum or copper conductors. The Quick Splice II 5451 and 5452 splices meet the 25 kV voltage rating requirements of ANSI/IEEE Std. 404–1986.

Kit Contents:

1 Molded Rubber Splice Body

1 Porta-Pencil

2 Packets of Silicone Grease

1 Template

1 Instruction Sheet

Splice Features:

One-piece design, for simple installation

Production tested, partial discharge and alternating current withstand, for long term reliability

Peroxide cured EPDM rubber construction, for long term elastic memory (sealing) and easy installation

Computer designed, for compact size and optimal distribution of the electrical field

Direct contact between insulation shields, for complete shield continuity between splice and cables

Visual reference of splice positioning, for accurate inspection of installation

2. Applications

To splice 25 kV class distribution cables:

For inline splicing

For concentric neutral (CN) cables

For jacketed concentric neutral (JCN) cables, when used with an accessory splice jacket (e.g., 3M SJ–2A or HSJ–2 Jacket Kit)

3M 5451 for insulation diameter sizes of 0.83″ to 1.04″ (21,1 to 26,4 mm)

3M 5452 for insulation diameter sizes of 1.00″ to 1.15″ (25,4 to 29,2 mm)

For use with 3M CI–A and CI–840 Series Connectors (Al/Cu) for conductor sizes 2 – 1/0 AWG (35 – 50 mm^2)

For use with 3M CI Series Connectors (Al/Cu) for conductor sizes 2/0 – 4/0 AWG (70 – 95 mm^2)

For direct burial installations

For aerial installations

For submerged locations

3. Data: Physical and Electrical Properties

The 3M 5451 and 5452 Quick Splice II kits can be used on distribution class cables with a rated operating temperature of 90°C, and an emergency overload rating of 130°C. Splices made with these kits are rated for 25 kV and meet the 25 kV rating requirements of ANSI/IEEE Std. 404–1986, “IEEE Standard for Cable Joints for Use with Extruded Dielectric Cable Rated 5000 V through 46,000 V.” The current rating of the splice meets or exceeds the current rating for the cables on which it is installed. BIL rating of splice is 200 kV.

Special 3M CI Series connectors are used with the splice. They are crimped with a standard 5/8 die or 840 die, depending upon the connector. The connectors meet the requirements of ANSI C119.4–1986, “Connectors for Use Between Aluminum or Aluminum-Copper Overhead Conductors.”

A. Selection Table

5451 SPLICE AND CONNECTOR SELECTION TABLE

NOTE: Final determining factor is cable insulation diameter.

Kit Number	Cable Insulation (O.D. Range)	Conductor Size (AWG)	Cable Insulation Thickness (mils)	3M Connector Number *
5451	0.83 – 1.04 in. (21,1 – 26,4 mm)	2 Solid	280 295	CI–22A or CI–22–840
		2 Stranded	260 280 295	CI–1A or CI–2A or CI–21–840
		1 Solid	260 280 295	CI–1A or CI–2A or CI–21–840
		1 Stranded	260 280 295	CI–1A or CI–21–840
		1/0 Solid	260 280 295	CI–1A or CI–21–840
		1/0 Stranded	260 280 295	CI–1/0A or CI–1/0–840
		2/0 Stranded	260	CI–2/0

Table 1

5451 SPLICE KIT(WITH CONNECTOR INCLUDED) SELECTION TABLE

NOTE: Final determining factor is cable insulation diameter.

Kit Number (With Connector) *	Cable Insulation (O.D. Range)	Conductor Size (AWG)	Cable Insulation Thickness (mils)
5451–CI–22–840	0.83 – 1.04 in. (21,1 – 26,4 mm)	2 Solid	280 295
5451–CI–22A	0.83 – 1.04 in. (21,1 – 26,4 mm)	2 Solid	280 295
5451–CI–2A	0.83 – 1.04 in. (21,1 – 26,4 mm)	2 Stranded 1 Solid	260 280 295
5451–CI–21–840	0.83 – 1.04 in. (21,1 – 26,4 mm)	2 or 1 Stranded 1 or 1/0 Solid	260 280 295
5451–CI–1A	0.83 – 1.04 in. (21,1 – 26,4 mm)	2 or 1 Stranded 1 or 1/0 Solid	260 280 295
5451–CI–1/0A	0.83 – 1.04 in. (21,1 – 26,4 mm)	1/0 Stranded	260 280 295
5451–CI–1/0–840	0.83 – 1.04 in. (21,1 – 26,4 mm)	1/0 Stranded	260 280 295
5451–CI–2/0	0.83 – 1.04 in. (21,1 – 26,4 mm)	2/0 Stranded	260

*Note: CI-A Series Connectors are sized for 5/8 crimping die;
CI-2/0 and CI-840 Series Connectors are sized for 840 crimping die.

Table 2

5452 SPLICE AND CONNECTOR SELECTION TABLE

NOTE: Final determining factor is cable insulation diameter.

Kit Number	Cable Insulation (O.D. Range)	Conductor Size (AWG)	Cable Insulation Thickness (mils)	3M Connector Number *
5452	1.00 – 1.15 in. (25,4 – 29,2 mm)	2/0 Stranded	280 295	CI–2/0
		3/0 Stranded	260 280 295	CI–3/0
		4/0 Stranded	260 280	CI–4/0

Table 3

5452 SPLICE KIT(WITH CONNECTOR INCLUDED) SELECTION TABLE

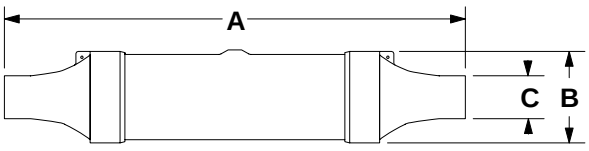
NOTE: Final determining factor is cable insulation diameter.

Kit Number (With Connector) *	Cable Insulation (O.D. Range)	Conductor Size (AWG)	Cable Insulation Thickness (mils)
5452–CI–2/0	1.00 – 1.15 in. (25,4 – 29,2 mm)	2/0 Stranded	280 295
5452–CI–3/0	1.00 – 1.15 in. (25,4 – 29,2 mm)	3/0 Stranded	260 280 295
5452–CI–4/0	1.00 – 1.15 in. (25,4 – 29,2 mm)	4/0 Stranded	260 280

*Note: CI-2/0, CI–3/0 and CI–4/0 Connectors are sized for 840 crimping die.

Table 4

B. Typical Dimensions



Kit Number	Dimension		
	A	B	C
5451	14.4 in. (366 mm)	2.47 in. (63 mm)	0.76 in. (19 mm)
5452	15.4 in. (391 mm)	2.63 in. (67 mm)	0.88 in. (22 mm)

Table 5

C. Typical Physical and Electrical Properties

Insulating EPDM Rubber

Physical Properties

Test Method	Typical Value*
• Color	White
• Ultimate Elongation ASTM D 412	570% min.
• Ultimate Tensile Strength ASTM D 412	900 psi min. (6.21 MPa min.)
• Shore A Hardness ASTM D 2240	55
• Permanent Set (3M Test Method: 100% strain with 5 min. recovery)	25%
• Compression Set ASTM D 395, Method B	19%
• 100% Modulus ASTM D 412	185 psi (1.28 MPa)
• 300% Modulus ASTM D 412	650 psi (4.49 MPa)

Electrical Properties

Test Method	Typical Value*
• Dielectric Constant ASTM D 150	
73°F (23°C)	2.71
194°F (90°C)	2.58
266°F (130°C)	2.56
• Dissipation Factor ASTM D 150	
73°F (23°C)	0.4%
194°F (90°C)	1.3%
266°F (130°C)	4.7%
• Dielectric Strength ASTM D 149	
25 mil thick slab	1177 Volts/mil (46.4 MV/m)
100 mil thick slab	518 Volts/mil (20.4 MV/m)
• 20 Days @ 96% RH and 194°F (90°C)	
25 mil thick slab	1066 Volts/mil (42.0 MV/m)
100 mil thick slab	790 Volts/mil (31.1 MV/m)

Splice Jacket Semi-Conductive Rubber

Physical Properties

Test Method	Typical Value*
• Color	Black
• Ultimate Elongation ASTM D 412	300% min.
• Ultimate Tensile Strength ASTM D 412	1700 psi min. (11.7 MPa min.)
• Shore A Hardness ASTM D 2240	70
• Die C Tear ASTM D 624	225 lbs/in min. (39.4 KN/m min.)
• Permanent Set (3M Test Method TM 86A)	20% max.
• 100% Modulus ASTM D 412	400 psi (2.8 MPa)
• 300% Modulus ASTM D 412	1800 psi (12.4 MPa)
• Ozone Resistance (70 hrs., 150 ppm @ 20% strain)	No Cracking
• UV Resistance (70 hrs. @ 20% strain)	No Cracking

Electrical Properties

Test Method	Typical Value*
• Volume Resistivity (3M Test Method TM 80)	15.4 Ohm–inch max. (40 Ohm–cm max.)

* This data is not to be used for specification. Values listed are for typical properties and should not be considered minimum or maximum.

4. Specification

Product
(Open Specification)

The concentric neutral (CN) and jacketed concentric neutral (JCN) cable splice must meet the requirements of ANSI/ IEEE Std. 404–1986 for a 25 kV rating, and must be rated by the manufacturer for use on 25 kV distribution systems. It must be rated for continuous operation at 90°C, with an emergency overload temperature rating of 130°C. The splice shall be a one-piece, slip-on design made of molded peroxide cured EPDM rubber. It shall be rated for indoor, outdoor and direct burial applications.

Engineering/Architectural
(Closed Specification)

Splicing of all 2 – 2/0 AWG 25 kV rated concentric neutral (CN) and jacketed concentric neutral (JCN) cables shall be performed in accordance with the instructions provided with the 3M 5451 Quick Splice II Molded Rubber Splicing Kit. Splicing of all 3/0 – 4/0 AWG 25 kV rated concentric neutral (CN) and jacketed concentric neutral (JCN) cables shall be performed in accordance with the instructions provided with the 3M 5452 Quick Splice II Molded Rubber Splicing Kit. For JCN applications, the splice shall be sealed with an additional jacket installed in accordance with the instructions provided with the 3M SJ–2A Cold Shrink™ Jacket Kit.

5. Performance Tests

IEEE Std. 404–1986
25 kV Voltage Rating

Design Test and Sequence	Test Requirements
Minimum Partial Discharge (Corona) Level (kV–rms @ <3 pC)	21.6
Alternating-Current 1 Minute Withstand (kV–rms)	52
Direct -Current 15 Minute Withstand (kV–dc)	100
Impulse Withstand (BIL) at 68°F (20°C) (kV–crest)	±150
Impulse Withstand (BIL) at 266F (130C) (kV–crest)	±150
Minimum Partial Discharge (Corona) Level (kV–rms @ <3 pC)	21.6
Cyclic Aging (kV–rms)	43
High Voltage Time 5 Hour Alternating-Current Withstand (kV–rms) 1 Hour Alternating-Current Withstand (kV–rms)	 52 78
Short-Time Current (sec.) (ICEA P–32–382 and ANSI/IEEE C37.09–1979)	0.17
Alternating-Current 1 Minute Withstand (kV–rms)	52
Shielding	IEEE Std. 592–1990
Connector Thermal and Mechanical	ANSI/NEMA CC3–1978 and ANSI C119.4–1986
Production Test	**Test Requirements**
Production Units Tested (%)	100
Minimum Partial Discharge (Corona) Level (kV–rms @ <3 pC)	21.6
Alternating-Current 1 Minute Withstand (kV-rms)	52

Table 6

6. Installation Techniques

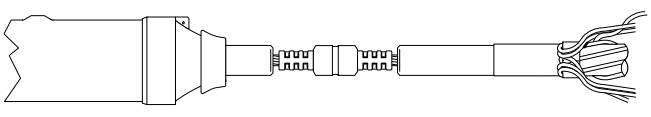
Detailed Instructions for installing the Quick Splice II are included with each kit. The following is a brief summary of the installation steps required for the 5451 and 5452 splicing kits:

a. Prepare cables using standard procedures.

b. Lubricate cable insulation and semi-con jacket of CABLE X with silicone grease provided.

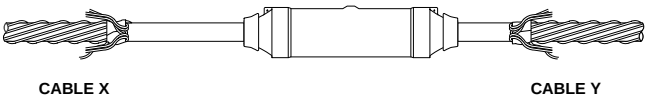
c. Slide splice onto CABLE X until Porta-Pencil is exposed.

d. Install CI–Connector.

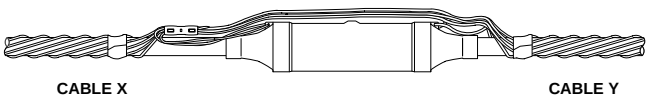


e. Lubricate connector and cable insulation of CABLE Y with silicone grease provided.

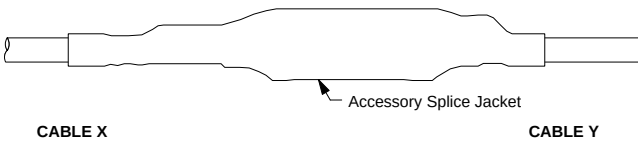
f. Slide splice into final position over connector, centering it between the ends of the cable semi-cons.



g. Connect neutral wire, attaching one wire from each cable to the splice grounding eyes.



h. JCN Cables Only: Install accessory splice jacket over splice and exposed neutral wires.



7. Maintenance

Components of the 3M 5451 and 5452 Quick Splice II Kits are stable under normal storage conditions. Normal stock rotation procedures are recommended. The splice can be field tested using normal field cable testing procedures (reference: ANSI/IEEE Std. 400, “Guide for Making High-Direct-Voltage Tests on Power Cable Systems in the Field).”

8. Availability

3M 5451 and 5452 Quick Splice II Kits are available to splice 25 kV CN and JCN distribution class cables. They are available in kits with the CI–Connector included. It is also available as a kit without a connector, where the CI-Connector must be ordered separately. These kits are available from your local authorized 3M electrical distributor.

Important Notice to Purchaser:

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