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**Transversal Grounding Connector - TGC**

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**1. SCOPE****1.1 Content**

This specification covers the performance, tests and quality requirements of TE Transversal Grounding Connector.

The TE Transversal Grounding Connector is composed basically of a "C" Member and a "Wing" Member.

**2. APPLICABLE DOCUMENTS**

The following documents form a part of this specification to extend specified herein. In the event of conflict between the requirements of this specification and the product drawing, the product drawing shall take precedence. In the event of conflict between the requirements of this specification and the referenced documents, this specification shall take precedence.

**2.1 TE Documents**

- 109-1 General Requirements for Test Specifications
- 411-37030 T.G.C., Instruction Sheet
- 501-37007 T.G.C., Qualification Test Report
- 501-37013 Medium T.G.C., Qualification Test Report

**2.2 Others Standards**

- UL 486-A Wire connectors and soldering lugs for use with copper conductors.
- UL 467 Grounding and Bonding Equipment.
- Bellcore TR-NWT-001075 Generic Requirements for Outside Plant Bonding and Systems Hardware.
- ASTM B117 Std. Practice for Operating Salt Spray Apparatus.

**3. REQUIREMENTS****3.1 Design and Construction**

Product shall be with design, construction and physical dimensions specified on the applicable product drawings.

**3.2 Materials**

- T.G.C. "C" Member: Stainless Steel.
- T.G.C. "Wing" Member: Copper Alloy.

**3.3 Performance and Test Description**

The product is designed to meet the electrical, mechanical and environmental performance requirements specified in figures 1 and 2 respectively.

**3.4 Samples Preparation**

**3.4.1 Test Groups 1 and 2:**

Assemble 2 loops with 2 connectors applied each one, following the procedures described in the TE Instruction Sheet 411-37030. The samples shall be separated by at least 457mm when measured center-to-center. See Table 1 for wire selection.

**3.4.2 Test Group 3:**

Assemble 9 samples with 1 connector applied each one, following the procedures described in the TE Instruction Sheet 411-37030, with a minimum of 153mm exposed lengths of cables outside the connector on each side, using the minimum wire size offered. For stranded conductors, equalizers needs to be used on conductor ends, to provide equipotential planes for resistance measurements. See Table 1 for wire selection.

**3.5 Wire Range**

The product is designed to accommodate the following wires and rods:

Part Number	Rod	Cable		
493643-1	3/4" – Diam. 17,30 to 19,05mm	4AWG STR 25mm <sup>2</sup> STR	2AWG STR 35mm <sup>2</sup> STR	
493644-1	5/8" – Diam. 14,30 to 15,87mm	4AWG STR 25mm <sup>2</sup> STR	2AWG STR 35mm <sup>2</sup> STR	
493645-1	1/2" – Diam. 12,00 to 12,70mm	4AWG STR 25mm <sup>2</sup> STR	2AWG STR 35mm <sup>2</sup> STR	
493645-2	5/8" – Diam. 14,30mm	4AWG SOL	--/--	
1380277-1	5/8" – Diam. 13,80 to 14,30mm	10 AWG SOL 10 AWG STR 8 AWG SOL 8 AWG STR	6mm <sup>2</sup> SOL 6mm <sup>2</sup> STR 10mm <sup>2</sup> SOL	
1380278-1	5/8" –Diam. 13,80 to 14,30mm	6 AWG SOL 6 AWG STR	10mm <sup>2</sup> STR 16mm <sup>2</sup> SOL 16mm <sup>2</sup> STR	
1599712-1	5/8" – Diam. 14,30 to 15,87mm	4AWG STR 25mm <sup>2</sup> STR	2AWG STR 35mm <sup>2</sup> STR	
Part Number	Cable		Cable	
493646-1	2AWG STR	35m <sup>2</sup> STR	2AWG STR	35mm <sup>2</sup> STR

**Table 1**

3.6 Test Requirements and Procedures Summary (Figure 1)

<b>ELECTRICAL</b>		
<b>Test Description</b>	<b>Requirement</b>	<b>Procedure</b>
Static Heating Test UL 486A	The temperature of connector shall not rise more than 50°C above ambient temperature.	The sample sets continuously carry the value of test current specified in the Table 11.1 from UL 486A, based on wire size tested, until stable temperature are reached.
Current Test UL 467	After carried the current specified, shall exist continuity on the test sample assembly. Crack, break, or melt, aren't acceptable.	Carry a current value specified in Table 13.1 from UL 467 for the time specified according to wire selected. The current shall be based on smaller wire used in the loop.
Resistance Test Bellcore TR-NWT-001075	Shall not exceed 10 mΩ.	Samples prepared according to Paragraph 3.4.2 shall be tested as follow: The resistance shall be measured through each sample from one cable end to another. Each consecutive measurement of a particular sample shall be made with the probes in the same location. Prior to each measurement, the test points shall be cleaned, to assure good contact between the instrument probes and the tested sample. Resistance shall be measured with an accuracy of ± 0,25 mΩ, and the samples shall be conditioned at a ambient temperature. The current through the test sample during the measurement shall not exceed 100 mA.
AC Fault Test Bellcore TR-NWT-001075	There shall be no arcing between connector and conductive element. The requirements of Pullout Test (Bellcore TR-NWT-001075) shall be met.	One end of the sample assembly shall be connected to the terminal of a 60 Hz source using a wire or wires equivalent a No. 4 AWG copper conductor. In the other end of the sample, the cable shall be connected to the second terminal of the AC source with No. 6 AWG bare solid copper conductor. A current of 1000A rms shall be applied to the sample for a minimum 20 seconds or until the No. 6 AWG wire fuses open. After that, parts shall be submitted to Pullout Test.
Lightning Surge Test Bellcore TR-NWT-001075	There shall be no arcing between connector and conductive element. After test, the connection resistance shall not exceed a change of 5 mΩ over the previous measurement.	The cables of a test sample shall be attached to the terminals of an impulse generator and a 8/20 μs current shall be applied. After that, the connection resistance shall be tested acc. to Resistance Test procedures.
Pullout Test UL 467	Connectors shall withstand for 5 minutes a pull of 667N.	Connectors subjected to Current Test (UL 467) shall be subjected to a direct pull of 667N during 5 minutes.
Vibration Test Bellcore TR-NWT-001075	No evidence of cracks, breaks, or loose parts on any of connector assemblies.	The samples shall be subjected to a simple harmonic motion having an amplitude of 0,75 mm minimum, 1,5 mm maximum total excursion, the frequency being varied uniformly between the limits of 10 to 55 Hz and return to 10 Hz, shall be traversed in approximately one minute. This motion shall be applied for a period of 2 hours in each of three mutually perpendicular directions. After that, parts shall be subjected to Tensile Test.

Figure 1

<b>MECHANICAL</b>		
<b>Test Description</b>	<b>Requirements</b>	<b>Procedures</b>
Tensile Test Bellcore TR-NWT-001075	Connectors shall remain firmly attached and fully engaged, with no slippage, under stress of a sustained load of 445N for one minute minimum. After test, the connection resistance shall not exceed 30 mΩ.	Apply a sustained load of 445N in the connectors secured to their conductive element for one minute in an axially direction away from the conductive element. After that, connection resistance shall be tested acc. to Resistance Test procedures.
Pullout Test Bellcore TR-NWT-001075	Connector shall withstand a pull of 155N for one minute. After test, the connection resistance shall not exceed a change of 5 mΩ over the previous measurement.	Apply a pull of 155N for one minute between the free end of each conductor and there shall be no sudden application force. After that, connection resistance shall be tested acc. to Resistance Test procedures.
<b>ENVIRONMENTAL</b>		
<b>Test Description</b>	<b>Requirement</b>	<b>Procedure</b>
Temperature and Humidity Cycling Test Bellcore TR-NWT-001075	After test, connection resistance shall not exceed 30 mΩ.	Samples shall be subjected to the temperature and humidity cycles specified in figure 7-1 from Bellcore Standard TR-NWT-001075 for 30 days. After 30 days of cycling the sample shall be allowed to return to ambient temperature and stabilize for 24 hours. After that, connection resistance shall be tested acc. to Resistance Test procedures.
Hydrogen Sulfide (H <sub>2</sub> S) Exposure Test Bellcore TR-NWT-001075	After test, connection resistance shall not exceed 30 mΩ.	Samples shall be placed in vacuum desiccators having a volume of approximately 0,03m <sup>3</sup> . The desiccators shall remain open. The open desiccators shall be placed in an oven operating at a test temperature of 65°C. After samples have stabilized to the test temperature, approximately one hour, the desiccators shall be sealed and evacuated to a pressure of 10mmHg (1.332 Pa). H <sub>2</sub> S shall be added to the desiccators as follow: Add H <sub>2</sub> S until the pressure reaches 200mmHg (27 kPa). Inject 1cm <sup>3</sup> of water into the chamber. Add H <sub>2</sub> S until pressure reaches 750mmHg (100 kPa). The samples shall be exposed to the H <sub>2</sub> S, at the test temperature, for a minimum period of one hour. Upon completion of the exposure period, the samples shall be immediately removed from the desiccators and subjected to a temperature of 65°C for a minimum period of one hour. Following the Hydrogen Sulfide Test, samples shall be stabilized at ambient temperature for 24 hours. After that, connection resistance shall be tested acc. to Resistance Test procedures.
Salt Fog Test Bellcore TR-NWT-001075	Any component of connector shall display no significant signs of corrosion penetration when compared to a non-exposed sample. After test, the connection resistance shall not exceed 30 mΩ.	Samples shall be subjected to a salt fog test for duration of 30 days, and in accordance with ASTM B117. Upon completion of exposure, the samples shall be rinsed in running tap water, and dried at 40°C for a period of 24 hours. Return samples to ambient conditions for a period of 24 hours before testing continue. After that, connection resistance shall be tested acc. to Resistance Test procedures.

Figure 1 (cont.)

**3.7 Product Qualification and Requalification Test Sequences**

Tests	Test Groups		
	1	2	3
	Test Sequences		
Static Heating Test (UL 486A)	1		
Current Test (UL 467)		1	
Pullout Test (UL 467)		2	
Resistance Test (Bellcore TR-NWT-001075)			1, 4, 6, 8, 10, 13, 15
Vibration Test (Bellcore TR-NWT-001075)			2
Tensile Test (Bellcore TR-NWT-001075)			3
Temperature and Humidity Cycling Test (Bellcore TR-NWT-001075)			5
Hydrogen Sulfide Exposure Test (Bellcore TR-NWT-001075)			7
Salt Fog Test (Bellcore TR-NWT-001075)			9
AC Fault Test (Bellcore TR-NWT-001075)			11
Pullout Test (Bellcore TR-NWT-001075)			12, 16
Lightning Surge Test (Bellcore TR-NWT-001075)			14

*Figure 2*

**4. QUALITY ASSURANCE PROVISIONS**

**4.1 Qualification Testing**

**a) Sample Selection**

Connector samples shall be prepared in accordance with applicable Instruction Sheet 411-37030. They shall be selected at random from current production.

**b) Test Sequence**

Qualification shall be verified by testing samples as specified in Figure 2.

**4.2 Requalification Tests**

If changes significantly affecting form, fit or function are made to the product or to the manufacturing process, quality assurance shall coordinate requalification testing, consisting of all or part of the original testing sequence as determined by development / product, quality and reliability engineering.

**4.3 Acceptance**

Acceptance is based on verification that the product meets the requirements of Figure 1, according test sequences as described in Figure 2. Failures attributed to equipment, test setup, or operation deficiencies shall not disqualify the product. When product failure occurs, corrective actions shall be taken and samples resubmitted for qualification. Testing to confirm corrective action is required before resubmitted.

#### 4.4 Quality Conformance Inspection

The applicable Quality Inspection Plan (QIP) will specify the sampling acceptable level to be used. Dimensional and functional requirements shall be in accordance with the applicable product drawing and this specification.

Revision Record				
Rev.	Date	Description	Checked	Approved
E	16-Sep-2011	Updated format document	L.Borelli	J.La Salvia