25kV Class - 200A
15.2 / 26.3kV
Load-break Connector
Type Test Report

Report Number:	Approved By:	Prepared By:
RN-R7612	Jack Tseng	Boris Hsieh

Chardon Taiwan
No. 37 Min-Chie Road
Tung Lo Industrial Park
Miao Li, Taiwan 366

No. 37, Min-Chie Road, Tung Lo Industrial Park,
Miao Li, 366 Taiwan, R.O.C.
Tel: +886-37-984385 | Fax: +886-37-984770
E-Mail: sales@chardongroup.com

INTRODUCTION

The Chardon Loadbreak System is a fully shielded and insulated connector for connecting underground cable to transformers, switchgear, and other apparatus equipped with loadbreak bushings, junctions, or other loadbreak connectors.

The Chardon Loadbreak Connector meets all the requirements of IEEE Standard 386, and is fully interchangeable with competitor's products and mating products that also meet IEEE Standard 386.

TEST PROGRAM

i. OBJECT

To verify the Chardon Power Systems 25kV Class 200 Amp Separable connector that the parts meet ANSI/IEEE Standard 386-2016.

ii. PROCEDURE

Design tests were performed on the number of samples as specified in Table 8 of IEEE Standard 386-2016. The 25kV 200 Amp Separable Connector parts were randomly selected from finished goods inventory and dimensionally checked to ensure that the interfaces were in compliance with the applicable figures of IEEE Standard 386-2016.

iii. PRODUCT LIST

The 25kV class 200 Amp Separable Connector System consists of the products listed below:

1.	25-LE200	25 kV 200A Loadbreak Elbow
2.	25-LFE200	25 kV 200A Loadbreak Fuse Elbow
3.	25-LBI200	25 kV 200A Bushing Insert
4.	25-LIC200	25 kV 200A Loadbreak Protective Cap
5.	25-LJ200	25 kV 200A Loadbreak Junction
6.	25-LFTI	25 kV 200A Feed-Thru Insert
7.	25-LPFT200	25 kV 200A Loadbreak Portable Feed Thru
8.	25-SOB200	25 kV 200A Insulated Standoff Bushing
9.	25-LEA	25kV Elbow Arrester
10.	25-ETP600-25-200	25 kV Elbow Tap Plug
11.	25-LRTP600-25-200	25 kV Loadbreak Reducing Tap Plug
12.	25-GLE200	25 kV 200A Grounding Elbow

No. 37, Min-Chie Road, Tung Lo Industrial Park,
Miao Li, 366 Taiwan, R.O.C.
Tel: +886-37-984385 | Fax: +886-37-984770
E-Mail: sales@chardongroup.com

Table of Contents

No. 37, Min-Chie Road, Tung Lo Industrial Park,
Miao Li, 366 Taiwan, R.O.C.
Tel: +886-37-984385 | Fax: +886-37-984770
E-Mail: sales@chardongroup.com

1. Sequence A: Partial Discharge Test

Object

To verify the Chardon Loadbreak Systems connectors that the parts meet ANSI/IEEE Standard 386-2016, Section 7.4, 25kV partial discharge requirement of 19kV/5pC.

Procedure and Testing Spec

The purpose of this test is to verify that the partial discharge minimum extinction voltage of the specimen is not less than of the 19kV.

The test voltage shall be raised to 20% above the partial discharge minimum extinction voltage of 19kV. If the partial discharge peak value exceeds 5pC, the test voltage shall be lower to the partial discharge minimum extinction voltage of 19kV and be maintained at this level for at least 3 seconds but not more than 60 seconds. Partial discharge readings taken during the interval 3 seconds to 60 seconds shall not exceed 5pC peak.

Results

The products tested were 1-11 of the Product List on page 1.

For all ten samples of each product tested the corona level was less than 5pC at the specified minimum corona extinction voltage level of 19kV rms.

No. 37, Min-Chie Road, Tung Lo Industrial Park,
Miao Li, 366 Taiwan, R.O.C.
Tel: +886-37-984385 | Fax: +886-37-984770
E-Mail: sales@chardongroup.com

2. Sequence A: AC Withstand Voltage Test

Object

To verify the Chardon Loadbreak Systems connectors that the parts meet ANSI/IEEE Standard 386-2016, Section 7.5.1, 25kV AC withstand requirement of 40kV/ 1 min.

Procedure and Testing Spec

The test voltage shall be raised to the value of 40kV in 30 seconds. The test sample shall withstand the specified test voltage for 1 minute without flashover or puncture.

Results

The products tested were 1-11 of the Product List on page 1.

All samples of each product withstood a 40 kV rms, 60 Hz AC 1 minute voltage withstand without a puncture or flashover.

No. 37, Min-Chie Road, Tung Lo Industrial Park,
Miao Li, 366 Taiwan, R.O.C.
Tel: +886-37-984385 | Fax: +886-37-984770
E-Mail: sales@chardongroup.com

3. Sequence A: Impulse Withstand Voltage

Object

To verify the Chardon Loadbreak Systems connectors that the parts meet ANSI/IEEE Standard 386-2016, Section 7.5.3, impulse withstand testing requirements of 1.2×50μs ±125kV wave., 3 positive and 3 negative full-wave impulses.

Procedure and Testing Spec

The test voltage shall be 1.2/50μs wave having the crest value (BIL) of 125kV. The wave shape shall meet the requirements of IEEE Std 4.

Prior to application of the first full-wave impulse, preconditioning pulses at 50% and then at 75% of the BIL. During a change of polarity, the preconditioning pulse sequence may again be applied.

The connector shall withstand 3 positive and 3 negative full-wave impulses without flashover or puncture.

Results

The products tested were 1-11 of the Product List on page 1.

All samples of each product withstood three positive and three negative full wave impulses with 125 kV crests without a puncture or flashover.

No. 37, Min-Chie Road, Tung Lo Industrial Park,
Miao Li, 366 Taiwan, R.O.C.
Tel: +886-37-984385 | Fax: +886-37-984770
E-Mail: sales@chardongroup.com

4. Sequence A: Test Point Capacitance Test

Object

To verify the Chardon Loadbreak Systems connectors that the parts meet ANSI/IEEE Standard 386-2016, Section 7.17.1, test point testing requirement.

Procedure and Testing Spec

The purpose of this test is to verify that the capacitance values of the test point meet the requirements of 6.5.1 in IEEE Std 386.

The connector shall be installed on a cable of the type for which it is designed to operate, and the shielding shall be grounded in the normal manner. The capacitances from test point to cable and test point to ground shall be measured with suitable instruments and proper shielding techniques.

The capacitance between the test point and conductor system shall be at least 1.0pF. The ratio of the capacitance between test point and ground shield to the capacitance between the test point and conductor system shall not exceed 12.0.

Results

The products tested were 1-2 of the Product List on page 1.

The test point capacitance test verified that the capacitance between the test point and conductor was at least 1.0pF for each of the ten elbow samples. The ratio of capacitance between test point and ground shield to the capacitance between the test point and the conductor system did not exceed 12.0 for each of the ten elbow samples.

No. 37, Min-Chie Road, Tung Lo Industrial Park,
Miao Li, 366 Taiwan, R.O.C.
Tel: +886-37-984385 | Fax: +886-37-984770
E-Mail: sales@chardongroup.com

5. Sequence A: Test Point Voltage Test

Object

To verify the Chardon Loadbreak Systems connectors that the parts meet ANSI/IEEE Standard 386-2016, Section 7.17.2, test point testing requirement.

Procedure and Testing Spec

The purpose of this is to verify proper operation of the test point.

The connector shall be installed on a cable of the type for which it is designed to operate, and the shielding shall be grounded in the normal manner. With a test elbow latched to the insert, a voltage of 15±2 kV was applied.

Results

The products tested were 1-2 of the Product List on page 1.

An energized voltage condition was detected on the test points of all ten elbows at an applied voltage of 15±2 kV.

No. 37, Min-Chie Road, Tung Lo Industrial Park,
Miao Li, 366 Taiwan, R.O.C.
Tel: +886-37-984385 | Fax: +886-37-984770
E-Mail: sales@chardongroup.com

6. Sequence B: Accelerated Sealing Life Test

Object

To verify the Chardon Loadbreak Systems connectors that the parts meet ANSI/IEEE Standard 386-2016, Section 7.12, accelerated sealing life testing requirement.

Procedure and Testing Spec

Four samples shall be assembled in series on AWG No. 1/0 XLPE insulated cable.

The cable shall be compatible with the thermal conditions of this test. A mandrel simulating the test cable may be substituted during the oven aging portion of this test.

The four connector assemblies shall be placed in an oven having 121°C temperature and remain there for three weeks. After this time has elapsed, the four samples shall be removed from the oven and each operated once by using the operating eye or an appropriate location on the axis of the separable interface.

The four connector assemblies shall then be subjected to 50 cycles of the following sequence of operations:

a) The assemblies shall be heated in air using sufficient current to raise the temperature of the conductor of the control cable to 90°C ± 5°C for the following time period:

1) 200 A connectors: 1 h

b) The assemblies shall be de-energized and within 3 min, submerged in 25°C ± 10°C conductive water (5000 Ω-cm maximum) to a depth of 30 cm (1 ft) for the following time periods:

1) 200 A connectors: 1 h

After the 50th cycle, the connector and cable assembly shall withstand a design impulse test (see 7.5.3).

The test point, if provided, shall be capable of passing the voltage test specified in 7.17.2.

Results

The products tested were 1-3 of the Product List on page 1.

Following the 50 accelerated sealing life test cycles, all four assemblies withstood three positive and three negative full wave impulses having 125 kV crest values, without a puncture or flashover.

After the impulse test, the elbow test point of each assembly indicated an energized condition with an applied voltage of 15±2 kV.

No. 37, Min-Chie Road, Tung Lo Industrial Park,
Miao Li, 366 Taiwan, R.O.C.
Tel: +886-37-984385 | Fax: +886-37-984770
E-Mail: sales@chardongroup.com

7. Sequence C: Switching Test

Object

To verify the Chardon Loadbreak Systems connectors that the parts meet ANSI/IEEE Standard 386-2016, Section 7.7, switching testing requirement.

Procedure and Testing Spec

30 pcs Chardon 25 kV Class, 200 Amp loadbreak bushing inserts were installed into a bushing well and mated with Chardon 25 kV Class, 200 Amp loadbreak elbows, which were assembled onto properly prepared XLPE insulated cables.

Each samples assembly tested was mounted in a fixture with all normally grounded parts grounded in a manner approximating normal service conditions.

Adjacent grounds consisting of a bushing well, insert and elbow assembly were mounted on each side of the connector being tested and appropriately grounded.

The center-to-center spacing of the test assembly sample to each adjacent ground assembly was 4.0 inches.

Each samples assembly was subjected to 10 complete 200 Amp switching operations at 26.3 kV phase-to-phase under the conditions listed in Figure 28 and Table 10 of the IEEE Standard 386-2016 for connectors with a voltage rating of 15.2/26.3 kV. A complete switching operation consists of closing and opening the connector.

Switching operations were performed manually in a series circuit with live-line tools.

Successive switching operations were performed at time intervals greater than 1 minute. Before each closing operation took place, a minimum dwell time of 5 seconds was maintained after the probe was positioned in the arc extinguishing area of the insert. Each closing and opening operation was made with a positive continuous motion with adequate time between the closing and interrupting of the test connectors to allow for steady-state voltage and current conditions.

Appropriate ground-fault detection equipment was incorporated into the test set-up. The last switching operation for each sample was recorded on an oscillogram.

Results

The products tested were 1, 3 of the Product List on page 1.

The connector samples exceeded the switching requirement of ten consecutive samples without a flashover to ground.

No. 37, Min-Chie Road, Tung Lo Industrial Park,
Miao Li, 366 Taiwan, R.O.C.
Tel: +886-37-984385 | Fax: +886-37-984770
E-Mail: sales@chardongroup.com

8. Sequence C: Fault-closure Test

Object

To verify the Chardon Loadbreak Systems connectors that the parts meet ANSI/IEEE Standard 386-2016, Section 7.8, Fault-closure testing requirement.

Procedure and Testing Spec

The samples assemblies which passed the 10 switching operations in Section 7, of this report were used for the fault-closure test.

The mounting preparation for the fault-close test was the same as specified in the switching test (Section 7) of this report.

The switched assemblies were subjected to one 10kA, 0.20 second, 26.3kV phase-to-phase fault-closure under the conditions as listed in Table 12 and shown in Figure 29 of IEEE Standard 386-2016 for connectors with a voltage rating of 15.2/26.3kV. Before each fault-closing operation, a 5 second dwell time was maintained after the probe was positioned in the arc extinguishing area of the insert.

Fault-closure testing continued until at least 10 consecutive assemblies passed the criteria of having no external ground current shown on the oscillograms, all component parts remaining within the closed connector assembly and at least one connector was closed when the voltage was 80% or more of the peak voltage value.

Results

The products tested were 1, 3 of the Product List on page 1.

Of the successful switching assemblies, ten consecutive samples passed the 10kA, 0.20 second, 26.3kV phase-to-phase fault-closure with no external ground current, all component parts remained within the closed connector assembly and at least one connector was closed when the voltage was 80% or more of the peak test voltage.

No. 37, Min-Chie Road, Tung Lo Industrial Park,
Miao Li, 366 Taiwan, R.O.C.
Tel: +886-37-984385 | Fax: +886-37-984770
E-Mail: sales@chardongroup.com

9. Individual tests: Short-time Current Test

Object

To verify the Chardon Loadbreak Systems connectors that the parts meet ANSI/IEEE Standard 386-2016, Section 7.6, short-time current testing requirement.

Procedure and Testing Spec

The peak value of the first major loop of a current wave shall be not less than the value specified in Table 3 multiplied by 2.27 (X/R=6) for 200 A connectors. The magnitude shall be measured in accordance with ANSI/IEEE C37.09.

Connectors shall withstand the current without separation of interfaces or impairing the ability to meet the other requirements of the standard.

Results

The products tested were 1-3, 5-7, and 12 of the Product List on page 1.

All samples of each product withstood short-time currents with magnitudes and durations of 3,500 amperes symmetrical for 3 seconds and 10,000 amperes symmetrical for 0.17 seconds (10 cycles) without any separation of the interfaces or impairing the connector's ability to meet the other requirements of IEEE Standard 386-2016.

No. 37, Min-Chie Road, Tung Lo Industrial Park,
Miao Li, 366 Taiwan, R.O.C.
Tel: +886-37-984385 | Fax: +886-37-984770
E-Mail: sales@chardongroup.com

10. Individual tests: Accelerated Thermal Test

Object

To verify the Chardon Loadbreak Systems connectors that the parts meet ANSI/IEEE Standard 386-2016, Section 7.10.1, accelerated thermal testing requirement.

Procedure and Testing Spec

A control cable, used for the purpose of obtaining conductor temperature, shall be installed in the heat cycle loop between two equalizers. Its length shall be 183 cm (72 in). The control cable shall be the same type and size as the cable used to join the connectors under test.

Four samples shall be assembled in series on AWG No. 1/0 XLPE insulated cable having a length of 91 cm (36 in).

The bushing bus shall be a flat, rectangular, bus bar 356 mm (14 in) long, 102 mm (4 in) wide, and 10 mm (3/8 in) thick. The bushing wells shall be mounted 31 cm (12 in) apart centered along the midline of the bus bar. The bushing well studs shall be tightened to the bus bar using an installation torque of 9 N·m ± 1 N·m (80 lbf·in ± 10 lbf·in).

Unless otherwise specified by the manufacturers, the elbow male contact probe shall be threaded into the elbow compression lug using an installation torque of 9 N·m ± 1 N·m (80 lbf·in ± 10 lbf·in).

Current-cycling tests shall be conducted at an ambient temperature of 15 °C to 35 °C in a space free of drafts.

The current-cycle amperes shall be adjusted during the current-on period of the first five cycles to result in a steady-state temperature rise of 100 °C to 105 °C on the control conductor. This current shall then be used during the remainder of the test current-on periods, regardless of the temperature of the control conductor.

The test shall consist of 50 current cycles, with the current on 4 h and off 2 h for each cycle. At the end of each current-on cycle, the assembly shall be de-energized and within 3 min be submerged in water at 5 °C ± 5 °C for the remainder of the current-off cycle. At the end of the 10th, 25th and 40th cycles (± 2 cycles), after the samples have returned to room temperature, a short time ac current of 3500 A ± 300 A rms shall be applied to each sample for a minimum of 3 s.

The temperature of at least the following current transfer points shall be measured at the end of each cycle with the current on:

a) Probe to compression lug
b) Probe to female contact
c) Female contact structure to metallic housing (piston contact)
d) Between bushing insert and bushing well.

No. 37, Min-Chie Road, Tung Lo Industrial Park,
Miao Li, 366 Taiwan, R.O.C.
Tel: +886-37-984385 | Fax: +886-37-984770
E-Mail: sales@chardongroup.com

These temperatures shall not exceed the temperature of the control conductor.

The temperature differences between the control conductor and the connector shall show a condition of stability from the fifth cycle to the end of the test. Stability is indicated when the change in the individual differences is not more than 10°C from the average of the measured differences in this interval for this connector.

The dc resistance of the connector system shall be measured at the end of cycles 10, 20, 30, 40, and 50 (± 2 cycles). The dc resistance measurements shall be made between the elbow cable equalizer and the bushing stud after the connector system has stabilized at ambient temperature. Ambient temperature shall be measured by devices located within 61 cm (2 ft.) of the test loop but in a location that minimizes the effect of thermal convection. The ambient temperature shall be recorded at the same time as each set of resistance measurements, and the resistance shall be corrected to 20°C. The dc resistance shall be stable over the period of measurement. Stability is achieved when any resistance measurement, including allowance for instrument accuracy, does not vary more than ± 5% from the average of all the measurements in this interval.

Results

The products tested were 1-3 of the Product List on page 1.

The temperatures at each transfer point did not exceed the temperature of the control conductor during the test.

Stability of the corrected dc resistance measurements was exhibited by the dc resistance measurements varying less than ± 5% from the average of all the measurements within the measurement interval.

No. 37, Min-Chie Road, Tung Lo Industrial Park,
Miao Li, 366 Taiwan, R.O.C.
Tel: +886-37-984385 | Fax: +886-37-984770
E-Mail: sales@chardongroup.com

11. Individual tests: Thermal Test with off-axis Operation

Object

To verify the Chardon Loadbreak Systems connectors that the parts meet ANSI/IEEE Standard 386-2016, Section 7.10.2, thermal test with off-axis operation requirement.

Procedure and Testing Spec

The elbow shall be disassembled with a 12.7 mm (0.5 in) wide pulling band, as shown in Figure 21 for application of an off-axis force. Grounding tabs or other obstructions may be removed to apply the pulling band. No provision is made for an off-axis closing force since it is not consistently reproducible.

Four samples shall be assembled in series on AWG No. 1/0 XLPE insulated cable having a length of 91 cm (36 in). The cable insulation thickness shall be selected according to its voltage class.

7.10.2.1 Mechanical operation

The elbow shall be rotated about the probe axis a minimum of 10° in both the clockwise and counterclockwise directions by means of a suitable live-line tool. The tool shall be approximately parallel with the axis of the probe.

The connector shall then be opened five times with the force applied to the pulling band and closed five times with the force applied to the operating eye. The force required to open or close the elbow shall be parallel to the axis of the probe. The applied force shall be sufficient to completely close the connector.

7.10.2.2 Current cycling test

A control cable, used for the purpose of obtaining conductor temperature, shall be installed in the current cycling loop between two equalizers. Its length shall be 183 cm (72 in). The control cable shall be the same type and size as the cable used to join the connectors under test.

The current shall be adjusted so that the temperature on the conductor of the control cable is 90 °C ± 5 °C.

The current shall be applied for eight continuous cycles, each cycle consisting of 3 h on and 3 h off.

Equalizers used shall be in accordance with ANSI C119.4.

Current-cycling tests shall be conducted at an ambient temperature of 15 °C to 35 °C in a space free of drafts.

No. 37, Min-Chie Road, Tung Lo Industrial Park,
Miao Li, 366 Taiwan, R.O.C.
Tel: +886-37-984385 | Fax: +886-37-984770
E-Mail: sales@chardongroup.com

The temperature shall be measured by thermocouples located as follows:

a) At the compression lug
b) At the approximate midpoint of the bushing contact or as near thereto as practical
c) On the conductor surface at the midpoint of the control cable

The temperature at location a) and location b) shall not exceed the temperature of the conductor of the cable at location c).

Results

The products tested were 1-3 of the Product List on page 1.

The temperatures at each transfer point did not exceed the temperature of the control conductor during the test.

No. 37, Min-Chie Road, Tung Lo Industrial Park,
Miao Li, 366 Taiwan, R.O.C.
Tel: +886-37-984385 | Fax: +886-37-984770
E-Mail: sales@chardongroup.com

12. Individual tests: Cable Pull Out

Object

To verify the Chardon Loadbreak Systems connectors that the parts meet ANSI/IEEE Standard 386-2016, Section 7.13, cable pull out testing requirement.

Procedure and Testing Spec

The purpose of this test is to determine if the connection between the cable conductor and compression lug of the connector is capable of withstanding a tensile force of 890 N (200 lbf).

The compression lug shall be held in a manner that will not affect the strength of the connection. The tensile force shall be applied to the cable conductor.

The connection shall withstand the applied force for 1 min without impairing the connector's ability to meet the other requirements of this standard.

Results

The products tested were 1-2, and 12 of the Product List on page 1.

All four connectors withstood the applied force of 200 lbf for one minute without impairing the connectors' ability to meet the other requirements of IEEE Standard 386-2016.

No. 37, Min-Chie Road, Tung Lo Industrial Park,
Miao Li, 366 Taiwan, R.O.C.
Tel: +886-37-984385 | Fax: +886-37-984770
E-Mail: sales@chardongroup.com

13. Individual tests: Operating-force Test

Object

To verify the Chardon Loadbreak Systems connectors that the parts meet ANSI/IEEE Standard 386-2016, Section 7.14, operating-force testing requirement.

Procedure and Testing Spec

The elbow shall be assembled with a probe and compression lug and the connector system shall be lubricated in accordance with the manufacturer's instructions.

The temperature of the components shall be −20°C, 25°C, and 65°C, respectively, for three separate tests. Each test shall consist of closing and then reopening the connector within 10 min. The force shall be applied to the operating eye parallel to the axis of the probe at a rate of 13 cm/min (5 in/min).

The forces required to open or close the connector shall be within the ranges specified in 6.2.

Results

The products tested were 1-12 of the Product List on page 1.

Each set of four connector/bushing insert assemblies had operating forces between 50 lbf and 200 lbf at the -20°C, +25°C and +65°C temperatures.

No. 37, Min-Chie Road, Tung Lo Industrial Park,
Miao Li, 366 Taiwan, R.O.C.
Tel: +886-37-984385 | Fax: +886-37-984770
E-Mail: sales@chardongroup.com

14. Individual tests: Operating-eye Test

Object

To verify the Chardon Loadbreak Systems connectors that the parts meet ANSI/IEEE Standard 386-2016, Section 7.15, operating-eye testing requirement.

Procedure and Testing Spec

A tensile force shall be gradually applied to the operating eye in the direction of normal operation. The operating eye shall withstand the force for 1 min.

A rotational force shall be applied with a suitable live-line tool to the operating eye in a clockwise direction and in a counter-clockwise direction.

Some distortion of the operating eye is acceptable provided the connector is serviceable after the test and meets the partial discharge requirement of the 19kV.

Results

The products tested were 1, 2, 4, 9 and 12 of the Product List on page 1.

The operating eye of each elbow and insulated protective cap were still serviceable after the withstand tests for tensile and rotational force.

The elbow and insulated protective cap, when tested on a bushing well insert, met the requirements of a corona voltage level of 19 kV rms before and after the mechanical tests.

No. 37, Min-Chie Road, Tung Lo Industrial Park,
Miao Li, 366 Taiwan, R.O.C.
Tel: +886-37-984385 | Fax: +886-37-984770
E-Mail: sales@chardongroup.com

15. Individual tests: Test Point Cap Test

Object

To verify the Chardon Loadbreak Systems connectors that the parts meet ANSI/IEEE Standard 386-2016, Section 7.16, test point cap testing requirement.

Procedure and Testing Spec

A tensile force shall be gradually applied to the test point cap in the direction parallel with the probe axis at −20°C, +25°C, and +65°C.

A tensile force of 445 N (100 lbf) shall be applied to the test point cap operating eye for 1 min at −20°C, +25°C, and +65°C.

Some distortion of the operating eye is acceptable provided the test point cap is serviceable after the test.

Results

The products tested were 1-2, and 12 of the Product List on page 1.

The test point cap operating force of each sample was within the specified requirements of 8 to 49 pounds-force at each temperature of -20°C, +25°C and +65°C.

The test point cap operating eye of each sample withstood the applied tensile force of 100 pounds-force at each temperature of -20°C, +25°C and +65°C.

No. 37, Min-Chie Road, Tung Lo Industrial Park,
Miao Li, 366 Taiwan, R.O.C.
Tel: +886-37-984385 | Fax: +886-37-984770
E-Mail: sales@chardongroup.com

16. Individual tests: Shielding Resistance Test

Object

To verify the Chardon Loadbreak Systems connectors that the parts meet ANSI/IEEE Standard 592-2007, Section 4.2, shielding resistance requirement.

Procedure and Testing Spec

Connectors shall have an electrically conductive shield and, where required, shall have provision for connecting an external ground to the shield. Except for nonelastomeric components, connectors shall meet the requirements of IEEE Std 592.

IEEE Std 592 4.2 Shield resistance test:

The resistance of the semiconducting shield shall be measured using the voltmeter-ammeter method, with either an ac or dc current supply. The current connections shall be as follows:

- For a separable insulated connector, the current connections shall be made on the shield at the cable entrance and at the farthest shield extremity, using a circumferential connection at both locations to give a uniform current distribution.
- For a joint, the current connections shall be made on the shield at the cable entrance and at the physical center of the shield, using a circumferential connection at both points to give a uniform current distribution.

The voltage shall be measured with the current adjusted to 1.0 mA ± 0.2 mA.

- Resistance measurements shall be made on test specimens that have had the following histories:

  a) Unaged
  b) Air oven aged for 504 h at 121°C ± 5°C

- Resistance measurements shall be made with the test specimen temperature at 20°C ± 5°C and at 90°C ± 5°C.

Results

The products tested were 1-2 of the Product List on page 1.

The shield resistance measurements between the extremities of the elbow were all less than the maximum allowable 5000 ohms.

No. 37, Min-Chie Road, Tung Lo Industrial Park,
Miao Li, 366 Taiwan, R.O.C.
Tel: +886-37-984385 | Fax: +886-37-984770
E-Mail: sales@chardongroup.com

17. Individual tests: Fault-current Initiation Test

Object

To verify the Chardon Loadbreak Systems connectors that the parts meet ANSI/IEEE Standard 592-2007, Section 4.3, fault-current initiation testing requirement.

Procedure and Testing Spec

Connectors shall have an electrically conductive shield and, where required, shall have provision for connecting an external ground to the shield. Except for nonelastomeric components, connectors shall meet the requirements of IEEE Std 592.

IEEE Std 592 4.3 Fault-current initiation test:

1) The test samples shall be assembled onto the cable(s) in conformance with the manufacturer's instructions, with the exception that the metallic cable shield shall be extended over the accessory shield.

2) The fault rod shall be of an erosion resistant metal, such as copper-tungsten, 3/8-in in diameter, and threaded at one end to engage the accessory connector through a drilled hole not to exceed 3/8-in in diameter.

3) The fault rod placement and the attitude of the accessory during the fault initiation test shall be as shown in standard. For separable insulated connectors, the rod shall be as close to the shield extremity as practicable. For joints, the rod shall be in the physical center of the connector.

4) The voltage source shall be connected between specimen neutral ground and cable conductor. The test voltage is 7kV. With an available short circuit current of 10 000 A rms symmetrical, the test specimen shall be subjected to two tests that cause initiation of a fault-current arc to ground. Each operation shall have a minimum current flow duration of 10 cycles at the normal power frequency used. After energizing the test circuit, the fault initiation must occur within 3 s. The second test shall be initiated in the shortest practical time. The test specimen must not be disturbed between operations.

Results

The product tested were 1 of the Product List on page 1.

Of the successful switching assemblies, ten consecutive samples passed the 10kA, 0.20 second, 26.3kV phase-to-phase fault-closure with no external ground current, all component parts remained within the closed connector assembly and at least one connector was closed when the voltage was 80% or more of the peak test voltage.

No. 37, Min-Chie Road, Tung Lo Industrial Park,
Miao Li, 366 Taiwan, R.O.C.
Tel: +886-37-984385 | Fax: +886-37-984770
E-Mail: sales@chardongroup.com

18. Individual tests: Operating Interface AC Withstand Test

Object

To verify the Chardon Loadbreak Systems connectors that the parts meet ANSI/IEEE Standard 386-2016, Section 7.5.2, operating interface AC withstand requirement.

Procedure and Testing Spec

The purpose of this test is to demonstrate that loadbreak and livebreak separable connectors or devices are capable of performing an opening operation under expected field conditions without a flashover to ground. All separable connectors or devices, designed to be operated while energized shall pass the requirements of this test. The connector component designed to prevent partial vacuum flashovers shall also demonstrate the ability to meet the requirements of this test when tested with mating components from other manufacturers where applicable.

If necessary, operating interfaces under test can be cleaned with a laboratory grade of isopropyl alcohol (2-pro-penal). After cleaning, the samples shall dry for a minimum of 15 min before assembly to allow the cleaning solvent to evaporate from the interface.

Further preparation of the samples shall follow Option A or Option B as follows:

Option A: The operating interfaces shall be free of any lubrication. Twelve separable connectors or devices to be evaluated should have test cable installed where appropriate and be assembled onto 12 mating connectors or components at an ambient temperature of 25 °C ±5 °C.

After Option A or Option B, chill the connector assemblies in a cold chamber at -20 °C to -25 °C for a minimum of 16 h. Remove one connector assembly at a time from the cold chamber and mount the assembly to a grounded test stand. Attach ground leads to the external shields of the connector. Adjacent grounds are not required. This conditioning may be performed at -1 °C to +4 °C for any connector or device that is to be mated for less than 24 h in any field applications, such as direct-test probes.

Separate the connector or device assembly from the bushing within 10 min after removal from the cold chamber. The opening operation shall be performed with a positive continuous motion applied manually or by a mechanical actuator with an average operating speed during the initial 2.5 cm (1.0 in) of travel of 89 cm/s ±13 cm/s (35 in/s ±5 in/s). The force shall be applied to the operating eye of the connector using a suitable live-line tool or equivalent device.

Results

The products tested were 1, 3 of the Product List on page 1.

The Elbow and Bushing Inster when tested on a bushing well, met the requirements of the operating interface AC withstand tests.