

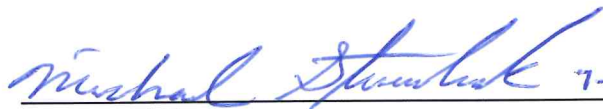
TEST REPORT NUMBER: 488-17-18162

DATE: July 13, 2018

## REPORT OF TEST ON Copper K676CH, K676I, K676CY Bus Bars IEEE 386-2016

Statements made and data shown are, are to the best of our knowledge and belief,  
correct and within the usual limits of commercial testing practices.

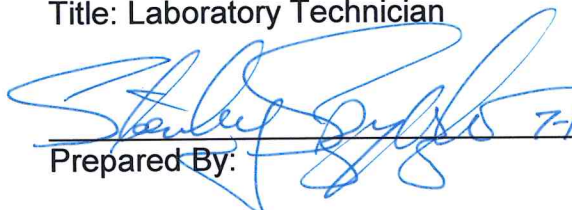
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Prepared By:

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Approved By:

Title: Senior Product Engineer

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Prepared By:

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|                                              |                                                                     |
|----------------------------------------------|---------------------------------------------------------------------|
| <b>1.0 Purpose of Test</b>                   | Evaluate the K676 copper bus bars Electrically as per IEEE 386-2016 |
| <b>2.0 Manufacturer</b>                      | Thomas & Betts Elastimold                                           |
| <b>3.0 Type, Part, or Model No.</b>          | K676I, K676H, 676CY bus bar                                         |
| <b>4.0 Drawing, Specification or Exhibit</b> |                                                                     |
| <b>5.0 Quantity or Items Tested</b>          |                                                                     |
| <b>6.0 Security Classification of Items</b>  |                                                                     |
| <b>7.0 Date(s) Test(s) Conducted</b>         |                                                                     |
| <b>8.0 Place(s) Test(s) Conducted</b>        |                                                                     |
| <b>9.0 Disposition of Specimens</b>          |                                                                     |
| <b>10.0 References</b>                       |                                                                     |
| <b>11.0 Report Distribution</b>              |                                                                     |

#### **PURPOSE:**

The objective for the testing is to ensure that the copper 900 amp K676I, K676CH, and K676CY separable connectors can withstand the electrical testing as per IEEE 386-2016.

#### **RESULTS:**

Tests performed to IEEE-386-2016 included,

- 7.4, Partial discharge
- 7.5.1, AC Withstand
- 7.5.3, Impulse Withstand
- 7.6, Short Time Current
- 7.11, Current Cycling
- 7.12, Accelerated Sealing Life
- 7.17.1, Test Point Capacitance
- 7.17.2, Test Point Voltage

7.4 Partial Discharge, Objective is verify the partial discharge extinction value is not less than 21.5kV for 28kV test levels as specified in table 2 of the standard. 10 samples tested.

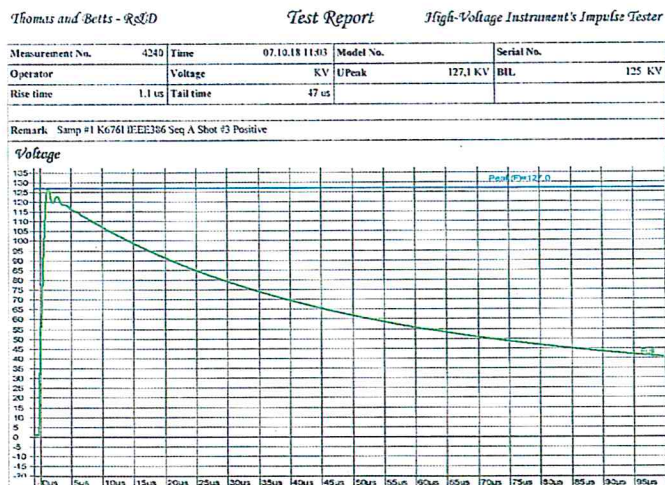
| Sample ID | CIV             | pC Value | CEV     | pC value | Pass/Fail | Product |
|-----------|-----------------|----------|---------|----------|-----------|---------|
| 1         | 40.0kV          | 12pC     | 38.0kV  | 2.5pC    | Pass      | I       |
| 2         | 28.06kV         | 45pC     | 21.67kV | 3.28pC   | Pass      | H       |
| 3         | 37.88kV         | 2nC      | 30.4kV  | 3.23pC   | Pass      | Y       |
| 4         | 45.0kV<br>Clear | N/A      | N/A     | N/A      | Pass      | I       |
| 5         | 23.8kV          | 32pC     | 22.0kV  | 3.15pC   | Pass      | H       |
| 6         | 25.9kV          | 83pC     | 24.5kV  | 2.7pC    | Pass      | I       |
| 7         | 37.37kV         | 30pC     | 32.55kV | 2.5pC    | Pass      | I       |
| 8         | 29.12kV         | 11pC     | 26.37kV | 2.8pC    | Pass      | I       |
| 9         | 45kV Clear      | N/A      | N/A     | N/A      | Pass      | I       |
| 10        | 24.9kV          | 20pC     | 22.6kV  | 3pC      | Pass      | Y       |

7.5.1, AC withstand, Apply 45kV for a one-minute duration.

| Sample ID | Applied Voltage | Pass/Fail |
|-----------|-----------------|-----------|
| 1         | 45.23kV         | Pass      |
| 2         | 45.16kV         | Pass      |
| 3         | 45.38kV         | Pass      |
| 4         | 45.05kV         | Pass      |
| 5         | 45.47kV         | Pass      |
| 6         | 45.37kV         | Pass      |
| 7         | 45.36kV         | Pass      |
| 8         | 45.16kV         | Pass      |
| 9         | 45.45kV         | Pass      |
| 10        | 45.16kV         | Pass      |

**7.5.3 Impulse Withstand**, three shot 125kV positive polarity are applied then three shots at 125kV negative polarity. Half shots are applied during each polarity change.

Sample #1 Shot 3 Positive



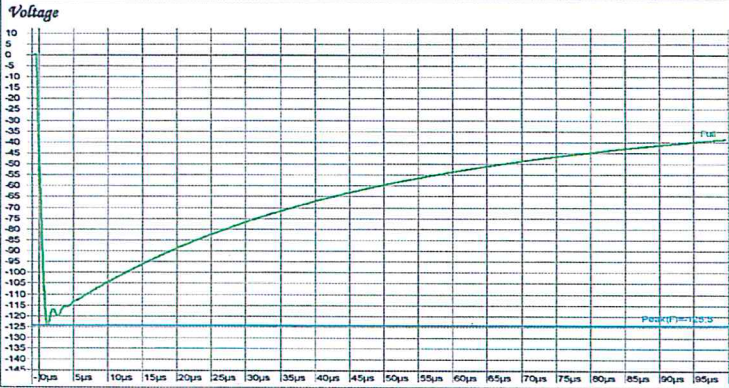


Sample #1 Shot 3 Negative

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|                 |        |           |                |           |           |            |        |
|-----------------|--------|-----------|----------------|-----------|-----------|------------|--------|
| Measurement No. | 4244   | Time      | 07.10.18 11:17 | Model No. |           | Serial No. |        |
| Operator        |        | Voltage   | KV             | UPeak     | -125.6 KV | BIL        | 125 KV |
| Rise time       | 1.1 us | Tail time | 47 us          |           |           |            |        |

Remark    Samp #1 K6761 IEEE386 Seq A Shot #3 Neg

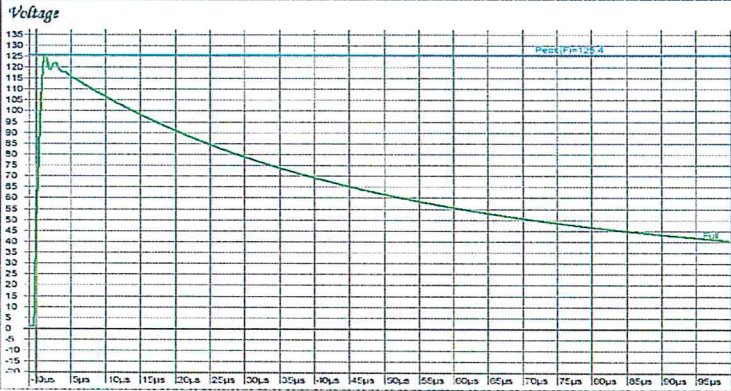


Sample #2 Shot 3 Positive

Thomas and Betts - R&D      Test Report      High-Voltage Instrument's Impulse Tester

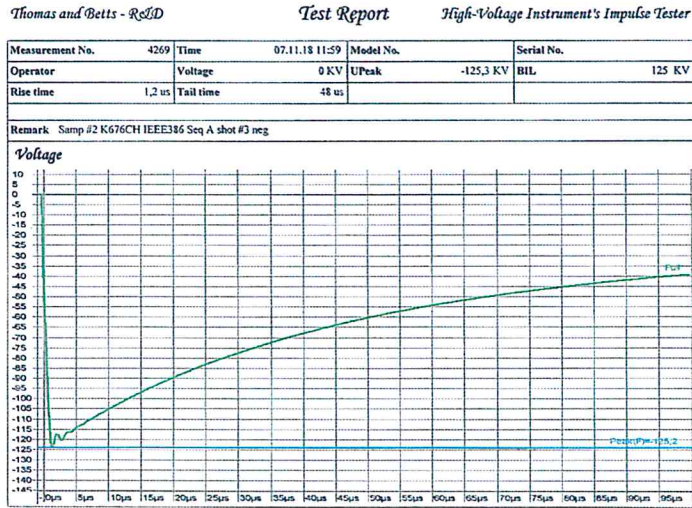
|                 |        |           |                |           |          |            |        |
|-----------------|--------|-----------|----------------|-----------|----------|------------|--------|
| Measurement No. | 4265   | Time      | 07.11.18 11:46 | Model No. |          | Serial No. |        |
| Operator        |        | Voltage   | 0 KV           | UPeak     | 125.4 KV | BIL        | 125 KV |
| Rise time       | 1.2 us | Tail time | 48 us          |           |          |            |        |

Remark    Samp #2 K676CH IEEE386 Seq A shot #3 pos

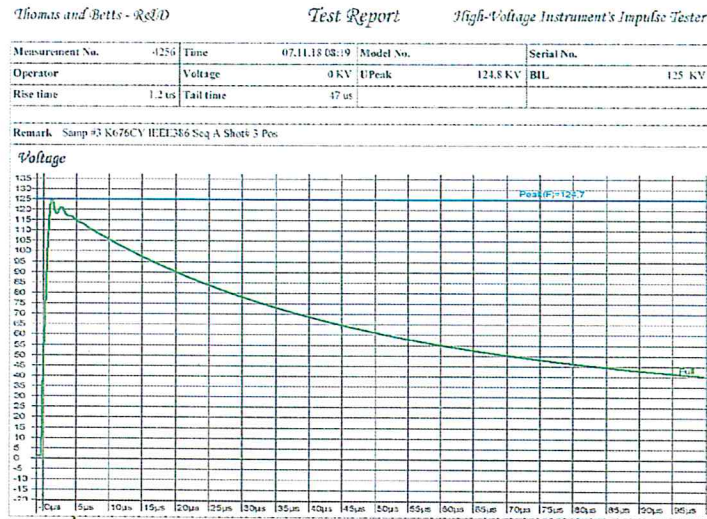




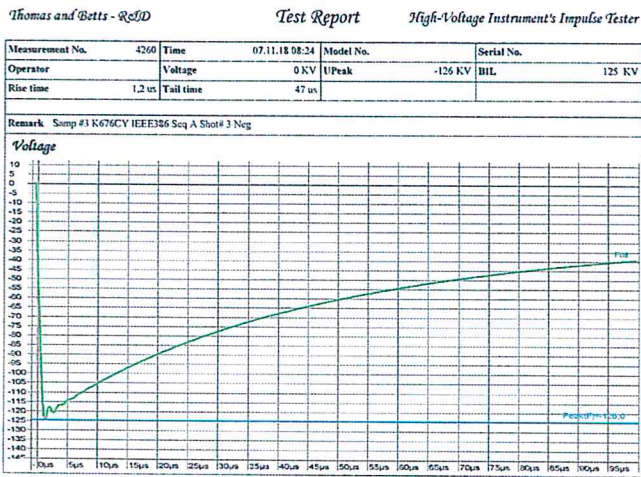
Sample #2 Shot 3 Negative



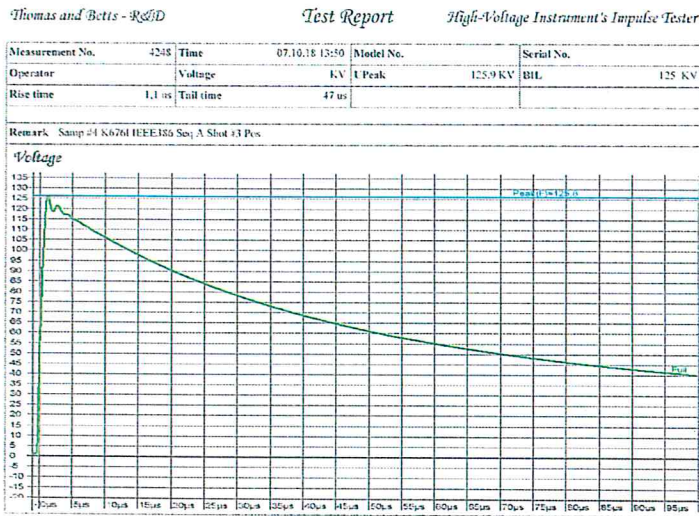
Sample #3 Shot 3 Positive



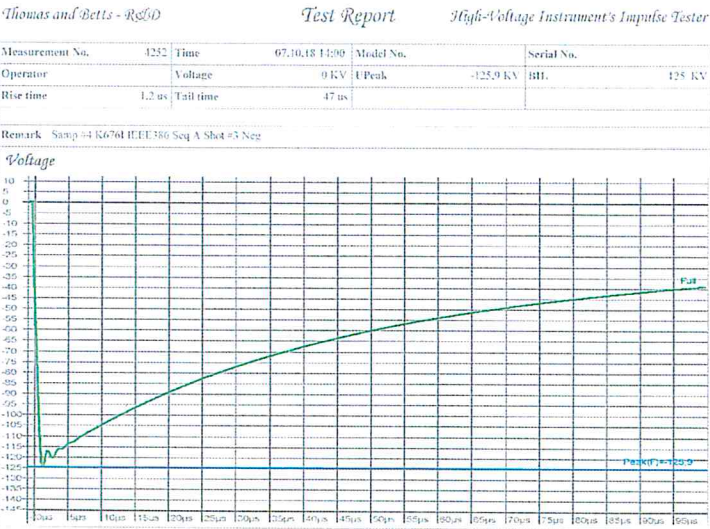
Sample #3 Shot 3 Negative



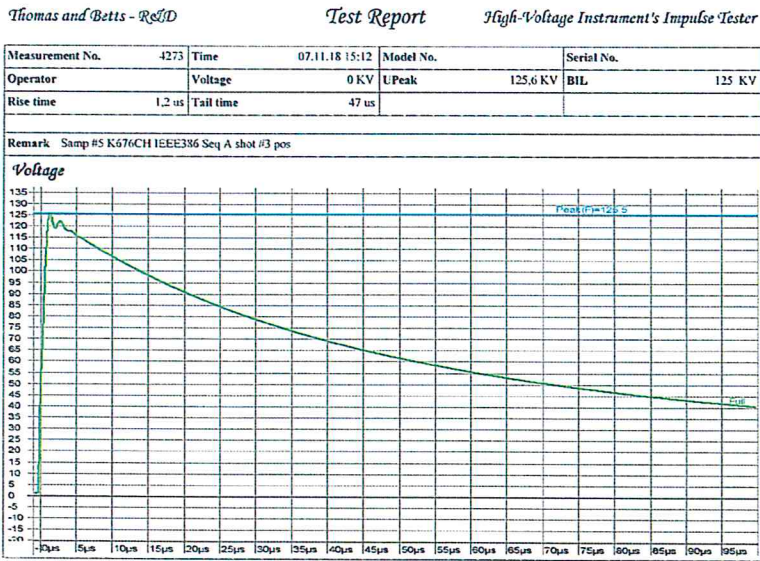
Sample #4 Shot # Positive



Sample #4 Shot 3 Negative

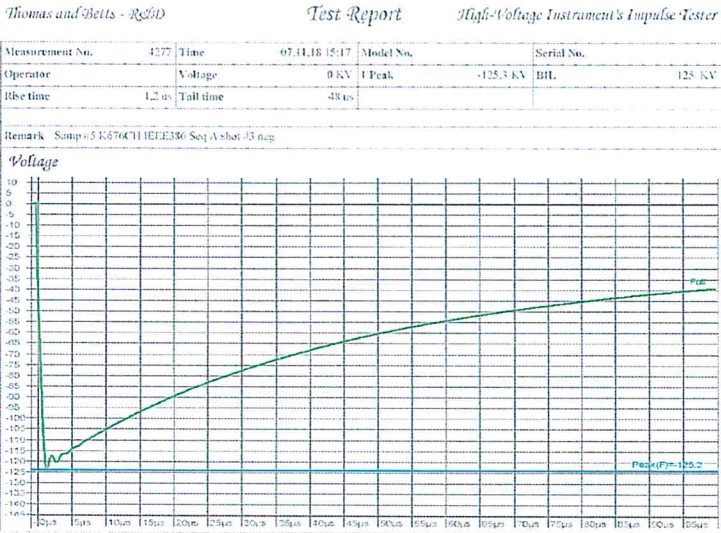


Sample #5 shot 3 Positive

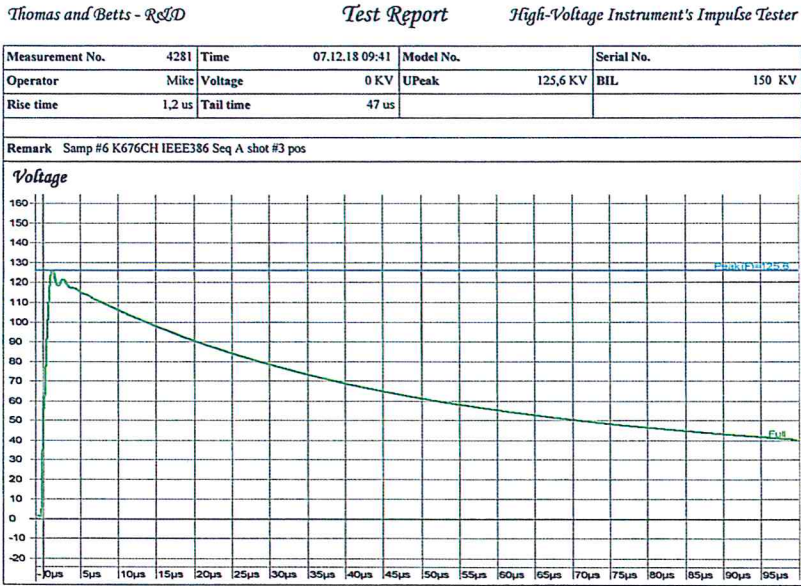




Sample #5 Shot 3 Negative



Sample #6 Shot 3 Positive



Sample #6 Shot 3 Negative

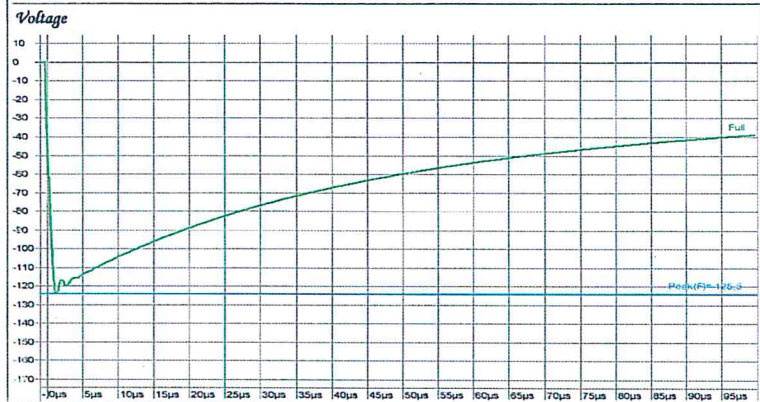
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Test Report

High-Voltage Instrument's Impulse Tester

|                 |        |           |                |           |           |            |        |
|-----------------|--------|-----------|----------------|-----------|-----------|------------|--------|
| Measurement No. | 4285   | Time      | 07.12.18 09:46 | Model No. |           | Serial No. |        |
| Operator        | Mike   | Voltage   | 0 KV           | UPeak     | -125.5 KV | BIL        | 150 KV |
| Rise time       | 1.2 us | Tail time | 47 us          |           |           |            |        |

Remark Samp #6 K676CH IEEE386 Seq A shot #3 neg



Sample #7 Shot 3 Positive

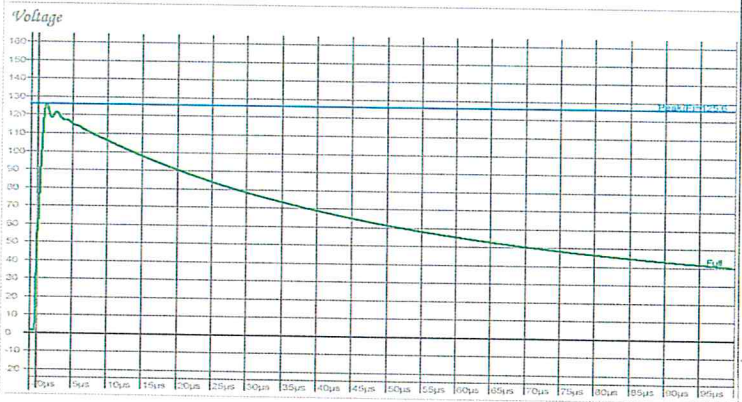
Thomas and Betts - RGLD

Test Report

High-Voltage Instrument's Impulse Tester

|                 |        |           |                |           |          |            |        |
|-----------------|--------|-----------|----------------|-----------|----------|------------|--------|
| Measurement No. | 4289   | Time      | 07.12.18 12:01 | Model No. |          | Serial No. |        |
| Operator        | Mike   | Voltage   | 0 KV           | UPeak     | 125.6 KV | BIL        | 150 KV |
| Rise time       | 1.1 us | Tail time | 47 us          |           |          |            |        |

Remark Samp #7 K676CH IEEE386 Seq A shot #3 pos



Sample #7 Shot 3 Negative

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Test Report

High-Voltage Instrument's Impulse Tester

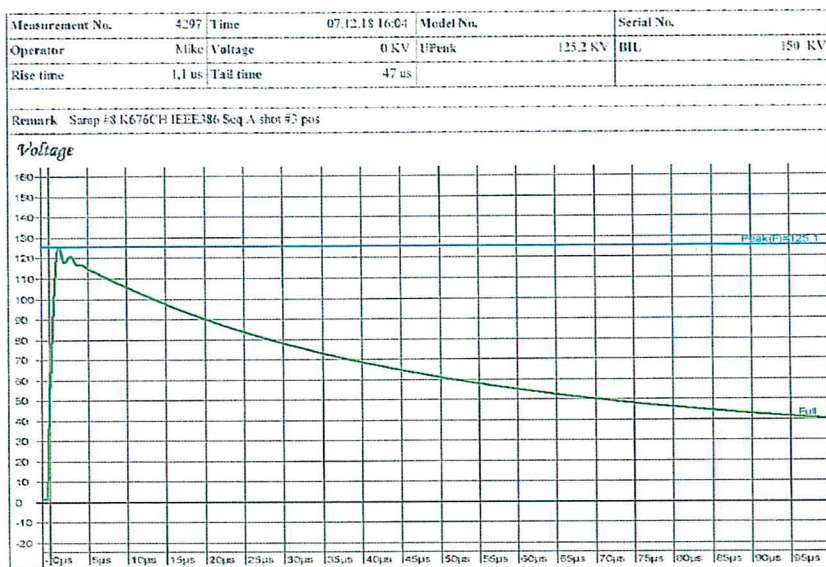


Sample #8 Shot #3 Positive

Thomas and Betts - R&D

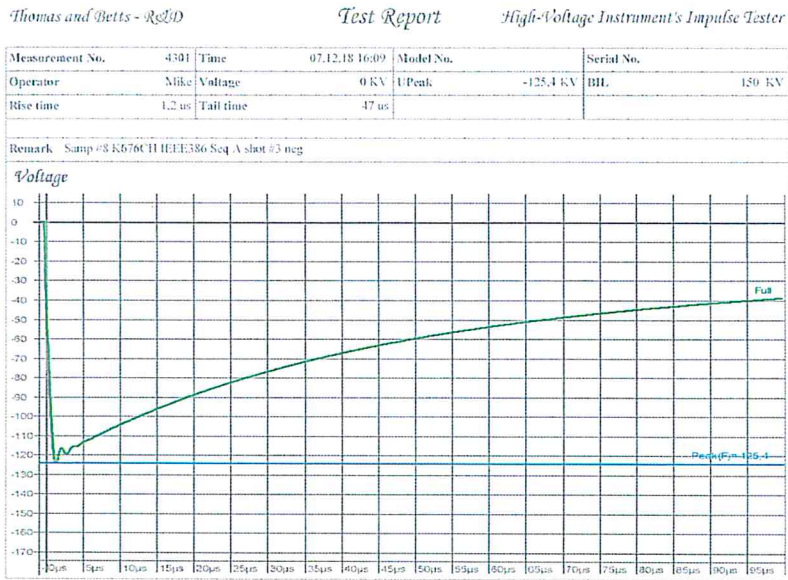
Test Report

High-Voltage Instrument's Impulse Tester

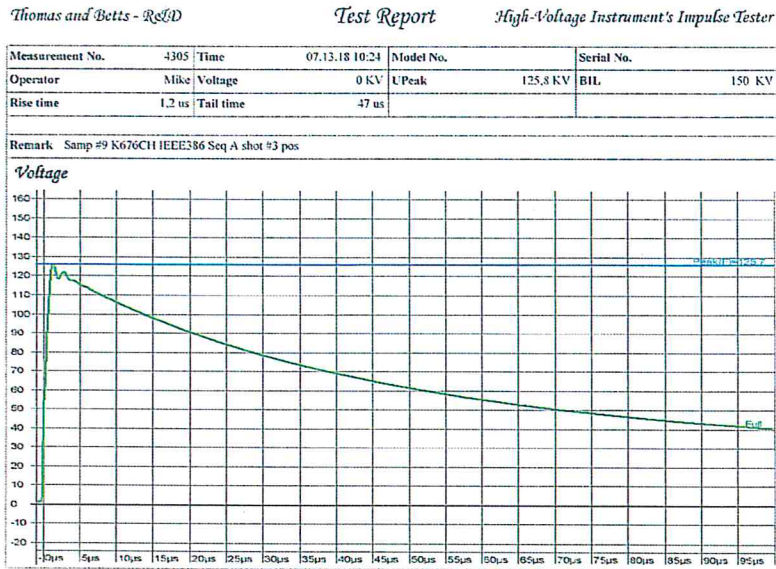




Sample #8 Shot 3 Negative



Sample #9 Shot 3 Positive

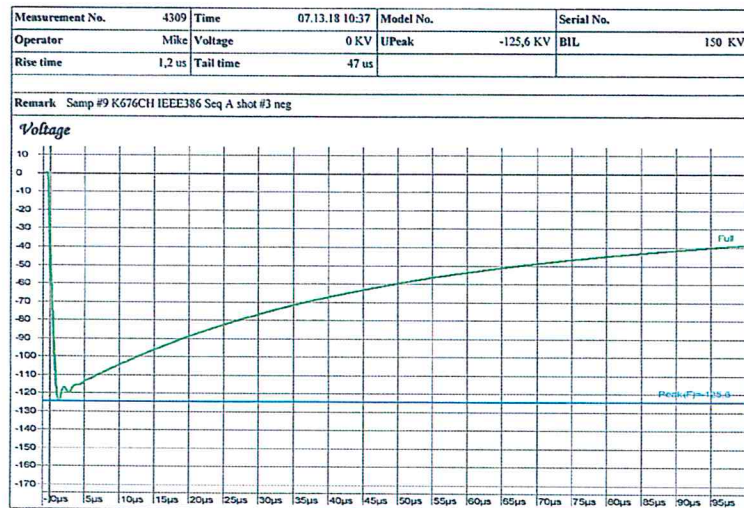


Sample #9 Shot 3 Negative

Thomas and Betts - R&D

Test Report

High-Voltage Instrument's Impulse Tester

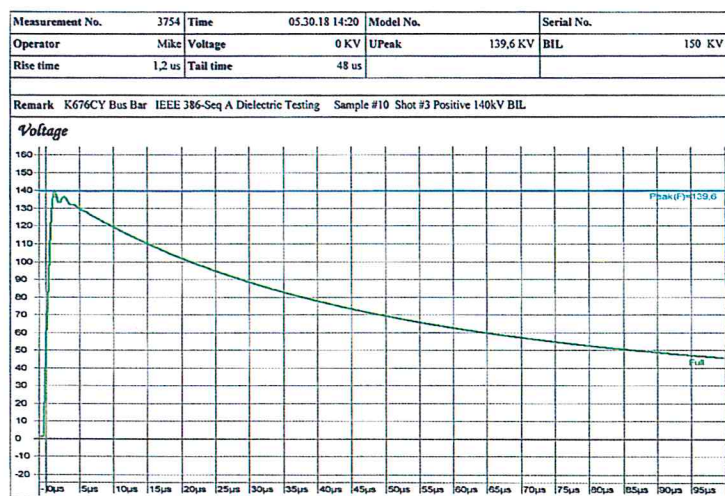


Sample #10 Shot 3 Positive

Thomas and Betts - R&D

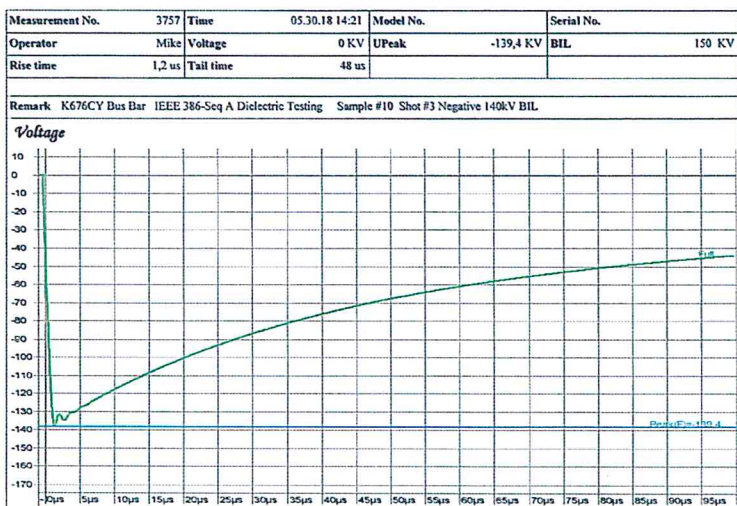
Test Report

High-Voltage Instrument's Impulse Tester



Sample #10 Shot 3 Negative

Thomas and Betts - R&D Test Report High-Voltage Instrument's Impulse Tester



7.17.1 Test Point Voltage,

15kV applied to test rig and capacitive test point tapped with Ross high voltage meter. Readings from Ross meter need to be between 12kV and 18kV

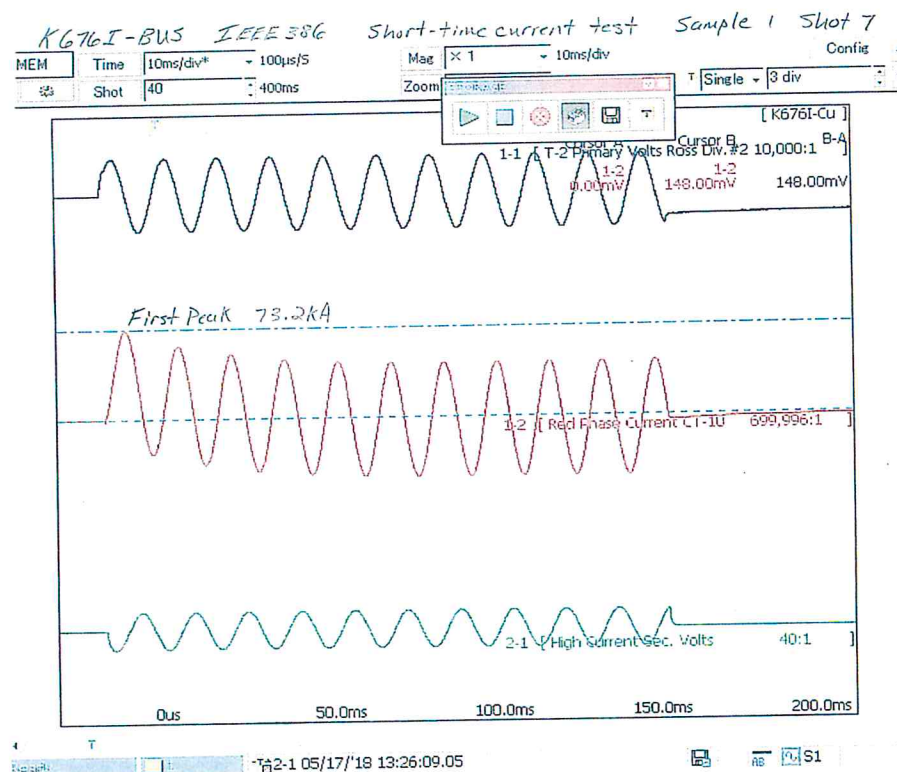
| Sample ID | Applied Voltage | Ross Meter Reading | Pass/ Fail |
|-----------|-----------------|--------------------|------------|
| 1         | 15.14kV         | 14.92kV            | Pass       |
| 2         | 15.04kV         | 16.53kV            | Pass       |
| 3         | 15.13kV         | 14.55kV            | Pass       |
| 4         | 15.23kV         | 13.96kV            | Pass       |
| 5         | 15.14kV         | 15.01kV            | Pass       |
| 6         | 15.13kV         | 13.84kV            | Pass       |
| 7         | 15.12kV         | 14.86kV            | Pass       |
| 8         | 15.25kV         | 15.48kV            | Pass       |
| 9         | 15.36kV         | 15.25kV            | Pass       |
| 10        | 15.45kV         | 17.94kV            | Pass       |



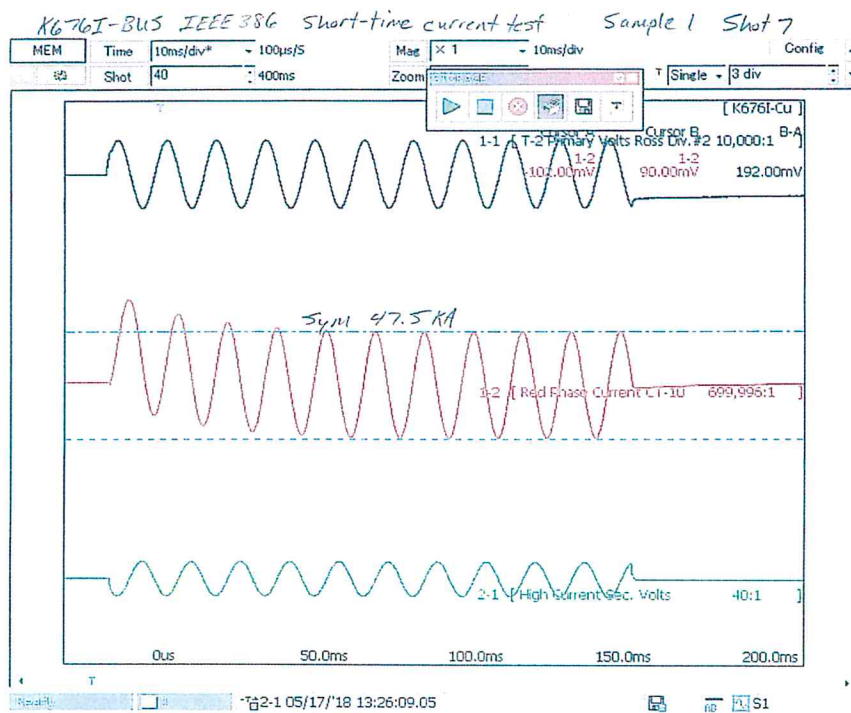
7.6 Short Time Current, Objective was to verify that the connector can withstand a 40kA shot. 4 samples tested.



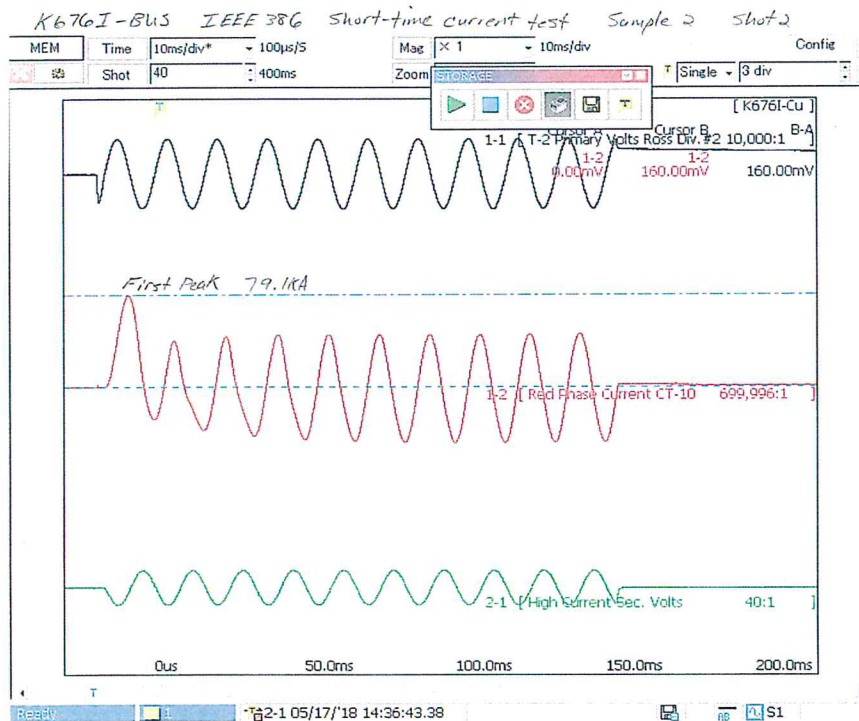
Sample #1 Peak 73.2kA



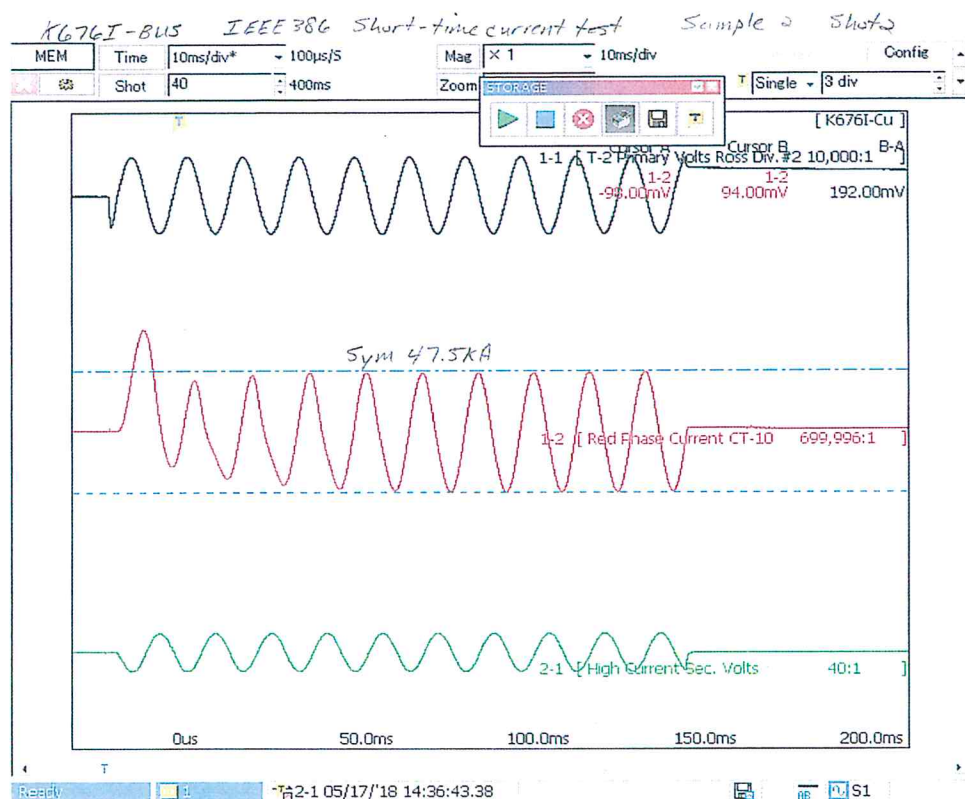
## Sample #1 47.5kA



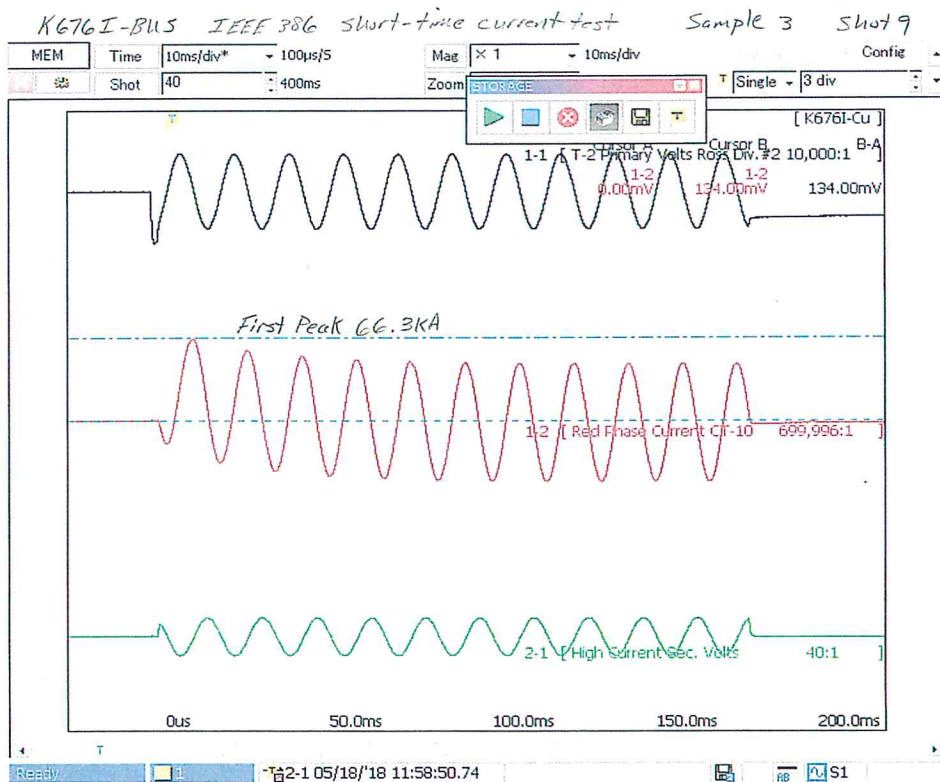
## Sample #2 Peak 79.1kA



Sample # 2 47.5kA

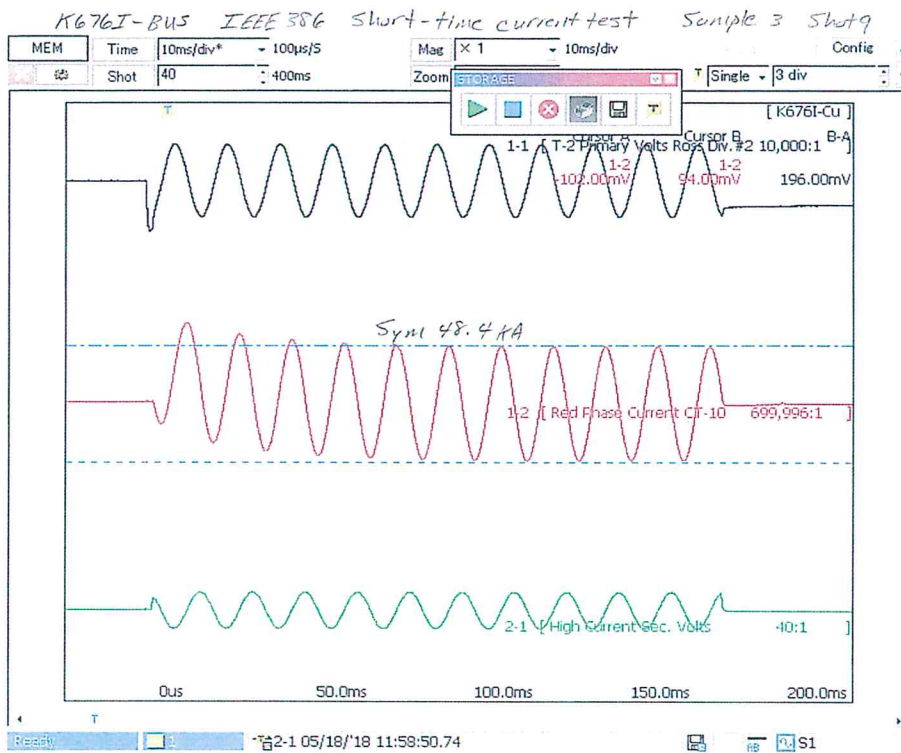


Sample #3 Peak 66.3kA

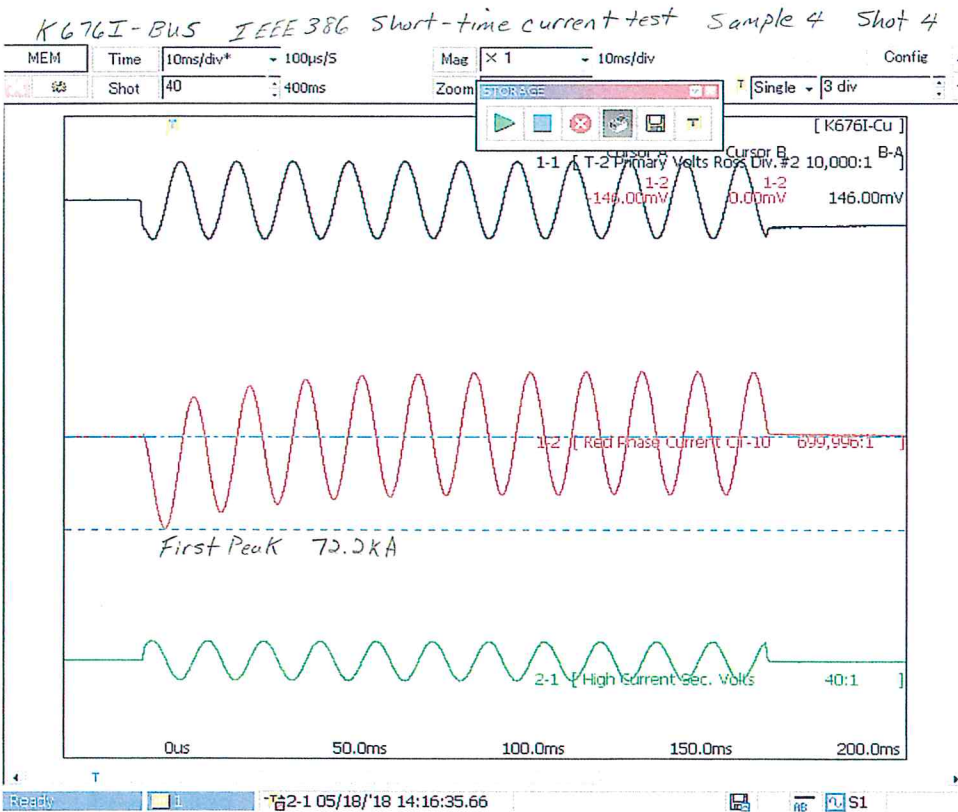




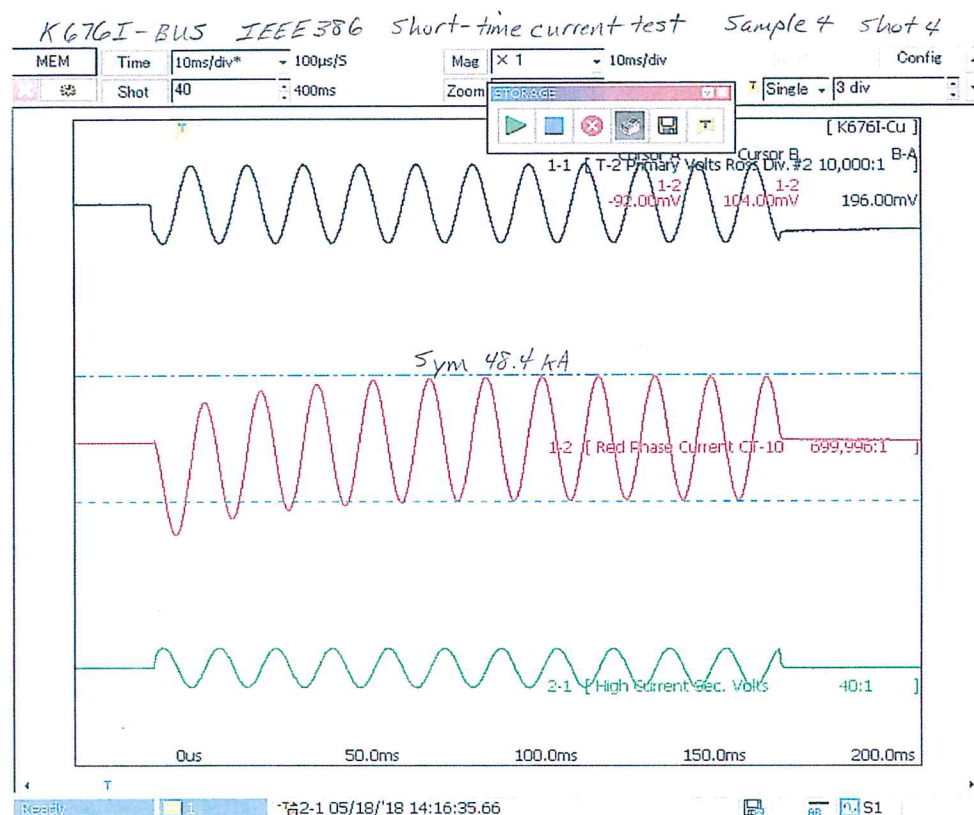
Sample #3 48.4kA



Sample #4 Peak 72.2kA



Sample #4 48.4kA



Four samples were installed on 750 MCM cable and connected via BSR receptacles. Current was raised to bring the control cable to 90° C +/-5°C. 50 cycles were completed and the hottest points were monitored.

[illegible]



| Timestamp             | AC Amps | Control Cable | Amb Temp | Sample #1 Conn 1 | Sample #1 Conn 2 | Sample #2 Conn 1 | Sample #2 Conn 2 | Sample #3 Conn 1 | Sample #3 Conn 2 | Sample #4 Conn 1 | Sample #4 Conn 2 |
|-----------------------|---------|---------------|----------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|
| Day 151 16:54:31 2018 | 16.5 A  | 30.5° C       | 28.2° C  | 31.3° C          | 31.3° C          | 31.3° C          | 31.2° C          | 30.8° C          | 30.8° C          | 30.3° C          | 30.4° C          |
| Cycle #4              |         |               |          |                  |                  |                  |                  |                  |                  |                  |                  |
| Heating Cycle         |         |               |          |                  |                  |                  |                  |                  |                  |                  |                  |
| Day 151 22:54:36 2018 | 1124 A  | 93.2° C       | 29.0° C  | 86.0° C          | 86.0° C          | 84.8° C          | 84.1° C          | 85.2° C          | 84.8° C          | 85.0° C          | 85.2° C          |
| Cooling Cycle         |         |               |          |                  |                  |                  |                  |                  |                  |                  |                  |
| Day 152 5:05:03 2018  | 6.5 A   | 28.6° C       | 26.1° C  | 28.6° C          | 28.6° C          | 28.7° C          | 28.6° C          | 28.4° C          | 28.4° C          | 27.8° C          | 27.8° C          |
| Cycle #5              |         |               |          |                  |                  |                  |                  |                  |                  |                  |                  |
| Heating Cycle         |         |               |          |                  |                  |                  |                  |                  |                  |                  |                  |
| Day 152 11:04:27 2018 | 1118 A  | 94.1° C       | 30.7° C  | 87.2° C          | 87.2° C          | 86.1° C          | 85.4° C          | 85.7° C          | 85.4° C          | 86.0° C          | 86.1° C          |
| Cooling Cycle         |         |               |          |                  |                  |                  |                  |                  |                  |                  |                  |
| Day 152 17:03:59 2018 | 7.6 A   | 31.7° C       | 29.7° C  | 32.9° C          | 32.9° C          | 32.8° C          | 32.7° C          | 32.2° C          | 32.2° C          | 31.8° C          | 31.8° C          |
| Cycle #6              |         |               |          |                  |                  |                  |                  |                  |                  |                  |                  |
| Heating Cycle         |         |               |          |                  |                  |                  |                  |                  |                  |                  |                  |
| Day 152 23:04:23 2018 | 1124 A  | 94.1° C       | 29.6° C  | 87.1° C          | 87.1° C          | 85.9° C          | 85.6° C          | 85.8° C          | 85.5° C          | 85.8° C          | 86.0° C          |
| Cooling Cycle         |         |               |          |                  |                  |                  |                  |                  |                  |                  |                  |
| Day 153 5:15:50 2018  | 7.0 A   | 28.8° C       | 26.2° C  | 28.7° C          | 28.7° C          | 28.9° C          | 28.8° C          | 28.6° C          | 28.6° C          | 28.0° C          | 28.0° C          |
| Cycle #7              |         |               |          |                  |                  |                  |                  |                  |                  |                  |                  |
| Heating Cycle         |         |               |          |                  |                  |                  |                  |                  |                  |                  |                  |
| Day 153 11:14:55 2018 | 1120 A  | 94.1° C       | 30.9° C  | 87.1° C          | 87.1° C          | 86.0° C          | 85.3° C          | 85.5° C          | 85.2° C          | 85.5° C          | 85.7° C          |
| Cooling Cycle         |         |               |          |                  |                  |                  |                  |                  |                  |                  |                  |
| Day 153 17:13:54 2018 | 7.1 A   | 31.4° C       | 29.4° C  | 32.3° C          | 32.3° C          | 32.2° C          | 32.1° C          | 31.6° C          | 31.6° C          | 31.3° C          | 31.3° C          |
| Cycle #8              |         |               |          |                  |                  |                  |                  |                  |                  |                  |                  |
| Heating Cycle         |         |               |          |                  |                  |                  |                  |                  |                  |                  |                  |
| Day 153 23:14:25 2018 | 1123 A  | 93.7° C       | 29.6° C  | 86.8° C          | 86.8° C          | 85.6° C          | 85.2° C          | 85.5° C          | 85.3° C          | 85.6° C          | 85.7° C          |
| Cooling Cycle         |         |               |          |                  |                  |                  |                  |                  |                  |                  |                  |
| Day 154 5:26:12 2018  | 7.9 A   | 28.8° C       | 26.2° C  | 28.8° C          | 28.8° C          | 28.9° C          | 28.9° C          | 28.6° C          | 28.6° C          | 28.0° C          | 27.9° C          |
| Cycle #9              |         |               |          |                  |                  |                  |                  |                  |                  |                  |                  |
| Heating Cycle         |         |               |          |                  |                  |                  |                  |                  |                  |                  |                  |
| Day 154 11:24:52 2018 | 1116 A  | 92.1° C       | 28.4° C  | 85.2° C          | 85.2° C          | 83.9° C          | 83.4° C          | 84.1° C          | 83.9° C          | 84.3° C          | 84.3° C          |
| Cooling Cycle         |         |               |          |                  |                  |                  |                  |                  |                  |                  |                  |
| Day 154 17:24:13 2018 | 7.3 A   | 28.9° C       | 26.3° C  | 29.3° C          | 29.3° C          | 29.3° C          | 29.2° C          | 29.0° C          | 29.0° C          | 28.5° C          | 28.4° C          |
| Cycle #10             |         |               |          |                  |                  |                  |                  |                  |                  |                  |                  |
| Heating Cycle         |         |               |          |                  |                  |                  |                  |                  |                  |                  |                  |
| Day 154 23:24:37 2018 | 1122 A  | 91.5° C       | 27.1° C  | 83.9° C          | 83.9° C          | 82.8° C          | 82.2° C          | 83.4° C          | 83.0° C          | 83.1° C          | 83.2° C          |
| Cooling Cycle         |         |               |          |                  |                  |                  |                  |                  |                  |                  |                  |
| Day 155 5:34:58 2018  | 6.7 A   | 26.9° C       | 24.3° C  | 26.8° C          | 26.8° C          | 27.0° C          | 26.9° C          | 26.8° C          | 26.8° C          | 26.1° C          | 26.0° C          |
| Cycle #11             |         |               |          |                  |                  |                  |                  |                  |                  |                  |                  |
| Heating Cycle         |         |               |          |                  |                  |                  |                  |                  |                  |                  |                  |
| Day 155 11:34:09 2018 | 1116 A  | 93.0° C       | 30.0° C  | 86.4° C          | 86.3° C          | 85.1° C          | 84.5° C          | 84.8° C          | 84.5° C          | 84.9° C          | 84.9° C          |
| Cooling Cycle         |         |               |          |                  |                  |                  |                  |                  |                  |                  |                  |
| Day 155 17:34:50 2018 | 6.7 A   | 29.7° C       | 27.0° C  | 31.1° C          | 31.2° C          | 31.2° C          | 31.1° C          | 30.7° C          | 30.7° C          | 30.2° C          | 30.2° C          |



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[illegible]



|                       |         | Cable         | Temp     | Conn 1           | #1 Conn 2        | #2 Conn 1        | #2 Conn 2        | #3 Conn 1        | #3 Conn 2        | Conn 1           | #4 Conn 2        |
|-----------------------|---------|---------------|----------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|
| Heating Cycle         |         |               |          |                  |                  |                  |                  |                  |                  |                  |                  |
| Day 160 0:25:07 2018  | 1119 A  | 93.9° C       | 30.2° C  | 86.8° C          | 86.7° C          | 85.3° C          | 84.8° C          | 86.1° C          | 85.8° C          | 85.9° C          | 85.9° C          |
| Cooling Cycle         |         |               |          |                  |                  |                  |                  |                  |                  |                  |                  |
| Day 160 6:35:50 2018  | 8.2 A   | 28.1° C       | 25.6° C  | 28.0° C          | 28.0° C          | 28.1° C          | 28.1° C          | 27.9° C          | 27.9° C          | 27.2° C          | 27.1° C          |
| Cycle #21             |         |               |          |                  |                  |                  |                  |                  |                  |                  |                  |
| Heating Cycle         |         |               |          |                  |                  |                  |                  |                  |                  |                  |                  |
| Day 160 12:35:07 2018 | 1120 A  | 93.6° C       | 30.5° C  | 87.3° C          | 87.3° C          | 86.0° C          | 85.3° C          | 85.4° C          | 85.2° C          | 85.6° C          | 86.0° C          |
| Cooling Cycle         |         |               |          |                  |                  |                  |                  |                  |                  |                  |                  |
| Day 160 18:34:28 2018 | 7.1 A   | 30.2° C       | 27.9° C  | 31.2° C          | 31.1° C          | 31.1° C          | 31.0° C          | 30.5° C          | 30.5° C          | 30.1° C          | 30.2° C          |
| Cycle #22             |         |               |          |                  |                  |                  |                  |                  |                  |                  |                  |
| Heating Cycle         |         |               |          |                  |                  |                  |                  |                  |                  |                  |                  |
| Day 161 0:34:49 2018  | 1119 A  | 92.3° C       | 28.6° C  | 85.2° C          | 85.2° C          | 83.7° C          | 83.2° C          | 84.6° C          | 84.3° C          | 84.4° C          | 84.5° C          |
| Cooling Cycle         |         |               |          |                  |                  |                  |                  |                  |                  |                  |                  |
| Day 161 6:46:39 2018  | 6.8 A   | 27.6° C       | 25.1° C  | 27.6° C          | 27.6° C          | 27.7° C          | 27.7° C          | 27.5° C          | 27.5° C          | 26.9° C          | 26.7° C          |
| Cycle #23             |         |               |          |                  |                  |                  |                  |                  |                  |                  |                  |
| Heating Cycle         |         |               |          |                  |                  |                  |                  |                  |                  |                  |                  |
| Day 176 19:22:09 2018 | 1070 A  | 93.9° C       | 32.1° C  | 87.8° C          | 87.9° C          | 86.9° C          | 86.4° C          | 86.1° C          | 85.9° C          | 86.1° C          | 86.2° C          |
| Cooling Cycle         |         |               |          |                  |                  |                  |                  |                  |                  |                  |                  |
| Day 177 1:20:56 2018  | 8.2 A   | 29.1° C       | 26.0° C  | 29.1° C          | 29.1° C          | 29.4° C          | 29.3° C          | 29.0° C          | 29.0° C          | 28.5° C          | 28.4° C          |
| Cycle #24             |         |               |          |                  |                  |                  |                  |                  |                  |                  |                  |
| Heating Cycle         |         |               |          |                  |                  |                  |                  |                  |                  |                  |                  |
| Day 178 8:34:12 2018  | 1073 A  | 90.7° C       | 29.2° C  | 83.4° C          | 83.5° C          | 82.6° C          | 82.1° C          | 82.5° C          | 82.2° C          | 82.3° C          | 82.4° C          |
| Cooling Cycle         |         |               |          |                  |                  |                  |                  |                  |                  |                  |                  |
| Day 178 14:34:23 2018 | 12.9 A  | 29.8° C       | 28.0° C  | 30.5° C          | 30.5° C          | 30.5° C          | 30.5° C          | 30.0° C          | 30.0° C          | 29.6° C          | 29.6° C          |
| Cycle #25             |         |               |          |                  |                  |                  |                  |                  |                  |                  |                  |
| Heating Cycle         |         |               |          |                  |                  |                  |                  |                  |                  |                  |                  |
| Day 178 20:34:10 2018 | 1070 A  | 91.3° C       | 29.2° C  | 84.1° C          | 84.1° C          | 83.1° C          | 82.6° C          | 83.5° C          | 83.2° C          | 83.2° C          | 83.3° C          |
| Cooling Cycle         |         |               |          |                  |                  |                  |                  |                  |                  |                  |                  |
| Day 179 2:34:30 2018  | 7.5 A   | 28.4° C       | 26.1° C  | 28.4° C          | 28.4° C          | 28.6° C          | 28.5° C          | 28.3° C          | 28.3° C          | 27.8° C          | 27.7° C          |
| Cycle #26             |         |               |          |                  |                  |                  |                  |                  |                  |                  |                  |
| Heating Cycle         |         |               |          |                  |                  |                  |                  |                  |                  |                  |                  |
| Day 179 8:34:04 2018  | 1069 A  | 90.9° C       | 29.3° C  | 83.8° C          | 83.9° C          | 82.9° C          | 82.5° C          | 82.7° C          | 82.4° C          | 82.6° C          | 82.7° C          |
| Cooling Cycle         |         |               |          |                  |                  |                  |                  |                  |                  |                  |                  |
| Day 179 14:44:13 2018 | 19.3 A  | 31.6° C       | 29.7° C  | 32.8° C          | 32.8° C          | 32.6° C          | 32.5° C          | 31.9° C          | 31.9° C          | 31.7° C          | 31.7° C          |
| Cycle #27             |         |               |          |                  |                  |                  |                  |                  |                  |                  |                  |
| Heating Cycle         |         |               |          |                  |                  |                  |                  |                  |                  |                  |                  |
| Day 179 20:43:57 2018 | 1072 A  | 93.8° C       | 32.0° C  | 87.3° C          | 87.3° C          | 86.3° C          | 85.9° C          | 85.7° C          | 85.5° C          | 85.7° C          | 85.8° C          |
| Cooling Cycle         |         |               |          |                  |                  |                  |                  |                  |                  |                  |                  |
| Day 180 2:44:27 2018  | 16.8 A  | 29.6° C       | 26.9° C  | 29.6° C          | 29.6° C          | 29.8° C          | 29.7° C          | 29.4° C          | 29.4° C          | 28.9° C          | 28.8° C          |
| Cycle #28             |         |               |          |                  |                  |                  |                  |                  |                  |                  |                  |
| Heating Cycle         |         |               |          |                  |                  |                  |                  |                  |                  |                  |                  |
| Timestamp             | AC Amps | Control Cable | Amb Temp | Sample #1 Conn 1 | Sample #1 Conn 2 | Sample #2 Conn 1 | Sample #2 Conn 2 | Sample #3 Conn 1 | Sample #3 Conn 2 | Sample #4 Conn 1 | Sample #4 Conn 2 |



|                       |         |               |          |                  |                  |                  |                |                |                |                  |           |
|-----------------------|---------|---------------|----------|------------------|------------------|------------------|----------------|----------------|----------------|------------------|-----------|
|                       |         |               |          |                  |                  |                  | 2              | 1              | 2              |                  | Conn 2    |
| Day 180 8:44:08 2018  | 1067 A  | 91.1° C       | 29.7° C  | 83.6° C          | 83.7° C          | 82.8° C          | 82.3° C        | 82.6° C        | 82.3° C        | 82.5° C          | 82.6° C   |
| Cooling Cycle         |         |               |          |                  |                  |                  |                |                |                |                  |           |
| Day 180 14:44:26 2018 | 7.8 A   | 32.6° C       | 30.7° C  | 34.0° C          | 33.9° C          | 33.8° C          | 33.6° C        | 33.0° C        | 33.0° C        | 32.7° C          | 32.8° C   |
| Cycle #29             |         |               |          |                  |                  |                  |                |                |                |                  |           |
| Heating Cycle         |         |               |          |                  |                  |                  |                |                |                |                  |           |
| Day 180 20:44:03 2018 | 1068 A  | 94.3° C       | 32.1° C  | 87.6° C          | 87.6° C          | 86.7° C          | 86.2° C        | 85.9° C        | 85.8° C        | 86.0° C          | 86.1° C   |
| Cooling Cycle         |         |               |          |                  |                  |                  |                |                |                |                  |           |
| Day 181 2:44:21 2018  | 12.7 A  | 29.9° C       | 27.1° C  | 29.8° C          | 29.9° C          | 30.1° C          | 30.0° C        | 29.7° C        | 29.7° C        | 29.2° C          | 29.1° C   |
| Cycle 30              |         |               |          |                  |                  |                  |                |                |                |                  |           |
| Heating Cycle         |         |               |          |                  |                  |                  |                |                |                |                  |           |
| Day 181 8:44:02 2018  | 1071 A  | 90.8° C       | 29.0° C  | 83.0° C          | 83.2° C          | 82.2° C          | 81.8° C        | 82.3° C        | 82.0° C        | 82.2° C          | 82.2° C   |
| Cooling Cycle         |         |               |          |                  |                  |                  |                |                |                |                  |           |
| Day 181 14:54:02 2018 | 17.2 A  | 31.3° C       | 29.2° C  | 32.3° C          | 32.3° C          | 32.2° C          | 32.0° C        | 31.5° C        | 31.5° C        | 31.2° C          | 31.2° C   |
| Cycle #31             |         |               |          |                  |                  |                  |                |                |                |                  |           |
| Heating Cycle         |         |               |          |                  |                  |                  |                |                |                |                  |           |
| Day 181 20:54:12 2018 | 1068 A  | 93.3° C       | 31.4° C  | 86.7° C          | 86.8° C          | 85.9° C          | 85.4° C        | 85.0° C        | 84.9° C        | 85.2° C          | 85.3° C   |
| Cooling Cycle         |         |               |          |                  |                  |                  |                |                |                |                  |           |
| Day 182 2:54:19 2018  | 7.8 A   | 29.6° C       | 27.0° C  | 29.6° C          | 29.7° C          | 29.8° C          | 29.8° C        | 29.4° C        | 29.4° C        | 28.9° C          | 28.9° C   |
| Cycle #32             |         |               |          |                  |                  |                  |                |                |                |                  |           |
| Heating Cycle         |         |               |          |                  |                  |                  |                |                |                |                  |           |
| Day 182 8:54:03 2018  | 1070 A  | 90.9° C       | 29.3° C  | 83.4° C          | 83.5° C          | 82.5° C          | 82.1° C        | 82.6° C        | 82.3° C        | 82.4° C          | 82.5° C   |
| Cooling Cycle         |         |               |          |                  |                  |                  |                |                |                |                  |           |
| Day 182 14:54:29 2018 | 7.8 A   | 31.5° C       | 29.6° C  | 32.8° C          | 32.6° C          | 32.4° C          | 32.3° C        | 31.7° C        | 31.8° C        | 31.6° C          | 31.7° C   |
| Cycle #33             |         |               |          |                  |                  |                  |                |                |                |                  |           |
| Heating Cycle         |         |               |          |                  |                  |                  |                |                |                |                  |           |
| Day 182 20:54:09 2018 | 1067 A  | 93.5° C       | 31.7° C  | 86.9° C          | 87.0° C          | 85.9° C          | 85.4° C        | 85.2° C        | 85.0° C        | 85.3° C          | 85.4° C   |
| Cooling Cycle         |         |               |          |                  |                  |                  |                |                |                |                  |           |
| Day 183 2:54:23 2018  | 7.9 A   | 29.8° C       | 27.2° C  | 29.9° C          | 29.9° C          | 30.1° C          | 30.0° C        | 29.7° C        | 29.7° C        | 29.2° C          | 29.2° C   |
| Cycle #34             |         |               |          |                  |                  |                  |                |                |                |                  |           |
| Heating Cycle         |         |               |          |                  |                  |                  |                |                |                |                  |           |
| Day 183 8:54:12 2018  | 1070 A  | 91.9° C       | 30.7° C  | 85.0° C          | 85.0° C          | 84.1° C          | 83.5° C        | 83.6° C        | 83.4° C        | 83.6° C          | 83.7° C   |
| Cooling Cycle         |         |               |          |                  |                  |                  |                |                |                |                  |           |
| Day 183 15:03:58 2018 | 7.9 A   | 33.4° C       | 31.6° C  | 35.0° C          | 34.9° C          | 34.8° C          | 34.6° C        | 34.0° C        | 34.0° C        | 33.8° C          | 33.8° C   |
| Cycle #35             |         |               |          |                  |                  |                  |                |                |                |                  |           |
| Heating Cycle         |         |               |          |                  |                  |                  |                |                |                |                  |           |
| Day 183 21:04:03 2018 | 1070 A  | 94.9° C       | 33.2° C  | 88.4° C          | 88.5° C          | 87.6° C          | 87.1° C        | 86.8° C        | 86.6° C        | 86.9° C          | 87.0° C   |
| Cooling Cycle         |         |               |          |                  |                  |                  |                |                |                |                  |           |
| Day 184 3:04:27 2018  | 8.1 A   | 31.1° C       | 28.4° C  | 31.1° C          | 31.1° C          | 31.3° C          | 31.2° C        | 30.8° C        | 30.8° C        | 30.3° C          | 30.3° C   |
| Cycle #36             |         |               |          |                  |                  |                  |                |                |                |                  |           |
| Heating Cycle         |         |               |          |                  |                  |                  |                |                |                |                  |           |
| Day 184 9:03:57 2018  | 1073 A  | 93.0° C       | 31.7° C  | 86.1° C          | 86.0° C          | 85.2° C          | 84.7° C        | 84.6° C        | 84.4° C        | 84.5° C          | 84.7° C   |
| Timestamp             | AC Amps | Control Cable | Amb Temp | Sample #1 Conn 1 | Sample #1 Conn 2 | Sample #2 Conn 1 | Sample #2 Conn | Sample #3 Conn | Sample #3 Conn | Sample #4 Conn 1 | Sample #4 |



|                       |         |               |          |                  |                  |                  |                  |                  |                  |                  |                  |
|-----------------------|---------|---------------|----------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|
|                       |         |               |          |                  |                  |                  | 2                | 1                | 2                |                  | Conn 2           |
| Cooling Cycle         |         |               |          |                  |                  |                  |                  |                  |                  |                  |                  |
| Day 184 15:04:28 2018 | 8.1 A   | 34.2° C       | 32.2° C  | 35.8° C          | 35.7° C          | 35.5° C          | 35.4° C          | 34.7° C          | 34.7° C          | 34.5° C          | 34.6° C          |
| Cycle #37             |         |               |          |                  |                  |                  |                  |                  |                  |                  |                  |
| Heating Cycle         |         |               |          |                  |                  |                  |                  |                  |                  |                  |                  |
| Day 184 21:03:48 2018 | 1071 A  | 95.3° C       | 33.5° C  | 88.8° C          | 88.8° C          | 87.9° C          | 87.4° C          | 87.2° C          | 87.0° C          | 87.2° C          | 87.3° C          |
| Cooling Cycle         |         |               |          |                  |                  |                  |                  |                  |                  |                  |                  |
| Day 185 3:04:13 2018  | 8.1 A   | 31.4° C       | 28.6° C  | 31.4° C          | 31.5° C          | 31.6° C          | 31.6° C          | 31.2° C          | 31.2° C          | 30.7° C          | 30.7° C          |
| Cycle #38             |         |               |          |                  |                  |                  |                  |                  |                  |                  |                  |
| Heating Cycle         |         |               |          |                  |                  |                  |                  |                  |                  |                  |                  |
| Day 185 9:04:08 2018  | 1074 A  | 92.1° C       | 30.6° C  | 85.0° C          | 85.0° C          | 84.0° C          | 83.6° C          | 84.2° C          | 83.9° C          | 83.9° C          | 84.0° C          |
| Cooling Cycle         |         |               |          |                  |                  |                  |                  |                  |                  |                  |                  |
| Day 185 15:14:23 2018 | 17.2 A  | 31.7° C       | 29.6° C  | 32.8° C          | 32.7° C          | 32.6° C          | 32.5° C          | 32.0° C          | 32.1° C          | 31.8° C          | 31.8° C          |
| Cycle #39             |         |               |          |                  |                  |                  |                  |                  |                  |                  |                  |
| Heating Cycle         |         |               |          |                  |                  |                  |                  |                  |                  |                  |                  |
| Day 185 21:14:00 2018 | 1069 A  | 92.1° C       | 30.5° C  | 85.3° C          | 85.4° C          | 84.3° C          | 83.9° C          | 84.4° C          | 84.1° C          | 84.2° C          | 84.3° C          |
| Cooling Cycle         |         |               |          |                  |                  |                  |                  |                  |                  |                  |                  |
| Day 186 3:13:45 2018  | 7.8 A   | 29.6° C       | 27.3° C  | 29.6° C          | 29.7° C          | 29.8° C          | 29.7° C          | 29.5° C          | 29.5° C          | 29.0° C          | 28.9° C          |
| Cycle #40             |         |               |          |                  |                  |                  |                  |                  |                  |                  |                  |
| Heating Cycle         |         |               |          |                  |                  |                  |                  |                  |                  |                  |                  |
| Day 186 9:13:49 2018  | 1067 A  | 91.9° C       | 31.0° C  | 85.2° C          | 85.4° C          | 84.4° C          | 83.9° C          | 83.9° C          | 83.6° C          | 83.9° C          | 84.0° C          |
| Cooling Cycle         |         |               |          |                  |                  |                  |                  |                  |                  |                  |                  |
| Day 186 15:14:14 2018 | 8.2 A   | 33.2° C       | 31.1° C  | 34.7° C          | 34.6° C          | 34.5° C          | 34.3° C          | 33.7° C          | 33.7° C          | 33.5° C          | 33.5° C          |
| Cycle #41             |         |               |          |                  |                  |                  |                  |                  |                  |                  |                  |
| Heating Cycle         |         |               |          |                  |                  |                  |                  |                  |                  |                  |                  |
| Day 186 21:13:45 2018 | 1070 A  | 94.0° C       | 32.5° C  | 87.5° C          | 87.5° C          | 86.6° C          | 86.1° C          | 86.0° C          | 85.7° C          | 86.0° C          | 86.0° C          |
| Cooling Cycle         |         |               |          |                  |                  |                  |                  |                  |                  |                  |                  |
| Day 187 3:24:07 2018  | 13.1 A  | 30.7° C       | 28.2° C  | 30.7° C          | 30.7° C          | 30.8° C          | 30.7° C          | 30.4° C          | 30.4° C          | 29.9° C          | 29.9° C          |
| Cycle #42             |         |               |          |                  |                  |                  |                  |                  |                  |                  |                  |
| Heating Cycle         |         |               |          |                  |                  |                  |                  |                  |                  |                  |                  |
| Day 187 9:23:55 2018  | 1069 A  | 92.8° C       | 31.2° C  | 86.2° C          | 86.2° C          | 85.2° C          | 84.8° C          | 84.8° C          | 84.5° C          | 84.8° C          | 84.8° C          |
| Cooling Cycle         |         |               |          |                  |                  |                  |                  |                  |                  |                  |                  |
| Day 187 15:24:11 2018 | 13.2 A  | 32.2° C       | 30.2° C  | 33.1° C          | 33.1° C          | 33.0° C          | 32.9° C          | 32.3° C          | 32.4° C          | 32.1° C          | 32.0° C          |
| Cycle #43             |         |               |          |                  |                  |                  |                  |                  |                  |                  |                  |
| Heating Cycle         |         |               |          |                  |                  |                  |                  |                  |                  |                  |                  |
| Day 187 21:24:12 2018 | 1069 A  | 93.3° C       | 31.1° C  | 86.3° C          | 86.3° C          | 85.4° C          | 84.9° C          | 85.3° C          | 85.0° C          | 85.1° C          | 85.1° C          |
| Cooling Cycle         |         |               |          |                  |                  |                  |                  |                  |                  |                  |                  |
| Day 188 3:24:17 2018  | 7.9 A   | 29.3° C       | 26.6° C  | 29.2° C          | 29.2° C          | 29.4° C          | 29.4° C          | 29.1° C          | 29.1° C          | 28.5° C          | 28.5° C          |
| Cycle #44             |         |               |          |                  |                  |                  |                  |                  |                  |                  |                  |
| Heating Cycle         |         |               |          |                  |                  |                  |                  |                  |                  |                  |                  |
| Hour #1               |         |               |          |                  |                  |                  |                  |                  |                  |                  |                  |
| Day 188 9:23:56 2018  | 1068 A  | 90.1° C       | 28.8° C  | 82.8° C          | 82.9° C          | 82.0° C          | 81.6° C          | 81.9° C          | 81.7° C          | 81.8° C          | 81.8° C          |
| Timestamp             | AC Amps | Control Cable | Amb Temp | Sample #1 Conn 1 | Sample #1 Conn 2 | Sample #2 Conn 1 | Sample #2 Conn 2 | Sample #3 Conn 1 | Sample #3 Conn 2 | Sample #4 Conn 1 | Sample #4 Conn 2 |



|                       |        |         |         |         |         |         |         |         |         |         |         |
|-----------------------|--------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| Cooling Cycle         |        |         |         |         |         |         |         |         |         |         |         |
| Day 188 15:24:22 2018 | 7.8 A  | 30.7° C | 28.8° C | 31.8° C | 31.7° C | 31.7° C | 31.6° C | 31.0° C | 31.0° C | 30.7° C | 30.7° C |
| Cycle #45             |        |         |         |         |         |         |         |         |         |         |         |
| Heating Cycle         |        |         |         |         |         |         |         |         |         |         |         |
| Day 188 21:23:46 2018 | 1069 A | 92.1° C | 30.2° C | 85.4° C | 85.5° C | 84.5° C | 84.0° C | 84.2° C | 83.9° C | 84.1° C | 84.2° C |
| Cooling Cycle         |        |         |         |         |         |         |         |         |         |         |         |
| Day 189 3:33:52 2018  | 18.1 A | 28.2° C | 25.5° C | 28.0° C | 28.0° C | 28.2° C | 28.2° C | 28.0° C | 28.0° C | 27.4° C | 27.3° C |
| Cycle #46             |        |         |         |         |         |         |         |         |         |         |         |
| Heating Cycle         |        |         |         |         |         |         |         |         |         |         |         |
| Day 189 9:34:08 2018  | 1074 A | 89.4° C | 28.4° C | 82.2° C | 82.3° C | 81.5° C | 81.1° C | 81.2° C | 81.0° C | 81.1° C | 81.2° C |
| Cooling Cycle         |        |         |         |         |         |         |         |         |         |         |         |
| Day 189 15:34:21 2018 | 7.9 A  | 30.6° C | 28.8° C | 31.8° C | 31.7° C | 31.7° C | 31.5° C | 31.0° C | 31.0° C | 30.7° C | 30.7° C |
| Cycle #47             |        |         |         |         |         |         |         |         |         |         |         |
| Heating Cycle         |        |         |         |         |         |         |         |         |         |         |         |
| Day 189 21:34:08 2018 | 1072 A | 92.1° C | 30.7° C | 85.5° C | 85.6° C | 84.7° C | 84.2° C | 84.3° C | 84.0° C | 84.1° C | 84.2° C |
| Cooling Cycle         |        |         |         |         |         |         |         |         |         |         |         |
| Day 190 3:34:21 2018  | 8.8 A  | 28.6° C | 25.9° C | 28.5° C | 28.6° C | 28.8° C | 28.7° C | 28.4° C | 28.4° C | 27.9° C | 27.8° C |
| Cycle #48             |        |         |         |         |         |         |         |         |         |         |         |
| Heating Cycle         |        |         |         |         |         |         |         |         |         |         |         |
| Day 190 9:33:46 2018  | 1067 A | 90.9° C | 30.0° C | 83.9° C | 84.0° C | 83.0° C | 82.6° C | 82.6° C | 82.4° C | 82.6° C | 82.7° C |
| Cooling Cycle         |        |         |         |         |         |         |         |         |         |         |         |
| Day 190 15:34:27 2018 | 8.7 A  | 32.6° C | 30.7° C | 34.1° C | 34.1° C | 34.0° C | 33.8° C | 33.1° C | 33.2° C | 32.9° C | 32.9° C |
| Cycle #49             |        |         |         |         |         |         |         |         |         |         |         |
| Heating Cycle         |        |         |         |         |         |         |         |         |         |         |         |
| Day 190 21:34:07 2018 | 1072 A | 93.5° C | 31.6° C | 86.8° C | 86.9° C | 85.9° C | 85.4° C | 85.6° C | 85.3° C | 85.4° C | 85.5° C |
| Cooling Cycle         |        |         |         |         |         |         |         |         |         |         |         |
| Day 191 3:44:26 2018  | 9.1 A  | 29.2° C | 26.5° C | 29.0° C | 29.0° C | 29.3° C | 29.3° C | 28.9° C | 28.9° C | 28.3° C | 28.3° C |
| Cycle #50             |        |         |         |         |         |         |         |         |         |         |         |
| Heating Cycle         |        |         |         |         |         |         |         |         |         |         |         |
| Day 191 21:44:07 2018 | 1069 A | 94.3° C | 32.5° C | 87.6° C | 87.7° C | 86.8° C | 86.4° C | 86.8° C | 86.4° C | 86.2° C | 85.9° C |
| Cooling Cycle         |        |         |         |         |         |         |         |         |         |         |         |
| Day 192 3:44:22 2018  | 9 A    | 30.1° C | 27.3° C | 30.1° C | 30.1° C | 30.3° C | 30.2° C | 29.9° C | 29.9° C | 29.4° C | 29.4° C |

### 7.12 Accelerated Sealing Life Test,

Testing ensures that a long-term seal can be maintained on all interface to prevent moisture ingress. Step 1 was to electrically test each K676I bus as well as its mating components to IEEE 386 sequence A test values for 28kV. Step 2 was to assemble all of the mating parts together and place into the Tenny oven for 3 weeks at 121° C. Step 3 was to assemble the samples onto 750 MCM copper cable rigs for current cycling. Samples were assembled in series in the test tank. Heating from current took place for a total of 4 hours. Next the samples were submerged in water for a total of 2 hours. The final steps were to remove the samples from the test tank and perform an impulse withstand test at 28kV levels. Test points were also verified to ensure proper functionality.



Figure showing electrical testing prior to oven aging for the K676I bus bar as per IEEE 386-Seq A 28kV levels



**7.4 Partial discharge prior to oven aging,**

| Sample ID | CIV level  | pC Value | CEV level | pC Value | Pass/Fail |
|-----------|------------|----------|-----------|----------|-----------|
| 1         | 45.6kV     | 7.56pC   | 43.4kV    | 2pC      | Pass      |
| 2         | 45kV Clear | N/A      | N/A       | 3pC      | Pass      |
| 3         | 44.9kV     | 42.8pC   | 42.8kV    | 3pC      | Pass      |
| 4         | 45kV Clear | N/A      | N/A       | 2pC      | Pass      |

**7.5.1 AC withstand prior to oven aging,**

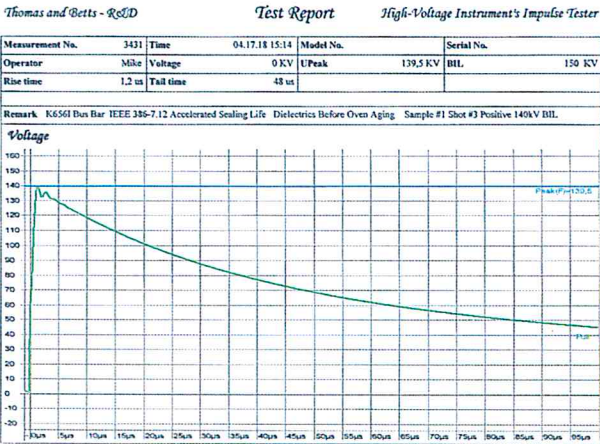
| Sample ID | Voltage Applied for one minute | Pass/Fail |
|-----------|--------------------------------|-----------|
| 1         | 45.36kV                        | Pass      |
| 2         | 45.22kV                        | Pass      |
| 3         | 45.89kV                        | Pass      |
| 4         | 45.81kV                        | Pass      |

**7.17.2 Test point voltage prior to oven aging,**

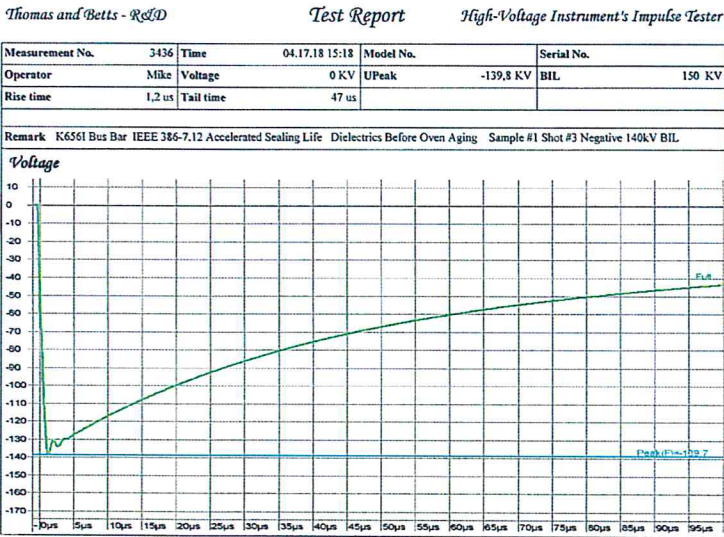
| Sample ID | Applied Voltage | Ross Meter Reading | Pass/Fail |
|-----------|-----------------|--------------------|-----------|
| #1        | 15.27kV         | 16.89kV            | Pass      |
| #2        | 15.32kV         | 17.40kV            | Pass      |
| #3        | 15.14kV         | 15.68kV            | Pass      |
| #4        | 15.31kV         | 15.31kV            | Pass      |

7.5.3 Impulse Withstand prior to oven aging,  
3 Shots at 140kV BIL positive and negative polarity's.

Sample #1 Shot 3 Positive



Sample #1 Shot 3 Negative

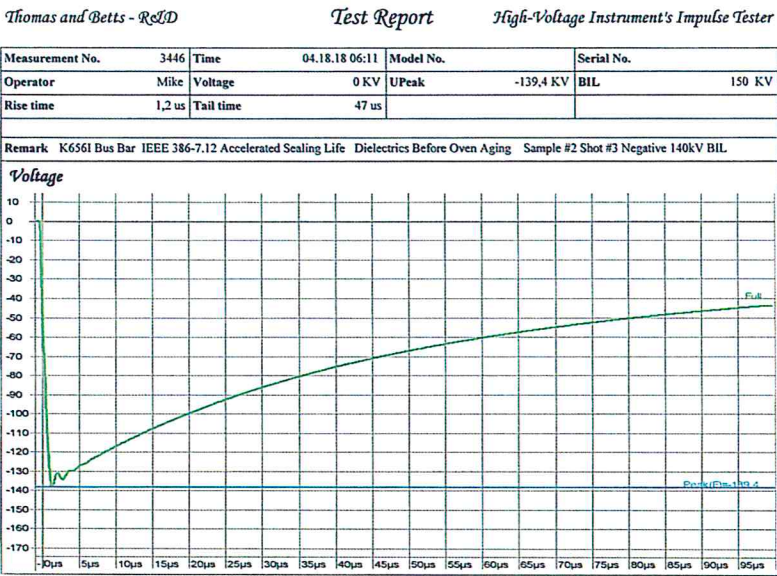




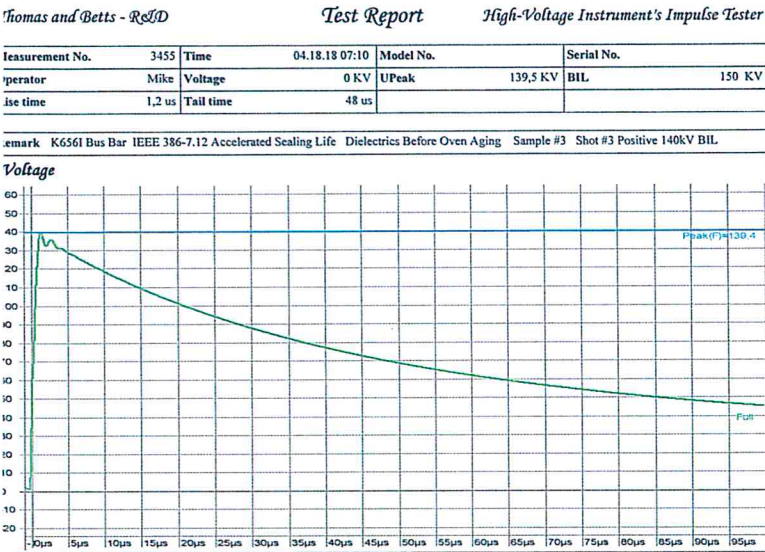
Sample #2 Shot 3 Positive



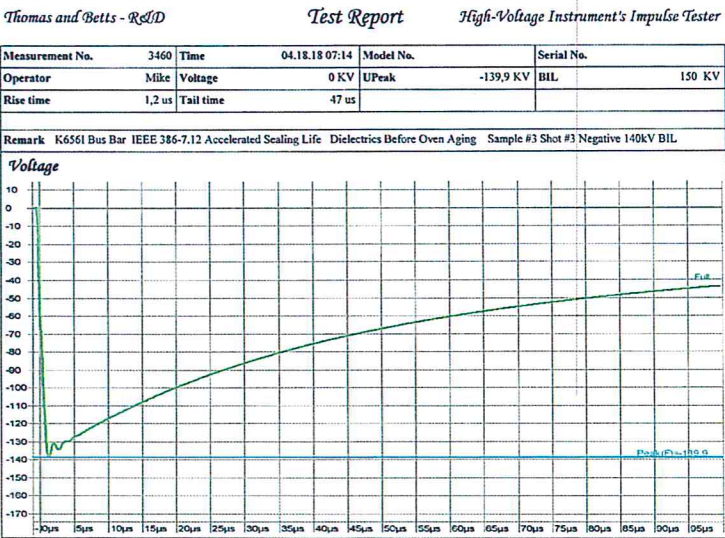
Sample #2 Shot 3 Negative



Sample #3 Shot 3 Positive

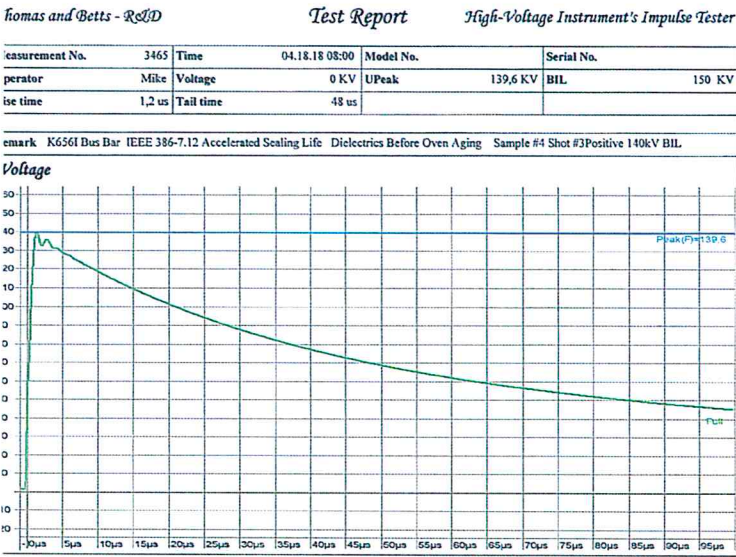


Sample #3 Shot 3 Negative

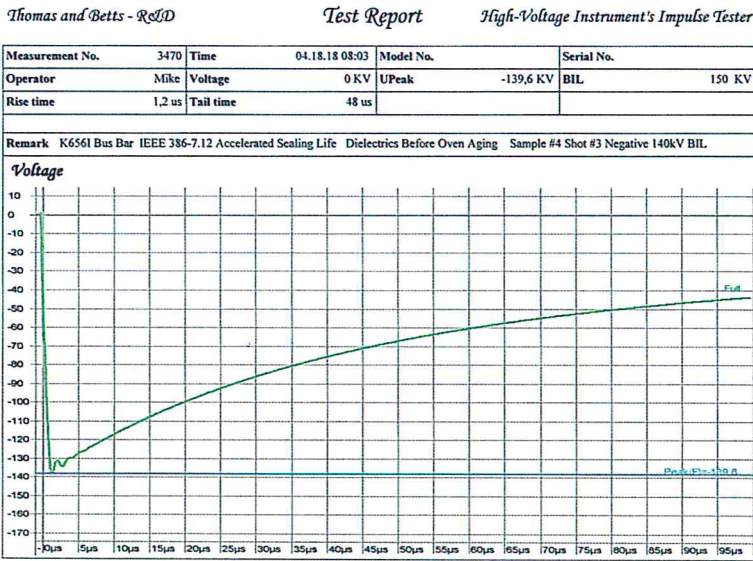




Sample #4 Shot 3 Positive



Sample #4 Shot 3 Negative



Oven Aging for three weeks 121° C



Figure showing four samples of the K676I bus bar with mating parts for oven aging.



Figure showing the Tenny environmental test chamber.



**Current cycling and water submerging.**



Figure showing water submerged after four hours of heating with current.

**Current Cycle Test Data.**

| Date                 | Time     | Control Cable Temperature | Test Tank Water Temp | Supply Tank Water Temp | Ambient Temp | Current |
|----------------------|----------|---------------------------|----------------------|------------------------|--------------|---------|
| <b>Cycle #1</b>      |          |                           |                      |                        |              |         |
| <b>Heating Cycle</b> |          |                           |                      |                        |              |         |
| 5/14/2018            | 10:35 AM | 92.5° C                   | 19.0° C              | 14.5° C                | 24.0° C      | 1117 A  |
| <b>Cooling Cycle</b> |          |                           |                      |                        |              |         |
| 5/14/2018            | 12:35 PM | 37.0° C                   | 19.0° C              | 14.5° C                | 23.0° C      | 7.3     |
| <b>Cycle #2</b>      |          |                           |                      |                        |              |         |
| <b>Heating Cycle</b> |          |                           |                      |                        |              |         |
| 5/15/2018            | 3:15 PM  | 93.5° C                   | 18.5° C              | 15.0° C                | 21.5° C      | 1120 A  |
| <b>Cooling Cycle</b> |          |                           |                      |                        |              |         |
| 5/15/2018            | 5:25 PM  | 37.5° C                   | 18.0° C              | 15.0° C                | 21.0° C      | 6.7     |
| <b>Cycle #3</b>      |          |                           |                      |                        |              |         |
| <b>Heating Cycle</b> |          |                           |                      |                        |              |         |
| 5/16/2018            | 9:35 AM  | 88.5° C                   | 18.0° C              | 15.5° C                | 21.0° C      | 1121 A  |
| <b>Cooling Cycle</b> |          |                           |                      |                        |              |         |
| 5/16/2018            | 11:35 AM | 32.0° C                   | 18.0° C              | 15.5° C                | 22.0° C      | 16.5    |

|                      |             |                     |                             |                               |                 |                |
|----------------------|-------------|---------------------|-----------------------------|-------------------------------|-----------------|----------------|
|                      |             |                     |                             |                               |                 |                |
| <b>Cycle #4</b>      |             |                     |                             |                               |                 |                |
| <b>Heating Cycle</b> |             |                     |                             |                               |                 |                |
| 5/16/2018            | 3:35 PM     | 91.5° C             | 19.0° C                     | 17.5° C                       | 21.5° C         | 1124 A         |
| <b>Cooling Cycle</b> |             |                     |                             |                               |                 |                |
| 5/16/2018            | 5:35 PM     | 33.5° C             | 19.0° C                     | 17.5° C                       | 22.0° C         | 6.5            |
|                      |             |                     |                             |                               |                 |                |
| <b>Cycle #5</b>      |             |                     |                             |                               |                 |                |
| <b>Heating Cycle</b> |             |                     |                             |                               |                 |                |
| 5/16/2018            | 9:35 PM     | 88.5° C             | 18.5° C                     | 19.0° C                       | 22.5° C         | 1119 A         |
| <b>Cooling Cycle</b> |             |                     |                             |                               |                 |                |
| 5/16/2018            | 11:45 PM    | 31.0° C             | 18.0° C                     | 19.0° C                       | 21.5° C         | 7.6            |
|                      |             |                     |                             |                               |                 |                |
| <b>Cycle #6</b>      |             |                     |                             |                               |                 |                |
| <b>Heating Cycle</b> |             |                     |                             |                               |                 |                |
| 5/17/2018            | 3:45 AM     | 89.0° C             | 18.0° C                     | 20.0° C                       | 22.0° C         | 1117 A         |
| <b>Cooling Cycle</b> |             |                     |                             |                               |                 |                |
| 5/17/2018            | 5:55 AM     | 29.0° C             | 18.0° C                     | 20.0° C                       | 22.0° C         | 7              |
|                      |             |                     |                             |                               |                 |                |
| <b>Cycle #7</b>      |             |                     |                             |                               |                 |                |
| <b>Heating Cycle</b> |             |                     |                             |                               |                 |                |
| 5/17/2018            | 9:55 AM     | 87.5° C             | 18.5° C                     | 21.0° C                       | 21.5° C         | 1119 A         |
| <b>Cooling Cycle</b> |             |                     |                             |                               |                 |                |
| <b>Date</b>          | <b>Time</b> | <b>Control Temp</b> | <b>Test Tank Water Temp</b> | <b>Supply Tank Water Temp</b> | <b>Amb Temp</b> | <b>Current</b> |
| 5/17/2018            | 11:55 AM    | 27.5° C             | 18.5° C                     | 21.0° C                       | 21.5° C         | 7.1            |
|                      |             |                     |                             |                               |                 |                |
| <b>Cycle #8</b>      |             |                     |                             |                               |                 |                |
| <b>Heating Cycle</b> |             |                     |                             |                               |                 |                |
| 5/17/2018            | 3:55 PM     | 86.5° C             | 18.0° C                     | 21.5° C                       | 21.5° C         | 1121 A         |
| <b>Cooling Cycle</b> |             |                     |                             |                               |                 |                |
| 5/17/2018            | 6:05 PM     | 30.0° C             | 18.0° C                     | 21.5° C                       | 22.0° C         | 7.9            |
|                      |             |                     |                             |                               |                 |                |
| <b>Cycle #9</b>      |             |                     |                             |                               |                 |                |
| <b>Heating Cycle</b> |             |                     |                             |                               |                 |                |
| 5/17/2018            | 10:05 PM    | 86.5° C             | 17.5° C                     | 22.0° C                       | 22.5° C         | 1125 A         |
| <b>Cooling Cycle</b> |             |                     |                             |                               |                 |                |
| 5/18/2018            | 12:05 AM    | 26.0° C             | 17.5° C                     | 22.0° C                       | 21.0° C         | 7.3            |
|                      |             |                     |                             |                               |                 |                |
| <b>Cycle #10</b>     |             |                     |                             |                               |                 |                |
| <b>Heating Cycle</b> |             |                     |                             |                               |                 |                |
| 5/18/2018            | 4:05 AM     | 87.5° C             | 17.5° C                     | 22.0° C                       | 21.0° C         | 1117 A         |
| <b>Cooling Cycle</b> |             |                     |                             |                               |                 |                |
| 5/18/2018            | 6:15 AM     | 23.0° C             | 17.5° C                     | 21.5° C                       | 19.5° C         | 6.7            |



|                      |             |                     |                             |                               |                 |                |
|----------------------|-------------|---------------------|-----------------------------|-------------------------------|-----------------|----------------|
|                      |             |                     |                             |                               |                 |                |
| <b>Cycle #11</b>     |             |                     |                             |                               |                 |                |
| <b>Heating Cycle</b> |             |                     |                             |                               |                 |                |
| 5/18/2018            | 10:15 AM    | 86.5° C             | 17.5° C                     | 21.5° C                       | 19.5° C         | 1123 A         |
| <b>Cooling Cycle</b> |             |                     |                             |                               |                 |                |
| 5/18/2018            | 12:25 PM    | 28.5° C             | 17.5° C                     | 21.5° C                       | 20.5° C         | 6.7            |
|                      |             |                     |                             |                               |                 |                |
| <b>Cycle #12</b>     |             |                     |                             |                               |                 |                |
| <b>Heating Cycle</b> |             |                     |                             |                               |                 |                |
| 5/18/2018            | 4:25 PM     | 86.5° C             | 17.5° C                     | 21.5° C                       | 20.5° C         | 1122 A         |
| <b>Cooling Cycle</b> |             |                     |                             |                               |                 |                |
| 5/18/2018            | 6:25 PM     | 27.0° C             | 17.0° C                     | 21.5° C                       | 22.0° C         | 7.1            |
|                      |             |                     |                             |                               |                 |                |
| <b>Cycle #13</b>     |             |                     |                             |                               |                 |                |
| <b>Heating Cycle</b> |             |                     |                             |                               |                 |                |
| 5/18/2018            | 10:25 PM    | 86.0° C             | 17.5° C                     | 21.5° C                       | 20.0° C         | 1123 A         |
| <b>Cooling Cycle</b> |             |                     |                             |                               |                 |                |
| 5/19/2018            | 12:35 AM    | 23.0° C             | 18.0° C                     | 21.5° C                       | 19.0° C         | 7.6            |
|                      |             |                     |                             |                               |                 |                |
| <b>Cycle #14</b>     |             |                     |                             |                               |                 |                |
| <b>Heating Cycle</b> |             |                     |                             |                               |                 |                |
| 5/19/2018            | 4:35 AM     | 86.0° C             | 18.0° C                     | 21.5° C                       | 19.0° C         | 1117 A         |
| <b>Date</b>          | <b>Time</b> | <b>Control Temp</b> | <b>Test Tank Water Temp</b> | <b>Supply Tank Water Temp</b> | <b>Amb Temp</b> | <b>Current</b> |
| <b>Cooling Cycle</b> |             |                     |                             |                               |                 |                |
| 5/19/2018            | 6:35 AM     | 22.5° C             | 17.5° C                     | 21.0° C                       | 18.0° C         | 7.4            |
| <b>Cycle #15</b>     |             |                     |                             |                               |                 |                |
| <b>Heating Cycle</b> |             |                     |                             |                               |                 |                |
| 5/19/2018            | 10:35 AM    | 88.0° C             | 17.0° C                     | 21.0° C                       | 18.0° C         | 1117 A         |
| <b>Cooling Cycle</b> |             |                     |                             |                               |                 |                |
| 5/19/2018            | 12:45 PM    | 22.5° C             | 17.0° C                     | 20.5° C                       | 18.0° C         | 9.5            |
|                      |             |                     |                             |                               |                 |                |
| <b>Cycle #16</b>     |             |                     |                             |                               |                 |                |
| <b>Heating Cycle</b> |             |                     |                             |                               |                 |                |
| 5/19/2018            | 4:45 PM     | 85.5° C             | 17.0° C                     | 20.5° C                       | 17.5° C         | 1123 A         |
| <b>Cooling Cycle</b> |             |                     |                             |                               |                 |                |
| 5/19/2018            | 6:45 PM     | 23.5° C             | 18.0° C                     | 20.0° C                       | 18.5° C         | 7.4            |
|                      |             |                     |                             |                               |                 |                |
| <b>Cycle #17</b>     |             |                     |                             |                               |                 |                |
| <b>Heating Cycle</b> |             |                     |                             |                               |                 |                |
| 5/19/2018            | 10:45 PM    | 87.5° C             | 18.0° C                     | 20.0° C                       | 18.0° C         | 1122 A         |
| <b>Cooling Cycle</b> |             |                     |                             |                               |                 |                |
| 5/20/2018            | 12:55 AM    | 23.5° C             | 17.5° C                     | 20.0° C                       | 18.0° C         | 7.3            |
|                      |             |                     |                             |                               |                 |                |

|               |          |              |                      |                        |          |         |
|---------------|----------|--------------|----------------------|------------------------|----------|---------|
| Cycle #18     |          |              |                      |                        |          |         |
| Heating Cycle |          |              |                      |                        |          |         |
| 5/20/2018     | 4:55 AM  | 85.5° C      | 17.0° C              | 20.0° C                | 18.5° C  | 1124 A  |
| Cooling Cycle |          |              |                      |                        |          |         |
| 5/20/2018     | 7:05 AM  | 23.0° C      | 16.5° C              | 20.0° C                | 18.0° C  | 16.8    |
|               |          |              |                      |                        |          |         |
| Cycle #19     |          |              |                      |                        |          |         |
| Heating Cycle |          |              |                      |                        |          |         |
| 5/20/2018     | 11:05 AM | 86.0° C      | 16.5° C              | 20.0° C                | 18.5° C  | 1120 A  |
| Cooling Cycle |          |              |                      |                        |          |         |
| 5/20/2018     | 1:05 PM  | 27.5° C      | 17.0° C              | 20.0° C                | 19.5° C  | 8.8     |
|               |          |              |                      |                        |          |         |
| Cycle #20     |          |              |                      |                        |          |         |
| Heating Cycle |          |              |                      |                        |          |         |
| 5/20/2018     | 5:05 PM  | 89.0° C      | 17.5° C              | 20.5° C                | 21.0° C  | 1122 A  |
| Cooling Cycle |          |              |                      |                        |          |         |
| 5/20/2018     | 7:15 PM  | 27.5° C      | 17.0° C              | 20.5° C                | 22.0° C  | 8.2     |
|               |          |              |                      |                        |          |         |
| Cycle #21     |          |              |                      |                        |          |         |
| Heating Cycle |          |              |                      |                        |          |         |
| 5/20/2018     | 11:15 PM | 85.5° C      | 18.0° C              | 21.0° C                | 20.5° C  | 1122 A  |
| Date          | Time     | Control Temp | Test Tank Water Temp | Supply Tank Water Temp | Amb Temp | Current |
| Cooling Cycle |          |              |                      |                        |          |         |
| 5/21/2018     | 1:25 AM  | 24.0° C      | 18.5° C              | 21.0° C                | 19.5° C  | 7.1     |
|               |          |              |                      |                        |          |         |
| Cycle #22     |          |              |                      |                        |          |         |
| Heating Cycle |          |              |                      |                        |          |         |
| 5/21/2018     | 5:25 AM  | 86.5° C      | 18.5° C              | 21.0° C                | 18.5° C  | 1117 A  |
| Cooling Cycle |          |              |                      |                        |          |         |
| 5/21/2018     | 7:25 AM  | 24.0° C      | 19.0° C              | 20.5° C                | 18.0° C  | 6.8     |
|               |          |              |                      |                        |          |         |
| Cycle #23     |          |              |                      |                        |          |         |
| Heating Cycle |          |              |                      |                        |          |         |
| 5/21/2018     | 11:25 AM | 92.0° C      | 19.5° C              | 20.5° C                | 19.0° C  | 1120 A  |
| Cooling Cycle |          |              |                      |                        |          |         |
| 5/21/2018     | 1:25 PM  | 34.5° C      | 20.0° C              | 20.5° C                | 21.0° C  | 7.6     |
|               |          |              |                      |                        |          |         |
| Cycle #24     |          |              |                      |                        |          |         |
| Heating Cycle |          |              |                      |                        |          |         |
| 5/21/2018     | 5:25 PM  | 93.5° C      | 20.0° C              | 21.5° C                | 24.0° C  | 1120 A  |
| Cooling Cycle |          |              |                      |                        |          |         |
| 5/21/2018     | 7:25 PM  | 36.0° C      | 20.0° C              | 21.5° C                | 25.5° C  | 1119 A  |
|               |          |              |                      |                        |          |         |



|               |          |              |                      |                        |          |         |
|---------------|----------|--------------|----------------------|------------------------|----------|---------|
| Cycle #25     |          |              |                      |                        |          |         |
| Heating Cycle |          |              |                      |                        |          |         |
| 5/21/2018     | 11:25 PM | 86.5° C      | 21.0° C              | 23.0° C                | 23.5° C  | 1121 A  |
| Cooling Cycle |          |              |                      |                        |          |         |
| 5/22/2018     | 1:35 AM  | 30.0° C      | 21.0° C              | 23.0° C                | 22.0° C  | 6.7 A   |
|               |          |              |                      |                        |          |         |
| Cycle #26     |          |              |                      |                        |          |         |
| Heating Cycle |          |              |                      |                        |          |         |
| 5/22/2018     | 5:45 AM  | 85.0° C      | 20.0° C              | 23.0° C                | 21.0° C  | 1121 A  |
| Cooling Cycle |          |              |                      |                        |          |         |
| 5/22/2018     | 7:45 AM  | 29.0° C      | 20.0° C              | 23.0° C                | 20.5° C  | 16.5 A  |
|               |          |              |                      |                        |          |         |
| Cycle #27     |          |              |                      |                        |          |         |
| Heating Cycle |          |              |                      |                        |          |         |
| 5/22/2018     | 4:55 PM  | 92.5° C      | 20.0° C              | 22.0° C                | 21.5° C  | 1124 A  |
| Cooling Cycle |          |              |                      |                        |          |         |
| 5/22/2018     | 6:55 PM  | 32.0° C      | 19.0° C              | 23.0° C                | 21.5° C  | 6.5 A   |
|               |          |              |                      |                        |          |         |
| Cycle #28     |          |              |                      |                        |          |         |
| Heating Cycle |          |              |                      |                        |          |         |
| Date          | Time     | Control Temp | Test Tank Water Temp | Supply Tank Water Temp | Amb Temp | Current |
| 5/22/2018     | 11:05 PM | 88.5° C      | 19.0° C              | 20.0° C                | 20.5° C  | 1119 A  |
| Cooling Cycle |          |              |                      |                        |          |         |
| 5/23/2018     | 1:15 AM  | 26.0° C      | 18.5° C              | 23.0° C                | 20.0° C  | 7.6 A   |
|               |          |              |                      |                        |          |         |
| Cycle #29     |          |              |                      |                        |          |         |
| Heating Cycle |          |              |                      |                        |          |         |
| Cooling Cycle |          |              |                      |                        |          |         |
| 5/23/2018     | 7:25 AM  | 29.0° C      | 18.0° C              | 22.5° C                | 19.5° C  | 7.0 A   |
|               |          |              |                      |                        |          |         |
| Cycle #30     |          |              |                      |                        |          |         |
| Heating Cycle |          |              |                      |                        |          |         |
| 5/23/2018     | 11:25 AM | 93.5° C      | 19.0° C              | 22.0° C                | 21.0° C  | 1119 A  |
| Cooling Cycle |          |              |                      |                        |          |         |
| 5/23/2018     | 1:25 PM  | 41.0° C      | 20.0° C              | 22.5° C                | 22.0° C  | 7.1 A   |
|               |          |              |                      |                        |          |         |
| Cycle #31     |          |              |                      |                        |          |         |
| Heating Cycle |          |              |                      |                        |          |         |
| 5/23/2018     | 5:35 PM  | 92.5° C      | 20.0° C              | 23.0° C                | 24.0° C  | 1122 A  |
| Cooling Cycle |          |              |                      |                        |          |         |
| 5/23/2018     | 7:35 PM  | 33.0° C      | 20.0° C              | 23.5° C                | 26.0° C  | 7.9 A   |
|               |          |              |                      |                        |          |         |
| Cycle #32     |          |              |                      |                        |          |         |

|               |          |              |                      |                        |          |         |
|---------------|----------|--------------|----------------------|------------------------|----------|---------|
| Heating Cycle |          |              |                      |                        |          |         |
| 5/23/2018     | 11:45 PM | 89.5° C      | 19.0° C              | 24.0° C                | 24.0° C  | 1119 A  |
| Cooling Cycle |          |              |                      |                        |          |         |
| 5/24/2018     | 1:45 AM  | 28.0° C      | 19.0° C              | 24.5° C                | 22.5° C  | 7.3 A   |
|               |          |              |                      |                        |          |         |
| Cycle #33     |          |              |                      |                        |          |         |
| Heating Cycle |          |              |                      |                        |          |         |
| 5/24/2018     | 5:45 AM  | 85.5° C      | 19.0° C              | 20.5° C                | 21.5° C  | 1117 A  |
| Cooling Cycle |          |              |                      |                        |          |         |
| 5/24/2018     | 7:45 AM  | 32.0° C      | 19.0° C              | 24.0° C                | 20.0° C  | 6.7 A   |
|               |          |              |                      |                        |          |         |
| Cycle #34     |          |              |                      |                        |          |         |
| Heating Cycle |          |              |                      |                        |          |         |
| 5/24/2018     | 11:55 AM | 95.0° C      | 19.5° C              | 23.0° C                | 21.5° C  | 1122 A  |
| Cooling Cycle |          |              |                      |                        |          |         |
| 5/24/2018     | 1:55 PM  | 42.0° C      | 20.0° C              | 24.0° C                | 23.5° C  | 6.7 A   |
|               |          |              |                      |                        |          |         |
| Cycle #35     |          |              |                      |                        |          |         |
| Heating Cycle |          |              |                      |                        |          |         |
| Date          | Time     | Control Temp | Test Tank Water Temp | Supply Tank Water Temp | Amb Temp | Current |
| 5/24/2018     | 6:05 PM  | 92.0° C      | 19.0° C              | 25.0° C                | 26.5° C  | 1117 A  |
| Cooling Cycle |          |              |                      |                        |          |         |
| 5/24/2018     | 8:05 PM  | 34.0° C      | 19.0° C              | 24.5° C                | 27.0° C  | 7.1 A   |
|               |          |              |                      |                        |          |         |
| Cycle #36     |          |              |                      |                        |          |         |
| Heating Cycle |          |              |                      |                        |          |         |
| 5/25/2018     | 12:15 AM | 92.0° C      | 18.0° C              | 25.0° C                | 24.5° C  | 1123 A  |
| Cooling Cycle |          |              |                      |                        |          |         |
| 5/25/2018     | 2:15 AM  | 30.5° C      | 18.0° C              | 25.5° C                | 24.0° C  | 7.6 A   |
|               |          |              |                      |                        |          |         |
| Cycle #37     |          |              |                      |                        |          |         |
| Heating Cycle |          |              |                      |                        |          |         |
| 5/25/2018     | 6:25 AM  | 88.5° C      | 19.0° C              | 21.5° C                | 22.5° C  | 1120 A  |
| Cooling Cycle |          |              |                      |                        |          |         |
| 5/25/2018     | 8:25 AM  | 32.0° C      | 19.0° C              | 25.0° C                | 21.0° C  | 7.4 A   |
|               |          |              |                      |                        |          |         |
| Cycle #38     |          |              |                      |                        |          |         |
| Heating Cycle |          |              |                      |                        |          |         |
| 5/25/2018     | 12:35 PM | 95.0° C      | 19.0° C              | 24.5° C                | 23.0° C  | 1117 A  |
| Cooling Cycle |          |              |                      |                        |          |         |
| 5/25/2018     | 2:45 PM  | 38.5° C      | 19.0° C              | 25.0° C                | 24.0° C  | 9.5 A   |
|               |          |              |                      |                        |          |         |
| Cycle #39     |          |              |                      |                        |          |         |

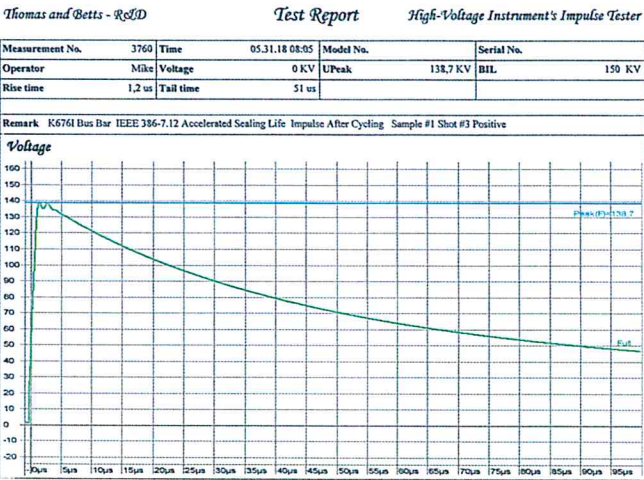


|                      |             |                     |                             |                               |                 |                |
|----------------------|-------------|---------------------|-----------------------------|-------------------------------|-----------------|----------------|
| <b>Heating Cycle</b> |             |                     |                             |                               |                 |                |
| 5/25/2018            | 6:55 PM     | 93.0° C             | 20.0° C                     | 29.5° C                       | 27.0° C         | 1116 A         |
| <b>Cooling Cycle</b> |             |                     |                             |                               |                 |                |
| 5/25/2018            | 9:05 PM     | 31.0° C             | 20.0° C                     | 26.0° C                       | 27.5° C         | 7.4 A          |
|                      |             |                     |                             |                               |                 |                |
| <b>Cycle #40</b>     |             |                     |                             |                               |                 |                |
| <b>Heating Cycle</b> |             |                     |                             |                               |                 |                |
| 5/26/2018            | 1:05 AM     | 90.0° C             | 19.0° C                     | 26.0° C                       | 25.0° C         | 1122 A         |
| <b>Cooling Cycle</b> |             |                     |                             |                               |                 |                |
| 5/26/2018            | 3:15 AM     | 29.0° C             | 19.5° C                     | 26.5° C                       | 25.0° C         | 7.3 A          |
|                      |             |                     |                             |                               |                 |                |
| <b>Cycle #41</b>     |             |                     |                             |                               |                 |                |
| <b>Heating Cycle</b> |             |                     |                             |                               |                 |                |
| 5/26/2018            | 7:25 AM     | 90.0° C             | 18.0° C                     | 26.5° C                       | 23.5° C         | 1117 A         |
| <b>Cooling Cycle</b> |             |                     |                             |                               |                 |                |
| 5/26/2018            | 9:35 AM     | 29.5° C             | 18.5° C                     | 26.0° C                       | 22.5° C         | 16.8 A         |
|                      |             |                     |                             |                               |                 |                |
| <b>Cycle #42</b>     |             |                     |                             |                               |                 |                |
| <b>Date</b>          | <b>Time</b> | <b>Control Temp</b> | <b>Test Tank Water Temp</b> | <b>Supply Tank Water Temp</b> | <b>Amb Temp</b> | <b>Current</b> |
| <b>Heating Cycle</b> |             |                     |                             |                               |                 |                |
| 5/28/2018            | 7:55 AM     | 86.5° C             | 20.5° C                     | 23.5° C                       | 19.0° C         | 1120 A         |
| <b>Cooling Cycle</b> |             |                     |                             |                               |                 |                |
| 5/28/2018            | 9:45 AM     | 36.5° C             | 21.0° C                     | 23.0° C                       | 19.0° C         | 8.8 A          |
|                      |             |                     |                             |                               |                 |                |
| <b>Cycle #43</b>     |             |                     |                             |                               |                 |                |
| <b>Heating Cycle</b> |             |                     |                             |                               |                 |                |
| 5/28/2018            | 1:45 PM     | 89.0° C             | 20.0° C                     | 22.5° C                       | 19.5° C         | 1122 A         |
| <b>Cooling Cycle</b> |             |                     |                             |                               |                 |                |
| 5/28/2018            | 3:45 PM     | 42.0° C             | 20.0° C                     | 22.0° C                       | 20.0° C         | 8.2 A          |
|                      |             |                     |                             |                               |                 |                |
| <b>Cycle #44</b>     |             |                     |                             |                               |                 |                |
| <b>Heating Cycle</b> |             |                     |                             |                               |                 |                |
| 5/28/2018            | 7:55 PM     | 90.5° C             | 20.0° C                     | 22.0° C                       | 22.0° C         | 1120 A         |
| <b>Cooling Cycle</b> |             |                     |                             |                               |                 |                |
| 5/28/2018            | 9:55 PM     | 30.0° C             | 20.0° C                     | 22.0° C                       | 21.5° C         | 7.1 A          |
|                      |             |                     |                             |                               |                 |                |
| <b>Cycle #45</b>     |             |                     |                             |                               |                 |                |
| <b>Heating Cycle</b> |             |                     |                             |                               |                 |                |
| 5/29/2018            | 1:55 AM     | 90.0° C             | 19.0° C                     | 21.5° C                       | 20.5° C         | 1117 A         |
| <b>Cooling Cycle</b> |             |                     |                             |                               |                 |                |
| 5/29/2018            | 4:05 AM     | 26.5° C             | 18.5° C                     | 21.5° C                       | 20.0° C         | 6.8 A          |
|                      |             |                     |                             |                               |                 |                |
| <b>Cycle #46</b>     |             |                     |                             |                               |                 |                |

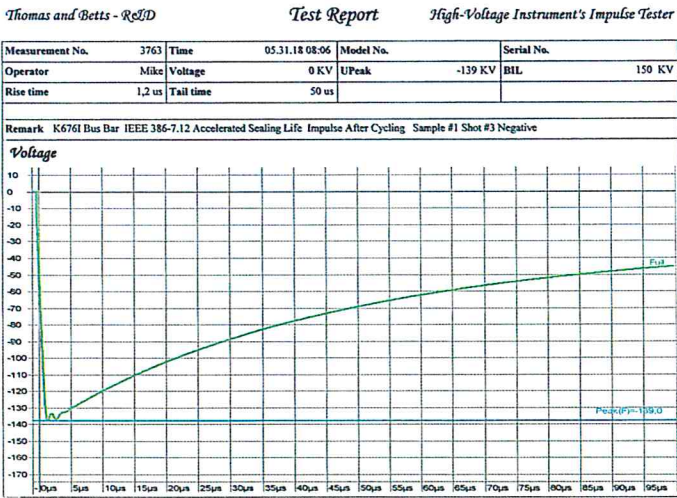
|               |          |              |                      |                        |          |          |
|---------------|----------|--------------|----------------------|------------------------|----------|----------|
| Heating Cycle |          |              |                      |                        |          |          |
| 5/29/2018     | 8:05 AM  | 88.5° C      | 17.0° C              | 21.5° C                | 20.0° C  | 1120 A   |
| Cooling Cycle |          |              |                      |                        |          |          |
| 5/29/2018     | 10:05 AM | 31.5° C      | 17.0° C              | 21.0° C                | 20.0° C  | 7.6 A    |
|               |          |              |                      |                        |          |          |
| Cycle #47     |          |              |                      |                        |          |          |
| Heating Cycle |          |              |                      |                        |          |          |
| 5/29/2018     | 2:15 PM  | 87.0° C      | 18.0° C              | 23.5° C                | 24.0° C  | 1120.0 A |
| Cooling Cycle |          |              |                      |                        |          |          |
| 5/29/2018     | 4:15 PM  | 31.0° C      | 19.0° C              | 21.5° C                | 26.0° C  | 7.3 A    |
|               |          |              |                      |                        |          |          |
| Cycle #48     |          |              |                      |                        |          |          |
| Heating Cycle |          |              |                      |                        |          |          |
| 5/29/2018     | 8:15 PM  | 86.5° C      | 19.0° C              | 26.5° C                | 27.5° C  | 1121 A   |
| Cooling Cycle |          |              |                      |                        |          |          |
| 5/29/2018     | 10:15 PM | 25.5° C      | 19.0° C              | 23.5° C                | 27.5° C  | 6.7 A    |
|               |          |              |                      |                        |          |          |
| Date          | Time     | Control Temp | Test Tank Water Temp | Supply Tank Water Temp | Amb Temp | Current  |
| Cycle #49     |          |              |                      |                        |          |          |
| Heating Cycle |          |              |                      |                        |          |          |
| 5/30/2018     | 2:25 AM  | 86.5° C      | 19.5° C              | 23.0° C                | 24.0° C  | 1121 A   |
| Cooling Cycle |          |              |                      |                        |          |          |
| Hour #1       |          |              |                      |                        |          |          |
| 5/30/2018     | 4:25 AM  | 22.0° C      | 18.5° C              | 24.5° C                | 23.5° C  | 16.5 A   |
|               |          |              |                      |                        |          |          |
| Cycle #50     |          |              |                      |                        |          |          |
| Heating Cycle |          |              |                      |                        |          |          |
| 5/30/2018     | 8:25 AM  | 90.0° C      | 17.0° C              | 23.5° C                | 23.5° C  | 1124 A   |
| Cooling Cycle |          |              |                      |                        |          |          |
| 5/30/2018     | 10:35 AM | 26.5° C      | 17.0° C              | 21.5° C                | 26.0° C  | 6.5 A    |



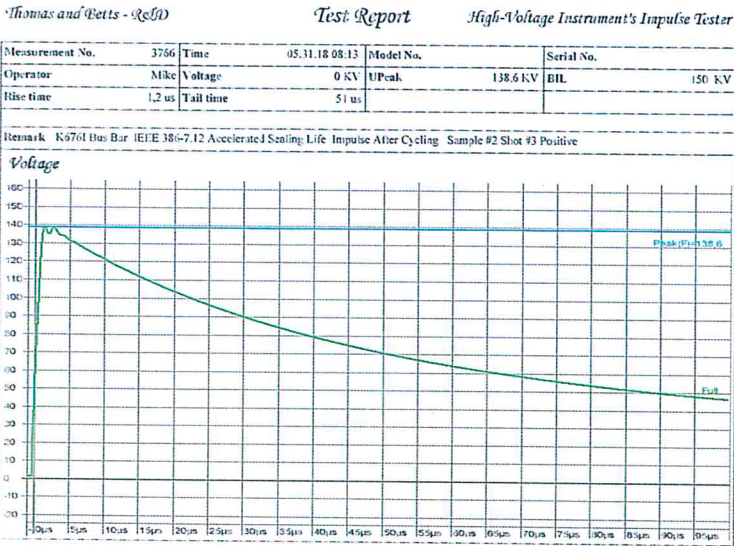
7.5.3 Impulse Withstand After Sealing Life,  
Sample #1 Shot 3 Positive



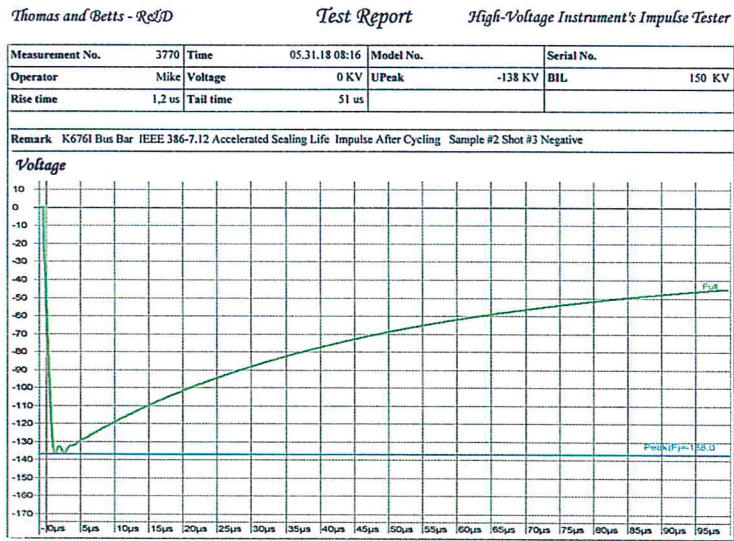
Sample #1 Shot 3 Negative



Sample #2 Shot 3 Positive



Sample #2 Shot 3 Negative





Sample #3 Shot 3 Positive

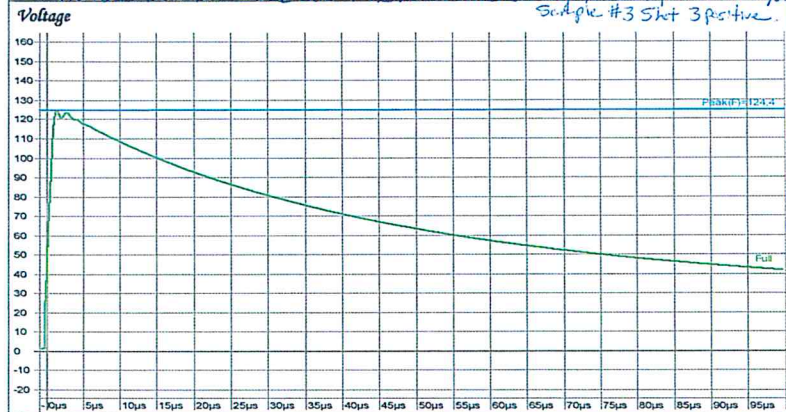
Thomas and Betts - R&D

Test Report

High-Voltage Instrument's Impulse Tester

|                 |        |           |                |           |          |            |        |
|-----------------|--------|-----------|----------------|-----------|----------|------------|--------|
| Measurement No. | 3779   | Time      | 05.31.18 09:45 | Model No. |          | Serial No. |        |
| Operator        | Mike   | Voltage   | 0 KV           | UPeak     | 124.4 KV | BIL        | 150 KV |
| Rise time       | 1.2 us | Tail time | 50 us          |           |          |            |        |

Remark K676T Bus Bar IEEE 386-7.17 Accelerated Sealing Life Impulse After cycling  
Sample #3 Shot 3 Positive



Sample #3 Shot 3 Negative

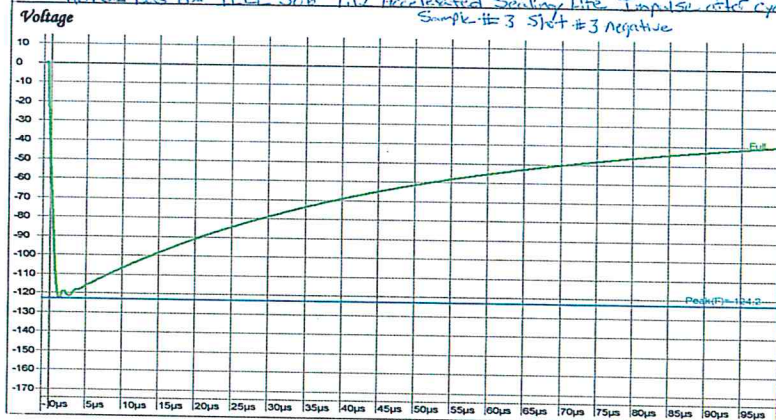
Thomas and Betts - R&D

Test Report

High-Voltage Instrument's Impulse Tester

|                 |        |           |                |           |           |            |        |
|-----------------|--------|-----------|----------------|-----------|-----------|------------|--------|
| Measurement No. | 3782   | Time      | 05.31.18 09:50 | Model No. |           | Serial No. |        |
| Operator        | Mike   | Voltage   | 0 KV           | UPeak     | -124.2 KV | BIL        | 150 KV |
| Rise time       | 1.3 us | Tail time | 50 us          |           |           |            |        |

Remark K676T Bus Bar IEEE 386-7.17 Accelerated Sealing Life Impulse After cycling  
Sample #3 Shot #3 Negative

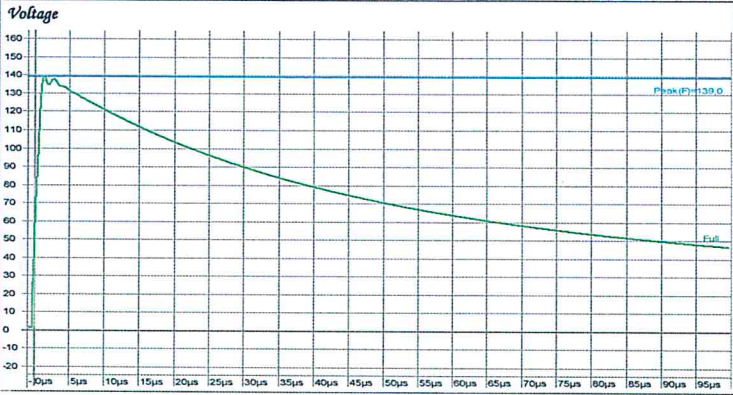


Sample #4 Shot 3 Positive

Thomas and Betts - *ReSD*      Test Report      High-Voltage Instrument's Impulse Tester

|                 |        |           |                |           |        |            |        |
|-----------------|--------|-----------|----------------|-----------|--------|------------|--------|
| Measurement No. | 3773   | Time      | 05.31.18 08:56 | Model No. |        | Serial No. |        |
| Operator        | Mike   | Voltage   | 0 kV           | UPeak     | 139 kV | BIL        | 150 kV |
| Rise time       | 1.3 us | Tail time | 50 us          |           |        |            |        |

Remark K676I Bus Bar IEEE 386-7.12 Accelerated Sealing Life Impulse After Cycling Sample #4 Shot #3 Positive

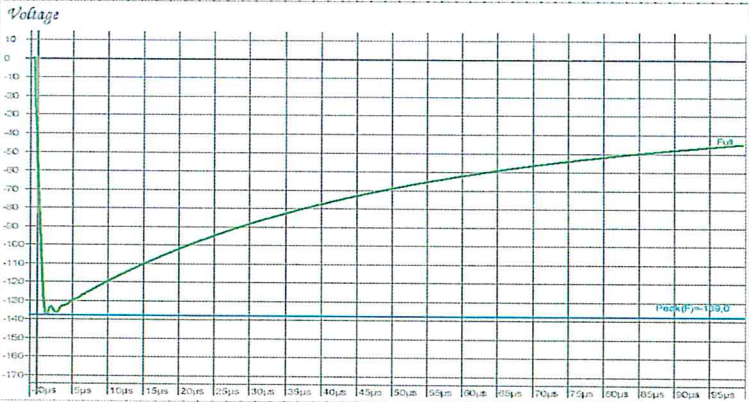


Sample #4 Shot 3 Negative

Thomas and Betts - *ReSD*      Test Report      High-Voltage Instrument's Impulse Tester

|                 |        |           |                |           |         |            |        |
|-----------------|--------|-----------|----------------|-----------|---------|------------|--------|
| Measurement No. | 3776   | Time      | 05.31.18 08:58 | Model No. |         | Serial No. |        |
| Operator        | Mike   | Voltage   | 0 kV           | UPeak     | -139 kV | BIL        | 150 kV |
| Rise time       | 1.3 us | Tail time | 50 us          |           |         |            |        |

Remark K676I Bus Bar IEEE 386-7.12 Accelerated Sealing Life Impulse After Cycling Sample #4 Shot #3 Negative





7.17.2 Test Point Voltage after Sealing Life,

| Sample ID | Applied Voltage | Ross Meter Reading | Pass/Fail |
|-----------|-----------------|--------------------|-----------|
| #1        | 15.62kV         | 12.36kV            | Pass      |
| #2        | 15.83kV         | 13.12kV            | Pass      |
| #3        | 15.43kV         | 15.01kV            | Pass      |
| #4        | 15.71kV         | 17.62kV            | Pass      |

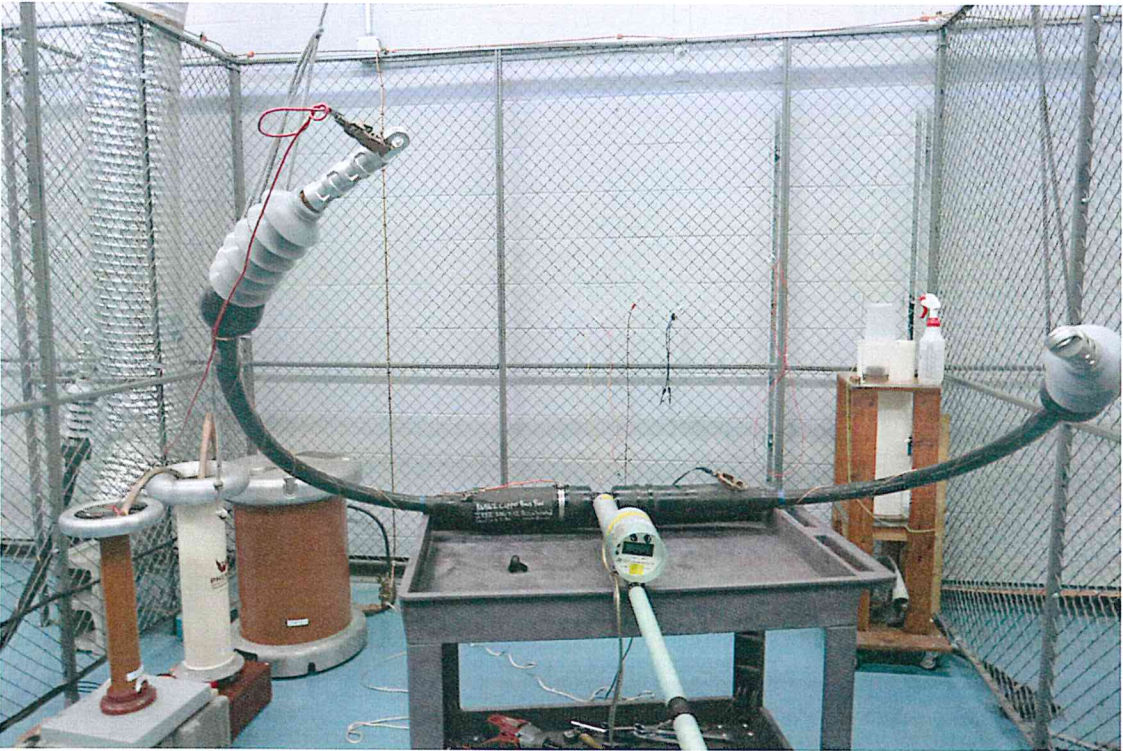


Figure showing test point voltage testing after cycling test.



Figure showing impulse test after cycling for sealing life test.



### 7.171 Test Point Capacitance.

Measured total capacitance levels for C1 readings are to be at least 1.0 PF and not to exceed 12.0 pF.

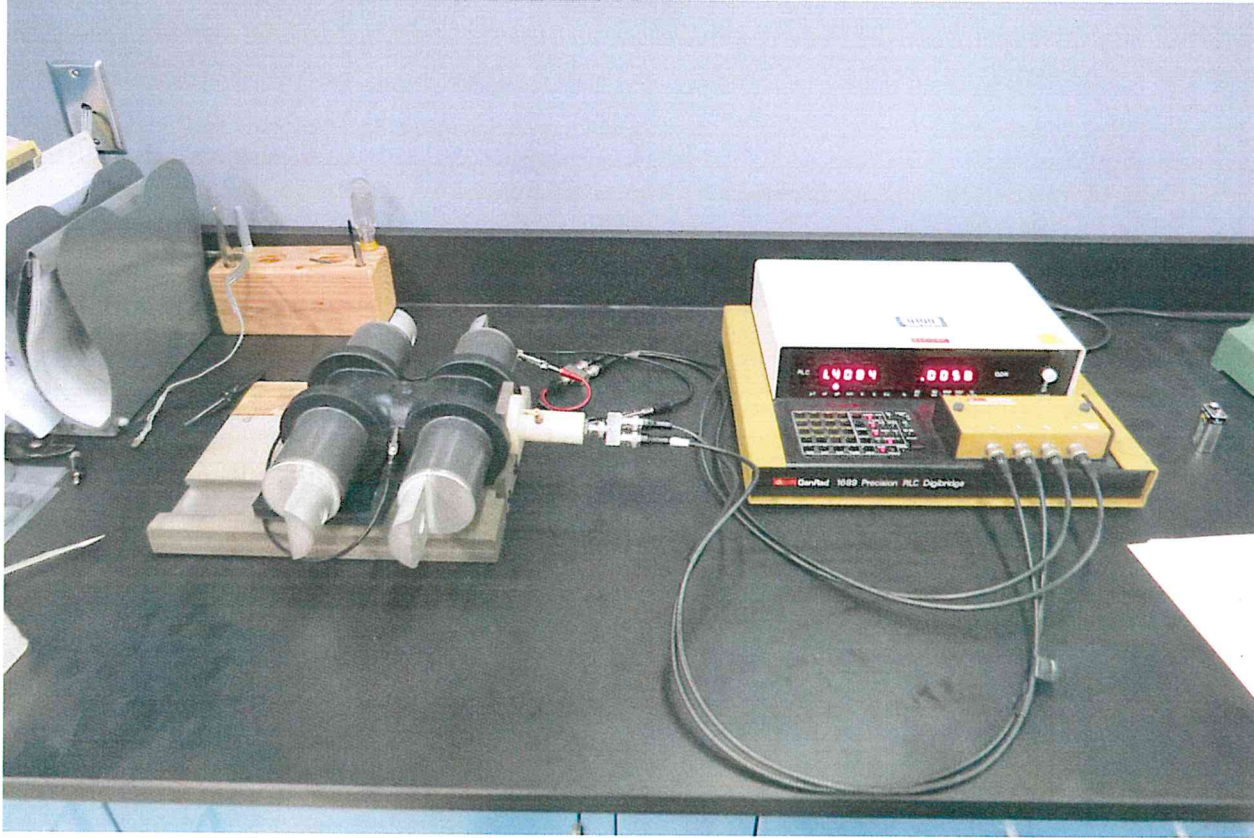


Figure showing K676CH bus bar connected to the GenRad capacitance bridge.

### Sample #1.

| Sample #1     | C1 Readings                |                   |                               | C2 Readings                |                   |                               |
|---------------|----------------------------|-------------------|-------------------------------|----------------------------|-------------------|-------------------------------|
| Measurement # | Total Measured Capacitance | Stray Capacitance | Calculated Actual Capacitance | Total Measured Capacitance | Stray Capacitance | Calculated Actual Capacitance |
| 1             | 1.5076                     | 0.0319            | 1.47563                       | 8.3378                     | 0.19983           | 8.13797                       |
| 2             | 1.5042                     | 0.00213           | 1.50207                       | 8.3403                     | 0.19882           | 8.14148                       |
| 3             | 1.5078                     | 0.00551           | 1.50229                       | 8.3375                     | 0.19939           | 8.13811                       |
| 4             | 1.5092                     | 0.00148           | 1.50772                       | 8.3361                     | 0.19849           | 8.13761                       |
| 5             | 1.5065                     | 0.01266           | 1.49384                       | 8.3378                     | 0.19846           | 8.13934                       |
| 6             | 1.5082                     | 0.00933           | 1.49887                       | 8.3381                     | 0.19747           | 8.14063                       |
| 7             | 1.508                      | 0.00554           | 1.50246                       | 8.338                      | 0.19605           | 8.14195                       |
| 8             | 1.5074                     | 0.00595           | 1.50145                       | 8.3383                     | 0.19603           | 8.14227                       |
| 9             | 1.5057                     | 0.01166           | 1.49404                       | 8.3399                     | 0.19807           | 8.14183                       |
| 10            | 1.5069                     | 0.01367           | 1.49323                       | 8.3405                     | 0.19763           | 8.14287                       |
|               |                            | AVG               |                               |                            | AVG               |                               |
|               |                            | C1=1.49716pF      |                               |                            | C2=8.140406pF     |                               |
|               |                            | Pass              |                               |                            | Pass              |                               |

**Sample #2,**

| Sample #2     | C1 Readings                |                      |                               | C2 Readings                |                   |                               |
|---------------|----------------------------|----------------------|-------------------------------|----------------------------|-------------------|-------------------------------|
| Measurement # | Total Measured Capacitance | Stray Capacitance    | Calculated Actual Capacitance | Total Measured Capacitance | Stray Capacitance | Calculated Actual Capacitance |
| 1             | 1.5791                     | 0.01848              | 1.56062                       | 9.9981                     | 1.3962            | 8.6019                        |
| 2             | 1.5801                     | 0.0196               | 1.5605                        | 9.9903                     | 1.3967            | 8.5936                        |
| 3             | 1.5812                     | 0.01879              | 1.56241                       | 9.9924                     | 1.3964            | 8.596                         |
| 4             | 1.5791                     | 0.01891              | 1.56019                       | 9.9937                     | 1.3962            | 8.5975                        |
| 5             | 1.58                       | 0.0202               | 1.5598                        | 10.026                     | 1.4795            | 8.5465                        |
| 6             | 1.5806                     | 0.01754              | 1.56306                       | 10.048                     | 1.4724            | 8.5756                        |
| 7             | 1.5822                     | 0.01744              | 1.56476                       | 10.046                     | 1.4721            | 8.5739                        |
| 8             | 1.582                      | 0.01699              | 1.5651                        | 10.042                     | 1.4713            | 8.5707                        |
| 9             | 1.583                      | 0.01713              | 1.56587                       | 10.043                     | 1.4701            | 8.5729                        |
| 10            | 1.5827                     | 0.01738              | 1.56532                       | 10.160                     | 1.4681            | 8.6919                        |
|               |                            | Avg<br>C1=1.562763pF |                               |                            |                   | Avg C2=8.62286pF              |
|               |                            | Pass                 |                               |                            |                   | Pass                          |

**Sample #3,**

| Sample #3      | C1 Readings                |                      |                               | C2 Readings                |                   |                               |
|----------------|----------------------------|----------------------|-------------------------------|----------------------------|-------------------|-------------------------------|
| Measurement ID | Total Measured Capacitance | Stray Capacitance    | Calculated Actual Capacitance | Total Measured Capacitance | Stray Capacitance | Calculated Actual Capacitance |
| 1              | 1.5691                     | 0.00481              | 1.56429                       | 10.187                     | 1.4157            | 8.7713                        |
| 2              | 1.5695                     | 0.00419              | 1.56531                       | 10.184                     | 1.4145            | 8.7695                        |
| 3              | 1.5698                     | 0.0531               | 1.5645                        | 10.191                     | 1.4149            | 8.7761                        |
| 4              | 1.5702                     | 0.046                | 1.5171                        | 10.189                     | 1.4155            | 8.7735                        |
| 5              | 1.5697                     | 0.0536               | 1.5237                        | 10.188                     | 1.4140            | 8.774                         |
| 6              | 1.5696                     | 0.0536               | 1.5236                        | 10.567                     | 1.4189            | 9.1481                        |
| 7              | 1.5698                     | 0.0522               | 1.5176                        | 10.200                     | 1.4190            | 8.7810                        |
| 8              | 1.5702                     | 0.0599               | 1.5103                        | 10.186                     | 1.4086            | 8.7774                        |
| 9              | 1.5700                     | 0.0548               | 1.5152                        | 10.181                     | 1.4084            | 8.7726                        |
| 10             | 1.5679                     | 0.0638               | 1.5059                        | 10.179                     | 1.4083            | 8.7707                        |
|                |                            | AVG C1=<br>1.53075pF |                               |                            |                   | AVG<br>C2=8.81142pF           |
|                |                            | Pass                 |                               |                            |                   | Pass                          |



**Sample #4,**

| Sample #4      | C1 Readings                |                      |                               | C2 Readings                |                   |                               |
|----------------|----------------------------|----------------------|-------------------------------|----------------------------|-------------------|-------------------------------|
| Measurement ID | Total Measured Capacitance | Stray Capacitance    | Calculated Actual Capacitance | Total Measured Capacitance | Stray Capacitance | Calculated Actual Capacitance |
| 1              | 1.4419                     | 0.0047               | 1.4372                        | 10.041                     | 1.4154            | 8.6256                        |
| 2              | 1.4428                     | 0.00403              | 1.43877                       | 10.040                     | 1.4163            | 8.6237                        |
| 3              | 1.4434                     | 0.00521              | 1.43819                       | 10.041                     | 1.415             | 8.6260                        |
| 4              | 1.4427                     | 0.00407              | 1.43863                       | 10.039                     | 1.4159            | 8.6231                        |
| 5              | 1.4432                     | 0.00399              | 1.43921                       | 10.037                     | 1.4152            | 8.6218                        |
| 6              | 1.4424                     | 0.00443              | 1.43797                       | 10.043                     | 1.4158            | 8.6272                        |
| 7              | 1.4432                     | 0.00383              | 1.43937                       | 10.038                     | 1.4164            | 8.6216                        |
| 8              | 1.4428                     | 0.00425              | 1.43855                       | 10.039                     | 1.4157            | 8.6233                        |
| 9              | 1.4431                     | 0.0036               | 1.4395                        | 10.036                     | 1.4153            | 8.6207                        |
| 10             | 1.4429                     | 0.00454              | 1.43836                       | 10.037                     | 1.4154            | 8.6216                        |
|                |                            | Avg<br>C1=1.438575pF |                               |                            |                   | Avg C2=8.62346pF              |
|                |                            | Pass                 |                               |                            |                   | Pass                          |

**Sample #5,**

| Sample #5      | C1 Readings                |                      |                               | C2 Readings                |                   |                               |
|----------------|----------------------------|----------------------|-------------------------------|----------------------------|-------------------|-------------------------------|
| Measurement ID | Total Measured Capacitance | Stray Capacitance    | Calculated Actual Capacitance | Total Measured Capacitance | Stray Capacitance | Calculated Actual Capacitance |
| 1              | 1.5369                     | 0.00448              | 1.53242                       | 9.9462                     | 1.4162            | 8.53                          |
| 2              | 1.5366                     | 0.00345              | 1.53315                       | 9.9475                     | 1.4161            | 8.5314                        |
| 3              | 1.5383                     | 0.00380              | 1.5345                        | 9.9466                     | 1.4153            | 8.5313                        |
| 4              | 1.5376                     | 0.00237              | 1.53423                       | 9.9507                     | 1.4154            | 8.5353                        |
| 5              | 1.5379                     | 0.00300              | 1.5349                        | 9.947                      | 1.4153            | 8.532                         |
| 6              | 1.5383                     | 0.00351              | 1.53479                       | 9.9485                     | 1.4165            | 8.532                         |
| 7              | 1.5378                     | 0.00282              | 1.54062                       | 9.9497                     | 1.4161            | 8.5336                        |
| 8              | 1.538                      | 0.00320              | 1.5348                        | 9.9459                     | 1.4153            | 8.5293                        |
| 9              | 1.5375                     | 0.00309              | 1.53441                       | 9.9441                     | 1.4148            | 8.5314                        |
| 10             | 1.5378                     | 0.00291              | 1.53489                       | 9.9455                     | 1.4141            | 8.5306                        |
|                |                            | AVG<br>C1=1.534871pF |                               |                            |                   | AVG C2=8.53169pF              |
|                |                            | Pass                 |                               |                            |                   | Pass                          |

**Sample #6.**

| Sample #6      | C1 Readings                |                      |                               | C2 Readings                |                   |                               |
|----------------|----------------------------|----------------------|-------------------------------|----------------------------|-------------------|-------------------------------|
| Measurement ID | Total Measured Capacitance | Stray Capacitance    | Calculated Actual Capacitance | Total Measured Capacitance | Stray Capacitance | Calculated Actual Capacitance |
| 1              | 1.4331                     | 0.00848              | 1.42462                       | 9.9053                     | 1.3961            | 8.5092                        |
| 2              | 1.4337                     | 0.0085               | 1.4252                        | 9.9052                     | 1.3962            | 8.509                         |
| 3              | 1.4336                     | 0.0088               | 1.4248                        | 9.9076                     | 1.3957            | 8.5119                        |
| 4              | 1.4338                     | 0.00939              | 1.42481                       | 9.9078                     | 1.3969            | 8.5109                        |
| 5              | 1.4332                     | 0.00839              | 1.42481                       | 9.912                      | 1.3971            | 8.5149                        |
| 6              | 1.4335                     | 0.00819              | 1.42531                       | 9.9122                     | 1.3969            | 8.5153                        |
| 7              | 1.434                      | 0.00817              | 1.42583                       | 9.9077                     | 1.3975            | 8.5102                        |
| 8              | 1.4343                     | 0.00847              | 1.42583                       | 9.9146                     | 1.3982            | 8.5164                        |
| 9              | 1.4335                     | 0.00869              | 1.42481                       | 9.9133                     | 1.3981            | 8.5152                        |
| 10             | 1.4337                     | 0.00854              | 1.42516                       | 9.9139                     | 1.3983            | 8.5156                        |
|                |                            | AVG<br>C1=1.425078pF |                               |                            |                   | AVG<br>C2=8.51286pF           |
|                |                            | Pass                 |                               |                            |                   | Pass                          |

**Sample #7.**

| Sample #7      | C1 Readings                |                      |                               | C2 Readings                |                   |                               |
|----------------|----------------------------|----------------------|-------------------------------|----------------------------|-------------------|-------------------------------|
| Measurement ID | Total Measured Capacitance | Stray Capacitance    | Calculated Actual Capacitance | Total Measured Capacitance | Stray Capacitance | Calculated Actual Capacitance |
| 1              | 1.5582                     | 0.00817              | 1.55003                       | 9.9099                     | 1.3834            | 8.5265                        |
| 2              | 1.5572                     | 0.00851              | 1.54869                       | 9.9117                     | 1.3834            | 8.5274                        |
| 3              | 1.558                      | 0.00752              | 1.55048                       | 9.9116                     | 1.3833            | 8.5283                        |
| 4              | 1.5571                     | 0.00804              | 1.54906                       | 9.9049                     | 1.3831            | 8.5218                        |
| 5              | 1.5568                     | 0.00801              | 1.54879                       | 9.9082                     | 1.3832            | 8.525                         |
| 6              | 1.5575                     | 0.00814              | 1.54936                       | 9.9022                     | 1.3836            | 8.5186                        |
| 7              | 1.5571                     | 0.00823              | 1.54887                       | 9.9075                     | 1.3823            | 8.5252                        |
| 8              | 1.5567                     | 0.00761              | 1.54909                       | 9.9091                     | 1.3832            | 8.5259                        |
| 9              | 1.5572                     | 0.00882              | 1.54838                       | 9.907                      | 1.3836            | 8.5234                        |
| 10             | 1.5574                     | 0.00806              | 1.54934                       | 9.906                      | 1.3818            | 8.5242                        |
|                |                            | AVG<br>C1=1.549209pF |                               |                            |                   | AVG C2=<br>8.52464pF          |
|                |                            | Pass                 |                               |                            |                   | Pass                          |



**Sample #8,**

| Sample #8      | C1 Readings                |                      |                               | C2 Readings                |                     |                               |
|----------------|----------------------------|----------------------|-------------------------------|----------------------------|---------------------|-------------------------------|
| Measurement ID | Total Measured Capacitance | Stray Capacitance    | Calculated Actual Capacitance | Total Measured Capacitance | Stray Capacitance   | Calculated Actual Capacitance |
| 1              | 1.522                      | 0.02563              | 1.49637                       | 9.9088                     | 1.3391              | 8.5697                        |
| 2              | 1.5219                     | 0.02575              | 1.49615                       | 9.9198                     | 1.3394              | 8.5804                        |
| 3              | 1.5222                     | 0.02561              | 1.49659                       | 9.9149                     | 1.3384              | 8.5765                        |
| 4              | 1.5219                     | 0.02578              | 1.49612                       | 9.9133                     | 1.3398              | 8.5735                        |
| 5              | 1.5214                     | 0.02552              | 1.49588                       | 9.9099                     | 1.3399              | 8.57                          |
| 6              | 1.5226                     | 0.02548              | 1.49712                       | 9.9177                     | 1.3408              | 8.5778                        |
| 7              | 1.5223                     | 0.02589              | 1.49641                       | 9.916                      | 1.3391              | 8.5769                        |
| 8              | 1.5218                     | 0.0258               | 1.496                         | 9.9171                     | 1.3383              | 8.5788                        |
| 9              | 1.5203                     | 0.02644              | 1.49386                       | 9.9174                     | 1.3384              | 8.579                         |
| 10             | 1.5205                     | 0.02648              | 1.49402                       | 9.9163                     | 1.3374              | 8.5789                        |
|                |                            | AVG<br>C1=1.495852pF |                               |                            | AVG<br>C2=8.57615pF |                               |
|                |                            | Pass                 |                               |                            | Pass                |                               |

**Sample #9,**

| Sample #9      | C1 Readings                |                      |                               | C2 Readings                |                     |                               |
|----------------|----------------------------|----------------------|-------------------------------|----------------------------|---------------------|-------------------------------|
| Measurement ID | Total Measured Capacitance | Stray Capacitance    | Calculated Actual Capacitance | Total Measured Capacitance | Stray Capacitance   | Calculated Actual Capacitance |
| 1              | 1.4141                     | 0.02324              | 1.39086                       | 9.9718                     | 1.369               | 8.6028                        |
| 2              | 1.4137                     | 0.02374              | 1.38996                       | 9.9666                     | 1.3694              | 8.5972                        |
| 3              | 1.4135                     | 0.02272              | 1.39078                       | 9.9698                     | 1.3695              | 8.6003                        |
| 4              | 1.414                      | 0.02315              | 1.39085                       | 9.9679                     | 1.3693              | 8.5986                        |
| 5              | 1.4135                     | 0.0233               | 1.3902                        | 9.9686                     | 1.3699              | 8.5987                        |
| 6              | 1.4139                     | 0.02312              | 1.39078                       | 9.9682                     | 1.3698              | 8.5984                        |
| 7              | 1.4126                     | 0.02328              | 1.38932                       | 9.9662                     | 1.369               | 8.5932                        |
| 8              | 1.4129                     | 0.02386              | 1.38904                       | 9.9665                     | 1.3682              | 8.5983                        |
| 9              | 1.4134                     | 0.02338              | 1.39002                       | 9.9693                     | 1.3684              | 8.6009                        |
| 10             | 1.4126                     | 0.02434              | 1.38826                       | 9.9618                     | 1.369               | 8.5928                        |
|                |                            | AVG<br>C1=1.390007pF |                               |                            | AVG<br>C2=9.45799pF |                               |
|                |                            | Pass                 |                               |                            | Pass                |                               |

### Sample #10.

| Sample #10    | C1 Readings                |                      |                               | C2 Readings                |                     |                               |
|---------------|----------------------------|----------------------|-------------------------------|----------------------------|---------------------|-------------------------------|
| Measurment ID | Total Measured Capacitance | Stray Capacitance    | Calculated Actual Capacitance | Total Measured Capacitance | Stray Capacitance   | Calculated Actual Capacitance |
| 1             | 1.408                      | 0.00263              | 1.40537                       | 10.138                     | 1.4103              | 8.7277                        |
| 2             | 1.4071                     | 0.00265              | 1.40445                       | 10.137                     | 1.4113              | 8.7257                        |
| 3             | 1.4078                     | 0.00228              | 1.40552                       | 10.135                     | 1.4108              | 8.7242                        |
| 4             | 1.4068                     | 0.00244              | 1.40436                       | 10.142                     | 1.411               | 8.731                         |
| 5             | 1.4071                     | 0.00275              | 1.40435                       | 10.136                     | 1.4123              | 8.7237                        |
| 6             | 1.4066                     | 0.00186              | 1.40474                       | 10.141                     | 1.4118              | 8.7292                        |
| 7             | 1.407                      | 0.00276              | 1.40424                       | 10.143                     | 1.411               | 8.732                         |
| 8             | 1.4074                     | 0.00265              | 1.40475                       | 10.141                     | 1.4104              | 8.7306                        |
| 9             | 1.4067                     | 0.00201              | 1.40469                       | 10.133                     | 1.4109              | 8.7221                        |
| 10            | 1.4065                     | 0.00249              | 1.40401                       | 10.138                     | 1.4114              | 8.7266                        |
|               |                            | AVG<br>C1=1.404648pF |                               |                            | AVG<br>C2=8.68608pF |                               |
|               |                            | Pass                 |                               |                            | Pass                |                               |

### Conclusion.

All of the copper 900-amp bus bars test samples successfully passed all aspects of the specifications stated IEEE 386-2016 test standard.