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|---|---|---|---|
| Project Number: Design Verification Test Report | Tracking Code: TC0928--2600_Report_Rev_2 | | |
| Requested by: Wy Chiang | Date: 07/09/2009 | Product Rev: 0 | |
| Part #: HSEC8-160-01-L-RA | Lot #: N/A | Tech: Kason He | Eng: Vico Zhao |
| Part description: HSEC8 | | | Qty to test: 60 |
| Test Start: 07/09/2009 | Test Completed: 09/18/2009 | | |



**Design Verification Test Report**

**HSEC8-160-01-L-RA**

## CERTIFICATION

All instruments and measuring equipment were calibrated to National Institute for Standards and Technology (NIST) traceable standards according to IS0 10012-l and ANSI/NCSL 2540-1, as applicable.

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### SCOPE

To perform the following tests: design verification test, please see flowchart.

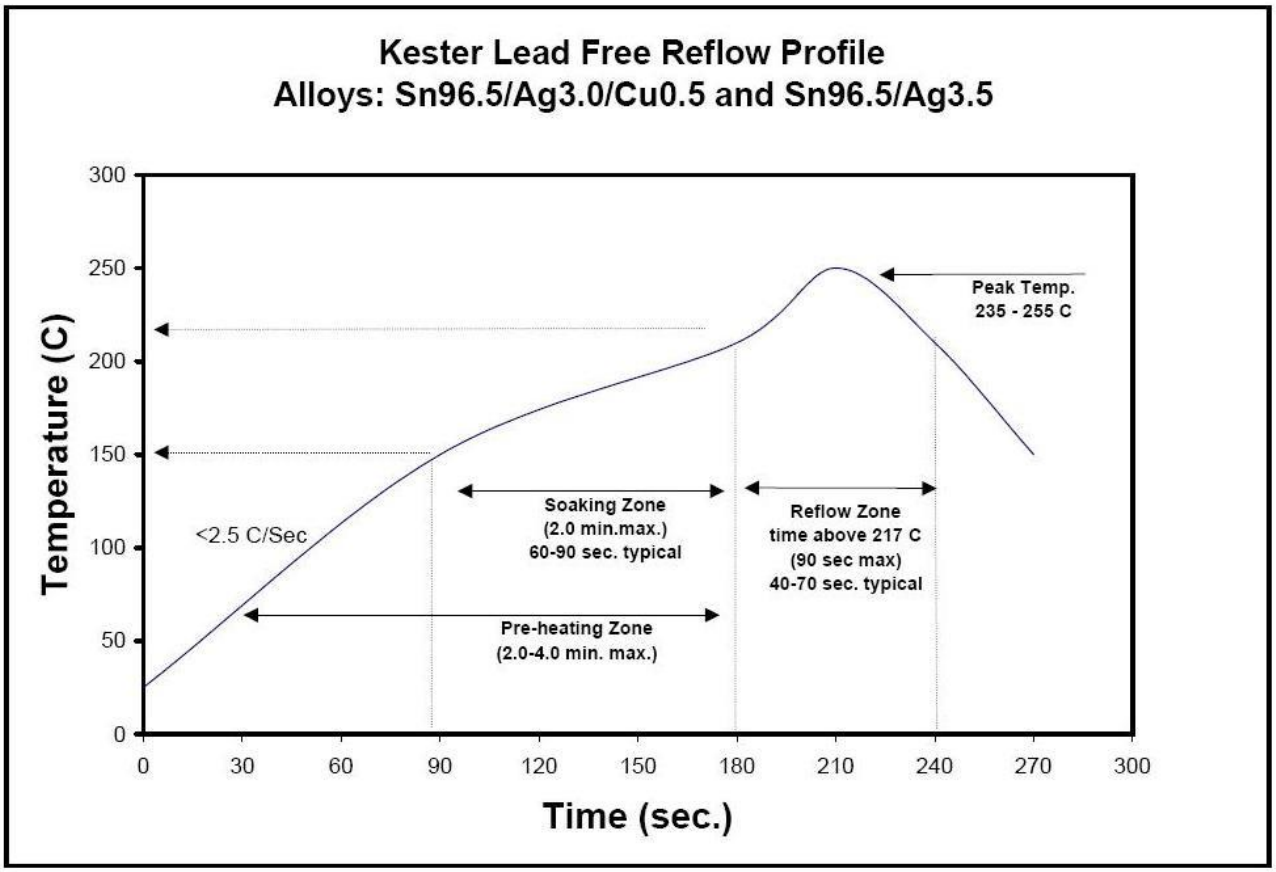
### APPLICABLE DOCUMENTS

Standards: EIA Publication 364

### TEST SAMPLES AND PREPARATION

1) All materials were manufactured in accordance with the applicable product specification.
2) All test samples were identified and encoded to maintain traceability throughout the test sequences.
3) After soldering, the parts to be used for LLCR and DWV/IR testing were cleaned according to TLWI-0001.
4) Either an automated cleaning procedure or an ultrasonic cleaning procedure may be used.
5) The automated procedure is used with aqueous compatible soldering materials.
6) Parts not intended for testing LLCR and DWV/IR are visually inspected and cleaned if necessary.
7) Any additional preparation will be noted in the individual test sequences.
8) Solder Information: Lead free
9) Re-Flow Time/Temp: See accompanying profile.
10) Samtec Test PCBs used: PCB-101754-TST

**TYPICAL OVEN PROFILE (Soldering Parts to Test Boards)**



# FLOWCHARTS

## Gas Tight

| TEST STEP | GROUP A 200 Points (min) |
|---|---|
| 01 | LLCR-1 |
| 02 | Gas Tight |
| 03 | LLCR-2 |

**Gas Tight = EIA-364-36A**

**LLCR = EIA-364-23, LLCR**

**use Keithley 580 in the dry circuit mode, 10 mA Max**

## Mating/Unmating/Gaps/Normal Force/Deflection Force

| TEST STEP | GROUP A 10 Boards | GROUP B1 Individual Contacts (30) min | GROUP B2 Individual Contacts (30) min |
|---|---|---|---|
| 01 | Contact Gaps | **Setup Approve** | **Setup Approve** |
| 02 | Mating / Unmating | Normal Force | Thermal Aging (Mated) |
| 03 | Data Review | Data Review | Normal Force |
| 04 | 100 Cycles | | |
| 05 | Mating / Unmating | | |
| 06 | Contact Gaps | | |
| 07 | Data Review | | |
| 08 | Thermal Aging (Mated) | | |
| 09 | Mating / Unmating | | |
| 10 | Contact Gaps | | |
| 11 | Data Review | | |
| 12 | Humidity (Mated) | | |
| 13 | Contact Gaps | | |
| 14 | Mating / Unmating | | |

**Thermal Aging = EIA-364-17, Test Condition 4, 105 deg C;**

**Time Condition 'B' (250 hours)**

**Humidity =EIA-364-31, Test Condition B (240 Hours)**

**and Method III (+25 ° C to +65 ° C @ 90%RH to 98% RH)**

**ambient pre-condition and delete steps 7a and 7b**

**Mating/Un-Mating Forces = EIA-364-13**

**Normal Force = EIA-364-04**

**(Perpendicular) displacement Force = 12.7 mm/min +/- 6 mm/min**

**Spec is 50 N @ 1 mm displacement**

**Contact Gaps/Height - No standard method. Usually measured optically**

**IR / DWV**

| TEST STEP | GROUP A1<br>2 Mated Sets<br>Break Down - Pin to Pin | GROUP A2<br>2 Unmated of Part # Being Tested<br>Break Down - Pin to Pin | GROUP A3<br>2 Unmated of Mating Part #<br>Break Down - Pin to Pin | GROUP B<br>2 Mated Sets<br>Pin to Pin |
|---|---|---|---|---|
| 01 | DWV/Break Down Voltage | DWV/Break Down Voltage | DWV/Break Down Voltage | IR & DWV at test voltage (on both mated sets and on each connector unmated) |
| 02 | | | | Thermal Aging (both sets unmated) |
| 03 | | | | IR & DWV at test voltage (on both mated sets and on each connector unmated) |
| 04 | | | | Cyclic Humidity (both sets unmated) |
| 05 | | | | IR & DWV at test voltage (on both mated sets and on each connector unmated) |

*** - DWV on group B to be performed at Test Voltage**
**DWV test voltage is equal to 75% of the lowest break down voltage from group A1, A2 or A3**
**Thermal Aging = EIA-364-17, Test Condition 4 (105 °C)**
**Time Condition 'B' (250 hours)**
**Humidity = EIA-364-31, Test Condition B (240 Hours)**
**and Method III (+25° C to +65° C @ 90%RH to 98% RH)**
**ambient pre-condition and delete steps 7a and 7b**
**IR = EIA-364-21**
**DWV = EIA-364-20, Test Condition 1**

## Durability/Thermal Age/Cyclic Humidity

| TEST STEP | GROUP A<br>200 Points<br>100 Cycles |
|---|---|
| 01 | LLCR-1 |
| 02 | Data Review |
| 03 | 100 Cycles |
| 04 | LLCR-2 |
| 05 | Data Review |
| 06 | Thermal Age |
| 07 | LLCR-3 |
| 08 | Data Review |
| 09 | Cyclic Humidity |
| 10 | LLCR-4 |

**Thermal Aging = EIA-364-17, Test Condition 4, 105 deg C;**
**Time Condition 'B' (250 hours)**
**Humidity =EIA-364-31, Test Condition B (240 Hours)**
**and Method III (+25 ° C to +65 ° C @ 90%RH to 98% RH)**
**ambient pre-condition and delete steps 7a and 7b**
**LLCR = EIA-364-23, LLCR**
**use Keithley 580 in the dry circuit mode, 10 mA Max**

## Current Carrying Capacity

**DOUBLE ROW**

## Current Carrying Capacity

**3 Mated Assemblies Each**

| TEST STEP | GROUP A<br>3 Mated Assemblies<br>2 CONTACT POWERED | GROUP B<br>3 Mated Assemblies<br>4 CONTACTS POWERED | GROUP C<br>3 Mated Assemblies<br>6 CONTACTS POWERED | GROUP D<br>3 Mated Assemblies<br>8 CONTACTS POWERED | GROUP E<br>3 Mated Assemblies<br>ALL CONTACTS POWERED |
|---|---|---|---|---|---|
| 01 | CCC | CCC | CCC | CCC | CCC |

**(TIN PLATING) - Tabulate calculated current at RT, 65° C, 75° C and 95° C**
**after derating 20% and based on 105° C**
**(GOLD PLATING) - Tabulate calculated current at RT, 85° C, 95° C and 115° C**
**after derating 20% and based on 125° C**
**CCC, Temp rise = EIA-364-70**

## ATTRIBUTE DEFINITIONS

The following is a brief, simplified description of attributes.

### THERMAL:

1) EIA-364-17, *Temperature Life with or without Electrical Load Test Procedure for Electrical Connectors.*
2) Test Condition 4 at 105° C.
3) Test Time Condition B for 250 hours.
4) All test samples are pre-conditioned at ambient.
5) All test samples are exposed to environmental stressing in the mated condition.

### HUMIDITY:

1) Reference document: EIA-364-31, *Humidity Test Procedure for Electrical Connectors.*
2) Test Condition B, 240 Hours.
3) Method III, +25° C to + 65° C, 90% to 98% Relative Humidity excluding sub-cycles 7a and 7b.
4) All samples are pre-conditioned at ambient.
5) All test samples are exposed to environmental stressing in the mated condition.

### MATING/UNMATING:

1) Reference document: EIA-364-13, *Mating and Unmating Forces Test Procedure for Electrical Connectors*.
2) The full insertion position was to within 0.003" to 0.004" of the plug bottoming out in the receptacle to prevent damage to the system under test.
3) One of the mating parts is secured to a floating X-Y table to prevent damage during cycling.

### NORMAL FORCE (FOR CONTACTS TESTED IN THE HOUSING):

1) Reference document: EIA-364-04, *Normal Force Test Procedure for Electrical Connectors*.
2) The contacts shall be tested in the connector housing.
3) If necessary, a "window" shall be made in the connector body to allow a probe to engage and deflect the contact at the same attitude and distance (plus 0.05 mm [0.002"]) as would occur in actual use.
4) The connector housing shall be placed in a holding fixture that does not interfere with or otherwise influence the contact force or deflection.
5) Said holding fixture shall be mounted on a floating, adjustable, X-Y table on the base of the Dillon $TC^2$, computer controlled test stand with a deflection measurement system accuracy of 5.0 µm (0.0002").
6) The nominal deflection rate shall be 5 mm (0.2")/minute.
7) Unless otherwise noted a minimum of five contacts shall be tested.
8) The force/deflection characteristic to load and unload each contact shall be repeated five times.
9) The system shall utilize the $TC^2$ software in order to acquire and record the test data.
10) The permanent set of each contact shall be measured within the $TC^2$ software.
11) The acquired data shall be graphed with the deflection data on the X-axis and the force data on the Y-axis and a print out will be stored with the Tracking Code paperwork.

## TEMPERATURE RISE (Current Carrying Capacity, CCC):

1) EIA-364-70, *Temperature Rise versus Current Test Procedure for Electrical Connectors and Sockets*.
2) When current passes through a contact, the temperature of the contact increases as a result of $I^2R$ (resistive) heating.
3) The number of contacts being investigated plays a significant part in power dissipation and therefore temperature rise.
4) The size of the temperature probe can affect the measured temperature.
5) Copper traces on PC boards will contribute to temperature rise:
    a. Self heating (resistive)
    b. Reduction in heat sink capacity affecting the heated contacts
6) A de-rating curve, usually 20%, is calculated.
7) Calculated de-rated currents at three temperature points are reported:
    a. Ambient
    b. $80^o$ C
    c. $95^o$ C
    d. $115^o$ C
8) Typically, neighboring contacts (in close proximity to maximize heat build up) are energized.
9) The thermocouple (or temperature measuring probe) will be positioned at a location to sense the maximum temperature in the vicinity of the heat generation area.
10) A computer program, *TR 803.exe*, ensures accurate stability for data acquisition.
11) Hook-up wire cross section is larger than the cross section of any connector leads/PC board traces, jumpers, etc.
12) Hook-up wire length is longer than the minimum specified in the referencing standard.

## INSULATION RESISTANCE (IR):

To determine the resistance of insulation materials to leakage of current through or on the surface of these materials when a DC potential is applied.

1) PROCEDURE:
    a. Reference document: EIA-364-21, *Insulation Resistance Test Procedure for Electrical Connectors*.
    b. Test Conditions:
        i. Between Adjacent Contacts or Signal-to-Ground
        ii. Electrification Time 2.0 minutes
        iii. Test Voltage (500 VDC) corresponds to calibration settings for measuring resistances.
2) MEASUREMENTS:
3) When the specified test voltage is applied (VDC), the insulation resistance shall not be less than 5000 megohms.

## DIELECTRIC WITHSTANDING VOLTAGE (DWV):

To determine if the sockets can operate at its rated voltage and withstand momentary over potentials due to switching, surges, and other similar phenomenon. Separate samples are used to evaluate the effect of environmental stresses so not to influence the readings from arcing that occurs during the measurement process.

1) PROCEDURE:
    a. Reference document: EIA-364-20, *Withstanding Voltage Test Procedure for Electrical Connectors*.
    b. Test Conditions:
        i. Between Adjacent Contacts or Signal-to-Ground
        ii. Barometric Test Condition 1
        iii. Rate of Application 500 V/Sec
        iv. Test Voltage (VAC) until breakdown occurs
2) MEASUREMENTS/CALCULATIONS
    a. The breakdown voltage shall be measured and recorded.
    b. The dielectric withstanding voltage shall be recorded as 75% of the minimum breakdown voltage.
    c. The working voltage shall be recorded as one-third (1/3) of the dielectric withstanding voltage (one-fourth of the breakdown voltage).

## LLCR:

1) EIA-364-23, *Low Level Contact Resistance Test Procedure for Electrical Connectors and Sockets*.
2) A computer program, *LLCR 221.exe*, ensures repeatability for data acquisition.
3) The following guidelines are used to categorize the changes in LLCR as a result from stressing
    a. <= +5.0 mOhms: ----------Stable
    b. +5.1 to +10.0 mOhms:----------Minor
    c. +10.1 to +15.0 mOhms: ----------Acceptable
    d. +15.1 to +50.0 mOhms: ----------Marginal
    e. +50.1 to +2000 mOhms: ----------Unstable
    f. >+2000 mOhms:----------Open Failure

**GAS TIGHT:**

To provide method for evaluating the ability of the contacting surfaces in preventing penetration of harsh vapors which might lead to oxide formation that may degrade the electrical performance of the contact system.

1) EIA-364-23, *Low Level Contact Resistance Test Procedure for Electrical Connectors and Sockets*.
2) A computer program, *LLCR 221.exe*, ensures repeatability for data acquisition.
3) The following guidelines are used to categorize the changes in LLCR as a result from stressing
    a. <= +5.0 mOhms: ----------Stable
    b. +5.1 to +10.0 mOhms:----------Minor
    c. +10.1 to +15.0 mOhms: ----------Acceptable
    d. +15.1 to +50.0 mOhms: ----------Marginal
    e. +50.1 to +2000 mOhms: ----------Unstable
    f. >+2000 mOhms:----------Open Failure
4) Procedure:
    a. Reference document: EIA-364-36, *Test Procedure for Determination of Gas-Tight Characteristics for Electrical Connectors, Sockets and/or Contact Systems*.
    b. Test Conditions:
        i. Class II--- Mated pairs of contacts assembled to their plastic housings.
        ii. Reagent grade Nitric Acid shall be used of sufficient volume to saturate the test chamber
        iii. The ratio of the volume of the test chamber to the surface area of the acid shall be 10:1.
        iv. The chamber shall be saturated with the vapor for at least 15 minutes before samples are added.
        v. Exposure time, 55 to 65 minutes.
        vi. The samples shall be no closer to the chamber walls than 1 inches and no closer to the surface of the acid than 3 inches.
        vii. The samples shall be dried after exposure for a minimum of 1 hour.
        viii. Drying temperature $50^{o}$ C
        ix. The final LLCR shall be conducted within 1 hour after drying.

## RESULTS

**Temperature Rise, CCC at a 20% de-rating**

- **CCC for a 30°C Temperature Rise ----------2.6A per contact with 2 adjacent contacts powered**
- **CCC for a 30°C Temperature Rise ----------2.1A per contact with 4 adjacent contacts powered**
- **CCC for a 30°C Temperature Rise ----------1.9A per contact with 6 adjacent contacts powered**
- **CCC for a 30°C Temperature Rise ----------1.7A per contact with 8 adjacent contacts powered**
- **CCC for a 30°C Temperature Rise ----------0.9A per contact with 120 adjacent contacts powered**

**Contact Gaps**

**Male**

- **Initial**
  - **Min ---------- 0.018”**
  - **Max ---------- 0.022”**
- **After 100 Cycles**
  - **Min ---------- 0.028”**
  - **Max ---------- 0.035”**
- **After Thermal**
  - **Min ---------- 0.031”**
  - **Max ---------- 0.039”**
- **After Humidity**
  - **Min ---------- 0.032”**
  - **Max ---------- 0.038”**

**Mating – Unmating Forces**

- **Initial**
  - **Mating**
    - **Min ---------- 8.93 Lbs**
    - **Max----------13.00 Lbs**
  - **Unmating**
    - **Min ---------- 2.73 Lbs**
    - **Max---------- 3.70 Lbs**
- **After 25 Cycles**
  - **Mating**
    - **Min ---------- 8.42 Lbs**
    - **Max----------11.80 Lbs**
  - **Unmating**
    - **Min ---------- 2.95 Lbs**
    - **Max---------- 3.90 Lbs**
- **After 50 Cycles**
  - **Mating**
    - **Min ---------- 8.05 Lbs**
    - **Max----------10.80 Lbs**
  - **Unmating**
    - **Min ---------- 3.00 Lbs**
    - **Max---------- 3.80 Lbs**
- **After 75 Cycles**
  - **Mating**
    - **Min ---------- 7.89 Lbs**
    - **Max----------10.00 Lbs**
  - **Unmating**
    - **Min ---------- 2.95 Lbs**
    - **Max---------- 4.20 Lbs**
- **After 100 Cycles**
  - **Mating**
    - **Min ---------- 7.58 Lbs**
    - **Max---------- 9.10 Lbs**
  - **Unmating**
    - **Min ---------- 3.04 Lbs**
    - **Max---------- 3.90 Lbs**
- **Thermal**
  - **Mating**
    - **Min ---------- 5.97 Lbs**
    - **Max---------- 8.40 Lbs**
  - **Unmating**
    - **Min ---------- 2.34 Lbs**
    - **Max---------- 4.30 Lbs**
- **Humidity**
  - **Mating**
    - **Min ---------- 5.56 Lbs**
    - **Max---------- 7.50 Lbs**
  - **Unmating**
    - **Min ---------- 1.71 Lbs**
    - **Max---------- 3.00 Lbs**

**Normal Force at 0.020" deflection**

- **Initial**
  - **Min ----------71.63 gf Set ----- 0.0003"**
  - **Max ----------76.57 gf Set ----- 0.0005"**
- **Thermal**
  - **Min ----------69.18 gf Set ----- 0.0018"**
  - **Max ----------74.96 gf Set ----- 0.0025"**

**Insulation Resistance minimums, IR**

- **Initial**
  - **Mated ----------10000Meg Ω ---------- Pass**
  - **Unmated ----------10000Meg Ω ---------- Pass**
- **Thermal**
  - **Mated ----------10000Meg Ω ---------- Pass**
  - **Unmated ----------10000Meg Ω ---------- Pass**
- **Humidity**
  - **Mated ----------10000Meg Ω ---------- Pass**
  - **Unmated ----------10000Meg Ω ---------- Pass**

**Dielectric Withstanding Voltage minimums, DWV**

- **Initial**
  - **Breakdown**
    - **Mated ----------750VAC**
    - **Unmated----------700VAC**
  - **DWV**
    - **Mated ----------525VAC**
    - **Unmated----------525VAC**
  - **Working voltage**
    - **Mated ----------175VAC**
    - **Unmated----------175VAC**
- **Thermal**
  - **DWV**
    - **Mated ----------525VAC**
    - **Unmated----------525VAC**
- **Humidity**
  - **DWV**
    - **Mated ----------525VAC**
    - **Unmated----------525VAC**

**LLCR Durability (200 LLCR test points)**

- **Initial ---------- 10.3 mOhms Max**
- **Durability, 100 Cycles**
  - **<= +5.0 mOhms ---------- 200Points ---------- Stable**
  - **+5.1 to +10.0 mOhms ----------0 Points ---------- Minor**
  - **+10.1 to +15.0 mOhms ----------0 Points ---------- Acceptable**
  - **+15.1 to +50.0 mOhms ----------0 Points ---------- Marginal**
  - **+50.1 to +2000 mOhms----------0 Points ---------- Unstable**
  - **>+2000 mOhms----------0 Points ---------- Open Failure**
- **Thermal**
  - **<= +5.0 mOhms ---------- 200 Points ---------- Stable**
  - **+5.1 to +10.0 mOhms ----------0 Points ---------- Minor**
  - **+10.1 to +15.0 mOhms ----------0 Points ---------- Acceptable**
  - **+15.1 to +50.0 mOhms ----------0 Points ---------- Marginal**
  - **+50.1 to +2000 mOhms----------0 Points ---------- Unstable**
  - **>+2000 mOhms----------0 Points ---------- Open Failure**

- **Humidity**
  - **<= +5.0 mOhms ---------- 200 Points ---------- Stable**
  - **+5.1 to +10.0 mOhms ----------0 Points ---------- Minor**
  - **+10.1 to +15.0 mOhms ----------0 Points ---------- Acceptable**
  - **+15.1 to +50.0 mOhms ----------0 Points ---------- Marginal**
  - **+50.1 to +2000 mOhms----------0 Points ---------- Unstable**
  - **>+2000 mOhms----------0 Points ---------- Open Failure**

**LLCR Gas Tight (200 LLCR test points)**

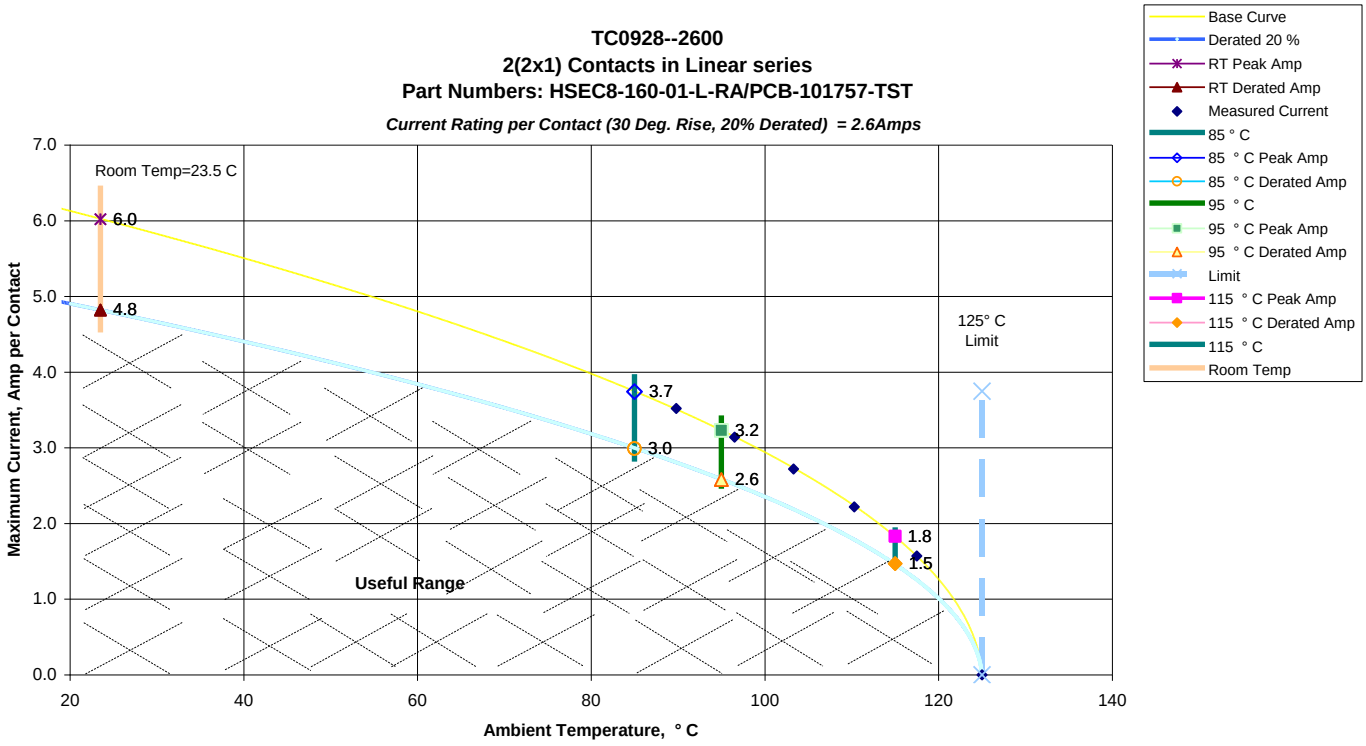
- **Initial ----------9.9 mOhms Max**
- **Gas-Tight**
  - **<= +5.0 mOhms ---------- 200 Points ---------- Stable**
  - **+5.1 to +10.0 mOhms ----------0 Points ---------- Minor**
  - **+10.1 to +15.0 mOhms ----------0 Points ---------- Acceptable**
  - **+15.1 to +50.0 mOhms ----------0 Points ---------- Marginal**
  - **+50.1 to +2000 mOhms----------0 Points ---------- Unstable**
  - **>+2000 mOhms----------0 Points ---------- Open Failure**

# DATA SUMMARY

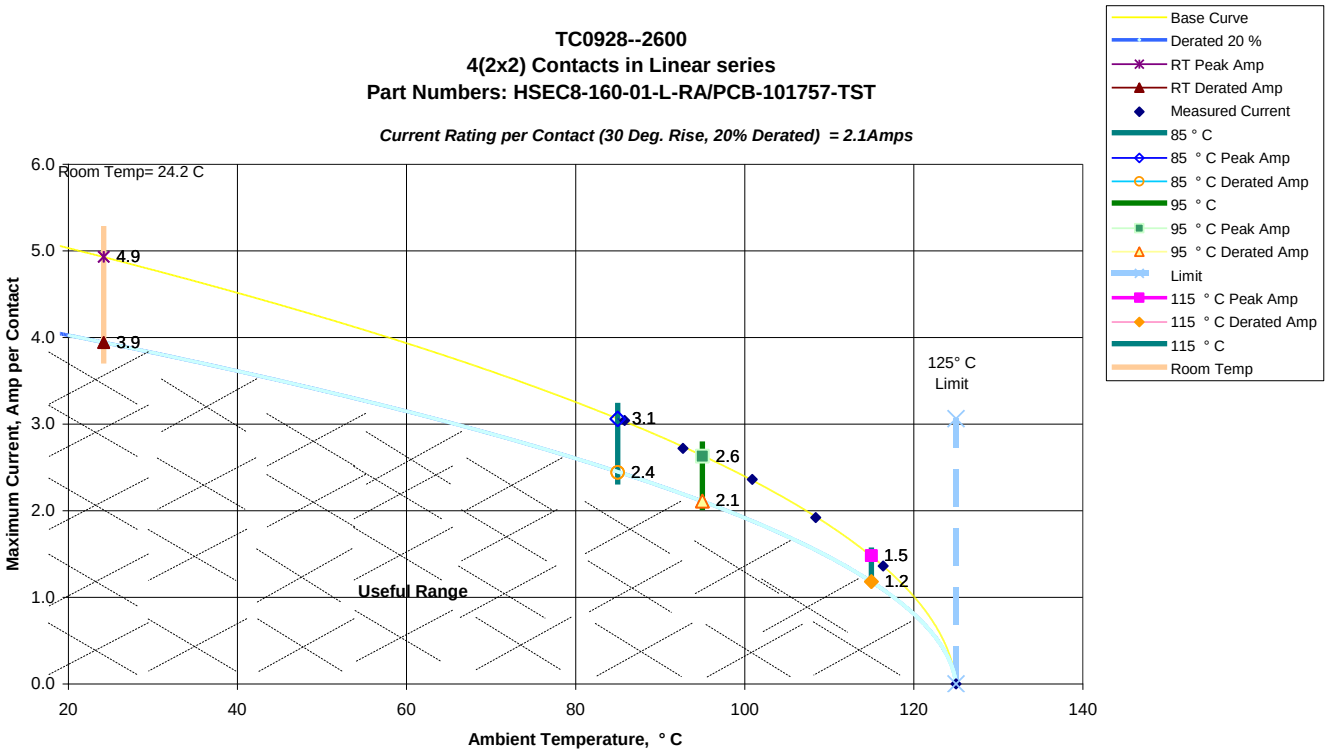
## TEMPERATURE RISE (Current Carrying Capacity, CCC):

1) High quality thermocouples whose temperature slopes track one another were used for temperature monitoring.
2) The thermocouples were placed at a location to sense the maximum temperature generated during testing.
3) Temperature readings recorded are those for which three successive readings, 15 minutes apart, differ less than 1° C (computer controlled data acquisition).
4) Adjacent contacts were powered:

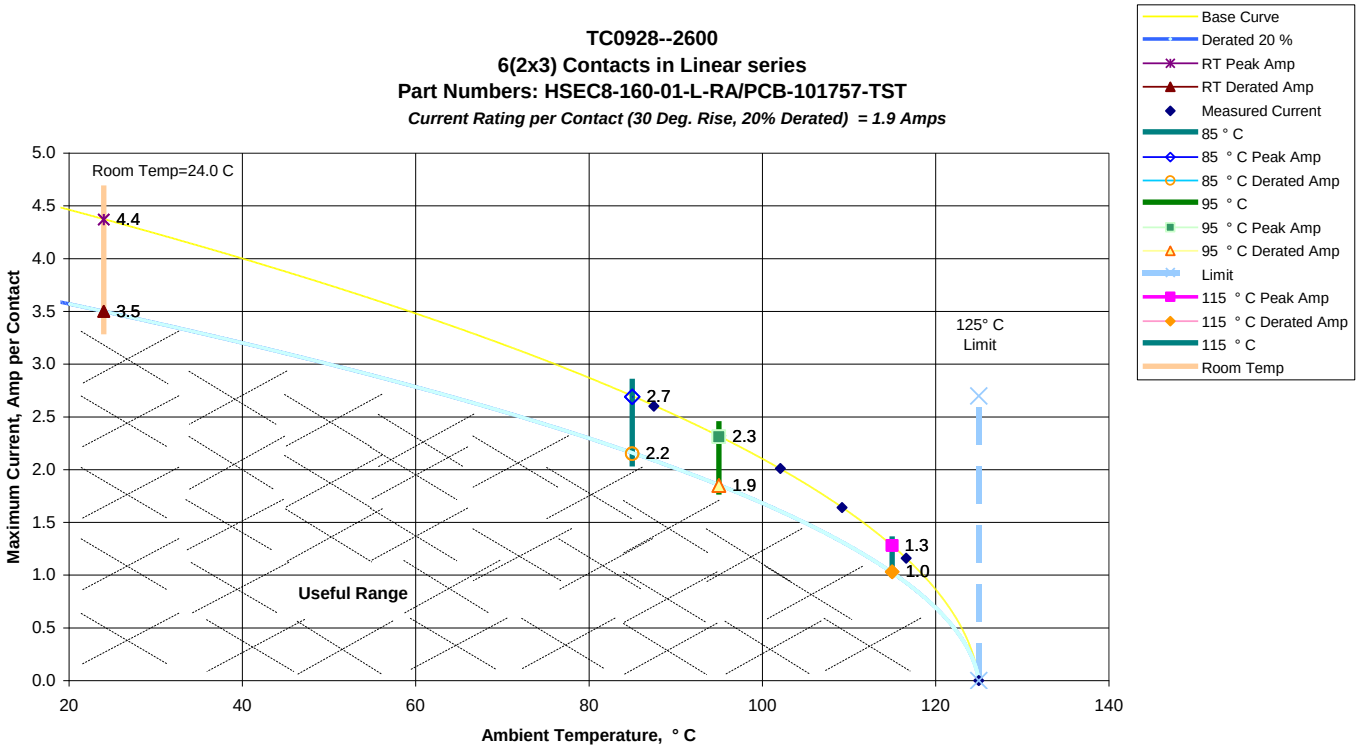
a. Linear configuration with 2 adjacent conductors/contacts powered



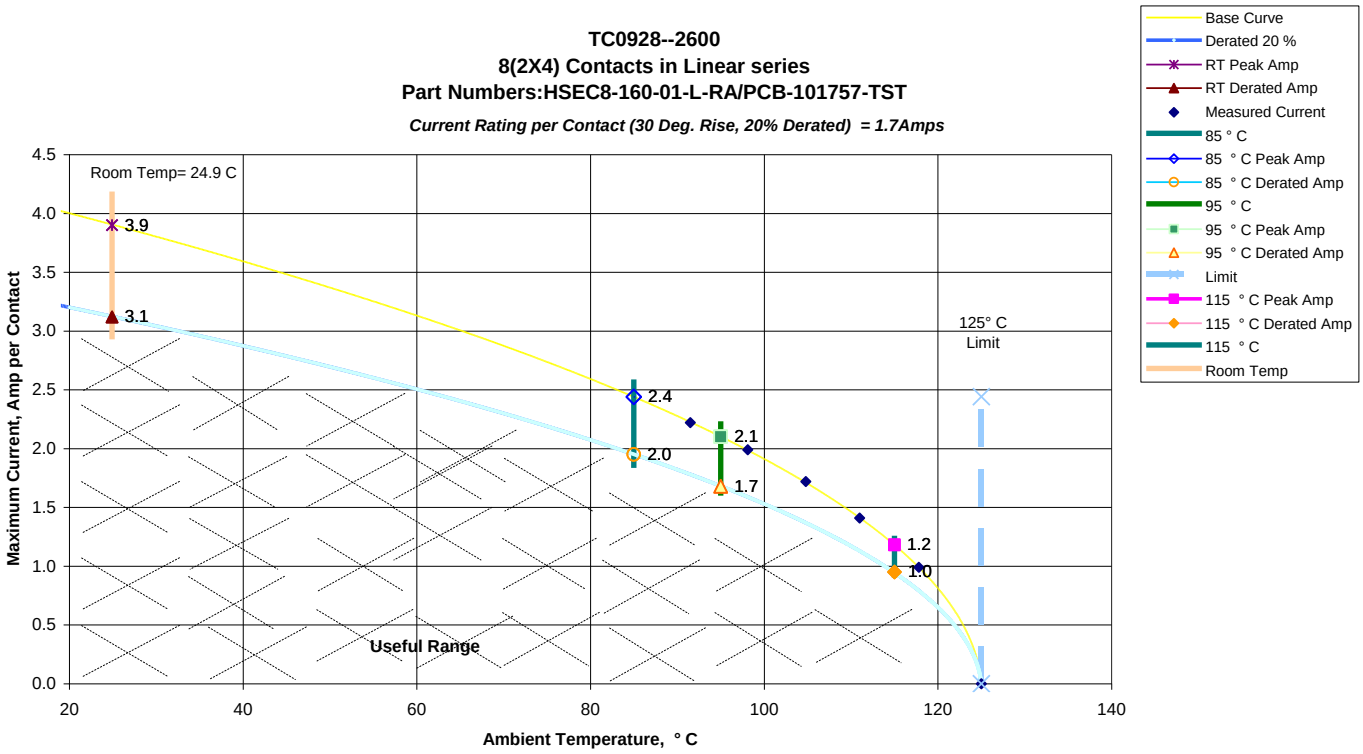
b. Linear configuration with 4 adjacent conductors/contacts powered



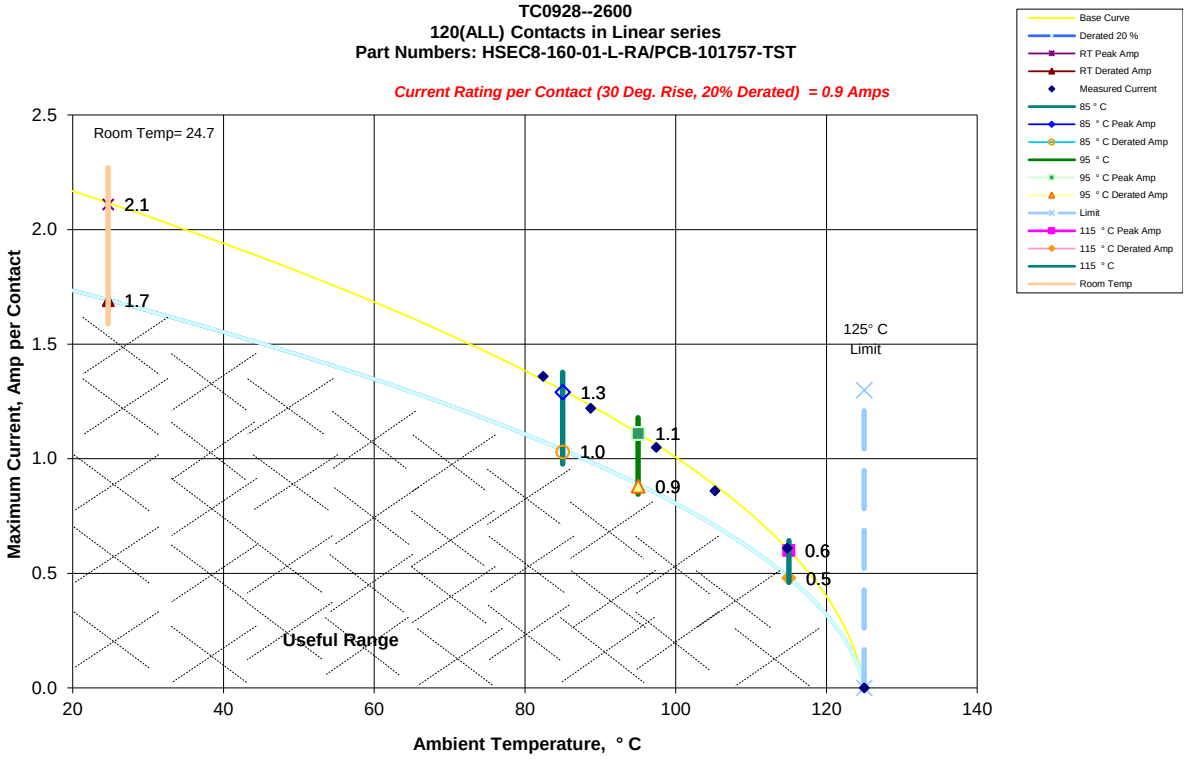

c. Linear configuration with 6 adjacent conductors/contacts powered



d. Linear configuration with 8 adjacent conductors/contacts powered




e. Linear configuration with all adjacent conductors/contacts powered



## CONTACT GAPS:

| Initial | | After 100 Cycles | | After Thermal | | After Humidity | |
|---|---|---|---|---|---|---|---|
| Units: | inches | Units: | inches | Units: | inches | Units: | inches |
| ***Minimum*** | 0.018 | ***Minimum*** | 0.028 | ***Minimum*** | 0.031 | ***Minimum*** | 0.032 |
| ***Maximum*** | 0.022 | ***Maximum*** | 0.035 | ***Maximum*** | 0.039 | ***Maximum*** | 0.038 |
| ***Average*** | 0.020 | ***Average*** | 0.030 | ***Average*** | 0.034 | ***Average*** | 0.034 |
| ***St. Dev.*** | 0.0008 | ***St. Dev.*** | 0.0015 | ***St. Dev.*** | 0.0011 | ***St. Dev.*** | 0.0011 |
| ***Count*** | 600 | ***Count*** | 600 | ***Count*** | 600 | ***Count*** | 600 |

| | Dimensional | | |
|---|---|---|---|
| | **Nominal** | **Minimum** | **Maximum** |
| **Product Spec:** | 0.022 | 0.018 | 0.026 |

## MATING/UNMATING

| | Initial | | | | After 25 Cycles | | | |
|---|---|---|---|---|---|---|---|---|
| | **Mating** | | **Unmating** | | **Mating** | | **Unmating** | |
| | Force (Oz) | Force (Lbs) | Force (Oz) | Force (Lbs) | Force (Oz) | Force (Lbs) | Force (Oz) | Force (Lbs) |
| Minimum | 142.9 | 8.9 | 43.7 | 2.7 | 134.7 | 8.4 | 47.3 | 3.0 |
| Maximum | 207.8 | 13.0 | 60.0 | 3.7 | 189.1 | 11.8 | 61.7 | 3.9 |
| **Average** | 182.6 | **11.4** | 52.3 | **3.3** | 160.0 | **10.0** | 56.8 | **3.5** |
| | After 50 Cycles | | | | After 75 Cycles | | | |
| | **Mating** | | **Unmating** | | **Mating** | | **Unmating** | |
| | Force (Oz) | Force (Lbs) | Force (Oz) | Force (Lbs) | Force (Oz) | Force (Lbs) | Force (Oz) | Force (Lbs) |
| Minimum | 128.7 | 8.0 | 48.0 | 3.0 | 126.3 | 7.9 | 47.3 | 2.95 |
| Maximum | 173.2 | 10.8 | 61.0 | 3.8 | 159.8 | 10.0 | 66.7 | 4.2 |
| **Average** | 146.9 | **9.2** | 55.8 | **3.5** | 143.3 | **9.0** | 57.4 | **3.6** |
| | After 100 Cycles | | | | After Thermals | | | |
| | **Mating** | | **Unmating** | | **Mating** | | **Unmating** | |
| | Force (Oz) | Force (Lbs) | Force (Oz) | Force (Lbs) | Force (Oz) | Force (Lbs) | Force (Oz) | Force (Lbs) |
| Minimum | 121.3 | 7.6 | 48.7 | 3.0 | 95.6 | 6.0 | 37.4 | 2.3 |
| Maximum | 146.0 | 9.1 | 61.7 | 3.9 | 134.0 | 8.4 | 68.4 | 4.3 |
| **Average** | 133.1 | **8.3** | 54.9 | **3.4** | 117.6 | **7.4** | 53.0 | **3.3** |
| | After Humidity | | | | | | | |
| | **Mating** | | **Unmating** | | | | | |
| | Force (Oz) | Force (Lbs) | Force (Oz) | Force (Lbs) | | | | |
| Minimum | 89.0 | 5.6 | 27.4 | 1.7 | | | | |
| Maximum | 119.7 | 7.5 | 48.3 | 3.0 | | | | |
| **Average** | 105.8 | **6.6** | 40.4 | **2.5** | | | | |

## NORMAL FORCE (FOR CONTACTS TESTED IN THE HOUSING):

1) Calibrated force gauges are used along with computer controlled positioning equipment.
2) For Normal force 8-10 measurements are taken and the averages reported.

| Initial | Deflections in inches Forces in Grams | | | | |
|---|---|---|---|---|---|
| | **0.005** | **0.010** | **0.015** | **0.020** | **SET** |
| **Averages** | 17.59 | 36.68 | 55.55 | 73.75 | 0.0004 |
| **Min** | 15.81 | 34.91 | 53.39 | 71.63 | 0.0003 |
| **Max** | 18.89 | 38.20 | 57.50 | 76.57 | 0.0005 |
| **St. Dev** | 0.75 | 1.00 | 1.14 | 1.37 | 0.0001 |
| **Count** | 15 | 15 | 15 | 15 | 15 |

| Thermal | Deflections in inches, Forces in Grams | | | | |
|---|---|---|---|---|---|
| | **0.005** | **0.010** | **0.015** | **0.020** | ***SET*** |
| **Averages** | 19.02 | 39.17 | 58.77 | 71.50 | 0.0021 |
| **Min** | 16.70 | 36.10 | 55.80 | 69.18 | 0.0018 |
| **Max** | 23.10 | 41.10 | 60.40 | 74.96 | 0.0025 |
| **St. Dev** | 1.83 | 1.67 | 1.61 | 1.40 | 0.0002 |
| **Count** | 15 | 15 | 15 | 15 | 15 |

## INSULATION RESISTANCE (IR):

| | Pin to Pin | | |
|---|---|---|---|
| | Mated | Unmated | Unmated |
| Minimum | **HSEC8/PCB** | **HSEC8** | **PCB** |
| **Initial** | 10000 | 10000 | Not Tested |
| **Thermal** | 10000 | 10000 | Not Tested |
| **Humidity** | 10000 | 10000 | Not Tested |

## DIELECTRIC WITHSTANDING VOLTAGE (DWV):

| Voltage Rating Summary | |
|---|---|
| **Minimum** | **HSEC8/PCB** |
| **Break Down Voltage** | 700 |
| **Test Voltage** | 525 |
| **Working Voltage** | 175 |

| Pin to Pin | |
|---|---|
| **Initial Test Voltage** | Passed |
| **After Thermal Test Voltage** | Passed |
| **After Humidity Test Voltage** | Passed |

**LLCR:**

1) A total of 200 points were measured.
2) EIA-364-23, *Low Level Contact Resistance Test Procedure for Electrical Connectors and Sockets.*
3) A computer program, *LLCR 221.exe*, ensures repeatability for data acquisition.
4) The following guidelines are used to categorize the changes in LLCR as a result from stressing.
   a. <= +5.0 mOhms: ----------Stable
   b. +5.1 to +10.0 mOhms:----------Minor
   c. +10.1 to +15.0 mOhms: ----------Acceptable
   d. +15.1 to +50.0 mOhms: ----------Marginal
   e. +50.1 to +2000 mOhms ----------Unstable
   f. >+2000 mOhms:----------Open Failure

| Date | Jul. 16 2009 | Jul. 16 2009 | Jul. 31 2009 | Aug. 11 2009 |
|---|---|---|---|---|
| Room Temp C | 23 | 23 | 23 | 24 |
| RH | 60% | 57% | 57% | 52% |
| Name | Kason He | Kason He | Kason He | Kason He |
| **mOhm values** | **Actual Initial** | **Delta 100 Cycles** | **Delta Thermal** | **Delta Humidity** |
| Average | 7.5 | -0.1 | 1.4 | 1.3 |
| St. Dev. | 1.0 | 0.7 | 0.9 | 1.2 |
| Min | 5.6 | -2.1 | -1.2 | -1.4 |
| Max | 10.3 | 3.2 | 4.3 | 4.3 |
| Count | 200 | 200 | 200 | 200 |

| | |
|---|---|
| **How many samples are being tested?** | 8 |
| **How many contacts are on each board?** | 25 |

| | Stable | Minor | Acceptable | Marginal | Unstable | Open |
|---|---|---|---|---|---|---|
| **100 Cycles** | 200 | 0 | 0 | 0 | 0 | 0 |
| **Thermal** | 200 | 0 | 0 | 0 | 0 | 0 |
| **Humidity** | 200 | 0 | 0 | 0 | 0 | 0 |

**GAS TIGHT:**

1) A total of 200 points were measured.
2) EIA-364-23, *Low Level Contact Resistance Test Procedure for Electrical Connectors and Sockets.*
3) A computer program, *LLCR 221.exe*, ensures repeatability for data acquisition.
4) The following guidelines are used to categorize the changes in LLCR as a result from stressing.
   a. <= +5.0 mOhms: ----------Stable
   b. +5.1 to +10.0 mOhms:----------Minor
   c. +10.1 to +15.0 mOhms: ----------Acceptable
   d. +15.1 to +50.0 mOhms: ----------Marginal
   e. +50.1 to +2000 mOhms: ----------Unstable
   f. >+2000 mOhms:----------Open Failure

| | | |
|---|---|---|
| Date | Jul. 16 2009 | Jul. 22 2009 |
| Room Temp C | 23 | 23 |
| RH | 60% | 57% |
| Name | Kason He | Kason He |
| **mOhm values** | **Actual Initial** | **Delta Gas Tight** |
| Average | 7.6 | 0.3 |
| St. Dev. | 0.9 | 1.0 |
| Min | 5.9 | -3.3 |
| Max | 9.9 | 3.5 |
| Count | 200 | 200 |

| | |
|---|---|
| **How many samples are being tested?** | 8 |
| **How many contacts are on each board?** | 25 |

| | Stable | Minor | Acceptable | Marginal | Unstable | Open |
|---|---|---|---|---|---|---|
| **Gas Tight** | 200 | 0 | 0 | 0 | 0 | 0 |

# DATA

## INSULATION RESISTANCE (IR):

| Initial Insulation Resistance |
|---|
| Measured In Meg Ohms |

| | Pin to Pin | | |
|---|---|---|---|
| | Mated | Unmated | |
| | x | x | |
| Sample# | HSEC8/PCB | HSEC8 | PCB |
| 1 | 10000 | 10000 | |
| 2 | 10000 | 10000 | |

| Thermal Insulation Resistance |
|---|
| Measured In Meg Ohms |

| | Pin to Pin | | |
|---|---|---|---|
| | Mated | Unmated | |
| | x | x | |
| Sample# | HSEC8/PCB | HSEC8 | PCB |
| 1 | 10000 | 10000 | |
| 2 | 10000 | 10000 | |

| Humidity Insulation Resistance |
|---|
| Measured In Meg Ohms |

| | Pin to Pin | | |
|---|---|---|---|
| | Mated | Unmated | |
| | x | x | |
| Sample# | HSEC8/PCB | HSEC8 | PCB |
| 1 | 10000 | 10000 | |
| 2 | 10000 | 10000 | |

## DIELECTRIC WITHSTANDING VOLTAGE (DWV):

| Initial Breakdown Voltage |
|---|
| Test Voltage *Until Breakdown Occurs* |

| | Pin to Pin | | |
|---|---|---|---|
| | Mated | Unmated | |
| | X | | |
| Sample# | HSEC8/PCB | HSEC8 | PCB |
| 1 | 750 | 750 | |
| 2 | 700 | 750 | |

| Initial DWV |
|---|
| Test Voltage= 525 |

| | Pin to Pin | | |
|---|---|---|---|
| | Mated | Unmated | |
| Sample# | HSEC8/PCB | HSEC8 | PCB |
| 1 | 525 | 525 | |
| 2 | 525 | 525 | |

| Thermal Test Voltage |
|---|
| Test Voltage= 525 |

| | Pin to Pin | | |
|---|---|---|---|
| | Mated | Unmated | |
| Sample# | HSEC8/PCB | HSEC8 | PCB |
| 1 | 525 | 525 | |
| 2 | 525 | 525 | |

| Humidity Test Voltage |
|---|
| Test Voltage= 525 |

| | Pin to Pin | | |
|---|---|---|---|
| | Mated | Unmated | |
| Sample# | HSEC8/PCB | HSEC8 | PCB |
| 1 | 525 | 525 | |
| 2 | 525 | 525 | |

## CONTACT GAPS:

Initial

Units:inches

| Pos.# | B1 | B2 | B3 | B4 | B5 | B6 | B7 | B8 | B9 | B10 |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 1 | 0.020 | 0.020 | 0.021 | 0.020 | 0.019 | 0.019 | 0.019 | 0.019 | 0.019 | 0.020 |
| 2 | 0.020 | 0.020 | 0.021 | 0.020 | 0.019 | 0.020 | 0.019 | 0.019 | 0.019 | 0.020 |
| 3 | 0.019 | 0.019 | 0.021 | 0.020 | 0.018 | 0.020 | 0.019 | 0.019 | 0.019 | 0.019 |
| 4 | 0.021 | 0.021 | 0.020 | 0.021 | 0.020 | 0.022 | 0.022 | 0.021 | 0.021 | 0.021 |
| 5 | 0.020 | 0.021 | 0.020 | 0.021 | 0.020 | 0.020 | 0.021 | 0.020 | 0.020 | 0.020 |
| 6 | 0.020 | 0.021 | 0.020 | 0.021 | 0.020 | 0.020 | 0.021 | 0.020 | 0.020 | 0.021 |
| 7 | 0.021 | 0.020 | 0.019 | 0.021 | 0.020 | 0.021 | 0.021 | 0.021 | 0.020 | 0.021 |
| 8 | 0.019 | 0.019 | 0.020 | 0.019 | 0.019 | 0.019 | 0.020 | 0.019 | 0.019 | 0.019 |
| 9 | 0.021 | 0.021 | 0.020 | 0.021 | 0.020 | 0.021 | 0.020 | 0.021 | 0.021 | 0.021 |
| 10 | 0.021 | 0.021 | 0.020 | 0.021 | 0.021 | 0.022 | 0.021 | 0.021 | 0.021 | 0.021 |
| 11 | 0.021 | 0.020 | 0.021 | 0.020 | 0.021 | 0.021 | 0.020 | 0.021 | 0.020 | 0.021 |
| 12 | 0.022 | 0.021 | 0.021 | 0.021 | 0.021 | 0.021 | 0.020 | 0.022 | 0.021 | 0.022 |
| 13 | 0.022 | 0.021 | 0.021 | 0.021 | 0.021 | 0.021 | 0.021 | 0.022 | 0.022 | 0.021 |
| 14 | 0.022 | 0.021 | 0.021 | 0.020 | 0.020 | 0.021 | 0.020 | 0.022 | 0.021 | 0.021 |
| 15 | 0.022 | 0.021 | 0.020 | 0.020 | 0.020 | 0.021 | 0.020 | 0.021 | 0.021 | 0.021 |
| 16 | 0.022 | 0.021 | 0.020 | 0.021 | 0.021 | 0.021 | 0.020 | 0.021 | 0.021 | 0.021 |
| 17 | 0.021 | 0.022 | 0.020 | 0.021 | 0.021 | 0.022 | 0.021 | 0.022 | 0.022 | 0.022 |
| 18 | 0.021 | 0.020 | 0.022 | 0.020 | 0.020 | 0.020 | 0.019 | 0.020 | 0.020 | 0.020 |
| 19 | 0.022 | 0.021 | 0.020 | 0.021 | 0.021 | 0.020 | 0.020 | 0.022 | 0.020 | 0.021 |
| 20 | 0.020 | 0.020 | 0.020 | 0.021 | 0.021 | 0.020 | 0.021 | 0.020 | 0.020 | 0.021 |
| 21 | 0.021 | 0.021 | 0.020 | 0.021 | 0.021 | 0.020 | 0.020 | 0.020 | 0.020 | 0.020 |
| 22 | 0.022 | 0.022 | 0.020 | 0.021 | 0.021 | 0.021 | 0.020 | 0.021 | 0.020 | 0.021 |
| 23 | 0.021 | 0.022 | 0.020 | 0.021 | 0.021 | 0.021 | 0.020 | 0.021 | 0.020 | 0.021 |
| 24 | 0.020 | 0.020 | 0.019 | 0.021 | 0.020 | 0.020 | 0.019 | 0.021 | 0.020 | 0.020 |
| 25 | 0.020 | 0.020 | 0.020 | 0.021 | 0.020 | 0.020 | 0.020 | 0.021 | 0.020 | 0.020 |
| 26 | 0.022 | 0.019 | 0.021 | 0.020 | 0.020 | 0.020 | 0.020 | 0.021 | 0.019 | 0.019 |
| 27 | 0.021 | 0.019 | 0.021 | 0.021 | 0.019 | 0.019 | 0.021 | 0.019 | 0.019 | 0.018 |
| 28 | 0.020 | 0.020 | 0.019 | 0.019 | 0.020 | 0.020 | 0.019 | 0.020 | 0.020 | 0.021 |
| 29 | 0.021 | 0.020 | 0.019 | 0.020 | 0.020 | 0.019 | 0.020 | 0.021 | 0.019 | 0.020 |
| 30 | 0.021 | 0.020 | 0.019 | 0.020 | 0.019 | 0.019 | 0.020 | 0.021 | 0.020 | 0.020 |
| 31 | 0.020 | 0.020 | 0.019 | 0.021 | 0.019 | 0.019 | 0.021 | 0.020 | 0.019 | 0.019 |
| 32 | 0.020 | 0.020 | 0.020 | 0.019 | 0.019 | 0.020 | 0.020 | 0.021 | 0.020 | 0.021 |
| 33 | 0.020 | 0.021 | 0.020 | 0.022 | 0.022 | 0.021 | 0.021 | 0.021 | 0.020 | 0.020 |
| 34 | 0.021 | 0.020 | 0.019 | 0.020 | 0.020 | 0.021 | 0.021 | 0.021 | 0.020 | 0.019 |
| 35 | 0.021 | 0.020 | 0.019 | 0.020 | 0.020 | 0.021 | 0.021 | 0.021 | 0.020 | 0.019 |
| 36 | 0.020 | 0.020 | 0.019 | 0.020 | 0.020 | 0.021 | 0.020 | 0.021 | 0.020 | 0.019 |
| 37 | 0.020 | 0.020 | 0.019 | 0.020 | 0.021 | 0.021 | 0.021 | 0.020 | 0.020 | 0.019 |
| 38 | 0.020 | 0.019 | 0.019 | 0.019 | 0.019 | 0.020 | 0.019 | 0.020 | 0.019 | 0.019 |
| 39 | 0.020 | 0.019 | 0.019 | 0.020 | 0.021 | 0.021 | 0.020 | 0.020 | 0.020 | 0.019 |
| 40 | 0.020 | 0.019 | 0.019 | 0.020 | 0.020 | 0.020 | 0.020 | 0.021 | 0.020 | 0.019 |
| 41 | 0.020 | 0.020 | 0.019 | 0.021 | 0.021 | 0.021 | 0.020 | 0.021 | 0.020 | 0.019 |
| 42 | 0.019 | 0.018 | 0.019 | 0.019 | 0.019 | 0.019 | 0.019 | 0.019 | 0.019 | 0.019 |
| 43 | 0.019 | 0.019 | 0.020 | 0.020 | 0.020 | 0.019 | 0.019 | 0.019 | 0.019 | 0.019 |
| 44 | 0.021 | 0.020 | 0.019 | 0.021 | 0.021 | 0.021 | 0.020 | 0.020 | 0.020 | 0.020 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **45** | 0.019 | 0.019 | 0.019 | 0.020 | 0.020 | 0.020 | 0.019 | 0.020 | 0.019 | 0.019 |
| **46** | 0.019 | 0.020 | 0.019 | 0.021 | 0.021 | 0.020 | 0.019 | 0.020 | 0.019 | 0.019 |
| **47** | 0.020 | 0.020 | 0.019 | 0.021 | 0.021 | 0.021 | 0.020 | 0.020 | 0.020 | 0.020 |
| **48** | 0.019 | 0.019 | 0.019 | 0.020 | 0.020 | 0.020 | 0.019 | 0.019 | 0.019 | 0.019 |
| **49** | 0.019 | 0.019 | 0.019 | 0.020 | 0.020 | 0.020 | 0.019 | 0.020 | 0.019 | 0.019 |
| **50** | 0.020 | 0.019 | 0.019 | 0.020 | 0.020 | 0.020 | 0.019 | 0.019 | 0.019 | 0.019 |
| **51** | 0.020 | 0.019 | 0.019 | 0.020 | 0.020 | 0.020 | 0.019 | 0.019 | 0.019 | 0.019 |
| **52** | 0.019 | 0.019 | 0.019 | 0.020 | 0.020 | 0.020 | 0.019 | 0.019 | 0.019 | 0.019 |
| **53** | 0.019 | 0.019 | 0.020 | 0.018 | 0.019 | 0.019 | 0.019 | 0.019 | 0.019 | 0.019 |
| **54** | 0.019 | 0.019 | 0.019 | 0.020 | 0.020 | 0.020 | 0.019 | 0.020 | 0.019 | 0.019 |
| **55** | 0.019 | 0.019 | 0.020 | 0.019 | 0.020 | 0.020 | 0.019 | 0.019 | 0.019 | 0.019 |
| **56** | 0.020 | 0.019 | 0.019 | 0.019 | 0.020 | 0.020 | 0.020 | 0.020 | 0.019 | 0.019 |
| **57** | 0.020 | 0.020 | 0.019 | 0.019 | 0.020 | 0.020 | 0.019 | 0.020 | 0.019 | 0.020 |
| **58** | 0.019 | 0.019 | 0.019 | 0.019 | 0.019 | 0.019 | 0.019 | 0.019 | 0.019 | 0.019 |
| **59** | 0.019 | 0.020 | 0.019 | 0.019 | 0.020 | 0.019 | 0.019 | 0.019 | 0.019 | 0.019 |
| **60** | 0.020 | 0.020 | 0.019 | 0.020 | 0.020 | 0.020 | 0.020 | 0.020 | 0.020 | 0.020 |

After 100 Cycles

Units:inches

| **Pos.#** | **B1** | **B2** | **B3** | **B4** | **B5** | **B6** | **B7** | **B8** | **B9** | **B10** |
|---|---|---|---|---|---|---|---|---|---|---|
| **1** | 0.033 | 0.033 | 0.031 | 0.032 | 0.034 | 0.030 | 0.030 | 0.034 | 0.032 | 0.033 |
| **2** | 0.032 | 0.031 | 0.032 | 0.032 | 0.032 | 0.030 | 0.032 | 0.033 | 0.032 | 0.032 |
| **3** | 0.030 | 0.030 | 0.032 | 0.030 | 0.031 | 0.031 | 0.032 | 0.033 | 0.032 | 0.033 |
| **4** | 0.030 | 0.030 | 0.030 | 0.031 | 0.031 | 0.030 | 0.030 | 0.032 | 0.031 | 0.032 |
| **5** | 0.030 | 0.028 | 0.030 | 0.029 | 0.030 | 0.029 | 0.029 | 0.031 | 0.034 | 0.031 |
| **6** | 0.029 | 0.028 | 0.030 | 0.031 | 0.030 | 0.030 | 0.030 | 0.031 | 0.030 | 0.031 |
| **7** | 0.030 | 0.029 | 0.029 | 0.030 | 0.030 | 0.029 | 0.029 | 0.030 | 0.029 | 0.031 |
| **8** | 0.032 | 0.028 | 0.030 | 0.029 | 0.029 | 0.028 | 0.028 | 0.030 | 0.028 | 0.030 |
| **9** | 0.030 | 0.030 | 0.029 | 0.030 | 0.030 | 0.029 | 0.029 | 0.030 | 0.030 | 0.030 |
| **10** | 0.031 | 0.030 | 0.030 | 0.029 | 0.030 | 0.029 | 0.029 | 0.030 | 0.030 | 0.030 |
| **11** | 0.030 | 0.032 | 0.032 | 0.029 | 0.029 | 0.029 | 0.029 | 0.030 | 0.030 | 0.031 |
| **12** | 0.032 | 0.030 | 0.031 | 0.030 | 0.029 | 0.030 | 0.028 | 0.030 | 0.029 | 0.030 |
| **13** | 0.031 | 0.029 | 0.030 | 0.029 | 0.031 | 0.029 | 0.029 | 0.029 | 0.029 | 0.030 |
| **14** | 0.028 | 0.030 | 0.031 | 0.028 | 0.029 | 0.029 | 0.029 | 0.030 | 0.030 | 0.029 |
| **15** | 0.029 | 0.029 | 0.033 | 0.034 | 0.029 | 0.030 | 0.029 | 0.030 | 0.030 | 0.030 |
| **16** | 0.033 | 0.034 | 0.029 | 0.030 | 0.030 | 0.029 | 0.029 | 0.030 | 0.030 | 0.030 |
| **17** | 0.029 | 0.034 | 0.031 | 0.029 | 0.030 | 0.030 | 0.030 | 0.030 | 0.031 | 0.031 |
| **18** | 0.032 | 0.029 | 0.031 | 0.029 | 0.033 | 0.029 | 0.029 | 0.030 | 0.029 | 0.029 |
| **19** | 0.033 | 0.029 | 0.030 | 0.029 | 0.033 | 0.029 | 0.028 | 0.029 | 0.030 | 0.029 |
| **20** | 0.029 | 0.030 | 0.028 | 0.033 | 0.029 | 0.029 | 0.029 | 0.029 | 0.030 | 0.030 |
| **21** | 0.035 | 0.029 | 0.031 | 0.030 | 0.029 | 0.030 | 0.029 | 0.030 | 0.031 | 0.030 |
| **22** | 0.029 | 0.031 | 0.030 | 0.030 | 0.030 | 0.029 | 0.029 | 0.029 | 0.032 | 0.029 |
| **23** | 0.028 | 0.029 | 0.030 | 0.031 | 0.030 | 0.029 | 0.028 | 0.028 | 0.030 | 0.029 |
| **24** | 0.033 | 0.031 | 0.030 | 0.031 | 0.029 | 0.030 | 0.029 | 0.030 | 0.030 | 0.029 |
| **25** | 0.030 | 0.030 | 0.030 | 0.029 | 0.028 | 0.030 | 0.029 | 0.030 | 0.031 | 0.029 |
| **26** | 0.033 | 0.030 | 0.032 | 0.033 | 0.030 | 0.029 | 0.029 | 0.030 | 0.030 | 0.030 |
| **27** | 0.032 | 0.029 | 0.030 | 0.034 | 0.029 | 0.030 | 0.030 | 0.031 | 0.030 | 0.030 |
| **28** | 0.030 | 0.029 | 0.033 | 0.028 | 0.029 | 0.030 | 0.030 | 0.030 | 0.030 | 0.030 |
| **29** | 0.029 | 0.030 | 0.030 | 0.029 | 0.029 | 0.032 | 0.031 | 0.032 | 0.031 | 0.032 |
| **30** | 0.030 | 0.031 | 0.030 | 0.031 | 0.030 | 0.033 | 0.032 | 0.034 | 0.033 | 0.032 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **31** | 0.032 | 0.031 | 0.033 | 0.031 | 0.030 | 0.033 | 0.035 | 0.034 | 0.033 | 0.029 |
| **32** | 0.031 | 0.032 | 0.031 | 0.030 | 0.030 | 0.032 | 0.033 | 0.033 | 0.032 | 0.029 |
| **33** | 0.032 | 0.032 | 0.031 | 0.032 | 0.032 | 0.030 | 0.031 | 0.030 | 0.033 | 0.028 |
| **34** | 0.030 | 0.031 | 0.030 | 0.030 | 0.030 | 0.031 | 0.032 | 0.032 | 0.032 | 0.029 |
| **35** | 0.029 | 0.030 | 0.031 | 0.030 | 0.030 | 0.030 | 0.031 | 0.030 | 0.035 | 0.029 |
| **36** | 0.031 | 0.030 | 0.030 | 0.030 | 0.030 | 0.031 | 0.031 | 0.030 | 0.030 | 0.029 |
| **37** | 0.029 | 0.030 | 0.029 | 0.029 | 0.029 | 0.031 | 0.031 | 0.031 | 0.031 | 0.029 |
| **38** | 0.028 | 0.029 | 0.029 | 0.028 | 0.028 | 0.029 | 0.030 | 0.028 | 0.034 | 0.030 |
| **39** | 0.029 | 0.030 | 0.030 | 0.029 | 0.029 | 0.030 | 0.030 | 0.030 | 0.029 | 0.029 |
| **40** | 0.029 | 0.030 | 0.028 | 0.029 | 0.029 | 0.031 | 0.031 | 0.031 | 0.030 | 0.028 |
| **41** | 0.030 | 0.030 | 0.029 | 0.030 | 0.029 | 0.030 | 0.030 | 0.030 | 0.034 | 0.029 |
| **42** | 0.029 | 0.029 | 0.029 | 0.029 | 0.028 | 0.030 | 0.030 | 0.032 | 0.030 | 0.031 |
| **43** | 0.030 | 0.029 | 0.029 | 0.029 | 0.029 | 0.030 | 0.031 | 0.031 | 0.031 | 0.032 |
| **44** | 0.029 | 0.029 | 0.029 | 0.030 | 0.029 | 0.029 | 0.029 | 0.030 | 0.029 | 0.030 |
| **45** | 0.029 | 0.030 | 0.030 | 0.030 | 0.030 | 0.029 | 0.029 | 0.031 | 0.033 | 0.030 |
| **46** | 0.028 | 0.029 | 0.029 | 0.030 | 0.030 | 0.030 | 0.030 | 0.031 | 0.034 | 0.031 |
| **47** | 0.030 | 0.030 | 0.029 | 0.030 | 0.030 | 0.030 | 0.030 | 0.030 | 0.031 | 0.030 |
| **48** | 0.028 | 0.030 | 0.028 | 0.029 | 0.028 | 0.030 | 0.029 | 0.034 | 0.033 | 0.029 |
| **49** | 0.030 | 0.028 | 0.029 | 0.029 | 0.029 | 0.029 | 0.030 | 0.030 | 0.034 | 0.030 |
| **50** | 0.028 | 0.029 | 0.028 | 0.029 | 0.029 | 0.030 | 0.029 | 0.029 | 0.034 | 0.029 |
| **51** | 0.029 | 0.029 | 0.030 | 0.029 | 0.029 | 0.029 | 0.030 | 0.034 | 0.034 | 0.030 |
| **52** | 0.028 | 0.028 | 0.029 | 0.028 | 0.029 | 0.030 | 0.030 | 0.031 | 0.034 | 0.030 |
| **53** | 0.028 | 0.028 | 0.030 | 0.028 | 0.028 | 0.030 | 0.034 | 0.031 | 0.034 | 0.030 |
| **54** | 0.029 | 0.029 | 0.030 | 0.029 | 0.029 | 0.029 | 0.029 | 0.031 | 0.034 | 0.029 |
| **55** | 0.029 | 0.029 | 0.032 | 0.029 | 0.029 | 0.034 | 0.030 | 0.033 | 0.034 | 0.028 |
| **56** | 0.029 | 0.029 | 0.030 | 0.031 | 0.029 | 0.034 | 0.031 | 0.031 | 0.034 | 0.029 |
| **57** | 0.030 | 0.030 | 0.030 | 0.030 | 0.030 | 0.030 | 0.034 | 0.030 | 0.033 | 0.029 |
| **58** | 0.029 | 0.030 | 0.033 | 0.030 | 0.029 | 0.029 | 0.030 | 0.030 | 0.034 | 0.030 |
| **59** | 0.032 | 0.031 | 0.033 | 0.034 | 0.031 | 0.030 | 0.031 | 0.031 | 0.034 | 0.029 |
| **60** | 0.033 | 0.033 | 0.033 | 0.033 | 0.032 | 0.030 | 0.032 | 0.030 | 0.034 | 0.029 |

After Thermal

Units:inches

| **Pos.#** | **B1** | **B2** | **B3** | **B4** | **B5** | **B6** | **B7** | **B8** | **B9** | **B10** |
|---|---|---|---|---|---|---|---|---|---|---|
| **1** | 0.036 | 0.037 | 0.035 | 0.035 | 0.037 | 0.037 | 0.037 | 0.039 | 0.038 | 0.037 |
| **2** | 0.035 | 0.036 | 0.036 | 0.035 | 0.036 | 0.036 | 0.036 | 0.037 | 0.035 | 0.036 |
| **3** | 0.034 | 0.034 | 0.036 | 0.034 | 0.034 | 0.034 | 0.038 | 0.035 | 0.034 | 0.034 |
| **4** | 0.034 | 0.034 | 0.034 | 0.034 | 0.035 | 0.035 | 0.036 | 0.037 | 0.035 | 0.035 |
| **5** | 0.033 | 0.033 | 0.034 | 0.034 | 0.035 | 0.035 | 0.036 | 0.035 | 0.034 | 0.035 |
| **6** | 0.032 | 0.033 | 0.034 | 0.034 | 0.034 | 0.034 | 0.035 | 0.035 | 0.034 | 0.035 |
| **7** | 0.034 | 0.033 | 0.033 | 0.033 | 0.034 | 0.034 | 0.035 | 0.035 | 0.033 | 0.035 |
| **8** | 0.032 | 0.032 | 0.033 | 0.032 | 0.033 | 0.033 | 0.033 | 0.034 | 0.032 | 0.033 |
| **9** | 0.033 | 0.033 | 0.034 | 0.033 | 0.034 | 0.034 | 0.033 | 0.035 | 0.034 | 0.034 |
| **10** | 0.034 | 0.034 | 0.033 | 0.033 | 0.035 | 0.035 | 0.035 | 0.035 | 0.035 | 0.035 |
| **11** | 0.034 | 0.033 | 0.035 | 0.033 | 0.034 | 0.034 | 0.034 | 0.034 | 0.034 | 0.034 |
| **12** | 0.033 | 0.032 | 0.033 | 0.033 | 0.033 | 0.033 | 0.033 | 0.034 | 0.034 | 0.034 |
| **13** | 0.034 | 0.033 | 0.033 | 0.033 | 0.034 | 0.034 | 0.034 | 0.035 | 0.035 | 0.034 |
| **14** | 0.033 | 0.033 | 0.034 | 0.032 | 0.033 | 0.032 | 0.032 | 0.033 | 0.034 | 0.033 |
| **15** | 0.033 | 0.032 | 0.035 | 0.031 | 0.032 | 0.033 | 0.032 | 0.033 | 0.033 | 0.033 |
| **16** | 0.034 | 0.033 | 0.034 | 0.033 | 0.033 | 0.033 | 0.033 | 0.034 | 0.035 | 0.034 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **17** | 0.034 | 0.033 | 0.034 | 0.033 | 0.033 | 0.033 | 0.034 | 0.034 | 0.034 | 0.034 |
| **18** | 0.033 | 0.033 | 0.035 | 0.033 | 0.034 | 0.033 | 0.034 | 0.034 | 0.034 | 0.034 |
| **19** | 0.033 | 0.033 | 0.034 | 0.033 | 0.033 | 0.032 | 0.033 | 0.034 | 0.033 | 0.033 |
| **20** | 0.034 | 0.033 | 0.032 | 0.033 | 0.033 | 0.032 | 0.034 | 0.032 | 0.033 | 0.034 |
| **21** | 0.034 | 0.033 | 0.034 | 0.033 | 0.033 | 0.033 | 0.033 | 0.033 | 0.034 | 0.033 |
| **22** | 0.034 | 0.033 | 0.034 | 0.034 | 0.034 | 0.033 | 0.034 | 0.034 | 0.034 | 0.034 |
| **23** | 0.034 | 0.032 | 0.034 | 0.034 | 0.034 | 0.033 | 0.034 | 0.034 | 0.034 | 0.034 |
| **24** | 0.034 | 0.032 | 0.034 | 0.034 | 0.033 | 0.032 | 0.034 | 0.034 | 0.034 | 0.034 |
| **25** | 0.034 | 0.033 | 0.033 | 0.033 | 0.034 | 0.032 | 0.033 | 0.034 | 0.033 | 0.034 |
| **26** | 0.034 | 0.034 | 0.035 | 0.033 | 0.033 | 0.033 | 0.033 | 0.034 | 0.034 | 0.033 |
| **27** | 0.034 | 0.033 | 0.034 | 0.033 | 0.032 | 0.033 | 0.034 | 0.034 | 0.034 | 0.033 |
| **28** | 0.034 | 0.033 | 0.034 | 0.033 | 0.033 | 0.033 | 0.034 | 0.034 | 0.034 | 0.034 |
| **29** | 0.034 | 0.033 | 0.035 | 0.033 | 0.033 | 0.033 | 0.034 | 0.035 | 0.033 | 0.034 |
| **30** | 0.035 | 0.034 | 0.033 | 0.034 | 0.033 | 0.033 | 0.035 | 0.036 | 0.034 | 0.034 |
| **31** | 0.035 | 0.034 | 0.035 | 0.035 | 0.034 | 0.034 | 0.036 | 0.036 | 0.035 | 0.035 |
| **32** | 0.035 | 0.035 | 0.035 | 0.034 | 0.034 | 0.034 | 0.036 | 0.036 | 0.035 | 0.035 |
| **33** | 0.036 | 0.035 | 0.035 | 0.036 | 0.035 | 0.035 | 0.036 | 0.037 | 0.035 | 0.036 |
| **34** | 0.035 | 0.034 | 0.035 | 0.034 | 0.034 | 0.034 | 0.036 | 0.036 | 0.035 | 0.034 |
| **35** | 0.034 | 0.033 | 0.035 | 0.034 | 0.033 | 0.033 | 0.036 | 0.035 | 0.034 | 0.033 |
| **36** | 0.035 | 0.034 | 0.034 | 0.034 | 0.034 | 0.034 | 0.035 | 0.035 | 0.034 | 0.034 |
| **37** | 0.034 | 0.032 | 0.034 | 0.033 | 0.033 | 0.033 | 0.035 | 0.034 | 0.033 | 0.033 |
| **38** | 0.033 | 0.032 | 0.034 | 0.033 | 0.032 | 0.033 | 0.034 | 0.034 | 0.032 | 0.032 |
| **39** | 0.034 | 0.033 | 0.033 | 0.033 | 0.033 | 0.033 | 0.035 | 0.034 | 0.033 | 0.033 |
| **40** | 0.034 | 0.033 | 0.033 | 0.033 | 0.033 | 0.033 | 0.035 | 0.035 | 0.034 | 0.033 |
| **41** | 0.034 | 0.034 | 0.033 | 0.034 | 0.033 | 0.034 | 0.035 | 0.035 | 0.034 | 0.034 |
| **42** | 0.033 | 0.033 | 0.034 | 0.033 | 0.032 | 0.033 | 0.034 | 0.034 | 0.033 | 0.033 |
| **43** | 0.033 | 0.033 | 0.034 | 0.033 | 0.033 | 0.033 | 0.034 | 0.034 | 0.033 | 0.033 |
| **44** | 0.034 | 0.033 | 0.034 | 0.034 | 0.033 | 0.034 | 0.034 | 0.034 | 0.034 | 0.033 |
| **45** | 0.034 | 0.033 | 0.034 | 0.034 | 0.033 | 0.034 | 0.034 | 0.034 | 0.035 | 0.034 |
| **46** | 0.033 | 0.032 | 0.033 | 0.034 | 0.034 | 0.033 | 0.034 | 0.033 | 0.034 | 0.033 |
| **47** | 0.034 | 0.034 | 0.034 | 0.034 | 0.034 | 0.034 | 0.035 | 0.034 | 0.035 | 0.034 |
| **48** | 0.033 | 0.033 | 0.033 | 0.033 | 0.033 | 0.033 | 0.034 | 0.033 | 0.033 | 0.032 |
| **49** | 0.033 | 0.033 | 0.033 | 0.033 | 0.033 | 0.033 | 0.034 | 0.033 | 0.034 | 0.033 |
| **50** | 0.033 | 0.033 | 0.033 | 0.034 | 0.033 | 0.034 | 0.034 | 0.034 | 0.035 | 0.034 |
| **51** | 0.034 | 0.033 | 0.033 | 0.034 | 0.034 | 0.034 | 0.035 | 0.035 | 0.035 | 0.034 |
| **52** | 0.033 | 0.032 | 0.033 | 0.033 | 0.033 | 0.033 | 0.033 | 0.033 | 0.034 | 0.033 |
| **53** | 0.033 | 0.033 | 0.034 | 0.033 | 0.033 | 0.033 | 0.034 | 0.033 | 0.034 | 0.032 |
| **54** | 0.034 | 0.033 | 0.035 | 0.033 | 0.034 | 0.034 | 0.034 | 0.034 | 0.034 | 0.034 |
| **55** | 0.034 | 0.033 | 0.036 | 0.034 | 0.034 | 0.034 | 0.034 | 0.034 | 0.035 | 0.034 |
| **56** | 0.034 | 0.033 | 0.034 | 0.034 | 0.034 | 0.034 | 0.035 | 0.034 | 0.034 | 0.034 |
| **57** | 0.035 | 0.034 | 0.035 | 0.035 | 0.035 | 0.035 | 0.035 | 0.035 | 0.035 | 0.035 |
| **58** | 0.034 | 0.034 | 0.035 | 0.034 | 0.034 | 0.035 | 0.035 | 0.035 | 0.034 | 0.034 |
| **59** | 0.036 | 0.036 | 0.037 | 0.036 | 0.036 | 0.036 | 0.036 | 0.037 | 0.036 | 0.036 |
| **60** | 0.036 | 0.036 | 0.036 | 0.037 | 0.037 | 0.037 | 0.037 | 0.038 | 0.036 | 0.036 |

After Humidity

Units:inches

| **Pos.#** | **B1** | **B2** | **B3** | **B4** | **B5** | **B6** | **B7** | **B8** | **B9** | **B10** |
|---|---|---|---|---|---|---|---|---|---|---|
| **1** | 0.033 | 0.033 | 0.031 | 0.032 | 0.034 | 0.030 | 0.030 | 0.034 | 0.032 | 0.033 |
| **2** | 0.032 | 0.031 | 0.032 | 0.032 | 0.032 | 0.030 | 0.032 | 0.033 | 0.032 | 0.032 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **3** | 0.030 | 0.030 | 0.032 | 0.030 | 0.031 | 0.031 | 0.032 | 0.033 | 0.032 | 0.033 |
| **4** | 0.030 | 0.030 | 0.030 | 0.031 | 0.031 | 0.030 | 0.030 | 0.032 | 0.031 | 0.032 |
| **5** | 0.030 | 0.028 | 0.030 | 0.029 | 0.030 | 0.029 | 0.029 | 0.031 | 0.034 | 0.031 |
| **6** | 0.029 | 0.028 | 0.030 | 0.031 | 0.030 | 0.030 | 0.030 | 0.031 | 0.030 | 0.031 |
| **7** | 0.030 | 0.029 | 0.029 | 0.030 | 0.030 | 0.029 | 0.029 | 0.030 | 0.029 | 0.031 |
| **8** | 0.032 | 0.028 | 0.030 | 0.029 | 0.029 | 0.028 | 0.028 | 0.030 | 0.028 | 0.030 |
| **9** | 0.030 | 0.030 | 0.029 | 0.030 | 0.030 | 0.029 | 0.029 | 0.030 | 0.030 | 0.030 |
| **10** | 0.031 | 0.030 | 0.030 | 0.029 | 0.030 | 0.029 | 0.029 | 0.030 | 0.030 | 0.030 |
| **11** | 0.030 | 0.032 | 0.032 | 0.029 | 0.029 | 0.029 | 0.029 | 0.030 | 0.030 | 0.031 |
| **12** | 0.032 | 0.030 | 0.031 | 0.030 | 0.029 | 0.030 | 0.028 | 0.030 | 0.029 | 0.030 |
| **13** | 0.031 | 0.029 | 0.030 | 0.029 | 0.031 | 0.029 | 0.029 | 0.029 | 0.029 | 0.030 |
| **14** | 0.028 | 0.030 | 0.031 | 0.028 | 0.029 | 0.029 | 0.029 | 0.030 | 0.030 | 0.029 |
| **15** | 0.029 | 0.029 | 0.033 | 0.034 | 0.029 | 0.030 | 0.029 | 0.030 | 0.030 | 0.030 |
| **16** | 0.033 | 0.034 | 0.029 | 0.030 | 0.030 | 0.029 | 0.029 | 0.030 | 0.030 | 0.030 |
| **17** | 0.029 | 0.034 | 0.031 | 0.029 | 0.030 | 0.030 | 0.030 | 0.030 | 0.031 | 0.031 |
| **18** | 0.032 | 0.029 | 0.031 | 0.029 | 0.033 | 0.029 | 0.029 | 0.030 | 0.029 | 0.029 |
| **19** | 0.033 | 0.029 | 0.030 | 0.029 | 0.033 | 0.029 | 0.028 | 0.029 | 0.030 | 0.029 |
| **20** | 0.029 | 0.030 | 0.028 | 0.033 | 0.029 | 0.029 | 0.029 | 0.029 | 0.030 | 0.030 |
| **21** | 0.035 | 0.029 | 0.031 | 0.030 | 0.029 | 0.030 | 0.029 | 0.030 | 0.031 | 0.030 |
| **22** | 0.029 | 0.031 | 0.030 | 0.030 | 0.030 | 0.029 | 0.029 | 0.029 | 0.032 | 0.029 |
| **23** | 0.028 | 0.029 | 0.030 | 0.031 | 0.030 | 0.029 | 0.028 | 0.028 | 0.030 | 0.029 |
| **24** | 0.033 | 0.031 | 0.030 | 0.031 | 0.029 | 0.030 | 0.029 | 0.030 | 0.030 | 0.029 |
| **25** | 0.030 | 0.030 | 0.030 | 0.029 | 0.028 | 0.030 | 0.029 | 0.030 | 0.031 | 0.029 |
| **26** | 0.033 | 0.030 | 0.032 | 0.033 | 0.030 | 0.029 | 0.029 | 0.030 | 0.030 | 0.030 |
| **27** | 0.032 | 0.029 | 0.030 | 0.034 | 0.029 | 0.030 | 0.030 | 0.031 | 0.030 | 0.030 |
| **28** | 0.030 | 0.029 | 0.033 | 0.028 | 0.029 | 0.030 | 0.030 | 0.030 | 0.030 | 0.030 |
| **29** | 0.029 | 0.030 | 0.030 | 0.029 | 0.029 | 0.032 | 0.031 | 0.032 | 0.031 | 0.032 |
| **30** | 0.030 | 0.031 | 0.030 | 0.031 | 0.030 | 0.033 | 0.032 | 0.034 | 0.033 | 0.032 |
| **31** | 0.032 | 0.031 | 0.033 | 0.031 | 0.030 | 0.033 | 0.035 | 0.034 | 0.033 | 0.029 |
| **32** | 0.031 | 0.032 | 0.031 | 0.030 | 0.030 | 0.032 | 0.033 | 0.033 | 0.032 | 0.029 |
| **33** | 0.032 | 0.032 | 0.031 | 0.032 | 0.032 | 0.030 | 0.031 | 0.030 | 0.033 | 0.028 |
| **34** | 0.030 | 0.031 | 0.030 | 0.030 | 0.030 | 0.031 | 0.032 | 0.032 | 0.032 | 0.029 |
| **35** | 0.029 | 0.030 | 0.031 | 0.030 | 0.030 | 0.030 | 0.031 | 0.030 | 0.035 | 0.029 |
| **36** | 0.031 | 0.030 | 0.030 | 0.030 | 0.030 | 0.031 | 0.031 | 0.030 | 0.030 | 0.029 |
| **37** | 0.029 | 0.030 | 0.029 | 0.029 | 0.029 | 0.031 | 0.031 | 0.031 | 0.031 | 0.029 |
| **38** | 0.028 | 0.029 | 0.029 | 0.028 | 0.028 | 0.029 | 0.030 | 0.028 | 0.034 | 0.030 |
| **39** | 0.029 | 0.030 | 0.030 | 0.029 | 0.029 | 0.030 | 0.030 | 0.030 | 0.029 | 0.029 |
| **40** | 0.029 | 0.030 | 0.028 | 0.029 | 0.029 | 0.031 | 0.031 | 0.031 | 0.030 | 0.028 |
| **41** | 0.030 | 0.030 | 0.029 | 0.030 | 0.029 | 0.030 | 0.030 | 0.030 | 0.034 | 0.029 |
| **42** | 0.029 | 0.029 | 0.029 | 0.029 | 0.028 | 0.030 | 0.030 | 0.032 | 0.030 | 0.031 |
| **43** | 0.030 | 0.029 | 0.029 | 0.029 | 0.029 | 0.030 | 0.031 | 0.031 | 0.031 | 0.032 |
| **44** | 0.029 | 0.029 | 0.029 | 0.030 | 0.029 | 0.029 | 0.029 | 0.030 | 0.029 | 0.030 |
| **45** | 0.029 | 0.030 | 0.030 | 0.030 | 0.030 | 0.029 | 0.029 | 0.031 | 0.033 | 0.030 |
| **46** | 0.028 | 0.029 | 0.029 | 0.030 | 0.030 | 0.030 | 0.030 | 0.031 | 0.034 | 0.031 |
| **47** | 0.030 | 0.030 | 0.029 | 0.030 | 0.030 | 0.030 | 0.030 | 0.030 | 0.031 | 0.030 |
| **48** | 0.028 | 0.030 | 0.028 | 0.029 | 0.028 | 0.030 | 0.029 | 0.034 | 0.033 | 0.029 |
| **49** | 0.030 | 0.028 | 0.029 | 0.029 | 0.029 | 0.029 | 0.030 | 0.030 | 0.034 | 0.030 |
| **50** | 0.028 | 0.029 | 0.028 | 0.029 | 0.029 | 0.030 | 0.029 | 0.029 | 0.034 | 0.029 |
| **51** | 0.029 | 0.029 | 0.030 | 0.029 | 0.029 | 0.029 | 0.030 | 0.034 | 0.034 | 0.030 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **52** | 0.028 | 0.028 | 0.029 | 0.028 | 0.029 | 0.030 | 0.030 | 0.031 | 0.034 | 0.030 |
| **53** | 0.028 | 0.028 | 0.030 | 0.028 | 0.028 | 0.030 | 0.034 | 0.031 | 0.034 | 0.030 |
| **54** | 0.029 | 0.029 | 0.030 | 0.029 | 0.029 | 0.029 | 0.029 | 0.031 | 0.034 | 0.029 |
| **55** | 0.029 | 0.029 | 0.032 | 0.029 | 0.029 | 0.034 | 0.030 | 0.033 | 0.034 | 0.028 |
| **56** | 0.029 | 0.029 | 0.030 | 0.031 | 0.029 | 0.034 | 0.031 | 0.031 | 0.034 | 0.029 |
| **57** | 0.030 | 0.030 | 0.030 | 0.030 | 0.030 | 0.030 | 0.034 | 0.030 | 0.033 | 0.029 |
| **58** | 0.029 | 0.030 | 0.033 | 0.030 | 0.029 | 0.029 | 0.030 | 0.030 | 0.034 | 0.030 |
| **59** | 0.032 | 0.031 | 0.033 | 0.034 | 0.031 | 0.030 | 0.031 | 0.031 | 0.034 | 0.029 |
| **60** | 0.033 | 0.033 | 0.033 | 0.033 | 0.032 | 0.030 | 0.032 | 0.030 | 0.034 | 0.029 |

## Mating—Unmating

| | Initial | | After 25 Cycles | | After 50 Cycles | | After 75 Cycles | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Sample # | Mating | Unmating | Mating | Unmating | Mating | Unmating | Mating | Unmating |
| 1 | 8.93 | 2.91 | 8.42 | 3.02 | 8.53 | 3.00 | 8.05 | 2.95 |
| 2 | 11.90 | 3.48 | 11.82 | 3.57 | 9.61 | 3.55 | 9.57 | 3.95 |
| 3 | 12.39 | 3.48 | 10.41 | 3.75 | 9.44 | 3.53 | 9.99 | 3.66 |
| 4 | 12.57 | 3.53 | 9.77 | 3.66 | 8.86 | 3.64 | 9.24 | 4.17 |
| 5 | 10.85 | 2.73 | 9.99 | 2.95 | 8.86 | 3.09 | 8.69 | 3.24 |
| 6 | 10.63 | 2.98 | 8.80 | 3.73 | 9.46 | 3.81 | 8.80 | 3.51 |
| 7 | 12.99 | 3.73 | 9.66 | 3.62 | 8.05 | 3.37 | 8.14 | 3.37 |
| 8 | 10.27 | 3.13 | 9.33 | 3.68 | 8.51 | 3.53 | 7.89 | 3.42 |
| 9 | 12.87 | 3.75 | 11.66 | 3.64 | 10.82 | 3.59 | 9.92 | 3.79 |
| 10 | 10.74 | 3.00 | 10.14 | 3.86 | 9.66 | 3.75 | 9.30 | 3.79 |

| | After 100 Cycles | | After Thermals | | After Humidity | |
| --- | --- | --- | --- | --- | --- | --- |
| Sample # | Mating | Unmating | Mating | Unmating | Mating | Unmating |
| 1 | 7.87 | 3.04 | 5.97 | 2.34 | 5.56 | 1.71 |
| 2 | 8.27 | 3.22 | 7.58 | 3.11 | 6.41 | 1.99 |
| 3 | 9.13 | 3.57 | 8.38 | 3.84 | 6.96 | 2.51 |
| 4 | 8.69 | 3.86 | 8.29 | 4.28 | 7.05 | 2.98 |
| 5 | 8.51 | 3.33 | 7.03 | 2.73 | 6.90 | 2.46 |
| 6 | 8.29 | 3.40 | 7.17 | 3.33 | 6.49 | 2.64 |
| 7 | 7.89 | 3.28 | 6.04 | 2.82 | 6.05 | 2.37 |
| 8 | 8.99 | 3.62 | 7.17 | 3.35 | 6.62 | 3.00 |
| 9 | 7.58 | 3.42 | 8.18 | 3.73 | 7.48 | 3.02 |
| 10 | 7.98 | 3.55 | 7.72 | 3.59 | 6.62 | 2.57 |

**NORMAL FORCE:**
**Initial**

| Initial | Deflections in inches Forces in Grams | | | | |
| --- | --- | --- | --- | --- | --- |
| **Sample #** | **0.005** | **0.010** | **0.015** | **0.020** | ***SET*** |
| 1 | 18.48 | 37.28 | 56.47 | 74.20 | 0.00040 |
| 2 | 17.66 | 37.17 | 55.86 | 74.45 | 0.00040 |
| 3 | 18.28 | 38.20 | 57.29 | 74.51 | 0.00050 |
| 4 | 17.66 | 37.17 | 56.06 | 74.90 | 0.00040 |
| 5 | 17.66 | 37.79 | 57.50 | 76.57 | 0.00050 |
| 6 | 17.66 | 37.38 | 56.47 | 75.71 | 0.00050 |
| 7 | 18.28 | 37.38 | 55.45 | 72.98 | 0.00030 |
| 8 | 17.46 | 36.25 | 55.24 | 73.07 | 0.00040 |
| 9 | 18.89 | 37.58 | 56.27 | 73.87 | 0.00050 |
| 10 | 17.25 | 35.94 | 54.62 | 73.89 | 0.00030 |
| 11 | 17.25 | 36.14 | 54.83 | 73.50 | 0.00030 |
| 12 | 15.81 | 34.91 | 53.39 | 72.21 | 0.00030 |
| 13 | 16.64 | 35.73 | 54.62 | 72.13 | 0.00040 |
| 14 | 17.66 | 36.14 | 54.83 | 72.57 | 0.00040 |
| 15 | 17.25 | 35.12 | 54.42 | 71.63 | 0.00030 |

**After thermal**

| Thermal | Deflections in inches Forces in Grams | | | | |
| --- | --- | --- | --- | --- | --- |
| **Sample #** | **0.005** | **0.010** | **0.015** | **0.020** | ***SET*** |
| 1 | 18.80 | 39.80 | 60.10 | 73.22 | 0.00250 |
| 2 | 20.40 | 40.70 | 60.40 | 72.13 | 0.00230 |
| 3 | 20.10 | 40.70 | 60.40 | 72.33 | 0.00230 |
| 4 | 23.10 | 40.70 | 60.40 | 74.96 | 0.00220 |
| 5 | 20.40 | 40.70 | 60.40 | 71.92 | 0.00230 |
| 6 | 20.70 | 41.10 | 60.10 | 71.89 | 0.00230 |
| 7 | 20.40 | 40.40 | 59.50 | 71.66 | 0.00240 |
| 8 | 17.30 | 37.60 | 57.90 | 71.20 | 0.00180 |
| 9 | 17.00 | 36.70 | 56.40 | 69.79 | 0.00180 |
| 10 | 19.40 | 40.10 | 58.90 | 71.10 | 0.00230 |
| 11 | 18.80 | 39.20 | 58.90 | 71.37 | 0.00210 |
| 12 | 16.70 | 36.10 | 55.80 | 69.18 | 0.00180 |
| 13 | 17.30 | 37.60 | 57.00 | 70.79 | 0.00200 |
| 14 | 17.60 | 38.50 | 58.30 | 70.68 | 0.00200 |
| 15 | 17.30 | 37.60 | 57.00 | 70.33 | 0.00190 |

**LLCR:**

| | mOhm values | Actual | Delta | Delta | Delta |
| --- | --- | --- | --- | --- | --- |
| Board | Position | Initial | 100 Cycles | Thermal | Humidity |
| 1 | P1 | 6.3 | 0.1 | 1.3 | 1.5 |
| 1 | P2 | 6.6 | 0.0 | 0.7 | 0.7 |
| 1 | P3 | 6.4 | 0.1 | 1.8 | 0.3 |
| 1 | P4 | 6.7 | -0.1 | 0.5 | 0.7 |
| 1 | P5 | 5.9 | 0.2 | 1.0 | 0.6 |
| 1 | P6 | 8.3 | -0.2 | 2.0 | 2.3 |
| 1 | P7 | 7.9 | 0.0 | 1.2 | 1.0 |
| 1 | P8 | 8.1 | -0.2 | 1.0 | -0.5 |
| 1 | P9 | 8.4 | -0.1 | 0.8 | 0.7 |
| 1 | P10 | 8.3 | -0.4 | 1.3 | 2.2 |
| 1 | P11 | 8.4 | -0.1 | 1.0 | 1.4 |
| 1 | P12 | 8.4 | 0.1 | 1.4 | 2.1 |
| 1 | P13 | 8.2 | -0.1 | 1.2 | 1.5 |
| 1 | P14 | 8.2 | -0.3 | 1.1 | 2.0 |
| 1 | P15 | 8.7 | -0.7 | 0.8 | 1.4 |
| 1 | P16 | 8.4 | -0.4 | 1.0 | 0.8 |
| 1 | P17 | 8.6 | -0.4 | 1.2 | 0.0 |
| 1 | P18 | 8.3 | 0.0 | 1.5 | 2.3 |
| 1 | P19 | 8.3 | -0.5 | 1.1 | 0.0 |
| 1 | P20 | 6.0 | 0.2 | 0.7 | 2.7 |
| 1 | P21 | 6.2 | 0.3 | 1.1 | 0.8 |
| 1 | P22 | 6.8 | -0.5 | 0.3 | -0.4 |
| 1 | P23 | 6.6 | -0.7 | 1.4 | 0.3 |
| 1 | P24 | 7.3 | -0.8 | 0.7 | -0.4 |
| 1 | P25 | 7.3 | -0.6 | 2.5 | 2.1 |
| 2 | P1 | 6.1 | 0.5 | 4.0 | 2.6 |
| 2 | P2 | 6.1 | 0.1 | 2.5 | 2.5 |
| 2 | P3 | 6.2 | 0.2 | 2.8 | 2.7 |
| 2 | P4 | 6.4 | -0.2 | 0.9 | 3.4 |
| 2 | P5 | 6.5 | -0.5 | 2.4 | -0.2 |
| 2 | P6 | 8.0 | 1.1 | 1.4 | 1.0 |
| 2 | P7 | 8.0 | -0.1 | 1.1 | 1.3 |
| 2 | P8 | 8.4 | -0.3 | 0.5 | 2.1 |
| 2 | P9 | 8.0 | 0.0 | 0.8 | 0.1 |
| 2 | P10 | 8.1 | 0.0 | 1.7 | 1.6 |
| 2 | P11 | 7.9 | 0.1 | 1.4 | 1.3 |
| 2 | P12 | 7.6 | 0.3 | 1.8 | 1.3 |
| 2 | P13 | 8.6 | -0.3 | 1.2 | 2.0 |
| 2 | P14 | 7.9 | -0.2 | 0.8 | 0.3 |
| 2 | P15 | 9.5 | -1.8 | 0.0 | -0.1 |
| 2 | P16 | 7.8 | 0.1 | 0.5 | 2.8 |
| 2 | P17 | 7.9 | -0.3 | 1.6 | 1.9 |
| 2 | P18 | 8.0 | -0.2 | 1.0 | 2.2 |
| 2 | P19 | 8.1 | 0.1 | 0.9 | 1.7 |

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| 2 | P20 | 6.1 | 0.1 | 2.5 | 2.7 |
| 2 | P21 | 5.9 | 0.7 | 4.3 | 2.9 |
| 2 | P22 | 6.0 | 0.4 | 2.6 | 2.7 |
| 2 | P23 | 6.1 | 0.0 | 1.0 | 2.0 |
| 2 | P24 | 6.3 | 0.2 | 1.3 | 0.4 |
| 2 | P25 | 6.3 | 0.5 | 3.8 | 4.0 |
| 3 | P1 | 6.6 | 1.6 | 1.6 | 3.8 |
| 3 | P2 | 6.7 | 0.1 | 0.8 | -0.1 |
| 3 | P3 | 6.9 | -0.8 | 0.2 | 1.3 |
| 3 | P4 | 6.4 | -0.2 | 0.8 | 2.2 |
| 3 | P5 | 6.1 | 0.2 | 1.0 | 2.0 |
| 3 | P6 | 7.9 | 0.4 | 2.5 | 1.4 |
| 3 | P7 | 7.9 | -0.2 | 2.0 | -0.3 |
| 3 | P8 | 8.0 | 0.0 | 2.2 | 2.7 |
| 3 | P9 | 8.2 | -0.3 | 1.1 | -0.3 |
| 3 | P10 | 8.4 | -0.2 | 1.7 | 2.1 |
| 3 | P11 | 7.8 | 0.4 | 2.5 | 1.7 |
| 3 | P12 | 8.1 | 0.3 | 2.1 | 1.2 |
| 3 | P13 | 8.2 | 0.3 | 2.1 | 1.3 |
| 3 | P14 | 8.4 | -0.5 | 1.6 | 1.8 |
| 3 | P15 | 8.5 | -0.7 | 1.5 | -0.3 |
| 3 | P16 | 7.8 | 0.0 | 1.3 | 0.8 |
| 3 | P17 | 7.9 | -0.4 | 1.2 | 0.1 |
| 3 | P18 | 7.7 | 0.0 | 2.6 | 0.4 |
| 3 | P19 | 8.2 | -0.5 | 1.6 | 0.2 |
| 3 | P20 | 6.4 | 0.0 | 2.1 | 2.1 |
| 3 | P21 | 6.4 | 0.2 | 3.3 | 2.1 |
| 3 | P22 | 6.6 | 0.4 | 1.2 | 2.0 |
| 3 | P23 | 7.3 | -0.8 | 0.2 | 0.7 |
| 3 | P24 | 6.8 | 0.4 | 1.7 | 0.6 |
| 3 | P25 | 6.2 | 3.2 | 2.2 | 3.4 |
| 4 | P1 | 6.5 | -0.3 | 2.5 | 2.7 |
| 4 | P2 | 6.4 | 0.7 | 1.2 | 3.9 |
| 4 | P3 | 6.5 | -0.1 | 0.8 | 1.4 |
| 4 | P4 | 6.8 | 0.0 | 0.7 | 3.7 |
| 4 | P5 | 6.0 | 0.7 | 1.6 | 0.4 |
| 4 | P6 | 8.2 | -0.1 | 1.3 | -0.1 |
| 4 | P7 | 8.6 | -0.1 | 1.3 | 0.5 |
| 4 | P8 | 8.1 | 0.1 | 1.7 | 2.2 |
| 4 | P9 | 8.0 | 0.0 | 2.2 | 0.9 |
| 4 | P10 | 8.6 | -0.7 | 0.9 | 1.8 |
| 4 | P11 | 8.3 | -0.2 | 1.6 | -0.2 |
| 4 | P12 | 8.9 | -0.7 | 1.9 | 1.0 |
| 4 | P13 | 9.2 | -1.0 | 0.1 | 0.2 |
| 4 | P14 | 8.6 | -0.4 | 0.8 | 1.6 |
| 4 | P15 | 8.2 | -0.1 | 1.2 | 2.3 |
| 4 | P16 | 9.0 | -0.9 | -0.1 | 0.6 |
| 4 | P17 | 8.9 | -0.9 | 0.0 | -0.3 |
| 4 | P18 | 8.4 | -0.5 | 0.8 | 0.2 |

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| --- | --- | --- | --- | --- | --- |
| 4 | P19 | 8.6 | -0.4 | 0.9 | 1.6 |
| 4 | P20 | 5.6 | 0.5 | 1.3 | 4.3 |
| 4 | P21 | 6.7 | 0.1 | 0.9 | 2.4 |
| 4 | P22 | 6.5 | 0.5 | 0.6 | 4.0 |
| 4 | P23 | 6.7 | -0.4 | 1.0 | 2.3 |
| 4 | P24 | 6.2 | 0.4 | 1.3 | 3.2 |
| 4 | P25 | 7.1 | -0.4 | 0.5 | 2.6 |
| 5 | P1 | 6.2 | 1.3 | 1.5 | 3.1 |
| 5 | P2 | 6.3 | 0.1 | 1.6 | 1.6 |
| 5 | P3 | 6.5 | -0.4 | 0.5 | 0.0 |
| 5 | P4 | 6.2 | 0.2 | 2.0 | 0.8 |
| 5 | P5 | 6.1 | 0.2 | 0.8 | 0.4 |
| 5 | P6 | 7.7 | 0.7 | 2.6 | 1.9 |
| 5 | P7 | 7.7 | -0.2 | 1.6 | 1.3 |
| 5 | P8 | 8.1 | 0.1 | 0.6 | -0.3 |
| 5 | P9 | 8.3 | 0.0 | 0.4 | 0.8 |
| 5 | P10 | 8.8 | -1.4 | 0.2 | -0.3 |
| 5 | P11 | 7.9 | 0.2 | 0.9 | 0.6 |
| 5 | P12 | 8.1 | -0.5 | 0.6 | 1.9 |
| 5 | P13 | 8.2 | -0.2 | 1.4 | 0.2 |
| 5 | P14 | 8.6 | -1.1 | 1.5 | -0.3 |
| 5 | P15 | 7.8 | -0.4 | 2.0 | 0.3 |
| 5 | P16 | 7.8 | 0.3 | 1.0 | 1.5 |
| 5 | P17 | 7.7 | 0.0 | 2.9 | 0.9 |
| 5 | P18 | 7.6 | -0.2 | 1.7 | 1.6 |
| 5 | P19 | 7.9 | 0.1 | 2.0 | 1.0 |
| 5 | P20 | 5.8 | 1.7 | 3.8 | 2.0 |
| 5 | P21 | 6.3 | 0.1 | 2.9 | 2.2 |
| 5 | P22 | 6.1 | 0.3 | 2.2 | 0.9 |
| 5 | P23 | 6.7 | -0.4 | 1.0 | 0.8 |
| 5 | P24 | 6.6 | -0.3 | 0.4 | -0.4 |
| 5 | P25 | 6.4 | 0.2 | 1.5 | 1.5 |
| 6 | P1 | 7.0 | -0.4 | 1.8 | 2.6 |
| 6 | P2 | 8.0 | -1.9 | -0.1 | 3.1 |
| 6 | P3 | 7.0 | -0.1 | 2.1 | 0.8 |
| 6 | P4 | 7.3 | -0.7 | 1.2 | 0.4 |
| 6 | P5 | 6.1 | -0.2 | 2.2 | 3.8 |
| 6 | P6 | 8.6 | 0.0 | 1.8 | 0.4 |
| 6 | P7 | 8.2 | 0.1 | 0.8 | 0.4 |
| 6 | P8 | 8.1 | 0.1 | 0.5 | 0.7 |
| 6 | P9 | 8.7 | -0.8 | 0.9 | -0.4 |
| 6 | P10 | 8.8 | -0.3 | 0.4 | 0.1 |
| 6 | P11 | 9.3 | -1.0 | 0.0 | -0.3 |
| 6 | P12 | 8.2 | -0.3 | 0.7 | 0.3 |
| 6 | P13 | 8.3 | 0.3 | 0.6 | 2.4 |
| 6 | P14 | 8.5 | 0.2 | 1.5 | 0.7 |
| 6 | P15 | 8.0 | 0.6 | 1.2 | -1.2 |
| 6 | P16 | 8.6 | 0.9 | 1.8 | 0.8 |
| 6 | P17 | 8.9 | 0.1 | 0.1 | 0.9 |

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| --- | --- | --- | --- | --- | --- |
| 6 | P18 | 8.3 | -0.2 | 1.0 | 0.5 |
| 6 | P19 | 8.1 | -0.3 | 1.5 | 0.5 |
| 6 | P20 | 6.3 | 0.6 | 1.1 | 3.6 |
| 6 | P21 | 6.3 | -0.2 | 2.8 | 1.1 |
| 6 | P22 | 6.1 | 0.6 | 1.8 | 2.8 |
| 6 | P23 | 6.4 | -0.3 | 1.2 | 2.9 |
| 6 | P24 | 6.5 | 1.6 | 0.7 | 1.7 |
| 6 | P25 | 6.4 | 0.0 | 2.2 | 0.4 |
| 7 | P1 | 6.8 | -0.6 | 0.5 | 2.0 |
| 7 | P2 | 6.7 | -0.3 | 1.2 | 3.2 |
| 7 | P3 | 7.0 | -0.2 | 0.1 | 1.7 |
| 7 | P4 | 6.7 | -0.2 | 0.7 | 1.4 |
| 7 | P5 | 7.2 | -0.5 | 0.3 | 1.0 |
| 7 | P6 | 9.6 | -1.9 | -0.5 | -1.0 |
| 7 | P7 | 8.5 | -0.6 | 0.5 | 0.2 |
| 7 | P8 | 8.3 | -0.2 | 1.8 | 0.4 |
| 7 | P9 | 8.3 | -0.3 | 1.3 | 0.4 |
| 7 | P10 | 8.2 | 0.1 | 1.2 | 0.5 |
| 7 | P11 | 8.0 | 0.5 | 2.0 | 1.4 |
| 7 | P12 | 8.2 | 0.2 | 0.9 | 2.2 |
| 7 | P13 | 8.4 | -0.4 | 1.2 | 1.0 |
| 7 | P14 | 8.2 | -0.3 | 0.7 | 0.5 |
| 7 | P15 | 8.9 | -0.6 | 0.0 | -0.6 |
| 7 | P16 | 8.3 | -0.2 | 1.5 | 1.5 |
| 7 | P17 | 8.4 | -0.4 | 1.8 | 1.4 |
| 7 | P18 | 8.1 | 0.2 | 0.5 | 0.4 |
| 7 | P19 | 8.9 | -1.1 | 0.0 | 2.3 |
| 7 | P20 | 7.4 | -1.2 | 0.7 | 3.8 |
| 7 | P21 | 7.6 | -0.3 | 1.3 | 2.7 |
| 7 | P22 | 8.3 | -1.7 | -1.2 | -0.5 |
| 7 | P23 | 7.6 | -1.6 | -0.5 | 2.3 |
| 7 | P24 | 7.8 | -1.1 | -0.1 | -0.6 |
| 7 | P25 | 6.8 | 1.3 | 2.1 | 1.1 |
| 8 | P1 | 6.8 | -0.4 | 2.3 | 2.9 |
| 8 | P2 | 6.8 | 0.1 | 2.4 | 1.2 |
| 8 | P3 | 6.4 | 0.1 | 2.9 | 1.9 |
| 8 | P4 | 6.5 | 0.0 | 3.0 | 2.0 |
| 8 | P5 | 6.2 | -0.1 | 2.8 | 2.1 |
| 8 | P6 | 7.8 | -1.0 | 1.3 | 2.1 |
| 8 | P7 | 7.9 | 0.3 | 1.1 | 0.2 |
| 8 | P8 | 7.9 | -0.9 | 2.2 | 0.4 |
| 8 | P9 | 8.5 | -0.3 | 1.2 | 0.6 |
| 8 | P10 | 8.1 | 0.1 | 1.3 | 1.4 |
| 8 | P11 | 7.9 | -0.5 | 2.1 | 1.3 |
| 8 | P12 | 10.3 | -2.1 | -1.2 | -1.4 |
| 8 | P13 | 8.5 | -1.6 | 1.2 | 0.8 |
| 8 | P14 | 7.9 | -1.4 | 1.0 | 0.7 |
| 8 | P15 | 8.0 | 0.5 | 0.9 | 0.7 |
| 8 | P16 | 7.8 | 0.5 | 2.0 | 1.2 |

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| 8 | P17 | 8.0 | -1.4 | 2.2 | 3.3 |
| 8 | P18 | 7.5 | 2.0 | 1.0 | 1.6 |
| 8 | P19 | 8.3 | -0.4 | 0.6 | 0.4 |
| 8 | P20 | 6.3 | 1.6 | 2.6 | 2.5 |
| 8 | P21 | 6.6 | 0.7 | 2.2 | 2.3 |
| 8 | P22 | 6.7 | -0.3 | 2.2 | 0.5 |
| 8 | P23 | 6.5 | 0.0 | 2.5 | 1.1 |
| 8 | P24 | 6.4 | 0.2 | 3.0 | 1.6 |
| 8 | P25 | 6.8 | -0.2 | 2.8 | 2.1 |

**GAS TIGHT**

| | mOhm values | Actual | Delta |
| --- | --- | --- | --- |
| **Board** | **Position** | **Initial** | **Gas Tight** |
| 1 | P1 | 6.2 | -0.1 |
| 1 | P2 | 6.0 | 0.2 |
| 1 | P3 | 6.5 | -0.3 |
| 1 | P4 | 6.5 | -0.2 |
| 1 | P5 | 6.0 | 0.1 |
| 1 | P6 | 8.0 | 0.4 |
| 1 | P7 | 8.2 | -0.4 |
| 1 | P8 | 8.2 | -0.1 |
| 1 | P9 | 8.3 | 0.7 |
| 1 | P10 | 8.5 | 0.2 |
| 1 | P11 | 8.6 | 0.1 |
| 1 | P12 | 8.6 | 0.5 |
| 1 | P13 | 8.4 | 0.2 |
| 1 | P14 | 8.3 | 0.3 |
| 1 | P15 | 8.5 | 0.0 |
| 1 | P16 | 8.4 | -0.6 |
| 1 | P17 | 8.4 | -0.3 |
| 1 | P18 | 8.4 | -0.6 |
| 1 | P19 | 8.6 | 0.0 |
| 1 | P20 | 6.8 | -0.8 |
| 1 | P21 | 7.4 | -0.7 |
| 1 | P22 | 6.5 | 0.3 |
| 1 | P23 | 6.3 | 0.0 |
| 1 | P24 | 6.2 | 0.5 |
| 1 | P25 | 8.5 | -0.2 |
| 2 | P1 | 7.0 | 0.7 |
| 2 | P2 | 6.7 | 1.1 |
| 2 | P3 | 6.9 | 1.0 |
| 2 | P4 | 6.7 | 0.1 |
| 2 | P5 | 6.7 | 0.2 |
| 2 | P6 | 8.3 | 0.8 |
| 2 | P7 | 8.5 | 0.0 |
| 2 | P8 | 8.3 | 0.1 |

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| --- | --- | --- | --- |
| 2 | P9 | 8.4 | -0.2 |
| 2 | P10 | 8.2 | 0.2 |
| 2 | P11 | 8.2 | 1.0 |
| 2 | P12 | 8.7 | 0.6 |
| 2 | P13 | 8.5 | 0.7 |
| 2 | P14 | 8.1 | 1.4 |
| 2 | P15 | 8.7 | 0.3 |
| 2 | P16 | 8.8 | -0.2 |
| 2 | P17 | 8.3 | 0.3 |
| 2 | P18 | 8.2 | 0.2 |
| 2 | P19 | 8.3 | 0.2 |
| 2 | P20 | 6.8 | -0.3 |
| 2 | P21 | 6.6 | 0.3 |
| 2 | P22 | 6.6 | 0.1 |
| 2 | P23 | 7.4 | 0.1 |
| 2 | P24 | 6.8 | 0.4 |
| 2 | P25 | 7.0 | 0.9 |
| 3 | P1 | 7.1 | -0.2 |
| 3 | P2 | 8.5 | -1.5 |
| 3 | P3 | 6.8 | 0.3 |
| 3 | P4 | 8.0 | -1.2 |
| 3 | P5 | 6.1 | 0.6 |
| 3 | P6 | 7.9 | 0.0 |
| 3 | P7 | 8.3 | 0.1 |
| 3 | P8 | 8.0 | -0.1 |
| 3 | P9 | 7.7 | 1.3 |
| 3 | P10 | 7.8 | -0.2 |
| 3 | P11 | 8.2 | -0.1 |
| 3 | P12 | 8.0 | 0.3 |
| 3 | P13 | 8.3 | 0.4 |
| 3 | P14 | 8.0 | 0.0 |
| 3 | P15 | 8.0 | -0.2 |
| 3 | P16 | 7.7 | -0.1 |
| 3 | P17 | 7.8 | 0.0 |
| 3 | P18 | 7.8 | -0.1 |
| 3 | P19 | 7.9 | 0.4 |
| 3 | P20 | 6.1 | 0.1 |
| 3 | P21 | 6.4 | 0.8 |
| 3 | P22 | 6.6 | 0.8 |
| 3 | P23 | 6.0 | 0.5 |
| 3 | P24 | 7.0 | 0.0 |
| 3 | P25 | 6.3 | 1.4 |
| 4 | P1 | 6.5 | 0.7 |
| 4 | P2 | 6.8 | -0.6 |
| 4 | P3 | 6.0 | -0.2 |
| 4 | P4 | 6.1 | 1.1 |
| 4 | P5 | 6.3 | -0.4 |
| 4 | P6 | 8.3 | -0.2 |
| 4 | P7 | 8.2 | 0.6 |

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| 4 | P8 | 8.3 | 1.8 |
| 4 | P9 | 8.1 | 0.3 |
| 4 | P10 | 7.9 | 1.1 |
| 4 | P11 | 8.0 | 2.1 |
| 4 | P12 | 8.2 | -0.1 |
| 4 | P13 | 8.4 | 0.1 |
| 4 | P14 | 8.1 | 1.3 |
| 4 | P15 | 8.8 | 0.1 |
| 4 | P16 | 8.9 | -0.8 |
| 4 | P17 | 8.4 | -0.1 |
| 4 | P18 | 7.7 | 0.2 |
| 4 | P19 | 8.1 | 0.2 |
| 4 | P20 | 6.0 | 0.3 |
| 4 | P21 | 6.9 | 0.0 |
| 4 | P22 | 6.5 | -0.4 |
| 4 | P23 | 6.6 | -0.1 |
| 4 | P24 | 5.9 | 0.0 |
| 4 | P25 | 6.3 | -0.3 |
| 5 | P1 | 7.2 | -0.5 |
| 5 | P2 | 6.4 | 1.1 |
| 5 | P3 | 7.1 | 0.0 |
| 5 | P4 | 7.2 | 1.9 |
| 5 | P5 | 6.5 | 0.0 |
| 5 | P6 | 8.5 | -0.4 |
| 5 | P7 | 8.0 | 0.0 |
| 5 | P8 | 9.1 | -1.0 |
| 5 | P9 | 8.7 | -0.8 |
| 5 | P10 | 8.3 | -0.4 |
| 5 | P11 | 8.3 | 0.1 |
| 5 | P12 | 8.1 | 0.3 |
| 5 | P13 | 8.5 | -0.3 |
| 5 | P14 | 8.4 | 0.1 |
| 5 | P15 | 8.5 | 0.3 |
| 5 | P16 | 9.0 | -0.6 |
| 5 | P17 | 8.3 | -0.5 |
| 5 | P18 | 8.4 | -0.3 |
| 5 | P19 | 8.3 | -0.3 |
| 5 | P20 | 6.8 | -0.7 |
| 5 | P21 | 7.0 | -0.3 |
| 5 | P22 | 7.1 | -0.4 |
| 5 | P23 | 6.6 | 0.7 |
| 5 | P24 | 7.3 | -0.1 |
| 5 | P25 | 7.0 | 1.0 |
| 6 | P1 | 6.8 | 0.7 |
| 6 | P2 | 6.5 | 0.1 |
| 6 | P3 | 6.5 | -0.3 |
| 6 | P4 | 6.6 | -0.3 |
| 6 | P5 | 6.1 | -0.3 |
| 6 | P6 | 8.7 | -0.7 |

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| 6 | P7 | 7.9 | 0.3 |
| 6 | P8 | 7.5 | 3.5 |
| 6 | P9 | 8.3 | -0.2 |
| 6 | P10 | 7.8 | 2.7 |
| 6 | P11 | 9.1 | 1.8 |
| 6 | P12 | 8.6 | 2.4 |
| 6 | P13 | 9.5 | 1.3 |
| 6 | P14 | 8.0 | 0.0 |
| 6 | P15 | 8.6 | 0.1 |
| 6 | P16 | 8.1 | 0.4 |
| 6 | P17 | 8.0 | 0.5 |
| 6 | P18 | 8.8 | 1.9 |
| 6 | P19 | 8.2 | 2.9 |
| 6 | P20 | 7.1 | -0.4 |
| 6 | P21 | 6.5 | 2.3 |
| 6 | P22 | 6.7 | 1.5 |
| 6 | P23 | 6.7 | 3.5 |
| 6 | P24 | 7.1 | -0.5 |
| 6 | P25 | 7.6 | -0.1 |
| 7 | P1 | 8.4 | -1.3 |
| 7 | P2 | 6.6 | 0.2 |
| 7 | P3 | 7.7 | -0.7 |
| 7 | P4 | 7.2 | -0.6 |
| 7 | P5 | 9.5 | -3.3 |
| 7 | P6 | 7.6 | 2.3 |
| 7 | P7 | 7.7 | 3.0 |
| 7 | P8 | 7.9 | 0.4 |
| 7 | P9 | 7.7 | 0.1 |
| 7 | P10 | 8.3 | 0.1 |
| 7 | P11 | 8.3 | -0.3 |
| 7 | P12 | 7.8 | -0.2 |
| 7 | P13 | 8.3 | -1.1 |
| 7 | P14 | 8.3 | 0.3 |
| 7 | P15 | 8.4 | -0.4 |
| 7 | P16 | 8.3 | -0.3 |
| 7 | P17 | 7.8 | 0.5 |
| 7 | P18 | 8.2 | 0.1 |
| 7 | P19 | 8.2 | 0.0 |
| 7 | P20 | 6.4 | -0.1 |
| 7 | P21 | 7.0 | -0.3 |
| 7 | P22 | 7.3 | -0.4 |
| 7 | P23 | 7.2 | -0.1 |
| 7 | P24 | 7.9 | -0.5 |
| 7 | P25 | 9.9 | -3.1 |
| 8 | P1 | 6.8 | 1.5 |
| 8 | P2 | 6.5 | 0.5 |
| 8 | P3 | 6.7 | -0.2 |
| 8 | P4 | 6.7 | -0.2 |
| 8 | P5 | 6.4 | 2.1 |

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| 8 | P6 | 8.4 | 0.9 |
| 8 | P7 | 7.7 | 2.7 |
| 8 | P8 | 8.0 | 2.2 |
| 8 | P9 | 8.2 | 2.1 |
| 8 | P10 | 8.2 | 3.0 |
| 8 | P11 | 8.1 | 1.5 |
| 8 | P12 | 7.9 | -0.1 |
| 8 | P13 | 8.3 | 2.8 |
| 8 | P14 | 8.1 | 2.1 |
| 8 | P15 | 8.1 | 0.9 |
| 8 | P16 | 8.4 | 0.7 |
| 8 | P17 | 8.3 | 1.1 |
| 8 | P18 | 8.7 | 1.3 |
| 8 | P19 | 8.5 | 0.5 |
| 8 | P20 | 6.6 | 1.5 |
| 8 | P21 | 6.6 | 1.3 |
| 8 | P22 | 6.2 | 1.2 |
| 8 | P23 | 6.6 | 0.5 |
| 8 | P24 | 6.9 | 0.5 |
| 8 | P25 | 7.5 | -0.3 |

## EQUIPMENT AND CALIBRATION SCHEDULES

**Equipment #:** HZ-MO-03
**Description:** Micro-ohmmeter
**Manufacturer:** Keithley
**Model:** 580
**Serial #:** 297288
**Accuracy:** Last Cal: 2009-8-07, Next Cal: 2010-8-06

**Equipment #:** HZ-TCT-01
**Description:** Normal force analyzer
**Manufacturer:** Mecmesin Multitester
**Model:** Mecmesin Multitester 2.5-i
**Serial #:** 08-1049-04
**Accuracy:** Last Cal: 2010-4-28, Next Cal: 2011-4-27

**Equipment #:** HZ-OV-01
**Description:** Oven
**Manufacturer:** Huida
**Model:** CS101-1E
**Serial #:** CS101-1E-B
**Accuracy:** Last Cal: 2009-12-15, Next Cal: 2010-12-14

**Equipment #:** HZ-THC-01
**Description:** Humidity transmitter
**Manufacturer:** Thermtron
**Model:** HMM30C
**Serial #:** D0240037
**Accuracy:** Last Cal: 2010-6-4, Next Cal: 2011-6-3

**Equipment #:** HZ-OGP-01
**Description:** Video measurement system
**Manufacturer:** OGP
**Model:** SMARTSCOPE FLASH 200
**Serial #:** SVW2003632
**Accuracy:** Last Cal: 2009-6-11, Next Cal: 2010-6-10