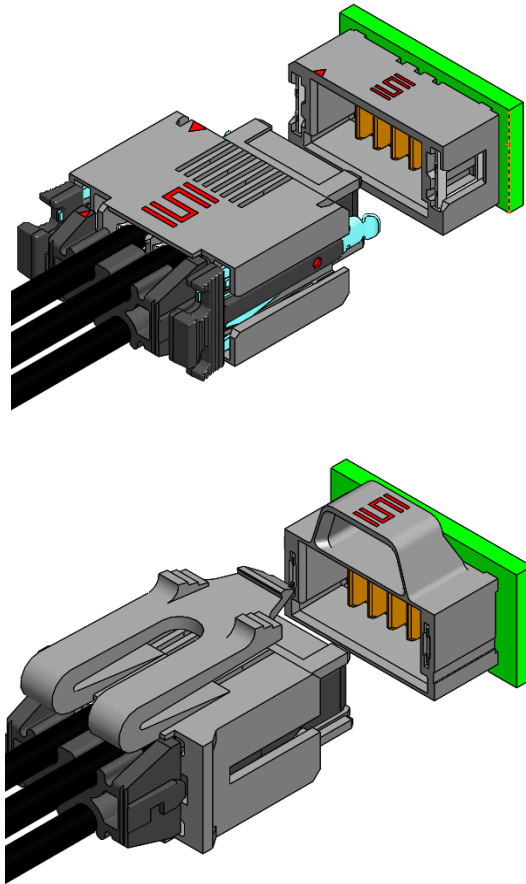




Project Number: Design Qualification Test Report	Tracking Code: 2489006_Report_Rev_2
Requested by: Michael Menkhaus	Date: 8/12/2021
Part #: UMPC-04-T-16-P-06.0 / UMPT-04-02.5-T-VT-SM-WT-P-K	Tech: Peter Chen
Part description: UMPC / UMPT	Qty to test: 80
Test Start: 07/25/2018	Test Completed: 09/02/2018



DESIGN QUALIFICATION TEST REPORT

UMPC / UMPT

UMPC-04-T-16-P-06.0 / UMPT-04-02.5-T-VT-SM-WT-P-K

REVISION HISTORY

DATA	REV.NUM.	DESCRIPTION	ENG
3/5/2021	1	Initial Issue	PC
6/4/2021	2	Update the test plan	PC

CERTIFICATION

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

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SCOPE

To perform the following tests: Design Qualification test. Please see test plan.

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) Samtec Test PCBs used: PCB-110815-TST. PCB-110817-TST. PCB-110949-TST. PCB-110816-TST. PCB-110824-TST.

FLOWCHARTS**Gas Tight**Group 1

UMPC-04-T-16-P-06.0
 UMPT-04-02.5-T-VT-SM-WT-P-K
 8 Assemblies

Step Description

1. LLCR ⁽²⁾
2. Gas Tight ⁽¹⁾
3. LLCR ⁽²⁾
Max Delta = 5 mOhm

(1) Gas Tight = EIA-364-36

(2) LLCR = EIA-364-23

Open Circuit Voltage = 20 mV Max
 Test Current = 100 mA Max

Normal ForceGroup 1

UMPC-04-T-16-P-06.0

 8 Contacts Minimum
 Signal Without Thermals

Step Description

1. Contact Gaps
2. Normal Force ⁽¹⁾
Deflection = 0.0039 "
Expected Force at Max Deflection = 100 g
Note: Use probe to deflect contact inside the housing. Do not cut the housing to deflect the beam.

Group 2

UMPC-04-T-16-P-06.0
 UMPT-04-02.5-T-VT-SM-WT-P-K
 8 Contacts Minimum
 Signal With Thermals

Step Description

1. Contact Gaps
2. Thermal Age ⁽²⁾
3. Contact Gaps
4. Normal Force ⁽¹⁾
Deflection = 0.0039 "
Expected Force at Max Deflection = 100 g
Note: Use probe to deflect contact inside the housing. Do not cut the housing out of the way to deflect.

(1) Normal Force = EIA-364-04

(2) Thermal Age = EIA-364-17

Test Condition = 4 (105°C)
 Time Condition = B (250 Hours)

FLOWCHARTS Continued**Thermal Aging**

Note: Cut off the plastic latches so mating/unmating force groups can be measured.

Group 1

UMPC-04-T-16-P-06.0

UMPT-04-02.5-T-VT-SM-WT-P-K

8 Assemblies

Step	Description
1.	Contact Gaps
2.	Mating/Unmating Force ⁽²⁾
3.	LLCR ⁽¹⁾
4.	Thermal Age ⁽³⁾
5.	LLCR ⁽¹⁾ Max Delta = 5 mOhm
6.	Mating/Unmating Force ⁽²⁾
7.	Contact Gaps

(1) LLCR = EIA-364-23

Open Circuit Voltage = 20 mV Max

Test Current = 100 mA Max

(2) Mating/Unmating Force = EIA-364-13

(3) Thermal Age = EIA-364-17

Test Condition = 4 (105°C)

Time Condition = B (250 Hours)

FLOWCHARTS Continued**Mating/Unmating/Durability**

Note: Cut off the plastic latches so mating/unmating force and cyclic groups can be run.

<u>Group 1</u> UMPC-04-T-16-P-06.0 UMPT-04-02.5-T-VT-SM-WT-P-K 8 Assemblies Middle Position		<u>Group 2</u> UMPC-02-T-16-P-06.0 UMPT-02-02.5-T-VT-SM-WT-P-K 8 Assemblies Smallest Position		<u>Group 3</u> UMPC-10-T-16-P-06.0 UMPT-10-02.5-T-VT-SM-WT-P-K 8 Assemblies Largest Position	
Step	Description	Step	Description	Step	Description
1.	Contact Gaps	1.	Contact Gaps	1.	Contact Gaps
2.	LLCR (2)	2.	Mating/Unmating Force (3)	2.	Mating/Unmating Force (3)
3.	Mating/Unmating Force (3)	3.	Cycles	3.	Cycles
4.	Cycles Quantity = 25 Cycles	4.	Mating/Unmating Force (3)	4.	Mating/Unmating Force (3)
5.	Mating/Unmating Force (3)	5.	Cycles	5.	Cycles
6.	Cycles Quantity = 25 Cycles	6.	Mating/Unmating Force (3)	6.	Mating/Unmating Force (3)
7.	Mating/Unmating Force (3)	7.	Cycles	7.	Cycles
8.	Cycles Quantity = 25 Cycles	8.	Mating/Unmating Force (3)	8.	Mating/Unmating Force (3)
9.	Mating/Unmating Force (3)	9.	Cycles	9.	Cycles
10.	Cycles Quantity = 25 Cycles	10.	Mating/Unmating Force (3)	10.	Mating/Unmating Force (3)
11.	Mating/Unmating Force (3)	11.	Contact Gaps	11.	Contact Gaps
12.	Contact Gaps				
13.	LLCR (2) Max Delta = 5 mOhm				
14.	Thermal Shock (4)				
15.	LLCR (2) Max Delta = 5 mOhm				
16.	Humidity (1)				
17.	LLCR (2) Max Delta = 5 mOhm				
18.	Mating/Unmating Force (3)				

(1) Humidity = EIA-364-31

Test Condition = B (240 Hours)

Test Method = III (+25°C to +65°C @ 90% RH to 98% RH)

Test Exceptions: ambient pre-condition and delete steps 7a and 7b

(2) LLCR = EIA-364-23

Open Circuit Voltage = 20 mV Max

Test Current = 100 mA Max

(3) Mating/Unmating Force = EIA-364-13

(4) Thermal Shock = EIA-364-32

Exposure Time at Temperature Extremes = 1/2 Hour

Method A, Test Condition = I (-55°C to +85°C)

Test Duration = A-3 (100 Cycles)

FLOWCHARTS Continued**IR/DWV****Pin-to-Pin**

<u>Group 1</u>		<u>Group 2</u>		<u>Group 3</u>		<u>Group 4</u>	
UMPC-04-T-16-P-06.0		UMPT-04-02.5-T-VT-SM-WT-P-K		UMPC-04-T-16-P-06.0 UMPT-04-02.5-T-VT-SM-WT-P-K		UMPC-04-T-16-P-06.0 UMPT-04-02.5-T-VT-SM-WT-P-K	
2 Assemblies Cable Breakdown		2 Assemblies Connector Breakdown		2 Assemblies Mated Set Breakdown		2 Assemblies Mated Set With Conditions Test	
Step	Description	Step	Description	Step	Description	Step	Description
1.	DWV Breakdown (2)	1.	DWV Breakdown (2)	1.	DWV Breakdown (2)	1.	IR (4)
						2.	DWV at Test Voltage (1)
						3.	Thermal Shock (5)
						4.	IR (4)
						5.	DWV at Test Voltage (1)
						6.	Humidity (3)
						7.	IR (4)
						8.	DWV at Test Voltage (1)

 (1) DWV at Test Voltage = EIA-364-20

Test Condition = 1 (Sea Level)

DWV test voltage is equal to 75% of the lowest breakdown voltage

Test voltage applied for 60 seconds

(2) DWV Breakdown = EIA-364-20

Test Condition = 1 (Sea Level)

DWV test voltage is equal to 75% of the lowest breakdown voltage

Test voltage applied for 60 seconds

(3) Humidity = EIA-364-31

Test Condition = B (240 Hours)

Test Method = III (+25°C to +65°C @ 90% RH to 98% RH)

Test Exceptions: ambient pre-condition and delete steps 7a and 7b

(4) IR = EIA-364-21

Test Condition = 500 Vdc, 2 Minutes Max

(5) Thermal Shock = EIA-364-32

Exposure Time at Temperature Extremes = 1/2 Hour

Method A, Test Condition = I (-55°C to +85°C)

Test Duration = A-3 (100 Cycles)

FLOWCHARTS Continued**Current Carrying Capacity**Group 1

UMPC-10-T-16-P-12.0-1
UMPT-10-02.5-T-VT-SM-WT-P-K
1 Pins Powered
Signal

Step	Description
1.	CCC ⁽¹⁾ Rows = 1 Number of Positions = 1

Group 2

UMPC-10-T-16-P-12.0-1
UMPT-10-02.5-T-VT-SM-WT-P-K
2 Pins Powered
Signal

Step	Description
1.	CCC ⁽¹⁾ Rows = 1 Number of Positions = 2

Group 3

UMPC-10-T-16-P-12.0-1
UMPT-10-02.5-T-VT-SM-WT-P-K
3 Pins Powered
Signal

Step	Description
1.	CCC ⁽¹⁾ Rows = 1 Number of Positions = 3

Group 4

UMPC-10-T-16-P-12.0-1
UMPT-10-02.5-T-VT-SM-WT-P-K
4 Pins Powered
Signal

Step	Description
1.	CCC ⁽¹⁾ Rows = 1 Number of Positions = 4

Group 5

UMPC-10-T-16-P-12.0-1
UMPT-10-02.5-T-VT-SM-WT-P-K
10 Pins Powered
Signal

Step	Description
1.	CCC ⁽¹⁾ Rows = 1 Number of Positions = 10

Group 6

UMPC-10-T-18-P-12.0-1
UMPT-10-02.5-T-VT-SM-WT-P-K
1 Pins Powered
Signal

Step	Description
1.	CCC ⁽¹⁾ Rows = 1 Number of Positions = 1

Group 7

UMPC-10-T-18-P-12.0-1
UMPT-10-02.5-T-VT-SM-WT-P-K
2 Pins Powered
Signal

Step	Description
1.	CCC ⁽¹⁾ Rows = 1 Number of Positions = 2

Group 8

UMPC-10-T-18-P-12.0-1
UMPT-10-02.5-T-VT-SM-WT-P-K
3 Pins Powered
Signal

Step	Description
1.	CCC ⁽¹⁾ Rows = 1 Number of Positions = 3

Group 9

UMPC-10-T-18-P-12.0-1
UMPT-10-02.5-T-VT-SM-WT-P-K
4 Pins Powered
Signal

Step	Description
1.	CCC ⁽¹⁾ Rows = 1 Number of Positions = 4

Group 10

UMPC-10-T-18-P-12.0-1
UMPT-10-02.5-T-VT-SM-WT-P-K
10 Pins Powered
Signal

Step	Description
1.	CCC ⁽¹⁾ Rows = 1 Number of Positions = 10

(1) CCC = EIA-364-70

Method 2, Temperature Rise Versus Current Curve

(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

FLOWCHARTS Continued**Mechanical Shock/Random Vibration/LLCR**Group 1

UMPC-04-T-16-P-12.0
 UMPT-04-02.5-T-VT-SM-WT-P-K
 8 Assemblies
 Plastic Latch

Step Description

1. LLCR ⁽¹⁾
2. Mechanical Shock ⁽²⁾
3. Random Vibration ⁽³⁾
4. LLCR ⁽¹⁾
Max Delta = 5 mOhm

Group 2

UMPC-04-T-16-M-12.0
 UMPT-04-02.5-T-VT-SM-WT-M-K
 8 Assemblies
 Metal Latch

Step Description

1. LLCR ⁽¹⁾
2. Mechanical Shock ⁽²⁾
3. Random Vibration ⁽³⁾
4. LLCR ⁽¹⁾
Max Delta = 5 mOhm

(1) LLCR = EIA-364-23

Open Circuit Voltage = 20 mV Max
 Test Current = 100 mA Max

(2) Mechanical Shock = EIA-364-27

Test Condition = C (100 G Peak, 6 milliseconds, Half Sine)
 Number of Shocks = 3 Per Direction, Per Axis, 18 Total

(3) Random Vibration = EIA-364-28

Condition = VB (7.56 gRMS Average, 2 Hours/Axis)

Mechanical Shock/Random Vibration/Event DetectionGroup 1

UMPC-04-T-16-P-12.0
 UMPT-04-02.5-T-VT-SM-WT-P-K
 60 Points
 Plastic Latch

Step Description

1. Nanosecond Event Detection
(Mechanical Shock) ⁽¹⁾
2. Nanosecond Event Detection
(Random Vibration) ⁽²⁾

Group 2

UMPC-04-T-16-M-12.0
 UMPT-04-02.5-T-VT-SM-WT-M-K
 60 Points
 Metal Latch

Step Description

1. Nanosecond Event Detection
(Mechanical Shock) ⁽¹⁾
2. Nanosecond Event Detection
(Random Vibration) ⁽²⁾

(1) Nanosecond Event Detection (Mechanical Shock)

Use EIA-364-87 for Nanosecond Event Detection:
 Test Condition = F (50 nanoseconds at 10 ohms)
 Use EIA-364-27 for Mechanical Shock:
 Test Condition = C (100 G Peak, 6 milliseconds, Half Sine)
 Number of Shocks = 3 Per Direction, Per Axis, 18 Total

(2) Nanosecond Event Detection (Random Vibration)

Use EIA-364-87 for Nanosecond Event Detection:
 Test Condition = F (50 nanoseconds at 10 ohms)
 Use EIA-364-28 for Random Vibration:
 Condition = VB (7.56 gRMS Average, 2 Hours/Axis)

FLOWCHARTS Continued**Cable Pull***Note: Pull until electrical or mechanical failure.*

Group 1		Group 2		Group 3		Group 4	
UMPC-04-T-16-P-12.0-1		UMPC-04-T-16-P-12.0-1		UMPC-04-T-16-M-12.0-1		UMPC-04-T-16-M-12.0-1	
UMPT-04-02.5-T-VT-SM-WT-P-K		UMPT-04-02.5-T-VT-SM-WT-P-K		UMPT-04-02.5-T-VT-SM-WT-M-K		UMPT-04-02.5-T-VT-SM-WT-M-K	
5 Assemblies		5 Assemblies		5 Assemblies		5 Assemblies	
0 Degrees Plastic Latch		90 Degrees Plastic Latch		0 Degrees Metal Latch		90 Degrees Metal Latch	
Step	Description	Step	Description	Step	Description	Step	Description
1.	Cable Pull ⁽¹⁾	1.	Cable Pull ⁽¹⁾	1.	Cable Pull ⁽¹⁾	1.	Cable Pull ⁽¹⁾

(1) Cable Pull = EIA-364-38

Measure and Record Force Required to Failure

Failure = Discontinuity >1 microsecond at 10 ohms

Cable Flex*Note: Use testing voltage found during IR/DWV testing in this test plan.*

Group 1		Group 2	
UMPC-04-T-16-P-16.0-1		UMPC-04-T-16-M-16.0-1	
UMPT-04-02.5-T-VT-SM-WT-P-K		UMPT-04-02.5-T-VT-SM-WT-M-K	
8 Assemblies		8 Assemblies	
Plastic Latch		Metal Latch	
<i>Note: 8 oz of hanging weight.</i>		<i>Note: 16 oz of hanging weight.</i>	
Step	Description	Step	Description
1.	IR ⁽³⁾	1.	IR ⁽³⁾
2.	DWV at Test Voltage ⁽²⁾	2.	DWV at Test Voltage ⁽²⁾
3.	Cable Flex ⁽¹⁾	3.	Cable Flex ⁽¹⁾
4.	Visual Inspection	4.	Visual Inspection
5.	IR ⁽³⁾	5.	IR ⁽³⁾
6.	DWV at Test Voltage ⁽²⁾	6.	DWV at Test Voltage ⁽²⁾
		7.	Rotate Cable 90°
		8.	Cable Flex ⁽¹⁾
		9.	Visual Inspection
		10.	IR ⁽³⁾
		11.	DWV at Test Voltage ⁽²⁾

(1) Cable Flex = EIA-364-41

Circular Jacket Cable - to be tested 90° each direction (180° total)

Flat Cable - to be tested 70° each direction (140° total)

Monitor continuity during flex testing

Failure = Discontinuity >1 microsecond at 10 ohms

(2) DWV at Test Voltage = EIA-364-20

Test Condition = 1 (Sea Level)

DWV test voltage is equal to 75% of the lowest breakdown voltage

Test voltage applied for 60 seconds

(3) IR = EIA-364-21

Test Condition = 500 Vdc, 2 Minutes Max

ATTRIBUTE DEFINITIONS

The following is a brief, simplified description of attributes.

THERMAL SHOCK:

- 1) EIA-364-32, *Thermal Shock (Temperature Cycling) Test Procedure for Electrical Connectors*.
- 2) Test Condition 1: -55°C to +85°C
- 3) Test Time: ½ hour dwell at each temperature extreme
- 4) Number of Cycles: 100
- 5) All test samples are pre-conditioned at ambient.
- 6) All test samples are exposed to environmental stressing in the mated condition.

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.

MECHANICAL SHOCK (Specified Pulse):

- 1) Reference document: EIA-364-27, *Mechanical Shock Test Procedure for Electrical Connectors*
- 2) Test Condition C
- 3) Peak Value: 100 G
- 4) Duration: 6 Milliseconds
- 5) Wave Form: Half Sine
- 6) Velocity: 12.3 ft/s
- 7) Number of Shocks: 3 Shocks / Direction, 3 Axis (18 Total)

VIBRATION:

- 1) Reference document: EIA-364-28, *Vibration Test Procedure for Electrical Connectors*
- 2) Test Condition V, Letter B
- 3) Power Spectral Density: 0.04 G² / Hz
- 4) G 'RMS': 7.56
- 5) Frequency: 50 to 2000 Hz
- 6) Duration: 2.0 Hours per axis (3 axis total)

NANOSECOND-EVENT DETECTION:

- 1) Reference document: EIA-364-87, *Nanosecond-Event Detection for Electrical Connectors*
- 2) Prior to test, the samples were characterized to assure the low nanosecond event being monitored will trigger the detector.
- 3) After characterization it was determined the test samples could be monitored for 50 nanosecond events

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.

ATTRIBUTE DEFINITIONS Continued

The following is a brief, simplified description of attributes.

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 four temperature points are reported:
 - a. Ambient
 - b. 65° C
 - c. 75° C
 - d. 95° 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.

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. $\leq +1.00$ mOhms: -----Stable
 - b. $+1.00$ to $+2.00$ mOhms: -----Minor
 - c. $+2.00$ to $+5.00$ mOhms: -----Acceptable
 - d. $+5.00$ to $+15.00$ mOhms: -----Marginal
 - e. $+15.00$ to $+1000$ mOhms: -----Unstable
 - f. $>+1000$ mOhms: -----Open Failure

ATTRIBUTE DEFINITIONS Continued

The following is a brief, simplified description of attributes.

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. $\leq +1.00$ mOhms: -----Stable
 - b. $+1.00$ to $+2.00$ mOhms: -----Minor
 - c. $+2.00$ to $+5.00$ mOhms: -----Acceptable
 - d. $+5.00$ to $+15.00$ mOhms:-----Marginal
 - e. $+15.00$ to $+1000$ mOhms:-----Unstable
 - f. $>+1000$ 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° C
 - ix. The final LLCR shall be conducted within 1 hour after drying.

ATTRIBUTE DEFINITIONS Continued

The following is a brief, simplified description of attributes.

NORMAL FORCE (FOR CONTACTS TESTED OUTSIDE THE HOUSING):

- 1) Reference document: EIA-364-04, *Normal Force Test Procedure for Electrical Connectors*.
- 2) The contacts shall be tested in the loose state, *not* inserted in connector housing.
- 3) The contacts shall be prepared to allow access to the spring member at the same attitude and deflection level as would occur in actual use.
- 4) In the event that portions of the contact prevent insertion of the test probe and/or deflection of the spring member under evaluation, said material shall be removed leaving the appropriate contact surfaces exposed.
- 5) In the case of multi-tine contacts, each tine shall be tested independently on separate samples as required.
- 6) The connector housing shall be simulated, if required, in order to provide an accurate representation of the actual contact system performance.
- 7) A holding fixture shall be fashioned to allow the contact to be properly deflected.
- 8) Said holding fixture shall be mounted on a floating, adjustable, X-Y table on the base of the Dillon TC², computer controlled test stand with a deflection measurement system accuracy of 5 μm (0.0002").
- 9) The probe shall be attached to a Dillon P/N 49761-0105, 5 N (1.1 Lb) load cell providing an accuracy of $\pm 0.2\%$.
- 10) The nominal deflection rate shall be 5 mm (0.2")/minute.
- 11) Unless otherwise noted a minimum of five contacts shall be tested.
- 12) The force/deflection characteristic to load and unload each contact shall be repeated five times.
- 13) The system shall utilize the TC² software in order to acquire and record the test data.
- 14) The permanent set of each contact shall be measured within the TC² software.
- 15) 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.

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.

ATTRIBUTE DEFINITIONS Continued

The following is a brief, simplified description of attributes

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).

CABLE PULL:

- 1) Secure cable near center and pull on connector
 - a. At 90 Degrees - Lateral
 - b. At 90 Degrees - Vertical



Fig. 1

0° Connector pull, notice the electrical continuity hook-up wires.

ATTRIBUTE DEFINITIONS Continued

The following is a brief, simplified description of attributes

CABLE FLEX:

- 1) Oscillate and monitor electrical continuity for open circuit indication.
 - a. $\pm 70^\circ$ Flex Mode, bend up to 500 cycles. 16 oz load on metal latch assemblies and 8 oz on the plastic assemblies .

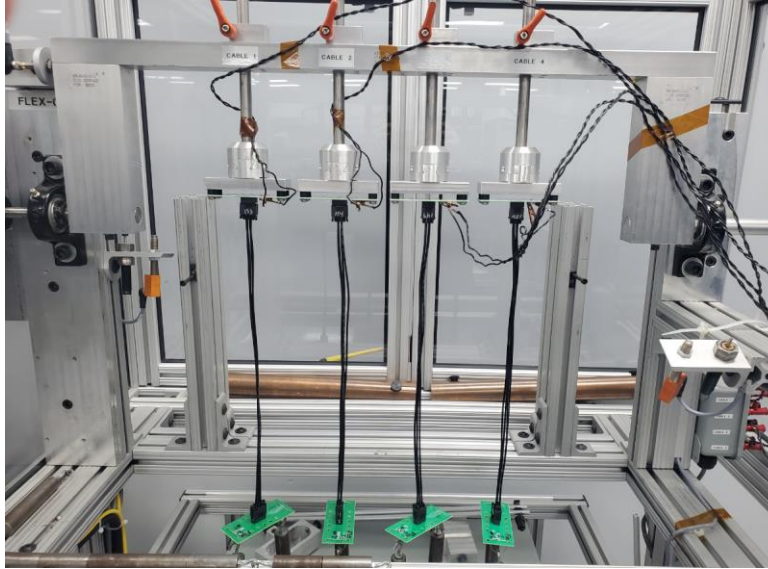


Fig. 2
(Setup picture)

RESULTS

Temperature Rise, CCC at a 20% de-rating

16 AWG

- CCC for a 30°C Temperature Rise-----16.8 A per contact with 1 contacts (1x1) powered
- CCC for a 30°C Temperature Rise-----14.6 A per contact with 2 contacts (1x2) powered
- CCC for a 30°C Temperature Rise-----12.6 A per contact with 3 contacts (1x3) powered
- CCC for a 30°C Temperature Rise-----11.6 A per contact with 4 contacts (1x4) powered
- CCC for a 30°C Temperature Rise-----8.8 A per contact with 5 contacts (1x5) powered

18 AWG

- CCC for a 30°C Temperature Rise-----15.5 A per contact with 1 contacts (1x1) powered
- CCC for a 30°C Temperature Rise-----13.0 A per contact with 2 contacts (1x2) powered
- CCC for a 30°C Temperature Rise-----10.9 A per contact with 3 contacts (1x3) powered
- CCC for a 30°C Temperature Rise-----9.9 A per contact with 4 contacts (1x4) powered
- CCC for a 30°C Temperature Rise-----7.3 A per contact with 5 contacts (1x5) powered

Mating – Unmating Forces

Thermal Aging Group

- Initial
 - Mating
 - Min ----- 6.03 Lbs
 - Max----- 7.11 Lbs
 - Unmating
 - Min ----- 3.59 Lbs
 - Max----- 4.88 Lbs
- After Thermal
 - Mating
 - Min ----- 2.63 Lbs
 - Max----- 3.28 Lbs
 - Unmating
 - Min ----- 1.56 Lbs
 - Max----- 2.52 Lbs

RESULTS Continued**Mating-Unmating Durability Group**

- **Initial**
 - **Mating**
 - **Min** ----- 5.74 Lbs
 - **Max** ----- 6.45 Lbs
 - **Unmating**
 - **Min** ----- 4.72 Lbs
 - **Max** ----- 5.49 Lbs
- **After 25 Cycles**
 - **Mating**
 - **Min** ----- 4.12 Lbs
 - **Max** ----- 4.39 Lbs
 - **Unmating**
 - **Min** ----- 2.80 Lbs
 - **Max** ----- 3.52 Lbs
- **After 50 Cycles**
 - **Mating**
 - **Min** ----- 3.92 Lbs
 - **Max** ----- 4.67 Lbs
 - **Unmating**
 - **Min** ----- 3.03 Lbs
 - **Max** ----- 3.46 Lbs
- **After 75 Cycles**
 - **Mating**
 - **Min** ----- 4.03 Lbs
 - **Max** ----- 4.70 Lbs
 - **Unmating**
 - **Min** ----- 2.87 Lbs
 - **Max** ----- 3.55 Lbs
- **After 100 Cycles**
 - **Mating**
 - **Min** ----- 4.19 Lbs
 - **Max** ----- 5.04 Lbs
 - **Unmating**
 - **Min** ----- 2.77 Lbs
 - **Max** ----- 3.46 Lbs
- **Humidity**
 - **Mating**
 - **Min** ----- 1.83 Lbs
 - **Max** ----- 2.28 Lbs
 - **Unmating**
 - **Min** ----- 0.92 Lbs
 - **Max** ----- 2.01 Lbs

RESULTS Continued**Mating-Unmating Basic (UMPC-02-T-16-P-06.0 / UMPT-02-02.5-T-VT-SM-WT-P-K)**

- **Initial**
 - **Mating**
 - **Min** ----- 3.58 Lbs
 - **Max** ----- 4.23 Lbs
 - **Unmating**
 - **Min** ----- 3.00 Lbs
 - **Max** ----- 3.75 Lbs
- **After 25 Cycles**
 - **Mating**
 - **Min** ----- 2.52 Lbs
 - **Max** ----- 2.79 Lbs
 - **Unmating**
 - **Min** ----- 2.04 Lbs
 - **Max** ----- 2.39 Lbs
- **After 50 Cycles**
 - **Mating**
 - **Min** ----- 2.67 Lbs
 - **Max** ----- 3.19 Lbs
 - **Unmating**
 - **Min** ----- 2.10 Lbs
 - **Max** ----- 2.42 Lbs
- **After 75 Cycles**
 - **Mating**
 - **Min** ----- 3.66 Lbs
 - **Max** ----- 3.64 Lbs
 - **Unmating**
 - **Min** ----- 2.02 Lbs
 - **Max** ----- 2.32 Lbs
- **After 100 Cycles**
 - **Mating**
 - **Min** ----- 3.27 Lbs
 - **Max** ----- 3.60 Lbs
 - **Unmating**
 - **Min** ----- 2.00 Lbs
 - **Max** ----- 2.27 Lbs

RESULTS Continued**Mating-Unmating Basic (UMPC-10-T-16-P-06.0 / UMPT-10-02.5-T-VT-SM-WT-P-K)**

- **Initial**
 - **Mating**
 - **Min** -----17.06 Lbs
 - **Max**-----18.61 Lbs
 - **Unmating**
 - **Min** -----14.55 Lbs
 - **Max**-----15.73 Lbs
- **After 25 Cycles**
 - **Mating**
 - **Min** -----11.81 Lbs
 - **Max**-----13.03 Lbs
 - **Unmating**
 - **Min** ----- 8.95 Lbs
 - **Max**-----11.56 Lbs
- **After 50 Cycles**
 - **Mating**
 - **Min** -----11.95 Lbs
 - **Max**-----13.91 Lbs
 - **Unmating**
 - **Min** ----- 8.50 Lbs
 - **Max**-----11.23 Lbs
- **After 75 Cycles**
 - **Mating**
 - **Min** -----13.65 Lbs
 - **Max**-----15.88 Lbs
 - **Unmating**
 - **Min** ----- 8.34 Lbs
 - **Max**-----10.96 Lbs
- **After 100 Cycles**
 - **Mating**
 - **Min** -----14.92 Lbs
 - **Max**-----18.17 Lbs
 - **Unmating**
 - **Min** ----- 8.29 Lbs
 - **Max**-----10.42 Lbs

Normal Force at 0.0052-inch deflection

- **Initial**
 - **Min** ----- 197.50 gf **Set** ---- 0.0005 mm
 - **Max** ----- 243.90 gf **Set** ---- 0.0009 mm
- **After Thermal**
 - **Min** -----75.10 gf **Set** ---- 0.0026 mm
 - **Max** ----- 137.40 gf **Set** ---- 0.0037 mm

RESULTS Continued**Cable Pull**

- **0 Degrees Plastic Latch**
 - Min -----16.22 Lbs
 - Max-----17.78 Lbs
- **90 Degrees Plastic Latch**
 - Min ----- 5.37 Lbs
 - Max----- 5.80 Lbs
- **0 Degrees Metal Latch**
 - Min -----23.83 Lbs
 - Max-----28.52 Lbs
- **90 Degrees Metal Latch**
 - Min ----- 7.90 Lbs
 - Max----- 8.75 Lbs

Cable Flex:**Plastic Latch****Insulation Resistance minimums, IR****Pin to Pin**

- **Initial**
 - Mated-----45000 Meg Ω ----- Passed
- **After 500 flex cycles**
 - Mated-----45000 Meg Ω ----- Passed

Dielectric Withstanding Voltage minimums, DWV

- Test Voltage ----- 1305 VAC

Pin to Pin

- **Initial DWV -----Passed**
- **After 500 Flex cycles DWV -----Passed**

Metal Latch**Insulation Resistance minimums, IR****Pin to Pin**

- **Initial**
 - Mated-----45000 Meg Ω ----- Passed
- **After 500 flex cycles**
 - Mated-----45000 Meg Ω ----- Passed
- **After 90° 500 flex cycles**
 - Mated-----45000 Meg Ω ----- Passed

Dielectric Withstanding Voltage minimums, DWV

- Test Voltage ----- 1305 VAC

Pin to Pin

- **Initial DWV -----Passed**
- **After 500 Flex cycles DWV -----Passed**
- **After 90° 500 Flex cycles DWV -----Passed**

RESULTS Continued**Insulation Resistance minimums, IR****Pin to Pin**

- **Initial**
 - Mated ----- 450000 Meg Ω ----- Passed
 - Unmated ----- 450000 Meg Ω ----- Passed
- **Thermal Shock**
 - Mated ----- 450000 Meg Ω ----- Passed
 - Unmated ----- 450000 Meg Ω ----- Passed
- **Humidity**
 - Mated ----- 450000 Meg Ω ----- Passed
 - Unmated ----- 450000 Meg Ω ----- Passed

Dielectric Withstanding Voltage minimums, DWV

- **Minimums**
 - Breakdown Voltage ----- 1739 VAC
 - Test Voltage ----- 1305 VAC
 - Working Voltage ----- 435 VAC

Pin to Pin

- **Initial DWV** ----- Passed
- **Thermal DWV** ----- Passed
- **Humidity DWV** ----- Passed

LLCR Gas Tight Group (32 LLCR test points)

- **Initial** ----- 3.55 mOhms Max
- **Gas-Tight**
 - $\leq +1.0$ mOhms ----- 32 Points ----- Stable
 - $+1.00$ to $+2.00$ mOhms ----- 0 Points ----- Minor
 - $+2.00$ to $+5.00$ mOhms ----- 0 Points ----- Acceptable
 - $+5.00$ to $+15.00$ mOhms ----- 0 Points ----- Marginal
 - $+15.00$ to $+1000$ mOhms ----- 0 Points ----- Unstable
 - $>+1000$ mOhms ----- 0 Points ----- Open Failure

LLCR Thermal Aging Group (32 LLCR test points)

- **Initial** ----- 3.43 mOhms Max
- **Thermal**
 - $\leq +1.0$ mOhms ----- 32 Points ----- Stable
 - $+1.00$ to $+2.00$ mOhms ----- 0 Points ----- Minor
 - $+2.00$ to $+5.00$ mOhms ----- 0 Points ----- Acceptable
 - $+5.00$ to $+15.00$ mOhms ----- 0 Points ----- Marginal
 - $+15.00$ to $+1000$ mOhms ----- 0 Points ----- Unstable
 - $>+1000$ mOhms ----- 0 Points ----- Open Failure

RESULTS Continued**LLCR Mating/Unmating Durability Group (32 LLCR test points)**

- **Initial** -----3.39 mOhms Max
- **Durability, 100 Cycles**
 - **<= +1.0 mOhms** -----32 Points ----- Stable
 - **+1.00 to +2.00 mOhms** -----0 Points ----- Minor
 - **+2.00 to +5.00 mOhms** -----0 Points ----- Acceptable
 - **+5.00 to +15.00 mOhms** -----0 Points ----- Marginal
 - **+15.00 to +1000 mOhms** -----0 Points ----- Unstable
 - **>+1000 mOhms** -----0 Points ----- Open Failure
- **Thermal Shock**
 - **<= +1.0 mOhms** -----32 Points ----- Stable
 - **+1.00 to +2.00 mOhms** -----0 Points ----- Minor
 - **+2.00 to +5.00 mOhms** -----0 Points ----- Acceptable
 - **+5.00 to +15.00 mOhms** -----0 Points ----- Marginal
 - **+15.00 to +1000 mOhms** -----0 Points ----- Unstable
 - **>+1000 mOhms** -----0 Points ----- Open Failure
- **Humidity**
 - **<= +1.0 mOhms** -----32 Points ----- Stable
 - **+1.00 to +2.00 mOhms** -----0 Points ----- Minor
 - **+2.00 to +5.00 mOhms** -----0 Points ----- Acceptable
 - **+5.00 to +15.00 mOhms** -----0 Points ----- Marginal
 - **+15.00 to +1000 mOhms** -----0 Points ----- Unstable
 - **>+1000 mOhms** -----0 Points ----- Open Failure

LLCR Shock & Vibration Group (32 LLCR test points)**Plastic Latch**

- **Initial** -----3.40 mOhms Max
- **Shock &Vibration**
 - **<= +1.0 mOhms** -----32 Points ----- Stable
 - **+1.00 to +2.00 mOhms** -----0 Points ----- Minor
 - **+2.00 to +5.00 mOhms** -----0 Points ----- Acceptable
 - **+5.00 to +15.00 mOhms** -----0 Points ----- Marginal
 - **+15.00 to +1000 mOhms** -----0 Points ----- Unstable
 - **>+1000 mOhms** -----0 Points ----- Open Failure

Mechanical Shock & Random Vibration:

- **Shock**
 - **No Damage**----- Pass
 - **50 Nanoseconds**----- Pass
- **Vibration**
 - **No Damage**----- Pass
 - **50 Nanoseconds**----- Pass

RESULTS Continued**Metal Latch**

- **Initial** -----3.28 mOhms Max
- **Shock & Vibration**
 - <= +1.0 mOhms -----32 Points ----- Stable
 - +1.00 to +2.00 mOhms -----0 Points ----- Minor
 - +2.00 to +5.00 mOhms -----0 Points ----- Acceptable
 - +5.00 to +15.00 mOhms -----0 Points ----- Marginal
 - +15.00 to +1000 mOhms -----0 Points ----- Unstable
 - >+1000 mOhms -----0 Points ----- Open Failure

Mechanical Shock & Random Vibration:

- **Shock**
 - **No Damage**----- Pass
 - **50 Nanoseconds**----- Pass
- **Vibration**
 - **No Damage**----- Pass
 - **50 Nanoseconds**----- Pass

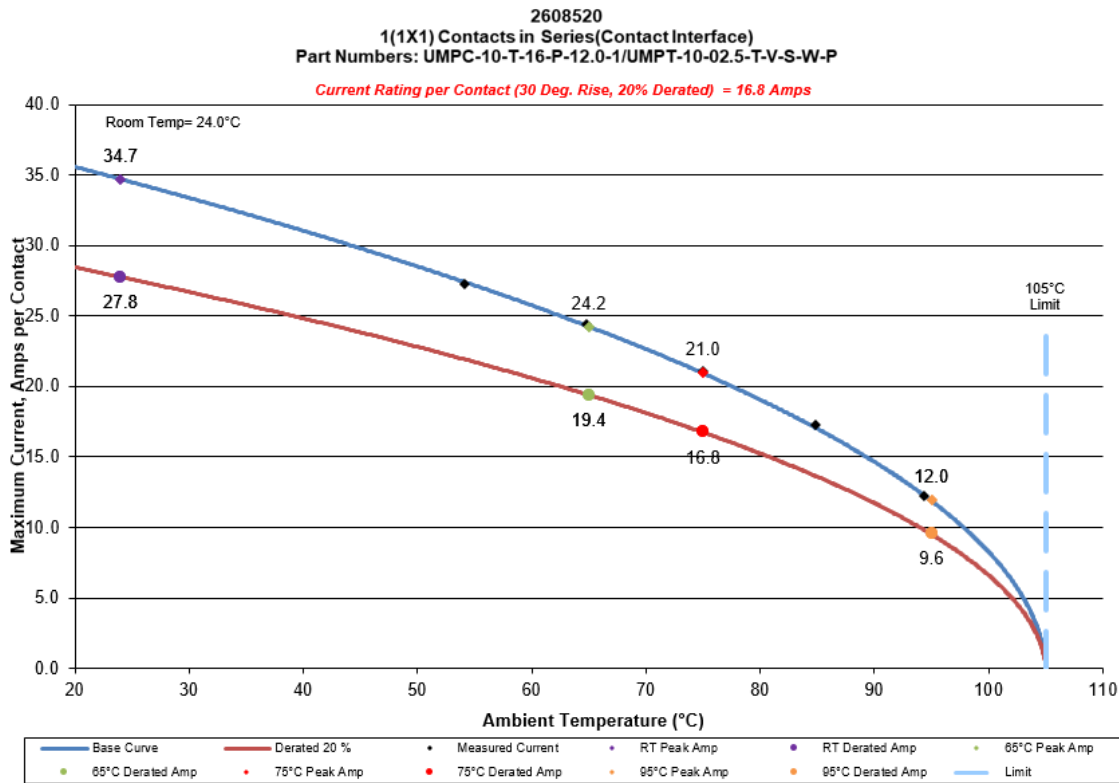
DATA SUMMARIES

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:

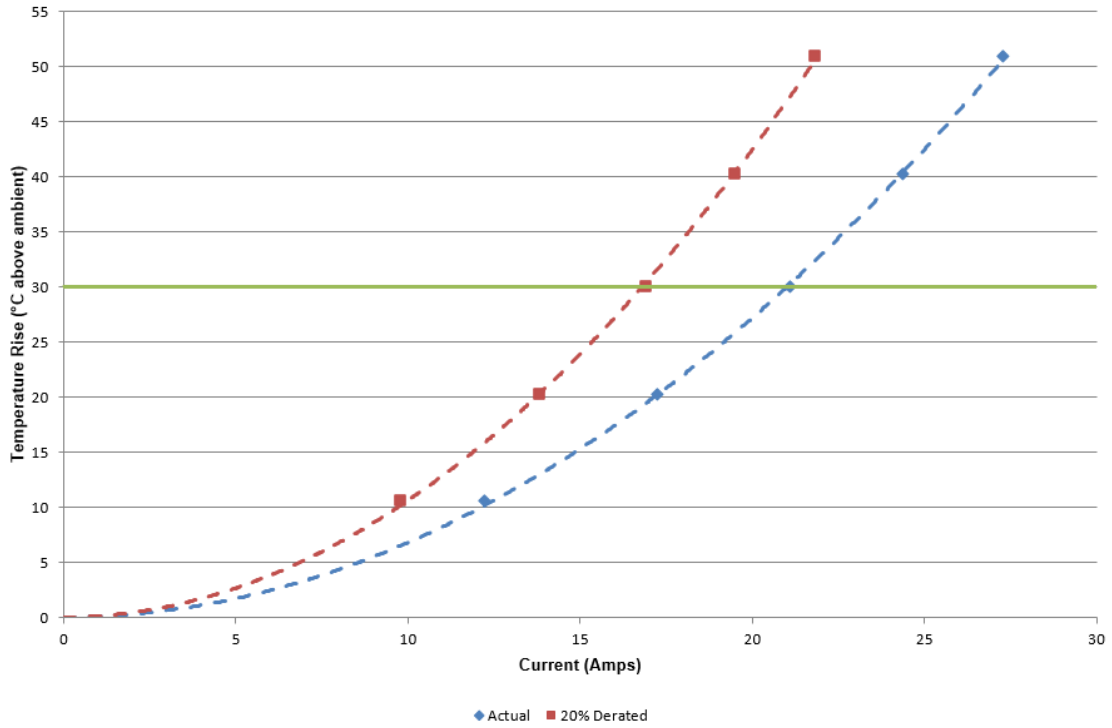
16 AWG

- a. Linear configuration with 1 adjacent conductors/contacts powered



DATA SUMMARIES Continued

2608520
1(1X1) Contacts in Series(Contact Interface)
Part Numbers: UMPC-10-T-16-P-12.0-1/UMPT-10-02.5-T-V-S-W-P

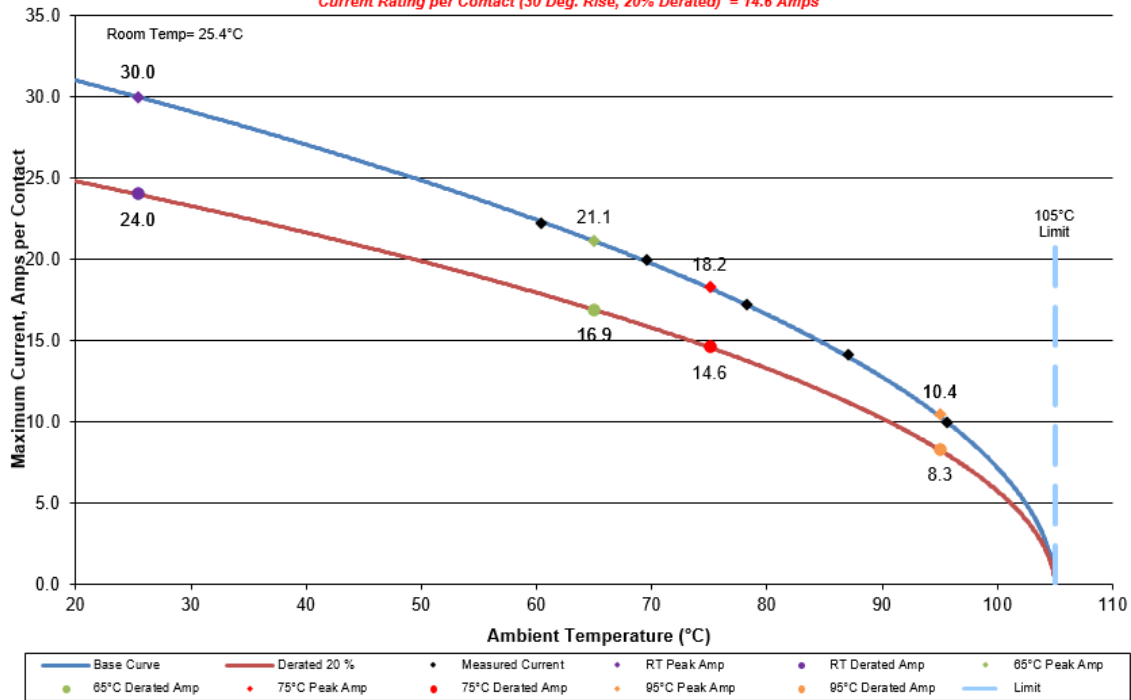


DATA SUMMARIES Continued

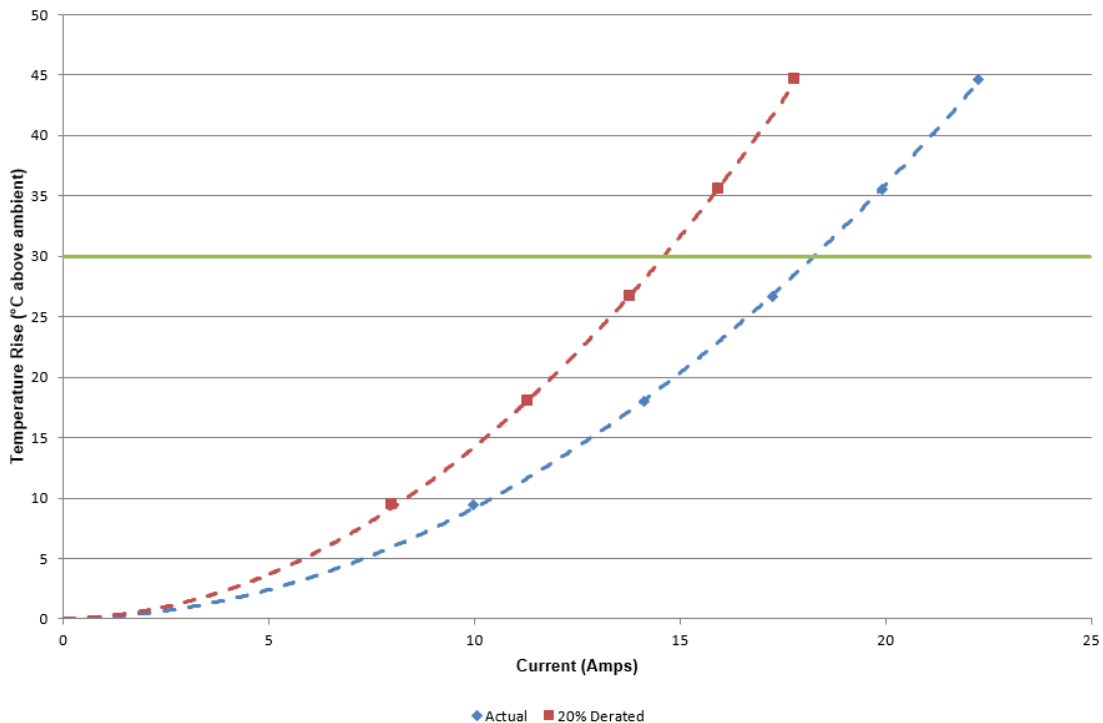
b. Linear configuration with 2 adjacent conductors/contacts powered

2608520
 2(1X2) Contacts in Series(Contact Interface)
 Part Numbers: UMPC-10-T-16-P-12.0-1/UMPT-10-02.5-T-V-S-W-P

Current Rating per Contact (30 Deg. Rise, 20% Derated) = 14.6 Amps

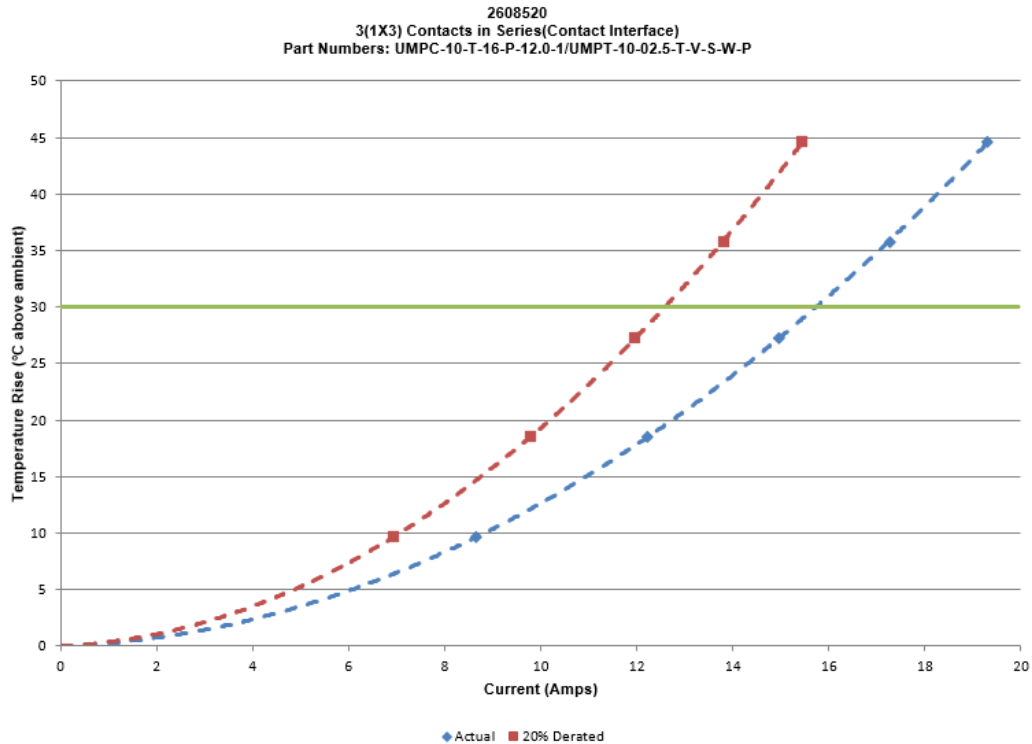
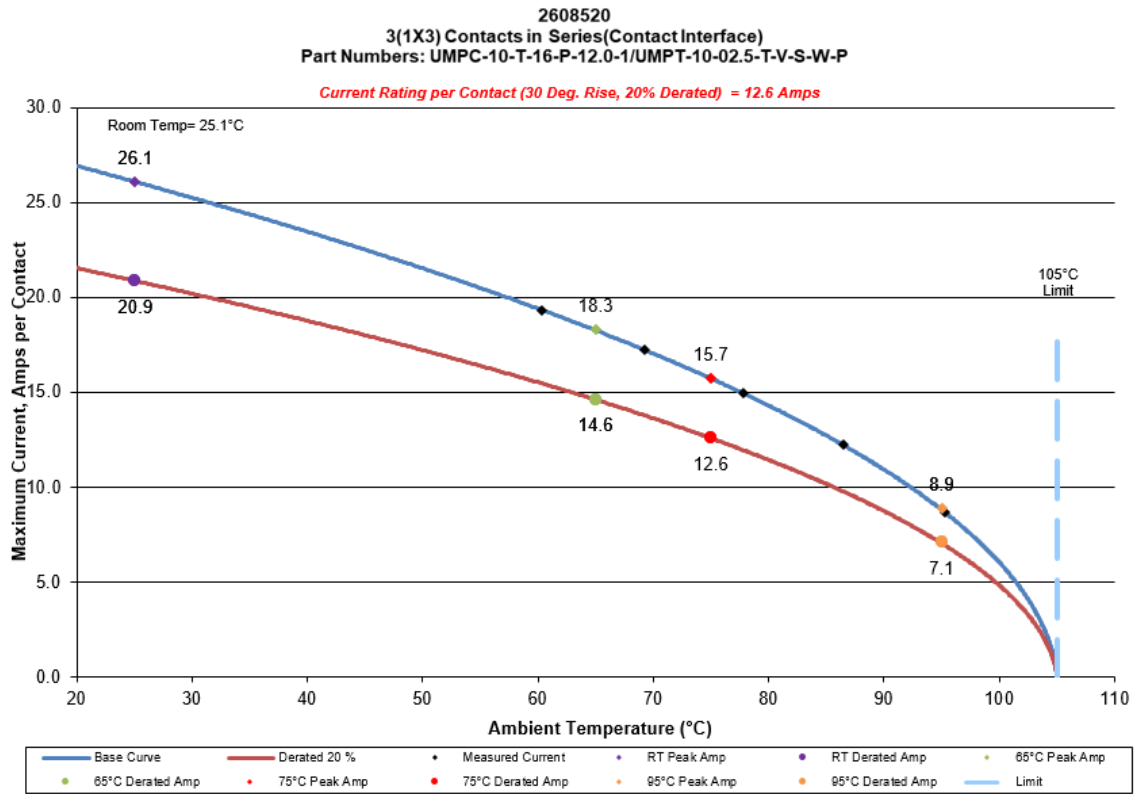


2608520
 2(1X2) Contacts in Series(Contact Interface)
 Part Numbers: UMPC-10-T-16-P-12.0-1/UMPT-10-02.5-T-V-S-W-P



DATA SUMMARIES Continued

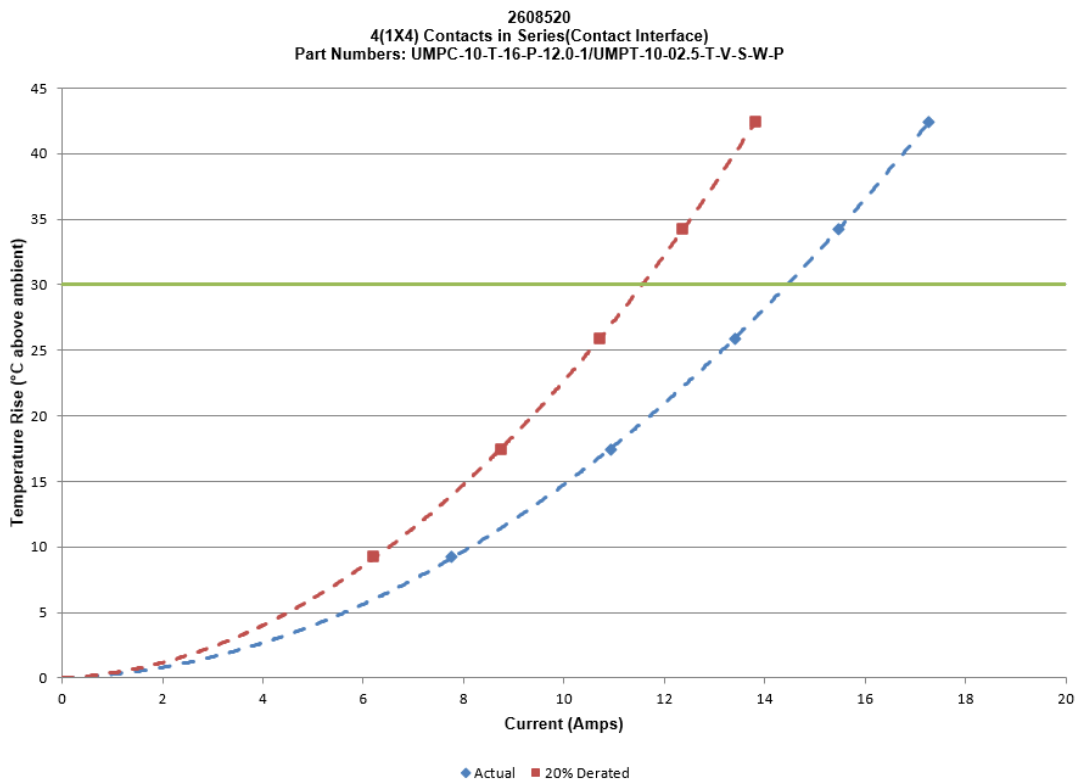
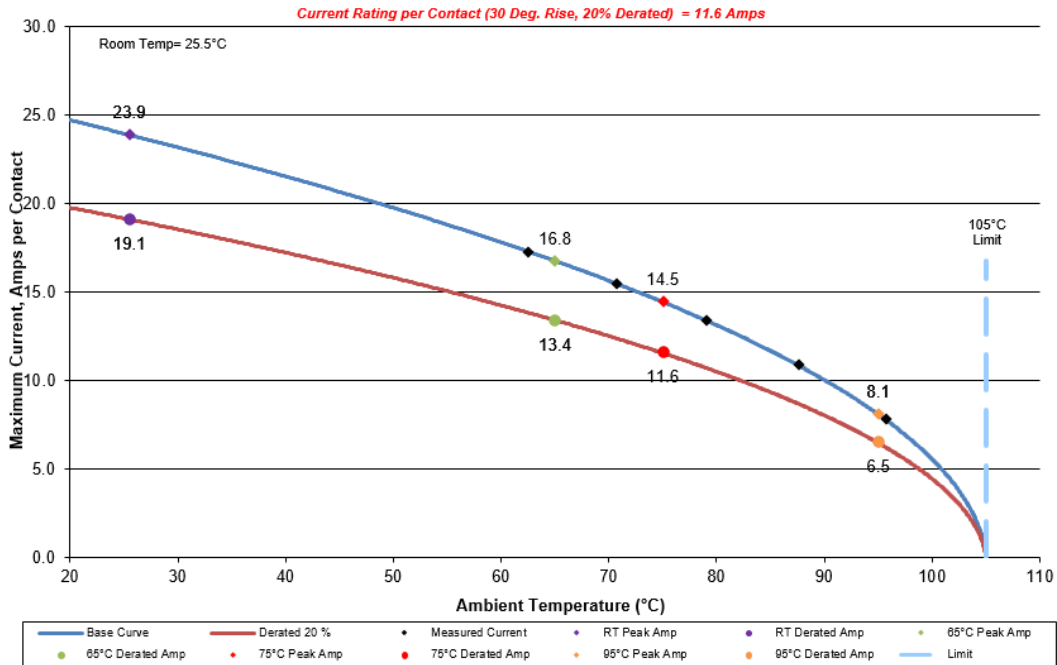
c. Linear configuration with 3 adjacent conductors/contacts powered



DATA SUMMARIES Continued

d. Linear configuration with 4 adjacent conductors/contacts powered

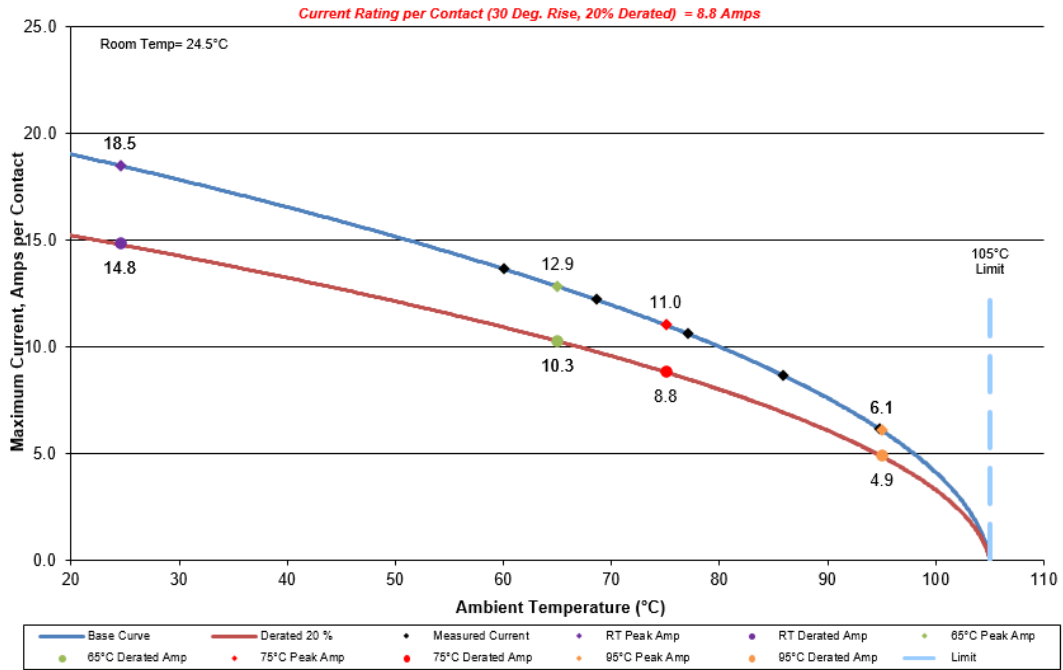
2608520
 4(1X4) Contacts in Series(Contact Interface)
 Part Numbers: UMPC-10-T-16-P-12.0-1/UMPT-10-02.5-T-V-S-W-P



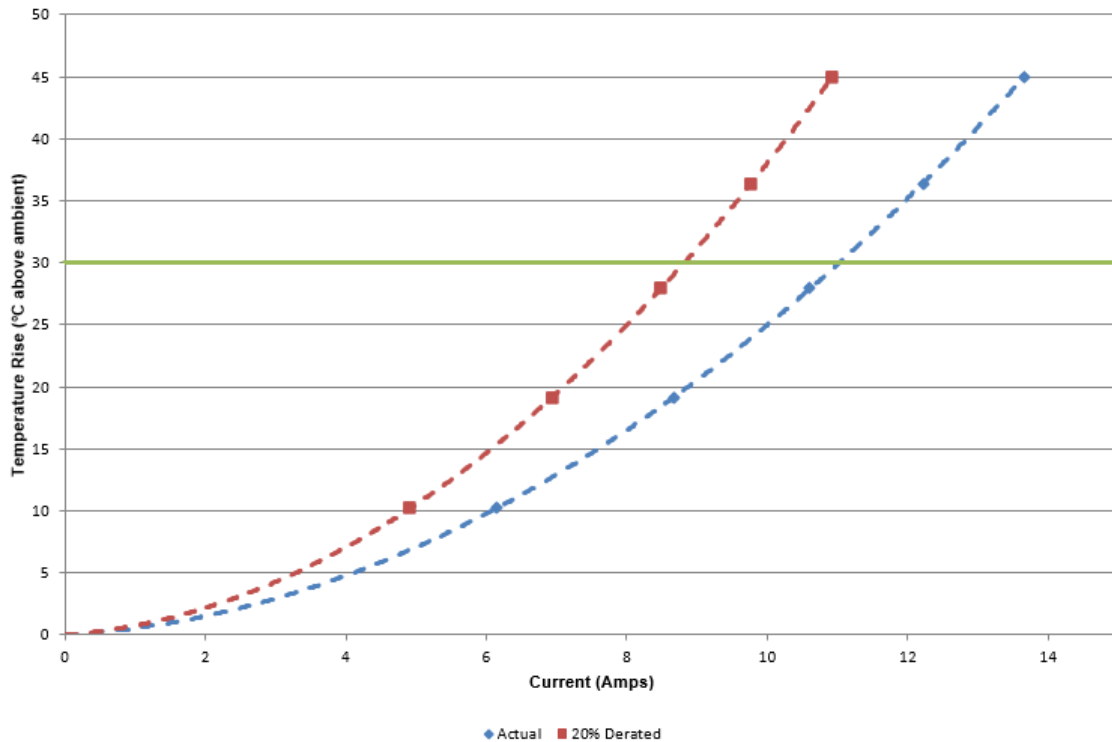
DATA SUMMARIES Continued

e. Linear configuration with all adjacent conductors/contacts powered

2608520
 10(1X10) Contacts in Series(Contact Interface)
 Part Numbers: UMPC-10-T-16-P-12.0-1/UMPT-10-02.5-T-V-S-W-P



2608520
 10(1X10) Contacts in Series(Contact Interface)
 Part Numbers: UMPC-10-T-16-P-12.0-1/UMPT-10-02.5-T-V-S-W-P

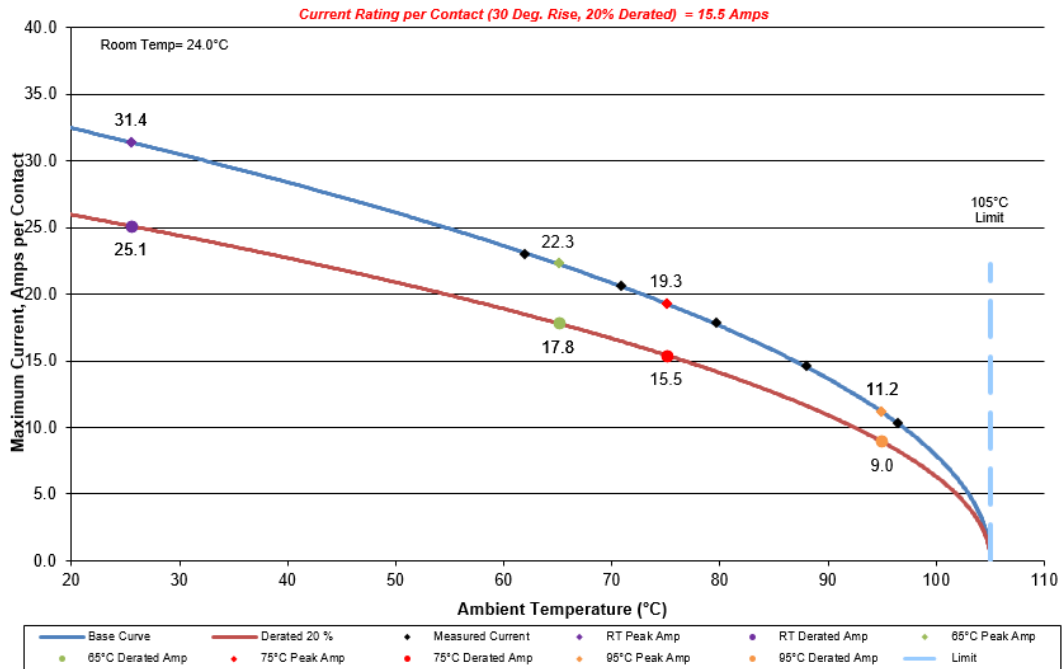


DATA SUMMARIES Continued

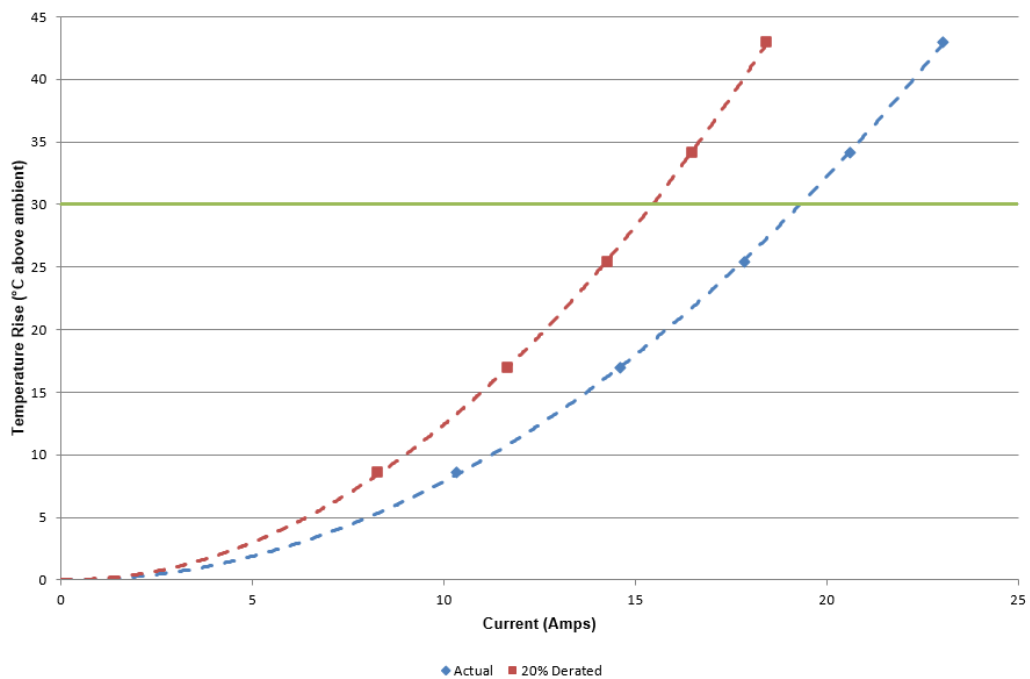
18 AWG

a) Linear configuration with 1 adjacent conductors/contacts powered

2608520
 1(1X1) Contacts in Series(Contact Interface)
 Part Numbers: UMPC-10-T-18-P-12.0-1UMPT-10-02.5-T-V-S-W-P



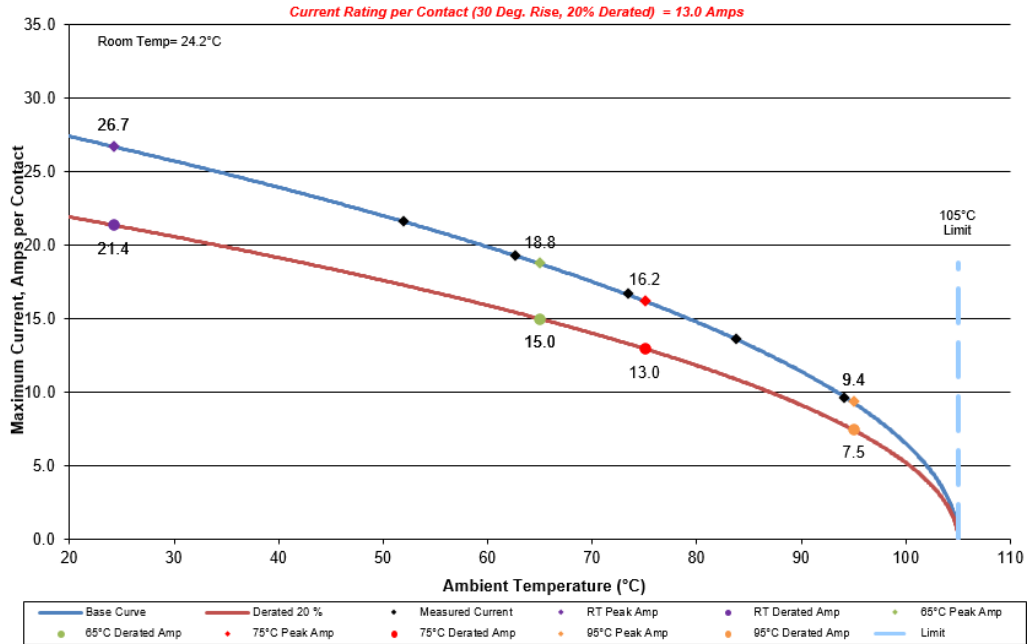
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 1(1X1) Contacts in Series(Contact Interface)
 Part Numbers: UMPC-10-T-18-P-12.0-1UMPT-10-02.5-T-V-S-W-P



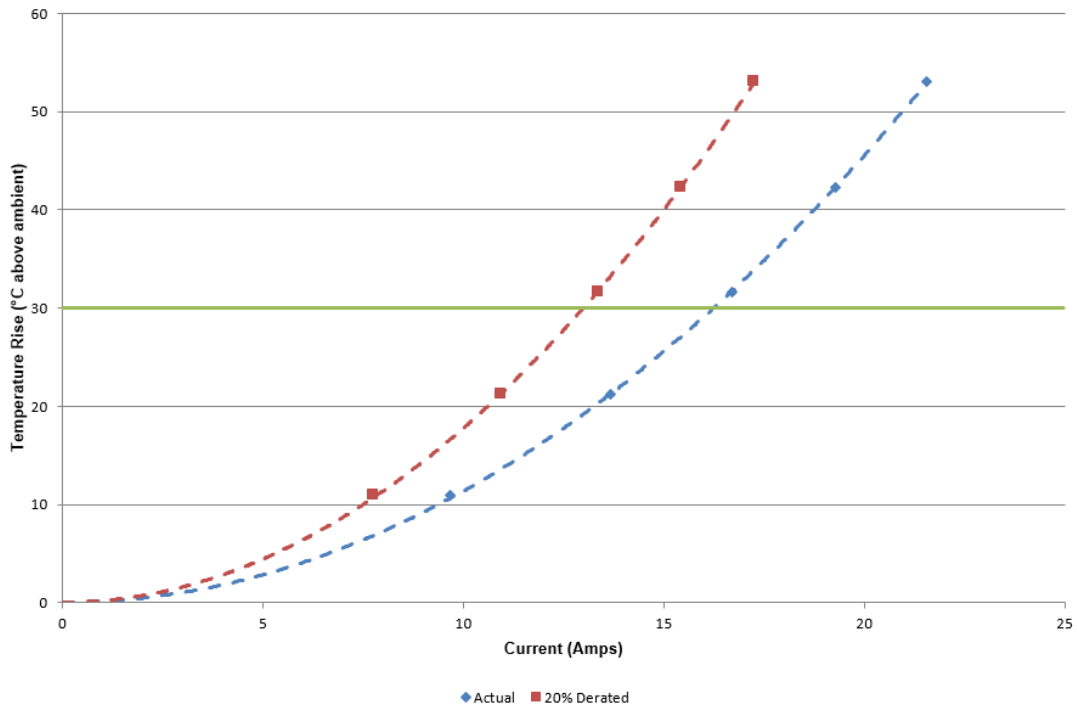
DATA SUMMARIES Continued

b) Linear configuration with 2 adjacent conductors/contacts powered

2608520
 2(1X2) Contacts in Series(Contact Interface)
 Part Numbers: UMPC-10-T-18-P-12.0-1/UMPT-10-02.5-T-V-S-W-P



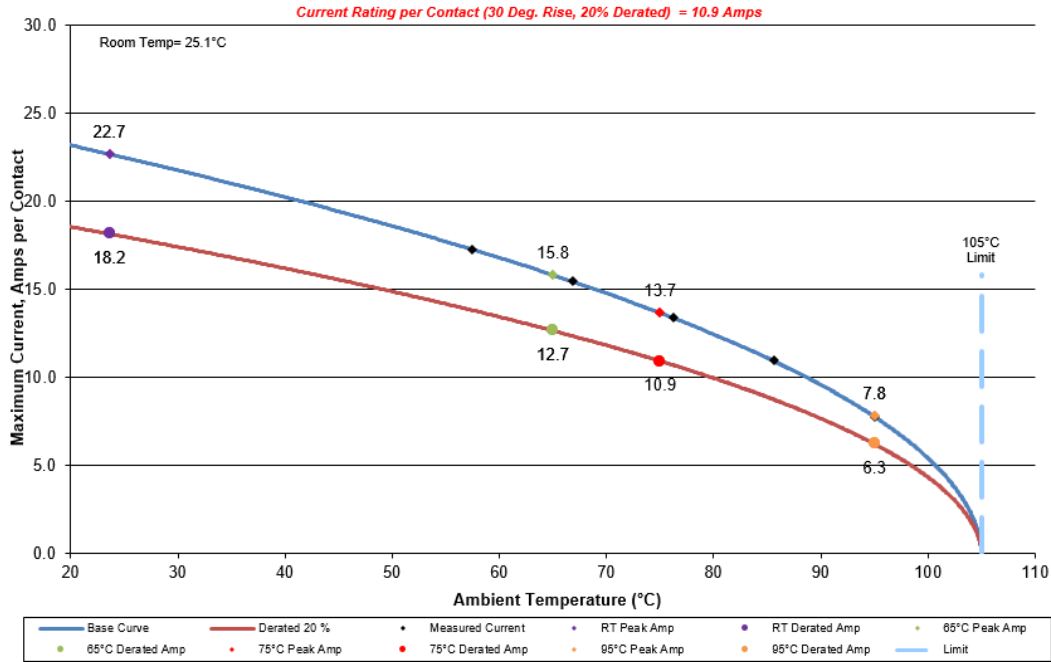
2608520
 2(1X2) Contacts in Series(Contact Interface)
 Part Numbers: UMPC-10-T-18-P-12.0-1/UMPT-10-02.5-T-V-S-W-P



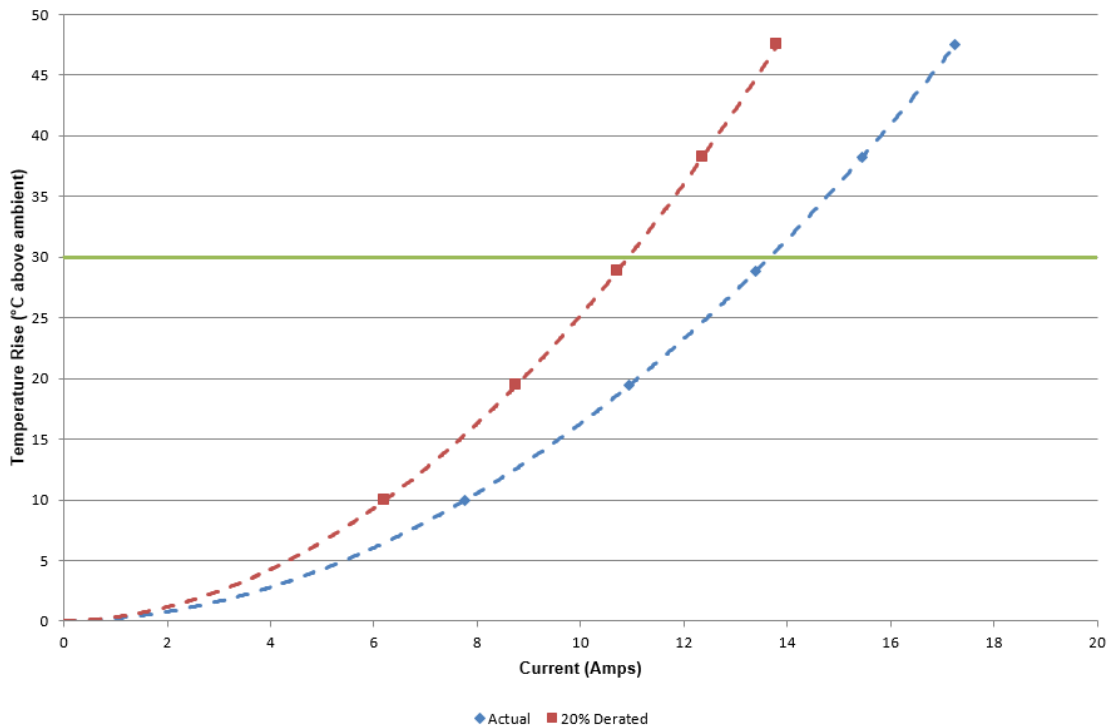
DATA SUMMARIES Continued

c) Linear configuration with 3 adjacent conductors/contacts powered

2608520
 3(1X3) Contacts in Series(Contact Interface)
 Part Numbers: UMPC-10-T-18-P-12.0-1\UMPT-10-02.5-T-V-S-W-P



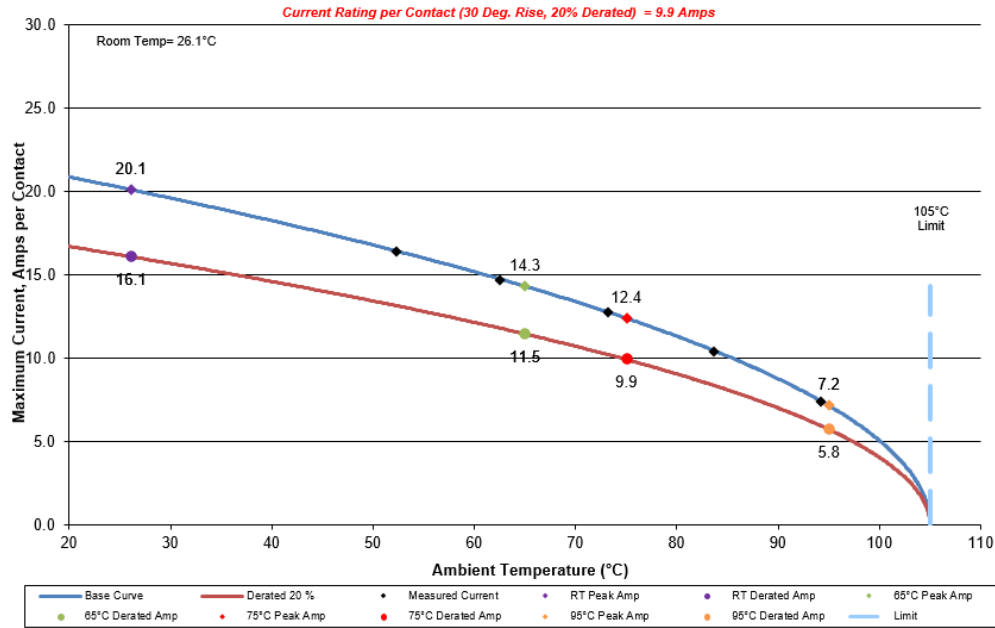
2608520
 3(1X3) Contacts in Series(Contact Interface)
 Part Numbers: UMPC-10-T-18-P-12.0-1\UMPT-10-02.5-T-V-S-W-P



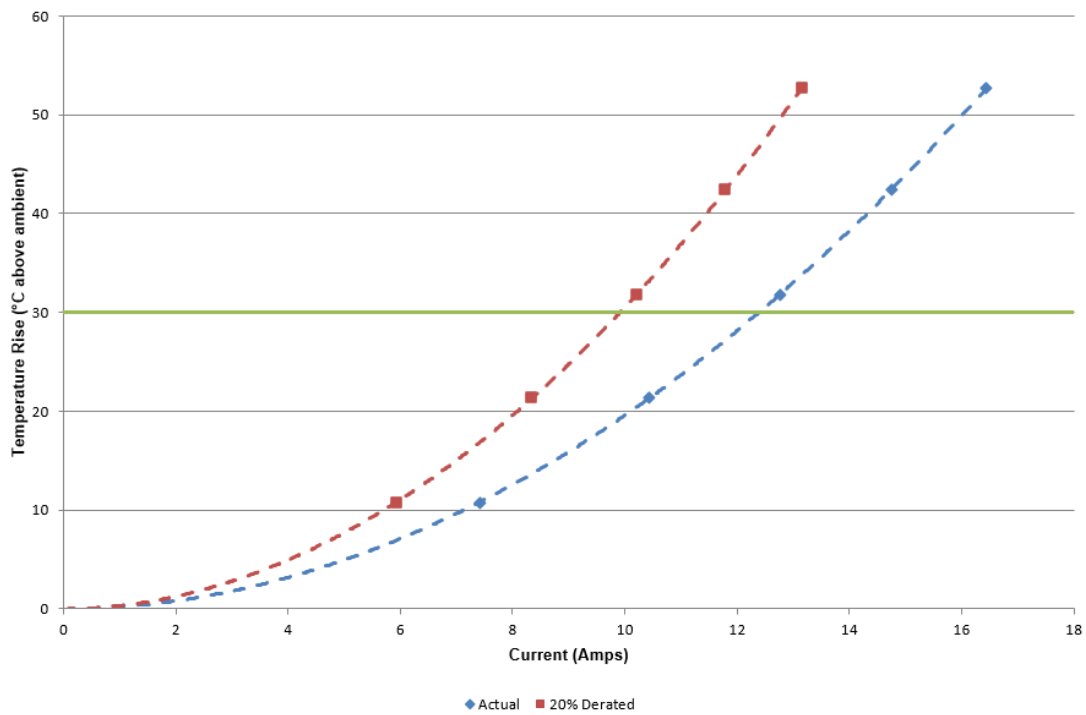
DATA SUMMARIES Continued

d) Linear configuration with 4 adjacent conductors/contacts powered

2608520
 4(1X4) Contacts in Series(Contact Interface)
 Part Numbers: UMPC-10-T-18-P-12.0-1UMPT-10-02.5-T-V-S-W-P



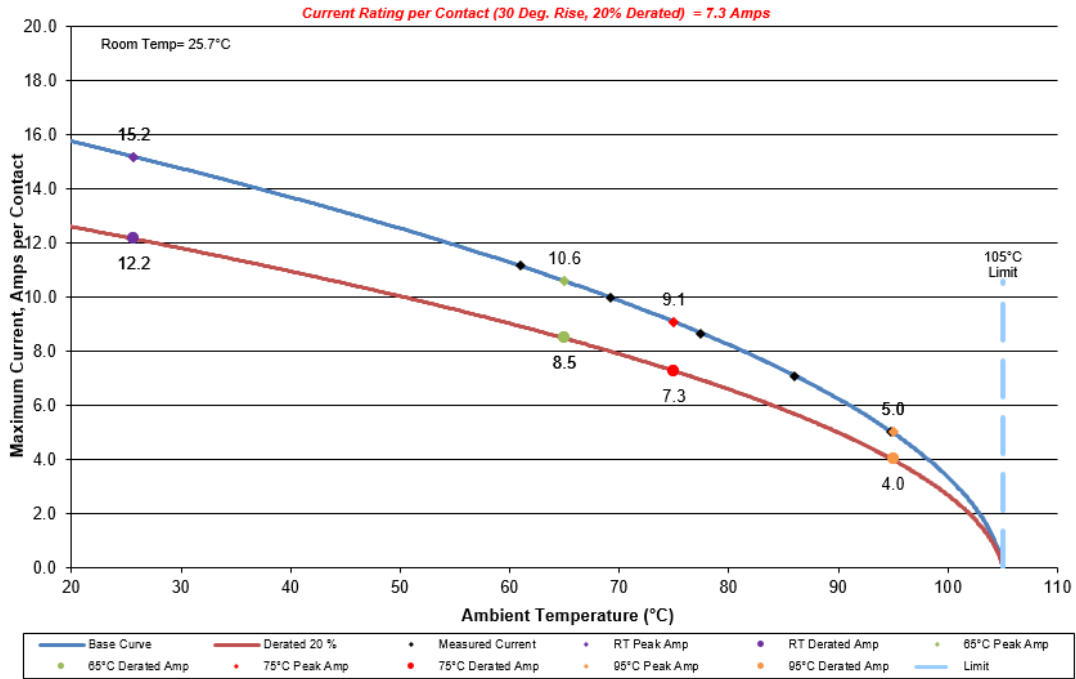
2608520
 4(1X4) Contacts in Series(Contact Interface)
 Part Numbers: UMPC-10-T-18-P-12.0-1UMPT-10-02.5-T-V-S-W-P



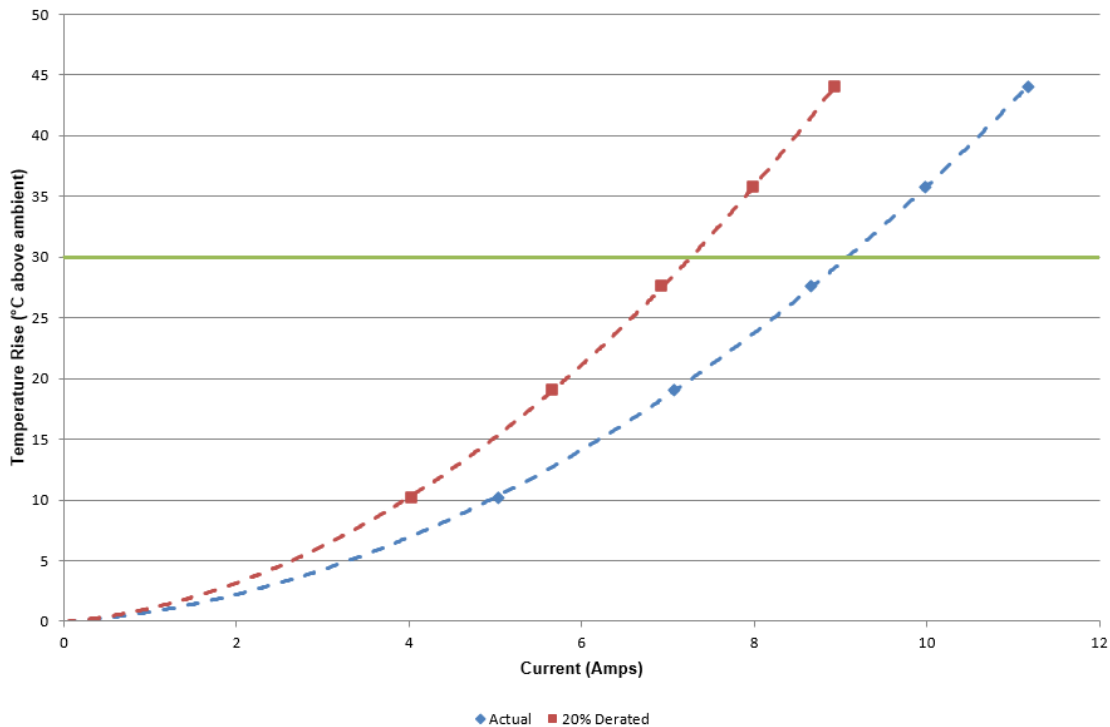
DATA SUMMARIES Continued

e) Linear configuration with all adjacent conductors/contacts powered

2608520
 10(1X10) Contacts in Series(Contact Interface)
 Part Numbers: UMPC-10-T-18-P-12.0-1\UMPT-10-02.5-T-V-S-W-P



2608520
 10(1X10) Contacts in Series(Contact Interface)
 Part Numbers: UMPC-10-T-18-P-12.0-1\UMPT-10-02.5-T-V-S-W-P



DATA SUMMARIES Continued**MATING-UNMATING FORCE:****Thermal Aging Group**

	Initial				After Thermals			
	Mating		Unmating		Mating		Unmating	
	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)	Newtons	Force (Lbs)
Minimum	26.82	6.03	15.97	3.59	11.70	2.63	6.94	1.56
Maximum	31.63	7.11	21.71	4.88	14.59	3.28	11.21	2.52
Average	29.60	6.65	18.98	4.27	13.32	3.00	9.33	2.10
St Dev	1.48	0.33	2.17	0.49	0.87	0.20	1.38	0.31
Count	8	8	8	8	8	8	8	8

Mating-Unmating Durability Group

	Initial				After 25 Cycles			
	Mating		Unmating		Mating		Unmating	
	New tons	Force (Lbs)	New tons	Force (Lbs)	New tons	Force (Lbs)	New tons	Force (Lbs)
Minimum	25.53	5.74	20.99	4.72	18.33	4.12	12.45	2.80
Maximum	28.69	6.45	24.42	5.49	19.53	4.39	15.66	3.52
Average	27.89	6.27	23.35	5.25	18.82	4.23	14.52	3.26
St Dev	1.05	0.24	1.21	0.27	0.37	0.08	1.08	0.24
Count	8	8	8	8	8	8	8	8
	After 50 Cycles				After 75 Cycles			
	Mating		Unmating		Mating		Unmating	
	New tons	Force (Lbs)	New tons	Force (Lbs)	New tons	Force (Lbs)	New tons	Force (Lbs)
Minimum	17.44	3.92	13.48	3.03	17.93	4.03	12.77	2.87
Maximum	20.77	4.67	15.39	3.46	20.91	4.70	15.79	3.55
Average	18.72	4.21	14.12	3.17	19.31	4.34	14.07	3.16
St Dev	1.07	0.24	0.80	0.18	1.24	0.28	1.32	0.30
Count	8	8	8	8	8	8	8	8
	After 100 Cycles				After Humidity			
	Mating		Unmating		Mating		Unmating	
	New tons	Force (Lbs)	New tons	Force (Lbs)	New tons	Force (Lbs)	New tons	Force (Lbs)
Minimum	18.64	4.19	12.32	2.77	8.14	1.83	4.09	0.92
Maximum	22.42	5.04	15.39	3.46	10.14	2.28	8.94	2.01
Average	20.39	4.59	13.55	3.05	9.41	2.12	6.89	1.55
St Dev	1.44	0.32	1.12	0.25	0.62	0.14	1.77	0.40
Count	8	8	8	8	8	8	8	8

DATA SUMMARIES Continued**Mating-Unmating basic (UMPC-10-T-16-P-06.0 / UMPT-02-02.5-T-VT-SM-WT-P-K)**

	Initial				After 25 Cycles			
	Mating		Unmating		Mating		Unmating	
	New tons	Force (Lbs)	New tons	Force (Lbs)	New tons	Force (Lbs)	New tons	Force (Lbs)
Minimum	75.88	17.06	64.72	14.55	52.53	11.81	39.81	8.95
Maximum	82.78	18.61	69.97	15.73	57.96	13.03	51.42	11.56
Average	79.51	17.88	66.83	15.03	54.83	12.33	44.46	10.00
St Dev	2.57	0.58	1.88	0.42	1.66	0.37	3.90	0.88
Count	8	8	8	8	8	8	8	8
	After 50 Cycles				After 75 Cycles			
	Mating		Unmating		Mating		Unmating	
	New tons	Force (Lbs)	New tons	Force (Lbs)	New tons	Force (Lbs)	New tons	Force (Lbs)
Minimum	53.15	11.95	37.81	8.50	60.72	13.65	37.10	8.34
Maximum	61.87	13.91	49.95	11.23	70.63	15.88	48.75	10.96
Average	57.77	12.99	42.62	9.58	65.19	14.66	41.41	9.31
St Dev	2.71	0.61	4.16	0.94	3.64	0.82	3.77	0.85
Count	8	8	8	8	8	8	8	8
	After 100 Cycles							
	Mating		Unmating					
	New tons	Force (Lbs)	New tons	Force (Lbs)				
Minimum	66.36	14.92	36.87	8.29				
Maximum	80.82	18.17	46.35	10.42				
Average	70.46	15.84	40.50	9.11				
St Dev	4.87	1.09	3.18	0.71				
Count	8	8	8	8				

DATA SUMMARIES Continued**Mating-Unmating basic (UMPC-02-T-16-P-06.0 / UMPT-10-02.5-T-VT-SM-WT-P-K)**

	Initial				After 25 Cycles			
	Mating		Unmating		Mating		Unmating	
	New tons	Force (Lbs)	New tons	Force (Lbs)	New tons	Force (Lbs)	New tons	Force (Lbs)
Minimum	15.92	3.58	13.34	3.00	11.21	2.52	9.07	2.04
Maximum	18.82	4.23	16.68	3.75	12.41	2.79	10.63	2.39
Average	17.51	3.94	15.02	3.38	11.68	2.63	10.00	2.25
St Dev	0.94	0.21	1.01	0.23	0.37	0.08	0.53	0.12
Count	8	8	8	8	8	8	8	8
	After 50 Cycles				After 75 Cycles			
	Mating		Unmating		Mating		Unmating	
	New tons	Force (Lbs)	New tons	Force (Lbs)	New tons	Force (Lbs)	New tons	Force (Lbs)
Minimum	11.88	2.67	9.34	2.10	13.61	3.06	8.98	2.02
Maximum	14.19	3.19	10.76	2.42	16.19	3.64	10.32	2.32
Average	13.02	2.93	9.94	2.24	14.90	3.35	9.72	2.19
St Dev	0.70	0.16	0.44	0.10	0.92	0.21	0.46	0.10
Count	8	8	8	8	8	8	8	8
	After 100 Cycles							
	Mating		Unmating					
	New tons	Force (Lbs)	New tons	Force (Lbs)				
Minimum	14.54	3.27	8.90	2.00				
Maximum	16.01	3.60	10.10	2.27				
Average	15.35	3.45	9.49	2.13				
St Dev	0.49	0.11	0.40	0.09				
Count	8	8	8	8				

DATA SUMMARIES Continued**Cable Pull**

0 Degrees Plastic Latch

	Force (lbs)
Minimum	16.22
Maximum	17.78
Average	17.23

90 Degrees Plastic Latch

	Force (lbs)
Minimum	5.37
Maximum	5.80
Average	5.61

0 Degrees Metal Latch

	Force (lbs)
Minimum	23.83
Maximum	28.52
Average	25.95

90 Degrees Metal Latch

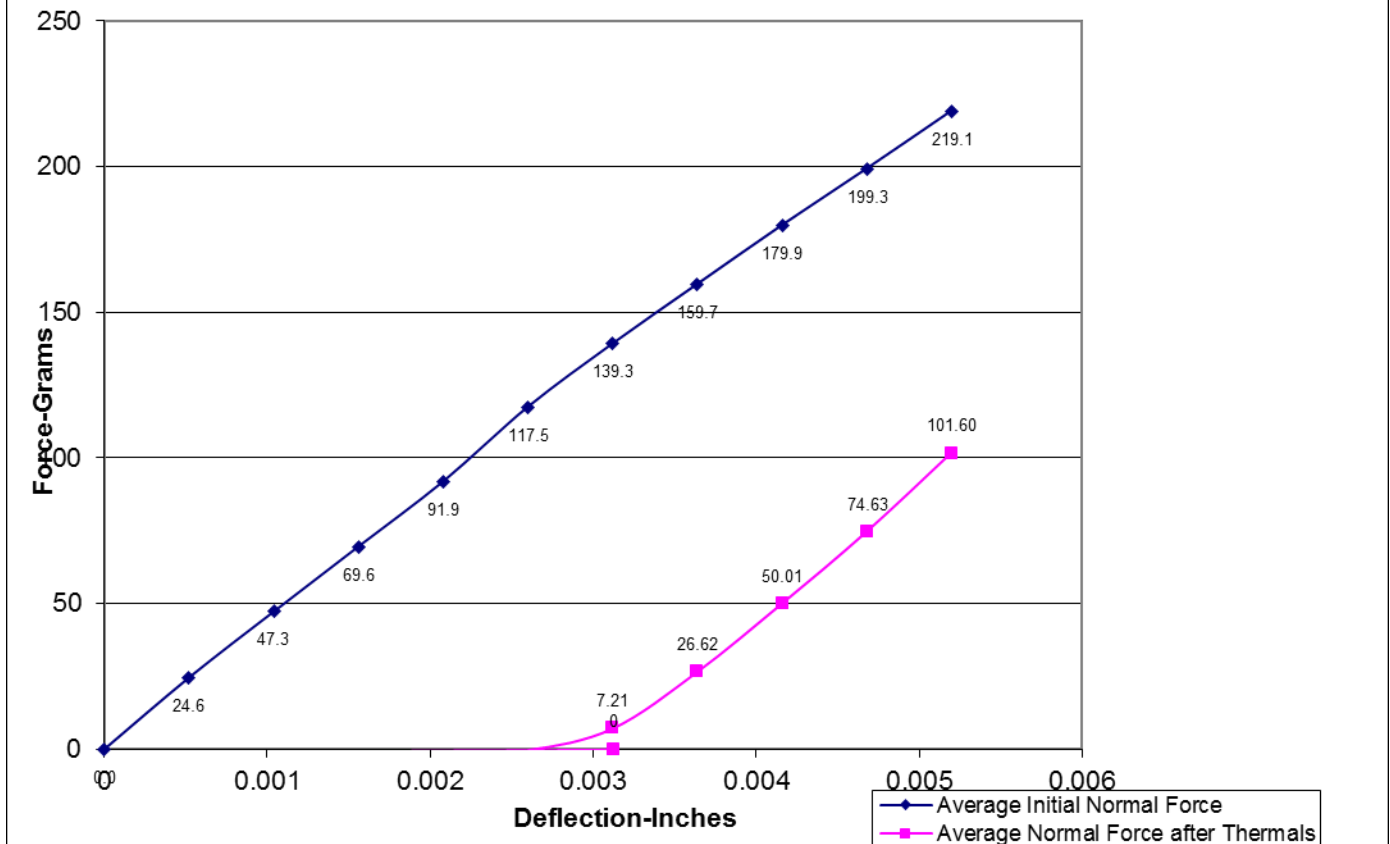
	Force (lbs)
Minimum	7.90
Maximum	8.75
Average	8.50

DATA SUMMARIES Continued**NORMAL FORCE (FOR CONTACTS TESTED OUT 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										
	<u>0.0005</u>	<u>0.0010</u>	<u>0.0016</u>	<u>0.0021</u>	<u>0.0026</u>	<u>0.0031</u>	<u>0.0036</u>	<u>0.0042</u>	<u>0.0047</u>	<u>0.0052</u>	<i>SET</i>
Averages	24.63	47.27	69.59	91.93	117.52	139.27	159.72	179.93	199.33	219.12	0.0007
Min	20.40	39.20	58.70	77.90	100.30	119.50	138.80	158.50	177.30	197.50	0.0005
Max	30.20	56.50	82.70	108.80	137.60	160.80	182.10	203.60	223.60	243.90	0.0009
St. Dev	3.412	6.060	8.134	10.454	12.431	14.101	14.848	15.741	16.080	15.010	0.0001
Count	12	12	12	12	12	12	12	12	12	12	12

After Thermals	Deflections in inches Forces in Grams										
	<u>0.0005</u>	<u>0.0010</u>	<u>0.0016</u>	<u>0.0021</u>	<u>0.0026</u>	<u>0.0031</u>	<u>0.0036</u>	<u>0.0042</u>	<u>0.0047</u>	<u>0.0052</u>	<i>SET</i>
Averages	-0.99	-1.01	-1.02	-1.01	-0.11	7.21	26.62	50.01	74.63	101.60	0.0032
Min	-1.30	-1.30	-1.40	-1.40	-1.20	-0.90	4.50	23.30	47.90	75.10	0.0026
Max	-0.90	-0.90	-0.80	-0.90	9.40	34.30	59.80	84.20	109.00	137.40	0.0037
St. Dev	0.138	0.138	0.175	0.156	2.996	9.643	14.605	16.125	16.804	17.873	0.0003
Count	12	12	12	12	12	12	12	12	12	12	12

Normal Force - Average Initial vs Average Thermal

DATA SUMMARIES Continued**Cable Flex
Plastic Latch**

Pin to Pin	
Mated	
Minimum	
Initial	45000
After 500 Flex Cycles	45000

Voltage Rating Summary	
Minimum	
Break Down Voltage	1739
Test Voltage	1305
Working Voltage	435

Pin to Pin	
Initial Test Voltage	Pass
After 500 Flex Cycles Test Voltage	Pass

Metal Latch

Pin to Pin	
Mated	
Minimum	
Initial	45000
After 500 Flex Cycles	45000
After 90° 500 Flex Cycles	45000

Voltage Rating Summary	
Minimum	
Break Down Voltage	1739
Test Voltage	1305
Working Voltage	435

Pin to Pin	
Initial Test Voltage	Pass
After 500 Flex Cycles Test Voltage	Pass
After 90°500 Flex Cycles Test Voltage	Pass

DATA SUMMARIES Continued**INSULATION RESISTANCE (IR):**

	Pin to Pin		
	Mated	Unmated	Unmated
Minimum	UMPC/UMPT	UMPC	UMPT
Initial	45000	45000	45000
Thermal	45000	45000	45000
Humidity	7700	8700	45000

DIELECTRIC WITHSTANDING VOLTAGE (DWV):

Voltage Rating Summary	
Minimum	UMPC/UMPT
Break Down Voltage	1739
Test Voltage	1304
Working Voltage	435

Pin to Pin	
Initial Test Voltage	Passed
After Thermal Test Voltage	Passed
After Humidity Test Voltage	Passed

DATA SUMMARIES Continued**LLCR Gas Tight Group**

- 1) A total of 32 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. $\leq +1.00$ mOhms: -----Stable
 - b. $+1.00$ to $+2.00$ mOhms: -----Minor
 - c. $+2.00$ to $+5.00$ mOhms: -----Acceptable
 - d. $+5.00$ to $+15.00$ mOhms:-----Marginal
 - e. $+15.00$ to $+1000$ mOhms:-----Unstable
 - f. $>+1000$ mOhms:-----Open Failure

LLCR Measurement Summaries by Pin Type					
	Date	9/2/2020	9/8/2020		
Room Temp (Deg C)		23	23		
Rel Humidity (%)		54	47		
Technician		John Crawford	John Crawford		
mOhm values		Actual	Delta	Delta	Delta
		Initial	Acid Vapor		
Pin Type 1: Signal					
	Average	3.23	0.08		
	St. Dev.	0.11	0.06		
	Min	3.08	0.00		
	Max	3.55	0.27		
	Summary Count	32	32		
	Total Count	32	32		

LLCR Delta Count by Category						
	Stable	Minor	Acceptable	Marginal	Unstable	Open
mOhms	≤ 1.00	>1.00 & ≤ 2.00	>2.00 & ≤ 5	>5 & ≤ 15	>15 & ≤ 1000	>1000
Acid Vapor	32	0	0	0	0	0

DATA SUMMARIES Continued**LLCR Thermal Aging Group**

- 1) A total of 32 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. $\leq +1.00$ mOhms: -----Stable
 - b. $+1.00$ to $+2.00$ mOhms: -----Minor
 - c. $+2.00$ to $+5.00$ mOhms: -----Acceptable
 - d. $+5.00$ to $+15.00$ mOhms: -----Marginal
 - e. $+15.00$ to $+1000$ mOhms: -----Unstable
 - f. $>+1000$ mOhms: -----Open Failure

LLCR Measurement Summaries by Pin Type				
Date	1/4/2021	1/18/2021		
Room Temp (Deg C)	23	22		
Rel Humidity (%)	37	37		
Technician	John Crawford	John Crawford		
mOhm values	Actual	Delta		
	Initial	Thermal		
Pin Type: Signal 1				
Average	3.24	0.21		
St. Dev.	0.08	0.13		
Min	3.12	0.04		
Max	3.43	0.6		
Summary Count	32	32		
Total Count	32	32		

LLCR Delta Count by Category						
	Stable	Minor	Acceptable	Marginal	Unstable	Open
mOhms	≤ 1.00	$>1.00 \ \& \ \leq 2.00$	$>2.00 \ \& \ \leq 5$	$>5 \ \& \ \leq 15$	$>15 \ \& \ \leq 1000$	>1000
Thermal	28	4	0	0	0	0

DATA SUMMARIES Continued**LLCR Mating/Unmating Durability Group**

- 1). A total of 32 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. $\leq +1.00$ mOhms: -----Stable
 - b. $+1.00$ to $+2.00$ mOhms: -----Minor
 - c. $+2.00$ to $+5.00$ mOhms: -----Acceptable
 - d. $+5.00$ to $+15.00$ mOhms: -----Marginal
 - e. $+15.00$ to $+1000$ mOhms: -----Unstable
 - f. $>+1000$ mOhms: -----Open Failure

LLCR Measurement Summaries by Pin Type					
	Date	9/22/2020	10/16/2020	10/21/2020	11/12/2020
Room Temp (Deg C)		23	22	22	23
Rel Humidity (%)		44	35	45	35
Technician		John Crawford	John Crawford	John Crawford	John Crawford
mOhm values		Actual	Delta	Delta	Delta
		Initial	100 Cycles	Therm Shck	Humidity
Pin Type 1: Signal					
	Average	3.19	0.29	0.62	1.17
	St. Dev.	0.08	0.12	0.28	0.65
	Min	3.07	0.09	0.13	0.29
	Max	3.39	0.56	1.09	2.80
	Summary Count	32	32	32	32
	Total Count	32	32	32	32

LLCR Delta Count by Category						
	Stable	Minor	Acceptable	Marginal	Unstable	Open
mOhms	≤ 1.00	>1.00 & ≤ 2.00	>2.00 & ≤ 5	>5 & ≤ 15	>15 & ≤ 1000	>1000
100 Cycles	32	0	0	0	0	0
Therm Shck	28	4	0	0	0	0
Humidity	17	10	5	0	0	0

DATA SUMMARIES Continued**LLCR Shock & Vibration Group**

- 1) A total of 40 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. $\leq +1.00$ mOhms: -----Stable
 - b. $+1.00$ to $+2.00$ mOhms: -----Minor
 - c. $+2.00$ to $+5.00$ mOhms: -----Acceptable
 - d. $+5.00$ to $+15.00$ mOhms: -----Marginal
 - e. $+15.00$ to $+1000$ mOhms: -----Unstable
 - f. $>+1000$ mOhms: -----Open Failure

Plastic Latch

LLCR Measurement Summaries by Pin Type					
	Date	9/2/2020	9/16/2020		
Room Temp (Deg C)		23	22		
Rel Humidity (%)		53	46		
Technician		John Crawford	John Crawford		
mOhm values	Actual	Delta	Delta	Delta	Delta
	Initial	Shock-Vib			
Pin Type 1: Signal					
Average		3.24	0.04		
St. Dev.		0.08	0.04		
Min		3.10	0.01		
Max		3.40	0.15		
Summary Count		32	32		
Total Count		32	32		

LLCR Delta Count by Category						
	Stable	Minor	Acceptable	Marginal	Unstable	Open
mOhms	≤ 1.00	>1.00 & ≤ 2.00	>2.00 & ≤ 5	>5 & ≤ 15	>15 & ≤ 1000	>1000
Shock-Vib	32	0	0	0	0	0

Nanosecond Event Detection:

Shock and Vibration Event Detection Summary	
Contacts tested	32
Test Condition	C, 100g's, 6ms, Half-Sine
Shock Events	0
Test Condition	V-B, 7.56 rms g
Vibration Events	0
Total Events	0

DATA SUMMARIES Continued**Metal Latch**

LLCR Measurement Summaries by Pin Type					
	Date	9/30/2020	1/22/2021		
Room Temp (Deg C)		22	23		
Rel Humidity (%)		44	33		
Technician		John Crawford	Aaron McKim		
mOhm values		Actual	Delta	Delta	Delta
		Initial	Shock-Vib		
Pin Type 1: Signal					
	Average	3.15	0.12		
	St. Dev.	0.07	0.16		
	Min	3.03	0.00		
	Max	3.28	0.66		
	Summary Count	32	32		
	Total Count	32	32		

LLCR Delta Count by Category						
	Stable	Minor	Acceptable	Marginal	Unstable	Open
mOhms	<=1.00	>1.00 & <=2.00	>2.00 & <=5	>5 & <=15	>15 & <=1000	>1000
Shock-Vib	32	0	0	0	0	0

Nanosecond Event Detection:

Shock and Vibration Event Detection Summary	
Contacts tested	32
Test Condition	C, 100g's, 6ms, Half-Sine
Shock Events	0
Test Condition	V-B, 7.56 rms g
Vibration Events	0
Total Events	0

EQUIPMENT AND CALIBRATION SCHEDULES

Equipment #: HZ-HPM-01
Description: Hipot Megommeter
Manufacturer: Hipotronics
Model: H306B-A
Serial #: M9905004
Accuracy: 2 % Full Scale Accuracy
... Last Cal: 2020-4-27, Next Cal: 2021-4-26

Equipment #: HZ-MO-03
Description: Micro-ohmmeter
Manufacturer: Keithley
Model: 580
Serial #: 297288
Accuracy: Last Cal: 2020-8-06, Next Cal: 2021-8-05

Equipment #: HZ-TCT-01
Description: Normal force analyzer
Manufacturer: Mecmesin Multitester
Model: Mecmesin Multitester 2.5-i
Serial #: 08-1049-04
Accuracy: Last Cal: 2020-4-28, Next Cal: 2021-4-27

Equipment #: HZ-OV-01
Description: Oven
Manufacturer: Huida
Model: CS101-1E
Serial #: CS101-1E-B
Accuracy: Last Cal: 2020-12-14, Next Cal: 2021-12-13

Equipment #: HZ-THC-01
Description: Humidity transmitter
Manufacturer: Thermtron
Model: HMM30C
Serial #: D0240037
Accuracy: Last Cal: 2020-3-3, Next Cal: 2021-3-2

Equipment #: HZ-MO-01
Description: Micro-ohmmeter
Manufacturer: Keithley
Model: 2700
Serial #: 1199807
Accuracy: Last Cal: 2020-4-28, Next Cal: 2021-4-27

EQUIPMENT AND CALIBRATION SCHEDULES**Equipment #:** HZ-PS-01**Description:** Power Supply**Manufacturer:** Agilent**Model:** 6031A**Serial #:** MY41000982**Accuracy:** Last Cal: 2020-4-28, Next Cal: 2021-4-27**Equipment #:** HZ-TSC-01**Description:** Thermal Shock transmitter**Manufacturer:** Keithley**Model:** 10-VT14994**Serial #:** VTS-3-6-6-SC/AC**Accuracy:** Last Cal: 2020-11-1, Next Cal: 2021-11-1**Equipment #:** SVC-01**Description:** Shock & Vibration Table**Manufacturer:** Data Physics**Model:** LE-DSA-10-20K**Serial #:** 10037**Accuracy:** Last Cal: 2020-11-31, Next Cal: 2021-11-31**Equipment #:** ACLM-01**Description:** Accelerometer**Manufacturer:** PCB Piezotronics**Model:** 352C03**Serial #:** 115819**Accuracy:** Last Cal: 2020-07-09, Next Cal: 2021-07-09**Equipment #:** ED-03**Description:** Event Detector**Manufacturer:** Analysis Tech**Model:** 32EHD**Serial #:** 1100604**Accuracy:** Last Cal: 2020-06-04, Next Cal: 2021-06-04