



# PRELIMINARY PRODUCT SPECIFICATION

## 1.0 SCOPE

This Product Specification covers the performance requirements for Molex's 0.8 mm pitch Flat Pad I/O connector series with gold plating.

## 2.0 PRODUCT DESCRIPTION

### 2.1 PRODUCT NAME AND SERIES NUMBER (S)

SMT Receptacle Connector, 44828-\*\*\*\*  
Accessory Plug Modules, 45339-\*\*\*\*, 45593-\*\*\*\*  
SMT Cradle Connector, 45560-\*\*\*\*

### 2.2 DIMENSIONS, MATERIALS, PLATINGS AND MARKINGS

Please see the applicable Sales Drawings for information on dimensions, materials, platings and markings.

### 2.3 SAFETY AGENCY APPROVALS

UL/CSA file numbers to be determined.

## 3.0 APPLICABLE DOCUMENTS AND SPECIFICATIONS

See applicable Sales Drawings and other sections of this specification for specific references to applicable documents and specifications.

## 4.0 RATINGS

### 4.1 VOLTAGE

30 Volts AC/DC maximum

### 4.2 CURRENT

1.5 Amps continuous; 1.8 Amps for 1 minute; 5 Amps peak for 3 milliseconds;  
2.1 Amps pulsed, 33% duty cycle @ 50 Hz on alternating circuits.

### 4.3 TEMPERATURE / HUMIDITY

Operating: - 40°C to + 85°C  
Storage: - 40°C to + 85°C, 50% RH

**PRELIMINARY RELEASE:** THIS SPECIFICATION IS BASED ON DESIGN OBJECTIVES AND THE VALUES GIVEN ARE STRICTLY TENTATIVE. THIS SPECIFICATION IS SUBJECT TO CHANGES BASED ON THE RESULTS OF ADDITIONAL TESTING AND EVALUATIONS.

REVISION: <b>B1</b>	EGR/ECN INFORMATION: EC No: UCR2004-1831 DATE: 2004/03/19	TITLE: <b>PRELIMINARY PRODUCT SPECIFICATION 0.8mm Handylink™ Connector System</b>	SHEET No. <b>1 of 24</b>
DOCUMENT NUMBER: <b>PS-44828-001</b>	CREATED / REVISED BY: <b>MARC SIMMEL</b>	CHECKED BY: <b>MARC SIMMEL</b>	APPROVED BY: <b>J. COMERCI</b>



# PRELIMINARY PRODUCT SPECIFICATION

## 5.0 PERFORMANCE

### 5.1 ELECTRICAL REQUIREMENTS

ITEM	DESCRIPTION	TEST CONDITION	REQUIREMENT
1	<b>Contact Resistance (Low Level)</b>	Mate connectors: Using a maximum open circuit potential of <b>20 mV</b> and a current of <b>100 mA</b> , measure contact resistance. (Measurement locations and methods are shown in Section 7.1) [EIA 364-23]	<b>50 milliohms</b> MAXIMUM ( initial )
2	<b>Insulation Resistance</b>	Un-mate connectors: apply a voltage of <b>250 VDC</b> between adjacent terminals and between terminals to ground for 1 minute. [EIA 364-21]	<b>1000 Meg-ohms</b> MINIMUM
3	<b>Withstanding Voltage</b>	Un-mate connectors: apply a voltage of <b>300 volts AC</b> for <b>1 minute</b> between adjacent terminals and between terminals to ground. [EIA 364-20]	No breakdown; current leakage < <b>5 mA</b>
4	<b>Capacitance</b>	Measure between adjacent terminals at <b>1 MHz</b> . [EIA 364-30]	<b>2 Pico farads</b> MAXIMUM [USB 2.0]
5	<b>Temperature Rise (Current Cycling)</b>	Mate connectors: measure the temperature rise at the rated current after <b>96 hours</b> . ( <b>45 minutes ON</b> and <b>15 minutes OFF</b> per hour). [EIA 364-55]	Temperature rise: <b>+30°C</b> MAXIMUM

### 5.2 MECHANICAL REQUIREMENTS

ITEM	DESCRIPTION	TEST CONDITION	REQUIREMENT
6	<b>Contact Normal Force</b>	Condition a plug terminal by displacing it fully in the mating direction (to the housing wall). Retract fully, then apply a displacement to within 0.55mm of the housing wall and measure the corresponding reaction force. [EIA 364-04]	<b>0.5 N</b> minimum.
7	<b>Connector Mate and Un-mate Forces</b>	Mate and un-mate connector (plug to receptacle) at a rate of <b>25 ± 6 mm</b> per minute applying forces parallel to the central axis of symmetry (straight pull). [EIA 364-13]	<b>20 N</b> MAXIMUM mating force <b>40 N</b> MAXIMUM, <b>7.5N</b> MINIMUM un-mating force.

REVISION: <b>B1</b>	EGR/ECN INFORMATION: EC No: <b>UCR2004-1831</b> DATE: <b>2004/03/19</b>	TITLE: <b>PRELIMINARY PRODUCT SPECIFICATION</b> <b>0.8mm Handylink™ Connector System</b>	SHEET No. <b>2 of 24</b>
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# PRELIMINARY PRODUCT SPECIFICATION

## 5.2 MECHANICAL REQUIREMENTS (continued)

ITEM	DESCRIPTION	TEST CONDITION	REQUIREMENT
8	<b>Angular Connector Un-Mate Forces</b>	Un-mate connector (plug from receptacle) by applying pulling forces away from the central axis of symmetry as follows: a) parallel to the plane of the PCB to which the receptacle connector is mounted; b) out of plane to the PCB to which the receptacle connector is mounted. See Section 7.3 for details about the test method.	<b>7.5 N MINIMUM</b> retention force at : a) 20 degrees off axis parallel to the PCB; b) 15 degrees off axis out of plane to the PCB.
9	<b>Perpendicular Connector Un-Mate Forces</b>	Apply a side load to the exterior housing of a plug connector that is mated with a corresponding receptacle connector. See Section 7.4 for details about the test method.	<b>25 N MINIMUM</b>
10	<b>Terminal Retention Force (in Housing)</b>	Apply an axial pullout force on the terminal in the housing at a rate of <b>25 ± 6</b> mm per minute. [EIA 364-29]	<b>2.5 N</b> MINIMUM retention force
11	<b>Durability</b>	Mate and un-mate connectors up to 15000 cycles at a maximum rate of <b>720</b> cycles per hour. Measure contact resistance. [EIA 364-09]	<b>10 milliohms</b> MAXIMUM (change from initial) <b>7.5 N</b> MINIMUM un-mating force (straight pull)
12	<b>Vibration (Random)</b>	Mate connectors and vibrate 15 minutes in each direction of each axis. [EIA 364-28, Cond. VII, C; IEC 68-2-36]	<b>10 milliohms</b> MAXIMUM (change from initial) Discontinuity < 1 microsecond
13	<b>Shock (Mechanical)</b>	Mate connectors and shock at <b>50 g's</b> with ½ sine wave (11 milliseconds) shocks in the ±X,±Y,±Z axes ( <b>18</b> shocks total). [EIA 364-27, Cond. A; IEC 68-2-27]	<b>10 milliohms</b> MAXIMUM (change from initial) Discontinuity < 1 microsecond
14	<b>PCB Connector Shear Strength</b>	Apply a load parallel to the PCB plane that would shear the soldered connector from the board.	<b>P/N 44828-1162: 200N</b> MIN. <b>P/N 45560-0160: 400N</b> MIN. <b>P/N 45560-0161: 50N</b> MIN. (no mounting screws) or physical damage to parts

REVISION: <b>B1</b>	EGR/ECN INFORMATION: EC No: <b>UCR2004-1831</b> DATE: <b>2004/03/19</b>	TITLE: <b>PRELIMINARY PRODUCT SPECIFICATION</b> <b>0.8mm Handylink™ Connector System</b>	SHEET No. <b>3 of 24</b>
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# PRELIMINARY PRODUCT SPECIFICATION

## 5.3 ENVIRONMENTAL REQUIREMENTS

ITEM	DESCRIPTION	TEST CONDITION	REQUIREMENT										
15	Thermal Shock	Mate connectors; expose to <b>100</b> cycles of: <table border="1"> <thead> <tr> <th>Temperature °C</th> <th>Duration (Minutes)</th> </tr> </thead> <tbody> <tr> <td>-40 +0/-3</td> <td>30</td> </tr> <tr> <td>+25 ±10</td> <td>5 MAXIMUM</td> </tr> <tr> <td>+85 +3/-0</td> <td>30</td> </tr> <tr> <td>+25 ±10</td> <td>5 MAXIMUM</td> </tr> </tbody> </table> [EIA364-32, Cond. I; IEC 68-2-14]	Temperature °C	Duration (Minutes)	-40 +0/-3	30	+25 ±10	5 MAXIMUM	+85 +3/-0	30	+25 ±10	5 MAXIMUM	<b>10 milliohms</b> MAXIMUM (change from initial) & Visual: No Damage
Temperature °C	Duration (Minutes)												
-40 +0/-3	30												
+25 ±10	5 MAXIMUM												
+85 +3/-0	30												
+25 ±10	5 MAXIMUM												
16	Thermal Aging	Mate connectors and expose to: <b>70 ± 2°C</b> for <b>500</b> hours. [EIA364-17, Method C, Cond. 2]	<b>10 milliohms</b> MAXIMUM (change from initial) & Visual: No Damage										
17	Cold Resistance	Operating: Mate connectors and expose to <b>-25± 2°C</b> for <b>96</b> hours [EIA364-59, Condition 4D] Storage: Mate connectors and expose to <b>-40± 2°C</b> for <b>96</b> hours [EIA 364-59, Condition 3D; IEC 68-2-1]	<b>10 milliohms</b> MAXIMUM (change from initial) & Visual: No Damage										
18	Mating Integrity	Verify mating of connectors subjected to the following temperature extremes: 1) <b>-40± 2°C</b> for <b>8</b> hours; 2) <b>85± 2°C, 95%RH</b> for <b>8</b> hours.	Connectors must mate after being exposed to opposite temperature extremes.										
19	Humidity (Steady State)	Mate connectors, expose to a temperature of <b>40 ± 2°C</b> with a relative humidity of <b>90-95%</b> for <b>96</b> hours.  Note: Remove surface moisture and air dry for <b>1</b> hour prior to measurements.  [EIA 364-31, Method II, Cond. C; IEC 68-2-3]	<b>10 milliohms</b> MAXIMUM (change from initial) & Withstanding Voltage: No Breakdown at <b>250 VAC</b> & Insulation Resistance: <b>1000 Megohms</b> MINIMUM & Visual: No Damage										

REVISION: <b>B1</b>	EGR/ECN INFORMATION: EC No: <b>UCR2004-1831</b> DATE: <b>2004/03/19</b>	TITLE: <b>PRELIMINARY PRODUCT SPECIFICATION 0.8mm Handylink™ Connector System</b>	SHEET No. <b>4 of 24</b>
DOCUMENT NUMBER: <b>PS-44828-001</b>	CREATED / REVISED BY: <b>MARC SIMMEL</b>	CHECKED BY: <b>MARC SIMMEL</b>	APPROVED BY: <b>J. COMERCI</b>



# PRELIMINARY PRODUCT SPECIFICATION

## 5.3 ENVIRONMENTAL REQUIREMENTS (continued)

ITEM	DESCRIPTION	TEST CONDITION	REQUIREMENT
20	Humidity (Cyclic)	Mate connectors, cycle as follows: <b>10</b> cycles at temperature <b>25 ± 3°C</b> at <b>80 ± 5%</b> relative humidity and <b>70 ± 3°C</b> at <b>95 ± 5%</b> relative humidity; dwell time of <b>1.0</b> hour; ramp time of <b>0.5</b> hours.  {Note: Remove surface moisture and air dry for <b>1</b> hour prior to measurements.} [EIA 364-31, Method III]	<b>10 milliohms</b> MAXIMUM (change from initial) & Dielectric Withstanding Voltage: No Breakdown at <b>250 VAC</b> & Insulation Resistance: <b>1000 Megohms</b> MINIMUM & Visual: No Damage
21	Solderability	Per EIA 364-52	Solder coverage: <b>95%</b> MINIMUM
22	IR Reflow Solder Resistance	Subject connectors to the standard IR Profile (see Section 7.2)	Visual: No Damage to insulator material
23	Salt Spray	Un-mated connectors: Duration: <b>48</b> hours exposure; Atmosphere: salt spray from a <b>5%</b> solution, pH: <b>6.5 to 7.2</b> , temperature: <b>35 +1/-2°C</b> Mate connectors and measure contact resistance. [EIA 364-26; IEC 68-2-11]	<b>10 milliohms</b> MAXIMUM (change from initial) & Visual: No Damage
24	Dust Exposure	Expose non-mated connectors to 140 mesh silica flour. Take LLCR measurements with the connectors mated. [EIA 364-50]	<b>10 milliohms</b> MAXIMUM (change from initial) & Visual: No Damage

REVISION: <b>B1</b>	EGR/ECN INFORMATION: EC No: <b>UCR2004-1831</b> DATE: <b>2004/03/19</b>	TITLE: <b>PRELIMINARY PRODUCT SPECIFICATION 0.8mm Handylink™ Connector System</b>	SHEET No. <b>5 of 24</b>
DOCUMENT NUMBER: <b>PS-44828-001</b>	CREATED / REVISED BY: <b>MARC SIMMEL</b>	CHECKED BY: <b>MARC SIMMEL</b>	APPROVED BY: <b>J. COMERCI</b>



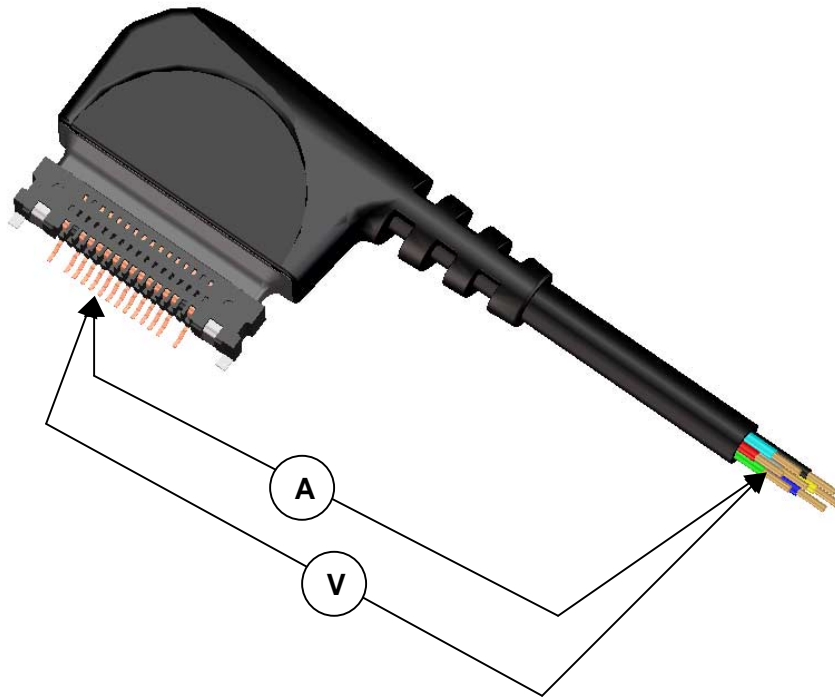
# PRELIMINARY PRODUCT SPECIFICATION

## 6.0 PACKAGING

Parts shall be packaged to protect against damage during handling, transit and storage.

## 7.0 TEST GAGES, FIXTURES, AND SET-UP METHODS

### 7.1 CONTACT RESISTANCE PROBE POINTS



Plug assembly and SMT receptacle shown mated.

Four point probe method: 20mV, 100mA max.

Wire and terminal bulk resistances must be subtracted from the result to obtain the contact resistance values.

REVISION: <b>B1</b>	EGR/ECN INFORMATION: EC No: <b>UCR2004-1831</b> DATE: <b>2004/03/19</b>	TITLE: <b>PRELIMINARY PRODUCT SPECIFICATION 0.8mm Handylink™ Connector System</b>	SHEET No. <b>6 of 24</b>
DOCUMENT NUMBER: <b>PS-44828-001</b>	CREATED / REVISED BY: <b>MARC SIMMEL</b>	CHECKED BY: <b>MARC SIMMEL</b>	APPROVED BY: <b>J. COMERCI</b>



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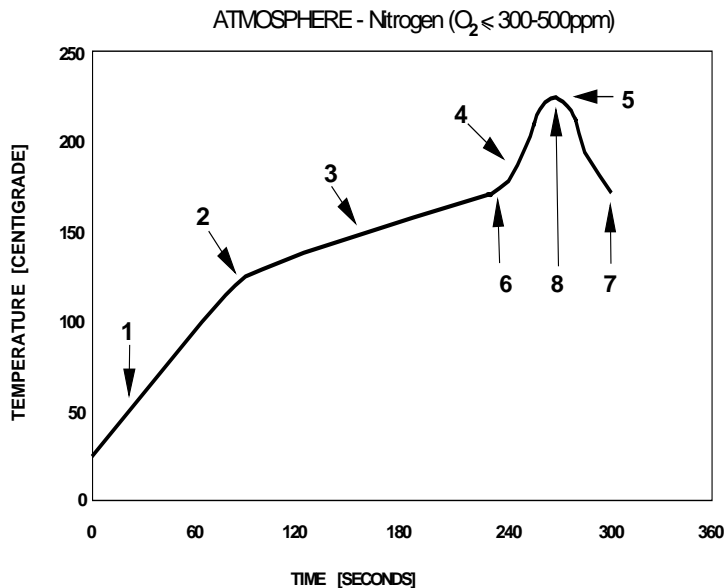
## 7.2 IR REFLOW SOLDERING PROFILES USED BY MOLEX

### A. TIN / LEAD:

PROFILE ELEMENTS	IR CONVECTION
Ramp rate: 183°C to peak	2.5°C - 3°C/second max.
Preheat / Soak temperature: 150°C (+/-20°C)	60 to 120 seconds max.
Temperature maintained above 183°C	60 to 90 seconds
Peak temperature range	205°C to 240°C
Ramp-down rate	6°C/second max.

### B. LEAD - FREE:

PROFILE ELEMENTS	IR CONVECTION
Ramp rate: 217°C to peak	2.5°C - 3°C/second max.
Preheat / Soak temperature: 155°C (+/-15°C)	60 to 90 seconds max.
Temperature maintained above 217°C	60 seconds
Peak temperature range	235°C to 250°C
Ramp-down rate	6°C/second max.



Description	Values
1. Initial Ramp	1.0 - 1.5 C/Second
2. Initial Soak	120 - 130 C
3. Soak Ramp	0.25 - 0.5 C/Second
4. Spike Ramp	1.25 - 2.0 C/Second
5. Peak Temperature	
6. Time to First Liquidus	175 - 275 Seconds
7. Time to Second Liquidus	220 - 360 Seconds
8. Total Liquidus Time	45 - 90 Seconds

**NOTE:** ACTUAL REFLOW SOLDERING PROFILES MUST BE DETERMINED BASED ON EVALUATIONS CONDUCTED WITH THE CUSTOMERS' OWN BOARDS, COMPONENTS AND SOLDERING EQUIPMENT.

REVISION: <b>B1</b>	EGR/ECN INFORMATION: EC No: <b>UCR2004-1831</b> DATE: <b>2004/03/19</b>	TITLE: <b>PRELIMINARY PRODUCT SPECIFICATION 0.8mm Handylink™ Connector System</b>	SHEET No. <b>7 of 24</b>
DOCUMENT NUMBER: <b>PS-44828-001</b>	CREATED / REVISED BY: <b>MARC SIMMEL</b>	CHECKED BY: <b>MARC SIMMEL</b>	APPROVED BY: <b>J. COMERCI</b>

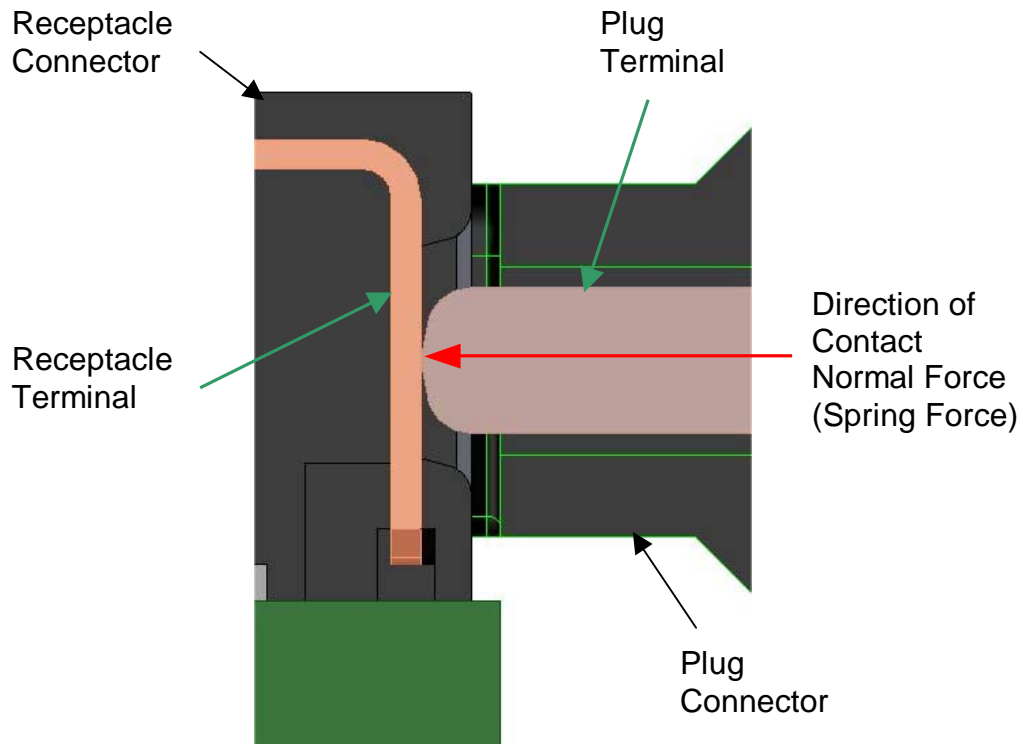


# PRELIMINARY PRODUCT SPECIFICATION

## 7.2 DEFINITION OF MECHANICAL FORCES (SECTION 5.2, Items 8, 9, 10, AND 14)

### Section 5.2, Item 8: Contact Normal Force

Normal force is defined as the force generated by the plug terminal's spring force on the mating surface of the receptacle connector.



REVISION: <b>B1</b>	EGR/ECN INFORMATION: EC No: <b>UCR2004-1831</b> DATE: <b>2004/03/19</b>	TITLE: <b>PRELIMINARY PRODUCT SPECIFICATION 0.8mm Handylink™ Connector System</b>	SHEET No. <b>8 of 24</b>
DOCUMENT NUMBER: <b>PS-44828-001</b>	CREATED / REVISED BY: <b>MARC SIMMEL</b>	CHECKED BY: <b>MARC SIMMEL</b>	APPROVED BY: <b>J. COMERCI</b>





# PRELIMINARY PRODUCT SPECIFICATION

## Section 5.2, Item 9: Connector Mate and Un-Mate Forces

Connector mate and un-mate forces are defined as the force required to fully engage and disengage the plug connector with the receptacle. The receptacle is rigidly mounted to a PCB and the forces are applied using a strain gauge tester along the principal axis of symmetry of the connectors, perpendicular to the mating (front) face of the receptacle connector.

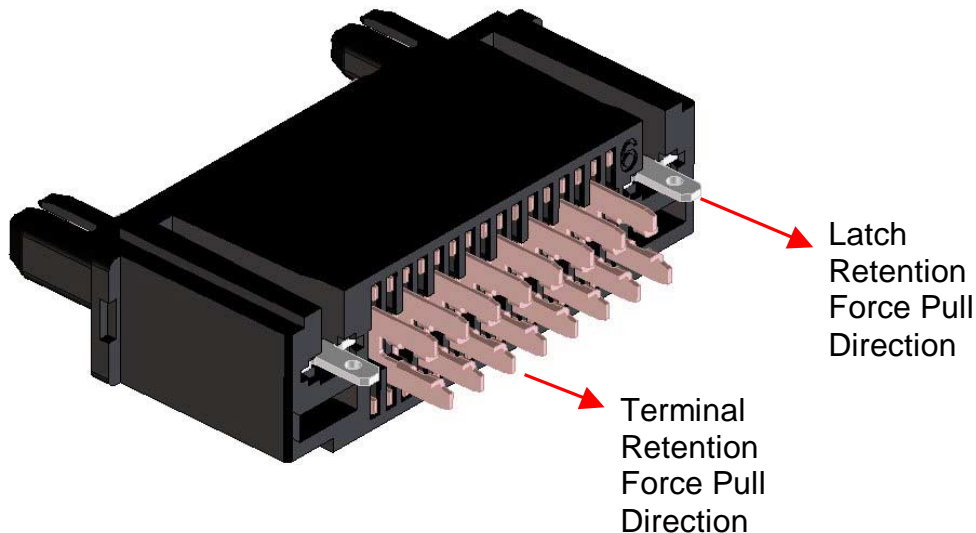
(See Section 7.3, below, for a description of how un-mating forces are measured at angles that are off-axis)

## Section 5.2, Item 10: Terminal Retention Force in Housing

Terminal retention force is defined as the forces required to dislodge the plug or receptacle terminal from the respective plastic housing.

The contact terminals used in the Handylink™ receptacle connector are encased in plastic during the manufacturing process and cannot be removed from the housing.

The contact terminals and spring latches are press-fitted into recesses in the plastic housing during the manufacturing process. The retention force is defined as the axial force necessary to remove the terminals or latches in the opposite direction to that used during assembly, as illustrated below.



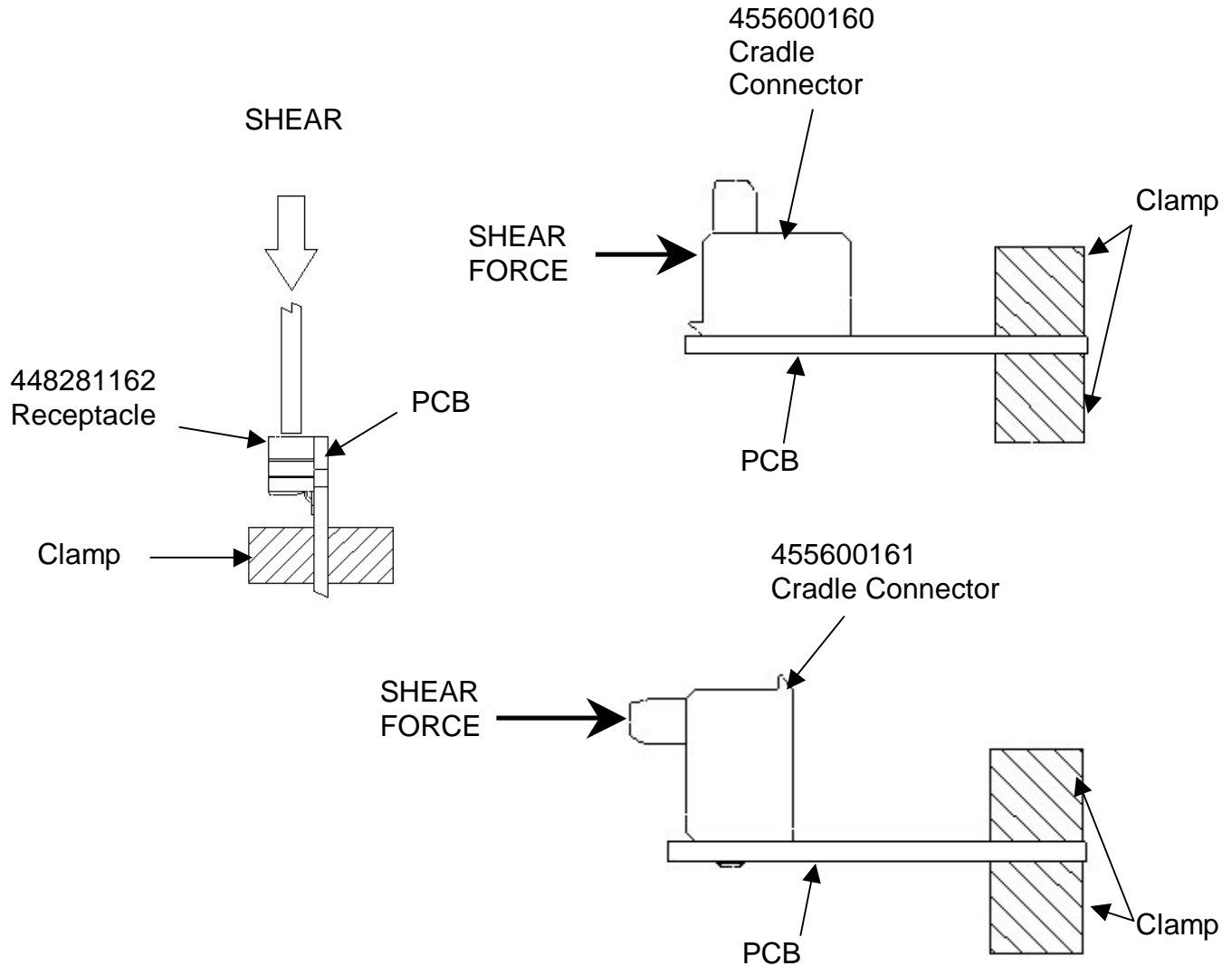
REVISION: <b>B1</b>	EGR/ECN INFORMATION: EC No: <b>UCR2004-1831</b> DATE: <b>2004/03/19</b>	TITLE: <b>PRELIMINARY PRODUCT SPECIFICATION 0.8mm Handylink™ Connector System</b>	SHEET No. <b>9 of 24</b>
DOCUMENT NUMBER: <b>PS-44828-001</b>	CREATED / REVISED BY: <b>MARC SIMMEL</b>	CHECKED BY: <b>MARC SIMMEL</b>	APPROVED BY: <b>J. COMERCI</b>



# PRELIMINARY PRODUCT SPECIFICATION

## Section 5.2, Item 14: PCB Connector Shear Strength

PCB shear strength is defined as the force necessary to irreperably damage or remove a soldered connector from the copper traces on a PCB. The connector is mounted in a vice and the forces are applied with a flat blade attached to a strain gauge tester as indicated in the diagrams, below. The peak force is recorded.



REVISION: <b>B1</b>	EGR/ECN INFORMATION: EC No: UCR2004-1831 DATE: 2004/03/19	TITLE: <b>PRELIMINARY PRODUCT SPECIFICATION 0.8mm Handylink™ Connector System</b>	SHEET No. <b>10 of 24</b>
DOCUMENT NUMBER: <b>PS-44828-001</b>	CREATED / REVISED BY: <b>MARC SIMMEL</b>	CHECKED BY: <b>MARC SIMMEL</b>	APPROVED BY: <b>J. COMERCI</b>

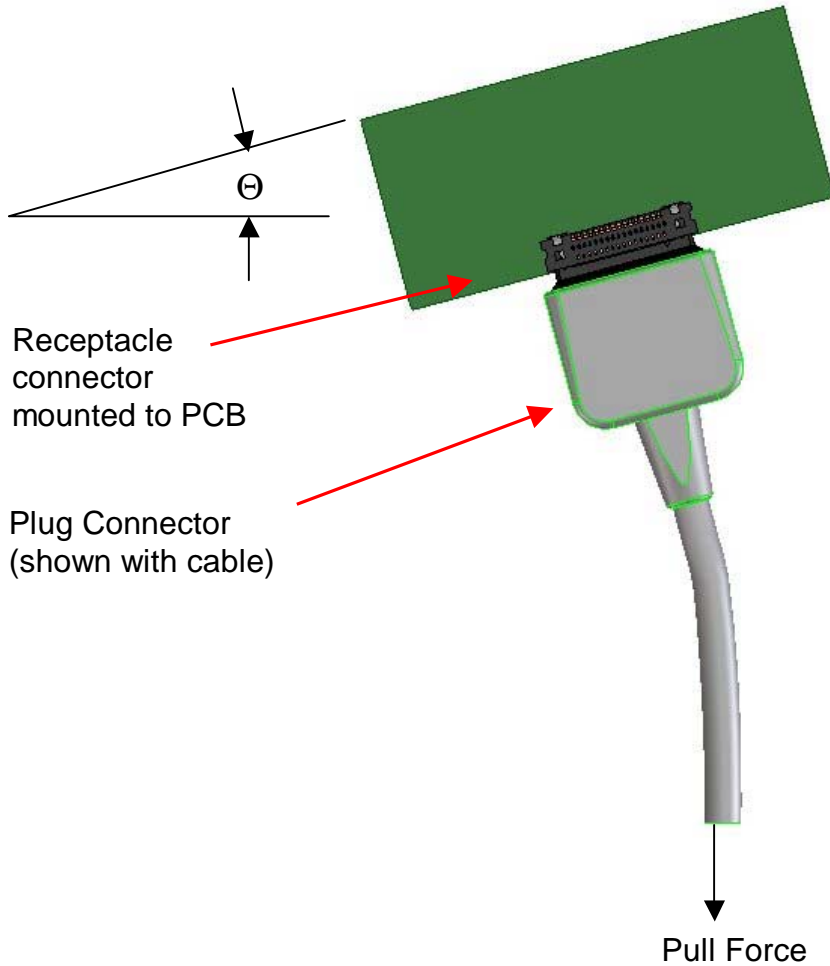


# PRELIMINARY PRODUCT SPECIFICATION

## 7.3 ANGULAR PULL FORCE TEST METHOD

A 16 circuit receptacle connector is soldered to a board and fixed to an angle measurement gauge that is mounted vertically. The force necessary to cause the plug connector latches to disengage is recorded at various angles and the results charted on a polar plot (see the diagrams on the pages that follow).

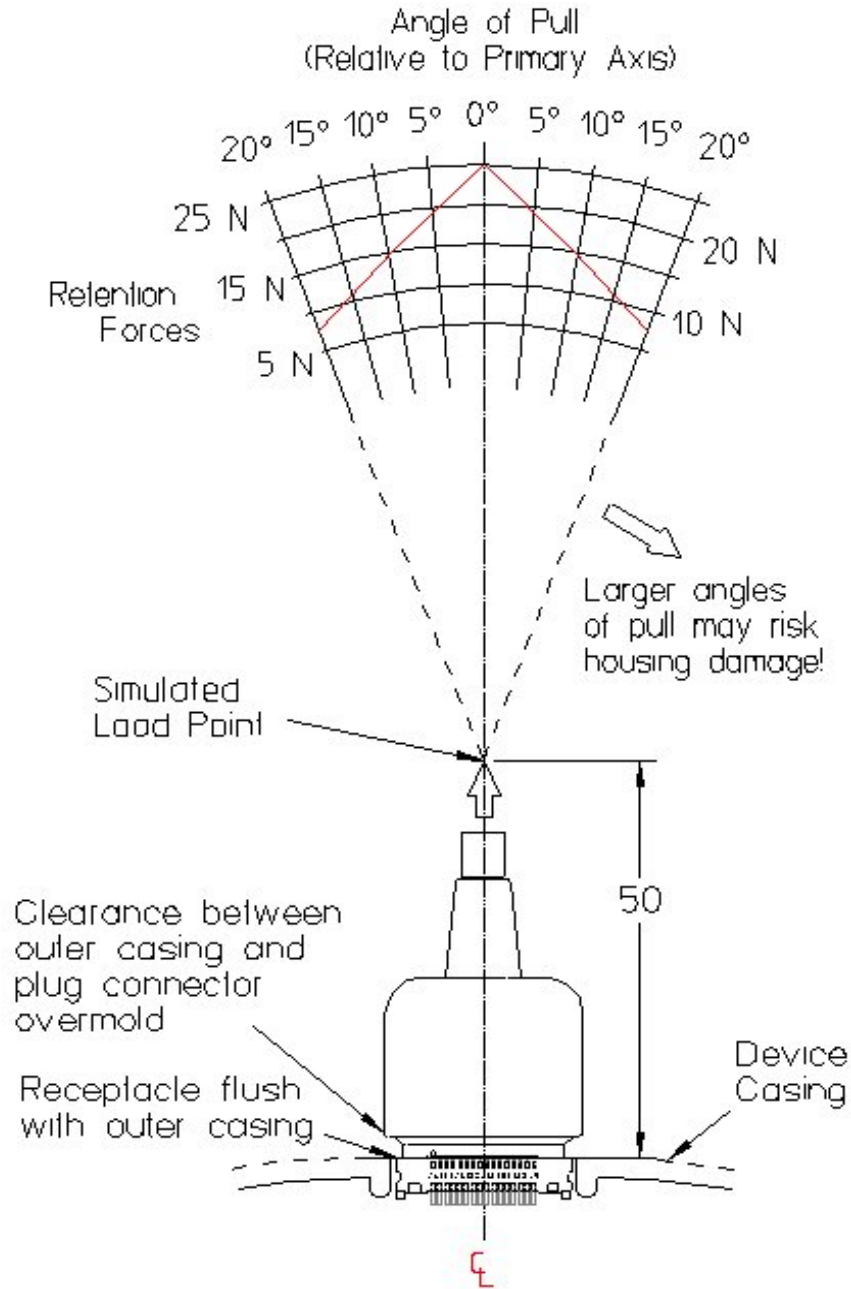
Units: Newtons, mm, degrees



REVISION: <b>B1</b>	EGR/ECN INFORMATION: EC No: <b>UCR2004-1831</b> DATE: <b>2004/03/19</b>	TITLE: <b>PRELIMINARY PRODUCT SPECIFICATION 0.8mm Handylink™ Connector System</b>	SHEET No. <b>11 of 24</b>
DOCUMENT NUMBER: <b>PS-44828-001</b>	CREATED / REVISED BY: <b>MARC SIMMEL</b>	CHECKED BY: <b>MARC SIMMEL</b>	APPROVED BY: <b>J. COMERCI</b>



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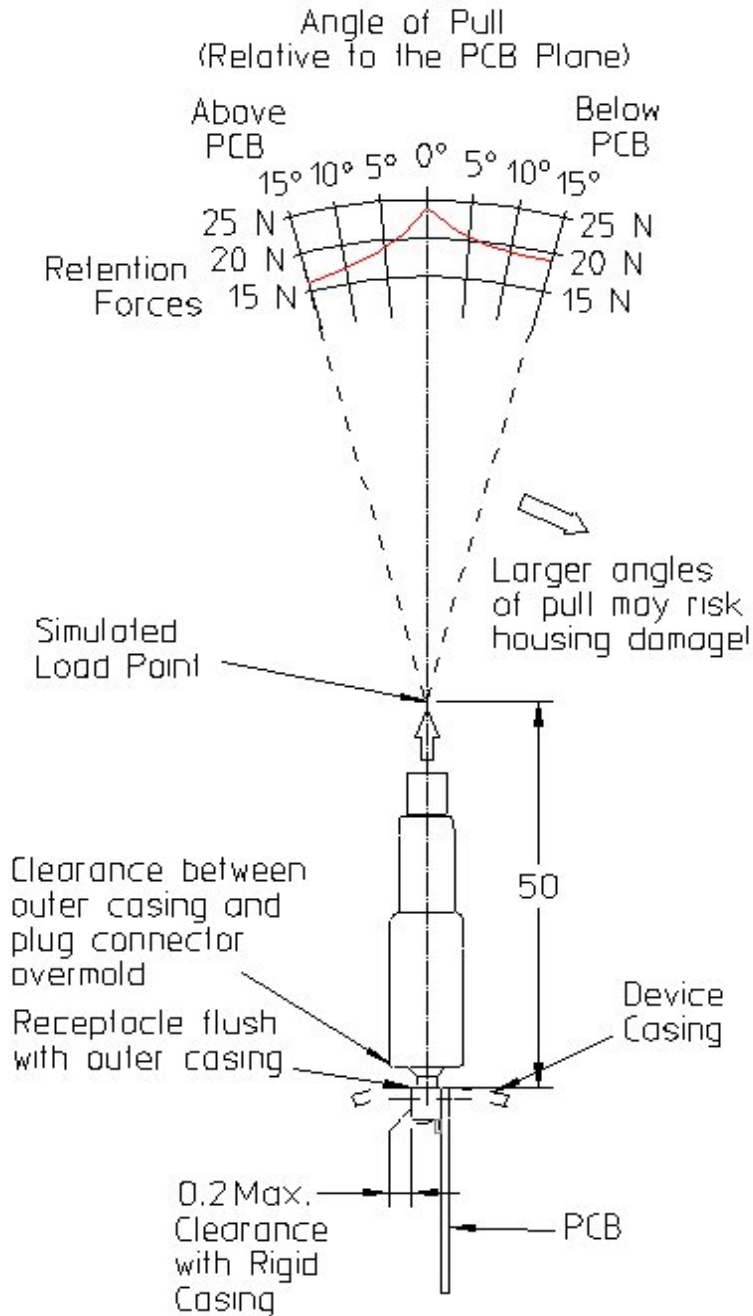


Note: Polar chart at the top of the diagram shows typical initial values. The actual change in retention force values from the axial (0 degree) pull may vary due to differences in the fit of the overmolded plug connector with the device casing, and the stiffness of both the cable and the overmolded strain relief. For further information, please see the application specification, AS-44828-001.

REVISION: <b>B1</b>	EGR/ECN INFORMATION: EC No: <b>UCR2004-1831</b> DATE: <b>2004/03/19</b>	TITLE: <b>PRELIMINARY PRODUCT SPECIFICATION 0.8mm Handylink™ Connector System</b>	SHEET No. <b>12 of 24</b>
DOCUMENT NUMBER: <b>PS-44828-001</b>	CREATED / REVISED BY: <b>MARC SIMMEL</b>	CHECKED BY: <b>MARC SIMMEL</b>	APPROVED BY: <b>J. COMERCI</b>



# PRELIMINARY PRODUCT SPECIFICATION



Note: Polar chart at the top of the diagram shows typical initial values. The actual change in retention force values from the axial (0 degree) pull may vary due to differences in the fit of the overmolded plug connector with the device casing, and the stiffness of both the cable and the overmolded strain relief. For further information, please see the application specification, AS-44828-001.

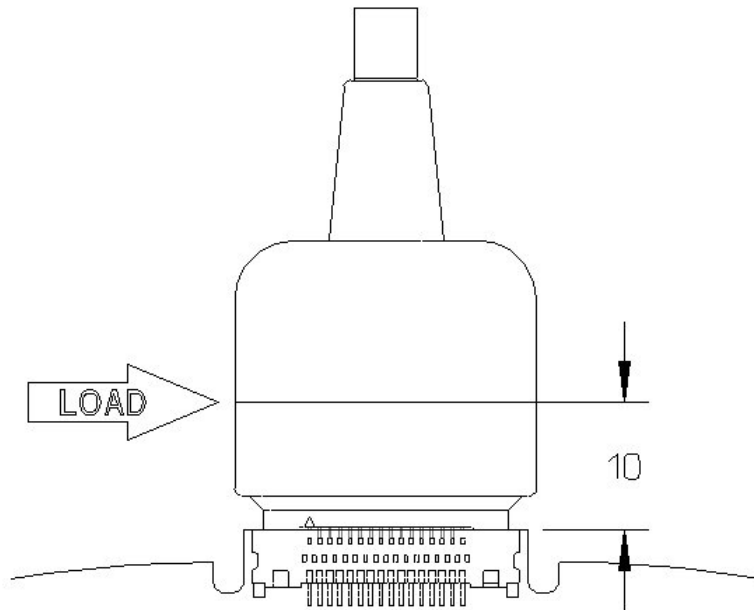
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DOCUMENT NUMBER: <b>PS-44828-001</b>	CREATED / REVISED BY: <b>MARC SIMMEL</b>	CHECKED BY: <b>MARC SIMMEL</b>	APPROVED BY: <b>J. COMERCI</b>



# PRELIMINARY PRODUCT SPECIFICATION

## 7.4 SIDE LOAD TEST METHOD

A 16 circuit receptacle connector is soldered to a board, and mated with a 16 circuit plug connector. A side-ways load, parallel to the mating front face of the receptacle housing is applied as shown in the diagram below. The force required to cause separation by one of the latches is recorded.  
Units: Newtons, mm.



Note: The actual sustainable load may vary due to differences in the fit of the overmolded plug connector with the device casings. For further information, please see the application specification, AS-44828-001.

REVISION: <b>B1</b>	EGR/ECN INFORMATION: EC No: <b>UCR2004-1831</b> DATE: <b>2004/03/19</b>	TITLE: <b>PRELIMINARY PRODUCT SPECIFICATION 0.8mm Handylink™ Connector System</b>	SHEET No. <b>14 of 24</b>
DOCUMENT NUMBER: <b>PS-44828-001</b>	CREATED / REVISED BY: <b>MARC SIMMEL</b>	CHECKED BY: <b>MARC SIMMEL</b>	APPROVED BY: <b>J. COMERCI</b>

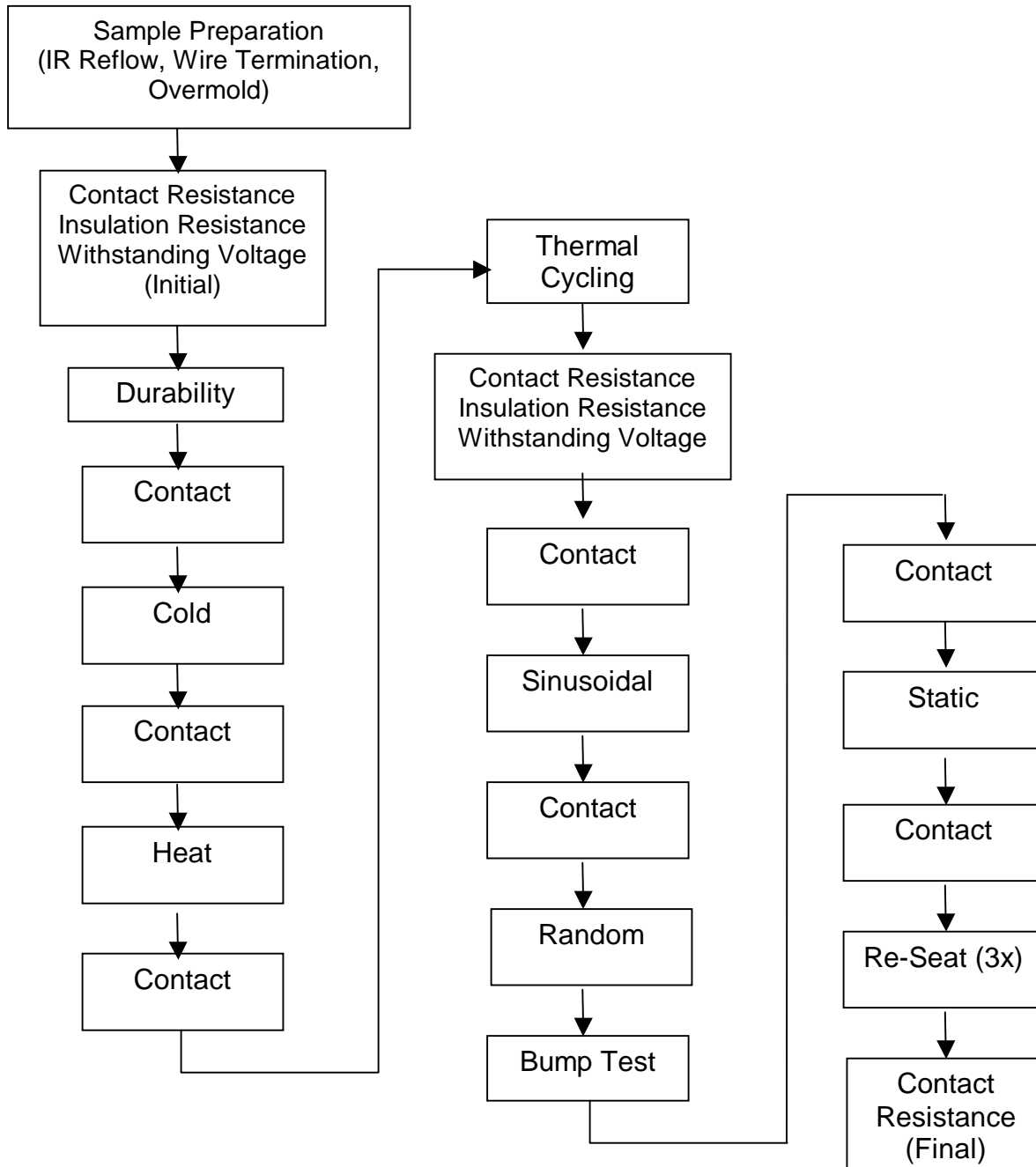


# PRELIMINARY PRODUCT SPECIFICATION

## 8.0 TEST PLAN

### 8.1 GROUP 1 - STORAGE AND TRANSPORTATION SEQUENCE

Sample Size: 5 mated connector pairs



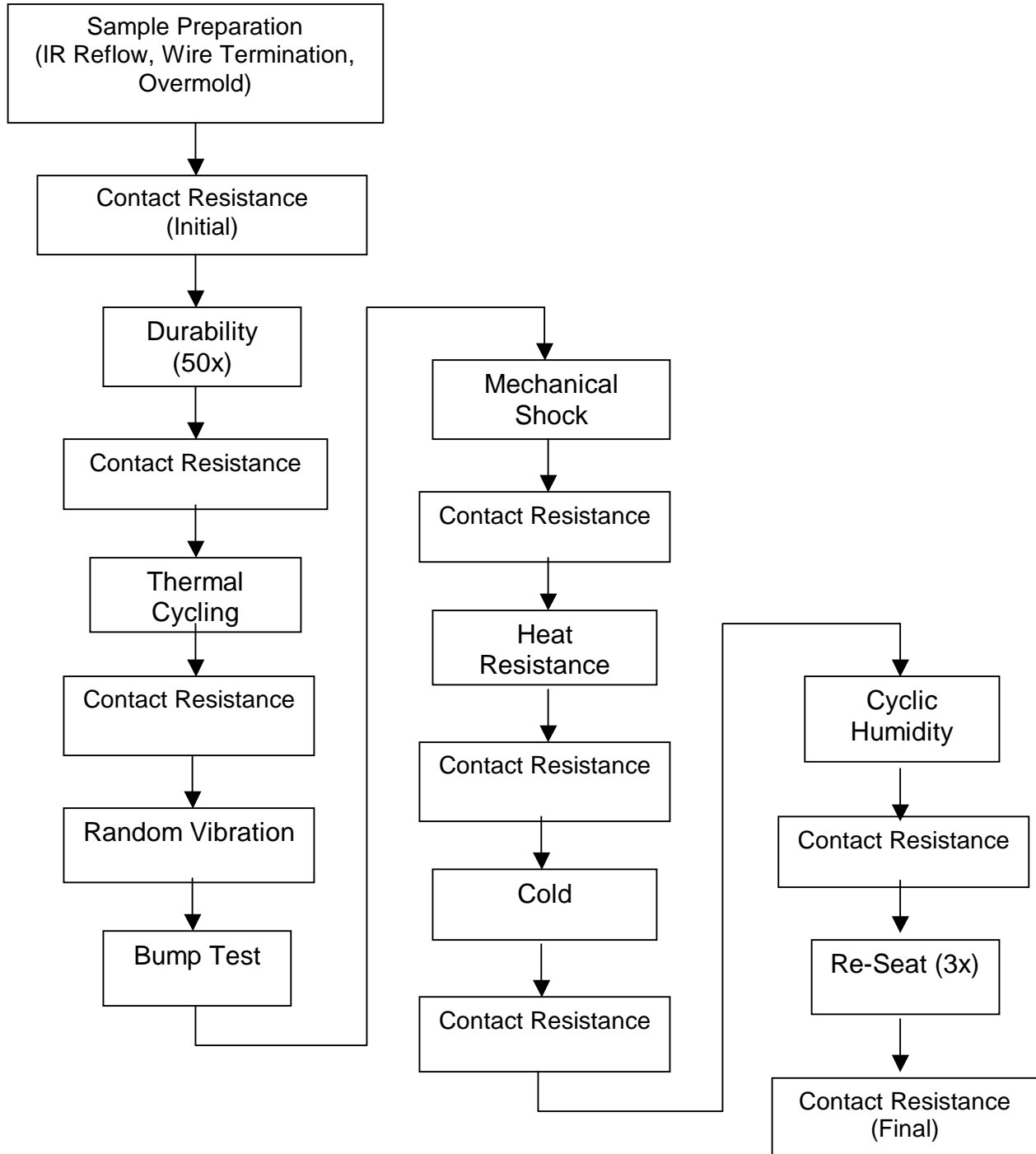
REVISION: <b>B1</b>	EGR/ECN INFORMATION: EC No: <b>UCR2004-1831</b> DATE: <b>2004/03/19</b>	TITLE: <b>PRELIMINARY PRODUCT SPECIFICATION 0.8mm Handylink™ Connector System</b>	SHEET No. <b>15 of 24</b>
DOCUMENT NUMBER: <b>PS-44828-001</b>	CREATED / REVISED BY: <b>MARC SIMMEL</b>	CHECKED BY: <b>MARC SIMMEL</b>	APPROVED BY: <b>J. COMERCI</b>



# PRELIMINARY PRODUCT SPECIFICATION

## 8.2 GROUP 2 - OPERATING SEQUENCE

Sample Size: 5 mated connector pairs



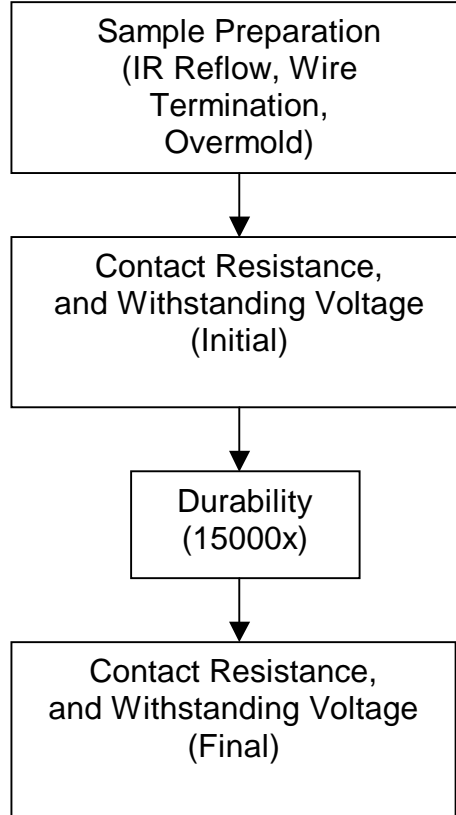
REVISION: <b>B1</b>	EGR/ECN INFORMATION: EC No: <b>UCR2004-1831</b> DATE: <b>2004/03/19</b>	TITLE: <b>PRELIMINARY PRODUCT SPECIFICATION 0.8mm Handylink™ Connector System</b>	SHEET No. <b>16 of 24</b>
DOCUMENT NUMBER: <b>PS-44828-001</b>	CREATED / REVISED BY: <b>MARC SIMMEL</b>	CHECKED BY: <b>MARC SIMMEL</b>	APPROVED BY: <b>J. COMERCI</b>





# PRELIMINARY PRODUCT SPECIFICATION

## 8.3 GROUP 3 – DURABILITY

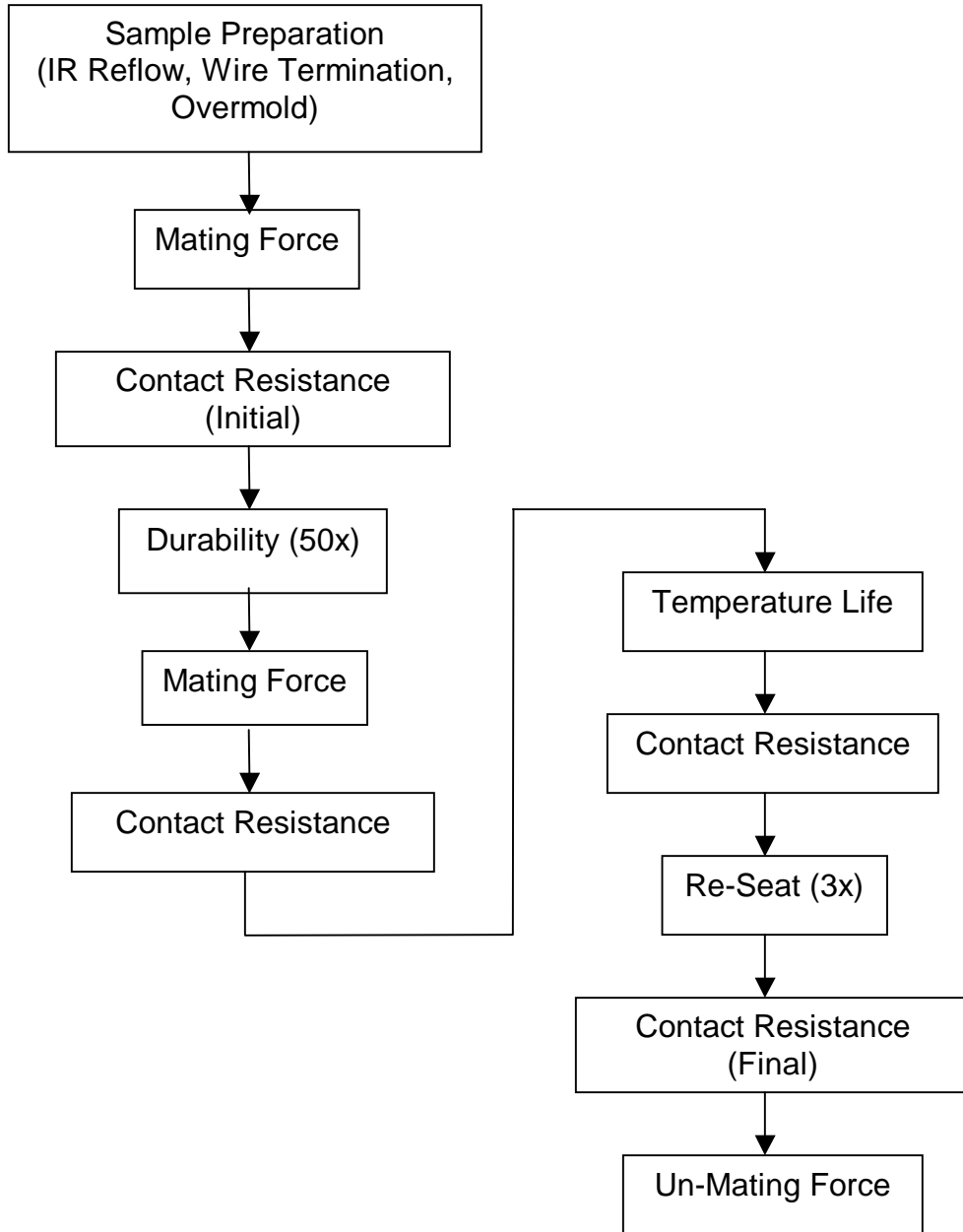


REVISION: <b>B1</b>	EGR/ECN INFORMATION: EC No: <b>UCR2004-1831</b> DATE: <b>2004/03/19</b>	TITLE: <b>PRELIMINARY PRODUCT SPECIFICATION 0.8mm Handylink™ Connector System</b>	SHEET No. <b>17 of 24</b>
DOCUMENT NUMBER: <b>PS-44828-001</b>	CREATED / REVISED BY: <b>MARC SIMMEL</b>	CHECKED BY: <b>MARC SIMMEL</b>	APPROVED BY: <b>J. COMERCI</b>



# PRELIMINARY PRODUCT SPECIFICATION

## 8.4 GROUP 4 - MATING / UN-MATING FORCES

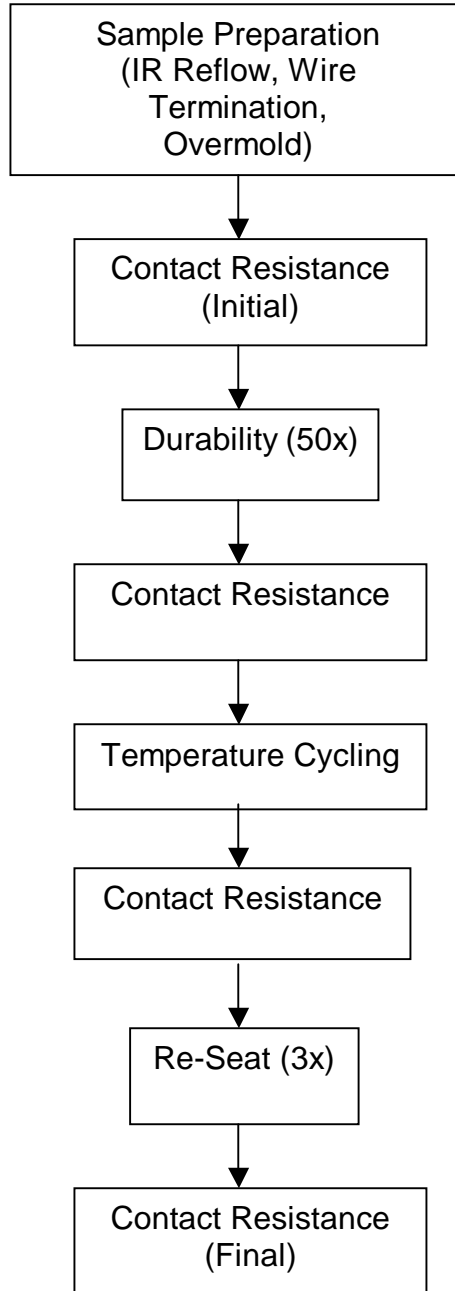


REVISION: <b>B1</b>	EGR/ECN INFORMATION: EC No: <b>UCR2004-1831</b> DATE: <b>2004/03/19</b>	TITLE: <b>PRELIMINARY PRODUCT SPECIFICATION 0.8mm Handylink™ Connector System</b>	SHEET No. <b>18 of 24</b>
DOCUMENT NUMBER: <b>PS-44828-001</b>	CREATED / REVISED BY: <b>MARC SIMMEL</b>	CHECKED BY: <b>MARC SIMMEL</b>	APPROVED BY: <b>J. COMERCI</b>



# PRELIMINARY PRODUCT SPECIFICATION

## 8.5 GROUP 5 - TEMPERATURE CYCLING

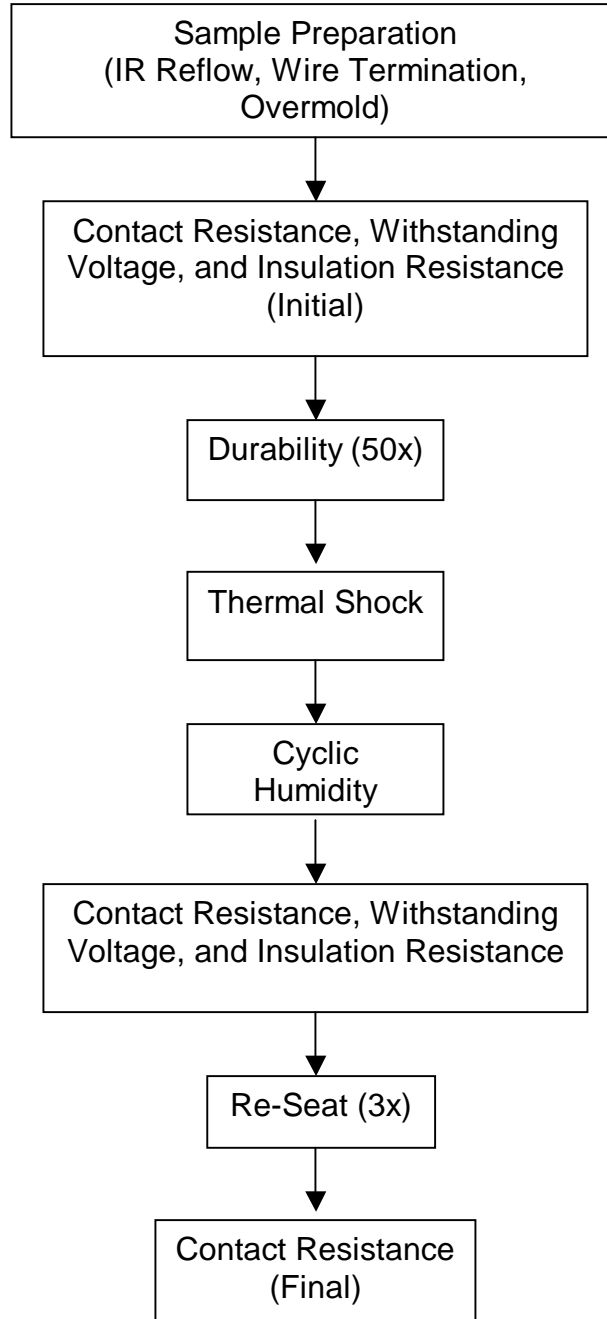


REVISION: <b>B1</b>	EGR/ECN INFORMATION: EC No: <b>UCR2004-1831</b> DATE: <b>2004/03/19</b>	TITLE: <b>PRELIMINARY PRODUCT SPECIFICATION 0.8mm Handylink™ Connector System</b>	SHEET No. <b>19 of 24</b>
DOCUMENT NUMBER: <b>PS-44828-001</b>	CREATED / REVISED BY: <b>MARC SIMMEL</b>	CHECKED BY: <b>MARC SIMMEL</b>	APPROVED BY: <b>J. COMERCI</b>



# PRELIMINARY PRODUCT SPECIFICATION

## 8.6 GROUP 6 - CYCLIC HUMIDITY

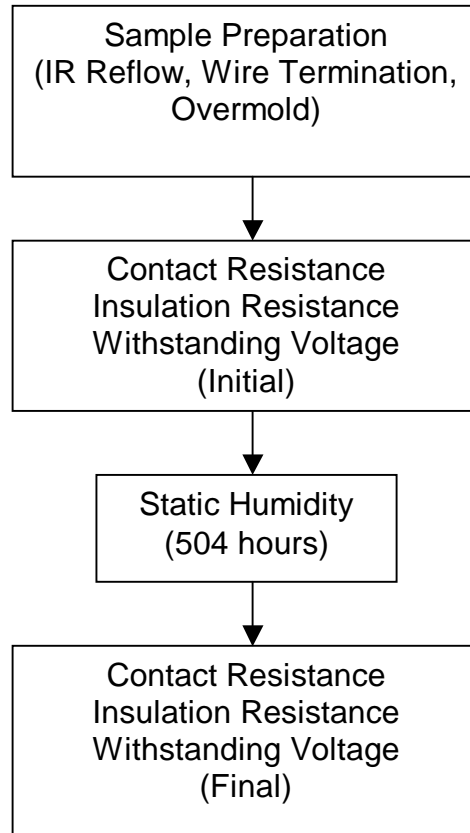


REVISION: <b>B1</b>	EGR/ECN INFORMATION: EC No: UCR2004-1831 DATE: 2004/03/19	TITLE: <b>PRELIMINARY PRODUCT SPECIFICATION 0.8mm Handylink™ Connector System</b>	SHEET No. <b>20 of 24</b>
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# PRELIMINARY PRODUCT SPECIFICATION

## 8.7 GROUP 7 - STATIC HUMIDITY

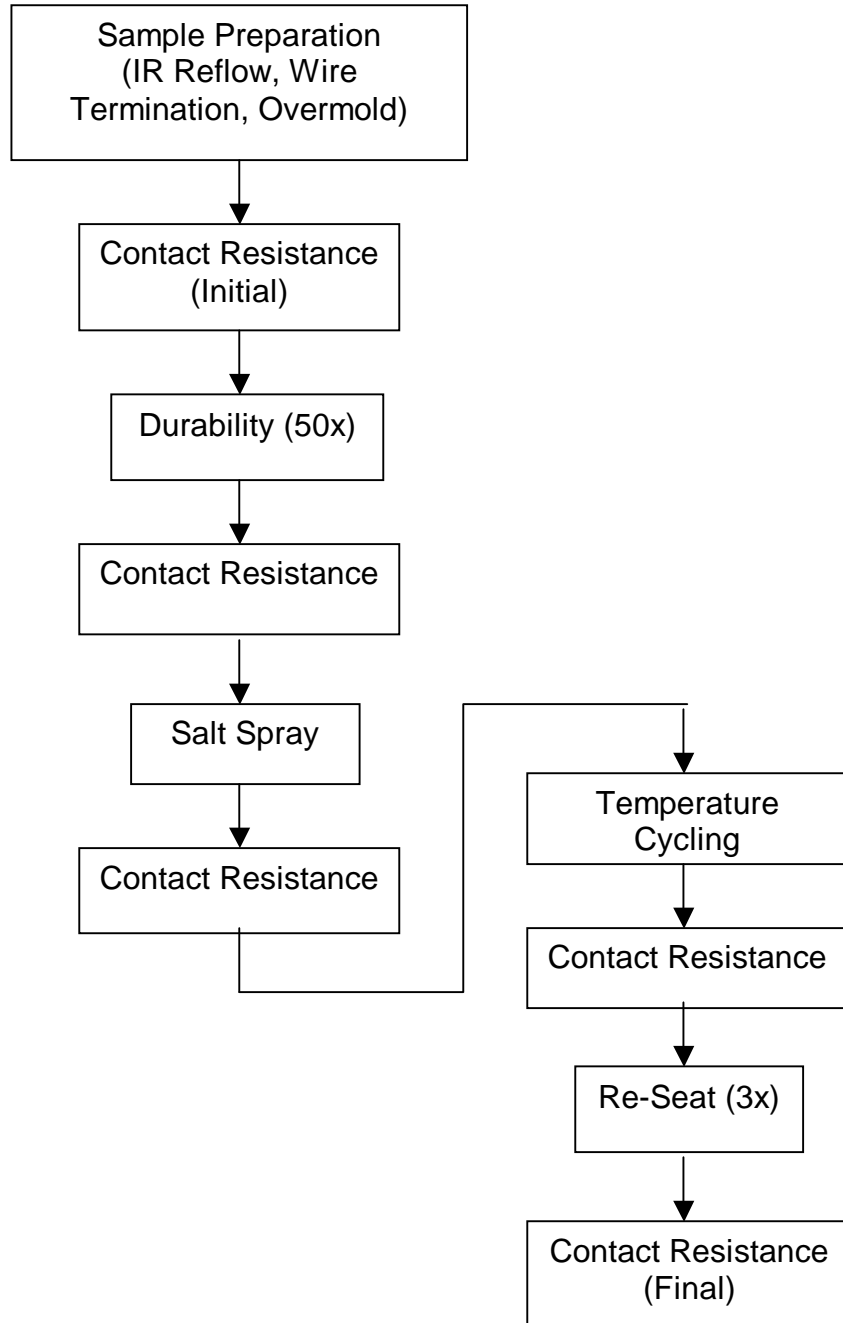


REVISION: <b>B1</b>	EGR/ECN INFORMATION: EC No: <b>UCR2004-1831</b> DATE: <b>2004/03/19</b>	TITLE: <b>PRELIMINARY PRODUCT SPECIFICATION 0.8mm Handylink™ Connector System</b>	SHEET No. <b>21 of 24</b>
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# PRELIMINARY PRODUCT SPECIFICATION

## 8.8 GROUP 8 - SALT SPRAY

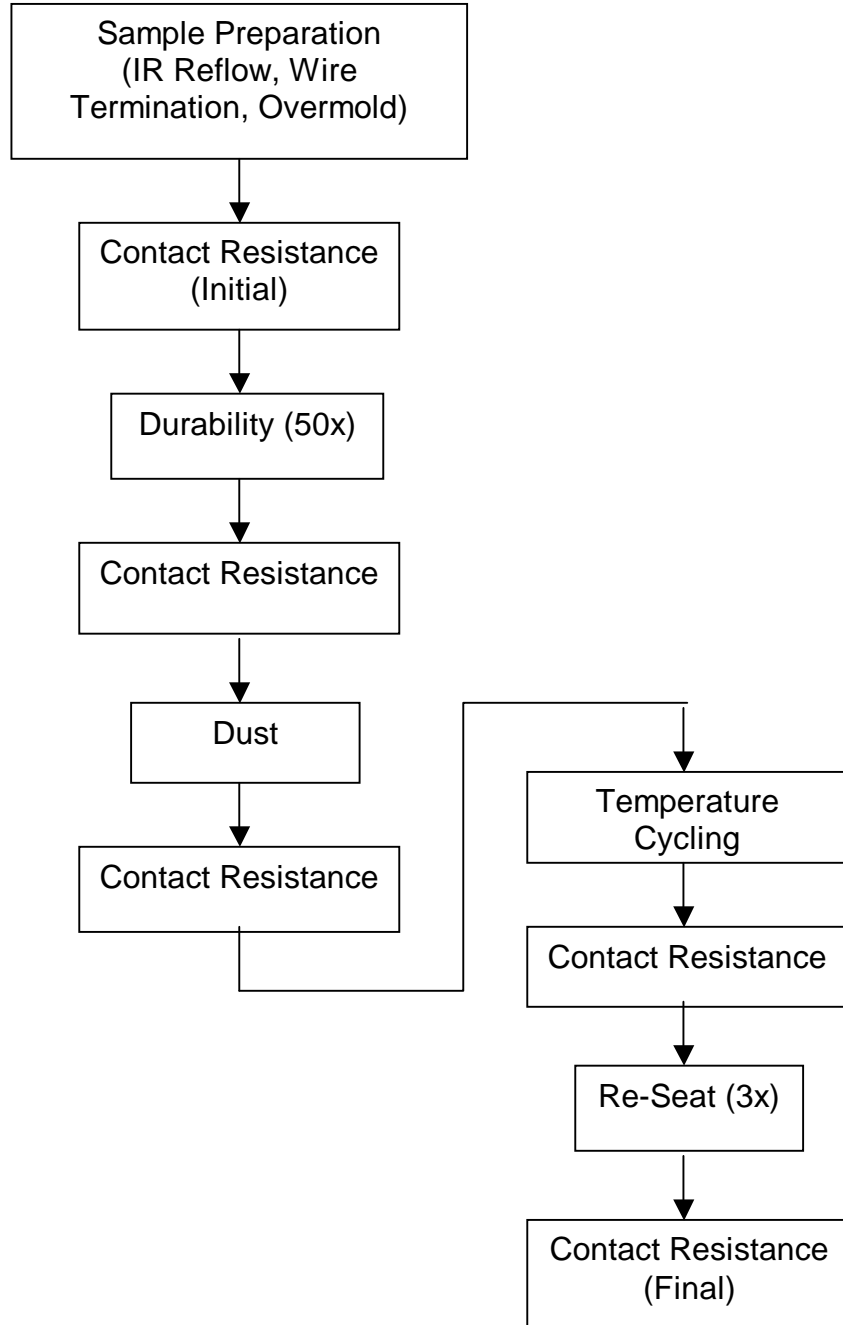


REVISION: <b>B1</b>	EGR/ECN INFORMATION: EC No: <b>UCR2004-1831</b> DATE: <b>2004/03/19</b>	TITLE: <b>PRELIMINARY PRODUCT SPECIFICATION 0.8mm Handylink™ Connector System</b>	SHEET No. <b>22 of 24</b>
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# PRELIMINARY PRODUCT SPECIFICATION

## 8.9 GROUP 9 – DUST

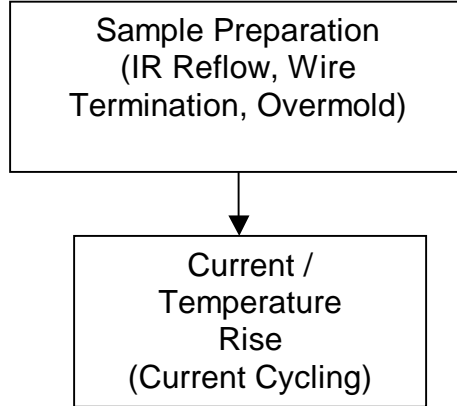


REVISION: <b>B1</b>	EGR/ECN INFORMATION: EC No: <b>UCR2004-1831</b> DATE: <b>2004/03/19</b>	TITLE: <b>PRELIMINARY PRODUCT SPECIFICATION 0.8mm Handylink™ Connector System</b>	SHEET No. <b>23 of 24</b>
DOCUMENT NUMBER: <b>PS-44828-001</b>	CREATED / REVISED BY: <b>MARC SIMMEL</b>	CHECKED BY: <b>MARC SIMMEL</b>	APPROVED BY: <b>J. COMERCI</b>



# PRELIMINARY PRODUCT SPECIFICATION

## 8.10 GROUP 10 - CURRENT / TEMPERATURE RISE



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