0.50/1.5 HYBRID SERIES UNSEALED CONNECTORS (SMT Type)

1. SCOPE:

1.1. Contents

This specification covers the requirements for product performance, test methods and quality assurance provisions of 0.50/1.5 Hybrid series unsealed Connectors (SMT-Type.).
Applicable product description and part numbers are as shown in Appendix 1.
However, the performance of 1.5 Receptacle Contacts refers to the specification of each Receptacle benders.

2. APPLICABLE DOCUMENTS:

The following documents form a part of this specification to the extent specified herein. In the event of conflict between the requirements of this specification and the product drawing, the product drawing shall take precedence. In the event of conflict between the requirements of this specification and the referenced documents, this specification shall take precedence.

2.1. TE Specifications:

A. 109-5000	Test Specification, General Requirements for Test Methods
B. 114-5379-1	Application Specification: Crimping of 0.50 Receptacle Contact
C. 501-5918	Qualification Test Report

2.2. Commercial Standards and Specifications:

A. JASO D605	Multi-pole Connector for Automobiles
B. JASO D7101	Test Methods for Plastic Molded Parts
C. JIS C3406	Low Voltage Wires and Cables for Automobiles
D. JIS D0203	Method of Moisture, Rain and Spray Test for Automobile Parts
E. JIS D0204	Method of High and Low Temperature Test for Automobile Parts
F. JIS D1601	Vibration Testing Method for Automobile Parts
G. JIS R5210	Portland Cement
H. MIL-STD-	202 Testing Method 208: Method of Soldering

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3. REQUIREMENTS:

3.1. Design and Construction:

Product shall be of the design, construction and physical dimensions specified on the applicable product drawing.

3.2. Materials:

A. Contact:

Description	Material	Finish
Tab (Male)	Brass	Part of Post-Tinned (nickel under plating)
Receptacle (Female)	Copper Alloy	Pre-Tinned

Fig. 1

B. Peg:

Description	Material	Finish
Peg	Brass	Post-Tinned (nickel under plating)

Fig. 2

C. Housing: LCP resin

D. Wire: The used wire is according to the following table

Tab	Wire used
0.50	0.35mm^2 (Applicable wire refer to 114-5379)
1.5	0.3~2.0 mm^2 (reference to the operation manual of the maker)

Fig. 3

3.3. Ratings:

A. Voltage Rating: 12 V DC

B. Temperature Rating: -30℃～85℃

3.4. Performance Requirements and Test Descriptions:

The product shall be designed to meet the electrical, mechanical and environmental performance requirements specified in Fig.4 and Fig5. All tests shall be performed in the room temperature, unless otherwise specified.
The samples used in test are implemented by the lead free solder paste with 0.15mm thick metal mask.

3.5. Test Requirements and Procedures Summary:

Para	Test Items	Requirements			Procedures	
3.5.1	Confirmation of Product	Meets requirements of product drawing and TE Specification 114-5379			Visually ,dimensionally and functionally inspected per applicable quality inspection plan	
Electrical Requirements (0.50 Terminals Only)						
3.5.2	Termination Resistance (Low Level)	0.50	Initial	10 mΩ Max.	Subject mated contacts assembled in housing to 20 mV Max. Closed circuit at 10 mA. Fig. 6 TE Spec. 109-5311-1	
			Final	20 mΩ Max.		
3.5.3	Termination Resistance (Specified Current)	0.50	Initial	10 mV/A Max.	Subject mated contacts assembled in housing to 12 V Max. Closed circuit at 1A. Fig. 6 TE Spec. 109-5311-2	
			Final	20 mV/A Max.		
3.5.4	Dielectric Withstanding Voltage	No creeping discharge or flashover shall occur.			Impressed voltage 500VAC for 1 min. Mated connector. Fig.7 TE Spec. 109-5301	
3.5.5	Insulation Resistance	100 MΩ Min. (Initial) 100 MΩ Min. (Final)			Impressed voltage 500VDC Mated connector. Fig. 7 TE Spec. 109-5302	
3.5.6	Current Leakage	3mA Max.			Impressed voltage 14VDC Fig. 8 TE Spec. 109-5312	
3.5.7	Temperature Rise	0.50	60℃ Max.		Measure temperature rising at wire crimped by applied current to all positions. Fig. 12 TE Spec. 109-5310	
3.5.8	Over Current Loading	0.50	No ignition is allowed during the test.		Apply the current to only one position. Applied Current: Fig.9	
Physical Requirements（0.5 Terminals Only）						
3.5.9	Vibration (High Frequency)	No electrical discontinuity greater than 1μsec. shall occur. Satisfy requirements of test item on the “3.6 sequence”.			Test connector on P. C. B Mount: Fig. 10	
					Vibration Frequency (Hz)	20→200→20
					Sweep time (min)	3
					Acceleration (m / s^2)	44.1
					Vibration Direction	X, Y, Z
					Duration	3hours each
3.5.10	Shock	No electrical discontinuity greater than 1μ sec. shall occur.			Test connector on P. C. B Mount: method at Fig. 10	
					Acceleration(m/s^2)	980
					Duration(msec)	6
					Waveform	Half sine wave
					Direction and number of Drops	3 drops each directions of X,-X, Y,-Y,Z and -Z axes, totally 18 drops
					TE Spec.	109-5208
3.5.11	Connector Mating Force	0.50	70N Max		Operation Speed : 100mm/min. Measure the force required to mate connectors. TE Spec. 109-5206	
3.5.12	Connector Unmating Force	0.50	70N Max		Operation Speed : 100mm / min. Measure the force required to unmate connectors. (without housing lock) TE Spec. 109-5206	

Fig.4 (To be continued)

<table>
<tr><th>Para.</th><th>Test Items</th><th colspan="4">Requirements</th><th>Procedures</th></tr>
<tr><td colspan="7">Physical Requirements (0.50 Terminals Only)</td></tr>
<tr><td>3.5.13</td><td>Connector Locking Strength</td><td colspan="4">100N Min.</td><td>Apply an axial pull-off load to one of the mated housing, measure locking strength.
Operation Speed: 100mm/min.
TE Spec. 109-5210</td></tr>
<tr><td>3.5.14</td><td>Terminal Insertion Force into Plug housing</td><td>0.50</td><td colspan="3">10N Max.
(per 1 terminal)</td><td>Measured insertion force of terminal fitting into housing.
TE Spec. 109-5211</td></tr>
<tr><td>3.5.15</td><td>Terminal Retention Force
(at final locked position)</td><td>0.50</td><td colspan="3">40N Min.</td><td>Measure contact retention force with secondary lock set it effect. Operation Speed: 100mm/min.
TE Spec. 109-5212</td></tr>
<tr><td rowspan="2">3.5.16</td><td rowspan="2">Crimp tensile strength</td><td rowspan="2">Wire size (mm^2)</td><td colspan="2">Tensile strength(N)</td><td rowspan="2">Apply an axial pull-off load to crimped wire of contact secured on the tester.
Release the insulation barrel.
Operation speed: 100mm/min.
TE spec. 109-5205 Condition B</td></tr>
<tr><td>Initial</td><td>Final</td></tr>
<tr><td>0.35</td><td>50 MIN.</td><td>40 MIN.</td></tr>
<tr><td rowspan="2">3.5.17</td><td rowspan="2">Retention Force of Post</td><td rowspan="2">Terminal size</td><td>0.50</td><td>20N Min.</td><td rowspan="2">Push tab contact from P. C. Board side to the mating side, measure the contact retention force.
Operation speed: 100mm/min.</td></tr>
<tr><td>1.5</td><td>20N Min.</td></tr>
<tr><td>3.5.18</td><td>Resistance to “Kojiri”</td><td colspan="4">Satisfy requirements of test item on the “3.6 sequence”.</td><td>Repeated mating-unmating by hand in up-down and right-left directions for 10 cycles.
TE Specification, 109-5215</td></tr>
<tr><td rowspan="5">3.5.19</td><td rowspan="5">Solder ability</td><td colspan="4" rowspan="5">Wet Solder Coverage (only the plating side): 95 % Min.
(with under plating)</td><td>Test condition is according to the following table</td></tr>
<tr><td>Solder</td><td>Sn-3Ag-0.5Cu</td></tr>
<tr><td>Solder temperature (℃)</td><td>250±5</td></tr>
<tr><td>Immersion duration (s)</td><td>5±0.5</td></tr>
<tr><td>Flux</td><td>ULF-300R</td></tr>
<tr><td rowspan="7">3.5.20</td><td rowspan="7">Solder ability (Reflow Soldering)</td><td colspan="4" rowspan="7">Fillet shall be formed around all contact.</td><td colspan="3">Test connector on P. C. B.
Temperature should be measured at contact.
Temperature at PCB :260℃Max.</td></tr>
<tr><td>Solder</td><td colspan="2">Sn-3Ag-0.5Cu Solder Paste</td></tr>
<tr><td>Metal mask (mm)</td><td colspan="2">0.15 Min.</td></tr>
<tr><td rowspan="2">Pre-Heat</td><td>Temperature (℃)</td><td>170~190</td></tr>
<tr><td>Time (s)</td><td>110 Min.</td></tr>
<tr><td rowspan="2">soldering</td><td>Temperature (℃)</td><td>200</td></tr>
<tr><td>Times (s)</td><td>70 Min.</td></tr>
<tr><td colspan="2">Peak temperature (℃)</td><td>245 Min.</td></tr>
<tr><td rowspan="7">3.5.21</td><td rowspan="7">Resistance to Reflow Soldering Heat</td><td colspan="4" rowspan="7">Tested housing shall no evidence of deformation or fusion of housing and no physical damage.</td><td colspan="3">Test connector on P. C. B.
Temperature should be measured at contact.
Temperature at PCB :260℃Max.</td></tr>
<tr><td>Solder</td><td colspan="2">Sn-3Ag-0.5Cu Solder Paste</td></tr>
<tr><td rowspan="2">Pre-Heat</td><td>Temperature (℃)</td><td>170~190</td></tr>
<tr><td>Time (s)</td><td>110 Min.</td></tr>
<tr><td rowspan="2">soldering</td><td>Temperature (℃)</td><td>200</td></tr>
<tr><td>Times (s)</td><td>70 Min.</td></tr>
<tr><td colspan="2">Peak temperature (℃)</td><td>245 Min.</td></tr>
</table>

Fig.4 (To be continued)

<table>
<tr><th>Para.</th><th>Test Items</th><th>Requirements</th><th>Procedures</th></tr>
<tr><td colspan="4">Physical Requirements (0.50 Terminals Only)</td></tr>
<tr><td rowspan="6">3.5.21</td><td rowspan="6">Resistance to Reflow Soldering Heat</td><td rowspan="6">Tested housing shall no evidence of deformation or fusion of housing and no physical damage.</td><td colspan="3">Test connector on P. C. B.
Temperature should be measured at contact.
Temperature at PCB :260℃Max.</td></tr>
<tr><td>Solder</td><td colspan="2">Sn-3Ag-0.5Cu Solder Paste</td></tr>
<tr><td rowspan="2">Pre-Heat</td><td>Temperature (℃)</td><td>170~190</td></tr>
<tr><td>Time (s)</td><td>110 Min.</td></tr>
<tr><td rowspan="2">soldering</td><td>Temperature (℃)</td><td>200</td></tr>
<tr><td>Times (s)</td><td>70 Min.</td></tr>
<tr><td colspan="2">Peak temperature (℃)</td><td>245 Min.</td></tr>
<tr><td>3.5.22</td><td>Handling Ergonomics</td><td>No abnormalities allowed in manual mating/unmating handling.</td><td colspan="3">Manually operated.</td></tr>
<tr><td colspan="4">Environmental Requirements (0.50 Terminals Only)</td></tr>
<tr><td rowspan="5">3.5.23</td><td rowspan="5">Thermal Shock</td><td rowspan="5">Satisfy requirements of test item on the “3.6 sequence”.</td><td colspan="3">[1], [2] in the following table as one cycle.
Repeat 1000 cycles.
Monitor resistance-variation at closed circuit current of 10mA during the test.</td></tr>
<tr><td></td><td>[1]</td><td>[2]</td></tr>
<tr><td>Time (hr)</td><td>0.5</td><td>0.5</td></tr>
<tr><td>Temperature</td><td>80±3</td><td>-40±3</td></tr>
<tr><td>TE Spec.</td><td colspan="2">109-5103</td></tr>
<tr><td colspan="4">Environmental Requirements (0.50 Terminals Only)</td></tr>
<tr><td rowspan="5">3.5.24</td><td rowspan="5">Humidity (Steady State)</td><td rowspan="5">Satisfy requirements of test item on the “3.6 sequence”.
Current Leakage: 3mA Max.</td><td colspan="3">Test condition is shown in the following table.
Monitor current leakage during the test.</td></tr>
<tr><td>Time (Hr)</td><td colspan="2">96</td></tr>
<tr><td>Temperature (℃)</td><td colspan="2">60±2</td></tr>
<tr><td>Humidity(%RH)</td><td colspan="2">90~95</td></tr>
<tr><td>TE Spec.</td><td colspan="2">109-5105-2</td></tr>
<tr><td rowspan="6">3.5.25</td><td rowspan="6">Industrial Gas (SO_2)</td><td rowspan="6">Satisfy requirements of test item on the “3.6 sequence”.</td><td colspan="3">Using unmated connector
Value the performance of mated connector after test</td></tr>
<tr><td>Gas Type</td><td colspan="2">SO_2</td></tr>
<tr><td>Gas density (ppm)</td><td colspan="2">25</td></tr>
<tr><td>Gas temperature (℃)</td><td colspan="2">Room temperature</td></tr>
<tr><td>Gas humidity(%RH)</td><td colspan="2">75</td></tr>
<tr><td>Test period (Hr)</td><td colspan="2">96</td></tr>
<tr><td>TE Spec.</td><td colspan="2">109-5107</td></tr>
<tr><td>3.5.26</td><td>Temperature Life (Heat Aging)</td><td>Satisfy requirements of test item on the “3.6 sequence”.</td><td colspan="3">120℃±3℃, 120hours
TE Spec. 109-5104</td></tr>
<tr><td>3.5.27</td><td>Resistance to Cold</td><td>Satisfy requirements of test item on the “3.6 sequence”.</td><td colspan="3">-40℃±3℃, 120hours
TE Spec. 109-5108</td></tr>
<tr><td>3.5.28</td><td>Humidity-Temperature Cycling</td><td>Satisfy requirements of test item on the “3.6 sequence”.</td><td colspan="3">Condition: Fig. 11
Making this condition a cycle, repeated 10 cycles.
Monitor fluctuation of electrical resistance at 10mA current loaded during the test.</td></tr>
</table>

Fig.4 (To be continued)

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<tr><th>Para.</th><th>Test Items</th><th>Requirements</th><th colspan="3">Procedures</th></tr>
<tr><td>3.5.26</td><td>Temperature Life (Heat Aging)</td><td>Satisfy requirements of test item on the “3.6 sequence”.</td><td colspan="3">120℃±3℃, 120hours
TE Spec. 109-5104</td></tr>
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TE Spec. 109-5108</td></tr>
<tr><td>3.5.28</td><td>Humidity-Temperature Cycling</td><td>Satisfy requirements of test item on the “3.6 sequence”.</td><td colspan="3">Condition: Fig. 11
Making this condition a cycle, repeated 10 cycles.
Monitor fluctuation of electrical resistance at 10mA current loaded during the test.</td></tr>
<tr><td>3.5.29</td><td>Dust Bombardment</td><td>Satisfy requirements of test item on the “3.6 sequence”.</td><td colspan="3">Subject JIS R 5210 cement blow of 1.5kg per 10 seconds in 15 minutes intervals for 8 cycles, with mating/unmating per 2 cycles.
TE Spec. 109-5110</td></tr>
<tr><td rowspan="9">3.5.30</td><td rowspan="9">Compound Environment Resistance</td><td rowspan="9">Satisfy requirements of test item on the “3.6 sequence”.
No electrical discontinuity greater than 1μsec. shall occur.</td><td colspan="3">Test condition is shown in the following table.
Monitor resistance-variation, and after this test check if instant cutoff occurs for an hour on “3.5.9 vibration”.</td></tr>
<tr><td>Temperature (℃)</td><td colspan="2">100</td></tr>
<tr><td>Vibration Frequency (Hz)</td><td colspan="2">20→200→20 / 3Min. (Log)</td></tr>
<tr><td>Sweep time (min)</td><td colspan="2">3</td></tr>
<tr><td>Acceleration (m/s^2)</td><td colspan="2">44.1</td></tr>
<tr><td>Vibration Direction</td><td colspan="2">X, Y, Z</td></tr>
<tr><td>Duration (Hr)</td><td colspan="2">300</td></tr>
<tr><td>Test Current</td><td colspan="2">Fig.13</td></tr>
<tr><td>Method of fixation</td><td colspan="2">Fig.10</td></tr>
<tr><td rowspan="5">3.5.31</td><td rowspan="5">Condensation</td><td rowspan="5">Satisfy requirements of test item on the “3.6 sequence”.</td><td colspan="3">[1],[2] in the following table as one cycle.
Repeat 48 cycles. move [1] to [2] directly
Monitor current leakage during the test.</td></tr>
<tr><td></td><td>[1]</td><td>[2]</td></tr>
<tr><td>Time (Hr)</td><td>1</td><td>1</td></tr>
<tr><td>Temperature (℃)</td><td>-30</td><td>+25</td></tr>
<tr><td>Humidity (%RH)</td><td>---</td><td>90~95</td></tr>
<tr><td>Current loaded</td><td>Yes</td><td>Yes</td></tr>
</table>

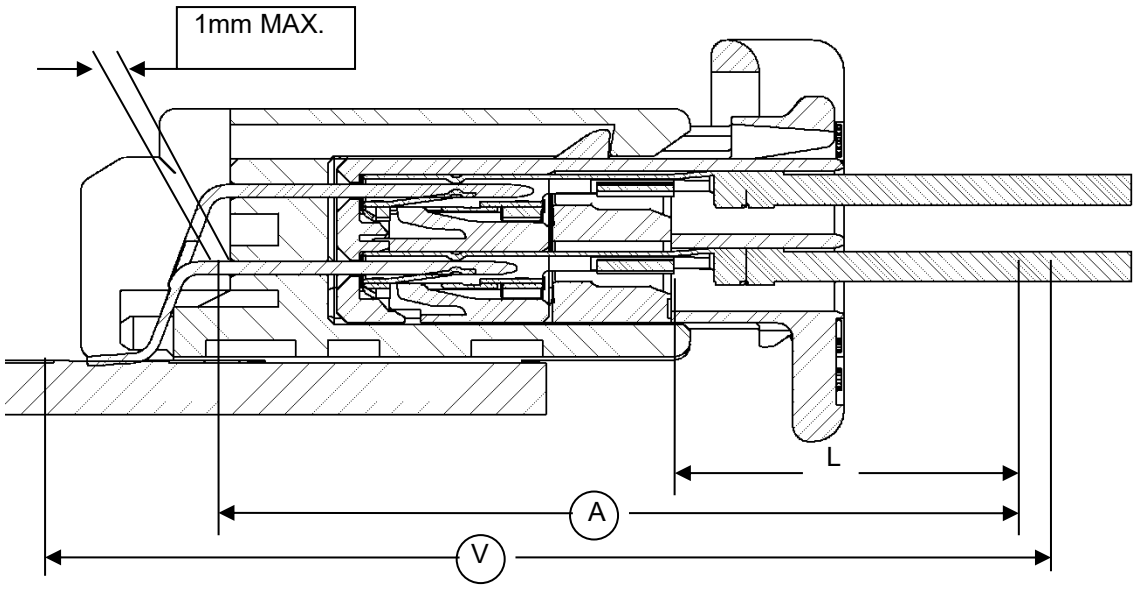
Fig. 4 (End)

3.6. Product Qualification Test Sequence

No.	Test Examination	Test Group															
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
		Test Sequence*															
3.5.1	Examination of Product	1,3	1,3	1,3	1,5	1,6	1,4	1,5	1,5	1,8	1,5	1,6	1,3	1,7	1,5	1,7	1,5
3.5.2	Termination Resistance (Low Level)	6	-	-	2,6	2,7	-	2,6	2,6	2,9	2,6	2,7	-	2,8	2,6	2,8	-
3.5.3	Termination Resistance (Rated Current)	7	-	-	3,7	3,8	-	3,7	3,7	3,10	3,7	3,8	-	3,9	3,7	3,9	-
3.5.4	Dielectric withstanding Voltage	9	-	-	-	-	-	-	-	5,12	-	-	-	5,11	-	-	-
3.5.5	Insulation Resistance	8	-	-	-	-	-	-	-	4,11	-	-	-	4,10	-	-	2,6
3.5.6	Current Leakage	-	-	-	-	-	-	-	-	7	-	-	-	-	-	-	4
3.5.7	Temperature Rising	10	-	-	-	-	-	-	-	-	-	4,9	-	-	-	5	-
3.5.8	Over Current Loading	-	-	-	4	-	-	-	-	-	-	-	-	-	-	-	-
3.5.9	Vibration (High Frequency)	-	-	-	-	5	-	-	-	-	-	-	-	-	-	6	-
3.5.10	Physical Shock	-	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-
3.5.11	Connector Mating Force	5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3.5.12	Connector Unmating Force	11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3.5.13	Connector Locking Strength	-	-	4	-	-	-	-	9	13	-	11	-	13	-	-	-
3.5.14	Contact Insertion Force	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3.5.15	Contact Retention Force	12	-	-	-	-	-	-	10	14	-	12	5	14	-	-	-
3.5.16	Crimp Tensile Strength	13	-	-	-	-	-	-	11	-	8	13	-	-	-	-	-
3.5.17	Tab Retention Force	14	-	-	-	-	-	-	-	-	-	14	-	-	-	-	-
3.5.18	Resistance to “Kojiri”	-	-	-	-	-	-	4	-	-	-	-	-	-	-	-	-
3.5.19	Solderability	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-
3.5.20	Solderability (Reflow)	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3.5.21	Resistance to Solder Heat	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3.5.22	Handling Ergonomics	-	-	-	-	-	-	-	8	-	-	10	4	12	-	-	-
3.5.23	Thermal Shock	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-	-
3.5.24	Humidity(Steady State)	-	-	-	-	-	-	-	-	6	-	-	-	-	-	-	-
3.5.25	Industrial SO_2 Gas	-	-	-	-	-	-	-	-	-	4	-	-	-	-	-	-
3.5.26	Temperature Life (Heat Aging)	-	-	-	-	4	2	-	-	-	-	5	-	-	-	-	-
3.5.27	Resistance to Cold	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	-
3.5.28	Humidity-Temperature Cycling	-	-	-	-	-	-	-	-	-	-	-	-	6	-	-	-
3.5.29	Dust Bombardment	-	-	-	-	-	-	-	-	-	-	-	-	-	4	-	-
3.5.30	Compound Environment Resistance	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	-
3.5.31	Condensation	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3

(a) Numbers indicate sequence in which tests are performed.

Fig. 5



Deduct resistance of wire “L”

Fig. 6

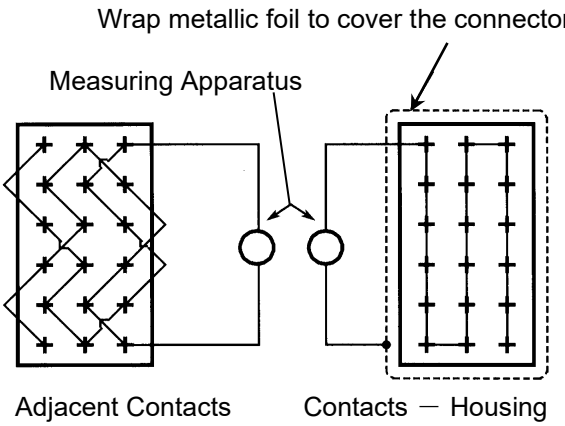


Fig. 7

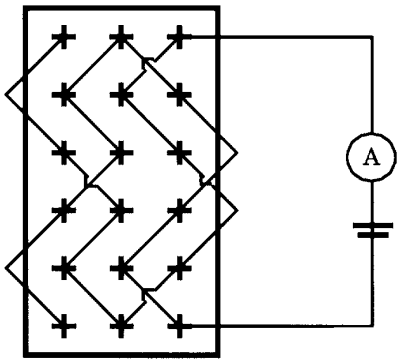


Fig. 8

Wire Size (mm^2)	Test Pattern	Test Current (A)	Duration
0.35	①	11.0	60 min.
	②	13.5	10 sec.
	③	15.0	5 sec.
	④	20.0	1 sec.

Fig. 9

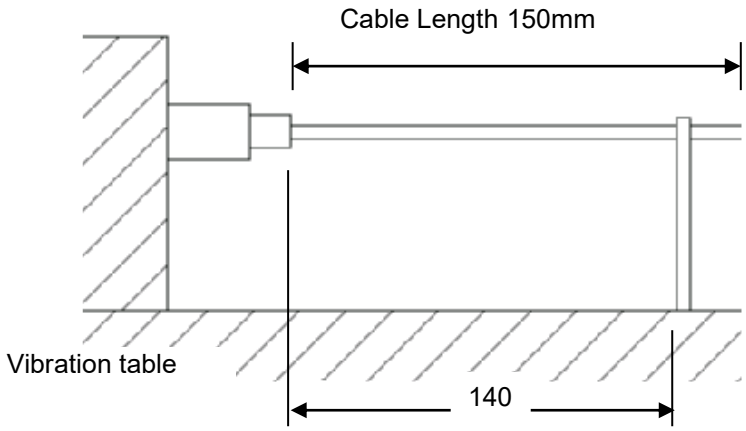

Cable Length 150mm
Vibration table
140

Fig. 10

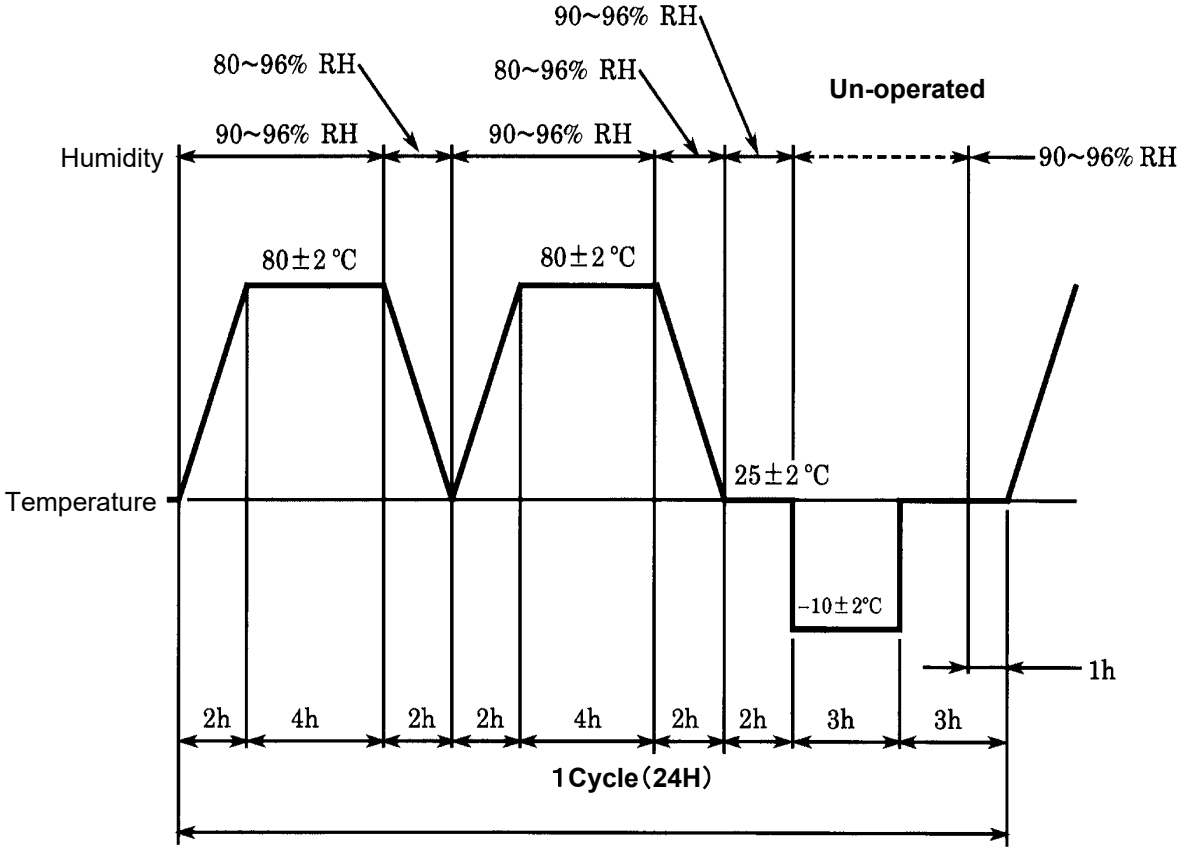

90~96% RH
80~96% RH
80~96% RH
Un-operated
Humidity
90~96% RH
90~96% RH
90~96% RH
80±2℃
80±2℃
25±2℃
Temperature
-10±2℃
1h
2h
4h
2h
2h
4h
2h
2h
3h
3h
1Cycle(24H)

Fig. 11

Contact	Wire size (mm^2)	Cap Housing (Left: Pos Right: frontage)		Test current (A)		Temperature rise (⊿t)
				Single Pos	All Pos	
0.50	0.35	12	---	5	2.5	60℃ MAX

Fig. 12

Contact	Finish	Wire size (mm^2)	Cap housing (Pos)	Test current (A)	Test time
0.50	Part of Post-Tinned	0.35	12	2.5	45 min ON、15 min OFF for one cycle 300 cycles

Fig. 13

No.	Product Part No.*	Description
○Cap Assembly (male connector)		
1	1939082	0.50/1.5 series 16Pos Cap Assembly SMT H-Type
○Plug Assembly (female connector) ･･･ Stacking Type**		
2	1903607	0.50/1.5 series 1.5 4Pos Lock Housing
3	1903611	0.50/1.5 Series 0.50 12Pos Plug Assembly (Lower Layer)
	2510061	
○Receptacle Contact (female contact)		
1827855		0.50 Receptacle Contact (S) (M) （Post-Tinned）
		1.5 Receptacle Contact （Post-Tinned）

Appendix. 1

**Note: Part number is consisted from listed base number and 1 digit numeric prefix and suffix with dash. Refer to catalog or customer drawing for specific part numbers for each base number. When prefix is zero, zero and dash are omitted.*

***Note: The construction of Cap Assembly and Plug Assembly is according to Appendix.2*

Cap Assembly (male connector)	Plug Assembly (female connector)
0.50/1.5 Ser. 16Pos.	4 + 12 (16Pos)

Appendix. 2

Note: The No. in Appendix.2 is consistent with Appendix.1.