LOCALIZED ECONOSEAL "J" MARK II+ CONNECTOR

REV	REV DESCRIPTION	DRW	APPROVER	DATE
A3	ADDED NBR NON-BIS SWS AND IPX7 TEST PROCEDURE & REQUIREMENTS,	CHANDRAKANTH U	DANAPPA.H	28 JUN 2021
A2	CONNECTOR RETENTION FORCE VALUES FOR 2P ECONOSEAL CONNECTOR UPDATED	SUKSHITHA H P	DANAPPA.H	30 JAN 2020
A1	2P ECONOSEAL PART NUMBERS ADDED AND TEST GROUPS 1,2&14 REMOVED	SANDESH CH	DANAPPA.H	14 MAR 2019
A	CREATION	SANDESH CH	DANAPPA.H	08 MAR 2018

CONTENT

1. SCOPE 3
1.1 Content 3
2. APPLICABLE DOCUMENTS 4
2.1 TE Connectivity Specifications 4
2.2 Reference Documents 5
2.3 Definition of Terms 5
2.3.1 Contact 5
2.3.2 Housing 5
2.3.3 Double Lock Plate 5
2.3.4 Rubber Plug 5
2.3.5 Cavity Plug 5
2.3.6 Seal Ring 6
3. REQUIREMENTS 5
3.1 Design and Construction 5
3.2 Materials 6
3.3 Ratings 6
3.3.1 Applicable Wires 6
3.4 Performance and Test Description 6
3.5 Test Requirements and Procedures Summary 7
4. Product Qualification and Requalification Testing 14
5. Quality Assurance Provisions 15
5.1 Test Conditions 15
5.2 Sample Preparation 15
5.2.1 Samples 15
5.2.2 Number of Samples 15
5.2.3 Wires Used 16
6. Crimping and Assembly Processing 16

LOCALIZED ECONOSEAL "J" Mark II+ Series Connector

1. Scope:

1.1 Contents:

This specification covers the requirements for product performance, test methods and quality Assurance provisions of ECONOSEAL-J Mark Ⅱ + Connector.

The applicable product descriptions and part number are as follows:

Part Number	Descriptions
171662	Receptacle Contact 070 Type
171661	Tab contact 070 Type
900324 (Silicone) **1-900325-9 (Silicone)** **2822352-1 (NBR non-Bis)** **2822354-1 (NBR non-Bis)**	Rubber Plug for .070
2822357	070 Cavity Plug
2307642	8 Pos. Plug Housing Assembly Econoseal J-Mark Connector
2307643	8 Pos. Plug Housing Econoseal J-Mark Connector
2307644	8 Pos. Peripheral seal
2307647	8 Pos. Double Lock Plate for Plug Housing Econoseal J-Mark
2307645	8 Pos. Cap Housing Econoseal J-Mark Connector
2307646	8 Pos. Double Lock Plate for Cap Housing Econoseal J-Mark
2315764	16 Pos. Plug Housing Assembly Econoseal J-Mark Connector
2315765	16 Pos. Plug Housing Econoseal J-Mark Connector
2315766	16 Pos. Econoseal J-Mark Connector Peripheral Seal
2315768	16 Pos. Double Lock Plate for Plug Housing Econoseal J-Mark

Part Number	Descriptions
2315769	16 Pos. Cap Housing Econoseal J-Mark Connector
2315767	16 Pos. Double Lock Plate for Cap Housing Econoseal J-Mark
2066042	12p.Econoseal J-Mark II Plug Assy
2066041	12 Pos. Plug Housing Econoseal Mark II Connector
2066043	12 Pos. Cap Housing Econoseal Mark II Connector
2322715	12 Pos. Peripheral Seal
2066499	12pos.Econoseal J-Mark II+ Connector Double Lock Plate For Cap Hsg
2066500	12pos.Econoseal J-Mark II+ Connector Double Lock Plate For Plug Hsg
2338360	2Pos. Plug Housing Assembly Econoseal J-Mark Connector
2338361	2pos. Plug Housing Housing Econoseal J-Mark Connector
2338362	2 Position Peripheral Seal
2338363	2 Pos. Double Lock Plate For Plug Housing Econoseal J-Mark Connector

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. 114-94473: Application Specification, Crimping Contacts for ECONOSEAL-J Mark Ⅱ +

C. 412-5325: ECONOSEAL-J Mark Ⅱ + Connector – Customer Manual.

2.2 Reference Documents:

JASO D 605	:	Automotive Multi-Pole Connectors
JASO D 7101	:	Test Methods for Molded Plastic Parts
JIS C 3406	:	Low Voltage Cables for Automobiles
JIS D 0203	:	Method of Moisture, Rain and Spray Test for Automobile Parts
JIS D 0204	:	Method of High and Low Temperature Test for Automobile Parts
JIS D 1601	:	Vibration Testing Method for Electronic Components
JIS D 0205	:	General Rules of Weatherability for Automobile Testing
JIS K 6301	:	Physical Testing Methods for Vulcanized Rubber
JIS K 2202	:	Gasoline for Automobiles

2.3 Definition of Terms:

2.3.1 Contact:

An electrically conductive metallic member, used independently or as a component of a connector assembly to form circuit connection by contacting.

2.3.2 Housing:

A dielectric component member of a connector made of insulating material that encapsulate contact in its contact cavities. In this product line, cap housing that encapsulates tab contacts, and plug housing that encapsulates receptacle contacts are available.

2.3.3 Double Lock Plate:

Attached to the housing, this plate is intended to detect improper contact mating as well as to Increase contact retention force.

2.3.4 Rubber Plug:

Attached to wire side of tab contact and receptacle contact, this plug is purposed for Water-proofing.

2.3.5 Cavity Plug:

This plug is used for blanking housing holes of unused contact position for connector having two or more positions.

2.3.6 Seal Ring:

This ring is attached to plug housing and serves for water-proofing when mated with cap housing

2.3.7 Connector:

A connector is an assembly of housing and crimped wire contacts with rubber plugs loaded in all contact positions, and further equipped with double lock plate. In this product line, cap housing assembled with tab contact and plug housing assembled with both receptacle contact and seal ring are available.

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: Pre-tinned brass or plain brass with selective gold plating over nickel underplate, conforming to Copper Alloy 260 of ASTM B 36, or pre-tinned phosphor bronze or plain phosphor bronze with selective gold plating over nickel underplate

B. Housing and Double Lock Plate: Molded Polybutylene-terephthalate (PBT) confirming to UL 94 V-2.

C. Accessories and Hardware:

Rubber Plug: Nitrile Butadiene Rubber or Silicon

Cavity Plug: Nitrile Butadiene Rubber

Seal Ring: Nitrile Butadiene Rubber or Silicon

3.3 Ratings:

A. Temperature Rating: －30℃ to + 105℃ (Ambient Temperature + Temperature Rise due to energized current)

3.3.1 Applicable Wires:

Part Number		Applicable Wire Conductor Size (mm^2)	Insulation Diameter (mm)
Contact	Rubber Plug		
171661-1 171662-1	900324-4 (Silicone) 1-900325-9 (Silicone) 2822354-1(NBR non-Bis) 2822352-1(NBR non-Bis)	0.5,1.00	1.4～2.1

3.4 Performance and Test Descriptions:

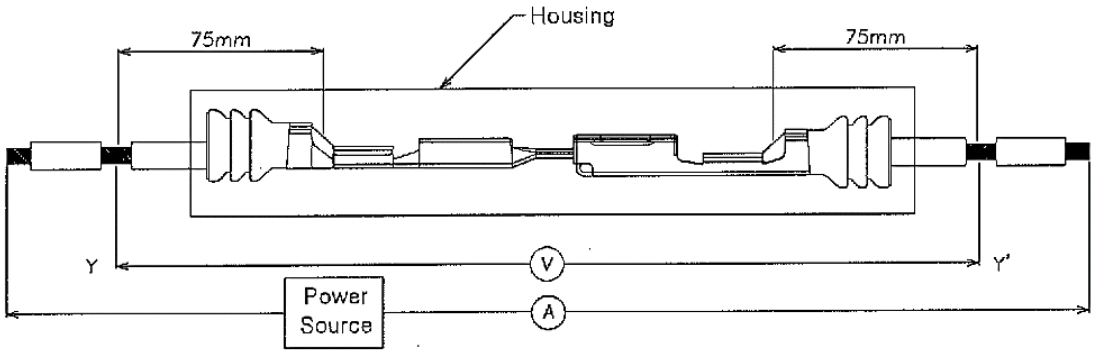
The product is designed to meet the electrical, mechanical and environmental performance requirements specified in Para. 3.5. All tests are performed at ambient temperature unless otherwise specified.

3.5 Test Requirements and Procedures Summary:

Para.	Test Items	Requirements	Procedures
3.5.1	Confirmation of Product	Product shall be conforming to the requirements of applicable product drawing and Application Specification 114-5082	Visually, dimensionally and functionally inspected as per applicable inspection plan.
3.5.2	Connector Mating Force	No. of Pos. / Mating Force N Max. 2 / 49 8 / 98 12 / 137 16 / 170.5	Measure the force required to mate connector using locking latch by operating at 100mm approx. a minute, with the locking mechanism of housing set in effect.

<table>
<tr>
<td>3.5.3</td>
<td>Connector Unmating Force</td>
<td>
<table>
<tr><th>No. of Pos.</th><th>Mating Force N Max.</th></tr>
<tr><td>2</td><td>39</td></tr>
<tr><td>8</td><td>98</td></tr>
<tr><td>12</td><td>137</td></tr>
<tr><td>16</td><td>170.5</td></tr>
</table>
</td>
<td>Measure the force required to unmate connector using locking latch by operating at 100mm a minute, without the locking mechanism of housing set in effect.</td>
</tr>
<tr>
<td>3.5.4</td>
<td>Double Lock Plate Loading Force</td>
<td>
<table>
<tr><th>No. of Pos.</th><th>loading Force N Max.</th></tr>
<tr><td>2</td><td>39</td></tr>
<tr><td>8</td><td>59</td></tr>
<tr><td>12</td><td>59</td></tr>
<tr><td>16</td><td>78</td></tr>
</table>
</td>
<td>Fix housing of the testing machine, and insert locking plate in axial direction by operating the head at a rate of 100mm approx. a minute. Measure the force required to complete loading of locking plate.</td>
</tr>
<tr>
<td>3.5.5</td>
<td>Termination Resistance (Low Level)</td>
<td>3mΩ max. (Initial)
10mΩ max. (Final)</td>
<td>Measure by applying closed circuit current of 50mA max. at open circuit voltage of 50mV max. to the mated contact test circuit in housing. Fig.2.</td>
</tr>
<tr>
<td>3.5.6</td>
<td>Termination Resistance (Specified Current)</td>
<td>Millivolt Drop:
3mV/A max. (Initial)
10mV/A max. (Final)</td>
<td>Measure by applying 1A at 12V DC to contacts in mated connectors, by probing at 75mm apart from wire crimp after temperature becomes stabilized. (Probing at Y and Y’ in Fig.2) Fig.2.</td>
</tr>
</table>

Termination Resistance (Low Level):



Termination resistance is obtained after deducting the millivolt drop of 150mm-long wire used for termination.
Probing points Y and Y’ shall be pretreated by uniform soldering in order to stabilize measurement reading during the test.

Fig.2 Measurement of Termination Resistance

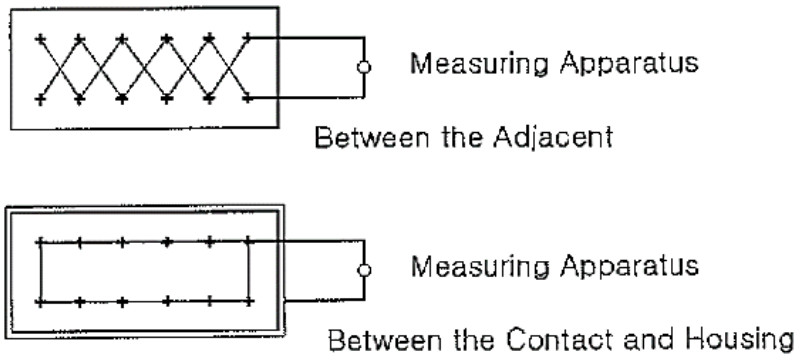
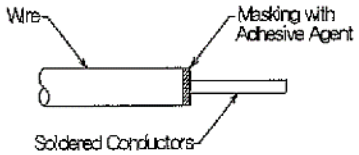
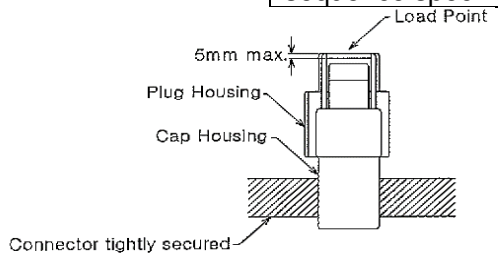
<table>
<tr><td>3.5.7</td><td>Insulation Resistance</td><td>100MΩ min. (Initial)</td><td>Measure by applying test potential between the adjacent contacts, and between the contacts and ground in the mated connectors.</td></tr>
<tr><td>3.5.8</td><td>Dielectric Strength</td><td>Connector must withstand test potential of 1.0kVAC for 1 minute. No physical damage shall be evident after the test.
 

Fig. 3</td><td>Measure by applying test potential between the adjacent contacts, and between the contacts and ground in the mated connector. Fig.3.</td></tr>
<tr><td>3.5.9</td><td>Handling Ergonomics</td><td>No abnormal touch shall be perceived during mating/ unmating, that may cause pain or fatigue on separator’s hand.</td><td>Repeat mating and unmating of connectors by hands.</td></tr>
<tr><td>3.5.10</td><td>Contact Retention Force</td><td>Contact shall not dislodge a distance greater than 78.5N Min.</td><td>Apply an axial load to 0.85mm², 100mm long crimped contact on housing. Measure the force required to dislodge the contact from housing with double lock plate engaged.

TE Spec. 109-30</td></tr>
<tr><td>3.5.11</td><td>Housing Locking Retention Force:</td><td><table><tr><th>No. of Pos.</th><th>Retention Force N Min.(Final)</th></tr><tr><td>2</td><td>78</td></tr><tr><td>8</td><td>98</td></tr><tr><td>12</td><td>98</td></tr><tr><td>16</td><td>98</td></tr></table></td><td>Fix mated pair of connectors on testing machine, and apply an axial separating force to one of them. Measure the force required to separate the connectors, with or without breakage of locking leg.</td></tr>
</table>

3.5.12	Watertight Sealing	49kPa (4.9mN/mm^2) min. (Initial) 29.4kPa (2.9mN/mm^2) min. (Final)  Fig. 4	Blow compressed air into mated pair of connectors through a small hole. For this test, wire ends are sealed with solder and adhesive masking. Place the connectors in 30cm deep water, and must withstand the air pressure of 9.8kPa (1mN/mm 2) for 30 seconds. Increase pressure at a rate of 9.8kPa (1mN/ mm 2) each time until air leakage takes place.
3.5.13	Temperature Life	Must meet the specified requirements after testing in the sequence specified in Fig.9.	Expose mated connectors under elevated temperature at 120±2℃ for 120 hours. Recondition in the room temperature before subsequent measurement.
3.5.14	Resistance to Cold	Must meet the specified requirements after testing in the sequence specified in Fig.9.	Expose mated pair of connectors under the cold atmosphere at －50±5℃ for 120 hours. Recondition in the room temperature before the subsequence measurement.
3.5.15	Resistance to “Kojiri”	Must meet the specified requirements after testing in the sequence specified in Fig.9.  Fig. 5	Tightly secure a connector on a sturdy bench, and mate the counterpart connector. In the unmating way, apply 196N·cm (T) force in right-left directions at every 1mm graduation along the disengaging full stroke. Making one disengagement a cycle repeat for 25 cycles. When the first direction cycles are completed, apply another 25 cycles to the traverse directions or manually repeat mating / unmating of connectors for 50 cycles with Kojiri motion mode. Fig.5.
3.5.16	Resistance to Liquid Detergents:	Must meet the specified requirements after testing in the sequence specified in Fig.9.	Immerse mated connectors into commercially suppliable car washer liquid detergent at 50±2℃ for 2 hours. After the durations, rinse in tap water for 5 minutes, and have it dried before subsequent measurement.
3.5.17	Resistance to Coolant	Must meet the specified requirements after testing in the sequence specified in Fig.9.	Immerse mated connectors into commercially suppliable L.L.C (long life coolant) at 50±2℃ for 2 hours. After the duration, lines in tap water for 5 minutes, and have it dried before subsequent measurement.

<table>
<tr><td>3.5.18</td><td>Resistance to Oil</td><td>Must meet the specified requirements after testing in the sequence specified in Fig.9.</td><td colspan="4">Immerse mated connectors into oils the following in the specified sequence:<table><tr><th>No.</th><th>Oil Names</th><th>Temperature</th><th>Dura-tion</th></tr><tr><td>1</td><td>Engine Oil (SAE 10w)</td><td>50±2℃</td><td>60 min.</td></tr><tr><td>2</td><td>Kerosene Linse</td><td>Room Temp.</td><td>5 min.</td></tr><tr><td>3</td><td>Motor Gasoline</td><td>Room Temp.</td><td>60 min.</td></tr><tr><td>4</td><td>Drying w/o Powered Ventilation</td><td>Room Temp.</td><td>AS Req’d</td></tr></table></td></tr>
<tr><td>3.5.19</td><td>Resistance to Ozone</td><td>Must meet the specified requirements after testing in the sequence specified in Fig.9.</td><td colspan="4">Suspend mated connector in a closed container, and expose in ozone atmosphere of 50±5ppm concentration per JIS K 6301 , Para.16, at 40±2℃ for 24 hours. After the duration, recondition in the room temperature, before subsequent measurement. Record cracking condition of tested rubber surfaces, according to JIS K 6301, Para.16.6.</td></tr>
<tr><td>3.5.20</td><td>Weather Aging:</td><td>Must meet the specified requirements after testing in the sequence specified in Fig.9.</td><td colspan="4">Expose mated connectors under the sunshine Xenon arc light beam per JIS D 0205, Para.5.4 (WAN-1S), Aging Tester, at 63±3℃ for 150 hours. Record cracking condition of tested rubber surfaces, according to JIS K 6301, Para.16.6.</td></tr>
<tr><td>3.5.21</td><td>Dust Bombardment</td><td>Must meet the specified requirements after testing in the sequence specified in Fig.9.</td><td colspan="4">Subject mated connectors to ejection of Port 1 and cement or Kanto Loam dust powder dispersed by compressed air blowing at a rate of 1.5kg per 10 seconds at every other 15 minutes for the total of 1hour. After completion of duration, repeat mating / unmating for 3cycles.</td></tr>
</table>

3.5.22	Temperature Rise	50℃ max. Must meet the specified requirements after testing in the sequence specified in Fig.9.	Subject mated connectors with all the contacts series wired, to be energized with the current of the intensity obtained by Fig.6. Measure temperature rising in a draft-free chamber after temperature becomes stabilized.
3.5.23	Water Sprinkle	Must meet the specified requirements after testing in the sequence specified in Fig.9. Current Leakage:100μA max.	Suspend mated connector in a closed cham ber. Subject it to heat at 120±3℃ for 40 minutes followed by sprinkling of water at room temperature for 20 minutes. Making this a cycles, repeat for 48 cycles per JIS D 0203. S1. Energize the contacts with 12VDC, and monitor the circuits for current leakage. Connected 2 meter lead wires are drawn out of the chamber for measurement.
3.5.24	Compound Environ-mental Testing (Optionally performed by customer's requirements)	Must meet the requirements after testing in the sequence specified in Fig.9.	Subject mated connectors, with all the loaded contacts series-wired as shown in Fig.7, to 44m/s^2 (4.5G) Vibration to reciprocate between 20-200 Hz one cycle every 3 minutes for 100 hours each to three axial directions. Measure termination resistance (low level) at completion of each axis vibration cycle. During vibration, apply test current of the intensity obtain by Table 1, for 45 minutes ON, and 15 minutes OFF for 300 cycles, in the heat cycle test condition to reciprocate between 80±3℃, −30±3℃, in 80-95% R.H. atmosphere. Fig.8.

<table>
<tr>
<td rowspan="2">3.5.25</td>
<td rowspan="2">Current Cycling</td>
<td>Must meet the specified requirements after testing in the sequence specified in Fig.9.</td>
<td>Subject mated contact to test current of the intensity obtained by Fig.6 applied for 300 cycles intermittently 45 minutes ON, 15 minutes OFF to the series wired contacts.</td>
</tr>
<tr>
<td colspan="2">
<table>
<tr><th>Wire Size (mm²)</th><th>Test Current (DC A)</th></tr>
<tr><td>0.2</td><td>7</td></tr>
<tr><td>0.3</td><td>9</td></tr>
<tr><td>0.5</td><td>11</td></tr>
<tr><td>0.85</td><td>14.5</td></tr>
<tr><td>1.25</td><td>18.5</td></tr>
</table>
<table>
<tr><th>No. of Positions</th><th>Reduction Coefficient</th></tr>
<tr><td>1</td><td>1</td></tr>
<tr><td>2～3</td><td>0.75</td></tr>
<tr><td>4～5</td><td>0.6</td></tr>
<tr><td>6～8</td><td>0.55</td></tr>
<tr><td>9～12</td><td>0.5</td></tr>
<tr><td>13～16</td><td>0.45</td></tr>
</table>
Fig.6
Note: Applying current is obtained by calculation by multiplying the current value of applicable wire size and the reduction coefficient according to the number of contact loading of the connector.
</td>
</tr>
<tr>
<td>3.5.26</td>
<td>Vibration Sinusoidal High Frequency</td>
<td>No electrical discontinuity greater than 1 microsecond shall occur.
Must meet the specified requirements after testing in the sequence specified in Fig.9.</td>
<td>Subject mated connectors to 20-200 Hz traversed in 3 minutes with 44m/s² (4.5G) accelerated velocity; 2 hours each for “X” and “Y” axis, and 4 hours for “Z” axis. Monitor circuit for electrical discontinuity greater than 1μsec. taking place in the series-wired contacts.</td>
</tr>
<tr>
<td>3.5.27</td>
<td>Contact Insertion Force</td>
<td>The maximum Insertion Force for a terminal is 30 Newtons.</td>
<td>Adjust the force tester to insert the terminal straight into the connector at a uniform rate not to exceed 50 mm per minute.Upon reaching the forward stop, continue applying force until failure point of the forward stop is reached (plastic failure or terminal damage).
Acc to USCAR-2- Para.5.4.1.3 A6 (Rev 6)</td>
</tr>
</table>

3.5.28	IPX7	Water shall not penetrate in a quantity causing harmful effects if the enclosure is immersed in water temporarily under specified pressure and time conditions. Acc to ISO20653	Keep The connector in the immersion basin at immersion depth of 1m (Deepest housing location). Difference of the temperature of the equipment under test no more than 5°C for 30 Min.
3.5.29	Dry Heat	Must meet the specified requirements after testing in the sequence specified in Fig.9.	Expose mated connectors under elevated temperature at 130 ℃ for 120 hours. Recondition in the room temperature before subsequent measurement.

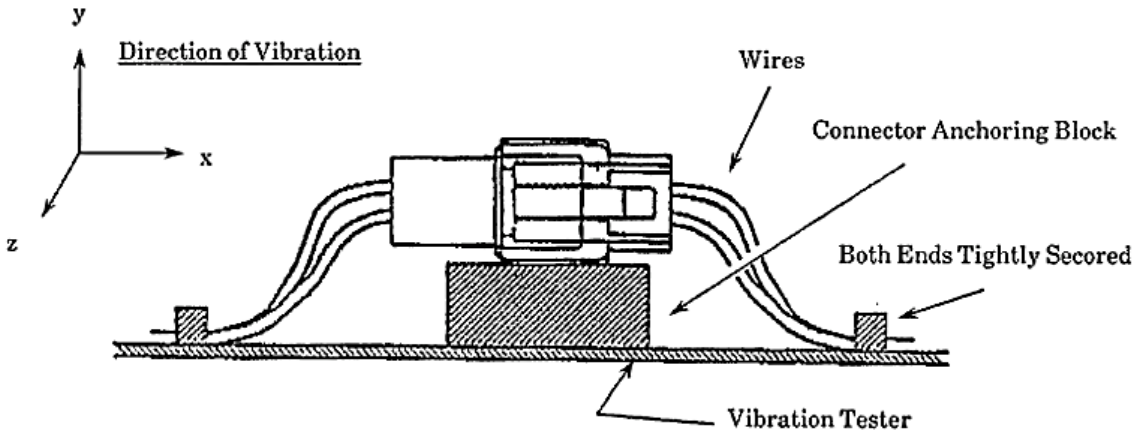


Fig.7

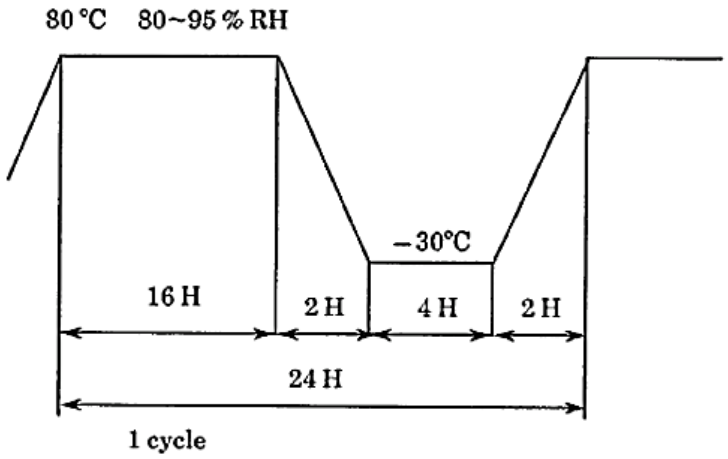


Fig.8

4. Product Qualification and Requalification Testing: Fig 9

Test of Examination	Sample groups										
	3	4	5	6	7	8	9	10	11	12	13
	Test Sequence										
Examination of Product	1	1	1	1	1	1	1,4	1,4	1	1	1
Connector Mating Force		2,10									
Connector Unmating Force		4,11									
Double Lock Plate Loading Force	3										
Termination Resistance Low Level		3,6 8		2,6 8,10			2,5	2,5	2,4	2,4	
Termination Resistance Specified Current			2,5		2,5 7						
Watertight Sealing		9		12	8	3	6	6			
Insulation Resistance				3,11							
Dielectric Withstanding Strength			4								
Handling Ergonomics					3						
Contact Retention Force	4										
Housing Retention Force		12									
Temperature Life		5									
Resistance to Cold		7									
Water Sprinkle						2					
Resistance to Kojiri					4						
Composite Environmental Test					6						
Resistance to Liquid Detergents				4							
Resistance to Coolant				5							
Resistance to Oil				7							
Resistance to Ozone							3				
Weather Aging								3			
Dust Bombardment				9							
Temperature Rise			3								
Vibration Sinusoidal High Frequency									3		
Current Cycling										3	
IP X7											3
Contact insertion Force	2										
Dry Heat											2

***NOTE:** Test group 7- Optionally performed by customer's requirements.

(a) The number in the columns indicate the sequence in which the tests are performed.

5. Quality Assurance Provisions:

5.1 Test Conditions:

Unless otherwise specified all the tests shall be performed in any combination of the following test conditions.

Temperature	15～35℃
Relative Humidity	45～75%
Atmospheric Pressure	86.7～107KPa
	(650～800mmHg)

Fig.10

5.2 Sample Preparation:

5.2.1 Samples:

The samples to be employed for the tests shall be prepared in accordance with 114-5082,

TE Application Specification, Crimping .070 & .250 Series Contact for AMP-ECONOSEAL "J"

Mark Ⅱ + Connector, by using the wires specifi ed in Table 8. No sample shall be reused, unless otherwise specified.

5.2.2 Number of Samples:

The number of contact and connector samples shall be consisting of more than 10 pieces contacts for testing contact, and more than 2 sets of connectors for testing connector.

5.2.3 Wires Used: The wires to be employed for the tests shall be the ones specified in Fig.11.

Nominal Size	Number of Strands/ Diameter of strands (mm)	Calculated Cross Section Area (mm^2)	Overall Outside Diameter (Standard) (mm)
0.5	16/0.21	0.55	1.4-1.6
0.7	24/0.21	0.83	1.7-1.9
1	32/0.21	1.108	1.9-2.1

Fig.11

6 Crimping and Assembly Processing:

In order to maintain reliable termination performance of housing and contacts, crimping contact shall be performed in accordance with 114-5082, TE Application Specification, Crimping .070 & .250 Series Contact for ECONOSEAL “J” Mark Ⅱ + Connector. Manufacturing harness and extracting contacts shall be performed in accordance with Customer Manual 412-5325, ECONOSEAL “J” Mark Ⅱ + Connectors.