090 SPT 32P, 40P, 76P Connector

1. SCOPE

1.1. Content

This specification covers the requirements for product performance, test methods and quality assurance provisions of 090 SPT Connector.

1.2. Qualification

When tests are performed on the subject product line, procedures specified shall be used. All inspections shall be performed using the applicable inspection plan and product drawing.

1.3. Qualification Test Results

Successful qualification testing on the subject product line has not been completed. The Qualification Test Report number will be issued upon successful qualification testing.

2. APPLICABLE DOCUMENTS AND FORMS

The following documents and forms constitute a part of this specification to the extent specified herein. Unless otherwise indicated, the latest edition of the document applies.

2.1. TE Documents

- 936321: Customer Drawing (090 SPT HYB 32P PLUG)
- 936352: Customer Drawing (090 SPT HYB 40P PLUG)
- 936195: Customer Drawing (090 SPT HYB 76P PLUG)

3. REQUIREMENTS

3.1. Design and Construction

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

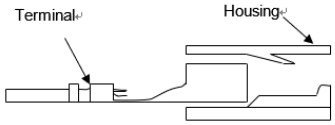
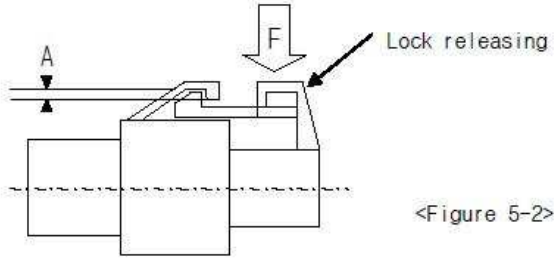
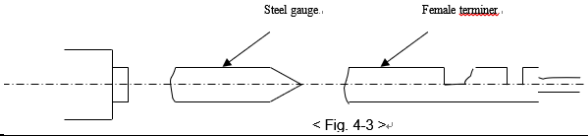
3.2. Ratings

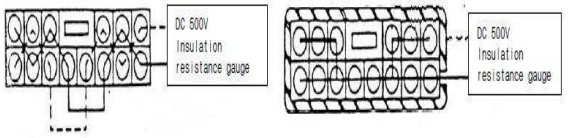
Voltage	Temperature	Humidity
12V DC	25±5℃	60±20%

3.3. Test Requirements and Procedures Summary

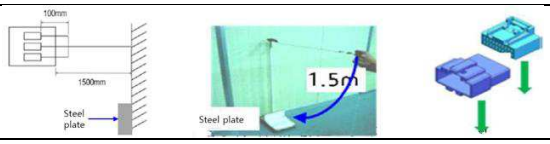
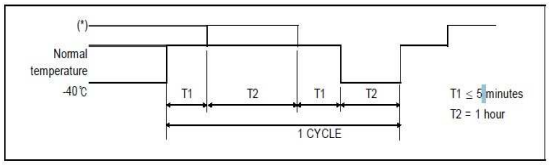
Unless otherwise specified, all tests shall be performed at ambient environmental conditions.

TEST DESCRIPTION	REQUIREMENT	PROCEDURE

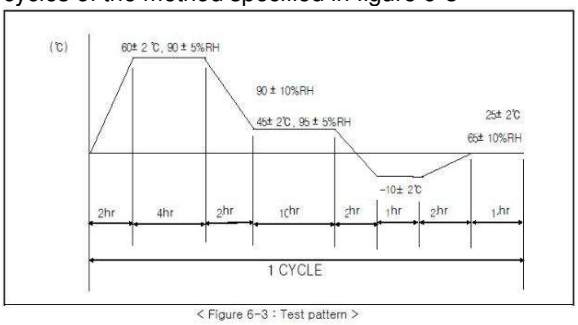
Appearance	No crack, damage, distortion are permitted	Using sense of sight and touch.
CONN engage and disengage force	Max 7.6 kgf and less	Measure force by inserting and disengaging the connector with terminal assembled at constant 50 mm/min speed. However, remove lock part when measuring disengage force.
Reverse insertion between housings	It shall not be incorrectly inserted by applying force of 20kgf.	Insert the housing with terminal by pushing it in reverse direction with applying 20kgf.
Reverse insertion between terminal and housing	5kgf or more	Crimp cable of maximum size on terminal and then, insert it into housing by the end of insulation.
Engage force between terminal and housing	1.5kgf or less	As shown in the following figure 4-1, measure the weight while inserting terminal into fixed housing at 50mm/min speed.  <Figure 4-1>
Strength of HSG lock	Min 10kgf	Combine housing only, fix the one side of housing in completely locked condition, and extend the other side in axial direction and 30 angle direction at a constant speed of 50mm/min. Then measure weight when lock structure is disengaged or destroyed.
HSG lock releasing force	Max 6kgf	Apply force (F) to lock releasing part, and measure weight on the point of A=0. However, cut connector and then perform test at the section in order to secure visibility.  <Figure 5-2>
Terminal retention force	090 Min 10kgf	Fix the housing after inserting crimped terminals. Extend one line of cable in axial direction at a speed of 50mm/min at a position 50~100mm away from crimped part, and measure weight when terminal is disengaged from the housing.
Terminal engage and disengage force (kgf)	Engage: 090 : 0.3~1.0kgf Disengage: 090 : 0.15~1.0kgf	As shown in figure 4-3, engage and disengage male terminal or steel gauge into or from female terminal at 50 mm/min speed.  < Fig. 4-3 >
Crimp strength	090 : Min 20kgf	Fix the crimped terminal, and draw the cable at a position 50~100 mm away from crimped part in axial direction at 100 mm/min speed. Then measure the weight when cable is cut or disengaged from the crimped part.
Voltage Drop	090 : Max 3mV/A	Measure the circuit voltage drop (V) by sending voltage and current described in the table 5-1 with terminal combined on the connector.

<table>
<tr><td></td><td></td><td>Then calculate a voltage drop (VD) in terminal
by subtracting cable resistance (L) from the circuit voltage drop (V).
1)HARNESS versus UNIT:VD =V(L3+L4)
<table><tr><td>Application</td><td>Open voltage</td><td>Short circuit current</td><td>Division</td></tr><tr><td>Signal circuit</td><td>20 ± 5 mV</td><td>10 mA</td><td>ECU, Sensor</td></tr><tr><td>Power circuit</td><td>13 V</td><td>1 A</td><td>Other than the above</td></tr></table>
<Table5-1></td></tr>
<tr><td>Insulation resistance</td><td>Min 250 MΩ</td><td>Measure resistance between neighbor terminals (figure 5-6), and between terminal and housing surface (figure 5-7) with DC 500V insulation resistance gauge with connector combined.
 

<Figure 5-6: Between neighboring terminals> <Figure 5-7: Between neighboring terminal and housing surface></td></tr>
<tr><td>Leakage current</td><td>Max 1㎂</td><td>Measure it by applying DC 14V between neighboring terminals</td></tr>
<tr><td>High voltage test</td><td>No allowed insulation breakdown</td><td>Measured by applying test potential of 1000 V AC between the adjacent contact between the contact and housing.</td></tr>
<tr><td>Temperature rise</td><td>Max 40℃</td><td>Apply basic current (I=I0×K) of clause 5.3 to the connector with electrodes in series in the room free from wind (normal temperature). And measure a temperature of crimped part after reaching saturation temperature. Then calculate a temperature of crimped part by subtracting ambient temperature from the temperature.</td></tr>
<tr><td>Twisting Test
- Connector Engage and Disengage Endurance Test</td><td>Appearance: No crack, damage, distortion are permitted
Max 10mV/A</td><td>Apply 8kgf force on the end part of combined connector 10 times each in the (front, rear, left, right) directions perpendicular to axial direction.
Make combine connectors engage and disengage at 100mm/min. Perform it 50 times.
(Do not use locking device)</td></tr>
<tr><td>Overcurrent cycle test</td><td>Appearance: No crack, damage, distortion are permitted
Voltage Drop: Max 10mV/A
Temperature Rise: Max 40℃</td><td>Engage and disengage connector with terminal assembled 10 times with hands, and apply the following current 1000 cycles for the connector with electrodes in series at 60℃ of ambient temperature.</td></tr>
<tr><td>Cold temperature test</td><td>Appearance: No crack, damage, distortion are permitted
Insulation Resistance:
Current Leakage: Max 1mA</td><td>Leave connector with terminal assembled in temperature chamber of -40℃ for 120 hours and estimate below items for each sample dividing two groups.
Estimate voltage drop and leakage current assembled connector.
Leave connector for 2 hours and separate connector with male and female, and then drop it onto the concreate surface more than 10T from 1.5m height 3 items. The method of connector drop follows figure 6-1.</td></tr>
</table>

			
Cold and hot temperature shock test	Appearance	No crack, damage, distortion are permitted	Engage and disengage Connector with terminal assembled 10 times with hands, this repeats 200 CYCLE by below test condition. (Sealed : 120℃, Non-Sealed : 80℃) 
	Voltage Drop	Max 10mV/A	
High temperature test	Appearance	No crack, damage, distortion are permitted	Engage and disengage connector with terminal assembled 10 times with hands, and leave it in combined state at the temperature chamber of the table 6-1 for 300 hours. Then pick it out and leave it until it returns to normal temperature.
	Voltage Drop	Max 10mV/A	

High temperature(*)	Connector using part
80℃	Non-waterproof connector

Temperature Humidity Test	Appearance	No crack, damage, distortion are permitted	Engage and disengage connector with terminal assembled 10 times with hands, and leave it at 25℃ ambient temperature and 65% relative humidity for 25 hours. And perform 5 cycles of the method specified in figure 6-3  < Figure 6-3 : Test pattern >
	Voltage Drop	Max 10mV/A	
	Insulation Resistance	Min 10 kΩ housing surface	
	Current Leakage	Max 1mA	
Dust Test	Voltage Drop	Max 10mV/A	Engage and disengage connector with terminal assembled 10 times with hands, and diffuse 1.5kg Portland cement(JIS R5210) with fan (or others) for 10 seconds per 15 minutes while maintaining 150mm distance from wall in the closed container of 900~1200mm length, width and height, with connector combined. After 1 hour, measure it.
Oil and liquid test	Appearance	No crack, damage, distortion are permitted	Engage and disengage connector with terminal assembled 10 times with hands, and perform test each sample with connector combined. A. Immerge connector in combined state for 2 hours in mixed oil of 50± 2℃ ENG oil (SAE10W) or equivalent oil and B. Immerge connector in combined state for1 hour in car gasoline (JIS K2202) at normal temperature, and then pick it out.

<table>
<tr><td></td><td>Voltage Drop</td><td colspan="2">Max 10mV/A</td><td>C. Immerge connector in combined state for 1 hour in brake liquid (pure product) at normal temperature, and then pick it out.
D. Immerge connector in combined state for 1 hour in 100% washer liquid (pure product) at normal temperature, and then pick it out.
E. Immerge connector in combined state for 1 hour in 50% LLC (Long life coolant) at normal temperature, and then pick it out.</td></tr>
<tr><td rowspan="2">Ozone Test</td><td>Appearance</td><td colspan="2">No crack, damage, distortion are permitted</td><td rowspan="2">Engage and disengage Connector with terminal assembled 10 times with hands, and samples keep at 40℃ and 50±5pphm Ozone for 100hour. Then pick connector out of chamber and dry it for 2hours or more.</td></tr>
<tr><td>Voltage Drop</td><td colspan="2">Max 10mV/A</td></tr>
<tr><td rowspan="2">Sulfur (SO2) gas test</td><td>Appearance</td><td colspan="2">No crack, damage, distortion are permitted</td><td rowspan="2">Engage and disengage connector with terminal assembled 10 times with hands, and expose it in combined state to sulfur gas of 40±3℃, density 10ppm, humidity 90~95%, for 24 hours. Then pick connector out of chamber and dry it for 2 hours or more.</td></tr>
<tr><td>Voltage Drop</td><td colspan="2">Max 10mV/A</td></tr>
<tr><td rowspan="4">Salt water test</td><td>Appearance</td><td colspan="2">No crack, damage, distortion are permitted</td><td rowspan="4">Engage and disengage connector with terminal assembled 10 times with hands, and pout it in 35℃ temperature regulation chamber, spray 5% salty water for 24 hours according to JIS Z2371, and, maintain room temperature without spray for 1 hour, Then repeat this four times. Then pick connector out of chamber and dry it at room temperature for 2 hours or more.</td></tr>
<tr><td>Voltage Drop</td><td colspan="2">Max 10mV/A</td></tr>
<tr><td rowspan="2">Insulation Resistance</td><td rowspan="2">Min 10 kΩ</td><td>Between terminals</td></tr>
<tr><td>housing surface</td></tr>
<tr><td>Current Leakage</td><td colspan="2">Max 1mA</td></tr>
<tr><td rowspan="6">Complex environment endurance test</td><td>Appearance</td><td colspan="2">No crack, damage, distortion are permitted</td><td rowspan="6">Engage and disengage connector with terminal assembled 10 times with hands, and leave it in combined state in the temperature chamber of 120℃ or 80℃ (follows table 7) for 48 hours.
And then perform the following vibration test. Then measure instant short circuit according to the method of clause 4.16 for 4 hours for X, Y, Z each.
<table>
<tr><th>Division</th><th>Condition</th></tr>
<tr><td>Ambient temperature/humidity</td><td>80℃, 90~95%</td></tr>
<tr><td>Applied current</td><td>Basic current (Connector electrodes in series.)</td></tr>
<tr><td>Current application cycle</td><td>120 CYCLE (45 minutes-ON, 15 minutes-OFF)</td></tr>
<tr><td>Vibration acceleration</td><td>4.4g</td></tr>
<tr><td>Frequency</td><td>20Hz ~ 200Hz (sweep time: 3 minutes or less)</td></tr>
<tr><td>Vibration time</td><td>40 hours for X, Y, Z each</td></tr>
<tr><td>Connector attaching method</td><td>Test mode A, B, C</td></tr>
</table></td></tr>
<tr><td>Crimp Tensile Strength</td><td>040</td><td>Min 9kgf</td></tr>
<tr><td></td><td>090</td><td>Min 20kgf</td></tr>
<tr><td>Voltage Drop</td><td colspan="2">Max 10mV/A</td></tr>
<tr><td>Temperature Rise</td><td colspan="2">Max 40℃</td></tr>
<tr><td>Instant short circuit</td><td colspan="2">Max 10μs</td></tr>
</table>

3.4. Applied Part No List

TE Part no	Description
936321	090 SPT HYB 32P PLUG ASSY
936352	090 SPT HYB 40P PLUG ASSY
936195	090 SPT HYB 76P PLUG ASSY