



The product described in this document has not been fully tested to ensure conformance to the requirements outlined below. Therefore, TE Connectivity (TE) makes no representation or warranty, express or implied, that the product will comply with these requirements. Further, TE may change these requirements based on the results of additional testing and evaluation. Contact TE Engineering for further details.

**SPT 4P PLUG ASSEMBLY**

**1. SCOPE**

1.1. Content

This specification covers the requirements for product performance, test methods and quality assurance provisions of SPT 4P Plug Assembly

1.2. Qualification

When tests are performed on the subject product line, procedures specified in Figure 1 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

- 936444: Customer Drawing (SPT 4P PLUG ASSY)

**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

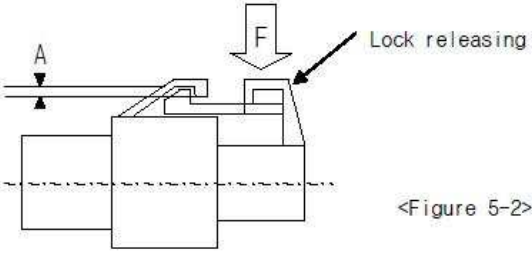
Voltage	Temperature	Humidity
12V DC	25±5°C	60±20%

3.3. Test Requirements and Procedures Summary

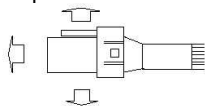
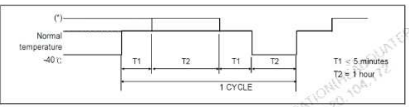
Unless otherwise specified, all tests shall be performed at ambient environmental conditions.

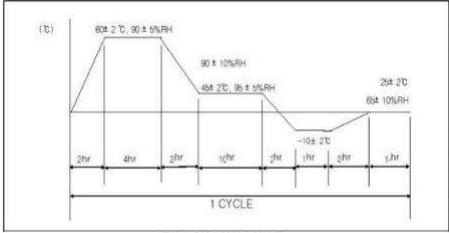
3.3.1 ES91500-00

TEST DESCRIPTION	REQUIREMENT	PROCEDURE
Appearance	No crack, damage, distortion are permitted	Using sense of sight and touch.
CONN engage and disengage force	Min 10kgf	Measure force by inserting and disengaging the connector with terminal assembled at constant 100 mm/min speed.

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	It shall not be incorrectly inserted by applying force of 5kgf.	Crimp cable of maximum size on terminal and then insert it into housing by applying force of 5kgf in the reserve direction.												
Engage force between terminal and housing	Max 1.5kgf	Measure the weight while inserting terminal into fixed housing at 100mm/min speed.												
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 at a constant speed of 100mm/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. 												
Terminal retention force	Min 10kgf	Fix the housing after inserting crimped terminals. Extend one line of cable in axial direction at a speed of 100mm/min at a position 50~100mm away from crimped part, and measure weight when terminal is disengaged from the housing.												
Engage and disengage force of terminal	Engage: 0.5~2kgf Disengage: 0.5~2.1kgf	Engage and disengage male terminal or steel gauge into or from female terminal at 100mm/min speed												
Crimp strength	3.0SQ: Min 35kgf	Fix the crimped terminal and draw the cable at a position 50~100mm away from crimped part in axial direction at 100mm/min speed. Then measure the weight when cable is cut or disengage from the crimped part.												
Voltage Drop	090~375series: Max 3mV/A	Measure the circuit voltage drop (V) by sending voltage and current described in the table -1 with terminal combined on the connector. Then calculate a voltage drop (VD) in terminal by subtracting cable resistance (L) from the circuit voltage drop (V). <table border="1" data-bbox="795 1696 1372 1822"> <thead> <tr> <th>Application</th> <th>Open voltage</th> <th>Short circuit current</th> <th>Division</th> </tr> </thead> <tbody> <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> </tbody> </table>	Application	Open voltage	Short circuit current	Division	Signal circuit	20 ± 5 mV	10 mA	ECU, Sensor	Power circuit	13 V	1 A	Other than the above
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Signal circuit	20 ± 5 mV	10 mA	ECU, Sensor											
Power circuit	13 V	1 A	Other than the above											

&lt;Table5-1&gt;

Insulation resistance	Min 100 MΩ		Measure resistance between neighbor terminals and between terminal and housing surface with DC 500V insulation resistance gauge with connector combined.										
Leakage current	Max 10 μA		Measure it by applying DC 13V between neighboring terminals.										
High voltage test	There shall be no insulation break		Apply AC 1000V voltage of normal frequency 1 minute between neighboring terminals, and between housing surfaces of terminal, with connector combined.										
Temperature rise	General Connector Max 30 °C		Apply basic current 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.										
Twisting test	Appearance	No crack, damage, distortion are permitted	Apply 8kgf force on the end part of combined connector 10 times each in the (front, rear, left, right) directions perpendicular to axial direction.										
	Voltage Drop	Max 10mV/A											
Connector engage and disengage endurance test	Appearance	No crack, damage, distortion are permitted	Make combine connectors engage and disengage at 100mm/min. Perform it 50 times. (Do not use locking device)										
	Voltage Drop	Max 10mV/A											
Overcurrent cycle test	Appearance	No crack, damage, distortion are permitted											
	Voltage Drop	Max 10mV/A	Condition A										
			Condition B										
	Temperature Rise	Max 40 °C	Condition A										
Condition B													
			<p>Engage and disengage connector with terminal assembled 10 times with hands, and apply to following current 1000 cycles for the connector with electrodes in series at 60°C of ambient temperature.</p> <table border="1"> <tr> <td rowspan="2">Current application condition A</td> <td>Applied current</td> <td>2 times of basic current</td> </tr> <tr> <td>Current application time</td> <td>1 minute - ON, 9 minutes - OFF</td> </tr> <tr> <td rowspan="2">Current application condition B</td> <td>Applied current</td> <td>5 times of basic current</td> </tr> <tr> <td>Current application time</td> <td>10 seconds - ON, 590 seconds - OFF</td> </tr> </table>	Current application condition A	Applied current	2 times of basic current	Current application time	1 minute - ON, 9 minutes - OFF	Current application condition B	Applied current	5 times of basic current	Current application time	10 seconds - ON, 590 seconds - OFF
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Cold temperature test	Appearance	No crack, damage, distortion are permitted	<p>Engage and disengage connector with terminal assembled 10 times with hands, and leave it in temperature chamber of -40 °C for 120 hours. Make connector engaged and disengaged 5 times immediately, and drop it onto the concrete surface from 1m height 3 times in the direction of figure 6-1. (Voltage drop &amp; Temperature rise test perform at normal temperature) :</p>  <p>&lt;Figure 6-1&gt;</p>										
	Insulation resistance	Min 10 MΩ											
	Current Leakage	Max 1mA											
Cold and hot temperature shock test	Appearance	No crack, damage, distortion are permitted	<p>Engage and disengage connector with terminal assembled 10 times with hands, and leave it in combined state at -40 °C for 2 hours, and perform 200 cycles according of the method specified in the figure 6-2. Then leave it at room temperature for 2 hours or more (*) follows table 6-1)</p>  <p>&lt;Figure 6-2 : Test pattern &gt;</p> <table border="1"> <tr> <td>Division</td> <td>High temperature (°)</td> <td>Connector using part</td> </tr> <tr> <td>A</td> <td>120 °C</td> <td>waterproof connector</td> </tr> <tr> <td>B</td> <td>80 °C</td> <td>Non-waterproof connector</td> </tr> </table> <p>&lt;Table 6-1 &gt;</p>	Division	High temperature (°)	Connector using part	A	120 °C	waterproof connector	B	80 °C	Non-waterproof connector	
	Division	High temperature (°)		Connector using part									
A	120 °C	waterproof connector											
B	80 °C	Non-waterproof connector											
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. <table border="1" data-bbox="792 304 1425 394"> <thead> <tr> <th>Division</th> <th>High temperature (*)</th> <th>Connector using part</th> </tr> </thead> <tbody> <tr> <td>A</td> <td>120 °C</td> <td>waterproof connector</td> </tr> <tr> <td>B</td> <td>80 °C</td> <td>Non- waterproof connector</td> </tr> </tbody> </table> < Table 6- 1 >	Division	High temperature (*)	Connector using part	A	120 °C	waterproof connector	B	80 °C	Non- waterproof connector
	Division	High temperature (*)		Connector using part								
A	120 °C	waterproof connector										
B	80 °C	Non- waterproof connector										
Voltage Drop	Max 10mV/A											
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°C ambient temperature and 65% relative humidity for 25 hours. And perform 5 cycles of the method specified in figure 6-3. Then pick connector out of chamber and dry it for 2 hours or more.  < Figure 6-3 : Test pattern >									
	Voltage Drop	Max 10mV/A										
	Insulation resistance	Min 10kΩ										
	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, Engage and disengage connector with terminal assembled 3 times with hands. And 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. <ul style="list-style-type: none"> <li>A. Immerge connector in combined state for 2 hours in mixed oil of 50± 2°C ENG oil (SAE10W) or equivalent oil and</li> <li>B. Immerge connector in combined state for 1 hour in car gasoline (JIS K2202) at normal temperature, and then pick it out.</li> <li>C. Immerge connector in combined state for 1 hour in brake liquid (pure product) at normal temperature, and then pick it out.</li> <li>D. Immerge connector in combined state for 1 hour in 100% washer liquid (pure product) at normal temperature, and then pick it out.</li> <li>E. Immerge connector in combined state for 1 hour in 50% LLC (Long life coolant) at normal temperature, and then pick it out.</li> </ul>									
	Voltage Drop	Max 10mV/A										
Sulfur (SO <sub>2</sub> ) gas test	Appearance	No crack, damage, distortion are permitted	Engage and disengage connector with terminal assembled 10 times with hands, and expose it in combined state to sulfur gas of 40±3°C, density 10ppm, humidity 90~95%, for 24 hours. Then pick connector out of chamber and dry it for 2 hours or more.									
	Voltage Drop	Max 10mV/A										

Complex environment endurance 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 in the temperature chamber of 80°C for 48 hours. And then perform the following vibration test. Then measure instant short circuit according to the method of below for 4 hours for X, Y, Z each. ■ Vibration test A (for non-waterproof connector)																										
	Crimp Tensile Strength	3.0SQ: Min 13kgf																											
	Voltage Drop	Max 10mV/A																											
	Temperature Rise	General Connector Max 40°C																											
	Instant Short Circuit	Max 10 $\mu$ s																											
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## 3.4 Applied Part No List

TE Part no	Description
936444-1/2/3	SPT 4P PLUG ASSY