011 2P

1. SCOPE

1.1. Content

This specification covers the requirements for product performance, test methods and quality assurance provisions of 110 2P

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

- 2109366 : CUSTOMER DRAWING FOR 110 UNSLD 2P PLUG ASSY

3. REQUIREMENTS

3.1. Design and Construction

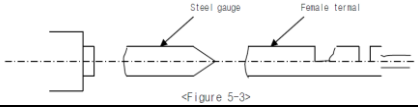
Product shall be of the design, construction, materials and physical dimensions specified on the applicable product drawing.

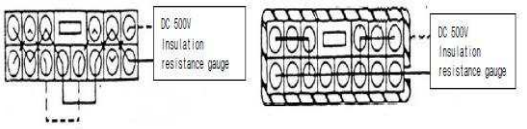
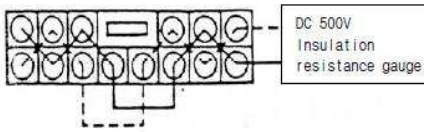
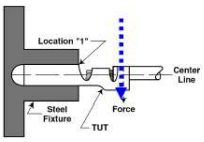
3.2. Ratings

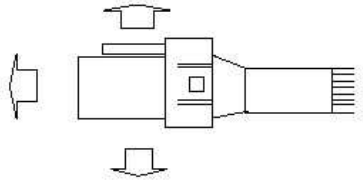
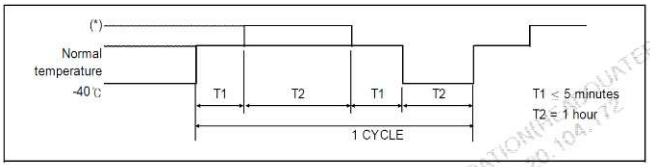
Voltage	Temperature	Humidity
12V DC	25±5℃	60±20%

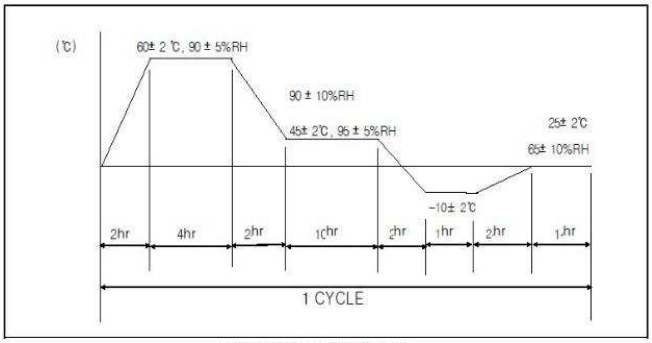
3.3. Test Requirements and Procedures Summary

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. 10 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.
Insertion force between terminal and HSG	Max. 1.5kgf		Insert terminal into fixed HSG at 50mm/min speed
Panel engage/ disengage forces of connector clip	Engage force	Max. 12kgf	1) Insert clip into the fixed plate that can be furnished with clip at 50mm/min and measure the force at that time. 2) Pull clip at 50mm/min and measure the force when destroyed or disengaged.
	Disengage force	Min. 15kgf	
Terminal retention force	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.
Engage and disengage force of terminal	Engage force	0.3 ~ 1.5kgf	As shown in figure 5- 3, engage and disengage male terminal or steel gauge into or from female terminal at 50 mm/min speed.  <Figure 5-3>
	Disengage force	0.15~1.5kgf	
Crimp strength	Min. 9kgf		Fix the crimped terminal, and draw the cable at a position 50~ 100mm 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	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. 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) 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 <Table5-1>
Insulation resistance	Between terminals	Min. 100 MΩ	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.

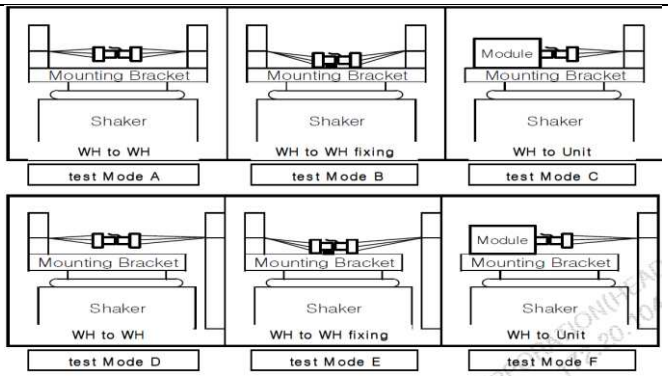
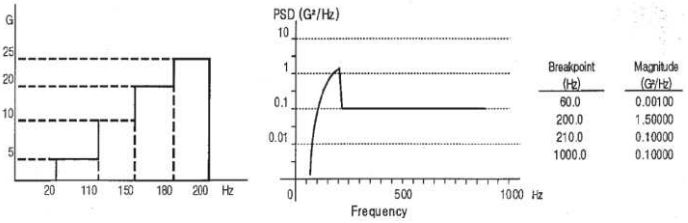
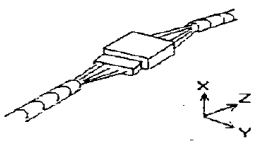
	Between housing surface		 <Figure 5-6: Between neighboring terminals> <Figure 5-7: Between neighboring terminal and housing surface>
Leakage current	10 ㎂ or less		Measure it by applying DC 14V between neighboring terminals (figure 5-6).  <Figure 5-6: Between neighboring terminals>
High voltage test	No allowed insulation breakdown		Measured by applying test potential of 1000 V AC for 1 minutes between the adjacent contact between the contact and housing.
Engage/ disengage force between HSG and Clip	Engage force	Max. 65kgf	Measure maximum force by engage and disengaging the clip at constant 50 mm/min speed
	Disengage force	Min. 11kgf	
Terminal bending strength	Terminals should not be torn. When bent terminal stretched to its originalstate, it should not be torn or cracked.		Terminal is ready to sample. As shown in the figure, makes fixed. After applying force on 15 seconds, expand at least 10 bent portion and scans. The new sample was fixed to rotate 90,180 degrees and then is measured in the same way. According to the thickness of raw material, apply power to the table below.  Terminal Material Thickness(mm) / Applied Force ≤ 0.20 — 0.4kgf ≤ 0.30 — 1kgf ≤ 0.40 — 1.5kgf ≥0.40 — 2kgf <Figure 5- 11>
Temperature rise	Max. 30℃		Apply basic current (I=I0*K) of clause 4.3 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.
Twisting Test - Connector Engage and Disengage Endurance 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. Make combine connectors engage and disengage at 100mm/min. Perform it 50 times. (Do not use locking device)
	Voltage drop	Max. 10mV/A	
Cold temperature test	Appearance	No crack, damage, distortion are permitted	Engage and disengage connector with terminal assembled 10 times with hands, and leave it in temperature chamber of -40℃ 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 &
	Voltage drop	Max. 10mV/A	

<table>
<tr><td></td><td>Insulation resistance</td><td colspan="2">Min. 100MΩ</td><td rowspan="3">Temperature rise test perform at normal temperature) :
 
<Figure 6-1></td></tr>
<tr><td></td><td>Current leakage</td><td colspan="2">Max. 1 ㎂</td></tr>
<tr><td></td><td>Temperature rise</td><td colspan="2">Max. 40℃</td></tr>
<tr><td rowspan="4">Overcurrent cycle 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 apply the following current 1000 cycles for the connector with electrodes in series at 60℃ of ambient temperature.
<table><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></td></tr>
<tr><td rowspan="2">Voltage drop</td><td>Condition A</td><td rowspan="2">Max. 10mV/A</td></tr>
<tr><td>Condition B</td></tr>
<tr><td rowspan="2">Temperature rise</td><td>Condition A</td><td rowspan="2">Max. 40 ℃</td></tr>
<tr><td>Condition B</td></tr>
<tr><td rowspan="2">Cold and hot temperature shock 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 leave it in combined state at -40℃ 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)
 

< Figure 6- 2 : Test pattern >
<table><tr><td>Division</td><td>High temperature (*)</td><td>Connector using part</td></tr><tr><td>A</td><td>120℃</td><td>waterproof connector</td></tr><tr><td>B</td><td>80℃</td><td>Non- waterproof connector</td></tr></table>
< Table 6- 1 ></td></tr>
<tr><td>Voltage drop</td><td colspan="2">Max. 10mV/A</td></tr>
<tr><td rowspan="2">High temperature 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 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><tr><td>High temperature(*)</td><td>Connector using part</td></tr><tr><td>80℃</td><td>Non-waterproof connector</td></tr></table></td></tr>
<tr><td>Voltage drop</td><td colspan="2">Max. 10mV/A</td></tr>
<tr><td rowspan="4">Temperature humidity 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 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 ></td></tr>
<tr><td>Voltage drop</td><td colspan="2">Max 10mV/A</td></tr>
<tr><td>Insulation resistance</td><td>Between terminals
Between housing surface</td><td>Min. 100MΩ</td></tr>
<tr><td>Current leakage</td><td colspan="2">Max. 1 ㎂</td></tr>
<tr><td>Dust test</td><td>Voltage drop</td><td colspan="2">Max 10mV/A</td><td>Engage and disengage connector with terminal assembled 10 times with hands, and diffuse 1.5kg Portland cement(JIS R5210)</td></tr>
</table>

				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.
Waterproof test	Appearance	No crack, damage, distortion are permitted		Make combined connectors engaged and disengaged 10 times by hands, and leave it in combined state at 120℃(waterproof), 80℃(non_waterproof) ambient temperature for 40 minutes and then spray water of normal temperature for 20 minutes according to S2 of JIS D0203. Repeat 48 cycles of this. * JIS D0203 S2 condition: Attach specimen at 400mm distance from the waterproof pipe with water spray hole or water discharge hole, and rotate waterproof pipe 23 times per minute around the axis (XX).
	Voltage drop	Max 10mV/A		
	Insulation resistance	Between terminals	Min. 100MΩ	
		Between housing surface		
	Current leakage	Max. 1 ㎂		
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. 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.
	Voltage drop	Max. 10mV/A		
Ozone 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 ozone of 40 ℃, 50 ± 5 pphm for 100 hours. Then pick connector out of chamber and dry it for 2 hours or more.
	Voltage drop	Max. 10mV/A		
Sulfur (SO2) 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℃, 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℃ 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. Follow figure 6-7 for connector attaching method.
	Crimp tensile strength	Min. 9kgf		
	Voltage drop	Max. 10mV/A		
	Temperature rise	Max. 40℃		

	Instant short circuit	Max 10㎲	 <Figure 6- 7 Connector attaching method> ■ Vibration test A (for non-waterproof connector) Division / Condition Ambient temperature/humidity: 80℃, 90~95% Applied current: Basic current (Connector electrodes in series.) Current application cycle: 120 CYCLE (45 minutes-ON, 15 minutes-OFF) Vibration acceleration: 4.4g Frequency: 20Hz ~ 200Hz (sweep time: 3 minutes or less) Vibration time: 40 hours for X, Y, Z each Connector attaching method: Test mode A, B, C   <Figure 6- 8 : X, Y, Z vibration direction>

3.4. Applied Part No List

TE Part no	Description
2109366-2	110 UNSLD 2P PLUG ASSY