020 16P & 28P

HEADER & PLUG ASS'Y FOR AMP

1. SCOPE:

This specification provides the method to the test connectors for low voltage cable (is called as CONNECTOR from hereunder) and the terminal for low voltage cable(is called as terminal from hereunder) for automobiles..

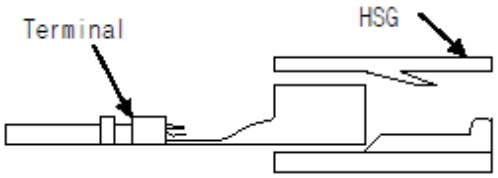
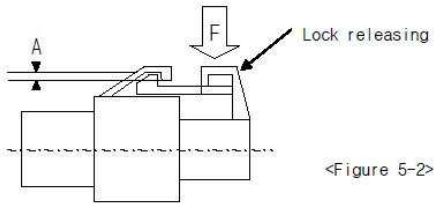
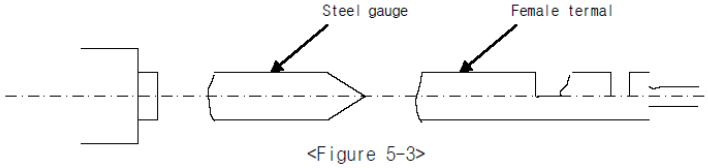
2. Quality

Quality of connector shall satisfy the characteristics of each item described in clause 3 after performing the test.

2.1. TE Specifications:

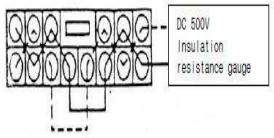
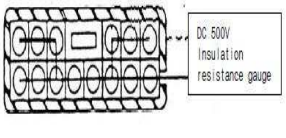
A. 114-5379 Application Specification : Crimping of 0.50 SERIES

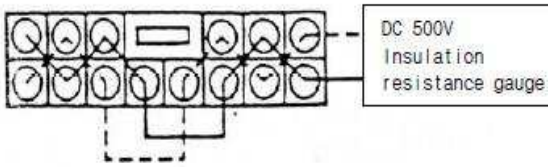
3. REQUIREMENTS :

Para.	Test items	Requirements	Procedures
3.5.1	Appearance	No crack, damage, distortion are permitted	Using sense of sight and touch.
3.5.2	CONN engage and disengage force	Max 7.6kgf	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.
3.5.3	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.
3.5.4	Engage force between terminal and housing	Max 1.5kgf	As shown in the following figure 5-1, measure the weight while inserting terminal into fixed housing at 50mm/min speed.  < Figure 5-1>
3.5.5	Strength of HSG lock	Min 8kgf	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.
3.5.6	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>
3.5.7	Terminal Engage and Disengage force	Enage : 0.1~0.5kgf Disengage : 0.1~0.5kgf	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>
	Test items	Requirements	Procedures

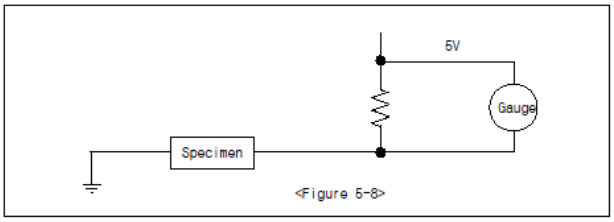
<table>
<tr><td>3.5.8</td><td>Crimp strength</td><td colspan="2"></td><td>Fix the crimped terminal, and draw the cable at a position 50~100mm away from crimped
part in axial direction at 100 mm/min speed. Then measure the weight when cable is cut or
disengaged from the crimped part.</td></tr>
<tr><td>3.5.9</td><td>Voltage Drop</td><td colspan="2">Initial :
Max 10mV/A

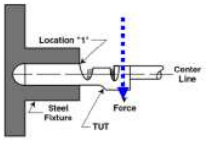
After endurance :
Max 20mV/A</td><td>Measure the circuit voltage drop (V) by sending voltage and current described in the table
5-1 with terminal combined on the connector.
Then calculate a voltage drop (VD) in terminal
by subtracting cable resistance (L) from the circuit voltage drop (V).
1)HARNESS versus UNIT:VD =V(L3+L4)
<table><tr><th>Application</th><th>Open voltage</th><th>Short circuit current</th><th>Division</th></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>3.5.11</td><td>Insulation resistance</td><td>Min 100MΩ</td><td>Between terminals

housing surface</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>3.5.12</td><td>Leakage current</td><td colspan="2">Initial :
10 μA or less

After endurance :
1 mA or less</td><td>Measure it by applying DC 14V between neighboring terminals (figure 5-6).
 
<Figure 5-6: Between neighboring terminals></td></tr>
<tr><td>3.5.13</td><td>High voltage test</td><td>No allowed insulation breakdown</td><td>Between terminals

housing surface</td><td>Measured by applying test potential of 500 V AC between the adjacent contact between the contact and housing.</td></tr>
<tr><td>3.5.14</td><td>Temperature rise</td><td colspan="2">Max 40℃</td><td>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.</td></tr>
<tr><td>Para.</td><td>Test items</td><td colspan="2">Requirements</td><td>Procedures</td></tr>
</table>

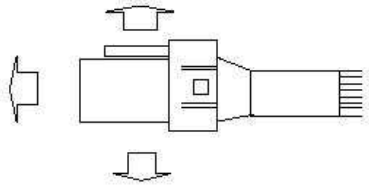
<table>
<tr><td>3.5.15</td><td>Instant short circuit</td><td>There shall be no 10 ㎲ or more instant short circuit.</td><td>It is instant short circuit, when 3.5V or less voltage continues for 10 ㎲ or more in gauge by applying 1 ㎃, 5V open voltage.
Figure 5-8 is an example of measured circuit.
 

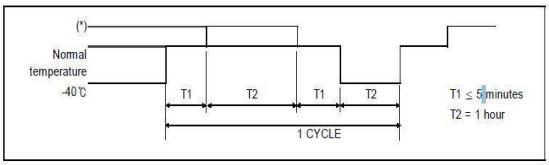
<Figure 5-8></td></tr>
<tr><td>3.5.16</td><td>Flexural strength of contact test</td><td>The contact does not be shredded and, if the contact is bended during test, when it turns back original form, it should not be with crack or shred.</td><td>To prepare samples and fix it on the base as below figure (fig. 5-11) then, apply force for 15 seconds and then, inspect it after enlarge it 10 times at least.
Rotate next new samples through 90, 180 ° from the position as below figure and then, inspect it by the same way after fix it.
The applied forces comply with terminal thickness below table (fig. 5-11).
 

<table><tr><th>Terminal Material Thickness(mm)</th><th>Applied Force</th></tr><tr><td>≤ 0.20</td><td>0.4kgf</td></tr><tr><td>≤ 0.30</td><td>1kgf</td></tr><tr><td>≤ 0.40</td><td>1.5kgf</td></tr><tr><td>≫0.40</td><td>2kgf</td></tr></table>
<fig.5-11></td></tr>
<tr><td>3.5.17</td><td>Mating sound of connector test</td><td colspan="2">Mating sound : Min 65db</td><td>Measure the sound of peak value, when connectors mate by hand after, a set sound measuring set up 350 ±50 ㎜ or thereabouts from the connector.</td></tr>
<tr><td rowspan="2">3.5.18</td><td rowspan="2">Twisting Test
+
Connector Engage and Disengage Endurance Test</td><td>Appearance</td><td>No crack, damage, distortion are permitted</td><td rowspan="2">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 colspan="2">Max 20mV/A</td></tr>
<tr><td>3.5.19</td><td>Overcurrent cycle test</td><td colspan="2">Initial :
Max 10mV/A

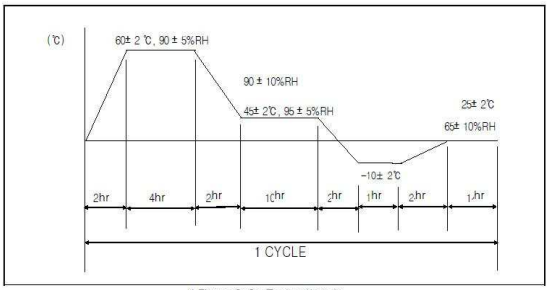
After endurance :
Max 20mV/A</td><td>Engage and disengage connector with terminal assembled 10 times with hands, and apply
the following current 1000 cycles for the connector with electrodes in series at 60℃ of
ambient temperature.
<table>
<tr><td rowspan="2">Current application condition A</td><td>Applied 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>
</table>

<table>
<tr><th>Para.</th><th>Test items</th><th colspan="3">Requirements</th><th>Procedures</th></tr>
<tr><td rowspan="5">3.5.20</td><td rowspan="5">Cold temperature test</td><td>Appearance</td><td colspan="2">No crack, damage, distortion are permitted</td><td rowspan="5">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 & Temperature rise test perform at normal temperature) :
 
<Figure 6-1></td></tr>
<tr><td>Voltage Drop</td><td colspan="2">Initial :
Max 10mV/A

After endurance :
Max 20mV/A</td></tr>
<tr><td rowspan="2">Insulation Resistance</td><td rowspan="2">Sealed CONN'R :
Min 100㏁</td><td>Between terminals</td></tr>
<tr><td>housing surface</td></tr>
<tr><td>Current Leakage</td><td colspan="2">Max 1 ㎂</td></tr>
<tr><td>Temperature Rise</td><td colspan="2">Max 40℃</td></tr>
<tr><td rowspan="2">3.5.21</td><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, this repeats 200 CYCLE by below test condition. (ENG ROOM : 120℃, ENG ROOM except : 80℃)
 
</td></tr>
<tr><td>Voltage Drop</td><td colspan="2">Initial :
Max 10mV/A

After endurance :
Max 20mV/A</td></tr>
<tr><td rowspan="2">3.5.22</td><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><th>High temperature(*)</th><th>Connector using part</th></tr><tr><td>80℃</td><td>Non-waterproof connector</td></tr></table></td></tr>
<tr><td>Voltage Drop</td><td colspan="2">Initial :
Max 10mV/A

After endurance :
Max 20mV/A</td></tr>
</table>

<table>
<tr><th>Para.</th><th>Test items</th><th colspan="3">Requirements</th><th>Procedures</th></tr>
<tr><td rowspan="5">3.5.23</td><td rowspan="5">Temperature Humidity Test</td><td>Appearance</td><td colspan="2">No crack, damage, distortion are permitted</td><td rowspan="5">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. Then pick connector out of chamber and dry it for 2 hours or more.
 

< Figure 6-3 : Test pattern ></td></tr>
<tr><td>Voltage Drop</td><td colspan="2">Initial :
Max 10mV/A

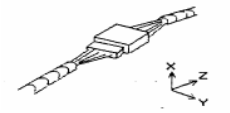
After endurance :
Max 20mV/A</td></tr>
<tr><td rowspan="2">Insulation Resistance</td><td rowspan="2">Min 100㏁</td><td>Between terminals</td></tr>
<tr><td>housing surface</td></tr>
<tr><td>Current Leakage</td><td colspan="2">Max 1㎂</td></tr>
<tr><td>3.5.24</td><td>Dust test</td><td>Voltage Drop</td><td colspan="2">Initial :
Max 10mV/A

After endurance :
Max 20mV/A</td><td>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.</td></tr>
<tr><td rowspan="2">3.5.25</td><td rowspan="2">Oil and liquid 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 perform test each sample with connector combined.
A. Immerge connector in combined state for 2 hours in mixed oil of 50± 2℃ ENG oil (SAE 10W) 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.</td></tr>
<tr><td>Voltage Drop</td><td colspan="2">Initial :
Max 10mV/A

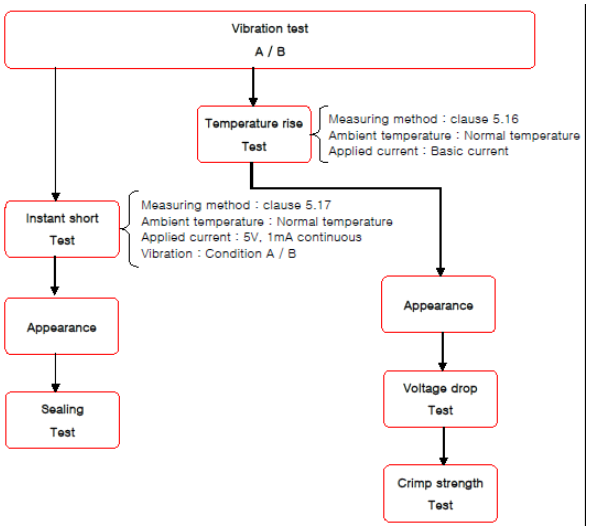
After endurance :
Max 20mV/A</td></tr>
</table>

Para.	Test items	Requirements		Procedures
3.5.26	Ozone test	Appearance	No crack, damage, distortion are permitted	Engage and disengage Connector with terminal assembled 10 times with hands,and samples keep at 40℃ and 50±5ppm Ozon for 100hour.
		Voltage Drop	Initial : Max 10mV/A After endurance : Max 20mV/A	
3.5.27	Sulfur 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	Initial : Max 10mV/A After endurance : Max 20mV/A	

<table>
<tr><th>Para.</th><th>Test items</th><th colspan="2">Requirements</th><th>Procedures</th></tr>
<tr><td rowspan="5">3.5.28</td><td rowspan="5">Composite Environmental Vibration /Mechanical Test</td><td>Appearance</td><td>No crack, damage, distortion are permitted</td><td rowspan="5">Engage and disengage Connector with terminal assembled 10 times with hands and leave it in combined state in the temperature chamber of 120℃ for 48hours. And then perform the following vibration test.

<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 (Connect 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>4.4 g</td></tr>
<tr><td>Frequency</td><td>20 Hz ~ 200 Hz (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>


<Figure 6-8 : X, Y, Z vibration direction>


</td></tr>
<tr><td>Crimp Tensile Strength</td><td>0.22SQ:Min. 4kgf
0.3SQ:Min. 6kgf</td></tr>
<tr><td>Voltage Drop</td><td>Initial :
Max 10mV/A

After endurance :
Max 20mV/A</td></tr>
<tr><td>Temperature Rise</td><td>Max 40℃</td></tr>
<tr><td>Electrical Discontinuity</td><td>Max 10 μs</td></tr>
</table>

Test items	Appearance	CONN insertion and drawing force	HSG reverse insertion	Engage force between terminal and housing	Strength of HSG LOCK	HSG LOCK release forc	Terminal retention force	Terminal engage/disengage force	Crimp strength	Voltage drop	Insulation resistance	Leakage current	High voltage	Temperature rise	Instant short circuit	Flexural strength of contact	Mating sound of connector
Initial test	0	0	0	0	0	0	0	0	0	0	0	0	0			0	0
Twisting test	0									0							
Connector engage /disengage endurance test	0									0							
Overcurrent cycle test A	0									0				0			
Overcurrent cycle test B	0									0				0			
Cold temperature test	0									0	0	0		0			
Cold and hot temperature shock t	0									0							
High temperature test	0									0							
Temperature and humidity cycle t	0									0	0	0					
Dust test										0							
Oil and liquid test	0									0							
Ozone test	0									0							
Sulfur test	0									0							
Complex environment endurance test A	0								0	0				0	0	0	
Complex environment endurance test B	0								0	0				0	0	0	

REV.	DESCRIPTION	DR/CHK	DATE
A	RELEASED	YJ KIM/ KT LIM	25-JULY-16
A1	LOCAL DOC TYPE Updated	SP/HM	08JAN2024