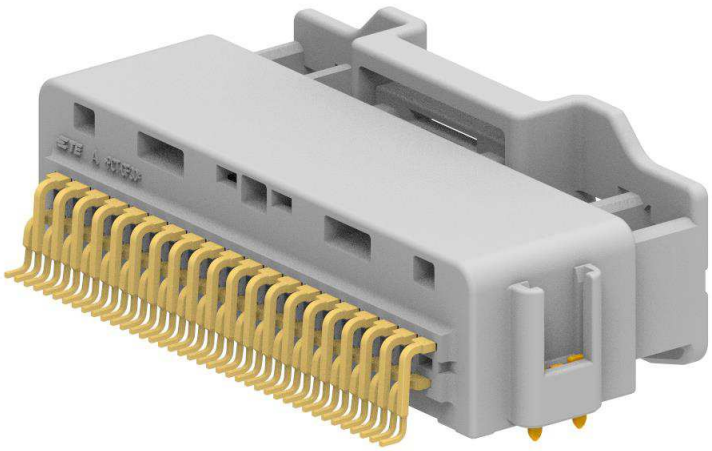
Product Specification

Plug Connector .025 SMD Series, Unsealed

025 SMD Series HEADER & PLUG ASS'Y



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:

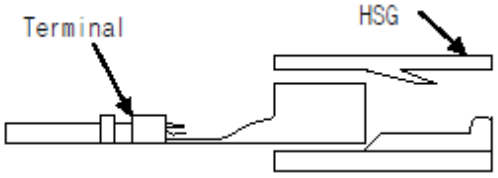
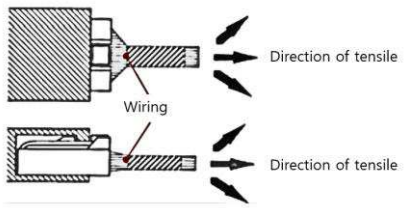
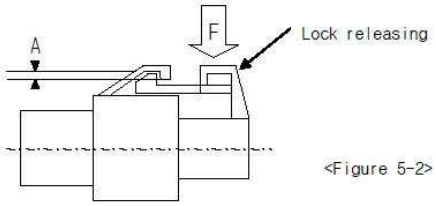
A. 114-61030 : Application Specification FOR .025 terminal

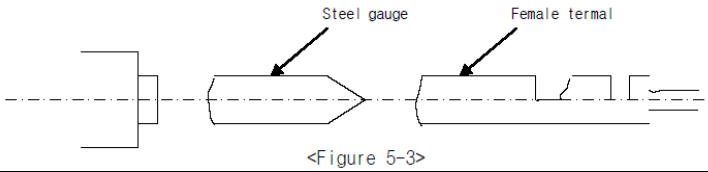
B. 411-160018 : Insturuction sheet

Reference Documents :

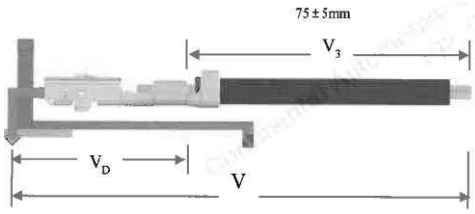
ES-91500-00(REV.32) : HMC Connector General Spec (24.JUN.19)

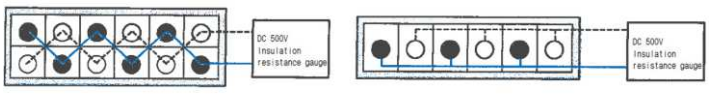
3. REQUIREMENTS :

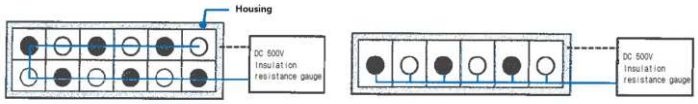
Para.	Test items	Requirements	Procedures
3.5.1	Appearance	No crack, damage, distortion are permitted	Using sense of sight and touch.
3.5.2	CONN engage and disengage force	Max 7.6kgf	Measure force by inserting and disengaging the connector with terminal assembled at constant 50 mm/min speed. However, 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	Reverse insertion between terminal and housing	Min 2.4kgf	Crimp cable of maximum size on terminal and then insert it into housing by end of insulation barrel in the reserve direction.
3.5.5	Engage force between terminal and housing	Max 0.8kgf	As shown in the following figure 5-1, measure the weight while inserting terminal into fixed housing at 50mm/min speed.  < Figure 5-1>
3.5.6	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(in 5 direction) at a constant speed of 50mm/min. Then measure weight when lock structure is disengaged or destroyed. The direction of wiring extension follows figure 
3.5.7	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>
3.5.8	Terminal retention force	Before TPA Assembly Min 3.5kgf After assembling TPA Min 6kgf	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±5mm away from crimped part, and measure weight when terminal is disengaged from the housing.

<table>
<tr><td>3.5.9</td><td>Terminal Engage and Disengage force</td><td>Enage : Max 0.5kgf
Disengage : Max 0.5kgf</td><td>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></td></tr>
<tr><td>3.5.10</td><td>Crimp strength</td><td>Wire SQ
0.22SQ or Below : Min 4kgf
0.5SQ or Below : Min 9kgf</td><td>Fix the crimped terminal, and draw the cable at a position 50±5mm 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>3.5.11</td><td>Voltage Drop</td><td>Initial :
Max 10mV/A

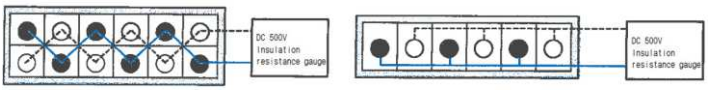
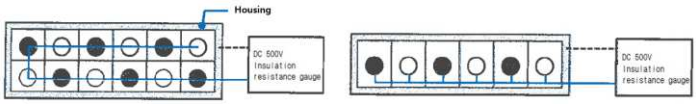
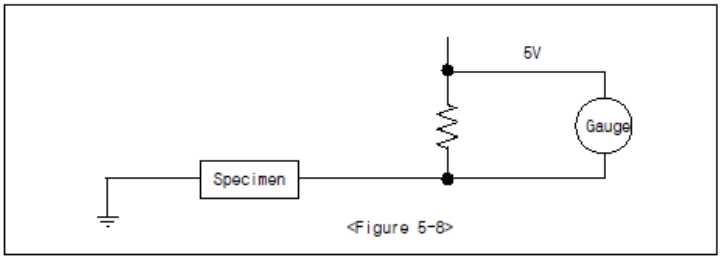
After endurance :
Max 20mV/A</td><td>Measure the circuit voltage drop (V) by sending voltage and current described in the table
5-1 with terminal combined on the connector.
Then calculate a voltage drop (VD) in terminal
by subtracting cable resistance (L) from the circuit voltage drop (V).
1) HARNESS versus UNIT : VD =V-V3
<table>
<tr><th>Application</th><th>Open voltage</th><th>Short circuit current</th></tr>
<tr><td>Signal circuit</td><td>20 ± 5 mV</td><td>10 mA</td></tr>
</table>
<Table5-1>


<HARNESS vs UNIT></td></tr>
<tr><td rowspan="2">3.5.12</td><td rowspan="2">Insulation resistance</td><td rowspan="2">Min 100MΩ</td><td>Between terminals</td><td rowspan="2">Measure resistance between neighbor terminals (figure 10), and between terminal and housing surface (figure 11) with DC 500V insulation resistance gauge with connector combined.
 

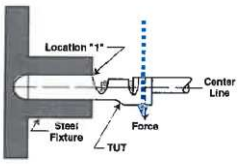
<Figure 10: Between neighboring terminals>
 

<Figure 11: Between neighboring terminal and housing surface></td></tr>
<tr><td>housing surface</td></tr>
</table>

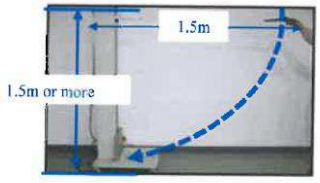
<table>
<tr><td>3.5.13</td><td>Leakage current</td><td colspan="2">Initial :
1 ㎂ or less

After endurance :
1 ㎂ or less</td><td>Measure it by applying DC 14V between neighboring terminals (figure10).
 
<Figure 10: Between neighboring terminals></td></tr>
<tr><td rowspan="2">3.5.14</td><td rowspan="2">High voltage test</td><td rowspan="2">No allowed insulation breakd own</td><td>Between terminals</td><td rowspan="2">Apply AC 1000V voltage of normal frequency for 1 minute between neighboring terminal (figure 10), and between housing surface of terminal (figure 11), with connector combined.
 
<Figure 10: Between neighboring terminals>
 
<Figure 11: Between neighboring terminal and housing surface></td></tr>
<tr><td>housing surface</td></tr>
<tr><td>3.5.15</td><td>Temperature rise</td><td colspan="2">Max 40℃</td><td>Apply basic current (I=I0*K) of table 5-2 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.
<table>
<tr><th rowspan="2">Cable size (SQ)</th><th colspan="2">I0</th><th rowspan="2">Remarks</th></tr>
<tr><th>General</th><th>L TYPE (375)</th></tr>
<tr><td>0.22</td><td>4 A</td><td></td><td></td></tr>
<tr><td>0.3</td><td>6 A</td><td></td><td>4A for signal</td></tr>
<tr><td>0.5</td><td>8 A</td><td></td><td>5A for signal</td></tr>
<tr><td>0.85</td><td>10 A</td><td></td><td></td></tr>
<tr><td>1.25</td><td>14 A</td><td></td><td></td></tr>
<tr><td>2.0</td><td>18 A</td><td></td><td></td></tr>
<tr><td>3.0</td><td>22 A</td><td>34 A</td><td></td></tr>
<tr><td>5.0</td><td>25 A</td><td>46 A</td><td></td></tr>
<tr><td>8.0</td><td></td><td>60 A</td><td></td></tr>
</table>
<table>
<tr><th>Number of simultaneous electrode within the same connector</th><th>K
Reduction factor</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 ~ 10</td><td>0.5</td></tr>
<tr><td>11 ~ 25</td><td>0.4</td></tr>
<tr><td>26 or more</td><td>0.3</td></tr>
<tr><td></td><td></td></tr>
</table>
<Table 5-2></td></tr>
<tr><td>3.5.16</td><td>Instant short circuit</td><td colspan="2">There shall be no 10 ㎲ or more instant short circuit.</td><td>It is instant short circuit, when 4.3V or less voltage continues for 10 ㎲ or more in gauge by applying 100 ㎃, 5V open voltage. Figure 5-8 is an example of measured circuit.
 

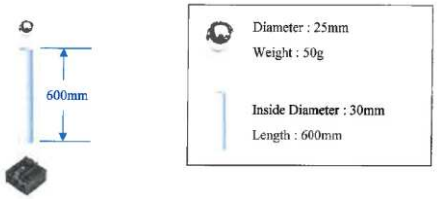
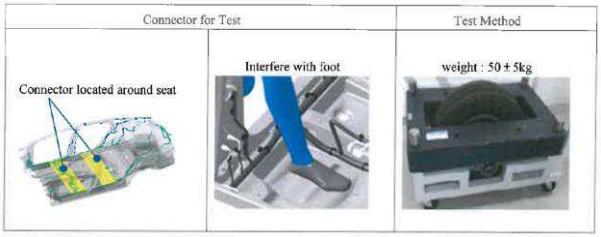
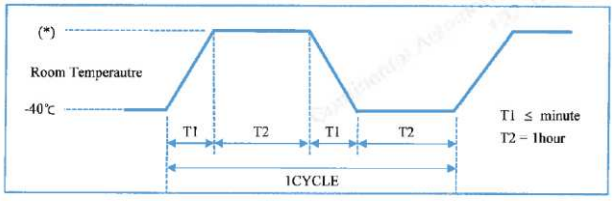
<Figure 5-8></td></tr>
</table>

<table>
<tr><td>3.5.17</td><td>Termial bending strength</td><td colspan="3">Terminals should not be torn. When bent terminal stretched to its original state, it should not be torn or cracked.</td><td>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.
 

<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>
<Figure 16></td></tr>
<tr><td>3.5.18</td><td>Mating sound of connector test</td><td colspan="3">Mating sound : Min 65db</td><td>Measure the sound of peak value, when connectors mate by hand after, a set sound measuring set up 700 ±10 ㎜ or thereabouts from the connector.</td></tr>
<tr><td rowspan="2">3.5.19</td><td rowspan="2">Twisting Test
+
Connector Engage and Disengage Endurance Test</td><td>Appear ance</td><td colspan="2">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.

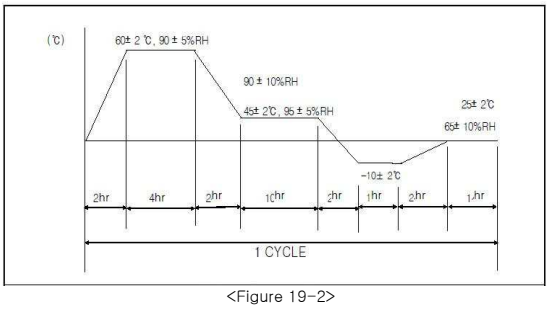
Make combine connectors engage and disengage at 100mm/min. Perform it 50 times.
(Do not use locking device)</td></tr>
<tr><td colspan="3">Max 20mV/A</td></tr>
<tr><td rowspan="3">3.5.20</td><td rowspan="3">Overcurrent cycle test</td><td>Appearance</td><td colspan="2">No crack, damage, distortion are permitted</td><td rowspan="3">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>Voltage Drop</td><td colspan="2">After endurance : Max 20mV/A</td></tr>
<tr><td>Temperature Rise</td><td colspan="2">Max 40℃</td></tr>
<tr><td rowspan="3">3.5.21</td><td rowspan="3">Cold temperature test</td><td>Appearance</td><td colspan="2">No crack, damage, distortion are permitted</td><td rowspan="3">Engage and disengage connector with terminal assembled 10 times with hands, and leave it
in temperature chamber of -40℃ for 120 hours and estimate below items for each sample dividing 2 groups.
A. Estimate voltage drop and leakage current assembled connectors.
B. Leave connector for 2 hours and separate connector with male and female, and then drop it onto the concrete surface more than 10T from 1.5m height 3 times. The method of connector drop follows figure 17.
 

<Figure 17></td></tr>
<tr><td>Voltage Drop</td><td colspan="2">After endurance : Max 20mV/A</td></tr>
<tr><td>Insulation Resistance</td><td>Min 100㏁</td><td>Between terminals</td></tr>
</table>

				housing surface	Test for improved connectors are checked for steel ball test 
		Current Leakage	After endurance : Max 1 ㎂		Connector located around seat are tested broken assessment. Test weight is 50±5kg (70% of standard weight for adult) 
		Temperature Rise	Max 40℃		
3.5.22	Cold and hot temperature shock 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 -40℃ for 2 hours, and perform 200 cycle according of the method specified in the fiqure 18. The leave it at room temperature for 2 hours or more((*) follows table 9)  < Figure 18 : Test pattern >
		Voltage Drop	After endurance : Max 20mV/A		
3.5.23	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	After endurance : Max 20mV/A		
3.5.24	Temperature Humidity 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 24 hours

Division	High temperature(*)	Connector using part
A	120℃	Waterproof connector
B	80℃	Non-waterproof connector

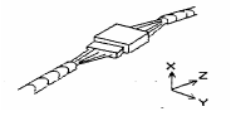
High temperature(*)	Connector using part
80℃	Non-waterproof connector

<table>
<tr><td></td><td></td><td>Voltage Drop</td><td colspan="2">After endurance : Max 20mV/A</td><td rowspan="4">in water bath at normal temperature, and the pick ti out.
B. Fix connector to the vertical axis with Female-up position.
C. Spray into the connector with being soaked water enough.
D. Perform %cycles of the method specified in figure19-1.
E. Perform 5 cycles of the method specified in figure 19-2. Then pick connector out of chamber and dry it for 2 hours or more.
※ Non-waterproof connector do not enforce A~D.
 

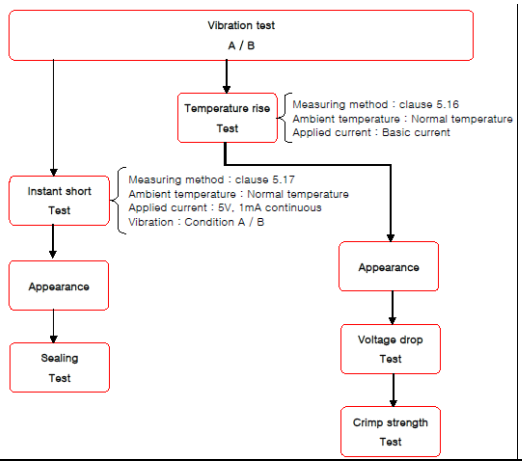
<Figure 19-2></td></tr>
<tr><td></td><td></td><td>Insulation Resistance</td><td>Min 100㏁</td><td>Between terminals</td></tr>
<tr><td></td><td></td><td></td><td></td><td>housing surface</td></tr>
<tr><td></td><td></td><td>Current Leakage</td><td colspan="2">Max 1㎂</td></tr>
<tr><td>3.5.25</td><td>Dust test</td><td>Voltage Drop</td><td colspan="2">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">3.5.27</td><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 expose it in combined state to ozone of 40℃ and 50±5ppm Ozon for 100hour. Then pick connector out of chamber and dry it for 2 hours or more.</td></tr>
<tr><td>Voltage Drop</td><td colspan="2">After endurance : Max 20mV/A</td></tr>
<tr><td rowspan="2">3.5.28</td><td rowspan="2">Sulfur 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">After endurance : Max 20mV/A</td></tr>
<tr><td rowspan="2">3.5.29</td><td rowspan="2">Composite Environmental Vibration /Mechanical 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 in the temperature chamber of 80℃ for 48hours. And then perform the following vibration test.</td></tr>
<tr><td>Crimp Tensile Strength</td><td colspan="2">0.22SQ:Min. 4kgf
0.5SQ:Min. 6kgf</td></tr>
</table>

		Voltage Drop	After endurance : Max 20mV/A	
		Temperature Rise	Max 40℃	
		Electrical Discontinuity	Max 10 μs & Min 4.3V	

Division	Condition
Ambient temperature/humidity	80℃, 90~95%
Applied current	Basic current (Connect electrodes in series.)
Current application cycle	120 CYCLE (45 minutes-ON, 15 minutes-OFF)
Vibration acceleration	4.4 g
Frequency	20 Hz ~ 200 Hz (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>



Test items	Appearance	CONN insertion and drawing force	HSG reverse insertion	Reverse insertion between terminal and housing	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	o	o	o	o	o	o	o	o	o	o	o	o	o	o			o	o
Twisting test	o										o							
Connector engage /disengage endurance test	o										o							
Overcurrent cycle test A	o										o				o			
Overcurrent cycle test B	o										o				o			
Cold temperature test	o										o	o	o		o			
Cold and hot temperature shock t	o										o							
High temperature test	o										o							
Temperature and humidity cycle t	o										o	o	o					
Dust test											o							
Oil and liquid test	o										o							
Ozone test	o										o							
Sulfur test	o										o							
Complex environment endurance test A	o									o	o				o	o	o	
Complex environment endurance test B	o									o	o				o	o	o	

REV.	DESCRIPTION	DR/CHK	DATE
A	RELEASED	BH LEE/ YJ YOUN	24-MAY-2021
A1	LOCAL DOC TYPE Updated	SP/HM	08JAN2024