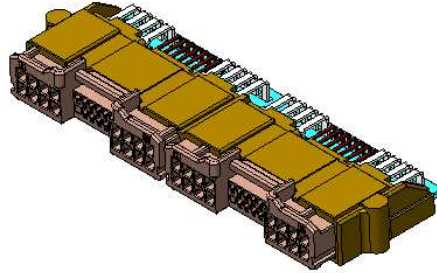


020/060 56P**HEADER & PLUG ASS'Y FOR AMP****1. SCOPE:**

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..

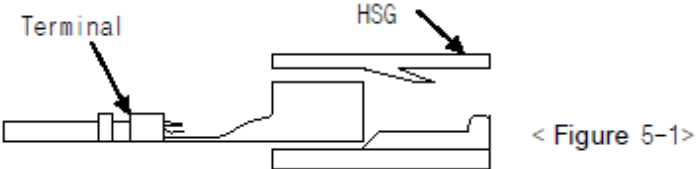
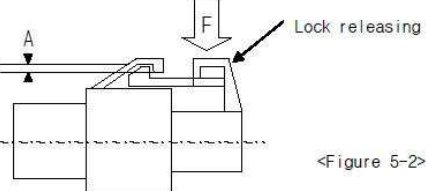
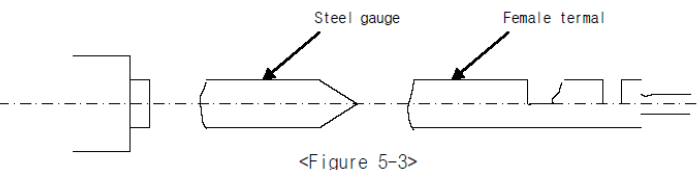
2. Quality

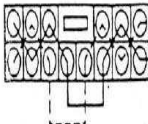
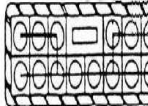
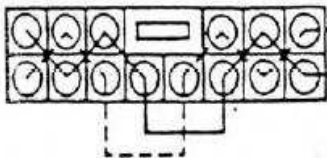
Quality of connector shall satisfy the characteristics of each item described in clause 3 after performing the test.

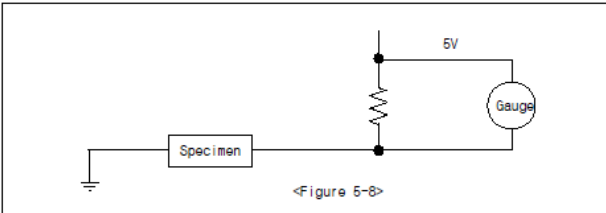
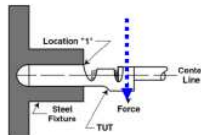
2.1. TE Specifications:

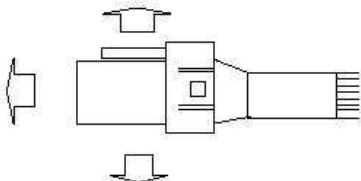
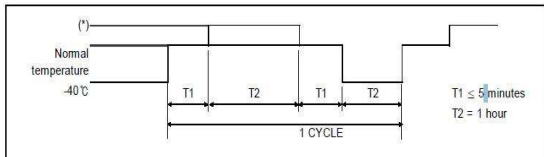
- A. 114-18858 Application Specification : Crimping of Nano MQS
- B. 114-61036 Application Specification : Crimping of 060

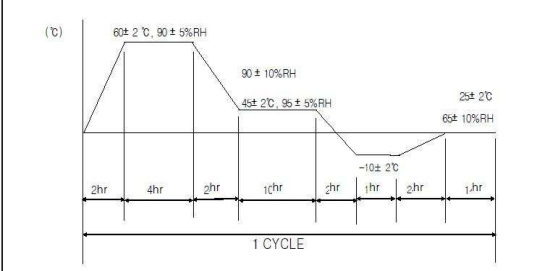
3. REQUIREMENTS :

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. 
3.5.5	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.
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. 
3.5.7	Terminal retention force	Min 8kgf	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.
3.5.8	Terminal Engage and Disengage force	Engage : 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. 

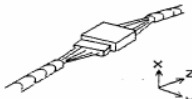
	Test items	Requirements		Procedures												
3.5.9	Crimp strength			Fix the crimped terminal, and draw the cable at a position 50~100mm away from crimped part in axial direction at 100 mm/min speed. Then measure the weight when cable is cut or disengaged from the crimped part.												
3.5.10	Voltage Drop	Initial : Max 10mV/A After endurance : Max 20mV/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) <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>	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
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													
3.5.11	Insulation resistance	Min 100MΩ	Between terminals housing surface	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.  DC 500V Insulation resistance gauge  DC 500V Insulation resistance gauge <Figure 5-6: Between neighboring terminals> <Figure 5-7: Between neighboring terminal and housing surface>												
3.5.12	Leakage current	Initial : 10 μA or less After endurance : 1 mA or less		Measure it by applying DC 14V between neighboring terminals (figure 5-6).  DC 500V Insulation resistance gauge <Figure 5-6: Between neighboring terminals>												
3.5.13	High voltage test	No allowed insulation breakdown	Between terminals housing surface	Measured by applying test potential of 500 V AC between the adjacent contact between the contact and housing.												
3.5.14	Temperature rise	Max 40℃		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.												

Para.	Test items	Requirements		Procedures										
3.5.15	Instant short circuit	There shall be no 10 μ s or more instant short circuit.		It is instant short circuit, when 3.5V or less voltage continues for 10 μs or more in gauge by applying 1 mA, 5V open voltage. Figure 5-8 is an example of measured circuit.  <Figure 5-8>										
3.5.16	Flexural strength of contact test	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.		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>	Terminal Material Thickness(mm)	Applied Force	≤ 0.20	0.4kgf	≤ 0.30	1kgf	≤ 0.40	1.5kgf	≥ 0.40	2kgf
Terminal Material Thickness(mm)	Applied Force													
≤ 0.20	0.4kgf													
≤ 0.30	1kgf													
≤ 0.40	1.5kgf													
≥ 0.40	2kgf													
3.5.17	Mating sound of connector test	Mating sound : Min 60db		Measure the sound of peak value, when connectors mate by hand after, a set sound measuring set up 350 $\pm$ 50 mm or thereabouts from the connector.										
3.5.18	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)										
3.5.19	Overcurrent cycle test	Initial : Max 10mV/A After endurance : Max 20mV/A		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>	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
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												

Para.	Test items	Requirements		Procedures				
3.5.20	Cold temperature test	Appearance	No crack, damage, distortion are permitted					
		Voltage Drop	Initial : Max 10mV/A After endurance : Max 20mV/A					
		Insulation Resistance	Sealed CONN'R : Min 100MΩ	Between terminals housing surface				
		Current Leakage	Max 100 μA					
		Temperature Rise	Max 40℃					
				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>				
3.5.21	Cold and hot temperature shock test	Appearance	No crack, damage, distortion are permitted					
		Voltage Drop	Initial : Max 10mV/A After endurance : Max 20mV/A					
				 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℃) 				
3.5.22	High temperature test	Appearance	No crack, damage, distortion are permitted					
		Voltage Drop	Initial : Max 10mV/A After endurance : Max 20mV/A					
				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>	High temperature(*)	Connector using part	80℃	Non-waterproof connector
High temperature(*)	Connector using part							
80℃	Non-waterproof connector							

Para.	Test items	Requirements		Procedures
3.5.23	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. Then pick connector out of chamber and dry it for 2 hours or more.  < Figure 6-3 : Test pattern >
		Voltage Drop	Initial : Max 10mV/A After endurance : Max 20mV/A	
		Insulation Resistance	Min 100MΩ	
			Between terminals housing surface	
		Current Leakage	Max 10μA	
3.5.24	Dust test	Voltage Drop	Initial : Max 10mV/A After endurance : Max 20mV/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.
3.5.25	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 (SAE 10W) or equivalent oil and B. Immerge connector in combined state for 1 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	Initial : Max 10mV/A After endurance : Max 20mV/A	

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	

Para.	Test items	Requirements		Procedures																
3.5.28	Composite Environmental Vibration /Mechanical 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 120℃ for 48hours. And then perform the following vibration test. <table border="1"><thead><tr><th>Division</th><th>Condition</th></tr></thead><tbody><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></tbody></table>  <Figure 6-8 : X, Y, Z vibration direction> <pre>graph TD A[Vibration test A / B] --> B[Instant short Test] A --> C[Temperature rise Test] B --> D[Appearance] D --> E[Sealing Test] C --> F[Appearance] F --> G[Voltage drop Test] G --> H[Crimp strength Test]</pre>	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
		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																			
Crimp Tensile Strength	0.3SQ:Min. 6kgf																			
Voltage Drop	Initial : Max 10mV/A After endurance : Max 20mV/A																			
Temperature Rise	Max 40℃																			
Electrical Discontinuity	Max 10 μs & Min 3.5V																			

Test item s	Appearance	CONN insertion and drawing force	HSG reverse insertion	Engage force between terminal and housing	Strength of HSG LOCK	HSG LOCK release force	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 test	0									0							
High temperature test	0									0							
Temperature and humidity cycle test	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	

[illegible]