MQS 4P

1. SCOPE

1.1. Content

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

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

- 936199 : CUSTOMER DRAWING FOR MQS 4P PLUG ASSY
- 936122 : CUSTOMER DRAWING FOR MQS 4P CAP ASSY
- 936399 : CUSTOMER DRAWING FOR MQS 4P CAP ASSY (VERTICAL TYPE)

3. REQUIREMENTS

3.1. Design and Construction

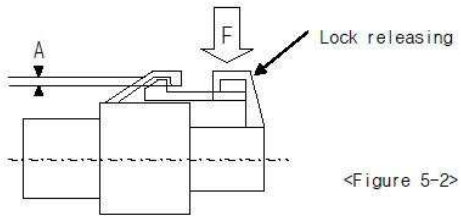
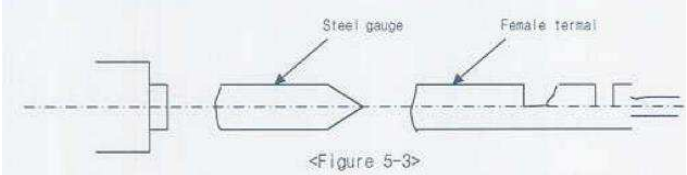
Product shall be of the design, construction, materials and physical dimensions specified on the applicable product drawing.

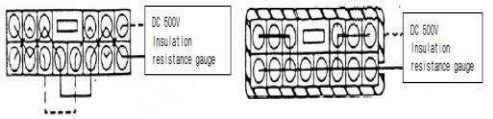
3.2. Ratings

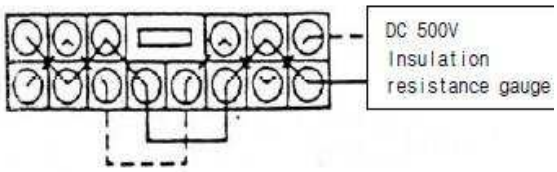
Voltage	Temperature	Humidity
12V DC	25±5℃	60±20%

3.3. Test Requirements and Procedures Summary

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

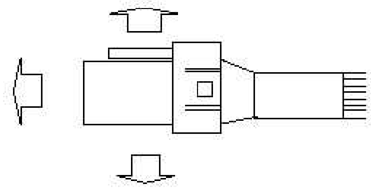
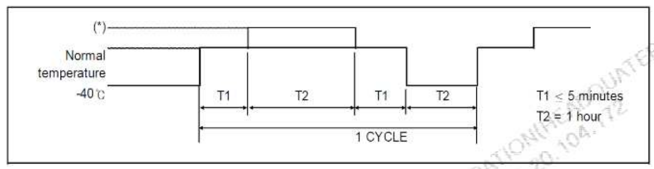
TEST DESCRIPTION	REQUIREMENT		PROCEDURE
Appearance	No crack, damage, distortion are permitted		Using sense of sight and touch.
CONN engage and disengage force	Max. 10 kgf and less		Measure force by inserting and disengaging the connector with terminal assembled at constant 100 mm/min speed. However, 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.
Reverse insertion between terminal and HSG	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 end of insulation barrel in the reserve direction with applying 5kgf..
Insertion force between terminal and HSG	Max. 1.5kgf		Insert terminal into fixed HSG at 100mm/min speed
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 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.  <Figure 5-2>
Terminal retention force	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 50~100mm away from crimped part, and measure weight when terminal is disengaged from the housing.
Engage and disengage force of terminal	Engage force	0.1~0.5kgf	As shown in figure 5-3, engage and disengage male terminal or steel gauge into or from female terminal at 100mm/min speed  <Figure 5-3>
	Disengage force	0.1~0.5kgf	
Crimp strength	0.5SQ: Min. 9kgf		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.

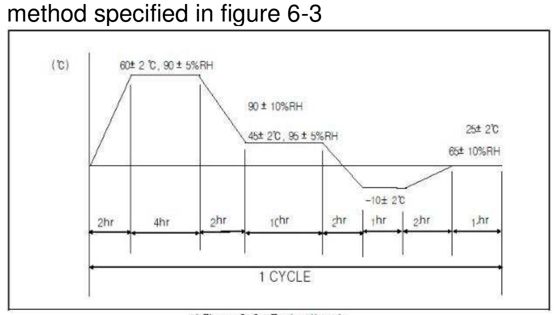
<table>
<tr><td>Voltage Drop</td><td>Max. 10mV/A</td><td>Measure the circuit voltage drop (V) by sending voltage and current described in the table
5-1 with terminal combined on the connector.
Then calculate a voltage drop (VD) in terminal
by subtracting cable resistance (L) from the circuit voltage drop (V).
1)HARNESS versus UNIT:VD =V-(L3+L4)
<table><tr><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></td></tr>
<tr><td>Insulation resistance</td><td>Min. 100 MΩ</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>Leakage current</td><td>10 ㎂ or less</td><td>Measure it by applying DC 13V between neighboring terminals (figure 5-6).
 

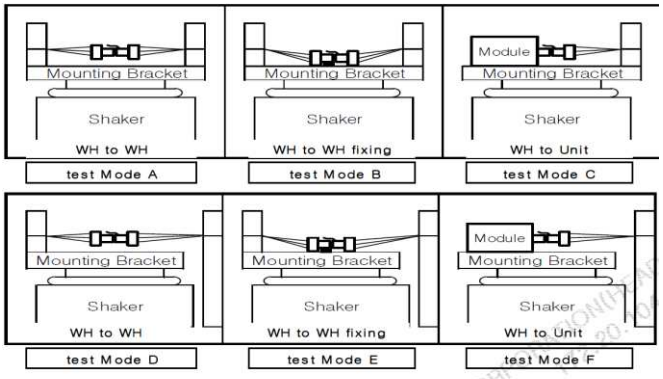
<Figure 5-6: Between neighboring terminals></td></tr>
<tr><td>High voltage test</td><td>No allowed
Insulation breakdown</td><td>Measured by applying test potential of 1000 V AC for 1 minutes between the adjacent contact between the contact and housing.</td></tr>
<tr><td>Temperature rise</td><td>Max. 30℃</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 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>Voltage drop</td><td>Max. 20mV/A</td></tr>
<tr><td rowspan="5">Overcurrent cycle 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 apply to 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 rowspan="2">Max. 20mV/A</td><td>Condition A(8.8A)</td></tr>
<tr><td>Condition B(22A)</td></tr>
<tr><td rowspan="2">Temperature rise</td><td rowspan="2">Max. 40℃</td><td>Condition A(8.8A)</td></tr>
<tr><td>Condition B(22A)</td></tr>
</table>

<table>
<tr>
<td rowspan="6">Cold temperature test</td>
<td>Appearance</td>
<td colspan="2">No crack, damage, distortion are permitted</td>
<td rowspan="6">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">Max. 10mV/A</td>
</tr>
<tr>
<td rowspan="2">Insulation resistance</td>
<td rowspan="2">Non-Sealed CONN'R :
Min. 100 MΩ</td>
<td>Between terminals</td>
</tr>
<tr>
<td>housing surface</td>
</tr>
<tr>
<td>Current leakage</td>
<td colspan="2">Max. 1mA</td>
</tr>
<tr>
<td>Temperature rise</td>
<td colspan="2">Max. 60℃</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)
 

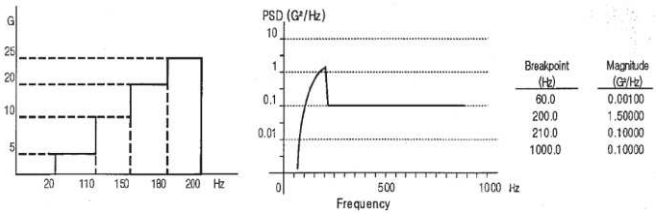
< Figure 6- 2 : Test pattern >
<table>
<tr><th>Division</th><th>High temperature (*)</th><th>Connector using part</th></tr>
<tr><td>A</td><td>120℃</td><td>waterproof connector</td></tr>
<tr><td>B</td><td>80℃</td><td>Non- waterproof connector</td></tr>
</table>
< Table 6- 1 ></td>
</tr>
<tr>
<td>Voltage drop</td>
<td colspan="2">Max. 20mV/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><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">Max. 20mV/A</td>
</tr>
<tr>
<td rowspan="3">Temperature Humidity 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 at 25℃ ambient temperature and 65% relative humidity for 25 hours. And perform 5 cycles of the method specified in figure 6-3
 

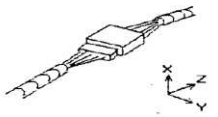
< Figure 6-3 : Test pattern ></td>
</tr>
<tr>
<td>Voltage drop</td>
<td colspan="2">Max. 20mV/A</td>
</tr>
<tr>
<td>Current leakage</td>
<td colspan="2">Non-waterproof connector Max. 1 mA</td>
</tr>
</table>

Dust test	Voltage drop	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.
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. 20mV/A	
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±5pphm Ozone for 100hour. Then pick connector out of chamber and dry it for 2hours 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. 20mV/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.  <Figure 6- 7 Connector attaching method>
	Crimp tensile strength	Min. 9kgf (0.5SQ)	
	Voltage drop	Max. 20mV/A	
	Temperature rise	Max. 60℃	
	Instant short circuit	Max 10㎲	

■ 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
936119-1	MQS 4P PLUG ASSY BLACK
936119-2	MQS 4P PLUG ASSY YELLOW
936119-3	MQS 4P PLUG ASSY DARK GRAY
936119-6	MQS 4P PLUG ASSY BLUE
1-936119-1	MQS 4P PLUG ASSY WITH CPA BLACK
1-936119-2	MQS 4P PLUG ASSY WITH CPA YELLOW
1-936119-3	MQS 4P PLUG ASSY WITH CPA DARK GRAY
1-936119-6	MQS 4P PLUG ASSY WITH CPA BLUE
936121-1	MQS 4P CAP ASSY BLACK
936121-2	MQS 4P CAP ASSY YELLOW
936399-1	MQS 4P CAP ASSY(VERTICAL TYPE) NATURAL
936399-2	MQS 4P CAP ASSY(VERTICAL TYPE) BLACK
1-936399-3	MQS 4P CAP ASSY(VERTICAL TYPE) DARK GRAY
936399-5	MQS 4P CAP ASSY(VERTICAL TYPE) YELLOW