The product described in this document has not been fully tested to ensure conformance to the requirements outlined below. Therefore, TE Connectivity (TE) makes no representation or warranty, express or implied, that the product will comply with these requirements. Further, TE may change these requirements based on the results of additional testing and evaluation. Contact TE Engineering for further details.

MQS 8P PLUG/HEADER ASSEMBLY

1. SCOPE

1.1. Content

This specification covers the requirements for product performance, test methods and quality assurance provisions of MQS 8P Plug/Header Assembly

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

- 2109329: Customer Drawing (MQS 8P HEADER ASSY)
- 965382: Customer Drawing (MQS 8P PLUG HSG)

| Indicates Change

This controlled document is subject to change.
For latest revision and Regional Customer Service, visit our website at www.te.com
PRODUCT INFORMATION 1-800-522-6752

3. REQUIREMENTS

3.1. Design and Construction

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

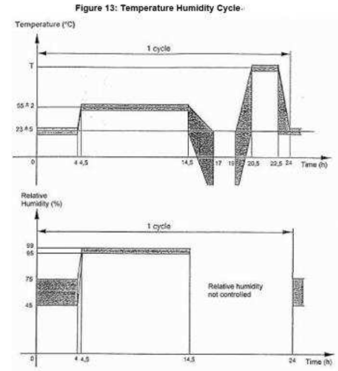
3.2. Ratings

Voltage	Temperature	Humidity
12V DC	25±5℃	65±20%

3.3. Test Requirements and Procedures Summary

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

<table>
<tr><th>TEST DESCRIPTION</th><th colspan="3">REQUIREMENT</th><th>PROCEDURE</th></tr>
<tr><td rowspan="4">Dielectric Strength</td><td rowspan="2">Appearance</td><td rowspan="2">There shall be no corrosion, fretting corrosion, discoloration, cracks, etc. which could affect the functionality of the part. Swelling or physical distortion shall not exceed the tolerances specified on the Drawing.</td><td>Before test</td><td rowspan="4">Apply a 1000 VRMS AC at 50 HZ or 60 HZ, or 1600 V DV between the terminals and metal foil for at least 60s.</td></tr>
<tr><td>After test</td></tr>
<tr><td rowspan="2">No dielectric breakdown or flash-over</td><td colspan="2">Between cavities</td></tr>
<tr><td colspan="2">Between the cavities and the HSG</td></tr>
<tr><td rowspan="3">Connector to Connector Engagement Force</td><td rowspan="2">Appearance</td><td rowspan="2">There shall be no corrosion, fretting corrosion, discoloration, cracks, etc. which could affect the functionality of the part. Swelling or physical distortion shall not exceed the tolerances specified on the Drawing.</td><td>Before test</td><td rowspan="3">1. Increase the mate force at a uniform rate of 50mm/min & 350~400mm/min until complete mating occurs.
2. Increase the mate force at a uniform rate of 50mm/minute until complete mating occurs from the first offset.
3. Increase the mate force at a uniform rate of 50mm/minute until complete mating occurs from the second offset.</td></tr>
<tr><td>After test</td></tr>
<tr><td colspan="3">Max 45N (4.58kgf)</td></tr>
<tr><td rowspan="3">Connector Polarization (Coding) Feature Effectiveness</td><td rowspan="2">Appearance</td><td rowspan="2">There shall be no corrosion, fretting corrosion, discoloration, cracks, etc. which could affect the functionality of the part. Swelling or physical distortion shall not exceed the tolerances specified on the Drawing.</td><td>Before test</td><td rowspan="3">Reverse engage the connector halves at a uniform rate of 50mm/min until the force specified.</td></tr>
<tr><td>After test</td></tr>
<tr><td colspan="3">Withstand a force of three times the engage force, and no terminal-terminal contact at a force of less than 150N.</td></tr>
</table>

<table>
<tr><td rowspan="3">Unlocked Connector Disengagement Force</td><td rowspan="2">Appearance</td><td rowspan="2">There shall be no corrosion, fretting corrosion, discoloration, cracks, etc. which could affect the functionality of the part. Swelling or physical distortion shall not exceed the tolerances specified on the Drawing.</td><td>Before test</td><td rowspan="3">Measure the force required to disengage the unlocked connector. Pull the mated connectors apart at a rate of 50mm/min.</td></tr>
<tr><td>After test</td></tr>
<tr><td colspan="3">Min 20N (Without locking features)</td></tr>
<tr><td rowspan="4">Thermal Aging</td><td rowspan="2">Appearance</td><td rowspan="2">There shall be no corrosion, fretting corrosion, discoloration, cracks, etc. which could affect the functionality of the part. Swelling or physical distortion shall not exceed the tolerances specified on the Drawing.</td><td>Before test</td><td rowspan="4">1. Measure the dry circuit resistance
2. Set the temperature chamber to the maximum ambient temperature specified in Temperature Class, for the class rating of the connector under test.
3. Place the samples in the chamber and heat age for 1008 hours.
4. Remove the samples from the chamber and let rest at ambient temperature and humidity for at least 24 hours.
5. Measure the dry circuit resistance</td></tr>
<tr><td>After test</td></tr>
<tr><td colspan="2">Dry Circuit Resistance (unit: mΩ)</td><td>Max 15mΩ</td></tr>
<tr><td colspan="2">Voltage Drop (unit: mV/A)</td><td>Max 15mV/A</td></tr>
<tr><td rowspan="5">Temperature Humidity Cycling</td><td rowspan="2">Appearance</td><td rowspan="2">There shall be no corrosion, fretting corrosion, discoloration, cracks, etc. which could affect the functionality of the part. Swelling or physical distortion shall not exceed the tolerances specified on the Drawing.</td><td>Before test</td><td rowspan="5">1. Measure the dry circuit resistance
2. Determine the minimum and maximum temperatures for the temperature class of the component set being tested. Set the temperature chamber to 23 +/- 5℃ with the relative humidity between 45 ~ 75%
3. Place the samples in to the thermal chamber and allow the chamber temperature to stabilize. Soak the test samples for an additional 30 minutes after temperature stabilization.
4. Cycle the test samples 10 times per the cycling schedule shown in Figure 13, Temperature Humidity Cycle, using the minimum and maximum Ambient Operating Temperatures for the respective temperature class as specified, while continuously monitoring the current level in the test circuit.
5. At the completion of the 10 cycles, measure the dry circuit resistance.
Figure 13: Temperature Humidity Cycle

</td></tr>
<tr><td>After test</td></tr>
<tr><td colspan="2">Dry Circuit Resistance (unit: mΩ)</td><td>Max 15mΩ</td></tr>
<tr><td colspan="2">Voltage Drop (unit: mV/A)</td><td>Max 15mV/A</td></tr>
<tr><td colspan="2">Instant short circuit</td><td>Max 1 μs / 7Ω</td></tr>
</table>

Thermal Shock	Appearance	There shall be no corrosion, fretting corrosion, discoloration, cracks, etc. which could affect the functionality of the part. Swelling or physical distortion shall not exceed the tolerances specified on the Drawing.	Before test	1. Solder the ends of the conductors to each other in the test sample set being monitored, to form a single series circuit with only two free ends. 2. Solder one of the free conductor ends to a 2 Watt 120 ± 1 Ohm resistor. 3. Solder the power supply negative lead to the free end of the resistor and the power supply positive lead to the remaining free conductor end of the test sample. 4. Preset the power supply to provide 100 mA to the circuit. 5. Connect the continuity monitoring equipment across the resistor, making sure that the negative lead of the continuity monitoring equipment is connected to the negative side of the resistor. Set the continuity monitoring equipment to monitor the current through the resistor. As an option, the continuity monitoring equipment may be used to monitor one or more terminal pairs instead of the resistor. 6. Measure the dry circuit resistance. 7. Place the test samples in the chamber so that there is no substantial air flow obstruction around the test samples. 8. Determine the minimum and maximum temperatures per the temperature class of the component set being tested. Set the temperature chamber to the minimum ambient temperature for that class. 9. Place the samples in the chamber and allow the Chamber temperature to stabilize. Soak the samples an additional 30 minutes. 10. Transfer the samples to the high temperature chamber set to the maximum ambient temperature for the class selected. Allow the test samples to soak for 30 minutes. (Chamber to chamber transfer time shall be less than 10 seconds.) 11. Transfer test samples between temperature extremes 300 total times while continuously monitoring for any loss of electrical current level per the set-up described above. 12. At the end of the cycling schedule remove the test samples from the chamber and measure the dry circuit resistance.
			After test	
	Dry Circuit Resistance (unit: mΩ)		Max 15mΩ	
	Voltage Drop (unit: mV/A)		Max 15mV/A	
	Instant short circuit		Max 1 μs / 7Ω	

Class	Ambient Operating Temperature in °C	Typical Installation Position
1	-40...+85	Passenger compartment or trunk
2	-40...+105	Under hood/chassis
3	-40...+125	On engine
4	-40...+155	On engine (hot locations)

<table>
<tr>
<td rowspan="6">MECHANICAL SHOCK / VIBRATION</td>
<td rowspan="2">Appearance</td>
<td rowspan="2">There shall be no corrosion, fretting corrosion, discoloration, cracks, etc. which could affect the functionality of the part. Swelling or physical distortion shall not exceed the tolerances specified on the Drawing.</td>
<td>Before test</td>
<td rowspan="6">■ Mechanical shock

1. Divide the test samples into two groups of 5

2. The first group shall be set up and monitored continuously. Refer to Figure 14, Series Circuit Monitoring, and the following instructions:

A. Solder the ends of the conductors to each other in the sample set being monitored to form a single series circuit with only two free ends.

B. Solder the end of one of the free conductors to a 2 Watt 120 ± 1.2 Ohm resistor.

C. Solder the power supply negative lead to the free end of the resistor and the positive lead of the power supply to the other free conductor end.

D. Connect the continuity monitoring equipment across the resistor, making sure that the negative lead of the continuity monitoring equipment is connected to the negative side of the resistor. Set the continuity monitoring equipment to monitor the current through the resistor.

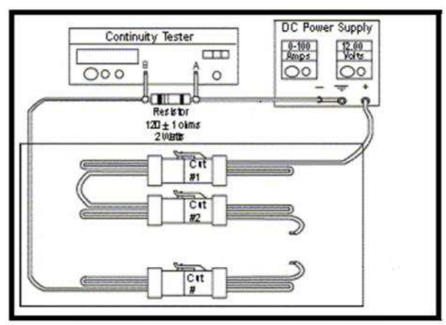


Figure 14: Series Circuit Monitoring

3. The second group shall not be monitored.

4. Construct a suitable mounting apparatus using the following design criteria:

A. The mounting apparatus shall be constructed and secured to minimize added effects, i.e., harmonics, dampening, resonances, etc.

B. For in-line connectors, mount the mated connector pair directly to the test fixture mounting bracket using the connector feature provided for mounting as shown in Method 1 in Figure 15, Vibration Mounting Fixture. Do not use a "Christmas Tree" or any similar type of mounting feature. Instead, the test fixture mounting bracket itself must be constructed so as to include a direct mounting feature to mate with the clip mount (dovetail) on the mated connector pair.</td>
</tr>
<tr>
<td>After test</td>
</tr>
<tr>
<td colspan="2">Dry Circuit Resistance (unit: mΩ)</td>
<td>Max 15mΩ</td>
</tr>
<tr>
<td colspan="2">Voltage Drop (unit: mV/A)</td>
<td>Max 15mV/A</td>
</tr>
<tr>
<td colspan="2">Instant short circuit</td>
<td>Max 1 μs / 7Ω</td>
</tr>
<tr>
<td colspan="3"></td>
</tr>
</table>

C. For device (panel mount) connectors, mount the device directly to the test fixture mounting bracket as shown in Method 2 in Figure 15, Vibration Mounting Fixture. Use the normal device mounting feature(s) used to secure the device in its intended vehicle location. The test fixture mounting bracket shall be fabricated to include any features necessary to mount the device directly to the fixture.

D. Secure the conductor bundle 100±5 mm from the rear surface of the conductors under test (CUT) as illustrated in Figure 15, Vibration Mounting Fixture.

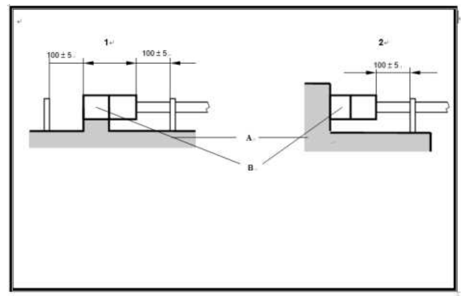


Figure 15: Vibration Mounting Fixture

5. Measure the dry circuit resistance

6. Set the power supply to provide 100 mA to the circuit throughout the Mechanical Shock Test.

7. Perform the Mechanical Shock Test according to EN 60068-2-27 and Table 11, Mechanical Shock.

Table 11: Mechanical Shock

	Sealed	Unsealed	All
Acceleration [g]	25	12	100
Nominal Shock Duration [ms]	10	20	11
Nominal Shock Shape	half sine	half sine	half sine
Number of shocks per axis, (positive and negative).	400 X 6 = 2400	400 X 6 = 2400	3 X 6 = 18

8. Perform the Vibration with Thermal Cycling Test

■ Vibration with Thermal Cycling

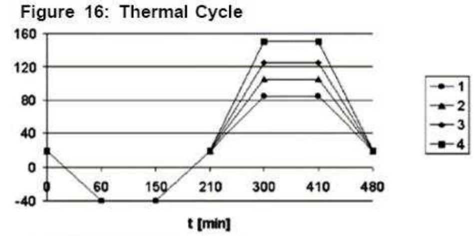
Using the same test samples and mounting fixtures utilized in the Mechanical Shock Test, vibrate the parts per the applicable vibration profiles defined in Figures 17 through 22 Vibration profiles and temperature settings are chosen based on the intended vehicle application.

Engine and transmission mounted connector assemblies shall be subjected to both the sine and random vibration profiles. The sine and random vibration schedules may be run in any order.

The test samples undergoing the appropriate vibration profile shall be simultaneously subjected to the thermal cycle as defined in Figure 16: Thermal Cycle and Table 12, Thermal Cycle Requirements. Refer to the appropriate vibration profile for specific test procedures, test duration, amplitude and frequency requirements.

At the completion of the required vibration cycles, measure the dry circuit resistance.

Figure 16: Thermal Cycle



1 Temperature class 1

2 Temperature class 2

3 Temperature class 3

4 Temperature class 4

t Time in min

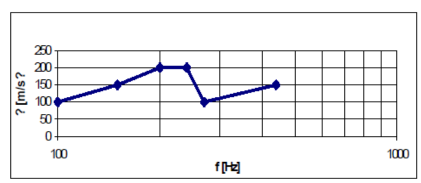
T Temperature in °C

Table 12: Thermal Cycle Requirements

Time in min	Temperature in °C			
	Class 1	Class 2	Class 3	Class 4
0	+20	+20	+20	+20
60	-40	-40	-40	-40
150	-40	-40	-40	-40
210	+20	+20	+20	+20
300	+85	+100	+125	+155
410	+85	+100	+125	+155
480	+20	+20	+20	+20

B – VIBRATION CLASS 2

Figure 23: Engine/Transmission Mount Sinusoidal Vibration Cycle - ISO 16750-3 Based – Vibration Class 2



â- Amplitude of acceleration [m/s^2]

f- Frequency [Hz]

Test according to EN 60068-2-6, frequency sweep: 1 octave/min. Test duration = 22 – 24 hours for each X, Y, Z co-ordinate axis of the part. The specified test profile applies to both gasoline and diesel engines. This test is followed by the Random Vibration Test in Figure 24.

Table 14: Engine/Transmission Mount Sinusoidal Vibration Cycle - ISO 16750-3 based – Vibration Class 2

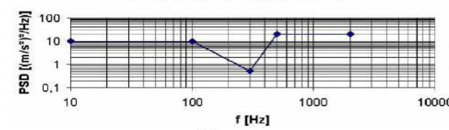
Frequency (Hz)	Amplitude of acceleration (m/s^2)
100	100
150	150
200	200
240	200
270	100
440	150

â- Amplitude of acceleration [m/s^2]

f- Frequency [Hz]

Test according to EN 60068-2-6, frequency sweep: 1 octave/min. Test Duration = 22 – 24 hours for each X, Y, Z co-ordinate axis of the part. The specified test profile applies to both gasoline and diesel engines. This test is followed by the Random Vibration Test in Figure 24.

Figure 24: Engine/Transmission Mount Random Vibration Cycle – ISO 16750-3-based – Vibration Class 2



PSD= Power Spectral Density [$(m/s^2)^2/Hz$]

F= Frequency [Hz]

Test according to EN 60068-2-64, RMS acceleration. Value = 181 m/s^2 Frequency Sweep: 1 octave/min for each X, Y, Z co-ordinate axis of the part.

Table 15: Engine/Transmission Mount Random Vibration Cycle - ISO 16750-3 based – Vibration Class 2

Frequency [Hz]	Power Spectral Density [$(m/s^2)^2/Hz$]
10	10
100	10
300	0.51
500	20
2000	20

Corrosion Sequence	Appearance	There shall be no corrosion, fretting corrosion, discoloration, cracks, etc. which could affect the functionality of the part. Swelling or physical distortion shall not exceed the tolerances specified on the Drawing.	Before test	1. Mount connector pairs in both a vertical and horizontal orientation within the test chamber. 2. Perform the 6 cycles of '8hr salt mist / 16hr dry' in accordance with IEC 60068-2-52, Test Kb, Salt Mist. 3. Measure the dry circuit resistance / Appearance / Terminal retention force.
			After test	
	Terminal Retention Force		Min 50N	
	Dry Circuit Resistance (unit: mΩ)		Max 15mΩ	
Terminal Push-Out Force	Min 15N		Pushing	Fix the connector body and move the connector pin pushing and pulling more than 0.2mm at a speed of 50mm/min to measure the peak force.
			Pulling	

3.3 Applied Part No List

TE Part no	Description
2109329-8	MQS 8P HEADER ASSY
9-965382-2	MQS 8P PLUG HSG