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/MCP HYB 22P

1. SCOPE

1.1. Content

This specification covers the requirements for product performance, test methods and quality assurance provisions of MQS/MCP HYB 22P

1.2. Qualification

When tests are performed on the subject product line, procedures specified 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

- 1897543: Customer Drawing (MQS/MCP HYB 22P PLUG ASSY)
- 1897540: Customer Drawing (MQS/MCP HYB 22P CAP ASSY)

2.2. Reference Document

- GMW3191 (1.0 January 2005)

3. REQUIREMENTS

3.1. Design and Construction

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

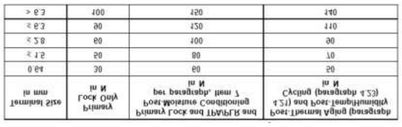
3.2. Ratings

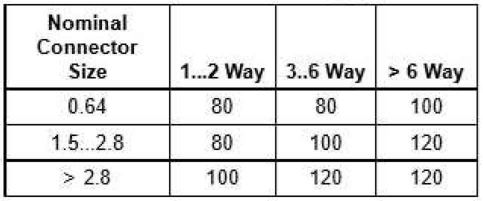
Voltage	Temperature	Humidity
12V DC	25±5℃	60±20%

3.3. Test Requirements and Procedures Summary

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

TEST DESCRIPTION	REQUIREMENT	PROCEDURE
Visual Inspection	Inspect for defects.	Assure parts used for testing are free of damage and obvious defects.

<table>
<tr><td rowspan="2">Terminal-to-Connector Engagement Force.</td><td rowspan="2">Refer GMW3191 4.7.5
Acceptance Criteria</td><td>**TPA in Open Position**
1 For terminals with <1.0mm2 wire, the engagement force to fully seat and lock the terminal shall be < 15 N max. 2 For terminals with 1.0 mm2 wire, the engagement force to fully seat and lock the terminal shall be < 20 N max. 3 For terminals with >1.0mm2 wire, the engagement force to fully seat and lock the terminal shall be < 30 N max. 4 Neither the terminal nor the conductor shall buckle during the insertion.</td></tr>
<tr><td>**TPA in Fully Seated Position**
1 Mount a connector with a fully seated TPA into a fixture. 2 Secure a terminated lead into a suitable fixture ≈20 mm from the back of the terminal or seal. Take special care when securing the terminated lead so that the lead fixture does not interfere with full terminal insertion during the test. 3 Insert the terminal into the connector at a uniform rate of(50 ±10) mm/min until it is either fully seated and locked into the cavity or all forward motion of the terminal ceases due to interference between the terminal and the TPA or the test insertion force reaches 75 N max. 4 Record peak force and graph force versus distance from initial contact of terminal to connector body to final engaged position.</td></tr>
<tr><td>Terminal-from-Connector Extraction Force</td><td>Refer GMW3191 4.9.5
Acceptance Criteria

<table><tr><th>Terminal Size in mm</th><th>Primary Lock Only in N</th><th>Primary Lock and TPA/PLR and Post-Moisture Conditioning per paragraph, item 7 in N</th><th>Post-Thermal Aging (paragraph 4.21) and Post-Temp/Humidity Cycling (paragraph 4.23) in N</th></tr><tr><td>0.64</td><td>30</td><td>60</td><td>50</td></tr><tr><td>≤ 1.5</td><td>50</td><td>80</td><td>70</td></tr><tr><td>≤ 2.8</td><td>60</td><td>100</td><td>90</td></tr><tr><td>≤ 6.3</td><td>90</td><td>120</td><td>110</td></tr><tr><td>> 6.3</td><td>100</td><td>150</td><td>140</td></tr></table></td><td>1 Assemble connectors and 10 of the terminals including all seals and other necessary components but without the TPA’s. Designs using pre-staged TPA’s shall have the TPA in the pre-staged position.
2 Secure the connector into a fixture.
3 Attach the conductor to the pull tester at a point < 100 mm behind the rear of the terminal.
4 Pull the conductor at a uniform rate of (50 ± 10) mm/min until pull-out occurs. Note pull-out value and failure mode.
5 Record peak force required to pull the terminal out of the connector cavity. If the conductor breaks or pulls out of the terminal before the terminal pulls out of the cavity, record this force and note the failure mode.
6 Using new test samplesrepeatsteps1 to 5 but with all TPA’s fully seated.
7 Using new test samples and fully seated TPA’s, repeat steps 1 to 5 using connectors that are moisture conditioned by being exposing to (95...98) % Relative Humidity at +40 C for 6 h. The pull test shall be performed immediately following</td></tr>
</table>

<table>
<tr><td></td><td></td><td>removal of the connectors from the temperature/humidity chamber.
8 Using new test samples and fully seated TPA’s, repeat steps 1 to 5 immediately after paragraph 4.21, Thermal Aging. See Figure 35 for test sequence.
9 Using new test samples and fully seated TPA’s, repeat steps 1 to 5 immediately after paragraph 4.23, Temperature/Humidity Cycling. See Figure 35 for test sequence.</td></tr>
<tr><td>Connector-to-Connector Engagement Force.</td><td>The maximum force for a manually assembled connector to reach full engagement is specified in Table 4. This requirement applies to lever locks and other mechanical assist features.</td><td>1 Secure connector to be mated into fixture.
2 Attach mating connector assembly into fixture.
3 Mate connectors together at a uniform rate of (50 ± 10) mm/min until fully seated and locked.
4 Record peak force and graph force versus distance from initial contact of connectors to final engaged position.</td></tr>
<tr><td>Locked Connector Disengagement Force</td><td>The force to defeat the primary locking mechanism shall exceed the disengagement force specified in Table

<table>
<tr><th>Nominal Connector Size</th><th>1...2 Way</th><th>3..6 Way</th><th>> 6 Way</th></tr>
<tr><td>0.64</td><td>80</td><td>80</td><td>100</td></tr>
<tr><td>1.5...2.8</td><td>80</td><td>100</td><td>120</td></tr>
<tr><td>> 2.8</td><td>100</td><td>120</td><td>120</td></tr>
</table></td><td>1 Make a fixture that will secure the connectors to be tested without distorting any of the parts either before or during the test.
2 Mount the mated connector housings in the fixture with the locking feature engaged. Ensure that all secondary locks and/or CPA’s are either removed or disengaged.
3 Pull the mated connectors apart at a rate of (50 ± 10) mm/min.
4 Record the force at which the connectors disengage.</td></tr>
<tr><td>Unlocked Connector Disengagement Force</td><td>1 The maximum force required to disconnect the connector pairs with the locks properly disengaged shall be < 100 N.
2 The maximum force required to disengage the primary lock shall be < 100 N.
Note: In the case of connector housings without locking features the disengagement force shall be 20 N min.</td><td>1 Make a fixture that will secure the connectors to be tested without distorting any of the parts either before or during the test.
2 Mount5 of the mated connector housings in the fixture with the locking feature disengaged. Ensure that all secondary locks and/or CPA’s are either removed or disengaged.
3 Pull the mated connectors apart at a rate of (50 ± 10) mm/min.
4 Record the force at which the connectors disengage.
5 Mount 5 of the mated connector housings in the fixture with the locking feature engaged.
6 Measure the force required to disengage the primary locking feature.
7 Record the force required to disengage the lock.</td></tr>
<tr><td>Connector Polarization (Coding) Feature Effectiveness.</td><td>1 The connection system shall withstand a minimum mating force of three times the force measured under paragraph 4.11.
2 Under no circumstances shall any terminal-to-terminal contact be made under an</td><td>1 Using a suitable fixture, orient the connector halves with respect to one another in one or more incorrect orientations specified by the design engineer as most likely to defeat the index feature.</td></tr>
</table>

	applied force of < 150 N. 3 There shall be no physical damage (cracking, breakage, etc.) to either connector half, or any deterioration that would prevent any subsequent mating and proper function.	2 Engage the connector halves at a uniform rate of 50 mm/min until the force specified under paragraph 4.16.5 is applied. Note whether electrical contact is made. 3 Repeat steps 1 and 2 with every other possible mate within the same connector family.
Terminal Position Assurance (TPA).	TPA locking system shall withstand 20 N, without separation. 4.12.1.5.2 TPA Closing Force with Correct Assembled Terminals. The closing force with correctly assembled terminals shall be < 30 N. 4.12.1.5.3 TPA Closing Force with One Improperly ISnserted Terminal. The closing force with one improperly or partially inserted terminal shall be > 60 N for all terminal sizes. 4.12.1.5.4 Closed TPA Locking Force. The force to unintentionally open the TPA shall be > 25 N.	4.12.1.4.1 TPA Pre-lock Force. Note: This appliesto connectors with pre-assembled TPA's only. 1 Using a suitable fixture, orient the connector with orientations specified by the design engineer as most likely to defeat the retaining feature. 2 Pull the TPA from the connector at a uniform rate (50 ± 10) mm/min until 20 N is applied. 4.12.1.4.2 TPA Closing Force with Properly Assembled Terminals. 1 Insert terminals into all cavities of the connector. 2 Secure connector body and TPA into a holding fixture. 3 Insert TPA into connector body at a uniform rate of (50 ± 10) mm/min. 4 Record peak force and graph force versus distance from initial position of TPA to connector body to final engaged position. 4.12.1.4.3 TPA Closing Force with One Improperly Assembled Terminal. 1 Study the design of the terminal and TPA and determine the position of the terminal where it's most likely that the TPA is possible to close with the lowest force and still provide terminal electrical contact. 2 Insert the terminal into that position. 3 Secure connector body to fixture. 4 Fully insert TPA into connector body at a uniform rate of (50 ± 10) mm/min. 5 Record the peak force and graph force versus distance from initial contact of the TPA to the connector body to the final engaged position. 4.12.1.4.4 Closed TPA Locking Force. 1 Using a suitable fixture, orient the connector with orientations specified by the design engineer as most likely to defeat the holding feature. 2 Pull or push the TPA from the connector at a uniform rate (50 ± 10) mm/min until a force of 20 N is applied.
Thermal Aging	1 The test samples shall meet the requirements specified in paragraph 4.17.5, Table 10, Dry Circuit, before and after the environmental tests. 2 All test samples shall meet the visual requirements of paragraph 4.1.8. All mechanical assists and/or other elements required to separate connectors for service must function without breakage	1 Measure the dry circuit resistance per paragraph 4.17. 2 Set the temperature chamber to the maximum ambient temperature especified in Table 1, Temperature Class, for the class rating of the connector under test. 3 Place the samples in the chamber and heat age for 1008 h. 4 Remove the samples from the chamber and let rest at ambient temperature and humidity for 24 h min. 5 Measure the dry circuit resistance per paragraph 4.17.

Thermal Shock.	1 There shall be no loss of electrical continuity(resistance > 7 > 1 µs) during this test. 2 Test samples shall meet the dry circuit requirements of paragraph 4.17.5, Table 10, both before and after thermal shock testing. 3 All test samples shall meet the visual requirements of paragraph 4.1.8. All mechanical assists and/or other elements required to separate connectors for service must function without breakage.	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 W (120 ± 1.2) 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 per paragraph 4.17. 7 Place the test samples in the chamber so that there is no substantial air flow obstruction around the test samples. 8 Determine the min. and max. 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 min. 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 min. Note: Chamber to chamber transfer time shall be < 10 s. 11 For temperature class 1: • Transfer test samples between temperature extremes 100 total times while continuously monitoring for any loss of electrical current level per the set-up described above. 12 Temperature classes 2, 3 and 4: • 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. 13 At the end of the cycling schedule remove the test samples from the chamber and measure the dry circuit resistance per paragraph 4.17
Temperature/Humidity Cycling	Test samples shall meetthedry circuitrequirementsofparagraph 4.17.5, Table 10 both before and after temperature/humidity cycling. All test samples shall meet the visual requirements of paragraph 4.1.8. All mechanical assists and/or other elements required to separate connectors for service must function without breakage **Refer GMW3191**	1 Measure the dry circuit resistance per paragraph 4.17. 2 Place the test samples in the chamber ensuring that there is no substantial air flow obstruction around the test samples. 3 Determine the min. and max. temperatures for the temperature class of the component set being tested. Set the temperature chamber to (+23 ± 5) C with the relative humidity between (45...75) %. 4 Place the samples in to the thermal chamber and allow the chamber temperature to stabilize. Soak the test samples for an additional 30 min after temperature stabilization. 5 Cycle the test samples 10 times per the cycling schedule shown in Figure 13, Temperature Humidity Cycle, using the min. and max. ambient operating temperatures for the respective temperature class as specified in Table 1, while

		continuously monitoring the current level in the test circuit. 6 Atthe completionofthe 10 cycles, measure the dry circuit resistance per paragraph 4.17.

3.4. Applied Part No List

TE Part no	Description
1897543-1	MQS/MCP HYB 22P PLUG ASSY
1897543-2	MQS/MCP HYB 22P PLUG ASSY
1897540-1	MQS/MCP HYB 22P CAP ASSY
1897540-2	MQS/MCP HYB 22P CAP ASSY