050110 48P Housing

1. SCOPE

1.1. Content

This specification covers the requirements for product performance, test methods and quality assurance provisions of 050110 48P Plug Housing

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

- 114-61058: Application Specification FOR 050110 48P Connector
- 2109452: Customer Drawing (050110 48P PLUG)
- 2109455: Customer Drawing (050110 48P CAP)

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.

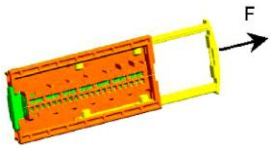
TEST DESCRIPTION	REQUIREMENT	PROCEDURE

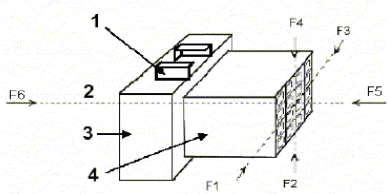
Visual Inspection	Inspect for defects.	Assure parts used for testing are free of damage and obvious defects.
Connector and / or Terminal Cycling	10 condition cycle	• Crimp wires of appropriate gauge size to terminals. Insert terminated leads into specific connector housings, when required. • Completely mate and unmate each connector or terminal pair 10 times. • Store test samples at an ambient temperature of (+23 ± 5) C for 24 h min.
Dry Circuit Resistance	- 1.2mm $R_T \leq 8m\Omega$ - 2.8mm $R_T \leq 5m\Omega$	**1** Attach micro-ohmmeter leads to locations A, B, and C as illustrated in Figure 12, In-Line Circuit Test Lead Location, to the terminated test leads. **2** Measure and record the resistance across (150 ± 3) mm of the new and non-preconditioned terminated leads to be used for the test. **3** Mate the terminated pairs. Measure the resistance across A to B and B to C using instrumentation, which determines resistance by either the offset compensation or current reversal methods. **4** Condition the terminal pairs, Conditioning. **5** Re-mate the terminated pairs and measure the resistance across A to B and B to C using instrumentation which determines resistance by either the offset compensation or current reversal methods. **6** Calculate the combined resistance of the terminal conductor attachments and the interface with the following formula: $R_{Total\ Connection} = R_{(DE)} = R_{(AB)} - R_{(BC)}$
Mechanical Shock (Wire size : 1.2Term : 1.5mm2 2.8Term : 2.5mm2)	Resistance >7Ω >1 μs	Fully populated connector with all terminals terminated to (300 ± 5) mm of the largest gauge wire specified for the respective terminal. Bundle the wires with cloth or vinyl tape in a spiral wrap configuration. Number of test samples: 10 connector pairs.
Vibration with Thermal Cycling -Vibration	Resistance >7Ω >1 μs	Using the same test samples and mounting fixtures utilized in the Mechanical Shock Test specified.
Thermal Aging +105℃ for 1008h Temp Class2		**1** Measure the dry circuit resistance. **2** Set the temperature chamber to the maximum ambient temperature specified, 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.
Heavy Duty Test -40℃ ~ +80℃ Temp Class2 - Temp Rise	+50℃ Max	**1** Complete the dry circuit test, Dry Circuit, and record the results for each terminal pair. **2** Set the power supply to provide the maximum de-rated current for the terminal and cable taken from the border of Area 2, Derating Curve, for the largest wire size at the specified test temperature, i.e., +80 C or +100 C. **3** Connect the thermocouple leads a data logger.

		4 Set the temperature chamber to +80 C for temperature classes (1...3) in Table 1 and +100 C for temperature class 4. **5** Run themaximum de-rated current through the test samples at the respective test temperature for 5 h. **6** Transfer the samples to -40 C and cool for 2 h at 0 A. **7** Repeat the above test procedure for a total of 5 cycles. **8** After 5 cycles, store the samples at (+23 ± 5) C for 24 h min. **9** Perform a dry circuit test, Dry Circuit, and record the results for each terminal pair.
Thermal Shock - -40℃ ~ +105℃ (Temp Class2) For 100h -Circuit Continuity Monitoring	Resistance >7Ω >1μs	**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. **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.
Temperature/Humidity Cycling for 240h - Temp Class 2		**1** Measure the dry circuit resistance. **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, 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** At the completion of the 10 cycles, measure the dry circuit resistance.
Terminal-to-Connector Engagement Force - 1.2mm Wire Size : 0.35mm2 -2.8mm Wire Size : 0.35mm2 - A-TPA In Open Position	-15 N Max	**1** Mount the connector with the TPA in the “Open” position 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 terminal into connector 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 terminal to connector body to final engaged position.
- B-TPA In Fully Seated Position	-30 N Min	**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.
Terminal-from-Connector Extraction Force -1.2mm Wire Size : 1.5 mm2 -2.8mm Wire Size : 2.5 mm2	- Primary lock only -1.2mm : 50 N Min -2.8mm : 60 N Min - Primary lock & TPA /PLR -1.2mm : 80 N Min -2.8mm : 100 N Min - Post-Moisture Conditioning -1.2mm : 80 N Min -2.8mm : 100 N Min	**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 samples repeat steps 1 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 m oisture conditioned by being exposing to (95...98) % Relative Humidity at +40 C for 6 h. The pull test shall be

		performed immediately following 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, Thermal Aging. **9** Using new test samples and fully seated TPA's, repeat steps 1 to 5 immediately, Temperature/Humidity Cycling.
Connector-to-Connector Engagement Force (50±10mm/min)	75N Max	**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.
Locked Connector Disengagement Force (50±10mm/min) 48 way	120N Max	**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.
Disengagement Unlock CONN'R Lock disengagement	100N Max	**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 5 of themated 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.
Connector Mated One or more incorrect orientations *Cap – Code B Plug – Code A *Cap – Code A Plug – Code B	No mating /electrical contact = 150 N or mating value *3	**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. **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.
TPA Pre-lock Force	Withstand 20N	**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.
TPA Closing Force with Properly Assembled Terminals	30N Max	**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.
TPA Closing Force with One Improperly Assembled Terminal	60N Min	**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.
Closed TPA Locking Force	25N Min	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.
Retention of Lever In Open Position - Apply the force in Figure 3 -Apply the force to Close the lever in The As delivered pre-lock position	Withstand 50 N Withstand 150 N	**1** Make a fixture that will secure the connectors to be tested without distorting any of the parts. **2** Mount the samples in the fixture with the slide or lever in the open position. **3** Apply a 50 N force in direction "F", as shown in Figure 3, at the rate of /50 ± 10) mm/min. **4** Mount new connectors in the fixture maintaining the slide or lever in the as-delivered pre-lock position. **5** Apply a 150 N force to close the slide or lever at the rate of (50 ± 10) mm/min. **6** Mount new connectors in the fixture maintaining the slide or lever in the as-delivered pre-lock position. **7** Apply an increasing force to the slide or lever at the rate of (50 ± 10) mm/min until the pre-lock position is defeated. Record the force.  **Figure 3: Retention of Slide in the Open Position**
Retention of Lever In Open Position - Apply the force in The direction (opposite to direction) "F" in Figure 4 (open positions) - Apply the force in The direction (opposite to direction) "F" in Figure 4 (closed positions)	Withstand 100N Withstand 100N	**1** Make a fixture that will secure the connectors to be tested without distorting any of the parts. **2** Mount the samples in the fixture. **3** Apply a 100 N force in Direction "F", as shown in Figure 4, at the rate of (50 ± 10) mm/min with the lever or slide in both the open and closed positions. **4** Apply a 100 N force in the direction opposite to Direction "F" at the rate of (50 ± 10) mm/min with the lever or slide in the open and closed positions. **5** Position the slide or lever in a position approximately half way between the open and closed positions. Apply a 60 N force in Direction "F", as shown in Figure 4, at the rate of (50 ± 10) mm/min. **6** Position the slide or lever in a position approximately half way between the open and closed positions.

- Apply a force in the direction (opposite to direction) "F" in Figure 4 in a position approximately half way between the open and closed position	Withstand 60N	Apply a 60 N force in the direction opposite to Direction "F", as shown in Figure 4, at the rate of (50 ± 10) mm/min.  **Figure 4: Side Force Strength**
With the connector assembly attached to the bracket, Apply a force Direction : F1 Direction : F2 Direction : F3 Direction : F4 Direction : F5 Direction : F6	 50 N Min 50 N Min 50 N Min 50 N Min 50 N Min 110 N Min	**1** Test a minimum of 30 connectors (five in each direction). **2** One non-mounting (mating) connector may be used to test all connectors. **3** Secure a new connector with the designed-in mounting feature to a bracket with a fixture simulating the coordinating mounting feature (see Figure 5). ***Note:*** No additional reinforcement of the connector slot is permitted. **4** With the connector assembly attached to the bracket, apply a downward force at a rate of 50 mm/min to the non-mounted mating connector in direction "F1" until breakage of the mounting feature or until the force specified in the Acceptance Criteria of paragraph 4.12.4.5 is reached. The force shall be applied 5 mm from the rear and side of the connector to affect the greatest moment arm (see Figure 6, Figure 7, and Figure 8). **5** Remove the connector from the fixture. **6** Repeat steps (2...5) with four additional connectors. **7** Repeat steps (2...6) in the other three directions ("F2", "F3", and "F4" - 90 apart, each perpendicular to the direction of mating of the mounting feature). **8** Secure a new connector with the designed-in mounting feature to a bracket with a fixture simulating the coordinating mounting feature (see Figure 5). **9** With the connector assembly attached to the bracket, apply a push force connector with a probe (at a rate of 50 mm/min) at the centerline of the connector in direction "F5" until breakage of the mounting feature or until the force specified in the Acceptance Criteria of paragraph 4.12.4.5 is reached (see Figure 6). **10** Remove the connector from the fixture. **11** Repeat steps (8...10) with four additional connectors. **12** Repeat steps (8...11) in the other direction ("F6"). **Figure 6: (3D View)** 
CPA Lock and Unlock Force - Locking force	22N Max	**1** Using a mated connector pair, close the CPA at a uniform rate of (50 ± 10) mm/min until fully seated and locked. Record the peak force.

-Opening force	20~40N	**2** Open the CPA at a uniform rate of (50 ± 10)mm/min until fully opened. Record the peak force.
CPA closing force on Unmated Connectors -48way	80 Min	Using an unmated connector, close the CPA at a uniform rate of (50 ± 10) mm/min until fully seated and locked. Record the peak force.
CPA Extraction Force -48way	80 N min	Using an unmated connector, apply a force to the CPA in the opposite direction to the normal closing direction at a uniform rate of (50 ± 10) mm/min until fully detached. Record the peak force.
Isolation Resistance	R > 100 Mohms @ 500 VDC For 15s	**1** Mate connector pairs. **2** Wrap metal foil around the exterior of the connector without contacting any terminals or wires. **3** Remove a minimal amount of insulation from the ends of the wires. **4** Separate wires under test with sufficient distance as to have no influence on isolation resistance between any two wire pairs. **5** Measure the isolation resistance by applying 500 VDC between all adjacent pairs of terminals. **6** Record the resistance after 15 s of stabilized readings. **7** Attach all the terminated wire leads to the positive lead of a Mega-Ohmmeter. Attach the negative lead of the Mega-Ohmmeter to the metal foil. **8** Measure the isolation resistance by applying 500 VDC between the terminals and the metal foil. **9** Record the resistance after 15 s of stabilized readings.
Dielectric Strength - AC1000V at 50 or 60Hz For 60s -DC 1600V For 60s	No Breakdown No Flash Over	**1** Mate connector pairs. **2** Wrapmetal foil around the exterior of the connector without contacting any terminals or wires. **3** Remove a minimal amount of insulation from the ends of the wires. **4** Separate wires under test with sufficient distance as to have no influence on isolation resistance between any two wire pairs. **5** Using the high potential (hi-pot) tester, apply an AC rms voltage of 1000 V at 50 Hz or 60 Hz or a DC voltage of 1600 V across each adjacent cavity for 60 s min. **6** Record any current leakage. **7** Attach all the terminated wire leads to the positive lead of the hi-pot tester. Attach the negative lead of the hi-pot tester to the metal foil. **8** Apply an AC voltage of 1000 V (rms) at 50 Hz or 60 Hz or a DC voltage of 1600 V between the terminals and the metal foil for 60 s min. **9** Record any current leakage.

3.4. Applied Part No List

TE Part no	Description
1-2109452-3	050/110 48P PLUG ASSY CODE B
2109452-2	050/110 48P PLUG ASSY CODE A
5-2109455-2	050/110 48P CAP ASSY CODE A