

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.

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
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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	$\begin{array}{l} -1.2mm\\ R_T \leq 8m\Omega\\ -2.8mm\\ R_T \leq 5m\Omega \end{array}$	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 terminated 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: RTotal 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°C for 1008h Temp Class2		 Measure the dry circuit resistance. Set the temperature chamber to the maximum ambient temperature specified, Temperature Class, for the class rating of the connector under test. Place the samples in the chamber and heat age for 1008 h. Remove the samples from the chamber and let rest at ambient temperature and humidity for 24 h min. Measure the dry circuit resistance.
Heavy Duty Test -40°C ~ +80°C Temp Class2 - Temp Rise	+50°C Max	 Complete the dry circuit test, Dry Circuit, and record the results for each terminal pair. Set the power supply to provide the maximum derated 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. Connect the thermocouple leads a data logger.



		4 Set the temperature chamber to +80 C for temperature classes (13) 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 curcles
		8 After 5 cycles, store the samples at $(+23 \pm 5)$ C for 24 h min.
		9 Perform a dry circuit test, Dry Circuit, and record the results for each terminal pair.
Thermal Shock 40°C ~ +105°C (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		 Measure the dry circuit resistance. Place the test samples in the chamber ensuring that there is no substantial air flow obstruction around the test samples. 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 (4575) %. Determine the complex 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.
		1 Mount the connector with the TPA in the "Open"
		position into a fixture
Terminal-to-Connector		2 Secure a terminated lead into a suitable fixture ~ 20
Engagement Force		\sim 20 mm from the back of the terminal or seal. Take special
- 1.2mm Wire Size		care when securing the terminated lead so that the lead
: 0.35mm2		fixture does not interfere with full terminal insertion
-2.8mm Wire Size	-15 N Max	during the test
: 0.35mm2		3 Insert terminal into connector at a uniform rate of (50 +
		\mathbf{J} insert terminal into connector at a dimonitrate of (50 \pm
- A-TPA In Open		A Record neak force and graph force versus distance
Position		from initial contact of terminal to connector body to final
		A Mount a connector with a fully control TDA into a
		T Mount a connector with a fully seated TPA into a
		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.
- B-TPA In Fully	-30 N Min	3 Insert the terminal into the connector at a uniform rate
Seated Position	50 14 14111	of (50 \pm 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.
		1 Assemble connectors and 10 of the terminals
		including all seals and other necessary components but
	- Primary lock only	without the TPA's. Designs using pre-staged TPA's shall
	-1.2mm	have the TPA in the
	: 50 N Min	pre-staged position.
	-2.8mm	2 Secure the connector into a fixture.
	: 60 N Min	3 Attach the conductor to the pull tester at a point < 100
		mm behind the rear of the terminal.
Terminal-from-Connector	- Primary lock &	4 Pull the conductor at a uniform rate of (50 ± 10)
Extraction Force	TPA /PLR	mm/min until pull-out occurs. Note pull-out value and
-1.2mm Wire Size	-1.2mm	failure mode.
: 1.5 mm2	: 80 N Min	5 Record peak force required to pull the terminal out of
-2.8mm Wire Size	-2.8mm	the connector cavity. If the conductor breaks or pulls out
: 2.5 mm2	: 100 N Min	of the terminal before the terminal pulls out of the cavity
	De et Melet	record this force and note the failure mode
	- Post-Moisture	6 Using new test samples repeat steps 1 to 5 but with all
	Conditioning	TPA's fully seated
	-1.211111 • 80 N Min	7 Using new test samples and fully seated TPA's repeat
	-2 8mm	stens 1 to 5 using connectors that are m
	· 100 N Min	
	. 100 14 141111	oisture conditioned by being exposing to (05, 08) %
		Relative Humidity at ± 40 C for 6 h. The null test shell be
	1	1 The pull test shall be



Connector-tor-Connector B 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-tor-Connector 1 Secure connector to be mated into fixture. B Using new test samples and fully seated TPA's, repeat steps 1 to 5 immediately, Temperature/Humidity Cycling. Connector-tor-Connector 75N Max B Mate connectors to be mated into fixture. 3 Mate connector to to be mated into fixture. State connector to to be mated into fixture. 3 Mate connectors to to the sector parts for the connectors to be tested without distorting any of the parts either before or during the test. Disengagement Force 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. Disengagement Unlock CONNR 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. Lock disengagement 100N Max 1 Make a fixture will mill force the connectors to be tested without distorting any of the parts either before or during the test. Lock disengagement 100N Max 1 Make a fixture disengaged. Ensure that all secondary locks and/or CPA's are either removed or disengaged. Disengagement 10Make a fixture disengaged. Ensure that all secorind the force			performed immediately following removal of the
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Solution induction3 Repeat steps 1 and 2 with every other possible mate within the same connector family.TPA Pre-lock ForceWithstand 20N1 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 Terminals30N Max1 Insert terminals1 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	Plug – Code B		contact is made
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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 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			within the same connector family.
The consistence of the connector with a 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 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	TPA Pre-lock Force	Withstand 20N	1 Using a suitable fixture, orient the connector with
TPA Closing Force 30N Max Terminals 30N Max			orientations specified by the design engineer as
Impose interfy to defeat the retaining reduce. 2 Pull the TPA from the connector at a uniform rate (50 ± 10) mm/min until 20 N is applied. TPA Closing Force 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			most likely to defeat the retaining feature
TPA Closing Force 30N Max with Properly Assembled 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			2 Pull the TPA from the connector at a uniform rate
TPA Closing Force with Properly Assembled30N Max1 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 until 20 N is applied
with Properly Assembled 2 Secure connector body and TPA into a holding fixture. 3 Insert TPA into connector body at a uniform rate of	TPA Closing Force	30N Max	1 Insert terminals into all cavities of the connector
Terminals 3 Insert TPA into connector body at a uniform rate of	with Properly Assembled	SOLUTION	2 Secure connector body and TPA into a holding fixture
	Terminals		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	60N Min	1 Study the design of the terminal and TPA and
Improperly		determine the position of the terminal where it's
Assembled Terminal		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 \pm 10) mm/min until a force of 20 N is applied.
Retention of Lever In Open		1 Make a fixture that will secure the connectors to be
Position		tested without distorting any of the parts.
		2 Mount the samples in the fixture with the slide or
Apply the force	Withstand 50 N	lever in the open position.
- Apply the force in Figure 3	withstalia 50 N	3 Apply a 50 N force in direction "F", as shown in
In Figure 5		Figure 3, at the rate of $/50 \pm 10$) mm/min.
-Apply the force to		4 Mount new connectors in the fixture maintaining
Close the lever in	Withstand 150 N	the slide of lever in the as-delivered pre-lock position.
The As delivered		5 Apply a 150 N force to close the slide of lever at
pre-lock position		the rate of (50 ± 10) mm/min.
		the elide or lover in the se delivered pre-lock position
		7 Apply an increasing force to the slide or lover at the
		rate of (50 ± 10) mm/min until the project back position is
		defeated. Record the force
		F
		Figure 3: Retention of Slide in the Open Position
Retention of Lever In		1 Make a fixture that will secure the connectors to be
Open Position		tested without distorting any of the parts.
		2 Mount the samples in the fixture.
- Apply the force in The		3 Apply a 100 N force in Direction "F", as shown in
direction	Withstand 100N	Figure 4, at the rate of (50 ± 10) mm/min with the
(opposite to direction)		lever or slide in both the open and closed positions.
r III Figure 4		4 Apply a 100 N force in the direction opposite to
(open positions)		Direction "F" at the rate of (50 ± 10) mm/min with
- Apply the force in The		the lever or slide in the open and closed positions.
direction	Withstand 100N	5 Position the slide or lever in a position approximately
(opposite to direction)		half way between the open and closed positions.
"F" in Figure 4		Apply a 60 N force in Direction "F", as shown
(closed positions)		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	50 N Min	 Test a minimum of 30 connectors (five in each direction). One non-mounting (mating) connector may be used to test all connectors. Secure a new connector with the designed-in mounting feature to a bracket with a fixture simulating the coordinating mounting feature (see
Direction : F2	50 N Min	Figure 5).
Direction : F3	50 N Min	slot is permitted.
Direction : F4	50 N Min	4 With the connector assembly attached to the bracket, apply a downward force at a rate of
Direction : F5	50 N Min	50 mm/min to the non-mounted mating connector in direction "F1" until breakage of the mounting
Direction : F6	110 N Min	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 (25) with four additional connectors. 7 Repeat steps (26) 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 (810) with four additional connectors. 12 Repeat steps (811) in the other direction ("F6"). Figure 6: (3D View)
CPA Lock and		1 Using a mated connector pair, close the CPA at a
Unlock Force	2221 14-	uniform rate of (50 ± 10) mm/min until fully seated
- Locking force	22N Max	and locked. Record the peak force.





On an interference	20 401	2 Open the CPA at a uniform rate of (50 ± 10) mm/min
-Opening force	20~40N	until fully opened. Record the peak force.
CPA closing force on	80 Min	Using an unmated connector, close the CPA
Unmated Connectors		at a uniform rate of (50 ± 10) mm/min until fully seated
-48way	00 M -	and locked. Record the peak force.
CPA Extraction Force	80 N min	Using an
-48way		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.
Isolation Desistance	$\mathbf{P} > 100 \text{ Mohme } @ 500$	A Mete connector poire
Isolation Resistance	K > 100 Mollins @ 500 VDC For 15s	a Wrap metal fail around the exterior of the connector
	VDC 101 158	without contacting any terminals or wires
		3 Remove a minimal amount of insulation from the
		onds of the wires
		A 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 Vpc 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		1 Mate connector pairs.
- AC1000V at 50 or	No Breakdown	2 Wrapmetal foil around the exterior of the connector
60Hz For 60s	No Flash Over	without contacting any terminals or wires.
-DC 1600V For 60s		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 TODU V ACTOSS EACH ADJACENT CAVITY FOR 60 S MIN.
		• Record any current leakage.
		I Allach all the terminated wile leads to the positive
		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 2 DC voltage of 1600 V between
		the terminals and the metal foil for 60 s min
		9 Record any current leakage
Dielectric Strength - AC1000V at 50 or 60Hz For 60s -DC 1600V For 60s	No Breakdown No Flash Over	 500 VDc between the terminals and the metal foil. 9 Record the resistance after 15 s of stabilized readings. 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 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 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