

DESIGN OBJECTIVES

108-101189

(Restricted only for Denso and Mazda)

The product described in this document has not been fully tested to ensure conformance to the requirements outlined herein. TE Connectivity makes no representation or warranty, express or implied, that the product will comply with these requirements. Further, TE Connectivity reserves the right these requirements based on the results of additional testing and evaluation. Contact TE Connectivity Engineering for further information. If necessary, This document will become the Product Specification at successful completion of testing.

1. Scope:

1.1 Content

This specification covers the requirements for product performance, test methods of 130P header and 65P plug.

130P Header TE Connectivity part No.: 2137477-1

65P Plug TE Connectivity part No.: 2050836-1 & 2050836-2
2137187-1 & 2137187-2

Female MQS contact or REM contact TE Connectivity part No.: 968220-1/968221-1/2050986-1

Female 1.5mm contact TE Connectivity part No.: 638652-1/-2

1.2 Qualification

When tests are performed on the subject product line, the procedures specified in TE Connectivity 109 series specifications shall be used. All inspections shall be performed using the applicable Inspection Plan and Product Drawing.

2. Applicable Documents:

The following documents form a part of this Specification to the extent specified herein. In the event of conflict between the requirements of this Specification and the product drawing shall take precedence. In the event of conflict between the requirements of this specification and the referenced documents, this specification shall take precedence.

				DR V.Li 03Aug11	 TE Connectivity Shanghai, China		
				CHK I.Yin 03Aug11			
				APP K.Oda 05Aug11	NO. 108-101189	REV A1	LOC ES
				PAGE	TITLE		
A1	Revised	V.L	09MAY12	1 of 10	CMX 130P Header & 65P Plug		
A	Released	V.L	05Aug11				
LTR	REVISION RECORD	DR	DATE				

2.1 TE Connectivity Specifications:

A. 109 SERIES: Test Specification, Requirements for Test Methods.

3. Requirements:

3.1 Design and Construction

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

3.2 Materials

3.2.1 Male side:

- A. Contact
 - Material: 0.63 Signal Pin Copper alloy
1.5 Power Pin Copper alloy
 - Finish: 0.63 Signal Pin plating: Tin
1.5 Power Pin plating: Tin
- B. Housing
 - Material: PBT GF 30%
- C. Jointer:
 - Material: PBT GF 30%

3.2.2 Female side:

- A. Female terminal
 - Material & Finish: 0.63 Signal Pin Copper alloy, Pre-tin Plated
1.5 Power Pin Copper alloy, Pre-tin Plated
- B. Housing
 - Material: PBT GF 15%
- C. Secondary lock
 - Material: PA66 GF 30%
- D. Lever
 - Material: PA66 GF 30%
- E. Cover
 - Material: PBT GF 15%
- F. Sealing
 - Material: Silicon

3.3 Ratings:

Operating temperature Range : -40°C to + 125°C

3.4 Performance and Test Descriptions

The product is designed to meet the electrical, mechanical and environmental performance requirements specified in fig.1 All tests are performed at test condition of the TE Connectivity test specification 109-1 unless otherwise specified.



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Para.	Test items	Requirements	Procedures			
MECHANICAL TEST						
3.5.1	Confirmation of product	Product shall be conforming to the requirements of applicable product drawing and Application Specification	Visually, Dimensionally and Functionally inspected per applicable inspection plan.			
3.5.2	Pin and Tab retention force	0.63 Signal Pin $\geq 30N$ 1.5 Power Tab $\geq 50N$	Apply the load to pin and tab to axis direction at the rate of $50 \pm 10\text{mm/min}$ and measure the maximum force. TE spec: 109-5212			
3.5.3	Pin and Tab retention force (after humidity pre-condition)	0.63 Signal Pin $\geq 15N$ 1.5 Power Tab $\geq 30N$	Pre-condition: connector is stored in surrounding of $80^\circ\text{C} \pm 2^\circ\text{C}$ and 95%-98% RH for 6 hours. Test method: same as 3.5.2. TE spec: 109-5212			
3.5.4	Terminal engage force	$2N \leq 0.63 \text{ Signal Pin} \leq 5N$ $1.5 \text{ Power Tab} \leq 3.5N$	Engage the mating terminals at a uniform rate not to exceed 50mm/min . The insertion force shall be applied parallel to centerlines of the terminals. Spec: 0.63 Signal pin: Din_41_640_p36 1.5 Power tab: USCAR-2-5.2.1			
3.5.5	Terminal disengage force	$1N \leq 0.63 \text{ Signal Pin} \leq 5N$ $1.5 \text{ Power Tab} \geq 0.5N$	Disengage the mating terminals at a uniform rate not to exceed 50mm/min . The extraction force shall be applied parallel to centerlines of the terminals. Spec: 0.63 Signal pin: Din_41_640_p36 1.5 Power tab: USCAR-2-5.2.1			
3.5.6	Connector mating force	Mating force $< 70N$	Connectors to be mated together by applying a measured force at speed 50 mm/min to slide fully seated and locked at the first time. TE spec: 109-42			
3.5.7	Connector un-mating force	Un-mating Force $< 75N$	Connectors without primary lock to be unmated by applying a measured force at speed 50 mm/min to slide out at the first time. TE spec: 109-42			
3.5.8	Waterproof	No entry of water	High-pressure washing, IP69K Connectors test after mating connection system. (Sealed header's stitching area, only need to test sealing performance) Spec: DIN_40_050_p9			
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3.5.9	Contact insertion force	30N Max.	Use a free floating fixture with an operating speed of 25mm/min. TE spec: 109-41		
3.5.10	Contact retention force (with primary lock)	0.63 Contact \geq 30N 1.5 Contact \geq 45N	Apply axial load to contact with secondary lock ineffective. Operation Speed: 25 \pm 5 mm/min TE spec: 109-41		
3.5.11	Contact retention force (with second lock)	0.63 Contact \geq 60N 1.5 Contact \geq 70N	Apply axial load to contact with secondary lock effective. Operation Speed: 25 \pm 5 mm/min TE spec: 109-41		
3.5.12	Contact crimping strength	0.63 Contact \geq 60N (Wire size 0.5mm ²) 1.5 Contact \geq 108N (Wire size 1.0mm ²)	Apply an axial pull-off load to crimped wire of contact secured on the tester. Operation Speed: 50 \pm 5 mm/min. TE spec: 109-6028		
3.5.13	TPA insertion force	50N max.	Apply an axial load to TPA on the tester. Operation Speed: 50 \pm 5 mm/min. Spec: USCAR 5.4.5		
3.5.14	TPA retention force	16N min. 50N max.	Apply axial pull-off load to TPA on the tester. Operation Speed: 50 \pm 5 mm/min. Spec: USCAR-2-5.4.5		
3.5.15	Polarization Feature Effectiveness	The minimum mis-mating force that must be resisted by the polarizing features is 220N. Pass the visual check and make sure that the function is good.	Male connector mis-mating with female connector in wrong way at the rate of 50mm/min. and apply Min. 220N force. Spec: USCAR-2-5.4.4.		
ELECTRICAL TEST					
3.5.16	Dielectric Withstanding Voltage	Acceptance criteria: V \geq 1000V (AC), no breakdown, disruptive and creeping discharge or flashover.	Measured applying \geq 1000V adjacent connector circuits of mated connector. Test condition: f= 50 Hz, t \geq 1 minute, TE spec: 109-5301		
3.5.17	Insulation Resistance	R \geq 100M Ω	Test condition: U=500V (DC), t \geq 2s Measured after applying 500 \pm 5V to adjacent connector. TE spec: 109-5302		
3.5.18	Low level resistance	0.63 Pin: Rc < 20m Ω , 1.5 Tab: Rc < 10m Ω , After ageing test: Δ Rc < 5 m Ω	Subject mated contact assembled in housing to closed circuit current of 10mA maximum at open circuit voltage of 20mV maximum TE spec: 109-5311		
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3.5.19	Voltage drop	0.63 Pin: $R_c < 20 \text{ mV/A}$, 1.5 Tab: $R_c < 10 \text{ mV/A}$, After ageing test: $\Delta R_c < 5 \text{ mV/A}$	Measured by applying 1A to contacts in mated connectors by probing at 75mm apart from wire crimp after temperature becomes stabilized TE spec: 109-5311		
3.5.20	Current leakage	Acceptance criteria: leakage current $I \leq 1 \text{ mA}$.	A circuit does DC12V, and the measurement of the leakage current is recorded after a connector is stored in the surroundings of $60^\circ \text{C} \pm 2^\circ \text{C}$ and 90%-95% RH for 1 hour. TE spec: 109-5312		
ENVIRONMENT TEST					
3.5.21	Temperature shock test	Appearance accepts: no deterioration, cracks deformities, etc. Check bending point of pins with 10x microscope.	Temperature: $-40 \sim +125^\circ \text{C}$ Low temperature: -40°C for 60min High temperature : $+125^\circ \text{C}$ for 60 min Test duration time: 200 hours Total 100 cycles Samples transfer time < 30s Test status: Passive (Not charge, not work condition) According to IEC 68-2-14Na.		
3.5.22	High temperature endurance test	Appearance accepts: no deterioration, cracks deformities, etc.	Connector is stored in 125°C for 1008h. Mating with female connector and load with 3A current. Spec: USCAR-2-5.6.3		
3.5.23	Temperature / humidity test	Appearance accepts: no deterioration, cracks deformities, etc. Inspect the terminals to see if there are some whiskers with 10 times microscope; especially the bending and tip area. If have, the whisker spec is less than $40 \mu\text{m}$.	Pre-aging test will be done at the beginning. Temperature range: $-10^\circ \text{C} \sim +65^\circ \text{C}$. Pre-conditioning: sample is under $55^\circ \text{C} \pm 2^\circ \text{C}$, below 20% RH for a period of 24 hours. The sample shall be slowed to attain thermal stability at standard atmospheric conditions. During any five of the first nine of the above cycles after exposure to the humidity sub-cycle, the sample shall be subjected to cold. The rest four cycles of the first nine of above cycle is excluding cold exposure. It shall be subjected to 10 temperature /humidity cycles, each of 24 hours duration. Spec: IEC 60068-2-38 (detail method)		
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3.5.24	Temperature cycle endurance test	Appearance accepts: no deterioration, cracks deformities, etc.	<p>Temperature range: -40 °C to +125 °C. Every cycle 2h, including: -40 °C, 30min; -40 °C to 125 °C, 5 ± 1 °C/min; 125 °C, 30min; 125 °C to -40 °C, 5 ± 1 °C/min. Total 500 cycles. Operation mode: Active Mating with female connector and load with 3A current.</p> <p>Spec: IEC 68-2-14Nb</p>								
3.5.25	Wettability test	<p>Bad wetting, bad areas are not allowed Soldering area ratio 90% or larger (Magnifying glass 10 times)</p>	<p>Using the wetting balance method (JIS C0053, EIAJ ET-7401) 3 types of components: Early stage product, high temperature and humidity treated (85 °C 85%RH 24 hours and 48 hours) components, are dipped into the solder for atmospheric soldering, and the ratio of the area which is covered with the new solder, are measured. (JIS C0050) Solder: Sn-37Pb Flux: Tamura Corporation ULF-300R Soldering temperature: 200 °C Dipping speed: 20±5mm/s Dipping time: 10±1s Dipping depth: Approximately 3mm</p> <p>Denso spec: J05088</p>								
3.5.26	Dipping test	<p>Early stage product: Area ratio 95% or larger</p> <p>85 °C 85%RH 24 hours: Area ratio 90% or larger</p> <p>85 °C 85%RH 48 hours: Area ratio 90% or larger</p>	<p>3 types of components: early stage product, high temperature and humidity treated (85 °C 85%RH 24 hours and 48 hours) components, are dipped into the solder for atmospheric soldering, and the ratio of the area which is covered with the new solder, is measured. (JIS C0050) Solder: Sn-3.0Ag-0.5Cu Flux: Tamura Corporation ULF-300R Soldering temperature: 245 °C Dipping time: 2±0.5s Dipping depth: 1.5 to 2.0mm from the bottom</p> <p>Denso spec: J05088</p>								
3.5.27	Temperature Rising	<p>Acceptance Criteria: (1) The measured temperature of the pin and terminal must not exceed a 55 °C rise over ambient. (2) Meet the requirements of 3.5.19.</p>	<p>The temperature of pins and contacts of connection system are measured after applying peak current. Average current is 3A and peak current is 6A for signal pins. Average current is 5A and peak current is 10A for power tabs.</p> <p>Spec: USCAR-2-5.3.3</p>								
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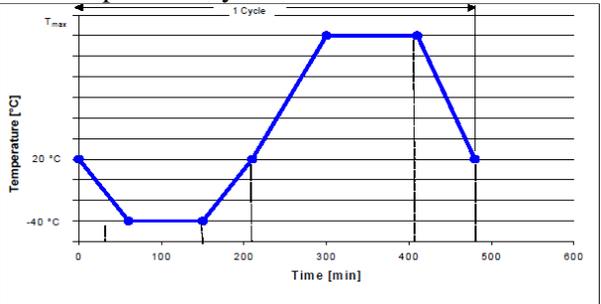
3.5.28	Vibration test	<p>Appearance accepts: no deterioration, cracks deformities, etc. In vibration test monitoring for impermissible. No electrical discontinuity greater than 7 Ω for 1us. (Series circuit with all terminals in one cavity.)</p>	<p>Vibration direction: XYZ axes Vibration duration per axis: 22h, total 66h for 3 directions. Board band vibration: 1.Sine Vibration schedule. Frequency Amplitude of acceleration Hz m/s² 100 100 150 150 200 200 240 200 255 150 440 150</p> <p>2.Random vibration</p> <table border="1" data-bbox="868 598 1364 819"> <thead> <tr> <th>Frequency Hz</th> <th>Power spectral density (m/s²)²/Hz</th> </tr> </thead> <tbody> <tr> <td>10</td> <td>10</td> </tr> <tr> <td>100</td> <td>10</td> </tr> <tr> <td>300</td> <td>0.51</td> </tr> <tr> <td>500</td> <td>20</td> </tr> <tr> <td>2000</td> <td>20</td> </tr> </tbody> </table> <p>Combined sine and random profiles concurrently with temperature cycling (New parts are to be used for each direction).</p> <p>Test temperature cycle:</p>  <p>Spec: USCAR-2-5.8.2</p>	Frequency Hz	Power spectral density (m/s ²) ² /Hz	10	10	100	10	300	0.51	500	20	2000	20
Frequency Hz	Power spectral density (m/s ²) ² /Hz														
10	10														
100	10														
300	0.51														
500	20														
2000	20														

Fig. 1

3.6 Product Qualification Test and Sequences

SAMPLE QUANTITIES									
Test or examination	TEST GROUP								
	1	2	3	4	5	6	7	8	9
Confirmation of product	1	1	1,4	1	1	1	1	1,4	1,10
Pin and Tab retention force	2								
Pin and Tab retention force (after humidity pre-condition)		2							
Terminal engage force			2						
Terminal disengage force			3						
Connector mating force								2	
Connector un-mating force								3	
Waterproof									9
Contact insertion force				2	2				
Contact retention force (with primary lock)				3					
Contact retention force (with second lock)					3				
Contact crimping strength						2			
TPA insertion force							2		
TPA retention force							3		
Polarization Feature Effectiveness									
Dielectric withstanding voltage									5
Insulation resistance									6
Low level resistance									2,7
Voltage drop									3,8
Current leakage									
Temperature shock test									
High temperature endurance test									
Temperature/humidity test									
Temperature cycle endurance test									4
Wettability test									
Dipping test									
Temperature Rising									
Vibration test									
Sample size	2	2	10 sets terminals	2	2	10pcs contacts	3	3	3

Fig. 2 (a)

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SAMPLE QUANTITIES									
Test or examination	TEST GROUP								
	10	11	12	13	14	15	16	17	18
Confirmation of product	1,10	1,10	1,10	1,8	1,3	1,3	1,3	1,7	1,3
Pin and Tab retention force									
Pin and Tab retention force (after humidity pre-condition)									
Terminal engage force									
Terminal disengage force									
Connector mating force									
Connector un-mating force									
Waterproof	9	9	9	7					
Contact insertion force									
Contact retention force (with primary lock)									
Contact retention force (with second lock)									
Contact crimping strength									
TPA insertion force									
TPA retention force									
Polarization Feature Effectiveness					2				
Dielectric withstanding voltage	5	5	5						
Insulation resistance	6	6	6						
Low level resistance	2,7	2,7	2,7	2,5				2,5	
Voltage drop	3,8	3,8	3,8	3,6				3,6	
Current leakage									2
Temperature shock test	4								
High temperature endurance test			4						
Temperature/humidity test		4							
Temperature cycle endurance test									
Wettability test						2			
Dipping test							2		
Temperature Rising								4	
Vibration test				4					
Sample size	3	3	3	3	3	30pcs pins and tabs	30pcs pins and tabs	3	3

Fig. 2 (b)

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4. QUALIFICATION TEST

4.1 Sample selection

Samples shall be prepared in accordance with applicable specification.

4.2 Test sequence

Qualification test shall be conducted as sequence specified in Fig. 2.

4.3 Requalification test

If changes significantly affecting form, fit or function are made to product or manufacturing process, product assurance shall co-ordinate requalification testing, consisting of all or part of original testing sequence as determined by developments, product, quality and reliability engineering.

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