

## Product Specification

### Hybrid Sealed 38pos plug assembly

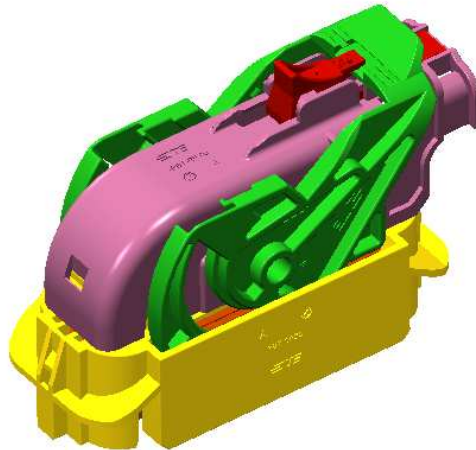
#### 1. SCOPE:

##### 1.1. Contents

This specification covers the requirements for product performance, test methods and quality assurance

Provisions of .MCP 060/110/250 38P PLUG ASSEMBLY (Plug P/N : X-2219210-X, Cover P/N : X-2219215-X)

The applicable product descriptions and part numbers are as follow.



No	Part Number	Description
1	114-61069	Interface Drwaing
2	X-2219211-X	MAIN HSG FOR HYB 38POS PLUG ASS'Y
3	2219212-3	DBL FOR HYB 38POS PLUG ASS'Y
4	2219213-3	BLOCK HSG FOR HYB 38POS PLUG ASS'Y
5	2219214-X	LEVER HSG FOR HYB 38POS PLUG ASS'Y
6	2219721-6	INNER SEAL FOR HYB 38POS PLUG ASS'Y
7	2219216-X	COVER HSG FOR HYB 38POS COVER ASS'Y
8	2219217-X	CPA HSG FOR HYB 38POS COVER ASS'Y

## 1.2 Inspection

The inspection of those products has to comply with procedure on the standard of 109 series that is AMP TEST.

All inspection shall be carried out with the adaptable plan of inspection and drawing of product.

## 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, 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.

### 2.1. TE Specifications:

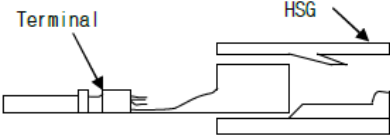

- A. 109-1 : Test Specification, General Requirements for Test Methods
- B. 109 series : Test Specification on "Testing method and procedure outline"
- C. 114-61069 : Interface drawing for HYB Sealed 38p plug ass'y
- D. 114-18386 : AMP MCP1.5K FLATCONTACT PRODUCT GROUP DRAWING
- E. 114-18387 : AMP MCP2.8K FLATCONTACT PRODUCT GROUP DRAWING
- F. 114-18388 : AMP MCP6.3/4.8K FLATCONTACT PRODUCT GROUP DRAWING

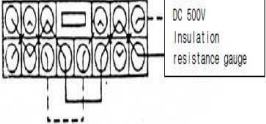
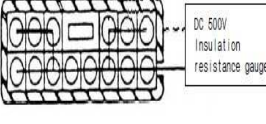
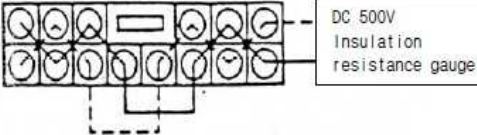
### 2.2. The other standards:

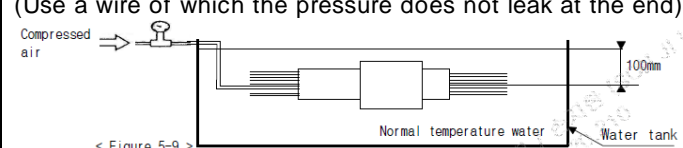
- A. ES91500-00 : General standard of HMC CONNECTOR.



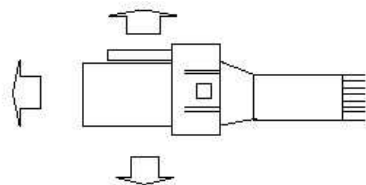
### 3.4. Test Requirements and Procedures Summary :

Para.	Test items	Requirements		Procedures	
3.4.1	Appearance	No crack, damage, distortion are permitted		Using sense of sight and touch.	
3.4.2	CONN engage and disengage force	<u>Min 7.6kgf</u>		Measure force by inserting and disengaging the connector with terminal assembled at constant 50 mm/min speed. However, remove lock part when measuring disengage force.	
3.4.3	Reverse insertion between housings	It shall not be incorrectly inserted and flowed current between terminal by housing deformation on applying force of 20 kgf		1) Insert terminal to housing. 2) Fix housing of female connector to moving part of measuring instrument in reverse insertion direction. (reverse insertion : 180- degree rotation on the locking part) 3) Set a measuring instrument to stop at force of 20kgf and insert that. At this moment, monitor resistance of one terminal matched to identify current carrying between terminals. 4) Check the insertion by housing modification of male connector after connector insertion.	
3.4.4	Engage force between terminal and housing	<u>060</u>	<u>1.5kgf or less</u>	As shown in the following figure 5- 1, measure the weight while inserting terminal into fixed housing at 50mm/min speed. 	
		<u>110</u>			
		<u>250</u>			
3.4.5	Strength of HSG lock	<u>10.0 kgf or more</u>		Combine housing only, fix the one side of housing in completely locked condition, and extend the other side in axial direction and 30 angle direction at a constant speed of 50mm/min. Then measure weight when lock structure is disengaged or destroyed.	
3.4.6	Terminal retention force	D/LOCK CONN	030- 060	8kgf or more	Fix the housing after inserting crimped terminals. Extend one line of cable in axial direction at a speed of 50mm/min at a position 50~ 100mm away from crimped part, and measure weight when terminal is disengaged from the housing. When housing is fixed on the jig, do not fix the retainer on the jig. 
			070- 312	10kgf or more	

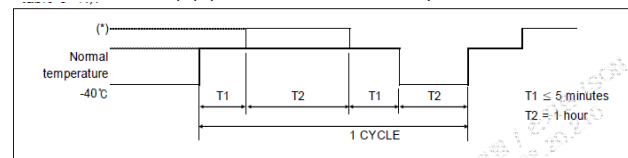
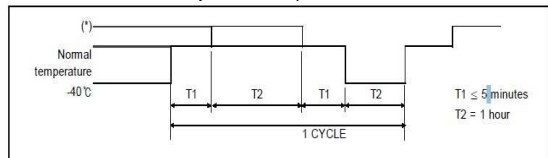
Para.	Test items	Requirements				Procedures											
			Initial	After endurance													
3.4.7	Voltage Drop	030 – 070	5mV/A or less	10 mV/A or less	Measure the circuit voltage drop (V) by sending voltage and current described in the table 5- 1 with terminal combined on the connector. Then calculate a voltage drop (VD) in terminal by subtracting cable resistance (L) from the circuit voltage drop (V). 1)HARNESS versus UNIT:VD =V(L3+L4 )												
		090 - 375	3mV/A or less														
<table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th>Application</th> <th>Open voltage</th> <th>Short circuit current</th> <th>Division</th> </tr> </thead> <tbody> <tr> <td>Signal circuit</td> <td>20 ± 5 mV</td> <td>10 mA</td> <td>ECU, Sensor</td> </tr> <tr> <td>Power circuit</td> <td>13 V</td> <td>1 A</td> <td>Other than the above</td> </tr> </tbody> </table>						Application	Open voltage	Short circuit current	Division	Signal circuit	20 ± 5 mV	10 mA	ECU, Sensor	Power circuit	13 V	1 A	Other than the above
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Signal circuit	20 ± 5 mV	10 mA	ECU, Sensor														
Power circuit	13 V	1 A	Other than the above														
<Table5- 1>																	
3.4.8	Insulation resistance	Min 250MΩ	Between terminals	Measure resistance between neighbor terminals (figure 5- 6), and between terminal and housing surface (figure 5- 7) with DC 500V insulation resistance gauge with connector combined.   <Figure 5-6: Between neighboring terminals>    <Figure 5-7: Between neighboring terminal and housing surface>													
			housing surface														
3.4.9	Leakage current	Initial : 1 μA or less  After endurance : 1 mA or less		Measure it by applying DC 14V between neighboring terminals (figure 5- 6).  <Figure 5-6: Between neighboring terminals>													
3.4.10	Crimp strength	Min strength of each SQ				Fix the crimped terminal, and draw the cable at a position 50~ 100mm away from crimped part in axial direction at 100 mm/min speed. Then measure the weight when cable is cut or disengaged from the crimped part.											
		Wire SQ	kgf	Wire SQ	kgf												
		0.22	4	2	20												
		0.3	6	2.5	25												
		0.5	9	3	35												
		0.75	11	5	40												
		0.85	13	8	50												
1.25	17	10	53														
3.4.11	High voltage test	No allowed insulation breakdown	Between terminals	Measured by applying test potential of 1000 V AC between the adjacent contact between the contact and housing.													
			housing surface														

Para.	Test items	Requirements		Procedures		
3.4.12	Sealing test	After endurance 0.5 kgf/cm <sup>2</sup> or more		<p>Engage and disengage connector with terminal assembled 10 times with hands, and shake wire 10 times each in the (front, rear, left, right) directions perpendicular to axial direction.</p> <p>And put the combined connector in water as shown in the figure 5-9 and supply 10Kpa(0.1kg/cm<sup>2</sup>) to connector for 30 seconds. Then increase it by 10Kpa(0.1kg/cm<sup>2</sup>) until 200Kpa(2kg/cm<sup>2</sup>) is reached and maximum value shall be specified in the test report for reference.</p> <p>(Use a wire of which the pressure does not leak at the end)</p>  <p>&lt; Figure 5-9 &gt;</p>		
3.4.13	Connector CPA insertion/separation force	Division	Before connector coupling	After connector coupling	<p>1) Insertion force before connector clamping ; Measure CPA insertion at constant speed 50mm/min when connector is not combined with male and female. (measure clamping force of CPA in connector which is not clamped)</p> <p>2) Insertion force after connector clamping ; Measure CPA insertion at constant speed 50mm/min after connector is combined with male and female. (measure complete clamping force of CPA in connector which is clamped)</p> <p>3) Separation force after connector clamping (separation force 1) ; Measure CPA separation at constant speed 50mm/min after connector is combined with male and female and CPA is completely installed. (measure returning force of CPA to primary lock state in clamped connector)</p> <p>4) Separation force before connector clamping (separation force 2) ; Measure CPA separation at constant speed 50mm/min when connector is not combined with male and female. (measure separated force of CPA from connector which is not clamped)</p>	
		Engage forces	Same to lock direction	8kgf or more		2kgf or less
			Differ to lock direction	5kgf or more		
		Retention forces 1	1kgf~ 4kgf			
Retention forces 2	5kgf or more					
3.4.14	Connector coupling sounds	65dB or more		Put sound measurement equipment on 350± 50mm away from the connector. Measure the peak sound that occurs when you combine the connector. Sounds unit: dB(A)		
3.5.1	Twisting Test	Appearance	No crack, damage, distortion are permitted		Apply 8kgf force on the end part of combined connector 10 times each in the (front, rear, left, right) directions perpendicular to axial direction. And Make combine connectors engage and disengage. Perform it 50 times. (Do not use locking device)	
		Voltage drop	030 - 070	After endurance 10mV/A or less		
090 - 375						
Para.	Test items	Requirements		Procedures		

3.5.2	Cold temperature test	Appearance	No crack, damage, distortion are permitted		Engage and disengage connector with terminal assembled 10 times with hands, and leave it in temperature chamber of -40°C for 120 hours. Make connector engaged and disengaged 5 times immediately, and drop it onto the concrete surface from 1m height 3 times in the direction of figure 6-1.
		Voltage drop	030 - 070	After endurance 10mV/A or less	
			090 - 375		
		Insulation resistance	After endurance 100 MΩ or more		
		Leakage Current	After endurance 1 μA or less		
		Temperature rise	Max 40 °C		
Sealing	Min 0.5 kgf/cm <sup>2</sup>				
3.5.3	Cold and hot temperature shock test	Appearance	No crack, damage, distortion are permitted		Engage and disengage Connector with terminal assembled 10 times with hands, this repeats 200 CYCLE by below test condition. (ENG ROOM : 120°C, ENG ROOM except : 80°C)
		Voltage Drop	030 - 070	After endurance 10mV/A or less	
			090 - 375		
Sealing	Min 0.5 kgf/cm <sup>2</sup>				
3.5.4	High temperature test	Appearance	No crack, damage, distortion are permitted		Engage and disengage connector with terminal assembled 10 times with hands, and leave it in combined state at -40°C for 2 hours, and perform 200 cycles according of the method specified in the figure 6-2. Then leave it at room temperature for 2 hours or more ( * ) follows table 6- 1.).
		Voltage Drop	030 - 070	After endurance 10mV/A or less	
			090 - 375		
Sealing	Min 0.5 kgf/cm <sup>2</sup>				
3.5.5	Temperature Humidity Cycle Test	Appearance	No crack, damage, distortion are permitted		Engage and disengage connector with terminal assembled 10 times with hands, and leave it at 25°C ambient temperature and 65% relative humidity for 25 hours. And perform 5 cycles of the method specified in figure 6- 3. Then pick connector out of chamber and dry it for 2 hours more.
		Voltage Drop	030 - 070	After endurance 10mV/A or less	
			090 - 375		
		Insulation resistance	After endurance 100 MΩ or more		
Leakage Current	After endurance 1 μA or less				
Sealing	Min 0.5 kgf/cm <sup>2</sup>				



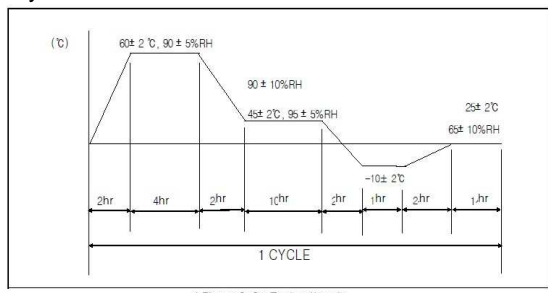
<Figure 6-1>



< Figure 6-2 : Test pattern >

B	80°C	Non-waterproof connector
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< Table 6-1 >



< Figure 6-3 : Test pattern >

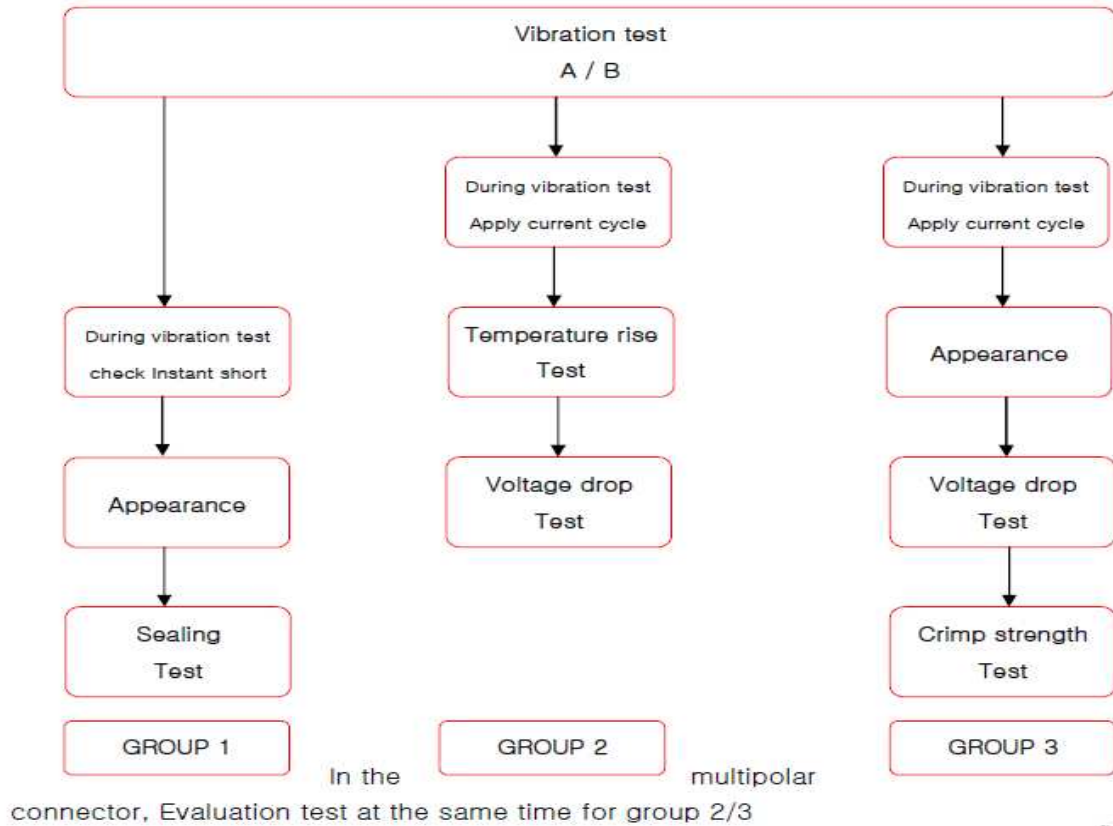
Para.	Test items	Requirements		Procedures	
3.5.6	Dust test	Voltage Drop	030 - 070	After endurance 10mV/A or less	Engage and disengage connector with terminal assembled 10 times with hands, and diffuse 1.5kg Portland cement(JIS R5210) with fan (or others) for 10 seconds per 15 minutes while maintaining 150mm distance from wall in the closed container of 900~ 1200mm length, width and height, with connector combined. After 1 hour, measure it.
			090 - 375		
		Sealing	Min 0.5 kgf/cm <sup>2</sup>		
3.5.7	Waterproof test	Appearance	No crack, damage, distortion are permitted		Make combined connectors engaged and disengaged 10 times by hands, and leave it in combined state at 120℃(waterproof), 80℃(non_waterproof) ambient temperature for 40 minutes and then spray water of normal temperature for 20 minutes according to S2 of JIS D0203. Repeat 48 cycles of this. * JIS D0203 S2 condition: Attach specimen at 400mm distance from the waterproof pipe with water spray hole or water discharge hole, and rotate waterproof pipe 23 times per minute around the axis (XX).
		Insulation resistance	After endurance 100 MΩ or more		
		Leakage Current	After endurance 1 μA or less		
		Sealing	Min 0.5 kgf/cm <sup>2</sup>		
3.5.8	Oil and liquid test	Appearance	No crack, damage, distortion are permitted		Engage and disengage connector with terminal assembled 10 times with hands, and perform test each sample with connector combined. <b>A.</b> Immerse connector in combined state for 2 hours in mixed oil of 50± 2℃ ENG oil (SAE 10W) or equivalent oil and <b>B.</b> Immerse connector in combined state for 1 hour in car gasoline (JIS K2202) at normal temperature, and then pick it out. <b>C.</b> Immerse connector in combined state for 1 hour in brake liquid (pure product) at normal temperature, and then pick it out. <b>D.</b> Immerse connector in combined state for 1 hour in 100% washer liquid (pure product) at normal temperature, and then pick it out. <b>E.</b> Immerse connector in combined state for 1 hour in 50% LLC (Long life coolant) at normal temperature, and then pick it out.
		Voltage Drop	030 - 070	After endurance 10mV/A or less	
			090 - 375		
		Sealing	Min 0.5 kgf/cm <sup>2</sup>		
3.5.9	Ozone test	Appearance	No crack, damage, distortion are permitted		Engage and disengage Connector with terminal assembled 10 times with hands, and samples keep at 40℃ and 50± 5ppm Ozon for 100hour.
		Voltage Drop	030 - 070	After endurance 10mV/A or less	
			090 - 375		
		Sealing	Min 0.5 kgf/cm <sup>2</sup>		
Para.	Test items	Requirements		Procedures	
3.5.10	Salt water test	Appearance	No crack, damage, distortion are permitted		Engage and disengage connector with terminal assembled 10 times with hands, and put it in 35℃ temperature regulation chamber, spray 5% salty water for 24 hours according to JIS Z2371, and, maintain room temperature without spray for 1 hour. Then repeat this four times. Then pick connector out of chamber and dry it at room temperature for 2 hours or more
		Voltage Drop	030 - 070	After endurance 10mV/A or less	
			090 - 375		
		Insulation resistance	After endurance 100 MΩ or more		



		Leakage Current	After endurance 1 $\mu$ A or less																										
3.5.11	Sulfur gas test	Appearance	No crack, damage, distortion are permitted		Engage and disengage connector with terminal assembled 10 times with hands, and expose it in combined state to sulfur gas of $40 \pm 3^\circ\text{C}$ , density 10ppm, humidity 90~95%, for 24 hours. Then pick connector out of chamber and dry it for 2 hours or more.																								
		Voltage Drop	030 - 070	After endurance 10mV/A or less																									
			090 - 375																										
Sealing	0.5 kgf/ $\text{cm}^2$ or less																												
3.5.12	Complex environment endurance test (Refer to the attached test process # 1)	Appearance	No crack, damage, distortion are permitted		<p>Engage and disengage connector with terminal assembled 10 times with hands, and leave it in combined state in the temperature chamber of <math>120^\circ\text{C}</math> or <math>80^\circ\text{C}</math> (follows table 6- 1) for 48 hours. And then perform the following vibration test. Then measure instant short circuit according to the method of clause 5.17 for 4 hours for X, Y, Z each.</p> <p>◆ Vibration test B (for waterproof connector) Perform both of sine wave and random wave tests.</p> <p>1) Sine wave test</p> <table border="1"> <thead> <tr> <th>Division</th> <th>Condition</th> </tr> </thead> <tbody> <tr> <td>Ambient temperature/humidity</td> <td>Refer to figure 5- 8, 90~95%</td> </tr> <tr> <td>Applied current</td> <td>Basic current (Connect electrodes in series.)</td> </tr> <tr> <td>Current application cycle</td> <td>120 CYCLE(45 minutes- ON, 15 minutes- OFF)</td> </tr> <tr> <td>Vibration acceleration</td> <td>Follow figure 6- 9</td> </tr> <tr> <td>Frequency</td> <td>20 Hz ~ 200Hz(Sweep time : 3minutes or less)</td> </tr> <tr> <td>Vibration time</td> <td>40 hours for X,Y, Z each</td> </tr> <tr> <td>Connector attaching method</td> <td>Test Mode A,B,C</td> </tr> </tbody> </table> <p>&lt;Figure 6-9 &gt;</p> <p>2) Random wave test Perform this test for the component of which sine wave test has been finished.</p> <table border="1"> <thead> <tr> <th>Division</th> <th>Condition</th> </tr> </thead> <tbody> <tr> <td>Ambient temperature</td> <td>Refer to figure 5- 8</td> </tr> <tr> <td>Applied current</td> <td>Basic current (Connect electrodes in series.)</td> </tr> <tr> <td>Current application cycle</td> <td>24 CYCLE(45 minutes- ON, 15 minutes- OFF)</td> </tr> </tbody> </table>	Division	Condition	Ambient temperature/humidity	Refer to figure 5- 8, 90~95%	Applied current	Basic current (Connect electrodes in series.)	Current application cycle	120 CYCLE(45 minutes- ON, 15 minutes- OFF)	Vibration acceleration	Follow figure 6- 9	Frequency	20 Hz ~ 200Hz(Sweep time : 3minutes or less)	Vibration time	40 hours for X,Y, Z each	Connector attaching method	Test Mode A,B,C	Division	Condition	Ambient temperature	Refer to figure 5- 8	Applied current	Basic current (Connect electrodes in series.)	Current application cycle	24 CYCLE(45 minutes- ON, 15 minutes- OFF)
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Temperature rise	Max $40^\circ\text{C}$																												
Crimp strength	Wire SQ	Min Crimp Strength(kgf)																											
	0.22	4																											
	0.3	6																											
	0.5	9																											
	0.75	11																											

			0.85	13	Vibration acceleration	Follow figure 6- 10
			1.25	17	Vibration time	8 hours for X, Y, Z each
			2	20	Connector attaching method	Test Mode D, E, F
			2.5	25		
			3	35		
			5	40		
			9	50		
			10	53		
Instant short circuit	There shall be no 10 $\mu$ S or more instant short circuit.		<p>&lt;Figure 6-10&gt;</p>			
Sealing	Min 0.5 kgf/cm <sup>2</sup>					

### Test process #1



Test items	Appearance	CONN engaging and disengaging force	HSG reverse insertion	Reverse insertion between terminal and housing	Engage force between terminal and housing	Strength of housing lock	Connector CPA insertion/separation force	Terminal retention force	Terminal engage / disengage force	Sealing	Crimp strength	Voltage drop	Insulation resistance	Leakage current	High voltage	Temperature rise	Instant short circuit	Flexural strength of contact	Connector coupling sounds
Initial test	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>
Twisting test	<input type="checkbox"/>											<input type="checkbox"/>				<input type="checkbox"/>			
Connector engage /disengage endurance test	<input type="checkbox"/>											<input type="checkbox"/>				<input type="checkbox"/>			
Over current cycle test A																			
Over current cycle test B																			
Cold temperature test	<input type="checkbox"/>									<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>			
Cold and hot temperature shock test	<input type="checkbox"/>									<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>					
High temperature test	<input type="checkbox"/>									<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>					
Temperature and humidity cycle test	<input type="checkbox"/>									<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>					
Dust test										<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>					



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