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Title **025/110 HYB 28P CAP & PLUG ASSY**

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1. SCOPE

This SPEC defines the test method for low voltage connectors (connector) and low voltage terminals (terminal).

*** Related specification: ES91500-00**

2. Quality

The quality of connector has to meet each characteristic at column 3 with items of test in table 1.

3. Requirements

NO	items	characteristics			Measuring method
1	Appearance	No harmful crack, rust, burr, damage, deformation, discoloration etc.			4.1
2	CONN engage and disengage Force	7.6kgf of less			4.2
3	Reverse insertion Between housing	It shall not be incorrectly inserted and flowed current between terminals by housing deformation on applying force of 20kgf.			4.3
4	Reverse insertion between terminal and housing	025	110		4.4
		2.4kf or more	5kgf or more		
5	Engage force between terminal and housing	025	110		4.5
		0.8kgf or less	1.5kgf or less		
6	HSG lock strength	10kgf or more			4.6
7	HSG lock release force	Force on release force point of lock part shall be 0.5~6kgf			4.7
8	Terminal retention force	Terminal type	025	110	4.8
		After engaging TPA	6kgf or more	10kgf or more	
		Before engaging TPA	3.5kgf or more	6kgf or more	
9	Terminal engage and disengage force (kgf)	Terminal type	025	110	4.9
		Engage	0.5kgf or less	1.5kgf or less	
		Disengage	0.5kgf or less	1.5kgf or less	

<table>
<tr><td rowspan="2">10</td><td rowspan="2">Crimp strength (kgf)</td><td>SQ</td><td>0.22</td><td>0.3</td><td>0.5</td><td>0.75</td><td>0.85</td><td>1.25</td><td>2.0</td><td>2.5</td><td>3.0</td><td>5.0</td><td>8.0</td><td rowspan="2">4.10</td></tr>
<tr><td>(kgf) or more</td><td>4</td><td>6</td><td>9</td><td>11</td><td>13</td><td>17</td><td>20</td><td>25</td><td>35</td><td>40</td><td>50</td></tr>
<tr><td rowspan="3">11</td><td rowspan="3">Voltage drop</td><td colspan="4">Division</td><td colspan="9">Initial</td><td rowspan="3">4.11</td></tr>
<tr><td colspan="4">025</td><td colspan="9">10 mV/A or less</td></tr>
<tr><td colspan="4">110</td><td colspan="9">3 mV/A or less</td></tr>
<tr><td rowspan="2">12</td><td rowspan="2">Insulation resistance</td><td colspan="4">Division</td><td colspan="4">Initial</td><td colspan="5">After endurance</td><td rowspan="2">4.12</td></tr>
<tr><td colspan="4">waterproof</td><td colspan="4">100㏁ or more</td><td colspan="5">100㏁ or more</td></tr>
<tr><td rowspan="2">13</td><td rowspan="2">Leakage current</td><td colspan="4">Division</td><td colspan="4">Initial</td><td colspan="5">After endurance</td><td rowspan="2">4.13</td></tr>
<tr><td colspan="4">waterproof</td><td colspan="4">1 ㎂ or less</td><td colspan="5">1㎂ or less</td></tr>
<tr><td>14</td><td>High voltage test</td><td colspan="13">There shall be no insulation break.</td><td>4.14</td></tr>
<tr><td rowspan="2">15</td><td rowspan="2">Sealing test</td><td colspan="6">Initial</td><td colspan="7">After endurance</td><td rowspan="2">4.15</td></tr>
<tr><td colspan="6">1.0kgf/㎠ or more</td><td colspan="7">0.5kgf/㎠ or more</td></tr>
<tr><td>16</td><td>Terminal bending strength</td><td colspan="13">The terminal should not be torn, and if it is bent, there shout be no tearing or cracking when stretched to its original position</td><td>4.16</td></tr>
<tr><td>17</td><td>Connector coupling sound</td><td colspan="13">65 dB(A) or more</td><td>4.17</td></tr>
<tr><td rowspan="2">18</td><td rowspan="2">Plate Retention</td><td colspan="6">Retention force</td><td colspan="7">Escaping force</td><td rowspan="2">4.18</td></tr>
<tr><td colspan="6">5kgf or more</td><td colspan="7">3kgf or more</td></tr>
<tr><td rowspan="5">19</td><td rowspan="5">Connector endurance test</td><td colspan="6">Appearance</td><td colspan="7">No harmful crack, rust, burr, damage, deformation, discoloration etc.</td><td rowspan="5">6.1</td></tr>
<tr><td rowspan="3">Voltage drop</td><td colspan="3">Division</td><td colspan="4">After endurance</td></tr>
<tr><td colspan="3">025</td><td colspan="4">20mV/A or less</td></tr>
<tr><td colspan="3">110</td><td colspan="4">10mV/A or less</td></tr>
<tr><td colspan="6">Connector coupling sound</td><td colspan="7">65dB(A) or more</td></tr>
<tr><td rowspan="9">20</td><td rowspan="9">Over current test</td><td rowspan="4">Cycle A</td><td colspan="6">Appearance</td><td colspan="7">No harmful crack, rust, burr, damage, deformation, discoloration etc.</td><td rowspan="9">6.2</td></tr>
<tr><td rowspan="3">Voltage drop</td><td colspan="3">Division</td><td colspan="4">After endurance</td></tr>
<tr><td colspan="3">025</td><td colspan="4">20mV/A or less</td></tr>
<tr><td colspan="3">110</td><td colspan="4">10mV/A or less</td></tr>
<tr><td colspan="6">Temperature rise</td><td colspan="7">40℃ or less</td></tr>
<tr><td rowspan="5">Cycle B</td><td colspan="6">Appearance</td><td colspan="7">No damage</td></tr>
<tr><td rowspan="3">Voltage drop</td><td colspan="3">Division</td><td colspan="4">After endurance</td></tr>
<tr><td colspan="3">025</td><td colspan="4">20mV/A or less</td></tr>
<tr><td colspan="3">110</td><td colspan="4">10mV/A or less</td></tr>
<tr><td colspan="6">Temperature rise</td><td colspan="7">40℃ or less</td></tr>
</table>

21	Cold temperature test	Appearance	No harmful crack, rust, burr, damage, deformation, discoloration etc.		6.3
		Voltage drop	Division	After endurance	
			025	20mV/A or less	
			110	10mV/A or less	
		Insulation resistance	100MΩ or more		
		Leakage current	1μA or less		
		Temperature rise	40℃ or less		
		Sealing test	0.5kgf/cm^2 or more		
22	Cold and hot temperature shock test	Appearance	No harmful crack, rust, burr, damage, deformation, discoloration etc.		6.4
		Voltage drop	Division	After endurance	
			025	20mV/A or less	
			110	10mV/A or less	
		Sealing test	0.5kgf/cm^2 or more		
23	High temperature test	Appearance	No harmful crack, rust, burr, damage, deformation, discoloration etc.		6.5
		Voltage drop	Division	After endurance	
			025	20mV/A or less	
			110	10mV/A or less	
		Sealing test	0.5kgf/cm^2 or more		
24	Temperature humidity test	Appearance	No harmful crack, rust, burr, damage, deformation, discoloration etc.		6.6
		Voltage drop	Division	After endurance	
			025	20mV/A or less	
			110	10mV/A or less	
		Insulation resistance	100MΩ or more		
		Leakage current	1μA or less		
		Sealing test	0.5kgf/cm^2 or more		
25	Dust test	Voltage drop	Division	After endurance	6.7
			025	20mV/A or less	
			110	10mV/A or less	
		Sealing test	0.5kgf/cm^2 or more		
26	Waterproof test	Appearance	No harmful crack, rust, burr, damage, deformation, discoloration etc.		6.8
		Insulation resistance	100MΩ or more		
		Leakage current	1μA or less		
		Sealing test	0.5kgf/cm^2 or more		

<table>
<tr><td rowspan="4">27</td><td rowspan="4">Oil and liquid test</td><td>Appearance</td><td colspan="8">No harmful crack, rust, burr, damage, deformation, discoloration etc.</td><td rowspan="4">6.9</td></tr>
<tr><td rowspan="3">Voltage drop</td><td colspan="4">Division</td><td colspan="4">After endurance</td></tr>
<tr><td colspan="4">025</td><td colspan="4">20mV/A or less</td></tr>
<tr><td colspan="4">110</td><td colspan="4">10mV/A or less</td></tr>
<tr><td>Sealing test</td><td colspan="8">0.5kgf/cm^2 or more</td></tr>
<tr><td rowspan="4">28</td><td rowspan="4">Ozone test</td><td>Appearance</td><td colspan="8">No harmful crack, rust, burr, damage, deformation, discoloration etc.</td><td rowspan="4">6.10</td></tr>
<tr><td rowspan="3">Voltage drop</td><td colspan="4">Division</td><td colspan="4">After endurance</td></tr>
<tr><td colspan="4">025</td><td colspan="4">20mV/A or less</td></tr>
<tr><td colspan="4">110</td><td colspan="4">10mV/A or less</td></tr>
<tr><td>Sealing test</td><td colspan="8">0.5kgf/cm^2 or more</td></tr>
<tr><td rowspan="4">29</td><td rowspan="4">Saltwater test</td><td>Appearance</td><td colspan="8">No harmful crack, rust, burr, damage, deformation, discoloration etc.</td><td rowspan="4">6.11</td></tr>
<tr><td rowspan="3">Voltage drop</td><td colspan="4">Division</td><td colspan="4">After endurance</td></tr>
<tr><td colspan="4">025</td><td colspan="4">20mV/A or less</td></tr>
<tr><td colspan="4">110</td><td colspan="4">10mV/A or less</td></tr>
<tr><td>Insulation resistance</td><td colspan="8">100MΩ or more</td></tr>
<tr><td>Leakage current</td><td colspan="8">1μA or less</td></tr>
<tr><td rowspan="4">31</td><td rowspan="4">Sulfur (SO_2) gas test</td><td>Appearance</td><td colspan="8">No harmful crack, rust, burr, damage, deformation, discoloration etc.</td><td rowspan="4">6.12</td></tr>
<tr><td rowspan="3">Voltage drop</td><td colspan="4">Division</td><td colspan="4">After endurance</td></tr>
<tr><td colspan="4">025</td><td colspan="4">20mV/A or less</td></tr>
<tr><td colspan="4">110</td><td colspan="4">10mV/A or less</td></tr>
<tr><td>Leakage current</td><td colspan="8">1μA or less</td></tr>
<tr><td rowspan="6">32</td><td rowspan="6">Complex environment endurance test</td><td>Appearance</td><td colspan="8">No harmful crack, rust, burr, damage, deformation, discoloration etc.</td><td rowspan="6">6.13</td></tr>
<tr><td>Crimp strength</td><td>SQ</td><td>0.22</td><td>0.3</td><td>0.5</td><td>1.25</td><td>2.0</td><td>2.5</td><td>3.0</td></tr>
<tr><td>kgf</td><td>4</td><td>6</td><td>9</td><td>17</td><td>20</td><td>25</td><td>35</td></tr>
<tr><td rowspan="3">Voltage drop</td><td colspan="4">Division</td><td colspan="4">After endurance</td></tr>
<tr><td colspan="4">025</td><td colspan="4">20mV/A or less</td></tr>
<tr><td colspan="4">110</td><td colspan="4">10mV/A or less</td></tr>
<tr><td>Temperature Rise</td><td colspan="8">40℃ or less</td></tr>
<tr><td>Instant short circuit</td><td colspan="8">There shall be no 10 μs more instant short circuit at 4.3V or less</td></tr>
<tr><td>Sealing test</td><td colspan="8">0.5kgf/cm^2 or more</td></tr>
</table>

< Table 1 >

4. Requirements Measuring Method

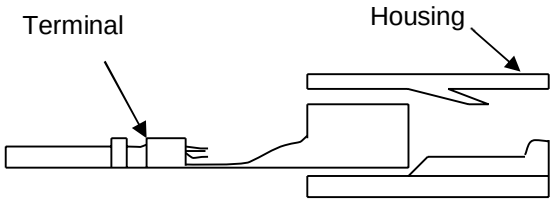
4.1 Appearance
It is enlarged by more than 10 times through the magnification inspector to check for functionally harmful crack, rust, burr, damage, deformation, discoloration etc.

4.2 CONNECTOR engage and disengage force
Measure force by engaging and disengaging the connector with terminal assembled at constant 50 mm/min speed. However, remove lock part when measuring disengage force.

4.3 Reverse insertion between housings
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.

4.4 Reverse insertion between terminal and housing
Crimp cable of maximum size on terminal and then, insert it into housing by the end of seal.

4.5 Engage force between terminal and housing
As shown in the following figure 4-1, measure the weight while inserting terminal into fixed housing at 50mm/min speed.

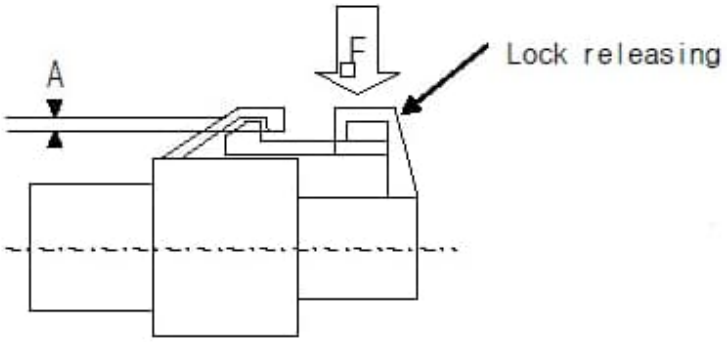


<Figure 4-1>

4.6 HSG Lock strength
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. And hang a 5kg weight for 60 minutes in the 60℃ chamber condition to check whether the lock is released or not.

4.7 HSG lock releasing force

Apply force (F) to lock releasing part, and measure weight on the point of A=0. However, cut connector and then perform test at the section to secure visibility.



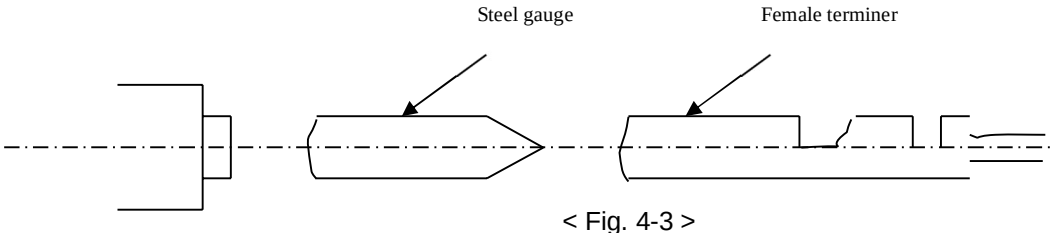
<Fig. 4-2>

4.8 Terminal retention force

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±5 mm away from crimped part, and measure weight when terminal is disengaged from the housing.

4.9 Terminal engage and disengage force

As shown in figure 4-3, engage and disengage male terminal or steel gauge into or from female terminal at 50 mm/min speed.



< Fig. 4-3 >

4.10 Crimp strength

Fix the crimped terminal and draw the cable at a position 50±5 mm 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.

4.11 Voltage Drop

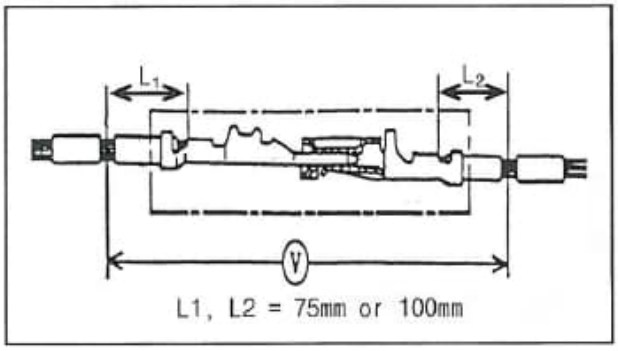
Measure the circuit voltage drop (V) by sending voltage and current described in the table 2 with terminal combined on the connector. Then calculate a voltage drop (V_D) in terminal by subtracting cable resistance (L) from the circuit voltage drop (V).

1) HARNESS vs. HARNESS : $V_D = V - (L_1 + L_2)$

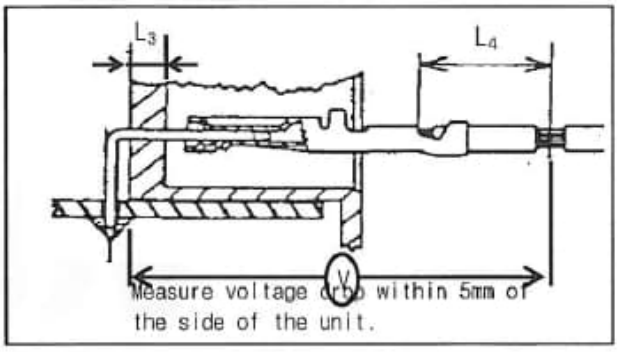
2) HARNESS vs. UNIT : $V_D = V - (L_3 + L_4)$

Application	Open voltage	Short circuit current	Division
Signal circuit	20 ± 5㎷	10 ㎃	ECU, Sensor
Power circuit	13 V	1 A	Other than the above

< Table 2 >



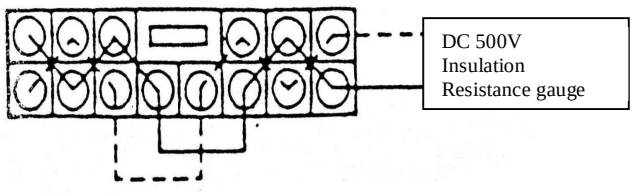
< Fig. 4-4 : HARNESS vs. HARNESS >



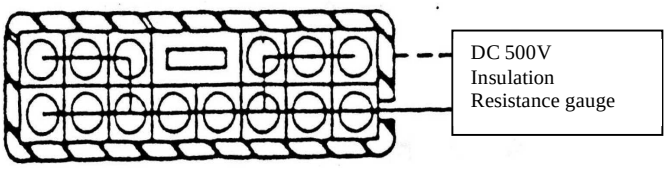
< Fig. 4-5 : HARNESS vs. UNIT>

4.12 Insulation resistance

Measure resistance between neighbor terminals (figure 4-6), and between terminal and housing surface (figure 4-7) with DC 500V insulation resistance gauge with connector combined.



<Fig. 4-6: Between neighboring terminals>



<Fig. 4-7: Between neighboring terminal and housing surface>

4.13 Leakage current

Measure it by applying DC 14V between neighboring terminals (figure 4-6).

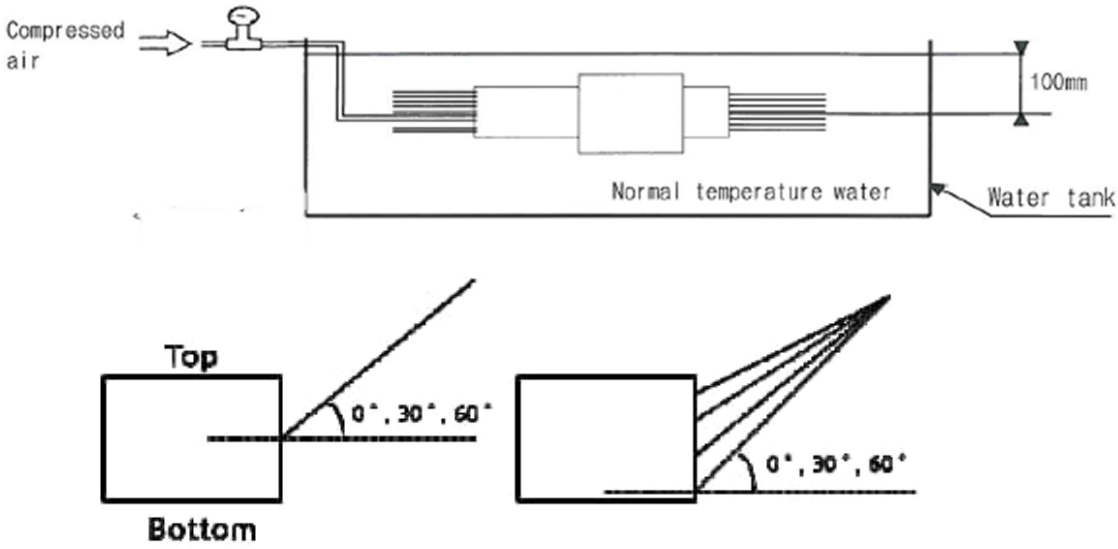
4.14 High voltage test

Apply AC 1000V voltage of normal frequency for 1 minute between neighboring terminals (figure 4-6), and between housing surfaces of terminal (figure 4-7), with connector combined.

4.15 Sealing test

Put the combined connector in water as shown in the figure 13 and supply 10Kpa (0.1kg/cm^3) to connector for 30 seconds. Then increase it by 10Kpa (0.1kg/ cm^3) until 200Kpa (2kg/ cm^3) is reached and maximum value shall be specified in the test report for reference. (30 seconds/step) (Use a wire of which the pressure does not leak at the end)

- Initial test
  Change wire direction (0º~180º) at each pressure to check sealing function.
- After endurance
  Sealing test after endurance.



<Fig. 4-9>

4.16 Terminal bending strength

Position the terminal sample on the fixture, apply force for 15 seconds, and magnify the bent part by at least 10 times for inspection. After fixing the sample by rotating 90°, 180°, measure it in the same way. The applied force follows the contents below.

t ≤ 0.20: 0.4 kgf, t ≤ 0.30: 1 kgf, t ≤ 0.40: 1.5 kgf, t > 0.40: 2 kgf

4.17 Connector coupling sounds

Put sound measurement equipment on 700±10 ㎜ away from the connector. Measure the peak sound that occurs when you combine the connector. Sounds unit: dB(A)

4.18 Plate retention

1) Plate retention: After fixing connector that is combined with plate, push the center of plate with the round bar which has diameter less than 10mm by pressing the 50 mm/min. Measure the value of the plate when the lock off.

2) Plate escape power: After fixing connector that is combined with plate, Connected by wire to the center of the plate. Pull the wires 50mm/min at a rate, measure the value when the plate is escaped.

5. Test conditions

5.1 Specimen

Unless there is specific mention, initial sample should use for the test specimen, and test specimen shall be 5EA or more for each cavity. However, if performance is expected to be clearly satisfactory ever by applying load to the same specimen in turn, it is possible to apply multiple test items to the same specimen. In such case, performance shall be satisfied with each item.

5.2 Laboratory condition

Perform each test at designated temperature and humidity. And control humidity at designated absorption ratio for the connector which uses absorbent resin housing.

Temperature: 25 ± 5 ℃

Humidity: 60 ± 20%

Standard absorption ratio (reference value)

6 NYLON: 2 ~ 4%

66 NYLON: 1.5 ~ 3%

5.3 Basic current

Basic current value “I” shall be based on the following. ($I = I_0 * K$)

Cable size (SQ)	I_0		Remarks
	General	L TYPE -375	
0.22	4 A		
0.3	6 A		4A for signal
0.5	8 A		5A for signal
0.85	10 A		
1.25	14 A		
2	18 A		
3	22 A	34 A	
5	25 A	46 A	
8		60 A	

< Table 3.1 >

Number of simultaneous electrode within the same connector	K
	Reduction factor
1	1
2 ~ 3	0.75
4 ~ 5	0.6
6 ~ 8	0.55
9 ~ 10	0.5
11 ~ 25	0.4
26 or more	0.3
-	-

< Table 3.2 >

5.4 Evaluation

Evaluation shall be represented by evaluation applicable connector. And Annual evaluation of connectors shall be represented by evaluation of connectors of the maximum number of poles in the same series.

5.5 Cable size

The size of connector lead wire used in each test shall be follow Table 4.

Test Item		MIN WIRE	MAX WIRE	Test Item		MIN WIRE	MAX WIRE
CONN engage And disengage Force		-	O	High temperature test	Voltage Drop	-	O
Reverse insertion between housing		-	O		Sealing	O	O
CPA engage and retention forces		-	-	Soldering test		-	-
Reverse insertion between terminal and housing		-	-	Temperature and humidity cycle test	Voltage Drop	-	O
Engage force between terminal and housing		O	-		Insulation resistance	O	O
CONN'R CLIP engage and disengage force		-	-		Leakage current	-	O
HSG lock strength		-	-		Sealing	O	O
HSG Lock release force		-	-	Dust test	Voltage Drop	-	O
Terminal retention force		-	O		Sealing	O	O
Terminal engage and disengage force		-	O	Waterproof test	Insulation resistance	-	O
Crimp strength		O	O		Leakage current	-	O
Voltage drop		-	O		Sealing	O	O
Insulation resistance		-	O	Oil and liquid test	Voltage Drop	-	O
Leakage current		-	O		Sealing	O	O
High voltage test		-	O	Ozone test	Voltage Drop	-	O
CONN endurance test	Appearance	-	O		Sealing	O	O
	Voltage Drop	-	O	Salt water test	Voltage Drop	-	O
Overcurrent cycle Test	Appearance	-	O		Insulation resistance	-	O
	Voltage Drop	-	O		Leakage current	-	O

Cold temperature Test	Appearance	-	O	Sulfur test	Voltage Drop	-	O
	Voltage Drop	-	O		Sealing	O	O
	resistance		O	Mechanical shock test	Instant	-	O
	Leakage current	-	O		short circuit		
	Temperature rise	-	O	Complex environment Endurance test	Crimp strength	O	O
	Sealing	O	O		Voltage Drop	-	O
Cold and hot Temperature test	Voltage Drop	-	O		Temperature rise	-	O
	Sealing	O	O		Instant short circuit	-	O
Connector coupling sounds		-	-		Sealing	O	O

< Table 4 >

6. Test Method

Test Items	Appearance	CONN engage and disengage Force	Reverse insertion Between housing	Reverse insertion between terminal and housing	Engage force between terminal and housing	HSG lock strength.	Lock release force	Terminal retention force	Terminal engage and disengage force (kgf)	Crimp strength (kgf)	Voltage drop	Insulation resistance	Leakage current	High voltage test	Temperature rise	Instant short circuit	Sealing	Terminal bending strength	CONNECTOR coupling sound	Plate retention
Initial test	0	0	0	0	0	0	0	0	0	0	0	0	0	0			0	0	0	0
Connector endurance test	0										0								0	
Overcurrent cycle test	0										0				0					
Cold temperature test	0										0	0	0		0		0			
Cold and hot temperature shock test	0										0						0			
High temperature test	0										0						0			
Temperature and humidity cycle test	0										0	0	0				0			
Dust test											0						0			
Waterproof test	0											0	0				0			
Oil and liquid test	0										0						0			
Ozone test	0										0						0			
Saltwater test	0										0	0	0							
Sulfur (SO_2) test	0										0		0							
Mechanical shock test																0				
Complex environment endurance test	0									0	0				0	0	0			

< Table 5: Test items >

6.1 Connector endurance test

Apply 8kgf 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)

6.2 Overcurrent cycle test

Engage and disengage connector with terminal assembled 10 times with hands and apply the following current 1000 cycles for the connector with electrodes in series at 60℃ of ambient temperature.

Condition A: 2 times of basic current (1 minute ON, 9 minutes OFF)

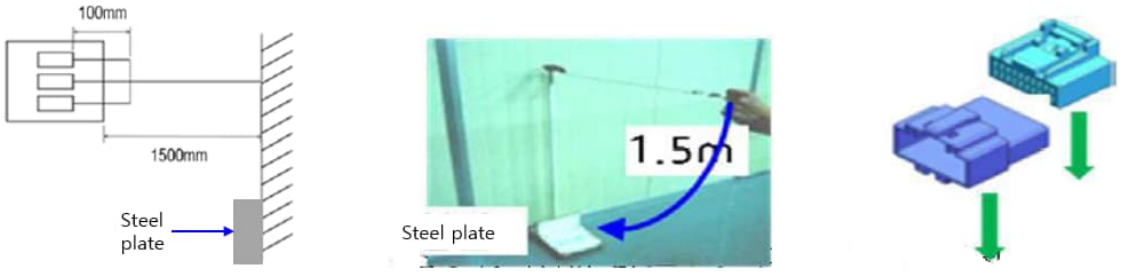
Condition B: 5 times of basic current (10 seconds ON, 590 seconds OFF)

6.3 Cold temperature test

Make connector engaged and disengaged 10 times immediately and leave connector with terminal assembled in temperature chamber of -40℃ for 120 hours and estimate below items for each sample dividing two groups.

A. Measure voltage drop, leakage current, insulate resistance, temperature rise and seal test with assembled connector.

B. Leave connector for 2 hours and separate connector with male and female, and then drop it onto the concreate surface more than 10T from 1.5±0.1m height 3 items. The method of connector drop follows figure 6-1.



< Fig. 6-1 >

6.4 Cold and hot temperature shock test

Engage and disengage connector with terminal assembled 10 times with hands and leave it in combined state at 40℃ for 2hours, and perform 200 cycles according of the method specified in figure 6-1 and table 6. Then leave it at room temperature for 2 hours or more ((*) follows table 6.).

< Fig 6-2: Test pattern >

Division	High temperature (*)	Connector using part
Waterproof	120℃	ENG room
Non-waterproof	80℃	except ENG room

< Table 6 >

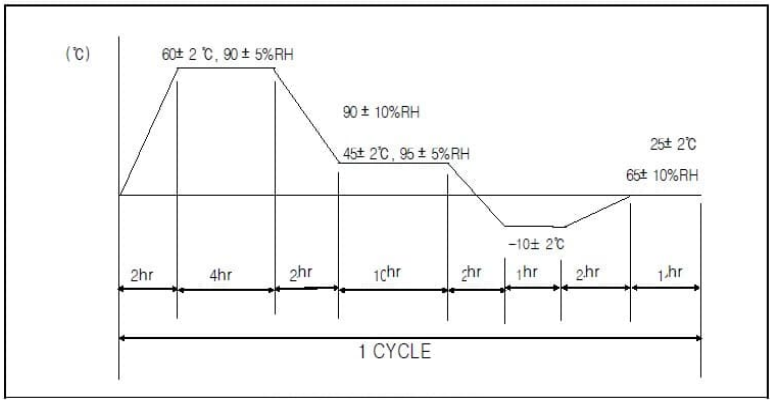
6.5 High temperature test

Engage and disengage connector with terminal assembled 10 times with hands and leave it in combined state at the temperature chamber of the table 6 for 300 hours. Then pick it out and leave it until it returns to normal temperature.

6.6 Temperature and humidity cycle test

Engage and disengage connector with terminal assembled 10 times with hands. And with the connector engaged, the following items are tested as separate parts.

A. Put the connector in a water bath for 24 hours and take it out.
B. Fix the plug side vertically in the chamber so that it is upward.
C. Spary the connectors to ensure they are sufficiently watery.
D. Perform 5 cycles of -40 ± 2℃ for 1 hour and 5 ± 2℃ for 1 hour.
E. Perform 5 cycles of the method specified in figure 6-3. Then pick connector out of chamber and dry it for 2 hours or more.



< Fig. 6-3 >

6.7 Dust test

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.

6.8 Waterproof test

Make combined connectors engaged and disengaged 10 times by hands, and leave it in combined state at 120 ℃ 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.

6.9 Oil and liquid test

Engage and disengage connector with terminal assembled 10 times with hands and perform test each sample with connector combined.

A. Immerge connector in combined state for 2 hours in 100% oil of 50± 2℃ ENG oil (SAE10W) and then pick it out.
B. Immerge connector in combined state for 1 hour in 100% car gasoline (JIS K2202) at normal temperature, and then pick it out.
C. Immerge connector in combined state for 1 hour in 100% brake liquid (pure product) at normal temperature, and then pick it out.
D. Immerge connector in combined state for 1 hour in 100% washer liquid (pure product) at normal temperature, and then pick it out.
E. Immerge connector in combined state for 1 hour in 85% ETHANOL FUEL + 15% GASONLINE at normal temperature, and then pick it out.

6.10 Ozone test

Engage and disengage Connector with terminal assembled 10 times with hands, and samples keep at 40℃ and 50 ± 5pphm Ozone for 100 hours. Then pick connector out of chamber and dry it for 2 hours or more.

6.11 Salt water test

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.

6.12 Sulfur (SO_2) gas test

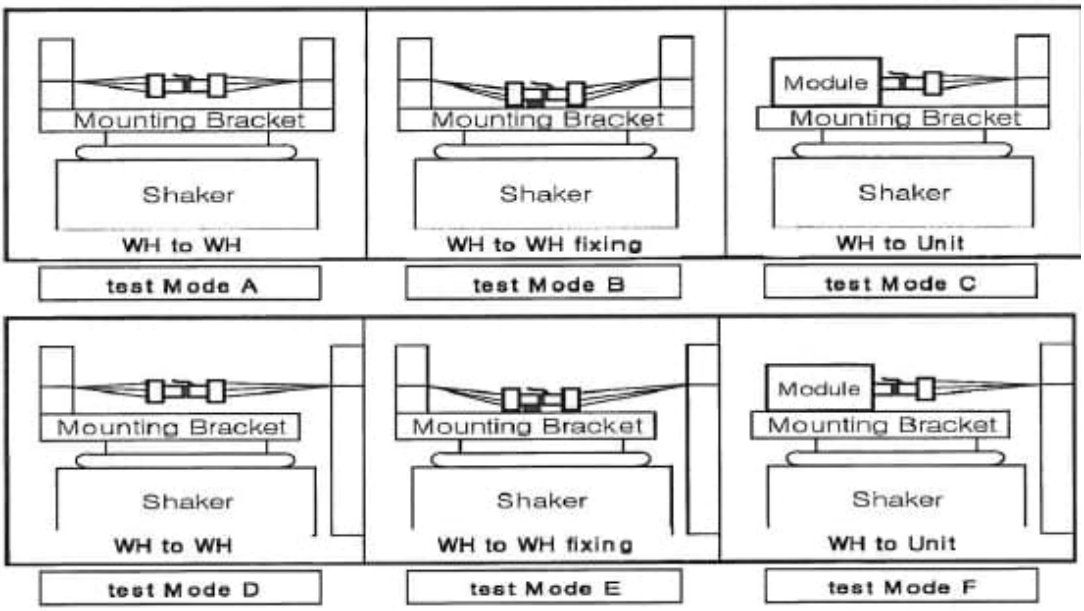
Engage and disengage connector with terminal assembled 10 times with hands and expose it in combined state to sulfur gas of 40 ± 3℃, density 10 ppm, humidity 90~95%, for 24 hours. Then pick connector out of chamber and dry it for 2 hours or more.

6.13 Complex environment endurance test B (Refer to the attached test process #1)

Engage and disengage connector with terminal assembled 10 times with hands and leave it in combined state in the temperature chamber of 120℃ (follows table 7) for 48 hours.

And then perform the following vibration test. Then measure instant short circuit according to the method of clause 4.16 for 4 hours for X, Y, Z each.

Follow figure 6-6 for connector attaching method.



< Fig 6-6 Connector attaching method >

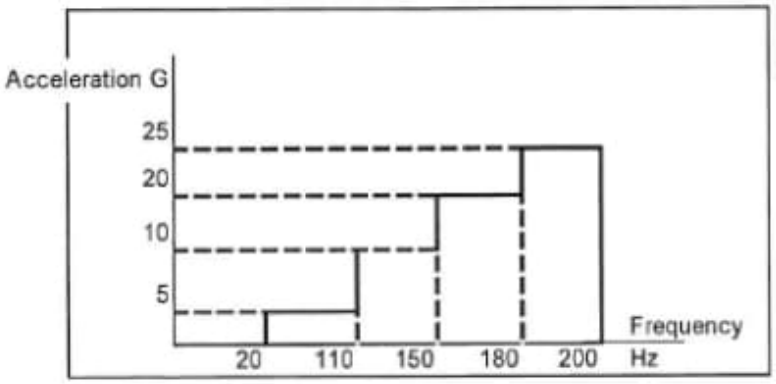
◈ Vibration test B (for non-waterproof connector)

Perform both of sine wave and random wave tests.

1) Sine wave test

Division	Condition
Ambient temperature/humidity	Refer to figure 4-8, 90~95%
Applied current	Basic current (Connector electrodes in series.)
Current application cycle	120 CYCLE (45 minutes-ON, 15 minutes-OFF)
Vibration acceleration	Follow figure 6-7
Frequency	20Hz ~ 200Hz (sweep time: 3 minutes or less)
Vibration time	40 hours for X, Y, Z each
Connector attaching method	Test mode A, B, C

< Table 7 >

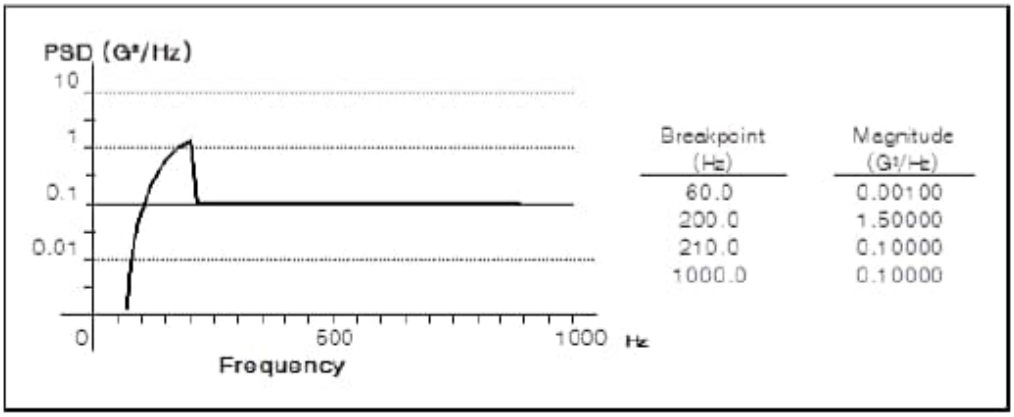


<Fig. 6-7 >

2) Random wave test
Perform this test for the component of which sine wave test has been finished.

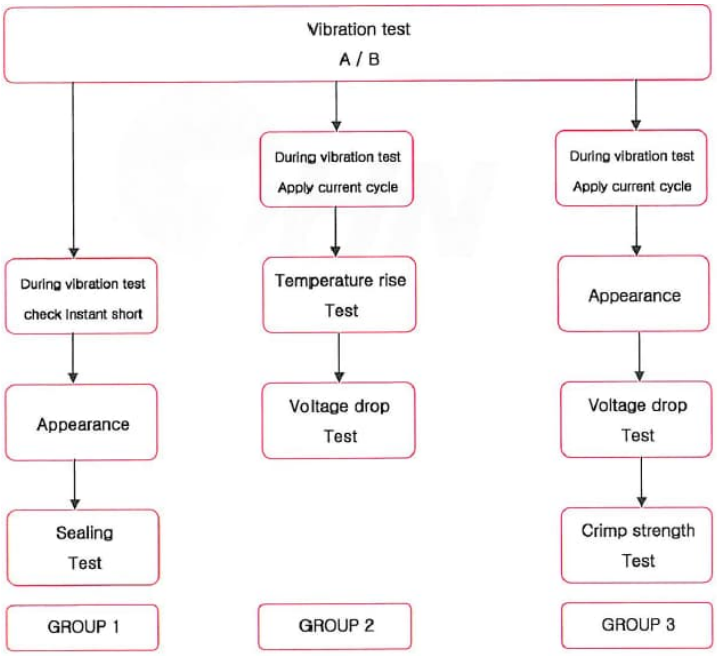
Division	Condition
Ambient temperature/humidity	Refer to figure 4-8, 90~95%
Applied current	Basic current (Connector electrodes in series.)
Current application cycle	24 CYCLE (45 minutes-ON, 15 minutes-OFF)
Vibration acceleration	Follow figure 6-8
Frequency	20Hz ~ 200Hz (sweep time: 3 minutes or less)
Vibration time	8 hours for X, Y, Z each
Connector attaching method	Test mode D, E, F

< Table 8 >



<Fig. 6-8 >

Test process #1



※ In the multipolar connector, Evaluation test at the same time for group 2/3

Rev	*Change*	*Description*	*Date*
A		**Initial Released**	**19.JUN.'24**

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SW KIM	CH CHO	YH KIM
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