

ISH® HYBRID HORIZONTAL HC 20P

Part No. V0123-020E-02,V0124-020B-02

Product Specification

Qualification Test Report No. TR-26046

0	S26276	August 7, 2026	Ka.Tanaka	K.Tsusu	T.Takeda
Rev.	ECN	Date	Prepared by	Checked by	Approved by

1. Scope

This standard specifies the performance and test conditions for ISH HYBRID HORIZONTAL HC 20P.

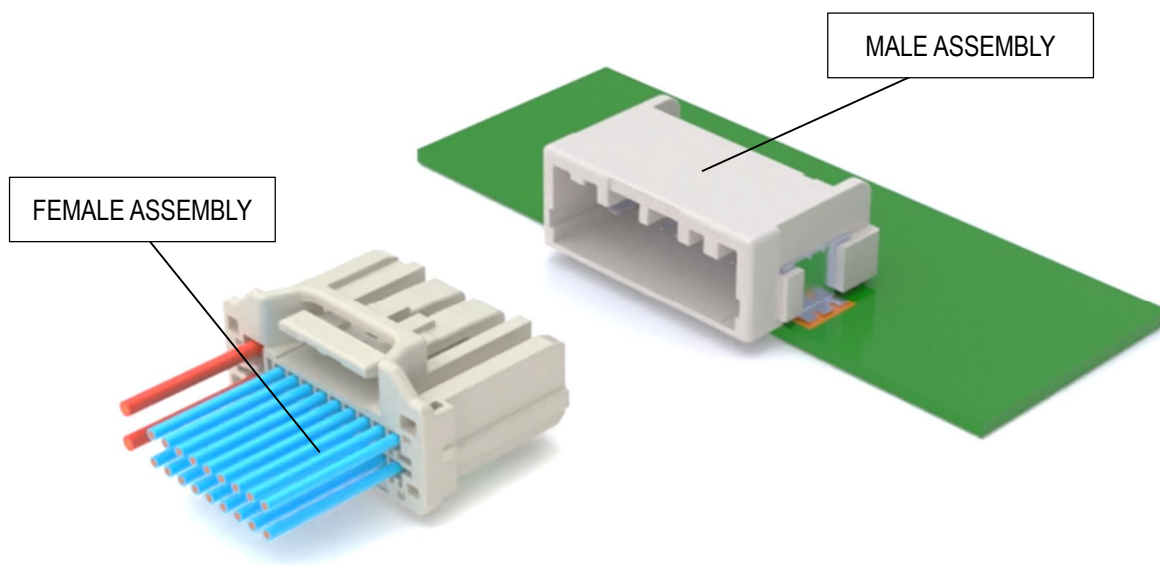
2. Product Name and Model Number

2.1 Product Name

ISH[®] HYBRID HORIZONTAL HC 20P

2.2 Model Number

- MALE ASSEMBLY : V0123-020E-02
- FEMALE SUB ASSEMBLY: V0124-020B-02
- FEMALE TERMINAL 0.5mm : VT009-02
- FEMALE TERMINAL 1.5mm : VT011-04



3. Ratings

3.1 Applicable Cables

Applicable Cables for 0.5 mm Female Terminal

....VT009-02 ... Cross section : 0.3mm², 0.5mm²

Outer diameter : Φ1.60mm MAX

Applicable Cables for 1.5 mm Female Terminal

....VT011-04 ...Cross section : 1.25mm²

Outer diameter : Φ2.84mm MAX

3.2 Operating Conditions

Temperature: 233~398K(-40℃~+125℃)

(including temperature rise due to current flow)

4. Construction, Materials and Finish

(1)MALE HSG.....Material : Glass-filled LCP, Flame retardance : UL94V-0, Color : WHITE

(2)MALE TERMINAL.....Material : BRASS, Plating : Sn(Reflow)

(3) Peg.....Material : BRASS, Plating : Sn(Reflow)

(4)FEMALE HOUSING.....Material : PBT, Flame retardance : UL94HB, Color : WHITE

(5) FEMALE RETAINER.....Material : PBT, Flame retardance : UL94HB, Color : BLACK

(6)0.5mm FEMALE TERMINAL.....BOX Material : BRASS, Plating : Sn(Reflow)

Spring Material : Copper alloy, Plating : Sn(Reflow)

(7)1.5mm FEMALE TERMINAL.....BOX Material : BRASS, Plating : Sn(Reflow)

Spring Material : Copper alloy, Plating : Sn(Reflow)

5. CONSTRUCTION, MATERIALS AND FINISH

Terminal crimp specification is based on Handling Manual 【HDM-0021】

6. REFLOW TEMPERATURE PROFILE

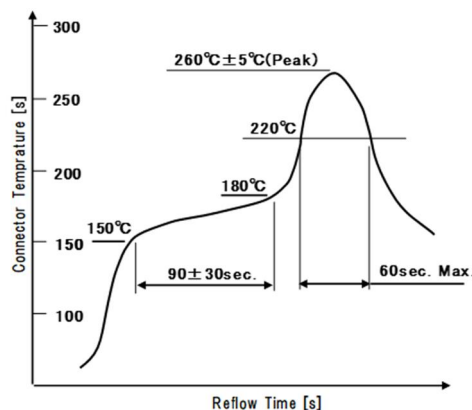


Fig.1.Reflow Temperature Profile

7. Test Methods and Performances

7.1. Initial characteristics

Table 1. Initial characteristics

Item	Measurement	Requirements	
1	Terminal appearance	No detrimental deformation	
2	Terminal outer dimension	Satisfy drawing dimension	
3	Housing appearance	No detrimental deformation	
4	Housing outer dimension	Satisfy drawing dimension	
5	Feeling(insertion/removal)	No discomfort	
6	Connector mating force	70N Max.	
7	Connector unmating force	55N Max.	
8	Connector retention force	100N Min.	
9	Unlocking force	50N Max.	
10	Insulation resistance	100MΩ Min.	
11	Withstanding voltage	No insulation breakdown or erosion	
12	Temperature rise	$\Delta T=50^{\circ}\text{C}$ Max.	
13	Leak current	1mA Max.	
14	Coplanarity	0.1mm Max.	
15	Peg strength	100N Min.	
16	Audible click	60dB(A) Min.	
17	Terminal crimp strength	0.5mm FEMALE TERMINAL : 70N Min. 1.5mm FEMALE TERMINAL : 150N Min.	
18	Terminal insertion force	0.5mm FEMALE TERMINAL : : 0.5N Min.~3N Max. 1.5mm FEMALE TERMINAL : 3.5N Min.~4.5N Max.	
19	Terminal removal force	0.5mm FEMALE TERMINAL : : 0.5N Min.~3N Max. 1.5mm FEMALE TERMINAL : 3.5N Min.~4.5N Max.	
20	Terminal contact force	0.5mm terminal	3N Min.
		1.5mm terminal	4N Min.
21	Terminal bend strength	a	Must not bend more than 1mm
		b	Terminal bending 30°MAX
22	Voltage drop	Initial	10mV/A Max.
		After test	20mV/A Max.
23	Dry circuit resistance	Initial	10mΩ Max.
		After test	20mΩ Max.
24	Microcut monitoring	Not exceed 7Ω for 1μs Min.	
25	Terminal retention force	With secondary lock	0.5mm FEMALE TERMINAL : 49N Min. 1.5mm FEMALE TERMINAL : 100N Min.
		Without secondary lock	0.5mm FEMALE TERMINAL : 20N Min. 1.5mm FEMALE TERMINAL : 60N Min.
26	Terminal to housing insertion force	10N Max.	
27	Retainer insertion/removal force	Insertion force	29.4N Max.
		Removal force	14.7N Min.
28	Housing lock strength without terminals	49N Min.	
29	Sn whisker	125μm Max.	

7.2. Environmental Performances

Table 2. Environmental Performances

Item	Test name	Measurement		Requirements
1	Thermal aging	Housing appearance		No detrimental deformation
		Feeling(insettrion/removal)		No discomfort
		Connector retention force	Direction 1	100N Min.
		Terminal crimp strength	0.5mm terminal	70N Min.
			1.5mm terminal	130N Min.
		Dry circuit resistance	Initial	10mΩ Max.
			After test	20mΩ Max.
		Terminal retention force	0.5mm terminal With secondary lock	49N Min.
			1.5mm terminal Without secondary lock	20N Min.
			0.5mm terminal With secondary lock	100N Min.
			1.5mm terminal Without secondary lock	60N Min.
2	Low temperature aging	Housing lock strength without terminals		49N Min.
		Housing appearance		No detrimental deformation
		Feeling(insettrion/removal)		No discomfort
		Dry circuit resistance	Initial	10mΩ Max.
			After test	20mΩ Max.
		Terminal retention force	0.5mm terminal With secondary lock	49N Min.
			1.5mm terminal Without secondary lock	20N Min.
			0.5mm terminal With secondary lock	100N Min.
			1.5mm terminal Without secondary lock	60N Min.
		Housing lock strength without terminals		49N Min.
3	Thermal shock	Housing appearance		No detrimental deformation
		Feeling(insettrion/removal)		No discomfort
		Connector retention force	Direction 1	100N Min.
		Terminal crimp strength	0.5mm terminal	70N Min.
			1.5mm terminal	130N Min.
		Dry circuit resistance	Initial	10mΩ Max.
			After test	20mΩ Max.
		Terminal retention force	0.5mm terminal With secondary lock	49N Min.
			1.5mm terminal Without secondary lock	20N Min.
			0.5mm terminal With secondary lock	100N Min.
			1.5mm terminal Without secondary lock	60N Min.
4	Resistance to humidity	Housing appearance		No detrimental deformation
		Connector retention force	Direction 1	100N Min.
		Insulation resistance		100MΩ Min.
		Withstand voltage		No insulation breakdown or erosion
		Leak current		1mA Max.
		Dry circuit resistance	Initial	10mΩ Max.
			After test	20mΩ Max.
		Terminal retention force	0.5mm terminal With secondary lock	49N Min.
			1.5mm terminal Without secondary lock	20N Min.
			0.5mm terminal With secondary lock	100N Min.
			1.5mm terminal Without secondary lock	60N Min.

7.2. Environmental PerformancesTable 3. Environmental Performances

Item	Test name	Measurement		Requirements
5	Corrosion gas	Terminal appearance		No detrimental deformation
		Housing appearance		No detrimental deformation
		Terminal crimp strength	0.5mm terminal	70N Min.
			1.5mm terminal	130N Min.
		Voltage drop	Initial	10mV/A Max.
			After test	20mV/A Max.
6	Vibration with temperature change	Terminal appearance		No detrimental deformation
		Housing appearance		No detrimental deformation
		Terminal contact force		3N Min.
		Dry circuit resistance	Initial	10mΩ Max.
			After test	20mΩ Max.
		Voltage drop	Initial	10mV/A Max.
			After test	20mV/A Max.
		Microcut		Not exceed 7Ω for more than 1μs

8. Test method

8.1. Initial characteristics Test Method

(1) Terminal appearance

Test method Visual(e.g. magnifier) and tactile verification.

(2) Terminal outer dimensions

Test method Measure dimensions using caliper, micrometer, projector.

(3) Housing appearance

Test method Visual(e.g. magnifier) and tactile verification.

(4) Housing outer dimensions

Test method Measure dimensions using caliper, micrometer, projector.

(5) Feeling (insertion/ extraction)

Test method Verification of feeling by insertion/ extraction of connector and single terminal.

(6) Connector mating force

Test method Measure the force required to mate female and male connectors at a rate of 100 mm/min. (terminals must be fully populated)

(7) Connector unmating Force

Test method Measure the force to pull the connectors apart at a rate of 100 mm/min. without the locking feature.

(8) Connector Retention Force

Test method Measure the maximum force to pull out female connector from mated state (Fig.2). Pull in four directions at a speed of 50mm/min. (terminals must be fully populated)

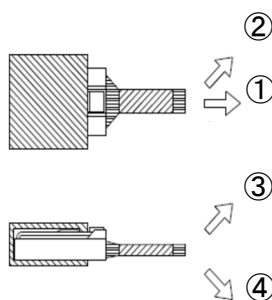


Fig 2.Measurement of connector retention force

(9) Unlocking force

Test method Measure the force to disengage the lock.

(10) Insulation resistance

Test method Supply DC500V insulation resistance between (a) terminals (b) terminal and ground on mated connectors.

(11) Insulation resistance

Test method Supply AC1000V between (a) terminals (b) terminal and ground on mated connectors for 1minute.
Same connection as for insulation resistance test.

(12) Temperature rise

Test method For temperature rise testing, wrap the test sample with half-lap tape starting 30 to 50 mm from the connector terminals. Ensure that the test sample is not affected by drafts or artificial cooling (e.g., installation of a thermocouple), and measure the temperature at the terminal crimping area. Measurements shall be performed with all terminals fully assembled, applying the following test currents to all terminals. Temperature measurements shall be taken after the temperature rise has stabilized.
0.5 mm terminals: 0.5 A per pole; 1.5 mm terminals: 13 A per pole

(13) Leak current

Test method Supply 16 ± 0.1 V to mated connector terminals. Measure maximum leak current.

(14) Coplanarity

Test method Measure coplanarity of male connector lead and peg at the reflow profile shown in Figure 3.

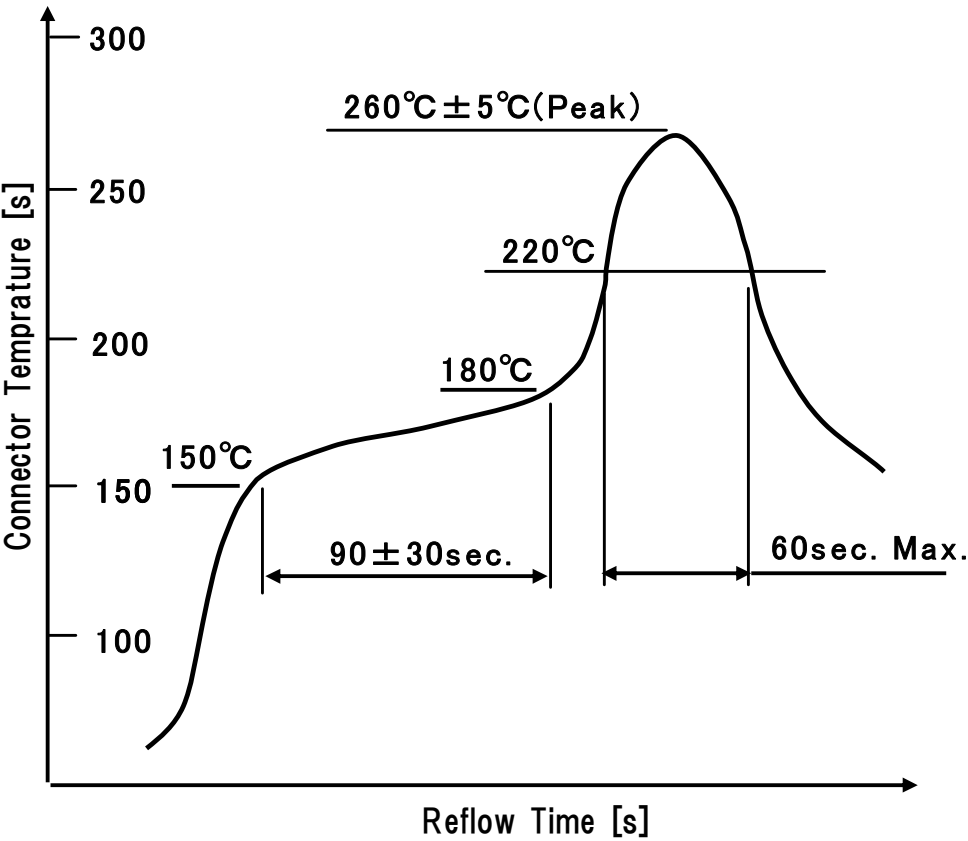


Fig 3.Coplanarity Measurement points

(15) Peg strength

Test method Mate a wired female connector to the soldered male connector, and pull the wire at a rate of 100mm/min. Measure the force when the peg comes out from the PCB.
If mating portion has some breakage, it is needed to reinforce them.
Fix the connector in the following 3 positions, and pull towards the arrowed direction.

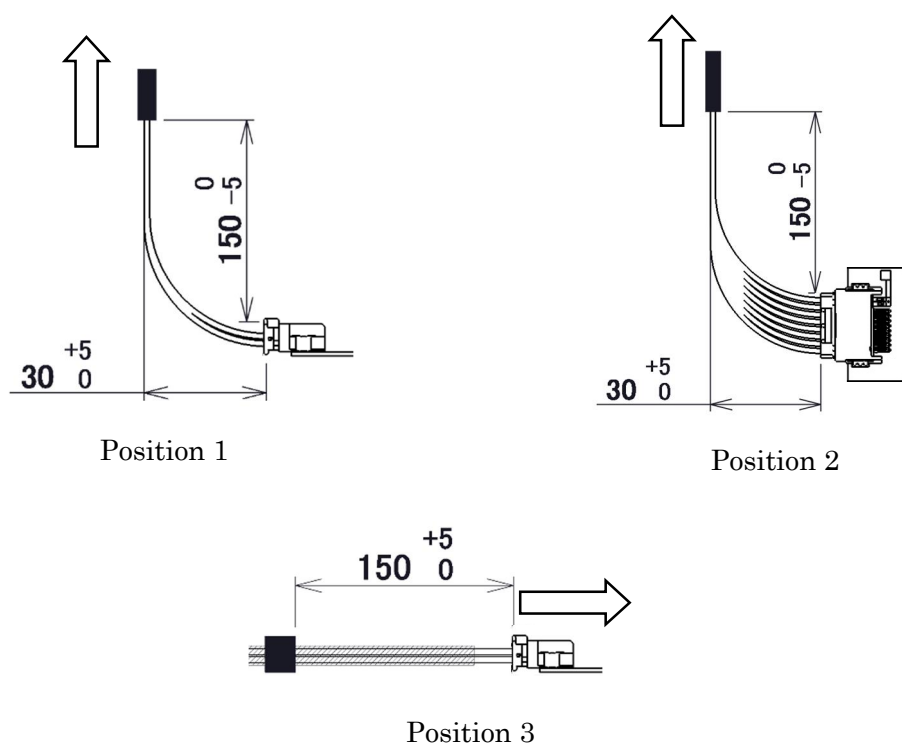


Fig.4.Peg strength measuring method

(16) Audible click

Test method Horizontally insert fully populated female connector to male connector which is soldered onto PCB.
Measure by the sound with sound level meter, and analyze the frequency analyzer (FFT).
Measurement range: 10kHz~20kHz
Background noise: 5kHz MIN, Peak: 50dB MAX
Measurement must be done in a room.
Keep the position of the connector lock 600mm away from sound level meter.
Fix PCB and measure the lock sound without any touches.

(17) Terminal crimp strength

Test method Crimp wire of 100mm approx. to female terminal and pull the wire at the speed of 50-100mm/min. Measure the force when the wire breaks or the wire comes out from the terminal. Do not use insulation barrel.

(18) Terminal insertion force

Test method Measure the force to insert female terminal into fixed male connector at a speed of 100 mm/min.

(19) Terminal removal force

Test method Measure the force to pull out female terminal from male connector at a speed of 100 mm/min.

(20) Terminal contact force

Test method Calculate a contact force of female terminal and male terminal.
Measure female terminal spring displacement-force characteristics, and calculate a contact force from displacement upon male terminal insertion.
(accuracy 0.01mm MAX)

(21) Terminal bend strength

Test method (a) Push a male terminal to mating direction from housing entrance at a speed of 50mm/min with the load (maximum of connector insertion force).
(b) Remove housing walls around male terminals. Push a terminals at a speed of 50mm/min to the perpendicular direction to mating axis (4 directions: up, down, left, right)with the force.
1.5mm terminal : 12N (only up , down) , 0.5mm terminal : 3N (4 directions)
applies a load.

(22) Voltage drop

Test method Open: 12V, Short circuit: 1A

Measure the voltage drop between male connector lead and temp. measurement point after where is 75mm for from the crimp area of female terminal.

temperature reached saturation at 75mm from female terminal crimp.

Then, subtract voltage drops of wire and male connector lead

Wire resistance: Table 4 or actual measurement.

Table 4. Wire resistance (20°C, 75mm)

Cable Size (mm ²)	Resistance (mΩ)
0.3	3.77
0.5(JIS)	2.45
0.5(ISO)	2.8
0.75	1.77
1.0	1.4
1.25	1.07

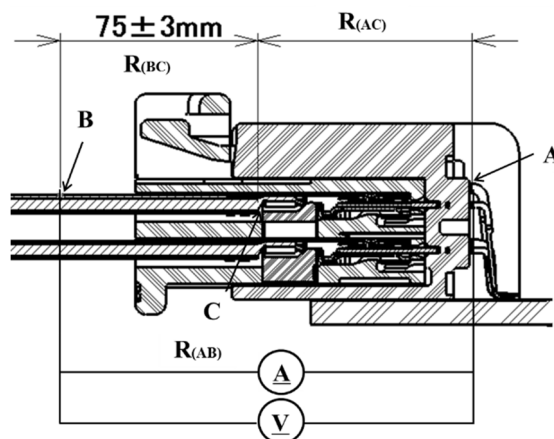


Fig 5. In-line Circuit Test Lead Location

(23) Dry circuit resistance

Test method Open: 20±5mV, Short circuit: 10±0.5mA

Measure resistance of point where is 75mm for from the crimp area of female terminal and male connector lead.

Then, subtract resistance of wire and male connector lead.

Wire resistance: Table 7 or actual measurement

(24) Microcut monitoring

Test method Measure dry circuit resistance.

(25) Terminal retention force

Test method Measure the force to pull out female terminal from female connector housing at a speed of 100mm/min. Test with and without retainer.

(26) Terminal insertion force to housing

Test method Measure the force to fully insert female terminal into female connector housing at a speed of 100mm/min

(27) Retainer insertion/removal force

Test method Fully populate female connector housing with the female terminals.
Measure the force to insert and remove the retainer at a speed of 100mm/min.
Measure the forces for each of the two locking positions.

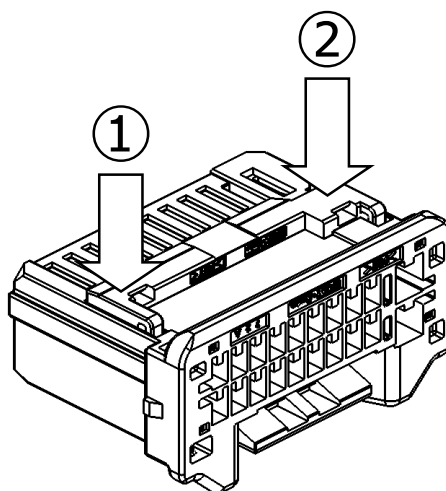


Fig 6.Measurement point

(28) Housing lock strength without terminals

Test method Measure the maximum force to pull out unpopulated female connector housing from mated status at a speed of 100mm/min.

(29) Sn whisker

Test method Check the surface of connector's metal portions(terminals, lead) with microscope, etc. to find Sn whisker. Use microscope with magnification of X100 MIN.
Check closely not to lose sight of whisker with different magnifications.

6.2. Environmental Performances Test Method

(1) Thermal Aging

Test method Place mated connectors in thermal chamber at $125\pm 3^{\circ}\text{C}$ for 120h.
Remove the connectors from the chamber and leave it to ambient temperature to recover.

(2) Low temperature aging

Test method Place mated connectors in thermal chamber at $-40\pm 3^{\circ}\text{C}$ for 120h.
Repeat insert/extraction for 5 times immediately after removing from the chamber,
then leave it to ambient temperature to recover.

(3) Thermal shock

Test method Place mated connectors in thermal chamber and subject them to heat /cold cycle
($100\pm 3^{\circ}\text{C}/-40\pm 3^{\circ}\text{C}$). No of cycles: 1000
Duration (0.5h) may be shortened if sample's temperature reaches test temperature
requirement early.
Monitor resistance during test, open circuit $20\pm 5\text{mV}$, short circuit $10\pm 0.5\text{mA}$.

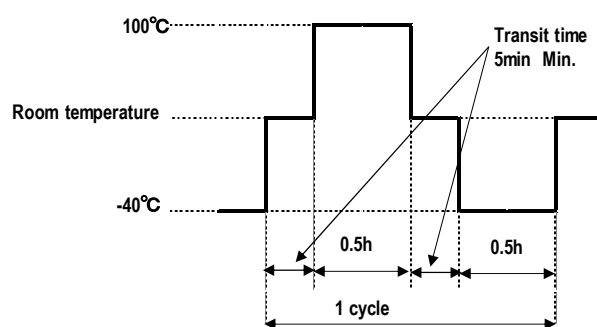


Fig.7 .Thermal shock

(4) Resistance to humidity

Test method Place mated connectors in climatic chamber and subject them to $60^{\circ}\text{C} \pm 5^{\circ}\text{C}$,
90~95%RH for 96h.
Hang connectors to prevent any drips the connectors

(5) Corrosion gas

Test method Place male and female connectors (not mated) in $25 \pm 5\text{ppm}$, $40 \pm 2^{\circ}\text{C}$, 90-98%RH,
SO₂ gas for 96h.

(6) Vibration with temperature change

Test method Fix mated connectors in same way as the shock test (show in Fig.9) on
fixture and subject them to vibration at $100 \pm 3^{\circ}\text{C}$.

◎Vibration condition

- Acceleration: 59.8m/s^2
- Frequency: 20-200Hz
- Sweep time: 3min (per sweep)

Apply the current value(1.5mm terminal : 9.75A , 0.5mm terminal : 2A) for 45min,
break for 15min. No. of cycles: 300

Repeat in other directions.

Monitor resistance during 2.2A current supply.

After test, carry out vibration test on 3 axes, each for 1h. Check for any microcuts.

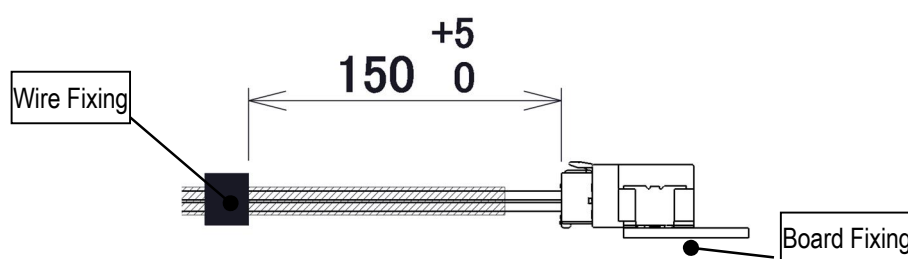


Fig8 Fixing method