CABLINE®-CAL

Part No. Plug: 20728-0**T-#1 Receptacle: 20729-0**E-##

Product Specification

Qualification Test Report No. TR-17036

Rev.	ECN	Date	Prepared by	Checked by	Approved by
5	S24022	January 17, 2024	T.Ono	M.Nakamura	T.Masunaga
4	S23291	September 5, 2023	R.Hatano	T.Tanigawa	H.Ikari
3	S22008	January 17, 2022	T.Ono	T.Masunaga	H.Ikari
2	S21047	February 3, 2021	S.Yamaguchi	T.Tanigawa	H.Ikari

1. Scope

This Product Specification defines the test conditions and the performances of the CABLINE-CAL Connector , a wire-to-board connector of 0.4mm contact pitch.

2. Product Name and Parts No.

2.1 Product Name

CABLINE-CAL

2.2 Parts No.

Plug: 20728-0**T-#1
Receptacle: 20729-0**E-##

3. Rating

3.1 Applicable Cable

Micro-Coaxial Cable・・・AWG#【44、42、40】
Discrete Wire・・・AWG#【38、36、34】

3.2 Operating Conditions

Amperage: 0.15A AC/DC [AWG#44] (Per Contact Pin / Up to 40 Contacts)
0.24A AC/DC [AWG#42] (Per Contact Pin / Up to 40 Contacts)
0.3A AC/DC [AWG#40] (Per Contact Pin / Up to 32 Contacts)
0.5A AC/DC [AWG#38] (Per Contact Pin, for Power / Up to 14 Contacts)
0.8A AC/DC [AWG#36] (Per Contact Pin, for Power / Up to 5 Contacts)
1.0A AC/DC [AWG#34] (Per Contact Pin, for Power / Up to 4 Contacts)

※Testing by a real machine is recommended because temperature rise may affected by actual situation.

Voltage: 100V AC (Per Contact Pin)
Operating Temperature: 233～358K(-40℃～+85℃) (Containing temperature rise by current.)
Operating Humidity: 85% max

3.3 Storage Conditions

Storage Temperature: 248～333K(-25℃～60℃)
Storage Humidity: 85% max. (Non-Condensing)

4. Test and Performance

Test Condition

This initial test is equal to it's at shipping condition and unless otherwise specified, all tests and measurements shall be performed under the following conditions in accordance with MIL-STD-202 G.

Temperature… 288K to 308K（15℃ to 35℃）
Pressure… 866hPa to 1066hPa（650mmHg to 800mmHg）
Relative Humidity… 45 to 75%R.H.

4.1. Electrical Performance

1. Contact Resistance	
Reference Standard:	MIL-STD-202G, Method 307
Test Conditions:	Solder the receptacle connector to the test board and mate the plug connector together, then apply 20mV MAX. DC open circuit voltage and 10mA MAX. DC closed circuit current. Measure the contact resistance of signal and ground at the section shown in Fig.1 by the four terminal methods.

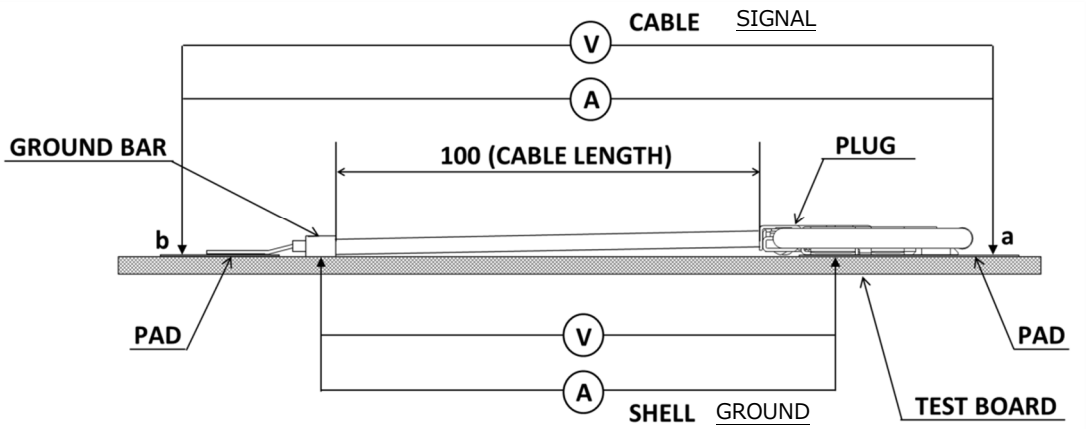


Fig.1 Contact Resistance

Pass Criteria:	Signal Contact Initial：180 mΩMAX.(AWG#34) 275 mΩMAX.(AWG#36) 360 mΩMAX.(AWG#38) 600 mΩMAX.(AWG#40) 700 mΩMAX.(AWG#42) 1080 mΩMAX.(AWG#44) After Testing：⊿R 40mΩ MAX. Ground Initial：50 mΩ MAX. After Testing：⊿R 40mΩ MAX.	Initial value contains the following conductor resistance of a cable 100mm. 100mΩMAX.(AWG#34) 195mΩMAX.(AWG#36) 280mΩMAX.(AWG#38) 520mΩMAX.(AWG#40) 620mΩMAX.(AWG#42) 1000mΩMAX.(AWG#44)

2. Insulation Resistance	
Reference Standard:	MIL-STD-202 G, Method 302
Test Conditions:	Mate the plug and receptacle connector together, and then apply DC 250 V between the neighboring contacts and between the contacts and SHELL.
Pass Criteria:	Initial: 1000 MΩ MIN. After Testing: 500 MΩ MIN.

3. Dielectric Withstanding Voltage	
Reference Standard:	MIL-STD-202 G, Method 301
Test Conditions:	Mate the receptacle and plug connector together, then apply AC 250V(rms) between the neighboring contacts and between the contacts and shell for a minute.
Pass Criteria:	No abnormalities such as creeping discharge, flashover, insulator breakdown occur.

4. Temperature Rising	
Reference Standard:	-
Test Conditions:	Mate the plug and receptacle connector together and apply rating current per contact pin. Measure delta T over ambient.
Pass Criteria:	Over Ambient：⊿T 30 ℃ MAX.

4.2. Mechanical Performance

1. Mating Force and Un-Mating Force	
Reference Standard:	-
Test Conditions:	Solder the receptacle connector to the test board, then place the board and plug on push-on/pull-off machine. Repeat mating/un-mating 30 cycles at a speed 25±3mm/min. along the mating axis. Measure the mating and un-mating force at the initial and after 30 cycles.
Pass Criteria:	Mating Force 30 P Initial: 12.0 N MAX. 30cycles: 12.0 N MAX. 40 P Initial: 16.0 N MAX. 30cycles: 16.0 N MAX. Un-Mating Force 30 P Initial: 1.80 N MIN. 30cycles: 1.80 N MIN. 40 P Initial: 2.40 N MIN. 30cycles: 2.40 N MIN.

2. Durability	
Reference Standard:	-
Test Conditions:	Solder the receptacle connector to the test board, then place the board and plug on the push-on/pull-off machine, and repeat mating and un-mating 30 cycles at a speed 25±3mm/min. along the mating axis.
Pass Criteria:	Contact Resistance: Shall meet 4.1.1

3. Contact Retention Force	
Reference Standard:	-
Test Conditions:	Place the connector on the push-on/pull-off machine, then apply force to the contact from opposite direction of the contact insertion at a speed of 25±3mm/min. Measure the force when the contact dislodges from the connector.
Pass Criteria:	Receptacle Contact Retention Force: 0.20N MIN.

4. Cable Retention Force	
Reference Standard:	-
Test Conditions:	Place the plug connector on the push-on/pull-off machine and pull the cable along the cable axis at a speed 25±3mm/min. Measure the force when the discontinuity occurs.
Pass Criteria:	30P: 11.8 N MIN. 40P: 12.4 N MIN.

4.2. Mechanical Performance

5. Vibration	
Reference Standard:	MIL-STD-202 G, Method 201A
Test Conditions:	Solder the receptacle connector to the test board, then mate plug connector, and place them on the vibrator. Then apply the following vibration. During the testing, run 100mA DC to check electrical discontinuity. Frequency: 10Hz→55Hz→10Hz/approx. 1min. Directions: 3 mutually perpendicular directions. Total Amplitude: 1.52 mm Sweep Duration: 2 hours for each direction, a total of 6 hours.
Pass Criteria:	Contact Resistance: Shall meet 4.1.1. Electrical Discontinuity: No electrical discontinuity greater than 1μs shall occur. Appearance: No abnormality adversely affecting the performance shall occur.

6. Shock	
Reference Standard:	MIL-STD-202 G, Method 213B, Condition A.
Test Conditions:	Solder the receptacle connector to the test board, then mate plug connector, and place them on the shock machine. Then apply the following shock. MAX.G: 50G　　Directions: 6 mutually perpendicular direction Duration: 11msec　　Cycle: 3 cycles about each direction Wave Form: Half Sinusoidal
Pass Criteria:	Contact Resistance: Shall meet 4.1.1. Electrical Discontinuity: No electrical discontinuity greater than 1μs shall occur. Appearance: No abnormality adversely affecting the performance shall occur.

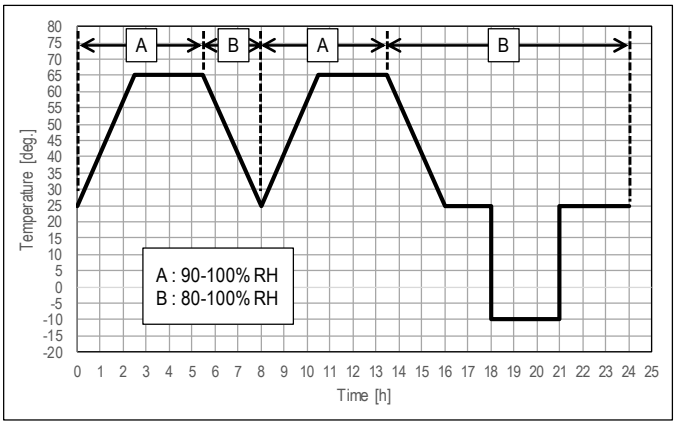
4.3. Environmental Performance

1. Thermal Shock	
Reference Standard:	MIL-STD-202 G, Method 107G, Condition A.
Test Conditions:	Solder the receptacle connector to the test board, then mate plug connector, and expose them to the following environment. Temperature: 218K(-55℃),30min.→358K(85℃),30min. Transition time: 5min. MAX. Cycle: 5 cycles
Pass Criteria:	Contact Resistance: Shall meet 4.1.1. Insulation Resistance: Shall meet 4.1.2. Dielectric Withstanding Voltage: Shall meet 4.1.3. Appearance: No abnormality adversely affecting the performance shall occur.

2. High Temperature Life	
Reference Standard:	MIL-STD-202 G, Method 108A, Condition B.
Test Conditions:	Solder the receptacle connector to the test board, then mate plug connector, and expose them to the following environment. Temperature: 358±2K (85±2℃) Duration: 250 hours
Pass Criteria:	Contact Resistance: Shall meet 4.1.1. Contact Retention Force: Shall meet 4.2.3. Appearance: No abnormality adversely affecting the performance shall occur.

4.3. Environmental Performance

3. Humidity (Steady State)	
Reference Standard:	MIL-STD-202 G, Method 103B, Condition A.
Test Conditions:	Solder the receptacle connector to the test board, then mate plug connector, and expose them to the following environment. Temperature: 313±2K (40±2℃) Humidity: 90～95%RH Duration: 240 hours
Pass Criteria:	Contact Resistance: Shall meet 4.1.1. Insulation Resistance: Shall meet 4.1.2. Dielectric Withstanding Voltage: Shall meet 4.1.3. Appearance: No abnormality adversely affecting the performance shall occur.

4. Humidity (Cycling)	
Reference Standard:	MIL-STD-202 G, Method 106G.
Test Conditions:	Solder the receptacle connector to the test board, then mate plug connector, and expose them to the following environment. Temperature: 298[263]～338K (25[-10]～65℃) Humidity: 90[80]～98%RH Duration: 10cycles (240hours) 
Pass Criteria:	Contact Resistance: Shall meet 4.1.1. Insulation Resistance: Shall meet 4.1.2. Dielectric Withstanding Voltage: Shall meet 4.1.3. Appearance: No abnormality adversely affecting the performance shall occur.

5. Saltwater Spray	
Reference Standard:	MIL-STD-202 G, Method 101E, Condition B.
Test Conditions:	Solder the receptacle connector to the test board, then mate plug connector, and expose them to the following environment. Temperature: 308±2K (35±2℃) Saltwater Density: 5±1% [by weight] Duration: 48 hours
Pass Criteria:	Contact resistance: Shall meet 4.1.1. No abnormality adversely affecting the performance shall occur.

4.3. Environmental Performance

6. H_2S Gas	
Reference Standard:	-
Test Conditions:	Solder the receptacle connector to the test board, then mate plug connector, and expose them to the following environment. Temperature: 313±2K (40±2℃) Relative Humidity: 80±5%RH Gas: H_2S 3±1ppm Duration: 48 hours
Pass Criteria:	Contact Resistance: Shall meet 4.1.1. Appearance: No abnormality adversely affecting the performance shall occur.

4.4. Others

1. Solderability	
Reference Standard:	-
Test Conditions:	Immerse the contact soldering part to flux of RMA or R type for 5 to 10 seconds, then dip the part into the solder bath of 518±5K（245±5℃） for 5±0.5 seconds.
Pass Criteria:	More than 95% of the dipped surface shall be evenly wet.

2. Soldering Heat Resistance	
Reference Standard:	-
Test Conditions:	Reflow temperature: See Fig.2. Cycle: 2

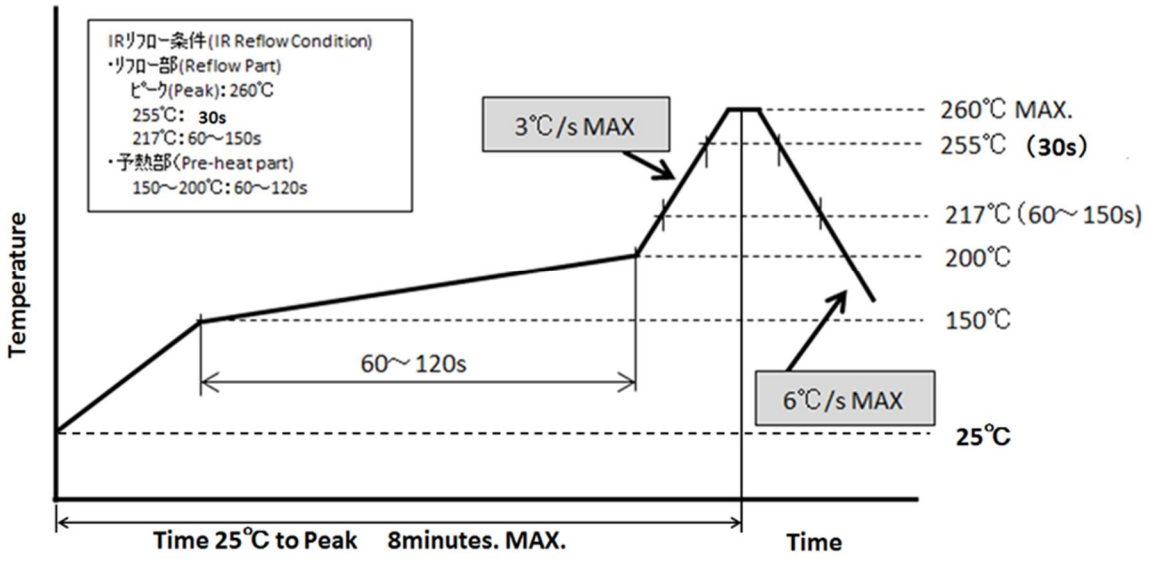


Fig.2

Pass Criteria:	No abnormality adversely affecting the performance shall not occur.

4.5 Test Sequence and Specimen Quantity

Table 1 Test Sequence and Sample Quantity

Test Item	Group											
	A	B	C	D	E	F	G	H	J	K	L	M
Contact Resistance	2,6		1,3,5	1,5	1,3	1,5	1,5,7	1,3	1,3			
Insulation Resistance				2,6		2,6	2,8					
D. W. Voltage				3,7		3,7	3,9					
Temperature Rising												1
Mating Force	1,5											
Un-Mating Force	3,7											
Durability	4						4 (10cycles)					
Contact Retention Force		1,3										
Cable Retention Force	8											
Vibration			2									
Shock			4									
Thermal Shock				4								
High Temperature Life		2			2							
Humidity (Steady State)						4						
Humidity (Cycling)							6					
Saltwater Spray								2				
H_2S Gas									2			
Solderability										1		
Soldering Heat Resistance											1	
Specimen Quantity.	5 pcs.	20 pos.	5 pcs.	5 pcs.	5 pcs.	5 pcs.	5 pcs.	5 pcs.	5 pcs.	10 pcs.	10 pcs.	5 pcs.

※Numbers indicate sequence in which tests are performed.

5. Recommended Metal Mask

Recommended Thickness of Metal Mask ： t=0.10
Recommended Opening Ratio of Metal Mask ： 100%
※The pattern dimensions refer to a drawing.

6. Precautions for Handling Cable Connectors

Refer to instruction manual ：HIM-17010 for the handling of CABLINE-CAL.