

CABLINE®-CAL

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

Product Specification

Qualification Test Report No. TR-17036

| | | | | | |
|------|--------|-------------------|-------------|------------|-------------|
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| 3 | S22008 | January 17, 2022 | T.Ono | T.Masunaga | H.Ikari |
| 2 | S21047 | February 3, 2021 | S.Yamaguchi | T.Tanigawa | H.Ikari |
| 1 | S19095 | February 18, 2019 | S.Yamaguchi | T.Masunaga | Y.Shimada |
| Rev. | ECN | Date | Prepared by | Checked by | Approved by |

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: 0.1A 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 be affected by actual situation.

Voltage: 100V AC (per contact pin)

Operating temperature: 233~358K(-40°C~+85°C) (Containing temperature rise by current)

Operating humidity: 85% max

3.3 Storage Conditions

Storage temperature: 248~333K(-25°C~60°C)

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°C to 35°C)

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.

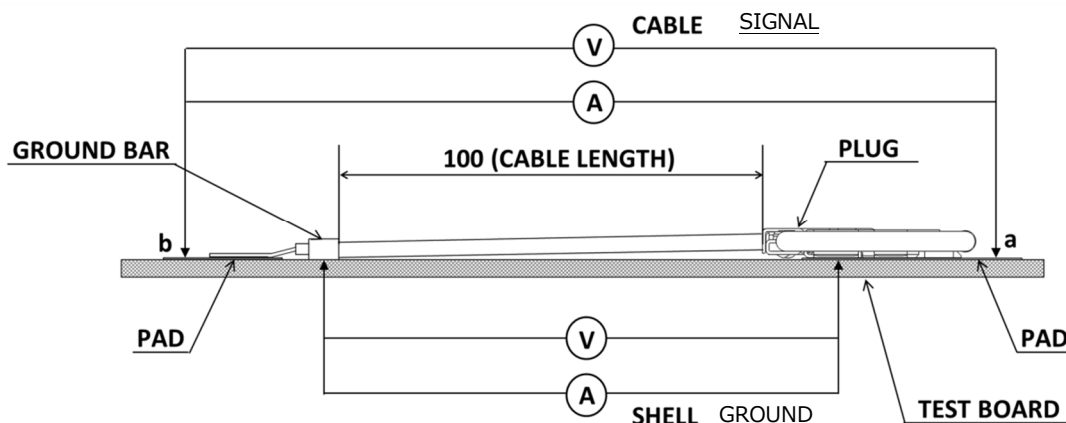


Fig.1 Contact Resistance

| | | |
|----------------|--------------------------------------|---|
| Pass criteria: | <u>Signal Contact</u> | Initial value contains the following conductor resistance of a cable 100mm. |
| | Initial : 180 mΩMAX.(AWG#34) | 100mΩMAX.(AWG#34) |
| | 275 mΩMAX.(AWG#36) | 195mΩMAX. (AWG#36) |
| | 360 mΩMAX.(AWG#38) | 280mΩMAX. (AWG#38) |
| | 600 mΩMAX.(AWG#40) | 520mΩMAX. (AWG#40) |
| | 700 mΩMAX.(AWG#42) | 620mΩMAX. (AWG#42) |
| | 1080 mΩMAX.(AWG#44) | 1000mΩMAX.(AWG#44) |
| | After testing : ΔR 40mΩ MAX. | |
| | <u>GROUND</u> | |
| | Initial : 50 mΩ MAX. | |
| | After testing : ΔR 40mΩ MAX. | |

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 ΔT 30 °C 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 $25\pm 3\text{mm/min}$. along the mating axis. Measure the mating and un-mating force at the initial and after 30cycles.

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 30cycles at a speed $25\pm 3\text{mm/min}$. 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 $25\pm 3\text{mm/min}$. 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 $25\pm 3\text{mm/min}$. Measure the force when the discontinuity occurs.

Pass criteria: 30P: 11.8 N MIN.
 40P: 12.4 N MIN.

4.2. Mechanical Performance

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| 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. |

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| 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 Duration: 11msec Wave Form: Half Sinusoidal Directions: 6 mutually perpendicular direction Cycle: 3 cycles about each direction |
| 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

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| 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°C),30min.→358K(85°C),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. |

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| 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°C) 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: $313\pm 2\text{K}$ ($40\pm 2^\circ\text{C}$)

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)

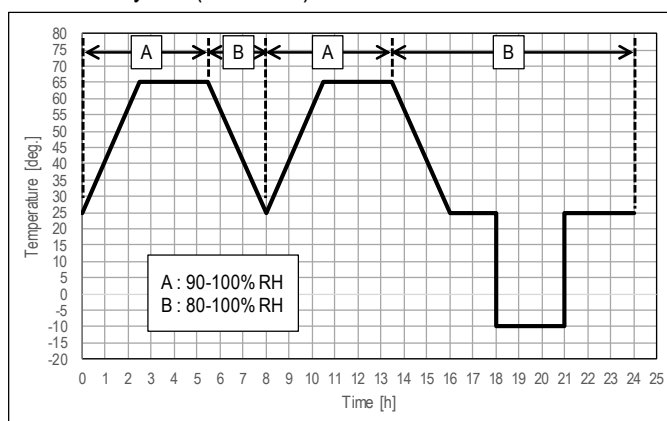
Reference standard: MIL-STD-202 G, Method 106G.

Test conditions: Solder the receptacle connector to the test board, then mate plug connector, and expose them to the following environment.

Temperature: $298[263]\sim 338\text{K}$ ($25[-10]\sim 65^\circ\text{C}$)

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: $308\pm 2\text{K}$ ($35\pm 2^\circ\text{C}$)Saltwater density: $5\pm 1\%$ [by weight]

Duration: 48 hours

Pass criteria:

- Contact resistance: Shall meet 4.1.1.
- No abnormality adversely affecting the performance shall occur.

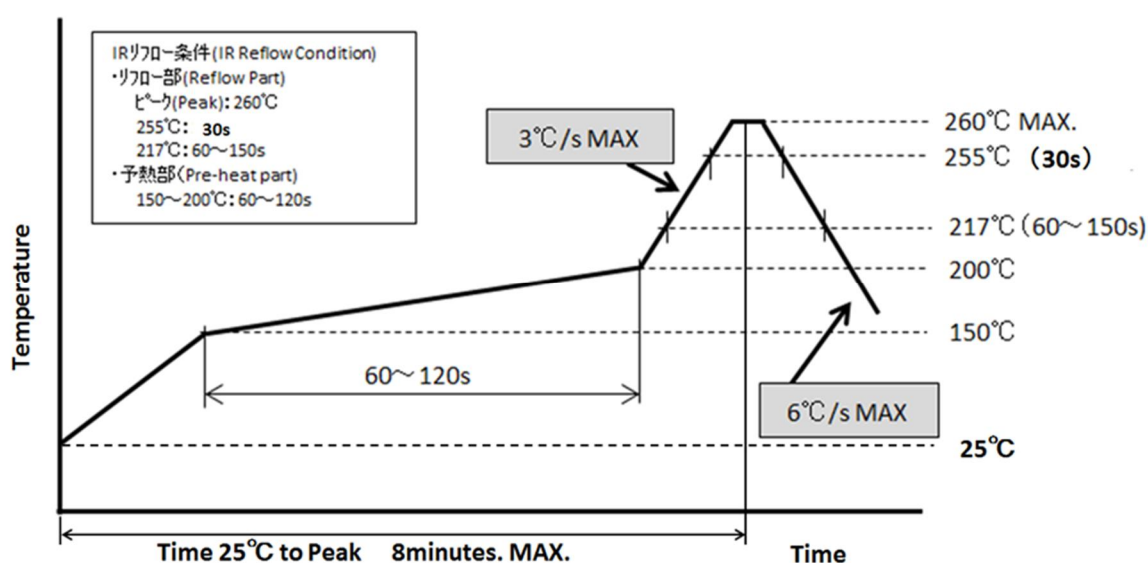
4.3. Environmental Performance

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| 6. H ₂ S 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°C) Relative humidity: 80±5%RH Gas: H ₂ S 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

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| 1. Solder ability | |
| 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°C) for 5±0.5seconds. |
| Pass criteria: | More than 95% of the dipped surface shall be evenly wet. |

2. Resistance to soldering heat

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|---|---|
| Reference standard: | - |
| Test conditions: | Reflow temperature: See Fig.2. Cycle: 2 |
|  <p>IRリフロー条件 (IR Reflow Condition)</p> <ul style="list-style-type: none"> リフロー部 (Reflow Part) ピーク (Peak): 260°C 255°C: 30s 217°C: 60~150s 予熱部 (Pre-heat part) 150~200°C: 60~120s <p>3°C/s MAX</p> <p>260°C MAX.</p> <p>255°C (30s)</p> <p>217°C (60~150s)</p> <p>200°C</p> <p>150°C</p> <p>6°C/s MAX</p> <p>25°C</p> <p>60~120s</p> <p>Time 25°C to Peak 8minutes. MAX.</p> <p>Time</p> | |
| 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 | | | | | |
| Salt Water Spray | | | | | | | | 2 | | | | |
| H ₂ S Gas | | | | | | | | | 2 | | | |
| Solder ability | | | | | | | | | | 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.