ICCON Power Connectors

1. INTRODUCTION

1.1. Purpose

Testing was performed on ICCON Power Connectors to determine their conformance to the requirements of Product Specification 108-128033.

1.2. Scope

This report covers the electrical, mechanical, and environmental performance of ICCON Power Connectors.

1.3. Conclusion

The ICCON Power Connectors listed in paragraph 1.4., conformed to the electrical, mechanical, and environmental performance requirements of Product Specification 108-128033.

1.4. Test Specimens

Test specimens were representative of normal production lots. Specimens identified with the following part numbers were used for test:

Part Number	Description
6643232-1	ICCON STANDARD SOCKET, RIGHT ANGLE, 10 PIN FOOTPRINT, SOLDER PIN
6643281-1	ICCON STANDARD PIN, RIGHT ANGLE, 10 PIN FOOTPRINT, SOLDER PIN, NON-LOCKING
6643269-1	ICCON STANDARD SOCKET, VERTICAL, 10 PIN FOOTPRINT, COMPLIANT PIN
6643274-1	ICCON STANDARD PIN, VERTICAL, 10 PIN FOOTPRINT, COMPLIANT PIN, NON-LOCKING
6643229-1	ICCON SLIMLINE SOCKET, RIGHT ANGLE, 10 PIN FOOTPRINT, SOLDER PIN
6643228-1	ICCON SLIMLINE PIN, RIGHT ANGLE, 10 PIN FOOTPRINT, SOLDER PIN
2085181-1	ICCON STACKED SOCKET
1766663-1	ICCON PIN

Figure 1 (end)

1.5. Environmental Conditions

Unless otherwise stated, the following environmental conditions prevailed during testing:

- Temperature: 15 to 35°C
- Relative Humidity: 25 to 75%

1.6. Qualification Test Sequence

Test or Examination	Test Group (a)					
	1	2	3	4	5	6
	Test Sequence (b)					
Initial examination of product	1	1	1	1	1	1
Low level contact resistance (LLCR)	3,7	2,5	2,4			
Contact resistance, specified current		6				
Insulation resistance				2,6		
Withstanding voltage				3,7		
Temperature rise vs current		3,7				
Random vibration	5					
Mechanical shock	6					
Durability	4					
Mating force	2					
Unmating force	8					
Compliant pin insertion						2
Radial holes distortion						3
Compliant pin retention						5
Component heat resistance to wave soldering					2	
Solderability dip test					3	
Thermal shock				4		
Humidity/temperature cycling				5		
Temperature life		4				4
Mixed flowing gas			3			
Final examination of product	9	8	5	8	4	6

NOTE *(a) See paragraph 1.4.*
(b) Numbers indicate sequence in which tests are performed.

2. SUMMARY OF TESTING

2.1. Initial Examination of Product - All Test Groups

All specimens submitted for testing were representative of normal production lots. A Certificate of Conformance (C of C) was issued by Product Assurance. Specimens were visually examined and no evidence of physical damage detrimental to product performance was observed.

2.2. Low Level Contact Resistance (LLCR) - Test Groups 1, 2, 3.

All power contact LLCR measurements, taken at 100 milliamperes maximum and 20 millivolts maximum open circuit voltage were less than 1 milliohm initially and 3 milliohms after testing.

2.3. Contact Resistance, Specified Current - Test Group 2

Average voltage drop for specific connector type is shown in Figure 3.

Connector Type	Voltage Drop
Single Pole Standard	21.0 millivolts at 35 amperes
Single Pole Slimline	27.2 millivolts at 35 amperes
Stacked	23.3 millivolts at 25 amperes(Lower port) 26.5 millivolts at 25 amperes(Upper port)

Figure 3

2.4. Insulation Resistance - Test Group 4

All insulation resistance measurements were greater than 5000 megohms.

2.5. Withstanding Voltage - Test Group 4

No dielectric breakdown or flashover occurred.

2.6. Temperature Rise vs Current - Test Group 2

Current listed in Figure 4 are for 30℃ temperature rise for initial.

Connector Type	PCB	Current (amperes)
Single Pole Standard	2 oz	27
	5 oz	32
Single Pole Slimline	2 oz	26
	5 oz	30
Stacked	N/A	28(per socket)

Figure 4

2.7. Random Vibration - Test Groups 1

No discontinuities were detected during vibration testing. Following vibration testing, no cracks, breaks, or loose parts on the specimens were visible.

2.8. Mechanical Shock - Test Groups 1

No discontinuities were detected during mechanical shock testing. Following mechanical shock testing, no cracks, breaks, or loose parts on the specimens were visible.

2.9. Durability - Test Groups 1

No physical damage occurred as a result of mating and unmating the specimens 50 cycles for regular plugging at a maximum rate of 500 cycles per hour.

2.10. Mating Force - Test Groups 1

All mating force measurements were less than 40 N.

2.11. Unmating Force - Test Groups 1

All unmating force measurements were greater than 5 N.

2.12. Compliant Pin Insertion – Test Group 6

All compliant pin insertion force measurements were less than 120 N per pin.

2.13. Radial holes distortion – Test Group 6

All radial holes distortion measurements were less than 0.050 mm and no evidence of damage to the plated hole.

2.14 Compliant Pin Retention – Test Group 6

All compliant pin retention measurements were greater than 33 N per pin.

2.15 Component Heat Resistance to Wave Soldering – Test Group 5

No evidence of physical damage was visible as a result of subjecting the specimens to wave soldering.

2.16 Solderability dip test – Test Group 5

All solderable areas had a minimum of 95% solder coverage.

2.17. Thermal Shock - Test Group 4

No evidence of physical damage was visible as a result of exposure to thermal shock.

2.18. Humidity/temperature Cycling - Test Group 4

No evidence of physical damage was visible as a result of exposure to humidity/temperature cycling.

2.19. Temperature Life - Test Group 2 and 6

No evidence of physical damage was visible as a result of exposure to temperature life.

2.20. Mixed Flowing Gas - Test Groups 3a, 3b and 5

No evidence of physical damage was visible as a result of exposure to the pollutants of mixed flowing gas.

2.21. Final Examination of Product – All Test Groups

Specimens were visually examined and no evidence of physical damage detrimental to product performance was observed.

3. TEST METHODS

3.1. Initial Examination of Product

A C o f C was issued stating that all specimens in this test package were produced, inspected, and accepted as conforming to product drawing requirements, and were manufactured using the same core manufacturing processes and technologies as production parts.

3.2. LLCR

LLCR measurements were made using a 4 terminal measuring technique. The test current was maintained at 100 milliamperes maximum with a 20 millivolt maximum open circuit voltage.

3.3. Contact Resistance, Specified Current

Millivolt drop was measured across the contacts of mated specimens at specified current.

3.4. Insulation Resistance

Insulation resistance was measured between adjacent contacts of mated specimens. A test voltage of 500 volts DC was applied for 2 minutes before the resistance was measured.

3.5. Withstanding Voltage

A test potential of 1500 volts DC was applied between adjacent contacts of mated specimens. These potentials were applied for 1 minute and then returned to zero.

3.6. Temperature Rise vs Current

Temperature rise curves were produced by measuring individual contact temperatures at 4 different current levels. These measurements were plotted to produce a temperature rise vs current curve. Thermocouples were attached to individual contacts to measure their temperatures. The ambient temperature was then subtracted from this measured temperature to find the temperature rise. When the temperature rise of 3 consecutive readings taken at 5 minute intervals did not differ by more than 1°C, the temperature measurement was recorded.

3.7. Random Vibration

Mated specimens were subjected to a random vibration test, specified by a random vibration spectrum, with excitation frequency bounds of 20 and 500 Hz. The Power Spectral Density (PSD) was flat at 0.05 G^2/Hz from 20 to 500 Hz. The root-mean square amplitude of the excitation was 4.90 GRMS. This was performed for 15 minutes in each of 3 mutually perpendicular planes for a total vibration time of 45 minutes. Specimens were monitored for discontinuities of 1 microsecond or greater using a current of 100 milliamperes DC.

3.8. Mechanical Shock, Half-sine

Mated specimens were subjected to a mechanical shock test having a half-sine waveform of 50 gravity units (g peak) and a duration of 11 milliseconds. Three shocks in each direction were applied along the 3 mutually perpendicular planes for a total of 18 shocks. Specimens were monitored for discontinuities of 1 microsecond or greater using a current of 100 milliamperes DC.

3.9. Durability

Specimens were mated and unmated 50 cycles for regular plugging at a maximum rate of 500 cycles per hour.

3.10. Mating Force

The force required to mate individual specimens was measured using a tensile/compression device with a free floating fixture and a rate of travel of 12.7 mm [.5 in] per minute.

3.11. Unmating Force

The force required to unmate individual specimens was measured using a tensile/compression device with a free floating fixture and a rate of travel of 12.7 mm [.5 in] per minute.

3.12. Compliant Pin Insertion

The force required to apply the specimens to a PCB was measured using a tensile / compression device with a rate of travel of 12.7 mm per minute. A flat rock technique was used to press the connectors off the PCB. In accordance with EIA–364-05.

3.13. Radial holes distortion

A total of 10 randomly picked pin/holes from 1 specimen were cross-sectioned horizontally as close as possible to the area of maximum deformation. These cross-sections were used to determine mean and maximum radial deformation/distortion as follows: Using an optical video probe with variable magnification of 100 to 300X, measurements were made using a round template affixed to the screen of the video monitor. The lines were matched to the radius of the plated thru-holes by adjusting the magnification of the probe. This line was placed on the original holes radius, and the difference between the original radius and the maximum and minimum deformation/distorted radius was measured for each of the 10 pin/holes. The same 10 pin/holes that were cross sectioned to measure hole deformation were also used to determine holes damage and minimum copper thickness between the pin and the PCB laminate. The holes were also examined for any evidence of cracks or breaks in the copper wall.

3.14 Compliant Pin Retention

The force required to remove a correctly applied specimen from a printed circuit board was measured using a tensile/compression device with a free floating fixture and a rate of travel of 12.7 mm [.5 in] per minute.

3.15 Component Heat Resistance to Wave Soldering

All specimens were checked dimensionally before and after exposure to heat. The solderable areas of the specimens were immersed in Kester 145 type ROL0 flux for 5 to 10 seconds. This flux is a nonactivated rosin flux having a nominal composition of 25% by weight of water white gum rosin in a solvent of 99% isopropyl alcohol. The specific gravity of the flux was between 0.838 and 0.858. The flux was maintained at room temperature. The specimens were then removed from the flux and the excess was allowed to drain off for 5 to 20 seconds. The specimens were attached to a dipping machine and immersed at a maximum rate of 25.4 mm [1 in] per second into a soldering bath filled with melted lead free solder (96.5% Sn, 3.0% Ag and 0.5% Cu) controlled at 265 ± 5℃ [509℉] until the solderable surface was coated. The specimens were held in the solder bath for 10 seconds. The specimens were then removed from the solder bath at a maximum rate of 25.4 mm [1 in] per second and subjected to a 5 minute cleaning in isopropyl alcohol. The specimens were then given a visual examination using 30X magnification.

3.16 Solderability dip test

The solderable areas of the specimens were immersed in Kester 145 type ROL0 flux for 5 to 10 seconds. This flux is a non-activated rosin flux having a nominal composition of 25% by weight of water white gum rosin in a solvent of 99% isopropyl alcohol. The specific gravity of the flux was between 0.838 and 0.858. The flux was maintained at room temperature. The specimens were then removed from the flux and the excess was allowed to drain off for 5 to 20 seconds. The specimens were immersed at a maximum rate of 25.4 mm [1 in] per second into a soldering bath filled with melted lead free solder (96.5% Sn, 3.0% Ag and 0.5% Cu) controlled at 245 ± 5℃ [473℉] until the solderable surface was coated. The specimens were held in the solder bath for 4 to 5 seconds. The specimens were then removed from the solder bath at a maximum rate of 25.4 mm [1 in] per second and subjected to a 5 minute cleaning in isopropyl alcohol. The specimens were then given a visual examination using 30X magnification.

3.17. Thermal Shock

Mated specimens were subjected to 5 cycles of thermal shock with each cycle consisting of 30 minute dwells at -40 and 105°C and 1 minute transition between temperatures.

3.18. Humidity/temperature Cycling

Mated specimens were exposed to 10 humidity/temperature cycles. Each cycle lasted 24 hours and consisted of cycling the temperature between 25 and 65°C twice while maintaining high humidity (Figure 5).

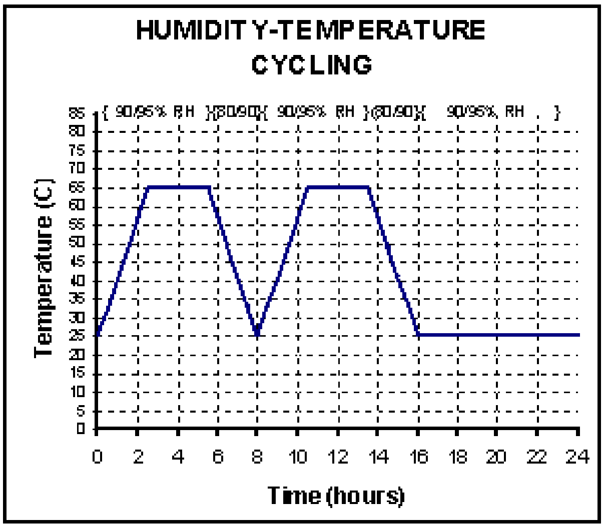

Figure 5
Humidity/Temperature Cycling Profile

3.19. Temperature Life

Mated specimens were exposed to a temperature of 105°C for 584 hours.

3.20. Mixed Flowing Gas

Mated specimens were exposed for 14 days to a mixed flowing gas Class IIA exposure. Class IIA exposure is defined as a temperature of 30°C and a relative humidity of 70% with the pollutants of Cl_2 at 10 ppb, NO_2 at 200 ppb, H_2S at 10 ppb and SO_2 at 100 ppb. In accordance with EIA–364-65 Class IIA.

3.21. Final Examination of Product

Specimens were visually examined for evidence of physical damage detrimental to product performance.