ELCON* Drawer Series Connectors

1. INTRODUCTION

1.1. Purpose

Testing was performed on ELCON* Drawer Series Connectors to determine their conformance to the requirements of Product Specification 108-2285 Revision A.

1.2. Scope

This report covers the electrical, mechanical, and environmental performance of ELCON Drawer Series Connectors. Testing was performed at the Engineering Assurance Product Testing Laboratory between 30Apr08 and 22Apr09. The test file numbers for this testing are EA20070231T, EA20080338T, EA20080507T, EA20080612T and 20090423T. This documentation is on file at and available from the Engineering Assurance Product Testing Laboratory.

1.3. Conclusion

The ELCON Drawer Series Connectors listed in paragraph 1.4., conformed to the electrical, mechanical, and environmental performance requirements of Product Specification 108-2285 Revision A.

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
1643560-1	Lower drawer connector assembly, 75 ampere compliant tail socket
1643605-1	Lower drawer pin connector
1643880-1	Custom drawer HV8P socket connector assembly
1643881-1	Custom drawer HV8P pin connector assembly
1766977-1	Drawer HV8P pin connector
1766978-1	Drawer HV8P socket connector
1926121-1	Custom drawer P7S24 Type 2 socket insulator housing
1926124-1	Custom drawer P7S24 Type 2 socket connector assembly
1926125-1	Pin connector assembly, gold contact
1926689-1	Custom drawer screw mount pin connector assembly
1926690-1	Custom drawer screw mount socket connector assembly
6643122-2	Quadpower pin connector
6643123-1	Quadpower top socket connector assembly
6643515-1	Lower drawer pin connector
6643748-2	Mini drawer P12S12 compliant tail socket connector
6651461-1	Drawer P5S0 pin connector
6651462-1	Drawer P5S0 socket connector
6643516-1	Lower drawer socket connector

Figure 1 (continued)

* Trademark
| Indicates change

Part Number	Description
6651594-1	Mini drawer P12S12 compliant press fit pin connector
6651886-2	Middle drawer 75 ampere pin connector
6651887-2	Middle drawer 75 ampere socket connector
6766379-1	Quadpower pin connector
6766380-1	Quadpower socket connector

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)								
	1a	1b	1c	1d	2	3a	3b	4	5
	Test Sequence (b)								
Initial examination of product	1	1	1	1	1	1	1	1	1
LLCR	3,7	3,5	3,5	2,5	2,5	2,4	2,4		2,4
Termination resistance, specified current					6				
Insulation resistance								2,6	
Withstanding voltage								3,7	
Temperature rise vs current					3,7				
Random vibration	5			3					
Mechanical shock	6			4					
Durability	4	4	4						
Mating force	2	2	2						
Unmating force	8	6	6						
Thermal shock								4	
Humidity/temperature cycling								5	
Temperature life					4(c)				
Mixed flowing gas						3(c)(d)	3(c)(d)		3(c)(e)
Final examination of product	9	7	7	6	8	5	5	8	5

NOTE

(a) See paragraph 1.4.
(b) Numbers indicate sequence in which tests are performed.
(c) Precondition specimens with 25 mating cycles with force data recorded.
(d) Measure LLCR after 10 days of unmated exposure.
(e) Measure LLCR after 7 days of unmated exposure.

Figure 2

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 1a, 1b, 1c, 1d, 2, 3a, 3b and 5

All signal contact LLCR measurements, taken at 100 milliamperes maximum and 20 millivolts maximum open circuit voltage were less than 15 milliohms initially and had a change in resistance (ΔR) of less than 10 milliohms after testing. 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. Termination Resistance, Specified Current - Test Group 2

Average voltage drop for specific contact sizes is shown in Figure 3.

Contact Size	Voltage Drop
22 (with 28 AWG cable)	12.86 millivolts at 1 ampere
20	13.57 millivolts at 5 amperes
16	5.97 millivolts at 16 amperes
12	11.26 millivolts at 35 amperes
8	30.11 millivolts at 75 amperes
4	14.87 millivolts at 120 amperes
0 (not average)	8.1 millivolts at 190 amperes

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

Temperature rise at both 30 and 50°C for specific contact sizes is shown in Figure 4.

Contact Size	Current (amperes)	
	30°C	50°C
22 (with 28 AWG cable)	5.1	6.4
20	11.0	14.6
16	23.4	30.7
12	32.4	44.9
8	49.8	65.5
4	81.1	112.2
0	157.6	210.7

Figure 4

2.7. Random Vibration - Test Groups 1a and 1d

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 1a and 1d

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 1a, 1b and 1c

No physical damage occurred as a result of mating and unmating the specimens 250 times for regular plugging and 50 times for hot plugging at a maximum rate of 500 cycles per hour.

2.10. Mating Force - Test Groups 1a, 1b and 1c

All mating force measurements were less than 311.3 N [70 lbf].

2.11. Unmating Force - Test Groups 1a, 1b and 1c

All unmating force measurements were greater than 26.7 N [6 lbf].

2.12. Thermal Shock - Test Group 4

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

2.13. Humidity/temperature Cycling - Test Group 4

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

2.14. Temperature Life - Test Group 2

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

2.15. 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.

2.16. 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. Termination 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. A test potential of 2200 volts DC for 600 volt Application Drawers 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 250 times for regular plugging and 50 times for hot 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. 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.

3.13. 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).

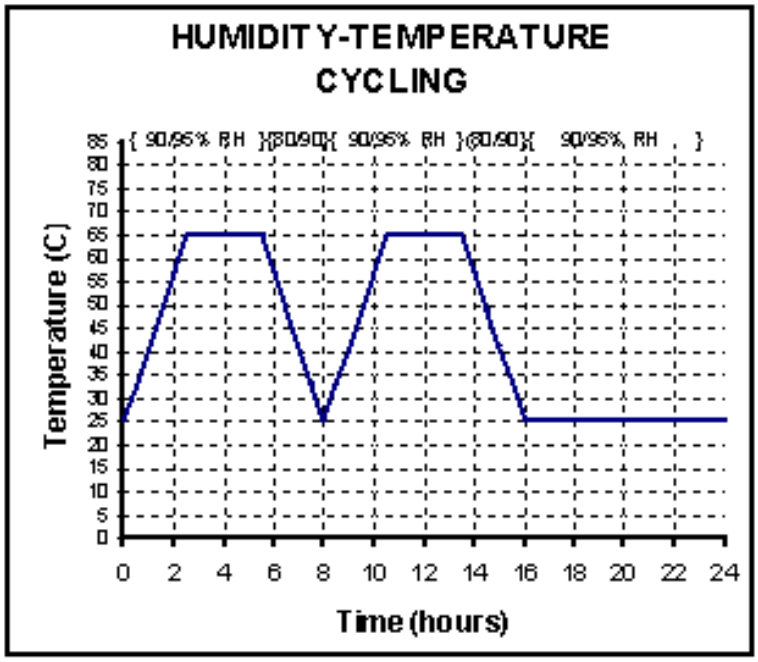

Figure 5
Humidity/Temperature Cycling Profile

3.14. Temperature Life

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

3.15. Mixed Flowing Gas

A. Class IIIA, Test Groups 3A and 3B

Mounted specimens were exposed for 20 days (10 days unmated followed by 10 days mated) to a mixed flowing gas Class IIIA exposure. Class IIIA exposure is defined as a temperature of 30°C and a relative humidity of 70% with the pollutants of Cl_2 at 20 ppb, NO_2 at 200 ppb, H_2S at 100 ppb and SO_2 at 200 ppb. Specimens were preconditioned with 25 cycles of durability with force data recorded.

B. Class IIA, Test Group 5

Mounted specimens were exposed for 14 days (7 days unmated followed by 7 days mated) 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. Specimens were preconditioned with 25 cycles of durability with force data recorded.

3.16. Final Examination of Product

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