AMP* DUAC Socket Connector

1. INTRODUCTION

1.1. Purpose

Testing was performed on the AMP* DUAC Socket Connector to determine its conformance to the requirements of Product Specification 108-19099 Revision O.

1.2. Scope

This report covers the electrical, mechanical, and environmental performance of the AMP DUAC Socket Connector. Testing was performed at the AMP-Holland B.V. Environmental Testing Laboratory. The test file number for this testing is R041-1804. This documentation is on file at and available from the AMP-Holland B.V. Environmental Testing Laboratory.

1.3. Conclusion

The AMP DUAC Socket Connector conformed to the electrical, mechanical, and environmental performance requirements of Product Specification 108-19099 Revision O.

* Trademark
| Indicates change

DESCRIPTION of TEST SAMPLES:

Tests were executed on fully loaded 24 position AMP DUAC female connectors.
Each connector consists of:

24 Contacts	part number 106528	rev A	terminated on AWG 26-24 and 22.
24 Contacts	part number 106529	rev A	terminated on AWG 22-20 and 18.
1 housing	part number 106527	rev O.	

To create a serie circuit adjacent contact pairs were terminated on pieces of wire with a length of 100 mm; the other half of the circuit was made on the header pins.

Wires were terminated by means of applicator 677879-1 and 677880-1.

The AMP DUAC connector were tested in combination with Molex Mini Fit Header.

Test group 1 consists of:	3 connector pairs.
Test group 2 consists of:	3 connector pairs for insulation resistance and voltage proof. 3 connector pairs for termination resistance measurements.
Test group 3 consists of:	2 connector pairs.
Test group 4 consists of:	24 contacts and 2 housings.
Test group 5 consists of :	10 housings and headers without contacts.
Test group 6 consists of :	3 connector pairs.
Test group 7 consists of:	15 contacts terminated on wire for each AWG size.
Test group 8 consists of:	1 Connector pair loaded with 16 contacts on wire for each wire size.

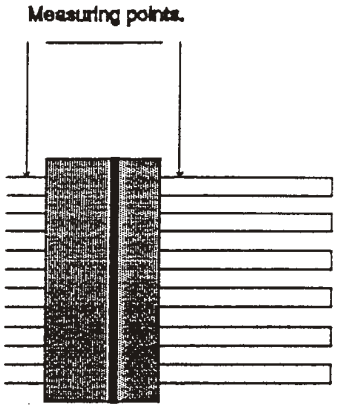
TEST SEQUENCE:

Test group 1:	Mating force. Termination resistance. Vibration. Termination resistance. Rapid change of temperature. Climatic sequence: Dry heat, 2 hours. Damp heat cyclic, 1 cycle. Cold, 2 hours. Damp heat cyclic, 5 cycles. Termination resistance. Unmating force.
Test group 2:	Termination resistance. Insulation resistance. Voltage proof. Damp heat steady state. Insulation resistance. Voltage proof. Termination resistance.
Test group 3:	Termination resistance. Mechanical operations. Electric load and temperature. Termination resistance.
Test group 4:	Contact retention in insert.
Test group 5:	Locking force. Unlocking force.
Test group 6:	Termination resistance. Dry heat, 500 hours. Termination resistance.
Test group 7:	Tensile strength.
Test group 8:	Temperature rise. Current-temperature, derating curve.

TEST PROCEDURES:

512-2-2a:

TERMINATION RESISTANCE:
The termination resistance was measured with an open circuit voltage of 20 mVolt and a maximum DC current of 100 mA.



512-2-3a:

INSULATION RESISTANCE:
This measurement was done with a programmable electrometer. Measuring voltage was 100 Volt during one minute.

512-2-4a:

VOLTAGE PROOF:
This measurement was done with a high voltage tester. The test duration was one minute at 1250 V_{rms}.

512-3-5a:

TEMPERATURE RISE:
The DC current was maintained for a stabilization period of 1 hour. The temperature measurements were done, inside the connector, by means of a thermocouple. The current was increased up to ΔT of 30°C.

512-3-5b:

CURRENT-TEMPERATURE DERATING: CURVE.
The test samples were charged with a current, up in steps to the maximum specified current. After each step, the adjusted DC current was maintained for a stabilization period of minimum 1 hour, and the temperature was measured. The temperature measurements were done, inside the connector, by means of a thermocouple.
Given are the derating curves for wires : AWG 26-24-22-20- and 18.

512-4-6d: **VIBRATION:**
The samples were mounted on a vibration table.
The frequency was traversed from 10-55-10 Hz with one octave per minute.
The samples were vibrated with an amplitude of 0,75 mm. The duration was 2 hours in each of the three mutually perpendicular directions. Interruption of continuity greater than 1 micro-second were detected.

512-5-9a: **MECHANICAL OPERATION: (Enduration)**
The connectors without locking were mated and unmated for 50 times with a maximum rate of 600 cycles per hour. 30 Seconds pause between each cycle.

512-5-9b: **ELECTRICAL LOAD and TEMPERATURE:**
The samples were placed in an oven with an ambient temperature of 85°C. (70% of the operating temperature).
All the test samples in series were charged with a current of 9 A DC during 500 hours.

512-6-11c: **DAMP HEAT, STEADY STATE:**
The samples were subjected to a damp heat steady state test under the following conditions:

Temperature	: 40°C.
Rel. humidity	: 95%.
Condition	: unmated.
Duration	: 21 days.

512-6-11d: **RAPID CHANGE of TEMPERATURE:**
The samples were subjected to a rapid change of temperature test under the following conditions:
One cycle consists of:

Upper temperature	: -55°C for 30 minutes.
Lower temperature	: 105°C for 30 minutes.
Conditions	: unmated.
Number of cycles	: 10.

512-6-11i: **DRY HEAT:** (during climatic sequence).
The samples were subjected to a dry heat test under the following conditions:

Temperature	: 105°C.
Conditions	: mated.
Duration	: 12 hours.

512-6-11i: **DRY HEAT:**
The samples were subjected to a dry heat test under the following conditions:

Temperature	: 105°C.
Conditions	: mated.
Duration	: 500 hours.

512-6-11j: **COLD:**
The samples were subjected to a temperature of -55 °C during 2 hours in unmated condition.

512-6-11m: **DAMP HEAT CYCLIC:**
The samples were subjected to a damp heat cyclic test under the following conditions:

Upper temperature	: 55 °C.
Lower temperature	: 25 °C.
Relative humidity	: 95%.
Condition	: unmated.
Number of cycles	: 6.

512-7-13b: **INSERTION / WITHDRAWAL FORCES:**
The test samples were mounted on the push-pull tester.
During a mechanical operation, with a rate of 10 mm per minute, the insertion and withdrawal forces were measured. (without locking).

512-8-15a: **CONTACT RETENTION IN INSERT:** (cont. from housing).
The contact retention force was measured on the push-pull tester.
(without contacts)

512-8-15f: **LOCKING / UNLOCKING FORCE:**
The samples, without contacts, were mate and unmate for 50 times with a maximum rate of 600 cycles per hour.

512-8-16d: **TENSILE STRENGTH:** Crimp connections
The tensile strength was measured on the tensile tester at a rate of 25 mm per minute.

EQUIPMENT USED:

Equipment	Manufacturer	Type	Serie Nb	Cal Due.
Micro-ohmmeter	Keithley	580	374687	11-96.
Desk top computer	H.P	Serie 300	C165/85	*
Accelero meter	B & K	4371	650308	12-97.
Exciter control	B & K	1050	1412882	12-97.
Vibrator	Ling+B&K	PA2000	S1165-002	12-97.
Climatic chamber	Weiss	64/80DUST	224/17413	11-97.
Oven	Heraeus	T5042EK	7901719	12-99.
Climatic chamber	Weiss	125SBDU70	200776	11-96.
Push pull tester	AMP	MkI	Blue	*
Force measuring system	HBM	KWS 3073	07057	for each use.
High voltage tester	Sefelec	PR-12-NN	264	02-96.
Electrometer	Keithley	617	325475	11-96.
Current source	Delta	SM 7020	01422	*
Dig Therm.meter	Keithley	874-C	T-13399	11-96.
Tensile tester	Karl Frank	81560	u01.3050	02-97.

*) Not Relevant.

REQUIREMENTS and RESULTS:

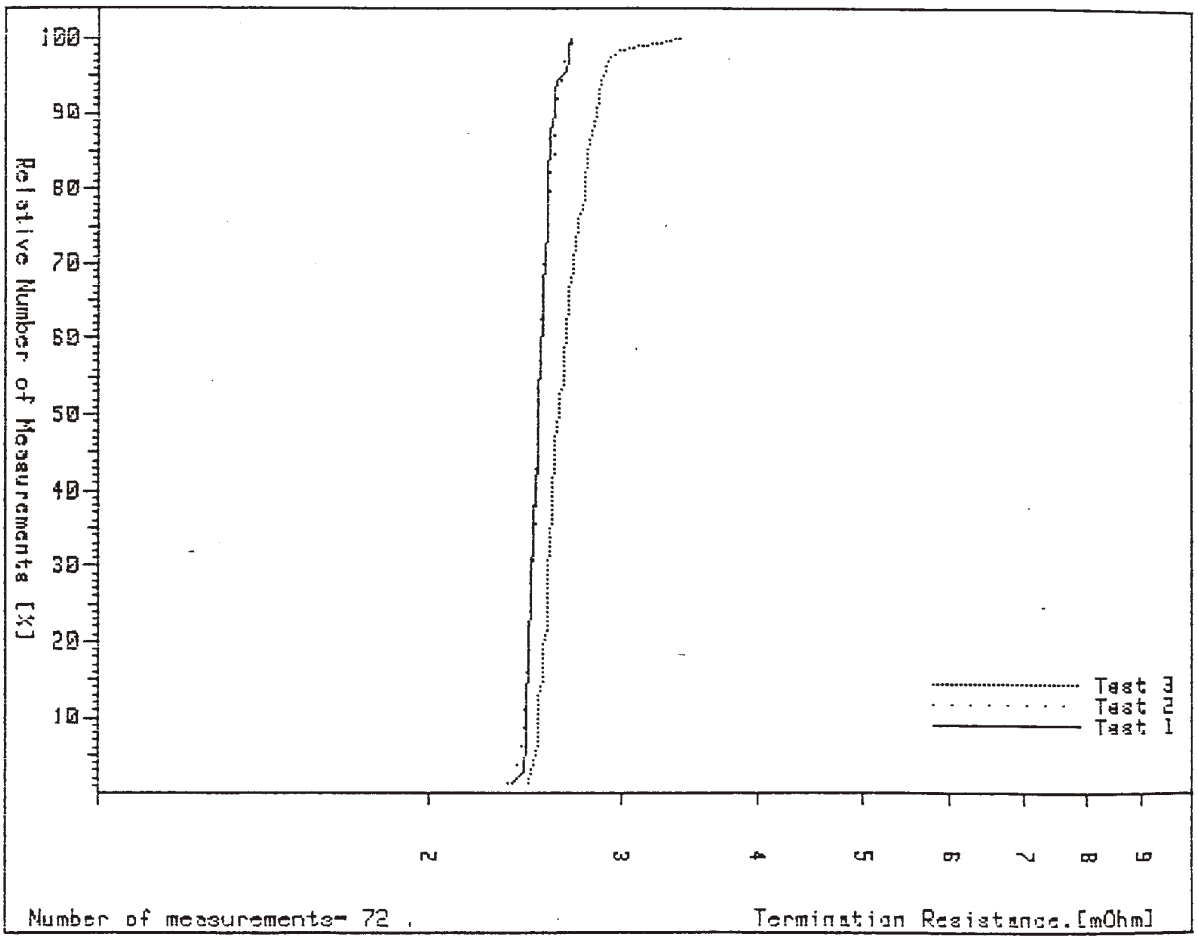
Requirements:	Measuring values:
Termination resistance:	
Initial : 5 mOhm maximum. Final : Δ 3 mOhm maximum.	Initial : 2,8 mOhm maximum. Final : 1,1 mOhm maximum.
Insulation resistance:	
Initial : 5000 MOhm. Final : 1000 MOhm.	Initial : 700 GOhm. Final : 3 GOhm minimum.
Voltage proof:	
Initial: 1250 V_{rms} during 1 minute. Final: as initial	Initial : 1250 V_{rms} during 1 minute. Final : as initial.
Temperature rise ΔT of 30°C.:	
AWG 26 : 4 A. AWG 24 : 5 A. AWG 22 : 6 A. AWG 20 : 7 A. AWG 18 : 8 A.	AWG 26 : 4 A. AWG 24 : 5 A. AWG 22 : 6 A. AWG 20 : 7 A. AWG 18 : 8 A.
Insertion / withdrawal forces:	After the first / 50th mating:
Insertion : 4,0 N max. per contact. Withdrawal : 0,5 N min. per contact	2,8 / 2,9 N maximum per contact. 1,1 / 0,9 N minimum per contact.
Contact retention in insert:	
Minimum : 22 Newton.	Minimum : 27 Newton.
Locking / unlocking force:	
Locking force : 30 Newton maximum. Unlocking force : 50 Newton minimum.	25 Newton maximum. 70 Newton minimum.
Tensile strength:	
AWG 26 on 106528 : 25 Newton minimum AWG 24 on 106528 : 35 Newton minimum AWG 22 on 106528 : 50 Newton minimum AWG 22 on 106529 : 50 Newton minimum. AWG 20 on 106529 : 80 Newton minimum AWG 18 on 106529 : 120 Newton minimum	30 Newton minimum. 45 Newton minimum. 82 Newton minimum. 74 Newton minimum. 117 Newton minimum. 156 Newton minimum.

Product: DUAC connector. Pn. 106529 on AWG 22.

Test 1 : Termination Resistance Initial.
Test 2 : Vibration.
Test 3 : Rapid change of Temperature and Climatic Sequence.
Group : 1
Lot : 1 - 3

All values in milliOhms

	Test 1	Test 2	delta R	Test 3	delta R
Max. :	2,70	2,68	0,17	3,39	0,83
Min. :	2,39	2,37	-0,18	2,47	-0,09
Mean :	2,53	2,53	-0,00	2,67	0,14
StDv :	0,06	0,07	0,06	0,15	0,14



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Termination Resistances in milliOhms.
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Product Tested: DUAC connector. Pn. 106529 on AWG 22.

Col.	Group	Lot	Test
-1-:	1	1	Termination Resistance Initial.
-2-:	1	1	Vibration.
-3-:	1	1	Rapid change of Temperature and Climatic Sequenc

	-1-	-2-	-3-
01	2,61	2,61	2,70
02	2,61	2,61	2,73
03	2,58	2,61	2,68
04	2,53	2,49	2,57
05	2,57	2,58	2,57
06	2,62	2,60	2,69
07	2,60	2,65	2,69
08	2,57	2,57	2,79
09	2,54	2,53	2,83
10	2,56	2,55	2,87
11	2,58	2,66	2,82
12	2,57	2,60	3,39
13	2,58	2,57	2,58
14	2,55	2,53	2,66
15	2,55	2,54	2,61
16	2,48	2,52	2,59
17	2,50	2,45	2,59
18	2,56	2,51	2,60
19	2,54	2,45	2,64
20	2,53	2,45	2,52
21	2,47	2,48	2,57
22	2,52	2,50	2,59
23	2,49	2,44	2,62
24	2,54	2,45	2,71
Max.:	2,62	2,66	3,39
Min.:	2,47	2,44	2,52
Mean:	2,55	2,54	2,69

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Termination Resistances in milliOhms.
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Product Tested: DUAC connector. Pn. 106529 on AWG 22.

Col.	Group	Lot	Test
-1-:	1	2	Termination Resistance Initial.
-2-:	1	2	Vibration.
-3-:	1	2	Rapid change of Temperature and Climatic Sequenc

	-1-	-2-	-3-
01	2,57	2,57	2,69
02	2,53	2,56	2,73
03	2,68	2,68	2,67
04	2,53	2,55	2,60
05	2,51	2,44	2,61
06	2,49	2,54	2,60
07	2,57	2,56	2,57
08	2,46	2,53	2,54
09	2,68	2,53	2,59
10	2,59	2,54	2,81
11	2,70	2,62	2,78
12	2,61	2,59	2,74
13	2,51	2,50	2,57
14	2,46	2,55	2,51
15	2,52	2,53	2,51
16	2,45	2,50	2,50
17	2,49	2,53	2,54
18	2,46	2,47	2,48
19	2,55	2,50	2,58
20	2,47	2,42	2,55
21	2,48	2,44	2,47
22	2,47	2,48	2,52
23	2,56	2,53	2,57
24	2,39	2,46	2,53
Max.:	2,70	2,68	2,81
Min.:	2,39	2,42	2,47
Mean:	2,53	2,53	2,59

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Termination Resistances in milliOhms.
****
Product Tested: DUAC connector. Pn. 106529 on AWG 22.

Col.	Group	Lot	Test
-1-:	1	3	Termination Resistance Initial.
-2-:	1	3	Vibration.
-3-:	1	3	Rapid change of Temperature and Climatic Sequenc

	-1-	-2-	-3-
01	2,52	2,59	2,91
02	2,53	2,62	2,66
03	2,50	2,47	2,85
04	2,46	2,53	2,67
05	2,53	2,52	2,66
06	2,58	2,65	2,76
07	2,56	2,51	2,78
08	2,67	2,49	2,98
09	2,47	2,50	2,88
10	2,48	2,51	2,64
11	2,50	2,67	2,78
12	2,47	2,51	2,86
13	2,53	2,48	2,79
14	2,51	2,54	2,66
15	2,51	2,47	2,54
16	2,49	2,45	2,54
17	2,44	2,50	2,57
18	2,49	2,52	2,60
19	2,45	2,51	2,91
20	2,48	2,50	2,71
21	2,46	2,42	2,56
22	2,50	2,37	2,63
23	2,46	2,49	2,52
24	2,47	2,61	2,72
Max.:	2,67	2,67	2,98
Min.:	2,44	2,37	2,52
Mean:	2,50	2,52	2,72

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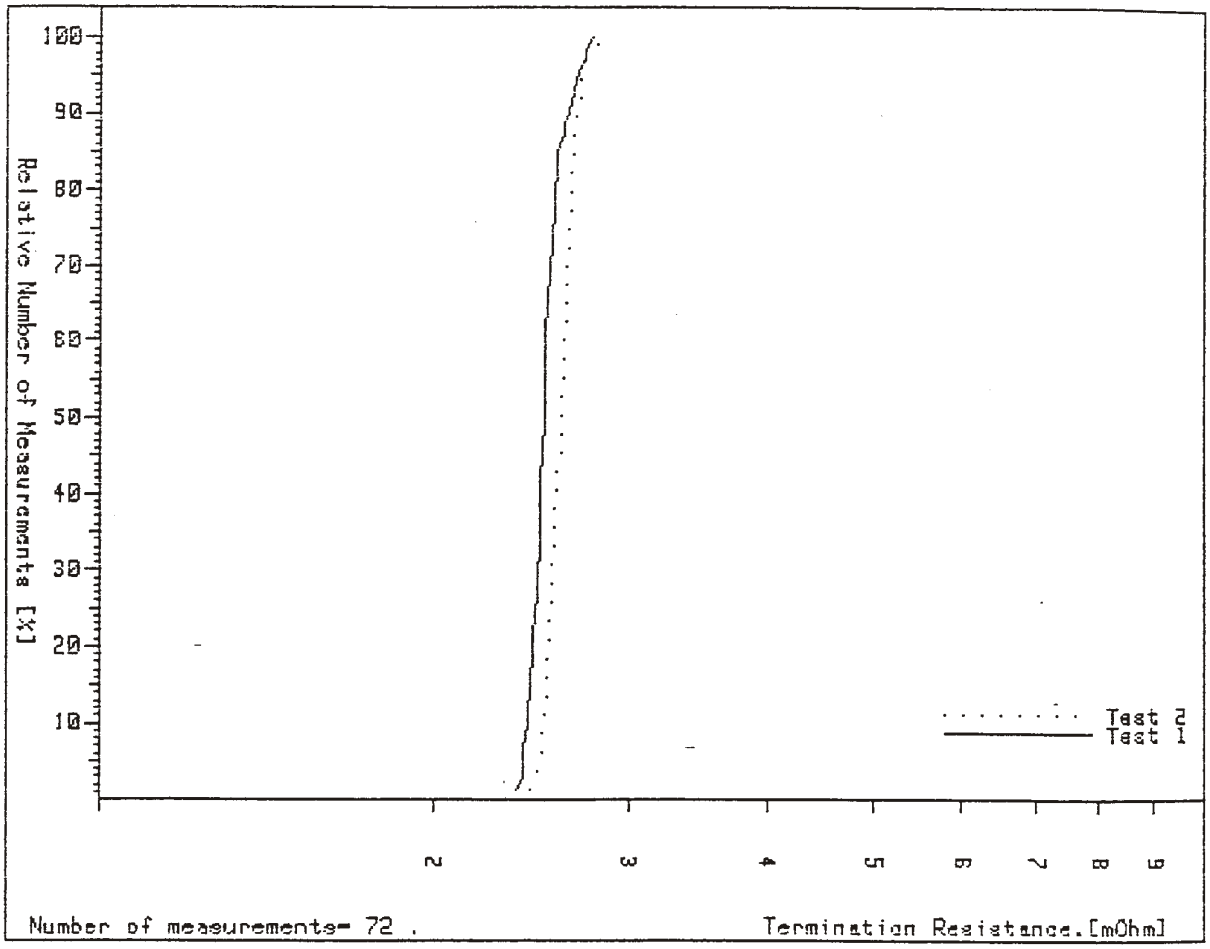
Product: DUAC connector. Pn. 106529 on AWG 22.

Test 1 : Termination Resistance Initial.
Test 2 : Damp Heat steady state. 40°C - 95% R.H.- 21 Days.
Group : 2
Lot : 1 - 3

---------- All values in milliOhms ----------

	Test 1	Test 2	delta R
Max. :	2,77	2,85	0,29
Min. :	2,37	2,45	-0,15
Mean :	2,53	2,61	0,08
StDv :	0,08	0,07	0,08



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Termination Resistances in milliOhms.
****
Product Tested: DUAC connector. Pn. 106529 on AWG 22.

Col.	Group	Lot	Test
-1-:	2	1	Termination Resistance Initial.
-2-:	2	1	Damp Heat steady state. 40°C - 95% R.H.- 21 Days
-3-:	2	2	Termination Resistance Initial.
-4-:	2	2	Damp Heat steady state. 40°C - 95% R.H.- 21 Days
-5-:	2	3	Termination Resistance Initial.
-6-:	2	3	Damp Heat steady state. 40°C - 95% R.H.- 21 Days

	-1-	-2-	-3-	-4-	-5-	-6-
01	2,56	2,85	2,45	2,53	2,48	2,53
02	2,58	2,61	2,52	2,64	2,45	2,58
03	2,55	2,67	2,51	2,61	2,44	2,57
04	2,58	2,67	2,49	2,54	2,74	2,58
05	2,70	2,62	2,55	2,60	2,52	2,64
06	2,62	2,73	2,62	2,67	2,66	2,68
07	2,74	2,71	2,64	2,69	2,67	2,64
08	2,57	2,71	2,58	2,63	2,53	2,77
09	2,77	2,64	2,68	2,64	2,51	2,67
10	2,55	2,72	2,50	2,54	2,59	2,71
11	2,60	2,65	2,57	2,61	2,42	2,51
12	2,54	2,67	2,49	2,54	2,52	2,56
13	2,41	2,55	2,50	2,58	2,47	2,60
14	2,56	2,56	2,49	2,56	2,52	2,51
15	2,48	2,61	2,49	2,56	2,50	2,45
16	2,53	2,60	2,53	2,57	2,54	2,58
17	2,52	2,66	2,45	2,48	2,46	2,57
18	2,54	2,66	2,50	2,62	2,46	2,55
19	2,55	2,63	2,47	2,57	2,52	2,57
20	2,51	2,52	2,48	2,61	2,56	2,50
21	2,49	2,51	2,46	2,55	2,41	2,62
22	2,50	2,65	2,52	2,62	2,43	2,63
23	2,46	2,64	2,50	2,46	2,37	2,65
24	2,41	2,55	2,43	2,66	2,42	2,51
Max.:	2,77	2,85	2,68	2,69	2,74	2,77
Min.:	2,41	2,51	2,43	2,46	2,37	2,45
Mean:	2,55	2,64	2,52	2,59	2,51	2,59

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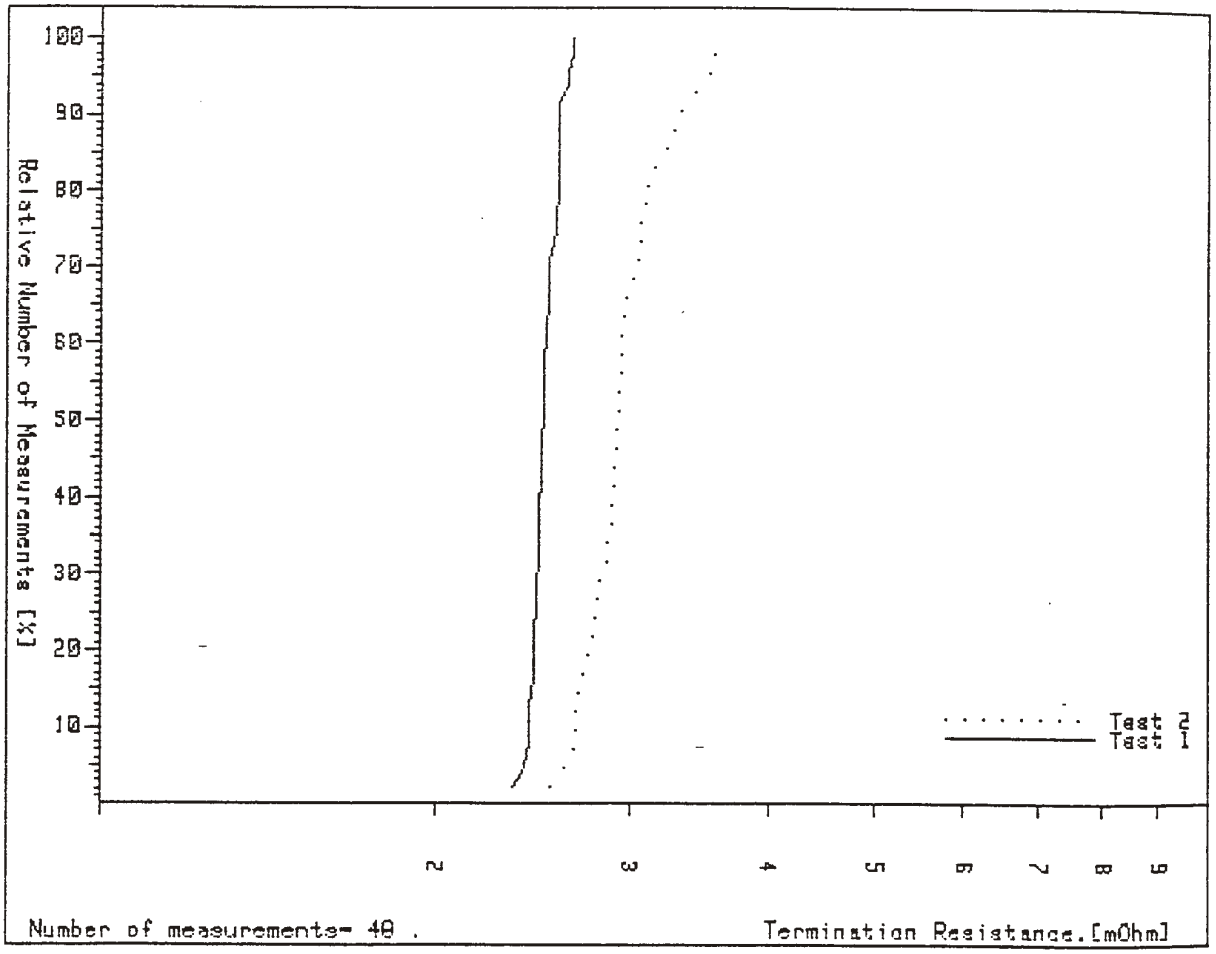
Product: DUAC connector. Pn. 106529 on AWG 18.

Test 1 : Termination Resistance Initial.
Test 2 : Electrical and Temperature.
Group : 3
Lot : 1 - 2

---------- All values in milliOhms ----------

	Test 1	Test 2	delta R
Max. :	2,66	3,68	1,10
Min. :	2,35	2,54	0,01
Mean :	2,51	2,97	0,46
StDv :	0,07	0,25	0,26



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Termination Resistances in milliOhms.
****
Product Tested: DUAC connector. Pn. 106529 on AWG 18.

Col.	Group	Lot	Test
-1-:	3	1	Termination Resistance Initial.
-2-:	3	1	Electrical and Temperature.
-3-:	3	2	Termination Resistance Initial.
-4-:	3	2	Electrical and Temperature.

	-1-	-2-	-3-	-4-
01	2,63	2,92	2,51	2,95
02	2,63	2,94	2,58	2,73
03	2,58	2,69	2,46	3,16
04	2,51	2,97	2,53	2,94
05	2,46	2,90	2,47	2,70
06	2,50	3,57	2,66	3,04
07	2,43	2,90	2,49	2,68
08	2,48	2,78	2,59	2,87
09	2,43	3,23	2,58	3,27
10	2,54	2,79	2,52	3,10
11	2,54	3,37	2,48	3,08
12	2,66	2,89	2,52	2,94
13	2,40	2,93	2,51	2,74
14	2,57	3,53	2,58	3,68
15	2,51	2,87	2,53	2,97
16	2,46	2,86	2,47	3,49
17	2,35	3,06	2,44	2,68
18	2,49	3,29	2,55	2,79
19	2,44	2,92	2,58	3,06
20	2,49	2,89	2,47	2,54
21	2,42	2,81	2,48	3,06
22	2,46	3,11	2,59	2,60
23	2,50	2,82	2,51	2,95
24	2,48	2,92	2,57	2,68
Max.:	2,66	3,57	2,66	3,68
Min.:	2,35	2,69	2,44	2,54
Mean:	2,50	3,00	2,53	2,95

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All values represented in NEWTONS.

Product Tested: DUAC connector. Pn. 106529.

Col. Group	Lot	Test
-1-: 4	1-10	Contact Retention in Insert.
-2-: 4	11-20	Contact Retention in Insert.

	-1-	-2-
01	49	34
02	30	31
03	34	33
04	40	43
05	38	36
06	34	34
07	47	33
08	27	37
09	45	38
10	37	35
Max.:	49	43
Min.:	27	31
Mean:	38,1	35,4

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All values represented in NEWTONS.
****
Product Tested: DUAC connector. Pn. 106527.

Col. Group	Lot	Test
-1-: 5	Lock	Locking / Unlocking Force.
-2-: 5	Unlock	Locking / Unlocking Force.

	-1-	-2-
01	25	72
02	26	76
03	24	76
04	25	72
05	27	71
06	26	73
07	25	76
08	24	75
09	25	74
10	26	74
Max.:	27	76
Min.:	24	71
Mean:	25,3	73,9

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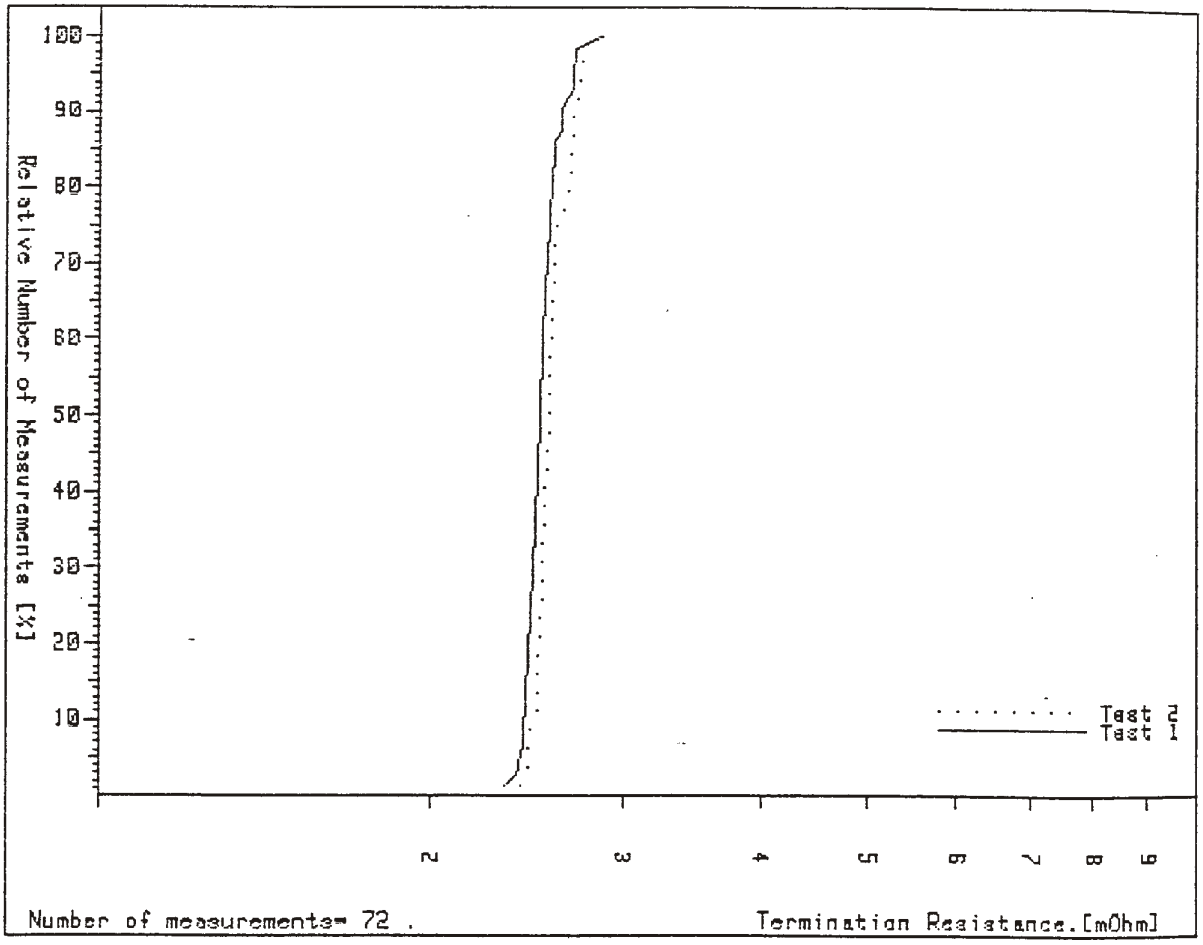
Product: DUAC connector. Pn. 106529 on AWG 22.

Test 1 : Termination Resistance Initial.
Test 2 : Dry Heat. 500 hours at 105°C.
Group : 6
Lot : 1 - 3

---------- All values in milliOhms ----------

	Test 1	Test 2	delta R
Max. :	2,87	2,82	0,21
Min. :	2,34	2,42	-0,16
Mean :	2,53	2,58	0,05
StDv :	0,09	0,08	0,07



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Termination Resistances in milliOhms.
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Product Tested: DUAC connector. Pn. 106529 on AWG 22.

Col.	Group	Lot	Test
-1-:	6	1	Termination Resistance Initial.
-2-:	6	1	Dry Heat. 500 hours at 105°C.
-3-:	6	2	Termination Resistance Initial.
-4-:	6	2	Dry Heat. 500 hours at 105°C.
-5-:	6	3	Termination Resistance Initial.
-6-:	6	3	Dry Heat. 500 hours at 105°C.

	-1-	-2-	-3-	-4-	-5-	-6-
01	2,48	2,53	2,55	2,58	2,45	2,55
02	2,55	2,51	2,60	2,57	2,34	2,55
03	2,52	2,51	2,51	2,54	2,50	2,53
04	2,44	2,46	2,71	2,69	2,87	2,71
05	2,47	2,51	2,58	2,60	2,64	2,70
06	2,66	2,74	2,53	2,71	2,70	2,76
07	2,57	2,52	2,55	2,54	2,56	2,68
08	2,59	2,67	2,71	2,73	2,70	2,72
09	2,41	2,57	2,57	2,60	2,52	2,69
10	2,70	2,82	2,60	2,61	2,57	2,58
11	2,50	2,58	2,50	2,58	2,52	2,57
12	2,64	2,75	2,64	2,73	2,52	2,68
13	2,44	2,55	2,55	2,55	2,44	2,50
14	2,58	2,58	2,50	2,59	2,54	2,45
15	2,46	2,54	2,40	2,46	2,48	2,51
16	2,49	2,54	2,54	2,58	2,51	2,47
17	2,47	2,61	2,49	2,67	2,46	2,53
18	2,53	2,57	2,53	2,49	2,44	2,60
19	2,46	2,55	2,48	2,54	2,55	2,68
20	2,51	2,60	2,45	2,53	2,58	2,54
21	2,49	2,52	2,47	2,56	2,46	2,52
22	2,52	2,42	2,43	2,56	2,54	2,46
23	2,50	2,52	2,44	2,59	2,49	2,59
24	2,58	2,58	2,52	2,57	2,55	2,51
Max.:	2,70	2,82	2,71	2,73	2,87	2,76
Min.:	2,41	2,42	2,40	2,46	2,34	2,45
Mean:	2,52	2,57	2,54	2,59	2,54	2,59

****

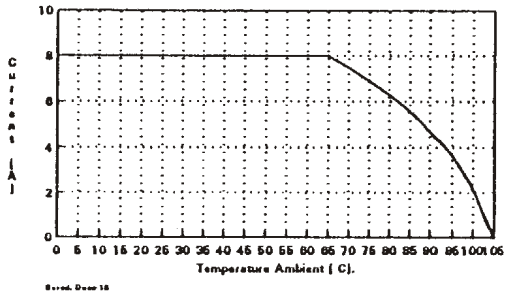
All values represented in NEWTONS.

Product Tested: DUAC connector. Pn. 106528 / 106529. Test Group 7

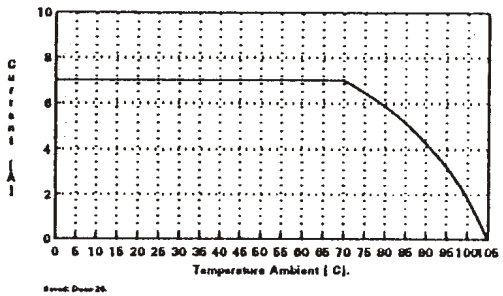
Col.	Group	Lot	Test
-1-:	106528	AWG 26	Tensile Strength.
-2-:	106528	AWG 24	Tensile Strength.
-3-:	106528	AWG 22	Tensile Strength.
-4-:	106529	AWG 22	Tensile Strength.
-5-:	106529	AWG 20	Tensile Strength.
-6-:	106529	AWG 18	Tensile Strength.

	-1-	-2-	-3-	-4-	-5-	-6-
01	32	50	84	77	136	171
02	30	47	82	76	131	168
03	33	45	83	85	140	169
04	33	48	85	75	139	161
05	31	49	87	75	121	157
06	32	49	84	80	127	165
07	33	49	84	76	121	172
08	33	49	85	81	123	156
09	32	48	83	77	135	163
10	31	46	87	85	117	167
11	32	45	87	77	136	161
12	31	46	87	88	140	173
13	31	48	87	74	124	159
14	31	47	85	85	139	169
15	30	45	87	86	126	162
Max.:	33	50	87	88	140	173
Min.:	30	45	82	74	117	156
Mean:	31,7	47,4	85,1	79,8	130,3	164,9

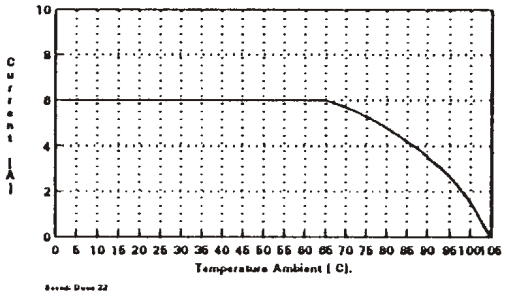
DUAC CONNECTOR.
DERATING CURVE.
Wire used: AWG 18.



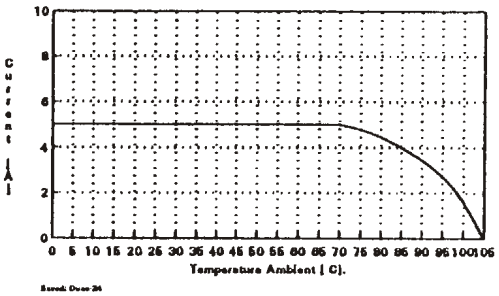
DUAC CONNECTOR.
DERATING CURVE.
Wire used: AWG 20.



DUAC CONNECTOR.
DERATING CURVE.
Wire used: AWG 22.



DUAC CONNECTOR.
DERATING CURVE.
Wire used: AWG 24.



DUAC CONNECTOR.
DERATING CURVE.
Wire used: AWG 26.